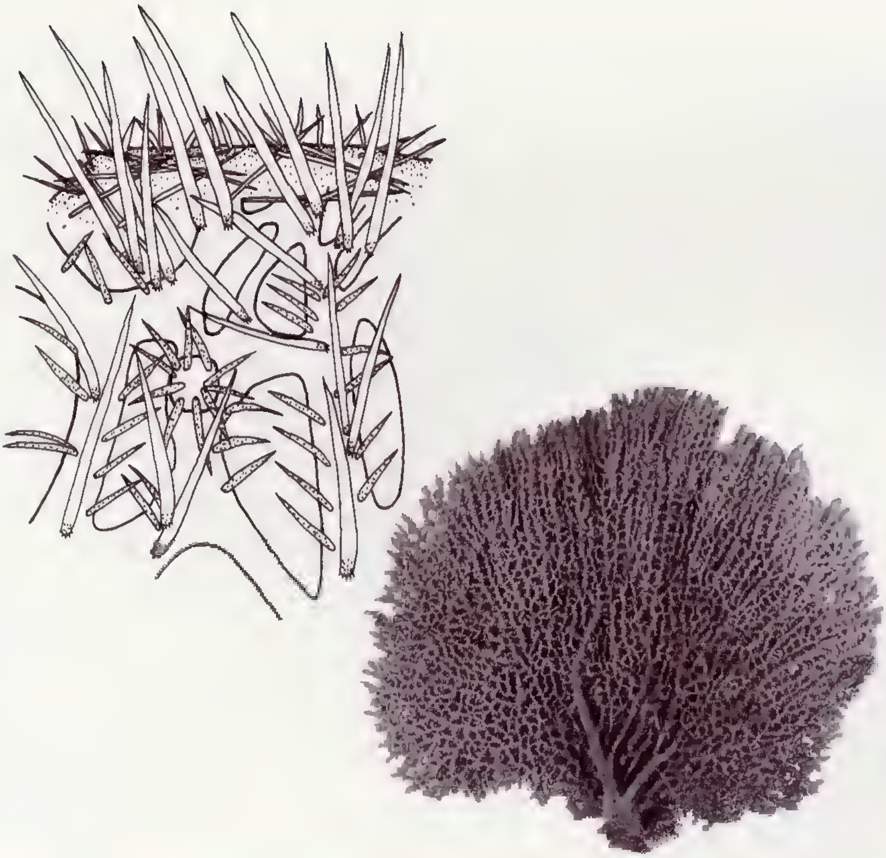
MEMOIRS

OF THE

QUEENSLAND MUSEUM



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REVISION OF MICROCIONIDAE (PORIFERA: POECILOSCLERIDA: DEMOSPONGIAE), WITH DESCRIPTION OF AUSTRALIAN SPECIES.

JOHN N.A. HOOPER

Hooper, J.N.A. 1996 07 01: Revision of Microcionidae (Porifera: Poecilosclerida: Demospongiae), with description of Australian species. *Memoirs of the Queensland Museum* **40**: 1-626. Brisbane ISSN 0079-8835.

A phylogenetic revision of the poecilosclerid Microcionidae is based on type material, the worldwide literature, and comprehensive Australian collections. Of 73 available generic names 7 genera and 12 subgenera are recognised here. Of 561 available species names 459 are considered valid (10 virtually unrecognisable), including 52 new species. The Australian fauna, including Australian Antarctic Territory, contains 148 species (31 new), many new records, most are new combinations, and many illustrated for the first time. A synonymy of world species is provided. Valid taxa include: *Clathria* (with 7 subgenera: *C.* (*Clathria*) (with 31 Australian species, 82 other species worldwide, with new species *murphyi, noarlungae,biclathrata, borealis, burtoni, sarai, saraspinifera*), *C.* (*Wilsonella*) (6, 8, *abrolhosensis, ensiae, lindgreni* spp. nov.), *C.* (*Microciona*) (5, 91, *illawarrae, lizardensis, simae, brondstedi, campecheae, claudei, hentscheli, leighensis, stephensae, tunisiae, urizae, vacelettia* spp. nov.), *C.* (*Dendrocia*) (7 species endemic to Australia), *C.* (*Axociella*) (6, 6, *patula , fromontae, georgiaensis* spp. nov.), *C.* (*Isociella*) (4, 1, *selachia, skia* spp. nov.), and *C.* (*Thalysias*) (36, 53, *aphylla, craspedia, darwinensis, fusterna, hallmanni, hesperia, lematolae, phorbasiformis, styloprothesis, tingens, wesselensis, amiranteiensis, hechteli* spp. nov.); *Antho* (with 3 subgenera: *A.* (*Antho*) (12, 10), *A.* (*Plocamia*) (2, 17) and *A.* (*Isopenectya*) (3,1, *punicea, saintvincenti* spp. nov.); *Echinoclathria* (14, 15, *bergquistae, levii, notialis, parkeri, riddlei* spp. nov.); *Holopsamma* (9 species endemic to Australia, 1 indeterminate species); *Echinochalina* (with 2 subgenera: *E.* (*Echinochalina*) (10, 2, *felixi* sp. nov.), *E.* (*Protophlitaspongia*) (8 species endemic to Australia and New Caledonia, *collata, favulosa, isaaci, tuberosa* spp. nov.)); *Artemisina* (4, 10); and *Pandaros* (*incertae sedis*) (0, 2). Generic keys are provided. Morphometric characters of primary importance include the origin, geometry and distribution of structural megascleres within the skeleton, modification of megascleres to monactinal or diactinal forms, the presence or absence of a specialised ectosomal skeleton, presence of detritus incorporated into spongin fibres, and overall skeletal structure (including compression of the axial skeleton and differentiation of axial and extra-axial regions). Brief zoogeographical comparisons are made between continental Australian and adjacent Indo-west Pacific faunas. Australian species comprise about 32% of the world's microcionid diversity; about 75% of species are endemic for the Australian region, and temperate species (81%) have higher levels of endemism than tropical species (59%). □ *Porifera, Demospongiae, Poecilosclerida, Microcionidae, family revision, new species, taxonomy, biogeography, Australia.*

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INTRODUCTION

Microcionidae is one of the largest families of Demospongiae, comprising about 8% of all described (extant) Porifera species (Hooper & Lévi, 1993a). The family has contained at one time or another about 70 genera and 550 species, although fewer than these are now recognised as valid. The family has a worldwide distribution and it is found from the intertidal zone to depths exceeding 2000m. It is clearly one of the more important, ecologically successful groups of Porifera.

Within the Indo-Australian region microcionids are particularly abundant, with some species being dominant components of the shallow water macrobenthos. Previous works describing this fauna (and other literature containing extra-limital records of Australian species) include: Lamarck (1814, 1815, 1816), Gray (1858, 1867, 1869, 1870), Bowerbank (1864, 1875, 1877), Barnard (1879), Kent (1871), Ridley (1884a), Ridley & Dendy (1886, 1887), Lendenfeld (1888, 1889a), Kieschnick (1896, 1900), Thiele (1898, 1899, 1900, 1903), Kirkpatrick (1900a, b), Whitelegge, (1901, 1902), Hentschel (1909, 1911, 1912), Hallmann (1912, 1914a-c, 1916a-c, 1920), Dendy & Frederick (1924), Topsent (1897b, 1930, 1932, 1933), Burton (1934a), Bergquist & Tizard (1967), Kelly-Borges & Bergquist (1988), Bergquist & Fromont (1988), Wiedenmayer (1989), Hooper (1990b), Hooper et al. (1991, 1992), Hooper & Lévi (1993a, 1994). A brief synopsis of the fauna is given by Hooper & Wiedenmayer (1994), although some of the nomenclature and synonymies contained in that earlier work are revised here.

Prior to the present study more than 200 species of Microcionidae had been described in the Australian fauna (including its territorial waters), but many of these were found to be either composite (consisting of several sibling species), or synonyms of other species. This study 1) describes 148 species (31 new), many new locality records for Australia and new taxonomic combinations; 2) provides an annotated synonymy for 311 other species worldwide (including 21 new species); 3) revises the morphometric characters used for classification and population variability for particular species; and 4) determines levels of endemism amongst provincial faunas.

MATERIALS AND METHODS

COLLECTION AND HISTOLOGICAL TECHNIQUES. Material examined in this study was predominantly collected using SCUBA (0-40m depth) or dredging and trawls (30-360m depth). Seasonal sampling for reproductive periodicity was conducted over two years in the Darwin and Cobourg Peninsula regions, NT. Immediately after collection specimens were either fixed in 80-100% methylated ethanol or frozen (which to some extent fixes the pigments), and later preserved in 70% alcohol. Reproductive products were searched for in fresh or frozen tissue.

Nitric acid spicule preparations, thick-sections and thin-section mounts were routinely made as follows. Fragments of each sponge, including ectosomal and choanosomal regions, were heated directly on a glass microscope slide in several drops in nitric acid (the solution was evaporated rather than boiled, using low heat), and mounted in Canada balsam once completely dry, and cooled. Thick, hand-cut sections were made perpendicular to the surface, soaked in a saturated solution of phenol and xylene (for approximately 24 hours), and mounted in Durcupan (ACM Fluka Products) using glass slivers or card to raise the coverslip level. Phenol-xylene precluded the necessity for dehydration through an alcohol series. Some microtome sections cut at 30-35m were made for each species. Fragments were passed through a dehydration series, cleared in toluene or Histosol, and wax embedded for at least 2 hours. Sections were cut from trimmed wax blocks (cutting from the centre of the block to the exterior so as to include both the outer surface and inner skeleton relatively intact), placed in clearing agent for an adequate period to dissolve wax and/or dewaxing on a hot plate, then soaked in ethanol until perfectly clear, floated onto albumen-coated slides, orientated and flattened, stained with basic fuccsin and mounted. Fragments of dry specimens (e.g., type material) were reconstituted in 5% buffered formalin for 12 hours, which produced rehydration of the mesohyl and enabled cleaner histological sections to be made.

MORPHOMETRIC ANALYSES. Spicules were measured with a stage micrometer, either directly through a microscope or computer digitiser. Twenty five spicules, of each spicule category, in all specimens were measured. Acanthostyle width measurements were taken immediately below the base. Toxa lengths refer to chord length; isochelae are measured from apex of alae; width measurements of other spicules refer to maximum width.

Spicule dimensions were sorted and statistically compared for various parameters (e.g., season, locality, depth), including one- and two-way ANOVs with replication, two-way ANOV with unequal replication, means differentiated using two-tailed t tests. Line-drawings were made using a calibrated camera lucida, and microphotographs were taken with an Olympus microphoto system. Taxonomic keys were constructed using ordered multistate, disordered multistate, morphometric and binary characters, utilising the DELTA system (Dallwitz & Paine, 1986).

SCANNING ELECTRON MICROSCOPY. Sections were prepared as follows:

1) Cut at 1-1.5mm thick, ensuring that both the ectosome and choanosome were represented.

2) Placed in a cavity block and covered with several drops of sodium hypochlorite to etch the mesohyl matrix from the skeleton. The etching process was monitored through a dissecting microscope in order to prevent the skeleton falling apart. Delicate structures (plumose, halichondroid, hymedesmoid skeletons) only required a few seconds treatment with bleach; robust skeletons (reticulate, fibrous, articulated

skeletons) required several minutes; but generally 30 seconds was adequate.

3) Bleach was pipetted off at the appropriate time and 70% ethanol immediately added. Sections were left to stand for several minutes to ensure bleach was completely neutralised.

4) Steps 2-3 were repeated, without removing section from cavity block, substituting concentrated hydrogen peroxide in place of sodium hypochlorite, finally rinsing in ethanol. The hydrogen peroxide step was omitted for very delicate sections.

5) Sections were placed on clean microscope slides and let dry completely.

6) Sections mounted on SEM stubs using double-sided tape, copper dag, or 'Supa Glue' (Supa Glue, Selleys Chemical Company, Padstow). An alternative method used to fix samples to stubs was to cover stub with 'Aquadhere' wood glue (Aquadhere, Selleys Chemical Company, Padstow), let dry completely (usually several days), then prior to use exposed dry glue to vigorous steam (which softened the set glue), and placed the section on top of the stub (it would sink in a short way but was bonded reasonably well to the stub, and had the advantage of producing a perfectly smooth background).

7) The stub was sputter-coated well to ensure that all fibres were well coated to reduce 'charging'. In some cases uncoated sections could be viewed successfully under low accelerator voltage, but better results were generally obtained on coated specimens at higher voltage. Typical viewing conditions used were 25kV, at close working distance to provide best depth of field and focus, and at low magnifications.

Spicule were prepared as follows:

1) Thinly cut sections including both ectosome and choanosome were placed in a durham tube (micro-test tube), to which drops of concentrated nitric acid are added, using drop-by-drop addition so as to control the oxidation reaction and production of by-product oxides.

2) Upon completion of acid digestion the durham tube was half filled with acid and gently heated over an alcohol flame, ensuring that only small bubbles form (low heat, no boiling), for 1-2 minutes.

3) Solution was let stand to cool, then centrifuged (approximately 4000rpm for 30 seconds).

4) Nitric acid was pipetted off leaving a spicule mass at the bottom of the tube, undisturbed.

5) Spicules were resuspended in fresh nitric acid and gently stirred using clean, fine, glass rod.

6) These steps were repeated if any collagen remained.

7) Spicules were resuspended firstly in demineralised water, 70% ethanol, then two series of 100% ethanol solutions, centrifuging and decanting the supernatant between each change of solution, finally ending with suspended spicules in a solution of absolute ethanol.

8) A micro-cover glass was adhered to an SEM stub using double-sided tap or copper dag, several drops of suspended spicules placed onto the cover glass, the alcohol-spicule solution ignited and spread across the glass with a glass rod or forceps until all ethanol was vaporised. Spicules bond to glass relatively firmly, but excess spicules could be blown off glass using compressed air, or spread out over the glass by adding further ethanol and igniting. The distribution of spicules on the cover glass was monitored under compound or dissecting microscope (magnification depending on spicule size). More drops of spicule solution added and this step repeated if too few spicules were present, ensuring not to overcrowd field of view for SEM photographic purposes.

9) An alternative method was used to produce a perfectly smooth background, using an 'Aquadhere' glue-coated stub, dried for several days then softened with steam, and spicules placed directly onto soft glue (in this case ethanol was not burnt but evaporated). Single spicules would sink into glue too far if it was too soft (i.e., left in steam too long).

10) Spicule coated stubs were sputter coated briefly and viewed at 25kV, minimum working distance and smallest apperture for best resolution.

ABBREVIATIONS

AAT, Australian Antarctic Territories; ABIP, Centro de Estudios Avanzados de Blanes, Instituto de Investigaciones Pesqueras Barcelona, Aquarium de Blanes, Gerona; ABRS, Australian Biological Resources Survey, Canberra; AFZ, Australian Fishing Zone; AHF, Alan Hancock Foundation, University of Southern California, Los Angeles; AIMS, Australian Institute of Marine Science, Townsville; AM, Australian Museum, Sydney; AMNH, American Museum of Natural History, New York; BMNH, The Natural History Museum, London; BPBM, Bernice P. Bishop Museum, Honolulu; CP, Cobourg Peninsula, NT; CPMNP, Cobourg Peninsula Marine National Park, NT; CSIRO, Commonwealth Scientific and Industrial Research Organisation, Marine Laboratories, Hobart, Cleveland and Perth; DAR, Darwin region, NT; DELTA, Description Language for Taxonomy computer software (Dallwitz & Paine, 1986); EIS, Environmental Impact Study; CSIROEMG, CSIRO Food Research Laboratory, Division of Food Processing, North Ryde, Sydney. EMU, Ensight (formerly Environmental Management Unit), Water Board (Sydney, Illawarra, Blue Mountains), Sydney; EPA, Environment Protection Authority, Sydney; EPALR, East Point Aquatic Life Reserve, Dudley Point, Darwin Harbour, NT; FNQ, far northern Queensland (Cooktown to Torres Straits); FUB, Freie Universität Berlin; GBR, Great Barrier Reef, Queensland; HNUK, Natural History Museum, Ham Nam University, South Korea; ICBUC, Instituto Central de Biologia, Universidad de Concepcion, Chile; ICZN, International Code of Zoological Nomenclature (see Anonymous, 1985); IM, Indian Museum (Zoological Survey of India), Calcutta; IMZUB, Istituto e Museo di Zoologia ed Anatomia Comparata della Università di Bari, Bari; IMZUN, Instituto e Museo di Zoologia dell'Università di Napoli, Naples; INM, National Museum of Ireland, Dublin; IZUG, Museo Civico di Storia Naturale di Genova, Genova; JCU, James Cook University of North Queensland, Townsville; KFAU, Zoologischen Sammlung der Universität Erlangen-Nürnberg, Erlangen; LFM, Merseyside County Museums (formerly Liverpool Free Museum), Liverpool; LMJG, Abteilung für Zoologie am Landesmuseum Joanneum (Landes Museum Jubileum Graz), Graz; MABA, Museo Argentino de Ciencias Naturales 'Bernardino Rivadavia', Buenos Aires; MCNP, Div. Invest. del Museo de Ciencias Naturales de la Plata, Argentina; MCZN, Museum of Comparative Zoology, Harvard University, Cambridge (Mass.); MEQ, mid eastern Queensland (Gladstone to Bowen); MHNG, Museum d'Histoire Naturelle de Genéve, Genéve; MLUM, Marine Laboratory of the University of Miami, Miami; MMBS, Mukaishima Marine Biological Station, Faculty of Science, Hiroshima University, Onomichi; MNHN, Muséum National d'Histoire Naturelle, Laboratoire de Biologie des Invertébrés Marins et Malacologie, Paris (DT, Topsent collections; DCL, Lévi collections; DJV, Vacelet collections; DNBE, Boury-Esnault collections); MOM, Musée Océanographique de Monaco, Monaco; MRAC, Koninklijk Museum voor Midden-Afrika, Tervuren; MRHN, Musée Royal d'-Histoire Naturelle de Belgique, Bruxelles; MTQ, Queensland Museum, Museum of Tropical Queensland, Townsville; NCIQ66C-, United States National Cancer Institute, Australian Institute of Marine Science shallow water collection contract (1984-91), Townsville (primary voucher samples now lodged in QM, others in NTM and USNM); NCIOCDN-, United States National Cancer Institute, Coral Reef Research Foundation shallow water collection contract, Chuuk State (voucher samples lodged in QM and USNM); NEQ, northeast Queensland (Bowen to Cooktown); NM, Natal Museum, Pietermaritzburg; NMB, Naturhistorisches Museums zu Basel, Basel; NMCIC, National Museum of Natural Sciences, National Museums of Canada, Ottawa; NMNZ, National Museum of New Zealand (formerly Dominion Museum), Wellington; NMV, Museum of Victoria (formerly National Museum of Victoria), Melbourne; NSM, National Science Museum, Tokyo; NSW, New South Wales; NT, Northern Territory; NTM, Northern Territory Museum of Arts and Sciences, Darwin; NTU, Northern Territory University, Darwin; NWS, Northwest Shelf region, Western Australia; PAUP, Phylogenetic Analysis Using Parsimony (see Swofford, 1991); PIBOC, Pacific Institute of Bio-organic Chemistry, Far East Scientific Centre, Academy of Sciences of the USSR, Vladivostok; PMJ, Phyletisches Museum, Jena; PNG, Papua New Guinea; QFS, Queensland Fisheries Service, Department of Primary Industries, Brisbane and Cairns; QLD, Queensland; QM, Queensland Museum, Brisbane; QVML, Queen Victoria Museum and Art Gallery, Launceston; RMBS, Roscoff Marine Biological Station, Roscoff, France; RMNH, Rijksmuseum van Natuurlijke Historie, Leiden; RRIMP, Roche Research Institute of Marine Pharmacology, Sydney (discontinued; sponge collections now held in AM); RSME, Royal Scottish Museum, Edinburgh; SA, South Australia; SAM, South Australian Museum, Adelaide; SEQ, southeast Queensland (Tweed River to Gladstone); SM, Musée Zoologique, Strasbourg; SME, Station Marine d'Endoume, Marseille; SMF, Natur-Museum und Forschungsinstitut Senckenberg, Frankfurt; TAS, Tasmania; TM, Museo e Istituto di Zoologia Sistematica dell'-Universita di Torino, Torino; TMAG, Tasmanian Museum and Art Gallery, Hobart; UAZD, University of Auckland, Zoology Department, Auckland; UB, Übersee-Museum, Bremen; UCT, South African Museum of Natural History, Cape Town; UQ, University of Queensland, Brisbane; USC, University of Southern California, Los Angeles; USNM, National Museum of Natural History, Smithsonian Institution, Washington DC; UZM, Zoologisk Museum, Universitetsparken, Copenhagen; VIC, Victoria; WA, Western Australia; WAM, Western Australian Museum, Perth; YPM, Peabody Museum of Natural History, Yale University, New Haven (Conn.); ZIL, Zoological Institute of Leningrad, Academy of Sciences Museum of Zoology, St Petersburg; ZMA, Zoölogisch Museum, Universiteit van Amsterdam, Amsterdam; ZMB, Museum für Naturkunde an der Humboldt-Universität zu Berlin, Berlin; ZMC, Zoologisk Museum, Copenhagen; ZMH, Zoologisches Institute und Zoologisches Museum der Universitat Hamburg, Hamburg; ZMUU, Uppsala Universitets Zoologiska Museet, Zoologiska Institutet, Uppsala; ZSN, Aquarium e Museo della Stazione Zoologica di Napoli, Naples; ZRS, Zoologiska Rijkmuseum, Stockholm.

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DEFINITION OF CHARACTERS

MINERAL SKELETON. The form, composition and division of the skeleton remains the most important character for classification of Demospongiae. Recent attempts at higher systematics of Demospongiae based on non-skeletal characters (e.g., Simpson, 1968a; Bergquist & Hartman, 1969; Bergquist, 1980a; Lee & Gilchrist, 1985; Hooper et al., 1992) have had only limited success because in many instances they are unable to corroborate all skeletal and non-skeletal evidence into a single systematics. In some cases amongst Demospongiae (e.g., Verongida), non-skeletal evidence has been decisive and to some extent well correlated with other characters. In other cases (e.g., Axinellida) that evidence has merely highlighted inadequacies in systematics based solely on skeletal morphology (Simpson, 1968a; Bergquist & Hartman, 1969; Bergquist, 1980a; Vacelet, 1985; Hooper et al., 1992).

COMPOSITION OF THE SKELETON. All microcionids are siliceous with discrete, free spicules. So far no desma-bearing species or hypercalcified 'relict' species are known. Many species undergo secondary acquisition, loss or reduction of spicule mineralisation, particularly when displaced by arenaceous particles (e.g., *Holopsamma*). *C.* (*Wilsonella*) is partly defined by this feature, with various degrees of arenaceous development among species; this trend is widespread throughout the Poecilosclerida.

ORGANISATION OF THE SKELETON. Gross organic and inorganic skeletal architecture, structural differentiation of the inorganic skeleton, and distribution of mineral components in that structure are primary diagnostics (Lévi, 1960a, 1973; Bergquist, 1978a; Hartman, 1982). However, when used alone skeletal architecture is not necessarily a reliable indicator of relationships. Hooper (1991, herein) noted that the so-called typical, compressed, axinellid-like skeleton of many Raspailiidae (*Raspailia pinnatifida*; Hooper, 1991: Fig.2b) also occurred in *C.* (*Axociella*) (Figs 7G, 119A). It is also probable that skeletal structure is influenced to some extent by environmental conditions, and there is some evidence to suggest that flexible, compressed axial skeletons are produced in response to high energy environments (e.g., Palumbi, 1984). Similarly, skeletal characters such as those found in encrusting species have obviously evolved independently in many (otherwise unrelated) taxa. Review of microcionid skeletal structures showed that species which were similar in spicule geometry had different skeletal architectures (Hooper, 1988).

Architectural types amongst the Microcionidae include: 1, hymedesmoid (with thin layer of basal spongin lying on the substrate containing erect megascleres (Fig. 7H); 2, microcionid (with a compressed basal spongin, producing ascending fibre nodes and plumose spicule columns) (Fig. 100F); 3, renieroid reticulate (consisting of a rectangular basal reticulation of uni- or paucispicular tracts fully enclosed within spongin fibres or cemented at their nodes by loose collagen) (Fig. 7C); 4, isotropic reticulation (a disorientated, random uni-, pauci- or multispicular reticulation in erect or massive forms, in which there is no distinction between primary or secondary tracts (not figured; seen only in nominal genus *Qasimella*); 5, isodictyal reticulation (reticulation with triangular meshes formed by uni- or paucispicular tracts of spicules, cemented at their nodes by collagen or fully enclosed within spongin fibres) (Fig. 131A); 6, regularly or irregularly reticulate (with large multispicular tracts and/or fibres forming irregular oval or rectangular meshes (Fig. 7A-B); 7, plumo-reticulate (producing ascending and consecutively diverging tracts and fibres, forming pauci- or multispicular primary lines, and interconnected by transverse uni- or paucispicular tracts and fibres) (Fig. 7D); 8, dendro-reticulate (similar to the preceding, but where ascending tracts are sinuous and more obviously diverging and branching than the less conspicuous transverse elements) (Fig. 231C); 9, plumose (with ascending and diverging primary lines that are not connected by transverse elements) (Fig. 7E); 10, axially or basally compressed (having a skeleton clearly divided into a compressed central or basal core of fibres and/or

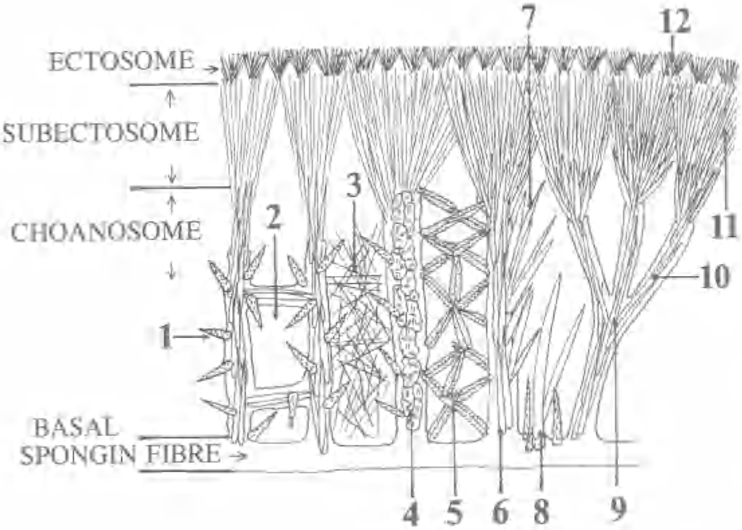


FIG. 1. Idealised microcionid skeletal structure. 1, Echinating acanthostyles. 2, Reticulate fibre skeleton; 3, Isotropic extra-fibre skeleton. 4, Detrital entrapping fibres. 5, Renieroid reticulate secondary fibre skeleton. 6, 'Microcionid' radial fibre skeleton. 7, 'Spicate' spicule skeleton. 8, Hymedesmoid spicule skeleton. 9, Plumose/dendritic fibre skeleton. 10, Coring principal spicules. 11, Subectosomal auxiliary spicules. 12, Ectosomal auxiliary spicules.

spicules, forming tight anastomosing meshes, and from which arise plumose or plumoreticulate extra-axial (subectosomal) fibres and/or spicules) (Fig. 7G). Some species have combinations of these skeletal structures with different structural types found in different parts of the skeleton (e.g., axis and periphery).

STRUCTURAL REGIONS OF THE SKELETON. The skeleton may be divided into three main structures or regions (Fig. 1): 1, ectosomal (outer perforated epithelium comprised of single elongate flattened pinacocytes, including an ectosomal skeleton, where present, arising from the mesohyl directly below the exopinacoderm); 2, choanosomal or axial core (central or basal region containing choanocyte chambers, fibres and spicule tracts and the mesohyl ground substance, in addition to the diverse and mobile cell types); 3, subectosomal or cortical zone (strictly part of the choanosome since it lies within the bounds of the external epithelial barrier, but is immediately subdermal, and the delineation of this region from the choanosome proper is based on the development of an extra-fibre in some species structurally differentiated from the deeper choanosomal or superficial ectosomal skeletons).

This system is used in conjunction with spicule nomenclature (Hallmann, 1912), based on origin of types: 1, principal spicules (Fig. 2A), robust, straight or slightly curved primary styles, subtylostyles, tylostyles or quasi-monactinal forms generally (but not invariably) confined within fibres; 2, auxiliary spicules (Fig. 2B), more slender, curved, sinuous or straight styles, subtylostyles, tylostyles or quasi-diactinal forms most commonly located outside fibres in the ectosomal or subectosomal skeletons, or dispersed throughout the mesohyl; 3, accessory spicules (Fig. 4), styles, acanthostyles or modified quasi-diactinal forms generally echinating fibres. Thus, most species have principal spicules coring fibres (=choanosomal principals), some (e.g., *Echinochalina*) have coring spicules derived from auxiliaries (=choanosomal auxiliaries), and some (e.g., *Clathria* (*Dendrocia*)) lack principal spicules altogether.

Ectosomal Skeleton. Within Microcionidae the ectosomal skeleton has been attributed greater importance (Van Soest, 1984b) than over elements such as choanosomal architecture and growth form (e.g., Lévi, 1960a; Berquist & Fromont, 1988), microsclere diversity (e.g., de Laubenfels, 1936a), or megascleres echinating fibres and choanosomal spicules (e.g., Hallmann, 1912, 1920). Within the family ectosomal development ranges from membraneous, without an ectosomal skeleton (Fig. 94F); membraneous, with a specialised tangential, reticulate fibre skeleton (Fig. 255C); with an ectosomal tangential reticulation of detritus (Fig. 92A); with subectosomal spicules erect, paratangential or tangential to surface (Fig. 65F), or forming discrete bundles (Fig. 59E); with special ectosomal spicules erect or paratangential to surface, forming a continuous palisade (Fig. 155G) or discrete bundles (Fig. 151F).

Subectosomal Skeleton. The region between choanosomal and ectosomal layers may or may not be differentiated into a subectosomal (subdermal or extra-axial) structure. This region may occupy a small proportion of the peripheral mesohyl (e.g., *Holopsamma*; Fig. 269D), or it may comprise the majority of sponge diameter

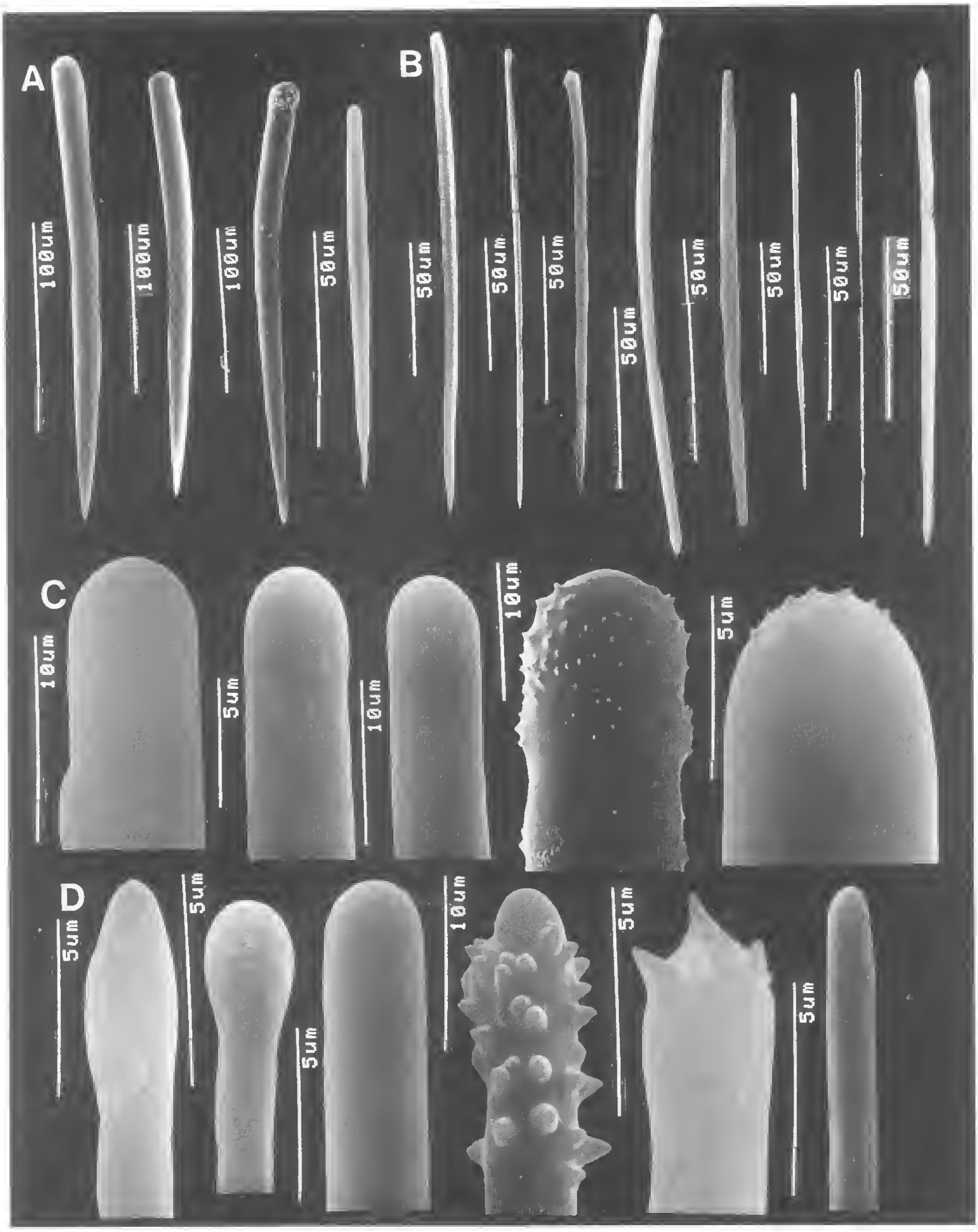


FIG. 2. Major structural megascleres. A, Principal spicules (style, subtylostyle, acanthostyle subtylostyle, hastate style). B, Auxiliary spicules (style, subtylostyle, rhabdose subtylostyle, spined subtylostyle, asymmetrical styloid, tornostyle, quasistrongyle, mucronate styloid). C, Bases of principal spicules (style, subtylostyle, hastate style, acanthose subtylostyle, vestigial basal spination). D, Bases of auxiliary spicules (pointed subtylostyle, tylostyle, style, acanthose style, terminal spines, tornostyle).

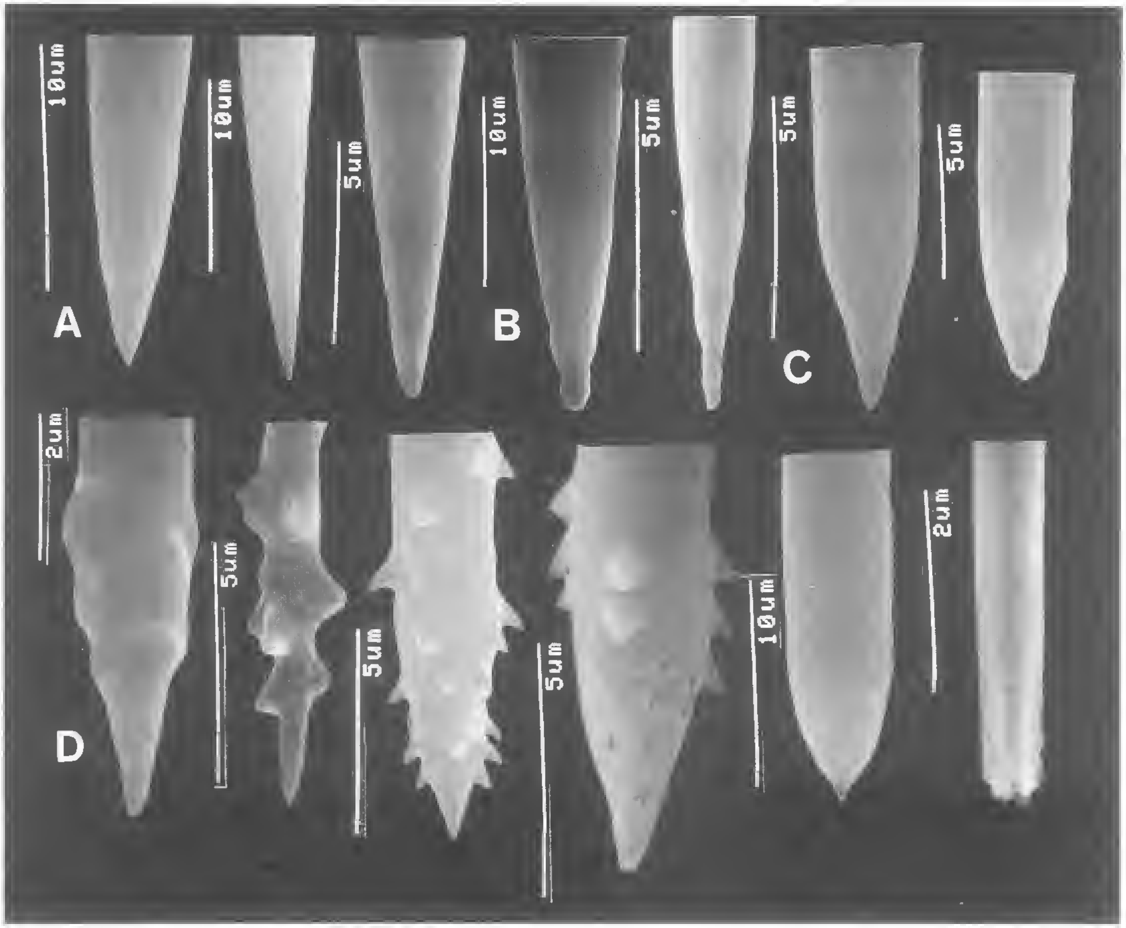


FIG. 3. Terminations of structural megascleres. A, Fusiform (pointed and rounded). B, Telescoped. C, Hastate (pointed and rounded). D, Spined (granular, tuberculate, terminal sharp, subterminal sharp, mucronate, bifurcate).

(e.g., *C.* (*Axociella*); Fig. 118F). When present, subectosomal extra-fibre development may be completely disorganised or it may be well organised into radial non-plumose bundles of spicules (Fig. 127B). The composition and geometry of spicules within the subectosomal skeleton varies from species lacking any form of subectosomal spicules (e.g., *C.* (*Microciona*); Fig. 102F), those with a single form of auxiliary spicule throughout the skeleton (e.g., *C.* (*Dendrocia*); Fig. 112D), those with two categories of structural megascleres, one in the ectosome and one in spongin fibres (e.g., *C.* (*Clathria*); Fig. 73F), to those with three forms of structural megascleres, all of which occur to some extent in the subdermal region (e.g., *C.* (*Thalysias*); Fig. 197G), and spicules may be monactinal (for most microcionid species; e.g., Fig. 28A-B), or quasi-diactinal (Fig. 298A-B), or truly diactinal (Fig. 307A-B) as seen in *E.* (*Protophlitaspongia*).

Choanosomal Skeleton. In Microcionidae skeletal structures are diverse (listed above), and traditionally important in classification. In terms of differentiated regions within the choanosomal skeleton there are species with simple reticulate fibres without any axial or extra-axial differentiation (Fig. 7C), those with marked axial and extra-axial differentiation of the choanosomal and subectosomal skeletons, which are structurally distinct from the peripheral skeleton (Fig. 7G), and those in which the choanosome is simply reduced to a basal layer of spongin lying on the substrate (Fig. 7H). Similarly, choanosomal skeletal tracts may be diversified into more than one element, including those with no obvious division of primary or secondary skeletal lines (Fig. 159F), those with more-or-less well differen-

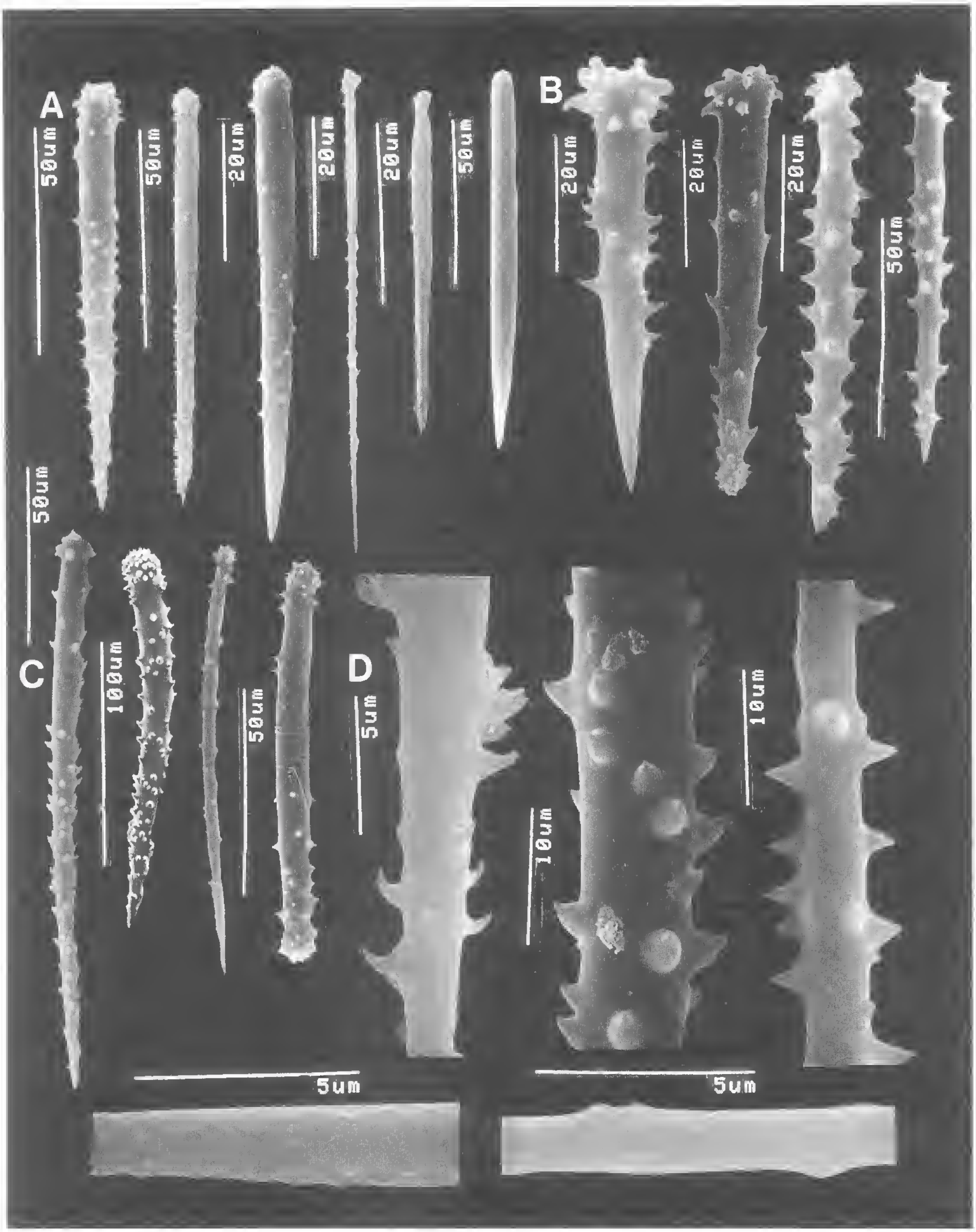


FIG. 4. Echinating and acanthose principal megascleres and spination. A, Microspined echinating acanthostyles (typical recurved spines, typical erect, vestigial, poorly silicified, hastate smooth, entirely smooth). B, Myxillid-like echinating acanthostyles (aspinose apex, clavulate apex, entirely spined, bare neck). C, Modified principal spicules (three forms of intermediate principal echinating spicules, acanthostrongyles). D, Spine geometry (greatly recurved spines, slightly recurved spines, erect spines, granular spines, tuberculate spines).

tiated primary (usually ascending) and secondary (usually transverse) lines of skeletal fibres or tracts (Fig. 48E), and those in which secondary (choanosomal) connecting tracts may be absent, leaving only radial primary lines (Fig. 227C).

DISTRIBUTION OF SPICULES WITHIN THE SKELETON. *Coring spicules*. (Fig. 2) Spicules coring spongin fibres or forming tracts within the skeleton (bound by loose collagen) range from principal megascleres (e.g., *C.* (*Clathria*); Figs 2A, 28A), auxiliary monacts (e.g., *C.* (*Wilsonella*); Figs 2B, 83A), auxiliary diacts or quasi-diacts (e.g., *E.* (*Echinochalina*); Figs 2B, 280B), hastate oxeas (e.g., *E.* (*Protophlitaspongia*); Figs 2B, 296A), secondarily incorporated echinating spicules (e.g., *C.* (*Thalysias*) *phorbasiformis*; Fig. 183G), acanthose principal styles, strongyles or rhabdostyles ('plocamiform' species; e.g., *A.* (*Plocamia*) *ridleyi*; Fig. 218C), coring spicules partially or completely absent replaced by foreign particles (detritus, algal filaments) (*C.* (*Wilsonella*); Fig. 91F; *Holopsamma*; Fig. 257D), primary fibres cored by principal styles, whereas secondary (connecting) fibres contain auxiliary megascleres (e.g., *C.* (*Thalysias*) *mutabilis*; not figured), primary fibres contain auxiliary spicules whereas secondary fibres mostly devoid of any spicules (e.g., *C.* (*Clathria*) *noarlungae* sp. nov.; Fig. 55F), axial fibres cored by auxiliary megascleres whereas peripheral fibres heavily arenaceous (e.g., *C.* (*Clathria*) *echinonematissima*; not figured).

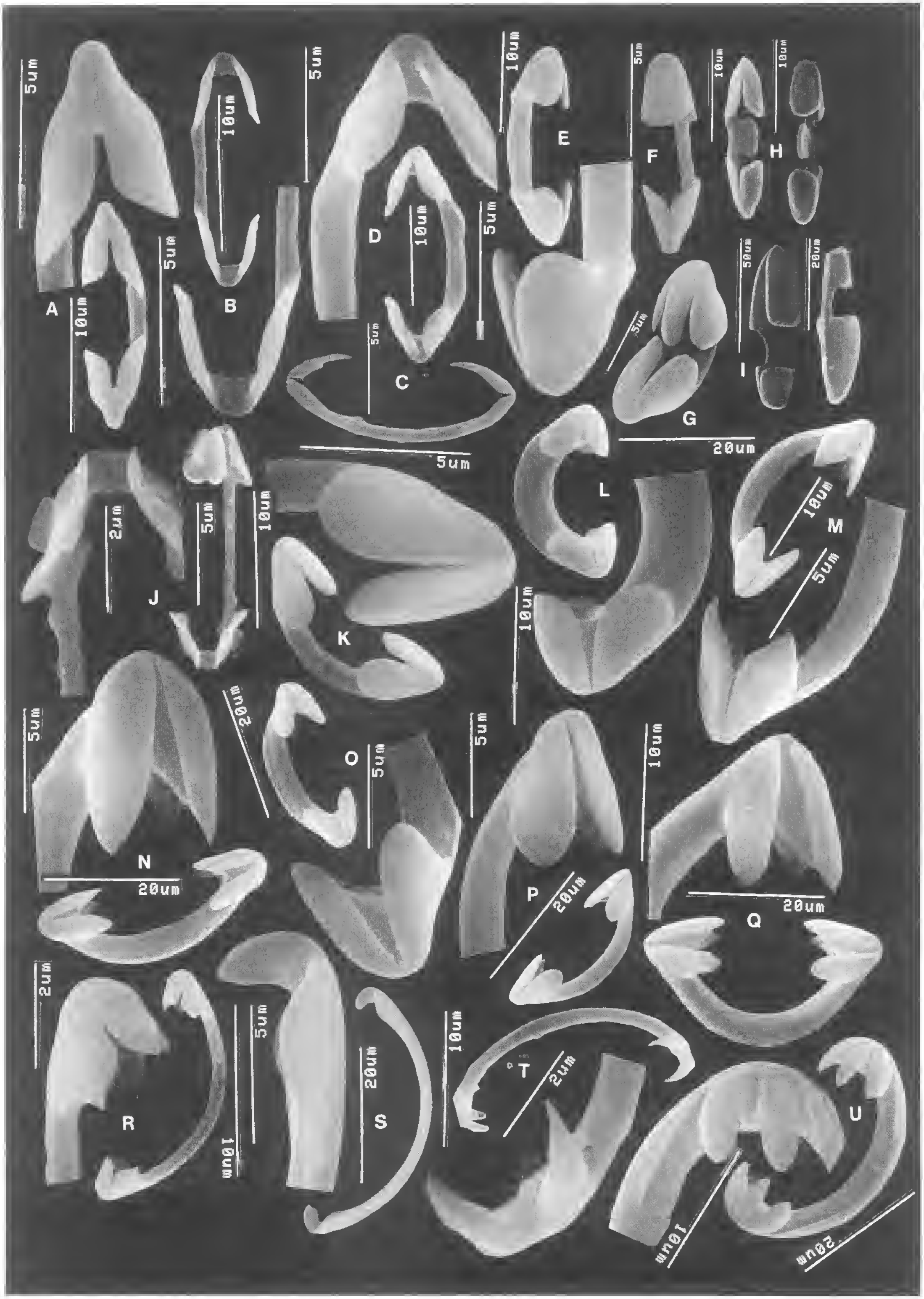
Echinating spicules. (Fig. 4) The presence, absence, distribution, geometry and secondary modification (including ornamentation) of echinating spicules (accessory spicules in the terminology of Hallmann, 1912) have been used as relatively important taxonomic characters by some authors (e.g., de Laubenfels, 1936a), whereas their importance in the supra-specific classification of the microcionids has been recently questioned (Simpson, 1968a; Van Soest, 1984b). The presence of echinating megascleres in the two families Microcionidae and Raspailiidae indicate the retention of an ancestral character by both families, interpreted as a synplesiomorphy (Hooper, 1991).

In Microcionidae echinating spicules may be absent (e.g., *C.* (*Axociella*), Fig. 124F; *C.* (*Isociella*), Fig. 134D; presumed to be a secondary loss), echinated sparsely by acanthostyles or styles (e.g., *C.* (*Clathria*) *nexus*; Fig. 53E), heavily echinated by acanthostyles or smooth styles (e.g., *C.* (*Thalysias*) *procera*; Fig. 187G), echinated by a second category of (acanthose) principal spicule (e.g., *A.* (*Antho*) *tuberosa*; Fig. 214F), or with both acanthose principal spicules and true echinating spicules present on fibres (e.g., *A.* (*Plocamia*) *ridleyi*; Fig. 218H).

Similarly, echinating spicules may be confined to the exterior surface of fibres (most microcionids), or clumped on basal spongin only and absent from ascending skeletal lines (e.g., *C.* (*Thalysias*) *tingens* sp. nov.; Fig. 201G), concentrated in tufts at fibre nodes or fibre junctions (*C.* (*Thalysias*) *spinifera*; Fig. 197G), concentrated on exterior edges of fibres, or exclusively on primary fibres, and/or in the peripheral skeleton only (e.g., *C.* (*Thalysias*) *abietina*; Fig. 138F), or secondarily incorporated into fibres (e.g., *C.* (*Dendrocia*) *myxilloides*; Fig. 112D).

Extra-fibre spicules. (Fig. 2) The distribution of structural megascleres within the choanosomal skeleton is certainly a feature relied upon by earlier authors (e.g., Carter, 1885 et seq.; Hallmann, 1912), but its value to the supra-specific classification has been recently questioned (Van Soest, 1984b). In most species these megascleres are confined within choanosomal fibres, lying parallel to fibres (e.g., *C.* (*Clathria*) *raphana*; Fig. 67D), or in the case of encrusting species, embedded in basal spongin (e.g., *C.* (*Microciona*) *illawarrae* sp. nov.; Fig. 100F). In other species they may core choanosomal fibres but also occur as plumose brushes on fibre endings (e.g., *C.* (*Thalysias*) *spinifera*; Fig. 197G). Choanosomal spicules may also poke out of fibres, much like echinating spicules (termed 'spicate'), forming plumose tracts near the surface (e.g., *C.* (*Thalysias*) *major*; Fig. 181A), or they may be absent from the fibre core, standing perpendicular to the nodes or fibre junctions (e.g., *C.* (*Clathria*) *biclathrata*; Fig. 30G), strewn in loosely aggregated, halichondroid, extra-fibre tracts (e.g., *E.* (*Echinochalina*) *anomala*; Fig. 277A), form a renieroid structure, without a fibre component, but merely bound at the nodes by loose collagen (e.g., *C.* (*Clathria*) *angulifera*; Fig. 26F).

SPICULE GEOMETRY. Spicule geometry is an important, sometimes ultimate (e.g., de Laubenfels, 1936a), feature of existing sponge classifications, based largely on the great diversity of megascleres and microscleres throughout the Porifera. This theoretical basis of sponge systematics using the mineral skeleton rests heavily on the assumption that morphogenesis of megascleres and microscleres is a function of the genotype (e.g., Reid, 1963). Whilst there is no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evidence to reject this hypothesis there is certainly some experimental data to show that spicule geometry and morphogenesis is at least partly influenced by environmental perturbations (e.g., Hartman, 1981; Jones, 1991), including examples from the Microcionidae (e.g., influence of seasonality (Simpson, 1978) and geographical distribution (Hooper et al., 1990) on spicule size and geometry). But the extent to which these phenotypic modifications occur within natural populations has not yet been examined rigorously. In general, however, these features appear to be relatively stable across wide geographical ranges as shown by studies on raspailiids (Hooper, 1991) and microcionids (Hooper & Lévi, 1993a) from east and west coasts of Australia and the western Pacific. Hartman (1981) and Simpson (1990) outline the various theories on the functional significance, process of silicification and evolution of demosponge spicules.

STRUCTURAL MEGASCLERES. *Spicule axes*. Microcionidae have exclusively monaxonic spicule axes. Megascleres are usually monactinal, although some may have modified secondary axes (i.e., anisoxeote diactinal modifications to styles), and a few appear to have true diactinal forms (*E.* (*Protophlitaspongia*)). Unlike *Trikentrion* and *Cyamon* in the allied Raspailiidae (Hooper, 1991) there are no tetraxonic spicule modifications in this family (triactinal, tetractinal or polyactinal forms). Furthermore, the Microcionidae have a comparatively small range of structural megasclere types in the skeleton, whereas some raspailiids have many. Major types of structural megascleres are illustrated in Figs 2-4. These range from hastate styles or tylostyles (Fig. 87A), fusiform styles or tylostyles (Fig. 77A), asymmetrical styloid, rounded, quasi-diactinal or strongylote spicules (Fig. 280B), and oxeote megascleres (Fig. 296A).

Spicule ornamentation. Spines on megascleres are of dubious importance to supraspecific classification (e.g., Simpson, 1968a), although they have been used frequently in the past to define genera (e.g., de Laubenfels, 1936a). Microcionid structural spicules frequently have basal microspines (Fig. 2C-D), occasionally with spines on shafts (Fig. 180B) or points of spicules (Fig. 3D). Spicule ornamentation ranges from entirely smooth (Fig. 28A), smooth shafts with acanthose bases (Fig. 30A), vestigial spination on the proximal portions of shafts only (Fig. 153A), acanthose on both bases and points (Fig. 83A), or entirely acanthose (Fig. 98A).

ECHINATING MEGASCLERES. There is a diverse range of echinating spicule geometries in Microcionidae, although not as great as in Raspailiidae. Major types (Fig. 4) include: evenly spined (granular), claviform or stump-like acanthostyles; acanthose styles with aspinose bases; acanthose styles with aspinose points; acanthose styles with aspinose 'necks' (i.e., area proximal to the basal swelling); acanthostrongyles; entirely smooth styles identical in geometry to principal megascleres; derived oxeotes; or entirely smooth stylotes of different geometry than principal spicules.

MICROSCLERES. The geometry, ornamentation and modification of microscleres is an important character for classification (Dendy, 1921), although it has probably been overemphasised by some authors (de Laubenfels, 1936a) and its primary importance has been questioned (Van Soest, 1984b). Within Microcionidae there are two forms of diactinal microscleres: meniscoid forms (chelae) and toxas. Other poecilosclerid microscleres (microxeas, raphides and meniscoid forms such as true sigmas) are not present. Microcionids show many modifications to both chelae and toxas, the latter sometimes resembling microxeas, and frequently microscleres are lost altogether.

FIG. 5. Chelae geometry (A-H,J-N, Microcionidae; I,O-U, Other poecilosclerids). A, Palmate (*C. australiensis*). B, Palmate, reduced alae (*C. australiensis*). C, Palmate sigmoid, vestigial alae (*C. hesperia* sp.nov.). D, Palmate, arcuate-like alae with straight shaft (*C. oxyphyla*). E, Palmate, fused alae (*C. curvichela*). F, Palmate, contort (*C. abietina*). G, Palmate, arcuate-like fusion (*C. macropora*). H, Palmate, central wing on shaft (*C. toxipraedita*). I, Palmate, anisochelate (*Mycale*). J, Palmate, arcuate-like alae, fluted alae (*C. macropora*). K, Arcuate-like, fusion of alae, curved shaft, alae practically fused together (*C. grisea*). L, Arcuate-like, unguiferous, detached alae (*C. scabida*). M, Anchorate-like, unguiferous, tooth-like alae (*C. scabida*). N, Arcuate-like, unguiferous, tooth-like alae (*C. myxilloides*). O, True arcuate (*Ectyodoryx*). P, Arcuate, unguiferous (*Ectyodoryx*). Q, Arcuate, unguiferous, tooth-like alae (*Crella*). R, Palmate unguiferous (*Crella*). S, Palmate, unguiferous, vestigial alae (*Hamigera*). T, Arcuate, unguiferous, tooth-like alae (*Monanchora*). U, Anchorate, unguiferous (*Monanchora*).

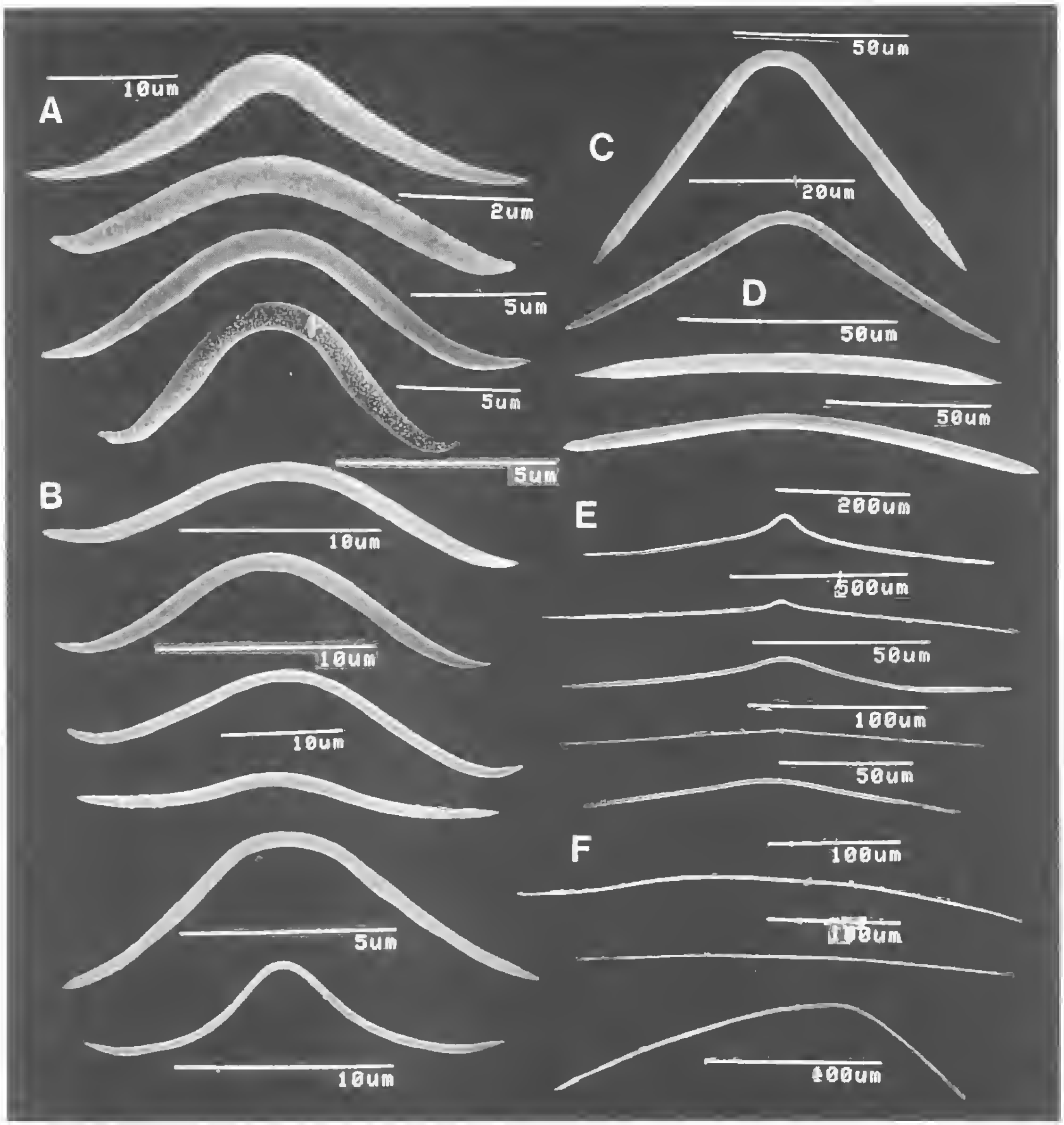

FIG. 6. Toxa geometry. A, Oxhorn. B, Wing-shaped (intermediate oxhorn-accolada. C, U- and V-shaped. D, Oxeote. E, Accolada. F, Sinuous and raphidiform.

CHELAE. These are autapomorphic for Poecilosclerida, although Hajdu et al. (1994b) suggested that the *Isodictya* might belong to Haplosclerida (with chelae retained as an ancestral feature), although it is more likely that its niphatid-like isodictyal skeleton is merely convergent on the haplosclerid condition. There are many geometric modifications possible to chelae (Fig. 5) which Hajdu et al. (1994a) proposed could be accomodated into three main lines: palmate, arcuate and anchorate (the latter two also termed bidentate- or tridentate-derived). These authors hypothesised further that chelae geometry might be an absolute indicator of phylogeny for the Poecilosclerida based on the assumption that they might be less susceptible to phenotypic modifications than structural spicules, following the arguments of Dendy (1921, 1922). This interpretation is based on parsimony and to some extent is corroborated by other evidence (such as congruence of structural features). There are, however, some anomolous examples of chelae that fall between these three categories (see Discussion).

Palmate. (Fig. 5A-B) This is the simplest form with 'typical' morphology consisting of straight shaft, front ala completely free and well developed, and lateral alae more-or-less completely fused to the shaft along its longest dimension. Most microcionids have unmodified 'typical' palmate isochelae. Modifications to this 'typical' palmate form include: partial reduction of alae (Fig. 5B), nearly vestigial alae producing a sigmoid spicule (Fig. 5C), partial fusion of alae along lateral margins producing spatulae (Fig. 5E), partial fusion (Fig. 5G) or complete fusion along medial margins in which both the front alae meet and/or fuse at the centre producing cleistochelae (Fig. 76G), sculpturing on fluting on alae (Fig. 5J), contortion of the shaft such that alae are at 90° to each other at each end of the shaft (Fig. 5F), expansions of the lateral alae fused with the shaft producing wing-like process on the shaft (Fig. 5H), 'crocae' or j-shaped sigmoid forms where the alae are vestigial and asymmetrical, producing a simple hook-like spicule (Fig. 17F), and deep curvature of shaft and reduction of alae to tooth-like structures (termed unquiferous; Fig. 5R-T).

Arcuate. (Fig. 5O) Here the lateral alae are more fully developed than in palmate forms and become almost completely detached from the shaft, and the shaft is usually prominently curved and thickened. However, there is no clear transition between the palmate and arcuate forms, whereby an increase in curvature and thickening of the shaft (Fig. 5D-E) and partial detachment of lateral alae (Fig. 5J-K) extend along a continuum from true palmate to true arcuate (compare Fig. 5D, G, J-L, N-Q, T). Somewhere along this continuum chelae are deemed to be arcuate (Fig. 5O-P).

Anchorate. (Fig. 5U) Further along the continuum are anchorate chelae, in which all three alae are fully formed, the lateral ones completely detached from the shaft, and there are also lateral ridges on the shaft. In this study I use the terms 'arcuate-like' or 'anchorate-like' for modified chelae although it is equivocal whether these spicules are truly arcuates or anchorates.

TOXAS. Toxas are found in only a few families of poecilosclerids but also known from Haplosclerida. There is also some evidence to suggest that they may be particularly common in young or larval tissue (e.g., Simpson, 1968b). Eight major morphotypes are delineated here (Fig 6), although intermediates are also possible: 1, Oxhorn toxas (wide central curve, reflexed arms and greatly recurved points; usually thick) (Fig. 6A); 2, Wing-shaped toxas (sharply curved at centre, with recurved arms and reflexed points; usually thick) (Fig. 6B); 3, U-shaped toxas (with wide central curvature but lacking reflexed arms) (Fig. 6C); 4, V-shaped toxas (pinched hairpin-like central curvature, straight arms running more-or-less vertical, and slightly reflexed points; usually thick) (Fig. 6C); 5, Oxeote toxas (virtually straight shaft and points) (Fig. 6D); 6, Accolada toxas (wide or slightly pinched central curvature, strait arms running more-or-less horizontal, and strait points; usually thin) (Fig. 6E); 7, Raphidiform toxas (sharply angular central curvature, straight arms and straight points; very thin, hair-like) (Fig. 6F); and 8, Sinuous toxas (asymmetrical, sinuous, raphidiform; very thin, hair-like) (Fig. 6F). The presence or absence of microspines on toxas was at one time considered to be an important supraspecific character (e.g., de Laubenfels, 1936a), but these have since been found in many genera and may not be important above the species level.

SIZE OF SPICULES. Variation of spicule size has also been an important diagnostic criterion, but this has been applied mainly at the species level of classification. Numerous (possibly a majority) of taxa have been erected solely on the basis of megasclere and microsclere dimensions, but only a few studies have investigated the statistical variability of spicule size or commented on the effects of physico-chemical factors on that variability (e.g., Hartman, 1958, 1981; Jones, 1984). There is some evidence to show that intraspecific variability can be significant for a given taxon, and spicule size-ranges can span across several closely related taxa which were otherwise erected solely on that basis. Hooper et al. (1990) demonstrated that two sibling species of *Clathria (Thalysias)* could not be reliably distinguished by their absolute spicule sizes, and only statistical comparisons between these species were of any value in this regard. Thus spicule dimensions used as diagnostic characteristics are of most significance at the species level of classification, and consequently their application is generally comparative rather than absolute.

ORGANIC SKELETON. The development of the organic skeleton, the amount of spongin it contains, its architecture and foreign inclusions contained within it, are diagnostic features for the Demospongiae in general. The organic skeleton

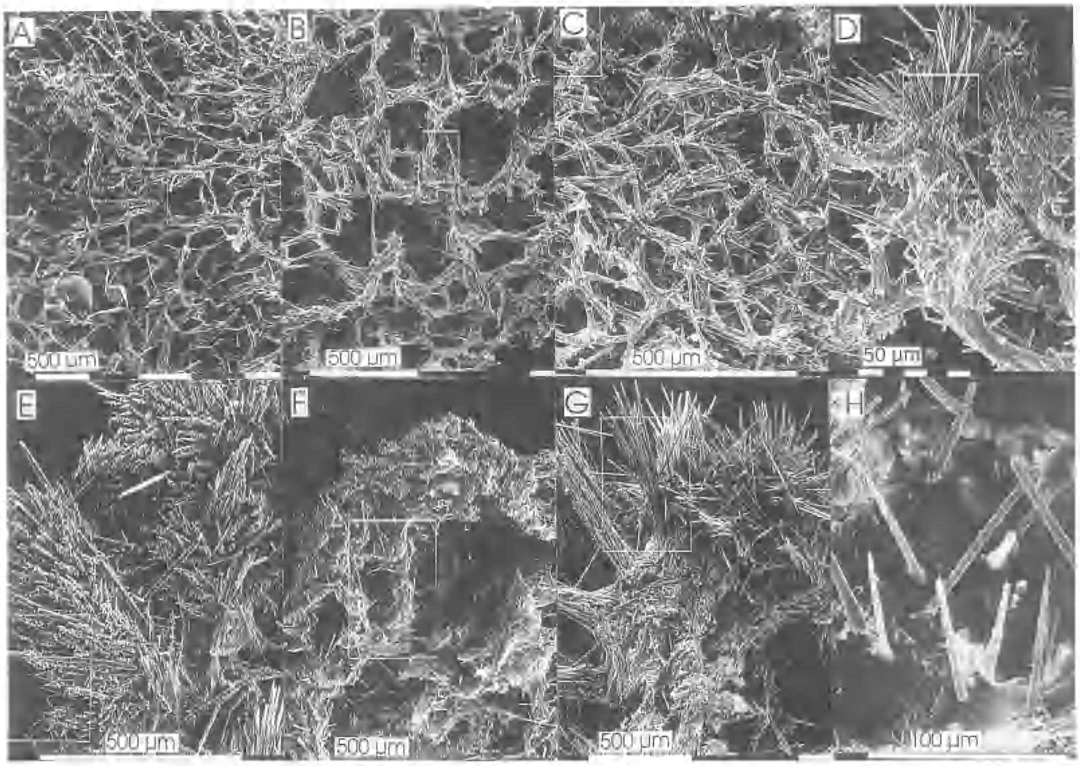

FIG. 7. Examples of microcionid skeletal structures, A, Regularly reticulate (*C.*(*C.*) *noarlungae* sp.nov.). B, Irregularly reticulate (*C.* (*C.*) *multipes*). C, Renieroid reticulate (*A.* (*I.*) *chartacea*). D, Plumoreticulate (*C.* (*T.*) *reinwardti*). E, Plumose (*C.* (*T.*) *procera*). F, Arenaceous (*C.* (*W.*) *tuberosa*). G, Axially compressed, extra-axially radial (*C.* (*A.*) *canaliculata*). H, Hymedesmoid (*C.* (*M.*) *tingens*).

can be differentiated into two components: a fibre system and a collagenous mesohyl.

Spongin fibres. These may be well developed, present but relatively lightly developed, secondarily lost, with or without spicule tracts, or even replaced partially or entirely by algal filaments (e.g., *Anomoclathria* (Fig. 9A-B)). Simpson (1984) elucidates two morphological types of spongin fibres (= type A spongin of Bergquist, 1978a): those that are cored by siliceous spicules and those that incorporate foreign particles.

Detrital-entrapping fibres are most prevalent in the 'keratose' sponges (Dictyoceratida, Dendroceratida, Verongida), Haplosclerida (*Arenosclera*), and Poecilosclerida of the Desmacididae (*Psammascus*, *Desmapsamma*), as well as several species of Microcionidae (i.e., *C.* (*Wilsonella*) and *Holopsamma*). In these species fibres may be totally void of true megascleres (e.g., *Holopsamma laminaefavosa*), or they may have a combination of both foreign particles and indigenous megascleres (e.g., *C.* (*Wilsonella*) *tuberosa*). The independent occurrence of detrital-entrapping fibres throughout the various orders of Demospongiae indicates that it is a character of ecological importance rather than of any phylogenetic significance.

Spiculose fibres are typical for microcionids, and the form, size, orientation and origin of megascleres coring the organic skeleton, and the structural complexities of the fibres themselves are important diagnostic characters for this family. In encrusting species that have a basal layer of spongin anchoring themselves to the substrate this spongin is continuous with the spiculated fibres, and as such both actually lie outside the living organism (Weissenfels, 1978).

Mesohyl. The development of collagen in the mesohyl matrix, also termed 'interstitial' spongin, extra-fibre spongin, type B spongin (Bergquist, 1978), or ground substance, and including collagenous fibrils, has not been given much value as a systematic character for the Microcionidae, whereas in the 'keratose' orders these features have more significance, and in *Aaptos* (Hadromerida) it has been used to differentiate species through deposition patterns (Kelly-Borges & Bergquist, 1995). However, within the Microcionidae there is evidence to show that the development of collagen throughout the mesohyl varies intra-specifically, especially between specimens in different reproductive condition or as a consequence of overwintering behaviour (e.g., *Pandaros acanthifolium*; Wiedenmayer, 1977; Van Soest, 1984b; *Microciona prolifera*; Simpson, 1963, 1968b; Knight & Fell, 1987). Simpson (1968a) attempted to define species and genera of Microcionidae on the basis of the organic skeleton and cytological characteristics but to a large extent his results did not corroborate with a classification based on the mineral skeleton, and in some cases evidence was directly conflicting.

GROWTH FORM. The use of external morphology as an important or even crucial diagnostic characteristic has diminished since early systematics (e.g., Lamarck, 1814). Bowerbank (1864), in developing Grant's (1861) scheme for the Porifera, de-emphasised sponge habit in his systematics although he recognised that growth form was related to 'anatomical peculiarities'. That external morphology is often closely linked to the internal architecture and composition of the skeleton has been well documented (e.g., Lévi, 1973; Bergquist, 1978). Although there are some groups which are immediately recognisable by their growth form and skeletal architecture (e.g., the honeycomb reticulate structure of *Holopsamma*), other groups show a higher degree of intraspecific variability in their morphology (e.g., most *Clathria*), ranging from encrusting to massive forms. Moreover, there is now evidence to suggest that gross morphology is highly plastic, greatly influenced by prevailing environmental conditions (temperature, depth, turbidity, currents, substrate etc.) (e.g., Hartman, 1958; Simpson, 1968a; Fry, 1971; Palumbi, 1984). It is not entirely clear to what extent abiotic factors influence growth form, or the degree to which genotype dictates possible shapes attainable by particular species, but it is becoming more apparent that the sponge 'species' is not as immutable as previously suspected. Palumbi (1984) proposed that sponges have evolved to be capable of producing a quick and decisive response to environmental adversities (unpredictable, high energy environments), and those responses are most readily seen as changes to both growth form and skeletal structure (e.g., the degree to which the skeletal becomes compressed). It is also not clearly understood why some species seem to be highly plastic (e.g., *C.* (*Thalysias*) *lendenfeldi*) (Hooper et al., 1990), whereas others with comparable depth and geographical distributions are much more conservative (e.g., *C.* (*Thalysias*) *abietina*). Growth forms, as characters used in a classification, can be defined as determinate (e.g., *Holopsamma*, *C.* (*Microciona*)) or indeterminate (e.g., most other *Clathria*, *Antho*).

CONSISTENCY. Sponge texture is a highly subjective characteristic, which is difficult to quantify, but one which may provide clues as to the composition of the skeleton, the amount of spongin present, whether or not detritus is incorporated into the sponge, and silicification of the skeleton (Bergquist, 1978). A description of sponge consistency is usually an integral part of any species description, but its application in systematics has been mostly comparative rather than absolute. More recently de Weerdt (1985) used consistency as an objective feature in the systematics of Haplosclerida. She noted that it was not only useful in characterising particular species but that in broad terms,texture was able to be used at the family level of classification. For the Microcionidae this character does not vary greatly, with most species being firm, compressible, flexible (e.g., *Clathria* (*Thalysias*)) or soft, compressible, spongy (e.g., *Holopsamma*).

MACROSCOPIC FEATURES OF THE SURFACE. *Surface sculpturing*. Macroscopic features of the sponge surface are important for some sponge groups (e.g., Haplosclerida), and surface ornamentation, such as tangential webs of spicules or fibres, perpendicular brushes of spicules, or elevated oscules may be diagnostic for particular genera. Within the Poecilosclerida however, including the Microcionidae, these features are less consistent, and they are usually only reliable in characterising particular species or occasionally genera (Simpson, 1968a). Encrusting species frequently exhibit intricate drainage canals radiating away from oscules, or highly hispid (furry) surfaces (e.g., *C.* (*Thalysias*) *toxifera*), whereas more massive or digitate species may have surface papillae or conules (e.g., *C.* (*Thalysias*) *abietina*), or a surface which is composed of reticulate ectosomal fibres (e.g., *Holopsamma globosa*).

Oscules. The distribution of oscules on the surface may vary considerably between related species, ranging from being confined to distinct pore areas, such as sieve-plates of *Echinochalina tubulosa*, or restricted to certain regions, such as lateral sides of branches, the tops of digits, or the exterior surface of vases, or scattered indiscriminantly over the surface. Oscules may also be conspicuous, discrete, with a membraneous lip, slightly raised or flush with the surface (e.g., *C. (Thalysias) reinwardti*), or terminal, raised on the apex of surface papillae or stoloniferous tubes (e.g., *C. (Isociella) eccentrica*), or scattered, conspicuous, producing a porous reticulate surface (e.g., *Holopsamma arborea*), or minute and not easily visible optically (e.g., *C. (Thalysias) coppingeri*).

COLOURATION. Sponge pigments are not generally diagnostic (Bergquist, 1978). Some species may show high intra-specific variation in live pigmentation, and this variability may be related directly to microhabitat and depth distribution. The nature of these pigments, their distribution within the mesohyl and their specific cellular association is still poorly known, but it is well established that carotenoids are predominant (Simpson, 1984). Isolation and identification of these pigments is more difficult, as is the determination of whether they are produced or modified by the host, or obtained directly from symbiotic associations (e.g., Litchfield & Liaaen-Jensen, 1980). The major proportion of sponge carotenoids are metabolised by the sponge (i.e., primary metabolites) and are intracellular (Simpson, 1984), whereas it is suspected that some sponges have a variable proportion (up to 20%) of pigments synthesised by symbiotic algae (e.g., Litchfield & Liaaen-Jensen, 1980; Liaaen-Jensen et al., 1982). Litchfield & Liaaen-Jensen (1980) studying *C. (Microciona) prolifera* suggested that the sponge could modify (aromatise) a large proportion of algal carotenoids, and Liaaen-Jensen et al. (1982) divide the classes of carotenoids into a phytoplankton-type, zooplankton-type, bacterial and/or fungal origin, and sponge metabolised (oxidative) groups. These authors found that phytoplankton derived and sponge metabolised carotenoids comprised the major proportion of carotenes in Demospongiae. The Poecilosclerida and Axinellida were found to exhibit the highest capacity for carotenoid accumulation and transformation, explaining their diverse and often brightly coloured pigmentation, and furthermore they possessed a similar carotenoid diversity.

Evidence suggests that carotenoid pigments may be photoprotective, in which case it would be expected that intertidal species contain a higher proportion of these pigments than deeper-water species. But it is not clear why some sympatric species have consistent pigmentation (e.g *C. (Wilsonella) tuberosa*), whereas in others pigmentation is highly variable even in specimens growing side-by-side (e.g., *C. (Thalysias) abietina*; Plate 4D). Colour consistency is not generally used as a reliable diagnostic character, but it is also true that only very few authors have investigated the intraspecific colour variability of any species. It is therefore advantageous to determine whether live colouration is stable and specific to a species, or has very narrow limits in variation (e.g., *C. (Isociella) eccentrica*). Alternatively, pigmentation may be highly unstable, not specific and without an accurately definable 'typical' colouration (e.g., *C. (Thalysias) abietina*).

REPRODUCTIVE PRODUCTS AND REPRODUCTIVE CYCLES. Reproductive products and modes of reproduction, as diagnostic characters, have been used predominantly at higher levels of classification (e.g., Bergquist, 1980a), whereas breeding seasons and spawning cycles are most useful for detecting sibling species (e.g., Fromont, 1989). As far as known, within the Microcionidae larvae are viviparous parenchymella with bare posterior poles. The apparent form of sexuality varies from gonochoristic to contemporaneous hermaphroditism (Fell, 1984, 1990; Simpson, 1984). Breeding seasons and/or spawning cycles may be continuous or periodical.

CYTOLOGY. Simpson (1984) provided a definitive treatment of sponge cell biology, including a description of diverse cell types and their functional morphology. He suggested that descriptions of characters such as cells with inclusions and the morphology of choanocyte chambers will probably provide further information directly relevant to demosponge systematics. For the Microcionidae, Simpson (1968a) showed that seemingly morphologically convergent genera could be readily differentiated by the presence and morphology of special cell types (gray cells), and that their higher systematic relationships could be defined in terms of cytological characters. However, there were many incongruities between systematics based on skeletal characteristics and those indicated by cytological data. Specific examples of these differences are discussed below in the synopsis of genera, but some general comments are appropriate.

Taxonomic groupings indicated by Simpson's microcionid cytological data suggested that many skeletal characters used previously by authors had little importance in differentiating genera. These included the presence or absence of palmate isochelae, the presence of acanthose versus smooth echinating megascleres, quantity of spongin in the skeleton, plumose versus anastomosing fibres, megascleres with basal spination or smooth bases, the presence of surface conules and distinct oscules, the production of upright branches, and the presence or absence of an ectosomal skeleton. With the exception of the last feature these conclusions are supported in the contemporary classification of Microcionidae (e.g., Van Soest, 1984b). However, other cytological evidence presented by Simpson (1968a) is more difficult to reconcile with microcionid skeletal data. For example, encrusting species (i.e., the nominal genera *Microciona* and *Ophlitaspongia*) were cytologically relatively homogeneous and distinct from ramose forms (*Clathria*). The cytological characteristics of these encrusting species were more similar to renieroid microcionids (nominal genus *Plocamilla*) than they were to the ramose forms (nominal genera *Rhaphidophlus* and *Thalysias*) which otherwise had the most similar spicule and surface characteristics.

Simpson concluded that generic definitions based primarily on spicule types did not lead to natural classifications, and he proposed that these definitions should include skeletal, cytological and histological evidence. He suggested that the numerous classification systems that were based solely on various combinations of skeletal characters, such as those of Vosmaer (1933, 1935a-b), de Laubenfels (1936a) and Lévi (1960a), could be defended with equal justification. Although some cytological features have been incorporated into existing systematics (e.g., morphology and arrangement of choanocytes), much of Simpson's (1968a) important work cannot be used in classification based primarily on skeletal characters.

SYSTEMATICS

Class **Demospongiae** Sollas, 1885

Order **Poecilosclerida** Topsent, 1928

Suborder **Microcionina** Hajdu, Van Soest & Hooper, 1994

Poecilosclerida Topsent, 1928a: 64, 309.

REMARKS. This order is the largest and most diverse of Demospongiae (Bergquist 1978). It is characterised by a skeleton of both spicule and spongin elements, usually well developed, sometimes vestigial, in which megascleres are monactinal, diactinal or both, and spongin development varies from well developed horny fibres enclosing spicules to an interspicular collagen cement (Bergquist, 1978; Hartman, 1982). Simpson (1984) suggested that the order is characterised by at least two distinctly localised types of megascleres (with or without distinctive geometry). Those megascleres are choanosomal principal spicules embedded in spongin fibres, and subectosomal auxiliary megascleres which are free in the mesohyl or protrude from spongin fibres in which they are embedded. This definition is consistent with the inclusion of Raspailiidae in the Poecilosclerida as proposed by Hooper (1991). Poecilosclerids usually have an abundantly collagenous mesohyl matrix, and microscleres may include chelae (apomorphic for the order), although not all taxa have them. Sexual reproduction is predominantly viviparous, oviparous in two families, and in those species incubating larvae they are parenchymella with uniform flagellum size and bare posterior poles.

The suborder Microcionina was established to include four families of Poecilosclerida (Microcionidae, Raspailiidae, Iophonidae and Rhabderemiidae), which have terminally spined ectosomal monactinal megascleres (occasionally modified to quasidiactinal forms), isochelae of palmate origin, diverse forms of toxas, up to five categories of megascleres and lacking sigmas. The other suborders (Myxillina and Mycalina) were also defined by their chelae morphology (bidentate-derived and sigmancistra-derived chelae, respectively), and absence of toxas and presence of sigmas, respectively (Hajdu et al., 1994), but assignment of particular genera to these suborders is still contentious.

The number of families recognised in the order varies according to different authors (e.g., Lévi, 1973; Wiedenmayer, 1977; Bergquist, 1978; Hartman, 1982; Van Soest, 1984b; Bergquist & Fromont, 1988). Recently Hooper & Wiedenmayer (1994) included 16 families in the order: 12 with chelae microscleres, 3 without chelae, and 1 of uncertain placement, whereas Hajdu et al. (1994) recognise 17: Microcionina (Microcionidae, Raspailiidae, Iophonidae, Rhabderemiidae); Myxillina (Myxillidae, Crambidae, Coelosphaeridae, Crellidae, Hymedesmiidae, Anchinoidae, Phoriospongiidae, Tedaniidae); and Mycalina (Mycalidae, Hamacanthidae, Desmacellidae, Cladorhizidae, Guitarridae). Latrunculiidae, included in the order by Lévi (1973) and Van Soest (1984b) has also been assigned to Hadromerida (Reid, 1968; Bergquist, 1978; Hartman, 1982), but is now considered to be polyphyletic (Kelly-Borges & Vacelet, 1995) with *Latrunculia* having affinities with Iophonidae and *Diacarnus*, *Sigmosceptrella*, *Negombata* more closely related to the Mycalidae.

Family **Microcionidae** Carter, 1875

Microcionina Carter, 1875. Microcionidae Hentschel, 1923; Wiedenmayer, 1977.

Clathriidae Lendenfeld, 1884a; Hentschel, 1923; Topsent, 1928a; Lévi, 1960a; Simpson, 1968a; Bergquist, 1978; Hartman, 1982; Van Soest, 1984b; Bergquist & Fromont, 1988.

Ophlitaspongiidae de Laubenfels, 1936a; Thomas, 1968; Hoshino, 1981.

Growth form encrusting, lobate, arborescent or flabellate; skeleton differentiated into choanosomal (axial), subectosomal (extra-axial) and ectosomal regions; axial skeleton formed by unispicular or multispicular tracts of choanosomal (principal) megascleres, typically coring spongin fibres or sometimes simply bound together by collagen; fibres echinated by (acantho-) styles (accessory spicules); skeletal structures include isodictyal, renieroid, reticulate, plumo-reticulate, plumose or hymedesmoid, but never radial; extra-axial skeleton formed by tracts of subectosomal (auxiliary) spicules, usually dispersed outside of fibres, rarely well organised but usually with some degree of difference between axial and extra-axial regions; ectosomal skeleton ranges from membraneous, or with protruding subectosomal (auxiliary) spicules, or with a special category of ectosomal (auxiliary) spicules; principal megascleres monactinal, predominantly smooth or partially spined only, occasionally vestigial or absent completely, or sometimes replaced by detritus in skeleton; auxiliary megascleres usually monactinal, rarely quasidiactinal, smooth shaft and basal spines, more slender than choanosomal spicules; echinating styles or subtylostyles smooth, partially or completely spined; microscleres include toxas of several morphologies (including raphidiform and microxeotes), and isochelae primarily of palmate origin (but occasionally with partial 'arcuate' and 'anchorate' modifications); larvae viviparous.

REMARKS. There has been disagreement as to which of Microcionidae Carter and Clathriidae Hentschel should be used. Wiedenmayer (1977: 139) argued that Microcionidae was established in 1875, whereas Clathriidae did not appear until 1884. He noted that under Article 40 of the International Code of Zoological Nomenclature (Anonymous, 1984), it was irrelevant whether or not *Clathria* Schmidt (1862) had priority over *Microciona* Bowerbank (1862; apparently published 1863). Conversely, Van Soest (1984b: 89) argued that the priority of *Clathria* over *Microciona* did have bearing on the choice of the family name. Although 'Clathriidae' is in current usage by most contemporary workers, its preferred use is in direct contravention with the Code and to long term stability of the group and Microcionidae is used here following Hooper & Wiedenmayer (1994).

The definition given above restricts Microcionidae to genera which possess predominantly smooth monactinal ectosomal and choanosomal spicules. It excludes certain microcionid-like genera which have true tylotes or strongylotes as their ectosomal spicules (e.g., *Acarnus*, *Megaciella*). These taxa are now referred to Iophonidae, as defined by their ectosomal features (Hajdu et al., 1994). However, the definition barely distinguishes species with modified or reduced quasidiactinal (styloid) auxiliary megascleres (e.g., several *Echinoclathria*, *Holopsamma* and *Echinochalina* species), or quasimonactinal (amphistrongylote or tornote-like) auxiliary megascleres (e.g., *E.* (*Protophlitaspongia*)). These modified auxiliary spicules are usually asymmetrical and are interpreted here as convergent upon true diactinal spicules. These anomalous microcionids share certain characteristics of both Microcionidae and Desmacididae, and the importance of these characters at higher levels of systematics must therefore be questioned, or a certain level of homoplasy must be accomodated in the phylogeny of the order.

Similarly, the definition given above cannot always clearly distinguish some Microcionidae and Raspailiidae, but this is a problem of semantics rather than a biological one. As a general rule most species of Raspailiidae have well compressed axial skeletons, and well differentiated axial and extra-axial skeletons. In contrast, most Microcionidae lack these features or they are only poorly developed and probably convergent, perhaps related to growth form (e.g., *Clathria* (*Axociella*)). Nevertheless, there are examples in both families where the boundaries between taxa blur, such as the microcionid-like *Raspailia* (*Clathriodendron*) *arbuscula* (see Hooper 1991: Figs 19-

20), and the raspailiid-like *Clathria* (*Axociella*) *canaliculata* (Figs 118-119)). These families are consistently differentiated by their ectosomal features and microscleres, which appear to be more important characters than skeletal structure.

Hajdu et al. (1994) restricted Microcionina (and hence Microcionidae) to taxa with only palmate isochelae, tacitly excluding several microcionid-like genera specifically created for species with bidentate-derived (arcuate or anchorate) chelae. Theoretically this is a viable system for the suprafamily classification of Microcionidae but in practical terms it is not always possible to distinguish between true bidentate-derived chelae and palmate chelae with 'arcuate-' or 'anchorate-like' modifications. These cases are discussed indivually below.

REVIEW. There are several problems in the taxonomy of Microcionidae that need to be addressed in order to clearly recognise and define valid genera and produce a phylogenetically valid systematics for the family.

1) The family is large, containing about 540 described species and many other as yet undescribed species known from various collections. 79 nominal genera have been previously included, of which 69 are currently recognised as residing here although fewer than this number are valid. Some of these genera have been merged in others by previous authors (e.g., Lévi, 1960a; Simpson, 1968a; Van Soest, 1984b; Bergquist & Fromont, 1988; Hooper, 1990a), but in some cases these synonymies are now deemed wrong and have produced further nomenclatural complexities. Several contemporary studies have attempted partial revisions of Microcionidae (Van Soest, 1984; Bergquist & Fromont, 1988; Hooper, 1990a), but these have mainly focused on smaller regional faunas without consideration of all the higher taxa. In the present work each of these genera is redefined and illustrated from its type species (i.e., strict definition).

2) The literature on Microcionidae is vast, scattered, mostly antiquated (pre-1900), descriptions are far too brief for modern purposes and many taxa have never been illustrated. The present work deals primarily with museum material and living populations of species, and decisions are less reliant on the literature than previous studies.

3) There are many characters in sponges whose expressions (character states) change subtly within populations of supposedly single species and across the whole range of species, usually without clear boundaries between related taxa. Some of these characters have been used as important diagnostic criteria in earlier works. This study has examined large numbers of specimens and species, and documents the range of intraspecific and inter-specific character states in an effort to clearly define taxa and understand relationships between them. Inclusion of nonskeletal evidence into the systematics can further support or refute opinions based solely on skeletal characters and gross morphology (to decide whether one character is more important than another, whether morphological characters are homologous, and whether the observed high levels of homoplasies within most Poriferan classifications are in fact real or acceptable). The previous studies of Hooper et al. (1990) and Hooper (1990a) are preliminary to this study.

4) There are nearly as many subjective interpretations between different authors, as to the phylogenetic importance of one character over another in the systematics, as there are taxa. This has arisen partly as a consequence of over reliance on definitions of type species (and hence nominal genera) from the literature (especially the work of de Laubenfels, 1936a), given that many type species are poorly described, misdescribed or barely differentiated from their cogeners. The present study uses a phylogenetic framework to produce an objective and consistent taxonomy for the family. Two previous studies (Van Soest, 1984b; Hooper, 1990a) partially resolved intrafamily relationships within Microcionidae, both are preliminary to this work.

GENERIC NAMES INCLUDED IN MICROCIONIDAE

Preoccupied generic names are shown in square brackets. The synonomy lists provided in this section refer to works in which the name is used and in the case of genera considered valid do not include the numerous synonyms. The diagnoses provided in this list are based solely on the type material of the type species unless otherwise stated.

[Abila] Gray, 1867
(Fig. 8A-B)

Abila Gray, 1867: 539.
Not *Abila* Gray, 1867: 522.

TYPE SPECIES. *Microciona laevis* Bowerbank, 1866: 124 (by monotypy) (holotype BMNH1877.5.21.1543).

Encrusting growth form. Surface hispid, even. Choanosomal skeleton composed of short

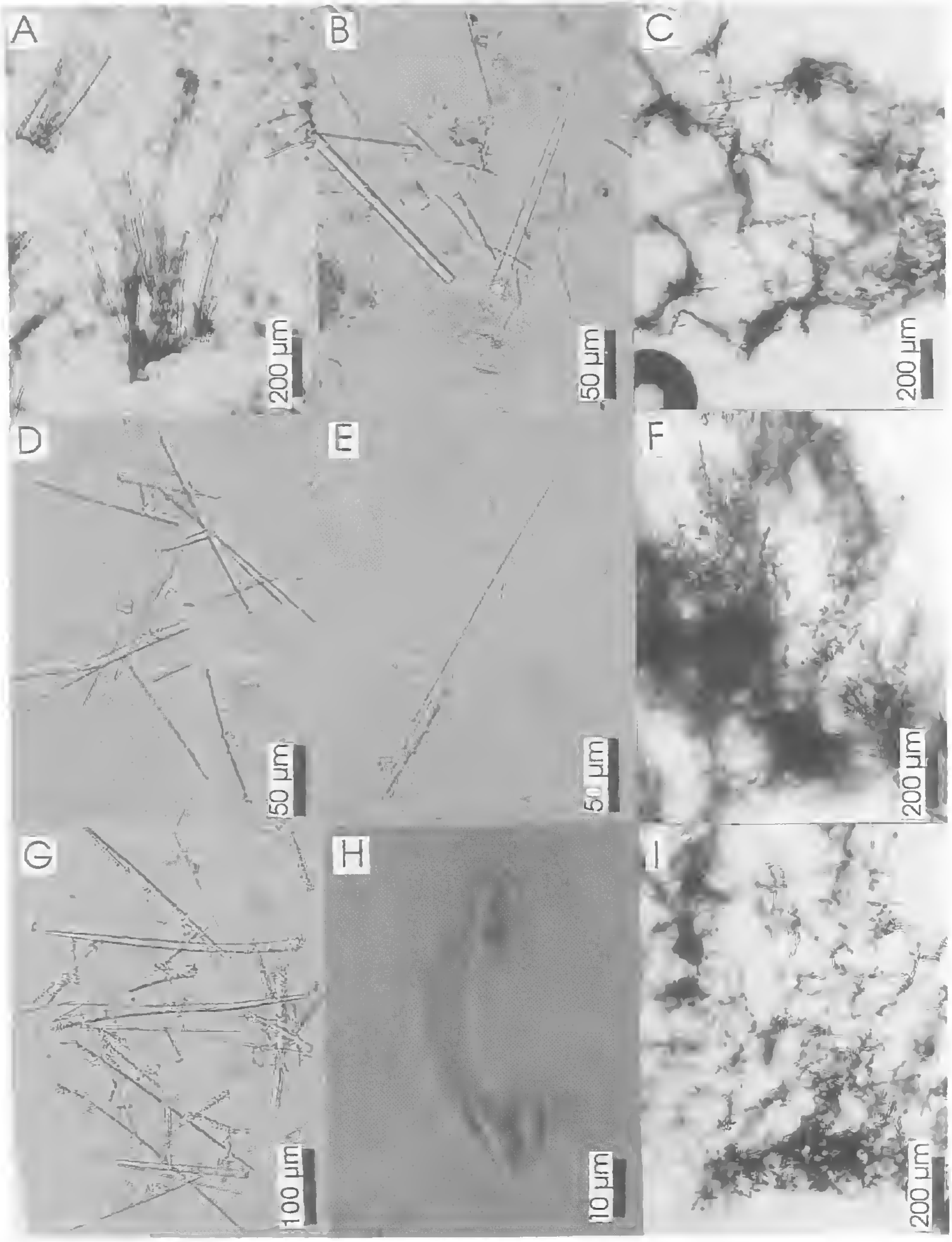

FIG. 8. Type species of microcionid genera. A-B, *Abila* (*Microciona laevis* Bowerbank, BMNH1877.5.21.424). C-E, *Allocia* (*Spanioplon cheliferum* Hentschel, SMF1571). F-H, *Anaata* (*A. spongigartina* de Laubenfels, USNM21428). I, *Anomoclathria* (*Alcyonium opuntioides* Lamarck, MNHNDT654).

plumose spongin fibre nodes, cored by very long smooth or basally spined choanosomal principal styles, with only slightly swollen bases, and with bases embedded in spongin fibres on substrate and points protruding through ectosome. Echinating acanthostyles erect on substrate. Subectosomal skeleton of a single category of very long, curved, sinuous or straight subectosomal auxiliary subtylostyle, with smooth or microspined bases, forming irregular brushes on ectosome. Special ectosomal spicules absent. Microscleres thick wing-shaped toxas. Isochelae absent.

REMARKS. Gray (1867) used the generic name *Abila* on two occasions, for two separate taxa. The senior name (Gray, 1867: 522) refers to a species originally described in *Raspailia* (viz. *R. freyerii* Schmidt), which Strand (1928: 32) unnecessarily proposed a replacement name *Abilana* Strand and which is a junior synonym of *Raspailia* Nardo (Strand should have replaced the junior name). The junior name (Gray, 1867: 539) was used for a microcionid, *M. laevis* Bowerbank, related to *Microciona* in skeletal structure, and related to *Thalyseurypon* de Laubenfels in lacking isochelae and having an encrusting growth form. De Laubenfels (1936a: 112) merged *Abila* with *Hymantho* Burton (see below), and Van Soest (1984b: 90) subsequently reduced *Hymantho* into synonymy with *Clathria*. Re-examination of the type species shows that the genus belongs with *Clathria* (*Microciona*).

Allocia Hallmann, 1920
(Fig. 8C-E)

Allocia Hallmann, 1920: 768; Bergquist & Fromont, 1988: 95.

TYPE SPECIES. *Spanioplon cheliferum* Hentschel, 1911: 362 (by original designation) (holotype ZMB4440, paratype SMF1571).

Arborescent, foliose, planar growth form. Surface hispid, uneven. Choanosomal skeleton reticulate, with multispicular ascending primary fibres and paucispicular transverse connecting fibres. Spongin fibres heavy, cored by styles and tylotes (also scattered throughout mesohyl), echinated by acanthostyles with spinose shafts and bases, apinose 'necks', and large recurved spines. Subectosomal region with ascending primary fibres cored by choanosomal principal styles, latter protruding through surface. Ectosomal skeleton with both tangential and paratangential layers of auxiliary spicules, latter protruding from peripheral fibres and also lying tangential to surface. Megascleres completely smooth principal styles of a single size category, smooth subectosomal auxiliary stylote spicules, with asymmetrical rounded and microspined ends, and acanthostyles. Microscleres palmate isochelae of two sizes. Toxas absent.

REMARKS. Hentschel (1911, 1912) expressed doubts concerning the initial generic assignment of *S. cheliferum* suggesting it showed certain affinities with *Ectodoryx* Lundbeck. Hallmann (1920) created *Allocia* to receive the species, including it in Microcionidae because of its 'typical' microcionid microscleres, echinating and coring megascleres. For similar reasons Dendy (1922: 70) merged the type species with *Clathria*. Based on its described ectosomal characteristics, supposedly consisting of true tylote spicules, the genus would be assigned to Iophonidae (see discussion for *Acarnus*), but re-examination of the type material found that these spicules were asymmetrical, modified styles very similar to those found in *Clathria* (*Thalysias*) *major*.

Allocia is monotypic and belongs in *Clathria* (*Clathria*). The type species is known from the north and southwest coasts of Australia (Arafura Sea and Perth region), Amirante (Indian Ocean), and New Zealand (Bergquist & Fromont, 1988).

Anaata de Laubenfels, 1932
(Fig. 8F-H)

Not *Aaata* Semenov, 1906.
Aaata de Laubenfels, 1930: 27.
Anaata de Laubenfels, 1932: 89, 1936a: 109.

TYPE SPECIES. *Aaata spongigartina* de Laubenfels, 1930: 27 (by original designation) (holotype USNM21428).

Encrusting growth form. Surface hispid, even. Choanosomal skeleton hymedesmoid, with bases of both echinating acanthostyles and choanosomal principal subtylostyles embedded in basal fibres. Ectosome with dense erect palisade of subectosomal auxiliary subtylostyles overlaying choanosomal megascleres, both protruding through surface. Megascleres principal choanosomal styles with prominently acanthose bases and partially acanthose shafts, echinating acanthostyles with aspinose points, and auxiliary subtylostyles of a single size category, being completely smooth. Microscleres two size categories of palmate isochelae with arcuate modifications (strong curvature, partially detached lateral alae, slightly pointed unguiferous teeth). Toxas absent.

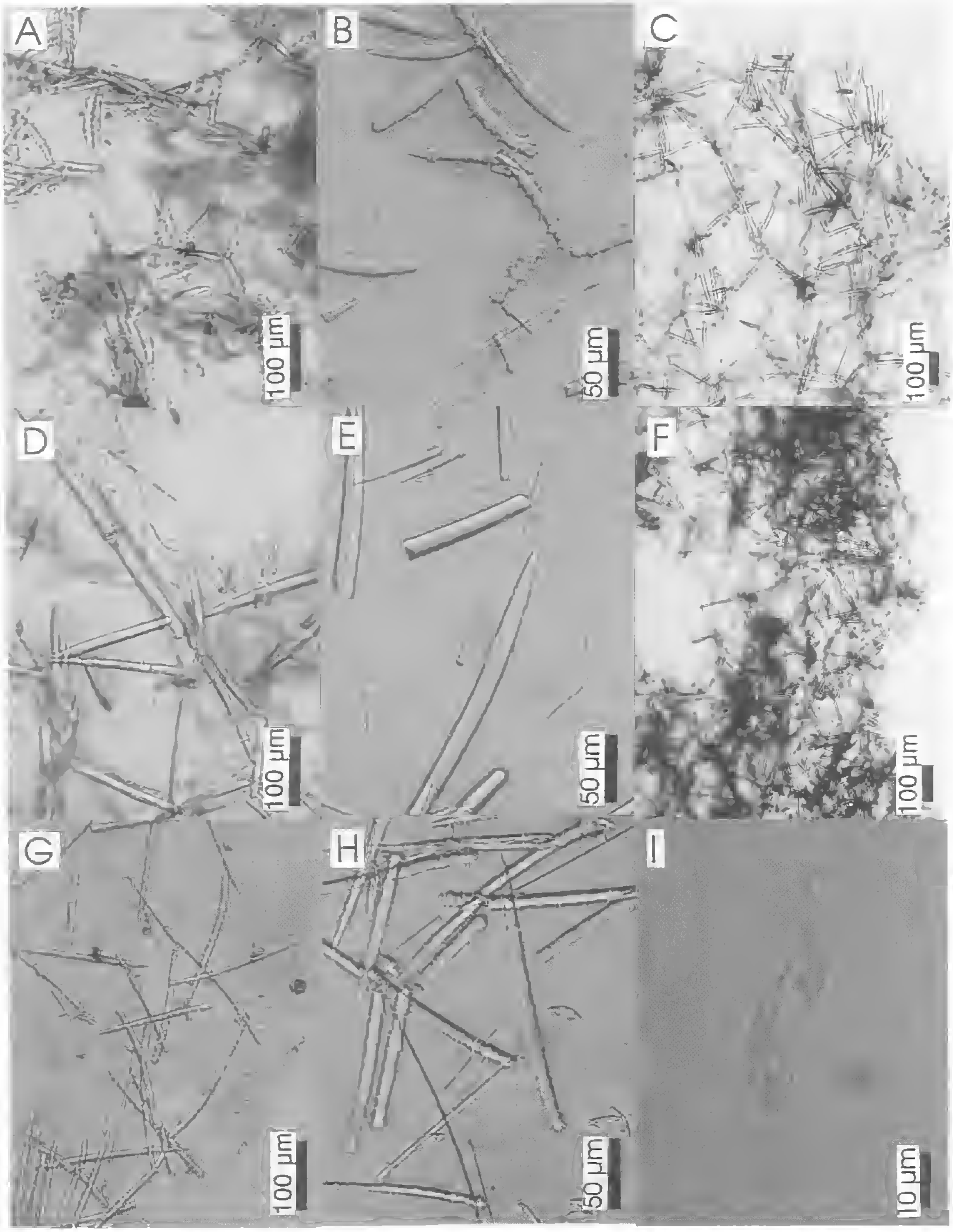

FIG. 9. Type species of microcionid genera. A-B, *Anomoclathria* (*Alcyonium opuntioides* Lamarck, MNHNDT654). C-E, *Antherochalina* (*A. crassa* Lendenfeld, BMNH1886.8.27.450). F-I, *Anthoarcuata* (*A. graceae* Bakus, USNM36284).

REMARKS. De Laubenfels (1932: 90) suggested that *Anaata* was characterised in part by lacking echinating acanthostyles, although he noted that two size categories of choanosomal megascleres may be present. However, in the holotype the smaller category of spined spicule standing perpendicular to spongin fibres are true echinating acanthostyles, as found in most other microcionids. These smaller spicules are predominantly spined, whereas larger choanosomal spicules are only partially spined and are principals.

Anaata was originally assigned to Hymedesmiidae Topsent, compared with genera such as *Leptosiopsis* Topsent (1927: 13) and *Leptosastra* Topsent (1904a: 194) (both of which have ectosomal tornotes with polytylote or anisotornote modifications, and anisochelae). All three genera have hymedesmoid architecture, which is persistent in Hymedesmiidae but also seen in many encrusting Microcionidae. Van Soest (1984b) mentioned that *Anaata* differed from other thinly encrusting microcionids, such as *Clathria* (*Microciona*) having arcuate isochelae replacing (or in addition to) palmate isochelae. It is questionable, however, whether these chelae are truly arcuate (as defined by Hajdu et al., 1994), given that their lateral alae are fused to the spicule shaft more than half way along their length. The smaller chelae are more-or-less evenly curved, slightly unguiferous (with reduced, slightly pointed alae), and lateral alae are fused to the shaft for about three-quarters their length. The larger spicules have more pronounced central curvature, they are more unguiferous (alae are reduced, sharper), and lateral alae are fused to the shaft for only about half their length. *Anaata* is considered here to be a *Clathria* (*Microciona*) with hymedesmoid architecture and chelae with slight 'arcuate' modifications.

Anomoclathria Topsent, 1929
(Figs 81, 9A-B)

Anomoclathria Topsent, 1929: 26.

TYPE SPECIES. *Alcyonium opuntioides* Lamarck, 1815: 164 (by original designation) (lectotype MNHNLBIMDT654).

Erect, arborescent or flabellate-digitate growth form. Surface smooth, not hispid. Choanosomal skeleton divisible into two components. Ascending primary skeleton plumose, with spongin fibres cored by paucispicular tracts of choanosomal principal styles and also incorporate algal filaments. Secondary basal skeleton renieroid reticulate, with spongin fibres fibres cored by large acanthostyles also grouped into plumose bundles on surface and secondarily incorporated into ascending primary fibres. Echinating spicules absent. Ectosome with sparse tangential skeleton of subectosomal auxiliary subtylostyles. Megascleres smooth choanosomal principal styles, acanthostyles with large spines in renieroid skeleton, with same morphology as principal spicules, and smooth subectosomal auxiliary subtylostyles. Microscleres palmate isochelae, wing-shaped and accolada toxas.

REMARKS. This diagnosis on the lectotype differs slightly from Topsent's (1929, 1932) redescriptions of the species, particularly in the emphasis on the secondary renieroid skeleton overlaying the ascending plumoreticulate primary skeleton. This is a prominent diagnostic feature of *Antho*. In *A.* (*Antho*) the secondary renieroid skeleton is composed of acanthostyles, as described above for *A. opuntioides*, whereas in another species originally referred to *Anomoclathria*, *Spongia frondifera* Lamarck, 1814: 445 (lectotype MNHNLBIMDT565), the spicules forming the renieroid skeleton are acanthostrongyles (diagnostic for *A.* (*Plocamia*)). Topsent (1932: 103) considered that *S. frondifera* a junior synonym of *A. opuntioides*, whereas Lamarck's type material shows that their differences in a number of characters, including spicule geometry, is sufficient to warrant species level separation.

Anomoclathria was erected on the basis of 'styloprothèse' (Topsent, 1929), whereby algal filaments are incorporated into spongin fibres, partially or completely replacing the coring choanosomal spicules. But this symbiosis has subsequently been shown to be relatively common in marine sponges (Scott et al., 1984), occurring in many families (e.g., Bowerbank, 1862a; Carter, 1878; Lendenfeld, 1886b; Topsent, 1929, 1932, 1933; Weber-van Bosse, 1910, 1921; Sciscioli, 1966; Scott et al., 1984; Price et al., 1984), and is an ecological rather than phylogenetic phenomenon. Although there is some evidence to suggest that particular species of algae are specific to particular sponge species, or at least restricted to a narrow range of taxa (Price et al., 1984)), it is unlikely that this symbiosis can be used as a diagnostic character at the supraspecific level. Nevertheless, it is intriguing to consider that a sponge can shed most or all of its diagnostic characters (spicules), replacing them with organic symbionts (e.g., see *Clathria*

(*Thalysias*) *abietina*) or inorganic foreign particles (e.g., see *Clathriopsamma*, *Wilsonella*).

Antherochalina Lendenfeld, 1887
(Fig. 9C-E)

Antherochalina Lendenfeld, 1887b: 741, 786; Burton, 1934a: 558; de Laubenfels, 1936a:112.

TYPE SPECIES. *Antherochalina crassa* Lendenfeld, 1887b:787 (by subsequent designation; Burton, 1934a: 558) (holotype BMNH1886.8.27.450).

Erect, thin lamellate growth form. Surface smooth, not hispid. Choanosomal skeleton with differentiated axial (compressed, renieroid reticulate) and extra-axial (loose plumose) skeletons, although no regional differences in spiculation. Spongin fibres heavy, cored by choanosomal principal subtylostyles, echinated by small acanthostyles. Ectosomal skeleton with sparse tangential subectosomal auxiliary subtylostyles. Megascleres include robust, entirely smooth choanosomal principal subtylostyles, lightly spined acanthostyles, and auxiliary subtylostyles with basal spines. Microscleres palmate isochelae and wing-shaped toxas.

REMARKS. Burton (1934a) designated *A. crassa* as type species of *Antherochalina*, in preference to Lendenfeld's (1887b) first-named species, *Veluspa polymorpha* var. *infundibuliformis* Maclay which was unrecognisable. He noted that *A. crassa* was a synonym of *Clathria s.s.*. Furthermore, of the eight species placed in the genus by Lendenfeld, only the type species now belongs here, whereas the other species are either unrecognisable or have affinities with *Raspailia* (*Syringella*), *Phakellia*, *Ophlitaspongia*, *Cymbastela* (*A. concentrica*; Hooper & Bergquist, 1992) or *Ectyoplasia* (*A. frondosa*; Hooper, 1991). *Antherochalina* also resembles some Desmacellidae (such as *Sigmaxinella*) and some Axinellidae (such as *Axinella*) in skeletal structure, having a slightly compressed renieroid axial and plumose extra-axial skeletons.

Antho Gray, 1867
(Fig. 10A-C)

Antho Gray, 1867: 524; Lévi, 1960a: 57, 76; Van Soest & Stone, 1986: 42; Bergquist & Fromont, 1988: 96. *Plocamilla*, in part, Burton, 1935a:402; Pulitzer-Finali, 1973: 40 (not *Plocamilla* Topsent, 1928a: 63).

TYPE SPECIES. *Myxilla involvens* Schmidt, 1864: 37 (by monotypy) (schizotype BMNH1867.3.11.92).

Thinly encrusting (*s.s.*) or erect, arborescent, lamellate or vasiform growth forms. Surface rugose, hispid. Choanosomal skeleton renieroid reticulate with acanthostyles-strongyles coring spongin fibres, or simply united at nodes by variable quantities of spongin, producing triangular and rectangular skeletal meshes. Junctions of skeletal meshes with principal choanosomal styles echinating fibre nodes, standing erect or at oblique angles, in tufts or singly. True echinating megascleres absent (i.e., undifferentiated from choanosomal principal styles). Ectosome contains tangential or paratangential multispicular brushes of subectosomal auxiliary styles protruding through surface. Megascleres acanthose principal styles/strongyles of renieroid basal skeleton, smooth or acanthose principal styles/subtylostyles of the choanosomal skeleton, and smooth subectosomal auxiliary styles, often with basal spines. Microscleres palmate isochelae, wing-shaped and accolada toxas.

REMARKS. This diagnosis is based on the type species and primarily on the type material, given the existing confusion about the true identity of *A. involvens* (cf. its alleged synonym *A. inconstans*; Ackers, Moss & Picton, 1992). *Antho* appears to be the earliest available name for a group of myxillid-like plocamiform sponges (*sensu* de Laubenfels, 1936a) which have microsclere spiculation typical of other Microcionidae. These taxa have an axial or basal skeleton composed of mostly acanthose styles or strongyles, producing a more-or-less regular renieroid reticulation. For this reason Bergquist & Fromont (1988) referred *Antho* to the Myxillidae, but the genus has monactinal rather than specialised tylote ectosomal spicules and does not fit the concept of Myxillidae (Van Soest, 1984b).

The potential generic synonymy of *Antho* is large. Burton (1930a: 501), de Laubenfels (1936a:-77), Lévi (1960a: 57) and Van Soest (1984b) combined species of *Dictyoclathria* Topsent in *Antho* (see below), and that genus has largely disappeared from current usage. Burton's (1959a: 252) merger of *Myxichela* de Laubenfels (1935: 331, 1936a: 85) (type species *Lissodendoryx tawiensis* Wilson (1925: 432)) into *Antho* is not upheld here, because it has a true myxillid ectosomal skeleton (diactinal (tylote) ectosomal spicules).

Renieroid reticulate skeletal architecture is not restricted to Myxillidae, known to occur in other families of sponges (e.g., Chalinidae (Haplosclerida), Iophonidae (*Acarnus*), Raspailiidae (*Amphinomia* Hooper, *Plocamione* Topsent, *Lithoplocamia* Dendy) and Axinellidae (*Pitalia*

Gray)), although it is certainly most common in the Myxillidae. The importance of a renieroid skeleton is interpreted differently by different authors, some giving it primary emphasis (e.g., Bergquist & Fromont, 1988) and others relegating it lesser importance (e.g., Van Soest, 1984b). Several species-groups have been created to accomodate microcionid-like species, with spiculation typical of the family, supplemented by a renieroid (myxillid-like) basal choanosomal skeleton composed of acanthose styles or strongyles. Vosmaer (1935a: 653) called this group *Microciona prolifera* tropus *renieroides* and de Laubenfels (1936a) recognised it at the family level (i.e., Plocamiidae *sensu* de Laubenfels (a junior homonym of Plocamiidae Topsent, 1928a)). However, only three genera appear to be sufficiently different to encompass all these microcionids: 1) *Plocamia* Schmidt (including *Plocamilla* Topsent, *Dirrhopalum* Ridley, and *Holoplocamia* de Laubenfels), which has predominantly (acantho)strongyles forming the renieroid skeleton (less commonly styles), and echinating acanthostyles overlap the main skeleton; 2) *Antho* Gray (including *Anthoarcuata* Bakus, *Dictyoclathria* Topsent, *Isociona* Hallmann and *Jia* de Laubenfels)), which has predominantly (acantho)styles forming the renieroid skeleton (less commonly strongyles), and echinating acanthostyles are absent; and 3) *Isopenectya* Hallmann, which has an axially compressed and extra-axially renieroid reticulate skeleton composed of two forms of choanosomal spicules inside spongin fibres, overlaid by a second extra-axial plumose skeleton. Several authors (Lévi, 1960a; Simpson, 1968a; Pulitzer-Finali, 1973) were unable to reach a consensus of whether or not *Plocamilla* and *Antho* were identical, since they only really differed by the presence or absence of echinating spicules, and the extent to which basal spicules of the renieroid skeleton are styles or strongyles (i.e., intermediates occur). Most authors tentatively retain these two genera; Simpson (1968a) and Van Soest & Stone (1986) suggest edthat any decision on these genera, which differ from *Clathria* in having a renieroid skeletal architecture, would require thorough re-examination of all type species. This has now been done and the conclusion reached here is that differences between all three species-groups (*Antho*, *Plocamia* and *Isopenecta*) are not as great as the similarities (as conferred by the possession of renieroid skeletal structure), and these differences are emphasised only at subgenus.

Anthoarcuata Bakus, 1966
(Fig. 9F-I)

Anthoarcuata Bakus, 1966: 431.

TYPE SPECIES. *Anthoarcuata graceae* Bakus, 1966:431 (by original designation) (holotype USNM36284 (161848)).

Thickly encrusting, massive, cylindrical growth form. Surface even, microscopically hispid. Choanosomal skeleton with basal renieroid reticulation composed of uni- or paucispicular tracts (occasionally multispicular) of acanthostyles joined at nodes by light collagen. Peripheral ascending spicule tracts terminate in brushes of smooth principal styles, originating in choanosome and protruding through surface. Ectosomal skeleton has a dense, mostly tangential crust of smooth subectosomal auxiliary styles (of a single size category). Megascleres include smooth ectosomal auxiliary styles-subtylostyles, sometimes with mucronate bases and telescoped points, and principal acanthostyles with even spination forming basal skeleton. True echinating megascleres absent. Microscleres palmate isochelae with slight arcuate modifications (curvature, partial detachment of lateral alae from shaft, slightly pointed teeth). Toxas absent.

REMARKS. The type species was originally identified as *Burtonancora lacunosa* (Lambe, 1892) by de Laubenfels (1961: 195), but Bakus (1966) noted that *B. lacunosa* (*sensu* de Laubenfels) was neither conspecific with Lambe's species nor referable to *Burtonanchora* (which in any case seems to be a synonym of *Myxilla*). *Anthoarcuata graceae* has the same spicule geometries and is structurally identical to *Antho*, differing only in the supposed possession of arcuate rather than palmate isochelae. However, in the type material chelae are not truly arcuate but are predominantly palmate with some 'arcuate' modifications including curvature and thickening of the shaft, partial detachment of lateral alae from the shaft (but for less than 20% of alar length), and reduced, slightly pointed, slightly unguiferous alae. They may be classed as palmate on the basis that lateral alae are only partially formed and are fused to the shaft for most of their length.

Artemisina Vosmaer, 1885
(Fig. 10D-E)

Artemisina Vosmaer, 1885b: 25; Ridley & Dendy, 1887: 112; Topsent, 1894: 12; Lundbeck, 1905: 110; Burton, 1930a: 501, 528-531; de Laubenfels,

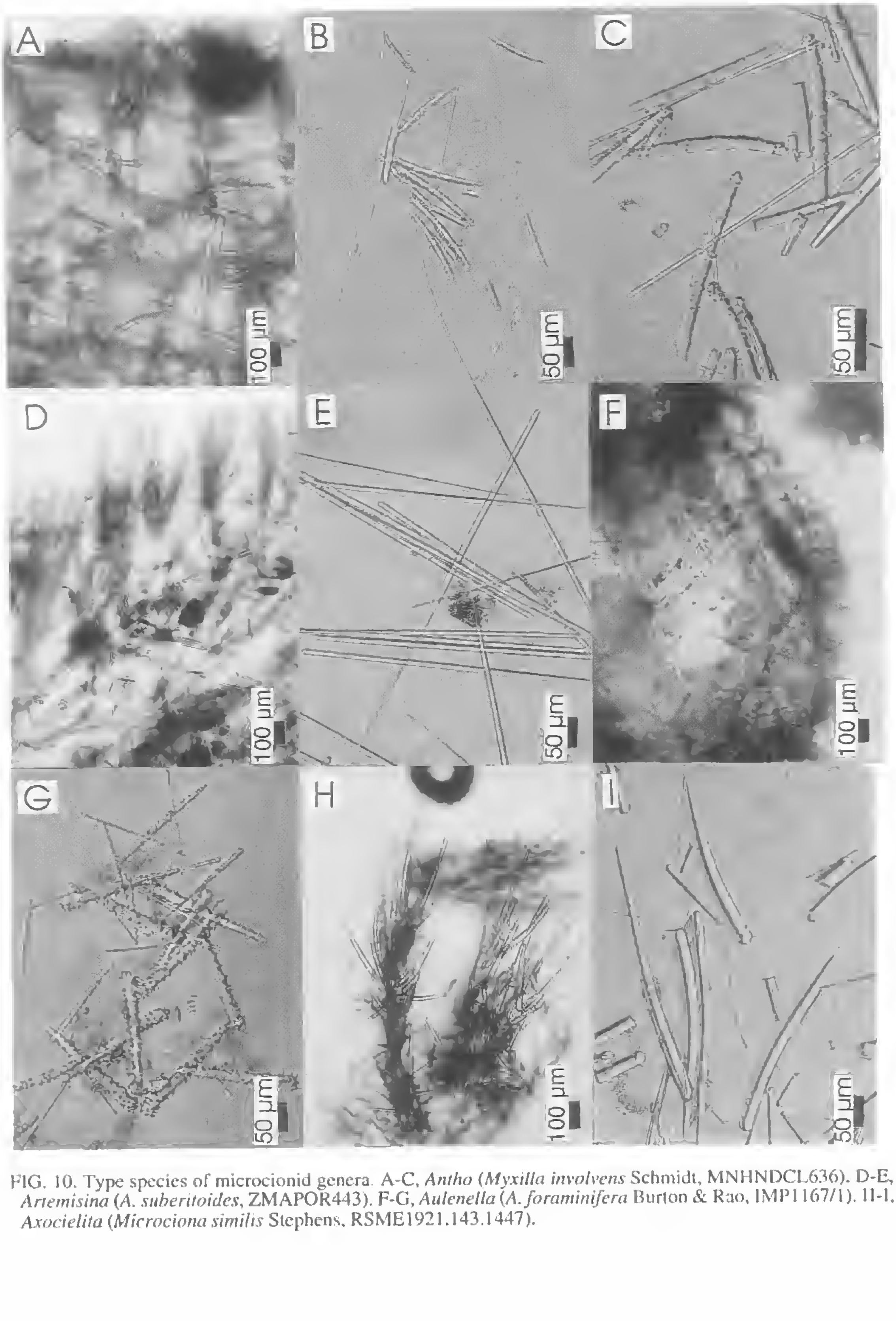

FIG. 10. Type species of microcionid genera. A-C, *Antho* (*Myxilla involvens* Schmidt, MNHNDCL636). D-E, *Artemisina* (*A. suberitoides*, ZMAPOR443). F-G, *Aulenella* (*A. foraminifera* Burton & Rao, IMP1167/1). H-I, *Axocielita* (*Microciona similis* Stephens, RSME1921.143.1447).

1936a: 117; Lévi, 1960a: 61, 83; Ristau, 1978: 585; Van Soest, 1984b: 122, 130; Bergquist & Fromont, 1988: 119.
Artenisina;Burton, 1934b: 54 [*lapsus*].

TYPE SPECIES. *Artemisina suberitoides* Vosmaer, 1885: 25 (by monotypy) (holotype ZMAPOR443); junior synonym of *Suberites arciger* Schmidt, 1870: 47 (Burton, 1930a: 528) (schizotype BMNH1870.5.3.90).

Massive, subspherical growth form. Surface skin-like, microscopically hispid, with few raised oscules; texture distinctly stringy. Choanosomal fibres indefinite or absent, overall architecture plumo-reticulate, nearly halichondroid in places, composed of multispicular ascending and paucispicular transverse tracts of choanosomal principal styles, bound together within spongin. Echinating megascleres absent. Ectosomal skeleton plumose, composed of single category of subectosomal auxiliary styles forming discontinuous palisade of discrete brushes. Megascleres smooth choanosomal principal subtylostyles and smooth fusiform subectosomal auxiliary styles or subtylostyles. Microscleres palmate isochelae, and wing-shaped toxas with spinous extremities.

REMARKS. Defining *Artemisina* in phylogenetic terms is problematic. The taxon has no real distinctive features, although it differs from other Microcionidae in lacking a distinctive choanosomal skeleton or definite spongin fibres (also found in *Qasimella* Thomas), lacking echinating spicules, and having a nearly radial ectosomal skeleton reminiscent of some *Ceratopsion* (Raspailiidae; Hooper, 1991). These characteristics, two of which might be interpreted as reductions or secondary losses and the third as a convergence, are the only definable morphological apomorphies. Moreover, ectosomal structure varies between several species, ranging from the typical condition composed of erect brushes (e.g., *A. arciger*) to a tangential layer of spicules in criss-cross fashion (e.g., *A. melana* Van Soest). This variability is equivalent to (or analogues of) the *Mycale* subgenera *Carmia* and *Aegagropila*, respectively (e.g., Topsent, 1924b). At least one species lacks a specialised ectosomal skeleton completely (e.g., *A. transiens* Topsent).

Some species of *Artemisina* (e.g., *A. foliata* (Bowerbank)) have honeycombed reticulate growth forms, approaching the characteristic *Holopsamma* morphology, but there is no consistency or pattern of gross morphologies amongst *Artemisina*, and in any case it is unlikely that the genus can be solely defined by its growth form. De Laubenfels (1936a) and Ristau (1978b) suggested that the *Artemisina* was defined by the absence of echinating acanthostyles and by the presence of spinous extremities on toxas. Neither character has much systematic value at the generic level. In the present interpretation echinating acanthostyles represent the retention of an ancestral character, in which case their presence or absence does not constitute a valid reason to define a phylogenetic grouping, and in any event they occur and disappear throughout numerous microcionid and raspailiid taxa. Similarly, toxas with spinous extremities are also known to occur in many Microcionidae, including the type species of *Clathria*, *C. compressa* Schmidt, *Microciona spinarchus* Carter & Hope, *M. coccinea* Bergquist, *M. rubens* Bergquist *M. spinatoxa* Hoshino, *Eurypon acanthotoxa* Stephens, *Stylostichon toxiferum* Topsent, *Labacea juncea* Burton, *Plocamia ridleyi* Hentschel, and *Ophlitaspongia thielei* Burton. They also occur in genera which have an ectosomal structure consistent with the Myxillidae (e.g., *Melonchela clathrata* Koltun). Several species of *Artemisina* have smooth toxas (e.g., *A. melana*), and one (*A. archegona* Ristau) has oxeote toxas similar to *Paratenaciella* Vacelet and Vasseur.

Thus, in the broad sense *Artemisina* contains a heterogenous assemblage of species, which prompted Burton (1930a) to divide the group into three sections based on the number of megasclere categories present. The simplest forms have only one category of spicule (choanosomal principal megascleres; e.g., *A. transiens* Topsent); the typical form has two categories of megascleres (larger choanosomal principal styles and smaller subectosomal auxiliary styles; e.g., *A. arciger*); and the third form has an incompletely differentiated series of three megasclere types (two choanosomal spicules and one subectosomal spicule; *A. plumosa* Hentschel). In all these forms species are only really united in their lax choanosomal skeletal structure. The majority of species have been described from Antarctic and Arctic regions.

[Aulena] sensu Lendenfeld, 1888

[*Aulena*]; Lendenfeld, 1888: 228, 1889a: 90; Topsent, 1894a: 19; de Laubenfels, 1936a: 16; Wiedenmayer, 1989: 58.
Not *Aulena* Lendenfeld, 1885c: 309.

TYPE SPECIES. *Aulena villosa* Lendenfeld, 1885c: 309 (by subsequent designation; de Laubenfels, 1936a: 16) (syntypes AMZ130, G8901).

Bulbous, subspherical growth form, consisting of fused digitate projections. Surface highly papillose but not hispid. Choanosomal skeleton regularly reticulate, with heavy spongin fibres cored by sparsely scattered sand grains mostly at nodes of fibres, and with a secondary fibre network between main skeleton. Ectosome lacks sand cortex or any other mineral skeleton. Megascleres and microscleres absent.

REMARKS. Hallmann (1912:275) merged *Aulena* and *Echinoclathria* Carter, whereas Wiedenmayer (1989) noted that in the strict sense (i.e., Lendenfeld, 1885c) it belongs to the Dictyoceratida (possibly related to *Coscinoderma*). Conversely, most other species referred to *Aulena* by Lendenfeld (1888) (*A. laxa* (Lendenfeld), *A. gigantea* (Lendenfeld), *A. crassa* (Carter)) belong to *Holopsamma*.

Aulenella Burton & Rao, 1932
(Fig. 10F-G)

Aulenella Burton & Rao, 1932:345.

TYPE SPECIES. *Aulenella foraminifera* Burton & Rao, 1932: 345 (by original designation and monotypy) (holotype IMP1167/1).

Flabello-digitate growth form, with subspherical, closely reticulate, honeycomb branching pattern. Surface uneven, not hispid. Choanosomal skeleton irregularly reticulate, with spongin fibres more-or-less fully cored by foreign particles and fewer choanosomal principal subtylostyles. Echinating acanthostyles abundant. Ectosome with single size category of subectosomal auxiliary subtylostyles tangential to surface and also strewn randomly throughout subectosome. Megascleres choanosomal principal subtylostyles with spined and tuberculate bases, echinating acanthostyles with evenly dispersed large recurved spines, and subectosomal auxiliary subtylostyles with or without spines on bases. Microscleres palmate isochelae, toxas absent.

REMARKS. The 'honeycombed' reticulate growth form of *Aulenella* is reminiscent of *Holopsamma* and some *E.* (*Echinochalina*). The incorporation of foreign particles into the skeleton is also seen in species of *Holopsamma*, *Aulena* of authors, *Clathriopsamma*, *Fisherispongia*, *Wilsonella* and *Anomoclathria*. It also occurs in other Poecilosclerida Raspailia (*Clathriodendron*) (Raspailiidae), and many species of Phoriospongiidae) and many Dictyoceratida, and is considered here to be a successful ecological adaptation independently acquired by several groups. Thus, *Aulenella* is not defined by any unique features, and furthermore the holotype of *A. foraminifera* has spiculation identical to *Clathria* (*s.s.*), lacking only toxa microscleres. Vacelet et al. (1976: 75) correctly synonymised *Aulenella* and *Clathriopsamma*, both of which now belong to *C.* (*Wilsonella*) (Van Soest, 1984b; Wiedenmayer, 1989; Hooper & Lévi, 1993a).

Axocielita de Laubenfels, 1936
(Fig. 10H-I)

Axocielita de Laubenfels, 1936a: 118; Hechtel, 1965: 44; Wiedenmayer, 1977: 140.

TYPE SPECIES. *Microciona similis* Stephens, 1915: 441 (by original designation) (holotype RSME-1921.143.1447).

Thickly encrusting growth form. Surface even, and hispid. Choanosomal skeleton hymedesmoid, with spongin fibres forming basal layer on substrate and ascending non-anastomosing fibre nodes, each node containing plumose short unbranched tracts of choanosomal principal subtylostyles, standing perpendicular to substrate with only bases embedded in spongin fibres. Echinating subtylostyles erect on basal spongin and also echinating erect plumose brushes of choanosomal megascleres. Ectosomal skeleton with single category of subectosomal auxiliary subtylostyles forming paratangential tracts at surface and plumose brushes extending from ends of choanosomal megascleres. Megascleres smooth or minutely basally spined choanosomal principal subtylostyles, echinating subtylostyles with only bases spined, subectosomal auxiliary subtylostyles mostly smooth, occasionally basally spined, of a single size category. Microscleres palmate isochelae and small wing-shaped toxas.

REMARKS. De Laubenfels (1936a) created *Axocielita* for thinly encrusting sponges resembling *Axociella* (i.e., lacking spined echinating megascleres). However, this is incorrect, based on misconceptions of both the type species (i.e., the published characters of *Microciona similis* do not agree with those seen in the holotype), and *Axociella* by de Laubenfels' (1936a). In the holotype of *M. similis*, diagnosed above, there is only a single category of auxiliary spicule, whereas *Axociella s.s.* has two distinct categories of auxiliary spicules in the peripheral skeleton. Thus, on the basis of its ectosomal features *Axociella* is strictly a *Thalysias*, whereas *Axocielita* has an unspecialised ectosomal spiculation typical of *Clathria*. In having plumose unbranched fibres forming a microcionid skeleton Hechtel (1965: 43) referred *Axocielita* to *Microciona*. He supported this decision on the basis that *M. similis* has both spined and smooth styles, which he considered to be diagnostic for *Microciona* (although in the strict sense that feature is diagnostic for *Anaata*). *Axocielita* is referred here to *Clathria* (*Microciona*).

Axociella Hallmann, 1920
(Fig. 11A-B)

Axociella Hallmann, 1920: 779; de Laubenfels, 1936a: 113; Wiedenmayer, 1977: 140; Bergquist & Fromont, 1988: 116.

TYPE SPECIES. *Esperiopsis cylindrica* Ridley & Dendy, 1886: 340 (by original designation) (holotype BMNH1887.5.2.96).

Arborescent, dichotomously branched, stalked growth form. Surface even, membraneous, transparent, hispid. Choanosomal fibre skeleton compressed at centre of stalk, with heavy spongin fibres forming reticulate axis, with longitudinal primary fibres cored by multispicular tracts and secondary connecting fibres aspicular or paucispicular tracts of choanosomal principal styles. Echinating megascleres absent. Subectosomal extra-axial skeleton plumose or plumoreticulate, well-differentiated from axial core, with light spongin fibres cored by multi- or paucispicular larger subectosomal auxiliary styles and few aspicular transverse fibres. Ectosomal skeleton composed of specialised category of smaller ectosomal auxiliary styles forming continuous palisade or individual brushes of spicules. Megascleres entirely smooth principal choanosomal styles-subtylostyles, and two categories of entirely smooth auxiliary styles-subtylostyles. Microscleres palmate isochelae and oxhorn toxas.

REMARKS. *Axociella* has been misinterpreted by all authors since it was first reviewed by de Laubenfels (1936a). It is similar to *Tenaciella* Hallmann in lacking echinating megascleres but it has a distinctive, compressed reticulate axis and plumose or plumo-reticulate subectosomal (extra-axial) skeleton, reminiscent of the distinctive extra-axial skeletal architecture seen in Raspailiidae. The structure of the ectosomal skeleton in the type species of *Axociella* (i.e., the possession of two categories of auxiliary megascleres) is the same as seen in *Thalysias*, and Van Soest (1984b) merged the two genera on this basis. However, unlike typical species of *Thalysias* or *Clathria*, those of *Axociella* have a distinctive skeletal structure (compressed axis and a radial extra-axial skeleton), which is more-or-less homogeneous amongst the several known species, and this structure is interpreted here as indicative of supraspecific relationships. This interpretation is consistent with the treatment of similar structures in Raspailiidae (Hooper, 1991). In fact, *Axociella* could be justifiably included in Raspailiidae (Hooper, 1991; Hooper et al., 1992), apart from having isochelae and toxa microscleres and lacking the unique raspailiid ectosomal specialisation (large protruding auxiliary or principal spicules surrounded by bundles of smaller auxiliary spicules). True examples of these ectosomal spicules are not seen in the Microcionidae, although two species have analogues of this ectosomal condition: *Esperiopsis canaliculata* Whitelegge, *Ophlitaspongia thetidis* Hallmann — both belonging to *Clathria* (*Axociella*).

Axociella is convergent upon Raspailiidae in skeletal structure, best developed in three Australian species, *Esperiopsis cylindrica*, *E. canaliculata* and *Ophlitaspongia thetidis*, all of which also have a *Thalysias* ectosomal skeleton. Another species from the NW Pacific, *Microciona lambei* Koltun, has a mix of both Raspailiidae and Microcionidae skeletons, being convergent on *Endectyon* in structure (with a markedly compressed axis, brushes of acanthostyles surrounding the bases of protruding choanosomal principal styles) but it also has palmate isochelae and a tangential layer of auxiliary styles lying tangential to the surface (i.e., the *Clathria* condition). *Axociella* is recognised here as a subgenus of *Clathria* based on its specialised compressed skeletal structure.

Axosuberites Topsent, 1893
(Fig. 11C-D)

Axosuberites Topsent, 1893a: 179; de Laubenfels, 1936a: 118.

TYPE SPECIES. *Axosuberites fauroti* Topsent, 1893a: 179 (by monotypy) (portion of holotype MNHN-LBIMDT1859).

Flabellate, flattened digitate growth form. Surface hispid, conulose. Choanosome with compressed reticulate axis and plumose extra-axial skeleton, with only light spongin fibres. Axial fibres produce close-meshed reticulation of multispicular tracts cored by choanosomal principal subtylostyles forming criss-cross reticulation, tracts plumose near periphery. Echinating megascleres absent. Subectosomal extra-axial skeleton well differentiated from axial region, with ascending plumose columns of larger subectosomal auxiliary subtylostyles arising from

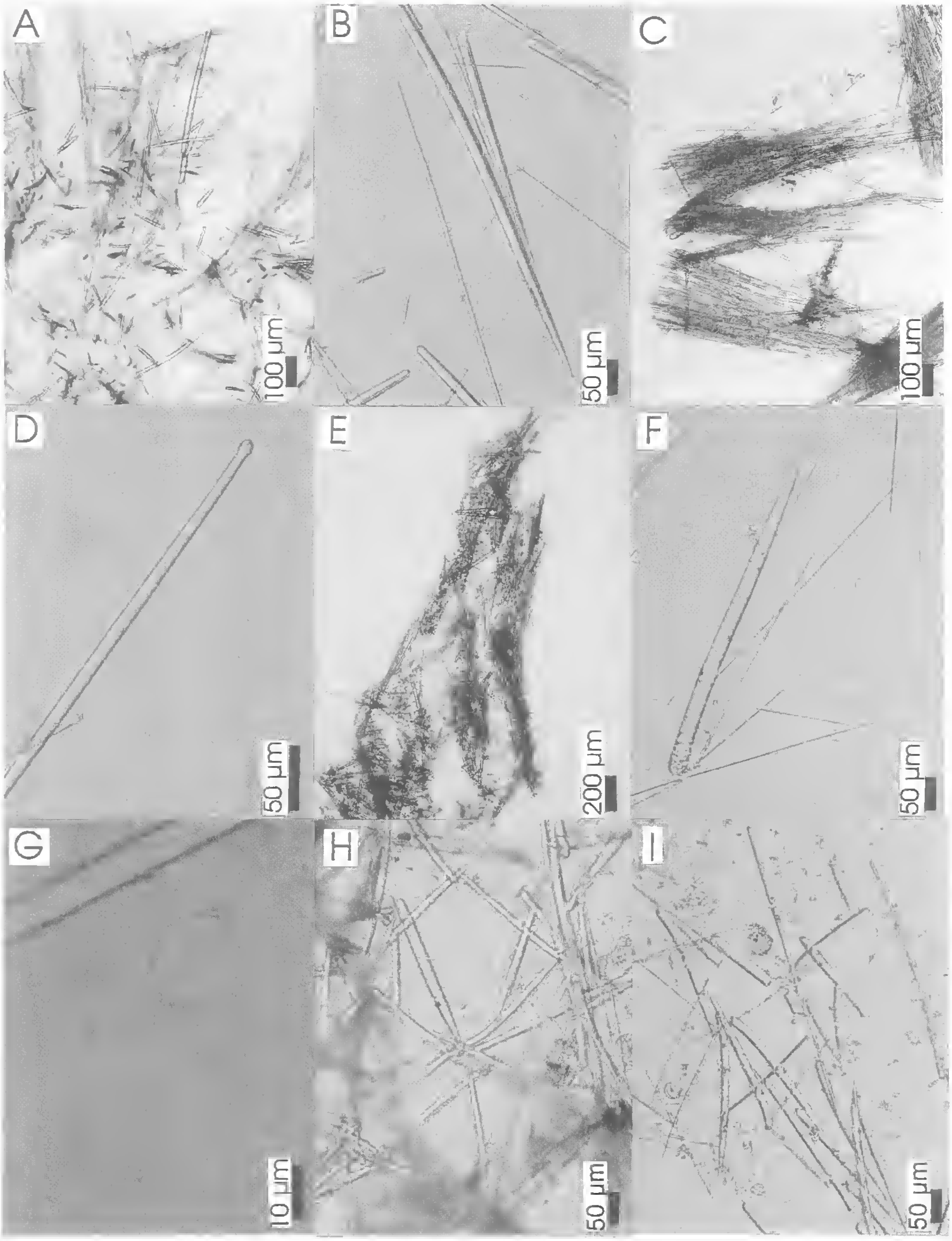

FIG. 11. Type species of microcionid genera. A-B, *Axociella* (*A. cylindrica* Ridley & Dendy, BMNH1887.5.2.96). C-D, *Axosuberites* (*A. fauroti* Topsent, MNHNDT1859). E-G, *Bipocillopsis* (*B. nexus* Koltun, BMNH1963.7.29.56). H-I, *Clathriella* (*C. primitiva* Burton, BMNH1938.7.4.93).

peripheral choanosomal skeleton. Ectosome with brushes of smaller auxiliary subtylostyles overlaying larger subectosomal spicules. Megascleres entirely smooth choano somal principal subtylostyles-tylostyles, and two size classes of auxiliary subtylostyles-tylostyles, both with smooth bases. Microscleres absent.

REMARKS. Redescription of the type species above is based on examination of a slide preparation in the MNHN collection and Topsent's (1893a) description; the corresponding specimen has not yet been seen. Topsent (1893a) initially compared *Axosuberites* with *Caulospongia* Kent and *Pseudosuberites* Topsent in Suberitidae (Hadromerida), noting that it showed a certain level of morphological similarity in choanosomal fibres and geometry of tylostyle megascleres. However, in skeletal structure and spiculation *Axosuberites* appears to be a microcionid, most similar to *Axociella*, both genera showing similarities in their ectosomal specialisation, axial and extra-axial differentiation, and absence of echinating megascleres. Van Soest (1984b) also suggested that the genus was probably an *Axociella* without microscleres, and under his scheme it was therefore referable to *Thalysias*, but in both genera axial and extra-axial skeletal structures are well developed and closely comparable, and it is suggested here that they both should be included in the same subgenus (i.e., *Clathria* (*Thalysias*)).

Bipocillopsis Koltun, 1964
(Fig. 11E-G)

Bipocillopsis Koltun, 1964a: 79.

TYPE SPECIES. *Bipocillopsis nexus* Koltun, 1964a: 80 (by monotypy) (holotype ZIL10644, paratype BMNH1963.7.29.56).

Erect, arborescent growth form with cylindrical reticulated branches. Surface hispid, raised into irregular sharp conules. Choanosomal skeleton subrenieroid reticulate, with ascending spongin fibres cored by multispicular plumose tracts and interconnected by paucispicular transverse tracts of choanosomal principal subtylostyles, and echinated by acanthostyles. Subectosomal region with heavy paratangential bundles of subectosomal auxiliary styles protruding through surface and also scattered between fibres. Ectosomal skeleton without specialised spiculation but with bundles of subectosomal auxiliary styles surrounding protruding choanosomal spicules, and also lying paratangential to ectosome. Megascleres choanosomal principal subtylostyles invariably with basal spines and sometimes with spines on shaft, echinating acanthostyles of similar morphology to principal megascleres but shorter and more extensively spined, and single category of entirely smooth subectosomal auxiliary style. Microscleres isochelae, strongly sigmoid, unguiferous with very reduced pointed alae, possibly anchorate. Toxas absent.

REMARKS. *Bipocillopsis* resembles *Damoseni* in lacking ectosomal specialisation and having modified sigmoid isochelae, but differs in growth form (arborescent versus encrusting) and subectosomal skeletal architecture (thickly paratangential versus tangential). The genus is monotypic and may be included in *Clathria* (*Clathria*) by its skeletal structure, whereas *Damoseni* has hymedesmoid skeletal structure typical of *Clathria* (*Microciona*). Chelae morphology has been described as tridentate sigmoid, allegedly related to the arcuate form, but this is very difficult to tell with certainty given that alae are nearly vestigial. There is no doubt that these chelae are more highly modified than most other microcionids. They are very small, strongly unguiferous (sigmoid curved with small pointed teeth), and lateral alae are completely free of the shaft and undifferentiated from the front ala, suggesting they may be of anchorate origin. However, there is no lateral ridge on the shaft of chelae to indicate an anchorate condition. The derivation of these chelae is indeterminable. Under the scheme of Hajdu et al. (1994) this genus could be included in Myxillina in possessing tridentate-derived isochelae, whereas all other features (skeletal structure, principal and auxiliary megascleres and ectosomal skeleton) indicate relationships with the Microcionidae, in which it is retained here tentatively. This decision is supported by the case of *Damoseni*, discussed below, which have chelae of identical form to *Bipocillopsis* with the addition of oxhorn toxas (which are not found in Myxillina).

Cionanchora de Laubenfels, 1936
(Fig. 12E-G)

Cionanchora de Laubenfels, 1936a: 108.

TYPE SPECIES. *Hymeraphia tuberosocapitata* Topsent, 1890b: 68 (by original designation) (fragment of holotype MNHNLBIMDT939).

Encrusting growth form. Surface smooth, even, microscopically hispid. Choanosomal skeleton hymedesmoid. Spongin fibres reduced to basal layer lying on substrate, with choanosomal principal subtylostyles erect and forming unispicular ascending columns protruding through ectosome, and echinating acanthostyles standing parallel to these. Ectosome tangential skeleton of subectosomal auxiliary subtylostyles, of a single category, forming brushes surrounding protruding choanosomal principal spicules. Megascleres choanosomal principal subtylostyles with tuberculate bases, echinating acanthostyles with large spines evenly dispersed over entire spicule except for bare point, and subectosomal auxiliary subtylostyles completely smooth. Microscleres anchorate-like isochelae. Toxas absent.

REMARKS. The diagnosis is based on a slide of the holotype and Topsent's (1890b) description; the corresponding specimen has not been seen. *Cionanchora* was erected for thinly encrusting sponges with hymedesmoid skeletal construction, similar to *Anaata*, but with anchorate-like instead of arcuate-like modifications to isochelae (de Laubenfels, 1936a). Both those genera were merged with *Clathria* (*s.l.*) by Van Soest (1984b) on the basis that modified microscleres were a homoplasy throughout the Poecilosclerida, and are interspecific discriminators only. Anchorate-like modifications are also found in *Folitispa* (both of which were included in *Clathria* by Hooper, 1990a). *Microciona dubia* from Christmas Island (Kirkpatrick, 1900a: 136), was referred to *Cionanchora* by de Laubenfels (1936a: 108) supposedly in having anchorate-like chelae but these are of palmate origin. Both species have skeletal architecture typical of *Microciona* where they are referred.

Clathria Schmidt, 1862
(Fig. 12A-B)

Clathria Schmidt, 1862: 57; Ridley, 1884a: 443-449, 612-615; Ridley & Dendy, 1887: 31; Hentschel, 1911: 368; Hallmann, 1912: 205; Dendy, 1922: 64; Dendy, 1924a: 352-354; Wilson, 1925: 439; Topsent, 1925: 645-658; Topsent, 1928a: 62,299; Burton & Rao, 1932: 334-337; Burton, 1932a: 319; Burton, 1934a: 558; Koltun, 1959: 184; Lévi, 1960a: 50,52,61; Melone, 1963: 1-8; Sarà & Melone, 1963: 362; Sarà, 1964: 229; Simpson, 1968a: 102, 104-106; Van Soest, 1984b: 90; Wiedenmayer, 1989: 56; Bergquist & Fromont, 1988: 106.

Clathria Schmidt, plus *Rhaphidophlus* Ehlers; Ridley & Dendy, 1887: 146,151; Topsent, 1894a: 14-15,18.

Clatharia;Kumar, 1925: 221 [*lapsus*].

TYPE SPECIES. *Clathria compressa* Schmidt, 1862: 58 (by subsequent designation (Schmidt, 1864: 35)) (holotype LMJG15509).

Erect, arborescent, thinly lamellate, branching growth form. Surface even, not hispid. Choanosomal skeleton regularly reticulate, with well developed spongin fibres forming regular or irregular anastomoses of differentiated primary and secondary spongin fibres. Fibres cored by choanosomal principal subtylostyles in multispicular ascending tracts and uni- or bispicular transverse connecting tracts, and echinated by acanthostyles perpendicular to or at acute angles to spongin fibres. Ectosomal skeleton with tangential layer of subectosomal auxiliary subtylostyles, of a single size category. Megascleres basally spined choanosomal principal subtylostyles, entirely smooth subectosomal auxiliary subtylostyles, and echinating acanthostyles with even spination. Microscleres palmate isochelae and forceps-shaped or accolada toxas with spinose extremities.

REMARKS. Strictly defining *Clathria* is essential in assigning a vast number of microcionids included in the genus by numerous authors. For example, *C. compressa* has toxas with spinose extremities, which therefore becomes a character 'typical' of *Clathria*, whereas earlier authors considered that this feature was diagnostic for *Artemisina* Vosmaer (de Laubenfels, 1936a). *Clathria*-like (viz. *Labacea* de Laubenfels) and *Artemisina*-like genera (viz. *Ligrota* de Laubenfels) also have spinous toxas, indicating that this character is homoplasious and probably not important above the species level of classification. In general, the original definition of *Clathria* (*s.s.*) is upheld here, as re-examination of Schmidt's syntype confirmed that all published characters cited in the species description (Schmidt, 1862: 58; Topsent, 1925: 647) are present in type material.

Topsent (1925: 648) noted that *C. compressa* has variable spicule dimensions, skeletal architecture, and live colouration. He correlated this variability with the diverse growth forms shown by the species: thinly encrusting examples had a hymedesmoid skeletal architecture, thickly encrusting forms had a plumose skeleton, and erect ramose forms had anastomosing fibres (i.e., encompassing the nominal genera *Leptoclathria*, *Microciona* and *Clathria*). He also found correlation between the size of megascleres and growth form variability, although he could find no obvious trends. Topsent's observations are invaluable in deciding whether to maintain nominal encrusting genera and more massive sponges as distinct genera, and whether to differentiate taxa with hymedesmoid, plumose or plumo-reticulate skeletal structure.

Clathria compressa is known only from the north Atlantic and Mediterranean regions, but judging by its extensive synonymy it appears to be (or have been) moderately common within those regions.

Clathriella Burton, 1935
(Fig. 11H-I)

Clathriella Burton, 1935c: 73; Koltun, 1959: 186.

TYPE SPECIES. *Clathriella primitiva* Burton, 1935c: 73 (by original designation) (holotype BMNH1938.7.4.93).

Crumpled, irregular, massive growth form. Surface porous, uneven, hispid, with meandering ridges covered by thin transparent dermal membrane. Choanosomal skeleton renieroid reticulate, with spongin fibres forming regularly triangular meshes cored by multispicular tracts of smaller principal rhabdostyles (confined to renieroid network) and larger principal styles (latter producing secondary plumose, subisodictyal skeleton of bi- or paucispicular ascending tracts). Echinating spicules absent. Ectosomal skeleton radially arranged tracts of subectosomal auxiliary styles, of a single size category. Extra-fibre skeleton (apparently) has centrally curved (arcuate) oxeote megascleres scattered throughout mesohyl. Megascleres two categories of choanosomal principal styles, larger smooth with rounded bases, smaller spined with rhabdose bases, and smooth or basally spined subectosomal auxiliary styles-subtylostyles. Microscleres absent.

REMARKS. *Clathriella primitiva* is obviously closely related to *Clathria chartacea* Whitelegge in its skeletal structure and spiculation, conforming to the definition of *Isopenectya* (see below). *Clathriella* also shows similarities to *Isociella* in having an isodictyal reticulate skeleton and in lacking echinating spicules, although in *Isociella* all megascleres are smooth and chelae and toxa microscleres are present. The presence of smaller spined rhabdostyles and an isodictyal component of the choanosomal skeleton are reminiscent of Rhabderemiidae, although the absence of thraustosigmata, thraustotoxa and other rhabderemiid microscleres in *C. primitiva* suggest that these similarities are convergent.

Burton (1935c) considered that *Clathriella* was a primitive member of the Microcionidae, in which styles and acanthostyles had not yet become differentiated or segregated into coring and echinating megascleres. He suggested further that the toxiform oxeas, recorded by both Burton (1935c) and Koltun (1959), were derived from acanthostyles, and that both forms were remnants of a primitive condition. There is no empirical evidence to support either argument, and the present study takes the alternative point of view, that species like *Clathriella primitiva* are derived or modified microcionids. Koltun (1959) also suggested that arcuate oxeas of *C. primitiva* were microxeas, and in that respect the genus should be compared with *Paratenaciella*. However, in *Clathriella* these spicules are supposedly large (200x7 µm), indicating that they are true megascleres, whereas in *Paratenaciella* microxeas are very small (40-75 x 0.7-3µm). In any case, re-examination of the holotype of *C. primitiva* (above) and more recent material from the Sakhalin Is, NW Pacific collected by PIBOC (QMG300052), did not find any toxiform oxeas although several examples of smaller auxiliary styles were sinuous, and it may be these the authors were referring to. The genus is referred here into synonymy with *Antho* (*Isopenectya*).

Clathriopsamma Lendenfeld, 1888
(Fig. 12C-D)

Clathriopsamma Lendenfeld, 1888: 227; Topsent, 1894a: 19; Hallmann, 1920: 771; de Laubenfels, 1936a: 98; Lévi, 1973: 614; Vacelet et al., 1976: 75.

TYPE SPECIES. *Clathriopsamma reticulata* Lendenfeld, 1888: 227 (by subsequent designation; Hallmann, 1920: 771) (lectotype AMG9135).

Erect, anastomosing, arborescent growth form. Surface uneven, arenaceous, microscopically hispid. Choanosomal skeleton irregularly reticulate. Spongin fibres without well developed primary or secondary differentiation, cored by choanosomal principal subtylostyles and abundant foreign debris. In subectosomal skeleton principal subtylostyles also form plumose brushes, protruding through ectosome. Fibres heavily echinated by acanthostyles also associated with ectosomal spicule brushes. Ectosome with paratangential tracts of subectosomal auxiliary subtylostyles, of a single category, usually forming discrete brushes of spicules at surface. Megascleres basally spined, fusiform choanosomal principal subtylostyles, smooth and basally spined subectosomal

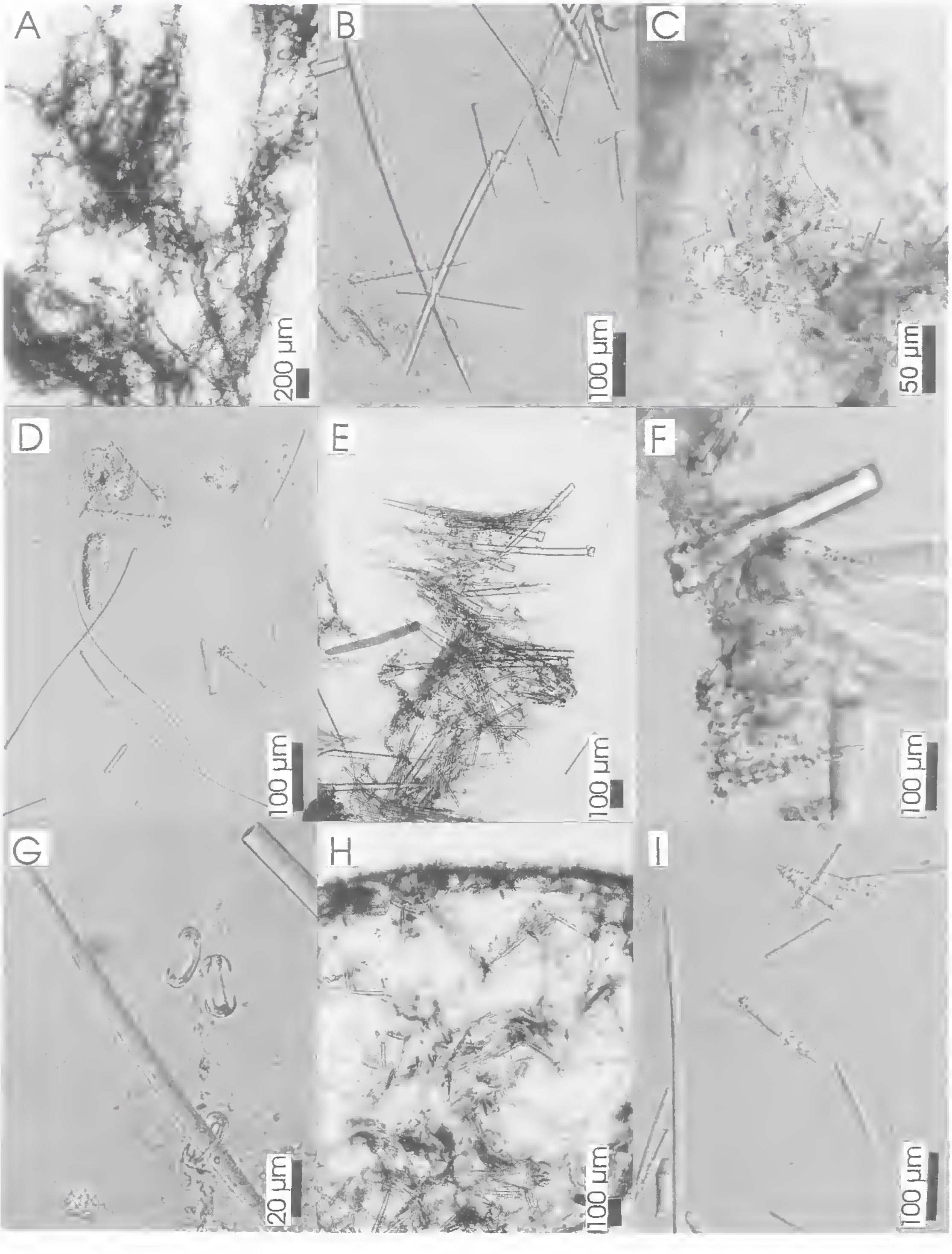

FIG. 12. Type species of microcionid genera. A-B, *Clathria* (*C. compressa* Schmidt, LMJG15509). C-D, *Clathriopsamma* (*C. reticulata* Lendenfeld, AMG9135). E-G, *Cionanchora* (*Hymeraphia tuberosocapitata* Topsent, MNHNDT939). H-I, *Colloclathria* (*C. ramosa* Dendy, BMNH1921.11.7.64).

auxiliary subtylostyles, and echinating acanthostyles with large spines evenly dispersed. Microscleres palmate isochelae of two size categories, including contort forms, and sinuous-raphidiform or accolada toxas.

REMARKS. In *Clathriopsamma* the ectosome is structurally close to the *Thalysias* condition, but there is only one category of auxiliary spicule producing surface bundles. The genus is distinguished from most other microcionid genera in having foreign particles incorporated into the skeleton (Hallmann, 1920) (see remarks for *Aulenella*). Detrital entrapment is also known to occur in other Microcionidae (e.g., some *Holopsamma*), other Poecilosclerida (e.g., Phoriospongiidae), and it certainly also occurs commonly in other sponge orders (Dysideidae, Thorectidae and Ircinidae in the Dictyoceratida, and many Haplosclerida). This evidence indicates that this feature has arisen independently several times within the Porifera, probably indicative of ecological specialisation, and obviously arisen independently in several groups. However, species of Microcionidae that do incorporate sand appear to be relatively homogeneous in most of their other characters (i.e., there are no other conflicting characters such as presence/absence of ectosomal specialisation, or modifications to chelae), and consequently this specialisation is recognised here at the subgenus level. Vacelet et al. (1976) synonymised *Clathriopsamma* with *Aulenella*, and Van Soest (1984b) merged *Clathriopsamma* with *Clathria*, whereas in this work it is shown that the earliest available name for these species is *Wilsonella* (see below).

Colloclathria Dendy, 1922
(Fig. 12H-I)

Colloclathria Dendy, 1922: 74.

TYPE SPECIES. *Colloclathria ramosa* Dendy, 1922: 74 (by monotypy) (holotypeBMNH 1921.11.7.64).

Cylindrical, arborescent, digitate growth form. Surface even, hispid. Choanosomal skeleton reticulate, with slightly compressed axis and slightly more cavernous extra-axial skeleton. Spongin fibres cored by large principal choanosomal styles, forming multispicular ascending tracts interconnected by multispicular transverse tracts. Echinating acanthostyles distributed irregularly over fibres. Subectosomal skeleton reduced to immediate outer edge of skeleton, with plumose tracts of larger subectosomal auxiliary subtylostyles extending through ectosome. Larger auxiliary megascleres also scattered between fibres and sometimes coring fibres. Ectosomal skeleton with smaller ectosomal auxiliary subtylostyle forming discrete brushes overlying subectosomal spicules. Megascleres smooth principal choanosomal styles, echinating acanthostyles with spined bases and points (bare 'necks'), and two sizes of auxiliary subtylostyles, usually with basal spines. Microscleres palmate isochelae, cleistochelae and accolada toxas.

REMARKS. *Colloclathria* has a specialised ectosomal identical to *Thalysias* with two categories of auxiliary spicules forming surface spicule bundles, and on that basis Van Soest (1984b: 115) suggested the two genera should be merged: it is included here in synonymy with *Clathria* (*Thalysias*). The possession of cleistochelae in *C. ramosa* is not unique to Microcionidae also found in *Plocamiopsis*, *Quizciona* and several species of *Clathria* (e.g., *C.* (*Clathria*) *toxipraedita*).

Damoseni de Laubenfels, 1936
(Fig. 13A-C)

Damoseni de Laubenfels, 1936a: 110.

TYPE SPECIES. *Hymeraphia michaelseni* Hentschel, 1911:351 (by original designation) (fragment of holotype SMF969T).

Encrusting growth form. Surface sparsely hispid, even. Choanosomal skeleton hymedesmoid, with spongin fibres reduced to basal layer of spongin lying on substrate, with bases of choanosomal principal subtylostyles and acanthostyles embedded in spongin, standing perpendicular to substrate, spicules protruding through ectosome. Ectosomal skeleton with paratangential, slightly plumose tracts of both larger and smaller auxiliary subtylostyles. Megascleres large principal choanosomal subtylostyles with spined bases, echinating acanthostyles with spined bases and shafts (bare 'necks'), and two size classes of subectosomal auxiliary subtylostyles with either smooth or spined bases. Microscleres strongly unguiferous, sigmoid isochelae with vestigial alae, arcuate- or anchorate-like but of uncertain affinity, and large wing-shaped (oxhorn derived) toxas.

REMARKS. Hentschel's (1911) description of *Hymeraphia michaelseni* does not mention the presence of toxa microscleres, nor that principal spicules protrude a long distance through the surface. The modified unguiferous isochelae (of possible anchorate or arcuate derivation) are identical to those of *Bipocillopsis*, and the combination of toxas and unguiferous isochelae of possible tridentate-derivation supports the inclusion of such taxa in Microcionidae contrary to Hajdu et al.'s (1994) proposal. *Damoseni* is similar to other encrusting genera with hymedesmoid architecture and it could be included in *Clathria* (*Microciona*) on this basis. However, the specialised ectosomal skeleton composed of smaller ectosomal and larger subectosomal auxiliary spicules indicates affinities to *Clathria* (*Thalysias*).

Dendrocia Hallmann, 1920
(Fig. 13D-E)

Dendrocia Hallmann, 1920: 767; de Laubenfels, 1936a: 109.

TYPE SPECIES. *Clathria pyramida* Lendenfeld, 1888: 222 (by original designation) (holotype AMG9047).

Massive, lobate-digitate growth form. Surface conulose, with subdermal sculpturing, oscules slightly raised above surface with membraneous lip. Choanosomal skeleton dendritic, slightly plumo-reticulate near axis, without any obvious division of primary or secondary fibres, but with clear structural differences between choanosomal, subectosomal and ectosomal regions. Spongin fibres heavy, meandering, cored by auxiliary styles indistinguishable from those in ectosomal skeleton, and heavily echinated by acanthostyles (sometimes also secondarily incorporated into fibres). Subectosomal skeleton plumose or radial, with spicule tracts composed of auxiliary styles diverging from ends of peripheral choanosomal fibres and supporting overlying ectosomal skeleton. Ectosomal skeleton with continuous, heavy palisade of erect auxiliary styles. Principal spicules absent, and megascleres include only echinating acanthostyles with spined bases and necks but smooth points, and single category of structural spicule (auxiliary styles-subtylostyles), entirely smooth with hastate points and sometimes secondarily pointed bases. Microscleres modified palmate isochelae with curved, thickened shaft and reduced alae. Toxas absent.

REMARKS. This strict diagnosis based on the type species should be widened to include the presence of modifications to isochelae, ranging from typical palmate forms (with straight shaft, completely fused lateral alae, as in *Clathria* (*Dendrocia*) *abrolhensis* sp. nov.), modified palmate isochelae (with greatly curved, thickened shaft, partially detached lateral alae, as in *C.* (*D.*) *dura*), to anchorate-like forms (in which lateral alae are detached from shaft, shaft is curved, thickened and has a lateral ridge, as in *C.* (*D.*) *myxilloides*). One species also has oxhorn toxas (*C.*(*D.*) *scabida*) supporting the hypothesis that *Dendrocia* has affinities with Microcionidae.

Dendrocia, like *Wilsonella*, differs from other microcionids in having auxiliary styles both coring fibres and forming the ectosomal skeleton. However, whereas *Wilsonella* has two categories of auxiliary spicules and detritus is incorporated into the skeleton, *Dendrocia* has only one category of structural spicule throughout the skeleton. *Dendrocia* also has a characteristic dendritic or plumo-reticulate skeletal architecture, whereas *Wilsonella* is invariably reticulate. In ectosomal skeletal structure (with a continuous ectosomal palisade of spicules) *Dendrocia* resembles the *Thalysias* condition, but it has only one geometric form of auxiliary spicule producing the extra-fibre skeleton (i.e., subectosome and ectosomal regions) more similar to *Clathria*. For this reason *Dendrocia* is enigmatic, and Hooper (1990a) maintained it as a separate taxon, whereas earlier Van Soest (1984b) had indicated that it was probably a synonym of *Clathria*. In this work it is referred to *Clathria* (*Dendrocia*).

Two Australian species were initially included in *Dendrocia* by Hallmann (1920), the type species and *C. alata* Dendy (holotype NMV G2280). Both are undoubtedly synonyms. They apparently differ only in their spicule dimensions (styles: 175-230x2-µm versus 240-250x4-µm; acanthostyles: 63-95x3-1µm versus 79-154x8-1µm; arcuate isochelae: 23-2µm versus 20-2µm, respectively). In contrast, *D. antyaja* Burton & Rao, from the Indian Ocean, should be removed from *Dendrocia* because it has regularly reticulate choanosomal architecture, lacks an ectosomal skeleton, and has palmate isochelae indicating affinities to *Clathria*. Several other Australian species previously referred to *Clathria s.s.* should also be referred to *Dendrocia* on the basis of their skeletal architecture and spiculation.

Dictyociona Topsent, 1913
(Fig. 13F-G)

Dictyociona Topsent, 1913a: 579, 618; de Laubenfels, 1936a: 110; Lévi, 1960a: 60; Bergquist & Fromont, 1988: 104.

TYPE SPECIES. *Microciona discreta* Thiele, 1905: 447 (by monotypy) (holotype ZMB3302).

Thickly encrusting, lobate growth form. Surface composed of interconnected micropapillae. Choanosomal skeleton plumose, becoming plumo-reticulate in thicker sections. Spongin fibres divided into primary and secondary elements, heavier in axis, lighter in subectosomal region where dermal spicules implanted at nodes of peripheral fibres. Fibres cored by multispicular tracts of choanosomal principal subtylostyles, and heavily echinated by acanthostyles projecting from fibres at all angles. Ectosomal skeleton composed of paratangential tracts of subectosomal auxiliary subtylostyles, of a single size category, arising from peripheral fibres and piercing surface. Megascleres choanosomal principal subtylostyles with acanthose bases and acanthose shafts near basal end, echinating acanthostyles with spined bases and points (bare 'necks'), and subectosomal auxiliary subtylostyles with microspined bases. Microscleres palmate isochelae and thin toxas intermediate between wing-shaped and oxhorn forms.

REMARKS. *Dictyociona* resembles *Microciona* in its plumose skeletal structure but has partially acanthose choanosomal megascleres similar to those found in *Anaata* and *Antho*. These spicules are also present in several Raspailiidae (e.g., *Hymeraphia*, *Eurypon*), and they are considered here to be of minor diagnostic importance above the species level following Simpson (1968a). Lévi (1960a: 60) merged *Dictyociona* with *Clathria*, although the species could as easily be placed in *Microciona*. It is included here within *Clathria* (*Clathria*). Apart from the type species, other taxa referred to *Dictyociona* at one time or another include: *Microciona clathrata* Whitelegge, *M. heterotoxa* Hentschel, *M. pyramidalis* Brondsted, *Hymedesmia oxneri* Topsent, *Eurypon asodes* de Laubenfels, *E. acanthotoxa* Stephens, *E. ditoxa* Stephens, *E. microchela* Stephens, *E. tenuissima* Stephens, *Clathria terranovae* Dendy, *D. contorta* Bergquist & Fromont and *D. atoxa* Bergquist & Fromont.

Dictyoclathria Topsent, 1920
(Fig. 13H-I)

Dictyoclathria Topsent, 1920b: 18; Burton, 1930a: 501, 533, 1933: 50; de Laubenfels, 1936a: 77; Lévi, 1960a: 80.

Dyctioclathria [lapsus]; Ferrer Hernández, 1921: 172.

TYPE SPECIES. *Clathria morisca* Schmidt, 1868: 9 (by original designation) (schizotype BMNH-1868.3.2.21); junior synonym of *Antho involvens* (Schmidt, 1864) (Lévi, 1960a: 57) (schizotype BMNH1867.3.11.92).

Arborescent growth form. Surface hispid, uneven. Choanosomal skeleton renieroid reticulate composed of spined acanthostyles forming triangular or rectangular meshes, enclosed within fibres (axis) or bound together at nodes by collagen (near periphery). Echinating megascleres absent. Subectosomal (extra-axial) skeleton plumose, with smooth principal styles standing perpendicular to fibre nodes, individually or in bundles, protruding through surface. Ectosomal skeleton with dense plumose or paratangential bundles of subectosomal auxiliary subtylostyles, sometimes surrounding protruding principal styles. Megascleres shorter lightly spined acanthostyles (renieroid skeleton) and longer completely smooth principal styles (extra-axial skeleton), and smaller subectosomal auxiliary subtylostyles with spined bases. Microscleres palmate isochelae and toxas intermediate between wing-shaped and oxhorn forms.

REMARKS. *Dictyoclathria* is an objective synonym of *Antho*, since the type species of both genera are conspecific (Lévi, 1960a). The type specimen of *Dictyoclathria* is remarkable in having a nearly raspailiid ectosomal condition with bundles of ectosomal spicules appearing to surround the protruding extra-axial spicules, but this is not as perfectly developed as in many *Raspailia*.

Dirrhopalum Ridley, in Ridley & Duncan, 1881

Plocamia Schmidt, 1870: 62.

Dirrhopalum Ridley in Ridley & Duncan, 1881: 477. See *Plocamia*.

Echinochalina Thiele, 1903
(Fig. 14A-B)

Echinochalina Thiele, 1903a:961; Hallmann, 1912: 288; Topsent, 1928a: 61; Burton, 1934a: 562; de Laubenfels, 1936a:118; Thomas, 1977: 115.

TYPE SPECIES. *Ophlitaspongia australiensis* Ridley, 1884a: 442 (by subsequent designation (Hallmann, 1912: 288)) (holotype BMNH1881.10.21.299).

Massive-digitate, reticulate growth form. Surface with low ridges and interconnected lamellae, producing angular cells with thin dermal membrane stretched between. Choanosomal skeleton irregularly reticulate, with heavy primary spongin fibres cored by paucispicular tracts of auxiliary spicules (tornotes), and heavy secondary spongin fibres cored by uni- or

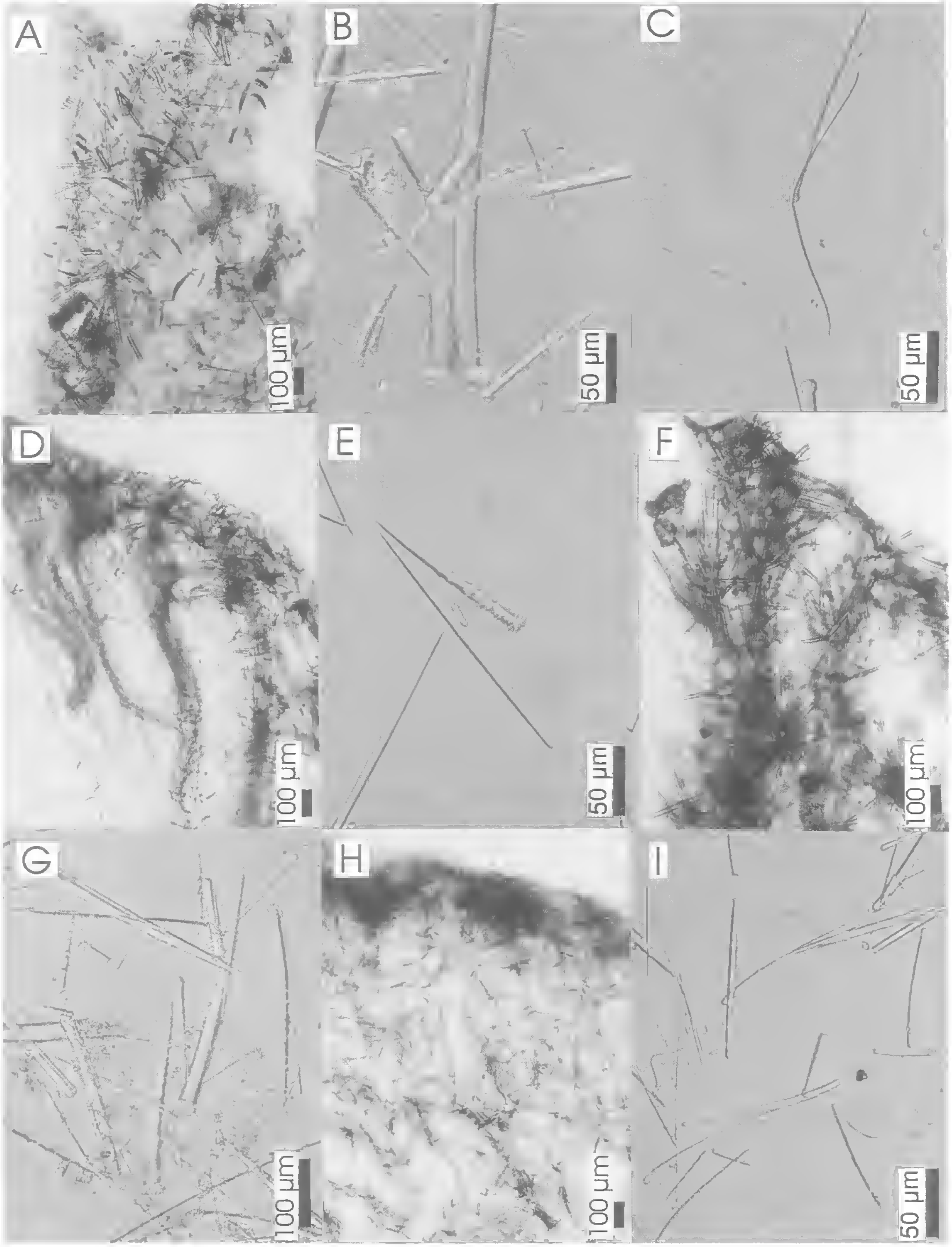

FIG. 13. Type species of microcionid genera. A-C, *Damoseni* (*D. michaelseni* Hentschel, SMF969T). D-E, *Dendrocia* (*Clathria pyramida* Lendenfeld, AMG9047). F-G, *Dictyociona* (*Microciona discreta* Thiele, ZMB3302). H-I, *Dictyoclathria* (*Clathria morisca* Schmidt, MNHNDT unreg.).

bispicular tracts of auxiliary spicules. Fibres lightly echinated by principal subtylostyles. Ectosomal skeleton with undulating fibres and loose paratangential tracts of auxiliary spicules (also distributed throughout mesohyl). Megascleres include quasidiactinal auxiliary tornotes with aymmetrical or symmetrical ends (coring fibres and on ectosome), and completely smooth principal subtylostyles-styles (echinating fibres), sometimes modified to oxeotes (asymmetrical with two pointed ends). Microscleres wing-shaped toxas. Isochelae absent.

REMARKS. In the type species coring spicules are tornotes, whereas in other species of *Echinochalina* they range from true styles to oxeotes. Re-examination of the holotype of *O. australiensis*, and Thiele's (1903a) specimen from Ternate, Indonesia (SMF1855) also found that echinating principal styles can sometimes be modified to oxeote spicules, providing support for the otherwise tenuous placement of *Protophlitaspongia* with this group of microcionids.

Hallmann (1912: 288) noted that *Echinochalina* differs from the allied *Echinoclathria* of authors (= *Holopsamma* as defined here) in having fibres cored by auxiliary spicules (tylotes or strongyles), which may be modified to quasi-monactinal forms (tylostrongyles, tornostrongyles), and echinated by smooth styles or subtylostyles. By comparison, *Echinoclathria* in the strict sense (or *Ophlitaspongia* of authors) has principal choanosomal styles (or modified monactinal megascleres) which both core and echinate fibres, as well as a second category protruding through the surface; *Holopsamma* has only a single category of coring and echinating principal spicule. As such, Van Soest (1984b: 129) suggested that *Echinochalina* possibly did not belong with the Microcionidae, and might be more appropriately placed elsewhere within the Poecilosclerida (e.g., Phoriospongiididae). However, examination of a suite of species included here in *Holopsamma* found that this group also undergoes a reduction in coring spicules (e.g., *H. pluritoxa* (Pulitzer-Finali)), whilst retaining other characteristics common to the genus, and it is possible that *Echinochalina*, *sensu* Hallmann, undergoes similar reduction.

Probably of greater importance in determining the appropriate placement of *Echinochalina* is its lack of any special ectosomal skeleton, and in this respect it is similar to *Dendrocia* (both with only one form of structural (auxiliary) spicule). Whereas *Echinoclathria* (*s.s.*) possesses monactinal auxiliary spicules in the peripheral skeleton (sometimes reduced to quasi-diactinal forms), *Echinochalina* has spicules which are closer to true diactinals (although sometimes modified to quasi-monactinal forms). Both genera lack definite ectosomal specialisation. Some *Echinochalina* appear to have affinities with certain species of *Echinodictyum* (Raspailiidae) and with the Desmacididae, and both Thiele (1903a) and Topsent (1904a) have already noted this resemblance, suggesting that they differ mainly in the geometry, ornamentation and derivation of the echinating megascleres. By comparison, Hallmann (1912) considered that these differences, and the presence of long subectosomal styles in many *Echinodictyum* species, are sufficient to maintain the two genera as distinct taxa (see Hooper, 1991d).

Although *Echinochalina* usually has smooth echinating megascleres, linking it to *Echinoclathria* and *Holopsamma*, there are two species which were previously referred to *Echinodictyum* (*E. ridleyi* Dendy and *E. spongiosum* Dendy), which have acanthose echinating megascleres but otherwise conform to *Echinochalina* in their spicule geometries and skeletal architectures. Hooper (1991) transferred these species to *Echinochalina*.

Tablis de Laubenfels is an obvious synonym of *Echinochalina*. The two genera differ only by the absence of microscleres and the presence of a reticulate architecture in *Tablis*.

Echinoclathria Carter, 1884
(Fig. 14C-E)

Echinoclathria Carter, 1884: 204 [nomen nudum]; Carter, 1885f: 355; Ridley & Dendy, 1887: 159; Topsent, 1894a: 18; Thiele, 1903a: 962; Hallmann, 1912: 275-276; Dendy, 1922: 71 [in part]; Topsent, 1928a: 61; de Laubenfels, 1936a: 119; Wiedenmayer, 1977: 143, 1989: 58. (not Uriz, 1988: 89].

TYPE SPECIES. *Echinoclathria tenuis* Carter, 1885f: 355 (by subsequent designation; Burton, 1934a: 562) (holotype BMNH1886.12.15.147); junior synonym of *Spongia leporina* Lamarck, 1814: 444 (Topsent, 1932: 101) (holotype MNHNLBIMDT567).

Thinly flabellate, flattened palmate, stalked growth form. Surface membraneous, microscopically hispid. Choanosomal skeleton renieroid reticulate, slightly compressed with well developed spongin fibres in axis, more openly reticulate, less compressed and with lighter spongin towards periphery. Axial fibres cored by pauci- or multispicular tracts of smaller principal styles producing rounded or irregularly shaped meshes, and echinated by same spicules.

Subectosomal (extra-axial) skeleton radial, uni- or paucispicular, with larger principal spicules erect on terminal fibres and usually protruding through surface. Ectosomal specialisation absent, with bundles of subectosomal auxiliary subtylostyles embedded perpendicularly and forming paratangential brushes surrounding larger principal spicules. Megascleres include smaller, robust, entirely smooth principal subtylostyles (coring and echinating fibres), larger principal subtylostyles of similar geometry (projecting from peripheral fibres and protruding through surface), and smooth subectosomal auxiliary subtylostyles, straight or flexuous. Microscleres absent.

REMARKS. There is substantial confusion concerning the precise definition of *Echinoclathria*, and its relationship with other nominal genera such as *Holopsamma*, *Halme*, *Aulena* and *Ophlitaspongia*. Consequently the above diagnosis is strict, pertaining only to the type species, and a detailed explanation is justified below.

Most authors follow Hallmann's (1912: 275) interpretation of *Echinoclathria* in which the genus is essentially characterised by 'a honeycomb mass of anastomosing flattened trabeculae', a reticulate skeleton of heavy spongin fibres cored and echinated by smooth monactinal principal megascleres of the same geometry, and with monactinal subectosomal auxiliary styles distributed throughout the mesohyl (and in some species also forming a radial subectosomal skeleton). Hallmann also noted that in some species he assigned to *Echinoclathria* there are both chelae and toxa microscleres, with quasi-monactinal auxiliary megascleres, or they may have their coring megascleres replaced partially or completely by detritus (e.g., *Holopsamma laminaefavosa*). Hallmann suggested further that *Echinoclathria* and *Ophlitaspongia* essentially differed only in growth form, a view perpetuated by Wiedenmayer (1989). This interpretation is emended here.

Most species included in *Echinoclathria* prior to the present study do have the characteristics outlined by Hallmann (1912), and most are relatively homogeneous and easily recognisable in the field by their characteristic 'honeycomb reticulate' growth form. It is therefore unfortunate that Burton (1934a) subsequently designated *E. tenuis* (a junior synonym of *Spongia leporina*) as the type species of *Echinoclathria*, because this species has a flabellate growth form (very dissimilar to 'honeycombed reticulate' species), skeletal architecture consisting of a differentiated axis, extra-axis, a renieroid skeleton, and a second category of principal spicules protruding through the ectosome. *Echinoclathria leporina* is typical of most *Ophlitaspongia* (of authors) (e.g., *O. axinelloides* Dendy).

Confusing the generic boundaries even further, *Spongia leporina* closely resembles *Antho* (*Isopenectya*) in growth form and gross skeletal construction, but differentiated by their skeletal structures, spicule ornamentation and localisation of particular spicules to certain regions of the skeleton. Nevertheless, it could be argued that *Isopenectya* could be included in *Echinoclathria* as equally as in *Antho*. The former option is tentatively rejected here based on the unequivocal possession of spined (versus smooth) styles composing the renieroid skeleton, and possession of a secondary, longitudinal, subisodictyal secondary skeleton in *Isopenectya*. Similarities in renieroid skeletal construction may link both these genera into a clade based on secondary reduction or loss. The difficulty in positively assigning *Isopenectya* is discussed further below.

Wiedenmayer (1977: 144) suggested that *Echinoclathria* should be restricted to Indo-Pacific species, although there were similarities in skeletal architecture with *Pandaros* from the West Indies (which lacks microscleres). He noted further that *Echinoclathria* had mostly smooth choanosomal spicules, except for occasional vestigial spines on the bases of some auxiliary spicules, whereas *Pandaros* had acanthose echinating spicules. Simpson (1968a) has already demonstrated that the loss of spination on echinating spicules is common amongst microcionids and not correlated with any cytological differences (i.e., of low taxonomic value). Wiedenmayer (1977, 1989) concluded that although two genera intergraded they could not be consistently differentiated, and *Pandaros* is not included in this group.

Thus, on the basis of evidence presented by Hallmann (1912: 275), Burton (1959a: 246) and Wiedenmayer (1989: 58), and re-examination of all nominal species belonging to these groups, it is clear that we are dealing with two distinct, homogenous groups. One, agreeing with the definition of *Spongia leporina* above, includes the genera *Echinoclathria* (in the strict sense only, and not of authors), and *Ophlitaspongia* (of authors, and not in the strict sense). *Echinoclathria* is the earliest available name for this group, and its characteristics should be taken as those traditionally associated with the concept of *Ophlitaspongia* (of authors). This genus is most closely related to *Antho* in its renieroid main skeletal structure, differing in having smooth choanosomal spicules and a single skeletal stucture (i.e., *Antho* has 2 skeletal structures: a renieroid skeleton composed of spined spicules and a plumose or subisodictyal skeleton composed of smooth spicules).

The second group contains honeycombed reticulate species traditionally associated with *Echinoclathria* (of authors, not in the strict sense), together with *Holopsamma*, *Halme*, *Plectispa* and *Aulena* (of authors, not in the strict sense). The earliest available name for this group is *Holopsamma* Carter (1885f). There is no doubt that this honeycombed reticulate group of microcionids warrants inclusion in a separate taxon, although its level of divergence is arguable (cf. Wiedenmayer, 1977, 1989; Hooper, 1991). Its peculiar growth form is consistent for all 12 Australian species (all from southern Australia (Gondwanan) faunas), and 4 non-Australian species (2 from South America (Gondwanan) and 2 from the Indo-west Pacific (Tethyan) faunas). This growth form is correlated with a reticulate skeletal architecture, forming a homogeneous group which is recognised here at the generic level.

A honeycombed reticulate growth form is also known for *Acamasina* de Laubenfels (1936a: 117) in Mycalidae (Van Soest, 1984b) and *Pandaros* (see below), both known only from the West Indies.

Echinonema Carter, 1875
(Fig. 14F-G)

Echinonema Carter, 1875: 194 [nomen nudum]; Carter, 1881a: 378; Ridley, 1884a: 615; Topsent, 1894a: 19; Dendy, 1896: 32; Whitelegge, 1901: 80; Topsent, 1928a: 61, 1932: 89, 98; de Laubenfels, 1936a: 112; Lévi, 1960a: 56.

TYPE SPECIES. *Echinonema typicum* Carter, 1881a: 377 (by typonymy) (lectotype BMNH1877.5.21.149); junior synonym of *Spongia cactiformis* Lamarck, 1814: 440 (lectotype MNHNLBIMDT580).

Arborescent, shrubby, lamellate growth form. Surface even, hispid, subectosomal striations. Choanosomal skeleton reticulate, with open rectangular or elongate open meshes although slightly compressed in axis. Primary spongin fibres ascending, heavy, cored by multispicular tracts of choanosomal principal styles, interconnected by pauci- or aspicular secondary spongin fibres. Fibres echinated by acanthostyles heaviest in peripheral skeleton. Subectosomal skeleton plumose, with brushes of larger subectosomal auxiliary subtylostyles erect on peripheral choanosomal fibres. Ectosomal skeleton dense, with smaller ectosomal auxiliary subtylostyles forming a dense palisade on surface. Megascleres include smooth choanosomal principal styles, larger subectosomal auxiliary subtylostyles with smooth or microspined bases, smaller ectosomal auxiliary subtylostyles with smooth or microspined bases, and short thick echinating acanthostyles with spined base and point but bare neck. Microscleres palmate isochelae of two sizes, including contort forms, and thin accolada and asymmetrical toxas.

REMARKS. It is confirmed here that Carter's (1881a) *Echinonema typicum* is identical to Lamarck's (1814) Spongia *cactiformis*, and consequently the name *cactiformis* has seniority over the better known junior synonym *Clathria typica*, widely used in the literature. Lendenfeld (1888), Whitelegge (1901) and Hallmann (1912) created many new subspecific names (as varieties) for this species, and Hooper & Wiedenmayer (1994) assigned Lamarck's (1814) specimen to *Clathria* (*Thalysias*) *cactiformis cactiformis*, and Carter's (1881) specimen to *C.* (*T.*) *cactiformis typica*. Examination of type material of all these subspecies (var. *typica* (SMF1589); var. *porrecta* (SMF1653); var. *brevispinus* (AMZ931); var. *favosus* (AMZ944); var. *geminus* (AMZ928); var. *obesus* (AMZ937); var. *proximus* (AMZ930); var. *stelligera* (AME648); and three unnamed varieties of Hallmann (1912) (AMZ1158; AMZ1430, G9135, Z938; and AMZ41), showed that they were conspecific with the nominotypical variety (based on spicule size, spicule geometry and skeletal structure), whereas growth forms and surface features varied substantially between each taxon. The recognition of these subspecies, a preoccupation of many earlier authors, does at least demonstrate a high degree of external morphological variability for the species, but is not of particular nomenclatural importance because there are no other morphological characters that correlate with these differences in external morphology. It may be eventually determined from biochemical or genetic data, that this polymorphism is indicative of sibling species relationships, but no studies of this sort have yet been undertaken.

De Laubenfels (1936a: 112) suggested that *Echinonema* was identical to *Thalysias* (*sensu* de Laubenfels), whereas Van Soest (1984b) and others placed both genera into synonymy with *Rhaphidophlus* (see below). The genus is in-

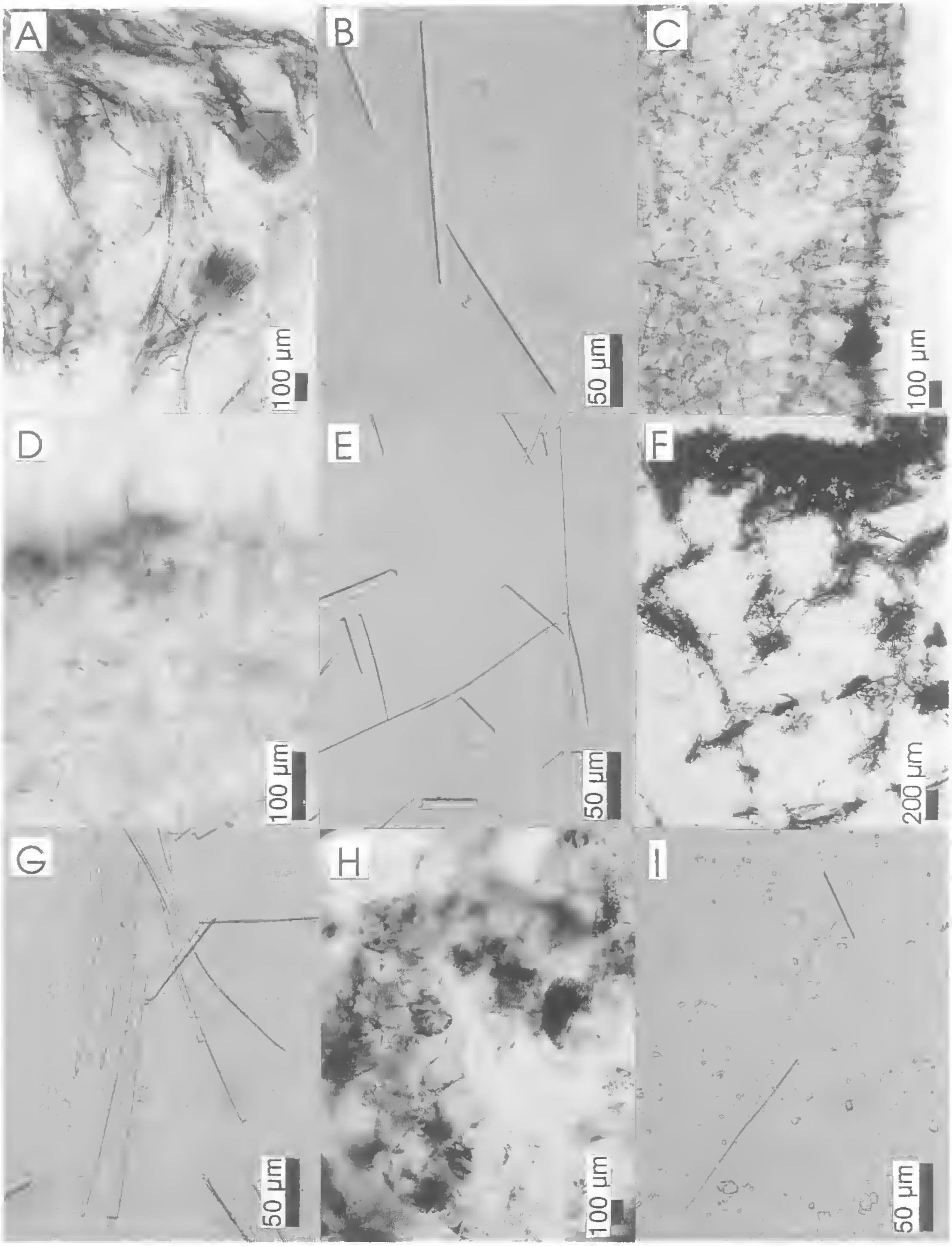

FIG. 14. Type species of microcionid genera. A-B, *Echinochalina* (*Ophlitaspongia australiensis* Ridley, BMNH1881.10.21.299). C-E, *Echinoclathria* (*E. tenuis* Carter, BMNH1886.12.15.147). F-G, *Echinonema* (*E. typicum* Carter, BMNH1877.5.21.149), H-I, *Halme* (*Holopsamma laminaefavosa* Carter, BMNH1886.12.15.312).

cluded here in *Clathria* (*Thalysias*) on the basis of its ectosomal specialisation.

Fisherispongia de Laubenfels, 1936
(Fig. 15A-C)

Fisherispongia de Laubenfels, 1936b: 460.

TYPE SPECIES. *Fisherispongia ferrea* de Laubenfels, 1936b: 460 (by original designation) (holotype USNM22239).

Encrusting growth form. Surface tuberculate, arenaceous, hispid. Choanosomal skeleton hymedesmoid, with basal layer of spongin fibre incorporating detritus and bases of larger choanosomal principal subtylostyles and smaller echinating styles, standing perpendicular to substrate, in groups or individually, ascending to but not protruding through ectosome. Ectosomal skeleton plumose, with subectosomal auxiliary polytylostyles, of a single category, arising from ends of choanosomal megascleres in multispicular bundles protruding through surface. Megascleres large choanosomal principal subtylostyles with smooth bases, smaller smooth echinating styles with smooth or microspined bases, and polytylote auxiliary tylostyles with smooth or microspined bases. Microscleres palmate isochelae, including contorted forms, and thick wing-shaped toxas.

REMARKS. De Laubenfels (1936b) distinguished *Fisherispongia* from other microcionids by the polytylote bases on their subectosomal auxiliary styles. In all other respects, however, the type species resembles other encrusting species with hymedesmoid architecture (e.g., *Leptoclathria*). Polytylote ectosomal megascleres are known in several other species of Microcionidae (e.g., *Clathria aceratoobtusa*, *Paratenaciella microxea*), as well as in other Poecilosclerida (e.g., *Camptisocale* Topsent and *Phelloderma* Ridley & Dendy; Coelosphaeridae). The incorporation of detritus into the choanosome and fibres is well known for several microcionids and other sponges (see remarks for *Aulenella*) and on this basis the species is included in *Clathria* (*Wilsonella*). Re-examination of the holotype found a marked contrast in size between the smaller and larger (so-called principal) spicules, with no intermediate sizes, and these smaller spicules are interpreted here as being smooth echinating styles. By its toxa morphology *Fisherispongia ferrea* (from the Atlantic coast of Panama) is very similar to *Clathria aceratoobtusa* (from the Indo-west Pacific).

Folitispa de Laubenfels, 1936
(Fig. 15D-F)

Folitispa de Laubenfels, 1936a: 119.

TYPE SPECIES. *Hymedesmia laevissima* Dendy, 1922:81 (by original designation) (holotype BMNH1921.11.7.69).

Thickly encrusting growth form. Surface even, slightly hispid. Choanosomal skeleton hymedesmoid, with spongin fibres lying on substrate and bases of choanosomal principal subtylostyles embedded, standing perpendicular to substrate individually or forming short multispicular plumose columns protruding through surface. Echinating megascleres absent. Subectosomal skeleton irregularly plumose, with loosely aggregated bundles of subectosomal auxiliary subtylostyles erect on surface or lying tangential to it. Megascleres include smooth choanosomal principal subtylostyles, and smooth subectosomal auxiliary subtylostyles with mucronate or telescoped points. Microscleres palmate isochelae with anchorate-like modifications (curvature, partially detached alae, continuous ridge on shaft). Toxas absent.

REMARKS. The type species of *Folitispa* differs from other encrusting microcionids with hymedesmoid skeletal architecture (e.g., *Leptoclathria*) in lacking echinating acanthostyles (cf. *Axocielita*) and having chelae with anchorate-like modifications instead of typical palmate isochelae (cf. *Cionanchora*). These chelae are strongly curved, with lateral alae partially detached from the shaft and a continuous lateral ridge running the length of the shaft. However, these lateral alae are not fully formed (being about two-thirds the size of the front ala), nor are they completely detached from the shaft (attached for approximately 50% of their length), and consequently they cannot be considered true anchorate chelae but perhaps palmate isochelae with substantial anchorate modifications. The genus is included here in *Clathria* (*Microciona*) based on its skeletal structure.

[Halme] Lendenfeld, 1885
(Fig. 14H-I)

Halme Lendenfeld, 1885c: 285, 1889a: 446; de Laubenfels, 1936a: 17; Bergquist, 1980b: 454; Wiedenmayer, 1989: 58 (preoccupied).
Not *Halme* Pascoe, 1869.

TYPE SPECIES. *Holopsamma laminaefavosa* Carter, 1885b: 212 (by subsequent designation; de Laubenfels, 1936a: 17) (holotype BMNH1886.12.15.312).

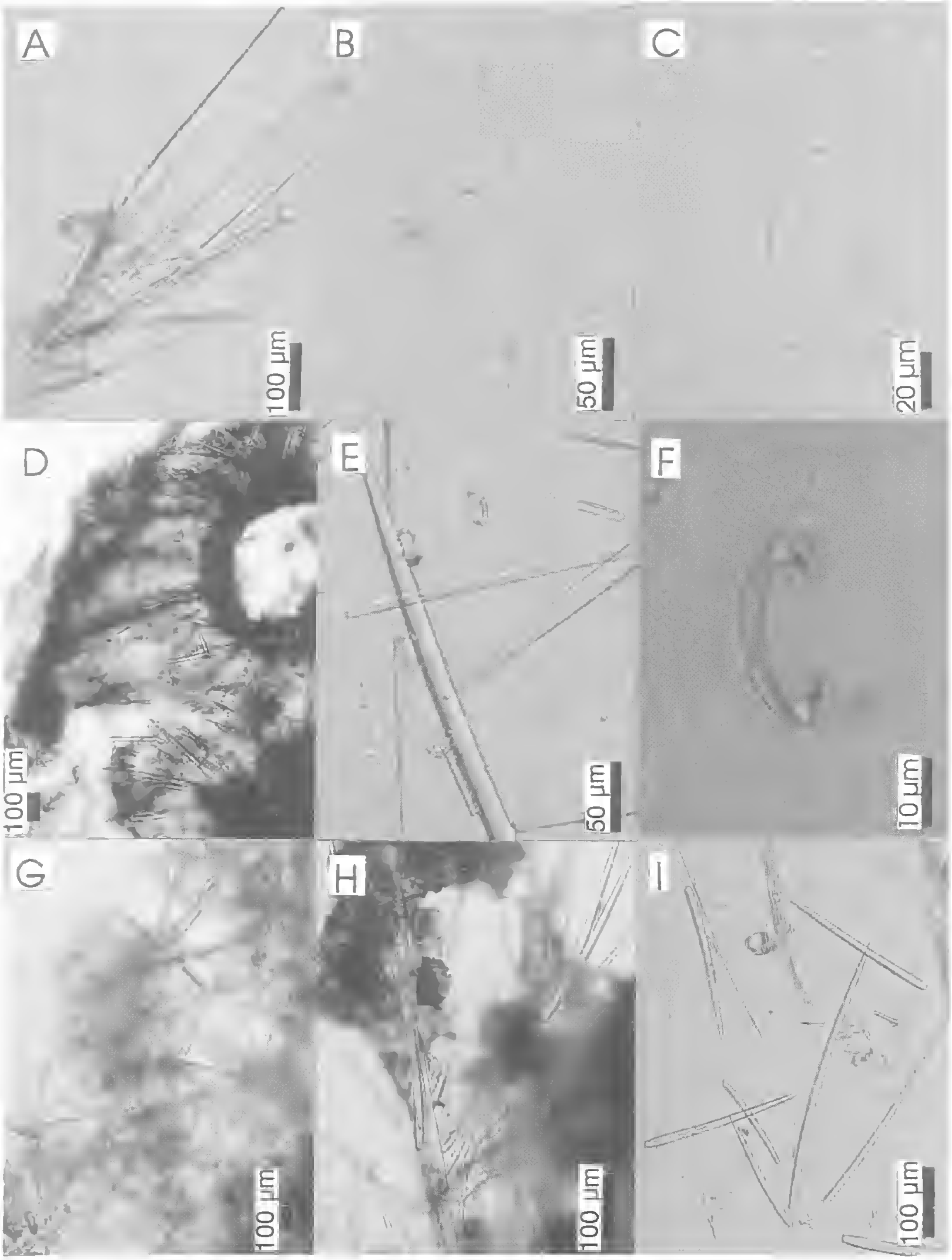

FIG. 15. Type species of microcionid genera. A-C, *Fisherispongia* (*F. ferrea* de Laubenfels, USNM22239). D-F, *Folitispa* (*Hymedesmia laevissima* Dendy, BMNH1921.11.7.69). G-I, *Holoplocamia* (*H. penneyi* de Laubenfels, USNM22460).

Massive, globular, lobate-digitate honeycombed reticulate growth form. Surface composed of small branches ('lacunae') interconnected to form regular network. Choanosomal skeleton irregularly reticulate, with heavy spongin fibres fully cored by both sand particles and other detritus, and with fewer choanosomal principal subtylostyles both coring and echinating fibres. Subectosomal skeleton with peripheral fibres cored and echinated by principal megascleres, slightly heavier, more plumose at periphery than at core, and with subectosomal auxiliary strongyles forming irregular paratangential tracts near surface. Ectosome with external fibre reticulation reinforced by sand. Megascleres vary from common to relatively scarse (or spicules reportedly absent entirely in some specimens), including short entirely smooth choanosomal principal subtylostyles, and smooth sinuous or straight subectosomal auxiliary strongyles or quasidiactinal styles. Microscleres absent.

REMARKS. *Halme* (*sensu* Lendenfeld, 1889b) is virtually identical to *Aulena* (of authors, e.g., Lendenfeld, 1888, but not Lendenfeld, 1885c), in skeletal construction, growth form and the presence of detritus within the fibre skeleton. In contrast, *Halme* (of Lendenfeld, 1885c) differs from *Aulena* (of authors) by the virtual absence (or inconsistent presence) of proper, heavily mineralised spicules. However, examination of relevant type material, recent material from southern and eastern Australian waters (see below) and the literature (e.g., Wiedenmayer, 1989) shows that *H. laminaefavosa* is relatively polymorphic in its growth form, surface structure, spongin fibre construction, amount of detritus incorporated into the skeleton and the number and presence or absence of megascleres. Despite this variability, the species is clearly a synonym of *Holopsamma*, closely related to other honeycombed reticulate species. Of the numerous species referred to *Halme* by Lendenfeld (1885c, 1888) many are Dictyoceratids (Bergquist, 1980b), whereas the type species is undoubtedly a microcionid. Unfortunately the name *Halme* Carter, 1885b is preoccupied by *Halme* Pascoe, 1869 (Wiedenmayer, 1989), and *Holopsamma* Carter is the senior-most available name for this group of honeycomb reticulate microcionid sponges.

Heteroclathria Topsent, 1904
(Fig. 16A-B)

Heteroclathria Topsent, 1904b: 93; Burton, 1935a: 403.

TYPE SPECIES. *Heteroclathria hallezi* Topsent, 1904b: 94 (by original designation and monotypy) (schizotype MNHNLBIMDT1884).

Erect, digitate growth form. Surface even, microscopically hispid. Choanosomal skeleton regularly renieroid reticulate, with heavy spongin fibres well differentiated into primary ascending multispicular fibres, cored by choanosomal principal tylostyles, and secondary transverse uni- or bispicular fibres cored by amphistrongyles. Subectosomal skeleton plumose or paratangential, with subectosomal auxiliary subtylostyles forming poorly developed brushes arising from peripheral primary fibres, and also forming clusters around margins of oscules. Echinating acanthostyles absent, but choanosomal principal styles sometimes echinate primary fibres. Megascleres choanosomal principal tylostyles with microspined bases, large strongyles (dumbell spicules) of renieroid skeleton with spined bases, and subectosomal auxiliary subtylostyles with microspined bases. Microscleres palmate isochelae and thin wing-shaped toxas.

REMARKS. *Heteroclathria* is unusual to the plocamiform group of sponges (de Laubenfels, 1936a), such as *Antho* and *Plocamilla*, in having a differentiated primary and secondary fibre network cored by monactinal and diactinal megascleres, respectively. The type species is only known from the holotype which unfortunately lacks collection data. Burton (1935a: 403) referred two other species to the genus, *Plocamia karykinos* de Laubenfels (1927: 262) and *P. manaarensis* (*sensu* Lambe, 1895: 124; holotype USNM6331; not Carter, 1880a: 34), which he renamed *H. lambei* Burton, and which Bakus (1966: 512) also renamed *Plocamilla zimmeri*. De Laubenfels (1936a: 78) suggested that *Heteroclathria* was a synonym of *Plocamia*, and this is confirmed here from re-examination of both *H. lambei* and *H. hallezi*. *Heteroclathria* is referred here to *Antho* (*Plocamia*) in having (acantho)-strongyles in the renieroid skeleton, although true echinating spicules are absent.

Another species which shows some similarities to *Heteroclathria* in skeletal structure is *Stylotella cornuta* Topent (1897b: 464), from the Andaman Sea off Malaysia, for which Burton & Rao (1932: 343) created *Acanthostylotella*. That species lacks the characteristic 'dumbell spicules' but has a renieroid skeleton of primary ascending multispicular fibres interconnected by unispicular tracts of smooth styles. It lacks an ectosomal skeleton and lacks microscleres, and it possibly best placed in Iophonidae.

Holoplocamia de Laubenfels, 1936
(Fig. 15G-I)

Holoplocamia de Laubenfels, 1936a: 75; Lévi, 1960a: 80; Little, 1963: 47.

TYPE SPECIES. *Holoplocamia penneyi* de Laubenfels, 1936a: 75 (by original designation) (holotype USNM22460).

Thinly encrusting growth form. Surface rugose, microscopically hispid. Choanosomal skeleton hymedesmoid, with basal layer of spongin fibre, principal choanosomal styles embedded in fibre nodes, standing perpendicular to and protruding through surface, and with basal mass of acanthostrongyles forming an irregular renieroid secondary reticulation of spicules around principal spicules, interconnected by sparse collagen at nodes. Smaller acanthostyles also present echinating fibre nodes. Mesohyl incorporates large quantities of detritus and auxiliary spicules. Ectosomal skeleton with tangential or paratangential tracts of subectosomal auxiliary subtylostyles. Megascleres principal choanosomal styles-subtylostyles with either smooth or microspined bases, acanthostrongyles or acanthostyles of basal skeleton more heavily spined at ends than middle, echinating acanthostyles evenly spined, and subectosomal auxiliary subtylostyles with microspined bases. Microscleres palmate isochelae, including contorted forms, and wing-shaped toxas.

REMARKS. *Holoplocamia* was erected for sponges similar to *Plocamia* Schmidt, but having spiny rather than smooth principal spicules. Lévi (1960a) suggested that the genus was a synonym of *Plocamilla*, whereas Topsent (1928a) and Little (1963) argued that *Plocamilla* was different from both *Plocamia* and *Holoplocamia* in lacking any differentiation between primary and secondary skeletal tracts. This opinion is not upheld here. De Laubenfels (1936a: 75) referred several 'plocamiform' species to *Holoplocamia*, including the type species of *Plocamilla*, and it is now generally accepted that *Holoplocamia* and *Plocamilla* are synonymous (Bakus, 1966; Simpson, 1968a; Lévi & Lévi, 1983a; Pulitzer-Finali, 1983; Van Soest, 1984b). Most of the 'plocamiform' species discussed by de Laubenfels (1936a) were subsequently found to belong to *Plocamione* Topsent (Raspailiidae; Hooper, 1991), whereas the poecilosclerids (including *Holoplocamia*) are considered here to belong to *Antho* (*Plocamia*) (the latter a senior name for *Plocamilla*).

Holopsamma Carter, 1885
(Fig. 16C-D)

Holopsamma Carter, 1885c: 211.

TYPE SPECIES. *Holopsamma crassa* Carter, 1885c: 211 (by subsequent designation, de Laubenfels, 1936a: 98) (lectotype BMNH1886.12.15.313; Hooper & Wiedenmayer, 1994), a senior synonym of *Halme globosa* Lendenfeld, 1885c: 303 (lectotype BMNH1886.8.27.71) (cf. Wiedenmayer, 1989: 63).

Subspherical, digitate, regularly 'honeycomb' reticulate growth form. Surface arenaceous, porous, with tympanic membrane-like ectosomal crust stretched across adjacent subdermal cavities. Choanosomal skeleton reticulate, with well developed spongin fibres not well differentiated into primary or secondary elements, although many ascending fibres have core of small quantities of detritus (mostly spicule fragments), whereas other fibres clear of detritus completely. Coring and echinating spicules absent from choanosomal skeleton. Ectosomal skeleton heavily arenaceous, with crust of sand and scattered reticulate (or plumose or paratangential in places) bundles of subectosomal auxiliary strongyles lying tangential on surface crust. Mesohyl matrix relatively heavy between fibres. Megascleres only smooth subectosomal auxiliary strongyles. Microscleres absent.

REMARKS. De Laubenfels (1936a: 97) noted that *Holopsamma* differs from other 'sandy sponges' (i.e., the polyphyletic 'family Psammascidae' de Laubenfels) in lacking microscleres and having both monactinal and diactinal megascleres. It is unfortunate that he designated *H. crassa* as the type species because in some of the 5 'valid' syntypes the monactinal (principal) styles may be lost completely, and the diactinal (auxiliary) strongyles are vestigial, leaving only heavy spongin fibres (the major ones with a core of detritus), and a heavy ectosomal sand cortex.

The status and affinities of this genus are still confused, despite the comprehensive redescription and discussion of the type species by Wiedenmayer (1989). This confusion is due to the fact that no-one had previously nominated a lectotype amongst the 31 syntypes of the type species, which are composite and represent at least 6 different species: only 5 of these actually conformed to Carter's (1885c) original description of *Holopsamma crassa*.

Furthermore, the lectotype (BMNH-1886.12.15.313) designated by Hooper & Wiedenmayer (1994) and figured by Wiedenmayer (1989: pl.6, fig.7) is identical to *Halme globosa* Lendenfeld, and there is some conjecture as to which name is the most valid. Wiedenmayer (1989: 63) chose to use the name *H. globosa* over *H. crassa*, although he admitted that *crassa* was more senior (apparently by only several months), and therefore under the rules of the ICZN it must take precedence. His arguments in choosing *globosa* over *crassa* were that type material of *globosa* was firmly established whereas the type series of *crassa* was an unresolvable mess, but this is inrelevant with the subsequent designation of a lectotype for *H. crassa* by Hooper & Wiedenmayer (1994).

Wiedenmayer (1989: 63) provided many further details concerning these species synonymies and the affinities of 'sandy sponges' belonging to the Microcionidae. But more important than the nomenclatural problems associated with the type species (and the genera *Halme* and *Holopsamma*), there are some biological questions unanswered by Wiedenmayer's (1989) work. *Holopsamma crassa* is very similar to *Holopsamma laminaefavosa*, the type species of *Halme* Lendenfeld, 1885 (not *Halme* Pascoe, 1869), and it is possible that in fact the two species are synonymous (given that they are both allegedly very polymorphic). A comparison of type material shows that the only substantial differences are that in *H. crassa* spongin fibres contain virtually no sand and principal spicules have been lost, whereas in *H. laminaefavosa* primary fibres are virtually fully cored with sand, and both principal and auxiliary spicules are retained. In dealing with preserved material (i.e., without accompanying field characters), these definitions should be adhered to strictly. Conversely, following Wiedenmayer's (1989) definition, diagnostic characters in each species overlap substantially providing reasonable cause to synonymise the species (and genera *Holopsamma* and *Halme*).

In the present work *Holopsamma* is the senior name for the group of honeycomb reticulate sponges traditionally known as *Echinoclathria* (of authors).

Hymantho Burton, 1930
(Fig. 16F-G)

Hymantho Burton, 1930a: 503.

TYPE SPECIES. *Hymantho normani* Burton, 1930a: 503 (by original designation) (holotypeBMNH 1910.1.1.791).

Thinly encrusting growth form. Surface even, hispid. Choanosomal skeleton hymedesmoid, with basal layer of spongin on substrate and bases of choanosomal principal subtylostyles and echinating acanthostyles embedded and standing perpendicular to substrate. Ectosomal skeleton with paratangential bundles of subectosomal auxiliary subtylostyles of single size category. Mesohyl matrix with some debris incorporated. Megascleres choanosomal principal subtylostyles with acanthose bases, echinating acanthostyles with spined bases and shafts but aspinose points, and smooth auxiliary subtylostyles or polytylostyles. Microscleres palmate isochelae and thick forceps-shaped or v-shaped toxas.

REMARKS. *Hymantho normani* was originally described with only toxa microscleres but re-examination of the holotype discovered that large palmate isochelae (18-22m), with large alae, are also present. *Hymantho* was erected by Burton (1930a), being similar to *Leptoclathria* Topsent in its hymedesmoid skeletal architecture, but supposedly lacking chelae microscleres (Lévi, 1960a: 60). In this latter respect the genus was also be compared with *Pseudanchinoe* and *Querciclona*, which Van Soest (1984b) considered to be junior synonyms of *Clathria* (*s.l.*), but in any case the discovery of isochelae in the type species negates the concept of the genus. Alander (1942) and Van Soest & Stone (1986) also suggested that the secondary loss of isochelae and the presence of a leptoclathriid skeleton have little generic value in the Microcionidae. The genus is referred into synonym with *Clathria* (*Microciona*).

Isociella Hallmann, 1920
(Fig. 16H-I)

Isociella Hallmann, 1920: 784; de Laubenfels, 1936a: 152; Bergquist & Tizard, 1967: 187; Bergquist & Fromont, 1988: 114.

TYPE SPECIES. *Phakellia flabellata*, in part (*sensu* Ridley & Dendy, 1886: 478) (by monotypy) (not *P. flabellata* Carter, 1885f: 363); = *Phakellia jacksoniana* Dendy (replacement name; Dendy, 1897: 236) (holotype BMNH1887.5.2.9), both junior synonyms of *Clathria macropora*, in part, Lendenfeld, 1888: 221 (holotype AMZ466) (this work).

Erect, stipitate, flabelliform growth forms. Surface hispid, relatively smooth, with ridges and lamellae. Choanosomal skeleton relatively homogeneous, renieroid, composed of primary, multispicular, plumose, ascending tracts of

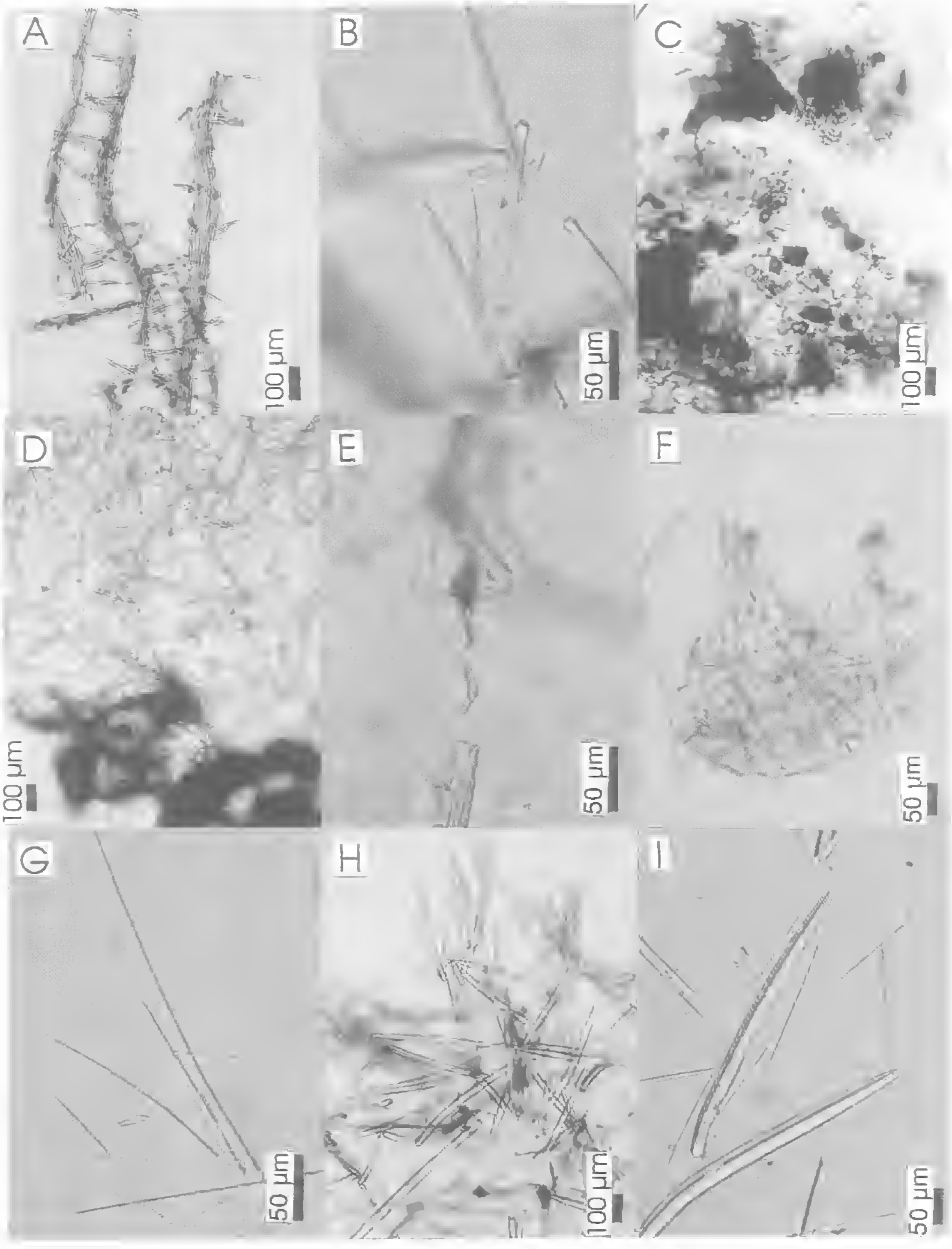

FIG. 16. Type species of microcionid genera. A-B, *Heteroclathria* (*H. hallezi* Topsent, MNHNDT1884). C-D, *Holopsamma* (*H. crassa* Carter,BMNH1886.12.15.313). E, *Halme* (*H. globosa* Lendenfeld, synonym of *H. crassa*, BMNH1886.8.27.71). F-G, *Hymantho* (*H. normani* Burton, BMNH1910.1.1.791). H-I, *Isociella* (*Phakellia flabellata sensu* Ridley & Dendy, BMNH1887.5.2.9).

choanosomal principal styles, interconnected by secondary, uni- or paucispicular, transverse tracts of same spicules, together forming regular renieroid or sub-renieroid (triangular) meshes; principal spicules bonded together at nodes by collagen or enclosed in relatively poorly developed spongin fibres. Echinating acanthostyles absent. Subectosomal auxiliary styles of a single category, arranged tangentially, paratangentially or in plumose brushes on surface, with some principal styles also protruding through peripheral skeleton singly or in sparse plumose brushes. Megascleres robust smooth choanosomal principal styles, and small smooth or basally spined subectosomal auxiliary styles-subtylostyles. Microscleres palmate isochelae with 'fluted' alae, no toxas (in type species).

REMARKS. *Isociella* contained 3 species prior to the present study (*Clathria macropora* Lendenfeld, *Ophlitaspongia eccentrica* Burton (1934a: 560), and *I. incrustans* Bergquist (1961a: 42)), although Hallmann (1920: 784) suggested that there were some other species included in his concept of *Ophlitaspongia* (=*Echinoclathria* as defined in this study) which could also be referred here. The definition above is widened below to include species with toxas and different forms of palmate isochelae.

Dendy (1897) renamed the type species *jacksoniana* because *Phakellia flabellata* Ridley & Dendy (1886) was preoccupied by *Phakellia flabellata* Carter (1885f) from Port Phillip Bay, but Hallmann (1920) considered that the 2 species belonged to different genera, and the replacement name *flabellata* was unnecessary. However, *P. flabellata* Ridley & Dendy is a junior homonym of *P. flabellata* Carter, and Dendy's (1897) replacement name *P. jacksoniana* is a valid emendment. Neither species belongs to *Phakellia*. In any case *C. macropora* Lendenfeld is identical to, and the senior available name for, *P. jacksoniana*.

Isociella is distinguished from other microcionids by its relatively homogeneous, wide-meshed, sub-renieroid reticulation of a single category of smooth choanosomal styles, lacking echinating spicules, and without any differentiation between axial and extra-axial regions (although choanosomal spicules may diverge slightly towards periphery, sometimes becoming plumose on surface). It differs from the two other groups of microcionids that have renieroid skeletal structure. *Antho* (including *Isociona*, *Plocamia*, *Plocamilla*, *Plocamiopsis*, and *Isopenectya*), has two categories of choanosomal megascleres, one acanthose forming a basal renieroid skeleton, and one smooth forming ascending plumose extra-fibre tracts of the true choanosomal skeleton. Some *Echinoclathria* species (as defined in the present study, including *Ophlitaspongia* in the sense of most authors), have a renieroid main skeleton of smaller, smooth choanosomal styles and the same spicules echinating fibres, a radial peripheral skeleton in which larger, smooth choanosomal styles are embedded in the subectosomal skeleton and protrude a long way through the surface, and a very well developed spongin fibre reticulation seen in most species, often with some axial compression (reflecting a digitate or flabellate growth form).

The most abundant Australian species, *Isociella eccentrica*, has a choanosomal skeleton reminiscent of *Callyspongia* (Haplosclerida) and an open, reticulate ectosomal skeleton, and all 3 known Australian species have closest affinities with certain *Clathria* species (e.g., *C.* (*Clathria*) *conectens*, *C.* (*Thalysias*) *hirsuta*). Thus, the definition of the type species is expanded below to include forms which are predominantly semi-encrusting, branching, with rugose reticulate surface sculpturing, well developed spongin fibres (as opposed to only having collagen binding principal spicules together); poorly differentiated primary and secondary skeletal tracts, and to allow for the presence of toxa microscleres. *Isociella* is included here as a subgenus of *Clathria*.

Isociona Hallmann, 1920
(Fig. 17A-B)

Isociona Hallmann, 1920: 768; de Laubenfels, 1936a: 111.

TYPE SPECIES. *Lissodendoryx tuberosa* Hentschel, 1911: 326 (by monotypy) (holotype ZMB4417).

Thickly encrusting, bulbous growth form. Surface irregularly microconulose, hispid. Choanosomal skeleton with differentiated primary and secondary skeletons. Secondary skeleton renieroid or subrenieroid reticulate, with acanthose styles forming uni-, pauci-, or less frequently multispicular tracts, bound together by very light fibres or collagen at spicule nodes. Primary skeleton plumose, with choanosomal principal styles forming larger primary ascending tracts irregularly connected by smaller secondary transverse tracts. Subectosomal skeleton plumose, with principal styles protruding through ectosome overlayed by erect bundles of subectosomal auxiliary subtylostyles. Echinating megascleres absent. Megascleres large smooth choanosomal principal styles, basally spined or entirely lightly spined styles-subtylostyles of renieroid skeleton, and smooth auxiliary subectosomal subtylostyles. Microscleres palmate isochelae and thick wing-shaped toxas.

REMARKS. *Isociona tuberosa* and *Isociella eccentrica* appear very similar from published descriptions whereas examination of type material shows that they are different. *Isociella eccentrica* has a wide meshed renieroid reticulate skeleton composed of smooth principal spicules, whereas *I. tuberosa* has a close-meshed renieroid secondary skeleton of spined monactinal spicules, overlayed by a plumose primary skeleton of smooth principal spicules. Van Soest (1984b) merged *Isociona* with *Antho*, although this relationship is not straightforward given that *Antho* is usually reserved for forms with diactinal megascleres (in the renieroid basal skeleton). Nevertheless, the two taxa have similar skeletal architecture and *Isociona* is maintained as a synonym of *Antho* herein.

Isopenectya Hallmann, 1920
(Fig. 17C-D)

Isopenectya Hallmann, 1920: 789; de Laubenfels, 1936a: 125.

TYPE SPECIES. *Clathria* (?) *chartacea* Whitelegge, 1907: 497 (by monotypy) (holotype AMZ436).

Thinly flabellate-lamellate growth form. Surface smooth, even. Choanosomal skeleton renieroid reticulate, with differentiated axial and extra-axial regions of skeleton. Axial skeleton with compressed spongin fibres running through centre of lamellae, cored by smooth choanosomal principal styles (marginally smaller than those in surface bundles) forming subisodictyal tracts, overlain by renieroid skeleton of small spined styles. Extra-axial skeleton with more open-meshed, regularly reticulate spongin fibres, cored by uni- or bispicular renieroid tracts of small acanthose styles, and plumose, subisodictyal tracts of longer smooth styles standing perpendicular to axis, both fully enclosed in spongin fibres. Echinating megascleres absent. Subectosomal skeleton plumose, with bundles of smooth choanosomal principal styles protruding through surface and tangential or paratangential tracts of subectosomal auxiliary styles. Ectosome lacks specialised spiculation. Megascleres lightly acanthose styles-subtylostyles forming renieroid skeleton, short and long smooth choanosomal principal styles, and subectosomal auxiliary styles with spined bases. Microscleres absent.

REMARKS. *Isopenectya* is similar to other renieroid 'plocamiform' genera (sensu de Laubenfels, 1936a), *Antho*, *Plocamilla*, *Plocamiopsis*, *Isociona*, *Labacea*, *Pandaros*, *Isociella* and *Echinoclathria*, in having a primarily renieroid reticulate skeleton. Unlike these other genera, however, *Isopenectya* has 2 forms of choanosomal megascleres enclosed within spongin fibres. The smaller acanthose styles forming the renieroid structure, whereas smooth styles form the subisodictyal, mostly longitudinal skeleton. These latter spicules also produce the extra-axial plumose tracts that ascend to the surface, and larger, smooth choanosomal styles produce brushes on the ectosome. Although the fibre skeleton is compressed in the axis the renieroid skeleton is barely different between axial and extra-axial regions.

Isopenectya chartacea is remarkable in that it closely resembles the type species of *Echinoclathria* (*E. leporina*) in growth form, gross skeletal architecture and fibre characteristics. Whereas *E. leporina* has one category of relatively homogeneous smooth principal styles throughout the choanosomal skeleton, *I. chartacea* has 2 differentiated structures within the choanosome (renieroid and plumose or subisodictyal skeletons) and 2 geometrically different categories of megascleres forming these skeletal structures. Skeletal architecture is also more regularly renieroid and renieroid fibres/tracts are relatively homogeneous than in most *Echinoclathria* species, but this is a matter of degree. *Echinoclathria* has a radial skeleton of larger, smooth principal styles embedded in peripheral fibres, poking through the surface, and it could be argued that this is a vestigial subisodictyal skeleton like that in *Isopenectya*. But this similarity is inferred and any relationship is equivocal, with emphasis placed here on the possession of spined spicules of the renieroid skeleton and clearly differentiated renieroid and subisodictyal skeletal structures in deciding on affinities of *Isopenectya*. Nevertheless, these 2 species are certainly remarkably similar and potentially may be confused.

Van Soest (1984b) suggested that *Isopenectya* may be valid, but 'plocamiform' microcionid type shows that it is a close relative of this group, of *Antho* in particular, differing from it only in having a unique subisodictyal skeleton of smooth spicules overlaying the renieroid basal skeleton. It is recognised here as a subgenus of *Antho*.

Jia de Laubenfels, 1930
(Fig. 17E-F)

Jia de Laubenfels, 1930: 28, 1932: 97.

TYPE SPECIES. *Jia jia* de Laubenfels, 1930: 28 (by original designation) (holotype USNM21510).

Encrusting growth form. Surface uneven, hispid. Choanosomal skeleton confused renieroid reticulate, composed of smaller smooth or acanthose styles forming basal more-or-less rectangular network, overlayed by larger smooth principal styles standing erect, forming ascending bundles or single spicules projecting through surface. Subectosomal auxiliary subtylostyles paratangential to surface. Ectosome without special spicules. Megascleres larger smooth choanosomal principal styles, smaller smooth or acanthose styles-subtylostyles of basal skeleton, and subectosomal auxiliary subtylostyles with basal spines. Microscleres palmate isochelae, modified J-shaped chelae resembling sigmas (= 'crocae'), and wing-shaped toxas with spinous extremities.

REMARKS. De Laubenfels (1932) description of the type is incomplete. The essential specific characteristics include the modified (J-shaped) isochelae (crocae of Van Soest & Stone, 1986), and a renieroid albiet ill-defined reticulation. Those characters are contrasted with the *Antho*-like nature of closely related *A. (Jia) brattegardi* Van Soest & Stone, which has acanthose monactinal and diactinal spicules in the main skeleton, whereas *Jia* (*s.s.*) has predominantly smooth spicules. Despite these differences, Van Soest & Stone (1986) justifiably merged *Jia* and *Antho* because many other *Antho*-like species without crocae also have predominantly smooth styles and poorly defined skeletal construction (e.g., *A. dichotoma* (Esper)). *Jia* is referred to *Antho* (*Antho*).

Crocae are not unique to *Jia*; other taxa with similarly modified chelae are *Dendoryx luciensis* Topsent (Myxillidae) and *Zygherpe hyaloderma* de Laubenfels (Hamacanthidae) (de Laubenfels, 1932; Bakus, 1966; Van Soest & Stone, 1986.

Labacea de Laubenfels, 1936
(Fig. 17G-H)

Labacea de Laubenfels, 1936a: 125.

TYPE SPECIES. *Clathria juncea sensu* Burton, 1931a: 343 (by original designation) (type fragment BMNH1926.2.19.2).

Erect digitate, arborescent growth form. Surface even, minutely hispid. Choanosomal skeleton reticulate, with well differentiated primary ascending and secondary transverse skeletal tracts. Primary skeleton with well developed thick spongin fibres, ascending to surface, cored by multispicular tracts of choanosomal principal styles, interconnected by thin transverse secondary fibres cored by pauci- or unispicular tracts of same spicules. Echinating acanthostyles moderately common in axial skeleton, very heavy in peripheral skeleton, forming plumose brushes at surface. Subectosomal skeleton tangential with subectosomal auxiliary subtylostyles lying on surface. Ectosome without specialised spiculation, but with many foreign spicule fragments embedded in outer layer of skeleton. Mesohyl with abundant detritus and auxiliary spicules dispersed between fibres. Megascleres include both smooth and completely lightly spined fusiform choanosomal principal styles, evenly spined echinating acanthostyles, and smooth auxiliary subectosomal subtylostyles. Microscleres large palmate isochelae and accolada toxas with microspined points.

REMARKS. *Clathria juncea* is attributed to Burton (1931a), and a lectotype designated from the syntypes (BMNH1933.7.4.4-7). However, Burton and de Laubenfels (1936a) suggested that *Clathria juncea sensu* Burton may be synonymous with *Alcyonium junceum* Lamarck, 1816. Topsent (1933: 26) merged Lamarck's species as a variety of *Anomoclathria opuntioides*, but noted that the type was missing from the MNHN. It is still missing, and must now be presumed destroyed. If Lamarck's species is identical with *A. opuntioides* then *C. juncea sensu* Burton is quite different (see remarks for *Anomoclathria*).

Burton's (1931a) description, and de Laubenfels' (1936a) interpretation of the type species are both erroneous. Burton's described material exhibits several characters not noted by either of these authors, so that *Labacea* is incorrectly diagnosed. The skeletal architecture of *C. juncea* is reticulate, not renieroid as supposed by de Laubenfels, and echinating acanthostyles (a prominent feature of the peripheral skeleton in particular) and palmate isochelae were overlooked. I assign it to *Clathria* (*Clathria*).

De Laubenfels (1936a) assigned *Clathria oxeifera* Ferrer Hernandez to this genus; it sup-

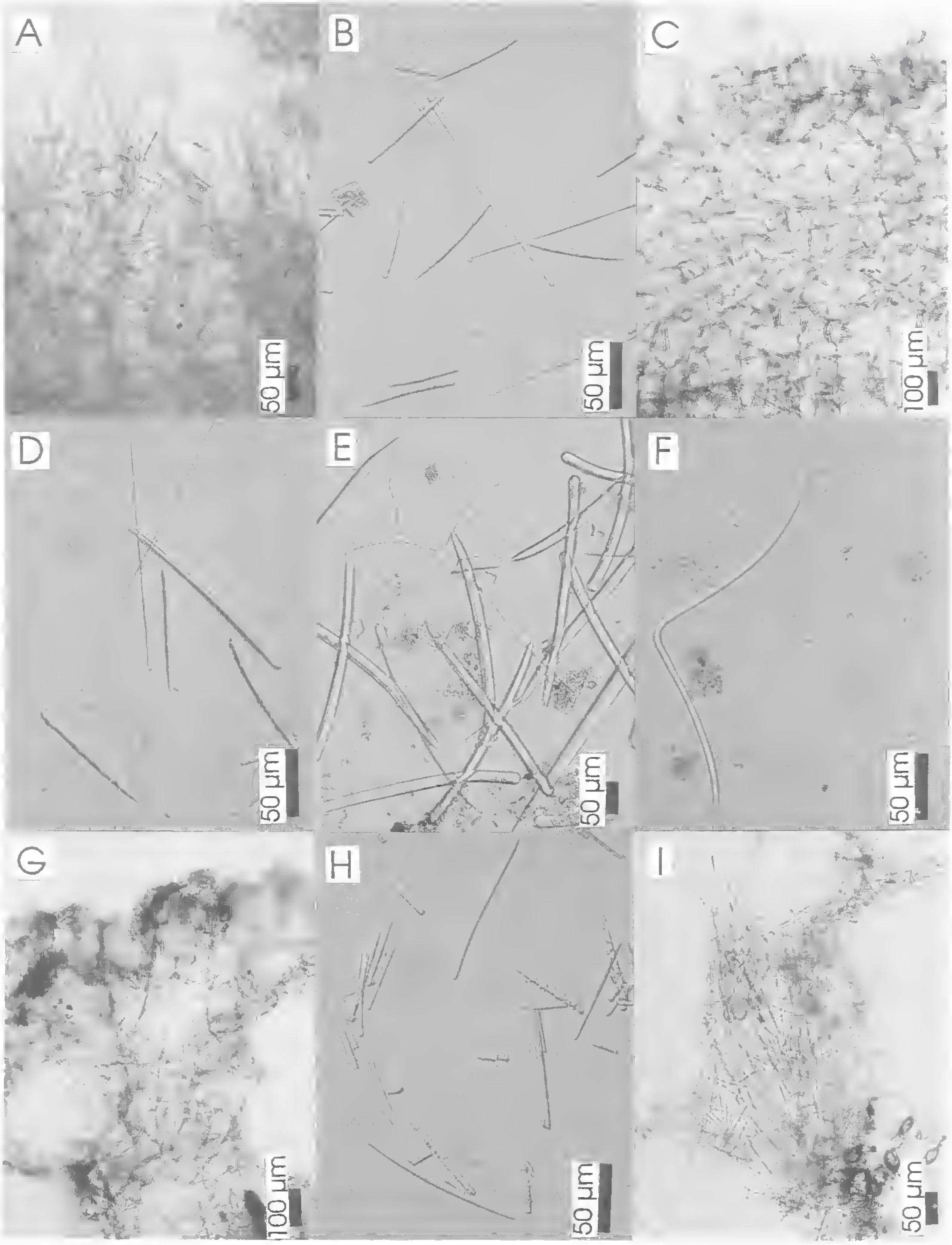

FIG. 17. Type species of microcionid genera. A-B, *Isociona* (*Lissodendoryx tuberosa* Hentshel, ZMB4417). C-D, *Isopenectya* (*Clathria chartacea* Whitelegge, AMZ436). E-F, *Jia* (*J. jia* de Laubenfels, USNM21510). G-H, *Labacea* (*Clathria juncea sensu* Burton, BMNH1926.2.19.2). I, *Leptoclathria* (*L. haplotoxa* Topsent, MNHNDT1101).

posedly differed from the type species in having echinating acanthostyles (as distinct from acanthose varieties of choanosomal principal megascleres (Lévi, 1960a: 84)) but as noted above these spicules are typical for the genus, and de Laubenfels' observation is redundant.

Leptoclathria Topsent, 1928
(Figs 17I, 18A)

Leptoclathria Topsent, 1928a: 298.

TYPE SPECIES. *Leptoclathria haplotoxa* Topsent, 1928: 298 (by monotypy) (holotype MNHNLBIMDT-1101).

Encrusting growth form. Surface irregular, hispid. Choanosomal skeleton hymedesmoid, with spongin fibres reduced to basal layer of spongin lying on substrate, with bases of choanosomal principal subtylostyles and abundant smaller acanthostyles standing perpendicular to substrate. Subectosomal skeleton with light tangential tracts of subectosomal auxiliary subtylostyles occurring in bundles or individually, forming irregular dermal brushes surrounding protruding choanosomal megascleres. Ectosomal skeleton without specialised spiculation. Megascleres include entirely acanthose choanosomal principal subtylostyles, evenly spined echinating acanthostyles, and subectosomal auxiliary subtylostyles with spined bases and telescoped or mucronate points, sometimes quasidiactinal. Microscleres palmate isochelae and toxas intermediate between wing-shaped and v-shaped.

REMARKS. The type species is simply a thinly encrusting *Microciona*-like species with a hymedesmoid skeletal architecture, but which differs from *Microciona* (*s.s.*) in having entirely acanthose principal styles (similar to *Dictyociona*, *Hymeraphia* and *Anaata*). Lévi (1960a) proposed that *Leptoclathria* should be merged with *Microciona*, and this is certainly true for the type species (referred here to *C.* (*Microciona*)), but there are some species which have a clearly differentiated ectosomal and subectosomal auxiliary spicules (e.g., *L. lambda* Lévi), and these species are more appropriately included in *C.* (*Thalysias*).

Topsent (1928a) overlooked the spined bases and telescoped (or mucronate) points on subectosomal auxiliary subtylostyles which are prominent in the holotype. Furthermore, and of greater taxonomic significance, there are at least a small proportion of auxiliary megascleres with tylote (quasidiactinal) geometry, including basal microspination, which is reminiscent of the specialised diactinal ectosomal megascleres characteristic of Myxillidae and Iophonidae. Only a few other microcionids have this feature, *C.* (*Clathria*) *chelifera*, *C.* (*Wilsonella*) *australiensis* and *C.* (*Thalysias*) *major* (see also Hooper et al., 1990). These quasi-diactinal spicules are analogous to (but not homologous with) ectosomal tylotes found in Myxillidae for example (see remarks for *Acarnus* below).

Ligrota de Laubenfels, 1936
(Fig. 18B-C)

Ligrota de Laubenfels, 1936a: 125.

TYPE SPECIES. *Clathria lobata* Vosmaer, 1880: 151 (by original designation) (holotype RMNH276).

Arborescent growth form with flattened branches. Surface even, microscopically hispid. Choanosomal skeleton regularly reticulate, with poorly developed spongin fibres forming differentiated primary and secondary tracts. Primary fibres ascend to surface, cored by plumose multispicular tracts of choanosomal principal styles; secondary fibres transverse, paucispicular, cored by same spicules. Subectosomal skeleton plumose, with bundles of choanosomal principal megascleres extending into ectosome and protruding through surface. Echinating acanthostyles most abundant in periphery, below surface spicule brushes. Some detritus incorporated into mesohyl, scattered between spicule tracts. Ectosome radially arranged, erect brushes of subectosomal auxiliary subtylostyles of a single size class. Megascleres robust choanosomal principal styles-subtylostyles with smooth bases, echinating acanthostyles with large spines and aspinose points, and subectosomal auxiliary subtylostyles with basal spines. Microscleres palmate isochelae and wing-shaped toxas with spined points.

REMARKS. This definition from the holotype differs from descriptions provided by Vosmaer (1880), Ridley & Dendy (1887), and Lévi (1963), but corresponds with Stephens's (1915) concept of the species. In particular, the species has a regularly reticulate skeleton with radial architecture, but it lacks a well differentiated axial and extra-axial region as suggested by these authors. *Ligrota* has spiculation virtually identical to that of *Clathria* (*s.s.*), including spines on the points of toxas. It is not a *Thalysias*, as supposed by Ridley & Dendy (1887), because it has only a single, undifferentiated category of auxiliary subtylostyle and is referred here to *Clathria* (*Clathria*). Similarly, de Laubenfels' (1936a) diagnosis of *Ligrota* is incorrect. *Clathria lobata* of Stephens (1915) does not have diactinal megascleres or sigmas. Those attributes were described by Vosmaer (1880) for the type specimen, but were discounted by Ridley & Dendy (1887) as being probable contaminants; nor were they observed in type material.

Lissoplocamia Brondsted, 1924
(Fig. 18D-E)

Lissoplocamia Brondsted, 1924: 470.

TYPE SPECIES. *Lissoplocamia prima* Brondsted, 1924: 470 (by original designation) (holotype in ZMC, not seen; MNHNLBIMDCL637 from South Africa).

Digitate, arborescent, flattened or cylindrical branches. Surface prominently hispid, velvetty. Choanosomal skeleton renieroid reticulate, with differentiated axial and extra-axial regions. Axial skeleton slightly compressed, with well developed spongin fibres cored by uni- or paucispicular tracts of tylotes forming renieroid reticulation, overlaid by plumose (or plumoreticulate) extra-axial skeleton composed of diverging single or multiple choanosomal principal styles, echinating (protruding from) spongin fibres and ascending to surface. Spongin fibres in extra-axial skeleton lighter, more-widely spaced. Subectosomal skeleton plumose, with bundles of subectosomal auxiliary styles perched on ends of principal megascleres. Ectosome without special category of megascleres, but isochelae microscleres predominant in peripheral skeleton. Megascleres tylotes ('dumbell-shaped' spicules) of renieroid skeleton with swollen microspined bases, choanosomal principal styles-subtylostyles, with smooth or faintly microspined bases, and smooth subectosomal auxiliary styles. Microscleres palmate isochelae and wing-shaped toxas.

REMARKS. This definition is based on a recent redescription of the holotype from New Zealand (Bergquist & Fromont, 1988: 122) and Lévi's (1963) specimen from South Africa. Lévi's material is more complete, with an intact ectosomal skeleton and containing palmate isochelae, whereas Brondsted's (1924) holotype is poorly preserved, lacking an ectosomal skeleton in which the isochelae are predominantly found (Bergquist & Fromont, 1988).

Lissoplocamia belongs to de Laubenfels' (1936a) 'plocamiform' group of sponges in having diactinal, quasi-diactinal or monactinal 'dumbell-shaped' spicules forming a renieroid basal skeleton (it should be noted that this character is different from (analogous to) similar 'sausage-shaped' diactinal spicules found in the ectosomal skeletons of some genera in families such as Coelosphaeridae and Petrosiidae). Some of these 'plocamiform' genera belong to Raspailiidae (Hooper (1991: 1319)), whereas others are closely related to Microcionidae and are referred to *Antho* (*Plocamia*). Bergquist & Fromont (1988: 122) mentioned several of these genera (*Lissoplocamia*, *Holoplocamia*, *Plocamilla*, *Heteroclathria*, and *Plocamia*), and to this group should also be added *Antho* and *Jia*. *Axoplocamia*, included by them with the microcionids, was shown to be a raspailiid (Hooper, 1991). Bergquist & Fromont (1988) included only 2 New Zealand species in *Plocamia*, *Dirrhopalum novizelanicum* Ridley and *L. prima*, both of which are referred here to *Antho*. *Lissoplocamia* differs from most other 'plocamiform' microcionids, such as *Antho* (*Antho*) in having predominantly smooth 'dumbell-shaped' spicules, similar to the type species of *Plocamia*, *P. gymnazusa*, but this character is considered insignificant at the generic level given its large variability within the family.

Litaspongia de Laubenfels, 1954
(Fig. 18F-G)

Litaspongia de Laubenfels, 1954: 162.

TYPE SPECIES. *Ophlitaspongia arbuscula* Row, 1911: 347 (by original designation) (holotype BMNH1912.2.1.63).

Convoluted arborescent growth form. Surface irregularly conulose, arenaceous, minutely hispid. Choanosomal skeleton regularly reticulate, with heavy spongin fibres cored by uni- or paucispicular tracts of choanosomal principal subtylostyles (sometimes fibres aspiculose). Echinating acanthostyles sparse. Subectosomal skeleton plumose, with dense bundles of principal styles (identical to coring spicules) diverging from ends of peripheral fibres and forming discrete brushes on surface. Ectosomal skeleton with sparse subectosomal auxiliary subtylostyles tangential to surface and also dispersed throughout mesohyl. Megascleres thin smooth choanosomal principal subtylostyles, smooth quasi-diactinal subectosomal auxiliary subtylostyles (usually resembling asymmetrical strongyles), and evenly spined echinating acanthostyles. Microscleres wing-shaped toxas. Isochelae absent.

REMARKS. De Laubenfels (1954) stated that *Litaspongia* was established for sponges like *Echinoclathria* (as defined here) in having monactinal megascleres, toxa microscleres and arborescent growth form. The holotype also has echinating acanthostyles, previously overlooked by Row (1911). The resemblance between *O. arbuscula* and *Echinoclathria* is here considered superficial, based on the fact that principal spicules in *O. arbuscula* are thin, attaining only the thickness typical of auxiliary spicules found in most other *Clathria* species; auxiliary spicules are quasidiactinal in *O. arbuscula*, resembling diactinal ectosomal spicules in some species of *Echinoclathria* (e.g., *E. chalinoides*) and *Holopsamma* (e.g., *H. ramosa*); and spongin fibres are regularly reticulate, well developed, and tend to dominate skeletal structure over spicule components. But unlike *Holopsamma* and *Echinoclathria* which have undifferentiated coring and echinating spicules, *Litaspongia* has different principal spicules coring fibres from those echinating fibres. I consider it a reduced *Clathria* (*Clathria*).

De Laubenfels (1954: 162) synonymised *O. arbuscula* and *O. horrida* Row (1911: 349), and re-examination of both holotypes (the latter BMNH1912.2.1.65) supports this decision. He added *Echinoclathria nodosa* (which he merged with *E. subhispida*) to *Litaspongia*, but both are species of *Echinoclathria*. Pulitzer-Finali (1982: 105) referred *O. arbuscula* and *O. horrida* to *Kerasemna* (Desmacellidae) (Hooper, 1984b), but neither have sigma microscleres and this placement was unjustified.

Marleyia Burton, 1931
(Fig. 18H-I)

Marleyia Burton, 1931a: 346; de Laubenfels, 1936a: 109.

TYPE SPECIES. *Marleyia irregularis* Burton, 1931a: 346 (by original designation) (holotype NM1279).

Digitate growth form, flattened branches. Surface uneven, porous, with specialised reticulate external fibrous skeleton. Choanosomal skeleton reticulate, with subisodictyal reticulation of well developed primary and secondary spongin fibres. Primary fibres ascending, cored by multispicular tracts of both choanosomal principal subtylostyles and subectosomal auxiliary subtylostyles. Fibres heavily echinated by short acanthostyles. Secondary fibres transverse, aspicular, but of similar diameter and density of echinating spicules as primary fibres. Abundant detritus scattered through mesohyl, but not incorporated into fibres. Ectosome with tangential reticulation of spongin fibres, more closely reticulate and slightly thinner than choanosomal fibres, lightly cored by both subectosomal and choanosomal subtylostyles and echinated by abundant acanthostyles. Megascleres smooth robust choanosomal principal subtylostyles, smooth straight or sinuous subectosomal auxiliary subtylostyles, and robust echinating acanthostyles with bare neck. Microscleres absent.

REMARKS. The holotype is dry and lacks a well preserved ectosomal skeleton). Burton suggested that *Marleyia* differs from all other microcionid genera in having a special ectosomal skeleton formed by a tangential reticulation of spongin fibres, which are thinner and more closely compacted than choanosomal fibres. This feature was not as remarkable as we are led to believe from the original description (although the holotype is not well preserved), nor is it unique in the Microcionidae (also seen in *Echinochalina* (*Protophlitaspongia*) *labouti* Hooper & Lévi) or other families (e.g., Callyspongiidae (Haplosclerida)).

In gross morphology and fibre characteristics *Marleyia* is similar to several *Holopsamma* species, but it has different spicules coring and echinating spicules (whereas *Holopsamma* has only one category of principal spicule performing these functions). Burton (1931a) made further casual comparisons between *Marleyia* and certain Dictyoceratida, based on fibre characteristics and a greatly reduced skeleton. De Laubenfels (1936a: 109) suggested that *Marleyia* may have affinities with *Acantheurypon*, representing a more mature form of that genus, but he noted that *Marleyia* had a remarkable external resemblance to 'keratose' sponges. On the basis of its unusual ectosomal fibre characteristics Van Soest (1984b) suggested that *Marleyia* might be a valid genus of Microcionidae, but re-examination of type material indicates that it clearly belongs to *Clathria* (*Clathria*). *Marleyia* is monotypic, and known only from the Durban region, Natal coast, South Africa.

Microciona Bowerbank, 1862
(Fig. 19F-G)

Microciona Bowerbank, 1862b: 1109; Topsent, 1894a: 18; Dendy, 1922: 60; Topsent, 1928a: 62; Vosmaer, 1935a: 604 (in part); de Laubenfels, 1936a: 447; Lévi, 1956b: 399; Koltun, 1959: 181; Burton, 1959a: 225; Lévi, 1960a: 51; Sarà, 1963: 210, 1964:

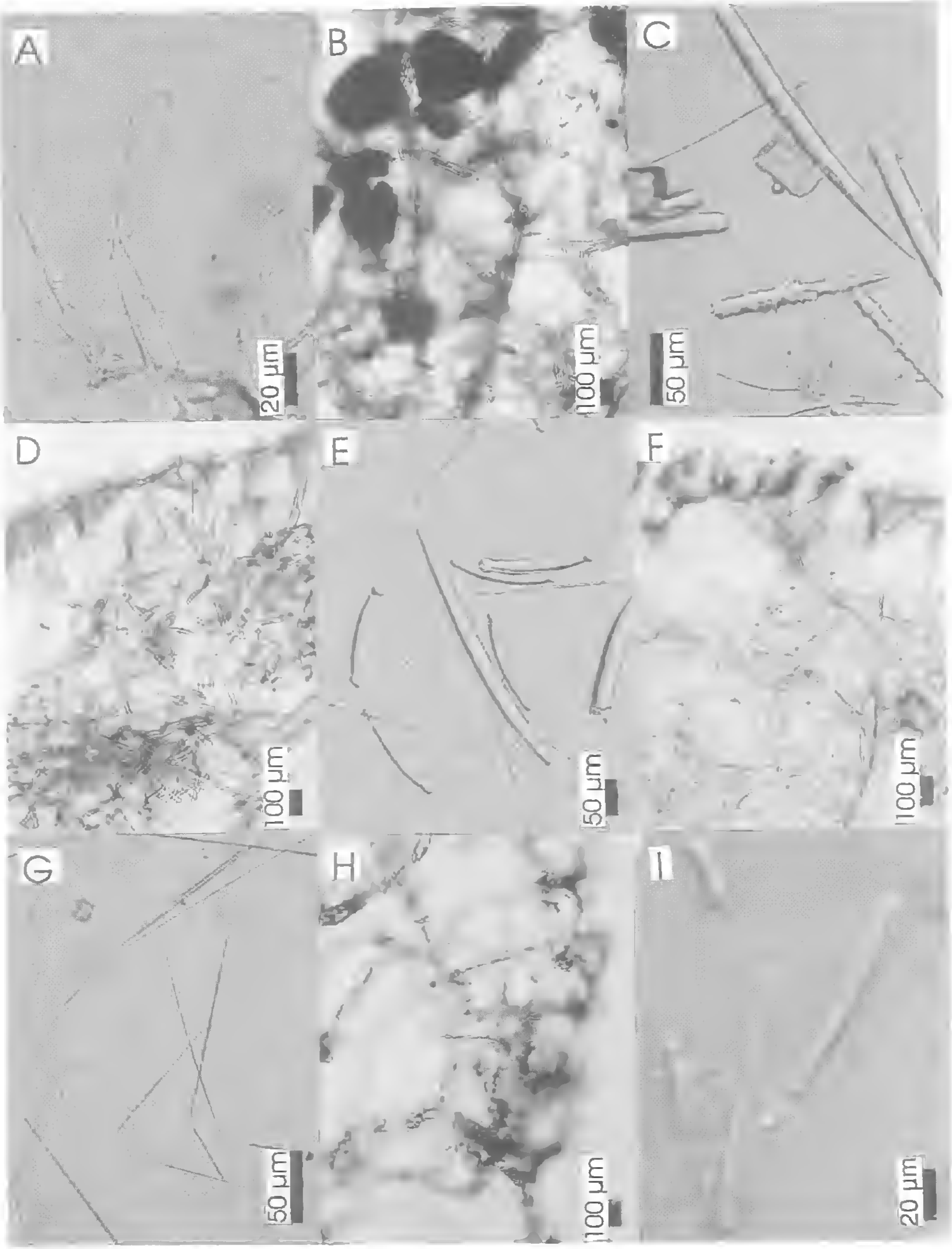

FIG. 18. Type species of microcionid genera. A, *Leptoclathria* (*L. haplotoxa* Topsent, MNHNDT1101). B-C, *Ligrota* (*Clathria lobata* Vosmaer, RMNH276). D-E, *Lissoplocamia* (*L. prima* Brondsted, MNHNDCL637). F-G, *Litaspongia* (*Ophlitaspongia arbuscula* Row, BMNH1912.2.1.63). H-I, *Marleyia* (*M. irregularis* Burton, NM1279).

230; Bergquist, 1965: 168; Hechtel, 1965: 41; Simpson, 1968a: 93, 102; Lévi, 1973: 613; Wiedenmayer, 1977: 140; Bergquist, 1978: 172; Bergquist & Fromont, 1988: 100.

TYPE SPECIES. *Microciona atrasanguinea* Bowerbank, 1862b: 1109 (by subsequent designation (Bowerbank, 1864: 188)) (holotype BMNH 1930.7.3.225).

Encrusting growth form. Surface hispid, uneven. Choanosomal skeleton hymedesmoid, with spongin fibres reduced to basal layer lying on substrate, bearing erect, non-anastomosing, rarely branching, scattered fibre nodes perpendicular to substrate ('microcionid' fibres), each cored by plumose ascending columns of choanosomal principal subtylostyles, wholly or partly embedded in fibres, with points of spicules usually projecting through ectosome. Echinating acanthostyles also erect on fibre nodes. Subectomal skeleton with tangential layer of subectosomal auxiliary subtylostyles, singly or in bundles on surface. Ectosomal skeleton without specialised spiculation, but choanosomal and subectosomal spicules protude through surface. Megascleres choanosomal principal subtylostyles with smooth or microspined bases, evenly spined echinating acanthostyles, and smooth or basally spined subectosomal auxiliary subtylostyles. Microscleres palmate isochelae and wing-shaped toxas.

REMARKS. In many publications, *Clathria* Schmidt and *Microciona* Bowerbank have the date 1862. In merging the two genera, Wiedenmayer (1977, 1989) and Van Soest (1984b) note that the former has priority, because Bowerbank's work was not officially published until 1863.

This ddefinition of *Microciona* is compiled from description of the type species (Bowerbank, 1862b, 1864, 1866) and histological preparations of the holotype and paratypes (BMNH1910.-1.1.68, 1930.7.3.226). *Microciona* (*s.s.*) differs from *Clathria* (*s.s.*) in its encrusting growth form, a reduced hymedesmoid skeleton with erect fibre nodes cored by plumose tracts of principal and echinating spicules standing erect on the substrate (= 'microcionid' architecture of Lévi, 1960a), and smooth toxas. The critical difference between these genera, therefore, is the possession of the plumose, non-anastomosing fibre nodes, whereas cofamilial encrusting genera have hymedesmoid skeletal construction (*Leptoclathria*, *Anaata*, *Cionanchora*, *Hymantho*) or a basal renieroid reticulation (e.g., some *Antho*, *Plocamilla*). By comparison, erect or massive Microcionidae commonly have reticulate or plumo-reticulate skeletons (*Clathria*, *Holopsamma*), renieroid or subisodictyal skeletons (e.g., *Isociella*, *Isopenectya*, *Pandaros*), or virtually halichondroid skeletal architecture (*Artemisina*).

Many authors maintain the distinction between *Microciona* and erect non-plumose genera, such as *Clathria* (e.g., Lévi, 1969; Wiedenmayer, 1977; Pulitzer-Finali, 1983; Uriz, 1984a-b; Wintermann-Kilian & Kilian, 1984; Boury-Esnault & Lopes, 1985; Bergquist & Fromont, 1988). Cytological evidence to support this argument (Simpson, 1968a) is difficult to reconcile completely with other morphological features. Moreover, only a few species were examined in this context, and the cytological characters themselves are obscure, not having been tested subsequently in other taxa. Conversely, no evidence was found from biochemistry (protein electrophoresis, free amino acid or carotenoid protein profiles) to support the differentiation of encrusting (hymedesmoid or microcionid) species from erect (reticulate, non-plumose) species (Hooper et al., 1992), but once again only few taxa were examined in this context. Thus, I have little clear evidence from non-skeletal sources on the boundary between these genera.

Overlying this classification based on skeletal structure many authors subdivide *Microciona*-like species groups (at the generic level) according to modifications in microsclere geometry, ornamentation on megascleres, or further reductions in skeletal structure (e.g., *Anaata*, *Axociella* (of authors), *Axocielita*, *Dictyociona*, *Leptoclathria*, *Pseudanchinoe*, *Thalyseurypon*; e.g., Little, 1963; Koltun, 1976; Alcolado, 1980; Hoshino, 1981; Lee & Gilchrist, 1985; Sim & Bakus, 1986). Undoubtedly, recognising all these genera is a matter of pragmatism, as this scheme offers a convenient and relatively quick means to manage a large and diverse assemblage of microcionids. Many authors have questioned the validity of these genera, debating generic distinction between *Microciona* and *Clathria*(Alander, 1942; Hechtel, 1965; Sarà & Melone, 1966; Van Soest, 1984b; Wiedenmayer, 1989; Hooper, 1990a). Some empirical evidence supports counterarguments, that these character states intergrade between these genera (ontogenetically and/or phenotypically), but no consensus has yet been reached.

Van Soest (1984b) and Hooper (1990a) questioned separation of encrusting genera with hymedesmoid or 'microcionid' skeletons (e.g., *Microciona*) from erect growth forms with reticulate or plumoreticulate skeletons (e.g., *Clathria*), because they are clearly linked to some extent by

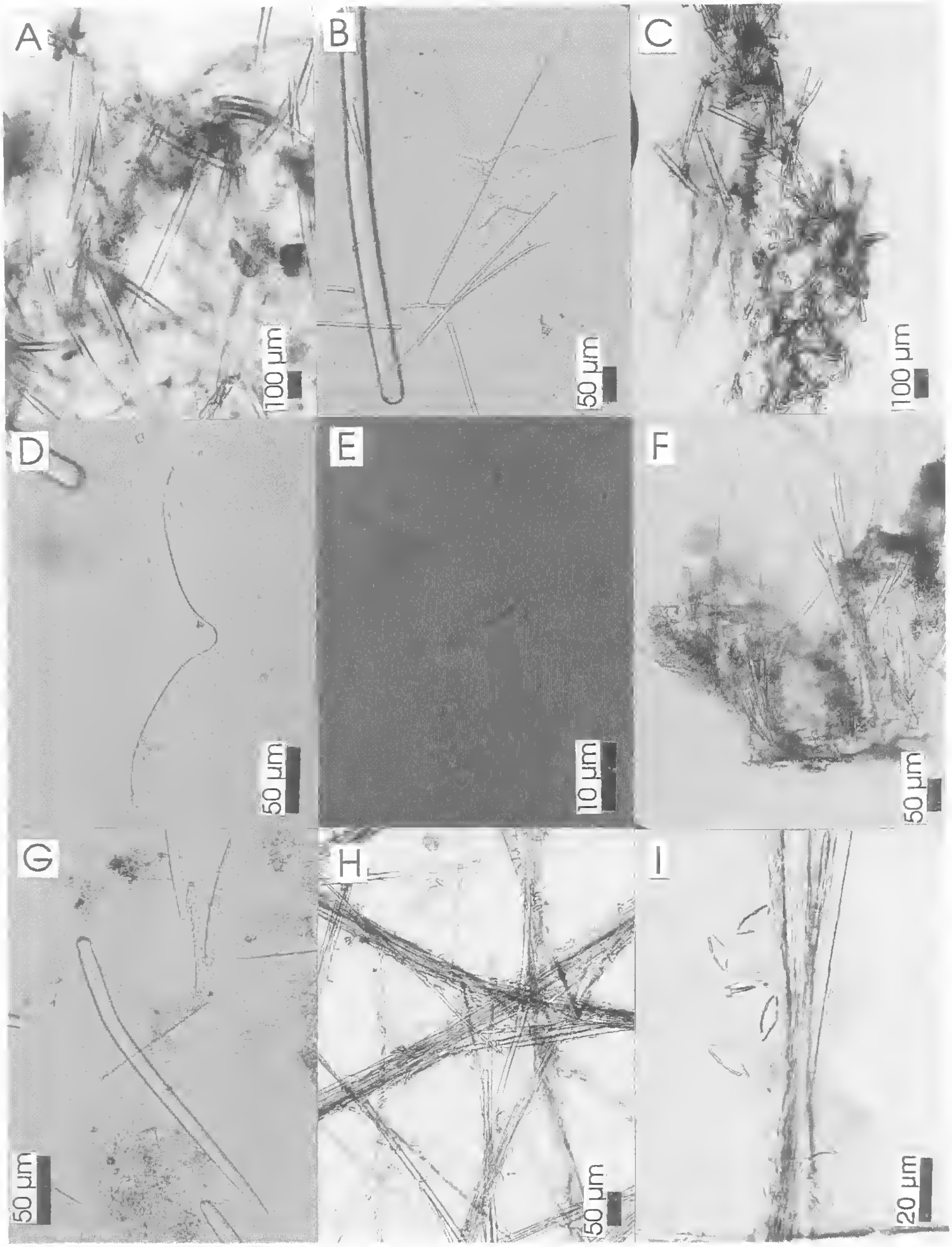

FIG. 19. Type species of microcionid genera. A-B, *Megaciella* (*Amphilectus pilosus* Ridley & Dendy, BMNH1887.5.2.125). C-E, *Melonchela* (*M. clathrata* Koltun, BMNH1963.7.29.7). F-G, *Microciona* (*M. atrasanguinea* Bowerbank, BMNH1930.7.3.438). H-I, *Naviculina* (*N. cliftoni* Gray, BMNH1877.5.21.270).

the ontogeny of the sponge individual (Simpson, 1968a). They argued from a phylogenetic basis that the recognition of this character as being a primary one confers exceptionally high levels of homoplasy within the classification, cutting across lines of apparent evolutionary decent based on a combination of other characters (such as the origin and disposition of structural megascleres within the skeleton, spicule geometry). For example, there are many thinly encrusting species with hymedesmoid architecture and plumose spongin fibre nodes referable to *Microciona* (e.g., *M. maunaloa* de Laubenfels, *M. microchela* Hechtel), but also having two differentiated categories of auxiliary spicules (i.e., a specialised ectosomal skeleton), which is characteristic of *Thalysias* species. Which genus do these species then belong to, *Microciona* or *Thalysias*, or do we recognise a third genus because they have both characters ? This third alternative was adopted by Bergquist & Fromont (1988), largely following de Laubenfels' (1936a), who recognised *Axociella* for microcionids with *Microciona*-like fibre skeletons and *Thalysias*-like ectosomal skeletons (although, like de Laubenfels (1936a), they misinterpreted *Axociella* which is neither encrusting nor hymedesmoid). This is a 'convenient classification' for managing species, but it is also responsible for most of the 70 or so microcionid genera that exist today (i.e., approximately 1 genus per 6 species).

Few authors agree on the level of taxonomic divergence, or the phylogenetic interpretation of character polarity: is encrusting growth form and hymedesmoid architecture a primitive or derived strategy? Is a 'microcionid' architecture (hymedesmoid with ascending plumose fibre nodes) a subsequent developmental stage of hymedesmoid architecture (spongin fibres flat against the substrate)? It is anticipated that evidence from biochemistry or genetic sources will eventually contribute towards the resolution of these conflicts. A resolution is provided here based on phylogenetic interpretation of morphology. We follow Lévi's (1960a) arguments in considering three alternatives.

1) One generic taxon may be used to encompass all the skeletal types from leptoclathriid (hymedesmoid), 'microcionid', to reticulate. This option was used by Vosmaer (1933, 1935a-b), who suggested that varying grades of skeletal construction (from hymedesmoid, plumose to renieroid reticulate) could be seen within populations of particular species and was apparently largely related to ontogenetic development. Van Soest (1984b), Hooper & Lévi (1993a) and others used this ontogenetic argument to merge *Microciona* and *Clathria* (as well as *Thalysias* and *Clathria*), and Hooper et al. (1992) presented some empirical data to show that there was no homogeneity in biochemical profiles to support the retention of distinct taxa for encrusting versus erect species.

2) Two separate taxa can be recognised for species with hymedesmoid plumose (*Microciona*) and reticulate (*Clathria*) architectures. This was the argument accepted by Lévi (1960a), Bergquist & Fromont (1988), and others, on the basis that these skeletal structures were consistent for populations of particular species, and therefore represented fixed genetic differences. Simpson (1968a) suggested further that this option had some empirical support from cytological evidence, although (unfortunately) the cytological characters themselves are at the moment not particularly useful taxonomic characters. A more pragmatic argument for the retention of the name *Microciona* is that it is in current widespread use by sponge biochemists, ecologists and experimental biologists, and retaining this name provides some sort of nomenclatural stability consistent with the previous literature. This argument, unfortunately, has a pragmatic rather than biological basis.

3) The name *Clathria* could be used for an adult terminal phase of skeletal architecture, related directly to the ontogeny of the sponge, whereas *Microciona* could be used for the juvenile phase of the same species. *Dictyociona* is an example of a *Clathria* with an intermediate *Microciona*-like skeleton, and *Pseudanchinoe* is an example of a *Microciona* verging on a reticulate *Clathria*-like skeleton. This argument presupposes that plumose skeletons are always precursors of, and juvenile to, reticulate skeletons. But there are several thinly encrusting species which do have reticulate skeletons (e.g., Sarà & Melone, 1966), even though most plumose species are also persistently encrusting.

In recognising *Microciona* at the subgeneric level, Van Soest (1984b) implicitly also recognised a phylogenetic basis for the 'microcionid' skeletal specialisation, even though there were no other corroboratory characters, such as unique spicule geometries. The phylogenetic interpretation of this skeletal specialisation taken in the present study is that *Microciona* is a persistently encrusting sponge which consistently has non-anastomosing basal spongin fibres cored by non-anastomosing plumose spicule tracts or single spicules, also lacking any ectosomal specialisation; it is an incompletely differentiated sister taxon of *Clathria* and recognised here at the subgenus level (*Clathria* (*Microciona*)). The *Leptoclathria* (flat, hymedesmoid) and *Microciona* (ascending 'microcionid' fibre nodes) conditions are not differentiated, these being interpreted as being more likely to be related to the thickness of encrusting growth forms than anything else.

Ophlitaspongia Bowerbank, 1866
(Fig. 20A-B)

Ophlitaspongia Bowerbank, 1866: 14, 378; Wiedenmayer, 1989: 59; Bergquist & Fromont, 1988: 113.
Not *Ophlitaspongia*; Dendy, 1896: 36; Hallmann, 1912: 253; Lévi, 1960a: 58; Wiedenmayer, 1977: 140.
Seriatula Gray, 1867: 515; de Laubenfels, 1936a: 122.

TYPE SPECIES. *Ophlitaspongia papilla* Bowerbank, 1866: 378 (by original designation) (holotype BMNH1910.1.1.395); = *Spongia seriata* Grant, 1826: 116 (Simpson, 1968a:37) (holotype BMNH1847. 9.7.14).

Encrusting bulbous growth form. Surface microconulose, microscopically hispid. Choanosomal skeleton isodictyal reticulate, with compressed layer of spongin fibre lying on substrate and regularly reticulate spongin fibres arising from base, producing regular isodictyal fibre network divided into primary ascending and secondary transverse fibre elements. Primary fibres cored by plumose tracts of choanosomal principal styles, which also protrude from fibres at acute angles resembling quasi-echinating spicules. Secondary transverse fibres uncored or with unispicular tracts of usually smaller choanosomal principal styles. Subectosomal skeleton paratangential, with scattered subectosomal auxiliary styles lying on or near surface and also dispersed throughout mesohyl. Ectosome without specialised spiculation, but plumose tracts of choanosomal principal megascleres protrude through surface. Megascleres large and small, entirely smooth choanosomal principal styles-subtylostyles, and thin smooth subectosomal auxiliary styles. Microscleres u-shaped toxas. Chelae absent.

REMARKS. This definition is based on type material and Simpson's (1968a) description of live populations. *Ophlitaspongia papilla*, was shown by Simpson (1968a: 95) to be a synonym of the type species of *Microciona* (*M. atrasanguinea*). A broader concept of *Ophlitaspongia* (Wiedenmayer, 1989), (not *O. seriata* (Grant)), is identical to *Echinoclathria* (*s.s.*) (see remarks for *Echinoclathria*). Wiedenmayer (1989) provided further explanation of these relationships, although his nomenclatural decisions are not entirely correct.

Seriatula was erected for *Spongia seriata* Grant (Gray, 1867) which is conspecific with *O. papilla* Bowerbank (e.g., Simpson, 1968a), and therefore *Seriatula* becomes an objective synonym of *Ophlitaspongia*.

Pandaros Duchassaing & Michelotti, 1864
(Fig. 20C-E)

Pandaros Duchassaing & Michelotti, 1864: 88; Schmidt, 1870: 59; de Laubenfels, 1936a: 123; Wiedenmayer, 1977: 143; Van Soest, 1984b: 127.

TYPE SPECIES. *Pandaros acanthifolium* Duchassaing & Michelotti, 1864: 90 (by subsequent designation of de Laubenfels, 1936a: 123)) (lectotype TMPOR57).

Bushy arborescent growth form. Surface highly conulose, with flattened or lobate lamellae. Choanosomal skeleton reticulate, with well-developed flattened spongin fibres (trabeculae) cored by choanosomal principal subtylostyles lying in all directions within fibres (from isodictyal reticulate to echinating) and with sparse acanthostyles echinating or also incorporated into fibres. Subectosomal skeleton radial, reduced to single long subectosomal auxiliary subtylostyles protruding through surface and also scattered throughout mesohyl. Ectosome without special spicules. Megascleres smooth choanosomal principal subtylostyles-tylostyles, often with slightly rhabdose bases and terminal or subterminal basal swellings, long curved or straight subectosomal auxiliary subtylostyles, and lightly acanthose or rarely smooth styles 'echinating' fibres. Microscleres absent.

REMARKS. This definition is based on the type and a fragment of the type MNHNLBIMDNBE 1309, specimen BMNH1884.7.11.2 and description of live populations by Van Soest (1984b). Important features are: 1) the prominently flattened fibres cored by smooth slightly rhabdose principal subtylostyles-tylostyles (more reminiscent of Rhabderemiidae than of Microcionidae); 2) the sparse, lightly spined styles which more closely resemble a second category of principal spicules than than they do echinating (accessory) spicules typical of other Microcionidae; furthermore, these spicules are only rarely seen echinating fibres, but more commonly they are incorporated into them together with the principal megascleres; and 3) the long subectosomal auxiliary subtylostyles protruding through the surface (more similar to a reduced Raspailiidae, such as *Echinodictyum* or *Ceratopsion*, than to typical Microcionidae).

Pandaros could be legitimately included in either Raspailiidae or Microcionidae. Van Soest (1984b) noted that only the rare echinating acanthostyles in *P. acanthifolium* gives any cause to link it to the Microcionidae at all. He speculated that it might be necessary to erect a separate family for the species, or even remove it from the Poecilosclerida altogether, as it also shows affinities with axinellids such as *Ptilocaulis*. There are no microscleres to give any further clues as to its affinities. *Pandaros* is maintained as a separate genus and tentatively included in Microcionidae. Of 12 species referred to *Pandaros*, only the type clearly belongs here. *Raspailia kasumiensis* Tanita (MMBS SIS-052) was assigned to *Pandaros* (Hooper, 1990a).

Wiedenmayer (1977) merged *Thalyseurypon* with *Pandaros*, because he considered that its type species had architecture closely comparable to *P. acanthifolium* (Hechtel, 1965), but this is not upheld here. The only features these genera have in common is lacking microscleres. Wiedenmayer (1977) also speculated that the genus had a close relationship with *Echinoclathria* (= *Holopsamma* as defined here), based on alleged similarities in skeletal architecture, and he suggested that the two genera probably intergrade in habit and spiculation, but these suggested affinities are not evident in relevant specimens.

Paradoryx Hallmann, 1920
(Fig. 20F-G)

Paradoryx Hallmann, 1920: 767; de Laubenfels, 1936a: 109.

TYPE SPECIES. *Clathria dura* Whitelegge, 1901: 83 (by original designation) (holotype AMG3046).

Arborescent, flabellate growth form with compressed branches. Surface even, smooth. Choanosomal skeleton reticulate, with heavy spongin fibres forming irregular anastomoses in axis becoming more regular and rectangular towards periphery. Spongin fibres differentiated into primary ascending and secondary connecting components, cored by auxiliary styles and heavily echinated by acanthostyles. Subectosomal skeleton plumose, with bundles of auxiliary styles forming plumose brushes on peripheral fibres. Ectosome fibrous, without specialised skeleton, and peripheral fibres form more-or-less reticulate structure through which choanosomal spicules protrude. Megascleres entirely smooth, hastate or quasidiactinal auxiliary styles or subtylostyles, and echinating acanthostyles with large and even spination. Microscleres palmate isochelae resembling arcuate forms with lateral alae fused to shaft for about 1/2 alae length, and shaft greatly curved, thickened. Toxas absent.

REMARKS. Ectosomal fibres of *Paradoryx* are unspecialised, identical to choanosomal fibres in size and form, unlike the *Callyspongia*-like ectosome of *Marleyia*. Hallmann (1920) erected *Paradoryx* for *Wilsonella* species (with auxiliary megascleres coring fibres) which had arcuate chelae instead of palmate isochelae. Loss or replacement of principal megascleres varies considerably between otherwise allied microcionid taxa and this feature is considered to be of lesser significance at the generic level than assumed by Hallmann (Hooper, 1990a; Hooper et al., 1990). Similarly, isochelae described by Hallmann (1920) as arcuate in the type species are modified (curved, thickened) palmate forms.

Apart from the type species, Hallmann (1920) included: *Dictyocylindrus piniformis* Carter and *W. oxyphila* (both of which belong to *Clathria* (*Clathria*)), and *Clathria elegantula* Ridley & Dendy and *Wilsonella curvichela* Hallmann (which are referred here to *Clathria* (*Dendrocia*)).

Paratenaciella Vacelet & Vasseur, 1971
(Fig. 20H-I)

Paratenaciella Vacelet & Vasseur, 1971: 103.

TYPE SPECIES. *Paratenaciella microxea* Vacelet & Vasseur, 1971: 103 (by original designation) (holotype MNHNLBIMDJV27).

Encrusting growth form. Surface uneven, hispid. Choanosomal skeleton hymedesmoid, with spongin fibres reduced to basal layer on substrate and with ascending fibre nodes enclosing bases of choanosomal principal subtylostyles standing perpendicular to substrate. In thicker sections up to 3-4 spicules form ascending plumose tracts, protruding through surface. Echinating megascleres absent. Subectosomal skeleton plumose or paratangential composed of bundles of subectosomal auxiliary subtylostyles often forming brushes around protruding principal spicules and protruding through ectosome. Megascleres entirely smooth choanosomal principal subtylostyles, and subectosomal auxiliary subtylostyles with microspined bases and polytylote shafts. Microscleres palmate

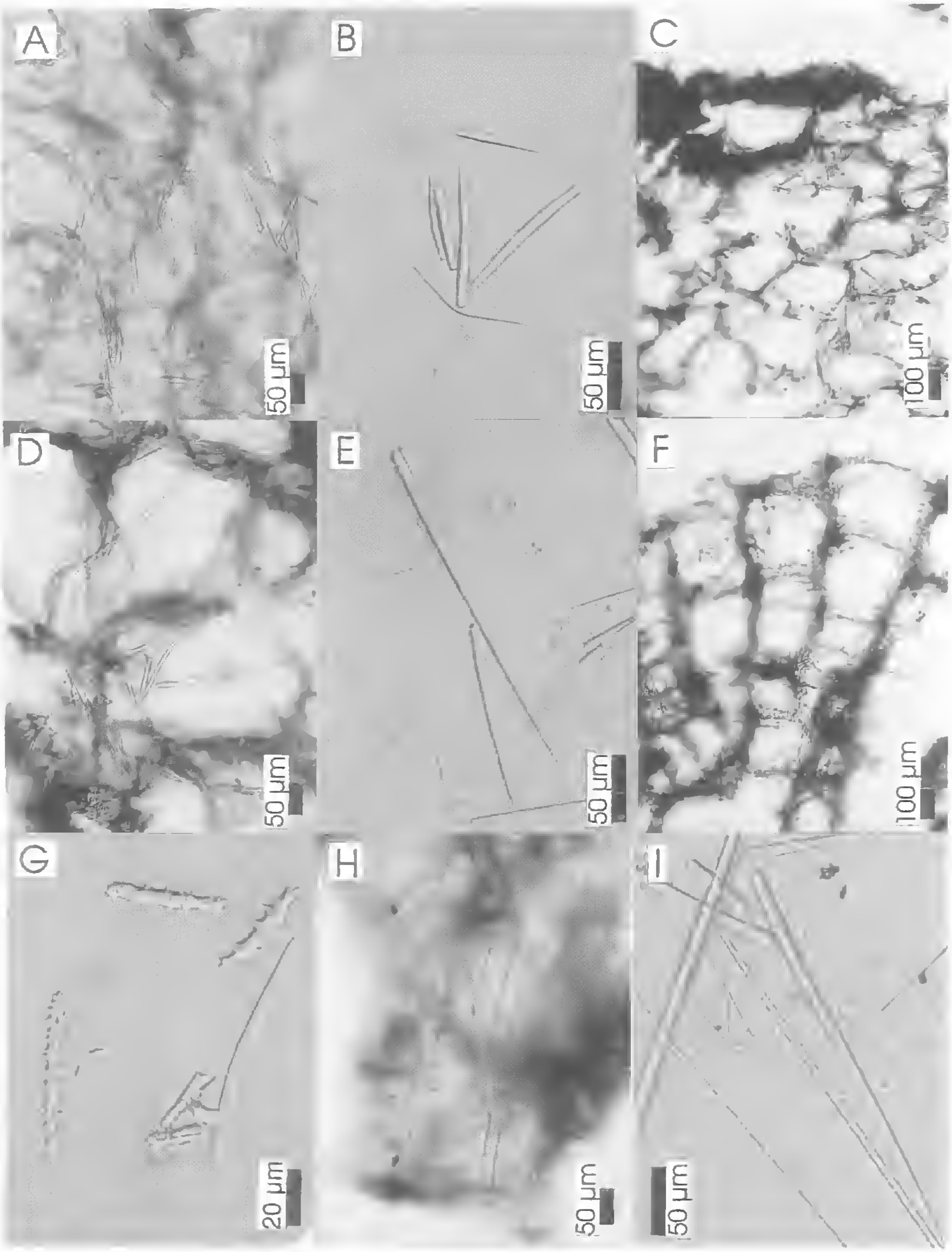

FIG. 20. Type species of microcionid genera. A-B, *Ophlitaspongia* (*O. papilla* Bowerbank, BMNH1910.1.1.395). C-E, *Pandaros* (*P. acanthifolium* Duchassaing & Michelotti, BMNH1884.7.17.2). F-G, *Paradoryx* (*Clathria dura* Whitelegge, AMG3046). H-I, *Paratenaciella* (*P. microxea* Vacelet & Vasseur, MNHNDJV27).

isochelae, including contort forms, and oxeote toxas.

REMARKS. *Paratenaciella* has a *Microciona*-like choanosomal fibre skeleton composed of non-anastomosing, plumose fibre nodes, but lacks acanthostyles (similar to *Axociella*, *Axocielita*, *Tenaciella*), has polytylote modifications to auxiliary spicules (similar to *Fisherispongia ferrea* de Laubenfels and *Microciona aceratoobtusa* Carter), and has modified (oxeote) toxas, like those in *Artemisina archegona* Ristau (although type material shows that they do resemble true microxeas). This latter feature appears to be the only unique character for the type species, and as far as is known it is also unique amongst the Microcionidae. *Paratenaciella* shows some similarities to *Esperiopsis canaliculata* Whitelegge (which is referred here to *Axociella*) in its spiculation, although *P. microxea* has a microcionid architecture, microxeote microscleres and undifferentiated ectosomal-subectosomal megascleres. The genus is monotypic and is synonymised with *Clathria* (*Microciona*).

Plectispa Lendenfeld, 1888
(Fig. 21C-D)

Plectispa Lendenfeld, 1888: 225; Topsent, 1894a: 19; de Laubenfels, 1954: 164.

TYPE SPECIES. *Plectispa macropora*, in part, Lendenfeld, 1888: 226 (by subsequent designation of Hallmann, 1912: 204) (holotype AMG9159).

Lobodigitate growth form. Surface 'honeycomb' reticulate. Choanosomal skeleton reticulate, with well developed spongin fibres forming more-or-less regular oval or eliptical meshes, sparsely cored and abundantly echinated by principal subtylostyles, and fewer auxiliary styles-tornotes also in fibres. Echinating megascleres less predominant in periphery than in axis. Some detritus also incorporated into choanosomal fibres. Subectosomal skeleton plumose, with brushes of principal subtylostyles from ascending fibres of peripheral skeleton protruding through surface, surrounded by paratangential loose bundles or individual auxiliary spicules. Megascleres smooth principal subtylostyles, and long curved, setaceous or sinuous auxiliary styles or quasi-diactinal tornotes, both with blackened axial canals. Microscleres palmate isochelae, including contort forms. Toxas absent.

REMARKS. This genus is poorly defined due to the dubious status of all of Lendenfeld's syntypes, inaccuracies in Lendenfeld's (1888) original description, and misinterpretation of the species (e.g., *Clathria macropora*; Whitelegge (1901: 91) is different from *C. macropora* Lendenfeld (1888)). Hallmann (1912: 165) attempted to sort out these problems but was only partially successful. He rejected Whitelegge's proposed merger of *P. macropora* with *Echinonema levis* Lendenfeld (1888), but instead he synonymised the latter with *C. macropora* (*sensu* Whitelegge), as *Crella incrustans* Carter, var. *levis* Lendenfeld. However, Hallmann's (1912) remarks and assumptions concerning the genus are not entirely correct (see remarks below for *Clathria macropora* and *Holopsamma macropora*), and there is no evidence that he actually re-examined relevant type material. His nomenclatural decisions are erroneous and not supported here.

There are 4 type specimens and one other specimen in the AM and BMNH which bear the name '*macropora*'. 1) AMZ959 (with the label 'dry, cotype') from Port Jackson, NSW, is the so-called 'type' of *Clathria macropora* (*sensu* Whitelegge), and is a species of *Crella*. It is probably a syntype of Lendenfeld's (1888) *Echinonema levis*, but that assumption is difficult to corroborate due to the loss of Lendenfeld's 'key-list' from the Australian Museum (E. Pope & F. Rowe, pers.comm.). 2) AMZ466 (with label stating 'spirit preserved, ?type') from Port Stephens, NSW is the lectotype of Lendenfeld's (1888: 221) *Clathria macropora*, later referred to *Wilsonella* by Hallmann (1912: 240). It is neither a *Wilsonella*, nor closely related to such species as *W. australiensis* Carter, but is a *Clathria* lacking echinating megascleres and having an axially compressed skeleton (e.g., *Clathria* (*Axociella*)). 3) AMG9159 (with the label stating 'dry, type'), probably from Port Jackson, NSW (i.e., there is a discrepancy between the published locality of Torres Strait, Qld. and the museum specimen label and register), is the holotype of *Plectispa macropora*. 4) BMNH1925.11.1.555 (with label stating '*Plectispa macropora*, dry, Dendy coll.') from Manly Beach, NSW, is identical to *Clathria multipes* Hallmann. 5) Another specimen (BMNH1957.8.30.2, with label stating '*Plectispa macropora*, dry') belongs to *Clathria lendenfeldi*. Consequently, only a single syntype is valid becoming the holotype of *P. macropora*, and the diagnosis of *Plectispa* is based on this specimen.

Hallmann (1912: 205) referred the type species (and genus *Plectispa*) to *Wilsonella*, but then returned it to *Clathria* (Hallmann, 1920: 768). The species has a 'honeycombed reticulate' growth form and smooth echinating spicules (not acanthose as supposed by Lendenfeld (1888) and Hallmann (1912)). It also has long, setaceous, quasi-diactinal auxiliary megascleres, which also core fibres, scattered throughout the mesohyl and associated with spicule brushes on the surface. These characters indicate that *Plectispa* belongs to *Holopsamma*, and the species shows some resemblance to *H. ramosa* (Hallmann, 1912) and *H. laminaefavosa* Carter, 1885b (*sensu* Wiedenmayer, 1989).

Plocamia Schmidt, 1870

(Fig. 21A-B)

Plocamia Schmidt, 1870: 62.
Dirrhopalum Ridley in Ridley & Duncan, 1881: 477.

TYPE SPECIES. *Plocamia gymnazusa* Schmidt, 1870: 62 (by subsequent designation (Burton, 1935a: 401)) (holotype possibly LMJG, schizotype MNHNLBIMDCL1105L).

DIAGNOSIS. Encrusting growth form. Surface even, microscopically hispid. Choanosomal skeleton renieroid, with tylotes forming basal reticulation, interconnected at nodes by light spongin fibres, and with plumose columns of choanosomal principal styles and echinating styles embedded in basal renieroid skeleton, individually or in bundles, largest protruding through surface. Subectosomal skeleton with paratangential and erect tracts of subectosomal auxiliary styles. Megascleres robust slightly curved choanosomal principal styles with microspined or smooth bases, robust tylotes with swollen microspined bases, long subectosomal auxiliary styles with smooth or microspined bases, smaller echinating styles with microspined bases. Microscleres palmate isochelae and wing-shaped toxas.

REMARKS. Ridley (in Ridley & Duncan, 1881) suggested that *Plocamia* Schmidt was preoccupied by *Plocamium* Lamouroux, 1828, a seaweed, and consequently proposed the replacement name *Dirrhopalum* Ridley. However, under Article 56b of the ICZN (Anonymous, 1985) this is an unjustified emendation and *Plocamia* stands. Bergquist & Fromont (1988) also used *Plocamia* over *Dirrhopalum*.

This definition is based on slides of the holotype and published descriptions (Schmidt, 1870; Ridley in Ridley & Duncan, 1881). The type species is essentially the same as *Plocamilla* in structure and spicule geometry, but spines on both the basal tylote spicules and echinating spicules are much better developed in *Plocamilla*. *Plocamia* is the earliest available name for a group of *Antho*-like ('plocamiform') microcionids having basal tylotes and echinating spicules (see remarks for *Holoplocamia*, *Lissoplocamia*).

Plocamilla Topsent, 1928

(Fig. 21E-F)

Plocamilla Topsent, 1928a: 63; Lévi, 1960a: 80; Lévi, 1960b: 760; Pulitzer-Finali, 1973: 40; Simpson, 1968a: 95; Van Soest, 1984b: 26, 29, 125; (not Burton, 1935a: 402).

TYPE SPECIES. *Isodictya coriacea* Bowerbank, 1874: 136 (by original designation of Topsent, 1928a: 63) (holotype BMNH1910.1.1.251).

DIAGNOSIS. Encrusting growth form. Surface uneven, porous, microscopically hispid. Choanosomal skeleton renieroid, with regular basal reticulation of acanthose strongyles in uni- or paucispicular tracts, overlaid by plumose brushes of larger choanosomal principal styles and echinating acanthostyles projecting perpendicularly from nodes of renieroid spicule skeleton. Ectosomal skeleton contains plumose or paratangential brushes of subectosomal auxiliary styles and projecting echinating acanthostyles from peripheral nodes of choanosomal renieroid skeleton. Megascleres acanthose strongyles or tylotes with spines mostly on basal ends, larger choanosomal principal styles-subtylostyles with spined bases, subectosomal auxiliary styles-subtylostyles with smooth or microspined bases, and small echinating acanthostyles with few spines concentrated mainly on basal end. Microscleres palmate isochelae, smaller wing-shaped toxas, and larger accolada toxas with spined points.

REMARKS. This definition is based on the holotype and descriptions of the type species (Topsent, 1928a; Lévi, 1960a). *Plocamilla* has spiculation similar to *Plocamia* Schmidt, but it has an encrusting growth form and therefore its skeleton is not clearly differentiated into primary or secondary lines (Topsent, 1928a: 63; Lévi, 1960a: 80). This skeletal development is probably related to growth form and not an important generic character. The genus was not formally diagnosed until Burton (1935a: 402) differentiated a number of 'plocamiform' genera, all of which had acanthostrongyles or acanthostyles forming the basal renieroid skeleton. Burton emphasised the diagnostic value of choanosomal acanthostrongyles ('dumbell spicules') which united those genera, but he differentiated them by their skeletal architecture and the presence or absence of various spicule types.

Holoplocamia is a synonym of *Plocamilla* (Lévi, 1960a: 80), although Little (1963: 47) argued to the contrary. Lévi (1960a) also noted that the skeleton of *P. coriacea* was very close to *Antho* and *Dictyoclathria* (both of which are objective synonyms), lacking special echinating spicules and having acanthostyles instead of acanthostrongyles in the basal renieroid skeleton. Lévi (1960a) and Pulitzer-Finali (1973: 40) were cautious in interpreting whether *Plocamilla* was distinct from *Antho*, because the spined acanthostyles and smooth principal styles could not be consistently differentiated in all taxa. For example, *P. elegans* (Ridley & Dendy) does not show any clear separation between the smaller category of smooth principal styles and the more sparsely spined acanthostyles (Pulitzer-Finali, 1973). On that basis, Pulitzer-Finali suggested that future studies may show that *P. elegans* should be referred to *Antho*, whereas *P. coriacea* has clearly differentiated coring and echinating megascleres, and should remain in *Plocamilla*. Lévi (1960a), Simpson (1968a), Pulitzer-Finali (1973) and Van Soest (1984b) maintained *Plocamilla* and *Antho* as separate genera, the former having echinating acanthostyles and predominantly (acantho)strongyles in the renieroid skeleton. However, all these authors admitted that the two genera may be too similar to maintain sufficient generic separation. Van Soest & Stone (1986) noted that the genus should probably be merged with *Antho*, together with other plocamiform genera containing renieroid skeleton of acanthose megascleres, and this suggestion is supported here (i.e., *Antho* (*Plocamia*)).

Simpson (1968a: 95) found that although *Plocamilla* and *Microciona* were easily differentiated by their skeletal construction and spicule geometries, they were remarkably similar in their cytological characteristics. These findings contradict the more obvious similarities between microcionid genera, based on spicule geometry and skeleton construction. *Microciona*, *Clathria* and *Thalysias* are a relatively homogenous group in skeletal construction, compared to any inferred relationship between *Plocamilla* and *Microciona* for example. Probably Simpson's (1968a) cytological characters have not been incorporated into the classification, nor have the the implications of his findings to phylogeny of demosponges been widely discussed.

Plocamiopsis Topsent, 1904
(Figs 21G-H, 22A)

Plocamiopsis Topsent, 1904a: 155; Burton, 1935a: 402.

TYPE SPECIES. *Plocamiopsis signata* Topsent, 1904a: 155 (by monotypy) (holotype MNHN-LBIMDT947).

DIAGNOSIS. Encrusting growth form. Surface even, hispid. Choanosomal skeleton irregularly renieroid, with basal reticulation of acanthostrongyles in uni- or bispicular tracts lying on substrate. Choanosomal principal subtylostyles, smaller acanthostyles and spicules intermediate to both embedded individually in basal skeleton, standing perpendicular to substrate. Subectosomal skeleton plumose, with ascending brushes of subectosomal auxiliary subtylostyles surrounding principal megascleres. Ectosome without specialised spiculation, but with both tangential and plumose tracts of subectosomal auxiliary spicules protruding through surface. Megascleres choanosomal principal subtylostyles with spines on bases and proximal region of shaft, smaller acanthostyles with aspinose points, and subectosomal auxiliary subtylostyles with spined bases. Microscleres cleistochelae and smooth wing-shaped toxas.

REMARKS. *Plocamiopsis* is a member of de Laubenfels' (1936a) plocamiform group of sponges having a basal renieroid skeleton of acanthostrongyles. It differs from others in this group (*Dirrhopalum*, *Heteroclathria*, *Holoplocamia*, *Lissoplocamia*, *Plocamilla*) having cleistochelae, which are also seen in *Colloclathria* and *Quizciona*. Cleistochelae are hypersilicified palmate isochelae with the front alae fused (Fig. 22A) but probably have little phylogenetic significance given the complete transitional series from palmate to cleistochelate (Fig. 76G). *Plocamiopsis* is referred to *Antho* (*Plocamia*).

Protophlitaspongia Burton, 1934
(Fig. 22B-C)

Protophlitaspongia Burton, 1934a: 562.

TYPE SPECIES. *Siphonochalina bispiculata* Dendy, 1895: 246 (by original designation) (lectotype NMVG2319).

Lamellar, tubulo-digitate growth form, with osculum on apex of each tube. Surface uneven, microscopically hispid. Choanosomal skeleton subisodictyal reticulate, with more-or-less regularly anastomosing heavy spongin fibres

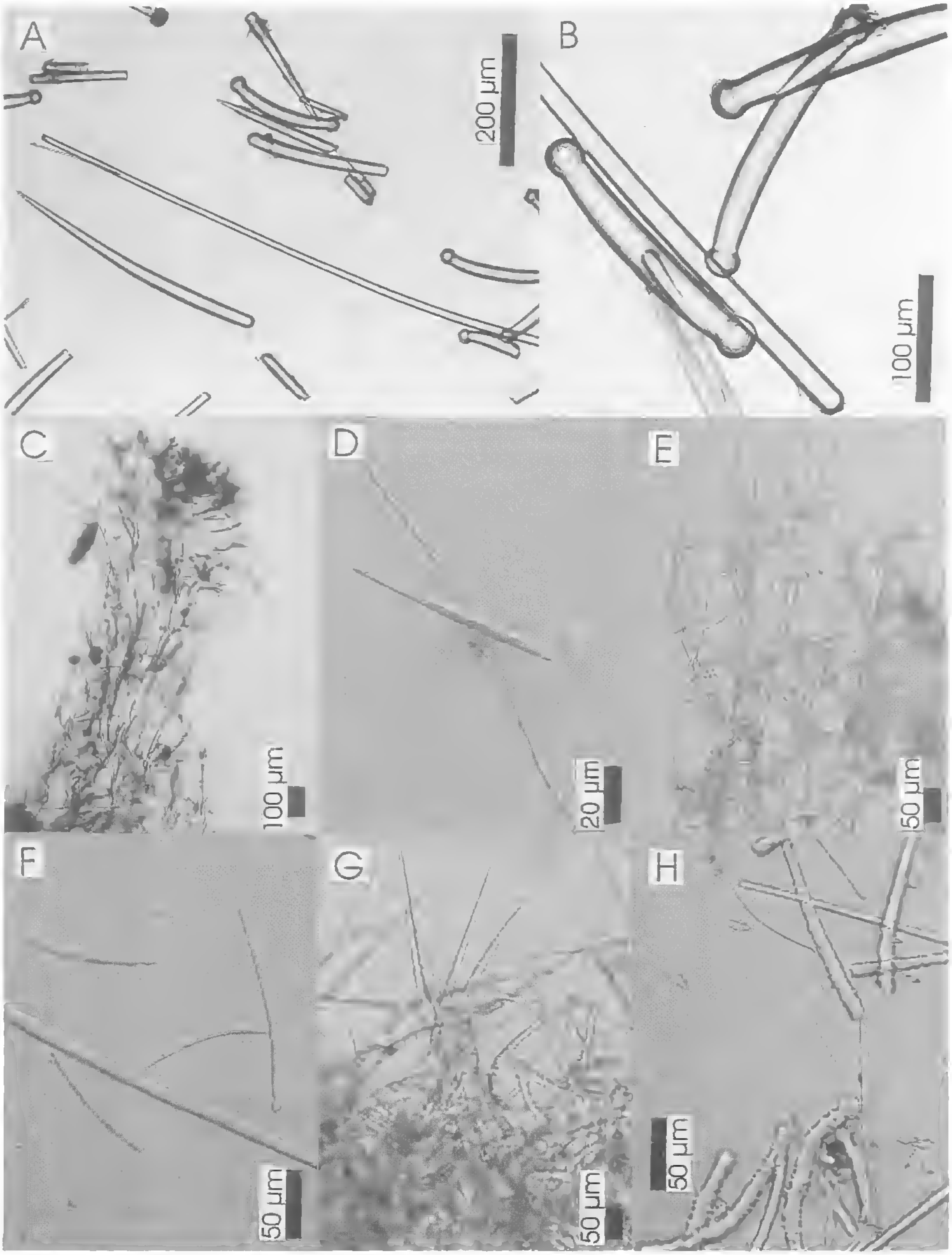

FIG. 21. Type species of microcionid genera. A-B, *Plocamia* (*P. gymnazusa* Schmidt, MNHNDCL1105L). C-D, *Plectispa* (*P. macropora sensu* Lendenfeld, AMG9159). E-F, *Plocamilla* (*Isodictya coriacea* Bowerbank, BMNH1910.1.1.251). G-H, *Plocamiopsis* (*P. signata* Topsent, MNHNDT947).

forming primary ascending and secondary transverse lines. Primary fibres cored by multispicular tracts of longer auxiliary oxeas; secondary fibres usually aspiculose occasionally with only single coring auxiliary oxeas. Fibres sparsely echinated by smaller, smooth hastate oxeas (presumed to be homologous with principal spicules). Ectosome lacks specialised spiculation, but has plumose erect brushes of oxeas from peripheral skeleton protruding through surface. Megascleres modified diactinal, including longer smooth hastate auxiliary oxeas, and smaller smooth hastate principal oxeas. Microscleres absent.

REMARKS. The genus contains 7 previously named species: *P. bispiculata* (Dendy, 1895: 246) from Port Phillip Bay, Victoria, *P. oxeata* Burton (1934a: 562) from the Papuan Pass, northern Australia, *P. ada* de Laubenfels (1954: 96) from Ponape, *P. aga* de Laubenfels (1954: 97) from the central west Pacific, *P. antillana* Pulitzer-Finali (1986: 138) from the West Indies, *Echinochalina* (*P.*) *laboutei* Hooper & Lévi (1993a: 1277) and *E.* (*P.*) *bargibanti* Hooper & Lévi (1993a: 1280) both from New Caledonia. These species resemble Haplosclerida to some extent: *P. antillana*is a haplosclerid, (Niphatidae). Similarly, de Laubenfels' (1954), *P. ada* and *P. aga*, are placed in the Phoriospongiidae leaving 4 known species and 4 new Australasian species described below.

The genus has a characteristic three-dimensional ectosomal architecture reminiscent of *Hemigellius* and *Amphimedon* (Haplosclerida: Niphatidae), with only oxeas as megascleres. However, smooth hastate oxeas echinating fibres, with a similar geometry but smaller size than coring spicules, gives some clues as to probable phylogenetic relationships (i.e., Microcionidae, some Iophonidae, and Raspailiidae). This pattern of spiculation is seen in *Echinochalina*, and to a lesser extent *Echinoclathria* as defined here. It is particularly well developed in *E. axinelloides*, and for this reason Burton (1934a: 562) tentatively referred *Protophlitaspongia* to the Microcionidae. Conversely, de Laubenfels (1936a: 54, 1954: 96) suggested that the genus was closer to *Guitarra* (although lacking their peculiar microscleres), or *Liosina*, and he referred *Protophlitaspongia* to the Desmacidonidae, but he was probably referring mainly to his two Micronesian species in doing this. Pulitzer-Finali (1986: 138) followed similar reasoning, placing the genus in Esperiopsidae, but none of these species belong to *Protophlitaspongia* in any case.

Further clues as to the most appropriate placement of this genus can be seen from other characteristics: the palmate isochelae in *E.* (*P.*) *bargibanti*, the accolada toxas in *E.* (*P.*) *oxeata*, and the plumose ectosomal skeleton, composed of auxiliary spicule brushes (typical of Microcionidae, Axinellidae and Raspailiidae) in all species. The present interpretation of *Protophlitaspongia* suggests affinities with *Echinoclathria* and *Holopsamma* microcionids and the reticulate Raspailiidae, and in the distribution of its megascleres (i.e., auxiliary spicules in fibres and peripheral skeleton, principal spicules echinating fibres) it is assigned to *Echinochalina*.

Pseudanchinoe Burton, 1929
(Fig. 22D-E)

Pseudanchinoe Burton, 1929a: 433; de Laubenfels, 1936a: 109.

TYPE SPECIES. *Stylostichon toxiferum* Topsent, 1913a: 621 (by original designation and monotypy) (holotype MNHNLBIMDT1612).

Massive subspherical growth form. Surface uneven, apical surface conules. Choanosomal skeleton plumoreticulate, with spongin fibres forming primary plumose ascending columns, partially interconnected by transverse secondary fibres, both cored by multispicular tracts of choanosomal principal subtylostyles and heavily echinated by acanthostyles. Subectosomal skeleton plumose, non-anastomosing, composed of multispicular plumose tracts of choanosomal principal spicules from peripheral fibres surrounded by plumose bundles of subectosomal auxiliary subtylostyles. Ectosomal skeleton with second tier of subectosomal auxiliary subtylostyles forming dense palisade on surface. Megascleres choanosomal principal subtylostyles with or without basal spines, subectosomal auxiliary subtylostyles with microspined bases, and echinating acanthostyles varying from smaller forms with even spination to larger forms with aspinose points. Microscleres oxhorn and accolada toxas. Chelae absent.

REMARKS. Burton (1929a) recorded palmate isochelae in the type species but none were found in the holotype nor did Topsent (1913a) record any in his original description. In fact the absence of isochelae and the possession of plumoreticulate skeletal architecture are virtually the only two diagnostic features that distinguish *Pseudanchinoe* from other *Clathria* (*s.s.*). Similarly, Topsent (1913a) stated that there were microspines on the points of toxas, but these were not seen in the holotype.

The type species of *Pseudanchinoe* is intermediate between *Clathria* and *Thalysias*, having the ectosomal structure of the latter (i.e., with a thick continuous palisade of erect spicules overlaying a similar subectosomal skeleton), but with spicule composition of the former (single category of auxiliary styles), further supporting the decision to merge these two genera in a single taxon (*Clathria s.l.*). In skeletal structure and diversity of megascleres the genus could be placed in the series: *Dendrocia* (single category of structural spicule in the entire skeleton), *Clathria* (one category of auxiliary spicule and one category of principal spicule), *Pseudanchinoe* (one category of auxiliary spicule forming a continuous ectosomal palisade), *Thalysias* (two categories of auxiliary spicules the smaller forming a continuous ectosomal palisade, and one category of principal spicule), and *Antho* (some of which have two categories of auxiliary spicules and two categories of principal spicules).

Burton (1929a) remarked on the apparent similarities between *Pseudanchinoe* and *Anchinoe* Gray (= *Phorbas* Duchassaing & Michelotti; Anchinoidae). The latter genus has plumose columns of intermingled acanthostyles and tornotes (or oxeas), which are echinated by acanthostyles, but these similarities are superficial. Anchinoidae have tangential ectosomal diactinal megascleres and plumose columns of choanosomal megascleres in which acanthostyles predominate (e.g., Van Soest, 1984b: 86). Of the numerous species assigned to *Pseudanchinoe* (e.g., de Laubenfels, 1936a: 109) most are interpreted here as belonging to *Clathria*, having secondarily lost their isochelae. Australian examples are *C.* (*C.*) *caelata* Hallmann, *C.* (*C.*) *costifera* Hallmann, *C.* (*C.*) *inanchorata* Ridley & Dendy, and *C.* (*C.*) *partita* Hallmann. Two other species belong to *Clathria* (*Thalysias*) (*C. dentata* Topsent and *C. fascicularis* Topsent, which are synonymous) (Van Soest, 1984b). Of contemporary authors only Koltun (1976) recognises this genus whereas Van Soest (1984b) and (Wiedenmayer, 1989) merged it with *Clathria*. It is included here in *Clathria* (*Clathria*).

Qasimella Thomas, 1974

Qasimella Thomas, 1974: 311.

TYPE SPECIES. *Qasimella indica* Thomas, 1974: 311 (by original designation)(holotype CMFRIT84/1 not seen).

Specialised tubular growth form, with apical oscules and central cavity running longitudinally through body. Surface smooth, even. Choanosomal fibres apparently absent, and skeletal structure poorly defined with more-or-less longitudinal tracts of choanosomal principal subtylostyles bound together at nodes by collagen. Echinating acanthostyles absent. Subectosomal skeleton rudimentary, composed of subectosomal auxiliary subtylostyles lying just below surface, not protruding through it. Ectosomal skeleton absent. Megascleres choanosomal principal subtylostyles with spined bases, and slender smooth subectosomal auxiliary subtylostyles. Microscleres described as 'arcuate' isochelae and wing-shaped toxas.

REMARKS. The holotype and paratypes (CMFRI T84/2) of *Q. indica* are housed at the Central Marine Fisheries Research Institute, Mandapan Camp, Cochin, India. A slide of the holotype is housed at the IM (A.K. Mandal, pers. comm.).

The genus is monotypic and known only from its original description (Thomas, 1974). It is an unusual, very thin-walled hollow tubular sponge with pseudo-syconoid construction, and attached to the substrate by short peduncles reminiscent of *Aulospongus* Norman (Raspailiidae). Apart from spicule diversity and geometry, which place the type species in Microcionidae, we know of few other characters that give clues as to its affinities with other microcionids. From its skeletal structure, or lack of it, *Qasimella* shows similarities to *Artemisina*. It is also possible that *Q. indica* is a larval sponge, but until type material is seen its published description suggests that it has affinities to *Artemisina*. The chelae have been described as 'arcuate', but this cannot be confirmed and must be regarded as suspect (e.g., they may be merely modified, curved, palmate ones).

Quizciona de Laubenfels, 1936
(Fig. 22F-G)

Quizciona de Laubenfels, 1936a: 111.

TYPE SPECIES. *Microciona heterospiculata* Brondsted, 1924: 465 (by original designation) (fragment of type BMNH1901.12.26.13).

Encrusting growth form. Surface hispid, uneven. Choanosomal skeleton differentiated into two components: renieroid basal layer composed of spongin fibres lying on substrate cored by bispicular tracts of acanthostyles forming triangular meshes; basal fibres ascending non-anastomosing fibre nodes echinated by multispicular plumose tracts of both choanosomal principal subtylostyles and echinating acanthostyles (of same morphology as basal renieroid skeleton spicules) embedded and erect on substrate. Ectosomal skeleton paratangential, composed of two size classes of subectosomal auxiliary subtylostyles, forming occasional brushes and scattered in mesohyl matrix near periphery. Megascleres longer choanosomal principal subtylostyles with heavily microspined bases, shorter acanthostyles with aspinose points (forming both renieroid basal skeleton and echinating fibre nodes), and two size classes of auxiliary subtylostyles with smooth or spined bases. Microscleres palmate isochelae, cleistochelae and small accolada toxas.

REMARKS. The original description differs slightly from the definition above. In particular, the very small, thin toxas were overlooked, as was a renieroid basal skeleton typical of de Laubenfels' (1936a) plocamiform sponges. Brondsted's (1924) description of *Quizciona* suggests that it is close to *Microciona* with a hymedesmoid basal skeleton and plumose ascending fibre nodes but having cleistochelae in addition to palmate isochelae. The type material shows the species more closely related to *Antho* with a renieroid basal skeleton. Smaller acanthostyles and larger principal styles echinating basal fibres is similar to *Plocamilla*, whereas acanthostyles rather than acanthostrongyles coring the basal fibres is similar to *Antho*, and this mix of characters illustrates the difficulty in separating these two taxa.

Cleistochelae have been recorded in several microcionids (*Microciona cleistochela* Topsent, *M. clathrata* Whitelegge, *M. chelifera* Lévi, *Clathria simpsoni* Van Soest, *C. toxipraedita* Topsent and *Colloclathria ramosa* Dendy). Alander (1942) and Van Soest (1984b) suggested that cleistochelae are modified palmate isochelae (with fused chelate teeth) which have arisen several times independently within the Microcionidae, and consequently they do not have primary taxonomic significance. Interestingly, Brondsted (1924) also remarked on the similarities between cleistochelae of Microcionidae and clavidiscs of the hypercalcified sponge *Merlia* Kirkpatrick, supporting current theories on the origin and affinities of the 'sclerosponges' with the demosponges (e.g., Vacelet, 1985).

Bergquist & Fromont (1988) merged *M. heterospiculata* with *Clathria mortensenii* and suggested that *Quizciona* should be abandoned on the basis that they did not find cleistochelae in their material, contrary to de Laubenfels' (1936a) description. This synonymy is not upheld here, although Bergquist's (1961a: 39) record of *M. heterospiculata* from northern New Zealand may be *Clathria mortensenii*. I interpret *Quizciona*, based strictly on the type specimen, as a synonym of *Antho* (*Antho*).

Ramoses de Laubenfels, 1936
(Fig. 22H-I)

Ramoses de Laubenfels, 1936a: 109.

TYPE SPECIES. *Clathria pauper* Brondsted, 1927: 3 (by original designation) (fragment of type BMNH1930.11.5.2).

Arborescent, tubulo-digitate growth form. Surface shaggy, uneven, microscopically hispid. Choanosomal skeleton irregularly plumo-reticulate, with vaguely ascending multispicular primary tracts interconnected by transverse paucispicular secondary tracts cored by both smooth and partially spined choanosomal principal styles and echinated by plumose bundles of smaller acanthostyles. Spongin fibres not seen but spicules united by moderate quantities of collagen. Subectosomal skeleton plumose, with bundles of subectosomal auxiliary subtylostyles protruding through surface. No special ectosomal skeleton. Megascleres longer entirely smooth choanosomal principal styles, slightly shorter principal subtylostyles with spines on bases and distal end of shaft, small slender echinating acanthostyles with even spination, and subectosomal auxiliary subtylostyles with spined bases. Microscleres accolada toxas, some with contort centres. Chelae absent.

REMARKS. The holotype of *C. pauper* has not yet been discovered in the Brondsted collection at UZM (O. Tendal, pers. comm.), but a fragment of it is held at the BMNH. A fragment of *C. pauper* (with second label stating '*Protoclathria antarctica*, 29.1.19?? [illegible], 340 fathoms, M Burton') is in Sydney (AMZ2239). It is possible that this material is also a fragment of the holotype, but its status and origin are not certain. Brondsted's (1927) original description conforms closely to the type material, although he appears to have overlooked the thin accolada toxa microscleres (some with asymmetrical contort central curvature).

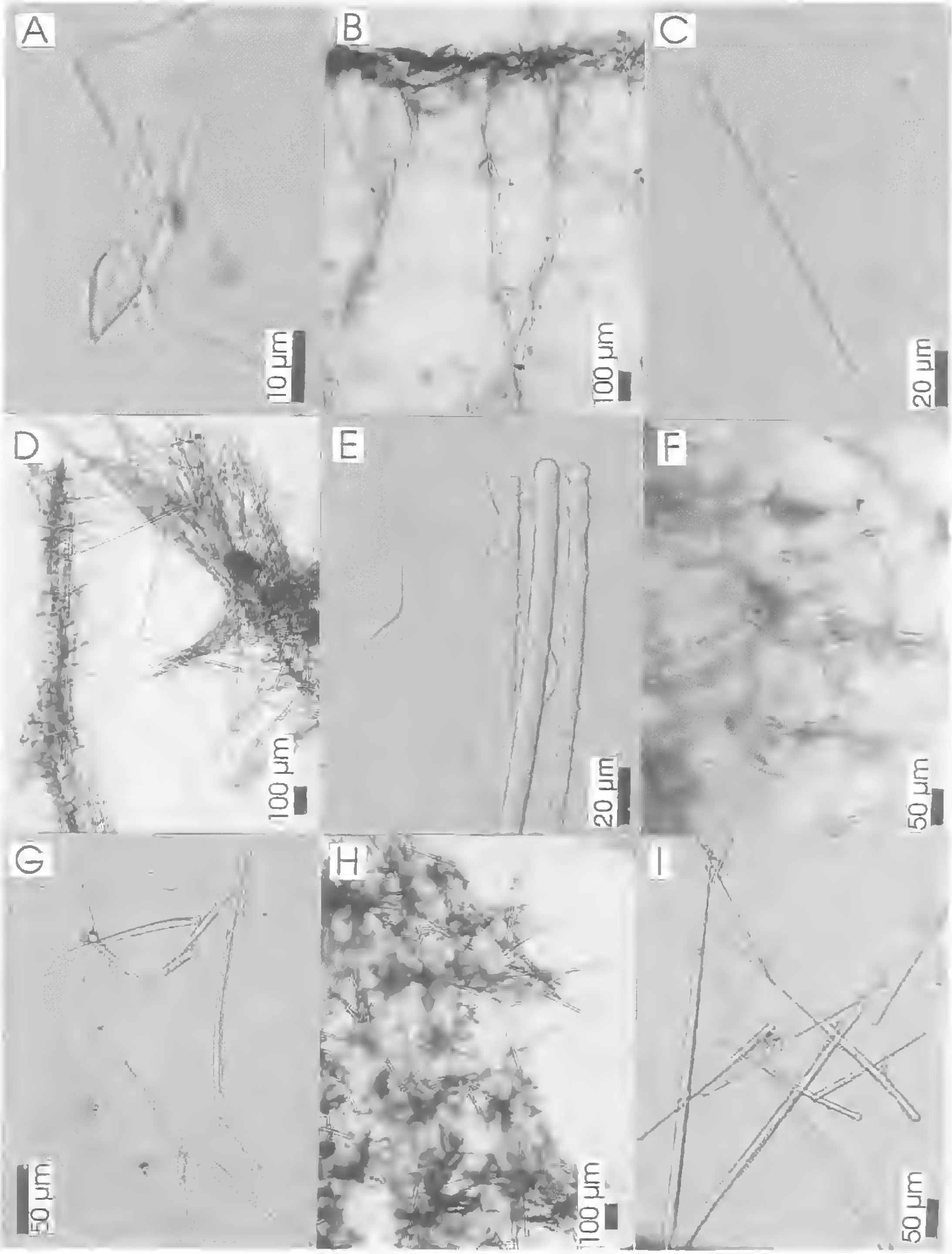

FIG. 22. Type species of microcionid genera. A, *Plocamiopsis* (*P. signata* Topsent, MNHNDT947). B-C, *Protophlitaspongia* (*Siphonochalina bispiculata* Dendy, NMVG2319). D-E, *Pseudanchinoe* (*Stylostichon toxiferum* Topsent, MNHNDT1612). F-G, *Quizciona* (*Microciona heterospiculata* Brondsted, BMNH1901.12.26.13). H-I, *Ramoses* (*Clathria pauper* Brondsted, BMNH1930.11.5.2).

Ramoses is similar to *Pseudanchinoe* in lacking chelae microscleres, and Koltun (1976: 155) synonymised the type species of *Ramoses* with *P. toxiferum* Topsent, the type species of *Pseudanchinoe* (both species are from the Ross Sea, Antarctica). This synonymy is confirmed here from type specimens and both species are lipochelous *Clathria* (*Clathria*). Koltun (1976) suggested that *C. pauper* was a synonym of *Microciona toxifera* (Topsent), also from the Antarctic, but this synonymy is rejected. Comparison of relevant type specimens shows that the two species differ substantially in their skeletal structure, spicule size and spination on megascleres.

Rhaphidophlus Ehlers, 187
(Fig. 23A-C)

Rhapidophlus Ehlers, 1870: 19,31; Ridley, 1884a: 449-453; Ridley & Dendy, 1887: 151; Topsent, 1894a: 19, 1925: 658, 1928a: 61, 1932: 98; Thiele, 1903a: 957; Dendy, 1905: 170; Hallmann, 1912: 175, 1920: 769; Burton, 1932a: 320; de Laubenfels, 1936a: 112; Lévi, 1960a: 56; Bergquist, 1965: 168; Simpson, 1968a: 101, 104-106; Wiedenmayer, 1977: 140; Van Soest, 1984b: 109; Bergquist & Fromont, 1988: 118.

TYPE SPECIES. *Spongia cratitia* Esper, 1797: 195 (by original designation) (fragment of type ZMB4577).

Arborescent growth form. Surface microscopically hispid, conulose. Choanosomal skeleton irregularly reticulate, with heavy spongin fibres cored by multispicular tracts of choanosomal principal subtylostyles which terminate in plumose tracts on peripheral fibres. Plumose multispicular tracts of echinating acanthostyles clumped around fibre nodes and also protruding from fibres at regular intervals. Subectosomal skeleton plumose, with well-developed multispicular columns of subectosomal auxiliary subtylostyles arising from ends of principal spicule brushes in peripheral skeleton. Ectosome with bundles of erect ectosomal auxiliary subtylostyles overlaying subectosomal plumose brushes of spicules. Megascleres entirely smooth hastate choanosomal principal subtylostyles, larger smooth subectosomal auxiliary subtylostyles, shorter thinner smooth ectosomal auxiliary subtylostyles, and echinating acanthostyles with aspinose necks. Microscleres palmate isochelae of two size categories, and two forms of toxas (small wing-shaped and larger asymmetrical sinuous toxas).

REMARKS. The type species is from the Indo-west Pacific region where most species occur.

The primary and only consistent morphological feature that distinguishes *Rhaphidophlus* from other *Clathria*-like taxa is the specialised ectosomal skeleton, consisting of two differentiated categories of auxiliary subtylostyles which form brushes on the surface (either as discrete brushes (*s.s.*) or in a continuous palisade). This is identical to the condition described for *Thalysias* (which has seniority).

Hallmann (1912), followed most recently by Van Soest (1984b), suggested that the two sizes of auxiliary megascleres may represent age differences in spicules, in which case the genus has a distinct localisation of adult and juvenile megascleres. This assertion, however, does not yet have any empirical (experimental) support. This difference in size/age of auxiliary spicules is crucial to the definition of *Rhaphidophlus*, because some species of *Clathria*, *Microciona* and *Dendrocia* have a dermal skeleton of similar structure but containing only one sort of auxiliary spicule (*C. imperfecta*, *C. striata*, *C. pyramida*). Similarly, some species of *Antho* (e.g., *A. ridleyi*) also have relatively dense ectosomal brushes, but these consist of a single undifferentiated category of subectosomal megasclere. Hallmann (1912) debated the value of ectosomal specialisation as a generic character, concluding that although the distinction between the two genera may eventually breakdown, they can be consistently differentiated on composition of peripheral skeleton rather than its development or density. These conclusions are supported here.

Another character predominant in *Thalysias* (including *Rhaphidophlus*) is the presence of more than one size category of isochelae, of which one or more may be contort (Fig. 5F). This feature is not consistent among species, nor is it exclusive to the genus. Contort chelae are common in *Clathria* (*Thalysias*) (e.g., *Spongia abietina* Lamarck, *Spongia cactiformis* Lamarck, *Rhaphidophlus cervicornis* Thiele, *R. spiculosus* Dendy, *R. topsenti* Thiele, *Clathria fasciculatus* Wilson and *C. spiculosus* var. *macilenta* Hentschel), *Clathria* (*Clathria*) and *Clathria* (*Microciona*) (e.g., *Dictyociona adioristica* de Laubenfels, *Clathria mixta* Hentschel, *C. bulbotoxa* Van Soest, *Fisherispongia ferrea* de Laubenfels, *Esperiopsis obliqua* George & Wilson, *Wilsonella conectens* Hallmann, and *M. prolifera* (*sensu* Wilson)), *Clathria* (*Wilsonella*) (e.g., *Microciona tuberosa* Bowerbank, *Clathriopsamma reticulata* Lendenfeld), *Clathria* (*Axociella*) (e.g., *Esperiopsis canaliculata* Whitelegge), *Antho* (*Antho*) (e.g., *Holoplocamia penneyi* de Laubenfels) and *Holopsamma* (e.g., *Plectispa macropora* Lendenfeld). It is also known to occur in *Cornulum* Carter (Iophonidae) (e.g., *C. johnsoni* (de Laubenfels)) and consequently it cannot be given much diagnostic value above the species level.

There are several other characters used by authors to define genera present in many species of *Thalysias* (including *Rhaphidophlus*), but are not apomorphies occurring throughout related groups in all combinations (e.g., encrusting growth form and hymedesmoid architecture (e.g., *Leptoclathria lambda* Lévi); absence of echinating megascleres (e.g., *Axociella arteria* de Laubenfels), absence of microscleres (e.g., *Clathria fascicularis* Topsent), and modified isochelae (e.g., *Colloclathria ramosa* Dendy)). A systematics based on these features conflicts with one based on ectosomal specialisation and dispersal of structural megascleres within the skeleton.

By comparison, Dendy (1905), Wilson (1925), de Laubenfels (1936a), Hartman (1955), Wells et al. (1960), Bergquist (1965), Hooper (1990a), Hooper et al. (1990, 1992) and Hooper & Lévi (1993a) amalgamated *Thalysias* (including *Rhaphidophlus*) and *Clathria* (including *Microciona*) on the basis that dermal specialisation can vary intraspecifically, especially in relation to growth form and age of an individual. These authors suggest that this feature is probably not a sound base on which to separate genera. In contrast, Simpson (1968a), Wiedenmayer (1977) and Bergquist & Fromont (1988) maintain these genera separately, although they do state that dermal specialisation may not be important at the generic level (i.e., they offer a convenient classification rather than one based on phylogeny). Simpson (1968a) showed that despite very close morphological similarities between *Clathria* and *Rhaphidophlus*, there were cytological differences between the taxa which he considered were sufficient to separate them at the generic level of classification. Thus, Simpson's (1968a) cytological data supports the conclusion above based on morphological evidence that the only morphological character of consistent diagnostic importance, and which correlates to some extent with supposed biological differences between those genera, is the possession of ectosomal specialisation. This conclusion is upheld in this study and used at the subgeneric level.

There are several nomenclatural complexities that still exist for *Rhaphidophlus*, and these require further discussion.

1) Van Soest (1984b: 91) argued that *Thalysias* should be abandoned in favour of *Rhaphidophlus*, following Lévi (1960a: 52). His argument was based on the premise that Carter (1876: 311) designated the 'representative' of *Thalysias* as *Thalysias subtriangularis* (Duchassaing, 1850), and he suggested that although Carter (1876) did not actually use the words 'type' or 'type species', there was no doubt of his intentions (*T. subtriangularis* is a species of *Xestospongia*; Wiedenmayer, 1977: 255; Van Soest et al., 1983: 199). Van Soest (1984b) also suggested that the use of *Rhaphidophlus* over *Thalysias* was a pragmatic solution since the name was in current usage by the majority of contemporary authors. Conversely, Wiedenmayer (1977: 140), Hooper (1990a), Hooper et al. (1990, 1992) and Hooper & Lévi (1993a) note that Carter (1876) merely compared three small specimens from the North Atlantic with *Thalysias*, but left them unnamed. Wiedenmayer (1977) states that although Carter did cite Duchassaing's (1850: pl. 17, fig. 1) figure of *Thalysias subtriangularis*, Carter's action cannot be construed as a subsequent designation of a type species under Articles 67c and 69a of the ICZN (Anonymous, 1985). Therefore, de Laubenfels' (1936a: 104) subsequent designation of *Thalysias virgultosa* (Lamarck, 1814) as type species of *Rhaphidophlus* is valid, and the genus is a junior synonym of *Thalysias*.

2) Simpson (1968a: 98) suggested that arguments supporting or refuting the choice of one genus name over another were irrelevant because *Rhaphidophlus*, *Thalysias* and *Axocielita* showed different cytological features, apparently justifying their recognition at the generic level. There are no arguments based on skeletal evidence which can contend with Simpson's hypothesis since his cytological data do not correlate with any skeletal features. However, Simpson's (1968a) conclusions are based on only three species, one in each genus, and it could be interpreted that the differences he observed may be applicable only at the species level.

Simpson (1968a) found that *Thalysias* was distinct from both *Microciona* (cf. Hartman, 1955; Wells et al., 1960), *Rhaphidophlus* and *Clathria* (cf. Lévi, 1960a). *Thalysias* was related to *Rhaphidophlus*, but cytologically distinct, which he stated was also apparently reflected in ectosomal cytological and morphological differences between the two genera. *Rhaphidophlus* (*sensu* Simpson) had a specialised and extensive region containing a secondary fibre system and a continuous ectosomal skeleton, whereas *Thalysias* had fibre cell tracts organised into dermal columns which produce tufts of ectosomal styles. However, no similar correlations were observed in any other species examined (Van Soest, 1984b; Hooper, 1990a). Simpson's (1968a) system is intrinsically unworkable as it presently stands, given that the existing systematics is based on skeletal attributes, and essentially *Thalysias* and *Rhaphidophlus* differ only in their nomenclature.

3) Simpson (1968a) suggested that *Axocielita* was distinct from, but most closely related to *Thalysias*, but this conclusion is not supported by their morphology. *Axocielita similis* (Stephens) has a hymedesmoid skeleton with plumose fibre nodes, each node cored by plumose spicule tracts, echinating acanthostyles are absent and only one size class of auxiliary spicule is present, suggesting that the species is more closely related to *Microciona* than *Thalysias* (Hooper, 1990a). Simpson (1968a: 113) also agreed that echinating acanthostyles are of minor diagnostic importance. The implication of these data is that *Axocielita hartmani* Simpson and *A. similis* (Stephens) are either not cogeneric, which is not indicated by their morphological characters, or that morphological systematics is not corroborated by cell biology, and this is the main obstacle in using Simpson's results.

4) Simpson (1968a) also suggested that *Clathria* was more closely related to *Rhaphidophlus* and *Thalysias* in its cytological characteristics, than it was to the morphologically more-similar *Microciona*. This result conflicted with the system proposed by Lévi (1960a), and developed further by Van Soest (1984b), which distinguished microcionid genera on the basis of their skeletal architecture and ectosomal characteristics, respectively. Nevertheless, it suggests that thinly encrusting microcionid sponges may have different cytological characteristics than ramose or massive forms, and this poses questions concerning environmental influences on cellular behaviour.

5) Hallmann (1920: 769) preferred *Tenacia* Schmidt (1870) to *Rhaphidophlus* Ehlers (1870) because t *Tenacia* had been firmly established by the redescription of *T. clathrata* Schmidt (Wilson, 1902: 397), whereas *Rhaphidophlus* was imperfectly known only from Ehlers' (1870: 18, 31) inadequate redescription of *Spongia cratitia* Esper. The argument is irrelevant, since *S. cratitia* is recognisable, and Thiele (1903a: 957) has already redescribed portions of the type material (ZMB4577, 4578), even though the whereabouts of the actual type specimen is presently unknown. Hallmann (1920) also suggested that *Tenacia* should be preferred to *Rhaphidophlus* because Schmidt's publication was abstracted in the *Zoological Record* for 1870, whereas Ehlers work was abstracted in 1872. There is no doubt that the genera are synonymous (Hartman, 1955: 176; Lévi, 1960a: 56; Wiedenmayer, 1977: 140; Van Soest, 1984b: 91) but *Rhaphidophlus* has seniority over *Tenacia*, and *Thalysias* has seniority over both. It is included in *Clathria* (*Thalysias*).

Seriatula Gray, 1867

Seriatula Gray, 1867: 515; de Laubenfels, 1936a: 122. (Refer to *Ophlitaspongia*).

Sophax Gray, 1867
(Fig. 23D-E)

Sophax Gray, 1867: 521; de Laubenfels, 1936a: 112.

TYPE SPECIES. *Microciona fallax* Bowerbank, 1866: 128 (by monotypy) (lectotype BMNH1910.1.1.71; paralectotype BMNH1930.7.3.198; fragment of lectotype USNM5047).

Encrusting growth form. Surface uneven, microscopically hispid. Choanosomal skeleton plumose (slightly plumoreticulate), with spongin fibres reduced to basal layer of spongin on substrate with ascending spongin fibre nodes cored by multispicular columns of choanosomal principal subtylostyles, and echinated by acanthostyles. Ascending fibres interconnected by sparse transverse spongin fibres, aspiculose or with few coring principal spicules. Ectosomal skeleton with tangential, paratangential or poorly developed brushes of subectosomal auxiliary subtylostyles. Megascleres long choanosomal principal subtylostyles with heavily microspined bases, entirely smooth, flexuous, sinuous or straight subectosomal auxiliary subtylostyles, and echinating acanthostyles of variable size and evenly distributed spines. Microscleres absent.

REMARKS. Gray (1867) erected *Sophax* for *M. fallax*, without further comment or comparison with other *Microciona* species. The type species has a *Microciona*-like hymedesmoid skeleton with erect spongin fibre nodes (similar to other nominal genera such as *Abila*, *Axosuberites*, *Stylotellopsis*, and *Thalyseurypon*), but unlike these it also has some transverse fibres intercon-

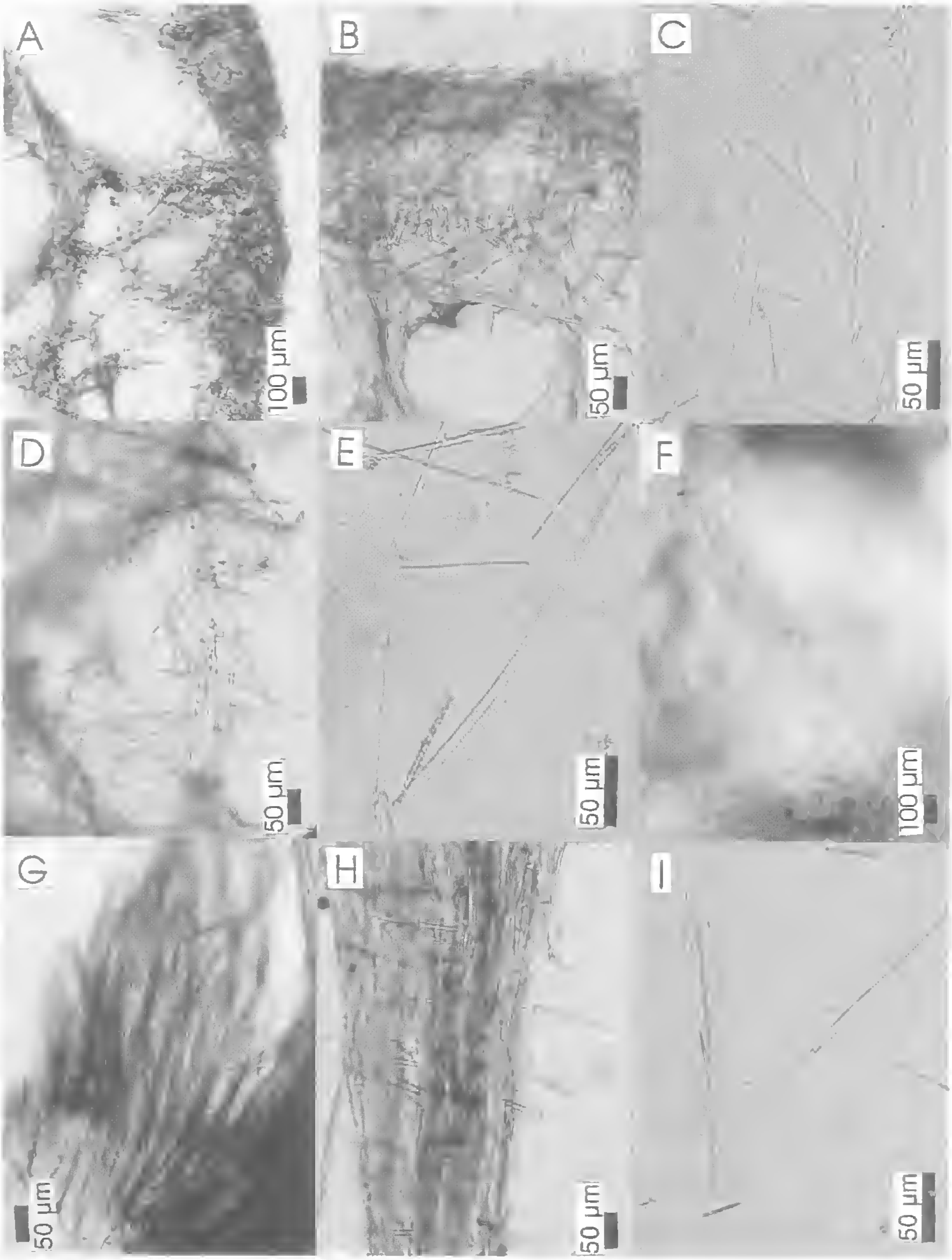

FIG. 23. Type species of microcionid genera. A-C, *Rhaphidophlus* (*Spongia cratitia* Esper, ZMB4577). D-E, *Sophax* (*Microciona fallax* Bowerbank, BMNH1910.1.1.71). F-G, *Stylotellopsis* (*S. amabilis* Thiele, ZMB3309). H-I, *Tablis* (*Echinochalina anomala* Hallmann, AMG10548).

necting multispicular tracts, producing a slightly plumoreticulate architecture. *Sophax* is referred here to *Clathria* (*Microciona*).

Stylotellopsis Thiele, 1905
(Fig. 23F-G)

Stylotellopsis Thiele, 1905: 456; de Laubenfels, 1936a: 112.

TYPE SPECIES. *Stylotellopsis amabilis* Thiele, 1905: 456 (by monotypy) (holotype ZMB3309).

Thickly encrusting growth form. Surface hispid, uneven. Choanosomal skeleton hymedesmoid, with basal layer of spongin fibres lying on substrate and plumose non-anastomosing fibre nodes. Spongin fibre nodes cored by large echinating acanthostyles standing perpendicular to substrate, forming multispicular plumose tufts on basal skeleton. Subectosomal skeleton plumose, with multispicular columns of subectosomal auxiliary subtylostyles arising from ends of echinating spicule brushes, producing dendritic whispy tracts especially near periphery. Ectosomal skeleton without special spiculation but erect subectosomal auxiliary styles form nearly continuous palisade on surface. Mesohyl has heavy deposits of loose spongin. Megascleres single category of smooth subectsomal auxiliary styles with tapering bases and hastate points, and large echinating acanthostyles with swollen bases, large spines, and aspinose points. Principal spicules undifferentiated from auxiliary spicules. Microscleres absent.

REMARKS. From published descriptions (Thiele, 1905; Topsent, 1928a; Koltun, 1964a) *Stylotellopsis* appears to be similar to *Thalysias* in having differentiated subectosomal and ectosomal auxiliary spicules (i.e., a specialised ectosomal skeleton), and Van Soest (1984b) synonymised the two genera on this basis. Re-examination of type material found that auxiliary spicules range greatly in their length, and principal spicules are very similar to auxiliary spicules scattered throughout the skeleton. The genus has a 'microcionid' choanosomal skeletal structure (i.e., hymedesmoid with plumose fibre nodes), and an unusual subectosomal skeleton composed of dendritic or sinuous auxiliary spicule tracts. It also lacks microscleres (although several arcuate isochelae were seen in histological preparations of the holotype, but these are probably foreign). *Stylotellopsis* is interpreted here as being an encrusting (hymedesmoid) species of *Clathria* (*Thalysias*). De Laubenfels (1936a) included the genus with *Eurypon* (Raspailiidae), but this is not upheld here: similarities between *Stylotellopsis* and *Thalysias* in their peripheral skeletal structure and the geometry of auxiliary spicules are closer than with the raspailiids (see Hooper, 1991).

Tablis de Laubenfels, 1936
(Fig. 23H-I)

Tablis de Laubenfels, 1936a: 76.

TYPE SPECIES. *Echinochalina anomala* Hallmann, 1912: 292 (by original designation) (holotype AMG10548).

Massive, lobate-digitate growth form. Surface 'honeycomb' reticulate. Choanosomal skeleton reticulate, with heavy primary and secondary spongin fibres forming wide-meshed reticulation cored by multispicular tracts of subectosomal auxiliary subtylostyles. Coring spicules in primary fibres compressed, more dispersed in secondary fibres. Fibres heavily echinated by principal styles. Subectosomal skeleton with scattered auxiliary megascleres dispersed between fibre meshes and protruding through surface in paratangential bundles. Megascleres entirely smooth principal styles-subtylostyles, and smooth subectosomal auxiliary subtylostyles, often secondarily modified to tornotes. Microscleres absent.

REMARKS. *Tablis* was erected for Whitelegge's (1907) specimen of *Echinochalina glabra* from Woolongong, NSW, a junior homonym of Ridley & Dendy's (1887) species renamed by Hallmann (1912) to *E. anomala*. This species has also been recorded from the Great Barrier Reef (Burton, 1934a). Three other species were referred to *Tablis* by de Laubenfels (1936a): *Echinochalina glabra* Ridley & Dendy (a synonym of *Spongia barba* Lamarck), *E. reticulata* Whitelegge, both from SW Australia, and *Spongia clavosa* Lamarck. The last mentioned species is unknown: it was not mentioned in Topsent's (1933) revision of Lamarck's species nor found in the Lamarck collections (MNHN). These other 2 species differ from *E. anomala* in having microscleres but lacking an *Holopsamma*-like 'honeycombed reticulate' growth form. *Tablis* is returned here to *Echinochalina* (*Echinochalina*).

Tenacia Schmidt, 1870
(Fig. 24A-C)

Tenacia Schmidt, 1870: 56; Hallmann, 1920: 769; Topsent, 1920b: 17; Burton & Rao, 1932: 337; Lévi, 1960a: 56.

TYPE SPECIES. *Tenacia clathrata* Schmidt, 1870: 56 (by monotypy) (fragment of type BMNH1870.-5.3.156); = *Spongia virgultosa* Lamarck, 1814: 444 (fragment of type MNHNLBIMDNBE1344, 1338).

Erect, arborescent, reticulate branching growth form. Surface highly conulose, uneven, microscopically hispid. Choanosomal skeleton irregularly reticulate, with well developed spongin fibres differentiated into ascending primary and transverse secondary fibres. Principal spicules confined to axis of primary fibres, but absent completely from secondary connecting fibres, and all fibres cored by paucispicular tracts of subectosomal auxiliary subtylostyles, and heavily echinated by small acanthostyles. Subectosomal skeleton plumose, with tracts of subectosomal auxiliary subtylostyles originating from deeper regions of choanosomal skeleton; subectosomal auxiliary subtylostyles also scattered abundantly throughout mesohyl between fibre meshes. Ectosome plumose, with brushes of smaller ectosomal auxiliary subtylostyles arising from ends of subdermal spicule brushes. Megascleres smooth choanosomal principal styles, smooth subectosomal auxiliary subtylostyles, smooth ectosomal auxiliary subtylostyles, and short thick echinating acanthostyles with aspinose points and necks. Microscleres palmate isochelae of two sizes, and wing-shaped, accolada and sinuous asymmetrical toxas.

REMARKS. *Tenacia* and *Rhaphidophlus* are synonyms (Hallmann, 1920; Topsent, 1932; Lévi, 1960a), and use of one name over another is merely a nomenclatural decision (see remarks for *Rhaphidophlus*). Topsent's (1932: 97) synonymy of *T. clathrata* and *Spongia juniperina* Lamarck is not upheld here; the former is considered here to be a synonym of *T. virgultosa* and restricted to Caribbean and NE. Atlantic populations, whereas *T. juniperina* (including *T. clathrata* of Hallmann, 1912) is known only from the Indian Ocean. The genus is synonymised with *Clathria* (*Thalysias*).

Tenaciella Hallmann, 1920
(Fig. 24D-E)

Tenaciella Hallmann, 1920: 772; de Laubenfels, 1936a: 126.

TYPE SPECIES. *Esperiopsis canaliculata* Whitelegge, 1906: 471 (by monotypy) (lectotype AMG4325).

Erect, branching, digitate growth form. Surface even, hispid, with oscules dispersed over lateral margins of branches. Choanosomal skeleton irregularly reticulate, nearly radial, with compressed axial and plumose extra-axial skeletons. In axis heavy spongin fibres cored by multispicular tracts of choanosomal principal styles, and in extra-axial skeleton principal styles protrude from peripheral fibres forming radial or plumose tracts, lying immediately below and supporting subectosomal skeleton. Echinating megascleres absent. Subectosomal skeleton plumose, with multispicular ascending tracts of subectosomal auxiliary styles at ends of peripheral choanosomal fibres. Ectosomal skeleton with thick continuous palisade of smaller ectosomal auxiliary styles standing perpendicular to surface. Megascleres smooth fusiform choanosomal principal styles, subectosomal auxiliary styles-subtylostyles with smooth or microspined bases, and ectosomal auxiliary styles-subtylostyles with microspined bases. Microscleres palmate isochelae of two sizes, including contorted forms, and oxhorn and wing-shaped toxas.

REMARKS. Hallmann (1920) erected *Tenaciella* for species like *Tenacia* (= *Thalysias*), but lacking echinating megascleres. Wells et al. (1960) also referred *Esperiopsis obliqua* George & Wilson to *Tenaciella*, but this species lacks dermal specialisation and is more closely allied with *Axocielita* (= *Clathria*). Ristau (1978) suggested that *Artemisina archegona* Ristau (USNM 24528) was similar to the type species of *Tenaciella* in having prominent subectosomal (extra-axial) spicule columns, and he suggested that the two species differed only in growth form, shape of the toxa microscleres and the appreciably more organised skeletal architecture in *T. canaliculata*. However, differences observed in types of these species are more noticable than their similarities (e.g., ectosomal skeleton, fibre reticulation, degree of axial and extra-axial differentiation), and their supposed affinities (Ristau, 1978), are superficial.

In its skeletal structure, differentiation of axial and extra-axial skeletons, fibre characteristics, the possession of similar extra-axial radial bundles of megascleres, and having a continuous ectosomal palisade of spicules the type species shows close similarities to *Ceratopsion axifera* (Hentschel) (Raspailiidae) from the Arafura Sea

(Hooper, 1991). In fact the resemblance between these two species is remarkable (although *Esperiopsis canaliculata* obviously belongs to Microcionidae, having isochelae and toxas, whereas *Ceratopsion* belongs to Raspailiidae in having long extra-axial spicules surrounded by bundles of ectosomal spicules and lacking chela or toxa microscleres). These structural similarities suggest a closer relationship between the two families, as proposed by Hooper (1991) in returning Raspailiidae to the Poecilosclerida, and subsequently supported by chemotaxonomic evidence (Hooper et al., 1992).

In skeletal architecture *E. canaliculata* is identical to *E. cylindrica*, the type species of *Axociella*. Consequently, both *Tenaciella* and *Axociella* are synonymised here (the latter being the most senior available name), both having a compressed reticulate axis and plumose or plumo-reticulate extra-axial (subectosomal) skeletons, isochelae and toxa microscleres, lacking echinating spicules, and referred to *Clathria* (*Axociella*).

Thalassodendron Lendenfeld, 1888

Thalassodendron Lendenfeld, 1888: 222; de Laubenfels, 1936a: 112.

TYPE SPECIES. *Thalassodendron typica* Lendenfeld, 1888: 223 (by indication) (holotype unknown).

Flabellate, cup-shaped growth form. Surface striated longitudinally. Choanosomal skeleton reticulate, with differentiated primary ascending and secondary transverse connecting spongin fibres; primary fibres cored by multispicular tracts of choanosomal principal styles, lightly echinated by acanthostyles (often secondarily incorporated into fibres), whereas secondary fibres aspiculose. Subectosomal and ectosomal skeletons unknown. Megascleres include smooth choanosomal principal styles, and short stout echinating acanthostyles. Microscleres unknown.

REMARKS. This diagnosis is based on Lendenfeld's (1888) description of the type species which is virtually unrecognisable (de Laubenfels, 1936a). It is suspected that *Thalassodendron typica* Lendenfeld is a synonym of *Echinonema typicum* Carter, given Lendenfeld's propensity for describing other authors' species as his own 'new species'. However, it is not possible to associate any type materialwith the name '*Thalassodendron typicum*' and this synonymy remains doubtful. *Echinonema typicum* is also a synonym of *Spongia cactiformis* Lamarck, in which case *Thalassodendron* would belong to *Clathria* (*Thalysias*). *Thalassodendron typica* of Whitelegge (1901: 86; holotype AMZ958) is not the same as Lendenfeld's species, being a synonym of *Echinodictyum mesenterinum* (Lamarck) (Raspailiidae) (Hooper, 1991: 1379).

Thalyseurypon de Laubenfels, 1936
(Fig. 24F-G)

Thalyseurypon de Laubenfels, 1936a: 107; Wiedenmayer, 1977: 143.

TYPE SPECIES. *Spongia raphanus* Lamarck, 1814: 444 (by original designation) (holotype MNHNLBIMDT572).

Arborescent, reticulate, bushy growth form. Surface conulose, not hispid. Choanosomal skeleton more-or-less regularly reticulate, with heavy spongin fibres undifferentiated into primary or secondary components. Choanosomal fibres mostly aspiculose, or with irregularly paucispicular tracts of choanosomal principal subtylostyles, sparsely echinated by acanthostyles. Subectosomal skeleton poorly developed, consisting only of extra-fibre paratangential tracts of subectosomal auxiliary subtylostyles, becoming tangential in ectosomal region. Megascleres entirely smooth fusiform choanosomal principal subtylostyles, smooth subectosomal auxiliary subtylostyles, and small vestigially spined acanthostyles. Microscleres absent.

REMARKS. *Thalyseurypon* was established for 8 species differing from *Clathria* only in lacking microscleres. Van Soest (1984b) proposed to merge the genus with *Clathria*, whereas Wiedenmayer (1977) synonymised it with *Pandaros* suggesting that the skeletal architecture and absence of microscleres in *Spongia raphanus* (*sensu* Topsent, 1932: 100) was similar to *P. acanthifolium* Duch. & Mich. However, re-examination of type material in both type specimens indicates that *S. raphanus* is most appropriately placed in *Clathria* (*Clathria*).

Thalysias Duchassaing & Michelotti, 1864
(Figs 24A-C, 25A-B, 176-177)

1) *Thalysias* Duchassaing & Michelotti, 1864: 82; de Laubenfels, 1936a: 104; Hartman, 1955: 172; Wiedenmayer, 1977: 140.
2) *Thalysias*; Carter, 1876: 311; de Laubenfels, 1954: 137; Lévi, 1960a: 52; Simpson, 1968a: 98.

TYPE SPECIES. 1) Interpretation by Wiedenmayer (1977), (i.e., *Thalysias s.s.*): *Spongia virgultosa* Lamarck, 1814 (by subsequent designation; de Laubenfels, 1936a: 104) (holotype MNHN missing, fragment BMNH1954.2.20.67); junior synonym of *Spongia juniperina* Lamarck, 1814 (lectotype MNHNLBIMDT570) (de Laubenfels, 1936a: 104). 2) Interpretation by Van Soest (1984b), i.e., *Thalysias* of authors: *Thalysias subtriangularis* Duchassaing, 1850 (by subsequent designation; Carter, 1876: 311); = *Xestospongia subtriangularis* (Wiedenmayer, 1977: 255).

DEFINITION OF TYPE SPECIES. As for *Tenacia*.

REMARKS. The nomenclatural complexities of *Thalysias* have been discussed above (see *Rhaphidophlus* and *Tenacia*). According to Van Soest (1984b), Carter's (1876) statement that *T. subtriangularis* was 'representative' of the genus means that *Thalysias sensu* Carter is a haplosclerid, but this is not a valid subsequent designation. Wiedenmayer (1977) stated that de Laubenfels' (1936a) subsequent designation of *T. virgultosa* as the type, which makes *Thalysias* (established 1864) a senior synonym of *Rhaphidophlus* (established 1870). Moreover, *Tenacia* is an objective synonym of *Thalysias* by synonymy of their respective type species.

This has been confirmed by type material (although the holotype of *Spongia virgultosa* is only represented by a fragment in the BMNH). *Thalysias* is used here as the earliest available subspecific name for *Clathria* with differentiated ectosomal and subectosomal spiculation (i.e., specialised ectosomal skeleton).

Wetmoreus de Laubenfels, 1936

Wetmoreus de Laubenfels, 1936a: 112.

TYPE SPECIES. *Microciona novaezealandica* Brondsted, 1924: 463 (by original designation) (holotype UZM not found).

Encrusting growth form. Surface shaggy, hispid. Choanosomal skeleton hymedesmoid, with spongin fibres reduced to basal layer of spongin on substrate with plumose non-anastomosing fibre nodes. Fibre nodes cored by erect multispicular bundles of choanosomal principal subtylostyles forming ascending plumose skeletal columns, and echinating acanthostyles at oblique angles to skeletal columns, usually forming brushes. Subectosomal skeleton paratangential or plumose, with single category of subectosomal auxiliary subtylostyles forming light dermal brushes erect on surface, or scattered individually on surface and throughout mesohyl. Megascleres choanosomal principal subtylostyles with prominent basal spines, smooth subectosomal auxiliary subtylostyles-styles, and small evenly spined echinating acanthostyles. Microscleres allegedly include both palmate and arcuate forms. Toxas absent.

REMARKS. This definition is from Brondsted's (1924) description of the type.

The holotype is possibly extant in Brondsted's collection at the UZM, but has not been located (O. Tendal, pers. comm.). *Wetmoreus* differs from *Microciona* (*s.s.*) in allegedly having both palmate and arcuate isochelae, and lacking toxas (see remarks for *Paradoryx*), but this cannot be verified. It is possible that both forms of chelae are merely modified (curved, thickened) palmate forms. *Wetmoreus* is included here in *Microciona* based on the possession of a hymedesmoid basal skeleton with plumose fibre nodes.

Wilsonella Carter, 1885
(Fig. 24H-I)

Wilsonella Carter, 1885f: 366; Hallmann, 1912: 237, 1920: 768; Topsent, 1928a: 62; de Laubenfels, 1936a: 109.

TYPE SPECIES. *Wilsonella australiensis* Carter, 1885f: 366 (by monotypy) (holotype BMNH1886.12.15.43).

Erect, massive or flabelliform growth forms. Surface prominently conulose at apex of sponge, with conspicuously raised oscules. Choanosomal skeleton reticulate, with moderately light spongin fibres forming irregular meshes with distinct primary ascending and secondary transverse lines. Primary fibres cored by paucispicular tracts of robust auxiliary subtylostyles and abundant detritus, and heavily echinating by acanthostyles particularly at fibre nodes. Secondary connecting fibres with paucispicular tracts, little detritus and lightly echinated. Ectosomal skeleton lightly arenaceous, mostly with spicule fragments, lacking specialised spiculation but with light tangential or paratangential tracts of more slender subectosomal auxiliary subtylostyles. Megascleres fusiform robust auxiliary subtylostyles with smooth bases and hastate or telescoped points (inside fibres), more slender auxiliary subtylostyles with spines on both bases and points (outside fibres), and echinating acanthostyles with even spination. Microscleres palmate isochelae and wing-shaped toxas.

REMARKS. *Wilsonella* is characterised by auxiliary megascleres coring fibres (i.e., without true choanosomal principal spicules), incorporation of sand and foreign spicule detritus into the skeleton, and lacking any differentiation between ectosomal and subectosomal skeletons. *Wilsonella australiensis* is unusual amongst 'sandy' microcionid sponges in that subectosomal auxiliary styles outside fibres (e.g., in the ectosomal skeleton) are geometrically very similar to those coring fibres differing only in having spines on both their bases and points. These spicules are characteristic of the type species (although they are also known in several other microcionids, such as *Clathria* (*C.*) *chelifera* and *Clathria* (*T.*) *major*). Even though spicules coring the fibres cannot be construed as being true principal megascleres, it must be concluded that this species has two distinct categories of auxiliary spicules. In this respect it is contrasted with *Clathria* (*Dendrocia*), which has a completely plumose skeletal architecture, including ectosomal and subectosomal differentiation, but only a single undifferentiated category of structural megascleres throughout the skeleton.

Species referred to *Paradoryx* by Hallmann (1920) are similar to *Wilsonella* in having only auxiliary megascleres in the skeleton, but these have arcuate-like chelae instead of palmate isochelae, more than one category of structural megasclere (i.e., *Clathria* (*Clathria*)), or only 1 category of auxiliary spicules and a plumose architecture (i.e., *Clathria* (*Dendrocia*)). In contrast, the type species of *Wilsonella* incorporates detritus into spongin fibres, and this character is interpreted as probably being phylogenetic rather than merely ecological despite being homoplasious througout Porifera (known also in Phorospongiidae, Raspailiidae, Ircinidae, Dysideidae, etc.), because it is correlated with distribution of megascleres within skeletal regions as described above. Contemporary authors (e.g., Lévi, 1967b) have included *Wilsonella* as a synonym of *Clathria*, whereas in the present work the type species of *Wilsonella* is synonymised with *Clathriopsamma* (both with detritus in the skeleton), the former being the senior name, and used as at the subgenus level, *Clathria* (*Wilsonella*).

GENERA EXCLUDED FROM MICROCIONIDAE

Acarnus Gray, 1867

Acarnus Gray, 1867: 544; Hooper, 1987: 71; Hiemstra & Hooper, 1991: 434; Van Soest et al., 1991: 49; Hooper & Lévi, 1993a: 1222 (for full synonymy see Hooper, 1987).

TYPE SPECIES. *Acarnus innominatus* Gray, 1867: 544 (by monotypy) (holotype BMNH not found).

Thickly encrusting, massive, flabellate or vasiform growth forms. Surface smooth or minutely hispid, uneven, often sculptured with subdermal canals in encrusting forms. Choanosomal skeleton with short plumose tracts connected by renieroid reticulation of spongin fibres, reduced to plumo-reticulate skeletal tracts, or further reduced to plumose-halichondroid skeleton in encrusting forms. Skeletal tracts composed of uni- or paucispicular tracts of smooth choanosomal principal styles or subtylostyles, sometimes with spined bases. Fibres usually heavily invested with spongin, with granular collagenous around nodes of skeletal tracts, and fibres echinated by smooth and/or spined cladotylotes of one or two size categories, with or without additional, smaller echinating acanthostyles. Ectosomal skeleton with a tangential or paratangential layer of basally spined tylotes. Microscleres palmate isochelae and up to three distinct forms of toxas: oxhorn, wing-shaped and accolada toxas.

REMARKS. The type species concept follows Van Soest (1984b: 61) based on material from the Caribbean given that the holotype is missing from the BMNH. The type has two categories of cladotylote megascleres, a larger smooth and smaller spined variety, whereas other species are known to have various combinations of those spicules (Van Soest et al., 1991), together with acanthostyles in some species (*A.* (*Acanthacarnus*) Lévi).

Although the genus has now been exhaustively discussed (Hooper, 1987; Hiemstra & Hooper, 1991; Van Soest et al., 1991), its family placement is still debatable. In its microsclere complement (palmate isochelae, diverse toxas), differentiated principal and auxiliary spicules, echinating acanthostyles in some species (as well as having a highly modified second category of echinating spicules (cladotylotes) which are unique to the genus, derived from either acanthostyles (Hooper, 1987) or ectosomal tylotes (Hiemstra & Hooper, 1991)), the genus appears to have affinities with the Microcionidae (e.g., Burton, 1959; Lévi, 1960a; Vacelet et al., 1976). Other authors (de Laubenfels, 1936a; Tanita, 1963; Hechtel, 1965; Bakus, 1966; Thomas, 1970a, 1973; Hoshino, 1981; Van Soest, 1984b; Hooper, 1987; Hiemstra & Hooper, 1991; Van Soest et al.,

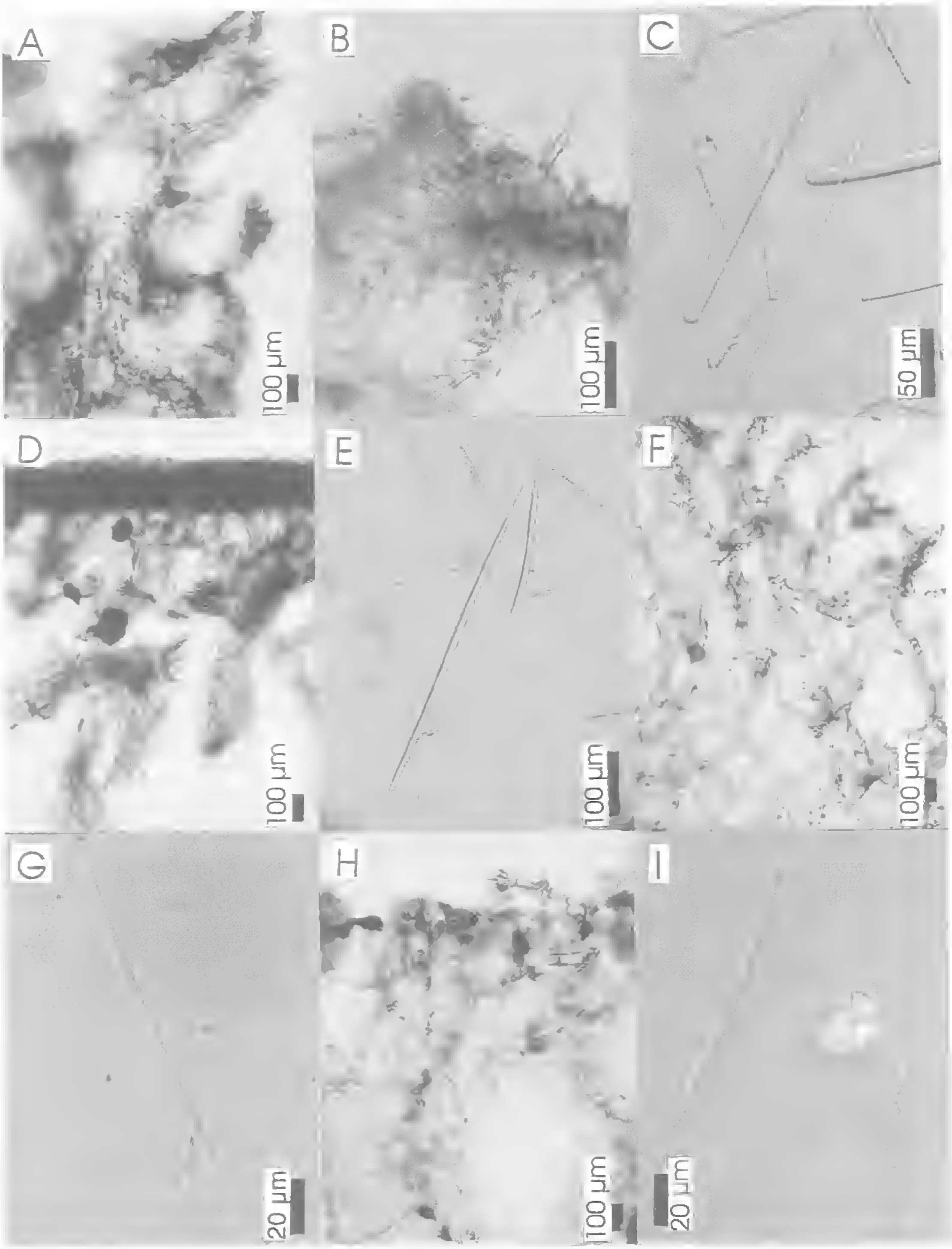

FIG. 24. Type species of microcionid genera. A-C, *Tenacia* (*Spongia juniperina* Lamarck, MNHNDT570). D-E, *Tenaciella* (*Esperiopsis canaliculata* Whitelegge, AMG4325). F-G, *Thalyseurypon* (*Spongia raphanus* Lamarck, MNHNDT572). H-I, *Wilsonella* (*W. australiensis* Carter, BMNH1886.12.15.43).

1991; Hooper & Lévi, 1993a) suggest that true diactinal ectosomal spicules (tylotes with terminal spines and swollen tips) and a renieroid reticulation indicate relationship to Myxillidae (in the sense of Hartman, 1982). Hajdu et al. (1994) resurrected Iophonidae for *Acarnus*, *Megaciella*, *Melonchela* and others with microcionid-like spiculation (terminally spined megascleres of diverse categories, palmate isochelae, toxas) as well as ectosomal tylotes (previously considered diagnostic for the Myxillidae; Van Soest, 1984b). This revised interpretation de-emphasises the primary importance placed on skeletal structure (Bergquist & Fromont, 1988) for example), and allows for the inclusion of renieroid reticulate skeletons in several families (Iophonidae, Microcionidae, Raspailiidae, Phoriospongiidae, Cornuliidae, etc.). Skeletal structure would, therefore, be a highly homoplasious character but this interpretation does allow a consistent differentiation between Microcionidae and Iophonidae based on monactinal versus diactinal-derived ectosomal spicules, whilst also acknowledging their affinities based on the possession of similar microscleres through their inclusion together in Microcionina.

Amphilectus Vosmaer, 1880

Amphilectus Vosmaer, 1880: 109; Ridley & Dendy, 1887: 123; Burton, 1929a: 428; Lévi, 1960a: 55.

TYPE SPECIES. *Isodictya gracilis* Bowerbank, 1866: 149 (by subsequent designation of Burton, 1929a: 428) (holotype BMNH1877.5.21.754).

Arborescent, dichotomously branched, stipitate growth form. Surface even, hispid. Choanosomal skeleton reticulate, with multispicular ascending primary fibres and uni- or paucispicular transverse connecting fibres, both cored by small styles. Subectosomal region with tracts of spicules projecting through surface. Ectosome membraneous, without specialised spiculation. Echinating megascleres absent. Megascleres small smooth styles of a single category. Microscleres palmate isochelae. Toxas absent.

REMARKS. Vosmaer (1880: 109) established *Amphilectus* for a heterogeneous assemblage of 42 poecilosclerid species, most of which were related to *Mycale*, *Esperiopsis* (Mycalidae), *Desmacidon* (Phoriospongiidae) or *Myxilla* (Myxillidae). Ridley & Dendy (1887) restricted the genus to taxa with smooth styles and palmate isochelae, but even so, they remarked that the taxon was undoubtedly artificial. Burton (1929a) designated Vosmaer's first-named species as genotype, and suggested that in the strict sense (i.e., the above diagnosis) the genus had affinities with *Esperiopsis*. Lévi (1960a) decided to abandon *Amphilectus* because, in the sense of Vosmaer (1880), it was too vague and served only as a catch-all taxon. In the broad sense *Amphilectus* contains some microcionid species (e.g., *Microciona armata* Bowerbank) whereas in the strict sense it fits with the concept of Myxillidae (Bergquist & Fromont, 1988; Hajdu et al., 1994).

Caulospongia Kent, 1871

Caulospongia Kent, 1871: 616; Burton, 1930c: 673; de Laubenfels, 1936a: 118.

Plectrodendron Lendenfeld, 1888: 66; Hallmann, 1914a: 306.

TYPE SPECIES. *Caulospongia verticillata* Kent, 1871: 616 (by subsequent designation of Hallmann, 1914a: 306) (holotype BMNH1895.7.16.1); =*Spongia perfoliata* Lamarck, 1814: 439 (Topsent, 1932: 85) (lectotype MNHNLBIMDT582).

Distinctive foliose growth form with lamellae arranged in whorls, or in plates, around an erect stalk. Surface even, minutely hispid. Choanosomal skeleton plumoreticulate, with well developed spongin fibres cored by pauci- or multispicular tracts of choanosomal principal tylostyles; longitudinal primary fibres form dendritic branches through axis, and ascending or oblique secondary fibres produce a nearly regular secondary reticulation. Subectosomal skeleton plumose, with erect brushes of choanosomal megascleres protruding through ectosome. Ectosome with tangential or paratangential crust of smaller tylostyles. Megascleres tylostyles of two sizes but with same geometry. Microscleres absent.

REMARKS. *Caulospongia* has been included in Suberitidae (Hadromerida) by most authors since Burton (1930c). The type species is distinctive in growth form, and although it is common in NW Australian coastal waters it has been recorded in the literature only infrequently (Lamarck, 1814; Kent, 1871; Topsent, 1932; Hooper, 1984a). De Laubenfels (1936a: 118) defined *Caulospongia* in Ophlitaspongiidae presumably based on similarities to ophlitaspongiids (most now included in Microcionidae) in skeletal architecture (differentiated axial and extra-axial regions), localisation of spicules to different parts of the skeleton, and growth form (erect, whereas 'typical' suberitids are massive). However, these similarities are convergent. The presence of true tylostyles in *Caulospongia* (which are charac-

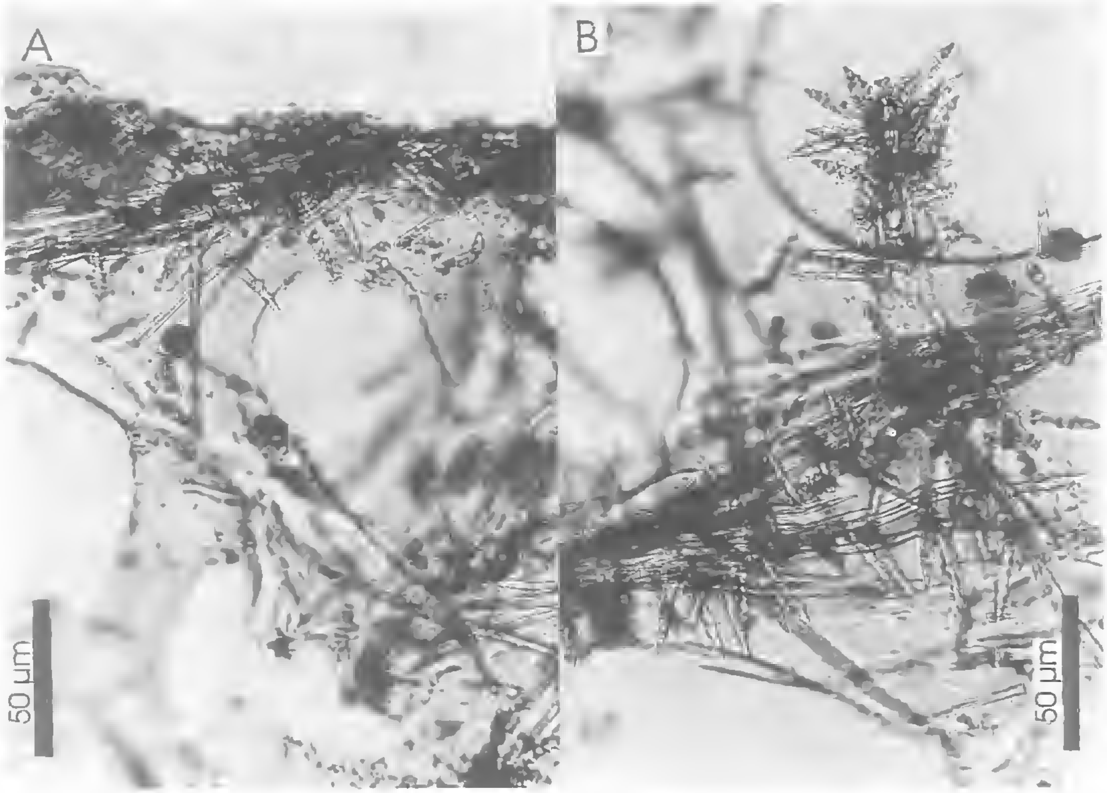

FIG. 25. Type species of microcionid genera. A-B, *Thalysias* (*Spongia virgultosa* Lamarck, BMNH-1954.2.20.67).

teristic of suberitids, as opposed to subtylote styles seen in many microcionids), and the absence of microscleres (which often provide useful clues on phylogenetic affinities) suggest that the genus should be retained in Suberitidae.

Plectrodendron (type species *Plectrodendron elegans* Lendenfeld, 1888: 66, by monotypy) was also referred to *Caulospongia* by Hallmann (1914a: 306).

Megaciella Hallmann, 1920
(Fig. 19A-B)

Megaciella Hallmann, 1920: 772.

TYPE SPECIES. *Amphilectus pilosus* Ridley & Dendy, 1886: 350 (by original designation) (lectotype BMNH1887.5.2.125).

Lobate flabellate growth form. Surface shaggy, ridged, hispid. Choanosomal skeleton reticulate, with ascending multi- or paucispicular tracts of choanosomal principal styles, interconnected by secondary uni- or bispicular tracts within light spongin, producing irregular wide meshes. Echinating spicules absent. Subectosomal skeleton radial or plumose, with erect choanosomal principal styles protruding from peripheral fibres through surface. Ectosome with tangential or paratangential layer of tylotes, often in bundles. Megascleres very large smooth choanosomal principal styles, and ectosomal tylotes, often curved or sinuous, with slightly swollen microspined bases. Microscleres minute palmate isochelae and two sizes of toxas (very large accolada and wing-shaped).

REMARKS. This diagnosis is based on the lectotype which differs slightly from the original description of Ridley & Dendy (1886, 1887). Specifically, the so-called 'long thin centrally curved oxeas' are very large accolada toxas with slight central curvature and slightly reflexed hastate points, some of which exceed 100µm long (i.e., larger than the principal styles). Similarly, these toxas are not associated with the ectosomal skeleton but are scattered throughout the mesohyl, whereas bundles of 'oxeas' described by Ridley & Dendy (1887) are actually bundles of ectosomal tylotes. A second morph of toxas is also present, being large and wing-shaped, and these too have hastate points.

Hallmann (1920) suggested that a lax skeletal construction and supposedly comparable spiculation indicated affinities between *Megaciella* and *Artemisina*. He noted that *Megaciella* differed from that genus in lacking ornamentation on toxas, which he considered was a significant diagnostic character at the generic level. However, in regard to this latter character, it has been found that a number of microcionid species have distally spined toxas (see remarks for *Clathria*), and in any case, both genera have quite different ectosomal skeletons. On the basis of its ectosomal characteristics (consisting of basally spined diactinal tylote spicules), Van Soest (1984b) referred *Megaciella* to the Myxillidae, whereas *Artemisina* (with a monactinal ectosomal skeleton) was retained in Microcionidae. Under the revised scheme proposed by Hajdu et al. (1994) *Megaciella* is included in Iophonidae, with palmate isochelae and toxas which being the only real synapomorphy between *Megaciella* and the Microcionidae (i.e., Microcionina).

Melonchela Koltun, 1955

(Fig. 19C-E)

Melonchela Koltun, 1955a: 17, 1959: 187.

TYPE SPECIES. *Melonchela clathrata* Koltun, 1955a: 17 (by original designation) (paratype BMNH-1963.7.29.7).

Arborescent, reticulate planar, branching growth form. Surface even, microscopically hispid. Choanosomal skeleton plumose, with bundles of independent ascending fibres cored by large and small choanosomal principal styles. Ascending fibres not interconnected. Echinating acanthostyles absent. Subectosomal skeleton plumose, with principal styles projecting through surface. Ectosome with tylotes forming tangential layer or erect brushes on surface. Megascleres large and small choanosomal principal styles, with smooth or microspined bases, and diactinal ectosomal tylotes (swollen bases) and strongyles (rounded bases) with microspined bases. Microscleres abundant palmate cleistochelae, palmate isochelae, small wing-shaped toxas, and oxhorn toxas with spines, mucronate points, or telescoped points, or simply with subterminal ridge.

REMARKS. This species is remarkable in several features: its erect planar reticulate growth form (superficially resembling the microcionid *Clathria coppingeri* and the raspailiid *Echinodictyum cancellatum*); extremely large size range of principal spicules, the largest protruding a long way through fibre bundles, reminiscent of Raspailiidae; the apparent lack of connecting fibres between the ascending plumose spicule tracts; a ridge-like subterminal ornamentation on toxas; and extremely abundant tracts of chelae microscleres throughout the mesohyl.

Diactinal ectosomal spicules (tylotes, strongyles and intermediates, varying in the degree of swelling of their bases), palmate isochelae and toxas indicates that the species has affinities to *Acarnus* and *Megaciella* in the Iophonidae.

Naviculina Gray, 1867

(Fig. 19H-I)

Naviculina Gray, 1867: 538; de Laubenfels, 1936a: 88.

TYPE SPECIES. *Naviculina cliftoni* Gray, 1867: 538 (by monotypy); for '*Hymedesmia* sp. nov.' of Bowerbank, 1864: 252 (fragment of type BMNH 1877.5.21.270).

Growth form and surface details unknown. Ectosomal features unknown. Choanosomal skeleton evenly reticulate, wide meshed, composed of tracts of subtylostyles bound together with nodal spongin, with multispicular tracts several spicules wide interconnected by uni- or paucispicular tracts only one spicule wide, both producing even triangular meshes. Megascleres single category of subtylostyles. Microscleres cleistochelate anisochelae, dispersed throughout mesohyl particularly between fibre anastomoses.

REMARKS. *Naviculina* is monotypic, and the type species, from Fremantle is characterised by cleistochelae ('naviculoid spiculum' of Bowerbank, 1864), but nothing else was known about the species. de Laubenfels (1936a) considered *Naviculina* dubious, with alleged affinities to *Plocamiopsis* (having cleistochelae), although several other nominal genera are also known to have cleistochelate microscleres, interpreted as modified palmate isochelae (*Colloclathria*, *Plocamiopsis* and *Quizciona* of the Microcionidae; and *Melonchela* of the Iophonidae). The holotype no longer exists. The holotype slide (Bowerbank, 1864; Gray, 1867) contains a small section of the skeleton (Fig. 19H-I), but enough detail to indicate the Mycalidae, probably *Arenochalina*.

Paracornulum Hallmann, 1920

Paracornulum Hallmann, 1920: 772.

TYPE SPECIES. *Cornulum dubium* Hentschel, 1912: 346 (by original designation) (holotype SMF964).

Encrusting growth form. Surface smooth, even. Choanosomal skeleton hymedesmoid, with spongin fibres lying on substrate and bases of acanthostyles embedded and spicules standing perpendicular to surface. Subectosomal skeleton radial or plumose, with ascending tracts of erect tornotes. Acanthostyles also scattered throughout mesohyl. Ectosome with tangential tracts of tornotes. Megascleres radial tornotes (with faintly rugose bases) and principal acanthostyles (with some oxeote or strongylote modifications). Microscleres palmate isochelae and oxhorn toxas.

REMARKS. *Paracornulum* does not appear to be as closely related to microcionids as inferred by Hallmann (1920), showing similarities in possession of echinating acanthostyles, hymedesmoid basal spongin fibres, palmate isochelae and toxas. Two other species referred by Hallmann to this genus (*Cliona purpurea* Hancock and *Suberites fuliginosus* Carter) are very poorly known and further comment on those taxa must await redescription of relevant type material. Based on its ectosomal characteristics and megasclere spiculation *Paracornulum* was subsequently referred to Cornulidae (Lévi & Lévi, 1983a: 966). The type species appears close to *Cornulum* Carter, *Iophon* Gray and *Zyzzya* de Laubenfels because the ectosomal tornotes are reduced tylotes with rugose (i.e., vestigially microspined) bases. These genera are referred to Iophonidae (Hajdu et al., 1994).

Paresperia Burton, 1930

Paresperia Burton, 1930a: 501.

TYPE SPECIES. *Paresperia intermedia* Burton, 1930a: 501 (by monotypy) (holotype BMNH-1910.1.1.912).

Irregularly massive, low growth form. Surface even, smooth. Choanosomal skeleton reticulate, with loose, unispicular, irregular reticulation of light spongin fibres cored by auxiliary subtylostyles, of same geometry as those in subectosomal and ectosomal skeletons. Echinating acanthostyles absent. Subectosomal and ectosomal skeletons lack specialised spiculation, but have loose tangential reticulation of subectosomal auxiliary megascleres. Megascleres only auxiliary subtylostyles, entirely acanthose or only basally spined. Microscleres palmate isochelae. Toxas absent.

REMARKS. Burton (1930a) assigned *Paresperia* to the Microcionidae based on supposed affinities to *Artemisina* (*sensu* Burton), having an irregular, confused skeletal architecture composed of undifferentiated choanosomal and ectosomal megascleres. The genus differed from *Artemisina* (*s.s.*) in having lightly and evenly spined auxiliary megascleres and lacking toxas. Burton also noted that *Paresperia* had affinities with the Mycalidae, whereas Van Soest & Stone (1986) suggested that the presence of a unispicular choanosomal reticulation of acanthostyles and palmate isochelae placed the genus closer to *Esperiopsis* (placement still controversial in either Mycalidae or Esperiopsidae) than to other microcionids.

Querciclona de Laubenfels, 1936

Querciclona de Laubenfels, 1936a: 46.

TYPE SPECIES. *Antherochalina quercifolia* Keller, 1889: 383 (by original designation) (holotype ZMB429).

Erect, arborescent, flabellate growth form. Surface even, hispid, regularly porous with oscules. Choanosomal skeleton reticulate, with heavy spongin fibres producing tight and irregular meshes, fibres cored by choanosomal principal styles which form primary ascending multispicular (eventually plumose) tracts, and secondary transverse uni- or paucispicular tracts, together producing a subisodictyal reticulation. Axial skeleton slightly different from extra-axial region: near axis skeletal architecture isodictyal, whereas towards periphery skeleton plumose. Echinating megascleres absent. Subectosomal skeleton plumose, with brushes of choanosomal principal styles protruding through surface. Ectosomal skeleton with brushes of smaller choanosomal styles surrounding one or few larger subectosomal styles. Megascleres small smooth choanosomal principal styles, and long smooth subectosomal auxiliary styles. Microscleres absent.

REMARKS. *Querciclona* seems to be a case where inadequate primary taxonomy has been badly misinterpreted. The genus is restricted here to include only *A. quercifolia*, and its association with the Microcionidae rests solely upon the original placement of the type species in *Antherochalina* (whereby many of the species originally described for the genus by Lendenfeld (1888) are true microcionids). By comparison, de Laubenfels (1936a) originally intended *Quer-*

ciclona to include *Haliclona*-like species (Haplosclerida), but this is only true for a second species, *Arenochalina arabica* Keller (which was subsequently transferred to *Arenosclera* Pulitzer-Finali (1982), but is probably an arenaceous *Callyspongia*). Conversely, the type species belongs to the Axinellidae.

Antherochalina quercifolia is structurally close to *Isociella* (*s.s.*) and *Phakellia* of authors. It has an almost regular isodictyal choanosomal reticulation of spongin fibres cored by primary and secondary skeletal lines, without any pronounced compression of the axial skeleton but with some differentiation of the axial and extra-axial skeletons, and it also lacks a specialised ectosomal skeleton. Details of the holotype (re-examined and redescribed above) bear little resemblance to Keller's (1889) original description, and it is concluded that *Querciclona* is most appropriately referred to *Phakellia* (Axinellidae) (Hooper & Lévi, 1993b). A specimen label in M. Burton's handwriting accompanying a fragment of the holotype in the BMNH (BMNH-1908.9.24.179) suggests further that *A. quercifolia* is a synonym of *Phakellia donnani* (Bowerbank), but this synonymy is so far unsubstantiated.

Scopalina Schmidt, 1862

Scopalina Schmidt, 1862: 78; Gray, 1867: 535.

TYPE SPECIES. *Scopalina lophyropoda* Schmidt, 1862: 79 (by monotypy) (holotype LMJG15117/154).

Thickly encrusting growth form. Surface prominently conulose. Choanosomal skeleton hymedesmoid, with heavy spongin fibres forming basal layer of spongin on substrate, with ascending non-anastomosing fibre nodes cored by plumose brushes of auxiliary styles. Echinating megascleres absent. Ectosome lacks specialised spiculation, although brushes of auxiliary styles protrude through surface. Mesohyl matrix heavy. Megascleres only a single category of long auxiliary style. Microscleres absent.

REMARKS. Gray (1867) and de Laubenfels (1936a) suggested that *Scopalina* was *Microciona*-like with plumose skeletal architecture and greatly reduced spiculation. Although skeletal architecture is hymedesmoid containing non-anastomosing ('microcionid') fibre nodes, and the possession of only a single category of auxiliary spicules could be construed as reduction of the typical *Microciona* condition (analogous to *Dendrocia* (Microcionidae) or *Amphilectus s.l.* (Myxillidae)), no other characters support its inclusion in the Microcionidae. Boury-Esnault (1971) and Uriz (1982) include it in the Halichondrida, and suggested close affinites with *Stylinos*.

KEY TO GENERA

1(0). Choanosomal skeleton more-or-less undifferentiated, unstructured . . . . *Artemisina*
Choanosomal skeleton well structured, hymedesmoid to reticulate, but lacking any differentiated components 2
Choanosomal skeleton well structured, predominantly reticulate, differentiated into two distinct components 7

2(1). Choanosomal fibres or skeletal tracts cored by one or more category of principal spicules . . . 3
Choanosomal fibres or skeletal tracts cored by auxiliary spicules but partially or wholly replaced by detritus 5
Choanosomal fibres or skeletal tracts cored by auxiliary spicules identical to those in ectosomal and subectosomal skeletons 6
Choanosomal fibres or skeletal tracts cored by auxiliary spicules different from those in peripheral skeleton . . . . *Pandaros*

3(2). Choanosomal skeleton without any marked axial compression or differentiated axial and extra-axial regions 4
Choanosomal skeleton with noticeably compressed axis and well differentiated axial and extra-axial (radial, plumose or plumoreticulate) regions . . . . *Clathria* (*Axociella*)
Choanosomal skeleton hymedesmoid or microcionid, with basal layer of spongin lying on substrate (with or without ascending, non-anastomosing fibre nodes), and bases of principal spicules standing perpendicular to substrate . . . . *Clathria* (*Microciona*)
Choanosomal skeleton evenly renieroid reticulate throughout with well developed spongin fibres cored by smooth principal styles . . . . *Clathria* (*Isociella*)

4(3). With single category of (subectosomal) auxiliary spicule on surface forming tangential, paratangential or plumose tracts . . . . *Clathria* (*Clathria*)
With two categories of auxiliary spicules, smaller ectosomal spicules generally overlaying larger subectosomal spicules forming discrete bundles or continuous palisade on surface . . . . *Clathria* (*Thalysias*)

5(2). Special category of (acantho)styles present echinating fibres, differentiated from principal spicules . . . . *Clathria* (*Wilsonella*)

Echinating spicules styles or acanthostyles undifferentiated from principal spicules coring spongin fibres . . . . *Holopsamma*

6(2). Special category of (acantho)styles present echinating fibres, differentiated from principal spicules . . . . *Clathria* (*Dendrocia*)

Echinating spicules styles or acanthostyles representing principal spicules, but different from those coring fibres . . . . *Echinochalina* (*Echinochalina*)

Echinating spicules oxeas or anisoxeas representing principal spicules, but different from those coring fibres . . . . . . *Echinochalina* (*Protophlitaspongia*)

7(1). Primary skeleton renieroid cored by axially or basally compressed tracts of acanthostyles, secondary skeleton cored by smooth principal styles in plumose, subisodictyal or plumoreticulate tracts . . . . *Antho* (*Antho*)

Primary skeleton renieroid cored by axially or basally compressed tracts of acanthostrongyles, secondary skeleton cored by smooth principal styles in plumose, subisodictyal or plumoreticulate tracts . . . . *Antho* (*Plocamia*)

Primary skeleton axially compressed spongin fibres cored by renieroid tracts of sparsely spined principal styles intermingled with plumose or plumoreticulate tracts of smooth principal styles, overlaid by secondary extra-axial plumose skeleton cored by larger smooth principal styles . . . . *Antho* (*Isopenectya*)

Primary renieroid reticulate skeleton cored by smooth principal styles and echinated by identical spicules, with secondary radial extra-axial skeleton on exterior edge of skeleton only cored by larger smooth principal styles . . . . *Echinoclathria*

DESCRIPTION OF AUSTRALIAN SPECIES

Clathria Schmidt, 1862

Refer to subgenera for synonymy.

TYPE SPECIES. *Clathria compressa* Schmidt, 1862: 58 (designated Schmidt, 1864: 35).

DEFINITION. Monactinal auxiliary spicules in 1 or 2 categories forming ectosomal skeletons ranging from sparse, mostly membraneous (*C.* (*Microciona*)), sparse, tangential (*C.* (*Clathria*)) to relatively dense, erect (*C.* (*Thalysias*)). Choanosomal skeletal tracts usually enclosed within spongin fibres, sometimes simply with nodal spongin; fibres cored by smooth, basally spined or partially spined principal monactinal megascleres, usually geometrically different from auxiliary megascleres, sometimes secondarily lost and cored by single category of auxiliary subtylostyle (*C.* (*Dendrocia*)), or sometimes replaced partially or fully by detritus in fibres (*C.* (*Wilsonella*)). Echinating megascleres partially or entirely acanthose, occasionally smooth or vestigial spination, sometimes secondarily lost (*C.* (*Axociella*), *C.* (*Isociella*)). Choanosomal structure ranges from leptoclathrid to microcionid plumose (*C.* (*Microciona*)), renieroid (*C.* (*Isociella*)), plumoreticulate or reticulate, with (*C.* (*Axociella*)) or without compressed axis and radial extra-axial regions. Microscleres include palmate isochelae and modified forms, and toxas with smooth or spined points, occasionally absent.

REMARKS. This definition is necessarily broad to encompass the 7 subgenera included in *Clathria*, showing a wide spectrum of character states, most of which are interpreted as secondary losses rather than unique apomorphies, and many characters show intermediate states making it virtually impossible to maintain generic boundaries recognised by earlier authors.

Clathria (Clathria) Schmidt, 1862

Clathria Schmidt, 1862: 57.
Allocia Hallmann, 1920: 768.
Antherochalina Lendenfeld, 1887b: 741.
Bipocillopsis Koltun, 1964a: 79.
Dictyociona Topsent, 1913a: 579.
Labacea de Laubenfels, 1936a: 125.
Ligrota de Laubenfels, 1936a: 125.
Litaspongia de Laubenfels, 1954: 162.
Marleyia Burton, 1931a: 346.
Ramoses de Laubenfels, 1936a: 109.
Thalyseurypon de Laubenfels, 1936a: 107.

TYPE SPECIES. *Clathria compressa* Schmidt, 1862: 58 (by subsequent designation of Schmidt, 1864).

DEFINITION. Ectosomal skeleton composed of a single undifferentiated category of auxiliary megasclere; choanosomal skeletal structure plumoreticulate or reticulate, usually without marked difference between axial and extra-axial regions; spongin fibres cored by completely smooth, basally spined or partially spined principal megascleres, geometrically differentiated from auxiliary megascleres, but sometimes secondarily lost; echinating megascleres entirely or partially acanthose, occasionally smooth, sometimes secondarily lost. Microscleres include palmate isochelae and modified forms, and toxas with smooth or spined points.

TABLE 1. Comparison between present and published records of *Clathria* (*Clathria*) *angulifera* Dendy. Measurements in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Holotype (NMG2286) (Victoria)	Specimens (N=2) (SE.Queensland)
Choanosomal principal styles	144-(172.4)-211 x 3-(4.3)-6	128-(141.3)-150 x 3-(3.8)-5
Subectosomal auxiliary styles	168-(175.0)-254 x 2.5-(3.6)-4.5	181-(195.8)-223 x 3-(2.3)-5
Echinating acanthostyles	58-(64.2)-72 x 3.5-(4.1)-4.5	58-(61.8)-72 x 2-(3.3)-5
Chelae	5.5-(7.1)-8.5	5-(6.7)-9
Toxas	18-(67.4)-101 x 0.5-(1.7)-3.3	absent

REMARKS. Of the 154 named species described in, or subsequently referred to *Clathria*, or one of its synonyms listed above, 112 are retained in this subgenus. There are 31 (2 new) species known from Australian waters.

Clathria (Clathria) angulifera Dendy, 1896
(Figs 26-27, Plate 1A, Table 1)

Clathria angulifera Dendy, 1896: 32; Ayling et al., 1982: 100; Hooper & Wiedenmayer, 1994: 258.
Thalysias angulifera; de Laubenfels, 1936a: 104.
cf. *Clathria conectens* Hallmann, 1912: 247.

MATERIAL. HOLOTYPE: NMVG2286 (fragment BMNH1902.10.18.323): Outside Port Phillip Heads, Vic, 38°09'S, 144°52'E, coll. J.B. Wilson (dredge). OTHER MATERIAL: Queensland – QMG303230, QMG303960.

HABITAT DISTRIBUTION. Submerged rock reef; 10-30m depth; Bass Strait (Vic), N. Stradbroke I. and Noosa Heads (SEQ) (Fig. 26G).

DESCRIPTION. *Shape.* Thickly lamellate, approximately 9 cm long, 30mm wide, 50mm high, with numerous bulbous lobate digits up to 15mm long.
Colour. Bright yellow-orange alive (Munsell 2.5Y 8/10), grey-brown in ethanol.
Oscules. Occasional large oscules, 1.5-3mm diameter, on edges and between lobes.
Texture and surface characteristics. Firm, compressible; glabrous skin-like surface.
Ectosome and subectosome. Ectosomal skeleton membraneous, with loose, irregular, tangential, occasionally paratangential or erect tracts of subectosomal auxiliary subtylostyles; rarely protruding above surface. Subectosomal portion of peripheral skeleton slightly plumose, with sparse diverging brushes of auxiliary megascleres which arise from ascending choanosomal tracts.
Choanosome. Choanosomal skeleton regularly reticulate, cavernous, vaguely renieroid; fibre anastomoses produce wide oval, rectangular or sometimes slightly triangular meshes; spongin fibres thin, only lightly invested with spongin, barely differentiated from mesohyl matrix; spongin fibres cored by uni- or paucispicular tracts of choanosomal principal megascleres; echinating acanthostyles sparsely dispersed on fibres; mesohyl matrix heavy, lightly pigmented, containing few straight or sinuous subectosomal auxiliary megascleres and abundant spherical incubated larvae (275-345µm diameter) with well differentiated cellular development.
Megascleres (Table 1). Choanosomal principal styles short, thin, fusiform, straight or slightly curved towards basal end, with rounded or only slightly subtylote, smooth bases.

Subectosomal auxiliary subtylostyles straight, thin, relatively long, almost hastate, with smooth and only slightly subtylote bases.

Acanthostyles small, thin, prominently subtylote, with rudimentary granular spination and small aspinose 'neck' near basal constriction.
Microscleres (Table 1). Palmate isochelae very small, weakly silicified, unmodified.

Toxas not common, relatively large, v-shaped, with sharply angular central curvature and straight arms.

REMARKS. The thickly lamellate, lobate growth form, glabrous surface, relatively open, slightly renieroid, paucispicular skeletal structure (cf. Dendy, 1896), and aspects of spiculation in *C.* (*C.*) *angulifera* are quite distinctive and unusual amongst microcionids (cf. Hallmann, 1912). Many of these features are similar to those in *C.* (*T.*) *aphylla* sp. nov. from the Houtman Abrolhos, WA, although the latter has a specialised ectosomal skeleton and hence is included in *C.* (*Thalysias*) rather than *C.* (*Clathria*). These species together with *C.* (*C.*) *hispidula* are sister species belonging to a species group termed here '*angulifera*' group. They are compared in detail in discussion on *C.* (*T.*) *aphylla*.

This species is also slightly reminiscent of *C.* (*C.*) *conectens*, differing in that megascleres coring fibres are true principal spicules rather than just undifferentiated auxiliary spicules (albiet these differences are not as well marked in *C.* (*C.*) *angulifera* as in many other species of *Clathria*). This reduction in coring spicules was interpreted by Hallmann (1912) to be charac-

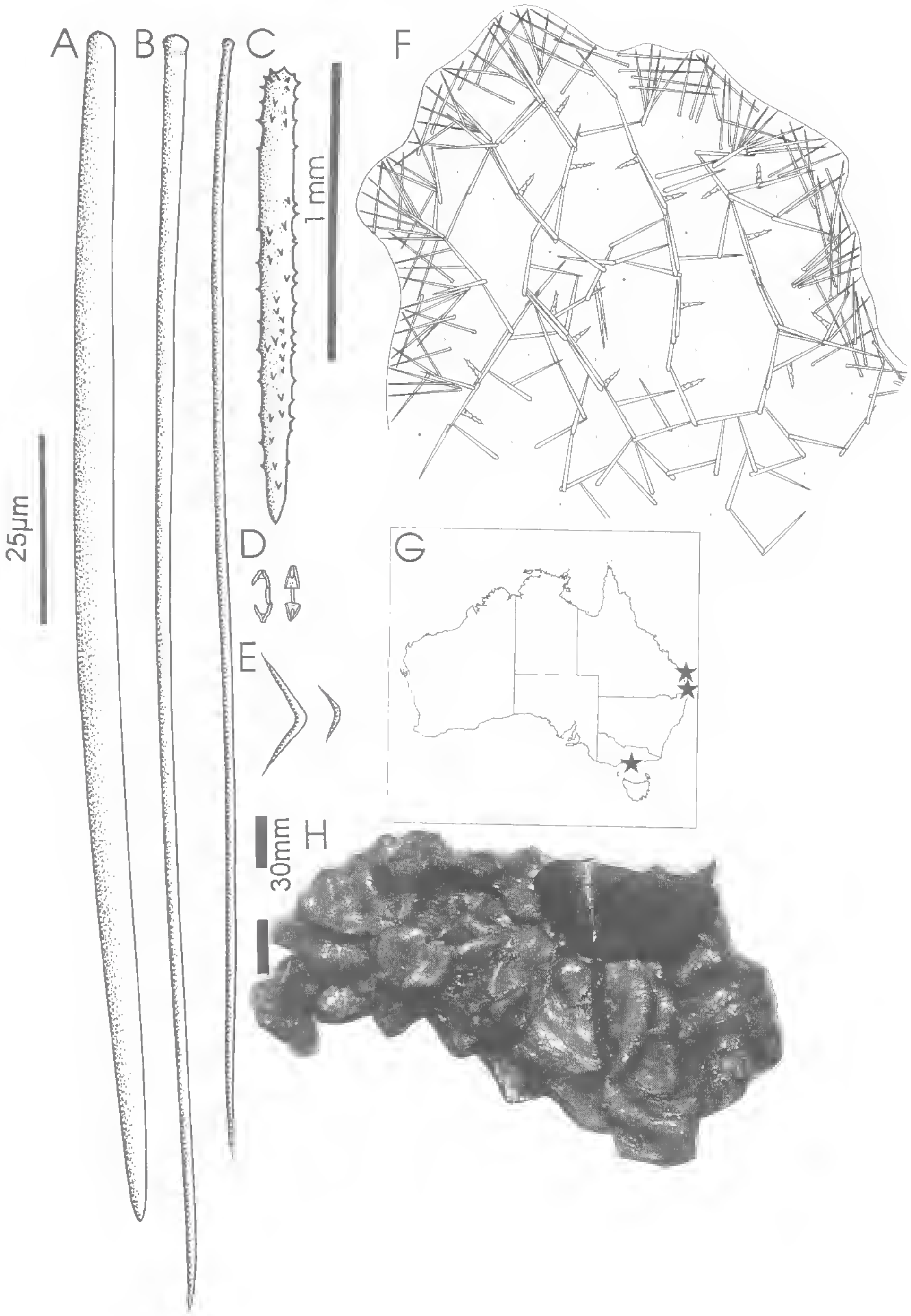

FIG. 26. *Clathria* (*Clathria*) *angulifera* Dendy (holotype NMVG2286). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyles. C, Echinating acanthostyle. D, Palmate isochelae. E, V-shaped toxas. F, Section through peripheral skeleton. G, Australian distribution. H, Holotype.

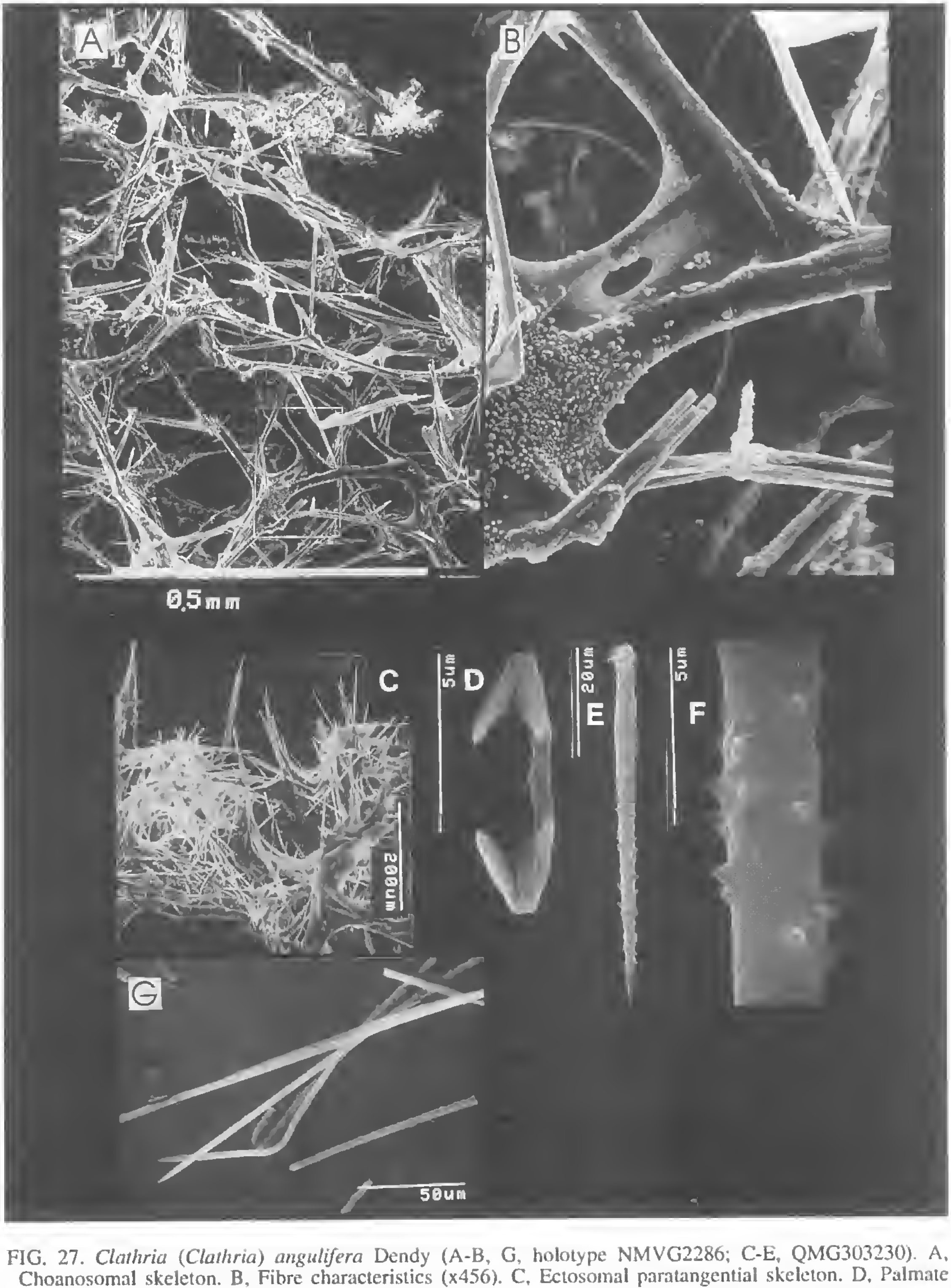

FIG. 27. *Clathria* (*Clathria*) *angulifera* Dendy (A-B, G, holotype NMVG2286; C-E, QMG303230). A, Choanosomal skeleton. B, Fibre characteristics (x456). C, Ectosomal paratangential skeleton. D, Palmate isochelae. E, Echinating acanthostyles. F, Acanthostyle spines. G, Principal styles and v-shaped toxas.

teristic of *C.* (*Wilsonella*) (although this is shown here to be an erroneous interpretation of *Wilsonella*). De Laubenfels (1936a) also transferred *C.* (*C.*) *angulifera* to *Thalysias*, but this was completely unjustified.

Although known only from 2 widely separated localities it is probable that it is more widely distributed within shallow coastal waters in southeastern Australia.

Clathria (Clathria) arcuophora Whitelegge, 1907 (Figs 28-29)

Clathria arcuophora Whitelegge, 1907: 491,500-501, pl.45, fig.29; Hallmann, 1912: 211, 229, 234- 237, 260, 263, text-fig. 49-49a; Hooper & Wiedenmayer, 1994: 258.

Thalysias arcuophora; de Laubenfels, 1936a: 105.

Microciona arcuophora; Vosmaer, 1935a: 611, 649, 665.

MATERIAL. LECTOTYPE: AMG4346: Off Barranjoey, S. coast of NSW, 33°35'S, 151°20'E, 50-66m depth, coll. FIV 'Thetis' (dredge). PARALECTOTYPE: AMZ1209: Off Botany Bay, NSW, 34°00'S, 151°11'E, 40-46m depth, coll. FIV 'Thetis' (dredge).

HABITAT DISTRIBUTION. Depth range 30-90m; substrate unknown; central and S. coast of NSW (Fig. 28G).

DESCRIPTION. *Shape.* Thinly flabelliform, 170mm long, 120mm maximum breadth, up to 4mm thick, with long cylindrical stalk, 90mm long, 13mm diameter, and rounded or slightly lobate margins.
Colour. Grey-brown in dry state.
Oscules. Surface covered with evenly distributed minute oscules, up to 1.5mm diameter.
Texture and surface characteristics. Harsh in dry state; surface optically smooth.
Ectosome and subectosome. Ectosome microscopically hispid, with regularly distributed choanosomal principal styles forming erect plumose brushes, and protruding from peripheral fibre endings; tangential layer of subectosomal auxiliary spicules lying on or just below surface, at base of principal styles. Subectosome with only slightly plumose tracts of choanosomal megascleres, virtually undifferentiated from choanosomal skeleton.
Choanosome. Choanosomal skeleton more-or-less regularly reticulate, sub-renieroid; axial skeleton slightly compressed, peripheral skeleton slightly plumo-reticulate; branching between moderately heavy spongin fibres produces ovoid to square meshes, and fibres differentiated into primary ascending and secondary transverse components; primary fibres with pauci- to multispicular core of choanosomal principal styles; secondary fibres with uni- or bispicular tracts of principal spicules; echinating acanthostyles sparse, slightly more abundant on peripheral fibres; mesohyl matrix light, with only few subectosomal auxiliary megascleres dispersed between fibres.
Megascleres. Choanosomal principal styles thick, slightly curved, slightly fusiform, with rounded smooth bases. Length 176-(258.4)-444µm, width 12-(22.2)-27µm.

Subectosomal auxiliary subtylostyles small, thin, straight, with smooth or microspined bases, bases slightly subtylote, points fusiform. Length 192-(231.1)-276µm, width 3.5-(4.8)-6µm.

Acanthostyles small, slightly subtylote, with relatively even granular spination. Length 68-(93.2)-104µm, width 6.5-(7.5)-10µm.
Microscleres. Palmate isochelae large, unmodified. Length 16-(21.4)-26µm.

Toxas intermediate between oxeote and oxhorn, thick, gently curved at centre, with straight arms or slightly reflexed points. Length 28-(104.0)-132µm, width 1.5-(4.8)-6µm.

REMARKS. This species is distinctive by its renieroid choanosomal skeleton, plumo-reticulate subectosomal skeleton, distinctive spongin fibres which contain only few but very thick coring spicules, and an ectosomal region which is dominated by plumose brushes of principal spicules. The renieroid skeletal construction is superficially similar to *Antho* (*Isopenectya*) and *Clathria* (*Isociella*)), and several other (otherwise unrelated) groups (some Raspailiidae (e.g., *Ectyoplasia*), Axinellidae (e.g., *Axinella aruensis* (Hentschel, 1912)), Iophonidae (e.g., *Acarnus*) and Myxillidae (*Lissodendoryx*) (see also remarks for *C.* (*C.*) *crassa*)). *Clathria* (*C.*) *arcuophora* is most reminiscent of *Ectoplasia frondosa* (Lendenfeld) (Raspailiidae; see Hooper, 1991: figs 47-48), which was originally described in the Microcionidae, having closely comparable architecture, fibre characteristics and geometry of some spicules. Within the Microcionidae, *C.* (*C.*) *arcuophora* is also similar to *C.* (*C.*) *biclathrata* in spicule geometry and fibre characteristics, although there are substantial differences between them in skeletal construction. The species should also be compared to *C.* (*C.*) *striata*, which differs mainly in the morphology of its toxa.

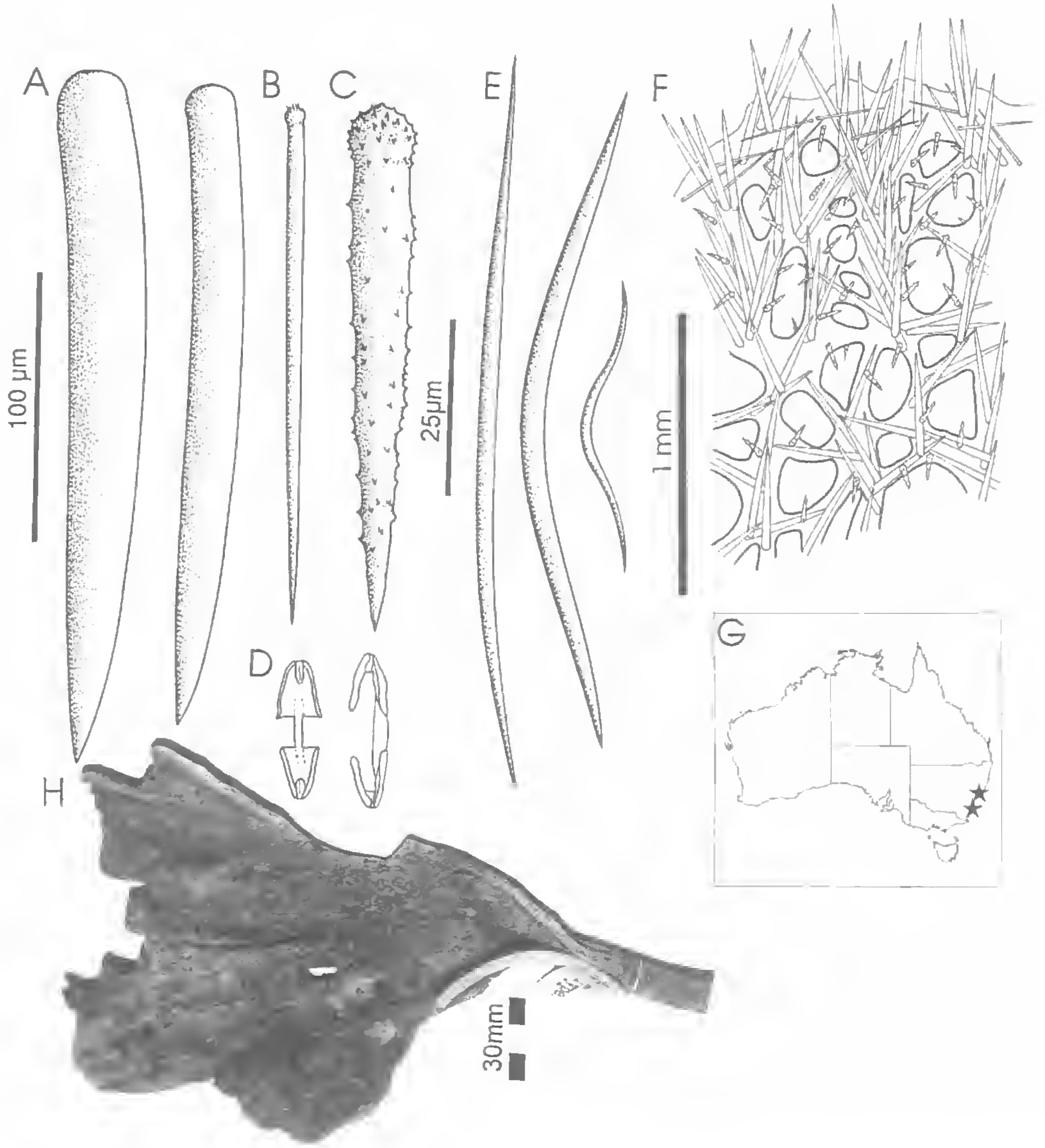

FIG. 28. *Clathria* (*Clathria*) *arcuophora* Whitelegge (paralectotype AMZ1209). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyle. C, Echinating acanthostyle. D, Palmate isochelae. E, Oxeote and oxhorn toxas. F, Section through peripheral skeleton. G, Australian distribution. H, Lectotype AMG4346.

Clathria (Clathria) biclathrata sp. nov.
(Figs 30-31, Table 2)

Microciona clathrata Whitelegge, 1907: 491-494, pl.46, fig. 38-38a; [?] Vosmaer, 1935a: 608; Hooper & Wiedenmayer, 1994: 258.
Clathria clathrata; Hallmann, 1912: 209.
Dictyociona clathrata; de Laubenfels, 1936a: 110.
Thalysias clathrata; de Laubenfels, 1953: 527.
Not *Tenacia clathrata* Schmidt, 1870: 56,80.
Not *Clathria clathrata*; Vosmaer, 1880: 153; Ridley & Dendy, 1887: 147; Wilson, 1902: 397-398; Alcolado, 1976: 5.

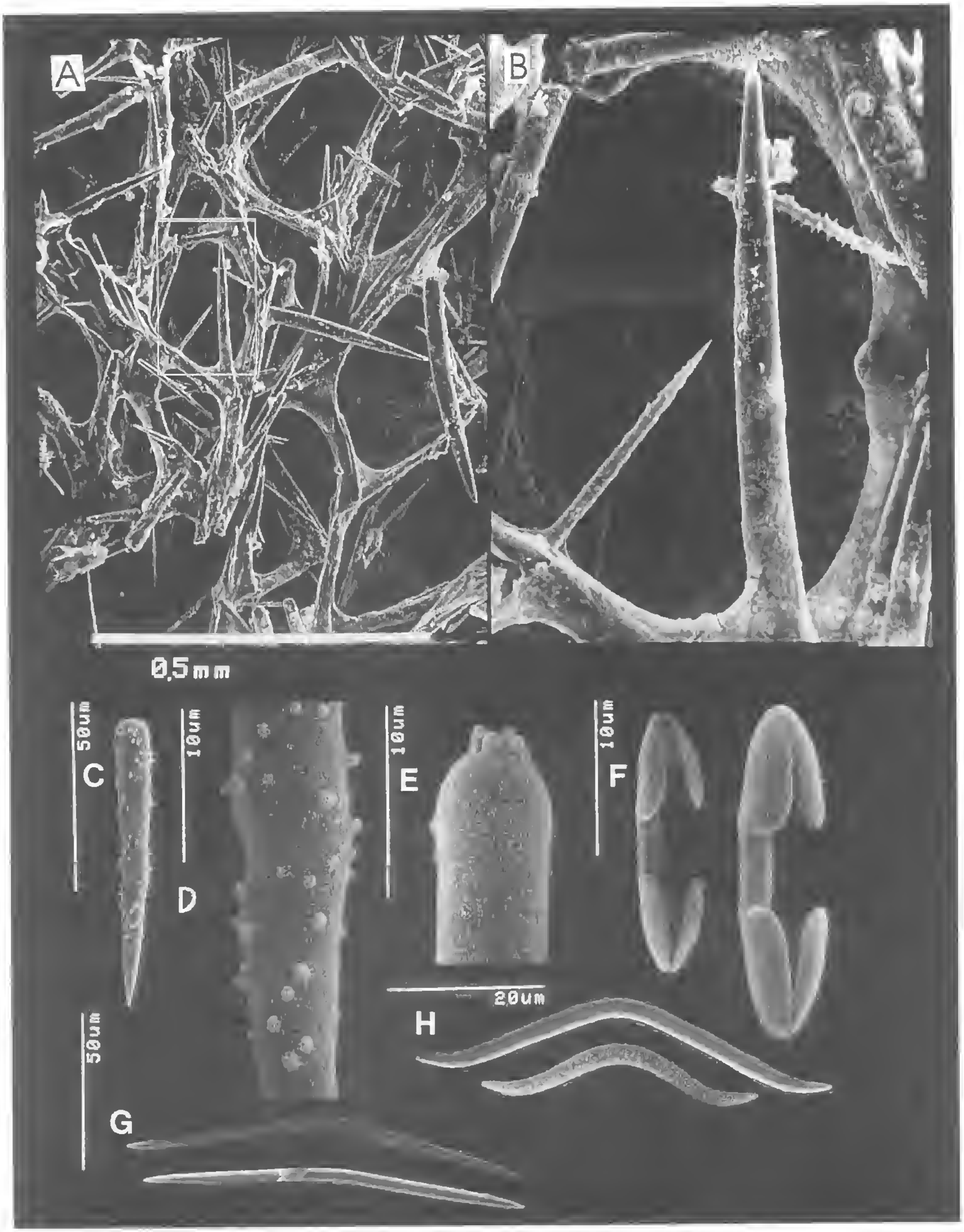

FIG. 29. *Clathria* (*Clathria*) *arcuophora* Whitelegge (paralectotype AMZ1209). A, Choanosomal skeleton. B, Fibre characteristics (x409). C, Echinating acanthostyle. D, Acanthostyle spination. E, Base of auxiliary subtylostyle. F, Palmate isochelae. G, Oxeote toxas. H, Oxhorn toxas.

TABLE 2. Comparison between present and published records of *Clathria* (*Clathria*) *biclathrata*, sp.nov. All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Lectotype (AMG4355)	Paralectotype (AMG10530)	Specimen (N=1)
Choanosomal principal styles	253-(372.3)-446 x 18-(22.8)-33	226-(337.5)-423 x 17-(22.6)-28	233-(319.8)-418 x 14-(17.8)-24
Subectosomal auxiliary styles	132-(214.0)-293 x 2-(4.9)-7	125-(165.4)-243 x 3-(5.5)-7	144-(197.0)-253 x 3-(4.6)-7
Echinating acanthostyles	73-(158.4)-231 x 4.5-(14.7)-19	114-(161.1)-193 x 11-(13.6)-18	113-(150.2)-193 x 8-(12.4)-16
Chelae	7-(10.4)-14	6-(8.6)-11	4-(7.8)-12
Toxas I	28-(93.0)-149 x 0.8-(2.4)-3.5	43-(102.8)-141 x 1.8-(2.8)-3.5	38-(66.6)-104 x 1-(2.7)-4
Toxas II	4-(10.2)-18 x 0.8-(1.7)-2.0	6-(18.0)-36 x 0.8-(1.9)-2.5	3-(12.4)-24 x 0.5-(1.4)-2.0

MATERIAL. LECTOTYPE: AMG4355: (dry) Off Woolongong, NSW, 34°25'S, 151°10'E, 110-112m depth, coll. FIV 'Thetis' (dredge). PARALECTOTYPES: AMG10530: (dry) unknown locality, NSW, coll. FIV 'Thetis' (dredge). AMG10531 (presently missing): (label 'Dictyociona clathrata, cotype'). OTHER MATERIAL: NEW SOUTH WALES - AMZ994.

HABITAT DISTRIBUTION. Up to 112m depth, substrate unknown; S. coast of NSW (Fig. 30H).

DESCRIPTION. *Shape.* Clavulate to subspherical, bushy, honeycombed mass, 85-105mm high, 30-55mm wide, up to 40mm maximum thickness, composed of numerous thin, cylindrical, tightly anastomosing branches; small cylindrical stalk, 8-15mm long, up to 8mm diameter.

Colour. Live colouration unknown, grey-brown to dark brown in dry state.

Oscules. Small oscules, 1-2.5mm diameter, on edges of surface microconules.

Texture and surface characteristics. Surface very hispid, minutely porous, with numerous slightly elevated microconules; texture unusually tough.

Ectosome and subectosome. Ectosomal skeleton a tangential layer of subectosomal auxiliary styles in multispicular tracts, with numerous choanosomal principal spicules protruding and extending a long way through surface; subdermal skeleton, if present, totally obscured by dense mass of erect choanosomal megascleres.

Choanosome. Choanosomal skeletal architecture irregularly reticulate, slightly renicroid, with heavy spongin fibres forming tight meshes, and some compression of axial fibres; spongin fibres not clearly divisible into primary or secondary components, but merely ascend and diverge towards surface; fibres mostly aspicular, sometimes with one or few choanosomal principal subtylostyles in core, heavily echinated by both acanthostyles and choanosomal principal subtylostyles (the latter 'spicate' in arrangement), and some intermediate spicules with rudimentary spines on shaft; echinating megascleres most abundant on peripheral fibres; mesohyl matrix heavy, with few subectosomal auxiliary subtylostyles between meshes.

Megascleres (Table 2). Choanosomal principal subtylostyles slightly curved or straight, fusiform, slightly constricted at base, heavily spined bases (smaller examples may also have scattered spines on shafts).

Subectosomal auxiliary subtylostyles short, fusiform, straight, with slightly subtylote microspined bases.

Acanthostyles relatively long, thick, slightly curved, with prominent subtylote bases, with evenly distributed large spines over entire spicule or with an aspinose region proximal to base.

Microscleres (Table 2). Palmate isochelae, some twisted.

Toxas include larger thick wing-shaped forms with large central curvature, slightly reflexed arms and microspined points, and smaller oxhorn forms, the smallest with abbreviated arms.

REMARKS. This species is characterised by its compressed skeletal architecture, fibre and ectosomal features, and it is unlikely to be confused with other members of Hallmann's (1912) *spicata* group of microcionid species (cf. Hooper et al., 1990) which have principal spicules protruding through fibres and surface skeletons but few within fibres themselves. A feature overlooked by previous authors is the presence of spinous extremities on toxas, which are virtually identical to those of type species of *Clathria*, *C.* (*C.*) *compressa*, also occurring in *C.* (*C.*) *juncea*, *C.* (*C.*) *lobata*, and *Artemisina suberitoides*. The geometry of spicules in *C.* (*C.*) *biclathrata* is similar to those in *C.* (*C.*) *arcuophora*, although these species differ quite substantially in their skeletal architecture.

Clathria (Clathria) caelata Hallmann, 1912
(Figs 32-33, Table 3)

Clathria caelata Hallmann, 1912: 139, 177, 206, 211-216, pl.33, fig.4, text-fig.43; Hooper & Wiedenmayer, 1994: 258.

Clathria coelata; Burton & Rao, 1932: 336 [lapsus].

Pseudanchinoe caelata; de Laubenfels, 1936a: 109.

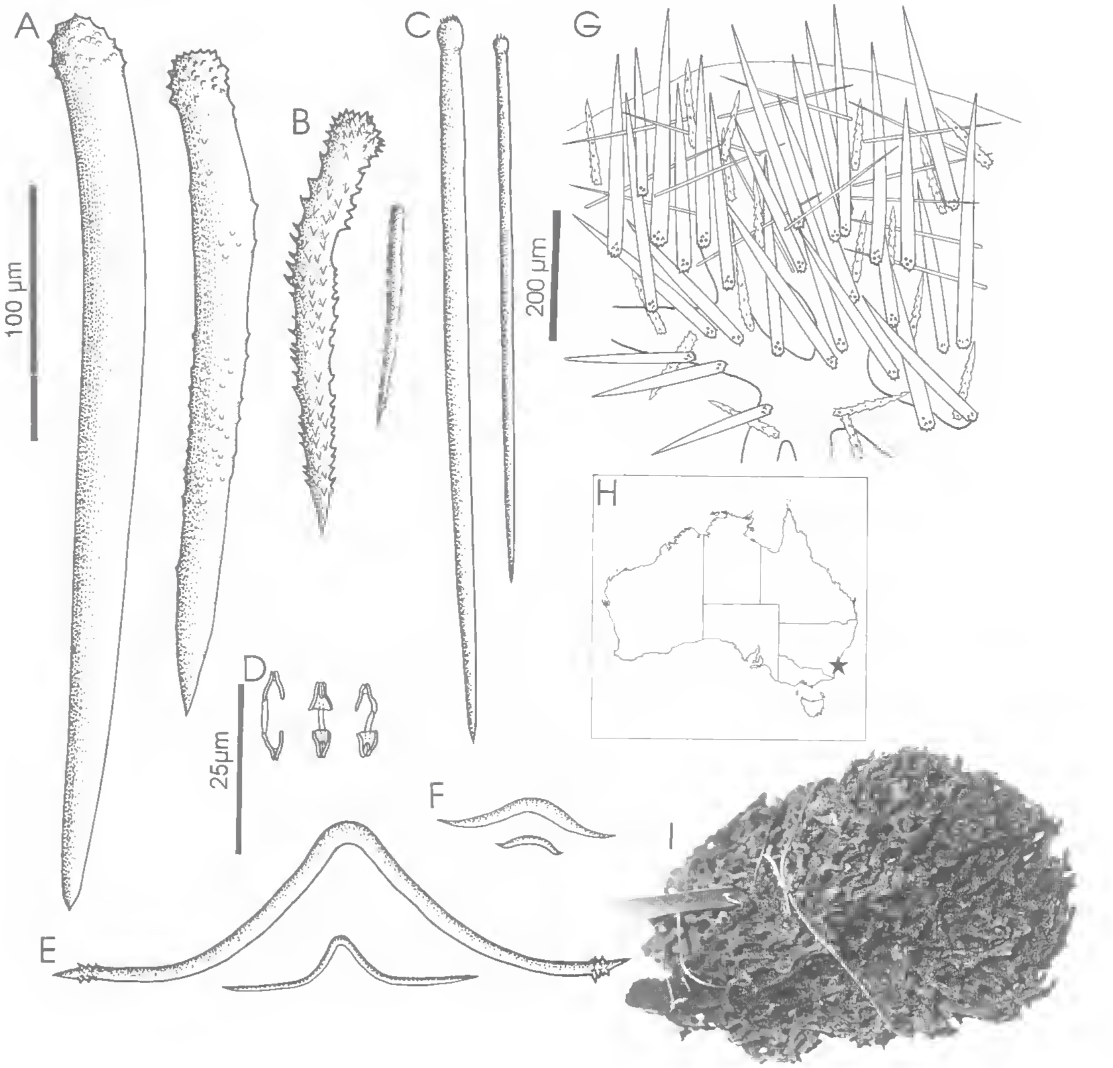

FIG. 30. *Clathria* (*Clathria*) *biclathrata* sp.nov. (lectotype AMG4355). A, Choanosomal principal subtylostyle and spined subtylostyle. B, Echinating acanthostyles. C, Subectosomal auxiliary subtylostyles. D, Palmate isochelae. E, Wing-shaped toxas. F, Oxhorn toxas. G, Section through peripheral skeleton. H, Australian distribution. I, Lectotype AMG4355.

Not *Clathria inanchorata* Ridley & Dendy, 1886: 475; Ridley & Dendy, 1887: 150, pl.28, fig.4, pl.29, figs 13,13a.

cf. *Microciona prolifera*; Vosmaer, 1935a: 611, 648, 664.

MATERIAL. LECTOTYPE: AMZ778: (wet) 64km W. of Kingston, SA, 36°50'S, 139°05'E, 60m depth, coll. FIV 'Endeavour' (dredge; label '4th consignment'). PARALECTOTYPES: AME53: (dry) same locality. AMZ952-953: unspecified locality, W. coast Tas. ('ref. G255'). OTHER MATERIAL: TAS-AME2273.

HABITAT DISTRIBUTION. Depth 53-106m; substrate unknown; Kingston (SA), Bass Strait (Vic), Cape Barren, W coast (Tas) (Hallmann, 1912).

DESCRIPTION. *Shape*. Planar or multiplanar, digitate fans, 110-150mm high, 70-90mm wide, with short cylindrical stalk, 8-17mm long, 5-

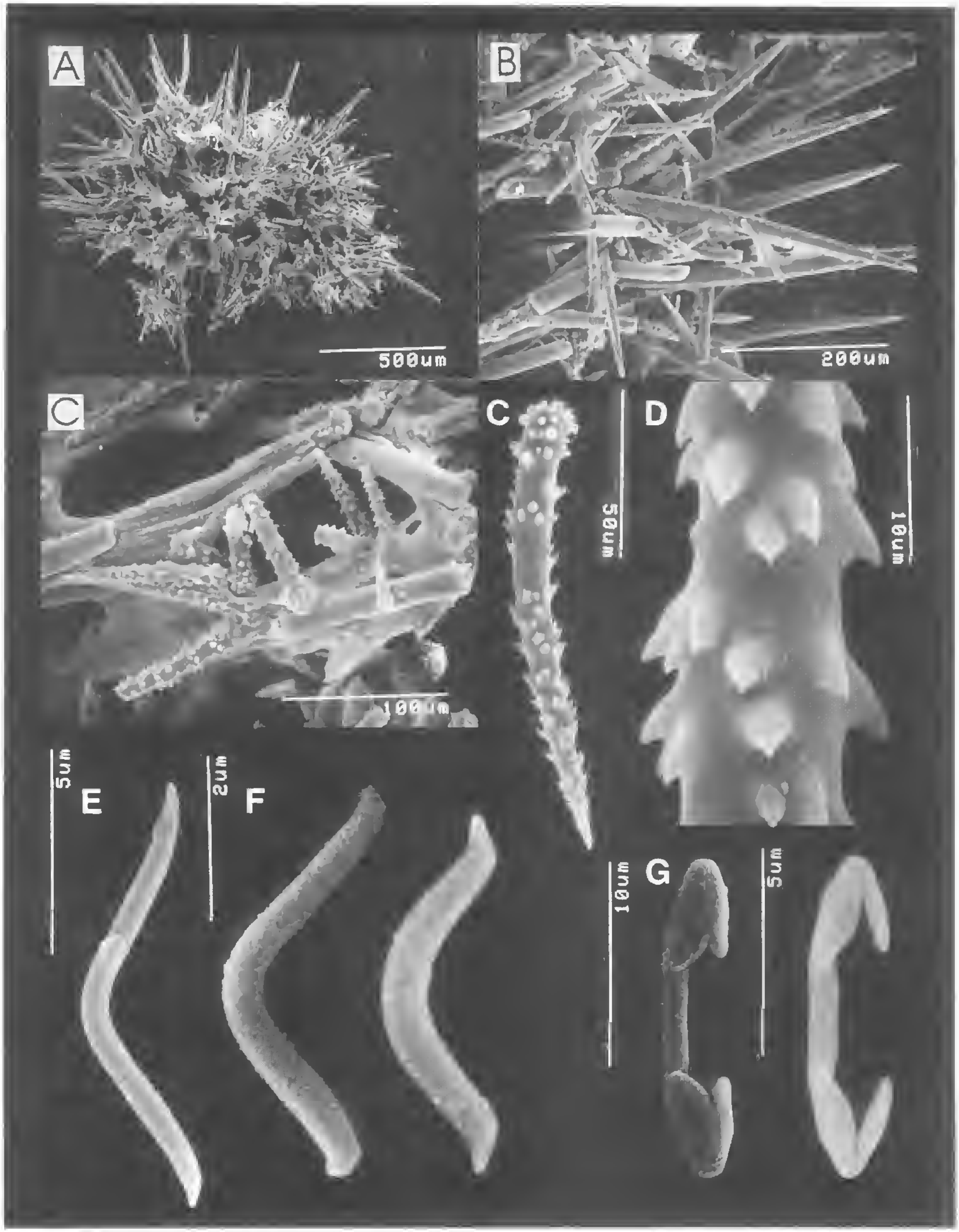

FIG. 31. *Clathria (Clathria) biclathrata* sp.nov. (lectotype AMG4355). A, Choanosomal skeleton. B, Ectosomal skeleton. C, Fibre characteristics. D, Echinating acanthostyle. E, Acanthostyle spination. F, Wing-shaped toxa. G, Oxhorn toxas. H, Palmate isochelae.

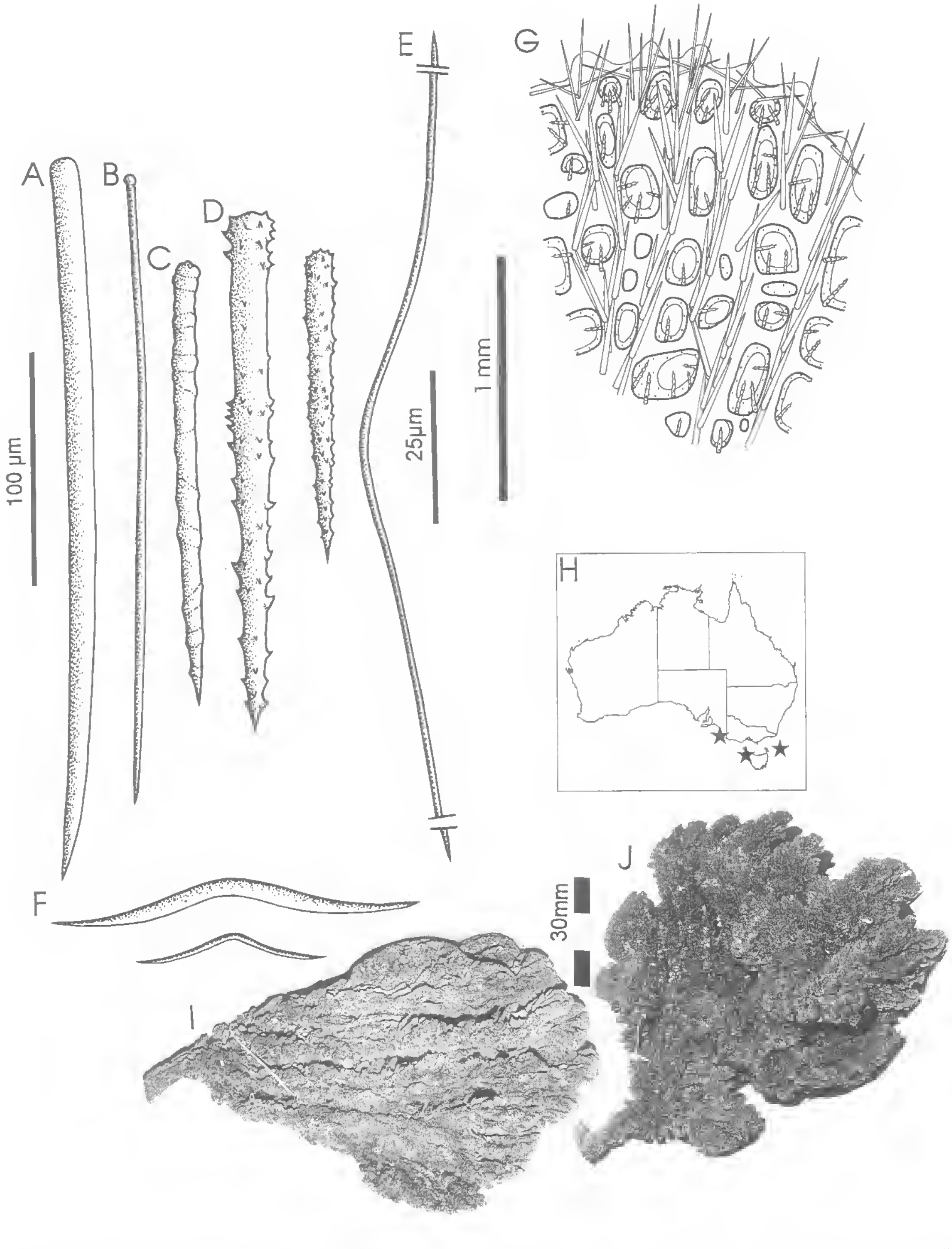

FIG. 32. *Clathria* (*Clathria*) *caelata* Hallmann (paralectotype AME53). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyle. C, Intermediate echinating and principal style. D, Echinating acanthostyle. E, Accolada toxa. F, Oxhorn toxas. G, Section through peripheral skeleton. H, Australian distribution. I, Paralectotype AMZ953. J, Paralectotype AMZ952.

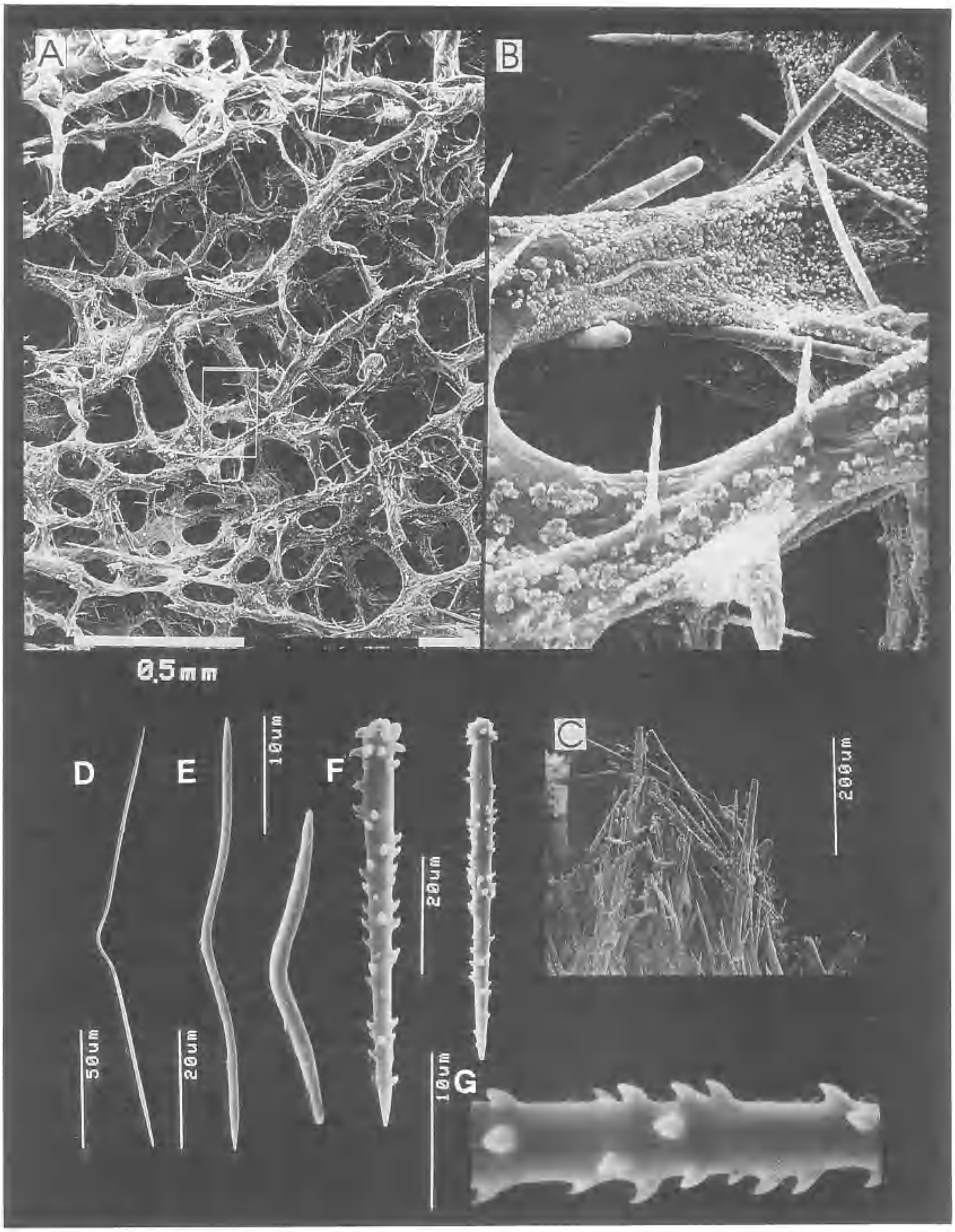

FIG. 33. *Clathria* (*Clathria*) *caelata* Hallmann (A-B, Lectotype AMZ778; C-G, E2273). A, Choanosomal skeleton. B, Fibre characteristics. C, Ectosomal skeleton. D, Accolada toxa. E, Oxhorn toxas, F, Echinating acanthostyles. G, Acanthostyle spination.

10mm diameter, rounded lobate, or digitate margins.

Colour. Llight to dark brown preserved.

Oscules. Small pores on margins of lobes, up to 1.5mm diameter.

Texture and surface characteristics. Surface highly rugose, with numerous close-set microconules, subdermal canals and grooves, between which extends a skin-like dermal membrane; texture firm, compressible.

Ectosome and subectosome. Ectosome microscopically hispid, with plumose brushes of choanosomal principal styles protruding through surface, and with thin layer of subectosomal auxiliary styles tangential to surface; subdermal region not markedly differentiated from choansome containing bundles of diverging principal styles embedded in peripheral fibres; peripheral fibres heavily echinated on their exterior surfaces; acanthostyles may extend into ectosomal skeleton.

Choanosome. Choanosomal skeletal architecture irregularly reticulate, with well developed spongin fibres forming ovoid to elongate meshes; fibre anastomoses relatively cavernous in axis, although smaller in peripheral skeleton; fibres clearly differentiated into primary ascending and secondary transverse components, although fibre diameter is consistent throughout skeleton: primary fibres contain pauci- or multispicular tracts of choanosomal principal subtylostyles, forming a radial architecture; secondary fibres uni- or aspicular; spongin fibres echinated on external surfaces only, with a variable density of echinating acanthostyles, mostly relatively light except at the periphery; choanosomal styles also echinate fibres, particularly at fibre nodes; mesohyl matrix moderately heavy, granular, pigmented; extra-fibre megascleres (subectosomal subtylostyles) usually abundant.

Megascleres (Table 3). Choanosomal principal subtylostyles thick, straight or slightly curved, fusiform, with slightly subtylote smooth bases, although some examples are obvious intermediates to echinating acanthostyles, bearing rudimentary spines on the shaft.

Subectosomal auxiliary subtylostyles straight or slightly curved, fusiform, relatively thin, evenly rounded or slightly subtylote bases, and smooth or microspined bases.

Echinating acanthostyles variable in length, subtylote, with evenly spined shafts on smaller forms, or with aspinose necks on larger forms.

Microscleres (refer to Table 3 for dimensions). Isochelae absent.

TABLE 3. Comparison between present and published records of *Clathria* (*Clathria*) *caelata* (Hallmann). All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Lectotype (AMZ778)	Paralectotype (AME53)	Specimen (N=1)
Choanosomal principal styles	148-(215.4)-276 x 8-(12.2)-16	154-(222.2)-262 x 9-(11.8)-14	186-(254.5)-353 x 6-(9.4)-10
Subectosomal auxiliary styles	128-(216.4)-294 x 2-(3.2)-5	134-(234.8)-324 x 3-(4.6)-7	166-(267.0)-355 x 2-(3.5)-7
Echinating acanthostyles	45-(71.9)-122 x 2-(5.1)-8	64-(89.4)-131 x 4-(6.4)-8	23-(64.4)-120 x 2-(4.8)-8
Chelae	absent	absent	absent
Toxas I	122-(151.7)-190 x 0.5-(1.1)-1.5	72-(101.8)-165 x 0.8-(1.4)-2	86-(121.1)-165 x 0.5-(1.4)-2
Toxas II	21-(55.9)-83 x 1-(2.3)-4	24-(48.2)-92 x 1-(2.1)-3.5	13-(38.8)-75 x 1-(2.2)-4

Toxas separated into two morphs: I - long, thin accolada toxas, with straight points and slight central curvature; II - relatively thick oxhorn toxas, ranging from almost straight with only slight and angular central curvature, to widely curved at the centre with reflexed points.

REMARKS. Not all of the specimens described by Hallmann (1912) belong to this species: AME771, E772 and E773 are species belonging to Axinellidae - *Reniochalina* (2 specimens) and *Acanthella*, respectively. All three specimens look very similar in external morphology to *C.* (*C.*) *caelata*, but differences are immediately obvious upon examination of the skeleton.

Among the few known specimens of this species there is relatively high variability in choanosomal skeletal construction although this is difficult to define concisely. The development of spongin fibres, the degree to which the skeletal meshes are compressed or elongated, and the density and pigmentation of the mesohyl matrix may vary between specimens. Growth form and spicule geometry appear to be closely comparable between all specimens, but some (e.g., AME2273) have predominantly long thin toxas, whereas others (e.g., AMZ952) have mostly short and thick toxas. All specimens have both choanosomal styles and acanthostyles echinating fibres, and in this respect the species belongs to Hallmann's (1912) '*spicata*' group, together with *Clathria* (*C.*) *biclathrata*, *C.* (*C.*) *inanchorata*, *C.* (*Thalysias*) *costifera*, *C.* (*T.*) *coppingeri*, *C.* (*T.*) *lendenfeldi* and others (Hooper et al., 1990).

Clathria (Clathria) calopora Whitelegge, 1907

Clathria calopora Whitelegge, 1907: 499-500, pl.46, fig.34; Hallmann, 1912: 211; Hooper & Wiedenmayer, 1994: 259.
Thalysias calopora; de Laubenfels, 1936a: 105.

MATERIAL. HOLOTYPE: AM (presently missing): Shoalhaven Bight, NSW, 34°49'S, 151°04'E, 30-90m depth, 1.vii.1911, coll. FIV 'Endeavour' (trawl).

HABITAT DISTRIBUTION. Depth 27-32m, substrate unknown; S. coast of NSW.

DESCRIPTION. *Shape.* Branching, 195mm high, with thin, bifurcate, cylindrical, mostly non-anastomosing digits, 3-8mm diameter, with tapering points, short cylindrical stalk.

Colour. Live colouration unknown, greyish-yellow preserved.

Oscules. Small oscules, about 1mm diameter, scattered over surface.

Texture and surface characteristics. Surface uneven, minutely hispid, honeycomb-like, with prominent bulbous conulose processes scattered over surface; texture hard, incompressible in dry state.

Ectosome and subectosome. Ectosome microscopically rugose, close-meshed reticulation of peripheral spongin fibres covered by a thin membrane; ectosomal skeleton with a thin tangential layer of subectosomal auxiliary subtylostyles, also forming plumose tufts on surface, through which choanosomal principal styles from peripheral fibres protrude, individually or in plumose brushes; subdermal auxiliary megascleres run parallel with peripheral fibres, but not forming organised extra-fibre tracts.

Choanosome. Choanosomal skeleton irregularly reticulate, with some axial and extra-axial differentiation; spongin fibres relatively heavy, clearly divided into primary ascending and secondary transverse components; primary fibres sinuous, forming radial architecture, with a paucispicular core of choanosomal principal styles; primary fibres more compressed at axis than at periphery; secondary fibres less common, with uni- or paucispicular core of megascleres; branching of spongin fibres produces elongate meshes in axis and round or rectangular meshes in periphery; spongin fibres very heavily echinated, particularly in peripheral regions; numerous sinuous toxodragmata dispersed in mesohyl between fibres.

Megascleres. Choanosomal principal styles thick, slightly curved, fusiform, with rounded smooth bases. Length 300-500μm, width 15-22μm.

Subectosomal auxiliary subtylostyles thin, straight or slightly curved, with smooth slightly subtylote bases. Length 150-200μm, width 2-4μm.

Acanthostyles short, stout, evenly spined, spines large. Length 30-80μm, width up to 12μm.

Microscleres. Palmate isochelae. Length 8-10μm.

Toxa morphology unknown, apparently long, slender, with large central curvature. Length ? 200-300μm, width ? up to 2μm.

REMARKS. This species is known only from Whitelegge's (1907) poor description. It is not possible to determine whether dimensions of echinating acanthostyle (cited as 0.3-0.8mm long by Whitelegge) is merely a typographical error. Whitelegge gave no indication of whether *C. (C.) calopora* has a special ectosomal skeleton, but described the species as having a tangential or paratangential layer of subdermal (auxiliary) megascleres, through which protrude choanosomal (principal) styles. Consequently, there was no justification for de Laubenfels (1936a) referring the species to *Thalysias*.

Clathria (Clathria) chelifera (Hentschel, 1911)
(Figs 34-35, Table 4)

Spanioplon cheliferum Hentschel, 1911: 362-363, fig.42; Hentschel, 1912: 368-369.
Allocia chelifera; Hallmann, 1920: 768; Bergquist & Fromont, 1988: 96, fig. 8c, pls 45e-f, 46a-c, table 73; Dawson, 1993: 44 (note).
Clathria chelifera; Dendy, 1922: 70-71, pl.14, fig. 3a-e; Hooper & Wiedenmayer, 1994: 259.
Not *Microciona chelifera* Lévi, 1960a: 70, fig.12.

MATERIAL. HOLOTYPE: ZMH (not seen) (fragment ZMB4440): precise locality unknown, Perth region, WA, 1905, coll. W. Michaelsen & R. Hartmeyer (dredge). PARATYPE: SMF 1571 (fragment MNHNDCL2327): same locality. OTHER MATERIAL: VIETNAM - PIBOC-05-216 (fragment QM G300058).

HABITAT DISTRIBUTION. 10-100m depth; rock or gravel substrates; Arafura Sea (NT) and Perth region (S. WA) (Fig. 34F). Also Indian Ocean (Amirante), New Zealand (Three Kings Is) and South China Sea (Hon Trung Lon, Vinh Loi coast, S. Vietnam).

DESCRIPTION. *Shape.* Arborescent, foliose, planar growth form, up to 50mm high made up of fused porous-reticulate lamellae 10-15mm thick.

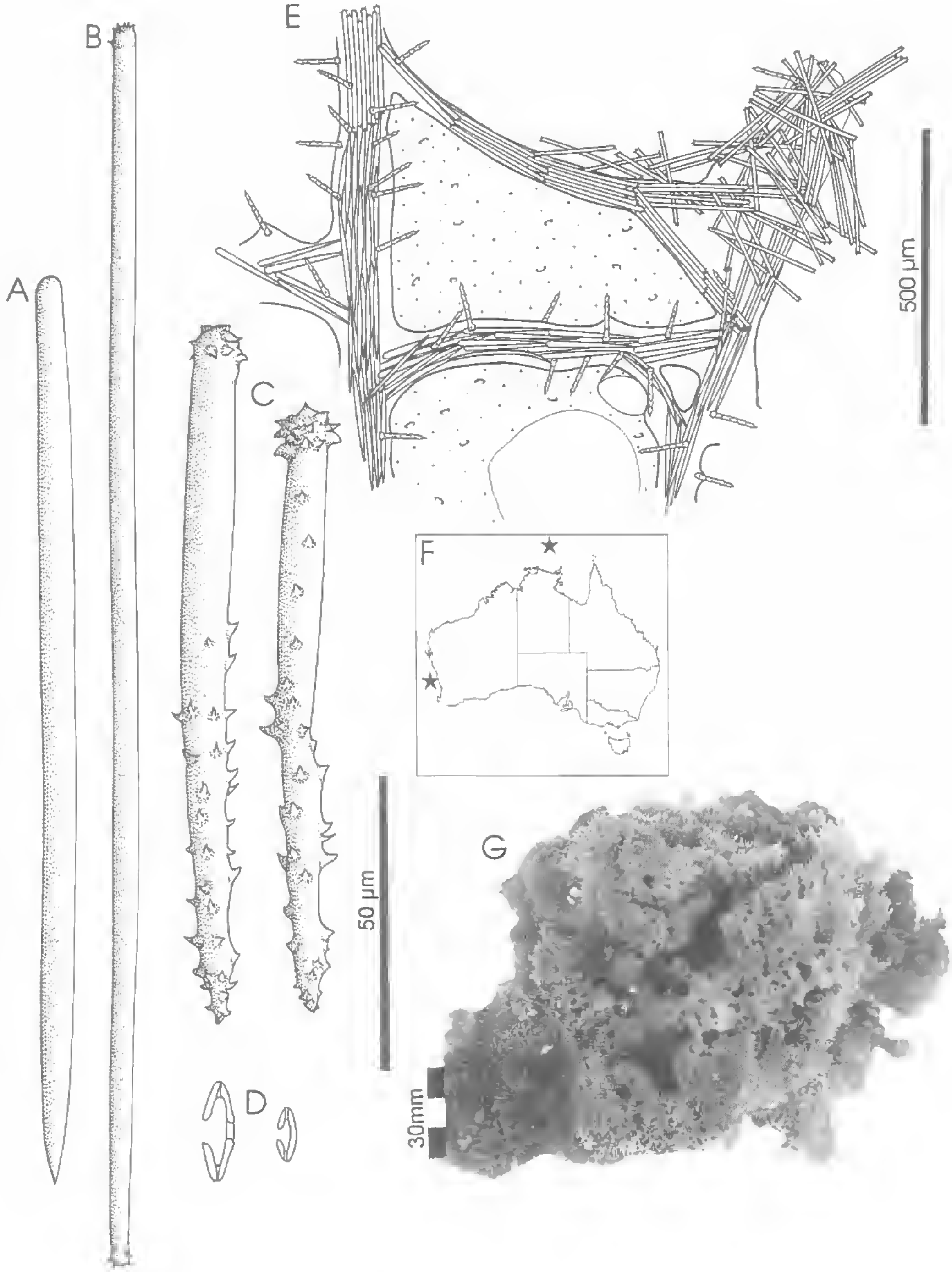

FIG. 34. *Clathria* (*Clathria*) *chelifera* (Hentschel) (paratype SMF1571). A, Choanosomal principal style. B, Subectosomal auxiliary styles (quasitylotes). C, Echinating acanthostyles. D, Palmate isochelae. E, Section through peripheral skeleton (ectosome on far right). F, Australian distribution. G, QG300058.

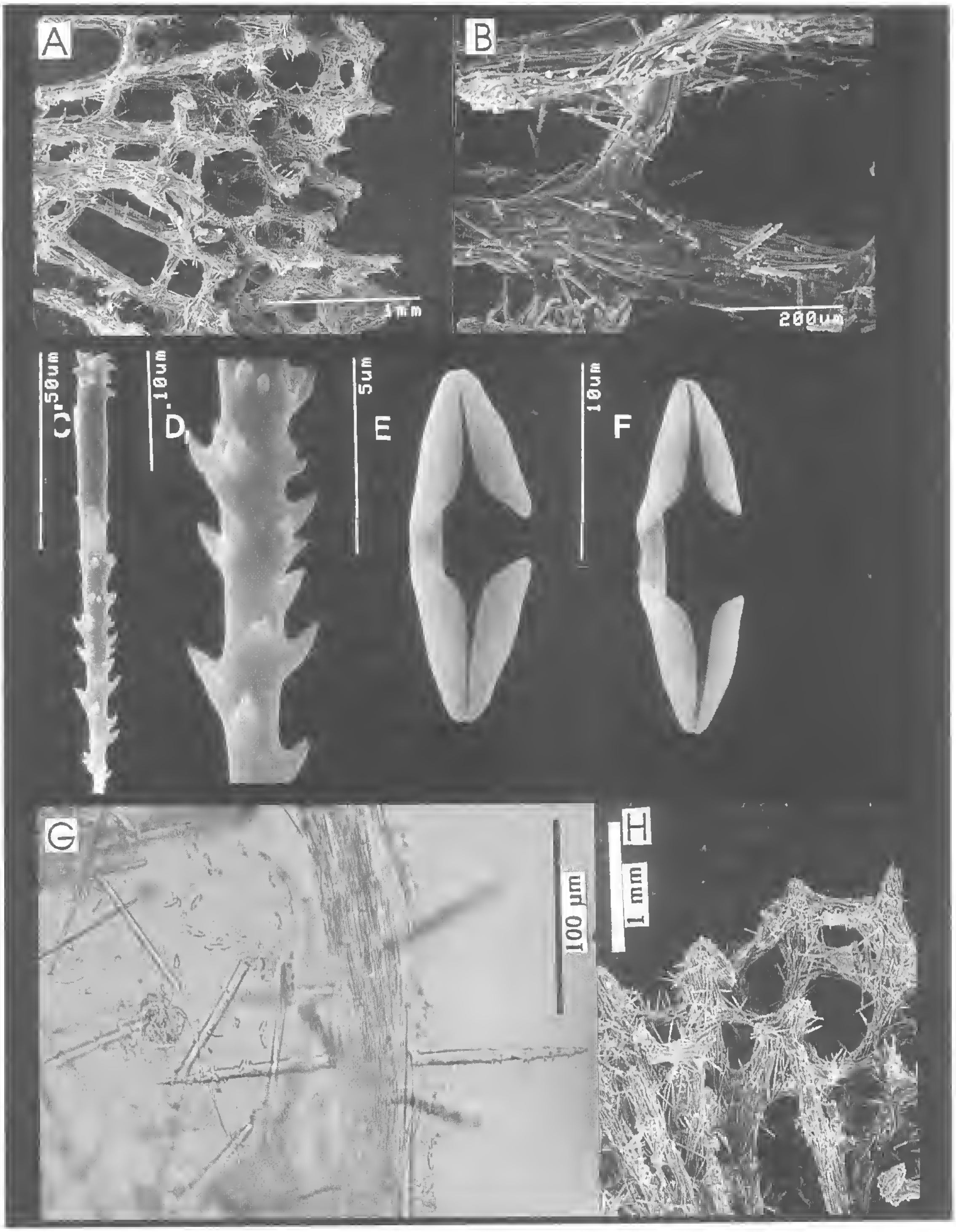

FIG. 35. *Clathria* (*Clathria*) *chelifera* (Hentschel) (QMG300058). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyle. D, Acanthostyle spines. E-F, Palmate isochelae. G, Pattern of echinating spicules. H, Section of peripheral skeleton.

TABLE 4. Comparison between present and published records of *Clathria* (*Clathria*) *chelifera* (Hemschel). All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Paratype (SMF1571) (Perth, WA)	Specimen Bergquist & Fromont (1988) (Three Kings Is, NZ)	Specimen (N=1) (S. Vietnam)
Choanosomal principal styles	140-(150.1)-161 x 4-(6.1)-7	270-(404)-550 x 15-(18)-20	150-(164.6)-174 x 4-(6.4)-10
Subectosomal auxiliary styles	173-(193.4)-205 x 2-(3.9)-5	280-(334)-375 x 4-(5)-6.5	192-(204.0)-212 x 3-(4.7)-7
Echinating acanthostyles	84-(93.2)-100 x 7-(7.8)-9	162-(207)-290 x 12.5-(14)-19	103-(116.5)-132 x 5-(8.0)-10
Chelae I	13-(14.6)-1	20-(21)-23	15-(17.6)-20
Chelae II	7-(8.7)-10	absent	9-(10.3)-12

Colour. Red alive (10R 5/8), beige or yellow brown in ethanol.

Oscules. Not seen.

Texture and surface characteristics. Surface hispid, uneven, irregularly conulose, with transparent ectosomal membrane stretched between adjacent conules; texture firm, compressible.

Ectosome and subectosome. Ectosomal skeleton with a tangential layer of auxiliary tylotes and numerous isochelae scattered between, supporting the membraneous ectosomal covering; subectosomal region with paratangential tracts of auxiliary tylotes supporting tangential ectosomal layer, the latter sometimes protruding through surface, with ascending primary tracts of choanosomal principal styles in turn supporting these.

Choanosome. Choanosomal skeleton reticulate, with multispicular ascending primary fibres and paucispicular transverse connecting fibres; spongin fibres heavy, cored by principal styles and auxiliary tylotes (the latter also scattered throughout the mesohyl), and echinated by acanthostyles more-or-less perpendicular to fibres; mesohyl matrix light, with numerous isochelae scattered between fibres.

Megascleres (Table 4). Principal styles slender, slightly curved near basal end, with abrupt hastate points, and completely smooth.

Subectosomal auxiliary spicules tylotes or quasitylotes, asymmetrical (and therefore probably modified styles), usually with microspined bases and points or sometimes completely smooth at both ends.

Echinating acanthostyles with spinose shaft, base and point but apinose 'neck'; spines large, recurved.

Microscleres (Table 4). Palmate isochelae of two sizes, both with thickened and elongate alae.

Toxas are absent.

REMARKS. Dimensions of some spicules were found to differ in type material (Table 4) from those published by Hentschel (1911). Similarly, two size classes of isochelae were found in the WA population, not one as described by Hentschel (1911). In both respects this population is the same as the one described from Amirante (Dendy, 1922) and the material described above from Vietnam, whereas the specimen described by Bergquist & Fromont (1988) from New Zealand has substantially larger spicule dimensions than either of the Indian Ocean populations, including only one size class of isochela. In spicule geometry, choanosomal skeletal structure and ectosomal characteristics (including the distribution of isochelae in the ectosomal membrane), these 4 disjunct populations are relatively homogeneous and I follow Bergquist & Fromont (1988) in recognising only a single species. No intermediate populations of *C.* (*C.*) *chelifera* are known, and the species is relatively rare with only few known specimens in the Indo-west Pacific.

This species is unusual to most *C.* (*Clathria*) in possessing modified auxiliary spicules with spines on both ends, considered by some authors to be true tylotes typical of the Myxillidae (Hallmann, 1920; Bergquist & Fromont, 1988) or Iophonidae (Hajdu et al., 1994). But these spicules are clearly asymmetrical (quasitylotes), not true diactinal megascleres, and Dendy (1922) correctly assigned this species (and thus the genus *Allocia*) to *Clathria*. These modified quasidiactinal auxiliary spicules are infrequent but known in several other microcionids (e.g., *C.* (*C.*) *bulbosa*, *C.* (*Thalysias*) *major*, *C.* (*Dendrocia*) *pyramida*, *C.* (*Wilsonella*) *australiensis*, most *Echinochalina*, some *Holopsamma*, and some *Echinoclathria* species).

Clathria (Clathria) conectens (Hallmann, 1912)
(Figs 36-37, Plate 1B, Table 5)

Wilsonella conectens Hallmann, 1912: 245-247, pl.32, fig.2, text-fig.50.

Clathria conectens; Hallmann, 1920: 768; Hooper & Wiedenmayer, 1994: 259.

MATERIAL. LECTOTYPE: AMZ220: (dry) 16km E of Fraser I., Qld, 25°22'S, 153°07'E, 48-52m depth, coll. FIV 'Endeavour' (dredge). PARALECTOTYPE: AME1533 (dry; presently missing): same locality. OTHER MATERIAL: QUEENSLAND - QMG-300455, QMGL714 (fragment NTMZ1537), QMGL-2757 (fragment NTMZ1564), QMGL2770 (fragment NTMZ1581), QMG301037, QMG303190, QMG303217, QMG304980, QMG304985, QMG305135, QMG304005, QMG304016. NEW SOUTH WALES - QMG301387.

HABITAT DISTRIBUTION. *Acropora* coral reef, fringing rock reef, boulders, algal turf, wharf pylons; inshore waters, 4-80m depth; Green I., S. Direction I., Innisfail (FNQ), Fraser I., Mudjimba I., Moreton I., N. Stradbroke I., Moreton Bay (SEQ), and Byron Bay (N. NSW) (16-28S) (Fig. 36G).

DESCRIPTION. *Shape*. Massive, subcylindrical mass 40-65mm high, 85-120mm broad, composed of irregularly reticulate, lamellate bulbous branches, up to 15mm diameter, standing erect on substrate.

Colour. Live colouration bright orange-yellow to bright orange-red (Munsell 2.5YR 7/10-10R 6/10), brown in ethanol.

Oscules. Small oscules, up to 1.5mm diameter, on edges and tips surface bulbs.

Texture and surface characteristics. Surface uneven, porous, optically smooth.

Ectosome and subectosome. Ectosome with tangential or paratangential layer of thin subectosomal auxiliary subtylostyles, on or just below a membraneous dermal layer; subectosomal auxiliary styles confined entirely to peripheral skeleton; subectosomal skeleton virtually nonexistent, with only few erect, plumose choanosomal principal styles, arising from peripheral choanosomal spongin fibres, projecting into tangential ectosomal layer.

Choanosome. Choanosomal skeleton irregularly reticulate, with regular circular, oval or elongate meshes enclosing small oval choanocyte chambers; spongin fibres relatively heavy, without size differentiation of primary or secondary components, although ascending (primary) skeletal fibres cored by paucispicular or multispicular tracts of choanosomal styles, whereas connecting, transverse (secondary) fibres uni-, pauci- or entirely aspicular; echinating acanthostyles sparse, scattered evenly throughout skeleton, occasionally incorporated into fibres; mesohyl matrix very light, some choanosomal styles scattered between fibres; some specimens also incorporating detritus into mesohyl, but not into fibres.

Megascleres (Table 5). Choanosomal principal styles thin, fusiform, occasionally styloid, slightly curved, with rounded or very slightly subtylote, smooth bases.

TABLE 5. Comparison between present and published records of *Clathria* (*Clathria*) *conectens* (Hallmann). All measurements are given in μm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Lectotype (AMZ220)	Specimens (N=7)
Choanosomal principal styles	94-(168.4)-268 x 2.5-(4.1)-5	110-(171.4)-218 x 3-(4.3)-6
Subectosomal auxiliary styles	92-(171.3)-219 x 1.5-(2.9)-4	174-(230.6)-295 x 1.5-(2.4)-3.5
Echinating acanthostyles	48-(58.3)-65 x 3-(3.7)-5	36-(64.2)-78 x 2-(3.9)-5
Chelae	6-(7.2)-8	4.5-(6.7)-9
Toxas	22-(69.8)-111 x 0.5-(0.9)-1.5	51-(102.6)-164 x 0.5-(0.7)-1.0

Subectosomal auxiliary subtylostyles slightly curved, sometimes sinuous, exceedingly thin, hastate, almost vestigial, with very slightly subtylote, smooth bases.

Acanthostyles subtylote, with more-or-less evenly distributed vestigial (granular) spination.

Microscleres (Table 5). Palmate isochelae small, unmodified.

Toxas accolada rare, thin, with sharply angular central curvature and straight arms.

REMARKS. Specimen AMZ220 is designated lectotype (labelled 'cotype of *Wilsonella conectens*, duplicate of E1533') as the latter specimen is presently missing from AM collections. Despite Hallmann's (1912) remarks to the contrary *C.* (*C.*) *conectens* is clearly different from *C.* (*C.*) *angulifera* (see above), although both species do fit into his (erroneous) concept of *Wilsonella*. Moreover, in *C.* (*C.*) *conectens* the megascleres which core fibres (choanosomal styles) are differentiated from those occurring in the dermal skeleton (subectosomal styles), and although their geometry is very similar, they have very different morphology (see Fig. 36) and thickness (see Table 5). Each category of spicule is localised in the choanosomal and ectosomal regions, respectively, and they are not intermingled as supposed by Hallmann (1912). The entire spiculation of this species is reduced, and for that reason it is easily recognisable. This species is a common member of the Solanderian-Peronian biogeographical overlap zone centred around Moreton Bay, Queensland.

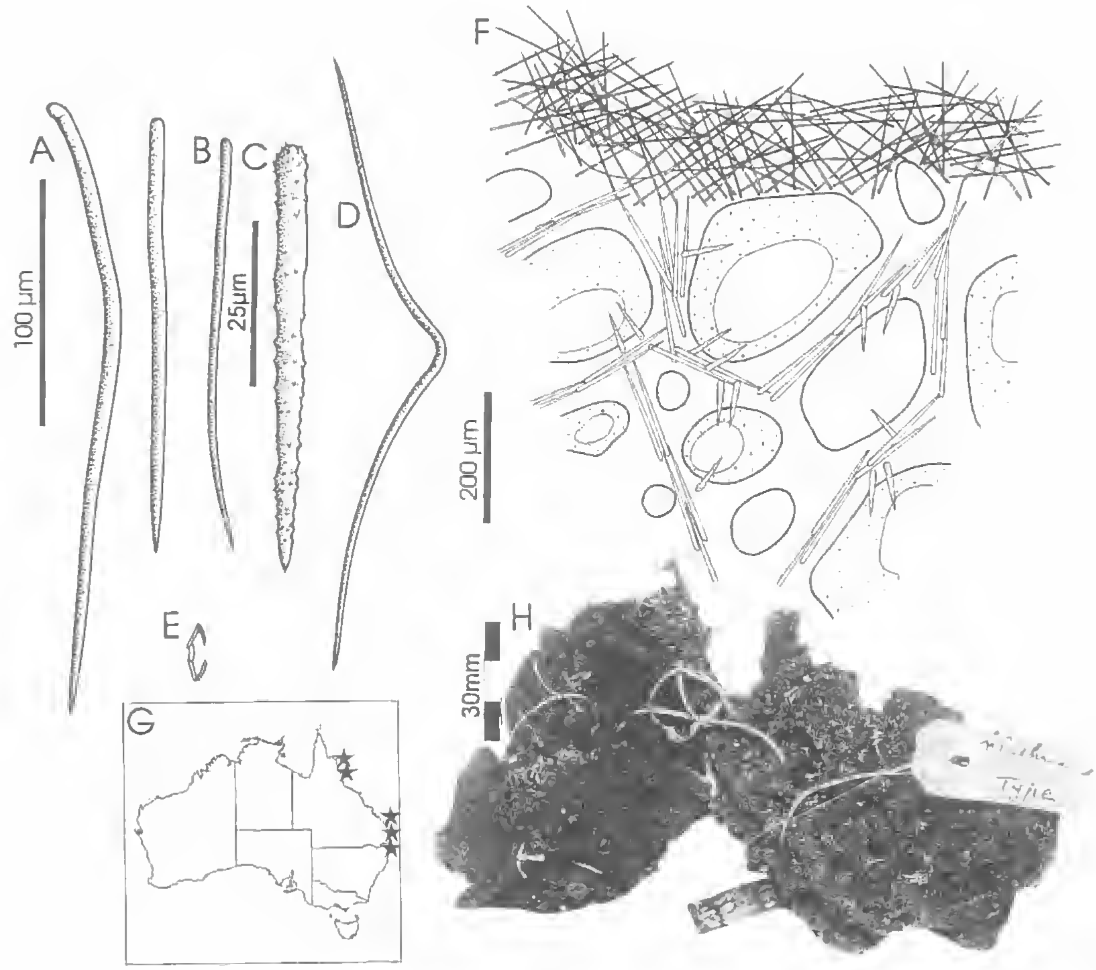

FIG. 36. *Clathria* (*Clathria*) *conectens* (Hallmann) (lectotype AMZ220). A, Choanosomal principal styles. B, Subectosomal auxiliary style. C, Echinating acanthostyle. D, Accolada toxa. E, Palmate isochela. F, Section through peripheral skeleton. G, Australian distribution. H, Lectotype.

Clathria (Clathria) crassa (Lendenfeld, 1887) (Figs 38-39)

Antherochalina crassa Lendenfeld, 1887b: 787, pl.22, fig.41.

Clathria crassa; Burton, 1934a: 558; Hooper & Wiedenmayer, 1994: 259.

Microciona or *Thalysias crassa*; de Laubenfels, 1936a: 112.

Not *Reniera crassa* Carter, 1876: 312.

Not *Aulena crassa*; Lendenfeld, 1889a: 101.

MATERIAL. HOLOTYPE: BMNH1886.8.27.450 (fragments AMG3460, AMZ1991): Port Jackson, NSW, 33°51'S, 151°16'E, other details unknown.

HABITAT DISTRIBUTION. Ecology unknown; central coast NSW.

DESCRIPTION. *Shape.* Thin fan, 230mm high, 190mm maximum width, up to 8mm thick, with short stalk, 25mm long, digitate margins.

Colour. Live colouration unknown, grey-brown in ethanol.

Oscules. Small pores seen on both faces of fan, 1-2mm diameter, with subdermal drainage canals surrounding oscules.

Texture and surface characteristics. Surface smooth, not optically hispid, with stellate sculpturing on both faces of fan (associated with aquiferous system); texture firm, flexible.

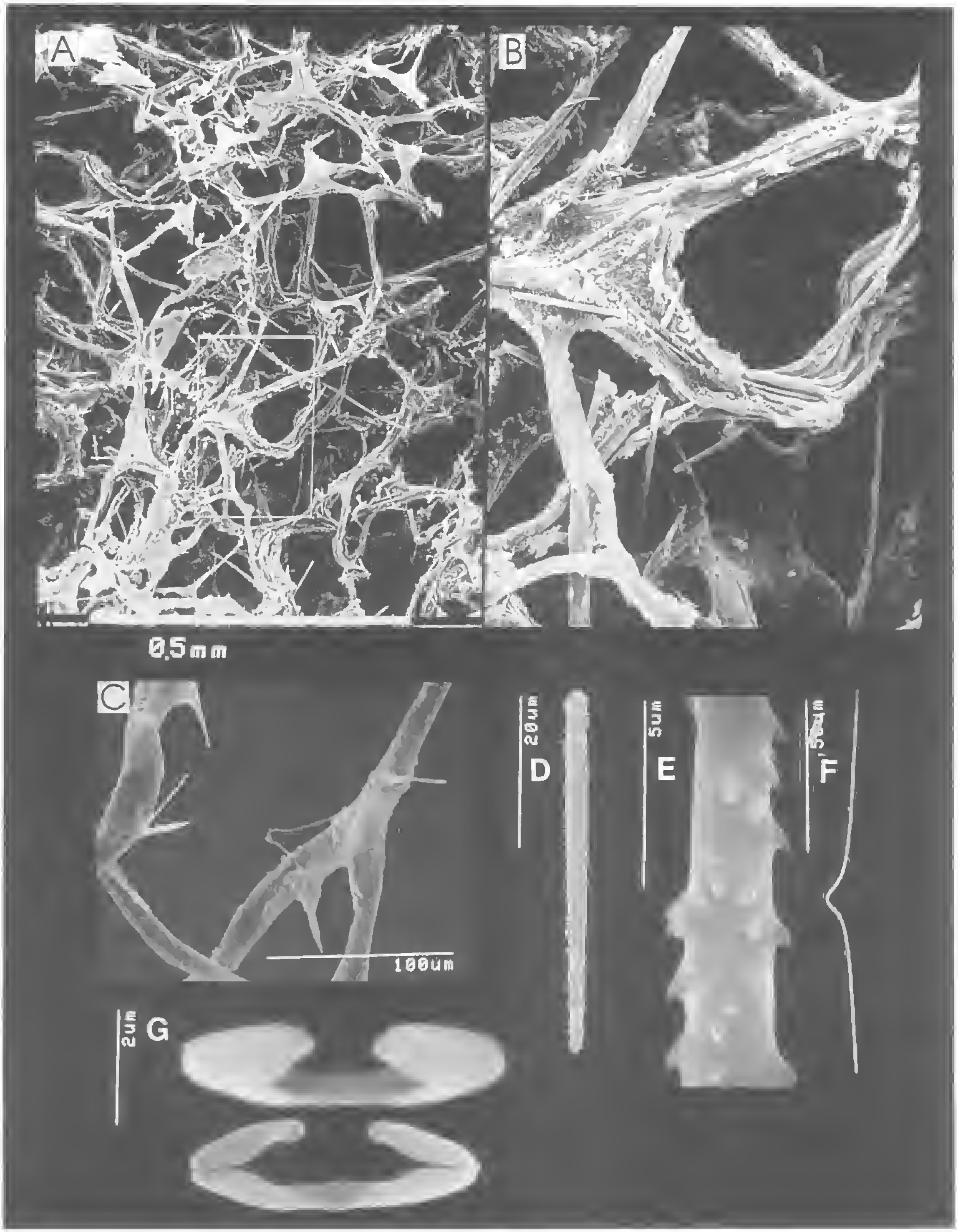

FIG. 37. *Clathria* (*Clathria*) *conectens* (Hallmann) (A-B, lectotype AMZ220; C-G, QMG303217). A, Choanosomal skeleton. B, Fibre characteristics. C, Choanosomal fibres. D, Echinating acanthostyle. E, Acanthostyle spines. F, Accolada toxa. G, Palmate isochelae.

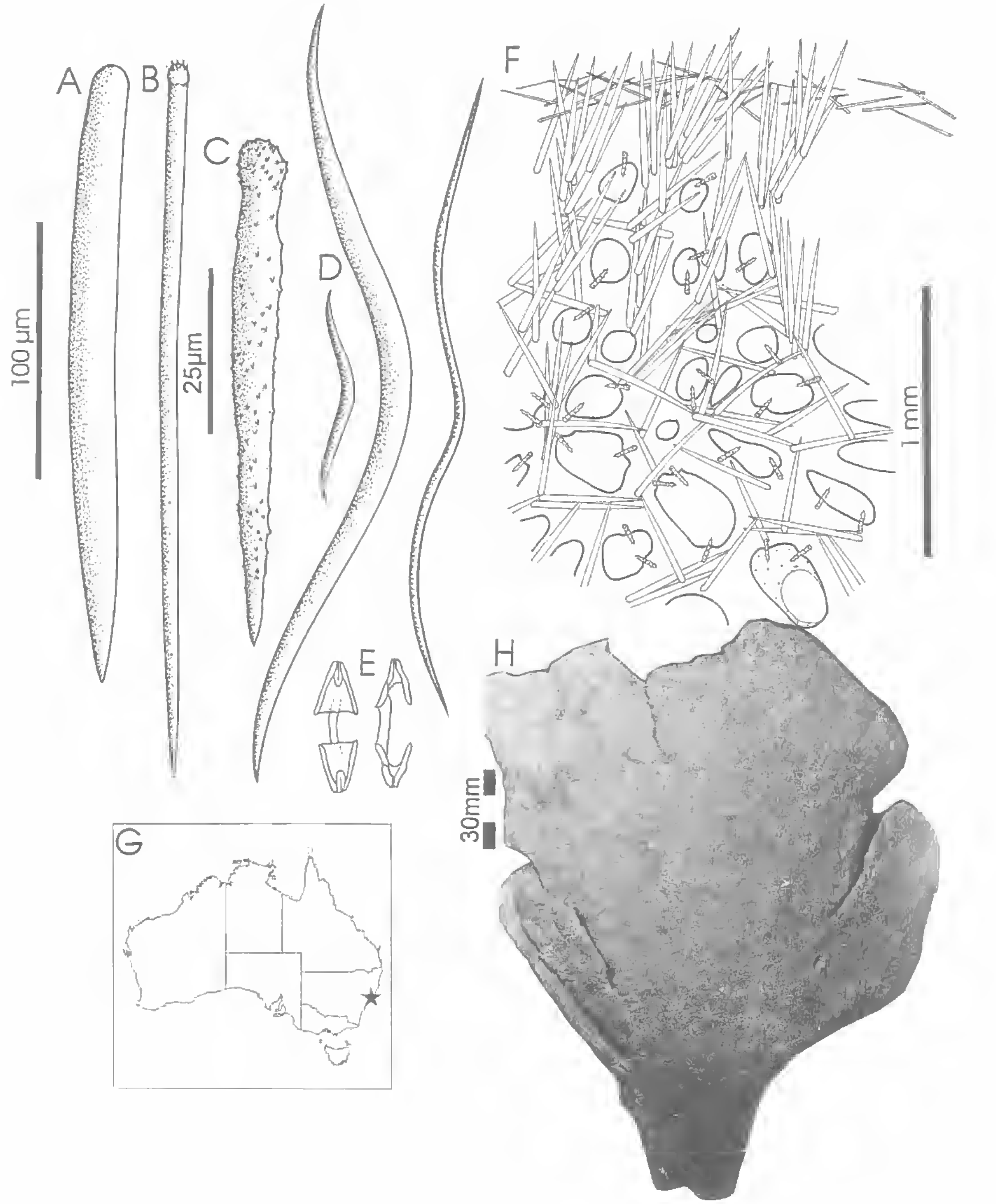

FIG. 38. *Clathria* (*Clathria*) *crassa* (Lendenfeld) (fragment of holotype AMZ1991). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyle. C, Echinating acanthostyle. D, Oxhorn toxas. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, holotype BMNH 1886.8.27.450.

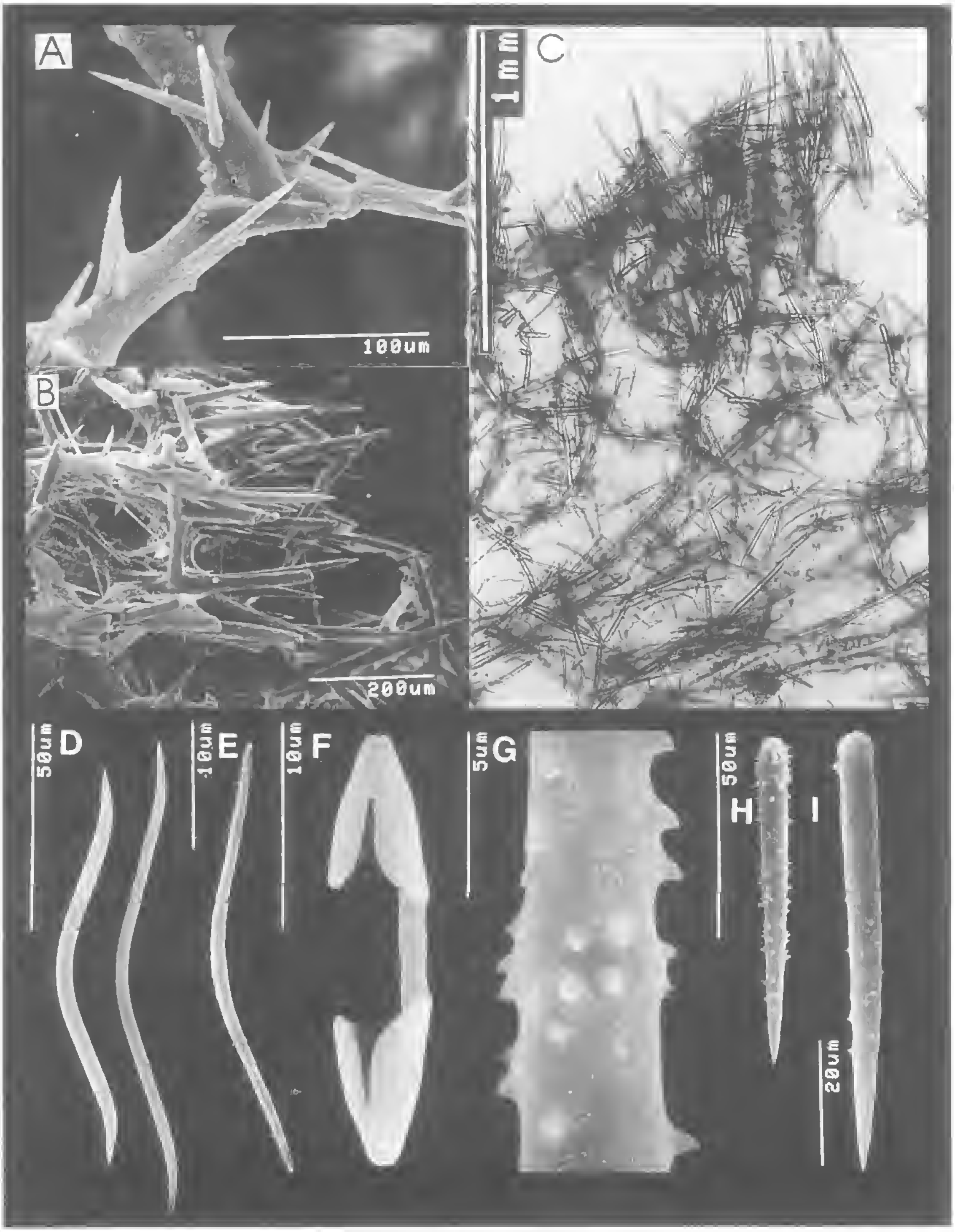

FIG. 39. *Clathria* (*Clathria*) *crassa* (Lendenfeld) (holotype BMNH1886.8.27.450). A, Fibre characteristics. B, Ectosomal region. C, Choanosomal skeleton. D, Oxhorn toxas. E, Smaller toxas intermediate between oxhorn and u-shaped. F, Palmate isochelae. G, Acanthostyle spines. H-I, Echinating acanthostyles.

Ectosome and subectosome. Ectosome microscopically hispid, with points of large choanosomal principal styles from peripheral fibres protruding through surface in plumose brushes; thin tangential layer of subectosomal auxiliary subtylostyles lying on or just below surface, at base of protruding choanosomal megascleres.

Choanosome. Choanosomal skeleton irregularly reticulate, with slightly renieroid axis and plumoreticulate extra-axis; spongin fibres in axis flattened, very heavy, running longitudinally through lamellae; axial fibres clearly divisible into primary (longitudinal) and secondary (ascending, connecting) components; primary fibres cored by paucispicular tracts of principal choanosomal styles; secondary fibres unispicular; extra-axial skeleton diverges from axis at an oblique angle, with moderately heavy fibres, divided into primary (multispicular, ascending) and secondary (unispicular, transverse) elements; choanosomal principal styles project from primary fibres in plumose tracts; secondary fibres connect ascending primary lines, producing reneiroid reticulation, except at periphery where architecture is distinctly plumose; echinating acanthostyles moderately common, evenly distributed throughout skeleton; mesohyl matrix abundant, containing few microscleres but few loose megascleres.

Megascleres. Choanosomal principal styles thick, fusiform, slightly curved, with rounded or slightly subtylote, smooth bases. Length 184-(292.3)-463µm, width 9-(17.3)-22µm.

Subectosomal auxiliary subtylostyles thick, straight, fusiform, with microspined subtylote bases. Length 118-(226.7)-316µm, width 3-(4.8)-6µm.

Acanthostyles short, thick, subtylote or rounded, with evenly dispersed vestigial (granular) spination. Length 51-(66.3)-82µm, width 5-(6.5)-9µm.

Microscleres. Palmate isochelae large, unmodified. Length 17-(19.5)-23µm.

Toxas oxhorn, thick, with rounded central curvature, slightly reflexed points although the smaller ones may lack reflexed points and are intermediate between oxhorn and u-shaped forms. Length 28-(68.0)-112µm, width 0.8-(2.6)-4.5µm.

REMARKS. Burton (1934a) designated *A. crassa* type species of *Antherochalina*, and subsequently declared that the genus was a synonym of *Clathria*. Lendenfeld's (1887b) brief description of *A. crassa* is vague and not very useful in distinguishing it from other *Clathria*, but type material is still extant and recognisable. However, there is little agreement between characters in the type material and as described by Lendenfeld. *C.* (*C.*) *crassa* is very closely related to *C.* (*C.*) *arcuophora*, with similar skeletal architecture (with 2 components, renieroid and plumoreticulate), spicule geometry, spicule sizes, similar fibre characteristics and comparable growth forms. It is possible that the two species are synonyms, but their formal merger is not warranted on the basis of the existing relatively poor material. Similarly *C.* (*C.*) *crassa* shows some similarities with *C.* (*Isociella*), particularly to *C.* (*I.*) *eccentrica*. This resemblance is mostly due to the renieroid axial skeletal architecture and geometry of both principal and auxiliary styles.

Clathria (Clathria) decumbens Ridley, 1884
(Figs 40-41)

Clathria decumbens Ridley, 1884a: 612, pl.53, fig.k, pl.54, fig.g-g'; Ridley & Dendy, 1887: 148; Burton, 1938a: 29, pl.3, fig.23; Hooper & Wiedenmayer, 1994: 259.
Wilsonella decumbens; Hallmann, 1912: 239.

MATERIAL. HOLOTYPE: BMNH1882.10.17.51: Boudouse and Etoile Is, Amirante Is Group, Indian Ocean, 6°S, 53°10'E, coll. HMS 'Alert' (dredge). PARATYPES: BMNH1882.10.17.71, 1882.10.17.76: same locality. OTHER MATERIAL: QUEENSLAND - BMNH1887.5.2.139.

HABITAT DISTRIBUTION. 6-26m depth; on sand and coral rubble substrate; Cape York, Torres Strait (FNQ) (Fig. 40F) (Ridley, 1884a), W. Indian Ocean (Ridley & Dendy, 1887), Madras (Burton, 1938a).

DESCRIPTION. *Shape.* Small, subcylindrical, irregularly lobate, 32-50mm long, 15-40mm wide, up to 25mm thick.

Colour. Brown to red-brown in ethanol.

Oscules. Numerous small oscules, 1-2mm diameter, dispersed between surface conules.

Texture and surface characteristics. Surface rugose, irregularly conulose, with canals, grooves and ridges meandering over the surface.

Ectosome and subectosome. Ectosome membraneous between ridges and surface projections, with spongin fibres from choanosome producing a dermal reticulation; dermal region lacks a mineral skeleton entirely; spongin fibres in subectosomal region closely reticulate, with relatively small mesh sizes.

Choanosome. Choanosomal skeletal architecture regularly to irregularly reticulate; spongin fibres moderately heavy, undifferentiated into primary or secondary lines, lightly cored by paucispicular tracts of both choanosomal principal styles and subectosomal auxiliary styles; heavily echinated by acanthostyles; coring spicules in peripheral fibres ascend to surface, piercing surface processes in light brushes; subectosomal auxiliary subtylostyles also sparsely scattered within mesohyl; fibre meshes in choanosomal skeleton cavernous; mesohyl matrix abundant, lightly pigmented.

Megascleres. Choanosomal principal styles straight or slightly curved near base, hastate points, with evenly rounded bases, smooth or with microspines on both points and bases. Length 128-(156)-176µm, width 4-(4.9)-6µm.

Subectosomal auxiliary subtylostyles straight, with hastate points, slightly subtylote bases, bases smooth or occasionally microspined. Length 159-(1177.8)-193µm, width 2-(3.7)-6µm.

Acanthostyles subtylote, with strongly formed, recurved spines over apical end, shaft and base but bare neck. Length 62-(83.2)-104µm, width 4-(6.2)-8µm.

Microscleres. Palmate isochelae unmodified, two discrete size classes, the smaller showing variation in fusion of alae. I: Length 14-(20.4)-28µm. II: length 5-(7.4)-10µm.

Toxas absent.

REMARKS. Hallmann (1912) referred this species to *Wilsonella*, presumably because Ridley (1884a) did not differentiate between choanosomal (principal) and subectosomal (auxiliary) megascleres. Subsequently, Burton (1938a) described additional specimens from Madras which had differentiated principal and auxiliary spicules (but were otherwise identical with Ridley's (1884) description). In type material there were consistent morphological differences between principal and auxiliary spicules, confirming that the species should be retained in *Clathria* (*Clathria*).

Although *C.* (*C.*) *decumbens* has been described from three widely separated localities, it remains poorly known, being only poorly differentiated from other low growing, lobate *Clathria* species. The species is similar to *C.* (*Thalysias*) *major* (with spines on both the bases and points of some of its megascleres), while at the same time being similar to species in the '*juniperina*' species complex (i.e., *Clathria* in which the geometry of choanosomal principal and subectosomal auxiliary spicules is barely different), but the species has little else of distinction.

Clathria (Clathria) echinonematissima
(Carter, 1881)

Wilsonella echinonematissima Carter, 1881a: 366; Carter, 1887: 210; Hallmann, 1912: 243.

Clathria echinonematissima; Dendy, 1896: 33, 34; Hooper & Wiedenmayer, 1994: 259.

MATERIAL. HOLOTYPE: BMNH not found (slide containing only a desilicified section is the only type material known to exist): Westernport Bay, 38°26'S, 145°08'E, or Port Phillip, Vic, 38°09'S, 144°52'E, coll. J.B. Wilson (dredge).

HABITAT DISTRIBUTION. Ecology unknown; Victoria.

DESCRIPTION. *Shape.* Massive.

Colour. Unknown.

Oscules. Unknown.

Texture and surface characteristics. Unknown.

Ectosome and subectosome. Ectosomal skeletal tracts heavily cored with detritus, megascleres excluded.

Choanosome. Choanosomal skeleton irregularly reticulate, with relatively heavy spongin fibres; fibres of peripheral skeleton are solely arenaceous, whereas within choanosome fibres cored by subectosomal auxiliary styles; echinating acanthostyles dispersed throughout skeleton.

Megascleres. Choanosomal principal megascleres apparently absent.

Subectosomal auxiliary subtylostyles with smooth bases. Length 210µm, width 4µm.

Acanthostyles apparently divided into two size categories. Length from 145µm, width 8.3µm.

Microscleres. Isochelae arcuate. Length 25µm.

Toxas absent.

REMARKS. This species is barely recognisable as *Clathria* from Carter's (1881) description, and it is only poorly differentiated from other microcionid species. One category of auxiliary spicule and the absence of choanosomal principal spicules places it in *Wilsonella* (sensu Hallmann, 1912). It also was described with arcuate isochelae, similar to species grouped by Hallmann (1920) in *Paradoryx*, but this is uncorroborated. *Clathria echinonematissima* is a *species inquirendum* as it is only known from a slide preparation, now desilicified, allegedly made from the missing holotype.

Clathria (Clathria) hispidula (Ridley, 1884)
(Figs 42-43)

Amphilectus hispidulus Ridley, 1884a: 429-430, pl.40, fig.c, pl.41, fig.y.

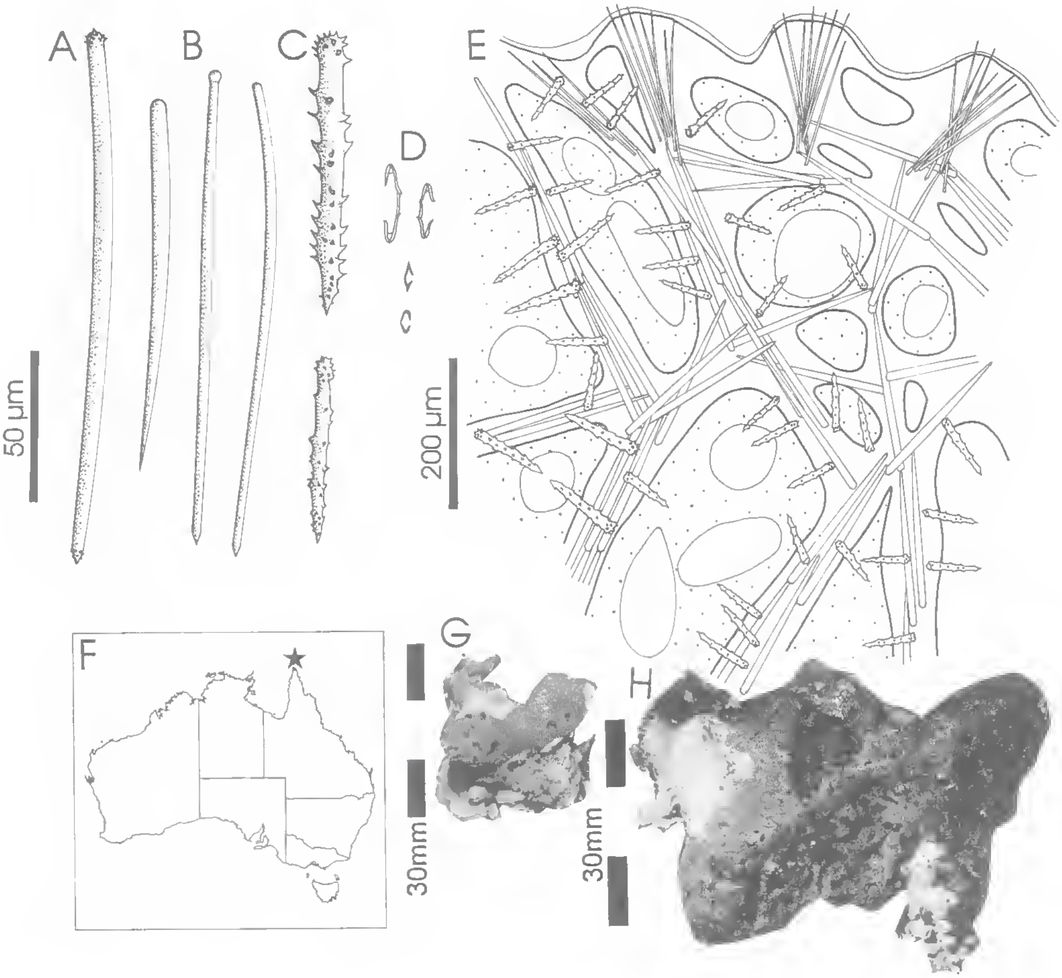

FIG. 40. *Clathria (Clathria) decumbens* Ridley (paratype BMNH1882.10.17.71). A, Choanosomal principal styles. B, Subectosomal auxiliary styles/subtylostyles. C, Echinating acanthostyles. D, Palmate isochelae. E, Section through peripheral skeleton. F, Australian distribution. G, Holotype BMNH1882.10.17.51. H, Paratype.

Axociella hispidulus; de Laubenfels, 1936a: 114.
Esperiopsis hispidula var. *ramosa*; Hentschel, 1911: 313.
Not *Hymeraphia hispidula* Topsent, 1904a: 164-165, pl.14, fig.2.

MATERIAL. LECTOTYPE: BMNH1881.10.21.261: Thursday I., Torres Strait, N. Qld, 10°35'S, 142°13'E, 6-10m depth. 01.vi.1881, coll. HMS 'Alert' (dredge). PARALECTOTYPE: BMNH1881.10.21.319: same locality (dry). OTHER MATERIAL: WESTERN AUSTRALIA - ZMB4408.

HABITAT DISTRIBUTION. Encrusting on bivalves, hydroids, and gorgonians and algae; 6-11m depth; Torres Strait (FNQ), and Shark Bay (WA) (Fig. 42G).

DESCRIPTION. *Shape.* Erect, irregular branching reticulate mass of clathrous digits, up to 60mm long, 55mm diameter.

Colour. Live colour unknown, light brown in ethanol.

Oscules. Small oscules, <2mm diameter in preserved material, scattered over lateral margin.

Texture and surface characteristics. Harsh, compressible, slightly elastic; surface with meandering irregular ridges and microconules scattered over branches, and tips of fibres from primary skeleton protruding.

Ectosome and subectosome. Sparse paratangential skeleton of subectosomal auxiliary subtylos-

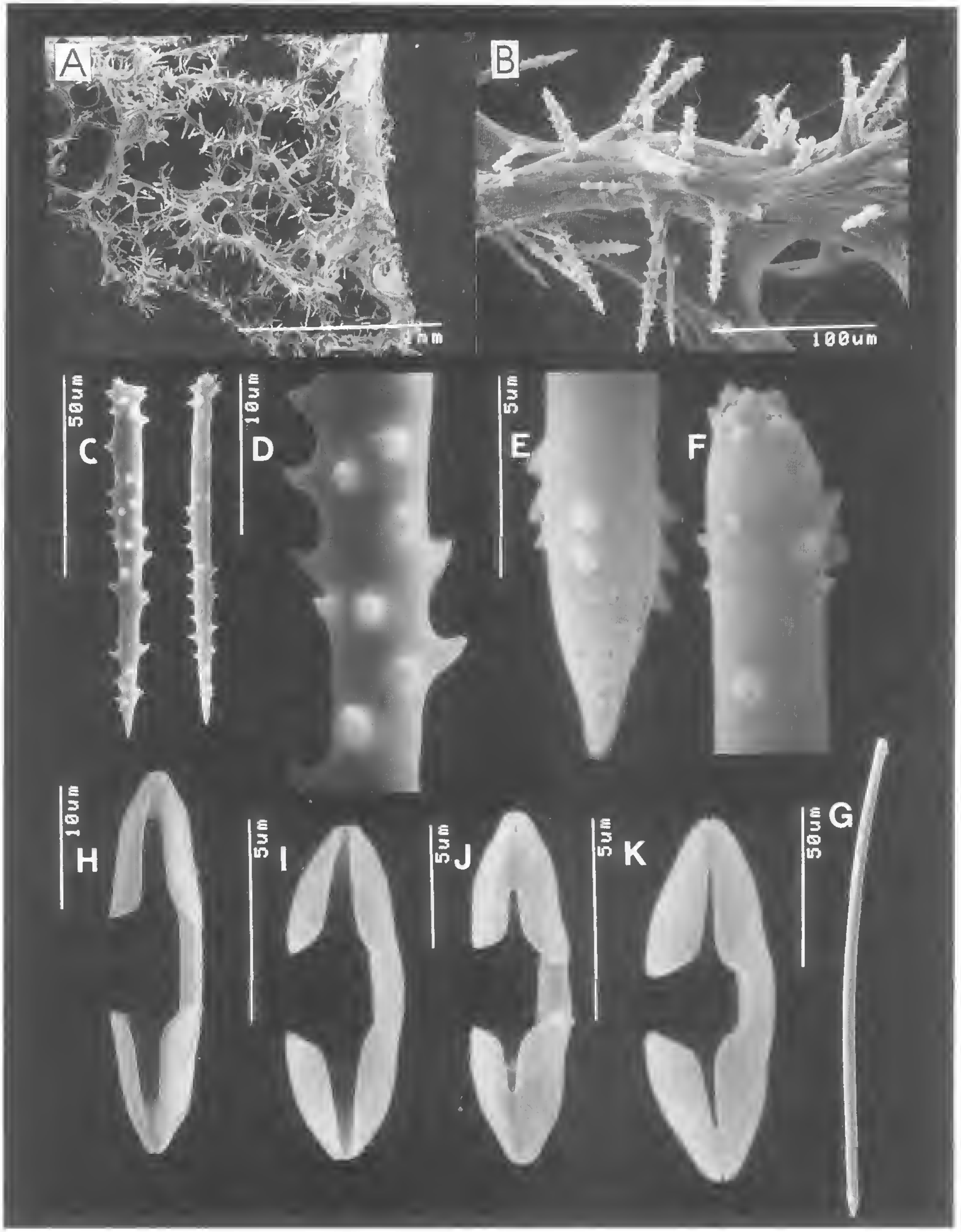

FIG. 41. *Clathria* (*Clathria*) *decumbens* Ridley (paratype BMNH1882.10.17.71). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyles. D, Acanthostyle spines. E-F, Terminations of principal styles. G, Principal styles. H-K, Palmate isochelae.

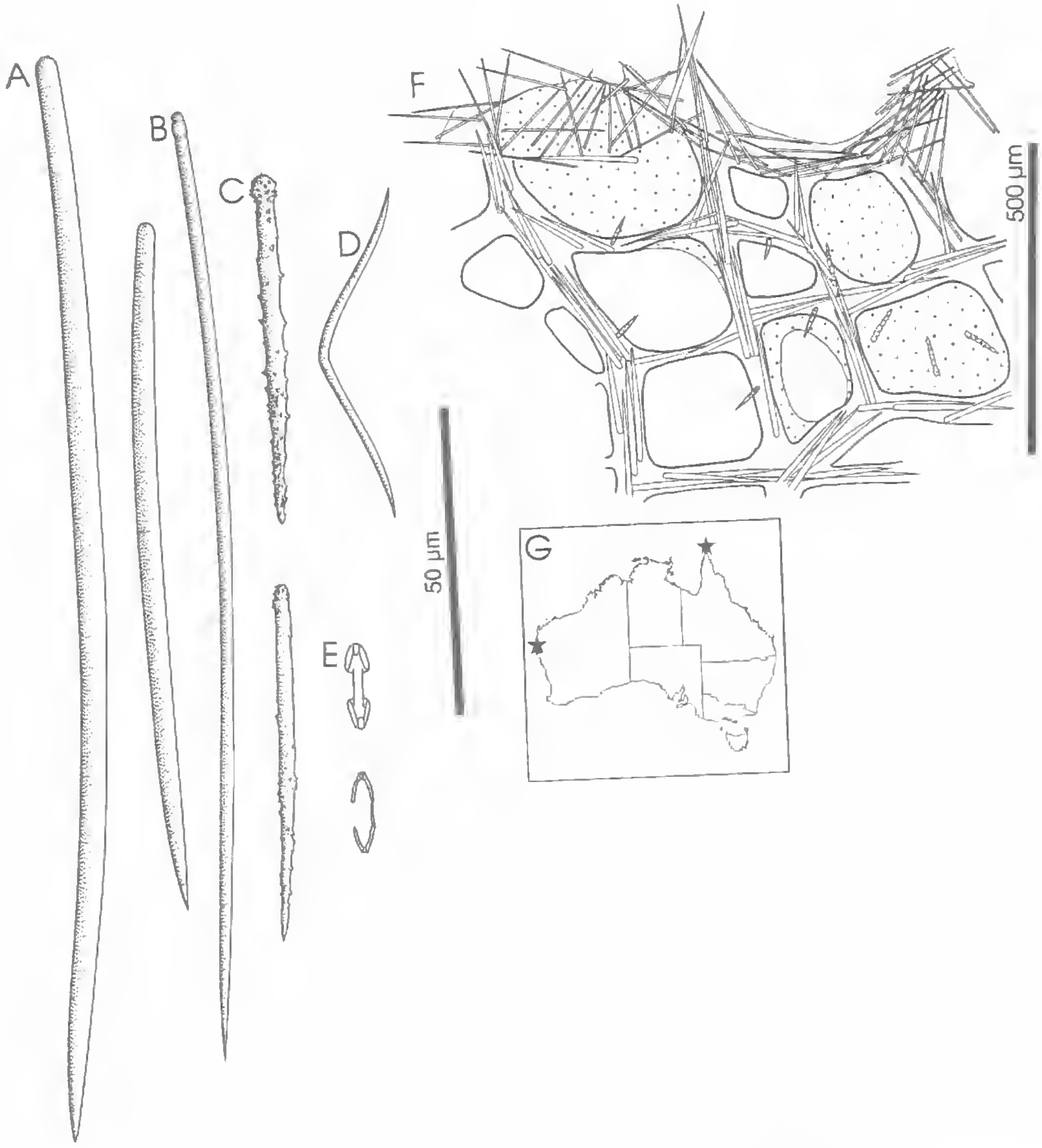

FIG. 42. *Clathria* (*Clathria*) *hispidula* (Ridley) (lectotype BMNH1881.10.21.261). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyle. C, Echinating acanthostyles. D, Wing-shaped toxas. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution.

tyles forming bundles or lying more-or-less erect on the surface, particularly on ends of surface conules; tips of conules with choanosomal principal styles also protruding only short distance through surface; choanosomal fibres immediately below surface skeleton with poorly developed subectosomal region.

Choanosome. Skeleton regularly reticulate, slightly renieroid, with thin but well developed spongin fibres forming oval or rectangular, relatively wide meshes, 150-350µm diameter, generally more cavernous in axis than in peripheral region; spongin fibres 20-70µm diameter, imperfectly divided into primary, ascending, multispicular tracts of 4-10 spicules per tract, interconnected by uni-, pauci- or aspicular secondary transverse tracts; fibres cored by choanosomal principal styles not occupying en-

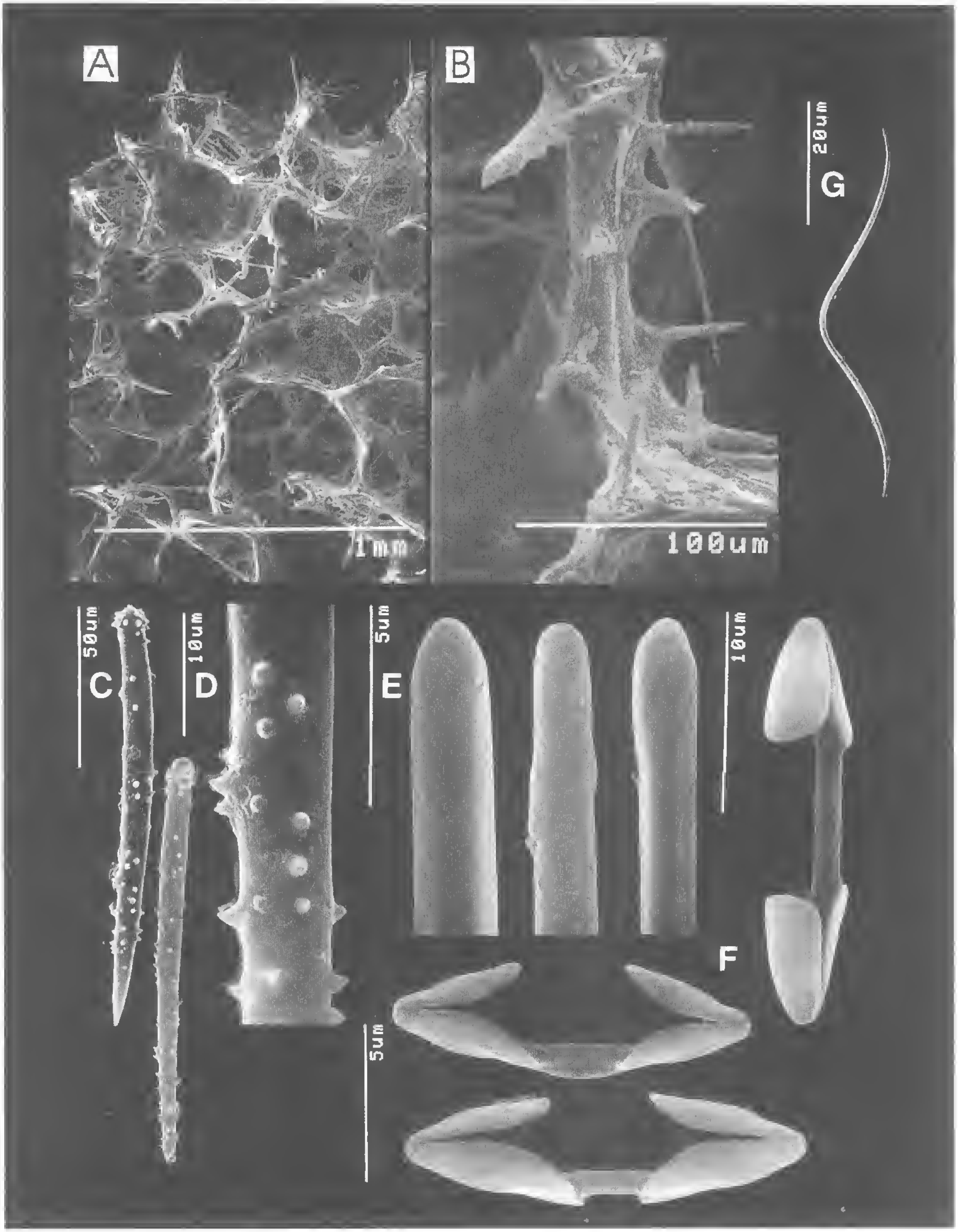

FIG. 43. *Clathria* (*Clathria*) *hispidula* (Ridley) (lectotype BMNH1881.10.21.261). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyles. D, Acanthostyle spination. E, Terminations of auxiliary spicules. F, Palmate isochelae. G, Wing-shaped toxa.

tire fibre diameter, and sparsely echinated by slender acanthostyles; mesohyl matrix light containing scattered microscleres and some auxiliary megascleres.

Megascleres. Choanosomal principal styles slender, straight or slightly curved midway along shaft, with evenly rounded smooth bases and fusiform points. Length 88-(162.7)-219µm, width 4-(4.8)-6µm.

Subectosomal auxiliary subtylostyles similar in geometry to principal spicules, but more slender and with subtylote bases; thinner (younger) principal spicules frequently sinuous. Length 94-(143.0)-175µm, width 2-(3.4)-5µm.

Echinating acanthostyles club-shaped, slender, slightly subtylote, evenly spines or with bare 'neck' below base, fusiform or rounded points, granular spination. Length 52-(59.4)-65µm, width 2-(4.1)-5µm.

Microscleres. Palmate isochelae very abundant, small, unmodified, with lateral alae completely fused to shaft and front ala entire; lateral and front alae of approximately equal length. Length 9-(11.6)-13µm.

Toxas uncommon, small, thick, wing-shaped, with rounded central curve and slightly reflexed arms. Length 17-(56.8)-104µm, width 1.5-(2.1)-3µm.

REMARKS. This species has not yet been rediscovered from either of the known locations of early collections, and it remains relatively poorly known from museum specimens. Surprisingly, both Ridley (1884a) and Hentschel (1911) failed to describe several spicule types present in their respective material, particularly echinating acanthostyles which are uncommon but certainly present, as well as auxiliary subtylostyles and less common toxa microscleres. Furthermore, Hentschel's material essentially differs from Ridley's only in the specific dimensions of spicules and growth form (being more elongate, branching), and it is not considered to be necessary to recognise the subspecific taxon proposed by Hentschel (1911) for the WA population.

Although the identity of this species has never been been clearly established from either published record, it is obviously a *Clathria* with relatively cavernous skeletal architecture and standard spiculation. It is similar to *C.* (*C.*) *angulifera* (Dendy) from Victoria and southern Queensland, and *C.* (*T.*) *aphylla* from the Houtman Abrolhos, in having a cavernous, slightly renieroid skeletal structure ('*angulifera*' species group), differing in the protruding fibrous ectosomal skeleton, spicule geometries (e.g., toxas, acanthostyles), a more-or-less branching growth form (cf. lobate lamellate and foliose lamellate, respectively), and spicule sizes.

Clathria (Clathria) inanchorata Ridley & Dendy, 1886 (Figs 44-45, Table 6)

Clathria inanchorata Ridley & Dendy, 1886: 475; Ridley & Dendy, 1887: 150, pl.28, fig.4, pl.29, fig.13; cf. Kieschnick, 1896: 533; cf. Thiele, 1903a: 959; Whitelegge, 1907: 492-495; Hallmann, 1912: 206, 211, 214, 215; Hooper & Wiedenmayer, 1994: 259.

Pseudanchinoe inanchorata; de Laubenfels, 1936a: 109.

cf. *Microciona prolifera*; Vosmaer, 1935a: 610, 635, 665.

MATERIAL. HOLOTYPE: BMNH1887.5.2.99: Bass Strait, Tas, 36°59'S, 150°20'E, 4.iv.1874, coll. HMS 'Challenger' (trawl). OTHER MATERIAL: NSW - AMG5675, AMZ131, AMZ1413, AMZ1414.

HABITAT DISTRIBUTION. Depth 110-300m, substrate mud; Bass Strait (Tas) (Ridley & Dendy, 1886), S. coast (NSW) (Whitelegge, 1907). Ternate, Moluccas, Indonesia (Kieschnick, 1896).

DESCRIPTION. *Shape.* Erect, irregularly cylindrical digits, 38-120mm high, 8-12mm diameter, encrusting on organic debris or standing free in substrate.

Colour. Grey- or yellow-brown preserved.

Oscules. Numerous oscules, up to 2.5mm diameter, scattered over branches.

Texture and surface characteristics. Surface rugose, reticulate, minutely hispid; texture firm, flexible.

Ectosome and subectosome. Ectosomal skeleton prominently hispid, with choanosomal principal megascleres from peripheral fibres protruding a long way through surface, and with a sparse tangential layer of subectosomal auxiliary megascleres dispersed between erect principal spicule brushes; subectosomal skeleton plumose, undifferentiated from choanosomal fibres which are immediately subdermal.

Choanosome. Choanosomal skeleton irregularly reticulate, with relatively heavy spongin fibres incompletely divided into primary ascending and secondary transverse components; secondary fibres uncored, lightly echinated by small acanthostyles; primary fibres contain sparse tracts of subectosomal auxiliary subtylostyles, identical to those occurring in the ectosomal skeleton, enclosed completely within spongin fibres, together with plumose brushes of choanosomal

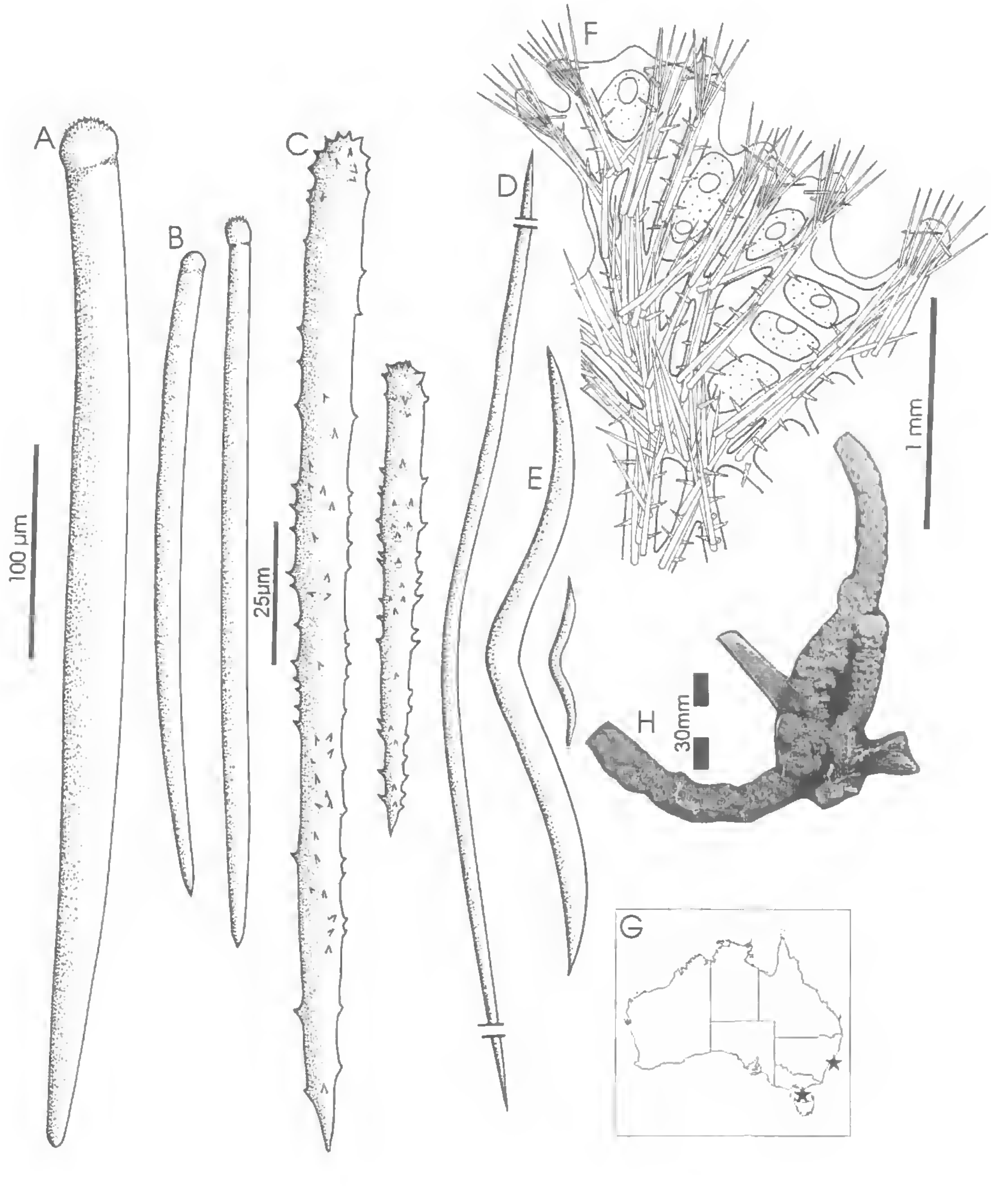

FIG. 44. *Clathria* (*Clathria*) *inanchorata* Ridley & Dendy (holotype BMNH1887.5.2.99). A, Choanosomal principal subtylostyles. B, Subectosomal auxiliary subtylostyle. C, Echinating acanthostyles. D, Accolada toxa. E, Oxhorn toxas. F, Section through peripheral skeleton. G, Australian distribution. H, Holotype.

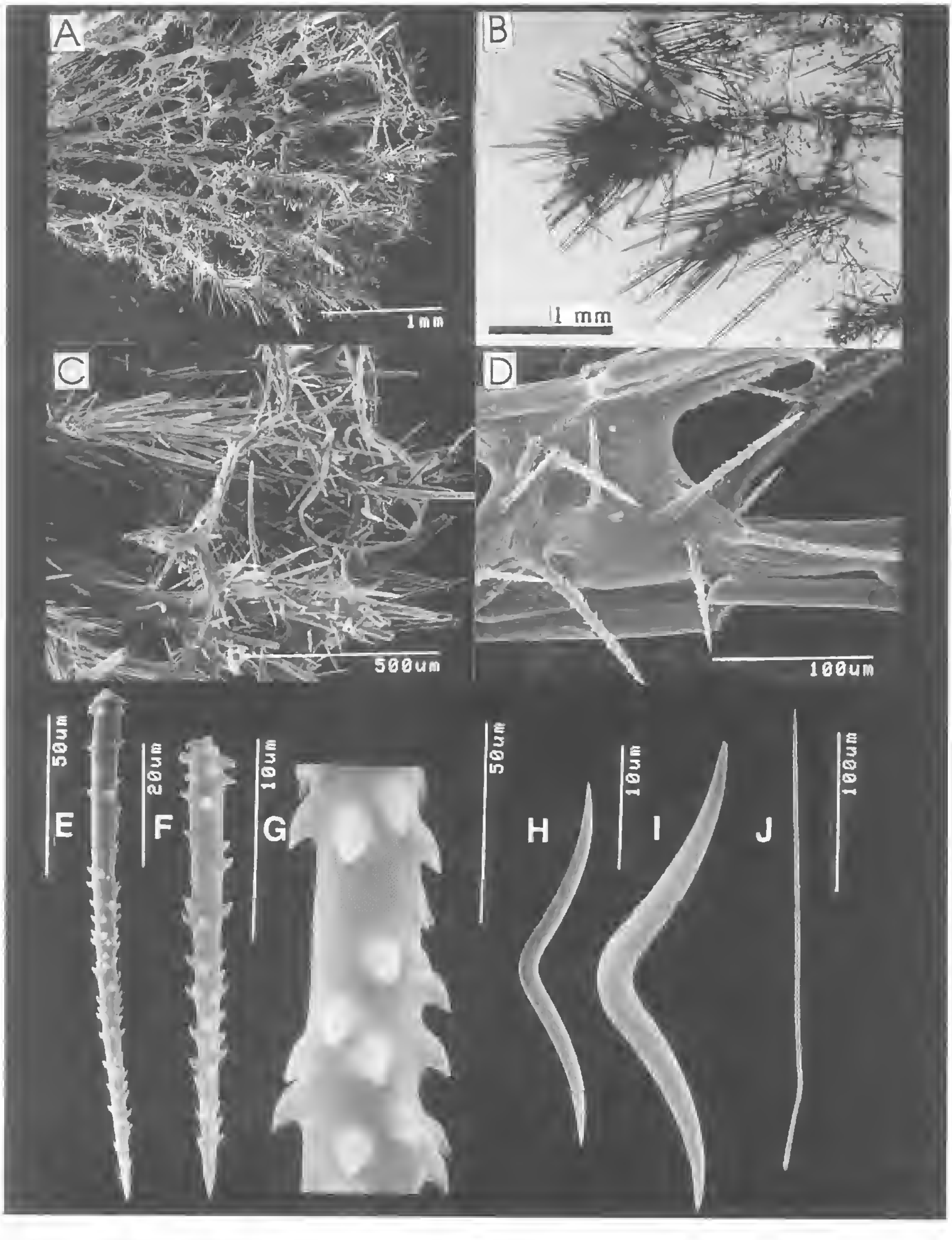

FIG. 45. *Clathria* (*Clathria*) *inanchorata* Ridley & Dendy (holotype BMNH1887.5.2.99). A, Choanosomal skeleton. B, Ectosomal spicule bundles. C, Ectosomal skeleton. D, Fibre characteristics. E, Echinating acanthostyle. F, Smaller echinating acanthostyle. G, Acanthostyle spination. H-I, Oxhorn toxas. J, Portion of accolada toxa.

TABLE 6.Comparison between present and published records of *Clathria* (*Clathria*) *inanchorata* Ridley & Dendy. All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Holotype (BMNH1887.5.2.99)	Specimens (N=4)
Choanosomal principal styles	292-(417.6)-535 x 8-(18.4)-28	273-(384.5)-540 x 12-(17.8)-25
Subectosomal auxiliary styles	252-(328.6)-432 x 3-(8.2)-11	290-(341.8)-410 x 3-(8.5)-12
Echinating acanthostyles I	58-(66.4)-78 x 3-(5.2)-7	58-(75.2)-88 x 4-(5.4)-7
Echinating acanthostyles II	118-(150.2)-175 x 4-(7.4)-11	119-(169.3)-228 x 6-(8.8)-12
Chelae	absent	absent
Toxas I	35-(73.8)-121 x 1.5-(2.0)-3	22-(66.2)-105 x 1.5-(3.4)-5
Toxas II	118-(349.2)-478 x 1.5-(2.1)-2.5	304-(408.3)-545 x 1.5-(2.1)-3

principal styles usually poking out of fibres; choanosomal principal styles, protruding through spongin fibres, together form multispicular ascending plumose tracts, also lightly echinated by acanthostyles; fibre anastomoses form circular to oval, cavernous meshes; mesohyl matrix very light, with few megascleres dispersed between fibres.

Megascleres (Table 6). Choanosomal principal styles long, thick, fusiform, slightly curved, with rounded or slightly subtylote, smooth or minutely microspined bases.

Subectosomal auxiliary subtylostyles straight, relatively thick, robust, almost hastate, with slightly subtylote microspined bases.

Acanthostyles very variable in size, with slightly subtylote bases, incompletely separated into two size classes with some intermediate examples. Smaller morph usually straight, often with aspinose necks, whereas larger morphs slightly curved, with evenly distributed large spines.

Microscleres. (Table 6). Isochelae absent.

Toxas clearly separated into two morphs - I: most common form are oxhorn toxas, small, relatively thick, with large, rounded or slightly angular curvature at centre, and reflexed points. II: Less frequent are accolada toxas, long, thin, sharply angular at centre, unreflexed arms.

REMARKS. This species has a distinctive growth form, spicule geometry, and spongin fibre characteristics, but otherwise it is similar to other species included in Hallmann's (1912) '*spicata*' group, particularly *C.* (*T.*) *costifera* and *C.* (*C.*) *caelata*. There is no doubt that Whitelegge's (1907) specimens from Wollongong are conspecific although this claim was disputed by Hallmann (1912: 206). Kiescknick's (1896) record of this species from Indonesia is dubious, since his material was not described and could possibly be any one of these '*spicata*'-like sponges. Thiele (1903a) compared Kieschnick's specimen with *C.* (*T.*) *coralliophila* from the same region, but that comparison is misleading: both taxa have quite different spiculation and spongin fibre characteristics.

Clathria (Clathria) kylista Hooper & Lévi, 1993
(Figs 46-47, Plate 1C, Table 7)

Clathria (*Clathria*) *kylista* Hooper & Lévi, 1993a: 1265-1267, figs 21-22, table 11; Hooper & Wiedenmayer, 1994: 259.

MATERIAL. HOLOTYPE: QMG300035: Inner Gneering Shoals, off Mooloolaba, Qld., 26°38.5'S, 153°09.5'E, 10m depth, 10.xii.1991, coll. J.N.A. Hooper & S.D. Cook (SCUBA). PARATYPE: QMG300690 (ORSTOM R1338; fragment NTMZ3876): N. entrance, Récif des Cinq Milles, SW. New Caledonia lagoon, 22°29.3'S, 166°44.4'E, 8m depth, 30.iv.1976, coll. G. Bargibant (SCUBA). OTHER MATERIAL: QUEENSLAND – QMG-303166.

HABITAT DISTRIBUTION. 8-20m depth; on rock pinnacles, in caves and coral rubble substrates; Mooloolaba and Moreton I. (SEQ) (Fig. 46F). New Caledonia (Hooper & Lévi, 1993a).

DESCRIPTION. (See Hooper & Lévi, 1993a).

DIAGNOSIS. (refer to Table 7 for spicule dimensions) Simple digitate, tubular or bulbous, erect, branching growth form; dark orange to pale orange alive; terminal osculum on single tubes and oscules scattered over the apical regions of more complex lobate digitate growth forms; oscules surrounded by membraneous lip; prominently conulose surface with large, bulbous tubercles; ectosome membraneous, with sparse, tangential layer of subectosomal auxiliary styles and erect brushes of auxiliary spicules scattered throughout both peripheral and subectosomal regions; choanosomal skeleton plumoreticulate with differentiated primary and secondary fibres; primary fibres ascending, paucispicular occupying only small proportion of fibre diameter, cored by principal spicules with fewer auxiliary megascleres interdispersed; secondary fibres transverse, uni- or aspicular; echinating styles

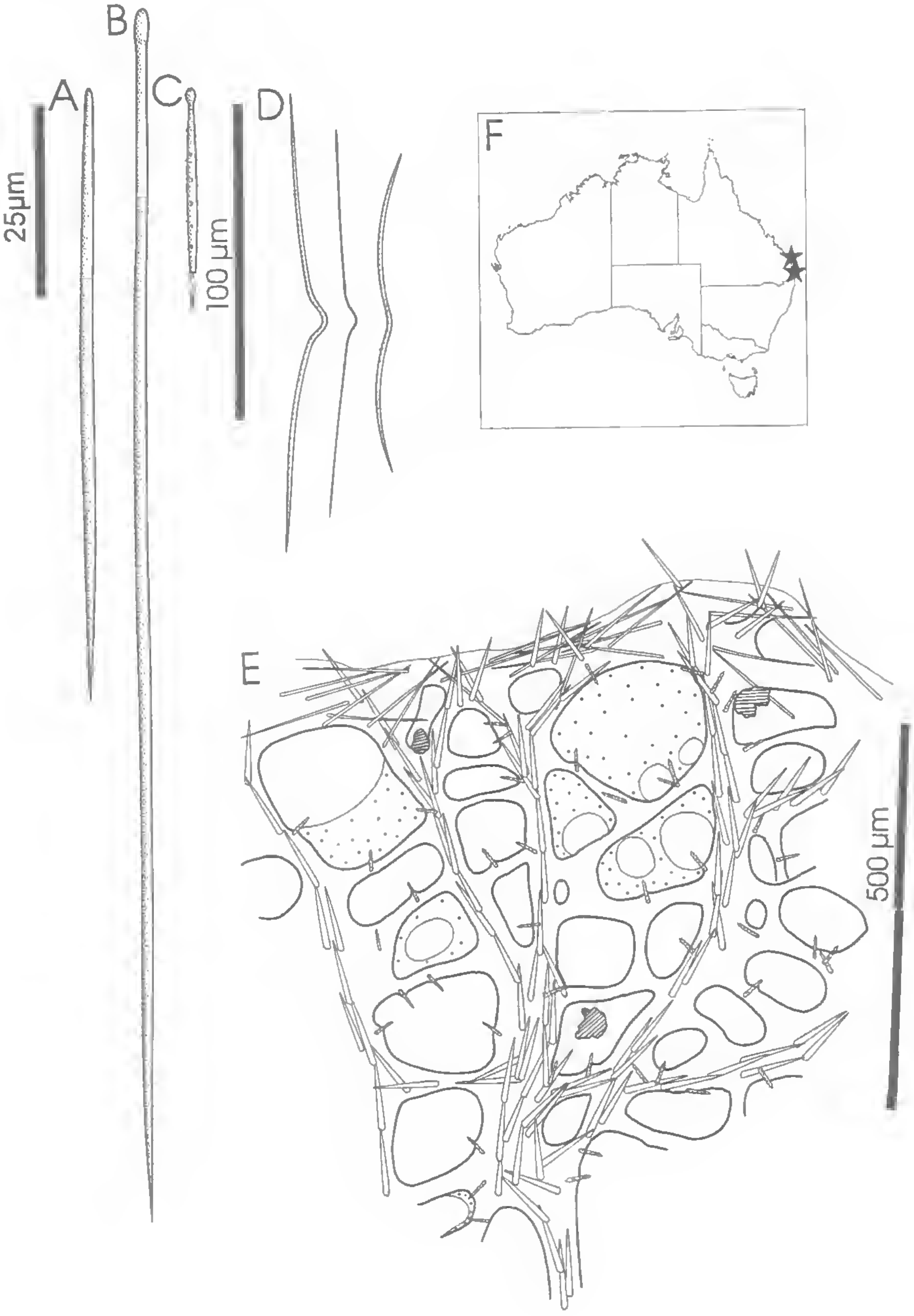

FIG. 46. *Clathria* (*Clathria*) *kylista* Hooper & Lévi (A-D, QMG303166; E, holotype QMG300035). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyle. C, Echinating acanthostyle. D, Accolada toxas. E, Section through peripheral skeleton. F, Australian distribution.

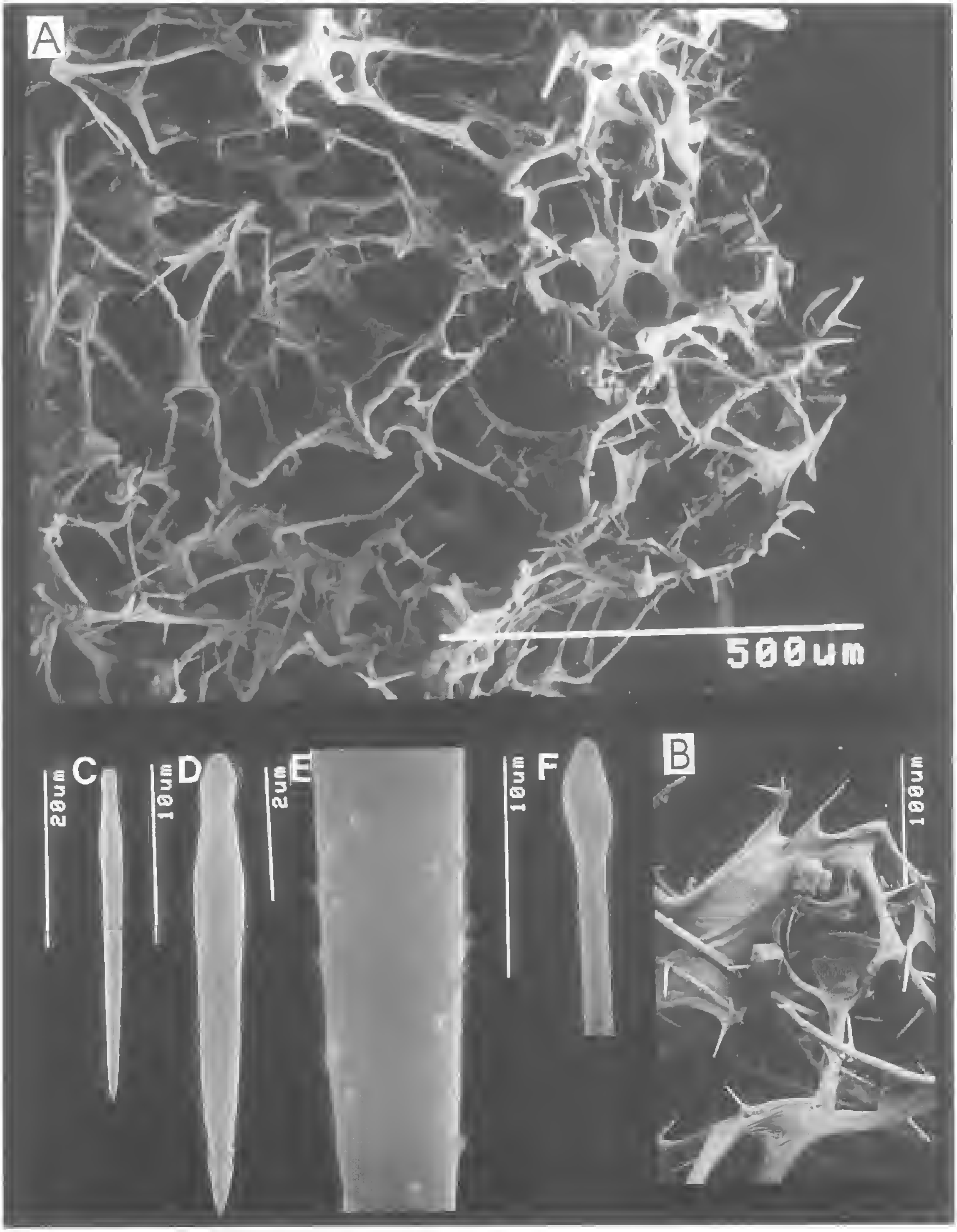

FIG. 47. *Clathria* (*Clathria*) *kylista* Hooper & Lévi (paratype QMG300690); A, Choanosomal skeleton. B, Fibre characteristics in peripheral skeleton. C-D, Echinating acanthostyles. E, Acanthostyle vestigial spines. F, Subtylote base of auxiliary subtylostyles.

TABLE 7. Comparison in spicule dimensions between types and specimen of *Clathria* (*Clathria*) *kylista* Hooper & Lévi. All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Holotype (QMG300035) (SE. Qld)	Paratype (QMG300690) (New Cal.)	Specimen (QMG303166) (SE. Qld)
Choanosomal principal styles	64-(84.7)-112 x 2.5-(2.9)-4.0	61-(81.6)-97 x 1.6-(2.7)-3.6	55-(78.2)-104 x 2.0-(3.1)-4.5
Subectosomal auxiliary styles	143-(168.9)-181 x 1.0-(2.4)-4.1	138-(159.4)-183 x 0.4-(2.1)-3.5	110-(142.3)-166 x 1.0-(1.8)-3.5
Ectosomal aux-iliary styles	absent	absent	absent
Echinating acanthostyles	26-(32.8)-40 x 1.0-(2.6)-4.0	32-(35.5)-39 x 1.1-(3.1)-5.0	18-(27.8)-35 x 1.0-(2.4)-3.5
Toxas	65-(129.6)-231.4 x 0.5-(1.3)-2.5	65-(135.6)-266 x 0.2-(1.1)-1.6	35-(146.5)-222 x 0.5-(1.0)-2.0
Chelae	absent	absent	absent

moderately common on primary ascending fibres, sparse on secondary connecting fibres; choanosomal principal styles slender, straight, relatively short, with hastate points and smooth, slightly swollen, subtylote bases; subectosomal auxiliary styles long, slender, straight, with hastate points and smooth, elongated, swollen subtylote bases; echinating styles entirely smooth, short, slender, sharply pointed, with prominent basal constriction ('neck'), subtylote base and widest just below basal constriction; isochelae absent; accolada toxas abundant, moderately long, ranging from slender to raphidiform, with straight arms and prominent central curve.

REMARKS. This species was assigned to *Clathria* (*Clathria*) by Hooper & Lévi (1993a), even though echinating spicules are smooth (cf. *Echinoclathria*), because coring (principal) and echinating megascleres have different geometries (see also *C.* (*M.*) *aceratoobtusa*). *Clathria* (*C.*) *kylista* is similar to *C.* (*C.*) *angulifera* and *C.* (*C.*) *noarlungae* in skeletal structure, having sparsely cored ascending primary fibres and uncored secondary connecting fibres, although both these other species have acanthose echinating spicules and palmate isochelae, and *C.* (*C.*) *noarlungae* also has slightly curved toxas. The unusual geometry of the echinating styles in *C.* (*C.*) *kylista* is the strongest apomorphy for the species, not seen elsewhere in the genus.

Clathria (Clathria) lipochela Burton, 1932 (Fig. 48)

Clathria lipochela Burton, 1932a: 319, figs 6-7, text-fig.29; Burton, 1940: 109, pl.4, fig.5; Koltun, 1964a: 69; Desqueyroux, 1972: 26-27, figs 87-89, 135; Sarà, 1978: 65; Hooper & Wiedenmayer, 1994: 260.
Thalyseurypon lipochela; de Laubenfels, 1936a: 107.

MATERIAL. HOLOTYPE: BMNH1928.2.15.352: Eddystone Rock, Falkland Is, 105-115m depth, coll. HMS 'Discovery' (trawl).

HABITAT DISTRIBUTION. 22-115m depth; on sand and hard substrates; King George Land (Australian Antarctic Territory), Antarctica (Koltun, 1964a) (Fig. 48F). South Georgia (Koltun, 1964a), Falkland Is (Burton, 1932a), Caleta Santa Marta, Chile (Desqueyroux, 1972), Mar del Plata, Argentina (Burton, 1940), Kerguelen Is (Koltun, 1964a), Magellan Straits (Burton, 1940), Cape Sebastiano, Punta Arenas, Rio Grande, Cape Domingo, Cape Viamonte, Tierra del Fuego (Sarà, 1978).

DESCRIPTION. *Shape.* Stalked, irregularly flabellate; digitate margins of fan.

Colour. Unknown.

Oscules. Not seen.

Texture and surface characteristics. Firm, compressible; uneven, pitted, porous surface.

Ectosome and subectosome. Surface skeleton with sparse paratangential or erect brushes of subectosomal auxiliary styles, mainly at ends of ascending primary spicule tracts; choanosomal principal styles protrude through surface in places; detritus scattered over surface but not embedded in ectosome.

Choanosome. Skeletal architecture regularly reticulate with ascending primary multispicular fibres and transverse uni-, pauci- or occasionally aspicular fibres, interconnecting at more-or-less regular intervals producing rectangular or elongate meshes, up to 450µm diameter; fibres cored by choanosomal principal styles and moderately heavily echinated by acanthostyles evenly scattered over fibres in both axial and peripheral regions of skeleton; spongin fibres well developed; few spicules scattered between fibres; mesohyl matrix light, smooth, virtually unpigmented.

Megascleres. Choanosomal principal styles short, relatively slender, fusiform, rounded and smooth bases, straight or only slightly curved near basal end. Length 153-(206.7)-254µm, width 7-(11.0)-14µm.

Subectosomal auxiliary styles long, slender, slightly hastate pointed, slightly subtylote or

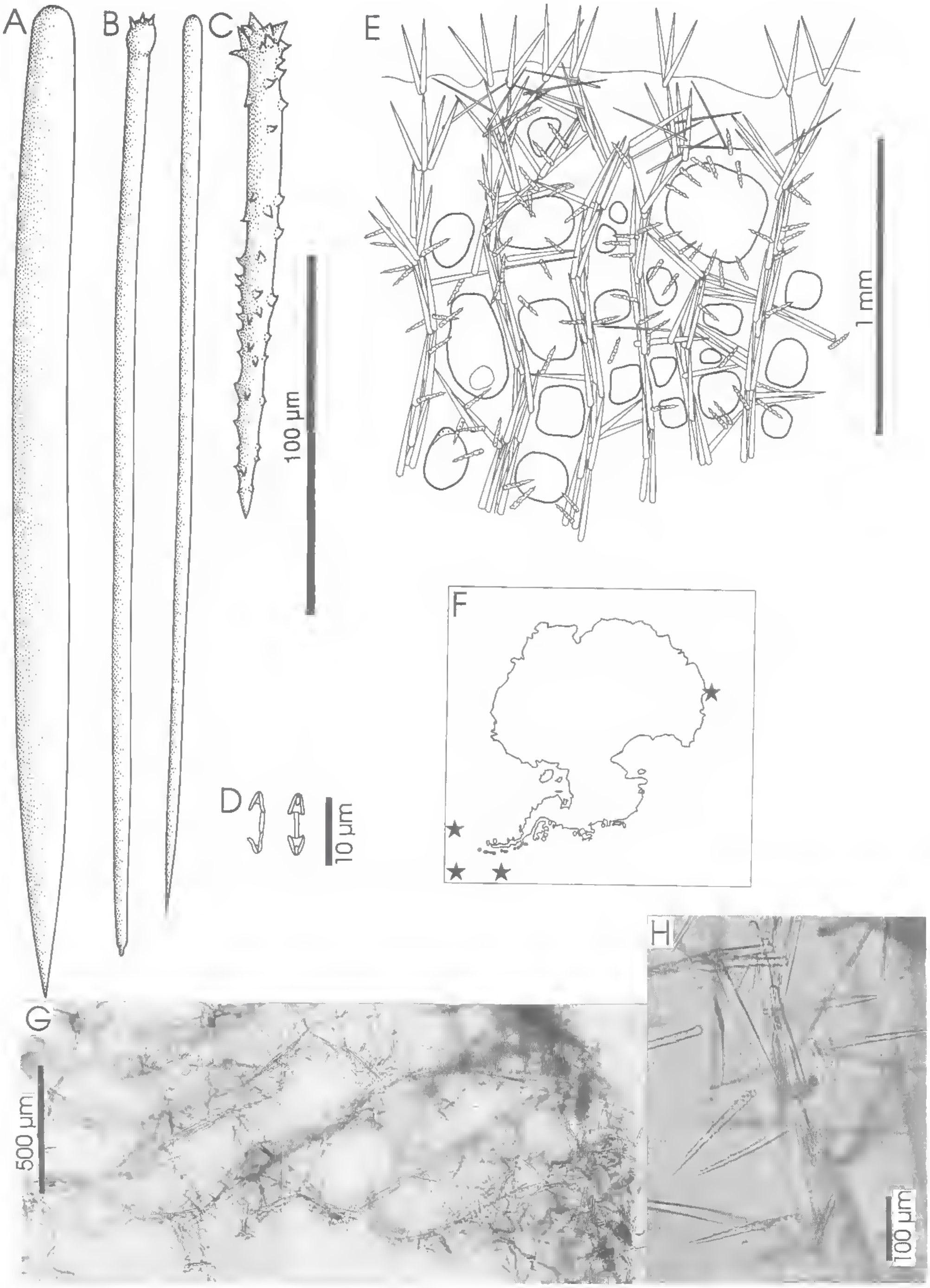

FIG. 48. *Clathria* (*Clathria*) *lipochela* Burton (holotype BMNH1929.2.15.352). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyle and style. C, Echinating acanthostyle. D, Palmate isochelae. E, Section through peripheral skeleton. F, Antarctic distribution. G, Choanosomal skeletal structure. H, Fibre characteristics.

rounded bases, microspined or smooth bases. Length 164-(179.4)-198µm, width 3-(3.9)-5µm.

Echinating acanthostyles relatively long, slender, straight, with subtylote bases, fusiform points, spines concentrated in basal and apical regions and bare 'necks'. Length 79-(93.1)-111µm, width 6-(8.7)-12µm.

Microscleres. Palmate isochelae small, unmodified, relatively abundant. Length 7-(8.5)-11µm.

Toxas absent.

REMARKS. Burton (1932a) named this species for the apparent absence of chelae, but these were found to be common in sections of the holotype. Burton's (1932a) comparison with *Raspaxilla phakellina* Topsent (Hooper, 1991: 1199), is misleading as they do not resemble each other in skeletal structure or spicule geometry. *Clathria (C.) lipochela* resembles *C. (T.) vulpina* (Lamarck) in geometry of principal and echinating spicules and skeletal architecture to some extent, although they differ in many other features.

***Clathria* (*Clathria*) *multipes* Hallmann, 1912**
(Figs 49-50, Table 8)

Clathria (Plectispa) arborea, in part, Whitelegge, 1901; 88, pl.11, fig.15.
Plectispa macropora, in part, Lendenfeld, 1888: 225-6.
Not *Plectispa arborea* Lendenfeld, 1888: 226.
Clathria (Plectispa) multipes Hallmann, 1912: 204, 211.
Clathria multipes; Hooper & Wiedenmayer, 1994: 260.

MATERIAL. LECTOTYPE: AMG9038(dry): Tuggerah Beach, Illawarra region, NSW, 34°32'S, 150°50'E (beach debris, label 'Clathria arborea Lendenfeld; ms name = Clathria plicatella'). PARALECTOTYPES: AMG9162 (dry): Maroubra Bay, NSW, 33°45'S, 151°20'E (label 'Plectispa arborea Lend. = Clathria arborea'). BMNH1887.4.27.9 (fragment AMG3590): Port Jackson, NSW, 33°51'S, 151°16'E (label 'Thalassodendron reticulata RvL, MS'). Other type fragments ZMB2264, 6894. SYNTYPE of *P. macropora*: BMNH1925.11.1.555: Manly Beach, NSW, 33°50'S, 151°17'E, other details unknown.

HABITAT DISTRIBUTION. Ecology unknown; central and S coast (NSW) (Fig. 49F).

DESCRIPTION. *Shape*. Branching, reticulate branches, planar, 85-140mm long, 62-73mm wide, with compressed, cylindrical and regularly anastomosing branches, 4-8mm diameter, and several small basal stalks (multiple points of attachment).

TABLE 8. Comparison between present and published records of *Clathria* (*Clathria*) *multipes* Hallmann. All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Lectotype (AMG9038)	Paralectotype (AMG9162)	Paralectotype (BMNH1887.4.27.9)
Choanosomal principal styles	142-(136.6)-174 x 4-(5.9)-7	145-(157.6)-178 x 6-(8.2)-10	112-(147.8)-262 x 7-(9.3)-12
Subectosomal auxiliary styles	162-(194.6)-239 x 1.5-(2.8)-4	132-(167.0)-222 x 2-(3.1)-4	143-(189.5)-262 x 2-(3.2)-4.5
Echinating acanthostyles	52-(62.8)-91 x 4-(5.6)-8	71-(85.8)-98 x 5-(6.4)-8	64-(78.5)-93 x 4-(6.6)-9
Chelae	4-(6.1)-8	5-(4.8)-8	3-(5.7)-8
Toxas	16-(112.2)-147 x 1-(4.3)-6	19-(101.4)-141 x 1-(3.9)-5	130-(124.4)-178 x 2-(4.5)-6

Colour. Live colouration brick red, grey-brown dry.

Oscules. Numerous large oscules, up to 3mm diameter, distributed over all surfaces.

Texture and surface characteristics. Surface irregularly rugose, with small elevated conules scattered mainly on lateral sides of branches.

Ectosome and subectosome. Ectosome, rarely intact in dry type material, consists of three dimensional fibre reticulation, with fibre endings forming small surface conules, and choanosomal principal styles protruding through peripheral fibres in light brushes or singly; subectosomal auxiliary subtylostyles dispersed in a tangential layer around projecting dermal fibres.

Choanosome. Choanosomal skeletal architecture irregularly reticulate, consisting of relatively heavy spongin fibres forming incompletely differentiated primary (vaguely ascending, multispicular) and secondary fibres (transverse uni-, pauci- or aspicular), and producing relatively tight oval to elongate meshes; fibres echinated by small, sparsely distributed acanthostyles; mesohyl matrix light, with moderate quantities of subectosomal subtylostyles and microscleres dispersed.

Megascleres (Table 8). Choanosomal principal styles hastate or stepped, relatively thick, slightly curved, with tapering or slightly subtylote and smooth bases.

Subectosomal auxiliary subtylostyles long, thin, fusiform, straight, curved or sinuous, with slightly subtylote, smooth bases.

Acanthostyles subtylote, with vestigial spination and an aspinose neck.

Microscleres (refer to Table 8 for dimensions). Palmate isochelae minute.

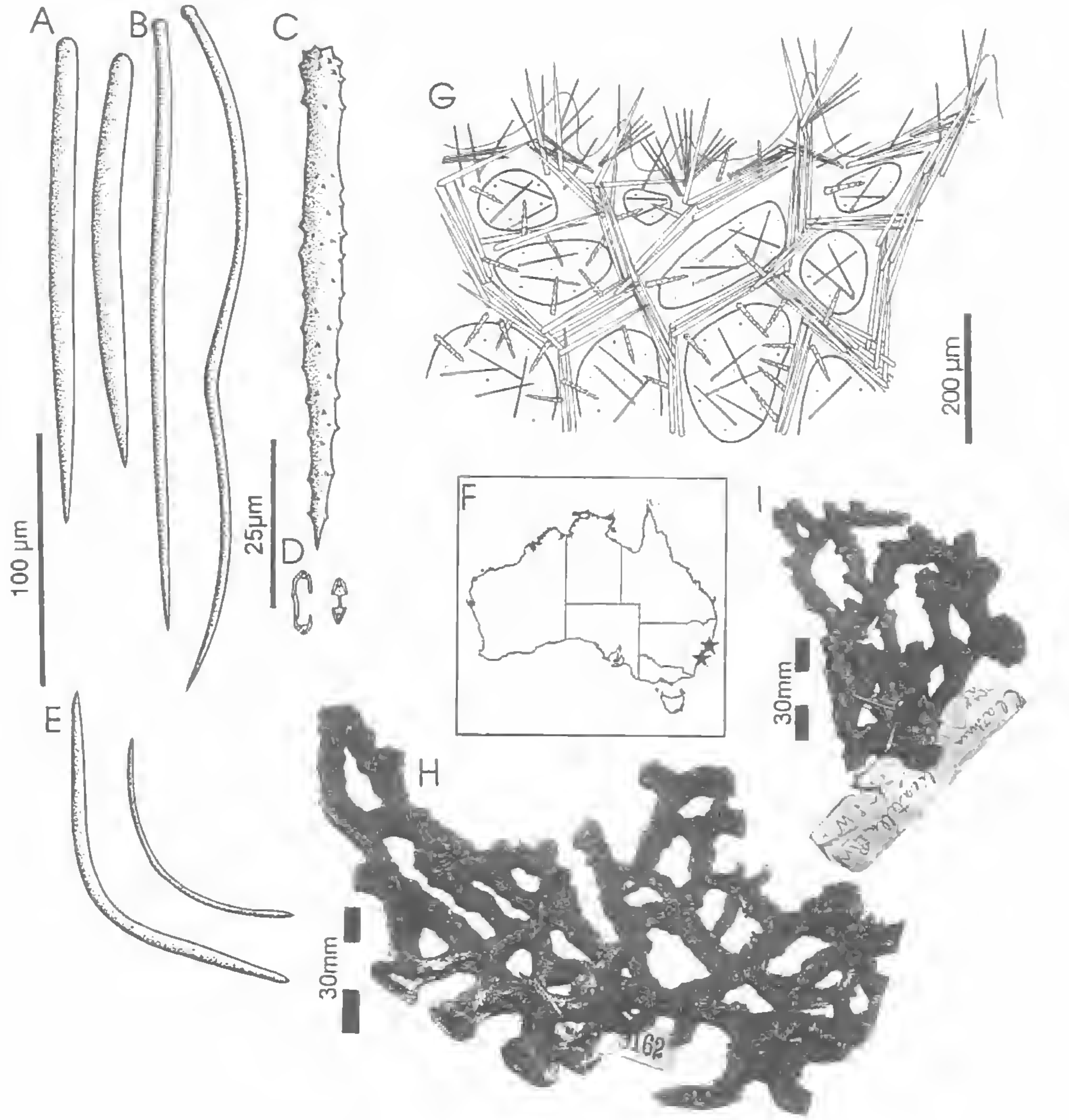

FIG. 49. *Clathria* (*Clathria*) *multipes* Hallmann (lectotype AMG9038). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyles. C, Echinating acanthostyle. D, Palmate isochelae. E, U-shaped toxas. F, Australian distribution. G, Section through peripheral skeleton. H, Paralectotype AMG9162. I, Lectotype.

Toxas u-shaped, relatively thick, oxeote, with hastate points, typically curved at right angles at the centre, with straight and unreflexed points.

REMARKS. All known specimens are in poor condition, and it is not possible to accurately determine ectosomal characteristics. The species is most closely related to *Clathria* (*Clathria*) rather than *Clathria* (*Thalysias*). Whitelegge (1901) remarked that the species was frequently washed up onto coastal beaches of S NSW after storms, inferring that it was a relatively prominent component of the benthos, and therefore it is surprising that it has not been collected since that time despite intensive trawling. The growth form of *C.* (*C.*) *multipes* (reminiscent of

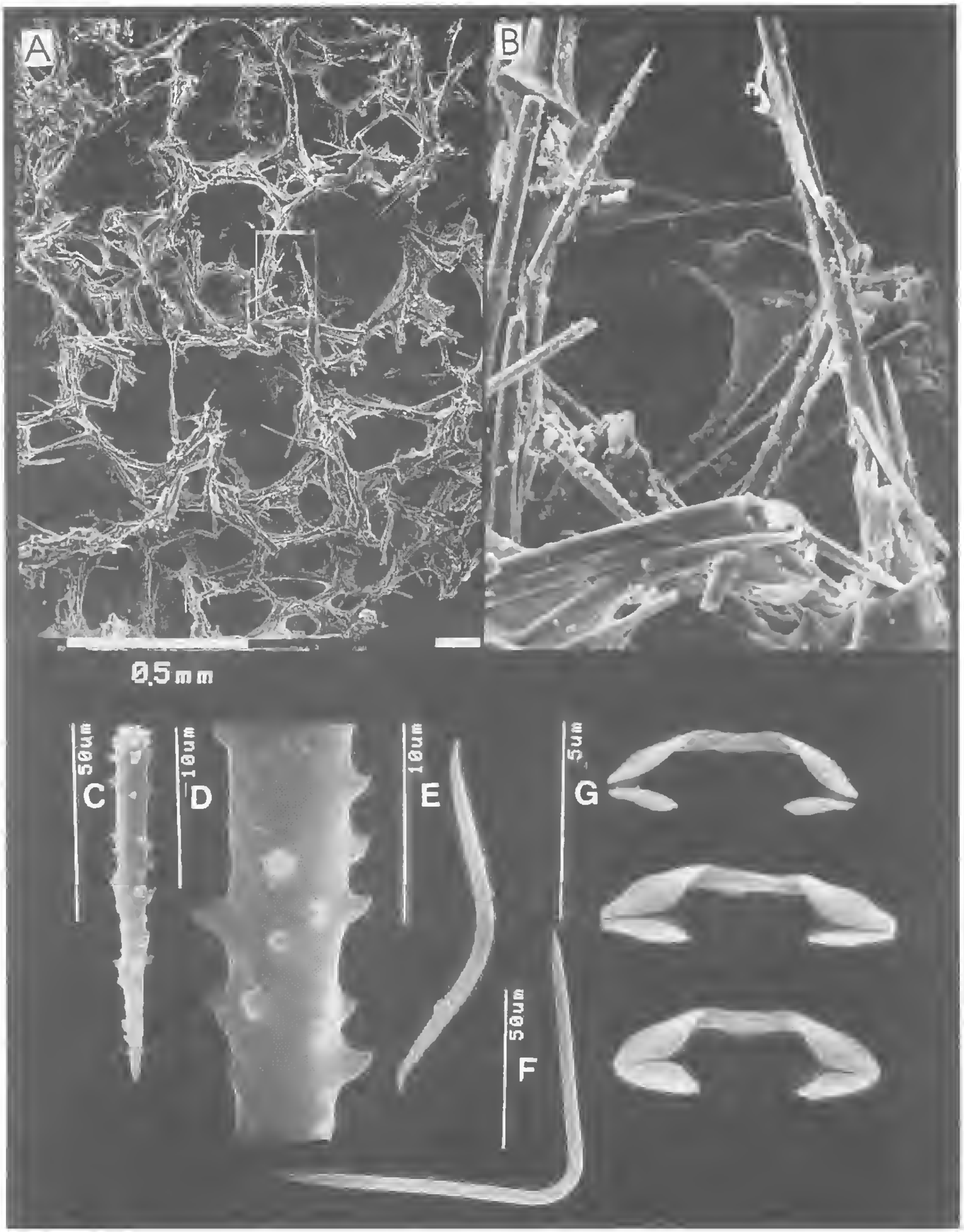

FIG. 50. *Clathria* (*Clathria*) *multipes* Hallmann (lectotype AMG9038). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyle. D, Acanthostyle spines. E-F, U-shaped toxas. G, Palmate isochelae.

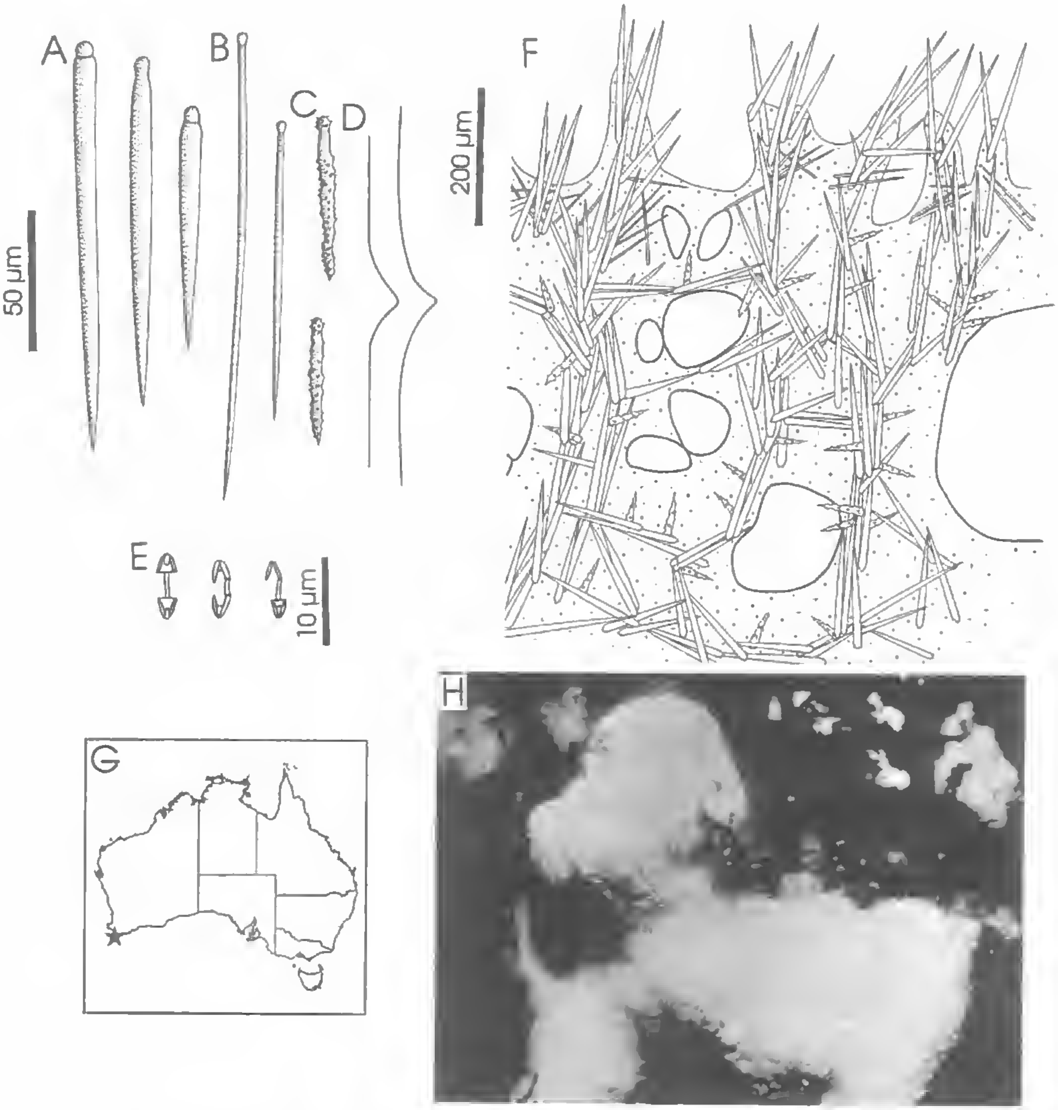

FIG. 51. *Clathria* (*Clathria*) *murphyi* sp.nov. (holotype QMG300656). A, Choanosomal principal subtylostyles. B, Subectosomal auxiliary subtylostyles. C, Echinating acanthostyles. D, Accolada toxas. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, Holotype in situ.

C. (*T.*) *coppingeri* and *Echinodictyum cancellatum* (Raspailiidae)), the small size of isochelae, the peculiar angular shapes of toxas, and the vestigial acanthostyles differentiates this species from other *Clathria*.

Clathria (Clathria) murphyi sp. nov.

(Figs 51-52, Plate 1D)

MATERIAL. HOLOTYPE: QMG300656 (NCIQ66C-2904-N, fragment NTMZ3754): Old jetty, E. end of Princess Royal Drive, Albany, WA, 35°02.3'S, 117°54.2'E, 9m depth, 27.ii.1989, coll. NCI (SCUBA).

HABITAT DISTRIBUTION. Wood jetty piles; 9m depth; SW WA (Fig. 51G).

DESCRIPTION. *Shape*. Thickly encrusting, bulbous digitate lumps, up to 80mm diameter, resembling the tropical *Higginsia massalis* (Desmoxyidae).

Colour. Orange-red alive (Munsell 10R 6/10), pale brown preserved.

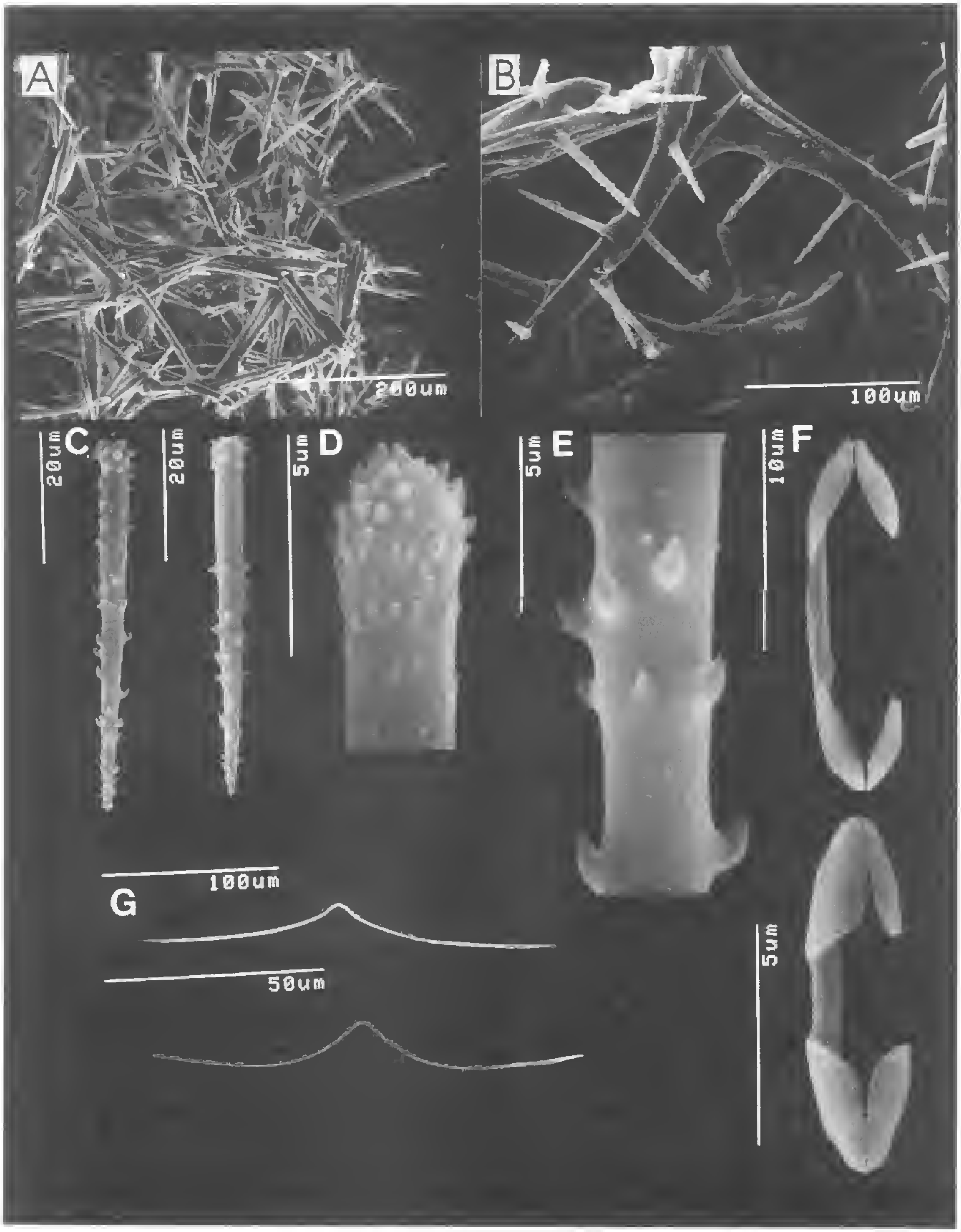

FIG. 52. *Clathria* (*Clathria*) *murphyi* sp.nov. (holotype QMG300656). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyles. D, Base of acanthostyle. E, Acanthostyle spines. F, Palmate isochelae. G, Accolada toxas.

Oscules. Large oscules, more than 5mm diameter, on ends of bulbs.

Texture and surface characteristics. Surface porous, microvillose, uneven, with epi- and zoophytes; texture soft, compressible, easily torn off wooden piles.

Ectosome and subectosome. Ectosome membraneous, with heavy, brown collagen and brushes of choanosomal principal styles poking through surface in plumose bundles, mainly on ends of microconules; subectosomal auxiliary styles in irregular, paratangential bundles below surface, at base of principal style brushes, not protruding through surface.

Choanosome. Choanosomal skeleton renieroid reticulate, cavernous, without visible spongin fibres, with differentiated primary and secondary spicule tracts; primary skeletal tracts ascending, multispicular, 20-40µm diameter, composed of plumose brushes of choanosomal principal styles, 3-10 spicules abreast; secondary tracts uni-, bi- or paucispicular, transverse, 8-20µm diameter, connecting primary tracts; echinating acanthostyles relatively sparsely dispersed throughout choanosome; mesohyl matrix heavy, granular, darkly pigmented, surrounding large oval, paired choanocyte chambers, up to 320µm diameter, with abundant toxa and isochelae microscleres dispersed throughout.

Megascleres. Choanosomal principal subtylostyles short, stout, straight, fusiform points, tapering smooth bases, terminally subtylote, with slightly swollen subterminal region. Length 87-(116.5)-149µm, width 5-(7.1)-9µm.

Subectosomal auxiliary subtylostyles short, slender, fusiform, slightly subtylote, smooth bases. Length 114-(138.4)-165µm, width 1.5-(2.6)-3.5µm.

Echinating acanthostyles short, slender, slightly subtylote bases, spines recurved, evenly spined except for bare neck. Length 42-(55.7)-68µm, width 3.5-(4.2)-5.5µm.

Microscleres. Palmate isochelae, small, poorly silicified, about 10% with twisted shafts. Length 5-(8.4)-14µm.

Toxas accolada form, long, very slender hair-like, with straight, unreflexed arms and angular central curvature. Length 72-(115.6)-164µm, width 0.5-(0.7)-0.8µm.

ETYMOLOGY. For Dr Peter Murphy, Australian Institute of Marine Science, Townsville.

REMARKS. This species is separated from other *Clathria* (*Clathria*) by its distinctive spicule geometries (principal styles with marked basal constrictions and swollen 'necks'), relatively small, poorly silicified spicules of all categories, renieroid choanosomal skeletal structure (with multispicular ascending tracts and uni- or paucispicular plumose transverse connecting spicule tracts, both sparsely echinated by acanthostyles), bulbous-digitate growth form, orange-red colouration, microvillose surface with plumose brushes of choanosomal styles protruding through the ectosome especially on the tips of microconules. *Clathria* (*C.*) *murphyi* has a skeletal architecture reminscent of *C.* (*C.*) *arcuophora* and *C.* (*C.*) *crassa* (both of which have much larger spicules of different geometry), and in this respect the species is included in the '*striata*' group (see remarks for *C.* (*C.*) *striata*).

Clathria (Clathria) nexus (Koltun, 1964)
(Figs 53-54)

Bipocillopsis nexus Koltun, 1964a: 79-80.
Clathria nexus; Hooper & Wiedenmayer, 1994: 260

MATERIAL. HOLOTYPE: ZIL 10644 (not seen): Clarie Coast or Wilhelm Land, Australian Antarctic Territory, 65°48'S, 89°49'E, 310-400m depth (dredge). PARATYPES: BMNH1963.7.29.56, ZIL 11525: same locality.

HABITAT DISTRIBUTION. 310-400m depth; substrate unknown; Australian Antarctica Territory (Fig. 53F).

DESCRIPTION. *Shape.* Erect arborescent growth form, 88-100mm high, 32-55mm wide, with tightly anastomosing cylindrical branches, up to 4mm diameter; tips of branches bifurcate, relatively sharply pointed.

Colour. Grey-brown preserved.

Oscules. Numerous small oscules, 1-2mm diameter, scattered over lateral margins of all branches.

Texture and surface characteristics. Surface hispid, raised into irregularly distributed, sharply pointed microconules.

Ectosome and subectosome. Ectosomal skeleton with choanosomal principal styles erect on surface, and bundles of subectosomal auxiliary spicules surrounding protruding principal spicules, or lying paratangential to surface.

Choanosome. Choanosomal skeleton sub-renieroid-reticulate, without clearly defined spongin fibres, but with heavy collagen enclosing principal subtylostyles and sparse acanthostyles echinating; mesohyl matrix heavy, with numerous isochelae, few auxiliary styles and some detritus dispersed throughout.

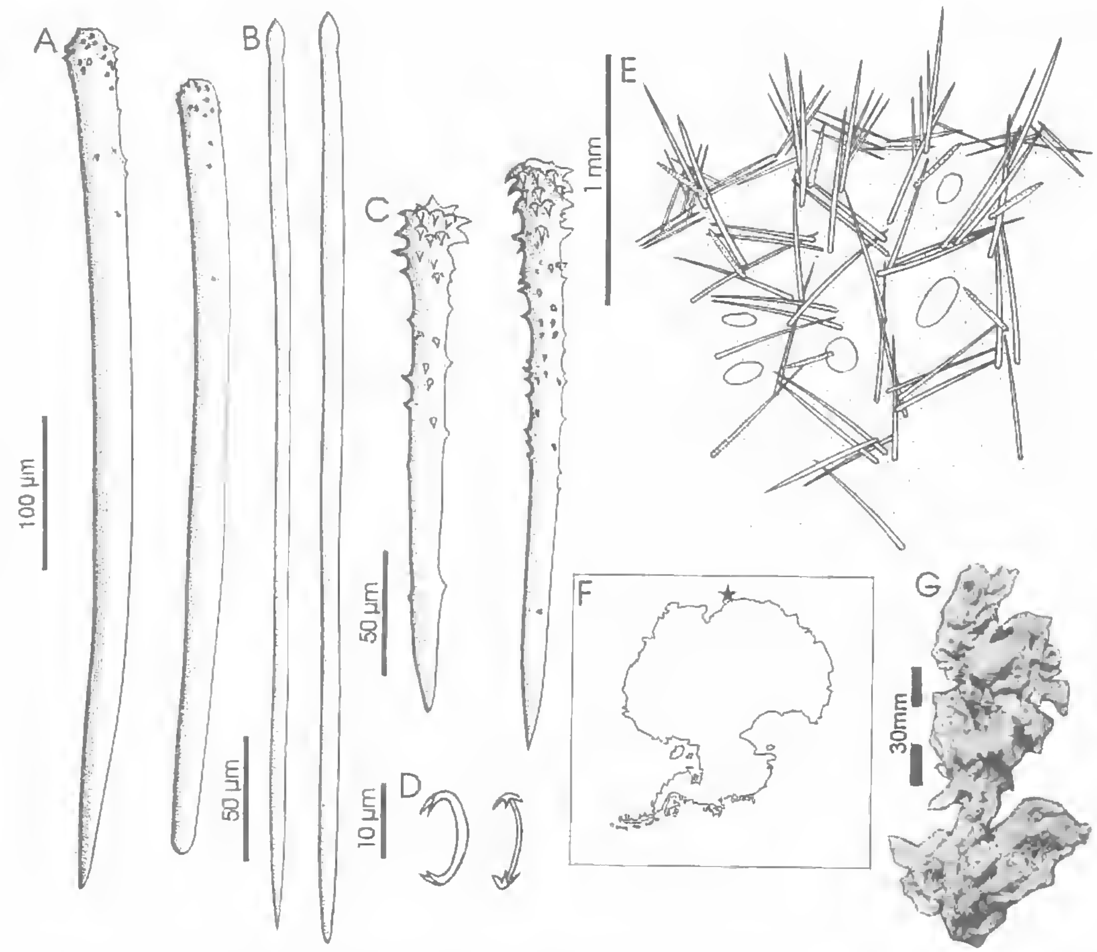

FIG. 53. *Clathria* (*Clathria*) *nexus* Koltun (paratype BMNH1963.7.29.56). A, Choanosomal principal subtylostyles. B, Subectosomal auxiliary subtylostyles. C, Echinating acanthostyles. D, Unguiferous palmate isochelae. E, Section through peripheral skeleton. F, Antarctic distribution. G, Paratype.

Megascleres. Choanosomal principal styles long, robust, straight or slightly curved towards the distal end, tapering to sharp points, with slightly swollen subtyloted bases, liberally microspined; basal spines may partially extend up shaft near basal end. Length 518-(567.3)-620µm, width 18-(22.4)-25µm.

Subectosomal auxiliary styles long, straight, abruptly pointed, with only slight basal swelling and pointed-hastate bases. Length 366-(394)-415µm, width 3-(5.6)-7µm.

Echinating acanthostyles relatively long, robust, subtylote, sharply pointed, with heavy recurved spines and heaviest concentrations of spines on basal end. Length 214-(241.3)-278µm, width 9-(13.8)-17µm.

Microscleres. Isochelae, strongly curved sigmoid, unguiferous with vestigial teeth, of anchorate or arcuate modification. Length 14-(16.6)-19µm.

Toxas absent.

REMARKS. This species is similar to *C.* (*T.*) *michaelseni* in having bidentate sigmoid isochelae, but differing in skeletal architecture and in most other features. These unguiferous, sigmoid-like chelae with vestigial, pointed alae, are not unique to these austral species, also known in W. Indian Ocean *C.* (*C.*) *spongodes* Dendy (including its synonym *C. madrepora* Dendy). In *C.* (*C.*) *spongodes* these reduced chelae were initially thought to be sigmas (Dendy, 1922; Burton, 1959a; Vacelet et al.,

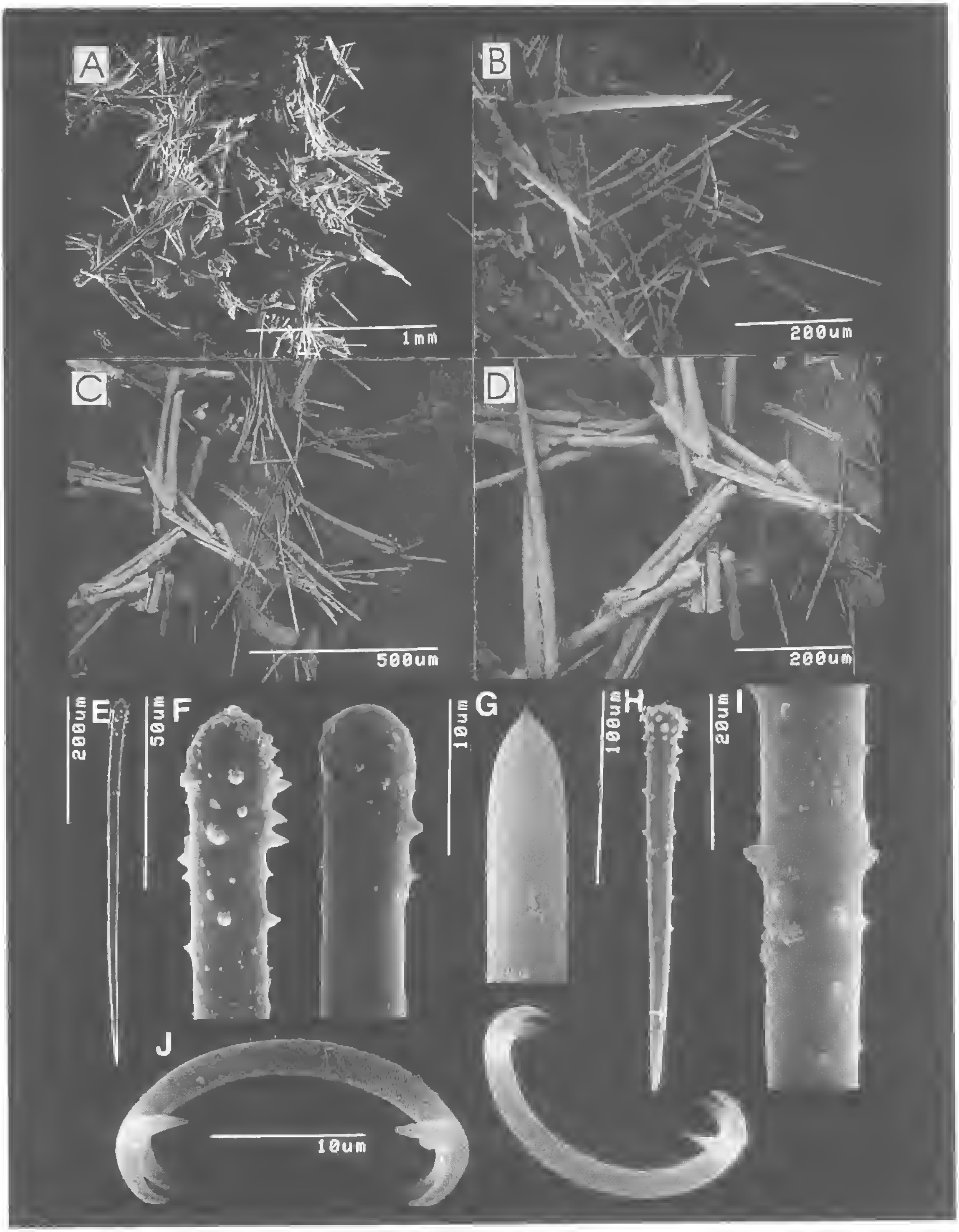

FIG. 54. *Clathria* (*Clathria*) *nexus* Koltun (paratype BMNH1963.7.29.56). A, Choanosomal skeleton. B, Peripheral skeleton C, Ectosomal structure. D, Fibre characteristics. E, Principal subtylostyles. F, Bases of principal subtylostyles. G, Base of auxiliary style. H, Echinating acanthostyle. I, Acanthostyle spines. J, Unguiferous palmate isochelae.

1976), but the type material showed that these are in fact reduced unguiferous isochelae with vestigial teeth.

Clathria (*C.*) *nexus* is also unusual in Microcionidae in having auxiliary styles obviously associated with (surrounding) protruding principal spicules, reminiscent (or analogous to) Raspailiidae. Unlike raspailiids, however, auxiliary spicules are also dispersed within the peripheral skeleton, paratangential to the surface. The other alternative, that the species belongs to Raspailiidae, is rejected due to the chelae microscleres. The bidentate-derived chelae is unusual to the Microcionidae and grounds to exclude the species from it under the phylogeny of Poecilosclerida hypothesised by Hajdu et al. (1994), but in all other respects the species fits in this group supporting the present classification.

Clathria (Clathria) noarlungae sp.nov.

(Figs 55-56, Plate 1E, Table 9)

MATERIAL. HOLOTYPE: SAMTS4047 (fragment NTMZ1632): Port Noarlunga, SA, 35°09'S, 13°29'E, 1973, coll. SA Fisheries (trawl). OTHER MATERIAL: S AUST - QMG300247 (NCIQ66C-2468-X, fragment NTMZ3566).

HABITAT DISTRIBUTION. 5-30m depth; from rock reef substrate; Port Noarlunga and Kingston, SE S.Aust.

DESCRIPTION. *Shape.* Branching, 58-190mm long, cylindrical digitate, bulbous-lobate branches, 15-33mm diameter, with bulbous lobes on tips of digits, single or bifurcate tips.

Colour. Orange alive (Munsell 10R 6/10), grey-brown preserved (7.5YR 5/4).

Oscules. Large oscules, 3-5mm diameter, in-line on lateral sides of branches and on apex of terminal bulbs.

Texture and surface characteristics. Texture rubbery, compressible, fibrous, difficult to tear; surface optically smooth, with few low rounded bulbous projections; detachable skin-like dermis, which is microscopically evenly porous, without projecting spicules.

Ectosome and subectosome. Ectosomal skeleton consisting of relatively even, light series of plumose brushes of ectosomal auxiliary subtylostyles, standing perpendicular or paratangential to surface, usually surrounding inhalant pores and forming a spiculo-fibrous reticulation on surface; ectosomal skeleton thin, 75-149μm wide, perched on ends of peripheral, ascending choanosomal fibres; subectosomal skeleton not differentiated from dermal skeleton, and ectosomal spicule brushes composed of a single category of auxiliary megascleres only; megascleres coring peripheral fibres sometimes project into, but not through ectosomal skeleton, but this is exceptional.

Choanosome. Choanosomal skeletal architecture arborescent, cavernous, consisting of well differentiated primary ascending and secondary transverse components; primary spongin fibres multispicular, 35-98μm diameter, relatively heavily invested with spongin, forming dendritic, arborescent, radial, relatively even structure; coring spicules in primary fibres occupy only a small proportion of sponge diameter in axial skeleton, becoming more heavily cored and increasingly plumose towards peripheral skeleton; spongin fibres cored by larger subectosomal auxiliary styles, and echinating acanthostyles occur only sparsely throughout entire skeleton; secondary spongin fibres entirely free of coring megascleres, 12-57μm diameter, forming a plumo-reticulate structure; meshes formed by primary and secondary spongin fibre branching are ovoid-elongate to rectangular in shape, relatively even, and markedly cavernous (155-560μm maximum diameter); choanocyte chambers paired, 90-311μm maximum diameter, becoming larger towards periphery; mesohyl matrix slightly granular, with toxas dispersed singly or in dragmata; thin, rhaphidiform, vestigial auxiliary megascleres also dispersed between fibres, difficult to distinguish from toxas.

Megascleres (refer to Table 9 for dimensions). Choanosomal principal megasclere absent, or completely undifferentiated from subectosomal auxiliary spicules.

Subectosomal auxiliary styles, coring fibres, thin, mostly straight, varying from hastate to almost fusiform, with smooth tapering, rounded or very slightly subtylote bases.

Ectosomal auxiliary styles geometrically similar to larger auxiliary styles, with slightly more pronounced, smooth, subtylote basal constrictions.

Acanthostyles vestigial, with subtylote bases, fusiform points, rudimentary spination, aspinose points and necks.

Vestigial auxiliary megascleres dispersed within mesohyl are styloid or quasidiactinal, often sinuous, with tapering or rounded bases, long fusiform points.

Microscleres (refer to Table 9 for dimensions). Palmate isochelae minute, abundant, frequently twisted (80% of samples), two size classes observed.

Toxas accolada, rhaphidiform, common, occurring individually or in dragmata, exceedingly thin, rhaphidiform with very slight rounded central curvature and straight points, or less often with more angular central curvature and slightly reflexed arms.

ETYMOLOGY. Named for type locality.

REMARKS. There are some minor differences in spicule dimensions between the two known specimens of *C.* (*C.*) *noarlungae* (Table 9), although there is no doubt that they are conspecific. In having sparsely cored ascending primary fibres and uncored secondary connecting fibres this species is similar to *C.* (*C.*) *kylista* and *C.* (*C.*) *angulifera* although spicule geometry and dimensions differs between all three. This species is also similar to *C.* (*T.*) *cactiformis* (Lamarck) in growth form and skeletal structure but they differ in geometry and size of spicules, number of spicule categories and structure of ectosomal and subectosomal skeletons.

This species is enigmatic in its higher systematic placement. On the one hand *C.* (*C.*) *noarlungae* has a classical, albiet thin ectosomal skeleton typical of *Thalysias* species, consisting of erect plumose brushes of smaller ectosomal auxiliary spicules. This feature is structurally discrete from the primary dendritic, and secondary plumo-reticulate choanosomal skeleton. Conversely, there is only a single category of auxiliary style which forms these ectosomal brushes, whereas the larger (subectosomal) auxiliary spicules are confined to inside the choanosomal fibres. Consequently this species technically belongs to *C.* (*Clathria*) (in having an undifferentiated ectosomal-subectosomal skeletal composition). *Clathria* (*C.*) *noarlungae* may be confused with *C.* (*Dendrocia*) *curvichela* and *C.* (*D.*) *elegantula* due to superficial similarities in spiculation and fibre characteristics, but it differs from these (and other *Dendrocia*) in having two different auxiliary spicule geometries, with palmate isochelae instead of arcuate-like isochelae, and different skeletal construction.

This species differs from all other known *Clathria* (and other microcionids) in several features: orange colouration; bulbous-lobate digitate growth form; rounded bulbous surface projections; absence of choanosomal principal styles, where dendritic multispicular primary spongin fibres are cored by subectosomal auxiliary styles, and the secondary fibre system is aspicular, plumo-reticulate, and sparsely echinated by vestigial acanthostyles; and specific spicule geometries.

Clathria (Clathria) oxyphila (Hallmann, 1912)
(Figs 57-58, Table 10)

Wilsonella oxyphila Hallmann, 1912: 249-253, pl.34, fig.3, text-fig.52; Guiler, 1950: 9.
Paradoryx oxyphila; Hallmann, 1920: 768.
cf. *Clathria elegantula*; Hallmann, 1912: 253.
cf. *Clathria piniformis*; Carter, 1885f: 354; Hallmann, 1912: 253.
Clathria oxyphila; Hooper & Wiedenmayer, 1994: 260.

MATERIAL. HOLOTYPE: AMZ51 (dry, fragment AME817): Off Marsden Point, Kangaroo I., SA, 35°30'S, 137°45'E, 34m depth, 19.viii.1909, coll. FIV 'Endeaour' (dredge; label 'Wilsonella oxyphila (curvichela) Hallmann, type'). PARATYPE: AME495 (dry): Oyster Bay, Tas, 42°40'S, 148°03'E, 60-80m depth, coll. FIV 'Endeavour', dredge; (specimen label 'Wilsonella oxyphila, Type'; AM register MS name 'Paraclathria oxyphila sp. nov.').

HABITAT DISTRIBUTION. 34-80m depth; substrate unknown; E. coast (Tas.) and Kanagaroo I. (S. Aust.) (Fig. 57G).

DESCRIPTION. *Shape.* Fan, 152mm high, 155mm wide, planar or multiplanar, with a small compressed, cylindrical basal stalk, 22mm long, 18mm diameter, thickly lobate, rounded, even margins.
Colour. Grey-brown preserved.
Oscules. Oscules dispersed on margins of branches.
Texture and surface characteristics. Surface relatively even, with radiating longitudinal subdermal grooves and pitted and porous ectosome.
Ectosome and subectosome. Ectosome membraneous with relatively heavy mesohyl matrix below surface, sparsely arenaceous, with very few choanosomal principal megascleres protruding through surface, and with sparse ectosomal skeleton of subectosomal auxiliary megascleres lying paratangential to surface, sometimes in light brushes around fibre endings.
Choanosome. Choanosomal fibres immediately subdermal, becoming slightly plumose near periphery; choanosomal skeleton sometimes dendritic in places, usually plumo-reticulate. Spongin fibres well developed, clearly divided into primary (ascending, sinuous, multispicular) and connecting (transverse, aspicular) elements; coring megascleres vestigial principal styles, barely differentiated from subectosomal auxiliary styles; spongin fibres heavily echinated

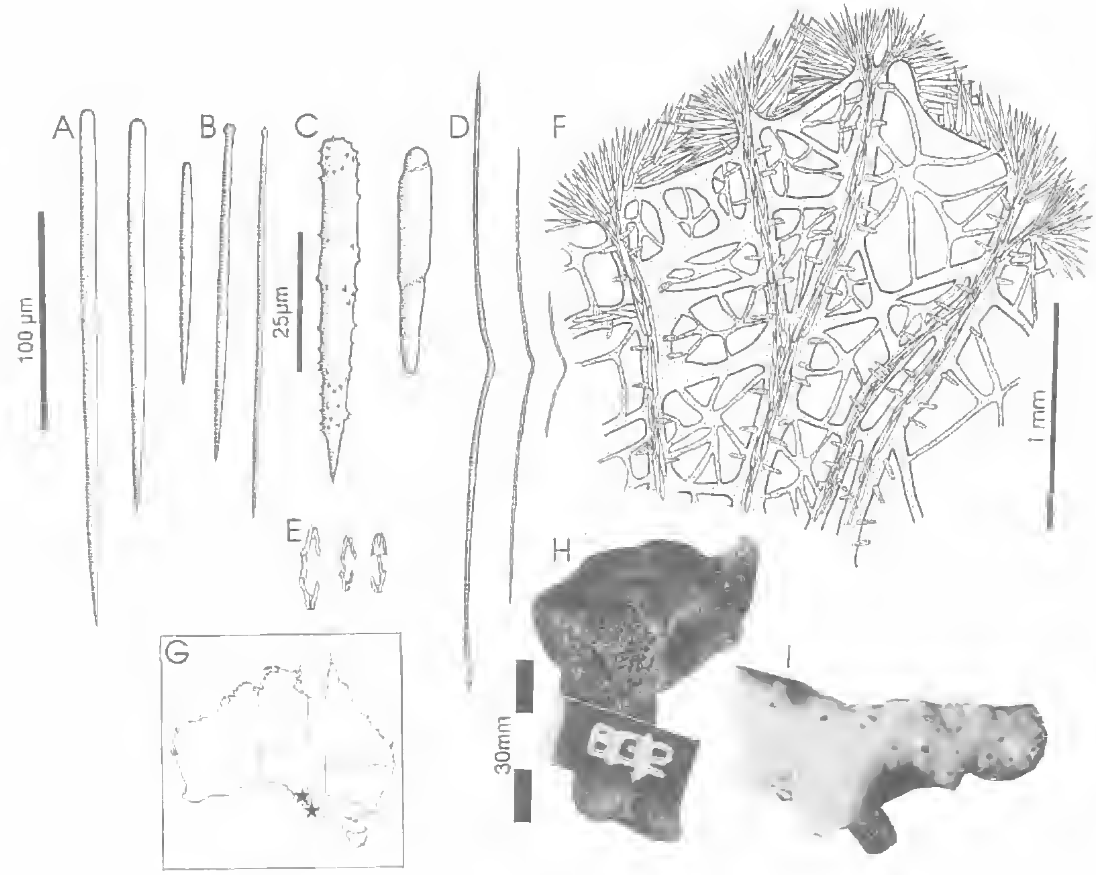

FIG. 55. *Clathria* (*Clathria*) *noarlungae* sp.nov. (holotype SATS4047). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyles. C, Echinating acanthostyle and modified style. D, Raphidiform-accolada toxas. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, fragment of holotype. I, Specimen NTMZ3566.

by acanthostyles, evenly dispersed over fibres; mesohyl matrix heavy, with few scattered subectosomal megascleres.

Megascleres (Table 10). Choanosomal principal styles slightly shorter and thicker, but otherwise with similar geometry to those occurring in peripheral skeleton; straight, hastate, with tapering or quasidiactinal, smooth bases.

Subectosomal auxiliary styles long, thin, slightly curved or sinuous, often with blackened axial canals; geometrically similar to principal megascleres.

Acanthostyles slightly subtylote, evenly spined, including oxeote modifications.

Microscleres (Table 10). Palmate isochelae sigmoid with reduced alae or vestigial teeth resembling true sigmas; isochelae predominant on membraneous ectosome.

Toxas intermediate between wing-shaped and u-shaped, uncommon, with low, rounded central curves, slightly reflexed points.

Larvae. Incubated parenchymella larvae oval-elongate, 120 x 210µm, with moderately light mesohyl.

REMARKS. This species was included in *Wilsonella* by Hallmann (1912, 1920) and other authors on the basis that principal and auxiliary styles were allegedly undifferentiated, but re-examination of type material found them to be similar but not identical in geometry (both relatively vestigial and modified quasidiactinal form). In this respect the species is similar to *C.*

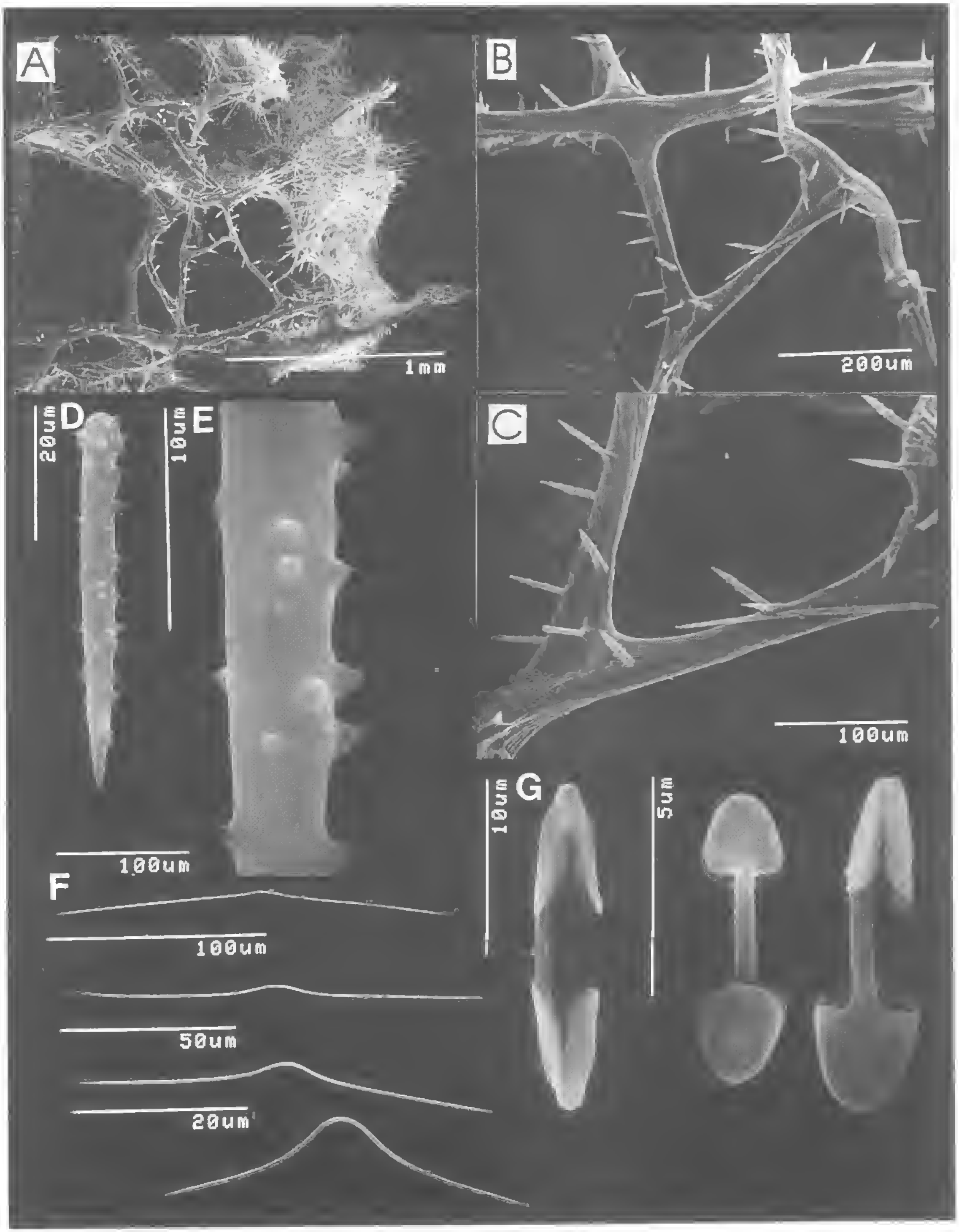

FIG. 56. *Clathria* (*Clathria*) *noarlungae* sp.nov. (QMG300247). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating spicules in situ. D, Echinating acanthostyle. E, Acanthostyle spines. F, Raphidiform-accolada toxas. G, Palmate isochelae.

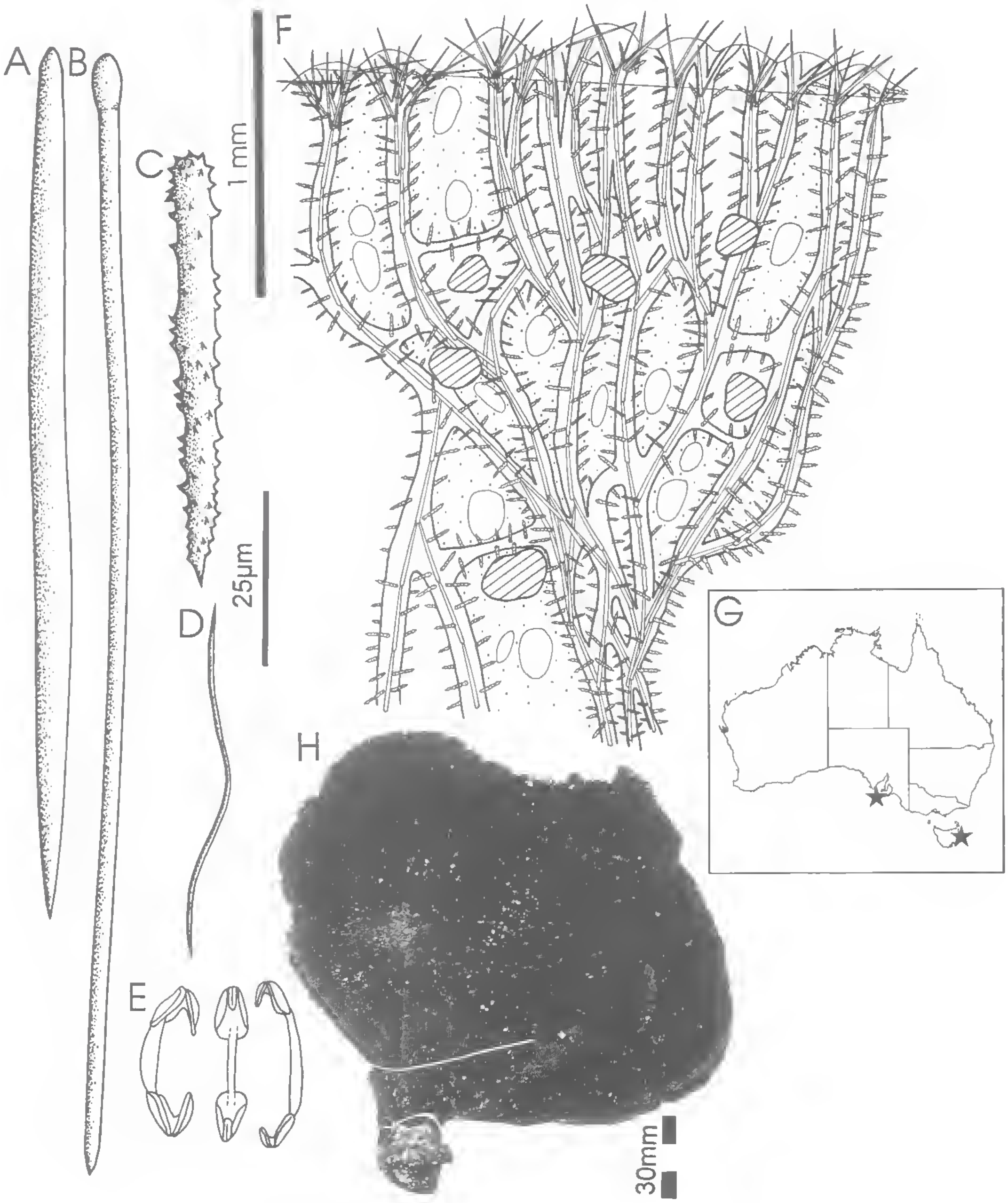

FIG. 57. *Clathria* (*Clathria*) *oxyphila* (Hallmann) (holotype AMZ51). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyle. C, Echinating acanthostyle. D, Intermediate wing shaped - u-shaped toxa. E, Sigmoid palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, Paratype AME495.

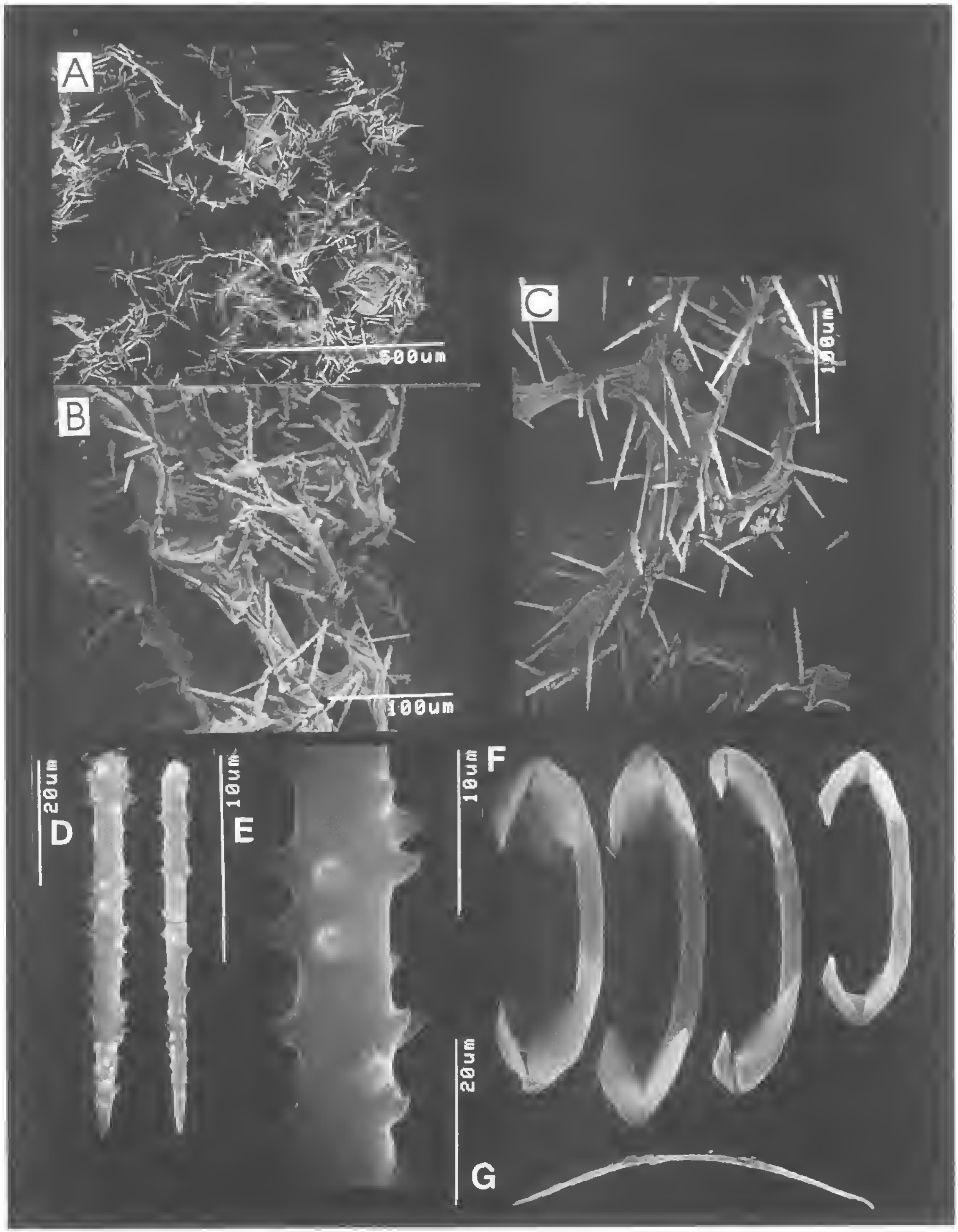

FIG. 58. *Clathria* (*Clathria*) *oxyphila* (Hallmann) (fragment of holotype AME817). A, Choanosomal skeleton. B, Peripheral skeleton. C, Fibre characteristics. D, Echinating acanthostyles. E, Acanthostyle spines. F, Sigmoid palmate isochelae. G, Intermediate wing-shaped - u-shaped toxa.

TABLE 9. Comparison between present and published records of *Clathria* (*Clathria*) *noarlungae* sp.nov. All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Holotype (SAMTS4047)	Specimen (NCIQ66C2468X)
Choanosomal principal styles	absent	absent
Subectosomal auxiliary styles	167-(204.4)-236 x 2.5-(4.8)-7.8	232-(250.2)-278 x 3-(4.3)-5
Ectosomal auxiliary styles	87.5-(112.8)-156 x 1.8-(3.4)-4.6	117-(146.0)-175 x 2-(2.7)-3.5
Echinating acanthostyles	36-(46.6)-54 x 3.8-(5.2)-6.5	48-(55.6)-61 x 4.5-(5.2)-6
Vestigial auxiliary styles	133-(186.2)-202 x 1.5-(2.1)-2.6	118-(170.1)-186 x 1.0-(1.6)-2.0
Chelae I	3-(6.3)-8.5	5-(7.3)-10
Chelae II	12-(13.5)-16.5	13-(15.7)-19
Toxas	36-(159.5)-216 x 0.4-(0.8)-1.1	19-(145.3)-265 x 0.5-(0.9)-1.5

(*C.*) *piniformis*, *C.* (*C.*) *raphanus* and *C.* (*Dendrocia*) *elegantula*, all referred here to an artificial species-group termed the '*oxyphila*' group, loosely corresponding to Hallmann's (1912, 1920) concept of *Wilsonella* (which is also possibly artificial). The present species differs from these by its sigmoid microscleres (virtually intermediate between palmate and arcuate-like geometry). Hallmann (1912) suggested that these chelae were arcuate, and thus he considered that the species had affinities with *C.* (*Dendrocia*) *curvichela*, but they actually appear to be no more than slightly modified, vestigial palmate forms. Similarly, Hallmann (1912) did not record toxas in his description, which are definitely present in type material. The modification of echinating acanthostyles to acanthoxeote megascleres in this species is reminscent of Crellidae but this modification is superficial. *Clathria* (*C.*) *oxyphila* was transferred to *Paradoryx* on the basis of its alleged arcuate chelae, but in all other respects the species is clearly a *Clathria* (*Clathria*).

Clathria (Clathria) partita Hallmann, 1912
(Figs 59-60)

Clathria partita Hallmann, 1912: 223, pl.32, fig.3, text-fig.46; Hooper & Wiedenmayer, 1994: 260.

Clathria (*Clathria*) cf. *partita*; Rudman & Avern, 1989: 335.

Pseudanchinoe partita; de Laubenfels, 1936a: 109.

MATERIAL. HOLOTYPE: AME1024(dry): Unknown locality, South Australian coast, 60m depth, 12.vii.1909, coll. FIV 'Endeavour' (dredge); (label '*Pseudanchinoe partita*, type').

TABLE 10. Comparison between present and published records of *Clathria* (*Clathria*) *oxyphila* (Hallmann). All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Holotype (AMZ51)	Paratype (AME495)
Choanosomal principal styles	104-(133.0)-152 x 1.8-(2.5)-3	119-(135.4)-154 x 1.5-(2.2)-3
Subectosomal auxiliary styles	142-(171.1)-199 x 0.8-(1.4)-2	143-(164.0)-186 x 1.0-(1.6)-2.0
Echinating acanthostyles	49-(60.3)-72 x 2.5-(4.1)-4.5	54-(63.6)-71 x 3.5-(4.2)-5.5
Chelae	17-(21.8)-25	16-(19.6)-23
Toxas	35-(42.0)-64 x 1.5-(1.7)-2.0	19-(50.6)-84 x 1.0-(1.4)-2.5

HABITAT DISTRIBUTION. 60m depth; substrate unknown; SA (Hallmann, 1912), and possibly S WA (Rudman & Avern, 1989) (Fig. 59F).

DESCRIPTION. *Shape.* Arborescent branching, 340mm long, 160mm wide, with a long cylindrical stalk, 55mm long, 14mm diameter, planar, bifurcate and occasionally anastomosing flattened branches, 12-25mm wide, approximately 8mm thick.

Colour. Orange alive (Rudman & Avern, 1989), brown, with a slightly whitish ectosomal crust .

Oscules. Small oscules, up to 2mm diameter, on lateral sides of branches.

Texture and surface characteristics. Surface rugose, laterally striated, resembling *Ectyoplasia tabula* (Raspailiidae; Hooper, 1991: Fig. 50), and margins of branches slightly wider and more spatuliferous than basal portions.

Ectosome and subectosome. Ectosomal skeleton almost halichondroid, well differentiated from choanosomal region, consisting of paratangential multispicular bundles of subectosomal auxiliary styles, forming criss-cross tracts on surface.

Choanosome. Choanosomal architecture basically isodictyal, consisting of differentiated axial and extra-axial sections of skeleton; axial region composed of very heavy and sinuous spongin fibres, forming relatively tight, oval or elongated triangular meshes; axial fibres divided into larger primary and smaller secondary elements, both containing paucispicular core of choanosomal principal styles; extra-axial skeletal architecture an irregular isodictyal reticulation of sinuous spongin fibres of approximately same diameter as axial secondary elements, relatively lightly invested with spongin, containing uni-, bi-, or more rarely paucispicular tracts of choanosomal styles; extra-axial fibres incompletely divided into primary (ascending) and secondary (vaguely transverse) components, differentiated mainly by number of coring spicules; echinating acanthostyles sparse, evenly distributed throughout skeleton, rarely incorporated into fibres (cf. Hallmann, 1912); some choanosomal principal styles may protrude through (echinate) fibres, particularly in extra-axial skeleton; mesohyl matrix very light containing few subectosomal auxiliary megascleres.

Megascleres. Choanosomal principal styles short, slightly curved or straight, almost hastate, with smooth rounded or very slightly subtylote bases. Length 112-(172.6)-239μm, width 5-(8.7)-12μm.

Subectosomal auxiliary styles long, slightly curved or straight, fusiform, with rounded or slightly subtylote bases. Length 222-(267.7)-315μm, width 3.5-(5.1)-7μm.

Acanthostyles slightly subtylote, with vestigial spines and an aspinous basal region. Length 56-(60.4)-88μm, width 3-(5.0)-6μm.

Microscleres. Isochelae absent.

Toxas sinuous rhaphidiform, usually symmetrical with slight angular central curvature and straight points, but asymmetrical and reflexed examples also occur. Length 72-(115.6)-212μm, width 0.5-(0.7)-1.2μm.

REMARKS. This species was referred to *Pseudanchinoe* by de Laubenfels (1936a) because it lacked chelae microscleres, but that feature has since been shown to be of little systematic value (e.g. Hooper, 1991: 288). As noted by Hallmann (1912), *C.* (*C.*) *partita* is known only from a single dry specimen, and it is possible that isochelae may be eventually discovered in other better preserved specimens should additional material become available.

Clathria (*C.*) *partita* has an unusual skeletal construction, combining features of myxillid-like microcionids (e.g. a basically isodictyal extra-axial skeleton closely resembling *C.* (*Isociella*) *eccentrica*) and raspailiid-like microcionids (e.g. compressed axis of *C.* (*Axociella*) *canaliculata*), and features of the compressed axial skeleton are also reminiscent of the skeletal plan seen in certain Axinellidae such as *Cymbastela*. On the basis of these characteristics *C.* (*C.*) *partita* is similar to *C.* (*C.*) *rubens* (Lendenfeld).

The record of *C.* (*C.*) *partita* from WA (Rudman & Avern, 1989), is based on a photograph without accompanying sample. The photograph was taken of a nudibranch (*Rostanga calumnus* Rudman & Avern) feeding on an orange sponge from Esperance Bay (33°51'S, 121°57'E).

Clathria (Clathria) paucispicula (Burton, 1932)
(Fig. 61)

Rhaphidophlus paucispiculus Burton, 1932a: 320, pl.56, fig.1, text-fig.30; Burton, 1940: 111; Desqueyroux, 1975: 68; Koltun, 1964a: 75; Desqueyroux-Faundez & Moyano, 1987: 49.

Clathria paucispicula; Hooper & Wiedenmayer, 1994: 260

MATERIAL. HOLOTYPE: BMNH1928.2.15.243a: Near Shag Rocks, South Georgia, 53°43.4'S, 40°57.0'W, 177m depth, coll. R.R.S. 'Discovery' (dredge).

HABITAT DISTRIBUTION 74-198m depth; on mud, sand and rock substrates; Australian Antarctic Territory: Queen Mary Land (Koltun, 1964a) (Fig. 61D). Also Falkland Is, South Georgia and S. Shetland Is (Burton, 1932a), Mar del Plata, Argentina (Burton, 1940), Low Is, Chilean Antarctic Territory (Desqueyroux, 1975), Tierra del Fuego (Desqueyroux-Faundez & Moyano, 1987).

DESCRIPTION. *Shape.* Massive, flabellate-digitate with irregular ridges and convoluted branches.

Colour. Live colouration unknown, light brown preserved.

Oscules. Large oscules 3-5mm diameter sparsely scattered on apex of ridges.

Texture and surface characteristics. Texture firm, tough, compressible; surface uneven, minutely conulose.

Ectosome and subectosome. Surface skeleton tangential confused crust of smaller ectosomal auxiliary styles, choanosomal principal styles and foreign spicule fragments together forming a dense crust 0.5-1.0mm thick; immediately below tangential ectosomal skeleton are erect bundles of both auxiliary styles (producing an irregular radial palisade of spicules), and principal styles (more sparsely dispersed).

Choanosome. Skeletal architecture reticulate, slightly plumo-reticulate near periphery, less organised towards axis; spongin fibres moderately well developed cored by pauci- or multispicular ascending tracts and interconnected by uni- or paucispicular tracts of choanosomal principal styles, producing rectangular or triangular meshes up to 250μm diameter; echinating megascleres absent; mesohyl matrix light, smooth, unpigmented.

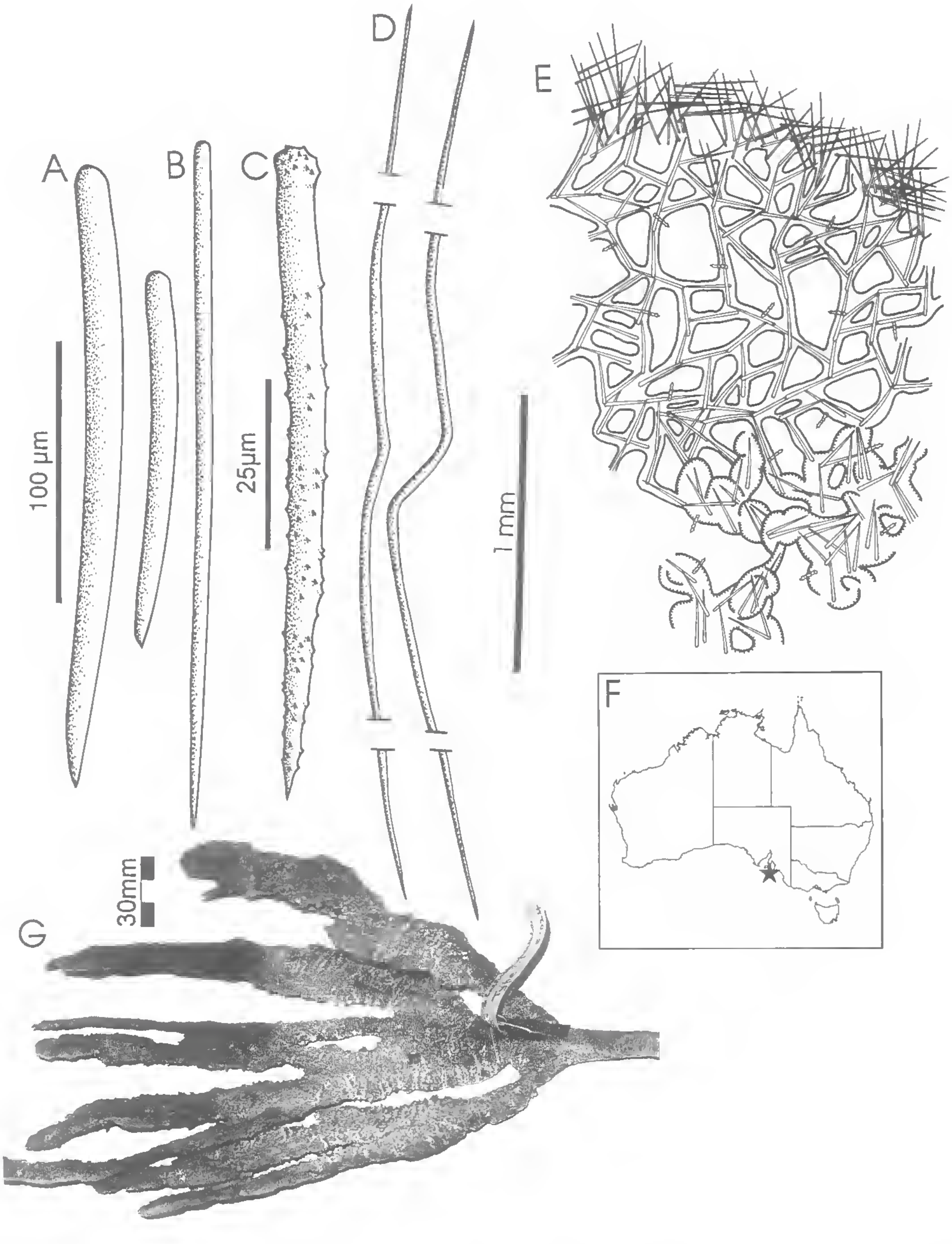

FIG. 59. *Clathria* (*Clathria*) *partita* Hallmann (holotype AME1024). A, Choanosomal principal styles. B, Subectosomal auxiliary style. C, Echinating acanthostyle. D, Sinuous-raphidiform toxas. E, Section through peripheral skeleton. F, Australian distribution. G, Holotype.

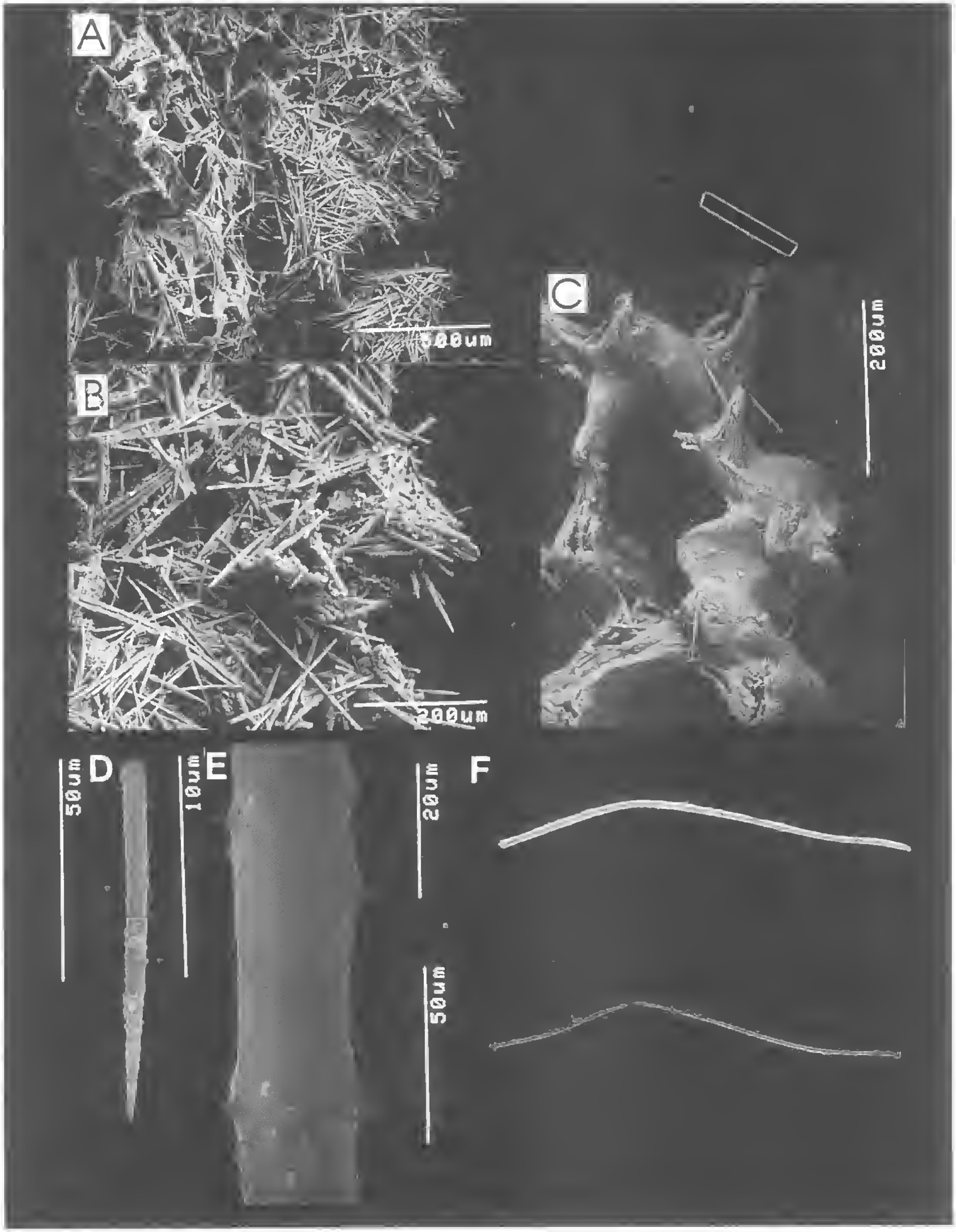

FIG. 60. *Clathria* (*Clathria*) *partita* Hallmann (holotype AME1024). A, Choanosomal skeleton. B, Peripheral skeleton. C, Fibre characteristics. D, Echinating acanthostyle. E, Vestigial acanthostyle spines. F, Fragments of sinuous and raphidiform toxas.

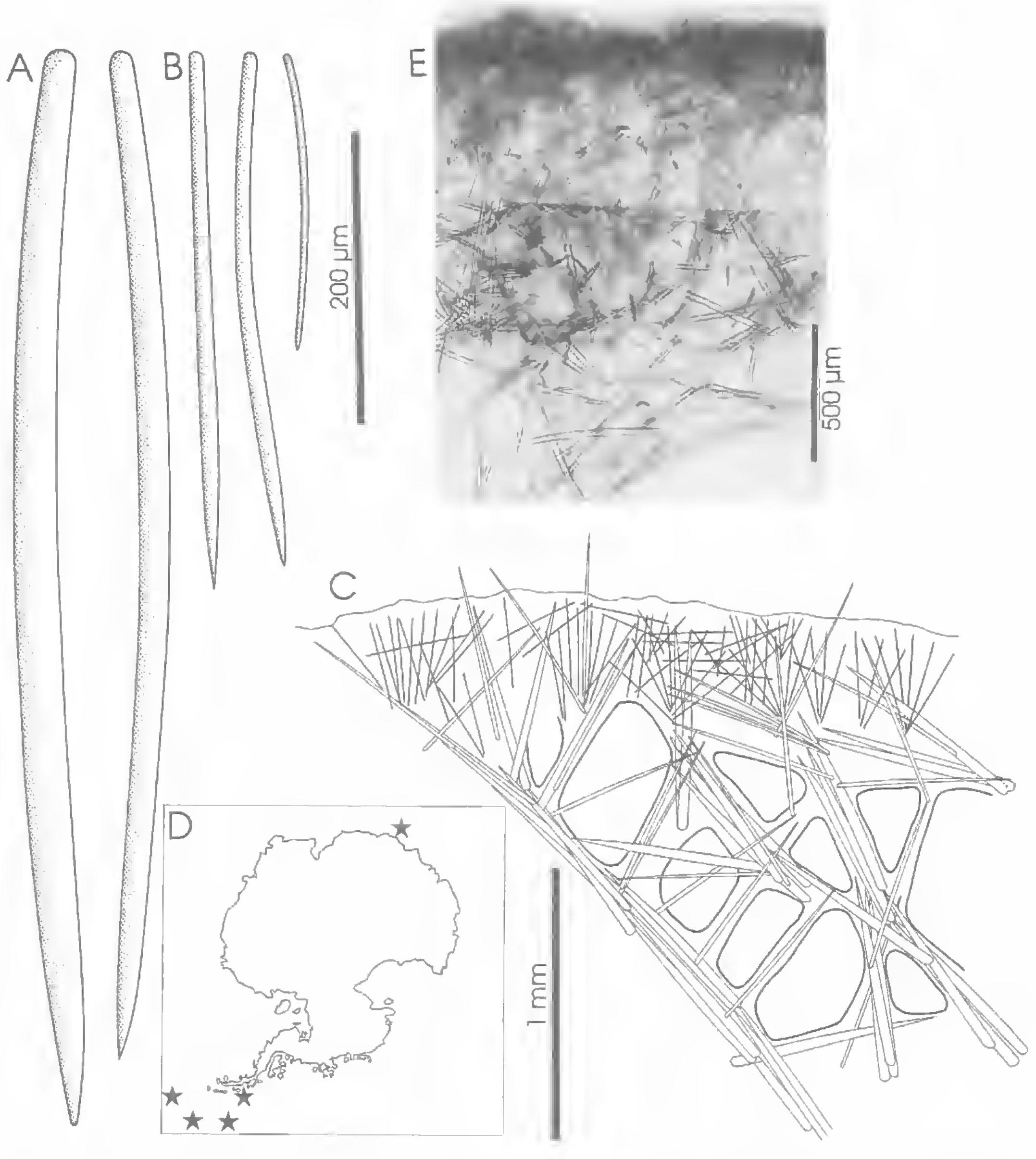

FIG. 61. *Clathria* (*Clathria*) *paucispicula* (Burton) (holotype BMNH1928.2.15.243a). A, Choanosomal principal styles. B, Subectosomal auxiliary styles. C, Section through peripheral skeleton. D, Antarctic distribution. E, Choanosomal skeletal structure.

Megascleres. Choanosomal principal styles long, thick, slightly hastate pointed or occasionally slightly telescoped pointed, curved at centre, with smooth rounded or slightly subtylote bases. Length 535-(663.4)-754µm, width 18-(23.3)-31µm.

Subectosomal auxiliary styles relatively long, thick, straight or slightly curved near basal end with evenly rounded smooth bases and tapering fusiform points. Length 255-(318.6)-402µm, width 6-(10.4)-14µm.

Echinating spicules absent.

Microscleres. Absent.

REMARKS. This species resembles a Suberitidae (Hadromerida) in skeletal structure, with the main clue as to its affinities with Microcionidae being the possession of megascleres that are not truly tylote in geometry, two distinct categories of principal and auxiliary megascleres, and slight compression of the skeleton in the axial region not generally seen in suberitids. Certain allocation of this species is difficult given that spicule diversity and skeletal structure are the main diagnostic characters for microcionids, and the species is aptly named for the reduction in these characters. It is well known and possibly widely distributed in Antarctic waters.

Clathria (Clathria) pauper Brondsted, 1926
(Figs 62-63)

Clathria pauper Brondsted, 1926: 3, text-fig.3; Burton, 1929a: 398; Burton, 1940: 109; Koltun, 1964a: 69, pl.12, figs 4-6; Sarà, 1978: 66-67, text-fig.40; Desqueyroux-Faundez & Moyano, 1987: 50.
Ramoses pauper; de Laubenfels, 1936a: 109.

MATERIAL. HOLOTYPE: NRHM (fragments BMNH 1930.11.5.2, AMZ2239): N. of Discovery Inlet, Victoria Land, Antarctica, 640m depth, 10.ii.1924, coll. Sten Warren (dredge).

HABITAT DISTRIBUTION. 10-640m depth; hard and soft substrates; Australian Antarctic Territory: Victoria Land, Banzare Coast, Wilkes Land (Brondsted, 1926; Koltun, 1964a) (Fig. 62G). Also SW. Maldonado, Mar del Plata, Argentina, S. Brazil (Burton, 1940), Cape Sebastiano, Cape Domingo, Rio Grande, Tierra del Fuego (Sarà, 1978).

DESCRIPTION. *Shape.* Erect branching digitate sponge, up to 80mm high.
Colour. Grey-brown preserved.
Oscules. Unknown.
Texture and surface characteristics. Texture firm, compressible, elastic; surface conulose with irregularly digitate processes, up to 20mm long and 4mm thick, and with convoluted distinct ectosomal membrane visible between conules.
Ectosome and subectosome. With irregular plumose brushes of subectosomal auxiliary styles protruding from end of choanosomal primary skeletal columns.
Choanosome. Skeletal architecture plumose-reticulate, with differentiated primary and secondary fibre systems; primary fibres ascending, multispicular, diverging near surface, cored by erect choanosomal principal styles with points of spicules directed upwards and outwards; skeletal columns dominated by spicules with poor spongin; secondary fibres uni- or paucispicular, interconnecting adjacent primary tracts, forming irregular or triangular meshes up to 350µm diameter; echinating acanthostyles protruding at acute angles from fibres, or clumped in plumose brushes, scattered over the whole length of primary tracts although more sparse near surface; mesohyl moderately heavy, lightly pigmented, granular.

Megascleres. Choanosomal principal styles long, thick, straight or slightly curved at midsection, tapering to long fusiform points, most commonly with rounded smooth bases or occasionally with microspined subtylote bases. Length 372-(606.1)-810µm, width 11-(15.8)-21µm.

Subectosomal auxiliary styles shorter, more slender than principals, straight, with fusiform points and microspined subtylote bases. Length 352-(480.8)-590µm, width 3-(7.6)-10µm.

Echinating acanthostyles in two size categories. Larger form intermediate between the smaller and the principal styles, slightly curved at midsection, fusiform pointed, subtylote, with heavily spined bases, lightly spined shafts and often with bare base. Length 219-(293.0)-384µm, width 10-(12.3)-15µm. Smaller acanthostyles straight, slender, subtylote, fusiform, more-or-less evenly spined except usually for an aspinose point. Length 92-(148.4)-183µm, width 5-(8.4)-11µm.

Microscleres. Chelae absent.

Toxas of two forms: Accolada toxas, long, thin, with long straight arms, sharply angular central curve or spirally twisted centre, and non-reflexed points. Length 93-(139.5)-185µm, width 0.8-(0.9)-1.5µm. Wing-shaped toxas, short, thick, gradually curved at centre, curved arms, slightly reflexed points. Length 31-(45.5)-52µm, width 1.5-(1.7)-2.0µm.

REMARKS. Koltun (1976) suggested that *C. pauper* is synonymous with *Stylostichon toxiferum* Topsent and *Microciona basispinosa* Burton, but respective types indicate that they differ substantially in a number of significant features, considered here to warrant recognition of *C. pauper* as a distinct species (see remarks for *C. (Microciona) antarctica* below). *Clathria pauper* differs from other species by a combination of characters (plumose-reticulate skeletal structure with differentiated primary and secondary fibre systems; principal spicules protruding through fibres in 'spicate' arrangement; two sizes of acanthostyles echinating fibres; two toxa morphologies; and absence of chelae).

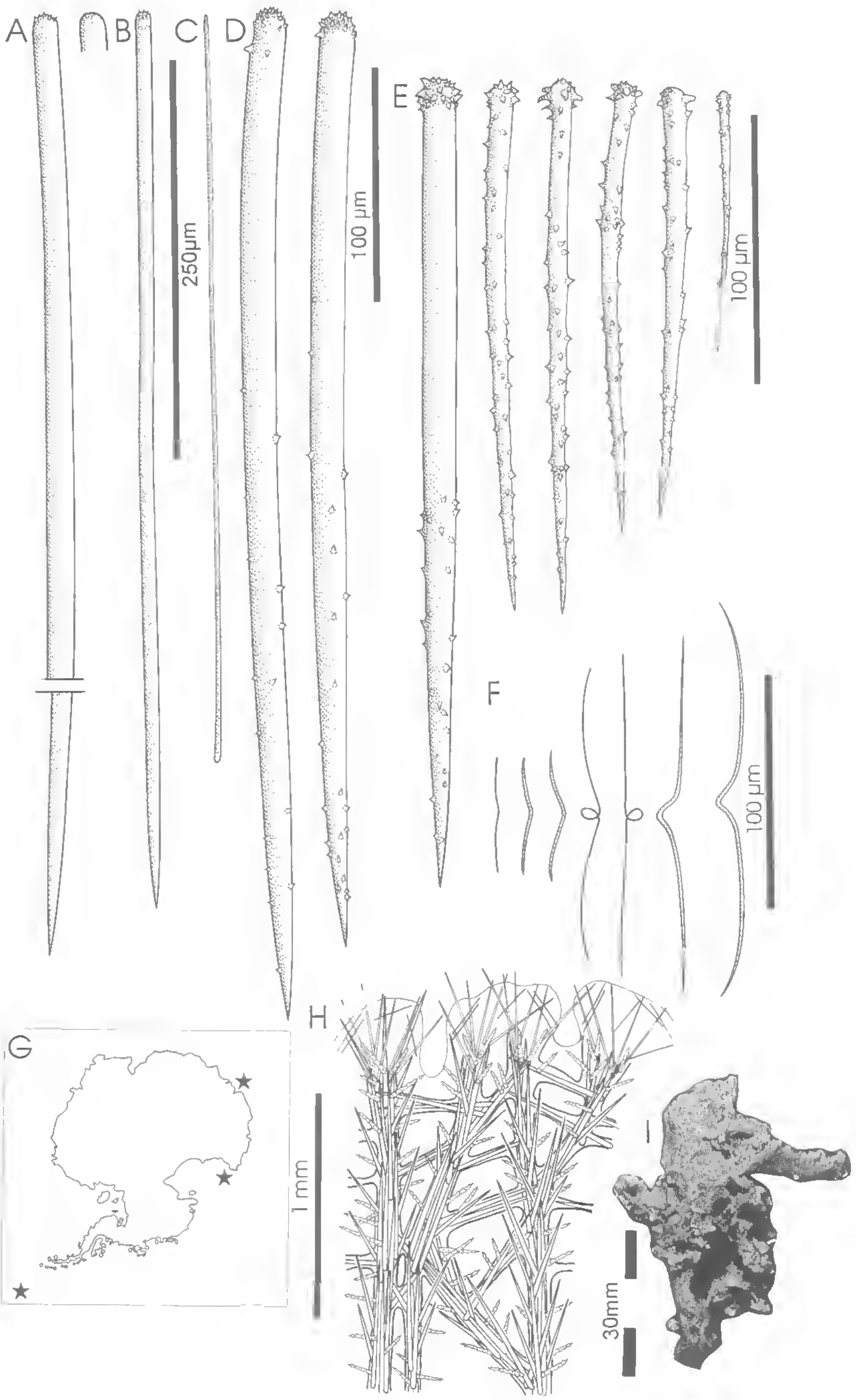

FIG. 62. *Clathria* (*Clathria*) *pauper* Brondsted (fragment of holotype BMNH1930.11.5.2). A, Choanosomal principal style. B, Subectosomal auxiliary style. C, Young auxiliary style. D, Larger category of echinating acanthostyles. E, Smaller form of echinating acanthostyles. F, Short wing-shaped toxas and larger accolada toxas. G, Known Antarctic distribution. H, Section through peripheral skeleton. I, Fragment of holotype.

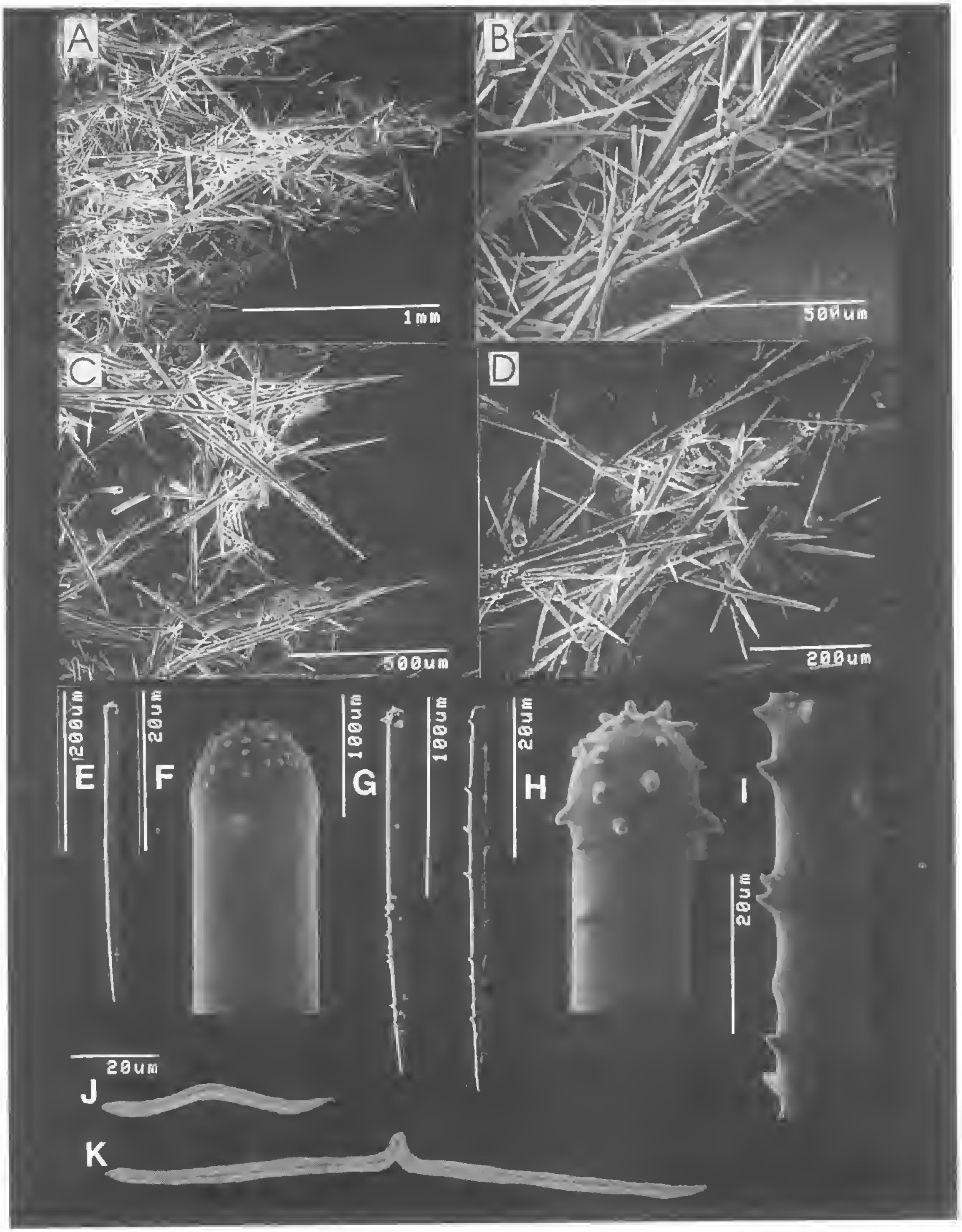

FIG. 63. *Clathria (Clathria) pauper* Brondsted (fragment of holotype BMNH1930.11.5.2). A, Choanosomal skeleton. B, Ectosomal skeleton. C, Peripheral skeletal structure. D, Fibre characteristics. E, Choanosomal principal subtylostyle. F, Base of principal subtylostyle. G, 2 sizes of echinating acanthostyles. H, Spined base of acanthostyle. I, Acanthostyle spine morphology. J, Accolada toxa. K, Wing-shaped toxa.

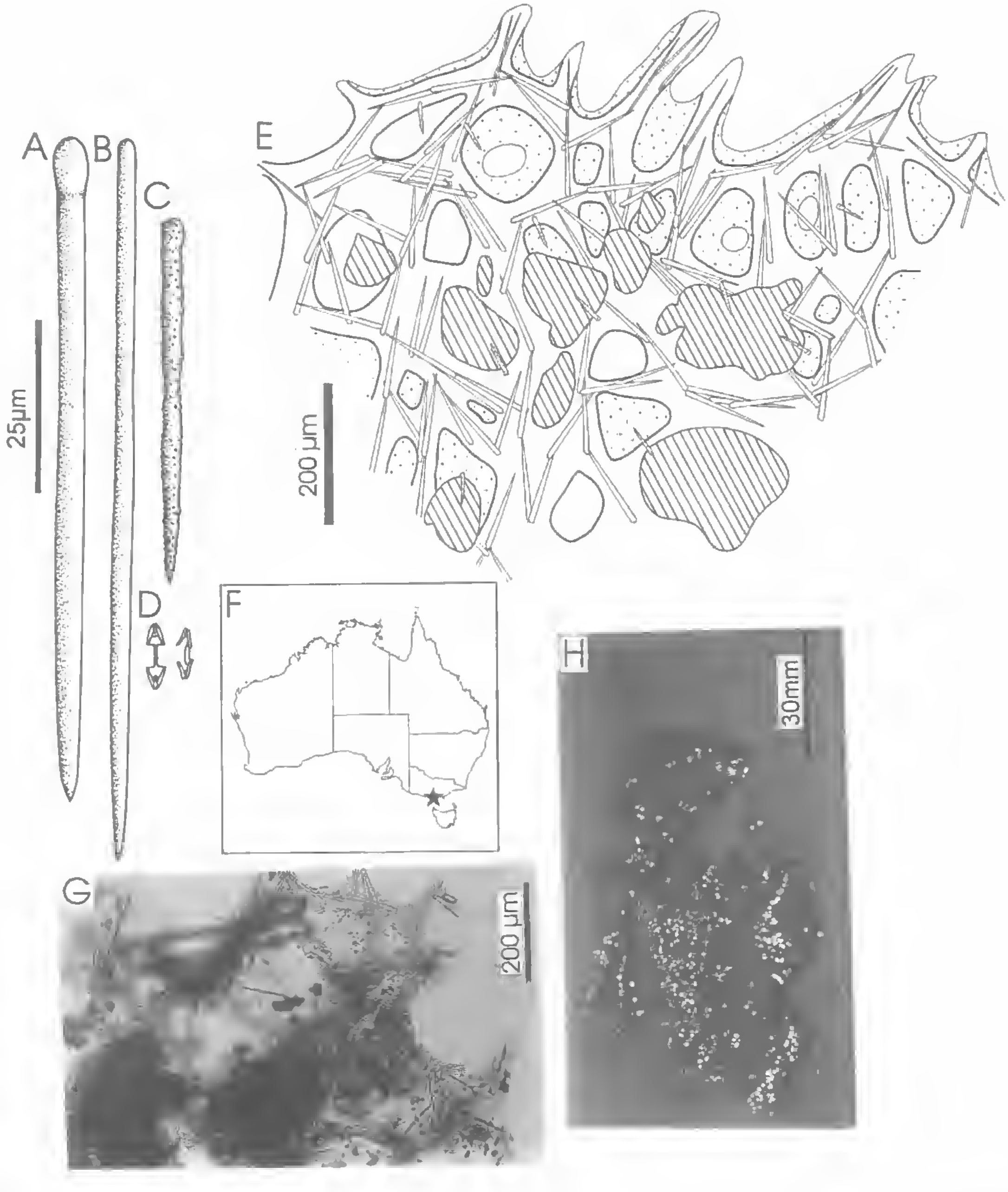

FIG. 64. *Clathria* (*Clathria*) *perforata* (Lendenfeld) (lectotype AMMG9010). A, Choanosomal principal subtylostyle. B, Subectosomal auxiliary style. C, Echinating acanthostyle. D, Palmate isochelae. E, Section through peripheral skeleton. F, Distribution. G, Skeletal structure. H. Surviving portion of type specimen.

Clathria (Clathria) perforata (Lendenfeld, 1887) (Fig. 64)

Antherochalina perforata, in part, Lendenfeld, 1887b: 788; in part, Lendenfeld, 1888: 89-90. (Not Lendenfeld, 1887b: pl.22, fig.44.)

Clathria perforata; Whitelegge, 1902b: 275, 279, 287; Hooper & Wiedenmayer, 1994: 260.

MATERIAL. LECTOTYPE: AMG9010: Port Phillip, Vic, 38°09'S, 144°52'E, other details unknown (specimen label reads 'Antherochalina perforata

Lend.', whereas AM register reads 'Suberapsamma philippi Lend., Port Phillip'). (Not SYNTYPE - BMNH1886.8,27,459: Broughton I., Port Stephens, NSW, 32°36'S, 152°19'E).

HABITAT DISTRIBUTION. Ecology unknown; SE. coast of Australia (Vic, NSW) (Fig. 64F).

DESCRIPTION. *Shape.* Irregularly flabellodigitate, thin, with a small stalk.
Colour. Live colouration unknown, dark brown preserved.
Oscules. Unknown.
Texture and surface characteristics. Surface arenaceaous, porous; texture harsh..
Ectosome and subectosome. Ectosome fibrous, arenacious, little remaining of original dermal skeleton.
Choanosome. Choanosomal skeleton irregularly isodictyal reticulate, with relatively heavy spongin fibres forming oval or hexagonal meshes, cored by one or few vestigial choanosomal principal styles; echinating acanthostyles very scarse, scattered evenly throughout skeleton; mesohyl matrix contains heavy deposits of siliceous detritus, especially large sand grains, with heavily pigmented and granular mesohyl matrix.
Megascleres. Choanosomal principal subtylostyles thin, fusiform, straight, with slightly subtylote, smooth bases. Length 96-(105.0)-118μm, width 4-(4.8)-6μm.

Subectosomal auxiliary styles barely differentiated from principal megascleres, usually much thinner, only seen scattered between fibres, few at surface. Length 85-(103.3)-146μm, width 1-(2.7)-4μm.

Acanthostyles small, slightly subtylote, with vestigial or granular spination. Length 46-(57.7)-72μm, width 2.5-(3.1)-4.5μm.
Microscleres. Palmate isochelae rare. Length 8-(9.7)-11μm.

Toxas absent.

REMARKS. Lendenfeld (1887) originally nominated two 'syntypes', but one (BMNH) (Lendenfeld, 1887b: pl.22, fig.44) is *Antho* (see *A.* (*Isopenectya*) *chartacea*), whereas the description was based on the other AM specimen (Lendenfeld, 1887b: 788, 1888: 89). This latter specimen is designated lectotype, but is in poor condition and the species is poorly known: ectosomal features cannot be clearly discerned; most megascleres within fibres are broken; and microscleres are extremely difficult to pick out between the abundant detritus within the mesohyl. In having flattened fibres which form irregular (isodictyal) anastomoses, *C.* (*C.*) *perforata* could also be assigned to *Pandaros* or *Echinoclathria*, whereas the few vestigial acanthostyles seen in the lectotype suggest that *Clathria* (*Clathria*) is more appropriate.

Clathria (Clathria) piniformis (Carter, 1885)
(Figs 65-66, Table 11)

Dictyocylindrus piniformis Carter, 1885f: 354.
Clathria piniformis; Dendy, 1896: 34; Hooper & Wiedenmayer, 1994: 261.
Wilsonella piniformis; Hallmann, 1912: 241.
Paradoryx piniformis; Hallmann, 1920: 768.

MATERIAL. HOLOTYPE: BMNH1886.12.15.62 (fragments MNHNDCL60, AMG2803): Port Phillip Heads, Vic, 38°17'S, 144°39'E, 38-40m depth, coll. J.B. Wilson (dredge). OTHER MATERIAL: VIC - NMVRN412-508.

HABITAT DISTRIBUTION. 38-40m depth; substrate unknown; Port Phillip Bay(Fig. 65G).

DESCRIPTION. *Shape.* Massive, subspherical lobate or lobo-digitate growth form, 110-130mm long, 55-65mm wide, with thick cylindrical stalk, 45mm long, 18-22mm diameter.
Colour. Bright orange-brown alive, olive-brown preserved.
Oscules. Large oscules, 2-4mm diameter dispersed over both faces of digitate lobes.
Texture and surface characteristics. Surface rugose, with irregularly distributed conules, and a skin-like dermis.
Ectosome and subectosome. Ectosome membraneous, with tangential and paratangential bundles of subectosomal auxiliary styles, sometimes forming quite thick, sinuous tracts.
Choanosome. Choanosomal skeleton reticulate; spongin fibres well developed, thin, forming sinuous tracts, branching and splitting, and producing oval or elongate meshes; spongin fibres without clear differentiation between primary or secondary elements, although thicker fibres, usually ascending and cored by principal styles, whereas connecting fibres usually aspiculose; spongin fibres cored with paucispicular tracts of vestigial choanosomal principal styles, and echinated by small acanthostyles in heavy concentrations and relatively evenly dispersed; mesohyl matrix heavy, with numerous extra-fibre spicules, especially acanthostyles and auxiliary styles in the peripheral skeleton.
Megascleres (Table 11). Choanosomal principal subtylostyles very thin, vestigial, with blackened axial canals, fusiform, usually straight, some-

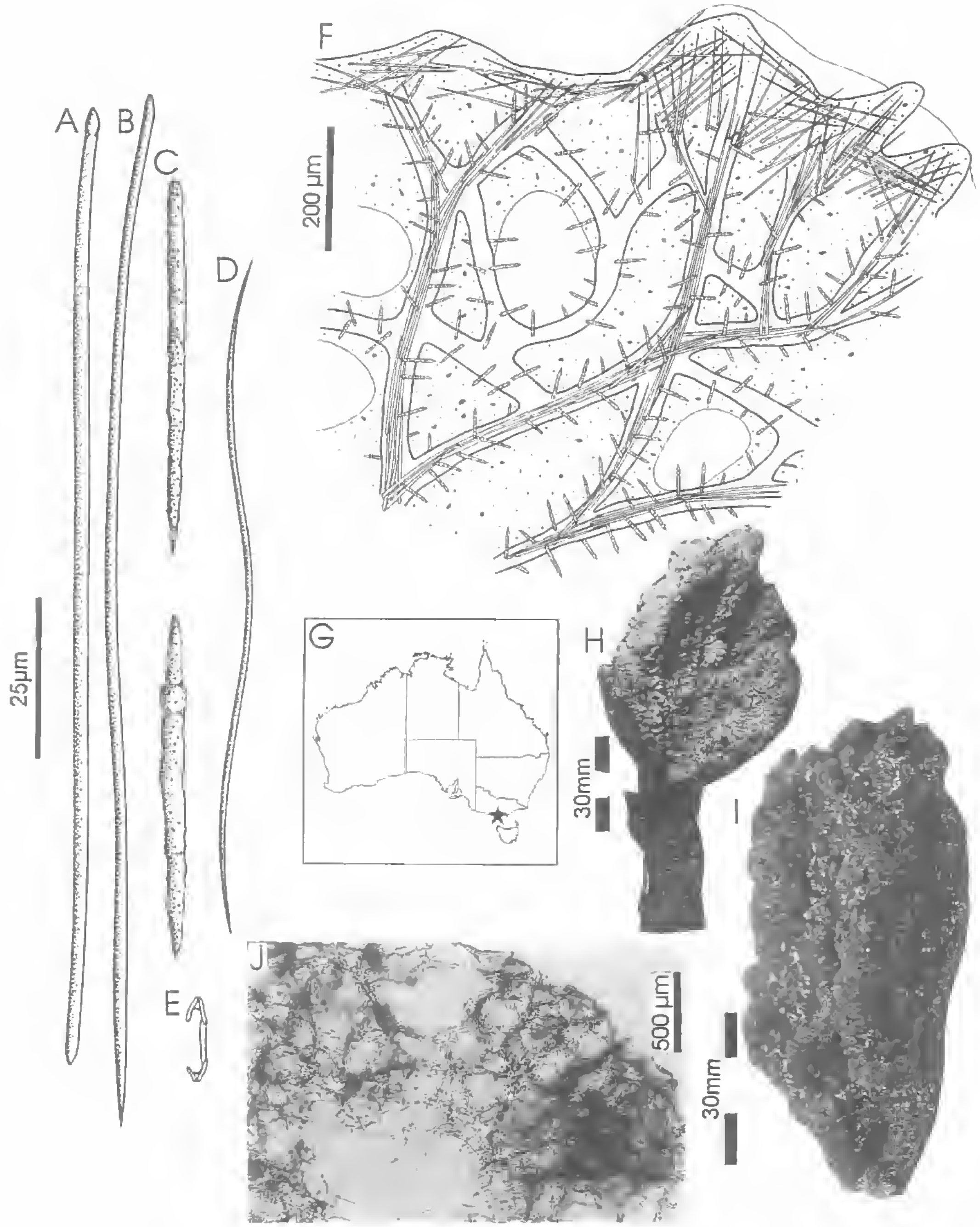

FIG. 65. *Clathria* (*Clathria*) *piniformis* (Carter) (holotype BMNH1886.12.15.62). A, Choanosomal principal subtylostyle. B, Subectosomal auxiliary style. C, Echinating acanthostyle and modified form. D, Raphidiform toxa. E, Palmate isochela. F, Section through peripheral skeleton. G, Australian distribution. G, Holotype. I, Specimen NMVRN412. J, Choanosomal skeleton.

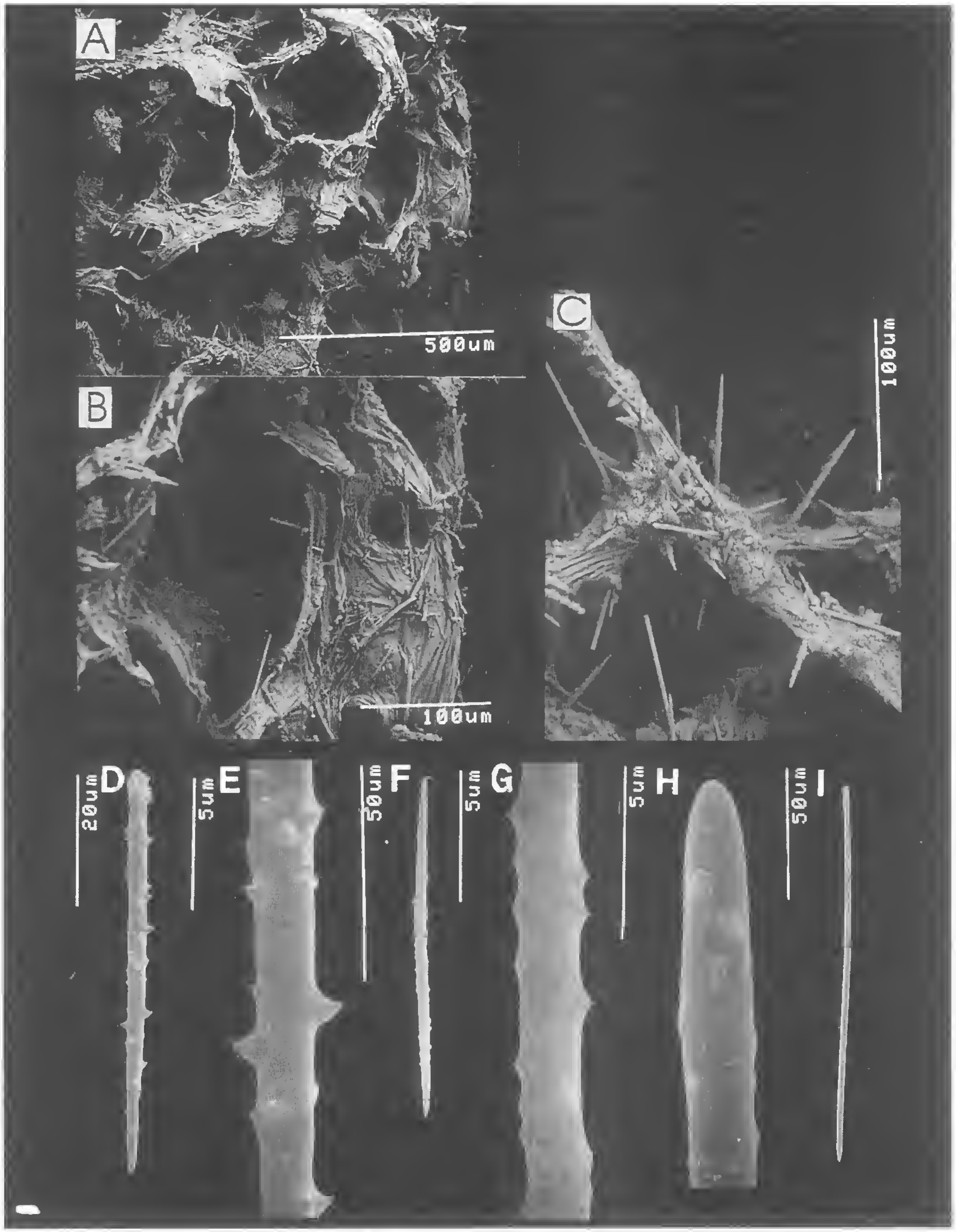

FIG. 66. *Clathria* (*Clathria*) *piniformis* (Carter) (holotype BMNH1886.12.15.62). A, Choanosomal skeleton. B, Peripheral skeleton. C, Fibre characteristics. D, Echinating acanthostyle. E, Acanthostyle spines. F, Modified acanthostyle. G, Modified acanthostyle spination. H, Base of principal style. I, Principal style.

times slightly curved, with rounded, tapering or more frequently quasidiactinal, smooth bases.

Subectosomal auxiliary styles almost identical to principal styles, longer, thin, slightly curved or sinuous, fusiform, with basal endings similar to principal megascleres.

Acanthostyles slightly subtylote with vestigial, evenly dispersed spines, include quasidiactinal modifications to base.

Microscleres (Table 11). Palmate isochelae rare, unmodified.

Toxas rhaphidiform, uncommon, with slight central curvature and reflexed points, sometimes sinuous.

REMARKS. In vestigial spicule geometry and generally reduced skeletal structures *C.* (*C.*) *piniformis* is most similar to *C.* (*C.*) *oxyphila*, both of which have most of their megascleres modified to quasidiactinal forms (see remarks for *C. oxyphila*), but the present species has quite different microsclere geometry, skeletal construction and growth form.

TABLE 11. Comparison between present and published records of *Clathria* (*Clathria*) *piniformis* (Carter). Measurements in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Holotype (BMNH-1886.12.15.62)	Specimen (N=1)
Choanosomal principal styles	124-(137.6)-156 x 1.5-(2.2.)-3	128-(144.4)-154 x 2-(2.6)-4
Subectosomal auxiliary styles	147-(164.4)-182 x 2.5-(3.1)-4	149-(178.3)-197 x 2-(3.9)-6
Echinating acanthostyles	51-(57.1)-64 x 2.5-(3.2)-4	49-(54.2)-58 x 2-(3.3)-6
Chelae	9-(10.2)-12	10-(10.8)-12
Toxas	92-(117.2)-143 x 0.5-(0.7)-1	110-(122.0)-135 x 0.5-(0.7)-0.8

Clathria (Clathria) raphanus (Lamarck, 1813) (Figs 67-68)

Spongia raphanus Lamarck, 1813: 444; 1814: 373.
Clathria raphanus; Topsent, 1932: 100, pl.4, fig.9; Hooper & Wiedenmayer, 1994: 261.
Clathria raphana; Van Soest, 1984b: 108.
Thalyseurypon raphanus; de Laubenfels, 1936a: 107.
Pandaros raphanus; Wiedenmayer, 1977: 143-4.

MATERIAL. HOLOTYPE: MNHNDT572(dry): Australian seas, Peron & Lesueur collection, no other details known.

HABITAT DISTRIBUTION. Ecology unknown; Australia.

DESCRIPTION. *Shape.* Arborescent fan, 90mm high, 95mm wide, with flattened multiplanar branches 48-80mm long, 5-10mm thick, which anastomose tightly to form several lobes.

Colour. Grey-brown dry.

Oscules. Large oscules, up to 3.5mm diameter, scattered over both faces of flattened branches.

Texture and surface characteristics. Surface microconulose with tapering processes; texture harsh in dry state.

Ectosome and subectosome. Ectosomal skeleton a sparse tangential or paratangential layer of subectosomal auxiliary styles.

Choanosome. Choanosomal skeleton almost regularly reticulate, with heavy spongin fibres forming oval or elongate meshes, without differentiation of primary or secondary elements; spongin fibres almost totally uncored, and where present, choanosomal principal styles form uni- or paucispicular tracts within axis of fibres; spongin fibres sparsely echinated by acanthostyles; mesohyl light (dried material).

Megascleres. Choanosomal principal subtylostyles fusiform, slightly curved, with rounded or slightly subtylote, smooth bases. Length 108-(148.6)-230µm, width 3.5-(5.6)-9µm.

Subectosomal auxiliary subtylostyles straight or slightly curved, thin, fusiform, with subtylote, smooth bases. Length 168-(225.7)-315µm, width 1.5-(2.6)-4µm.

Acanthostyles curved, slightly subtylote, with vestigial, granular, evenly dispersed spines. Length 47-(65.2)-82µm, width 2.5-(4.1)-5µm.

Microscleres. Absent.

REMARKS. This species is known only from an antiquated dried specimen collected from 'somewhere in the vicinity of Australia' (Topsent, 1932). It was made the type species of *Thalyseurypon* de Laubenfels and has since been the subject of lengthy discussions by de Laubenfels (1936a), Hechtel (1965), Wiedenmayer (1977), Van Soest (1984b) and Fromont & Bergquist (1990). These discussions have centred mostly on the value of the loss of meniscoid (chelae) microscleres used as a valid taxonomic character. These arguments have been addressed in the synopsis of *Thalyseurypon* (see Included Genera, above). *Clathria raphanus* bears little resemblance to *Pandaros* as supposed by Wiedenmayer (1977) which has flattened fibres, or *Echinoclathria* (as interpreted by Wiedenmayer, 1989) which has smooth echinating megascleres. This species is most appropriately placed in *Clathria* (*Clathria*) based on the distribution and geometry of its megascleres.

Clathria (*C.*) *raphanus* is depauperate in morphological features, with a reduced spicule diversity and vestigial spicule development, and a relatively heavy evenly reticulate fibre skeleton, and in this respect the species is associated with a species-group (the '*oxyphila*' group; also containing *C.* (*C.*) *piniformis*, *C.* (*C.*) *oxyphila* and *C.* (*Dendrocia*) *elegantula*).

Clathria (Clathria) rubens (Lendenfeld, 1888) (Figs 69-70, Table 12)

Thalassodendron rubens Lendenfeld, 1888: 223.
Not *Thalassodendron rubens* var. *dura*, in part, Lendenfeld, 1888: 223-224.
Not *Thalassodendron rubens* var. *lamella*, in part, Lendenfeld, 1888: 224, pl.7.
Clathria rubens, in part; Whitelegge, 1901: 85-86, pl.11, fig.13.
Clathria rubens; Hallmann, 1912: 218-223, pl.32, fig.1, text-fig.45; Burton, 1934a: 558; Burton, 1938b: 20; Shaw, 1927: 425-426; Guiler, 1950: 7; Hooper & Wiedenmayer, 1994: 261.
Clathria tenuifibra Whitelegge, 1901: 82-83, pl.11, fig.10; Whitelegge, 1902b: 274, 279, 287; Hallmann, 1912: 211.
Thalysias tenuifibra; de Laubenfels, 1936a: 105.
Placochalina pedunculata var. *mollis*, in part; Lendenfeld, 1888: 91-92; Whitelegge, 1902b: 274.
cf. *Microciona prolifera*; Vosmaer, 1935a: 611, 644, 668.
Not *Microciona rubens* Bergquist, 1961a: 38.

MATERIAL. LECTOTYPE: AMG9119 (dry): Port Jackson, NSW, 33°51'S, 151°16'E, no other details known (label 'Thalassodendron rubens RvL, type'). PARALECTOTYPES: AMZ455 (slide AMG3585: same locality (dry, label 'Clathria rubens, type or cotype, Lendenfeld's duplicate A50'). AMZ634: same locality; (dry, label 'Thalassodendron rubens RvL, type or cotype, Lendenfeld's no.240'). BMNH1887.1.24.35 (fragment AMG3586): same locality, Ramsay collection (listed as 'var. *intermedia* MS name'). HOLOTYPE of *C. tenuifibra*: AMG3045(dry): Lake Illawarra region, NSW, 34°32'S, 150°50'E (label 'Thalysias tenuifibra Whitelegge; type'). OTHER MATERIAL: NSW - QMG300452.

HABITAT DISTRIBUTION. Shallower than 56m depth; on shell, gravel and *Halimeda* substrates; Port Jackson (Lendenfeld, 1888), Broken Bay, Lake Illawarra, and Woolongong (NSW) (Whitelegge, 1901; Hallmann, 1912); Direction and Eagle Is, Great Barrier Reef (FNQ) (Burton, 1934a); Maria I. (Tas) (Shaw, 1927; Guiler, 1950); St Vincent Gulf (SA) (Hallmann, 1912) (Fig. 69G).

DESCRIPTION. *Shape*. Arborescent digitate sponge, 100-190mm high, 60-110mm wide, with numerous anastomosing, repeatedly bifurcate, stoloniferous branches, 30-75mm long, up to 19mm diameter, without definite basal stalk; branches subcylindrical, slightly flattened at ends.

Colour. Grey-brown in ethanol.

Oscules. Large oscules, 2-4mm diameter, scattered over surface of branches, often raised on a small lip.

Texture and surface characteristics. Surface even, optically smooth, but with prominent subdermal grooves and stellate drainage canals radiating from a central osculum (not seen in dry material).

Ectosome and subectosome. Ectosomal region membraneous, with a sparse tangential layer of subectosomal auxiliary styles, through which protrude sparse brushes of choanosomal principal styles; subectosomal skeleton has auxiliary styles dispersed paratangentially, and peripheral choansomal fibres diverging slightly just below surface.

Choanosome. Choanosomal skeletal architecture subisodictyal, with triangular or irregular meshes and thin spongin fibres, cored by uni-, bi- or paucispicular tracts of choanosomal principal styles; spongin fibres imperfectly divided into axial and extra-axial components, differing only in fibre diameter; axial fibres comparatively thick, paucispicular, forming cavernous and irregular ovoid meshes; extra-axial skeletal meshes more obviously triangular, subisodictyal, with thin, paucispicular ascending primary spongin fibres interconnected by uni- or bispicular secondary fibres; echinating acanthostyles lightly and evenly dispersed over fibres; mesohyl matrix heavier in peripheral skeleton than at core, containing few principal and auxiliary styles and microscleres.

Megascleres (Table 12). Choanosomal principal styles thick, mostly straight, hastate-fusiform, with rounded, tapering or subtylote bases, usually smooth, occasionally microspined.

Subectosomal auxiliary subtylostyles longer than principal styles, thin, straight, fusiform, with slightly subtylote, microspined bases.

Acanthostyles subtylote, with mostly granular, evenly dispersed spines, sometimes with aspinose necks, and some clearly intermediate forms of choanosomal styles.

Microscleres (refer to Table 12 for dimensions). Palmate isochelae rare, small, unmodified.

Toxas accolada, thin, long, usually with very large, angular, sometimes coiled, central curves, slightly reflexed points, or they may be nearly straight with coiled central flexion.

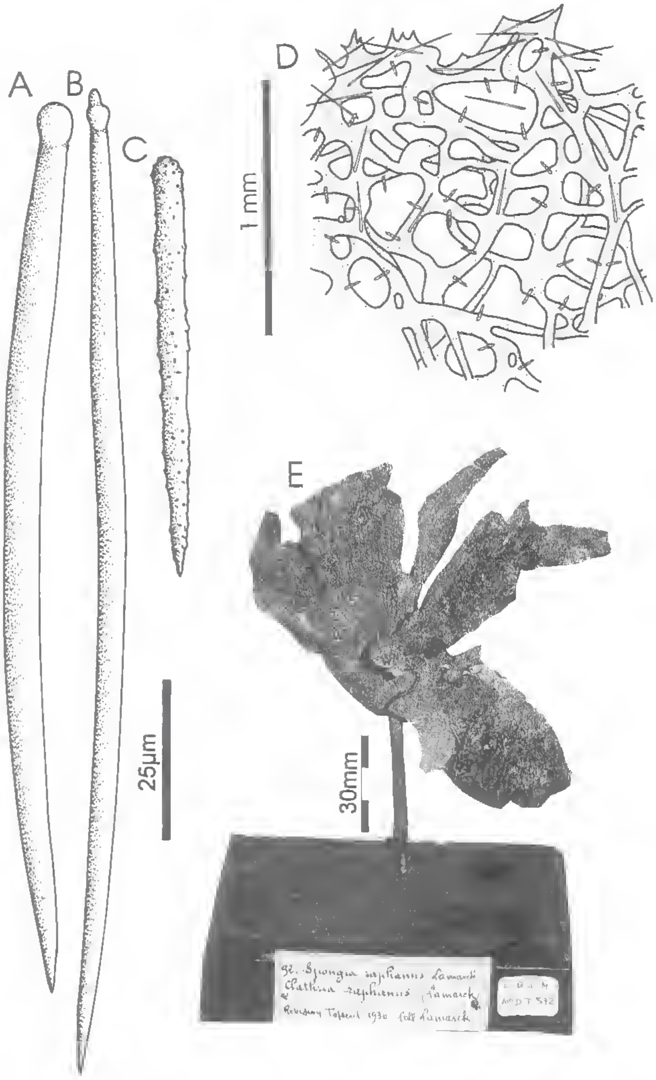

FIG. 67. *Clathria* (*Clathria*) *raphanus* (Lamarck) (holotype MNHNDT572). A, Choanosomal principal subtylostyle. B, Subectosomal auxiliary subtylostyle. C, Echinating acanthostyle. D, Section through peripheral skeleton. E, Holotype.

REMARKS. *Clathria* (*C.*) *rubens* is very similar to *C.* (*C.*) *partita* in skeletal architecture and fibre characteristics. Both species have a more-or-less differentiated axial and extra-axial choanosomal skeleton. Whereas the present species has an irregularly subisodictyal reticulate skeleton with ovoid meshes and heavy fibres, *C.* (*C.*) *partita* has a nearly regular *Isociella*-like isodictyal skeleton. These two species are also similar in the extent to which axial and extra-axial skeletons are separated (with more marked separation in *C.* (*C.*) *partita*), geometry of choanosomal styles and toxas (Figs 59, 69), and having similar growth forms (although branches are cylindrical in *C.* (*C.*) *rubens* but flattened in *C.* (*C.*) *partita*). Nevertheless, spicule geometries, fibre characteristics and spicule dimensions indicate that they are probably separate sibling species.

There are 3 other AM specimens which have been associated with *C.* (*C.*) *rubens*. One, AMZ4810 from Port Jackson (with label '*Thalassodendron rubens*, donated by A. Dendy'), is probably a fragment of the BMNH paralectotype, but this has not been verified. AMZ2241 from Tasmania (apparently identified by M. Burton, with an old label '*Rhaphidophlus typicus*, dried up in 1917-18'), and AMZ2246 (locality unknown, also identified by M. Burton, with an old label which reads '*Crella incrustans*'), were both obtained from the Antarctic Publications Committee (donated by Prof. Haswell). All three are in too poor condition to identify reliably, but they appear related to *C.* (*Thalysias*) *cactiformis*. The origin of the QM specimen, obviously of great antiquity, is not known (L. Cannon, pers. comm.), but it may have been an exchange specimen from the AM during Whitelegge's era. That specimen certainly belongs to *C.* (*C.*) *rubens*.

The holotype of *C. tenuifibra* is also in poor condition, and irrespective of skeletal reconstitution following rehydration during sectioning only few features were discernible. What little can be seen of the skeletal structure is identical to *C.* (*C.*) *rubens*, particularly the fibre characteristics and spiculation, and on this basis the two species are merged here.

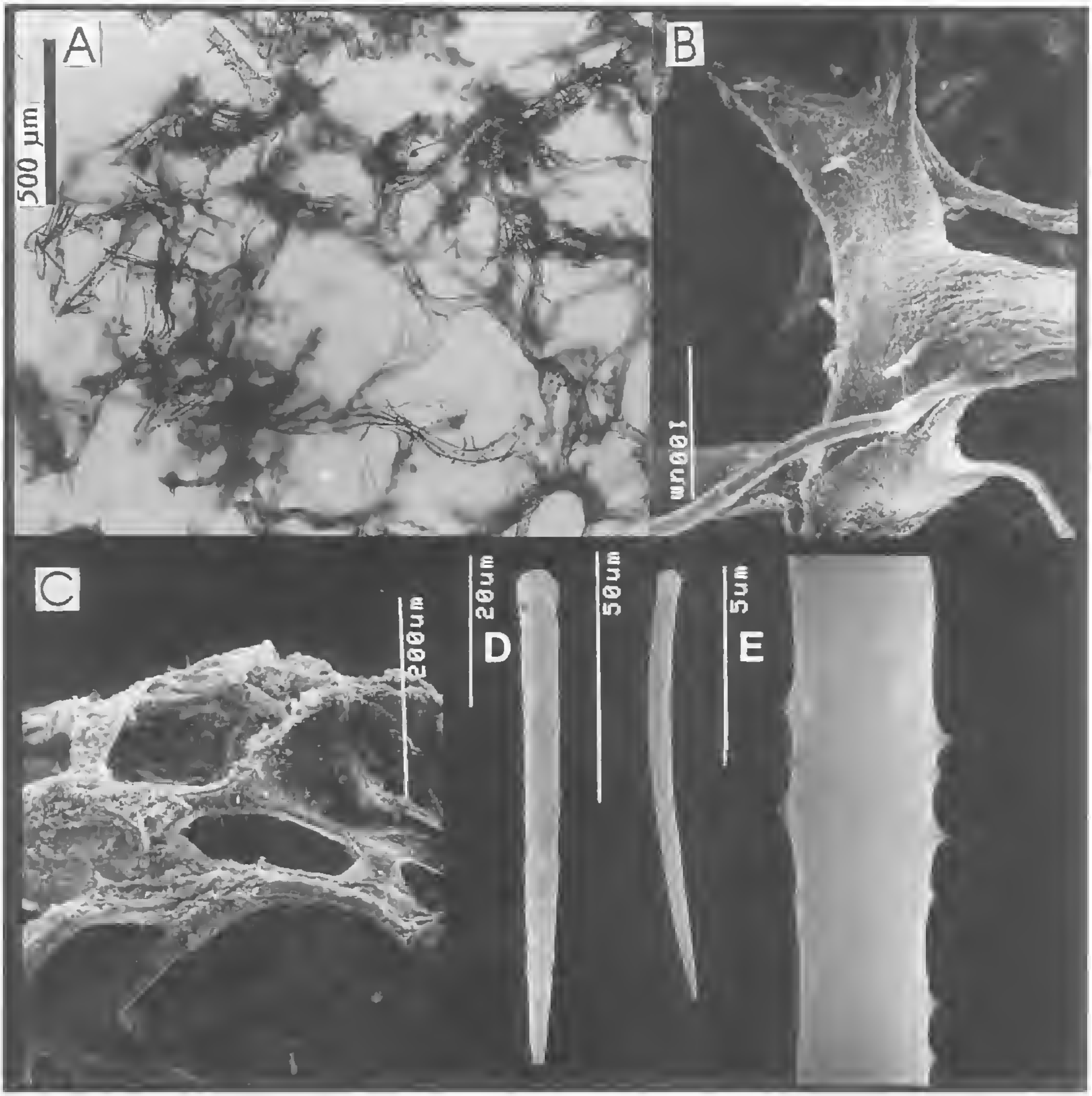

FIG. 68. *Clathria* (*Clathria*) *raphanus* (Lamarck) (holotype MNHNDT572). A, Choanosomal skeleton. B, Fibre characteristics. C, Membraneous ectosomal region. D, Echinating acanthostyles. E, Vestigial acanthostyle spines.

Clathria (Clathria) squalorum Wiedenmayer in Hooper & Wiedenmayer, 1994

(Figs 71-72)

Clathria squalorum Wiedenmayer, in Hooper & Wiedenmayer, 1994: 261.
Clathria dura var. *mollis* Hentschel, 1911: 370-372, text-fig.45; Hallmann, 1912: 242.
Not *Clathria dura* Whitelegge, 1901: 83.
Not *Clathria mollis* Kirkpatrick, 1903: 249.

MATERIAL. LECTOTYPE: ZMB4444: Freycinet Reach, Shark Bay region, WA, 26°05'S, 113°30'E, 3.5-11m depth, 5.ix.1905, coll. W. Michaelsen & R. Hartmeyer (dredge). PARALECTOTYPES: HM: same locality (9 dry specimens). HM: Geographe Bay, Bunbury region, WA, 33°35'S, 115°26'E (5 dry specimens).

HABITAT DISTRIBUTION. 3.5-11m depth; on sand, stone, mud and algal bed substrates; Bunbury-Shark Bay region (WA) (Fig. 71G).

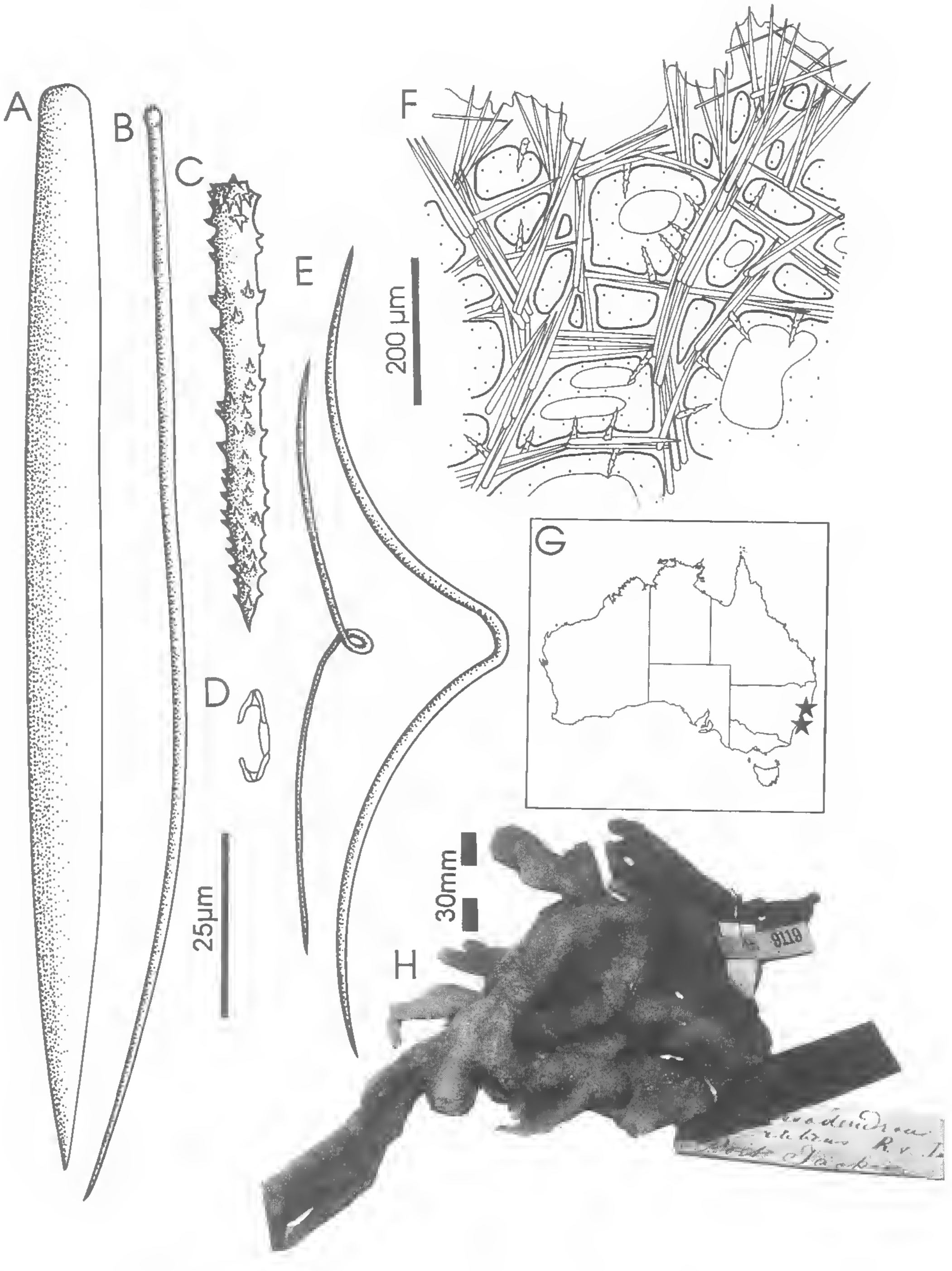

FIG. 69. *Clathria* (*Clathria*) *rubens* (Lendenfeld) (lectotype AMZ9119). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyle. C, Echinating acanthostyle. D, Palmate isochela. E, Accolada toxas. F, Section through peripheral skeleton. G, Australian distribution. H, Lectotype.

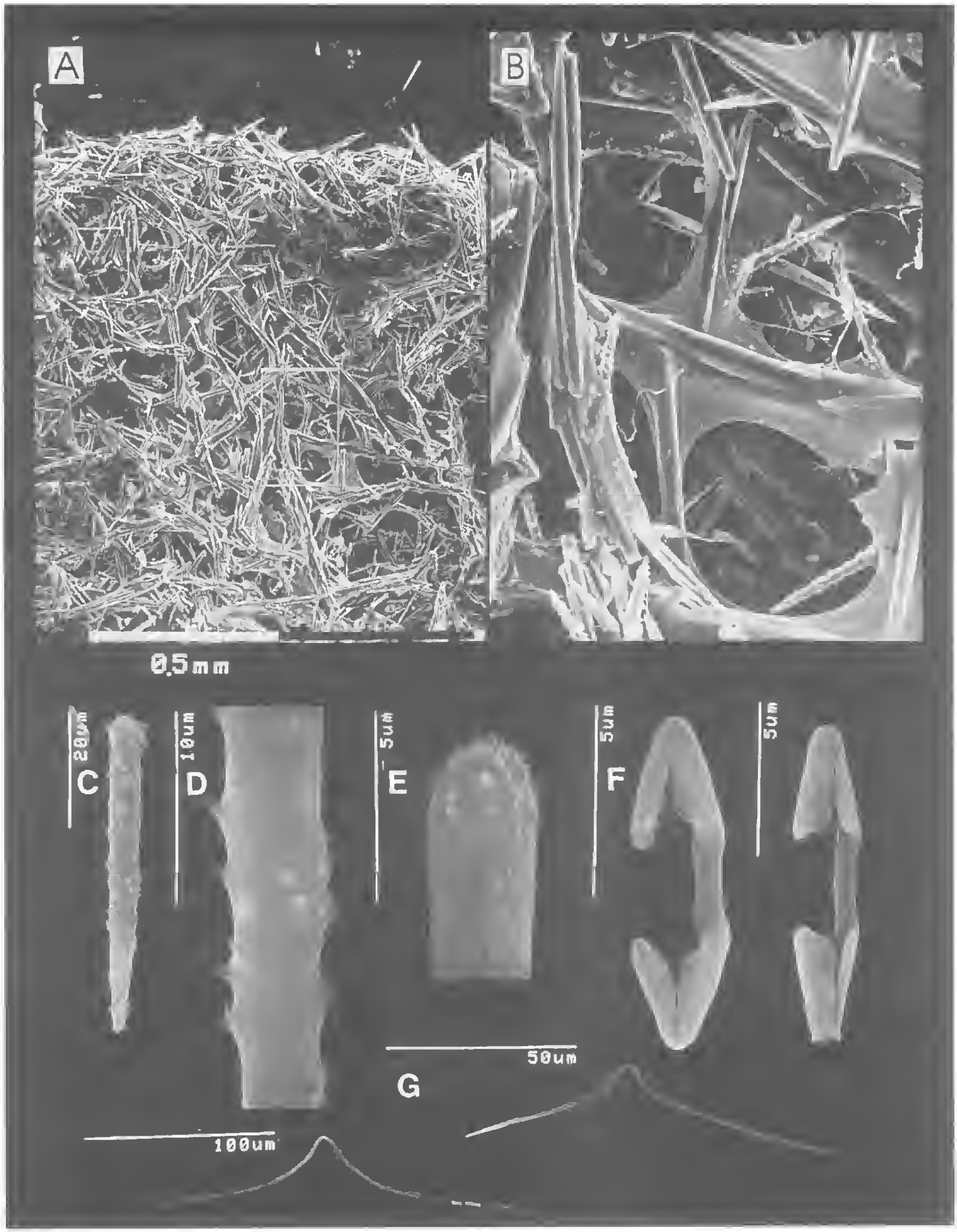

FIG. 70. *Clathria* (*Clathria*) *rubens* (Lendenfeld) (A-B, NTMZ1527; C-G, QMG300452). A, Choanosomal skeleton. B, Fibre characteristics (x313). C, Echinating acanthostyle. D, Acanthostyle spines. E, Base of auxiliary subtylostyle. F, Palmate isochelae. G, Accolada toxas.

TABLE 12. Comparison between present and published records of *Clathria* (*Clathria*) *rubens* (Lendenfeld). All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Lectotype (AMG9119)	Paralectotypes (N=3)	Holotype of *C. tenuifibra* (AMG3045)	Specimen (N=1)
Choanosomal principal styles	96-(135.3)-162 x 5-(9.0)-11	128-(135.6)-147 x 5.5-(7.1)-9	112-(139.2)-159 x 8-(9.4)-11	118-(140.6)-155 x 6-(7.8)-10
Subectosomal auxiliary styles	106-(157.2)-212 x 1.5-(2.9)-4	132-(146.2)-168 x 2.5-(2.9)-4	112-(153.7)-185 x 2.5-(3.7)-4.5	105-(139.2)-165 x 2.5-(3.3)-4.5
Echinating acanthostyles	55-(71.8)-111 x 3-(5.6)-7	58-(77.3)-112 x 4.5-(5.6)-6.5	51-(68.6)-118 x 5-(6.4)-8	48-(69.4)-108 x 4-(5.8)-7.5
Chelae	6-(9.6)-13	7-(9.8)-13	8-(9.7)-11	6-(9.0)-12
Toxas	101-(153.4)-215 x 0.8-(1.3)-1.5	115-(161.6)-208 x 1-(1.4)-2	94-(126.3)-153 x 1-(1.2)-1.5	114-(138.6)-194 x 1-(1.4)-2

DESCRIPTION. *Shape.* Variable growth form, ranging from thickly encrusting with small stoloniferous digits, to digitate planar arborescent with anastomosing branches.

Colour. Live colouration unknown, beige preserved.

Oscules. Large oscules on apex and lateral margins of stoloniferous branches

Texture and surface characteristics. Surface microconulose.

Ectosome and subectosome. Ectosomal skeleton hispid, with points of choanosomal principal styles protruding through surface individually or in small bundles, piercing a sparse paratangential layer of subectosomal auxiliary subtylostyles.

Choanosome. Choanosomal skeletal architecture wide-meshed nearly renieroid reticulate, more regular in peripheral skeleton than in axis, with differentiated primary (ascending, multispicular) and secondary (transverse, pauci- or unispicular) spongin fibres; fibre diameter generally small (primaries 30-50µm; secondaries 10-22µm), fibre anastomoses rectangular, and fibres cored by choanosomal principal styles; coring spicules in axial region heavier, more plumose (protruding through fibres) than in peripheral skeleton; echinating acanthostyles relatively sparse, evenly distributed throughout skeleton; mesohyl matrix light, usually containing choanosomal and/or subectosomal megascleres dispersed between fibres.

Megascleres. Choanosomal principal subtylostyles slightly curved, fusiform, entirely smooth, very slightly subtylote. Length 124-(152.4)-165µm, width 4-(8.8)-12µm.

Subectosomal auxiliary subtylostyles straight, thin, fusiform, with smooth slightly subtylote bases. Length 85-(148.5)-184µm, width 2-(2.8)-4µm.

Acanthostyles slightly subtylote, with evenly dispersed relatively large spines, slightly less spinose below basal region. Length 48-(62.3)-74µm, width 2-(4.2)-6µm.

Microscleres. Palmate isochelae unmodified. Length 4-(8.6)-12µm long.

Accolada toxas very thin, straight arms, sharply angular central curvature, occasionally raphidiform. Length 105-220µm, width 1-(2.2)-3µm.

REMARKS. Hallmann (1912) noted that *C. dura* var. *mollis* Hentschel was distinctly different from *C. dura* Whitelegge and he considered that Hentschel's (1911) species required a new name. The subspecific name '*mollis*' is preoccupied by *C. mollis* Kirkpatrick, 1903, and so a new name *C. squalorum* was proposed by Wiedenmayer (in Hooper & Wiedenmayer, 1994). Some of the characters and measurements of the lectotype differ from those published by Hentschel (1911). His description was presumably based on a series of syntypes, but these have not been located or re-examined.

Comparison between the type material of *C.* (*C.*) *squalorum* and *C.* (*Dendrocia*) *dura* show that both species are different in several significant respects: (1) differences in the geometry of structural spicules where *C.* (*C.*) *squalorum* has differentiated principal and auxiliary spicules (and hence is referrable to *C.* (*Clathria*)), and *C.* (*D.*) *dura* has completely undifferentiated structural megascleres (and hence is referrable to *C.* (*Dendrocia*)); (2) palmate isochelae versus arcuate-like isochelae; (3) long thick accolada toxas versus no toxas; (4) nearly renieroid reticulation of thin fibres versus a regularly reticulate skeleton with heavy fibres, respectively. In having a slightly renieroid skeletal architecture *C.* (*C.*) *squalorum* is reminiscent of *C.* (*Isociella*) *eccentrica*, although spicule geometry and spicule dimensions are otherwise different.

Clathria (Clathria) striata Whitelegge, 1907
(Figs 73-74, Plate 1F, Table 13)

Clathria striata Whitelegge, 1907: 495-496, pl.45, fig.27; Hooper & Wiedenmayer, 1994: 261.

Thalysias striata; de Laubenfels, 1936a: 105.
Rhaphidophlus tenebratus Whitelegge, 1907: 501-503, pl.45, fig.19.
Clathria tenebrata; Hallmann, 1912: 211.
cf. *Spongia sartaginula* Lamarck, 1813: 383; 1814: 362.

MATERIAL. LECTOTYPE: AMG4344 (in part): Near Coogee, Sydney, NSW, 34°05'S, 151°10'E, coll. FIV 'Thetis' (dredge; label 'Clathria striata; type'). PARALECTOTYPES: AMG4344 (in part), Z823 (in part): Off Botany Bay, NSW, 34°00'S, 151°11'E, 40-46m depth, coll. FIV 'Thetis' (dredge; dry, two specimens, label 'Thalysias striata; cotypes'). HOLOTYPE of *R. tenebratus*: AMG4336: Off Woolongong, NSW, 34°30'S, 150°50'E, coll. FIV 'Thetis' (dredge; dry, label 'Clathria tenebrata Whitelegge; type'). OTHER MATERIAL: NSW - QMG303755.

HABITAT DISTRIBUTION. 40-50m depth; on rock substrate; central and S. coasts (NSW) (Fig. 73G).

DESCRIPTION. *Shape*. Flabellate, digitate or a combination of both, 170-285mm long, 30-110mm wide, with short, tapering, cylindrical stalk, 35-55mm long, 6-13mm diameter, cylindrical or flattened branches and even, slightly undulating, ragged margins.

Colour. Live colouration unknown, dark grey-brown preserved.

Oscules. Not observed on flabellate specimens, but small oscules, up to 2mm diameter, seen on lateral margins of branches for digitate specimen.

Texture and surface characteristics. Surface optically smooth, with prominent longitudinally radiating subdermal grooves and low ridges.

Ectosome and subectosome. Ectosome strongly hispid, with discrete, plumose, or paratangential tufts of subectosomal auxiliary spicules surrounding protruding choanosomal principal styles; principal styles in peripheral skeleton usually larger than principal spicules within fibres; ectosomal skeleton relatively dense in places, merely paratangential or sometimes tangential to the surface in other places; thick tracts of palmate isochelae mostly confined to dermal and subdermal regions; subectosomal region plumose, with diverging tracts of choanosomal principal styles intermingled with extra-fibre tracts of auxilairy styles, together producing relatively dense peripheral skeleton.

Choanosome. Choanosomal skeleton predominantly renieroid but with differentiated plumose and renieroid-reticulate components, and clearly differentiated axial and extra-axial regions but no well-marked separation of primary or secondary fibre elements (cf. Whitelegge, 1907); axial skeleton with very heavy, thick spongin fibres forming relatively tight ovoid meshes, with paucispicular core of choanosomal styles forming vaguely ascending skeletal tracts; extra-axial region with much heavier, rectangular, almost renieroid spicule skeleton, with a criss-cross of longitudinal and transversely orientated spicules, and spongin fibres lighter than in axis; longitudinal spongin fibres in periphery cored by paucispicular tracts of principal styles; transverse/ascending tracts with multispicular tracts of spicules, many protruding through fibres and forming plumose brushes at right angles to surface; tendency for some larger principal styles to form ascending tracts, and small styles to occur mainly in longitudinal tracts; ultimate choanosomal spicule tracts diverge into subectosomal region; echinating acanthostyles relatively sparse in axis, only marginally more abundant in peripheral skeleton; mesohyl matrix heavy, granular, with few megascleres between fibres.

Megascleres (Table 13). Choanosomal principal styles thick, curved, relatively variable in length, fusiform, mostly sharply-pointed, less frequently with rounded points, with smooth rounded, or occasionally very slightly subtylote bases.

Subectosomal auxiliary subtylostyles thin, fusiform, straight or slightly curved, occasionally sinuous, usually with smooth, sometimes microspined, slightly subtylote bases, occasionally polytylote bases.

Acanthostyles subtylote, with small and evenly distributed spines.

Microscleres (Table 13). Palmate isochelae abundant, unmodified.

Toxas accolada, long, moderately thick, with sharply angular or slightly angular central curvature, straight unreflexed points.

REMARKS. *Rhaphidophlus tenebratus* is a synonym of *Clathria striata*, both species having identical skeletal architecture, fibre characteristics and spicule geometry, although there is some variation in spicule dimensions between these two nominal species (Table 13). They differ only in growth form (*C. striata* being flabellate, *R. tenebratus* being digitate, with flattened and anastomosing branches; Fig. 73I). In his original description Whitelegge (1907) omitted to mention toxas, abundant in the preserved specimens but relatively rare in the dry holotype, and also, that echinating acanthostyles were 0.6-0.8mm long (typographical error for 0.06-0.08mm).

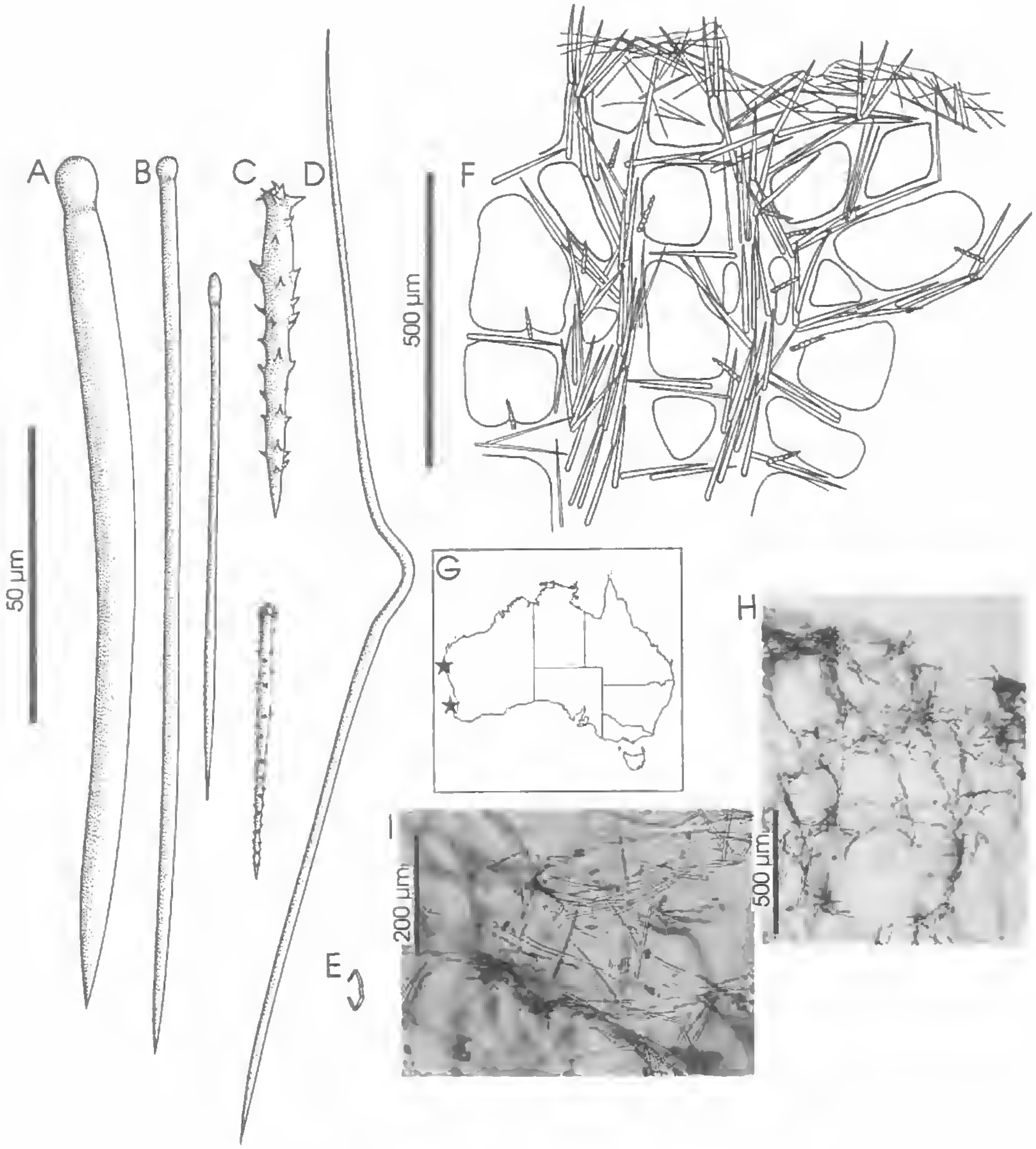

FIG. 71. *Clathria* (*Clathria*) *squalorum* Wiedenmayer (holotype ZMB4444). A, Choanosomal principal subtylostyle. B, Subectosomal auxiliary subtylostyles. C, Echinating acanthostyles. D, Accolada toxa. E, Palmate isochela. F, Section through peripheral skeleton. G, Australian distribution. H, Skeletal structure. I, Subrenieroid reticulate fibres.

Clathria (*C.*) *striata* is similar to *C.* (*C.*) *sartaginula* (Lamarck) in shape, slightly renieroid skeletal architecture, and to some extent spiculation. However, fibre characteristics differ markedly between the two species, particularly the density of coring and echinating spicules on fibres, the degree to which peripheral fibres radiate from the skeletal axis, and the very small but thick, stumpy choanosomal styles in *C.* (*C.*) *sartaginula*. This species is also compared with *C.* (*C.*) *arcuophora* and *C.* (*C.*) *biclathrata* in spicule geometry, spicule dimensions, and to

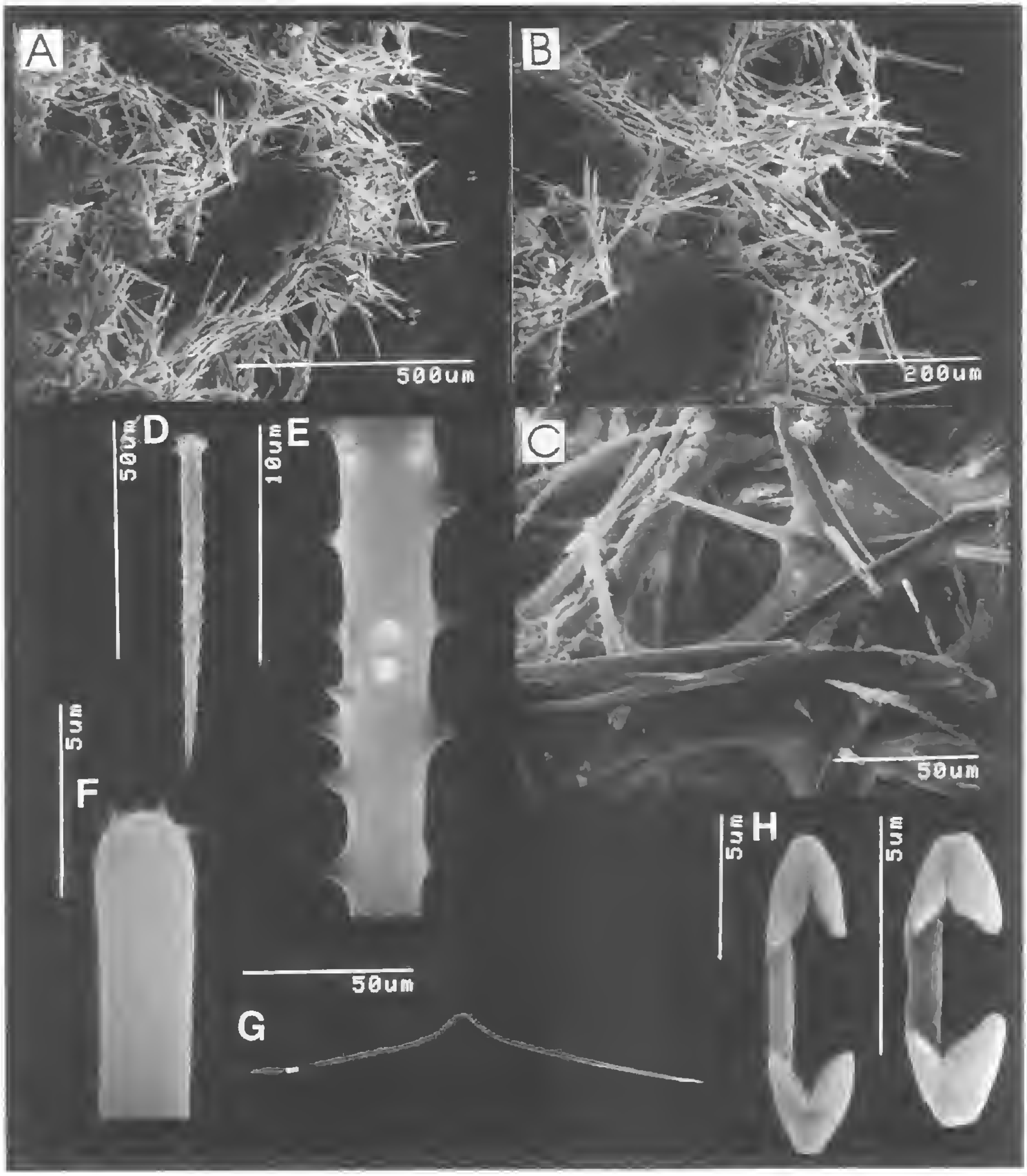

FIG. 72. *Clathria* (*Clathria*) *squalorum* Wiedenmayer (holotype ZMB4444). A, Choanosomal skeleton. B, Ectosomal skeleton. C, Fibre characteristics. D, Echinating acanthostyle. E, Acanthostyle spines. F, Base of auxiliary subtylostyle. G, Accolada toxa. H, Palmate isochelae.

some extent fibre characteristics. *Clathria* (*C.*) *striata* also has a similar skeletal architecture as *C.* (*C.*) *arcuophora*, differing substantially only in toxa geometry. All these species (*C.* (*C.*) *striata*, *C.* (*C.*) *arcuophora*, *C.* (*C.*) *sartaginula*, *C.* (*C.*) *crassa* and *C.* (*C.*) *biclathrata*), are characterised by their slightly renieroid or subrenieroid choanosomal skeletons and spongin fibres cored by few, thick principal spicules. They are grouped together here in the '*striata*' species

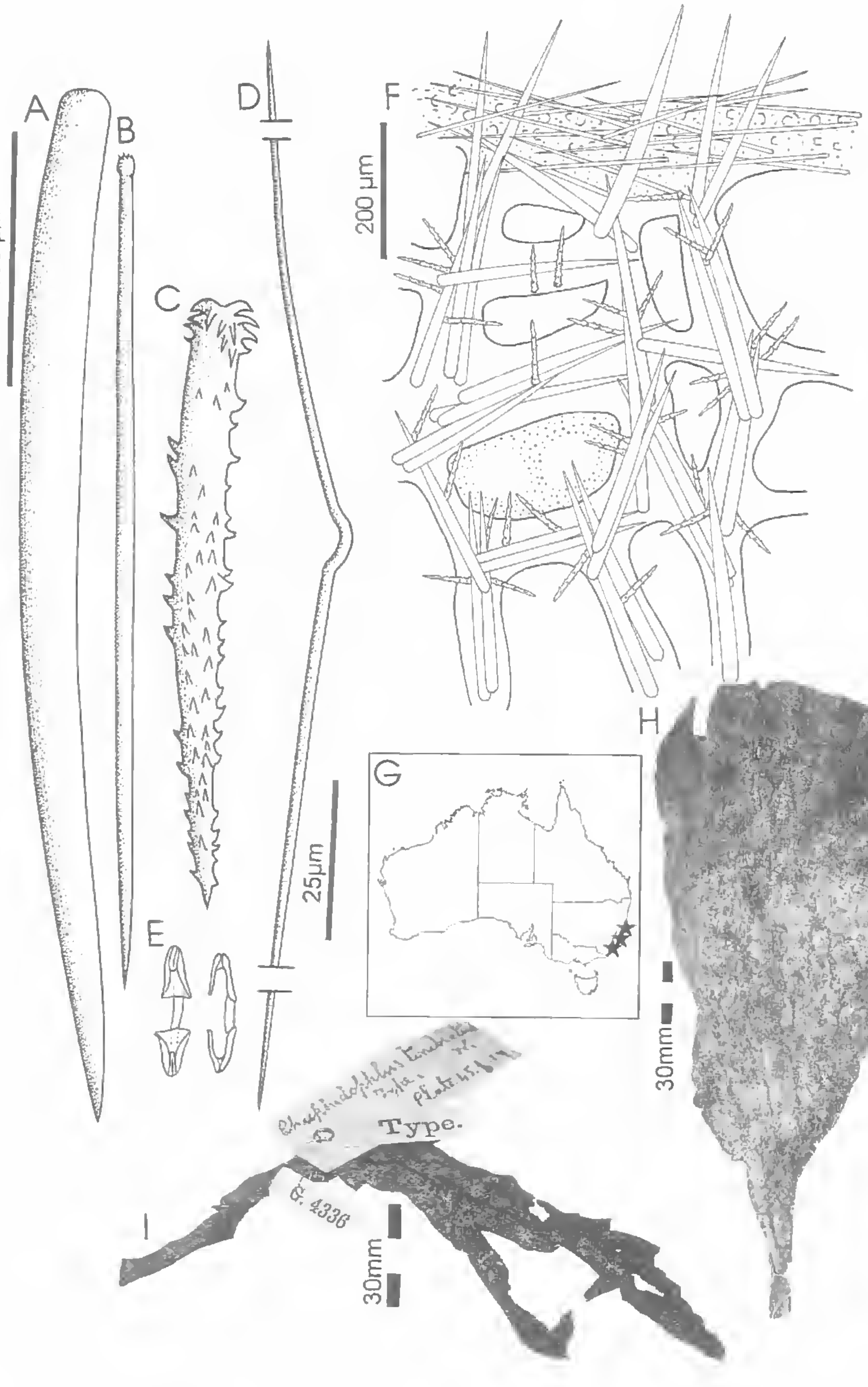

FIG. 73. *Clathria* (*Clathria*) *striata* Whitelegge (lectotype AMZ4344). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyle. C, Echinating acanthostyle. D, Accolada toxa. E, Palmate isochela. F, Section through peripheral skeleton. G, Australian distribution. H, Lectotype. I, Holotype of *R. tenebratus* AMG4336.

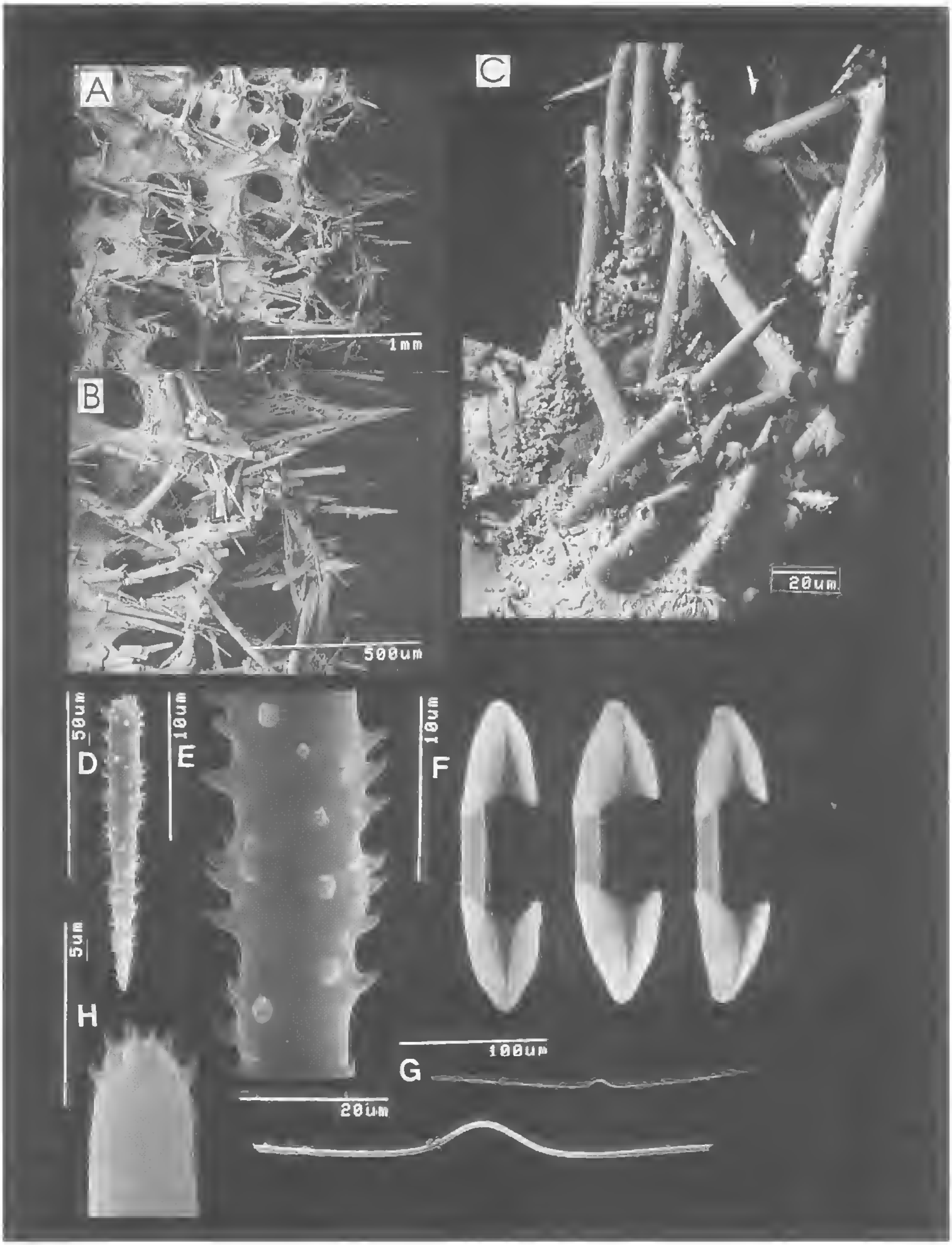

FIG. 74. *Clathria* (*Clathria*) *striata* Whitelegge (paralectotype AMZ823). A, Choanosomal skeleton. B, Peripheral skeleton. C, Fibre characteristics. D, Echinating acanthostyle. E, Acanthostyle spines. F, Palmate isochelae. G, Accolada toxas. H, Base of auxiliary subtylostyle.

TABLE 13. Comparison between present and published records of *Clathria (Clathria) striata* Whitelegge. All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Lectotype (AMG4344)	Paralectotypes (N=2)	Holotype of *R. tenebratus* (AMG4336)	QMG303755
Choanosomal principal styles	168-(268.3)-523 x 12-(17.7)-28	184-(285.2)-496 x 14-(19)-24	193-(282.2)-546 x 15-(19.1)-23	209-(299.7)-462 x 14-(16.5)-22
Subectosomal auxiliary styles	142-(245.6)-363 x 3-(4.1)-6	153-(229.2)-294 x 3-(4.2)-6	175-(274.4)-387 x 3.5-(5.6)-8	132-(181.4)-273 x 2-(2.9)-5
Echinating acanthostyles	71-(81.8)-93 x 6-(7.3)-9	75-(86)-94 x 7-(7.6)-9	84-(97.8)-112 x 6-(9.2)-11	58-(78.0)-92 x 4-(8.1)-11
Chelae	14-(16.5)-21	14-(16.4)-19	14-(16.4)-20	13-(15.1)-17
Toxas	165-(224.3)-265 x 1-(1.3)-2	110-(211.0)-255 x 0.8-(1.4)-2	108-(202.4)-305 x 0.8-(1.4)-2	163-(221.8)-325 x 0.8-(1.7)-3.0

group. *Clathria* (*C.*) *striata* differs from other '*striata*' species in growth form, spicule geometry and spicule dimensions.

De Laubenfels (1936a) referred *C. striata* to *Thalysias* but his decision is not supported. Although there are relatively dense plumose ectosomal brushes composed of auxiliary megascleres (structurally similar to *Clathria* (*Thalysias*)) there is only one undifferentiated size category (142-387µm long) (composition of *Clathria* (*Clathria*)).

Clathria (Clathria) toxipraedita Topsent, 1913 (Figs 75-76)

Clathria toxipraedita Topsent, 1913a: 620-621, pl.5, fig.4, pl.6, fig.12; Burton, 1932a: 319; Burton, 1934b: 32, pl.4, figs 2-3, text-fig.3; Koltun, 1964a: 68-69, pl.12, figs 15-24; Koltun, 1976: 187; Hooper & Wiedenmayer, 1994: 262.

Thalysias toxipraedita; de Laubenfels, 1936a: 105.

Rhaphidophlus toxipraedita; Van Soest, 1984b: 115.

cf. *Clathria toxipraedita*; Sim & Byeon, 1989: 38 (Korea; possible misidentification).

MATERIAL. HOLOTYPE: RSME1921.143.1400: Burwood Bank, off Tierra del Fuego, S. Atlantic, 54°25'S, 57°32'W, 112m depth, 1.xii.1903, coll. R.R.V. 'Scotia' (dredge).

HABITAT DISTRIBUTION. 93-540m depth; on mud, sand and hard substrates; Australian Antarctic Territory: MacRobertson Land (Koltun, 1976) (Fig. 75H). Also Tierra del Fuego (Topsent, 1913a), South Georgia, Shag Rock (Burton, 1932a, 1934b), South Sandwich Is, Falkland Is (Koltun, 1964a), Palmer Archipelago, Antarctica (Burton, 1932a).

DESCRIPTION. *Shape.* Massive encrusting, subspherical, 70mm long, 60mm wide, up to 25mm thick, composed of fused irregular fibre bundles superficially resembling a *Pseudaxinella* (Axinellidae).

Colour. Pale yellow-brown preserved.

Oscules. Not seen.

Texture and surface characteristics. Texture harsh, compressible; surface prominently conulose, hispid.

Ectosome and subectosome. Surface skeleton with protruding single principal styles embedded in peripheral skeleton and forming a plumose hispid surface; thick bundles of both subectosomal auxiliary styles and toxa microscleres surrounding protruding principal spicules, and also scattered paratangentially across surface.

Choanosome. Skeletal architecture plumo-reticulate, with slightly differentiated axial and extra-axial regions; in peripheral region skeleton more plumose than reticulate, with skeletal columns diverging but without connecting elements; skeletal columns composed of erect multispicular bundles of light spongin fibres fully cored by choanosomal principal styles; spicules mostly contained within fibres but also slightly protruding through fibres producing the plumose ('spicate') arrangement; towards base skeleton more disorganised, predominantly reticulate, and spicules more-or-less completely contained within fibres; echinating acanthostyles moderately abundant; mesohyl matrix heavy, smooth, containing abundant microscleres.

Megascleres. Choanosomal principal styles long, robust, straight or slightly curved near base, with fusiform points and rounded or slightly subtylote smooth bases. Length 518-(616.2)-894µm, width 19-(27.7)-33µm.

Subectosomal auxiliary subtylostyles short, very slender, straight, hastate pointed, subtylote, with pointed (mucronate) or minutely spined bases. Length 278-(310.2)-343µm, width 4-(4.8)-6µm.

Echinating acanthostyles small, straight, long, tapering fusiform pointed, subtylote or tylote bases, with small spines and aspinose bases and points. Length 102-(99.2)-154µm, width 4-(7.8)-11µm.

Microscleres. Palmate isochelae in two size categories, both modified. Smaller chelae with relatively small alae and a small plate/ridge on central inner margin of shaft protruding between the alae. Length 12-(15.7)-18μm. Larger chelae often cleistochelate, with teeth partially or completely fused and a large central plate/ridge on inner margin of shaft between alae. Length 20-(22.3)-24μm.

Two categories of toxas. Longer toxas accolada, very long, thick, with sharply angular but only slight central curvature, straight arms and smooth fusiform points. Length 635-(1022.6)-1470μm, width 4-(5.2)-6μm. Smaller toxas wing-shaped, more widely curved at centre, occasionally looped/twisted at centre, with slightly reflexed arms and points. Length 56-(85.3)-132μm, width 0.5-(1.1)-2.0μm.

REMARKS. *Clathria (C.) toxipraedita* has peculiar, large palmate cleistochelae resembling sigmancistras (in some Mycalidae), with alae varying from partially to completely fused, and with the addition of a well formed central plate-like ridge protruding between the alae (Fig. 76G). Smaller chelae have smaller diffuse alae and a smaller central plate-like ridge, indicating that they are ontogenetic stages of the larger forms. Cleistochelae are known in a number of other poecilosclerids including a several microcionids (e.g. *C. (Microciona) cleistochela* Topsent, *C. (T.) ramosa* (Dendy), *Antho (Plocamia) signata* (Topsent)), whereas the central plate-like ridge appears to be unique to the family and only previously recorded from Mycalidae (E. Hajdu, pers.comm.). *Clathria toxipraedita* is unusual amongst the antiboreal species in having a great diversity of spicule geometries; generally microcionids from Antarctic waters appear to have reduced spicule diversity in comparison to the tropical fauna.

Clathria (Clathria) transiens Hallmann, 1912
(Figs 77-78, Plate 2A, Table 14)

Clathria transiens Hallmann, 1912: 205, 226-234, 253, 254, pl.33, figs 1-3, pl.34, fig.2, text-figs 47-48; Shaw, 1927: 426; Burton, 1934a: 599; Guiler, 1950: 7; Burton, 1959a: 244; Wiedenmayer, 1989: 57, pl.5, fig.8, pl.23, fig.6, text-fig.38; Hooper & Wiedenmayer, 1994: 262.
Thalysias transiens; de Laubenfels, 1936a: 105.
cf. *Microciona prolifera*, tropus *stylota* and tropus *senta*, Vosmaer, 1935a: 611, 649-650, 666.

MATERIAL. LECTOTYPE: AME302: Off Devonport, N. coast Tas, 41°11'S, 146°21'E, coll. FIV 'Endeavour' (dredge) (label 'Clathria transiens; typical form a'). PARALECTOTYPES: AMZ49 + E819: 64km W. of Kingston, SA, 36°50'S, 139°05'E, 60m depth, coll. FIV 'Endeavour' (dredge) (specimen cut in half, form b). AME779: same locality; (form c). AMZ744: Port Phillip Bay, Vic, 38°09'S, 144°52'E, coll. J.B. Wilson (dredge) (label 'Clathria transita Hallmann', AM register ref. 342/85, JBW sp.3, cotype, form d). (uncertain type status - AMZ743: Port Phillip Bay, Vic., 38°09'S, 144°52'E, coll. J.B. Wilson; (dredge; label 'Clathria transita Hallmann', dry, 'type')). OTHER MATERIAL: VIC. - NCIQ66C-3231-C (fragment NTMZ3694). TAS. - QMG300268 (NCIQ66C-3638-U, fragment NTMZ3802).

HABITAT DISTRIBUTION. Shallow subtidal-60m depth; on rock substrates; Port Phillip (Vic) (Hallmann, 1912; present study), Furneaux Is and Devonport (Tas) (Shaw, 1927; Guiler, 1950; Wiedenmayer, 1989; present study), Kingston (SA) (Hallmann, 1912), Qld. (Burton, 1934a) (Fig. 77G). Burton (1959a) recorded the species from the Red Sea but his material was not described, and his record is questionable.

DESCRIPTION. *Shape.* Usually arborescent with short, bulbous branches, 75-185mm long, 40-160mm wide; stipitate with short cylindrical stalk, 25-55mm long, 8-22mm diameter; branches simply bifurcate, or repeatedly bifurcate and arborescent, flabello-digitate, or they may anastomose to form thickly clathrous, bushy lobes.

Colour. Live colouration vermilion red (Munsell 5R 3/10), beige-brown or dark brown preserved.

Oscules. Small oscules, up to 3mm diameter, in ridges and grooves of branches.

Texture and surface characteristics. Surface markedly conulose, with conules actually being rounded vestigial branches; with or without irregular ridges striating surface; surface covered by distinct membraneous skin-like ectosome.

Ectosome and subectosome. Ectosome minutely hispid, with the points of larger choanosomal principal styles protruding through membraneous surface, with a paucispicular, usually tangential layer of subectosomal auxiliary subtylostyles, lying on or just below surface; occasionally auxiliary styles form plumose brushes, surrounding 1 or more principal style; subectosomal skeletal structure vaguely plumose, formed by diverging peripheral spongin fibres and spicule tracts of smaller choanosomal principal styles.

Choanosome. Choanosomal skeletal architecture almost regular, radial-renieroid, with poorly differentiated axial and extra-axial skeletons; axis formed by evenly anastomosing spongin fibres, forming relatively cavernous, rectangular or circular meshes; spongin fibres cored by pauci- or multispicular tracts of smaller choanosomal principal styles; primary and secondary skeletal tracts in axis vaguely differentiated, but not pronounced, and spongin fibre elements only dif-

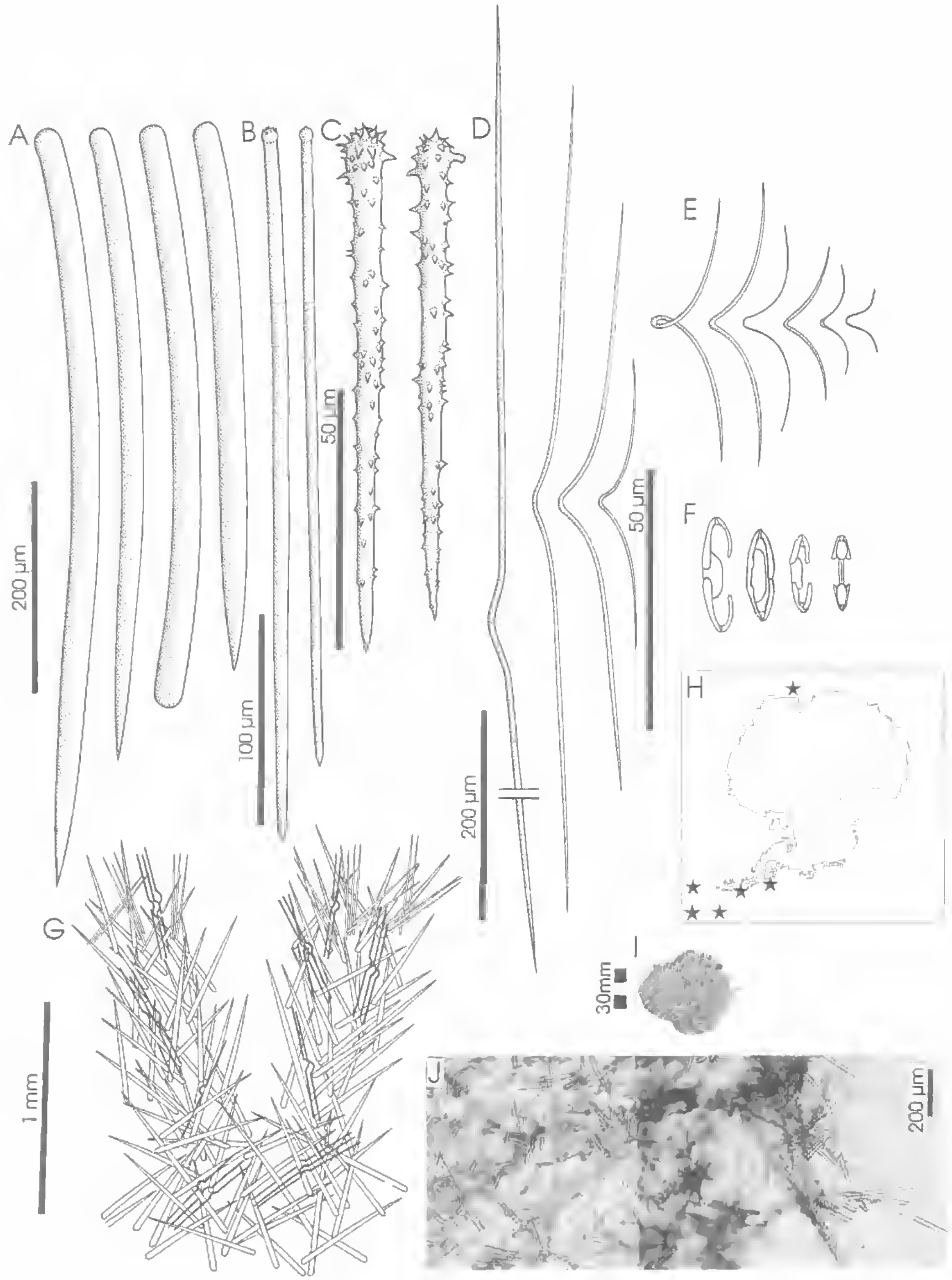

FIG. 75. *Clathria* (*Clathria*) *toxaepraedita* Topsent (holotype RSME1921.143.1400). A, Choanosomal principal styles and modifications. B, Subectosomal auxiliary subtylostyles. C, Echinating acanthostyles. D, Accolada toxas. E, Wing-shaped toxas. F, Modified palmate isochela. G, Section through peripheral skeleton. H, Antarctica distribution. I, Holotype. J, Choanosomal structure.

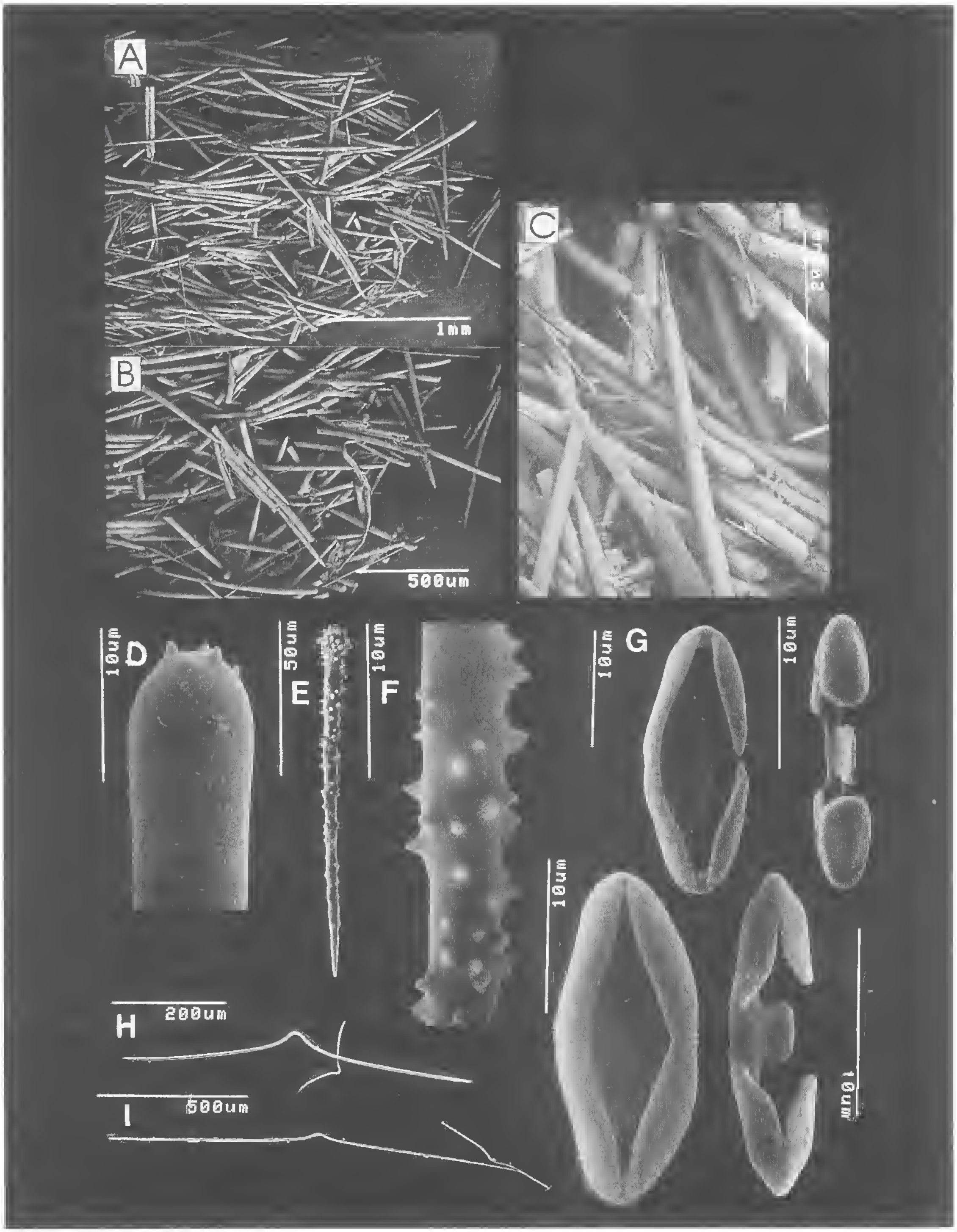

FIG. 76. *Clathria* (*Clathria*) *toxaepraedita* Topsent (holotype RSME1921.143.1400). A, Choanosomal skeleton. B, Peripheral skeleton. C, Fibre characteristics. D, Base of auxiliary subtylostyle. E, Echinating acanthostyle. F, Acanthostyle spines. G, Transitional series from cleistochelae to modified palmate isochelae. H, Accolada and wing-shaped toxas. I, Accolada toxas.

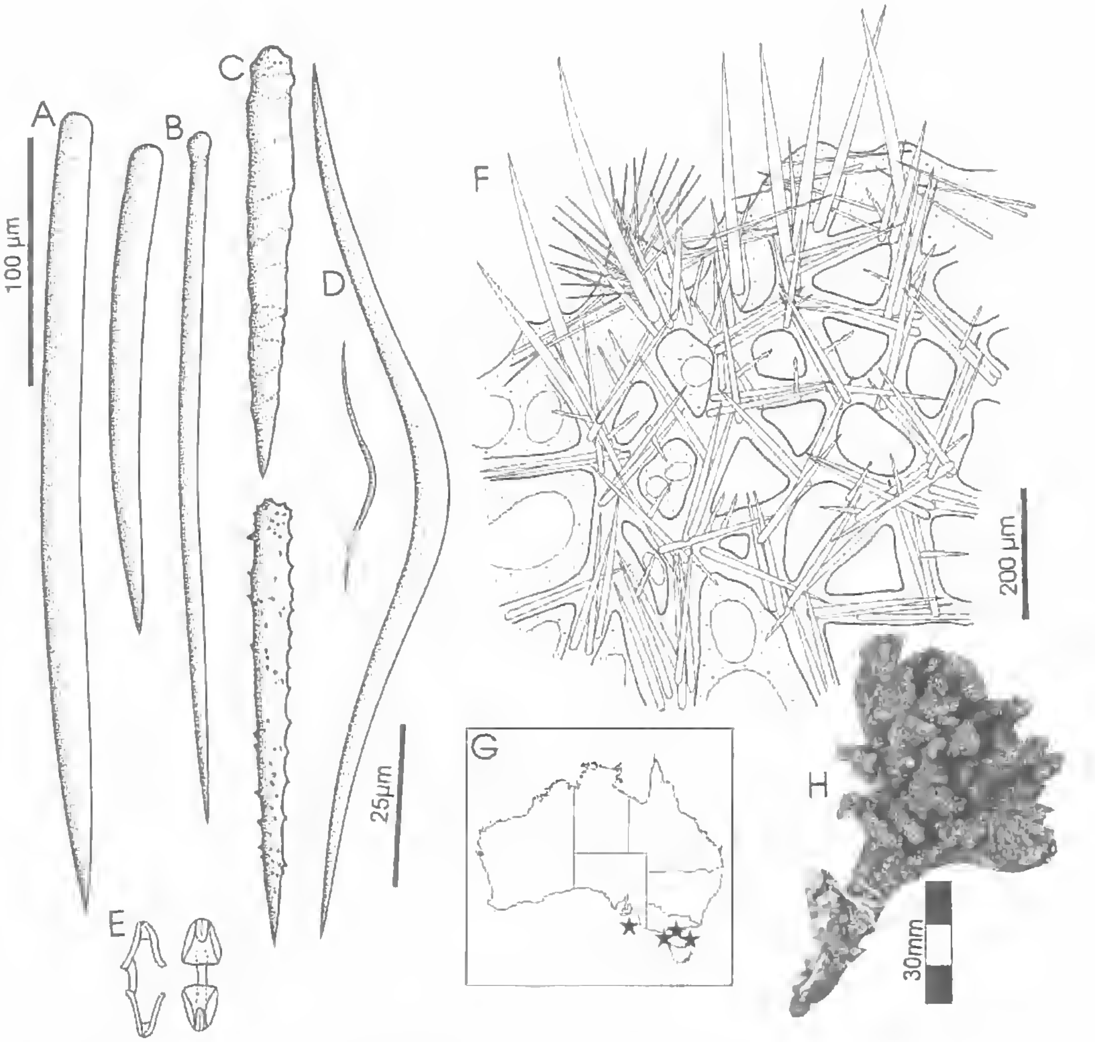

FIG. 77. *Clathria* (*Clathria*) *transiens* Hallmann (lectotype AME302). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyle. C, Echinating acanthostyles. D, Oxhorn toxas. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, lectotype.

ferentiated by density of coring spicules; extra-axial skeletal architecture regularly renieroid, with ascending plumo-reticulate primary and secondary fibre elements which diverge increasingly towards surface; fibre anastomoses much closer toward periphery than at core; primary ascending fibres heavily multispicular, secondary transverse fibres more irregular, pauci- or multispicular; all fibres relatively heavily invested with spongin; echinating acanthostyles abundant on all fibres, only slightly more dense at fibre nodes; mesohyl matrix light, containing numerous subectosomal styles and microscleres scattered between fibres.

Megascleres (Table 14). Choanosomal principal styles divided into 2 (overlapping) size classes: larger found in brushes protruding from surface; smaller coring choanosomal spongin fibres; both similar in geometry, fusiform, straight or slightly curved, with smooth, rounded or very slightly subtylote bases.

Subectosomal auxiliary subtylostyles straight, thin, fusiform, with smooth subtylote bases, variable length but only 1 size class.

Acanthostyles slightly subtylote, very sharply pointed, with granular, vestigial, evenly dispersed spines, sometimes completely smooth.

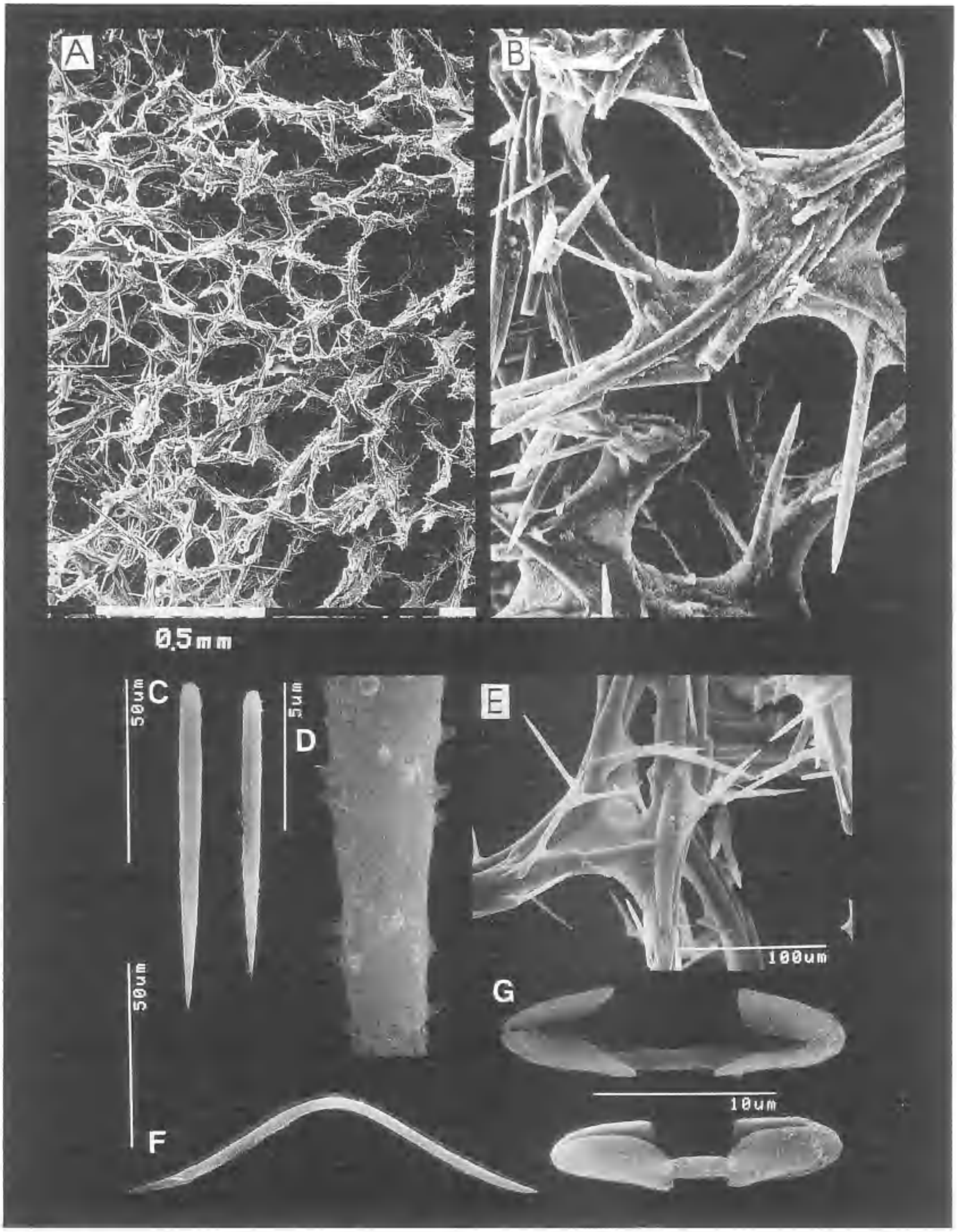

FIG. 78. *Clathria* (*Clathria*) *transiens* Hallmann (paralectotype AMZ743). A, Choanosomal skeleton. B, Fibre characteristics (x306). C, Echinating acanthostyles. D, Vestigial acanthostyle spines. E, Echinating spicules *in situ*. F, Accolada toxa. G, Palmate isochelae.

Microscleres (Table 14). Palmate isochelae large, unmodified, rare in some material.

Toxas oxhorn, relatively thick, with rounded, large or small central curvature, slightly reflexed or straight arms.

Larvae. Larvae viviparous, ovoid or elongate parenchymella, up to 210µm diameter, with larval megascleres dispersed throughout axis.

REMARKS. The status of specimen AMZ743 (from Port Phillip Bay) is not completely certain. The label states that it is a 'dry, type', but the four type specimens described by Hallmann (1912) are accounted for by other AM register numbers (cited above). It is possible that the specimen is a fragment of the paralectotype (AMZ744), as both come from the same locality.

Clathria (*C.*) *transiens* is relatively well known from SE. Australian waters (e.g. Wiedenmayer, 1989). The species appears to be the temperate water equivalent of the widely distributed tropical species *C.* (*Thalysias*) *lendenfeldi* (see Hooper et al., 1990). Both species have a large range of growth forms and comparable surface features, although this resemblance is superficial, in the field, and the two species differ markedly in most other features. The ectosomal features of *C.* (*C.*) *transiens* (with protruding choanosomal styles), and fibre characteristics (almost a subrenieroid peripheral skeleton), are also reminiscent of *C.* (*T.*) *vulpina*, although growth form and spicule diversity differ significantly between these two species. *Clathria* (*T.*) *darwinensis* sp.nov. from northwest Australia is similar to *C.* (*T.*) *transiens* in ectosomal features, vaguely subrenieroid skeletal architecture, and toxa morphology, but differs in acanthostyle geometry, possession of 2 size classes of auxiliary styles, gross morphology and spicule dimensions.

Despite a relatively variable growth form the skeletal architecture of this species is consistent. There are only minor differences between specimens in the degree to which the axial skelton is compressed and differentiated from extra-axial structures (e.g. compare Hallmann's (1912) 'form a' and 'form c'). Similarly, in some places on the ectosomal skeleton are distinct plumose brushes of auxiliary spicules, radiating from bases of protruding choanosomal principal styles, whereas in other places ectosomal structure is simply tangential. This plumose structure is generally associated with the ectosomal skeleton characteristic of *Clathria* (*Thalysias*) species, but only a single size class of auxiliary styles is present in *C.* (*C.*) *transiens* and it technically belongs to *Clathria* (*Clathria*).

TABLE 14. Comparison between present and published records of *Clathria* (*Clathria*) *transiens* Hallmann. All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Lectotype (AM E302)	Paralectotypes (N=4)	Specimens (N=2)
Large choanosomal principal styles	273-(339.4)-409 x 12-(16.8)-19	264-(359.7)-528 x 13-(16.1)-19	269-(408.2)-632 x 9-(13.8)-19
Small choanosomal principal styles	133-(188.4)-24 x 3 8-(13.2)-18	113-(170.3)-247 x 6-(9.5)-13	132-(191.8)-275 x 8-(11.2)-13
Subectosomal auxiliary styles	162-(272.4)-357 x 2.5-(4.0)-5.5	96-(249.2)-416 x 1.5-(3.6)-6	142-(277.0)-402 x 1.5-(4.2)-6
Echinating acanthostyles	58-(70.7)-88 x 3-(4.9)-6.5	42-(71.1)-98 x 2-(4.9)-7.5)	63-(76.2)-92 x 3.5-(5.1)-7
Chelae	15-(17.8)-20	14-(18.4)-22	14-(19.2)-22
Toxas	17-(84.6)-131 x 0.8-(1.5)-3	18-(109.1)-192 x 0.8-(1.8)-3.5	71-(108.4)-134 x 0.8-(1.1)-1.8

Clathria (Clathria) wilsoni Wiedenmayer, 1989

(Figs 79-80)

Clathria wilsoni Wiedenmayer, 1989: 57-58, pl.5, fig.9, pl.24, fig.1, text-fig.39; Hooper & Wiedenmayer, 1994: 262.

Rhaphidophlus wilsoni; Carpay, 1986: 27.

MATERIAL. HOLOTYPE - NMVF51967: Garden Cove, N. side of Deal I., Kent Is Group, Bass Strait, Tas, 39°29'S, 147°20'E, 10m depth, 25.ii.1981, coll. F. Wiedenmayer et al. (SCUBA).

HABITAT DISTRIBUTION. 10m depth; on algal covered boulders; Bass Strait and E. coast (Tas) (Fig. 79H).

DESCRIPTION. *Shape*. Small sponge, thickly encrusting with irregular low-formed branches, 5mm high, up to 20mm diameter.

Colour. Live colouration dull vermilion, beige preserved.

Oscules. Oscules small, up to 2mm diameter, scattered on base and sides of branches.

Texture and surface characteristics. Surface uneven, microconulose, hispid, particularly on points of branches. Texture easily compressible, spongy.

Ectosome and subectosome. Ectosome skeleton a layer of subectosomal auxiliary styles, in small

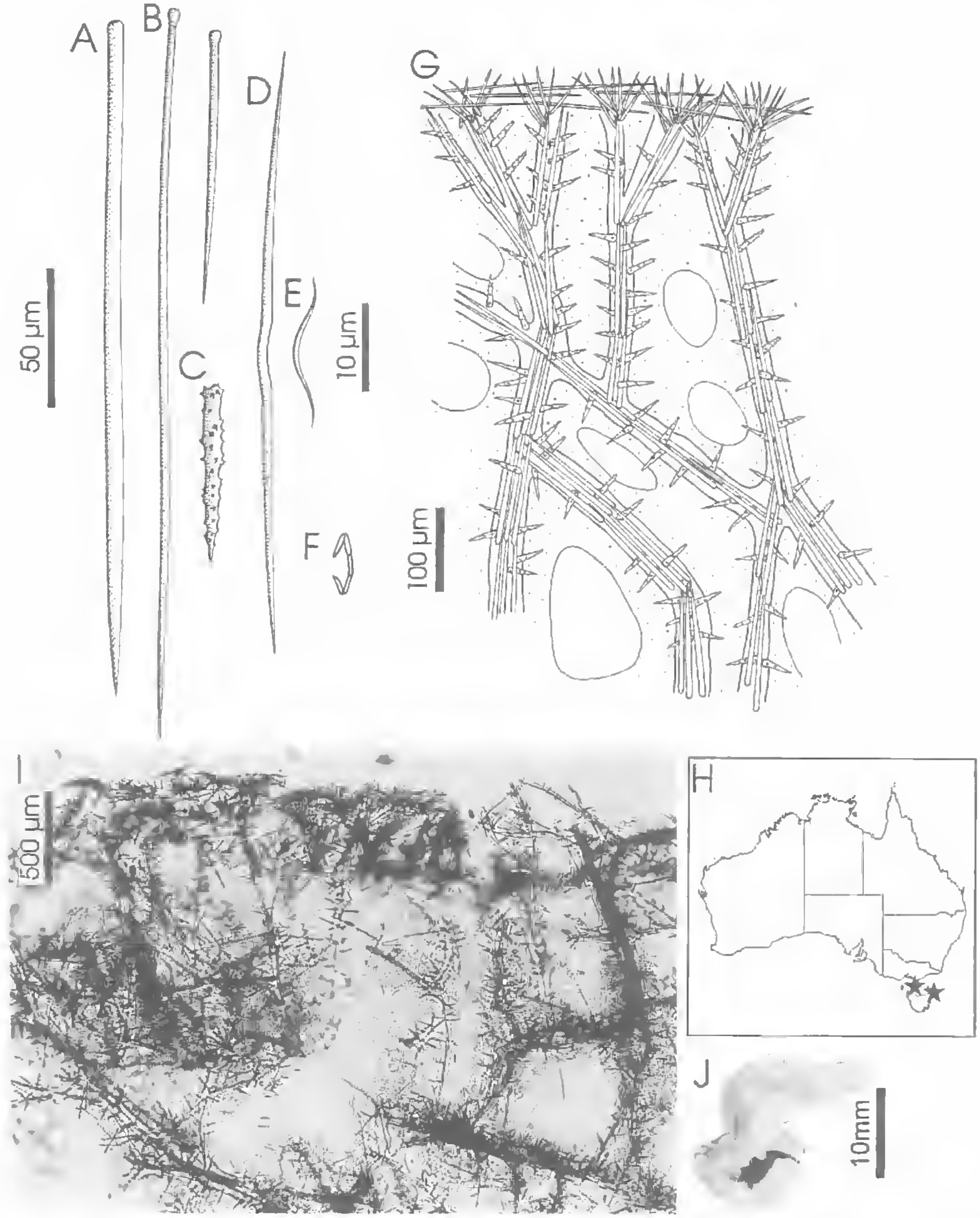

FIG. 79. *Clathria* (*Clathria*) *wilsoni* Wiedenmayer (holotype NMVF51967). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyles. C, Echinating acanthostyle. D, Accolada toxa. E, Oxhorn toxa. F, Palmate isochela. G, Section through peripheral skeleton. H, Australian distribution. I, Choanosomal skeletal structure. J, Holotype.

bundles, erect on surface, with acanthostyles echinating peripheral fibres also contributing to ectosomal skeleton; choanosomal principal styles, embedded in peripheral fibres, form plumose brushes, which approach but usually do not pierce surface.

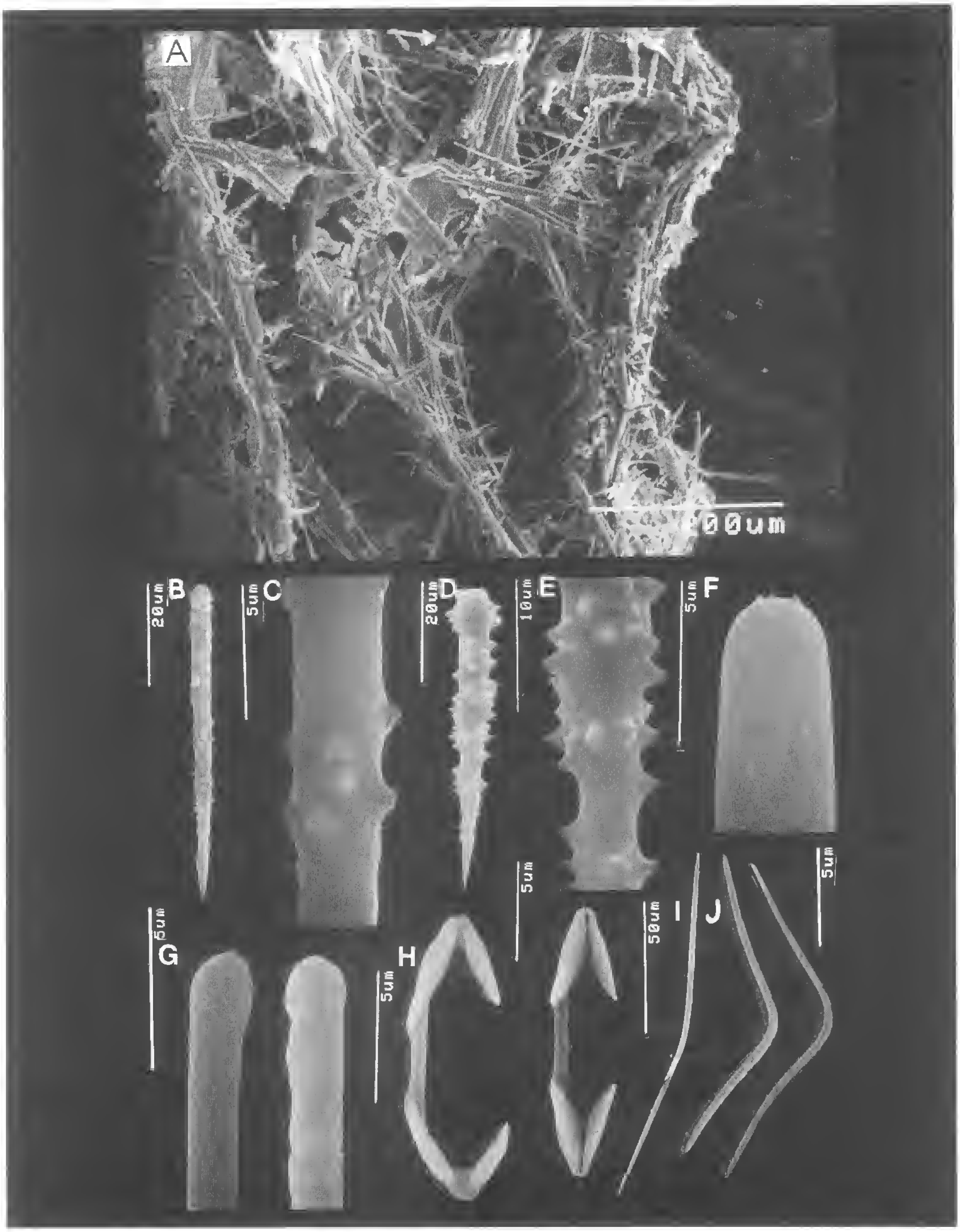

FIG. 80. *Clathria* (*Clathria*) *wilsoni* Wiedenmayer (holotype NMVF51967). A, Choanosomal skeleton. B,D, Echinating acanthostyles. C,E, Acanthostyle spines. F, Base of principal style., G, Base of auxiliary styles. H, Palmate isochelae. I, Larger accolada toxa. J, Smaller oxhorn toxas.

Choanosome. Choanosomal skeleton irregularly reticulate, consisting of moderately light, slender spongin fibres, up to 35µm diameter, forming irregular rectangular or polygonal meshes; spongin fibres cored by multispicular tracts of choanosomal styles, in rows of 2-10 spicules abreast, echinated by regularly dispersed acanthostyles; mesohyl matrix light, many vestigial and fully formed subectosomal styles, and numerous rhaphidiform toxa microscleres.

Megascleres. Choanosomal principal styles slightly curved, with evenly rounded or slightly subtylote, smooth or rarely microspined bases. Length 164-(191.8)-290µm, width 2.4-(5.1)-7.4µm.

Subectosomal auxiliary subtylostyles straight, occasionally slightly curved, with tapering or rounded, smooth bases. Length 83-(153.6)-282µm, width 1-(2.3)-3.5µm.

Acanthostyles short, thick, subtylote, with relatively evenly dispersed spines. Length 31.6-(62.6)-71µm, width 2.6-(6.6)-10µm.

Microscleres. Palmate isochelae very rare, small, poorly silicified. Length 4-(5.5)-9µm.

Toxas accolada, straight, very thin rhaphidiform, occasionally with roughened points; some smaller examples slightly curved, with reflexed arms. Length 71-(121.6)-168µm, width 0.4-(0.7)-2µm.

REMARKS. This species is transitional between the ectosomal structures of *Clathria* and *Thalysias*, and it is not surprising that Carpay (1987) referred it to the latter. However, although there is a large size range of auxiliary styles, ectosomal spicule brushes are composed only of a single size of spicule, and the species is technically correctly included in *Clathria* (*Clathria*). Nevertheless, this example further illustrates the inappropriateness of recognising a strict (phylogenetic) boundary between these two genera.

Clathria (*C.*) *wilsoni* is peculiar in having almost straight raphide-like toxas, which are known to occur in only a few microcionids (e.g. *C.* (*Thalysias*) *costifera* and *C.* (*Wilsonella*) *reticulata*, both from Australia, *C.* (*T.*) *juniperina* from the Caribbean, *C.* (*C.*) *microxea* from Madagascar, and *Artemisina archegona* from the Pacific coast of America). Wiedenmayer (1989) notes some similarities between *C.* (*C.*) *wilsoni* and other species of Hallmann's (1912) '*spicata*' group, but this is not upheld here.

OTHER SPECIES OF *CLATHRIA* (*CLATHRIA*)

Clathria (Clathria) acanthostyli (Hoshino, 1981)

Thalysias acanthostyli Hoshino, 1981: 156-157, text-fig.68, pl.7, fig.2 [Uchinoura, Japan].

MATERIAL. HOLOTYPE: MMBSSAT-020. Japan.

Clathria (Clathria) acanthotoxa (Stephens, 1916)

Eurypon acanthotoxa Stephens, 1916: 238-239 [SW coast, Ireland].
Microciona acanthotoxa; Stephens, 1921: 50, pl.5, fig.1; Alander, 1942: 62 [Sweden]; Burton, 1959b: 43 [Iceland]; Lévi, 1960a: 75 [Isle of Man, W. Ireland].
Not *Microciona acanthataxa*; Lilly et al., 1953: 97.
Dictyaciana acanthataxa; de Laubenfels, 1936a: 110 [note]; de Laubenfels, 1953: 527.
Clathria acanthataxa; Van Soest, 1984b: 7 [generic synonymy for *Dictyociona*].
Not *Microciona acanthotoxa* Lévi & Lévi, 1989: 81, fig. 49 [see *C. claudei*, nom.nov.].

MATERIAL. HOLOTYPE: INMSR253.8.1916. NE. Atlantic, North Sea.

Clathria (Clathria) anchorata (Carter, 1874)

Dictyocylindrus anchoratus Carter, 1874: 251 [Gulf of Manaar, Ceylon].
Clathria ancharata; Vosmaer, 1880: 153 [Atlantic]; [?] Stephens, 1916: 242 [W coast, Ireland]; Burton, 1959b: 42 [Iceland]; Lévi, 1960a: 63-64 [English Channel, Atlantic]; [?] Vacelet, 1969: 206, text-fig.45 [Mediterranean].
Micraciana anchorata; Alander, 1942: 62 [Sweden].
Echinonema anchoratum; Dendy, 1889a: 44.
Wilsanella anchoratum; Hallmann, 1912: 152, 185, 189, 210, 211, 243, 296, 298, 299.
Cionanchora anchorata; de Laubenfels, 1936a: 108 [note].
Not *Echinonema ancharatum* Carter, 1881a: 362, 379, 380 [S. coast of Australia].
Not *Echinanema ancharatum*, varr.; Lendenfeld, 1888: 219-220 [Port Jackson, New South Wales].
Not *Echinanema ancharatum* var. *ramasa*; Whitelegge, 1901: 81.
Clathria typica, in part; Dendy, 1896: 32; Kirkpatrick, 1903: 248-249.
Clathria longichela Topsent, 1928a: 300, pl.10, fig.9.
cf. *Micraciana pralifera*; Vosmaer, 1935a: 610, 632, 668.

MATERIAL. HOLOTYPE: LFM destroyed, fragments-BMNH1953.11.11.63-69. NE. Atlantic, Mediterranean, Gulf of Manaar.

Clathria (Clathria) antyaja (Burton & Rao, 1932)

Dendrocia antyaja Burton & Rao, 1932: 348-350, pl.28, fig.12, text-figs 13-14 [Indian Ocean]

MATERIAL. HOLOTYPE: IMP791/1. Indian Ocean.

Clathria (Clathria) anthoides Lévi, 1994

Clathria anthaides Lévi, 1994: 36-37, fig. 21A, pl.7, fig.5 [Norfolk Rise, 610m depth].

MATERIAL. HOLOTYPE: MNHNDCL3637. SW. Pacific.

Clathria (Clathria) arbuscula (Row, 1911)

Ophlitaspangia arbuscula Row, 1911: 347-349, pl.39, fig.22, pl.40, fig.25, text-fig.22 [Red Sea].
Ophlitaspangia harrida Row, 1911: 349-351, pl.40, fig.26, text-fig.23 [Red Sea].

Litaspongia arbuscula; de Laubenfels, 1954: 162 [note].
Kerasemna arbuscula; Pulitzer-Finali, 1982: 105.
Kerasemna horrida; Pulitzer-Finali, 1982: 105.

MATERIAL. HOLOTYPE: BMNH1912.2.1.63 (*O. arbuscula*); BMNH1912.2.1.65 (*O. horrida*). Red Sea.

Clathria (Clathria) asodes (de Laubenfels, 1930)

Eurypon asodes de Laubenfels, 1930: 27; de Laubenfels, 1932: 92-93, text-fig.54 [Carmel,California]; Lee & Gilchrist, 1985: 24-32 [biochemistry].
Dictyociona asodes; de Laubenfels, 1936a: 110 [note].
Clathria asodes; Van Soest, 1984b: 7 [generic synonymy].
Leptoclathria asodes; Sim & Bakus, 1986: 10 [California]; Bakus & Green, 1987: 72 [S. California].

MATERIAL. HOLOTYPE: USNM21442. NE. Pacific.

Clathria (Clathria) atoxa (Bergquist & Fromont, 1988)

Dictyociona atoxa Bergquist & Fromont, 1988: 105-106, pl.49, figs a-c [Tokatu]; Dawson, 1993: 38 [note].

MATERIAL. HOLOTYPE: NMNZPOR116. New Zealand.

Clathria (Clathria) axociona Lévi, 1963

Clathria axociona Lévi, 1963: 49, text-fig.56, pl.8A [Cape of Good Hope, South Africa]; Uriz, 1988a: 83-84, pls 20-21a, text-fig. 59 [Namibia].

MATERIAL. HOLOTYPE: MNHNDCL632. SW. and S. Africa.

Clathria (Clathria) barleei (Bowerbank, 1866)

Isodictya barleei Bowerbank, 1866: 333; Bowerbank, 1874: pl.57.
Tragosia barleei; Topsent, 1894a: 25.
Axinella barleei; Arndt, 1935: 88, fig.186.
Clathria barleei; Van Soest & Stone, 1986: 45-46, fig.4 [Norway]; Ackers, Moss & Picton, 1992: 138 [Ireland].
Halichondria foliata Bowerbank, 1874: 198, pl.73, figs 1-5; Carter, 1876: 310, pl.12, fig.10, pl.29, fig.29; Bowerbank, 1882: 106.
Esperia foliata; Fristedt, 1885: 41.
Homeodictya foliata; Topsent, 1894a: 12.
Echinoclathria foliata, Topsent, 1913b: 38; Stephens, 1916: 234 [Ireland]; Stephens, 1921: 57; Hentschel, 1929: 894, 971 [Arctic].
Artemisina foliata; Burton, 1930a: 501, 529, pl.2, figs 1-2 [Norway]; Burton, 1959b: 42-43 [Iceland].
Amphilectus foliatus; Vosmaer, 1880: 118.
Antho foliata; Alander, 1942: 63 [Sweden; defined in Esperiopsidae].
? *Halichondria mutula* Bowerbank, 1874: 209, pl.74, figs 4-8; Bowerbank, 1882: 96 [as *H. mutulus*].
? *Amphilectus mutulus*; Vosmaer, 1880: 118.
Isodictya laciniosa Bowerbank & Norman, 1869: 333.
Amphilectus laciniosus; Vosmaer, 1880: 116.
Clathria laciniosa; Arndt, 1935: 81, fig.167; Burton, 1959b: 42 [Iceland].
Artemisina laciniosa; Burton, 1950: 891 [revision].

MATERIAL. HOLOTYPE: BMNH1930.7.3.338. Arctic, NE. Atlantic.

Clathria (Clathria) basilana Lévi, 1961

Clathria basilana Lévi, 1961b: 520, fig.11 [Zamboanga, Philippines]; Van Soest, 1989: 1-2, fig.6 [Lesser Sumba Is, Indonesia].

MATERIAL. HOLOTYPE: MNHNDCL722. S. Philippines - E. Indonesia.

Clathria (Clathria) borealis sp.nov.

Clathria robusta Koltun, 1959: 186, pl.25, fig.5, text-fig.147 [Arctic, USSR]; Van Soest & Stone, 1986: 47 [note].
Not *Microciona strepsitoxa* var. *robusta* Dendy, 1922: 60.
Not *Tenacia robusta*; Burton & Rao, 1932: 339-340.

MATERIAL. HOLOTYPE: ZIL, no fragment in BMNH. Note: *C.* (*C.*) *robusta* (Dendy, 1922) has priority. Arctic.

Clathria (Clathria) bulbosa Hooper & Lévi, 1993

Clathria (Clathria) bulbosa Hooper & Lévi, 1993a: 1268-1270, figs 23-24 [Chesterfield Is, Coral Sea].

MATERIAL. HOLOTYPE: QMG300021. SW. Pacific.

Clathria (Clathria) burtoni sp. nov

Clathria prolifera Burton, 1940: 109, pl.4, figs 3-4, text-fig.2 [Argentina].
Not *Spongia prolifera* Ellis & Solander, 1786: 189.

MATERIAL. HOLOTYPE: MABA15582, fragments-BMNH1934.1.17.13, 116, 117. Note: *C. prolifera* (Ellis & Solander, 1786) has seniority. Province: SW. Atlantic.

Clathria (Clathria) caespes (Ehlers, 1797), unrecognizable.

Spongia tubulosa, in part, Esper, 1797: 196, pl.44 [Cape of Good Hope, South Africa].
Scopalina caespes; Ehlers, 1870: 19-20, 31.

MATERIAL. HOLOTYPE: unknown. S. Africa.

Clathria (Clathria) calypso Boury-Esnault, 1973

Clathria calypso Boury-Esnault, 1973: 286, text-fig.47 [Brazilian Basin]

MATERIAL. HOLOTYPE: MNHNDNBE1035. tropical SW. Atlantic.

Clathria (Clathria) cantabrica (Orueta, 1901)

Rhaphidophlus filifer var. *cantabrica* Orueta, 1901: 331-335, pls 3,4 [Bay of Biscay].
Tenacia filifer var. *cantabrica*; Hallmann, 1920: 771.
Clathria cantabrica; Lévi, 1960a: 55-56, 63.

MATERIAL. HOLOTYPE: Madrid. NE. Atlantic.

Clathria (Clathria) compressa Schmidt, 1862

Clathria compressa Schmidt, 1862: 8, 10, 58-59, 86, pl.6, fig.1; Schmidt, 1864: 35, pl.4, fig.3; Crivelli, 1863: 299; Gray, 1867: 513; Claus, 1868: 23; Carter, 1875: 195; Vosmaer, 1880: 150 [Triest]; Graeff, 1882: 318; Vosmaer, 1884: 119; Ridley, 1884a: 443-449, 612-615; Schmidt, 1880: 34-35, 45, pl.4, fig.3; Ridley & Dendy, 1887: 147; Dendy, 1889c: 8; Hope, 1889: 337; Norman, 1892: 13; Topsent, 1892a: 17; Topsent, 1894a: 18; Heider, 1895: 280; Topsent, 1896: 123; Thiele, 1899: 13; Topsent, 1911: 10, 13; Dendy, 1922: 64; Dendy, 1924a: 352-354; Wilson, 1925: 439; Topsent, 1925: 647-650, fig.8 [Banyuls, Gulf of Naples]; Topsent, 1928a: 62, 299; Burton & Rao, 1932: 334-337; Burton, 1932a: 319; Burton, 1934a: 558; Topsent & Olivier, 1943: 1 [Monaco]; Koltun, 1959: 184; Lévi, 1960a: 50, 52, 61, 62 [Mediterranean, Atlantic]; Lévi, 1960b: 761, fig.14 [Kayar, W. Africa]; Melone, 1963: 1-8; Sarà & Melone, 1963: 362; Sarà, 1964: 229; Simpson, 1968a: 102, 104-106, pl.17, table 49; Boury-Esnault, 1971:

323 [Banyuls]; Pulitzer-Finali, 1983: 610; Desqueyroux-Faundez & Stone, 1992: 9, 35, 103 [list].

Thalysias compressa; de Laubenfels, 1936a: 105-106.

? *Spongia clathrus* Esper, 1797; Vosmaer, 1880: 150.

Not *Chalina compressa*; Carter, 1882b: 112-113.

Not *Halichondria compressa* Carter, 1886g: 450 [Westernport Bay, Victoria].

Not *Pseudoclathria compressa*; Dendy, 1897: 259.

MATERIAL. HOLOTYPE: LMJG15509, fragments BMNH1867.7.26.78, BMNH1910.1.1.2362, 2363. Mediterranean, NE. Atlantic, W. Africa.

Clathria (Clathria) conica Lévi, 1963

Clathria conica Lévi, 1963: 50-51, text-fig.57, pl.8E [Cape of Good Hope].

MATERIAL. HOLOTYPE: MNHNDCL617. S. Africa.

Clathria (Clathria) contorta (Bergquist & Fromont, 1988)

Dictyociona contorta Bergquist & Fromont, 1988: 105, pl.48, figs d-f [Manukau]; Dawson, 1993: 38 [note].

MATERIAL. HOLOTYPE: NMNZPOR115. New Zealand.

Clathria (Clathria) coralloides (Olivi, 1792)

Spongia coralloides Olivi, 1792: 264; Bertoloni, 1819: 228; Blainville, 1819: 125; Lamouroux, 1824: 369; Martens, 1824: 535.

Grantia coralloides; Nardo, 1833: 522.

Halichondria corona Lieberkühn, 1859: 521, 529, pl.11, fig.3.

Clathria coralloides; Schmidt, 1862: 7, 10, 11, 58, 85, pl.5, figs 10-11; Kölliker, 1864: 52, 71; Schmidt, 1864: 34; Schmidt, 1868: 9, 41; Schmidt, 1870: 56, 60; Gray, 1867: 513, 533, 552; Dybowsky, 1880: 5, 70, pl.4, figs 7,9; Krukenberg, 1880: 70, 72; Vosmaer, 1880: 149-150 [Mediterranean]; Ridley, 1881: 485; Vosmaer, 1881: 4; Vosmaer, 1882-6: 119, 121-122; Vosmaer, 1884b: 492; Vosmaer, 1885a: 186, 356; Carter, 1882a: 281; Graeffe, 1882: 318; Carter, 1884a: 204; Ridley & Dendy, 1887: 147; Lendenfeld, 1889a: 410-415, 498-505, 586, 592, 594, 598, 602, 604, 608, 612, 614, 618, 622, 624, 628, 634, 640, 644, 646, 650, 669, pl.34, figs 193-205; Lendenfeld, 1890a: 72; Maas, 1892: 427-428; Norman, 1892: 13; Maas, 1893: 331, 334-335, 414, 441, 444, pl.20, fig.19, pl.21, fig.32; Topsent, 1893d: 445; Topsent, 1894a: 18, 24; Topsent, 1894b: 35; Heider, 1895: 280; Dendy, 1896: 36; Loisel, 1898: 38; Zimmermann, 1907: 308; Korschelt & Heider, 1910: 321; Walther, 1910: 21; Babic, 1921: 84 [Adriatic]; Babic, 1922: 244; Topsent, 1925: 646-647, fig.7 [Gulf of Naples]; Topsent & Olivier, 1943: 1 [Banyuls and Naples]; de Laubenfels, 1954: 139; Lévi, 1960a: 61-62 [Mediterranean, Adriatic,Naples, Banyuls]; Laubier, 1966 [Banyuls]; Vidal, 1967 [Mediterranean]; Boury-Esnault, 1971: 323 [Banyuls]; Pulitzer-Finali, 1983: 568-569, 610 [Mediterranean]; Boury-Esnault & Lopes, 1985: 194-195, fig.43 [Azores]; Pansini, 1987 [Adriatic Sea]; Desqueyroux-Faundez & Stone, 1992: 9, 35, 103 [list].

Ophlitaspongia coralloides; Bowerbank, 1874: 10.

Ophlitaspongia corona; Lévi, 1960a: 61

MATERIAL. HOLOTYPE: unknown; fragments LMJG 15356, BMNH1867.7.26.74, 1910.1.1.2364, 2365. Mediterranean, NE. Atlantic.

Clathria (Clathria) curvispiculifera (Carter, 1880)

Microciona curvispiculifera Carter, 1880a: 43,44,151,153, pl.4, fig.6a-d [Gulf of Manaar]; Vosmaer, 1935a: 608.

? *Rhabdoploca curvispiculifera*; Topsent, 1904a: 157-159.

MATERIAL. HOLOTYPE: LFM missing, no fragment in BMNH. Gulf of Manaar. Note: virtually unrecognisable.

Clathria (Clathria) dayi Lévi, 1963

Clathria dayi Lévi, 1963: 51, pl.8B, text-fig.58 [Cape of Good Hope]; Sim & Byeon, 1989: 39, pl.4, figs 1-2 [Korea; possible misidentification].

MATERIAL. HOLOTYPE: MNHNDCL611. S. Africa.

Clathria (Clathria) depressa Sarà & Melone, 1966

Clathria depressa Sarà & Melone, 1966: 2-4, text-figs 1-2, pl.1 [Olivetta, Portofino, Levante coast, Italy]; Pulitzer-Finali, 1983: 610.

MATERIAL. HOLOTYPE: IMZUB. E. Mediterranean.

Clathria (Clathria) discreta (Thiele, 1905)

Microciona discreta Thiele, 1905: 447-449, 494, pl.31, fig. 65a-e [Calbuco, Chile].

Dictyociona discreta; Topsent, 1913a: 580, 583, 614, 618-620, 642, pl.3, fig.5 [Gough I., S. Atlantic Ocean]; Burton, 1932: 324, pl.56, figs 3-4 [Falklands]; Burton, 1940: 112, pl.4, figs 1-2, pl.6, fig.2 [Argentina and Chile]; de Laubenfels, 1953a: 527; Desqueyroux, 1972: 29-30, figs 95-102, 136-137 [Chile]; Desqueyroux & Moyana, 1987: 49 [Chile, Tierra del Fuego, Argentina, Falkland Is, Kerguelen Is].

cf. *Microciona prolifera*; Vosmaer, 1935a: 608, 646.

MATERIAL. HOLOTYPE: ZMB3302, fragment BMNH1908.9.24.159. SW. Atlantic, SE. Pacific, Subantarctic.

Clathria (Clathria) elastica Lévi, 1963

Clathria elastica Lévi, 1963: 52, text-fig.59, pl.8C [Cape of Good Hope].

Not *Clathria elastica* Sarà, 1978: 70 [see *C. sarai*, nom.nov.].

MATERIAL. HOLOTYPE: MNHNDCL604. S. Africa.

Clathria (Clathria) elegans Vosmaer, 1880

Clathria elegans Vosmaer, 1880: 152 [North America]; Vosmaer, 1884b: 492.

? *Anaata elegans*; de Laubenfels, 1936a: 109.

Not *Plectispa elegans* Lendenfeld, 1888: 226.

Not *Antherochalina elegans* Lendenfeld, 1887b: 787.

cf. *Microciona prolifera*; Vosmaer, 1935a: 630.

MATERIAL. HOLOTYPE: unknown. NE. Pacific. Note: virtually unrecognisable.

Clathria (Clathria) foliacea Topsent, 1889

Clathria foliacea Topsent, 1889: 39-40, text-fig.5 [Banc de Campeche]; Van Soest, 1984b: 107, table 4; Van Soest & Stentoft, 1988: 126 [table].

Thalyseurypon foliacea; de Laubenfels, 1936a: 107-108 [Florida].

Pandaros foliaceum; Wiedenmayer, 1977: 144 [note].

Clathria carteri Topsent, 1889: 38-39, text-fig.4B [Banc de Campeche]; Van Soest, 1984b: 108.

Thalyseurypon carteri; de Laubenfels, 1936a: 107.

Pandaros carteri; Wiedenmayer, 1977: 144 [note].

MATERIAL. HOLOTYPE: MNHN missing, reference specimen USNM22516. NE. Atlantic, Caribbean.

Clathria (Clathria) foliascens Vacelet & Vasseur, 1971

Clathria foliascens Vacelet & Vasseur, 1971: 95-96, text-fig.49, pl.4, figs 5-6 [Tulear Madagascar]; Vacelet & Vasseur, 1977: 114; Vacelet et al., 1976: 71 [Tulear, Madagascar]

MATERIAL. HOLOTYPE: MNHNDJV30. W. Indian Ocean.

Clathria (Clathria) frondiculata (Schmidt, 1864)

Reniera (?) *frondiculata* Schmidt, 1864: 39, 40, 45, pl.4, fig.10 [Adriatic].
Pitalia frondiculata; Gray, 1867: 524.
Clathria frondiculata; Vosmaer, 1880: 153 [Triest]; Vosmaer, 1885: 236; Norman, 1892: 13; Topsent, 1892b: 23; Heider, 1895: 282; Burton, 1930a: 514.
cf. *Clathria compressa* and *C. coralloides*; Vosmaer, 1935a: 625 [intermediate form].

MATERIAL. HOLOTYPE: LMJG, fragment: BMNH-1910.1.1.542. E. Mediterranean.

Clathria (Clathria) gorgonoides (Dendy, 1916)

Echinodictyum gorgonoides Dendy, 1916a: 129 [Kattiawar, Indian Ocean]; Hooper, 1991: 1348.

MATERIAL. HOLOTYPE: BMNH1920.12.9.38. W. India.

Clathria (Clathria) hexagonopora Lévi, 1963

Clathria hexagonopora Lévi, 1963: 53-54, text-fig.60, pl.8D [Cape of Good Hope].

MATERIAL. HOLOTYPE: MNHNDCL620. S. Africa.

Clathria (Clathria) indica Dendy, 1889

Clathria indica Dendy, 1889b: 73, 84, pl.4, fig.10 [Gulf of Manaar, Ceylon]; Burton & Rao, 1932: 336-337, pl.18, figs 8-9 [Tuticorin, India]; Thomas, 1979a: 58, pl.3, fig.10 [Mozambique].
Wilsonella indica; Dendy, 1905: 171 [Ceylon]; Hallmann, 1912: 242; Burton, 1931a: 346 [Natal Coast].

MATERIAL. HOLOTYPE: BMNH1887.8.4.19, fragment: MNHNDCL2528. E. Africa, SE. India, Gulf of Manaar.

Clathria (Clathria) inhacensis Thomas, 1979

Clathria inhacensis Thomas, 1979: 27-28, pl.2, fig.2 [Inhaca I., Mozambique].

MATERIAL. HOLOTYPE: MRAC511. E. Africa.

Clathria (Clathria) intermedia Kirk, 1911

Clathria intermedia Kirk, 1911: 579, text-fig.5 [Kermadec Is]; Fell, 1950: 11, text-fig.2; Berquist & Fromont, 1988: 109-110; Dawson, 1993: 37 [note].
Thalysias intermedia; de Laubenfels, 1936a: 105.

MATERIAL. HOLOTYPE: NMNZ unregistered. N. New Zealand.

Clathria (Clathria) irregularis (Burton, 1931)

Marleyia irregularis Burton, 1931a: 346, pl.23, fig.6, text-fig.5 [Durban, Natal]; de Laubenfels, 1936a: 109 [note]; Van Soest, 1984b: 130 [note].

MATERIAL. HOLOTYPE: NM1279; paratype: BMNH-1934.10.1.17. S. Africa.

Clathria (Clathria) juncea Burton, 1931

Clathria juncea Burton, 1931a: 343, pl.23, fig.5, text-fig.3 [Natal coast]; Lévi, 1960a: 85; Lévi, 1963: 66 [note].
Labacea juncea; de Laubenfels, 1936a: 66 [note].
cf. *Alcyonium junceum* Lamarck, 1816: 77.
cf. *Anomoclathria opuntioides* var; Topsent, 1933: 26 [note].

MATERIAL. HOLOTYPE: MNHN missing (fragment BMNH1954.2.20.85, unconfirmed); 'representative specimen': BMNH1926.2.19.2. Note: Burton's species is probably the same as Lamarck's but this cannot be verified and the species is taken in the sense of Burton (1931a). South Africa.

Clathria (Clathria) labyrinthica (Schmidt, 1864)

Reniera labyrinthica Schmidt, 1864: 39, pl.4, fig.9 [Adriatic].
Clathria labyrinthica; Burton, 1930a: 514 [imperfectly known].

MATERIAL. HOLOTYPE: LMJG. Mediterranean.

Clathria (Clathria) laevigata Lambe, 1893

Clathria laevigata Lambe, 1893: 31-32, pl.2, figs 9-9f [Pacific coast, Canada]; Lambe, 1900: 160; Koltun, 1959: 185, text-fig.146 [Kurile Is].
Thalysias laevigata; de Laubenfels, 1936a: 105.
cf. *Microciona prolifera*, tropus *senta*; Vosmaer, 1935a: 641.

MATERIAL. HOLOTYPE: NMCIC1900-2892. NW. and NE. Pacific.

Clathria (Clathria) lissosclera Bergquist & Fromont, 1988

Clathria lissosclera Bergquist & Fromont, 1988: 106-107, pl.49, figs d-f [Mayor I.]; Dawson, 1993: 37 [note].

MATERIAL. HOLOTYPE: NMNZPOR112. New Zealand.

Clathria (Clathria) lobata Vosmaer, 1880

Clathria lobata Vosmaer, 1880: 151 [Cape of Good Hope]; Vosmaer, 1882: 45; Carter & Hope, 1889: 101, 105; Stephens, 1915: 444-445 [Cape of Good Hope]; Lévi, 1963: 54, text-fig.61, pl.8F [Cape of Good Hope].
Rhaphidophlus lobatus, var. *horrida*; Ridley & Dendy, 1887: 153-155, pl.28, fig.1, pl.29, fig.4a-c [Simon's Bay, Cape of Good Hope].
Ligrota lobata; de Laubenfels, 1936a: 125.
Artemisina lobata; Van Soest, 1984b: 130 [generic synonymy for *Ligrota*].
cf. *Microciona prolifera*; Vosmaer, 1935a: 631-632.

MATERIAL. HOLOTYPE: unknown, fragments RMNH276-277, BMNH1887.5.2.100. S Africa.

Clathria (Clathria) macroisochela Lévi, 1994

Clathria (Clathria) macroisochela Lévi, 1994: 37, fig.21b, pl.7, figs 7-9 [Norfolk Rise, 680m depth].

MATERIAL. HOLOTYPE: MNHNDCL3638. SW Pacific.

Clathria (Clathria) maeandrina Ridley, 1884

Clathria maeandrina Ridley, 1884a: 588, 614, pl.53, fig.l, pl.54, fig.H [Amirante Is]; Burton, 1930c: 668 [Gulf of Manaar]; Burton, 1959: 244 [Red Sea].

MATERIAL. HOLOTYPE: BMNH1882.10.17.55. Red Sea, W Indian Ocean, Gulf of Manaar.

Clathria (Clathria) marissuperi Pulitzer-Finali, 1983

Clathria marissuperi Pulitzer-Finali, 1983: 569-571, text-fig.67 [Italy].

MATERIAL. HOLOTYPE: IZUG(MSNG 47179). Mediterranean.

Clathria (Clathria) menoui Hooper & Lévi, 1993

Clathria (Clathria) menoui Hooper & Lévi, 1993a: 1270-1273, figs 25-26 [New Caledonia].

MATERIAL. HOLOTYPE: QMG301267. SW. Pacific.

Clathria (Clathria) meyeri (Bowerbank, 1877)

Ophlitaspongia meyeri Bowerbank, 1877: 456 [Selat Japen, Irian Jaya, E. Indonesia].

Clathria meyeri; Vosmaer, 1880: 154.

? *Anaata meyeri*; de Laubenfels, 1936a: 109.

MATERIAL. HOLOTYPE: Dresden Musuem destroyed (fragments BMNH1877.5.21.1306-1309). Indonesia.

Clathria (Clathria) microchela (Stephens, 1916)

Eurypon microchela Stephens, 1916: 240-241 [SW coast, Ireland]; Lilly et al., 1953 [Lough Ine, Ireland]; Burton, 1959b: 44 [Iceland]; Van Soest & Weinberg, 1980: 10 [Lough Ine, Ireland].

Dictyociona microchela; de Laubenfels, 1936a: 110 [note]; de Laubenfels, 1953: 528.

Clathria microchela; Van Soest, 1984b: 7 [generic synonymy].

Not *Microciona microchela* Hechtel, 1965: 41.

MATERIAL. HOLOTYPE: INMSR353.10.1916. NE. Atlantic.

Clathria (Clathria) microxa Desqueyroux, 1972

Clathria microxa Desqueyroux, 1972: 27-28, text-figs 76-80,134 [Gulf of Corcovado, Chile].

MATERIAL. HOLOTYPE: ICBUC. SE Pacific.

Clathria (Clathria) mortensenii Brondsted, 1923

Clathria mortensenii Brondsted, 1923: 143-144, text-fig.22 [Campbell Is]; Burton, 1940: 111 [Argentina]; Bergquist & Fromont, 1988: 107-108, pl.50, figs a-c [N. New Zealand]; Dawson, 1993: 37 [note].

Microciona mortensenii; de Laubenfels,1936a: 111; Burton, 1940: 111 [Argentina].

Microciona heterospiculata; Bergquist, 1961a: 39 [N of New Zealand].

Not *Microciona heterospiculata* Brondsted, 1924: 465, text-fig.20.

MATERIAL. HOLOTYPE: UZM, fragment: BMNH1930.8.11.10. SW. Atlantic, Subantarctic, New Zealand.

Clathria (Clathria) mosulpia Sim & Bakus, 1989

Clathria mosulpia Sim & Byeon, 1989: 38-39, pl.3, figs 1-5. [South Korea].

MATERIAL. HOLOTYPE: HNUKPor9. S. China Sea

Clathria (Clathria) obliqua (George & Wilson, 1919)

Esperiopsis obliqua George & Wilson, 1919: 148-150, pl.60, figs 20-23, pl.66, fig.58 [North Carolina].

Microciona obliqua; de Laubenfels, 1936a: 111.

cf. *Microciona prolifera*; de Laubenfels, 1947; de Laubenfels, 1949a.

Haliclona oculata; Pearse & Williams, 1951 [North Carolina].

Cholina arbuscula; Coues & Yarrow, 1879: 312; Verrill & Smith, 1873: 743 [North Carolina].

Tenaciella obliqua; Wells et al., 1960: 218-219, text-figs 16,25 [North Carolina].

Not *Tenaciella obliqua*; Alcolado, 1976: 5.

Clathria obliqua; Van Soest, 1984b: 104, 108, table 4 [affinity with *Clathria prolifera*].

Not *Dictyociona adioristica* de Laubenfels, 1953a: 526; Van Soest, 1984b: 108 [possible synonym].

MATERIAL. HOLOTYPE: USNM23612, paratype-USNM23613. NW. Atlantic-Caribbean.

Clathria (Clathria) oculata Burton, 1933

Clathria oculata Burton, 1933: 250-251, text-fig.2 [Natal]; Lévi, 1963: 67 [Natal].

Thalysias oculata; de Laubenfels, 1936a: 105.

MATERIAL. HOLOTYPE: BMNH1933.7.4.65. S. Africa.

Clathria (Clathria) oxneri (Topsent, 1928)

Hymedesmia oxneri Topsent, 1928a: 256 [Azores].

Dictyociona oxneri; de Laubenfels, 1936a: 110 [note]; de Laubenfels, 1953a: 528.

Clathria oxneri; Van Soest, 1984b: 7 [generic synonymy for *Dictyociona*].

MATERIAL. HOLOTYPE: MOM (fragment MNHNDT-963). NE. Atlantic.

Clathria (Clathria) pachystyla Lévi, 1963

Clathria pachystyla Lévi, 1963: 56, text-fig.63, pl.8G [Cape of Good Hope].

MATERIAL. HOLOTYPE: MNHNDCL609. S. Africa.

Clathria (Clathria) papillosa Thiele, 1905

Clathria papillosa Thiele, 1905: 449-450, text-fig.66 [Calbuco, Chile]; Burton, 1932a: 319 [Falkland Is]; Desqueyroux-Faundez & Moyana, 1987: 49 [Chile, Argentina, Falkland Is, Kerguelen Is].

Pseudanchinoe papillosa; de Laubenfels, 1936a: 109; Burton, 1940: 115, pl.5, figs 1-7 [Argentina].

MATERIAL. HOLOTYPE: ZMB not located, fragment: BMNH1908.9.24.162. SE. Pacific, SW. Atlantic.

Clathria (Clathria) pellicula Whitelegge, 1897

Clathria pellicula Whitelegge, 1897: 327-328 [Funafuti (Ellice Is)].

Hymeraphia pellicula; Hallmann, 1912: 208-209.

cf. *Microciona prolifera* tropus *tegens*; Vosmaer, 1935a: 641-2.

MATERIAL. HOLOTYPE: AMG1660. SW central Pacific.

Clathria (Clathria) plurityla Pulitzer-Finali, 1983

Clathria plurityla Pulitzer-Finali, 1983: 571-572, 610, text-fig.68 [Italy].

MATERIAL. HOLOTYPE: IZUG(MSNG47180). Mediterranean.

Clathria (Clathria) productitoxa (Hoshino, 1981)

Thalysias productitoxa Hoshino, 1981: 157-159, text-fig.69, pl.7, fig.3 [Uchinoura].

MATERIAL. HOLOTYPE: MMBSSAT-018. Japan.

Clathria (Clathria) prolifera (Ellis & Solander, 1786)

Spongia prolifera Ellis & Solander, 1786: 189-190, pl.58, fig.5; Linnaeus, 1791: 3822; Esper, 1794: 178, 281; Bosc, 1802: 143; Lamarck, 1814: 372; Lamouroux, 1816: 81-82;

Montagu, 1818: 86; Blainville, 1819: 106; Lamouroux, 1821: 31, 109, pl.58, fig.5; Lamouroux, 1824: 368; Templeton, 1836: 472; Johnston, 1842: 170-171; Gray, 1848: 19, 23.

Not *Spongia prolifera*; Grant, 1826: 115-116, 123, 135, 138, 347.

Microciona prolifera; Verrill, 1873: 741-742, pls 1-5 [USA]; Verrill, 1880: 232; Coues & Yarrow, 1879: 312 [North Carolina]; Hyatt, 1885: 131; Norman, 1892: 14; Wilson, 1900: 350 [Beaufort, N.Carolina]; Wilson, 1902: 396-397; Wilson, 1907: 246; Wilson, 1910: 1269; Wilson, 1911: 3-11, 14, 29-30, pl.1, figs 1-6, pl.2, figs 7-12, pl.3, figs 13-20, pl.4, figs 21-25, pl.5, figs 26-32; George & Wilson, 1919: 157-158, pl.62, figs 31, 33, pl.63, figs 35-36, pl.66, fig.57 [North Carolina]; Allee, 1923: 175; Galtsoff & Pertzoff, 1926: 239-254 [physiology]; Burton & Rao, 1932: 344 [Arabian Sea; probable misidentification]; Proctor, 1933: 104; de Laubenfels, 1936a: 111; McDougall, 1943: 331-332; Bergmann, Schedl & Low, 1945: 580; de Laubenfels, 1947: 35; Hopkins, 1956a: 44; Hopkins, 1962: 124; Hartmann, 1958a: 36-41, text-fig.10, table 11 [New England, USA]; Lévi, 1960a: 52; Wells et al., 1960: 213-216, text-figs 18,22 [North Carolina]; Little, 1963: 49 [Florida]; Wells et al., 1964: 757-758 [North Carolina]; Bagby, 1966: 167-181, pls 3-5 [cytology]; Simpson, 1968a: 18, pls 1-5 [Connecticut, USA]; Simpson, 1968b: 252-277 [reproduction]; Wendt, 1970: 3500-B [cytology]; Sindelar, 1970: 3771-B [cytology]; Bagby, 1970: 579-594 [ultrastructure]; Kunen et al., 1970: 565-576 [physiology]; Madri et al., 1970: 1-5 [biochemistry]; Swartz, 1972: 17 [ecology]; Bagby, 1972: 217-244 [ultrastructure]; Bito, 1972: 65 [biochemistry]; Bose et al., 1972: 217-222 [biochemistry]; Turner & Burger, 1973: 509-510, text-fig.1 [cytology]; Weinbaum & Burger, 1973: 510-512, [biochemistry]; Stempien, 1973: 363; Sutherland, 1974: 859-873 [ecology]; Turner et al., 1974: 35 [cytology]; Bose, 1974: 476-490 [chemistry]; Jefferts et al., 1974: 244-247 [biochemistry]; Reiswig, 1975: 493-502 [physiology]; Reed et al., 1976: 153-169 [cytology]; Jumblatt et al., 1976: 73-86 [cytology]; Morales & Litchfield, 1976: 206-216 [biochemistry]; Burger, 1977: 357-376 [cytology]; Greenberg et al., 1977: 95-102 [cytochemistry]; Morales, 1977: 5043 [biochemistry]; Morales & Litchfield, 1977: 570-576 [biochemistry]; Simpson, 1978: 31-42 [morphology]; Burkart et al., 1979: 239-246 [cytology]; Leith, 1979: 212-223 [cytology]; Litchfield & Liaaen-Jensen, 1980: 359-365 [biochemistry]; Jumblatt et al., 1980: 1038-1042 [biochemistry-cytology]; Saxegaard et al., 1981: 325-327 [hiochemistry]; Lee & Nicol, 1981: 445 [chemistry]; Biernbaum, 1981: 85-96 [ecology]; Liaaen-Jensen et al., 1982: 170-171 [biochemistry]: Misevic & Burger, 1982: 200 [biochemistry-cytology]; Misevic et al., 1982: 6931-6936 [biochemistry-cytology]; Kuhns et al., 1980: 73-79 [cell reaggregation]; Dunham et al., 1983: 4756 [cell reaggregation]; Rice & Humphreys. 1983: 6394-9 [biochemistry]; Akiyama & Johnson, 1983: 687-694 [biochemistry]; Collier, 1983: 428-432 [biochemistry]; Lee & Gilchrist, 1985: 24-32 [biochemistry]; Dunham et al., 1985: 2914 [cytology]; Sharma et al., 1985: 241 [biochemistry]; Knight & Fell, 1987: 263 [physiology]; Misevic et al., 1987: 5870 [cytology]; Stanley-Samuelson, 1987: 92 [chemistry]; Sliwka et al., 1987: 245 [chemistry]; Knight & Fell, 1987: 253 [cytology]; Misevic & Burger, 1988: 134-152; Fell, Knight & Rieders, 1989: 195; Misevic & Burger, 1988: 134; 1990a: 307; 1990b: 20577 [cytology]; Kuhns, Misevic & Burger, 1990: 358 [biochemistry]; Leamon & Fell, 1990: 265 [cytology]; Ayanoglu et al., 1990: 597; Lam et al., 1991: 372 [biochemistry]; Misevic & Burger, 1990c: 81 [chemistry]; Fell, 1990: 497 [ecology]; Misevic et al., 1990: 182 [ontogeny]; Spillmann et al., 1993: 13378 [chemistry]; Aho et al., 1993: 7288 [genetics].

Not *Microciona prolifera*; de Laubenfels, 1949a: 12, text-figs 8-10 (Pearse & Williams, 1951: 135); Johnson, 1971: 110-111, text-fig.14 (Van Soest, 1984b: 93).

cf. *Microciona prolifera*, in part; Vosmaer, 1935a: 612-613 [excessive lumping of species].

Clathria (Clathria) prolifera; Van Soest, 1984b: 91-93, text-fig.35, table 4 [North Carolina].

Not *Clathria prolifera* Burton, 1940: 109 [see *C. burtoni*, nom.nov.].

Spongia ostacina Rafinesque, 1819: 150.

Spongia urceolata Desor, 1851: 67.

Clathria delicata Lambe, 1896: 12, 160, 192, pl.2, fig.2 [St.Lawrence Gulf]; Lambe, 1900: 160; Whiteaves, 1901: 18 [Canada]; Hentschel, 1912: 365; Hentschel, 1929: 971; Hartman, 1958: 37.

Thalysias delicata; de Laubenfels, 1936a: 105.

Esperiopsis obliqua, in part; de Laubenfels, 1947: 5.

MATERIAL. HOLOTYPE: BMNH missing; representative specimens: USNM23562, ZMAPOR38, MCZH6907, PMNH754, PMNH1912E, NMCIC1900-2874. NW. Atlantic.

Clathria (Clathria) pyramidalis (Brondsted, 1924)

Microciona pyramidalis Brondsted, 1924: 466, text-figs 21a-e [Slipper Is]; Dawson, 1993: 37 [note].

Dictyociona pyramidalis; de Laubenfels, 1936a: 110 [note]; de Laubenfels, 1953a: 528; Bergquist & Fromont, 1988: 104.

MATERIAL. HOLOTYPE: UZM (not located). New Zealand.

Clathria (Clathria) rectangulosa Schmidt, 1870

Clathria rectangulosa Schmidt, 1870: 60 [Tortugas, Florida]; Vosmaer, 1880: 149; Ridley & Duncan, 1881: 485; Wiedenmayer, 1977: 261, table 52 [imperfectly known]; Desqueyroux-Faundez & Stone, 1992: 36, 103.

cf. *Clathria coralloides*; Vosmaer, 1880: 149.

MATERIAL. HOLOTYPE: BMNH1870.5.3.68. NW. Atlantic - Caribbean.

Clathria (Clathria) rhaphidotoxa Stephens, 1915

Clathria rhaphidotoxa Stephens, 1915: 445-447, pl.38, fig.2, pl.40, fig.15 [Saldanha Bay]; Lévi, 1963: 57-58, text-fig. 65, pl.8H [St. Helena and Saldanha Bays].

Thalysias raphidotoxa; de Laubenfels, 1936a: 105.

MATERIAL. HOLOTYPE: RSME 1921.143.1451 (fragment BMNH 1953.11.11.144). S Africa.

Clathria (Clathria) sarai sp.nov.

Clathria elastica Sarà, 1978: 70-73, text-figs 44-46 [Cape San Sebastiono, Tierra del Fuego]; Desqueyroux-Faundez & Moyano, 1987: 50 [Tierra del Fuego, Argentina].

Not *Clathria elastica* Lévi, 1963: 52.

MATERIAL. HOLOTYPE: IZUG116, fragment: MNHNDCL604. Note: *C. elastica* Lévi, 1963 has seniority. SW Atlantic.

Clathria (Clathria) saraspinifera sp. nov.

Clathria spinifera Sarà, 1978: 67-70, text-figs 41-43 [Rio Grande, Tierra del Fuego]; Desqueyroux-Faundez & Moyano, 1987: 50 [Tierra del Fuego, Argentina].

Not *Rhaphidophlus filifer* var. *spinifera* Lindgren, 1897: 483.

Not *Rhaphidophlus spinifer* Thiele, 1903a: 958, pl.28, fig. 23; Hallmann, 1912: 177.

MATERIAL. HOLOTYPE: IZUG147, fragment: MNHNDCL2755. SW. Atlantic. Note: *C. spinifera* (Lindgren, 1897) has seniority.

Clathria (Clathria) sartaginula (Lamarck, 1814)

Spongia sartaginula Lamarck, 1814: 383,362 [locality unknown].

Pseudanchinoe sartaginula; de Laubenfels, 1936a: 109 [note].

Clathria sartaginula; Topsent, 1930: 45, pl.4, fig.1.

MATERIAL. HOLOTYPE: MNHNDT527. Unknown.

Clathria (Clathria) shirahama Tanita, 1977

Clathria shirahama Tanita, 1977: 38, pl.2, fig.9, text-fig.6 [Kii-Shirahama]; Hoshino, 1981: 161.

MATERIAL. HOLOTYPE: MMBS. Japan.

Clathria (Clathria) spinispicula Tanita, 1968

Clathria spinispicula Tanita, 1968: 48-49, pl.1, fig.6, text-fig.8 [Ariake Sea]; Rho et al., 1972: 5, pl.4, figs 9-10 [South Korea]; Hoshino, 1981: 161 [Ariake Sea]; Sim & Bakus, 1988: 25 [Korea]; Sim & Byeon, 1989: 38 [Korea].

MATERIAL. HOLOTYPE: MMBS. Japan, S. China Sea.

Clathria (Clathria) spongodes Dendy, 1922

Clathria spongodes Dendy, 1922: 69, pl.6, fig.1, pl.14, fig.2 [Amirante]; Vacelet et al., 1976: 70-71, text-fig. 48, pl.3, fig.e [Madagascar].

Damoseni spongodes; de Laubenfels, 1936a: 110 [note].

Clathria madrepora Dendy, 1922: 68-69, pl.5, fig.3, pl.14, fig.1 [Seychelles]; Sim & Kim, 1988: 25, pl.2, figs 1-2 [Korea]; Sim & Byeon, 1989: 38 [Korea; possible misidentification].

Thalysias madrepora; de Laubenfels, 1936a: 105.

Clathria spongiosa Burton, 1959a: 245, text-fig. 26 [Red Sea]; Vacelet et al., 1976: 70 [with question].

MATERIAL. HOLOTYPE: BMNH1921.11.7.58. W. Indian Ocean, ? S. China Sea.

Clathria (Clathria) surculosa (Esper, 1797)

Spongia surculosa Esper, 1797: 39, pl.65 A3 ['East Indies'].

Clathria surculosa; Ehlers, 1870: 23,31.

MATERIAL. HOLOTYPE: Unknown. Indonesia.

Clathria (Clathria) terranovae Dendy, 1924

Clathria terrae-novae Dendy, 1924a: 353-354, pl.12, fig.5, pl.14, figs 9-13 [North Cape, New Zealand]; Dawson, 1993: 37 [note].

Dictyociona terrae-novae; Burton, 1932a: 324 [Falkland Is]; Burton, 1940: 112-114, pl.5, figs 3-4 [Argentina]; de Laubenfels, 1953a: 528; Koltun, 1964a: 72-73 [Antarctica].

Clathria terranova; Koltun, 1976: 188; Rho & Sim, 1976: 74, pl.6, figs 3-4 [Seogwipo, South Korea; possible misidentification]; Boury-Esnault & van Beveren, 1982: 107-108, pl.18, fig.69, text-fig.31 [Kerguelen Is]; Bergquist & Fromont, 1988: 109, pl.50, figs d-f, pl.51, fig.a [N. New Zealand]; Sim & Byeon, 1989: 38 [Korea].

MATERIAL. HOLOTYPE: BMNH1923.10.1.132, paratypes BMNH1923.10.1.133, 134. Antarctica, Subantactic, New Zealand, SW Atlantic.

Clathria (Clathria) textile (Carter, 1876)

Cornulum textile Carter, 1876: 309.

Clathria textile; Vosmaer, 1880: 154 [Shetland Is; imperfectly known].

MATERIAL. HOLOTYPE: BMNH1882.7.28.75. NE Atlantic.

Clathria (Clathria) tortuosa Uriz, 1988

Clathria tortuosa Uriz, 1988a: 86-87, pls 22a, 42a-b, text-fig.62 [Namibia].

MATERIAL. HOLOTYPE: ABIP6B-11d. SW Africa.

Clathria (Clathria) toxistricta Topsent, 1925

Clathria toxistricta Topsent, 1925: 656-658, text-fig.13 [Gulf of Naples]; Sarà, 1960a: 462 [Ischia]; Lévi, 1960a: 62-63 [Naples]; Boury-Esnault, 1971: 324 [Banyuls]; Pulitzer-Finali, 1983: 610 [list].

MATERIAL. HOLOTYPE: MOM, fragments-MNHNDT327, 1244. Mediterranean.

Clathria (Clathria) toxistyla (Sarà, 1959)

Microciona toxistyla Sarà, 1959: 17, text-fig.6 [Naples]; Siribelli, 1960: 9-10, text-fig. 3B [Naples]; Sarà, 1961: 47 [Adriatic Sea]; Cimino et al., 1979: 3619-3622 [biochemistry].

Clathria toxistyla; Melone, 1963: 5-7, pl.1, fig.2, text-fig.2 [Adriatic Sea; erect form of *Microciona toxistyla*]; Sarà, 1964: 229 [Ligurian Sea]; Sarà & Melone, 1963: 20 [Adriatic Sea]; Labate, 1964: 334 [Adriatic Sea]; Pulitzer-Finali, 1983: 569, 610, fig.66 [Mediterranean].

MATERIAL. HOLOTYPE: ZSN1000. Mediterranean.

Clathria (Clathria) toxivaria (Sarà, 1959)

Microciona toxivaria Sarà, 1959: 14, pl.1C, text-fig.5 [Naples]; Siribelli, 1960: 8, text-fig.3A [Naples].

Clathria toxivaria; Melone, 1963: 2-3, pl.1, fig.1, text-fig.1 [Adriatic; erect forms of *Microciona toxivaria*]; Pulitzer-Finali, 1977: 61 [Bay of Naples]; Sarà, 1964: 229-230 [Ligurian Sea]; Sarà & Melone, 1963: 20-21 [Adriatic]; Labate, 1964: 334 [Adriatic]; Boury-Esnault, 1971: 323 [Banyuls]; Pulitzer-Finali, 1983: 568, 610 [Mediterranean].

MATERIAL. HOLOTYPE: ZSNGG920, paratype ZSNGG-923. Mediterranean.

Clathria (Clathria) toxotes (Schmidt, 1868)

Scopalina toxotes Schmidt, 1868: 12, 26, 39, 40, 44, pl.5, fig.5 [Canal of Zara, Adriatic]; Schmidt, 1870: 2, 56; Pagenstecher, 1872: 43; Hyatt, 1877: 500; Schmidt, 1880: 81; Vosmaer, 1880: 118-119; Fristedt, 1885: 37; Vosmaer, 1885b: 353; Carter & Hope, 1889: 101; Schulze & Lendenfeld, 1889: 9; Heider, 1895: 281; Kieschnick, 1896: 533; Thiele, 1903a: 959; Svarcevskij, 1906: 342; Lévi, 1960a: 55.

? *Microciona toxotes*; de Laubenfels, 1936a: 111 [imperfectly known].

cf. *Microciona armata*; Vosmaer, 1935a: 627.

MATERIAL. HOLOTYPE: unknown, possibly LMJG. Mediterranean.

Clathria (Clathria) typica Kirkpatrick, 1904

Clathria typica Kirkpatrick, 1904: 148 [Natal]; Hallmann, 1912: 208 [anomalous species].

? *Tenacia clathrata*; Carter, 1875: 195 [nomen nudum]; Carter, 1878: 160,163; *sensu* Vosmaer, 1935a: 628.

Not *Echinonema typicum* Carter, 1881a: 362.

MATERIAL. HOLOTYPE: BMNH1902.11.16.31. Note: imperfectly known; listed in BMNH register as *C. typica* Carter. S Africa.

Clathria (Clathria) ulmus Vosmaer, 1880

Clathria ulmus Vosmaer, 1880: 151 [locality unknown]; Ridley, 1884a: 444.

Thalysias ulmus; de Laubenfels, 1936a: 105 [note].

MATERIAL. HOLOTYPE: possibly RNHL. Unknown locality.

Clathria (Clathria) unica Cuartas, 1993

Clathria unica Cuartas, 1993: 112 [Argentina].

MATERIAL. HOLOTYPE: Division Invertebrados del Museo de Ciencias Naturales de La Plata, Argentina. SW Atlantic.

Clathria (Clathria) vasiformis (de Laubenfels, 1953)

Thalyseurypon vasiformis de Laubenfels, 1953a: 525, text-fig.4 [Gulf of Mexico]; Little, 1963: 50 [note].

Clathria vasiformis; Van Soest, 1984b: 109, table 4.

Pandaros vasiformis; Wiedenmayer, 1977: 144 [note].

MATERIAL. HOLOTYPE: USNM23403, paratype MLUM-ML4-232. E Pacific.

Clathria (Clathria) zoanthifera Lévi, 1963

Clathria zoanthifera Lévi, 1963: 58, text-fig.66, pl.9D [Cape of Good Hope].

MATERIAL. HOLOTYPE. UCT (fragment MNHNDCL607). S Africa.

TRANSFERS

List of other species described in *Clathria* (*Clathria*), or one of its synonyms, but now transferred to another genus.

Clathria australis Lendenfeld, 1888: 222 [Port Phillip, Victoria].

Wilsonella australis; Hallmann, 1912: 239.

Not *Clathria australis* Whitelegge, 1901: 90.

Not *Plumohalichondria australis*; Whitelegge, 1901: 90, pl.11, fig.14.

MATERIAL. LECTOTYPE: AMZ957. Note: referred Crellidae, synonym of *Crella incrustans* var. *arenacea* (Hallmann, 1914c: 411).

Plumohalichondria australis Whitelegge, 1901: 90-92, pl.11, fig.14a,b [New South Wales coast]; Whitelegge, 1907: 492 [New South Wales coast].

MATERIAL. HOLOTYPE: AMG9042. Note: referred Crellidae, synonym of *Crella incrustans* (Hallmann, 1912: 160).

Isodictya beanii Bowerbank, 1866: 274, 334, 335 [Britain]; Gray, 1868: 164; Schmidt, 1870: 77; Bowerbank, 1874: 147, pl.58, figs 1-6.

Amphilectus beanii; Vosmaer, 1880: 115.

Clathria beanii; Ridley, 1881: 485, 486; Bowerbank, 1882: 13, 23, 150; Topsent, 1890c: 203.

Myxilla beani; Topsent, 1892b: 23; Topsent, 1894a: 8, 9, 25; Hanitsch, 1894: 179.

cf. *Microciona prolifera*; Vosmaer, 1933: 610.

MATERIAL. HOLOTYPE: BMNH1930.7.3.339. Note: Synonym of *Antho involvens* (Lévi, 1960a: 76).

Echinonema caespitosa Carter, 1885f: 352 [Port Phillip, Victoria].

Plumohalichondria caespitosa; Dendy, 1896: 41.

MATERIAL. HOLOTYPE: BMNH1886.12.15.453. Note: referred to Anchinoidae, *Plumohalichondria*.

Antherochalina concentrica Lendenfeld, 1887b: 788, pl.22, fig.42 [Port Molle (Airlee Beach), Qld.].

Cymbastela concentrica; Hooper & Bergquist, 1992: 114.

MATERIAL. HOLOTYPE: AMZ1993 (lectotype), fragment BMNH1886.8.27.451, 460 (paralectotypes). Note: referred to Axinellidae, *Cymbastela*.

Clathria corallorhizoides Fristedt, 1887: 460, pl.25, figs 73-77, pl.29, fig.23.

MATERIAL. HOLOTYPE: unknown, fragment: BMNH1910.1.1.1445. Note: referred to Myxillidae, synonym of *Lissodendoryx complicata* (Lundbeck, 1905: 166).

Antherochalina elegans Lendenfeld, 1887b: 787, pl.22, fig.40.

Syringella elegans; Burton, 1934a: 558.

Raspailia (Syringella) elegans; Hooper, 1991: 1262.

MATERIAL. HOLOTYPE: BMNH1886.8.27.452. Note: referred to Raspailiidae, *Raspailia*.

Echinonema incrustans Carter, 1885f: 353 [Port Phillip, Victoria].

Plumohalichondria incrustans; Dendy, 1896: 42.

Plumohalichondria mammillata; Carter, 1885f: 355; Ridley & Dendy, 1887: 156, pl.30, fig.4, pl.47, fig.4.

Crella incrustans; Hallmann, 1912: 152-156, pl.23, figs 2-3, pl.24, text-figs 28-34.

MATERIAL. HOLOTYPE: BMNH1886.12.15.123, paratypes 1886.12.15.249, AME651, AMZ957. Note: referred to Crellidae, *Crella*.

Cornulum johnsoni de Laubenfels, 1934: 15.

Clathria johnsoni; Van Soest, 1984b: 104 [possible synonym of *Clathria*].

MATERIAL. HOLOTYPE: USNM Note: referred to Coelosphaeridae, possibly *Cornulum* (imperfectly known).

Echinonema levis Lendenfeld, 1888: 220 [Port Jackson, New South Wales].

Plumohalichondria australis, in part; Whitelegge, 1901: 65, 91, 92; Whitelegge, 1902a: 212.

Crella incrustans var. *levis*; Hallmann, 1912: 164-167, text-figs 33-34.

MATERIAL. LECTOTYPE: AMZ959, paralectotype AMG9708. Note: referred to Crellidae, synonym of *Crella incrustans* (Hallmann, 1912: 164).

Clathria loveni Fristedt, 1887: 458, pl.25, figs 70-72, pl.30, fig.24 [Cape Jakan, Siberian Arctic Ocean]; Lambe, 1900: 160.

[?] *Esperella loveni*; Lambe, 1895: 123, pl.4, fig.1 (W coast, North America).

Esperia loveni; de Laubenfels, 1936a: 120 [note].

MATERIAL. HOLOTYPE: unknown, fragments BMNH1927.2.22.2. Note: referred to Mycalidae, *Mycale*.

Plumohalichondria microcionides Carter, 1876: 236, pl.12, fig.11, pl.15, fig.30 [between Scotland and Faroe Is].
Clathria microcionides; Vosmaer, 1880: 154.
Plocamionida microcionides; Alander, 1942: 53 [Sweden].
Not *Hymeraphia microcionides* Carter, 1876: 390.
Not *Plocamia microcionides*; Topsent, 1891a: 529, 544-545.

MATERIAL. HOLOTYPE: BMNH1954.3.9.173. Note: referred to Anchinoidae, *Plocamionida*.

Clathria mollis Kirkpatrick, 1903: 249-250, pl.5, fig.15, pl.6, fig.16 [East London Coast, Natal].
Pronax mollis; Lévi, 1963: 66.
Not *Wilsonella mollis*; Hallmann, 1912: 243.
Not *Clathria dura* var. *mollis*; Hentschel, 1911: 370.

MATERIAL. HOLOTYPE: BMNH1902.11.16.32. Note: referred to Anchinoidae, *Pronax*.

Clathria morisca Schmidt, 1868: 9, 41, 43, pl.2, fig.7 [Algiers, Mediterranean]; Vosmaer, 1880: 150-151 [Algiers]; Topsent, 1902: 329; Topsent, 1938: 11; Desqueyroux-Faundez & Stone, 1992: 10, 35.
Dictyoclathria morisca; Topsent, 1920b: 18-21 [re-examination of holotype]; Topsent, 1925: 660-661, pl.8, fig.1 [Gulf of Naples]; Topsent, 1928a: 301-302, pl.3, fig.3 [Porto Santo, Azores]; Lévi, 1959: 134, text-fig.27, pl.5, fig.1 [Rio de Oro, Gulf of Guinea]; Lévi, 1960b: 761-762, text-fig.15 [var. *anisotyla*; SW. Cape of Naze, W. Africa]; Sarà, 1960a: 462 [Ischia, Mediterranean].
Artemisina mediterranea Babic, 1921: 87 [Adriatic]; Babic, 1922: 258, text-fig.3; Burton, 1930a: 528.
Myxilla banyulensis, in part, Topsent, 1892b: 23; Topsent, 1902: 351, 363, 366; Cotte, 1903: 423.
cf. *Clathria coralloides* and *C. compressa*; Vosmaer, 1935a: 626 [intermediate form].

MATERIAL. HOLOTYPE: MNHN DT2170, fragment BMNH 1868.3.2.21. Note: Synonym of *Antho involvens* (Lévi, 1960a: 57).

Clathria oroides Schmidt, 1864: 35, pl.4, figs 1-2 [Quarnerno, Adriatic]; Carter, 1875: 195; Vosmaer, 1880: 155; Dendy, 1889a: 41; Desqueyroux-Faundez & Stone, 1992: 10, 35, 103.
? *Oroidea adriatica*; Gray, 1867: 520.
Chalinopsis oroides; Schmidt, 1870: 60.
Ophlitaspongia oroides; Bowerbank, 1874: 10.
Agelas oroides; Rützler, 1965: 34 [Banyuls]; Boury-Esnault, 1971: 322 [Banyuls]; Laubier, 1966 [Banyuls]; Pulitzer-Finali, 1983: 534 [Mediterranean].

MATERIAL. HOLOTYPE: LMJG 15957, fragment BMNH1868.3.2.22. Note: referred to Agelasidae, *Agelas*.

Artemisina paradoxa Babic, 1921: 87; Babic, 1922: 258-261, pl.8, fig.6, text-fig.c [Adriatic]; Lévi, 1960a: 85-86 [Adriatic; with question]
Clathria paradoxa; Burton, 1930a: 528.
Dictyoclathria morisca; Topsent, 1925: 660; Ristau, 1978: 585-586 [note on affinities].

MATERIAL. HOLOTYPE: unknown. Note: synonym of *Antho involvens* (Topsent, 1925: 660).

Clathria pelligera Schmidt, 1864: 34, pl.3, fig.13 [Lesina, Adriatic]; Desqueyroux-Faundez & Stone, 1992: 10, 36, 103.
Rhaphidostyla pelligera; Burton, 1935b: 652; Sarà, 1958: 246-247, fig.15 [Gulf of Naples].
Stylotella pelligera; Topsent, 1925: 638; Boury-Esnault, 1971: 328 [Banyuls].
Dictyonella pelligera; Pulitzer-Finali, 1983: 545.

MATERIAL. HOLOTYPE: LMJG 15517; fragment BMNH 1867.3.11.29. Note: referred to Dictyonellidae, *Dictyonella*.

Clathria procumbens Brondsted, 1923; Brondsted, 1926: 329 [probably a typographical error for *Clathrina* (Calcarea), and possibly synonym of *Ascetta procumbens* Lendenfeld, 1885a].

Antherochalina quercifolia Keller, 1889: 383-384, pl.23, fig.34 [Red Sea].
Querciclona quercifolia; de Laubenfels, 1936a: 46 [note].

MATERIAL. HOLOTYPE: ZMB429, fragment BMNH1908.9.24.179. Note: referred to Axinellidae, *Phakellia*.

Clathria raphida Hechtel, 1976: 244; Van Soest, 1984b: 153. Note: cited in a list of Brazilian endemic sponges; attributed to Boury-Esnault (1973); probably a misprint for *Cliona rhaphida* Boury-Esnault, 1973.

Antherochalina renieroides Lendenfeld, 1887b: 788, pl.28, figs 18, 23 [New Zealand].

MATERIAL. HOLOTYPE: BMNH1886.8.27.449. Referred to Axinellidae, synonym of *Phakellia flabellata* (Carter) (see Hooper, 1991).

Hymeraphia tuberosocapitata Topsent, 1890b: 68 [Azores, Atlantic]; Topsent, 1892a:113, pl.11, fig.6 [Atlantic].
Cionanchora tuberosocapitata; de Laubenfels, 1936a: 108 [note].
Clathria tuberosocapitata; Van Soest, 1984b: 7 [generic synonymy for *Cionanchora*].
Discorhabdella tuberosocapitata; Boury-Esnault, Pansini & Uriz, 1992: 2-6.

MATERIAL. HOLOTYPE: MOM040323, fragment MNHNDT938, referred to Hymedesmiidae, *Discorhabdella*.

Clathria (Wilsonella) Carter, 1885
Hooper & Wiedenmayer, 1994

Wilsonella Carter, 1885f: 366 (not Hallmann, 1912: 242).
Clathriopsamma Lendenfeld, 1888: 227.
Aulenella Burton & Rao, 1932: 345.

TYPE SPECIES. *Wilsonella australiensis* Carter, 1885f: 366 (by monotypy).

DEFINITION. Sand grains and foreign spicules partially or completely replacing coring spicules inside fibres; coring spicules same or very similar geometry to auxiliary spicules located outside fibres; skeletal architecture reticulate.

REMARKS. Microcionids with sand and foreign debris incorporated into fibres ('arenaceous sponges') are a predominant feature of S Australian waters. Of the 17 species in *Wilsonella* or a synonym, 14 are valid and 6 are known to live in this region including 2 new species.

This group of arenaceous microcionids is well known as *Clathriopsamma* (Hooper, 1990a; Hooper & Lévi, 1993a). However, the inclusion of *C. (W.) australiensis* in this group means that *Wilsonella* (1885) takes precedence over *Clathriopsamma* (1888).

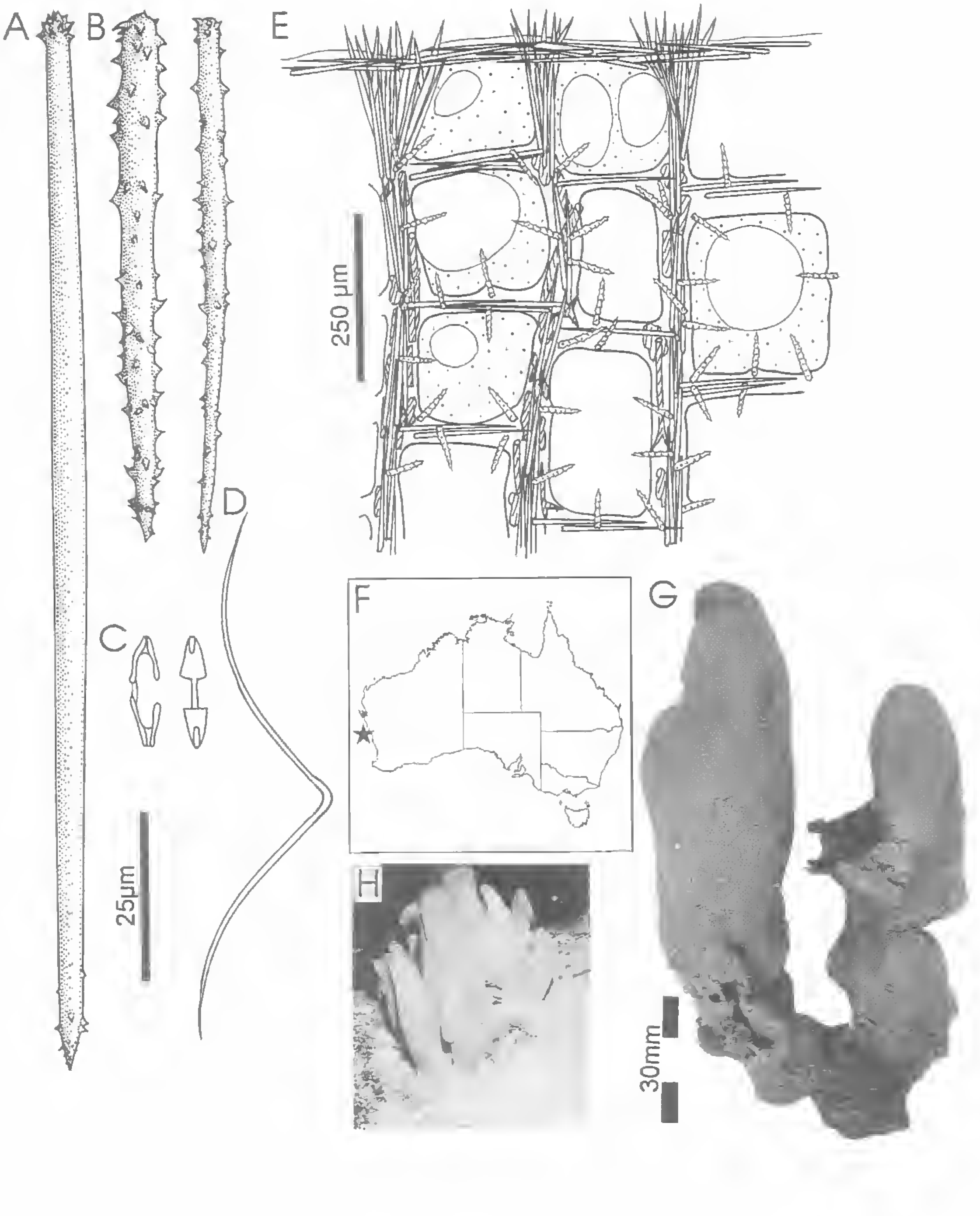

FIG. 81. *Clathria* (*Wilsonella*) *abrolholensis* sp.nov. (holotype NTMZ3218). A, Auxiliary style. B, Echinating acanthostyles. C, Palmate isochelae. D, Wing-shaped toxas. E, Section through peripheral skeleton (hatches foreign spicules). F, Australian distribution. G, Preserved holotype. H, Holotype.

Clathria (Wilsonella) abrolhosensis sp. nov.
(Figs 81-82, Plate 2C)

MATERIAL. HOLOTYPE: NTMZ3218 (fragment QMG300584): N. edge of Pelsart Is, Houtman Abrolhos, WA, 28°47.2'S, 113°58.5'E, 10.vii.1987, 22m depth, coll. J.N.A. Hooper (SCUBA).

HABITAT DISTRIBUTION. 22m depth; on an *Acropora* reef; Houtman Abrolhos, WA (Fig. 81F).

DESCRIPTION. *Shape*. Fistulose, with multiple fistules composed of erect, bulbous-cylindrical digits, single or fused together with adjacent digits, each tapering at base and apex, thickest in apical portion, attached directly to substrate without stalk; each digit between 75-140mm long, up to 45mm maximum diameter.

Colour. Pale beige-yellow alive (Munsell 2.5Y 8/4), dark brown in ethanol.

Oscules. Single, large, apical oscule on apex of each digit, 10-15mm diameter in life, with slightly raised membraneous lip surrounding oscule; oscules nearly completely contractile upon preservation; pores not observed in life or preserved.

Texture and surface characteristics. Compressible, spongy, relatively easily torn; surface glabrous, even, without any ornamentation.

Ectosome and subectosome. Discrete, erect bundles of auxiliary styles, relatively closely packed together, arising from ends of peripheral fibres, with tangential layer of auxiliary styles connecting adjacent bundles; erect spicules protrude only a short distance through surface; mesohyl matrix light in ectosomal region; subectosomal region slightly cavernous, reticulate.

Choanosome. Almost regular, ovoid reticulation of fibres and spicule tracts forming ovoid, square or rectangular meshes, 220-360µm diameter; spongin fibres moderately light, relatively homogenous in size, 40-70µm diameter, but with differentiated primary and secondary tracts; primary ascending fibres cored by multispicular tracts of auxiliary styles, interconnected by secondary, pauci- or multispicular transverse tracts of auxiliary styles; fibres relatively heavily echinated by acanthostyles; sparse core of detritus in primary ascending fibres only, mostly foreign spicules; mesohyl matrix moderately heavy, lightly pigmented; choanocyte chambers small, oval, 40-90µm diameter, usually lined by isochelae.

Megascleres. Principal spicules absent.

Auxiliary spicules coring fibres and forming dermal skeleton moderately thin, straight or slightly curved near base, with slightly subtylote bases, hastate or slightly telescoped points, and apical and basal spination on most spicules. Length 124-(151.7)-162µm, width 3-(4.1)-6µm.

Echinating acanthostyles short, thin, claviform, sharply pointed, slightly subtylote bases, lightly and evenly spined, with relatively large recurved spines. Length 71-(76.3)-86µm, width 3-(4.7)-7µm.

Microscleres. Isochelae of 'typical' palmate form, with straight shaft, lateral alae completely fused to shaft, very long, broad front ala. Length 14-(15.7)-18µm.

Toxas wing-shaped, slender, with pronounced central curvature, slightly reflexed arms. Length 48-(88.4)-112µm, width 0.8-(1.6)-2.0µm.

ETYMOLOGY. For Houtman Abrolhos.

REMARKS. This species is a sibling species of *C.* (*Wilsonella*) *australiensis* having basal and apical spines on auxiliary styles. It was first assigned to the Western Australian subspecies *C. australiensis spinulata* Hentschel (1911) but subsequent re-examination of Hentschel's (1911) syntype (ZMB4446) found that he omitted several crucial characters from his description (and that his species was not substantially different from typical *C. australiensis*). Conversely, *C.* (*W.*) *abrolhosensis* differs from that species in several respects, warranting its recognition as a distinct taxon. Growth form in *C.* (*W.*) *abrolhosensis* is endolithic, consisting of discrete bulbous-cylindrical digits arising from a partially burrowing, encrusting massive base, and with large terminal oscules (superficially resembling syconoid calcarean growth forms) (whereas *C.* (*W.*) *australiensis* has lobate or clavulate morphologies); there is only one class of auxiliary spicule (as compared with two); fibre reticulation is small, close-set, nearly regular, and predominantly ovoid (whereas in *C. australiensis* meshes are elongate and cavernous); spongin fibres are poorly developed (compared with well developed fibres); there is very little detritus in fibres, and these are completely confined to primary ascending fibres and more-or-less restricted to foreign spicules without sand (*C.* (*W.*) *australiensis* has abundant detritus in all fibres, including sand grains, and this is a prominent feature of the skeleton); and spicule dimensions differ between both species. Further comparisons are given below under remarks for *C.* (*W.*) *australiensis*.

This species strictly belongs to *Clathria* (*Dendrocia*) in having only a single undifferentiated category of structural megasclere within

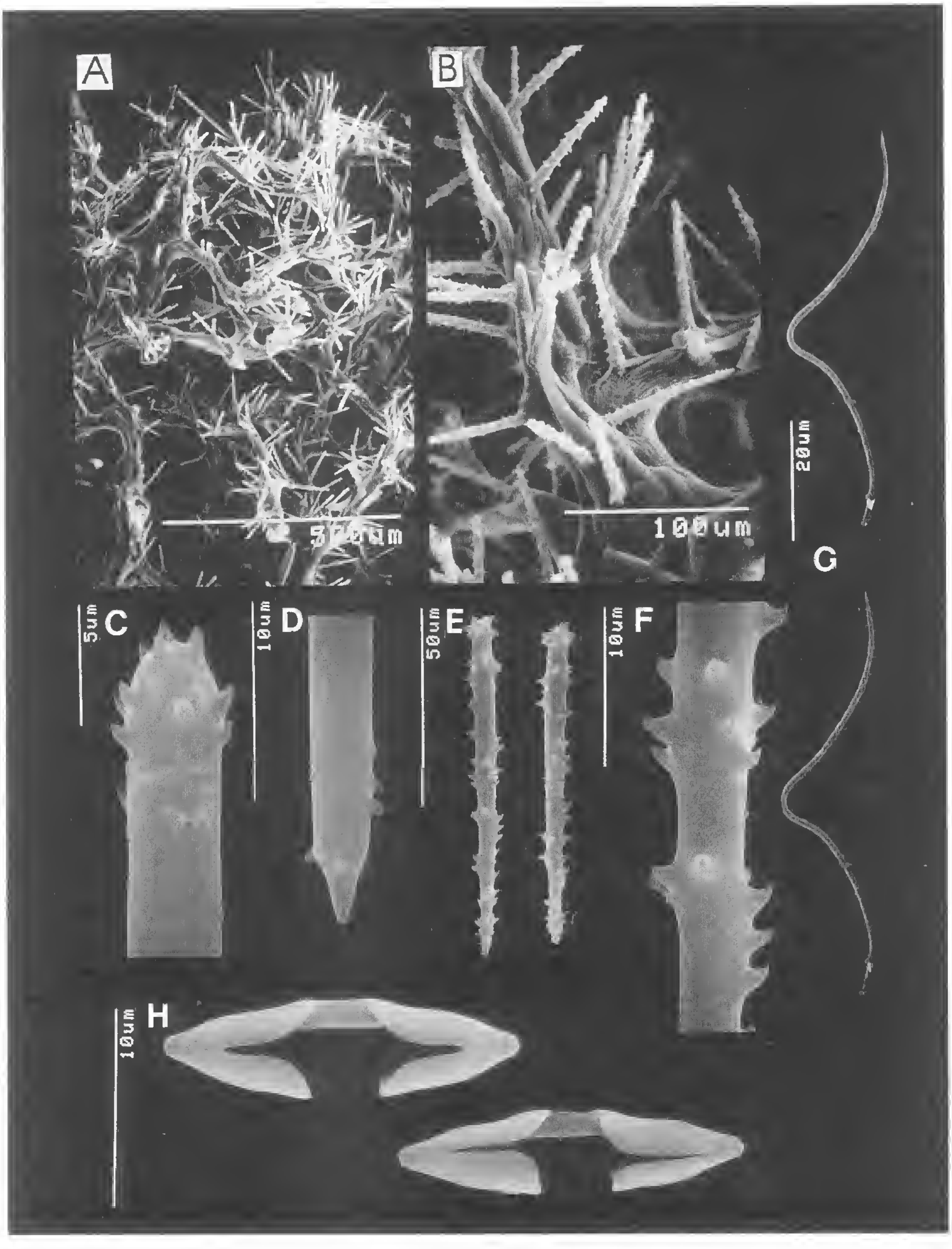

FIG. 82. *Clathria* (*Wilsonella*) *abrolholensis* sp.nov. (holotype NTMZ3218). A, Choanosomal skeleton. B, Fibre characteristics. C-D, Spined base and point of auxiliary style. E, Echinating acanthostyles. F, Acanthostyle spines. G, Wing-shaped toxas. H, Palmate isochelae.

TABLE 15 Comparison between present and published records of *Clathria* (*Wilsonella*) *australiensis* Carter. All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Lectotype (BMNH1886. 12.15.43)	Paralectotype (BMNH1886. 12.15.284)	Holotype of *C. labosa* (AMG9053)	Holotype of *T. ramsayi* (AMG8820)	Paratype of var. *spinulata* (ZMB4446)	Specimen (Abrolhos Is) (NCIQ66 C4266C)	Specimen (N=1) (NW.Australia)	Specimen (Lévi,1967) (New Caledonia)
Choanosomal auxiliary styles	92-(119.8)-152 x 2.5-(3.6)-4	105-(125.6)-152 x 2.5-(3.2)-4	92-(122.6)-146 x 1.5-(2.7)-4	106-(127.4)-173 x 2.5-(3.7)-5	112-(118.8)-135 x 2-(3.3)-5	121-(149.0)-163 x 2.5-(3.7)-4.5	89-(111.4)-175 x 2.5-(4.1)-8	125-180 x4
Subectosomal auxiliary styles	92-(122.6)-148 x 2-(2.9)-4	101-(118.3)-155 x 1.5-(2.9)-4	94-(119.6)-141 x 2-(2.7)-3.5	98-(117.2)-139 x 2-(2.8)-4	108-(120.1)-134 x 2.5-(3.7)-6	118-(154.8)-172 x 3-(4.1)-4.5	95-(123.1)-164 x 2-(2.8)-5	-
Echinating acanthostyles	49-(59.8)-68 x 2-(3.6)-4.5	45-(64.0)-77 x 2-(3.8)-4.5	54-(62.6)-78 x 2-(3.5)-4.5	46-(58.4)-70 x 2.5-(3.4)-4.5	46-(57.7)-66 x 4-(6.1)-9	59-(67.6)-74 x 3-(3.9)-6	51-(60.4)-81 x 2.5-(3.7)-5.5	65-80 x 4
Chelae	11-(14.7)-18	12-(13.2)-16	12-(13.8)-16	12-(13.4)-15	12-(13.8)-16	14-(15.2)-17	12-(14.6)-19	14-15
Toxas	35-(61.2)-89 x 0.5-(0.7)-1	28-(53.4)-75 x 0.5-(0.8)-1	32-(52.3)-74 x 0.5-(0.8)-1	24-(45.4)-75 x 0.5-(0.8)-1	72-(89.4)-105 x 1-(1.6)-2.5	28-(39.4)-59 x 0.5-(0.6)-0.8	43-(55.6)-88 x 0.5-(0.8)-1.5	40-75 x 1-2

fibres, but it is included here in *Clathria* (*Wilsonella*) having detritus in fibres and spined terminations on auxiliary spicules similar to *C.* (*W.*) *australiensis*. This further illustrates the unclear generic boundary between many nominal genera of Microcionidae, and supports the recognition of a wide definition for *Clathria*.

Clathria (Wilsonella) australiensis (Carter, 1885) (Figs 83-84, Plate 2B, Table 15)

Wilsonella australiensis Carter, 1885f: 366; Hallmann, 1912: 239; Hallmann, 1920: 768; Burton, 1934a: 599.
Clathria australiensis; Dendy, 1896: 33; Whitelegge, 1901: 66, 84, 85, pl.11, fig.12; Hooper & Lévi, 1993a: 1242, table 4; Hooper & Wiedenmayer, 1994: 275.
Clathria australiensis var. *spinulata* Hentschel, 1911: 374-375, text-fig. 47; Dendy, 1922: 71.
Clathriopsamma lobosa Lendenfeld, 1888: 149; Whitelegge, 1901: 85; Hallmann, 1912: 239.
Thorecta ramsayii Lendenfeld, 1888: 149.
Sigmatella corticata var. *elegans* Lendenfeld, 1888: 199-201; Lendenfeld, 1889b: pl.40, fig.7.
Not *Clathria australiensis*; Lévi, 1967b: 22, pl.2, fig.D, text-fig.6.
Not *Ophlitaspongia australiensis* Ridley, 1884a: 442.
Not *Echinochalina australiensis*; Thiele, 1903a: 961-962.

MATERIAL. LECTOTYPE: BMNH1886. 12.15.43 (fragment AMG2805): Port Phillip, Vic, 38°09'S, 144°52'E, 12m depth, coll. J.B. Wilson (dredge). PARALECTOTYPE: BMNH1886.12.15.284: same locality. HOLOTYPE of *C. lobosa*: AMG9053: Port Jackson, NSW, 33°51'S, 151°16'E. HOLOTYPE of *T. ramsayi*: AMG8820: same locality. SYNTYPES of var. *spinulata*: ZMB4446, HM numbers unknown: Bunbury and Middleton Beach areas, WA, 33°20'S, 115°36'E, coll. W. Michaelsen & R. Hartmeyer (dredge). OTHER MATERIAL: NSW - QMG301447, QMG301458, AMG975, BMNH1886.12.15.288, AMZ1412, fragment NTMZ1526, AMZ3176, AMZ3199, AMZ3140, AMZ4283. VICTORIA - NMVRN748. S. AUST. - SAMTS4098 (fragment NTMZ1646), SAMTS4116 (fragment NTMZ1627). WESTERN AUSTRALIA - WAM623-81(1) (fragment NTMZ1710), QMG300622 (NCIQ66C-4266-C).

HABITAT DISTRIBUTION. Subtidal to 160m depth; on rock, sand and algal bed substrates; known only from Australia: throughout temperate Australian waters — from Houtman Abrolhos, Perth, Bunbury (WA) (Hentschel, 1911; present study), Nuyts Archipelago, St Vincent Gulf (SA) (present study), Port Phillip (Vic) (Carter, 1885f; present study), Bega, Jervis Bay, Port Hacking, Port Jackson, Botany Bay, N. Sydney, Tweed River region (NSW) (Lendenfeld, 1888 Whitelegge, 1901; present study), and extending into the tropics as far as Low Isles, GBR, Qld. (Burton, 1934a) (Fig. 83G).

DESCRIPTION. *Shape*. Lobate, lobate-digitate, club-shaped, thickly lamellate, or thickly encrusting-bulbous growth forms, up to 140mm high, 110mm wide, with subspherical, tubular, bulbous or flabellate digits, up to 75mm high, 45mm wide, 25mm thick.

Colour. Pale orange alive (Munsell 7.5 YR 8/6), pale pink, brown or yellow preserved.

Oscules. Large oscules, up to 4mm diameter, on apical or lateral margins of surface digits/lobes.

Texture and surface characteristics. Surface optically even, microscopically rugose, with a whitish arenaceous, slightly hispid dermal membrane.

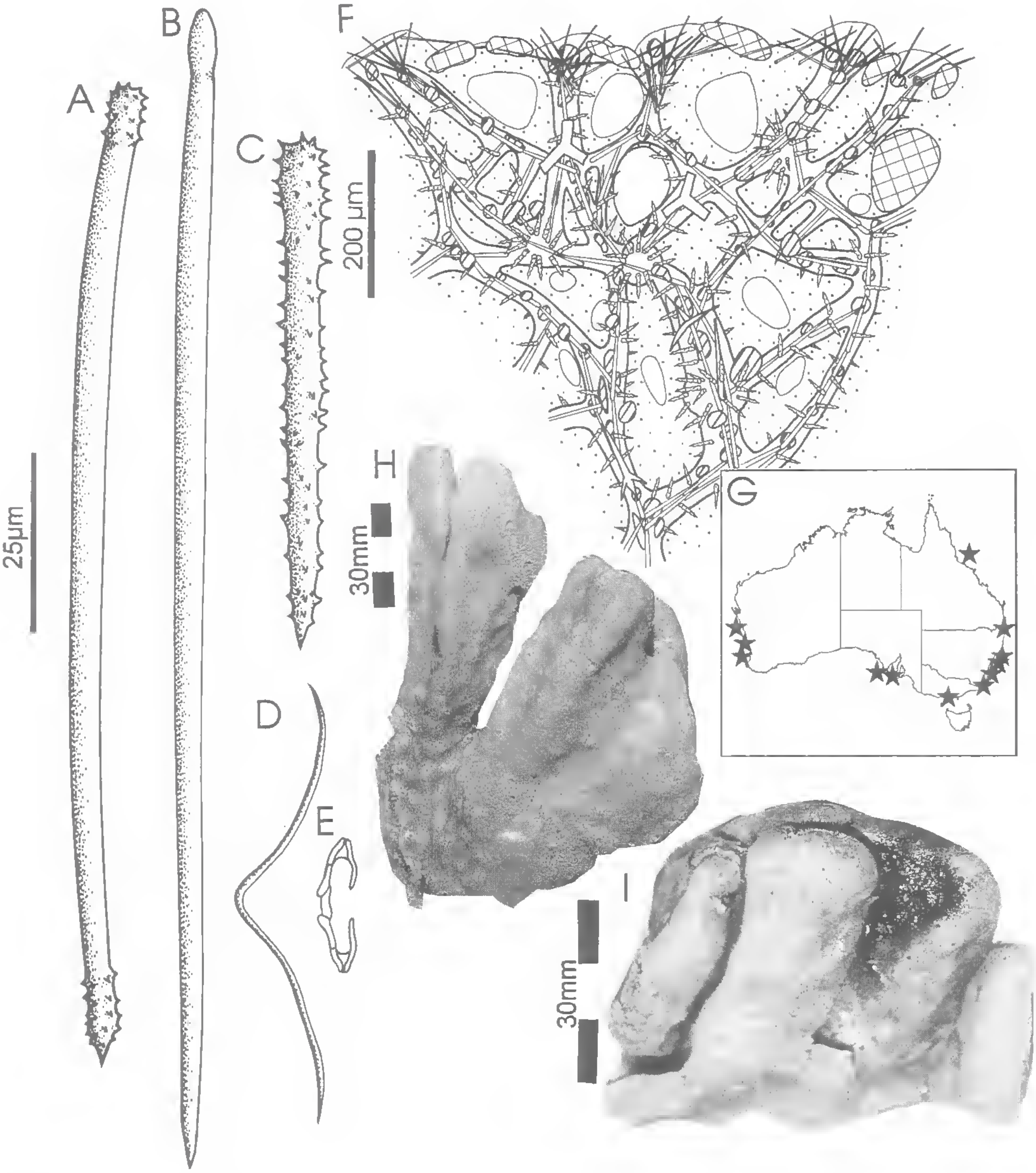

FIG. 83. *Clathria* (*Wilsonella*) *australiensis* (Carter) (NTMZ1627). A, Subectosomal auxiliary subtylostyles. B, Choanosomal auxiliary subtylostyles. C, Echinating acanthostyle. D, Oxhorn toxa. E, Palmate isochela. F, Section through peripheral skeleton. G, Australian distribution. H, Holotype BMNH1886.12.15.43. I, NMVRN748.

Ectosome and subectosome. Ectosome membraneous, without specialised dermal megasclere, varying from densely arenaceous, with most or all dermal megascleres obscured by large sand grains and spicule fragments, or with light palisade of erect brushes of subectosomal auxiliary subtylostyles, arising from ascending primary choanosomal fibres; sand grains at surface slightly larger than those in choanosome.

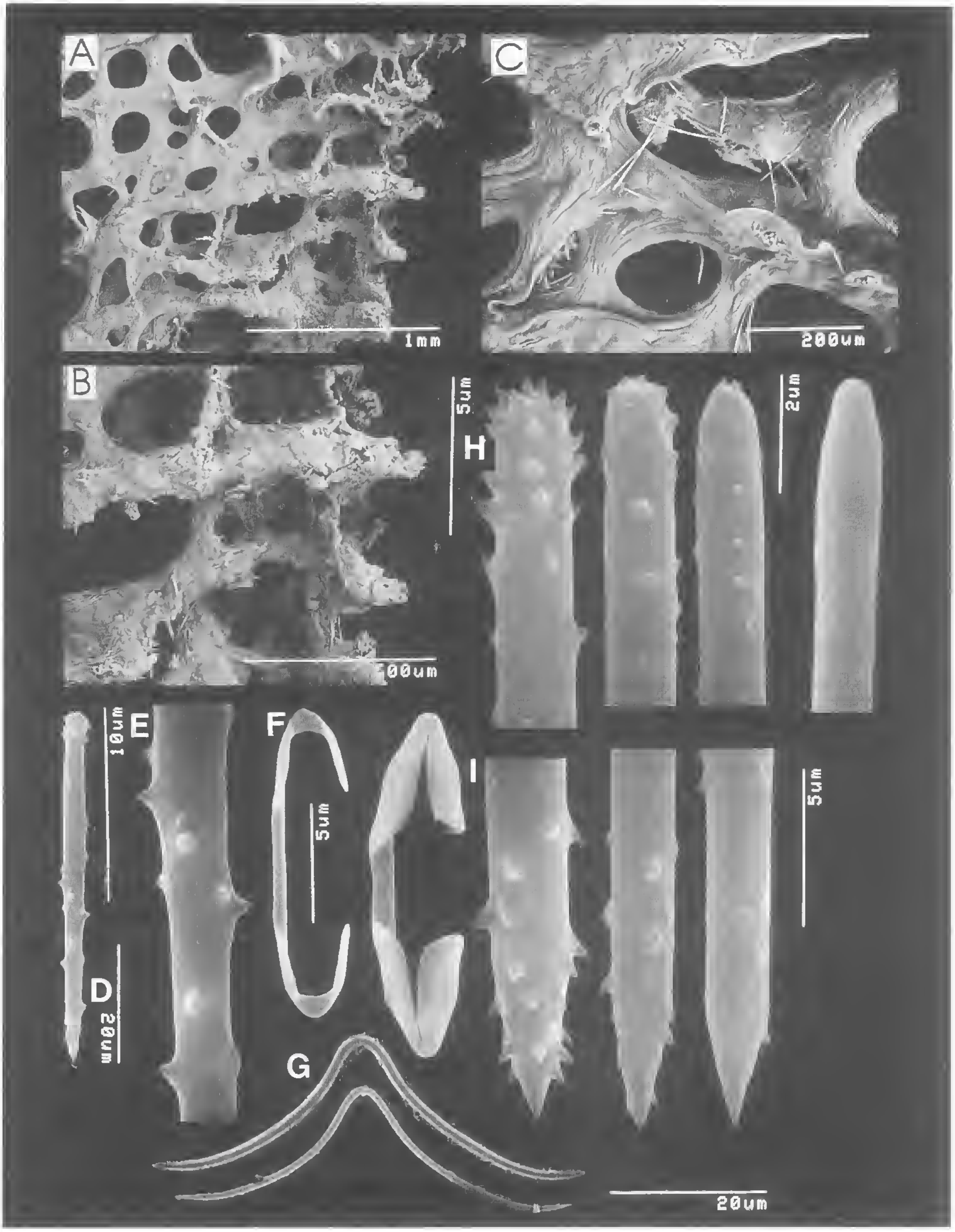

FIG. 84. *Clathria* (*Wilsonella*) *australiensis* (Carter) (A-B, AMG9053, C-I, QMG301447). A, Choanosomal skeleton. B, Peripheral skeleton. C, Fibre characteristics. D, Echinating acanthostyle. E, Acanthostyle spines. F, Palmate and modified isochelae. G, Oxhorn toxas. H-I, Continuum in basal and apical spination of auxiliary subtylostyles.

Choanosome. Choanosomal skeleton irregularly reticulate, with clearly differentiated primary and secondary spongin fibres, forming a vaguely longitudinal reticulation with cavernous meshes; spongin fibres well developed; primary ascending fibres marginally thicker, producing ascending lines abundantly cored by detritus, lightly cored by auxiliary styles, heavily echinated by acanthostyles, particularly at fibre nodes; smaller secondary spongin fibres mainly transverse, connecting with primary elements, with no or little detritus, paucispicular tracts of auxiliary styles and lightly echinated by acanthostyles; auxiliary megascleres coring fibres occupy only a small proportion of fibre diameter; detritus in fibres consists of scattered sand grains and spicule fragments; mesohyl matrix heavy; choanocyte chambers oval to eliptical, some appear to be paired, and chambers lined by microscleres.

Megascleres (Table 15). Choanosomal auxiliary styles coring fibres differ from subectosomal auxiliary styles only in being slightly thicker and lacking characteristic apical microspines of the latter. Coring spicules relatively thin, straight, smooth, mostly hastate, with slightly subtylote and occasionally microspined bases.

Subectosomal auxiliary styles, dispersed between fibres and in dermal skeleton, straight, usually hastate, subtylote bases with microspines on both points and bases.

Echinating acanthostyles small, evenly spinose or with granular, vestigial spines, slightly subtylote bases, fusiform points.

Microscleres (Table 15). Palmate isochelae relatively large, unmodified.

Toxas oxhorn, uncommon, rare in some specimens, often forming trichodragmata, usually with wide, angular, central curves and slightly reflexed points.

Larvae. Ovoid, incubated parenchymella larvae, up to 350µm diameter seen in some material.

Associations. Commensal polychaetes common in many specimens; Abrolhos specimen with epizootic zoanthids on surface.

REMARKS. *Clathria (W.) australiensis* is the only species retained by Hallmann (1920) in Wilsonella; other species were transferred to either *Clathria* or *Paradoryx*, depending on whether they had palmate or arcuate-like isochelae microscleres. Some of these, however, are further allocated here to *Clathria (Dendrocia)* or *Clathria (Thalysias)*, depending on their ectosomal skeletons, choanosomal skeletal structure and spicule diversity (i.e., there are differences in interpretation of character importance between the present study and that of Hallmann (1920) (see also Hooper, 1990a).

Unlike *Clathria (Dendrocia)*, in which there is only a single category of coring and extra-fibre megasclere, most *Clathria (Wilsonella)* have more than one form of auxiliary style, one coring the fibres (choanosomal megascleres) and one outside of fibres (subectosomal megascleres). In some cases (e.g., *C. (W.) australiensis, C. (W.) ensiae* sp. nov.), these spicules are only slightly different in geometry, although showing clear differences in patterns of spination; in others (e.g., *C. (W.) reticulata, C. (W.) mixta*) these spicules have different geometry; whereas in one (*C. (W.) abrolhosensis*) there are no apparent differences which is interpreted as a convergence or subsequent loss of a spicule category. *Clathria (Dendrocia)* and *Clathria (Wilsonella)* can also be distinguished by their skeletal architecture - being predominantly plumose in the former and reticulate in the latter.

In material listed above most of the larger auxiliary styles without spines on points appeared to be located within spongin fibres (i.e., choanosomal spicules), whereas most of the auxiliary styles with spines on both bases and points were found predominantly outside fibres, strewn within the mesohyl, and in the dermal skeleton (i.e., subectosomal spicules). However, this observation is difficult to verify in all cases because of the dense core of sand particles in fibres. In this species both sorts of spicules are classed as auxiliary styles due to their very similar geometry: true principal styles are absent (i.e., *Wilsonella* s.s.).

The principal diagnostic characteristics of *C. (W.) australiensis* and its affinities with other species are discussed elsewhere (see Table 19 and remarks for *C. (W.) tuberosa*). This species differs from most Australasian *Clathria (Wilsonella)* in having spinose extremities on both the bases and points of quasidiactinal auxiliary subtylostyles. In this regard it is similar to its sibling species, *C. (W.) abrolhosensis* from the Houtman Abrolhos, WA (which is sympatric with *C. australiensis*) and the allopatric species *C. (W.) rugosa*, from New Caledonia (Hooper & Lévi, 1993a; Table 19). Spicule geometry (megascleres and toxas) are useful in distinguishing these species of *Clathria (Wilsonella)* (Table 19).

Lévi's (1967b) material from New Caledonia, described as *C. australiensis*, was referred to *C. (W.) rugosa* (Hooper & Lévi, 1993a), based on differences in spicule geometry (especially shape and spination of auxiliary spicules), and the latter having flabellate-digitate growth forms. The quasidiactinal (strongylotes) modifications of some of the subectosomal auxiliary spicules in both species, with weakly spined points and bases, is a unique trait within the *Wilsonella* group, but is also known in a few other species of Microcionidae *(C. (Dendrocia) pyramida, C. (Thalysias) major, C. (Clathria) chelifera)*. These quasidiactinal spicules are convergent in geometry with true tornotes and strongyles found in other groups such as Iophonidae (see remarks for *Megaciella* and *Acarnus* in the introductory section above).

Hentschel (1911) created a subspecies *spinulata* for material from WA, indicating that it differed substantially from typical forms of the species in spicule dimensions (particularly isochelae), and supposedly lacked toxas. However, Hentschel's type has toxas and isochelae dimensions are within the size range of other S Australian populations, and all other aspects (growth form, fibre characteristics, amount and form of detritus in fibres) are identical between populations. Hentschel (1911) suggested that *spinulata* differed from other populations in having spines on both the points and bases of auxiliary spicules, but this feature occurs in all other populations, and the WA population is conspecific with *C. (W.) australiensis*.

Clathria (W.) australiensis is widely distributed throughout temperate Australia, from the Houtman Abrolhos on the W coast (30°S), around S Australia to the Tweed River (28°S). Burton (1934a) recorded this species from Low Isles, (16°S), but his voucher material has not been examined, and his description is not detailed enough to differentiate between *C. (W.) australiensis* and *C. (W.) rugosa* from New Caledonia. Recent collections from this region do not include the species. Examination of many other specimens (cited above), from many locations throughout Australia, showed that *C. (W.) australiensis* is a heterogeneous species. Most regional populations differ from each other slightly in spicule geometry or spicule size, but there is not enough available material of any of these populations to determine whether these differences are consistent within populations, nor are there any features in any of these regional populations worthy of distinguishing separate taxa (cf. Hentschel, 1911). Widespread sampling of regional populations, collection of samples for biochemical and genetic studies, and determination whether or not observed morhological differences correlate with any fixed genetic differences is a worthwhile study for the future.

Clathria (Wilsonella) claviformis Hentschel, 1912
(Figs 85-86, Table 16, Plate 2D)

Clathria claviformis Hentschel, 1912: 366-367, pl.19, fig.29.

MATERIAL. HOLOTYPE: SMF 1504 (fragment MNHNDCL2238): Sungi Manumbai, near Kapala Sungi, E. side of Aru I., Arafura Sea, Indonesia, 6°S, 134°50'E, 28.iii.1908, 23m depth, coll. H. Merton (dredge). OTHER MATERIAL: NT - NCIQ66C-0528-O, NTMZ3082.

HABITAT DISTRIBUTION. 18-23m depth; sand, rock and dead coral substrate; Timor Seas (Fig. 85G). Also Arafura, SE Indonesia.

DESCRIPTION. *Shape*. Claviform, 160-220mm high, 60-150mm wide, with small cylindrical base and stalk, and one or more lobate, club-shaped, or bulbous digits, up to 80mm long, 65mm diameter.
Colour. Pale 'dusty' beige and red-brown mottled colour alive (Munsell 2.5Y 8/6 and 5R 8/4), yellow-grey preserved.
Oscules. Large oscules, up to 5mm diameter, on ends of bulbous digits, occasionally in crevices between digits.
Texture and surface characteristics. Surface even, with distinct, partially arenaceous, skin-like covering, and with several longitudinal ridges on sides of digits and between bulbous digits; texture rubbery, compressible, sandy.
Ectosome and subectosome. Ectosome lightly and evenly arenaceous, hispid, with plumose tufts of subectosomal auxiliary subtylostyles protruding through surface, sometimes in dense brushes; subectosome cavernous, with sparsely cored, arenaceous, ascending primary spongin fibres forming large meshes in periphery.
Choanosome. Choanosomal skeleton irregularly reticulate, cavernous, with light spongin fibres and spicule tracts; spongin fibres divisible into primary and secondary components; primary fibres relatively large, with very little fibre spongin content, cored by both large and small sand grains, Foraminifera and paucispicular tracts of choanosomal principal styles, becoming sinuous during towards periphery; secondary fibres consist of uni- or paucispicular spicule tracts bound together by collagenous spongin and debris; primary fibres moderately echinated, slightly heavier towards periphery; secondary fibres with

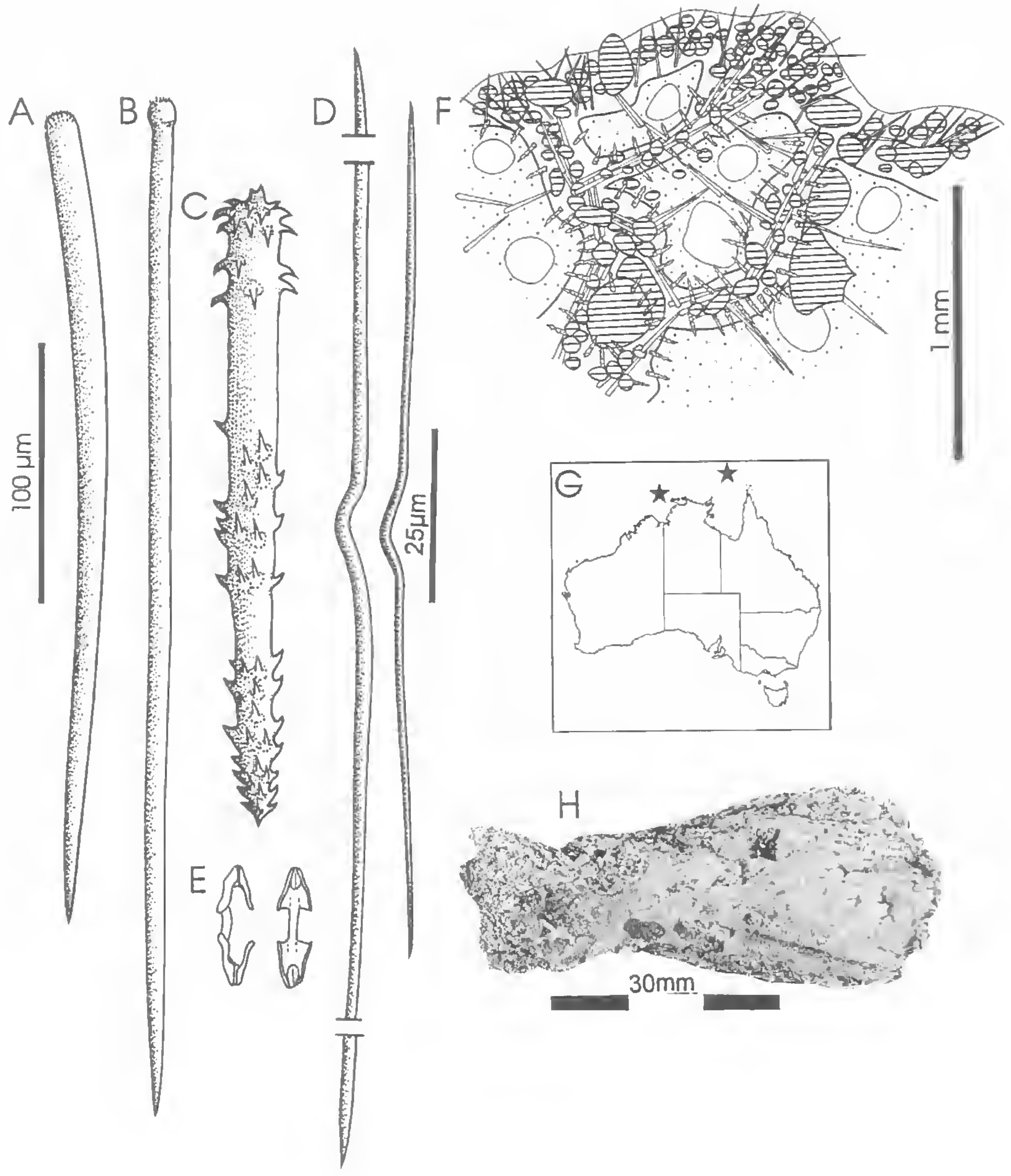

FIG. 85. *Clathria* (*Wilsonella*) *claviformis* Hentschel (holotype SMF1504). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyle. C, Echinating acanthostyle. D, Accolada toxas. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, Holotype.

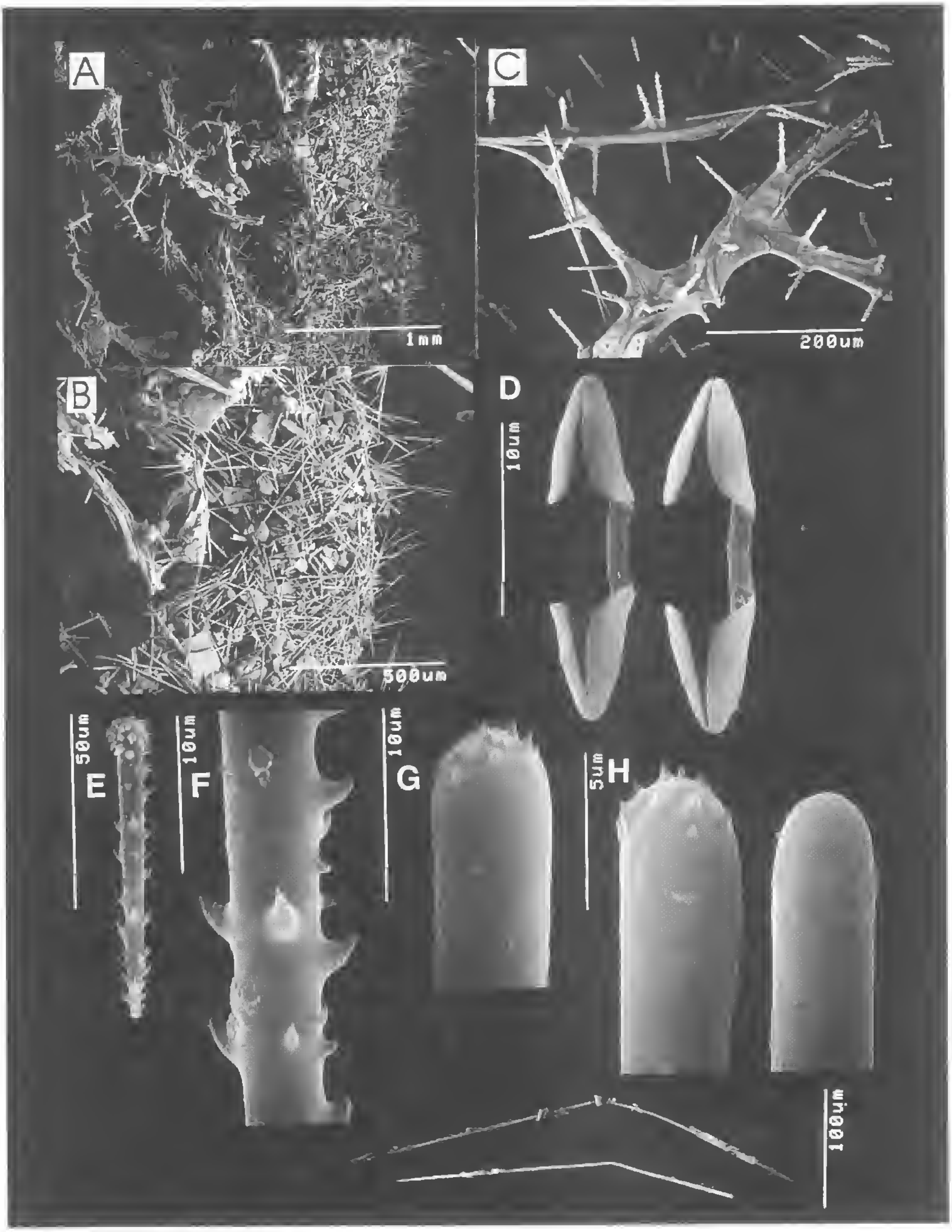

FIG. 86. *Clathria* (*Wilsonella*) *claviformis* Hentschel (holotype SMF1504). A, Choanosomal skeleton. B, Peripheral skeleton. C, Fibre characteristics. D, Palmate isochelae. E, Echinating acanthostyle. F, Acanthostyle spines. G, Base of principal subtylostyle. H, Bases of auxiliary subtylostyles. I, Accolada toxas.

no or few echinating acanthostyles; mesohyl matrix heavy, granular, with abundant microscleres and detritus scattered throughout, usually lining small oval choanocyte chambers.

Megascleres (Table 16). Choanosomal principal styles thin, slightly curved, fusiform, with rounded or slightly subtylote, lightly microspined bases.

Subectosomal auxiliary subtylostyles hastate, thin, mostly straight, with slightly subtylote bases, usually microspined.

Echinating acanthostyles slightly subtylote, with few, dispersed, large spines on base and apex, usually with aspinose neck; spines located on point usually more recurved than those on base.

Microscleres (Table 16). Palmate isochelae large, abundant, with some twisted examples.

Toxas thin, with slight angular central curvature and straight, unreflexed points.

REMARKS. *C. (W.) claviformis* is relatively easily differentiated from other arenaceous species by its skeletal architecture, fibre characteristics and spiculation (see remarks for *C. (W.) tuberosa* below, and compare spicule dimensions between species in Table 19). Hentschel's (1912) mention of similar isochelae geometry in *C. (W.) claviformis* and other microcionid species such as *C. (Dendrocia)* pyramida is misleading, since the latter species has arcuate-like chelae whereas those of *C. (W.) claviformis* are simply palmate. The nearest relative of *C. (W.) claviformis* is probably *C. (W.) tuberosa*, especially in specific features of its arenaceous ectosome.

TABLE 16. Comparison between present and published records of *Clathria (Wilsonella) claviformis* Hentschel. All measurements are in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Holotype (SMF1504)	Specimens (N=2)
Choanosomal principal styles	258-(308.6)-364 x 6-(9.6)-13	235-(287.2)-338 x 7-(8.4)-10
Subectosomal auxiliary styles	164-(292.0)-371 x 3-(5.1)-8	169-(289.2)-375 x 3-(5.2)-7
Echinating acanthostyles	79-(88.8)-103 x 4-(6.4)-8	64-(74.0)-82 x 4-(6.4)-8
Chelae	16-(18.4)-22	14-(16.8)-20
Toxas	28-(140.8)-266 x 0.8-(1.1)-1.5	44-(113.6)-218 x 0.8-(0.9)-1.2

Clathria (Wilsonella) ensiae sp. nov.
(Figs 87-88, Table 17, Plate 2E)

MATERIAL. HOLOTYPE: NTMZ3561 (NCIQ66C-2384-I) (fragment QMG05004): Marion Reef, off Edithburg, S. Yorke Peninsula, SA, 35°09.5'S, 137°48.0'E, 10.ii.1989, 6m depth, coll. NCI (SCUBA). PARATYPE: NTMZ3821 (NCIQ66C-3744-L) (fragment QMG300270): Trap Reef, Bicheno, Tas., 41°51.7'S, 148°18.6'E, 30m depth, 26.ii.1990, coll. NCI (SCUBA).

HABITAT DISTRIBUTION. 6-30m depth; on sand covered rock substrate, with algae and seagrasses on patch reef; Yorke Peninsula (SA), E coast (Tas) (Fig. 87F).

DESCRIPTION. *Shape*. Erect, digitate, flabellate growth form, 205-350mm high, 70-150mm wide, with multiple branches usually aligned in one plane, composed of long, slender, flattened or cylindrical, bifurcate digits, 70-190mm long, up to 18mm diameter, frequently fused near their basal ends, attached to a common base or on a short cylindrical stalk.

Colour. Red-brown alive (Munsell 2.5R 8/8), darkening in air (2.5R 6/10), brown preserved.

Oscules. Large oscules, up to 4mm diameter, scattered evenly over all surfaces of digits, in life slightly raised above the surface with a membraneous lip.

Texture and surface characteristics. Surface even, optically smooth, broken only by raised oscules; texture firm, compressible, rubbery.

Ectosome and subectosome. Ectosome heavily arenaceous, with peripheral spongin fibres fully packed with mostly sand particles and some foreign spicule fragments (holotype; vice versa in paratype), and with sparse plumose tracts of subectosomal auxiliary styles, confined completely below surface; spongin fibres in subectosomal region ascend to surface, plumose, fully arenaceous, with plumose brushes of subectosomal auxiliary spicules.

Choanosome. Choanosomal skeleton irregularly reticulate in axis, plumo-reticulate near periphery, clearly divided into primary, ascending fibres, 60-130µm diameter, and secondary, connecting, transverse spongin fibres, 30-70µm diameter; primary fibres fully arenaceous, incorporating both sand and foreign spicule fragments, and a sparse core of choanosomal auxiliary styles amongst the debris; secondary fibres without sand particles, with some foreign spicules, and also with a light core of choanosomal auxiliary spicules; echinating acanthostyles not abundant on fibres, usually echinating fibres at acute angles, directed towards surface; mesohyl matrix moderately heavy, with few foreign spicules and

TABLE 17. Comparison between present and published records of *Clathria (Wilsonella) ensiae* sp.nov. All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Holotype (NCIQ66C2384I)	Paratype (NCIQ66C3744L)
Choanosomal principal styles	69-(111.4)-132 x 3.5-(4.2)-6	87-(108.6)-120 x 4-(4.4)-5.5
Subectosomal auxiliary styles	106-(130.7)-147 x 1.5-(2.6)-3.5	97-(132.0)-154 x 2-(2.4)-3.5
Echinating acanthostyles	28-(40.7)-54 x 2.5-(3.1)-4	48-(61.1)-70 x 3.5-(4.3)-5.5
Chelae	11-(14.2)-16	13-(14.4)-16
Toxas	absent	absent

very little sand; choanocyte chambers large, 180-480µm diameter, oval or eliptical.

Megascleres (Table 17). Choanosomal auxiliary megascleres straight or slightly curved towards base, slightly subtylote bases, hastate, abruptly pointed; very similar geometry to subectosomal auxiliary styles but shorter, slightly thicker.

Subectosomal auxiliary styles short, slender, straight or rarely slightly curved at centre, slightly subtylote bases, hastate, stepped points.

Echinating acanthostyles short, slender, straight, slightly subtylote bases, fusiform points, spined all over but spines slightly heavier on base and point.

Microscleres (Table 17). Palmate isochelae relatively long, slender, unmodified.

Toxas absent.

ETYMOLOGY. Phonetic acronym in the National Cancer Institute (NCI), in appreciation of the AIMS group who provided the author with unrestricted access to all their sponge collections.

REMARKS. There are some differences between the two specimens of *C. (W.) ensiae* in the size of acanthostyles (Table 17). Similarly, primary spongin fibres of the holotype are predominantly cored with sand particles, whereas in the paratype foreign spicules are more abundant than sand, but in all other respects both these specimens are identical, and these observed differences are considered to be relatively minor.

C. (W.) ensiae differs from other species of the *Wilsonella* group primarily in its flattened-flabelliform, erect, bifurcate, branching growth form and in having auxiliary styles with peculiar hastate, telescoped points. Other features such as skeletal structure and spicule dimensions can also be used to distinguish allied species (Table 19). Like *C. (W.) australiensis*, the present species could also be included in *C. (Dendrocia)* due to close resemblance between choanosomal and subectosomal styles, both classed here as auxiliary spicules (i.e., *Wilsonella* s.s.). However, like *C. (W.) australiensis*, those styles coring fibres differ subtly in their terminations from those styles outside of fibres.

Clathria (Wilsonella) reticulata (Lendenfeld, 1888)
(Figs 89-90, Table 18)

Clathriopsamma reticulata Lendenfeld, 1888: 227; Hallmann, 1920: 771.

Clathria reticulata; Hooper & Wiedenmayer, 1994: 275.

Not *Echinochalina reticulata*; Whitelegge, 1907: 506, pl.45, fig.25; Hallmann, 1912: 287, pl.30, fig.2, text-fig.66.

Not *Dictyocylindrus reticulatus* Carter, 1881a: 377.

Not *Rhaphidophlus reticulatus*; Hallmann, 1912: 177.

MATERIAL. LECTOTYPE: AMG9135 (dry): E coast of Australia, no other details known. PARALECTOTYPES: AMZ457: E coast of Australia, no other details known. BMNH1925.11.1.576 (dry): Manly Beach, NSW, 33°49'S, 151°18'E, no other details known.

HABITAT DISTRIBUTION. Ecology unknown; central E coast (NSW) (Fig. 89G).

DESCRIPTION. *Shape*. Subspherical, reticulate-branching growth form, 80-150mm high, 55-95mm wide, composed of lobate, bifurcating, sometimes anastomosing tubular digits with rounded margins, 30-50mm long, up to 18mm diameter.

Colour. Dark brown in ethanol.

Oscules. Not seen (available material dry and surface contracted).

Texture and surface characteristics. Surface shaggy, reticulate; texture brittle in dry state.

Ectosome and subectosome. Ectosomal skeleton lightly arenaceous, with plumose brushes or individual choanosomal principal styles protruding, together with a paratangential layer of subectosomal auxiliary subtylostyles, lying near bases of principals, and echinating acanthostyles projecting into these.

Choanosome. Choanosomal skeleton irregularly reticulate, with moderately heavy, large spongin fibres forming relatively wide ovoid meshes, lined by very large, typically curved oxeote toxas; spongin fibres not easily divisible into primary or secondary components based on fibre diameter, although primary, ascending fibres contain plumose, paucispicular tracts of both principal

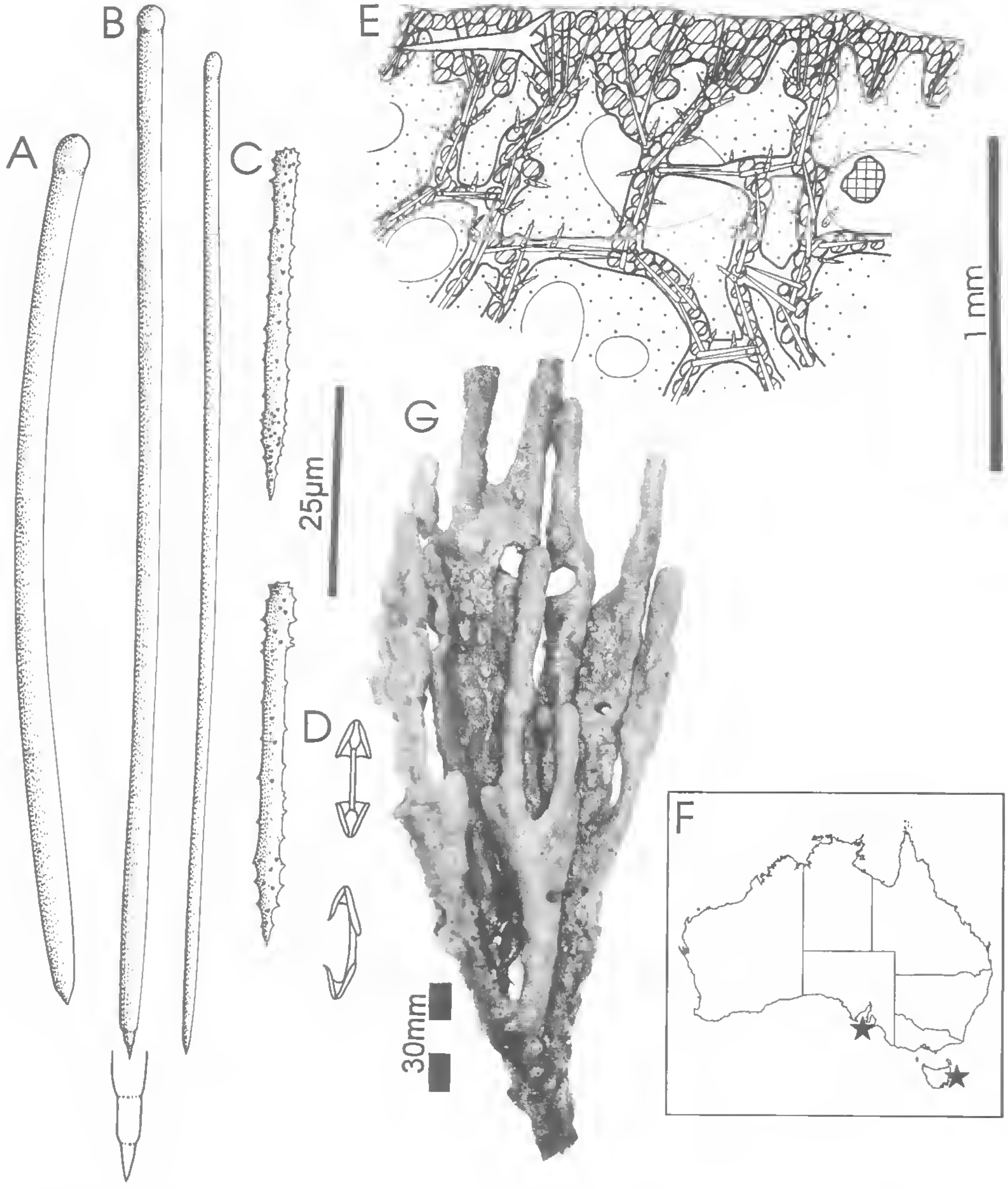

FIG. 87. *Clathria* (*Wilsonella*) *ensiae* sp.nov. (holotype NTMZ3561). A, Choanosomal auxiliary subtylostyle. B, Subectosomal auxiliary subtylostyles. C, Echinating acanthostyles. D, Palmate isochelae. E, Section through peripheral skeleton. F, Australian distribution. G, Paratype QMG300270.

and auxiliary megascleres; secondary, transverse, connecting fibres without coring spicules; both sorts of spongin fibres contain a light core of detritus, especially small sand grains; echinating acanthostyles very abundant, including peripheral fibres; mesohyl matrix heavy, darkly pigmented, with abundant microscleries, especially bundles of whispy, sinuous toxas (toxodragmata); extra-fibre auxiliary megascleres organised into ascending subdermal tracts, with few loose spicules scattered between fibres.

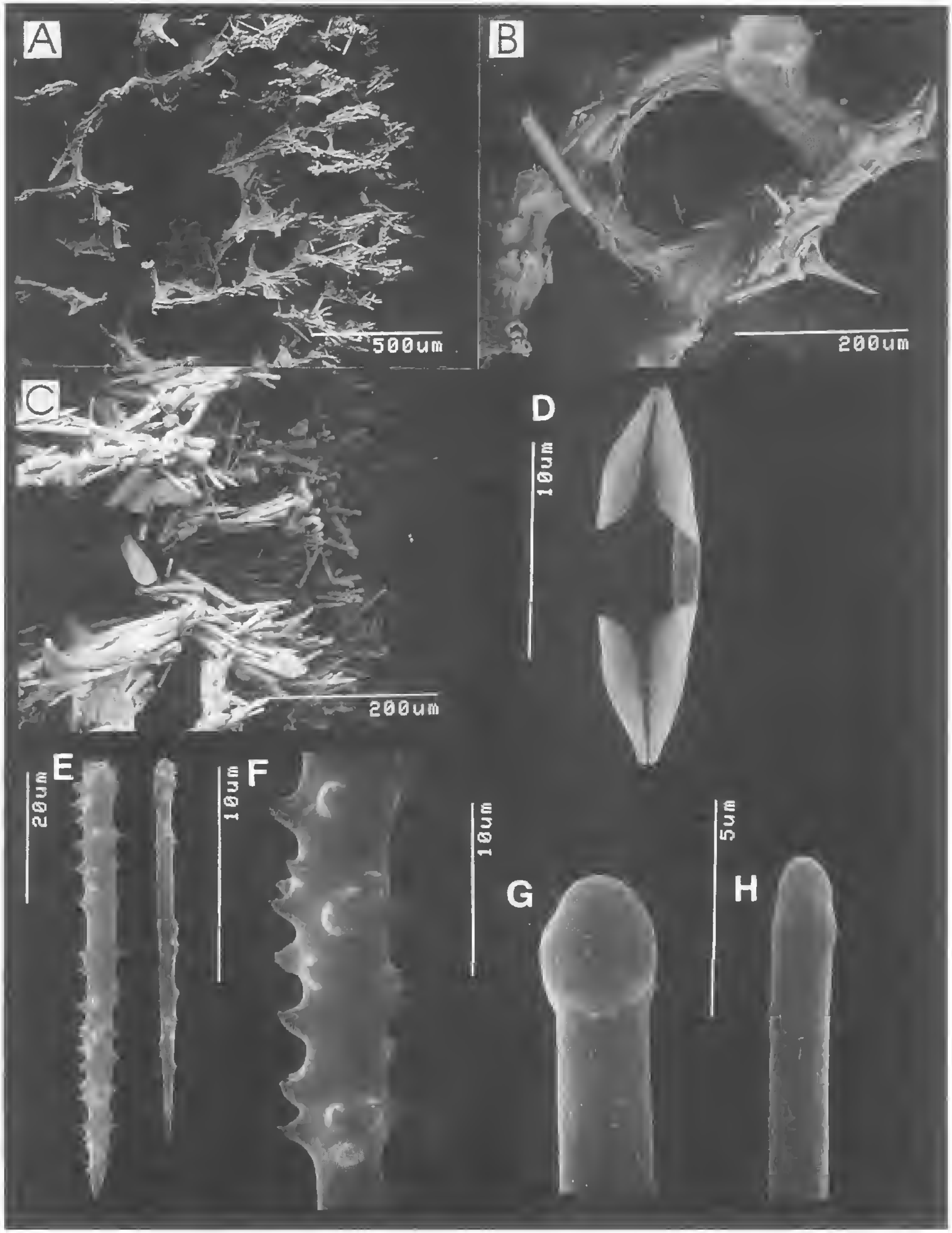

FIG. 88. *Clathria* (*Wilsonella*) *ensiae* sp.nov. (holotype NTMZ3561). A, Choanosomal skeleton. B, Peripheral skeleton. C, Fibre characteristics. D, Palmate isochela. E, Echinating acanthostyles. F, Acanthostyle spines. G, Base of principal subtylostyle. H, Bases of auxiliary subtylostyle.

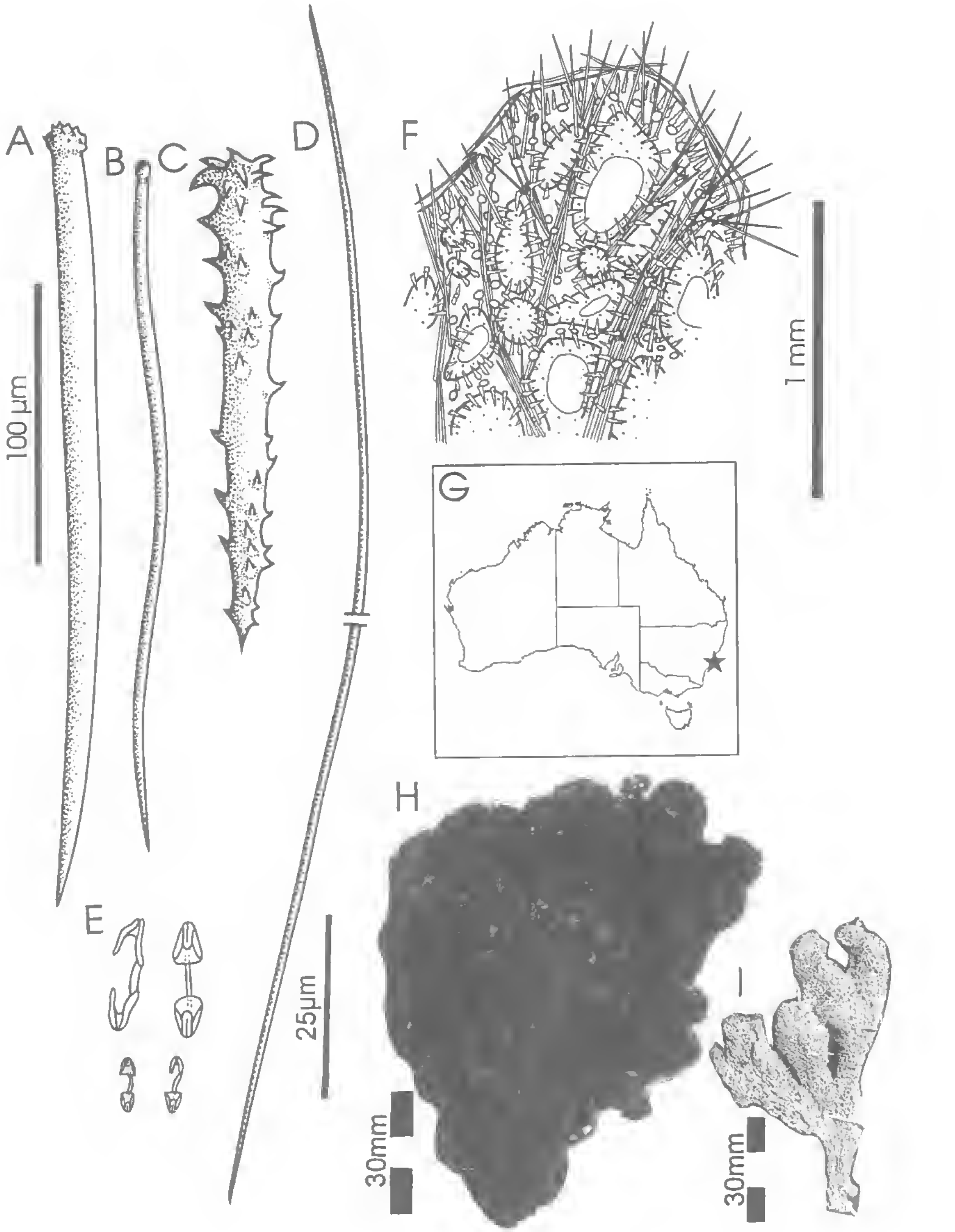

FIG. 89. *Clathria* (*Wilsonella*) *reticulata* Lendenfeld (lectotype AMG9135). A, Choanosomal principal subtylostyle. B, Subectosomal auxiliary subtylostyle. C, Echinating acanthostyle. D, Oxeote toxa. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, Lectotype. I, Paralectotype BMNH1925.11.1.576.

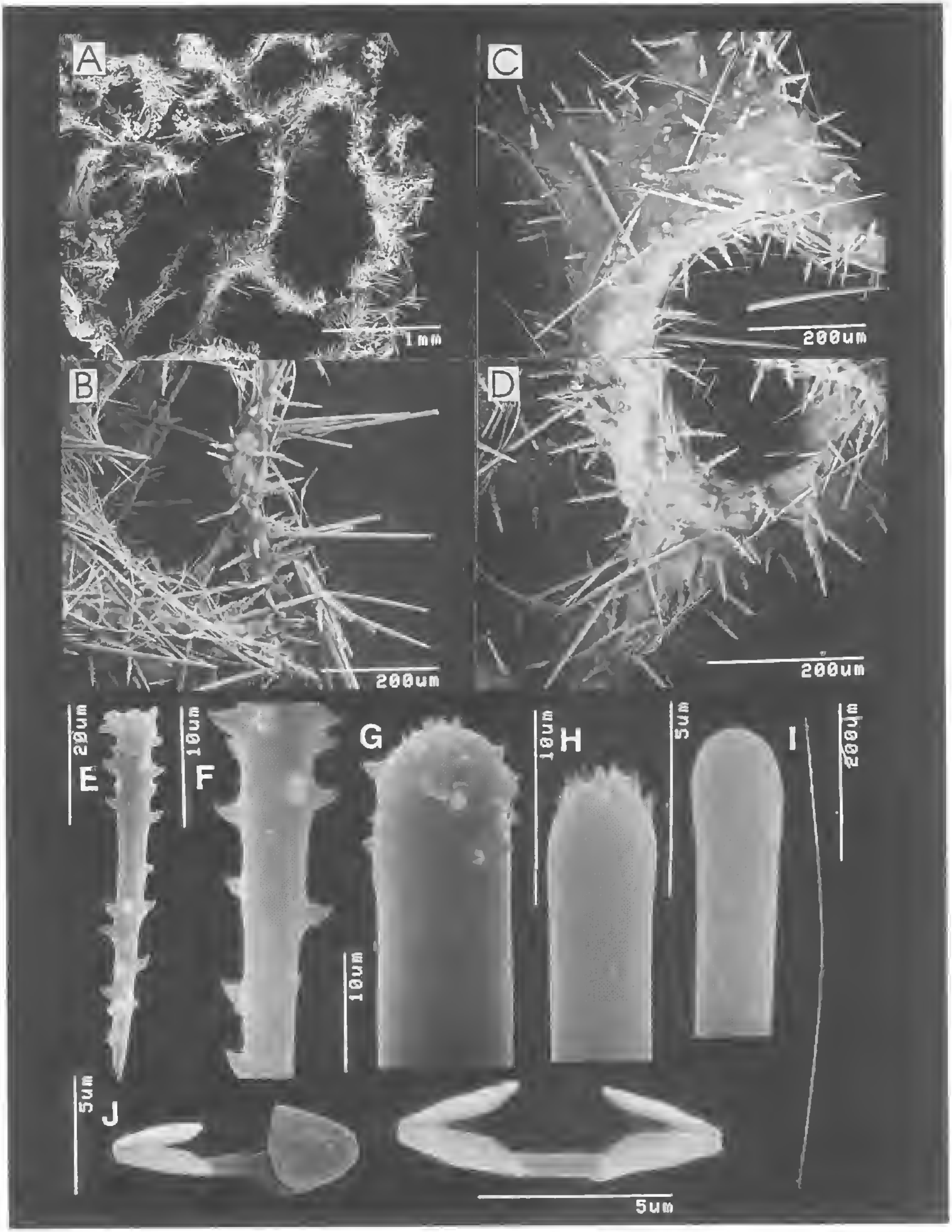

FIG. 90. *Clathria* (*Wilsonella*) *reticulata* Lendenfeld (paralectotype AMZ457). A, Choanosomal skeleton. B, Peripheral skeleton. C-D, Fibre characteristics. E, Echinating acanthostyle. F, Acanthostyle spines. G, Base of principal subtylostyle. H, Bases of auxiliary subtylostyles. I. Oxeote toxa. J, Palmate isochelae.

Megascleres (Table 18). Choanosomal principal subtylostyles well differentiated from auxiliary spicules, mostly straight, fusiform, with profusely microspined, slightly subtylote bases.

Subectosomal auxiliary subtylostyles thin, fusiform, straight, slightly curved, sometimes sinuous, with minutely microspined, subtylote bases.

Echinating acanthostyles with rounded bases, relatively even spination, although basal and distal portions slightly more heavily spined than points.

Microscleres (Table 18). Palmate isochelae differentiated into 2 size classes, smaller with approximately 75% of contort forms.

Toxas extremely abundant, long, thin, sinuous, characteristically oxeote, with only very slight or no central curvature and straight tapering points.

REMARKS. This species is poorly known from 3 specimens but differentiated from other species in the *Wilsonella* group having only a very light core of detritus in fibres, usually composed of small sand and spicule particles, differentiated primary and secondary fibres, and prominent bundles of sinuous toxas lining aquiferous chambers (Fig. 90). Affinities with other species (Table 19) are discussed elsewhere (remarks under *C. (W.) tuberosa* and *C. (W.) australiensis*). In some respects (growth form, geometry of some spicules, presence of two sizes of isochelae with contort forms) the species is closest to *C. (W.) tuberosa*, but toxa geometry is quite different between these two species.

Clathria (Wilsonella) tuberosa (Bowerbank, 1875)
(Figs 91-93, Table 19, Plate 2F)

Microciona tuberosa Bowerbank, 1875: 281, 282, 286; Vosmaer, 1935a: 607.
Clathria tuberosa; Ridley, 1881: 121; Ridley, 1884a: 444-445, pl.42, fig.d; Hentschel, 1912: 365-366; Hooper & Wiedenmayer, 1994: 275.

MATERIAL. HOLOTYPE: BMNH1877. 5.21.1312: Straits of Malacca, Malaysia, vicinity of 2°N, 102°E, coll. Capt. Parish (dredge). OTHER MATERIAL: INDONESIA - SMF978 (fragment MNHNDCL2346). QLD - BMNH1881.10.21.325, BMNH1882.2.23.198, 253, 283, 334. NT - AMZ4559 (RRIMP FN989), NTMZ777, NTMZ809, NTMZ920, NTMZ933, NTMZ946, NTMZ1091, NTMZ2087, NTMZ2400, NTMZ2708, QMG303336, NTMZ2157, NTMZ2189, NTMZ1959, NTMZ1980, NTMZ1987, NTMZ2020, NTMZ2098, QMG303428, NTMZ2107, NTMZ234, NTMZ235, NTMZ236 - NTMZ2496, NTMZ540, NTMZ107, NTMZ112, NTMZ128, NTMZ554. WESSEL ISLANDS; NT - NTMZ3955.

TABLE 18. Comparison between present and published records of *Clathria (Wilsonella) reticulata* (Lendenfeld). All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Lectotype (AMG9135)	Paralectotype (AMZ457)	Paralectotype (BMNH 1925.11.1.576)
Choanosomal principal styles	173-(209.4)-258 x 7-(9.1)-11	182-(240.2)-289 x 8-(9.3)-11	227-(251.5)-296 x 8-(9.4)-11
Subectosomal auxiliary styles	163-(236.8)-324 x 3-(4.0)-6	187-(259.0)-322 x 3-(4.2)-5	198-(243.4)-309 x 3-(4.6)-7
Echinating acanthostyles	52-(61.7)-71 x 3-(6.5)-9	54-(63.6)-75 x 4-(7,2)-9	65-(67.8)-72 x 6-(7.3)-9
Chelae I	5-(6.6)-9	4-(5.8)-7	6-(6.1)-9
Chelae II	12-(14.4)-17	13-(14.8)-17	14-(15.2)-17
Toxas	238-(402.7)-684 x 0.8-(2.4)-4	45-(231.3)-433 x 0.5-(1.9)-3.5	302-(427.7)-593 x 1-(2.2)-4

HABITAT DISTRIBUTION. Semi-encrusting on rock, dead or live coral heads, epizootic on other sponges and gorgonians; usually associated with shallow coral reef habitats; 2-19m depth range; prevalent in the tropical, Australian and Indo-Malay shallow water macrobenthic community, extending as far south as 13°S latitude: Torres Strait (FNQ) (Ridley, 1884a), Bynoe Harbour, Darwin Harbour, Coral Bay, Port Bremer, Wessel Is (NT). Also Straits of Malacca (Bowerbank, 1875; Ridley, 1881) and Aru Is, Indonesia (Hentschel, 1912).

DESCRIPTION. *Shape.* Subspherical, predominantly bulbous growth form, 60-135mm diameter, less often club-shaped with apical lobate digits, or pseudo-vasiform on low stalk with convoluted, apical, lobate digits; surface projections (or branches) rounded lobate, relatively close-set, attached to common centre, which in turn is usually attached to substrate by a small peduncle; lobate digits usually bifurcate with rounded margins. In life lobes prominently bulbous, evenly rounded; after preservation lobes become slightly flattened and angular.

Colour. Live pigmentation dusty pale pink-red (Munsell 2.5R 6/10) to pink (5RP 8/6), with a darker choanosome (5RP 7/8); lighter ectosomal colouration due to arenaceous nature of ectosome; dessicated colouration darkens to brown (2.5Y 8/2), red-brown (5Y 8/4), or red-purple (5RP 3/6), as paler ectosome collapses. In situ, subdermal ridges and canals red-pink in life, showing darker choanosomal pigmentation.

Oscules. Exhalant pores variable in diameter, ranging from 1-3mm, each with prominent,

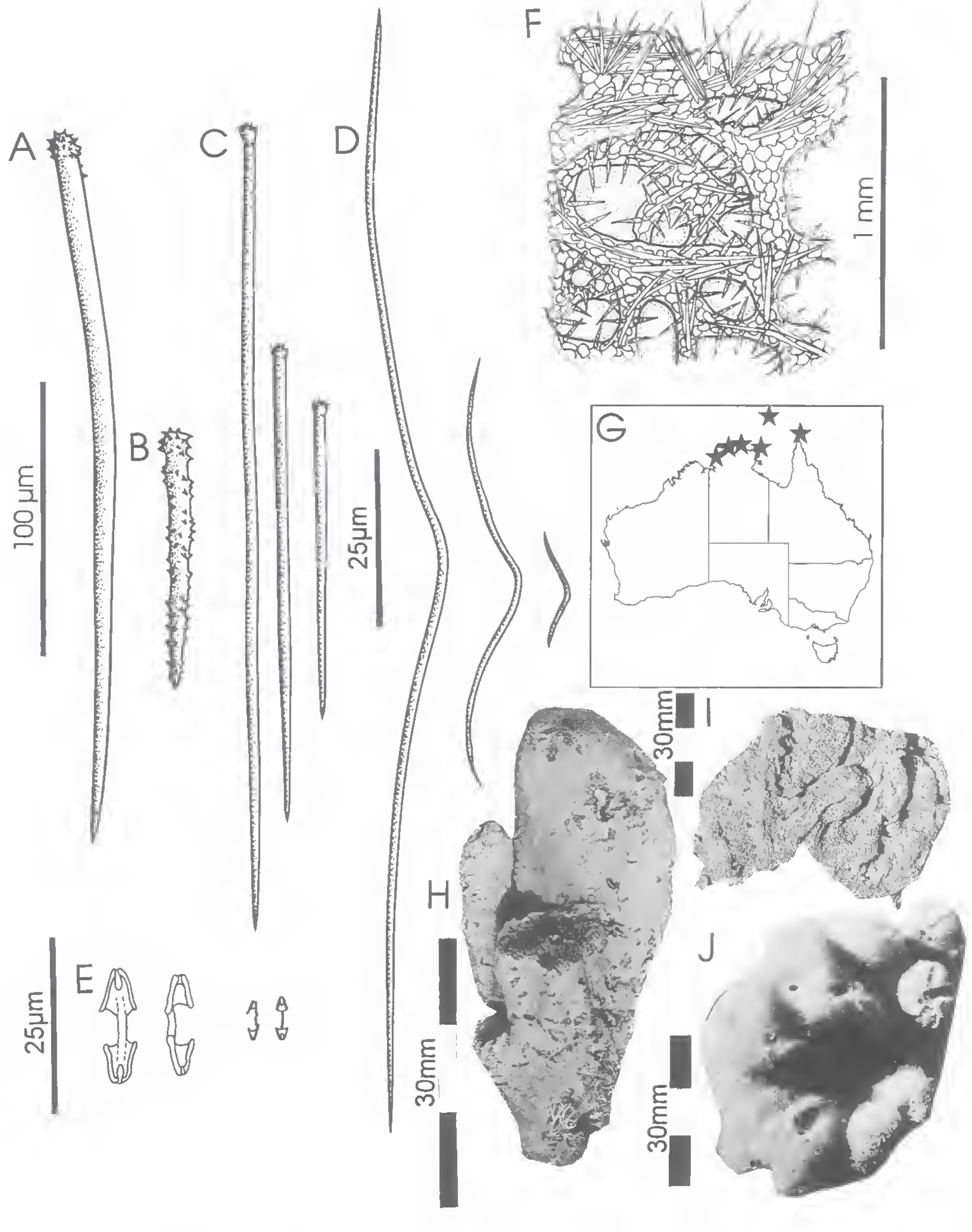

FIG. 91. *Clathria* (*Wilsonella*) *tuberosa* (Bowerbank) (NTMZ2157). A, Choanosomal principal subtylostyle. B, Echinating acanthostyle. C, Subectosomal auxiliary subtylostyles. D, Longer accolada and smaller wing-shaped toxas. E, Palmate isochelae. F, Section through peripheral skeleton. G, Known Australian distribution. H, Specimen of Hentschel (1912) SMF978. I, Specimen of Ridley (1884) BMNH1882.2.23.198. J, NTMZ107 *in situ*.

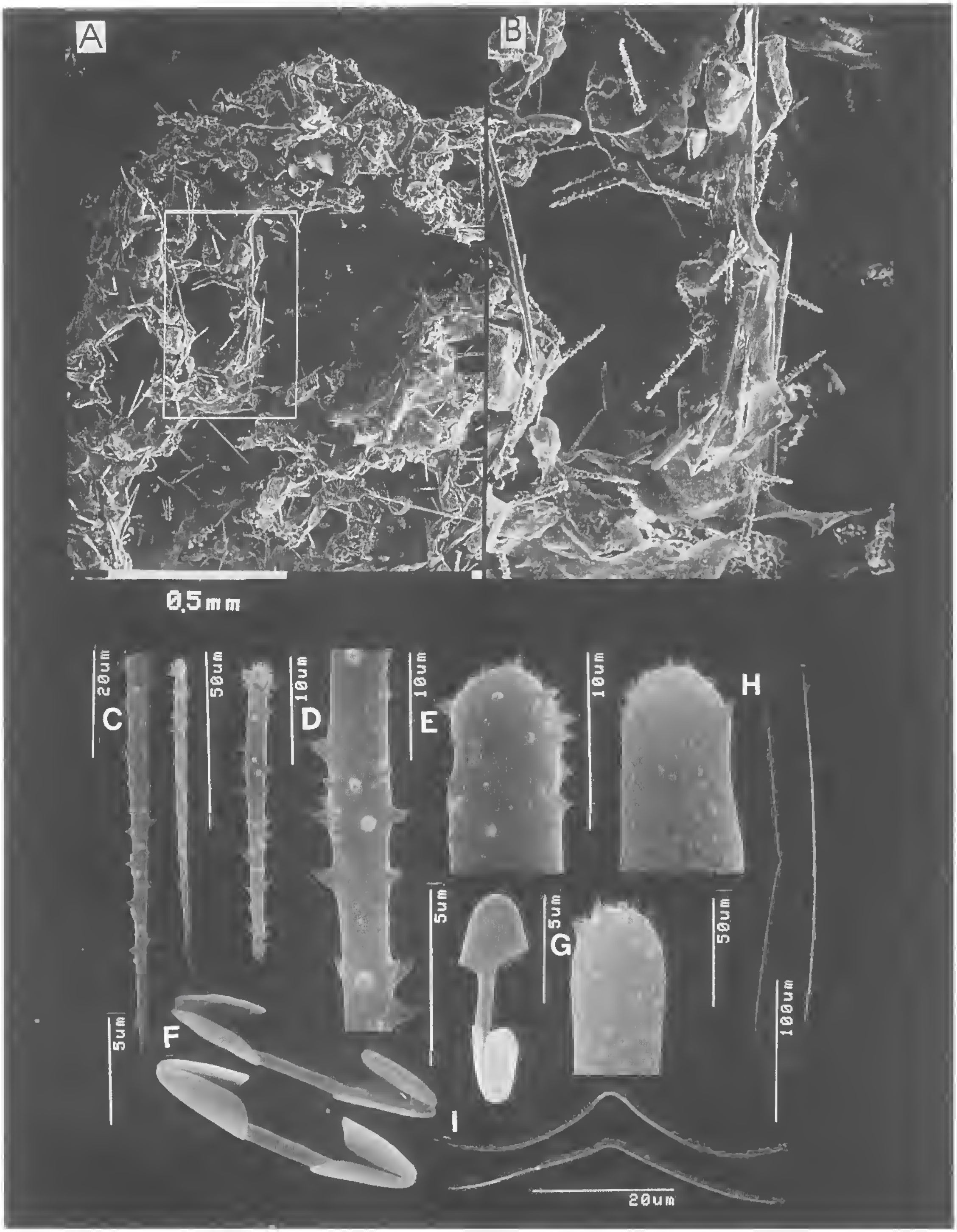

FIG. 92. *Clathria* (*Wilsonella*) *tuberosa* (Bowerbank) (NTMZ2708). A, Choanosomal skeleton. B, Fibre characteristics (x164). C, Echinating acanthostyles. D, Acanthostyle spines. E, Bases of principal subtylostyles. F, Palmate isochelae. G, Base of auxiliary subtylostyle. H, Longer accolada toxas. I. Smaller wing-shaped toxas.

SEASON	TOTAL SAMPLES	SAMPLES WITH LARVAE
WET	3	2
PREDRY	5	5
DRY	10	0
PREWET	10	5

FIG. 93. *Clathria* (*Wilsonella*) *tuberosa* (Bowerbank). Seasonal production of incubated larvae in populations from NW Australia.

membraneous, raised lip (collapses upon preservation); oscules confined to apex of lobate digits, with subdermal canals and grooves radiating away from pores in cruciform pattern.

Texture and surface characteristics. Surface optically smooth, even in situ, distinctly membranous; ectosomal membrane transparent or slightly opaque when intact, stretched across adjoining lobes, with darker subdermal pigmentation and fibre reticulation clearly visible below; subdermal grooves and minute subdermal canals produce a more-or-less microscopically reticulate surface; upon dessication ectosome collapses to become optically reticulate, distinctly arenaceous, with convoluted ridges and conules, and large amounts of clear mucous usually produced; texture stiffly compressible, arenaceous, harsh to touch, minutely hispid.

Ectosome and subectosome. Ectosomal skeleton heavily arenaceous, with delicate traces of sand coring peripheral fibres, through which protrude sparse tufts of subectosomal auxiliary styles, usually raised on low surface conules; special ectosomal megascleres absent; subectosomal auxiliary subtylostyles also form tangential or paratangential tracts perpendicular to dermal crust, intermingled with foreign particles auxiliary spicules variable in size, but no distinct localisation of smaller or larger forms; subectosomal region obscured by abundant sand grains coring peripheral subdermal fibres; individual extra-fibre auxiliary styles are intermingled amongst sand and fibres in subdermal region, sometimes forming dense paratangential plumose brushes, ascending to ectosome, but usually producing sparse tangential subdermal tracts; subdermal tracts clustered tightly around fibres and sand matrix, bound together with abundant collagen; on peripheral fibres, choanosomal principal spicules produce plumose brushes, sometimes protruding through surface, but usually only obvious in places where ectosome has collapsed and peripheral fibres are closest to surface.

Choanosome. Choanosomal skeleton irregularly reticulate, with light spongin fibres fully cored by sand grains and fewer choanosomal principal megascleres, the latter in rows of 6-10 abreast in larger fibres; spicule fragments also common amongst detritus, particularly haplosclerid oxeas; spongin fibres heavily echinated by acanthostyles; fibre branching produces irregular oval meshes, 50-(334)-600μm diameter, with irregular eliptical choanocyte chambers (38-121μm diameter), with light mesohyl matrix and abundant microscleres, without sand or any megascleres; spongin fibres not clearly divisible into primary or secondary elements, but thinner fibres (30-55μm diameter) have coring megascleres more visible (fewer detrital particles); larger spongin fibres 70-(104)-230μm diameter; megascleres core fibres in paucispicular tracts, slightly more heavily aggregated in thicker fibres but partially obscured by sand particles; mesohyl matrix in axis light, with little foreign debris or auxiliary megascleres.

Megascleres (Table 19). Choanosomal principal subtylostyles slightly curved towards basal end, occasionally straight, with heavily microspined bases, tapering to sharp fusiform points.

Subectosomal auxiliary subtylostyles straight, variable in size, usually with microspined, prominently subtylote bases, sharply tapering, fusiform points.

Acanthostyles very variable in length and width, straight, subtylote, fusiform, evenly spinose with granular spines (thinner spicules) or heavy thorn-like spines (thicker spicules).

Microscleres (Table 19). Palmate isochelae typically very abundant, incompletely divided into two size classes, with some twisted smaller examples.

Toxas abundant, thin, usually long, without reflexed points, only slightly curved at centre, although smaller examples may have more angular central curvature; occurring individually or more often in toxodragmata within mesohyl matrix.

Larvae. Incubated parenchymella larvae were recorded in only 17% of specimens, collected from Darwin and Cobourg Peninsula regions, NT, during May, September, October and December, suggesting a possible breeding period during the wetter months (Fig. 93). Larvae orange-brown pigmented, oval - elongate, ranging from 165-280 x 110-160μm. All larvae contained juvenile megascleres scattered throughout central portion of mesohyl, usually with heavy collagen. In the few adult sponges seen incubating larvae, the mesohyl was usually lightly orange in colour, whereas in non-fecund specimens the mesohyl matrix was invariably pigmented light brown.

Associations. Scyllid polychaete worms (Typosyllis spongicola) relatively common (31% of specimens examined).

Morphological variation. Gross morphology: characteristic, relatively consistent, varying only in elongation of basal stem and clump of digits on apex, ranging from low spherical bulbs (69%), club-shaped (16%), or convoluted, semivasiform growth forms (15%). Live colouration: consistent, only slight variation in pinkish hue. Ectosomal skeletal structure: extends from densely arenaceous with few dermal spicule brushes (39%), arenaceous with abundant protruding plumose subectosomal brushes (35%), to arenaceous with plumose brushes of subectosomal spicules and single choanosomal styles erect on surface (26%). Subectosomal skeletal structure: varies from well-developed, plumose ascending spicule tracts composed of subectosomal auxiliary styles (27%), few plumose extra-fibre brushes with most extra-fibre spicules closely bound by collagen (31%), or with all extra-fibre spicules simply bound closely but external to spongin fibres (42%). Choanosomal skeletal structure: relatively consistent, ranging from simply irregularly reticulate (54%) to regularly reticulate (46%), with oval meshes (88%) or less commonly longitudinally elongated meshes (12%). Mesohyl matrix: lightly pigmented (58%), moderately heavily pigmented (23%), or heavily pigmented collagen (19%). Echinating acanthostyles: forming dense (42%), moderately dense (50%), or only lightly echinating fibres (8%). Megasclere geometry: consistent; majority of choanosomal subtylostyles with microspined bases, 8% of specimens with smooth subtylote bases. Acanthostyles vary only in dimensions. Microsclere geometry: consistent although proportion of contort versus unmodified

TABLE 19. Comparison between morphological characteristics of some Australasian arenaceous *Clathria* (*Wilsonella*) species, based on present and published records. All measurements are given in µm.

CHARACTER	MATERIAL					
	1	2	3	4	5	6
Shape	massive subspherical tubular	elongate subspherical tubular	claviform	digitate flabellate	digitate	fan
Digits	lobate	lobate	clubs/bulbs	cylindrical or flattened	cylindrical	lobate
Live colour	pale orange	pale orange	red-brown	red-brown	unknown	unknown
Skeletal architecture	irreg. retic	irreg. retic	irreg. retic. axis, plumo-,regular retic. subect.	regular retic	irreg. retic.	irreg. retic.
Differentiated primary/secondary fibre system	yes	yes	yes	yes	yes	no
Choanosomal styles	89-175 x2.5-8 smooth or spined base	96-214 x4-6.5 smooth or spined base	235-364 x6-13 spined base	69-132 x3.5-6 smooth base	172-388 x6-16 smooth base	192-298 x6-11 spined base
Subectosomal styles	92-172 x1.5-5 spined apex and base	99-148 x2.5-3.5 spined apex and base	164-375 x3-8 spined base	97-154 x1.5-3.5 smooth base	162-541 x3-7 smooth base	160-325 x2.5-5.5 spined base
Acanthostyles	49-85 x2-6	52-63 x3-5.5	64-103 x4-8	28-70 x2.5-5.5	63-94 x4-8	78-94 x3-9
Large chelae	11-19	12-15	14-22	11-16	14-18	12-18
Small chelae	absent	absent	absent	absent	absent	3-8 twisted
Toxas	28-89 x 0.5-1.5 angular centre	43-59 x0.8-1.5 angular centre	28-266 x 0.8-1.5 slightly angular centre	absent	57-74 x1-2 rounded centre	91-435 x0.8-2 straight at centre

Material:
1. *W. australiensis* (Carter) - present study.
2. *C. lobosa* Lendenfeld (1888:149) (=*W. australiensis*) - holotype AMU G9053; Port Jackson,NSW.
3. *W. claviformis* (Hentschel) - present study.
4. *W. ensiae*, sp.nov. - present study.
5. *W. rumosa* (Lindgren, 1897:482) - schizotype BMNH 1929.11.26.48.
6. *W. mixta* (Hentschel, 1912:298) - holotype SMF 974.

small isochelae varies from 0-20% of contort spicules (12%), 20-40% (19%), 40-60% (24%), 60-80 (35%), to 80-10% of spicules (12%). Spicule dimensions: Few specimens atypical but variation apparently random with no statistical significance between specimens irrespective of seasonal or geographical distribution of samples.

REMARKS. *C. (W.) tuberosa* is distinctivein the field: pink colour, bulbous growth form, soft texture. However, it is more difficult to differentiate descriptively. Pertinent differences are:

Choanosomal architecture and fibre characteristics of *C. (W.) reticulata* are identical to those of *C. (W.) tuberosa*; acanthostyles are as equally abundant in both species, but many acanthostyles have heavier spines on the distal part than on points; and there are two sizes of isochelae, 75% of the smaller being contort. Thus, the major features distinguishing the two taxa are the straight or sinuous oxeote toxas in *C. (W.) reticulata*, which are never present in *C. (W.) tuberosa*, and the light deposits of debris into fibres. Nevertheless, the two species are closely related.

Clathria (W.) australiensis has choanosomal fibres divided into ascending and radial primary elements, fully cored by detritus, with less heavily cored secondary transverse elements. Subectosomal auxiliary subtylostyles have spines on both bases and points, typically with a prominent terminal spine/point and also smaller spines occuring at least part of the way along the shaft. Choanosomal subtylostyles are also auxiliary spicules, with smooth or spined bases only. Acanthostyles are pointed and tapering; there is only one size of isochelae; and toxas have strongly curved (rounded or sharply angular) central curves.

Clathria (W.) rugosa is a sister species of *C. (W.) australiensis*, differing in having prominent subectosomal drainage canals ('astrorhizae'). Subectosomal auxiliary styles are also spined on both ends, but spines are perched only on the very extremity of the spicule point (not on the shaft); acanthostyles have bulbous points; there is only

CHARACTER	MATERIAL					
	7	8	9	10	11	12
Shape	fan palmate-digitate	massive spherical tubular	massive spherical globular	elongate subspherical tubular	massive spherical globular cupriform	reticulate branches
Digits	cylindrical	lobate	lobate	lobate	lobate	lobate tubular
Live colour	bt.red-orange	pale pink or pink-red	pale pink or pink-red	pale pink or pink-red	pale pink or pink-red	unknown
Skeletal architecture	irreg.retic.	irreg.retic.	irreg.retic.	irreg.retic.		
Differentiated primary/secondary fibre system	yes	none	none	none	none	partial
Choanosomal styles	134-159 x4.5-8 smooth base	167-278 x4-11 most spined bases	144-286 x4-8 most spined bases	172-302 x6-8.5 most smooth bases	133-(226.3)-343 x4-(8.2)-14 most spined bases	173-296 x7-11 all spined bases
Subectosomal styles	162-206 x2.5-4 spined apex and base	159-333 x2-6 spined bases	148-223 x2-5 spined bases	154-324 x2-5 spined bases	129-(228.9)-375 x1.5-(4.1)-8 spined bases	163-324 x3-7 spined bases
Acanthostyles	58-91 x4-7	44-97 x4-9	43-75 x3-8	69-88 x3.5-5	60-(79.9)-112 x4-(6.7)-11	52-75 x3-9
Large chelae	12-17	11-19	11-16	13-19	10-(13.3)-18	14-17
Small chelae	absent	4-8 twisted	4-7 twisted	6-8 rare	4-(6.1)-9 twisted	4-9 twisted
Toxas	24-122 x0.8-3 slight curve at centre	55-255 x0.5-1.5 rounded centre	95-215 x0.5-1.5 angular& rounded centre	81-94 x1-2 rounded centre	30-(140.3)-388 x0.4-(1.1)-2 rounded centre	45-684 x0.5-4 sinuous oxeote

Material:
7. *W. rugosa* (Hooper & Lévi, 1993) - New Caledonian population (included for comparative purposes).
8. *W. tuberosa* (Bowerbank, 1875:281); holotype BMNH 1877.5.21.1312; Straits of Malacca (N=25).
9. *W. tuberosa*; Ridley, 1884a:444; BMNH 1881.10, 21.325, 1882.2.23.198, 253, 283, 334; Torres Strait (N=125).
10. *W. tuberosa*; Hentschel, 1912:365; SMF 978; Arafura Sea (N=25).
11. *W. tuberosa*; present material - NW Australia (N=650)
12. *W. reticulata* (Lendenfeld) - present study.

a single small category of isochelae; and toxas are only slightly curved at their centre.

Clathria (W.) claviformis, C. (W.) ensiae, and *C. (W.) ramosa* are different from these other species in spicule geometry, spicule size, skeletal architecture and fibre characteristics. These Indo-Australasian species are relatively easy to distinguish from their gross morphology and field characteristics although their skeletal characters are usually at least partially obscured by the incorporation of sand into fibres.

With the exception of *C. (W.) australiensis* species of *Clathria (Wilsonella)* have relatively restricted, mostly allopatric distibutions: *C. (W.) tuberosa* is from N Australia and SE Asia; *C. (W.) claviformis* from the Arafura and Timor Seas; *C. (W.) mixta* from 2 disjunct populations in the Arafura Sea and the S. Arabian coast; *C. (W.) ramosa* from the Java Sea; *C. (W.) ensiae* in S Australia and Tasmania; *C. (W.) reticulata* SE Australia. *C. (W.) australiensis* ranges from SW Australia to S Queensland, whereas its cryptic sibling *C. (W.) rugosa* is restricted to New Caledonia.

OTHER SPECIES OF *CLATHRIA (WILSONELLA)*

Clathria (Wilsonella)cercidochela (Vacelet & Vasseur, 1971)

Clathriopsamma cercidochela Vacelet & Vasseur, 1971: 104-105, text-fig.62, pl.3, fig.1 [Tulear, Madagascar].

MATERIAL. HOLOTYPE: MNHNDJV24. W Indian Ocean.

Clathria (Wilsonella) ferrea (de Laubenfels, 1936)

Fisherispongia ferrea de Laubenfels, 1936b: 460, fig.44. [Atlantic coast of Panama].

Clathria (Microciona) ferrea; Van Soest, 1984b: 101-103, text-fig.40, table 4 [Curaçao].

Clathria ferrea; Zea, 1987: 172, text-fig.60 [Colombian Caribbean].

Microciona ferrea; Pulitzer-Finali, 1986: 149 [West Indies].

MATERIAL. HOLOTYPE: USNM22239. Caribbean.

Clathria (Wilsonella) foraminifera (Burton & Rao, 1932)

Aulenella foraminifera Burton & Rao, 1932: 345-346, pl.18, fig.11, text-fig.11 [Gaspar Straits, Java Sea].

MATERIAL. HOLOTYPE: IMP790/1. E Indonesia.

Clathria (Wilsonella) lindgreni sp. nov.

Clathria ramosa Lindgren, 1897: 482-483; Lindgren, 1898: 308-309, pl.17, fig.9, pl.18, fig.15, pl.19, fig.16 [Belitung I., Java Sea]; Hentschel, 1912: 367.

Thalysias ramosa; de Laubenfels, 1936a: 105.

Not *Rhaphidophlus ramosus* Kieschnick, 1896: 533; Kieschnick, 1900: 53-54, pl.45, figs 47-50.

Not *Echinoclathria ramosa*; Hallmann, 1912: 277, pl.30, fig.3.

Not *Wilsonella ramosa*; Hallmann, 1912: 243, 298.

Not *Colloclathria ramosa* Dendy, 1922: 74-76.

cf. *Microciona prolifera tropus spinosa*; Vosmaer, 1935a: 642.

MATERIAL. HOLOTYPE: NHRM (fragment BMNH1929.11.26.48). Indonesia. Clathria (Thalysias) ramosa (Kieschnick, 1896) has priority.

Clathria (Wilsonella) litos Hooper & Lévi, 1993

Clathria (Clathriopsamma) litos Hooper & Lévi, 1993a: 1243-1246, figs 9-10 [New Caledonia].

MATERIAL. HOLOTYPE: QMG301269. SW Pacific.

Clathria (Wilsonella) mixta Hentschel, 1912

Clathria mixta Hentschel, 1912: 298, 367, 368, pl.13, fig.8, pl.19, fig.30 [Aru I., Arafura Sea]; Burton, 1959a: 244 [S. Arabian coast].

Thalysias mixta; de Laubenfels, 1936a: 105.

cf. Clathria lobata or Clathria ulmus; Vosmaer, 1935a: 649.

MATERIAL. HOLOTYPE: SMF 974 (fragment MNHNDCL2280). Indonesia, Arabian Gulf.

Clathria (Wilsonella) pseudonapya (de Laubenfels, 1930)

Clathriopsamma pseudonapya de Laubenfels, 1930: 28; de Laubenfels, 1932: 96-97, text-fig.57 [Pacific Grove, California]; Sim & Bakus, 1986: 10 [California].

MATERIAL. HOLOTYPE: USNM21436. PARATYPE BMNH1929.8.22.19. NE Pacific rim.

Clathria (Wilsonella) rugosa Hooper & Lévi, 1993 (Table 19)

Clathria (Clathriopsamma) rugosa Hooper & Lévi, 1993a: 1237-1243, figs 7-8, tables 4-5 [New Caledonia].

MATERIAL. HOLOTYPE: QMG300278 (fragment NTMZ3880). PARATYPE QMG300696 (fragment NTMZ3889). SW Pacific.

Clathria (Microciona) Bowerbank, 1862

Microciona Bowerbank, 1862b: 1109.
[*Abila*] Gray, 1867: 539 [preocc.].
[*Aaata*] de Laubenfels, 1930: 27[preocc.].
Anaata de Laubenfels, 1932: 89.
Axocielita de Laubenfels, 1936a: 118.
Cionanchora de Laubenfels, 1936a: 108.
Fisherispongia de Laubenfels, 1936b: 460.
Folitispa de Laubenfels, 1936a: 119.
Hymantho Burton, 1930a: 503.
Hymeraphia, in part, Hentschel, 1912: 377; not *Hymeraphia* Bowerbank, 1864: 189.
Leptoclathria Topsent, 1928a: 298.
Ophlitaspongia Bowerbank, 1866: 14; not *Ophlitaspongia* of authors.
Paratenaciella Vacelet & Vasseur, 1971: 103.
Pseudanchinoe Burton, 1929a: 433.
Seriatula Gray, 1867: 515
Sophax Gray, 1867: 521.
Wetmoreus de Laubenfels, 1936a: 112.

DEFINITION. Persistently encrusting growth form, with hymedesmoid skeletal architecture consisting of a basal layer of spongin, typically with ascending, plumose, non-anastomosing, spongin fibre nodes, and megascleres embedded and erect on basal layer; ectosomal skeleton with only a single undifferentiated category of auxiliary megasclere.

TYPE SPECIES. *Microciona atrasanguinea* Bowerbank, 1862b: 1109 (by subsequent designation of Bowerbank, 1864: 188).

REMARKS. Of 118 named species described in, or subsequently referred to *Microciona* or one of its synonyms, 103 appear to be valid , and 7 are recorded from Australasia, including 2 new species.

Clathria (Microciona) aceratoobtusa
(Carter, 1887)
(Figs 94-95, Table 20, Plate 3C)

Microciona acerato-obtusa Carter, 1887: 62, 67, 83, pl.5, figs 7-10; Dendy, 1896: 18; Hentschel, 1911: 348, text-fig. 32a-f.
Axocielita aceratoobtusa; de Laubenfels, 1936a: 118.
Clathria aceratoobtusa; Rudman & Avern, 1989: 335; Hooper & Wiedenmayer, 1994: 266.
cf. *Microciona prolifera*; Vosmaer, 1935a: 608, 637.

MATERIAL. HOLOTYPE: LFM (confirmed destroyed during WWII): Kadan Kyun (King I.), Mergui Archipelago, Andaman Sea, Burma. NEOTYPE: NTMZ3676: NW. side of N. I., Ko Wao Yai Group, vicinity of Ko Samui, Gulf of Thailand, 9°46.7'N, 99°40.3'E, 12m depth, 6.vi.1990, coll. J.N.A. Hooper (SCUBA). OTHER MATERIAL: NSW - NTMZ2835 (fragment QMG300543), NTMZ3125. QLD - QMG303089, QMGL713 (fragment NTMZ1536). SAHUL SHELF, WA - QMG301083, QMG301188. INDONESIA - BMNH1946.11.25.244.

HABITAT DISTRIBUTION. Coral rubble, rock and bivalve substrata; intertidal-14m depth; Shark Bay, Cartier I., Hibernia Reef, Sahul Shelf (WA) (Hentschel, 1911, present study); Cairns and Shelburne Bay (FNQ) (present study); Sydney and Iluka (NSW) (Rudman & Avern, 1989, present study) (Fig. 94G). Also Indo-Malay Archipelago – Andaman Sea (Burma) (Carter, 1887), Gulf of Thailand (present study).

DESCRIPTION OF NEOTYPE. Thinly encrusting on bivalves, up to 1mm thick; colour orange-red alive (Munsell 10R 6/12); firm texture; oscules not seen; surface microscopically hispid, with choanosomal principal styles protruding up to 100µm from ectosome; subectosomal auxiliary styles lie paratangential to surface, in bundles or individually; choanosomal skeleton leptoclathriid, with principal styles and echinating acanthostyles embedded in and perpendicular to basal spongin fibres; principal styles form plumose brushes, and both sorts of spicules also scattered individually in skeleton; mesohyl matrix heavy, dark brown, granular, with incorporated detritus, numerous toxas and auxiliary styles dispersed; principal choanosomal styles long, fusiform, rounded or very slightly subtylote, with smooth or minutely spined bases (length 175-548µm, width 11-22µm); subectosomal auxiliary subtylostyles polytylote, with microspined swollen bases (length 264-387µm, width 1.5-4.5µm); echinating styles short, slightly curved, robust, with prominently swollen, usually microspined bases and smooth shafts (length 128-183µm, width 5-12µm); palmate isochelae small, relatively homogeneous in size, with many twisted forms (9-14µm long); toxas short, thickest at centre, tapering to sharp, slightly reflexed points (length 58-92µm, width 2-5.5µm).

DESCRIPTION. *Shape*. Thinly encrusting, contiguous or discrete mats on rock or coral substrata, covering up to 120mm2, 0.4-2mm thick.

Colour. Bright orange-red alive (Munsell 10R 6/12-14), grey-brown in ethanol.

Oscules. Small exhalant apertures unevenly distributed over surface, up to 1.5mm diameter, slightly raised or flush with surface; small membraneous lip surrounding oscules when alive, collapsing in air. Minute inhalant pores irregularly dispersed, producing slightly reticulate appearance.

Texture and surface characteristics. Firm, mucusy alive, minutely hispid; surface with irregularly dispersed, bifurcate subdermal drainage canals meandering from oscules.

Ectosome and subectosome. Ectosomal skeleton hispid, with points of large choanosomal principal styles protruding up to 200µm from surface, occurring individually or in paucispicular plumose brushes of about 5 spicules; subectosomal auxiliary styles usually lie paratangential to surface, sometimes forming tangential tracts lying immediately subdermal; auxiliary styles arise from skeleton at oblique angles, rarely protruding through ectosome; tracts of auxiliary spicules originate in basal half of skeleton, with 8-12 spicules per tract.

Choanosome. Choanosomal skeletal architecture hymedesmoid in thin sections, microcionid in thicker regions, with a relatively thick layer of heavy spongin fibre lying on basal substrate, 22-43µm diameter; bases of principal and echinating styles embedded in basal spongin, perpendicular to substrate, individually or in plumose bundles;

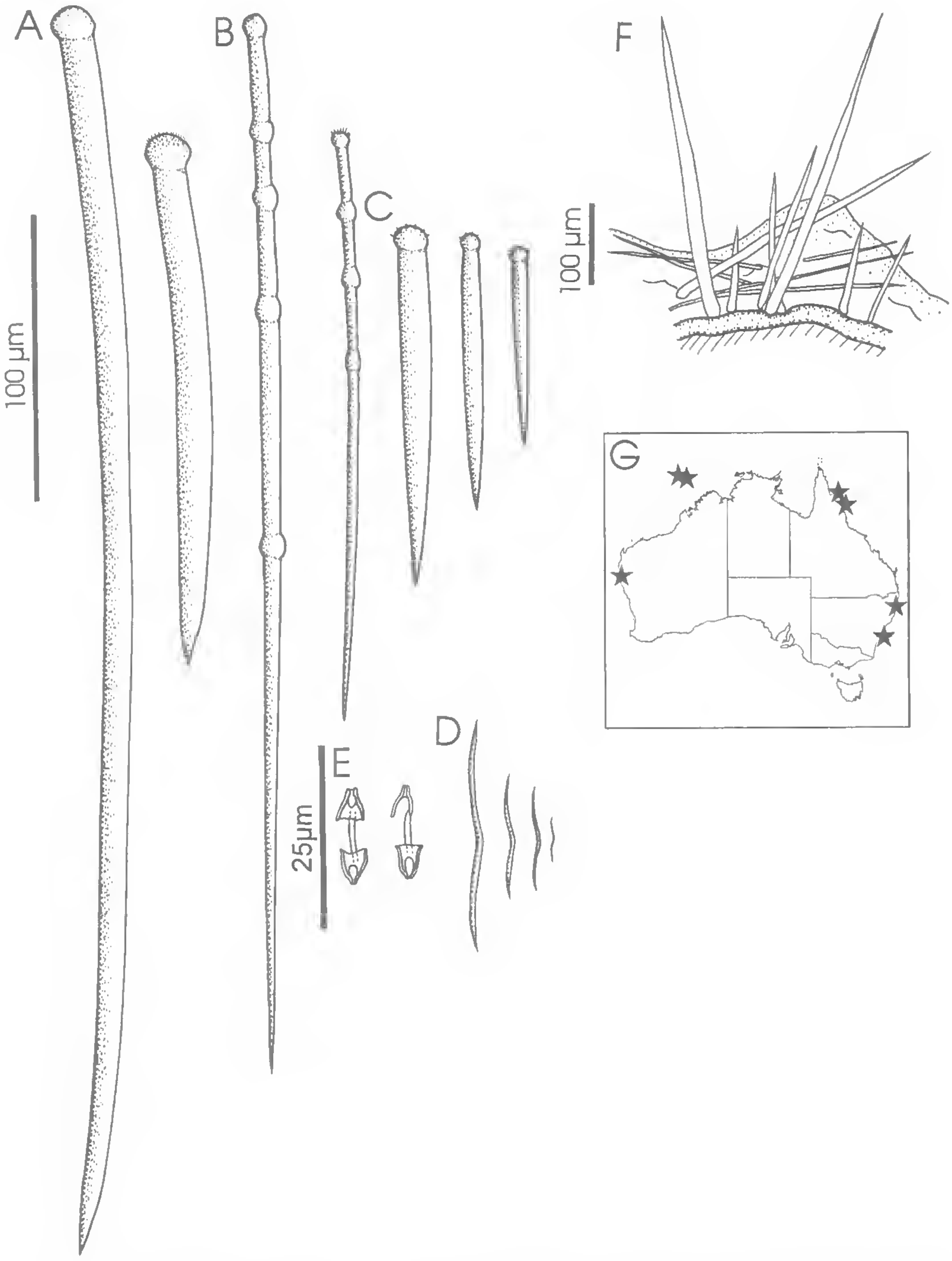

FIG. 94. *Clathria* (*Microciona*) *aceratoobtusa* (Carter) (NTMZ2835). A, Choanosomal principal subtylostyles. B, Polytylote subectosomal auxiliary subtylostyles. C, Echinating subtylostyles. D, Oxhorn toxas. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution.

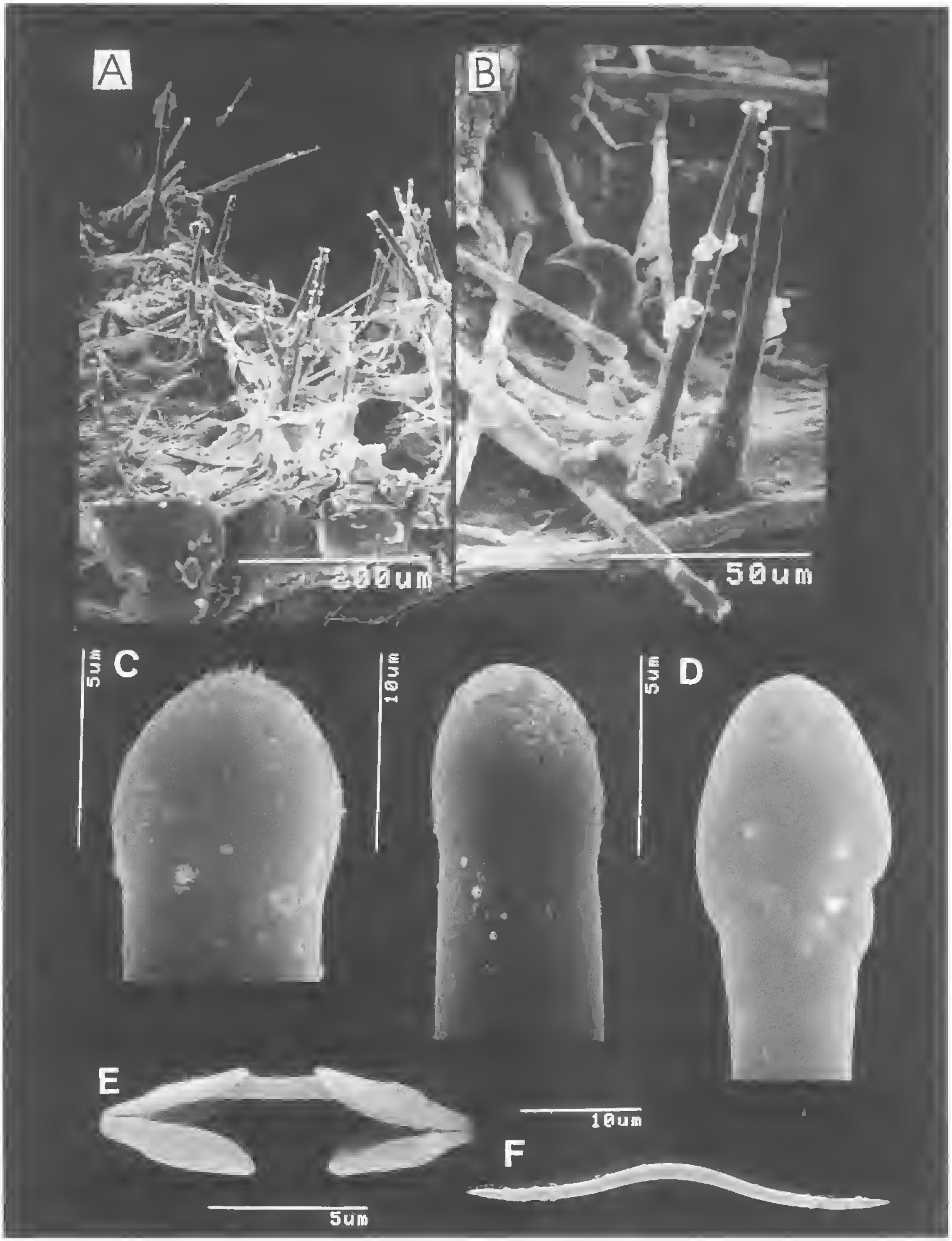

FIG. 95. *Clathria* (*Microciana*) *aceratoobtusa* (Carter) (QMG303089). A, Choanosomal skeleton. B, Close view of hymedesmoid skeleton. C, Bases of choanosomal principal subtylostyles. D, Polytylote base of auxiliary subtylostyle. E, Palmate isochela. F, Oxhorn toxa.

TABLE 20. Comparison between present and published records of *Clathria* (*Microciona*) *aceratoobtusa* (Carter). All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Neotype (NTMZ3676)	Hentschel (1911)	Specimens (N=6)
Choanosomal principal styles	175-(386,0)-548 x 11-(15.5)-22	up to 408 x 8	235-(352.8)-492 x12.5-(17.2)-22
Subectosomal auxiliary styles	264-(324.3)-387 x 1.5-(3.8)-4.5	168 x 4	217-(379.8)-443 x 3.5-(4.3)-6
Echinating styles	128-(149.9)-183 x 5-(7.2)-12	from 64 x 5	97-(130.8)-194 x 5.2-(6.8)-9
Chelae	9-(12.2)-14	9-12	10.5-(13.5)-16
Toxas	58-(71.5)-92 x 2-(3.1)-5.5	35-92 x 3-4	18-(57.3)-84 x 0.8-(2.2)-3.5

in thick sections basal spongin fibres form small erect nodes, 22-35µm thick, up to 48µm high, enveloping bases and parts of spicule shafts; mesohyl matrix heavy, granular, darkly pigmented, incorporating irregularly dispersed sand grains and other foreign debris, numerous toxas occurring singly or in dragmata, more-or-less ascending tracts of subectosomal auxiliary megascleres, and fewer isochelae; choanocyte chambers minute, ovoid but rarely seen, 12-18µm diameter, mostly obscured by heavy collagen; large subectosomal cavities, 110-145µm diameter, visible where inorganic substrate is fragmented and discontiguous.

Megascleres (Table 20). Choanosomal principal subtylostyles long, thick, fusiform, typically curved in basal third, with slightly subtylote mostly smooth, less often microspined bases.

Subectosomal auxiliary subtylostyles usually long, straight, thin, fusiform, with prominently swollen, smooth or microspined bases.

Echinating subtylostyles entirely smooth or occasionally with lightly microspined bases, small, thick, fusiform, slightly curved or straight. Intermediates between echinating and principal styles also occur.

Microscleres (Table 20). Palmate isochelae small, with long lateral alae fused to shaft for most of its length; chelae relatively common, of a single size class, homogeneous in size and geometry, approximately 70% with contort shafts.

Toxas very abundant, oxhorn, with slightly rounded central curves, straight or slightly reflexed points; central part thickest whereas tips taper to fine points.

Associations. On the NSW coast this species has been found in association with pairs of nudibranchs grazing on the sponge, Rostanga arbutus (AMC151078, 154589) (W.B. Rudman, pers.comm.). These predators are identical in their live colouration to the sponge, presumably utilising the sponge's carotenoid pigments.

REMARKS. This species was originally recorded from Mergui Archipelago and by Hentschel (1911) from Shark Bay, WA. The holotype was destroyed during WWII (its absence from the LFM collections has been checked by Shirley Stone, BMNH, pers.comm.); the neotype comes from an area in Thailand relatively close to the type locality. The first record of the species in the Pacific Ocean is also made here.

Previous published descriptions of this species are relatively poor and non-discriminatory; some attributes of the type material are still uncertain. Carter (1887) did not give any spicule dimensions, but his figures indicate that Mergui specimens are very similar to present material. There are some minor differences between my material and descriptions by Carter (1887) and Hentschel (1911). Hentschel's specimens from Shark Bay were thickly encrusting with stoloniferous, mammiform surface processes. Choanosomal architecture varied from leptoclathriid, with a thin layer of spongin lying on the substrate, to microcionid in thicker regions, with fibre nodes and single, non-anastomosing columns of spongin arising from the substrate. Principal styles were fusiform, prominently subtylote, often with microspined bases. Palmate isochelae were frequently contort. By comparison, Carter (1887) reported the holotype had principal styles with hastate or styloid points, and their bases were completely smooth and only slightly subtylote. Similarly, there was no mention in Carter's description whether isochelae were modified (contort). Vosmaer (1935a) expressed doubts about the conspecificity between Carter's and Hentschel's material based on alleged differences between them in megasclere and microsclere geometries, but this criticism is unfounded. Both Carter and Hentschel reported that their specimens were thinly encrusting on living and dead serpulid worm tubes, bivalves and gastropods; colour was brown to beige preserved; toxa geometry was distinctive and identical; and echinating megascleres were entirely smooth.

De Laubenfels (1936a) erected *Axocielita* for this species, having smooth echinating

TABLE 21. Spicule dimensions of of *Clathria* (*Microciona*) *antarctica* (Topsent), giving comparisons between nominotypical material and other type material. All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Holotype of *S. toxifera* (MNHNDT1612)	Part of type of *M. basispinosa* (BNMN1933.3.17.39)
Choanosomal principal styles	409-(519.9)-676 x 9-(13.8)-22	293-(498.3)-618 x 9-(12.6)-18
Subectosomal auxiliary styles	213-(424.9)-899 x 4-(10.5)-16	252-(360.9)-503 x 4-(7.2)-10
Echinating acanthostyles	52-(110.8)-214 x 2.5-(6.8)-10	78-(130.1)-265 x 3-(8.7)-11
Chelae	absent	absent
Toxas	31-(46.1)-84 x 0.8-(1.8)-3.0	18-(27.8)-35 x 1.5-(2.3)-4.0

megascleres (i.e., like *Axociella*) but also with a *Microciona*-like encrusting growth form. This is surprising given that *Ophlitaspongia seriata*, a north Atlantic species, also has an encrusting growth form, microcionid architecture and smooth echinating spicules (which Simpson (1968a) subsequently showed was a synonym of *Microciona* based on cytology and other characters). These arguments demonstrate that the apparent generic boundaries between microcionids based on growth form and spicule spination are tenuous at best.

QMGL713 from the Cairns region, encrusting on an ascidian, has skeletal architecture, fibre characteristics and spiculation closely comparable to other material of *C. (M.) aceratoobtusa* but lacks toxas completely. It is difficult to confirm the identity of this specimen (i.e., because the species is largely characterised by the geometry of its toxas), but given that all other characters are the same it is included here.

Although only known from few specimens it is likely that this species is widespread in the Indo-west Pacific shallow-water fauna.

Clathria (Microciona) antarctica (Topsent, 1917)
(Figs 96-97, Table 21)

Stylostichon toxiferum Topsent, 1913a: 621-622, pl.4, fig.7, pl.6, fig.14.
Not *Hymeraphia toxifera* Hentschel, 1912: 382.
Anchinoe toxifera var. *antarctica*; Topsent, 1917: 43, pl.4, fig.5, pl.6, fig.5.
Pseudanchinoe toxifera; Burton, 1929a: 433-434; Burton, 1932a: 325; Burton, 1934b: 39; Burton, 1940: 115; Koltun, 1964a: 72; Koltun, 1976: 155, 188, figs 11-12.
Clathria toxifera; Van Soest, 1984b: 129.
Pseudanchinoe toxiferum; Koltun, 1976: 155, 188.
Stylostichon tuberculata Burton, 1934b: 35, pl.3, fig.2, text-figs 6-9; Koltun, 1976: 188.
Microciona basispinosa Burton, 1934b: 38-39, pl.5, fig.2, text-figs 11-12; Burton, 1938b: 17; Koltun, 1964a: 76; Desqueyroux, 1972: 31, figs 103-107; Desqueyroux & Moyana, 1987: 49; Dawson, 1993: 36.
Clathria antarctica; Hooper & Wiedenmayer, 1994: 266.

MATERIAL. HOLOTYPE: MNHNDT1612: Gough I., S. Atlantic, 40°20'S, 95°6.3'W, 200m depth, 22.iv.1904, coll. R.R.V. 'Scotia' (dredge). HOLOTYPE of *M. basispinosa*: NHRM997 III (fragment BMNH 1933.3.17.39): Port Albemarle, Falkland Is, 18-30m depth, 11.ix.1902, Swedish Antarctic Expedition (dredge).

HABITAT DISTRIBUTION. Deeper water rock reefs; 16-610m depth (Koltun, 1976); Antarctica - Discovery Inlet, Ross Sea, McMurdo Sound, Graham Land, Victoria Land, Enderby Land; Subantarctic – Macquarie I. (Fig. 96F). Also SW Atlantic; SW and SE Pacific – Tierra del Fuego, Falkland Is, Shag Rocks, South Georgia, Gough I., Argentina, Chile, Kerguelen, New Zealand.

DESCRIPTION. *Shape*. Growth forms range from thickly encrusting to massive, subspherical.
Colour. Brown in ethanol.
Oscules. Small, 2mm diameter, on apex of surface conules.
Texture and surface characteristics. Compressible; smooth surface with scattered prominent conules, translucent surface.
Ectosome and subectosome. Moderately dense plumose brushes of auxiliary subtylostyles, of a single size category, arising from ends of erect fibre nodes, protruding through surface and interdispersed with long principal spicules.
Choanosome. Skeletal architecture microcionid, with hymedesmoid basal layer of spongin lying on substrate echinated by erect acanthostyles of various sizes, and erect fibre nodes at 200-400µm intervals; fibre nodes non-anastomosing, forming discrete skeletal columns in choanosome; erect fibre columns, 40-100µm diameter, cored by long choanosomal subtylostyles, usually protruding through fibres in plumose bundles or individually, and also heavily echinated by smaller acanthostyles in their basal portion only; fibres form single, discrete columns of spongin and spicules for most of their length but diverge into 2 or more branches in subectosomal region, ultimately producing ectosomal spicule brushes at their ends; mesohyl matrix light, choanocyte chambers 30-50µm diameter, numerous spherical cells, and dispersed auxiliary spicules outside

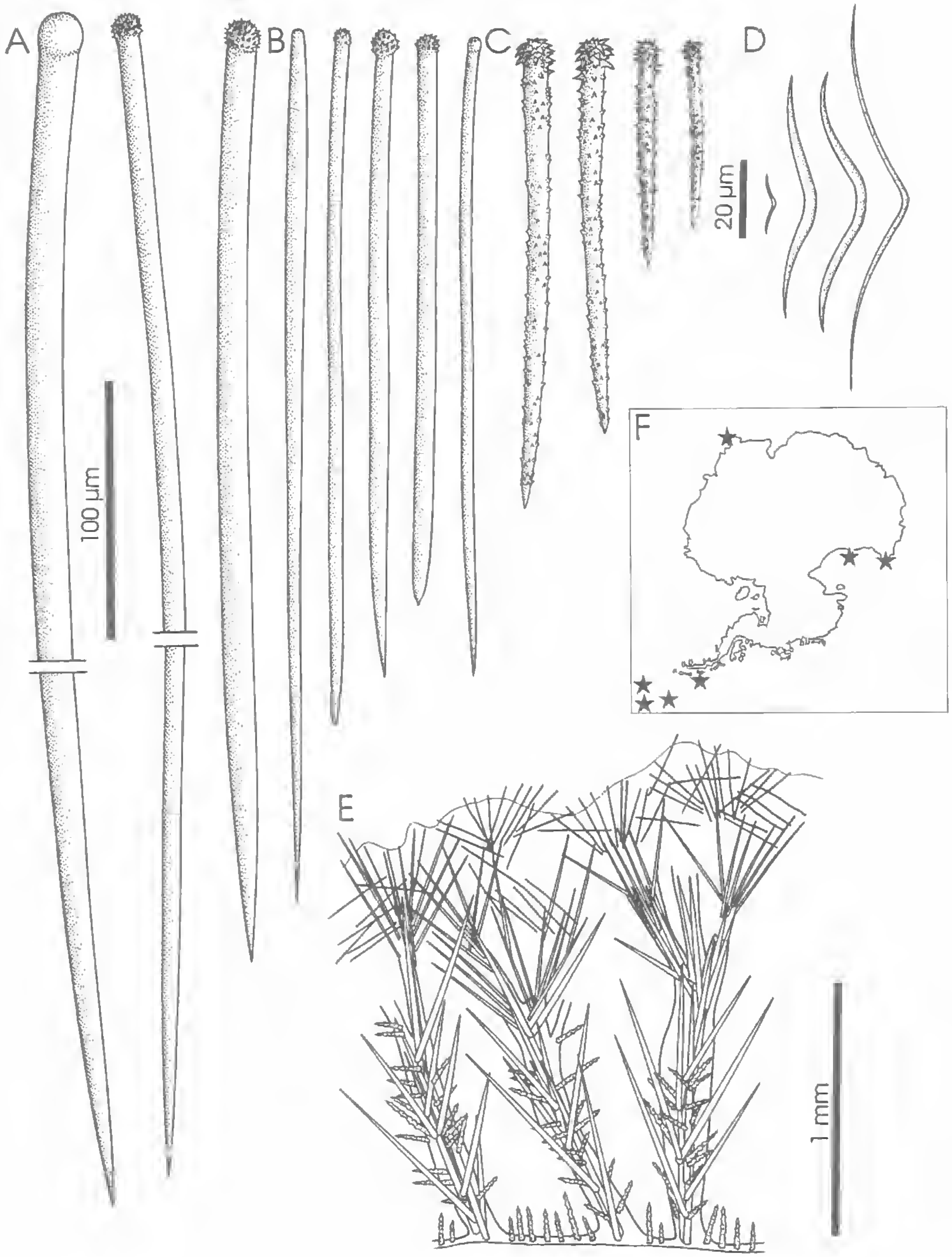

FIG. 96. *Clathria* (*Microciona*) *antarctica* (Topsent) (holotype MNHNDT1612). A, Choanosomal principal subtylostyle. B, Subectosomal auxiliary subtylostyles. C, Echinating acanthostyles. D, Wing-shaped toxas. E, Section through skeleton. F, Antarctic distribution.

fibres also form plumose columns; mesohyl collagenous.

Megascleres (Table 21). Choanosomal principal subtylostyles very long, slender, with fusiform points, slightly curved towards apical end, subtylote or slightly subtylote bases, smooth or microspined bases.

Subectosomal auxiliary subtylostyles short, robust, straight or slightly curved near basal end, hastate points or at least less fusiform than principal spicules, with subtylote microspined bases.

Echinating acanthostyles variable size range, the larger ones clearly intermediate between principal spicules and smaller spined spicules; spicules straight or slightly curved, moderately heavily spined, evenly spined, spination becoming vestigial on larger spicules, fusiform points, subtylote bases.

Microscleres (Table 21). Chelae absent.

Toxas short, thick, wing-shaped, with wide central curvature, curved at slight angle, slightly reflexed arms.

REMARKS. Hentschel's (1912) *toxifera* has seniority over Topsent's (1913a) name, and hence the next available name *antarctica* (Topsent, 1917) is used for this species (Hooper & Wiedenmayer, 1994).

Koltun (1976) proposed that *M. basispinosa* Burton was conspecific with *S. toxiferum* Topsent, and this is now confirmed. Koltun's (1976) proposed synonymy of this species and *S. tuberculata* Burton has not yet been corroborated (types not yet found). His proposal to include *C. (Clathria) pauper* Brondsted, 1927, in this taxon is rejected, the latter species having a plumo-reticulate skeleton (as opposed to exclusively plumose skeleton), different pattern of spination on acanthostyles, two toxa morphologies *(C. (M.) antarctica*

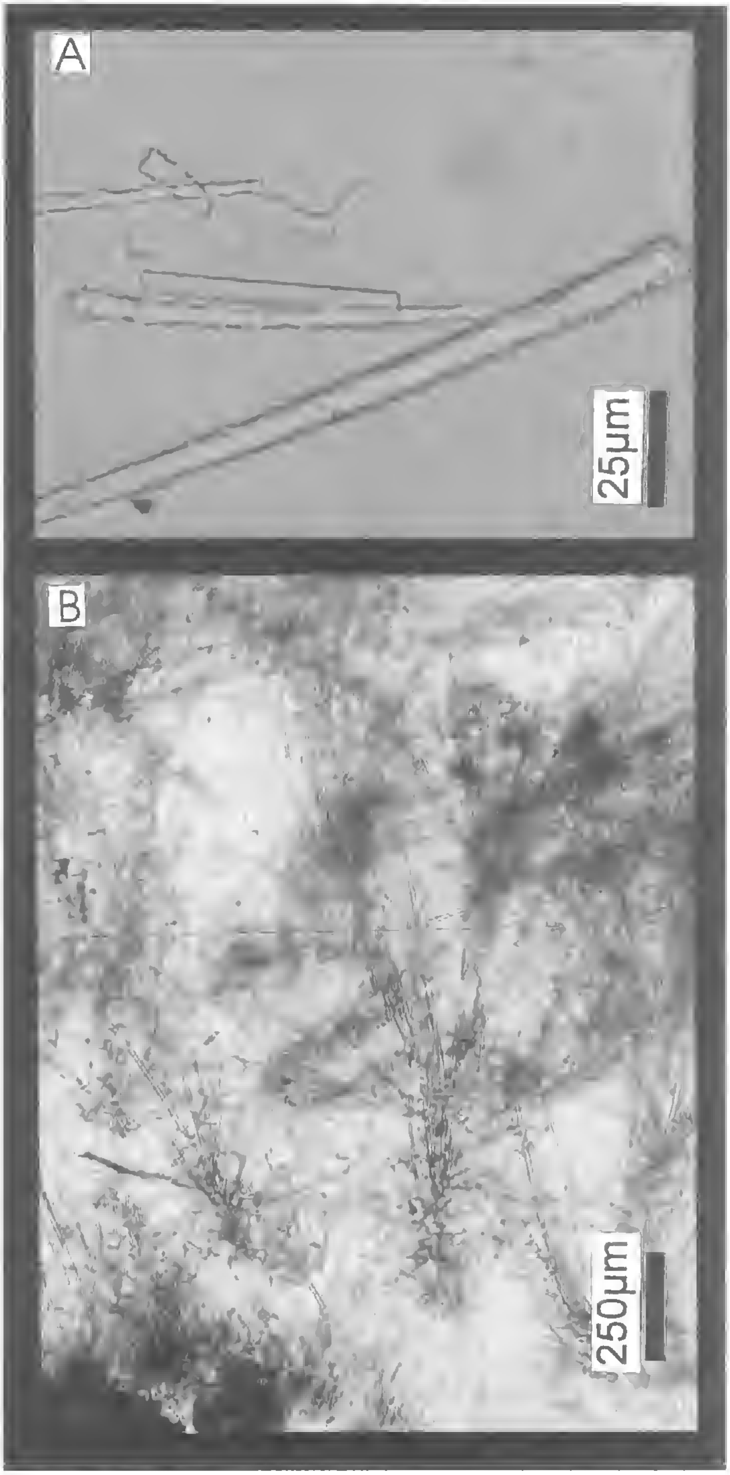

FIG. 97. *Clathria* (*Microciona*) *antarctica* (Topsent) (fragment of holotype BMNH1933.3.17.39a). A, Echinating acanthostyles and toxa. B, Plumose skeletal structure.

having only one), and spicule sizes differing substantially between the two species (compare Table 21 and description of *C. (C) pauper* above).

Clathria (Microciona) grisea (Hentschel, 1911) (Figs 98-99, Table 22)

Leptosia grisea Hentschel, 1911: 353, text-fig.35.
Microciona grissa [lapsus]; de Laubenfels, 1936a: 111.
Clathria grisea; Hooper & Wiedenmayer, 1994: 266

MATERIAL. HOLOTYPE: ZMB4435: NW. of Middle Bluff, Shark Bay, WA, 2548'S, 11326'E, 7-8m depth, 21.ix.1905, coll. W. Michaelsen & R. Hartmeyer (dredge). OTHER MATERIAL: WA- NTMZ2863 (fragments QMG300054, PIBOC 04-295).

HABITAT DISTRIBUTION. 7-25m depth; growing on bivalves and *Acropora* cf. *robusta*; Shark Bay and Pelsart Is, Houtman Abrolhos (WA) (Fig. 98F).

DESCRIPTION. *Shape*. Thinly encrusting, up to 3mm thick (holotype) or long cylindrical digitate sponge, 480mm long, 70mm maximum width, with few, slightly flattened, bifurcate, cylindrical branches, up to 40mm diameter, and short basal, holdfast attachment.

Colour. Red-brown alive (Munsell 10R 4/10), brownish-grey preserved.

Oscules. Large oscules, up to 4mm diameter, irregularly distributed on lateral sides of branches in ramose material.

Texture and surface characteristics. Surface smooth, unornamented, with distinct skin-like detachable covering; texture compressible, rubbery.

Ectosome and subectosome. Ectosome heavily collagenous, up to 180µm thick, including a light crust of arcuate isochelae, and with tangential fibres running longitudinally along surface; subectosomal skeleton consists of plumose brushes of auxiliary subtylostyles, in bundles, standing erect or semi-erect but not protruding beyond surface; subectosomal spicule bundles arise from ends of principal spicules erect on the substrate (in holotype) or from peripheral fibres (in specimen).

Choanosome. Holotype – choanosomal skeleton hymedesmoid, with a basal layer of spongin fibre, acanthose bases of principal styles and smaller acanthostyles embedded in basal spongin, standing erect upon substrate. Specimen – choanosomal skeleton irregularly plumose, slightly reticulate, with sinuous, heavy spongin fibres, up to 220µm diameter, cored by both subectosomal auxiliary subtylostyles and principal styles, and echinated by plumose brushes of both choanosomal principal styles and echinating acanthostyles poking through fibres into mesohyl; mesohyl matrix light, choanocyte chambers elongate-oval, up to 150µm diameter, with abundant arcuate isochelae dispersed throughout.

TABLE 22. Comparison between present and published records of *Clathria (Microciona) grisea* (Hentschel). All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Holotype (ZMB4435)	Specimen (N=1)
Choanosomal principal styles	135-(198.2)-212 x 6-(10.4)-12	241-(268.5)-298 x 11-(13.2)-16
Subectosomal auxiliary styles	195-(218.9)-242 x 4-(6.3)-8	246-(264.4)-283 x 4-(5.8)-8
Echinating acanthostyles	95-(103.4)-116 x 6-(7.8)-10	109-(124.6)-158 x 8-(9.4)-11
Chelae I	15-(16.8)-19	14-(15.2)-17
Chelae II	20-(22.9)-28	23-(25.5)-28
Toxas	absent	absent

Megascleres (Table 22). Choanosomal principal styles thick, long, slightly curved at centre, subtylote, with heavily spined bases and sparsely microspined shafts.

Subectosomal auxiliary subtylostyles, in dermal skeleton within choanosomal fibres, long, thick, straight, with fusiform points and very slightly subtylote, smooth bases.

Echinating acanthostyles long or short, relatively slender, straight, slightly subtylote, heavily spined all over spicule except for aspinose point.

Microscleres (Table 22). Arcuate-like isochelae divided into two size classes, without intermediates; larger chelae with very thick, strongly curved shaft, small rounded lateral alae attached to shaft for most of its length, front ala completely free; smaller chelae with slightly curved shaft, long lateral alae only partially attached to shaft.

Toxas absent.

REMARKS. There are some notable differences in skeletal structure and spicule sizes between the encrusting holotype and the branching specimen described above (Table 22), but the two specimens agree so closely in spicule diversity and geometry that they are obviously conspecific. These differences may be due to the holotype being immature, having smaller spicule dimensions and a hymedesmoid skeleton, whereas the larger branching specimen still retains the ascending plumose (non-anastomosing) fibre nodes, typical of the *Microciona* condition.

The major distinguishing features in *C. (M.) grisea* are the arcuate isochelae and spined principal spicules. On this basis it is surprising that de Laubenfels (1936a) did not refer it to *Anaata* which he created specifically for this purpose (i.e., to include species with acanthose principal spicules, echinating acanthostyles, smooth subectosomal styles and arcuate isochelae). The holotype of *Leptosia grisea* has a hymedesmoid choanosome, without plumose fibre nodes (and therefore strictly a member of *Leptoclathria*), and only a single category of auxiliary spicule. *Anaata, Leptoclathria* and *Microciona* are considered synonyms of *Clathria*.

Clathria (M.) grisea belongs to Hallmann's (1912) *spicata* group of species (see comments for *C. (Thalysias) lendenfeldi*), having a spicate arrangement of principal and echinating spicules, which protrude through fibres in a plumose manner (Hooper et al., 1990).

Clathria (Microciona) illawarrae sp. nov.
(Figs 100-101, Plate 3D)

MATERIAL. HOLOTYPE: QMG304572: Shellharbour, Illawarra, NSW, 34°35'S, 150°52'E, 10.vi.1993, coll. L. Miller (SCUBA).

HABITAT DISTRIBUTION. Shallow subtidal; on rock reef, growing over bivalves and coralline algae; central E coast (NSW) (Fig. 100G).

DESCRIPTION. *Shape*. Thinly encrusting, 0.3-1.5mm thick, following contours of substrate.
Colour. Pale yellowish-orange alive (Munsell 2.5Y 8/10), beige in ethanol.
Oscules. Minute, less than 2mm diameter, scattered over surface, with slightly raised surrounding membraneous lip; pores very small covering entire surface.
Texture and surface characteristics. Soft, compressible, easily torn; porous, opaque, even, fleshy surface, without any sculpturing or other ornamentation.
Ectosome and subectosome. Single category or large subectosomal auxiliary subtylostyles form paratangential plumose brushes, protruding only slightly through surface but extending well into mesohyl.
Choanosome. Skeleton microcionid, with thin basal layer of spongin lying on substrate, 30-40μm thick, containing incorporated sand grains; erect spongin fibre nodes arise at approximately 200μm intervals along basal spongin, 20-40μm thick, 100-150μm long, cored by erect choanosomal principal styles in uni- or multispicular tracts, up to 5 spicules per bundle, forming perfectly erect or slightly plumose brushes ascending to but not protruding through surface; fibre nodes discrete, not anastomosing with adjacent nodes, but some principal spicules from adjacent nodes cross within mesohyl; paratangential plumose brushes of auxiliary spicules located in several places within mesohyl, forming a tangential tract near basal spongin layer, forming stellate brushes midway along erect fibre nodes, and forming plumose paratangential brushes near surface; echinating acanthostyles relatively sparse on both basal spongin and erect fibre nodes; mesohyl matrix moderately heavy with microscleres dispersed throughout; choanocyte chambers not seen.
Megascleres. Choanosomal principal styles long, thin, slightly curved or whispy near point, often bent in distal third of spicule, with smooth tapering hastate bases and fusiform points, occasionally slightly telescoped. Length 62-(129.4)-165μm, width 3-(3.6)-4.5μm.

Subectosomal auxiliary subtylostyles long, thin, straight, with elongated smooth subtylote bases and hastate points. Length 176-(206.5)-228μm, width 1.0-(2.3)-3.0μm.

Echinating acanthostyles short, relatively thick, cylindrical, usually thickest above basal constriction, slightly spined, aspinose slightly constricted neck, slightly swollen base, rounded or fusiform point. Length 36-(53.2)-68μm, width 2-(3.8)-6μm.
Microscleres. Palmate isochelae very small, with greatly reduced lateral alae, often no more than ridge on shaft, and small front ala complete; sometimes asymmetrical ends. Length 4-(5.9)-7.5μm.

Toxas small, thick, u-shaped or forceps shaped, with angular central curve and non-reflexed arms. Length 6-(8.1)-11m, width 0.5-(0.8)-1.0μm.

ETYMOLOGY. For the type locality.
REMARKS. This species is one of the most thinly encrusting microcionids, with most sections no more than 300μm thick. Its choanosomal skeleton is typical of Microciona (erect fibre nodes arising from a hymedesmoid basal skeleton), but subectosomal auxiliary spicules have an unusual distribution within the skeleton forming both stellate brushes around the fibre nodes and basal tangential tracts near the substrate. The species is also unusual amongst thinly encrusting microcionids in that there are no subsurface drainage canals associated with the aquiferous system, whereasthe surface is smooth, porous and fleshy. These live surface features, the

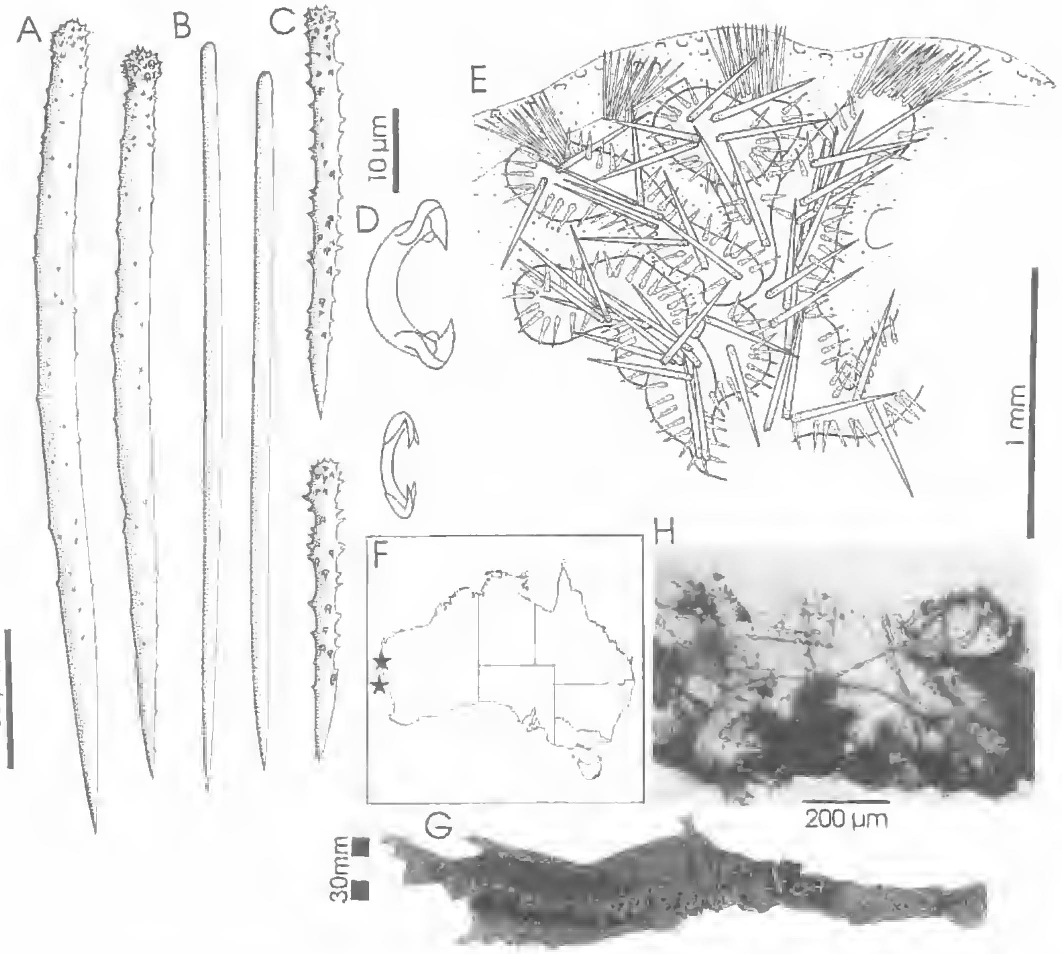

FIG. 98. *Clathria* (*Microciona*) *grisea* (Hentschel) (NTMZ2863). A, Choanosomal principal acanthostyles. B, Subectosomal auxiliary subtylostyles. C, Echinating acanthostyles. D, Arcuate isochelae. E, Section through peripheral skeleton. F, Australian distribution. G, NTMZ2863. H, Section through fragment of holotype ZMB4435.

skeletal structure, spicule geometry, and spicule sizes differentiate this species from other *Microciona* in the Indo-west Pacific.

Clathria (Microciona) lizardensis sp. nov.
(Figs 102-103, Plate 3E)

MATERIAL. HOLOTYPE - QMG304121: Blue Lagoon, Lizard I., Cairns Section, Great Barrier Reef, 14°41.0'S, 145°27.5'E, 9m depth, 03.iv.1994, coll. J.N.A. Hooper, L.J. Hobbs, J.A. Kennedy & S.D. Cook (SCUBA).

HABITAT DISTRIBUTION. Coral reef, patch reef in lagoon, under coral overhangs, on ledges or exposed coral heads, growing on live coral, coral rubble at base of reef or on dead bivalves; 9-12m depth; Lizard I. (FNQ) (Fig. 102G).

DESCRIPTION. *Shape*. Thinly or thickly encrusting, bulbous in life, usually following contours of substrate, up to about 10mm thick, collapsing and less than 4mm thick when preserved.

Colour. Pale red alive (Munsell 2.5R 6-5/10), light brown in ethanol.

Oscules. Large, up to 4mm diameter alive, surrounded by raised membraneous lip, usually situated on apex of bulbous (flaccid) surface, with drainage canals radiating towards pores; oscules and drainage canals not visible in preserved material.

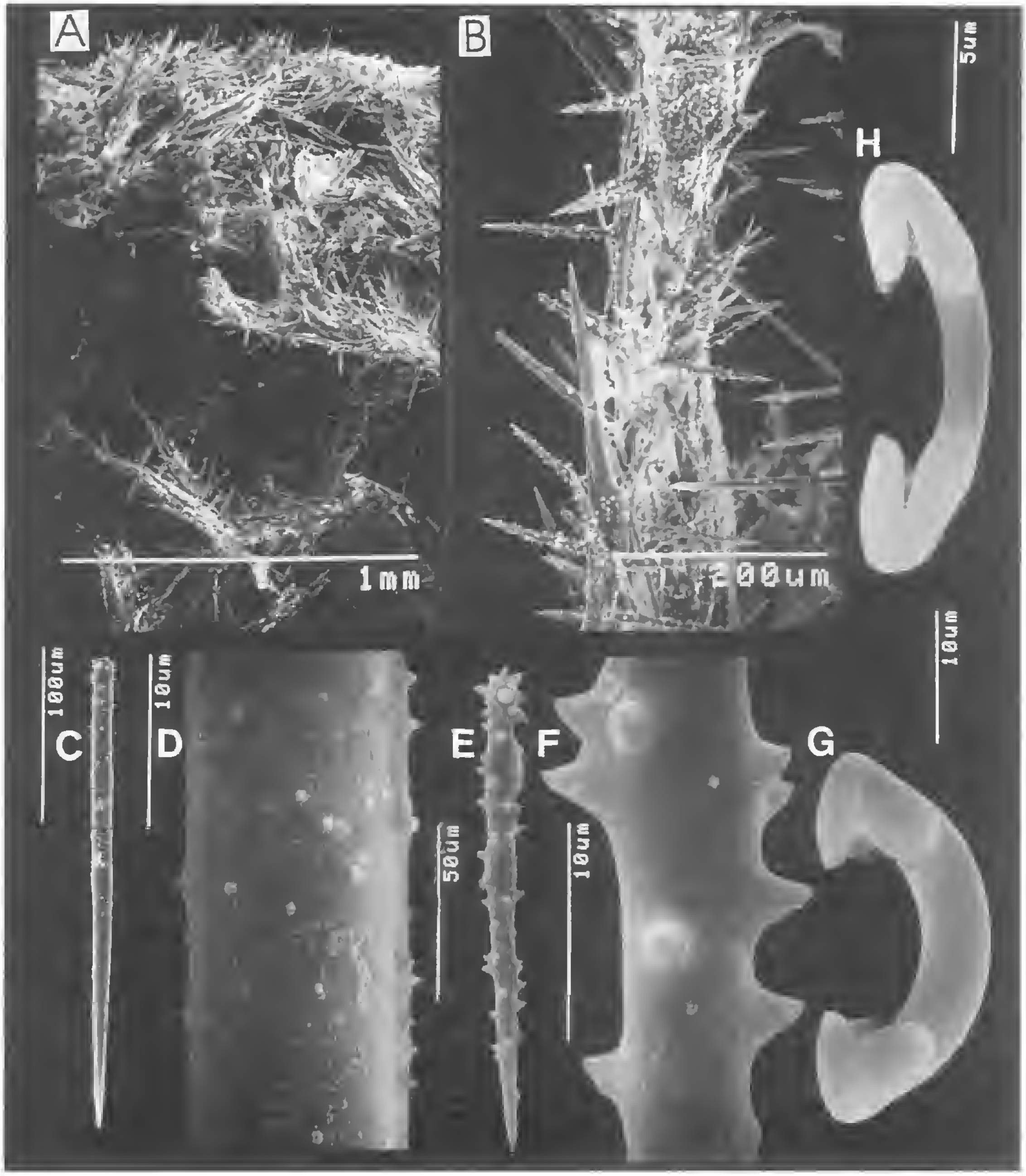

FIG. 99. *Clathria* (*Microciona*) *grisea* (Hentschel) (NTMZ2863). A, Choanosomal skeleton. B, Fibre characteristics. C, Choanosomal principal acanthostyle. D, Spination on principal acanthostyle. E, Echinating acanthostyle. F, Echinating acanthostyle spines. G-H, Smaller and larger arcuate isochelae.

Texture and surface characteristics. Soft, slimy, easily peeled from substrate; smooth, fleshy flaccid surface in life, with slightly sculptured subectosomal drainage canals visible in live sponge; in preserved material surface uneven, regularly papillose.

Ectosome and subectosome. Membraneous, collagenous, rarely intact in histological sections, with some detritus; tips of choanosomal principal

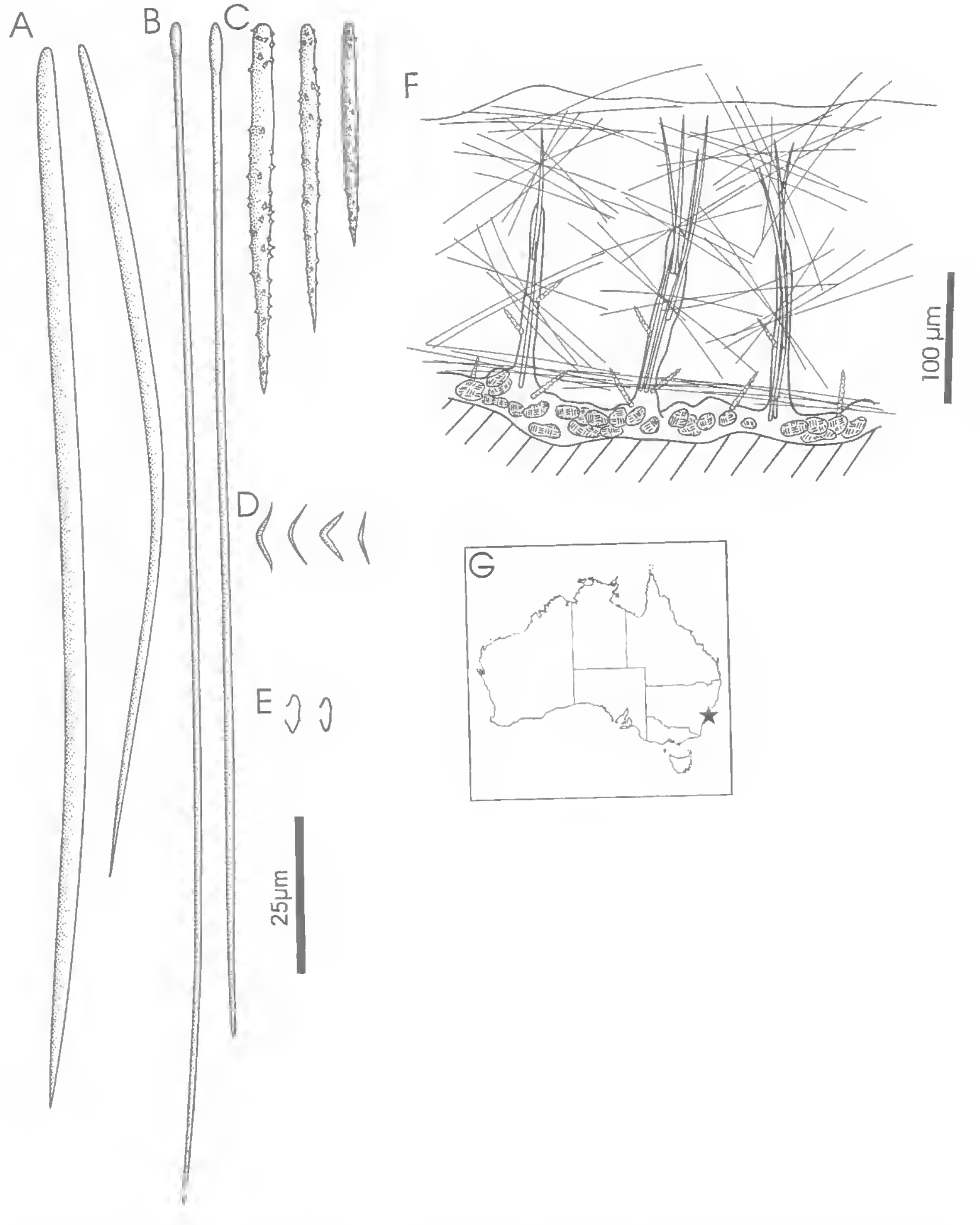

FIG. 100. *Clathria* (*Microciona*) *illawarrae* sp.nov. (holotype QMG304572). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyles. C, Echinating acanthostyles. D, U-shaped toxas. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution.

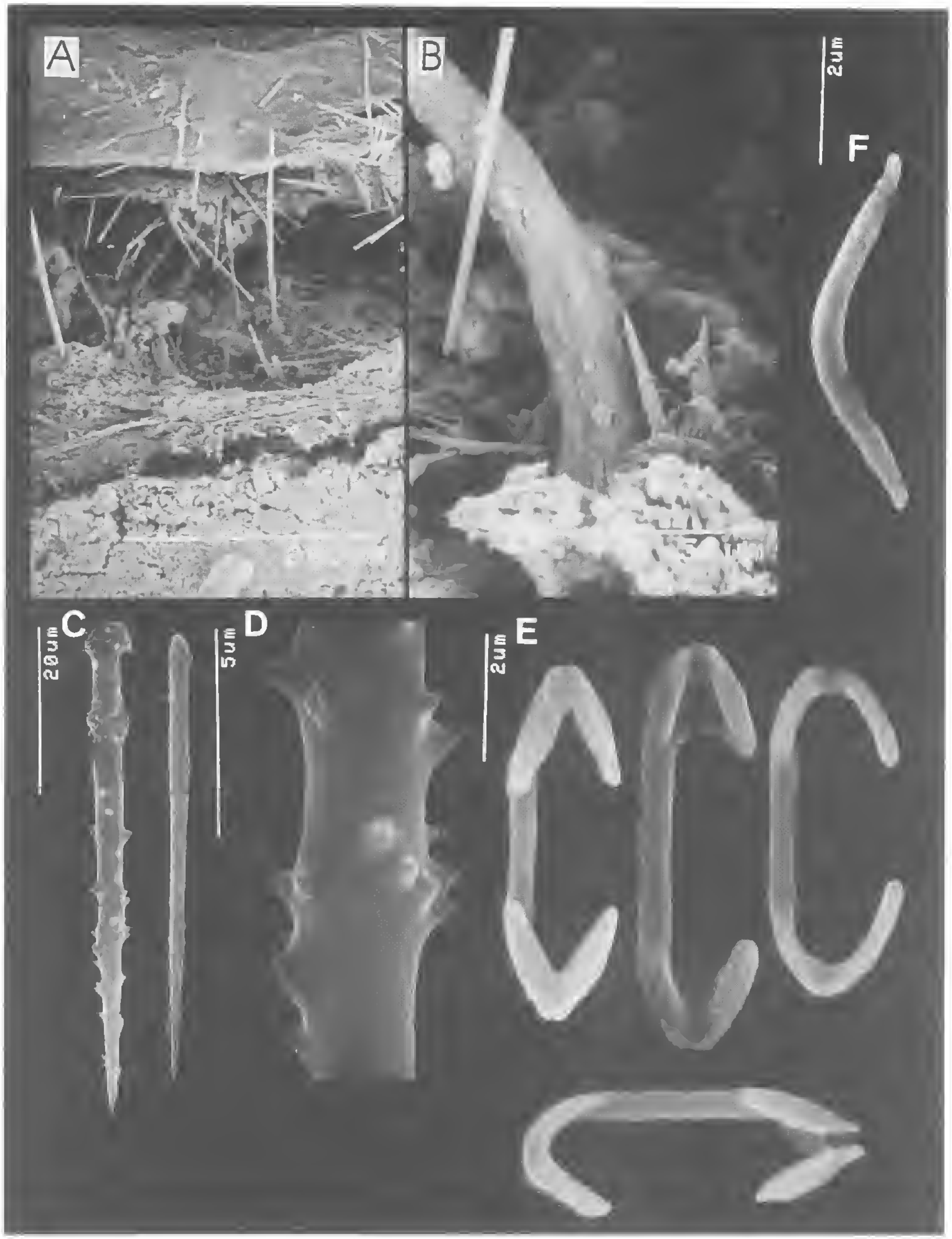

FIG. 101. *Clathria* (*Microciona*) *illawarrae* sp.nov. (holotype QMG304572). A, Hymedesmoid basal skeleton. B, Erect spongin fibre. C, Echinating acanthostyles. D, Acanthostyle spines. E, Reduced palmate isochelae. F, U-shaped toxa.

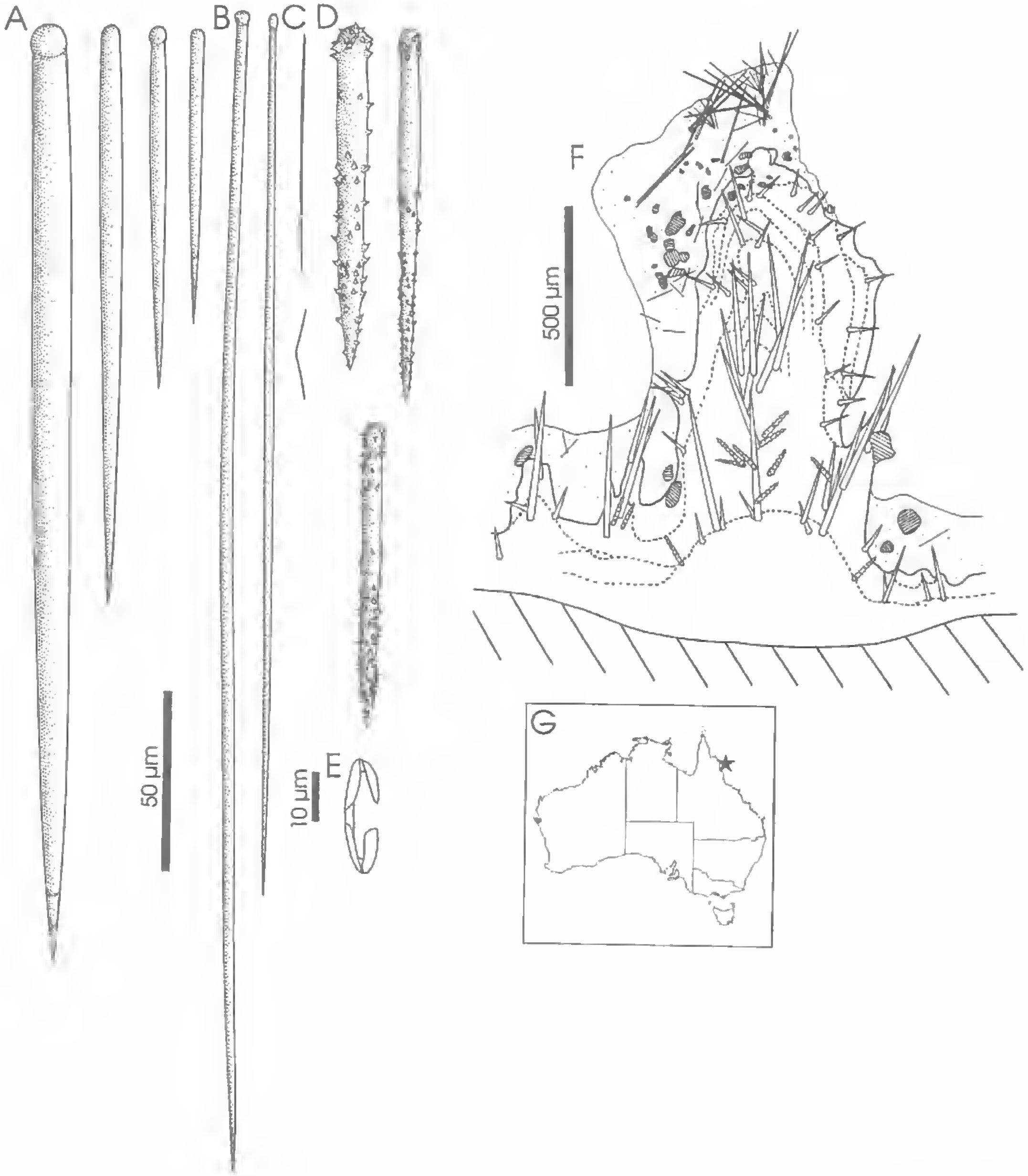

FIG. 102. *Clathria* (*Microciona*) *lizardensis* sp.nov. (holotype QMG304121). A, Choanosomal principal style/ subtylostyles. B, Subectosomal auxiliary subtylostyles. C, Accolada-U-shaped toxas. D, Echinating acanthostyles. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution.

styles arising from fibre endings, and subectosomal auxiliary subtylostyles protrude through surface in preserved material, but probably do not when alive; no special ectosomal skeleton but plumose bundles of subectosomal subtylostyles clustered on intact parts of surface skeleton, usually lying just below the ectosome.

Choanosome. Microcionid skeletal structure, with very thick, relatively long spongin fibre nodes, 450-1900µm long, up to 420µm diameter, arising from hymedesmoid basal spongin fibre, 70-230µm diameter, lying directly on substrate; fibre nodes discrete, erect, without any anastomoses between adjacent nodes, 300-770µm

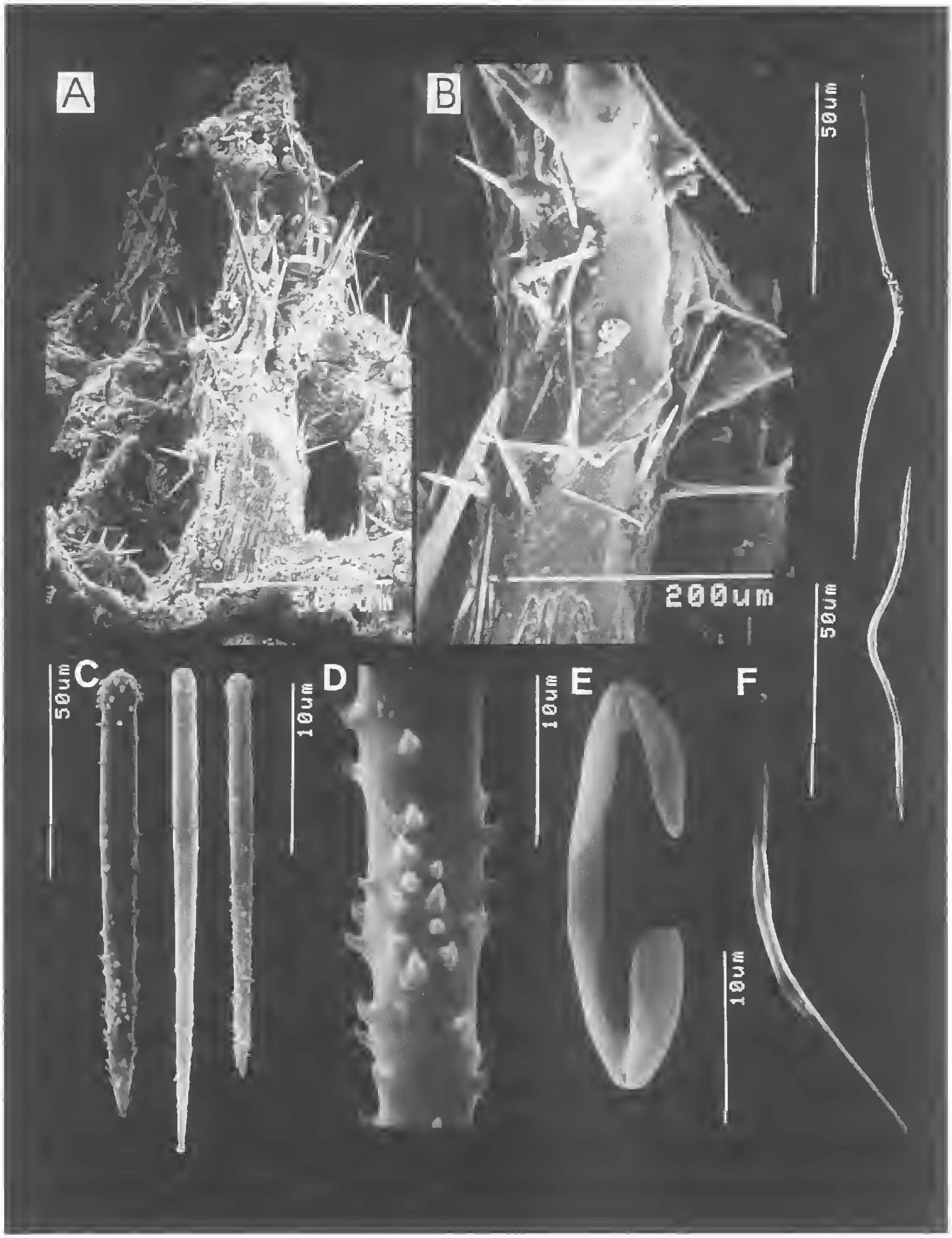

FIG. 103. *Clathria* (*Microciona*) *lizardensis* sp.nov. (holotype QMG304121). A, Choanosomal skeleton. B, Ascending fibre node. C, Echinating acanthostyles. D, Acanthostyle spines. E, Palmate isochela. F, Accolada and u-shaped toxas.

apart, unbranched except at apex of each node which bifurcates 1 or more times; fibres dark brown, with heavy spongin, cored by multi- or paucispicular plumose tracts of choanosomal principal styles, with 1 or more principal styles protruding from apex of each fibre node; fibres moderately heavily echinated by acanthostyles dispersed evenly over each ascending fibre node and all basal fibres; exterior surface of most fibres often with small amount of collagen and plumose bundles of auxiliary spicules lying paratangential to surface (but this is probably an artifact of preservation, the mesohyl region collapsing around the fibres, whereas in life the areas between fibres is likely to contain a more structured aquiferous system); mesohyl matrix granular, containing some detritus, abundant auxiliary spicules, and rare microscleres; choanocyte chambers difficult to see in preserved material, small, oval, up to 40μm diameter.

Megascleres. Choanosomal principal styles long or short, thick, straight, cylindrical or club-shaped, variable basal terminations from tapering hastate, evenly rounded or faintly subtylote, fusiform points. Length 183-(272.3)-345μm, width 8-(12.3)-16μm.

Subectosomal auxiliary subtylostyles long, very slender, usually straight, rarely curved, sometimes sinuous, with well developed smooth subtylote bases, fusiform points. Length 211-(306.2)-428μm, width 2-(3.8)-6μm.

Echinating acanthostyles relatively long, thick, prominently subtylote, fusiform pointed, with more-or-less evenly dispersed very small spines, but abundant larger spines concentrated only on base and point, giving appearance of aspinose shaft. Length 81-(94.3)-112μm, width 4-(6.6)-11μm.

Microscleres. Isochelae palmate, unmodified, uncommon, moderately large, with long broad front ala, reduced lateral alae completely fused to shaft, front and lateral alae approximately the same size. Length 16-(22.4)-28μm.

Toxas uncommon, accolada to u-shaped, long or short, very thin, with slight central curvature, straight arms or faintly reflexed arms. Length 22-(85.5)-112μm, width 1.0-(1.2)-1.5μm.

ETYMOLOGY. For the type locality.

REMARKS. This species has typical 'microcionid' skeletal structure, with long, discrete, virtually unbranched spongin fibre nodes arising from a hymedesmoid basal fibre skeleton. The species is also remarkable for the thickness and density of its spongin fibres, which are even heavier than those found in *C. (T.) corneolia* from New Caledonia (which was named for this character). The external colouration and bulbous surface processes seen in *C. (M.) lizardensis* are also reminiscent of *C. (T.) corneolia*, although spicule geometry, spicule size and skeletal structure differ substantially between the two species (Hooper & Lévi, 1993a), and they do not appear to be otherwise closely related. In its live external appearance this species could also be mistaken for *C. (M.) aceratoobtusa*, but that species has entirely smooth echinating styles, curved principal styles, oxhorn toxas and abundant isochelae. Comparisons with other Indo-west microcionids are discussed in the remarks for *C. (M.) aceratoobtusa*.

OTHER SPECIES OF *CLATHRIA* (*MICROCIONA*)

Clathria (Microciona) adioristica (de Laubenfels, 1953)

Dictyocioua adioristica de Laubenfels, 1953a: 526-528, text-fig.5 [Gulf of Mexico]; Wells et al.,1960: 217-218, text-figs 21,24 [North Carolina].
Clathria (Microciona) adioristica; Van Soest, 1984b: 104, 108-109, table 4 [affinity with Clathria obliqua, possible synonymy].

MATERIAL. HOLOTYPE: USNM23403, paratype MLUM-ML4-214. NW. Atlantic, Caribbean.

Clathria (Microciona) affinis (Cartcr, 1880)

Microciona affinis Carter, 1880a: 41, 151, 153, pl.4,fig.15 [Gulf of Manaar, Ceylon]; Carter, 1881a: 368, 384; Carter, 1882b: 111; Ridley & Dendy, 1887: 110; Dendy, 1889a: 38; Vosmaer, 1935a: 608; Burton, 1959a: 247 [S. Arabian coast, Zanzibar].
Not *Microciona affinis*; de Laubenfels, 1936a: 111.
Not *Hymeraphia affinis* Topsent, 1889: 43, fig.8.

MATERIAL. HOLOTYPE: LFM destroyed, fragment BMNH1936.3.4.597. Gulf of Manaar, Arabian Gulf.

Clathria (Microciona) africana (Lévi, 1956)

Microcioua africana Lévi, 1956b: 402-403, text-fig.8 [Dakar, Sengal].

MATERIAL. HOLOTYPE: MNHNDCL1276. NW. Africa.

Clathria (Microciona) angularis (Sarà & Siribclli, 1960)

Microciona angularis Sarà & Siribelli, 1960: 69-71, fig.18 [Bay of Naples]; Siribelli, 1960: 12, fig.5C [Naples]; Sarà & Siribelli, 1962: 47 [Gulf of Naples]; Pulitzer-Finali, 1983: 610.

MATERIAL. HOLOTYPE: IMZUN100.4. Mediterranean.

Clathria (Microciona) anonyma (Burton, 1959)

Microciona anonyma Burton, 1959a: 250-251, fig.30 [Zanzibar area, Indian Ocean]

MATERIAL. HOLOTYPE: BMNH1936. 3.4.575. Central E Africa.

Clathria (Microciona) armata (Bowerbank, 1862)

Microciona armata Bowerbank, 1862a: 779, 1858, pl.24, figs 26-28; Bowerbank, 1864: 41, pl.4, figs 96-98; Bowerbank, 1866: 124, 129-131, 141 [Britain]; Gray, 1867: 535; Norman, 1869: 330; Schmidt, 1870: 76; Bowerbank, 1874: 60, pl.23, figs 17-24; Carter, 1874b: 405, pl.21, fig.27; Carter, 1874c: 456-457; Carter, 1876: 310; Carter, 1880a: 40-41, 151 [Gulf of Manaar]; Koehler, 1886a: 62 [English Channel]; Topsent, 1888: 117, 124, 125, 141, 156, 158, pl.6, fig.8; Topsent, 1891a: 528 [Roscoff]; Stephens, 1916: 234 [W coast, Ireland]; Stephens, 1921; Vosmaer, 1935a: 6-7, 666; Alander, 1942: 62 [Sweden]; Lévi, 1956b: 399-400, text-fig.6 [Dakar, Senegal]; Koltun, 1959: 181-182, text-fig. 141 [White Sea]; Lévi, 1960a: 73, text-figs 16, 17 [Roscoff,Sidmouth]; Poggiano, 1965: 3, 7, 11-14, text-fig.5, tables 1, 2 [Italy]; Pulitzer-Finali, 1983: 573-574, 610, text-fig. 69 [Mediterranean]; Wintermann-Kilian & Kilian, 1984: 134 [Colombia]; Ackers, Moss & Picton, 1992: 143 [Ireland].

Microciona armatus; Bowerbank, 1882: 7, 18, 53; Sollas, 1884: 614; Vosmaer, 1884a: 121; Vosmaer, 1885b: 353; Koehler, 1886a: 11, 55; Carter, 1889a: 287; Carter & Hope, 1889: 99, 101-106; Dendy, 1889c: 17; Hope, 1889: 333, 336, 337; Chatin, 1890: 889; Topsent, 1890c: 202, 204; Topsent, 1892a: 17; Topsent, 1893d: 445; Norman, 1892: 6, 11; Hanitsch, 1894: 176; Topsent, 1894a: 8, 23; Topsent 1899: 105; Topsent, 1900: 255; Topsent, 1904a: 189; Loisel, 1898: 38; Minchin, 1898: 529; Minchin, 1909: 215; Stephens, 1912: 27; Ferrer Hernández, 1914: 41.

Clathria armata; Topsent, 1925: 649 [discussion]; Van Soest & Stone, 1986: 45 [Norway].

Scopalina armata; Wright, 1868: 224.

Amphilectus armatus; Vosmaer, 1880: 118-119; Vosmaer, 1889: 353; Svarcevskij, 1906: 342; Babic, 1921: 87-88 [Adriatic]; Babic, 1922: 261-262, text-fig.6.

Esperia armata Fristedt, 1885: 36-38.

Not *Microciona armatus*; de Laubenfels, 1936a: 111.

Microciona svarchevskyi de Laubenfels, 1936a: 111; Lévi, 1960a: 73.

cf. *Microciona prolifera*; Vosmaer, 1935a: 607.

MATERIAL. HOLOTYPE: BMNH1910.1.1.66 (1930.7.3.209). Caribbean, NE Atlantic, Gulf of Manaar, NW Africa, Mediterranean. Many of these records are suspect given their disjunct distribution and this taxon is likely to consist of a species complex.

Clathria (Microciona) ascendens
(Cabioch, 1968)

Microciona ascendens Cabioch, 1968a: 239, text-fig.11 [Roscoff, France]; Rodriguez Solórzano et al., 1979: 44, 59-60, text-fig.15 [Galicia, Spain].

MATERIAL. HOLOTYPE: RMBS. NE Atlantic.

Clathria (Microciona) assimilis Topsent, 1925

Clathria assimilis Topsent, 1925: 649; Topsent & Olivier, 1943: 1 [no diagnosis; Adriatic].

Pseudanchinoe assimilis; de Laubenfels, 1936a: 109 [note].

Microciona assimilis; Lévi, 1960a: 76 [Adriatic, Naples, Marseilles]; Siribelli, 1960: 18, text-fig.7C [Naples]; Poggiano, 1965: 3, table 1; Vacelet, 1969: 207, text-fig.46 [Mediterranean]; Pulitzer-Finali, 1977: 61 [Bay of Naples]; Pulitzer-Finali, 1983: 610; Pansini, 1987: 170 [Alboran Sea].

cf. *Clathria compressa*; Topsent, 1925: 649.

MATERIAL. HOLOTYPE: MOM, fragment MNHNDT125. Mediterranean. Possible synonym of *Clathria spinarcus* (Carter & Hope) (Maldonado, 1992: 1152).

Clathria (Microciona) atrasanguinea (Bowerbank, 1862)

Microciona atrasanguinea Bowerbank, 1862c: 824, 1109, 1110, 1135, pl.30, fig.1, pl.74, fig.2 [British Seas]; Bowerbank, 1864: 188, 286, pl.33, fig.368, pl.34, fig.369; Bowerbank, 1866: 7, 124, 138-141 [Britain]; Bowerbank, 1874: 63, pl.24, figs 14-19; Topsent, 1888: 141, 157; Topsent, 1890c: 202, 204; Topsent, 1891a: 528 [Roscoff]; Topsent, 1892c: 17 [Banyuls]; Dendy, 1922: 60, pl.13, fig.1a-e [Egmont Reef]; Burton, 1934b: 37, text-fig.10; Burton, 1938a: 30, pl.4, fig.24 [Madras]; Lilly et al., 1953 [record-Lough Ine, Ireland]; Lévi, 1960a: 72-73, text-fig.15 [English Channel, Atlantic]; Sarà & Siribelli, 1962: 47 [Gulf of Naples]; Lévi, 1965: 18-19, text-fig.21 [Red Sea]; Simpson, 1968a: 33, text-fig.1 [Plymouth,England]; Juniper & Steele, 1969: 161 [Portsmouth, England]; Van Soest & Weinberg, 1980: 10 [Lough Ine, Ireland]; Boury-Esnault, 1971: 326 [Banyuls]; Ackers, Moss & Picton, 1992: 142 [Ireland].

Microciona atrosanguinea; Gray, 1867: 535; Norman, 1869: 330; Schmidt, 1870: 76; Carter, 1870a: 332, 339, 340; Carter, 1871a: 272, 274; Carter, 1871b: 8; Carter, 1872a: 106, 111, pl.10, figs 17-20; Carter, 1874c: 457; Carter, 1875: 195; Carter, 1876: 308; Carter, 1880a: 38-41, 151 [Gulf of Manaar]; Carter, 1880b: 59 [Indian Ocean]; Carter, 1881a: 384 [record]; Bowerbank, 1882: 7, 18, 54; Koehler, 1885: 53, 55; Vosmaer, 1885b: 209; Koehler, 1886a: 61, 62 [English Channel]; Carter, 1887b: 355; Carter & Hope, 1889: 102, 104-106; Dendy, 1889c: 18; Hope, 1889: 334; Topsent, 1889: 39; Topsent, 1890c: 202; Topsent, 1891d: 232; Topsent, 1893d: 445; Topsent, 1894a: 8, 10, 23; Norman, 1892: 6; Hanitsch, 1894: 176; Heider, 1895: 280; Loisel, 1898: 38; Topsent, 1900: 255 [note]; Woodland, 1908: 140, 145; Minchin, 1909: 217; Burton & Rao, 1932: 344-345; [coasts of Bengal, Burma, India and Arabian Sea]; de Laubenfels, 1936b: 448-449 [Panama]; Pulitzer-Finali, 1983: 610; Rodriguez Solórzano et al., 1991: 177 [Galicia, Spain].

Microciona atrasanguineum; Cuenot, 1903: 4 [Arcachon].

Clathria (Microciona) atrasanguinea; Van Soest, 1993: 103 [Mauritius].

Amphilectus atrasanguineus; Vosmaer, 1880: 115.

Plumohalichondria atrasanguinea; Hanitsch, 1890: 207-208, 210 [England].

Scopalina lophyropoda; Schmidt, 1868: 26, 40.

Scopalina atrosanguinea; Schmidt, 1866a: 149; Schmidt, 1866b: 15.

cf. *Microciona prolifera*; Vosmaer, 1935a: 604, 607.

MATERIAL. HOLOTYPE: BMNH1930.7. 3.225, paratypes BMNH1930.7.3.226, 1910.1.1.68. Caribbean, NE Atlantic, Mediterranean, Red Sea, Arabian Gulf, W Indian Ocean, W India, Gulf of Manaar, Bay of Bengal, Andaman Sea.

Clathria (Microciona) basifixa
(Topsent, 1913)

Ophlitaspongia basifixa Topsent, 1913b: 39 [Norway]; Burton, 1935c: 74 [Japan; probable misidentification]; de Laubenfels, 1954: 162 [note].

Clathria (Microciona) basifixa; Van Soest & Stone, 1986: 45 [Norway].

MATERIAL. HOLOTYPE: MOM, fragment MNHNDT1957. NE Atlantic.

Clathria (Microciona) bitoxa (Burton, 1930)

Hymantho bitoxa Burton, 1930a: 503, text-fig.2 [Norway]; Alander, 1942: 63 [Sweden].
Microciona levis; Fristedt, 1887: 416.
Clathria bitoxa; Van Soest, 1984b: 90 [generic synonymy]; Van Soest & Stone, 1986: 47 [note].
Microciona bitoxa Rodriguez Solórzano & Rodriguez Babio, 1993: 62 [Iberian Peninsula].

MATERIAL. HOLOTYPE: BMNH1910.1. 1.787.v, NE Atlantic.

Clathria (Microciona) brepha (de Laubenfels, 1930)

Aaata brepha de Laubenfels, 1930: 27 [California]
Anaata brepha; de Laubenfels, 1936a: 91, text-fig.53.
Clathria brepha; Van Soest, 1984b: 7 [generic synonymy].

MATERIAL. HOLOTYPE: USNM21427. PARATYPES BMNH1929.8.22.36, 57. NE Pacific.

Clathria (Microciona) brondstedi sp. nov.

Hymedesmia pennata Brondsted, 1932: 12 [Faeroe Is].
Anaata pennata; de Laubenfels, 1936a: 109.
Clathria pennata; Van Soest, 1984b: 7 [generic synonymy for *Anaata*].
Not *Desmacella pennata* Lambe, 1895: 129.

MATERIAL. HOLOTYPE: UZM (not located). NE Atlantic. *Clathria (Microciona) pennata* (Lambe, 1895) has seniority.

Clathria (Microciona) bulboretorta (Carter, 1880)

Microciona bulboretorta Carter, 1880a: 41, 42, 151, 153, pl.4, fig.3a-e [Gulf of Manaar, Ceylon]; Vosmaer, 1935a: 608.

MATERIAL. HOLOTYPE: LFM destroyed. Gulf of Manaar.

Clathria (Microciona) bulbotoxa Van Soest, 1984

Clathria (Microciona) bulbotoxa Van Soest, 1984b: 103-104, pl.7, figs 5-8, text-fig.41, table 4 [Curaçao, West Indies].
Microciona bulbotoxa; Pulitzer-Finali, 1986: 149-150 [West Indies].

MATERIAL. HOLOTYPE: ZMAPOR4789. Caribbean.

Clathria (Microciona) calla (de Laubenfels, 1934)

Axociella calla de Laubenfels, 1934: 16 [Puerto Rico].
Axocielita calla; de Laubenfels, 1954: 149 [note]; Sim & Byeon, 1989: 40, pl.5, figs 3-5 [Korea; probable misidentification].
Clathria calla; Boury-Esnault, 1973: 286, text-fig.46 [Brazilian Basin]; Zea, 1987: 170, text-fig.59, pl.2, fig. 3 [Colombian Caribbean].
Clathria (Microciona) calla; Van Soest, 1984b: 100-101, pl.7, fig.1, text-fig.39, table 4 [Curaçao, Florida; affinity with Clathria coralloides from Mediterranean].
Microciona calla; Pulitzer-Finali, 1986: 150 [West Indies].
Microciona rarispinosa Hechtel, 1965: 42-44, text-fig.8 [Port Royal, Jamaica]; Wintermann-Kilian & Kilian, 1984: 135 [Colombia].
Tenaciella obliqua; Alcolado, 1976: 5; Alcolado, 1980: 10.

MATERIAL. HOLOTYPE: USNM. Caribbean, tropical SW Atlantic.

Clathria (Microciona) campecheae nom. nov.

Hymeraphia affinis Topsent, 1889: 43, fig.8A [Banc de Campêche]; Topsent, 1904a: 162-3 [Azores].
Microciona affinis; de Laubenfels, 1936a: 111.
Clathria (Microciona) affinis; Van Soest, 1984b: 93-95, 108, text-fig.36, table 4 [Curaçao, West Indies].
Clathria cf. *affinis*; Kobluk & Van Soest, 1989: 1216 [Bonaire].
Not *Microciona affinis* Carter, 1880a: 41, pl.14, fig.15; Vosmaer, 1933: 608.

MATERIAL. HOLOTYPE: MNHNDT1841, paratype MNHNDT3584. Caribbean, NE Atlantic. *Clathria (Microciona) affinis* (Carter, 1880a) has priority.

Clathria (Microciona) carnosa (Bowerbank, 1862)

Microciona carnosa Bowerbank, 1862a: 804, 1110 [Britain]; Bowerbank, 1866: 133; Vosmaer, 1935a: 607
? *Halichondria incrustans*; Schmidt, 1866a: 150

MATERIAL. HOLOTYPE: BMNH1930.7. 3.203, fragment BMNH1910.1.1.666. NE Atlantic, tropical SW. Atlantic.

Clathria (Microciona) claudei sp. nov.

Microciona acanthotoxa Lévi & Lévi, 1989: 81, fig.49 [Philippines].

MATERIAL. HOLOTYPE: MNHNDCL3411. Philippines. Clathria acanthotoxa (Stephens) has seniority.

Clathria (Microciona) cleistochela Topsent, 1925

Clathria cleistochela Topsent, 1925: 650-651, fig.9 [Gulf of Naples].
Microciona cleistochela; de Laubenfels, 1936a: 111 [note]; Lévi, 1960a: 72, fig.14 [Naples,Banyuls]; Siribelli, 1960: 12-14, fig.5B [Naples]; de Laubenfels, 1951b: 214 [Black Sea]; Pulitzer-Finali, 1983: 610; Boury-Esnault & Lopes, 1985: 193-194, fig.42 [Azores].

MATERIAL. HOLOTYPE: MOM, fragment MNHNDT329. Mediterranean, NE Atlantic.

Clathria (Microciona) coccinea (Bergquist, 1961)

Microciona coccinea Bergquist, 1961a: 38, fig.8a,b [N. New Zealand]; Bergquist & Sinclair, 1968: 427, 428, fig.1a [morphology and larvae]; Bergquist & Sinclair, 1973: 43; Bergquist et al., 1970: 248, 254; Evans & Bergquist, 1977: 195-196; Bergquist & Fromont, 1988: 102-103, pl.47, fig.f, pl.48, fig.a; Rudman & Avern, 1989: 335; Dawson, 1993: 36 [note].
Not *Thalisias coccinea* Duchassaing & Michelotti, 1864: 84, pl.18, fig.5 [St.Thomas]; Wiedenmayer, 1977a: 253, table 49.

MATERIAL. HOLOTYPE: NMNZ unregistered. New Zealand.

Clathria (Microciona) ctenichela (Alander, 1942)

Microciona ctenichela Alander, 1942: 61-62, pl.15, fig.20 [Sweden].
Clathria (Microciona) ctenichela; Van Soest & Stone, 1986: 44-45 [Norway].

MATERIAL. HOLOTYPE: ZMA. NE Atlantic.

Clathria (Microciona) dendyi (Bergquist & Fromont, 1988)

Microciona dendyi Bergquist & Fromont, 1988: 100-102, pl.47, figs d,e [Slipper I.]; Dawson, 1993: 37 [note].

MATERIAL. HOLOTYPE: NMNZPOR114. New Zealand.

Clathria (Microciona) densa (Burton, 1959)

Microciona densa Burton, 1959a: 248, text-fig.28 [S Arabian coast]

MATERIAL. HOLOTYPE: BMNH1936.3. 4.456. Arabian Gulf.

Clathria (Microciona) dianae (Schmidt, 1875)

Suberites dianae Schmidt, 1875: 116, pl.1,fig.1 [Norway]; Czerniawsky, 1880: 70.

Microciona dianae; Thiele, 1903b: 394, 395, 398, pl.21, fig.28a-e; Vosmaer, 1935a: 608, 630; de Laubenfels, 1936a: 111 [note].

Not *Artemisina dianae* Topsent, 1907: 69; Vosmaer, 1935a: 630.

Clathria dianae; Van Soest & Stone,1986: 47 [note].

MATERIAL. HOLOTYPE: unknown. NE Atlantic.

Clathria (Microciona) ditoxa (Stephens, 1916)

Eurypon ditoxa Stephens, 1916: 239-240 [W coast of Ireland]; Stephens, 1921: 51, pl.5; Burton, 1959b: 44-45 [Iceland].

Microciona ditoxa; Lévi, 1960a: 66 [W coast of Ireland, Atlantic].

Dictyociona ditoxa; de Laubenfels, 1936a: 110 [note].

MATERIAL. HOLOTYPE: INMSR151.9.1916. NE Atlantic.

Clathria (Microciona) duplex Sarà, 1958

Clathria duplex Sarà, 1958: 262-264, fig.24 [Gulf of Naples].

Microciona duplex; Lévi, 1960a: 69 [Naples]; Siribelli, 1960: 14-15, fig.6A [Naples]; Sarà, 1963: 210 [Gulf of Policastro]; Pulitzer-Finali, 1983: 610; Rodriguez Solórzano et al., 1991: 179, fig.3 [Galicia, Spain].

MATERIAL. HOLOTYPE: IMZUN93.26.x.58. Mediterranean.

Clathria (Microciona) echinata (Alcolado, 1984)

Axociella echinata Alcolado, 1984: 7 [Cuba].

Clathria echinata; Kobluk & Van Soest, 1989: 1216; Meesters et al., 1991: 194 [Curaçao, Bonaire].

Clathria (Microciona) simpsoni Van Soest, 1984b: 97-99, pl.7, figs 2-4, text-fig.38, table 4 [Puerto Rico, Curaçao]; Pulitzer-Finali, 1986: 150 [West Indies].

Clathria simpsoni; Zea, 1987: 168, text-fig.58, pl.3, fig.1 [Colombian Caribbean].

MATERIAL. HOLOTYPE: Cuba. Holotype of simpsoni: ZMAPOR3332. Caribbean.

Clathria (Microciona) elliptichela (Alander, 1942)

Microciona elliptichela Alander, 1942: 58-61 [Sweden].

Clathria elliptichela; Van Soest & Stone, 1986: 45 [note].

MATERIAL. HOLOTYPE: ZMA. NE Atlantic.

Clathria (Microciona) fallax (Bowerbank, 1866)

Microciona fallax Bowerbank, 1866: 124, 128, 129, 135 [Hastings, Britain]; Vosmaer, 1935a: 607; Curtis, 1970: 260-261 [cytology]; Ackers, Moss & Picton, 1992: 147 [Ireland].

Sophax fallax; Gray, 1867: 521.

MATERIAL. LECTOTYPE-BMNH1910.1. 1.71. PARALECTOTYPE BMNH1930.7.3.198, fragment USNM5047. NE Atlantic.

Clathria (Microciona) fascispiculifera (Carter, 1880)

Microciona fascispiculifera Carter, 1880a: 44, 45, 151, 153, pl.4, fig.7a-g [Gulf of Manaar]; Hallmann, 1916c: 637 [note]; [?] Vosmaer, 1935a: 608.

Damoseni fascispiculifera; de Laubenfels, 1936a: 110.

MATERIAL. HOLOTYPE: LFM destroyed, no extant fragment in BMNH. Gulf of Manaar.

Clathria (Microciona) fraudata (Bowerbank, 1874)

Microciona fraudata Bowerbank, 1874: 273, 275, 277, pl.83, figs 7-11 [Polperro, Fowey Hbr.]; Vosmaer, 1935a: 607.

MATERIAL. HOLOTYPE: BMNH1930.7.3. 205. NE Atlantic.

Clathria (Microciona) frogeti (Vacelet, 1969)

Microciona frogeti Vacelet, 1969: 208, text-fig.47 [Mediterranean].

Microciona fregeti [sic.], Pulitzer-Finali, 1983: 610 [list].

MATERIAL. HOLOTYPE: MNHN missing. W Mediterranean.

Clathria (Microciona) gradalis Topsent, 1925

Clathria gradalis Topsent, 1925: 651-653 [Gulf of Naples]; Topsent & Olivier, 1943: 1 [Monaco]; Sarà, 1958: 258-260, text-fig.22 [Gulf of Naples]; Sarà, 1960a: 461 [Ischia].

Clathria gradalis var. *atoxa*; Topsent, 1928a: 299, pl.10, fig.14 [Boavista I., Senegal].

Microciona gradalis; de Laubenfels, 1936a: 111; Lévi, 1960a: 75 [W Mediterranean]; Sarà & Siribelli, 1960: 67 [Bay of Naples]; Siribelli, 1960: 16, text-fig.6B [Naples]; Sarà & Siribelli, 1962: 47-48 [Gulf of Naples]; Poggiano, 1965: 3, table 1; Cabioch, 1968a: 244 [Roscoff, N. France]; Vacelet, 1969: 207 [W Mediterranean]; Pulitzer-Finali, 1977: 63 [Bay of Naples]; Pulitzer-Finali, 1983: 610.

MATERIAL. HOLOTYPE: MOM, fragment MNHNDT328. Mediterranean, NE Atlantic, NW Africa.

Clathria (Microciona) haematodes (de Laubenfels, 1957)

Microciona haematodes de Laubenfels, 1957: 240, text-fig.6 [Oahu, Hawaii]; Bergquist, 1977: 67 [Hawaii].

MATERIAL. HOLOTYPE: USNM23533. Hawaii

Clathria (Microciona) haplotoxa (Topsent, 1928)

Leptoclathria haplotoxa Topsent, 1928a: 298, pl.10, fig.16 [Madeira I.]; [cf.] Topsent, 1934b: 24.

Microciona haplotoxa; Topsent, 1934a: 92-93 [Gulf of Gabes, Tunisia]; Lévi, 1956b: 400-402, text-fig.7 [Dakar, Senegal]; Lévi, 1960a: 70 [Madeira, Tunisia]; Pulitzer-Finali, 1983: 610.

MATERIAL. HOLOTYPE: MNHNDT1101. Mediterranean, NE Atlantic, NW Africa.

Clathria (Microciona) hentscheli sp. nov.

Hymeraphia lendenfeldi Hentschel, 1912: 378-379, pl.20, fig. 35 [Mimien Bay, Aru I., Arafura Sea].

Eurypon lendenfeldi; de Laubenfels, 1936a: 110.

Not *Clathria lendenfeldi* Ridley & Dendy, 1886: 474.

MATERIAL. LECTOTYPE: SMF 1705. Indonesia. *Clathria (Thalysias) lendenfeldi* Ridley & Dendy has priority.

Clathria (Microciona) heterotoxa (Hentschel, 1929)

Microciona heterotoxa Hentschel, 1929: 891-892, 970, pl.14, fig.5 [White Sea]; Koltun, 1959: 182-183, text-fig.142 [Arctic, USSR].

Dictyociona heterotoxa; de Laubenfels, 1936a: 110 [note]; de Laubenfels, 1953a: 527.

MATERIAL. HOLOTYPE: HM or ZMB (not located). Arctic.

Clathria (Microciona) hymedesmioides Van Soest, 1984

Clathria (Microciona) hymedesmioides Van Soest, 1984b: 104-105, pl.7, figs 9-10, text-fig.42, table 4 [Curaçao].

MATERIAL. HOLOTYPE: ZMAPOR4790. Caribbean.

Clathria (Microciona) ixauda (Lévi, 1969)

Microciona ixauda Lévi, 1969: 965, text-fig.7a [Vema Seamount].

MATERIAL. HOLOTYPE: MNHNDCL1415. S Atlantic.

Clathria (Microciona) jecusculum (Bowerbank, 1866)

Hymeniacidon jecusculum Bowerbank, 1866: 198 [Harris I., Hebrides].

Microciona jecusculum; Bowerbank, 1874: 273-275, pl.83, figs 1-6; Carter, 1876: 237 [Cape St. Vincent; Faroe Is]; Vosmaer, 1933: 607 [imperfectly known].

MATERIAL. HOLOTYPE: unknown; fragments BMNH1954.3.9.176, 177. NE Atlantic.

Clathria (Microciona) kentii (Bowerbank, 1874)

Microciona kentii Bowerbank, 1874: 311, 312, 317-319, pl.89, figs 9-13 [Jersey, Strangford Lough]; Vosmaer, 1935a: 607.

MATERIAL. HOLOTYPE: BMNH1910.1.1.77, fragment USNM5044. NE Atlantic.

Clathria (Microciona) laevis (Bowerbank, 1866)

Microciona laevis Bowerbank, 1866: 124, 127-128 [Britain]; Stephens, 1917: 12, pl.1, fig.3 [N. of Bolus Head, Ireland]; Vosmaer, 1935a: 607; Burton, 1959b: 43 [Iceland].

Not *Microciona laevis*; Fristedt, 1887: 415.

Abila laevis; Gray, 1867: 539.

Hymantho laevis; de Laubenfels, 1936a: 111; Alander, 1942: 63 [Sweden].

MATERIAL. HOLOTYPE: BMNH1930.7.3.215. NE Atlantic.

Clathria (Microciona) laevissima (Dendy, 1922)

Hymedesmia laevissima Dendy, 1922: 81-82, pl.15, fig.1 [Mauritius].

Folitispa laevissima; de Laubenfels, 1936a: 119 [note].

MATERIAL. HOLOTYPE: BMNH1921.11.7.69. W Indian Ocean.

Clathria (Microciona) lajorei (de Laubenfels, 1954)

Anaata lajorei de Laubenfels, 1954: 147-148, text-fig. 95 [Ailing-lap-lap Atoll].

Clathria lajorei; Van Soest, 1984a: 129 [generic synonymy].

MATERIAL. HOLOTYPE: USNM22827. W central Pacific.

Clathria (Microciona) leighensis sp. nov.

Microciona rubens Bergquist, 1961a: 38, text-fig.9 [NNew Zealand]; Bergquist & Green, 1977b: 289-302 [ontogeny]; Bergquist & Fromont, 1988: 103, pl.48, figs b-c [N New Zealand]; Dawson, 1993: 37 [note].

Not *Thalassodendron rubens* Lendenfeld, 1888: 223.

MATERIAL. HOLOTYPE: NMNZ unregistered. New Zealand. *C (Clathria) rubens* (Lendenfeld, 1888) has priority.

Clathria (Microciona) levii (Sarà & Siribelli, 1960)

Microciona levii Sarà & Siribelli, 1960: 71-73, text-fig.19 [Bay of Naples]; Siribelli, 1960: 6-8, text-fig.2 [Naples]; Poggiano, 1965: 3, table 1; Pulitzer-Finali, 1983: 610 [list].

MATERIAL. HOLOTYPE: IMZUN31. Mediterranean.

Clathria (Microciona) longispiculum (Carter, 1876)

Microciona longispiculum Carter, 1876: 231, 237, 238, 470, pl.12, fig.1h, pl.15, fig.31a-c [N. Scotland]; Vosmaer, 1935a: 608 [insufficiently known].

MATERIAL. HOLOTYPE: BMNH1887.10.29.3. NE Atlantic.

Clathria (Microciona) longistyla (Burton, 1959)

Microciona longistyla Burton, 1959a: 249-250, text-fig.29 [S. Arabian coast]; Sim & Kim, 1988: 26 [Korea]; Sim & Byeon, 1989: 40 [Korea; possible misidentifications].

MATERIAL. HOLOTYPE: BMNH1936.3.4. 583. Arabian Gulf, ? S China Sea.

Clathria (Microciona) macrochela (Lévi, 1960)

Microciona macrochela Lévi, 1960a: 70, text-fig.13 [Roscoff].

MATERIAL. HOLOTYPE: MNHNDCL940. NE Atlantic.

Clathria (Microciona) microjoanna (de Laubenfels, 1930)

Microciona microjoanna de Laubenfels, 1930: 27 [Carmel, California]; de Laubenfels, 1932: 93-95, text-fig.55 [California]; Bakus, 1966: 433-435, text-fig.4, table 4 [San Juan Arch., Washington State]; Lee & Gilchrist, 1985: 24-32 [biochemistry]; Bakus & Green, 1987: 72 [S. California].

MATERIAL. HOLOTYPE: USNM21468. PARATYPE USNM21469, fragment BMNH1929.8.22.28. NE Pacific.

Clathria (Microciona) micronesia (de Laubenfels, 1954)

Microciona micronesia de Laubenfels, 1954: 145-146, text-fig.93 [Majuro Atoll].

MATERIAL. HOLOTYPE: USNM22833. W central Pacific.

Clathria (Microciona) microxea (Vacelet & Vasseur, 1971)

Paratenaciella microxea Vacelet & Vasseur, 1971: 103, text-fig.61 [Tulear, Madagascar].

MATERIAL. HOLOTYPE: MNHNDJV27. W Indian Ocean.

Clathria (Microciona) mima (de Laubenfels, 1954)

Ophlitaspongia mima de Laubenfels, 1954: 161-162, text-fig.105 [Majuro Atoll, central W. Pacific]; Wintermann-Kilian & Kilian, 1984: 135 [Colombia].

MATERIAL. HOLOTYPE: USNM22839. NW central Pacific, Caribbean.

Clathria (Microciona) namibiensis (Uriz, 1984)

Micraciana namibiensis Uriz, 1984b: 111-113, text-figs 3 A-B, 5D; Uriz, 1988a: 87 [Namibia].

MATERIAL. HOLOTYPE: ABIPB-12. SW Africa.

Clathria (Microciona) normani (Burton, 1930)

Hymantha normani Burton, 1930a: 503, text-fig.1 [Norway].

Clathria normani; Van Soest, 1984b: 90 [generic synonymy]; Van Soest & Stone, 1986: 46-47 [note].

MATERIAL. HOLOTYPE: BMNH1910.1.1.791.iii. NE Atlantic.

Clathria (Microciona) novaezealandiae (Brondsted, 1924)

Microciona novaezealandiae Brondsted, 1924: 463-464, text-fig.19 [Slipper Is]; Bergquist & Fromont, 1988: 103-104; Dawson, 1993: 37.

Wetmoreus novaezealandica; de Laubenfels, 1936a: 112.

MATERIAL. HOLOTYPE: UZM not located, no fragment in BMNH. New Zealand

Clathria (Microciona) osismica (Cabioch, 1968)

Microciona osismica Cabioch, 1968a: 240-244, text-fig.12 [Roscoff, France].

MATERIAL. HOLOTYPE: RMBS. NE Atlantic.

Clathria (Microciona) parthena (de Laubenfels, 1930)

Micraciona parthena de Laubenfels, 1930: 27 [California]; de Laubenfels, 1932: 95-96, text-fig.56 [California]; Henkart et al., 1973: 3045-3050, text-figs 1-5 [biochem.]; Cauldwell et al., 1973: 3051-3058, text-figs 1-5 [biochem.]; Lee & Gilchrist, 1985: 24-32 [biochem.]; Sim & Bakus, 1986: 9 [California]; Bakus & Green, 1987: 72-73 [S. California].

MATERIAL. HOLOTYPE: USNM21383. PARATYPE BMNH1929.9.30.6. NE Pacific.

Clathria (Microciona) pennata (Lambe, 1895)

Desmacella pennata Lambe, 1895: 129, pl.4, figs 6a-d [Sooke, Vancouver I., Canada]; Ricketts & Calvin, 1948: 34 [Vancouver I., Canada].

Ophlitaspangia pennata; de Laubenfels, 1927: 265-266, text-figs 1-4 [Laguna Beach and Monterey Pen., California]; de Laubenfels, 1930: 28; Burton, 1930a: 521; de Laubenfels, 1932: 103, text-fig.62 [var. *californiana*]; Hewatt, 1946: 193 [California]; Hartman (in Light, 1954): 20 [California]; de Laubenfels, 1954: 162 [note]; Burton, 1959a: 247 [key to species]; de Laubenfels, 1961: 198, fig.1 [California and Washington State]; Bakus, 1966: 435-440, text-fig.5, tables 5-6 [et var., San Juan Arch., Washington]; Anderson, 1973: 5668 [associates]; Lee & Gilchrist, 1985: 24-32 [biochem.]; Sim & Bakus, 1986: 10; Bakus & Green, 1987: 73 [var. *califarniana*]; Sim & Byeon, 1989: 37, pl.1, figs 1-4 [var. *califarniana*; Korea]; Lee & Klontz, 1991: 61 [chemistry].

Tylodesma pennata; Koltun, 1959: 96 text-fig.51, 1-3 [S. Kuriles].

Biemna pennata; Koltun, 1958: 54.

Ophlitaspongia affinis basifixa; Burton, 1935c: 74 [Possiet Bay, Sea of Japan].

Microciona pennata; Simpson, 1968a: 40, pl.15 [Washington State].

Clathria (Ophlitaspongia) pennata; Rudman & Avern, 1989: 335 [associates; probable misidentification of sponge].

Not *Pandaros pennata* Duchassaing & Michelotti, 1864: 88.

Not *Hymedesmia pennata* Brondsted, 1932: 12 [see C. brondstedi sp. nov.].

MATERIAL. HOLOTYPE: USNM7488. PARATYPE NMCIC1900-2826. NE Pacific, NW. Pacific, Japan.

Clathria (Microciona) plana (Carter, 1876)

Microciona planum Carter, 1876: 238, 472 [Cape St. Vincent, Hebrides].

Microciona plana; Topsent, 1889: 41-42 [Banc de Campêche]; Norman, 1892: 9.

Amphilectus planus; Vosmaer, 1880: 121; Dendy, 1889: 18.

Clathria plana; Topsent, 1894b: 30; Van Soest, 1984b: 108 [unrecognisable].

cf. *Microciona prolifera*; Vosmaer, 1935a: 608.

MATERIAL. HOLOTYPE: BMNH1890.4.10.13. NE Atlantic.

Clathria (Microciona) plinthina (de Laubenfels, 1954)

Microciona plinthina de Laubenfels, 1954: 144-145, text-fig.92 [Ailing-lap-lap Atoll].

MATERIAL. HOLOTYPE: USNM22949. W central Pacific.

Clathria (Microciona) poecilosclera (Sarà & Siribelli, 1960)

Microciona paecilasclera Sarà & Siribelli, 1960: 73-75, text-fig.20 [Bay of Naples]; Siribelli, 1960: 18, text-fig.7B [Naples]; Poggiano, 1965: 3, table 1; Pulitzer-Finali, 1983: 610.

MATERIAL. HOLOTYPE: IMZUN350. Mediterranean.

Clathria (Microciona) polita (Ridley, 1881)

Hymedesmia polita Ridley, 1881: 121-122, pl.10, fig.9 [Sandy Point, Magellan Straits; supposed affinities with Clathria tuberosa (Bowerbank)].

Microciona polita; Topsent, 1900: 113 [English Channel; identified with doubt].

MATERIAL. HOLOTYPE: BMNH1879.12.27.22. SW Atlantic, NE. Atlantic.

Clathria (Microciona) primitiva (Koltun, 1955)

Micraciona primitiva Koltun, 1955a: 16-17, text-fig.6 [Behring Sea]; Burton, 1959: 43 [Iceland]; Koltun, 1959: 184, text-fig. 144 [USSR].

Not *Clathriella primitiva* Burton, 1935c: 73.

MATERIAL. HOLOTYPE: ZIL, fragments BMNH1932.1.1.241, 572. Boreal region.

Clathria (Microciona) proxima (Lundbeck, 1910)

Hymedesmia proxima Lundbeck, 1910: 81 [Denmark Strait].

Anaata proxima; de Laubenfels, 1936a: 109 [imperfectly known].

Clathria proxima; Van Soest, 1984b: 7 [generic synonymy for Anaata].

MATERIAL. HOLOTYPE: ZRS. NE Atlantic.

Clathria (Microciona) pugio (Lundbeck, 1910)

Hymedesmia pugio Lundbeck, 1910: 94 [Denmark Strait].

Anaata pugio; de Laubenfels, 1936a: 109.

Clathria pugio; Van Soest, 1984b: 7 [generic synonymy for Anaata].

MATERIAL. HOLOTYPE: ZRS. NE Atlantic.

Clathria (Microciona) pustulosa (Carter, 1882)

Halichondria pustulosa Carter, 1882a: 285, pl.11, fig.1 [vicinity of Pantagonia and Falkland Is].

Not *Halichondria pustulosa*; Carter, 1886g: 450 [Port Phillip Bay, Victoria].

Anaata pustulosa; de Laubenfels, 1936a: 109.

MATERIAL. HOLOTYPE: BMNH not found, fragment BMNH1954.3.9.233. SW Atlantic.

Clathria (Microciona) quadriradiata (Carter, 1880)

Microciona quadriradiata Carter, 1880a: 42, 43, 151, 153, pl.4, figs 4a-d [Gulf of Manaar]; [?] Vosmaer, 1935a: 608.

MATERIAL. HOLOTYPE: LFM destroyed. Gulf of Manaar.

Clathria (Microciona) rhopalophora (Hentschel, 1912)

Hymeraphia rhopalophora Hentschel, 1912: 380, pl.20, fig.37 [Aru I., Arafura Sea].

Microciona rhopalophora; Burton, 1959a: 248 [Maldives]; Thomas, 1970b: 206, text-fig.7 [Cocos-Keeling Basin, Gulf of Manaar].

Eurypon rhopalophora; de Laubenfels, 1936a: 111.

MATERIAL. HOLOTYPE: HM (fragment SMF992). Indonesia.

Clathria (Microciona) scotti Dendy, 1924

Clathria scotti Dendy, 1924a: 352, pl.10, fig.1, pl.14, figs 5-8 [E of North Cape, New Zealand].

Pseudanchinoe scotti; de Laubenfels, 1936a: 109 [note]; Bergquist & Fromont, 1988: 110-111, pl.51, figs b-d [N. New Zealand]; Dawson, 1993: 39 [note].

MATERIAL. HOLOTYPE: BMNH1923.10. 1.128, paratypes BMNH1923.10.1.129-131, AMZ2568. New Zealand.

Clathria (Microciona) seriata (Grant, 1826)

Spongia seriata Grant, 1826: 116.

Halichondria seriata; Johnston, 1842: 74, 125, 197, 248, 258, pl.14, fig.2; Gray, 1848: 12,16.

Haliclona seriata; Bowerbank, 1861: 235; Bowerbank, 1862a: 769, 824, pl.29, fig.10.

Chalina seriata; Bowerbank, 1864: 24,2275, pl.17, fig.287; Bowerbank, 1866: 139, 294, 361, 376-378; Wright, 1868: 228; Norman, 1869: 298-299; Schmidt, 1870: 3, 77; Carter, 1871b: 196.

Clathria seriata; Schmidt, 1866b: 10, 24, pl.1, fig.7; Vosmaer, 1935a: 619 [uncertain affinity]; Hanitsch, 1889: 158; Hanitsch, 1890: 205-207 [England]; Babic, 1921: 84 [Adriatic]; Babic, 1922: 244-245, text-fig.T [Adriatic].

Seriatula seriata; Gray, 1867: 515.

Desmacidon seriata; Schmidt, 1868: 12.

? *Desmacodes seriatus*; Vosmaer, 1880: 107.

Ophlitaspongia seriata; Bowerbank, 1874: 6, 167, pl.65, figs 1-4; Carter, 1875: 196; Bowerbank, 1882: 14, 24, 120, 186-188; Carter, 1883b: 314; Vosmaer, 1885: 357; MacMunn, 1888: 12, 14, 20; Dendy, 1889c: 14; Topsent, 1890c: 204; Topsent, 1891a: 529; Norman, 1892: 8; Minchin, 1900: 20, fig.32; Thiele, 1905: 450-451; Kirkpatrick, 1907: 274; Kirkpatrick, 1908a: 26; Weltner, 1910a: 23; Hallmann, 1912: 254; Stephens, 1912: 3, 28; Stephens, 1916: 234 [Ireland]; Ferrer Hernández, 1914: 43; Lilly et al., 1953 [Ireland]; de Laubenfels, 1954: 161-162 [note]; Burton, 1959a: 247 [key to species of *Ophlitaspongia*]; Lévi, 1960a: 64-65, text-fig.9 [Atlantic]; Lévi, 1963: 59-60, text-fig. 69, pl.9B-C [Cape Town, South Africa]; Bergquist & Sinclair, 1968: 427, 428, text-fig.1B [larvae, New Zealand]; Bergquist & Hogg, 1969: 207, 210; Fry, 1970: 135-157 [ecology]; Fry, 1971: 155-178 [larvae]; Bergquist & Sinclair, 1973: 37-39; Fry, 1973: 159-170 [ecology]; Van Soest & Weinberg, 1980: 10 [Lough Ine, Ireland]; Lee & Gilchrist, 1985: 24-32 [biochemistry]; Rudman & Avern, 1989: 335 [associates]; Ackers, Moss & Picton, 1992: 147 [Ireland]; Dawson, 1993: 38 [note].

Echinoclathria seriata; Topsent, 1893d: 445; Hanitsch, 1894: 179; Hanitsch, 1895: 212; Heider, 1895: 281; Topsent, 1896: 114; Loisel, 1898: 38; Minchin, 1900: 20; Whitelegge, 1907: 503.

Microciona seriata; Simpson, 1968a: 37, pls 9-10, text-fig.2 [Plymouth, England]

Not *Rhaphidophlus seriatus* Thiele, 1899: 14, pl.1, fig.6, pl.5, fig.7 [Celebes].

Ophlitaspongia papilla Bowerbank, 1866: 14, 378-380 [Vazon Bay, Guernsey]; Bowerbank, 1874, pl.70, figs 1-4; Bowerbank, 1882: 187 [Westport Bay, Guernsey]; Koehler, 1886a: 62 [English Channel]; Hallmann, 1912: 254 [note].

? *Clathria papilla*; Schmidt, 1870: 77; Vosmaer, 1880: 155.

Echinoclathria papilla; Hanitsch, 1894: 8-10, 16, 25, 26.

Ophistospongia papilla; Gray, 1867: 515.

MATERIAL. HOLOTYPE: BMNH1847.9.7.14, fragments BMNH1910.1.1.2368, 2369. NE Atlantic, S Africa, New Zealand, Mediterranean. This species is undoubtedly composite, consisting of at least two sibling species (Atlantic and Indo-Pacific populations).

Clathria (Microciona) sigmoidea (Cuartas, 1992)

Microciona sigmoidea Cuartas, 1992: 85-88, figs 53-57, 67 [Mar del Plata, Argentina].

MATERIAL. HOLOTYPE: MCNPCO4-81-43. SW Atlantic.

Clathria (Microciona) simae sp. nov.

Axociella cylindrica; Sim & Byeon, 1989: 39-40, pl.5, figs 1-2 [S. Korea].

Not *Esperiopsis cylindrica* Ridley & Dendy, 1886: 340, Ridley & Dendy, 1887: 79-80, pl.19, figs 2a-b.

Not *Axociella cylindrica*; Hallmann, 1920: 780-783, pl.37, figs 2-4, text-fig.2.

Not *Rhaphidophlus cylindricus* Kieschnick, 1900: 53, pl.44, fig.10.

MATERIAL. HOLOTYPE: Department of Biology, Han Nam University, Korea 18/vii/1987. S China Sea. *C. (Axociella) cylindrica* (Ridley & Dendy, 1886) has priority.

ETYMOLOGY. Named for Dr C.J. Sim.

Clathria (Microciona) similis (Thiele, 1903)

Hymeraphia similis Thiele, 1903a: 957, fig.22 [Ternate, Moluccas]; Hentschel, 1912: 377 [Aru I., Arafura Sea].

Eurypon similis; de Laubenfels, 1936a: 111.

Not *Microciona similis* Stephens, 1915: 441.

Not *Eurypon similis*; Uriz, 1988a: 53-54, text-fig.29.

MATERIAL. HOLOTYPE: ZMB7215, Indonesia.

Clathria (Microciona) spinarcus (Carter & Hope, 1889)

Microciona spinarcus Carter & Hope, 1889: 99-106, pl.6, figs 1-6 [Hastings, England]; Carter, 1889b: 250; Hope, 1889: 339; Topsent, 1890c: 199, 202, 205; Topsent, 1892a: 113 [Banyuls]; Topsent, 1892c: 17; Topsent, 1894a: 8, 11; Topsent, 1896: 115; Ferrer Hernández, 1914: 14; Topsent, 1928a: 62; Lévi, 1960a: 74, 76, text-fig.18 [Atlantic]; Boury-Esnault, 1971: 324-325 [Banyuls]; Van Soest & Weinberg, 1980: 6-8, 10, text-fig.8 [Lough Ine, Ireland]; Boury-Esnault & Lopes, 1985: 193, fig.41 [Azores]; Uriz, 1988a: 88-89 [Namibia]; Uriz, 1988b: 68 [Namibia]; Maldonado, 1992: 1152 [Aldoboran Sea]; Ackers, Moss & Picton, 1992: 146 [Ireland].

Microciona armata, in part; Carter, 1874c: 457; Carter & Hope, 1889: 101-106.

Ligrota spinarcus; de Laubenfels, 1936a: 126 [transferred with hesitation].

Microciona acanthotoxa; Lilly et al., 1953 (Van Soest & Weinberg, 1980: 10).

cf. *Microciona prolifera*; Vosmaer, 1935a: 608.

MATERIAL. HOLOTYPE: BMNH1910.1.1. 501, fragment BMNH1954.3.9.175. NE Atlantic, W Mediterranean, SW Africa.

Clathria (Microciona) spinatoxa (Hoshino, 1981)

Microciona spinatoxa Hoshino, 1981: 155, text-fig.67, pl.7, fig.1 [Sasajima].

MATERIAL. HOLOTYPE: MMBSSIS-033. Japan.

Clathria (Microciona) spinosa (Wilson, 1902)

Microciona spinosa Wilson, 1902: 396-397 [St.Thomas, Puerto Rico]; Simpson, 1968a: 37, pls 9-10, text-fig.2 [Bahamas]; Simpson, 1968b: 26, pls 6-8, tables 5-7; Wiedenmayer, 1977: 141-142, text-fig. 145 [Bimini].

Axociella spinosa; de Laubenfels, 1936a: 113 [Florida]; de Laubenfels, 1949a: 16 [Bimini]; Storr, 1964: 42 [W coast Florida]; Hechtel, 1965: 43.

Clathria (Microciona) spinosa; Van Soest, 1984b: 95-96, table 4, text-fig.37 [Curaçao]

Clathria spinosa; Zea, 1987: 167, text-fig. 57 [Colombian Caribbean].

cf. *Microciona prolifera*; Vosmaer, 1935a: 608, 645.

MATERIAL. HOLOTYPE: USNM7680. Caribbean.

Clathria (Microciona) spongigartina (de Laubenfels, 1930)

Aaata spongigartina de Laubenfels, 1930: 27 [Carmel, California].

Anaata spongigartina, de Laubenfels, 1932: 89-91, text-fig. 52; Sim & Bakus, 1986: 12 [California].

Clathria spongigartina; Van Soest, 1984b: 7 [generic synonymy].

MATERIAL. HOLOTYPE: USNM21428, fragment BMNH1929.8.22.13. NE Pacific.

Clathria (Microciona) stephensae sp. nov.

Microciona similis Stephens, 1915: 441, pl.40, fig.6 [Saldanha Bay]; Lévi, 1963: 58-59, text-fig.67, pl.9A [St. Helena Bay]; Hechtel, 1965: 43-44 [note].

Axocielita similis; de Laubenfels, 1936a: 118.

Not *Hymeraphia similis* Thiele, 1903a: 957

Not *Eurypon similis*; Uriz, 1988: 53 [see C. urizae, nom. nov.].

MATERIAL. HOLOTYPE: RSME1921.143, 1447, fragments INM.31.1914, BMNH1939. 3.20.11. South Africa. *Clathria (Microciona) similis* (Thiele, 1903a) has seniority.

Clathria (Microciona) strepsitoxa (Hope, 1889)

Microciona strepsitoxa Hope, 1889: 334-338, 342, pl.16, figs 1-10; Topsent, 1890c: 199, 205; Topsent, 1891a: 529 [Roscoff]; Topsent, 1892c: 17 [Banyuls]; Topsent, 1894a: 8; Topsent, 1934a: 90-92 [Gulf of Gabes]; Alander, 1942: 62 [Sweden]; Lévi, 1960a: 67, text-fig.10 [English Channel, Atlantic, Mediterranean]; Siribelli, 1960: 4, text-fig.1A [Naples]; Sarà & Siribelli, 1960: 67-69, text-fig.17 [Bay of Naples]; Poggiano, 1965: 3, table 1; Boury-Esnault, 1971: 326 [Banyuls]; Pulitzer-Finali, 1977: 62 [Bay of Naples]; Rodriguez Solórzano et al., 1979: 44, 58-59, text-fig.14 [Galacia, Spain]; Van Soest & Weinberg, 1980: 6, text-fig. 7 [Lough Ine, Ireland]; Pulitzer-Finali, 1983: 573, 610 [Mediterranean]; Wintermann-Kilian & Kilian, 1984: 134 [Colombia]; Boury-Esnault & Lopes, 1985: 192-193, fig.40 [Azores]; Ackers, Moss & Picton, 1992: 145 [Ireland].

cf. *Microciona prolifera*; Vosmaer, 1935a: 608, 640.

MATERIAL. HOLOTYPE: BMNH1910.1.1.500. NE Atlantic, Mediterranean, Caribbean.

Clathria (Microciona) tenuis (Stephens, 1915)

Microciona tenuis Stephens, 1915: 443, pl.40, fig.5 [Saldanha Bay]; Lévi, 1963: 67.

Hymantho tenuis; de Laubenfels, 1936a: 111.

MATERIAL. HOLOTYPE: RSME missing. South Africa.

Clathria (Microciona) tenuissima (Stephens, 1916)

Eurypon tenuissima Stephens, 1916: 240 [W coast Ireland; 780m depth]; Stephens, 1921.

Dictyociona tenuissima; de Laubenfels, 1936a: 110 [note]; de Laubenfels, 1953a: 528.

Microciona tenuissima; Lévi, 1960a: 69 [W coast Ireland]; Biblioni, 1993: 312-3, fig.8 [W. Mediterranean].

Not *Leptolabis tenuissima* Hentschel, 1911: 360-361, text-fig.41 [Shark Bay, Western Australia].

MATERIAL. HOLOTYPE: INMSR151.11.1916. NE Atlantic.

Clathria (Microciona) tetrastyla (Hentschel, 1912)

Hymeraphia tetrastyla Hentschel, 1912: 379-380, pl.20, fig.36 [Aru I., Arafura Sea].

Eurypon tetrastyla; de Laubenfels, 1936a: 111.

MATERIAL. HOLOTYPE: SMF 954. Indonesia.

Clathria (Microciona) thielei (Hentschel, 1912)

Hymeraphia thielei Hentschel, 1912: 377-378 [Aru I., Arafura Sea].

Not *Ophlitaspongia thielei* Burton, 1932a: 322, pl.55, fig.8, text-fig.32; Koltun, 1964a: 70.

MATERIAL. HOLOTYPE: SMF 1708. Indonesia.

Clathria (Microciona) toximajor Topsent, 1925

Clathria toximajor Topsent, 1925: 653-655, text-fig.11 [Gulf of Naples]; Sarà, 1960a: 461 [Ischia].

Microciona toximajor, Lévi, 1960a: 67 [Naples]; Siribelli, 1960: 6, text-fig.1B [Naples]; Sarà & Siribelli, 1962: 48 [Gulf of Naples]; Poggiano, 1965: 3, table 1; Rützler, 1966

[Banyuls]; Boury-Esnault, 1971: 325 [Banyuls]; Pulitzer-Finali, 1983: 610 [list].

MATERIAL. HOLOTYPE: MOM, fragment MNHNDT326. Mediterranean

Clathria (Microciona) toxirecta (Sarà & Siribelli, 1960)

Microciona toxirecta Sarà & Siribelli, 1960: 75-77, text-fig.21 [Bay of Naples]; Siribelli, 1960: 14, text-fig.5A [Naples]; Sarà & Siribelli, 1962: 48 [Gulf of Naples]; Pulitzer-Finali, 1983: 610 [list].

MATERIAL. HOLOTYPE: IMZUN382. Mediterranean.

Clathria (Microciona) toxitenuis Topsent, 1925

Clathria toxitenuis Topsent, 1925: 655 [Gulf of Naples]; Sarà, 1958: 261-262, text-fig.23 [Gulf of Naples]; Sarà, 1960a: 462 [Ischia].

Pseudanchinoe toxitenuis; de Laubenfels, 1936a: 109 [note].

Microciona toxitenuis; Lévi, 1960a: 69, text-fig.11 [Marseilles, Naples]; Sarà & Siribelli, 1960: 69-71 [Bay of Naples]; Siribelli, 1960: 10-12, text-fig.4 [Naples]; Sarà & Siribelli, 1962: 48 [Gulf of Naples]; Labate, 1964: 334-335, pl.2, fig.8 [Adriatic Sea]; Sarà, 1964: 230 [Ligurian Sea]; Poggiano, 1965: 3, table 1; Cabioch, 1968a: 244 [Roscoff, France]; Pulitzer-Finali, 1977: 62 [Bay of Naples]; Boury-Esnault, 1971: 325 [Banyuls]; Pulitzer-Finali, 1983: 573, 610 [Mediterranean]; Wintermann-Kilian & Kilian, 1984: 134 [Colombia; possible misidentification].

MATERIAL. HOLOTYPE: MOM, fragment MNHNDT325. Mediterranean, NE Atlantic.

Clathria (Microciona) tumulosa (Bowerbank, 1882)

Microciona tumulosa Bowerbank, 1882: 7, 18, 50-52, pl.11, figs 1-4 [Westport Bay, Ireland]; Vosmaer, 1935a: 608.

MATERIAL. HOLOTYPE: BMNH1910.1.1.82. NE Atlantic.

Clathria (Microciona) tunisiae sp. nov.

Microciona chelifera Lévi, 1960a: 70, fig.12 [Sicily-Tunisian Strait]; Pulitzer-Finali, 1983: 610.

MATERIAL. HOLOTYPE: MNHN missing. W Mediterranean. *Spanioplon (= Clathria) cheliferum* Hentschel, 1911 has seniority.

Clathria (Microciona) urizae sp. nov.

Eurypon similis; Uriz, 1988a: 53-55, text-fig. 29 [Namibia].

Not *Hymeraphia similis* Thiele, 1903a: 957.

Not *Microciona similis* Stephens, 1915: 441 [see *C.(M) stephensae* sp. nov.].

MATERIAL. SPECIMENS: ABIP7B-58, 7B-59, 7B-61. SW Africa. Note: *E. similis* of Uriz (1988a) is conspecific with neither *Clathria (Microciona) similis* (Thiele, 1903a), nor *Microciona similis* Stephens, 1915 (= *C. (M.) stephensae* sp. nov.), and requires a new name.

ETYMOLOGY. Named for Dr. M.J. Uriz.

Clathria (Microciona) vacelettia nom. nov.

Microciona curvichela Vacelet & Vasseur, 1965: 106-108, pl.9, fig.31 [Madagascar].

Not *Wilsonella curvichela* Hallmann, 1912: 247.

MATERIAL. HOLOTYPE: MNHN missing. W Indian Ocean. *C. (D.) curvichela* (Hallmann, 1912) has priority.

TRANSFERS

Other species described in *Clathria (Microciona)*, or a synonym, but now transferred to other genera.

Microciona ambigua Bowerbank, 1862b: 1110; Bowerbank, 1864: 188; Bowerbank, 1866: 124, 136-138 [Britain]; Gray, 1867: 535; Norman, 1869: 330; Schmidt, 1870: 76; Bowerbank, 1874: 65, pl.25, figs 1-9; Marenzeller, 1878: 2, 4, 5, 14-15, 370, pl.1, fig.3, pl.2, figs 3-3a; Urban, 1880: 257; Bowerbank, 1882: 7,18,53; Topsent, 1891a: 528,543, 554 [Roscoff, France]; Norman, 1892:6,11; Vosmaer, 1935a: 607.

Hastatus ambiguus; Fristedt, 1885: 31-32, pl.3, fig.1a-h; Fristedt, 1887: 443, 465.

Plocamia ambigua; Topsent, 1894a: 8, 14, 21-22, 23, 26; Topsent, 1895: 214, 216; Topsent, 1896: 115, 127; Topsent, 1898: 226; Topsent, 1900: 112-113; Topsent, 1904a: 10, 24, 26, 154-155, 201 [et var. *elegans*; Azores]; Arnesen, 1903: 22-23, pl.3, fig.5 [Norway]; Thiele, 1903b: 389, 395, 397, pl.21, fig.21; Arndt, 1913: 119; Topsent, 1913b: 6, 7,32, 63, pl.5, fig.15; Hentschel, 1914: 120; Burton, 1930a: 494 [Norway]; Hentschel, 1929: 895, 973 [White Sea].

Plocamionida ambigua; Topsent, 1927: 1-19; Alander, 1942: 53 [Sweden]; Lilly et al., 1953 [Lough Ine, Ireland]; Burton, 1959b: 39 [Iceland]; Vacelet, 1969: 208 [Mediterranean]; Van Soest & Weinberg, 1980: 10 [Lough Ine, Ireland]; Uriz & Rosell, 1990: 387-388, figs 4g-k [Mediterranean]; Ackers, Moss & Picton, 1992: 137 [Ireland].

Scopalina ambigua; Schmidt, 1866a: 149; Schmidt, 1866b: 15; Schmidt, 1868: 26, 40.

Amphilectus ambiguus; Vosmaer, 1880: 116.

Stylostichon ambiguum; Hanitsch, 1894: 176, 195.

Hymedesmia indistincta Bowerbank, 1874: 303-306, pl.87, figs 1-10.

Myxilla indistincta; Vosmaer, 1880: 129.

Hymeraphia indistincta; Hanitsch, 1894: 181, 196.

Plocamia microcionides; Carter, 1876: 390 [Cape St. Vincent]; Topsent, 1891a: 529, 544-545 [Roscoff]; Topsent, 1892a: 117.

MATERIAL. HOLOTYPE: BMNH1930.7.3.227, fragment BMNH1910.1.1.65. Referred to Anchinoidae, *Plocamionida*.

Microciona bihamigera Waller, 1877: 261 [Torbay, Britain; nomen nudum]; Waller, 1878: 1, pls 1-2 [new, cf. Zool Rec. 1877]; Ridley & Dendy, 1887:139; Vosmaer, 1935a: 608.

Stylostichon bihamigera; Lilly et al., 1953 [Lough Ine, Ire.].

Pronax bihamigera; Van Soest & Weinberg, 1980: 10 [Lough Ine, Ireland].

MATERIAL. HOLOTYPE: unknown. Referred to Anchinoidae, *Pronax*.

Microciona dives Topsent, 1891a: 529, 543-544, 554, pl.22, figs 2-3 [Roscoff, France].

Stylostichon dives; Pulitzer-Finali, 1983: 567 [Mediterranean]; Ackers, Moss & Picton, 1992: 136 [Ireland].

cf. *Hymedesmia zetlandica*; Vosmaer, 1935a: 608.

MATERIAL. HOLOTYPE: MOM, fragments BMNH1910.1.1.498-9. Referred to Anchinoidae, probably *Plumohalichondria*.

Microciona fictitia Bowerbank, 1866: 124-126 [Guernsey, Britain]; Vosmaer, 1935a: 607.

Hymedesmia fictitia; Alander, 1942: 36 [Sweden].

Anchinoe fictitius; Stephens, 1916: 242 [W coast of Ireland].

Phorbas fictitius; Lilly et al., 1953 [Lough Ine, Ireland]; Van Soest & Weinberg, 1980: 10 [Lough Ine, Ireland].

MATERIAL. HOLOTYPE: BMNH1930.7.3. 199, fragment USNM5043. Referred to Anchinoidae, *Phorbas*.

Microciona intexta Carter, 1876: 238-239, pl.15, fig.43a-c [Cape St. Vincent, Hebrides]; Vosmaer, 1935a: 607.

Rhabderemia intexta; Topsent, 1892a: 116; Topsent, 1904a: 152 [transferred with hesitation]; Hooper, 1990: 72; Van Soest & Hooper, 1993: 337.

Rhabdosigma intexta; Hallmann, 1916b: 520; Hallmann, 1917: 398-399.

MATERIAL. HOLOTYPE: BMNH1890.4. 10.12. Referred to Rhabderemiidae, *Rhabderemia*.

Microciona minutula Carter, 1876: 479, pl.16, fig.51 [justified emendation]; Carter, 1880a: 44; Vosmaer, 1935a: 608.

Rhabderemia minutula; Topsent, 1904a: 152-153, pl.1, fig.10, pl.13, fig.13 [Banyuls]; Lévi, 1956b: 393, fig.2; Boury-Esnault, 1971: 306 [Banyuls]; Biblioni & Gili, 1982: 231; Pulitzer-Finali, 1983: 533-534, text-fig.51 [Mediterranean].

Microciona pusilla Carter, 1876: 239, pl.16; Carter, 1880c: 437; Topsent, 1889: 41, text-fig. 7.

Rhabderemia pusilla; Topsent, 1892a: 116; Hallmann, 1917: 399; Dendy, 1922: 85; Van Soest, 1984b: 534; Hooper, 1990: 72 [note]; Van Soest & Hooper, 1993: 323.

Rhabderemia indica, in part; Sarà, 1961: 44, text-fig. 8; Pulitzer-Finali, 1983: 534.

MATERIAL. HOLOTYPE: BMNH1902.11.16.32, fragment BMNH1954.3.9.178. Referred to Rhabderemiidae, *Rhabderemia*.

Axinella monticularis Ridley & Dendy, 1886: 481; Ridley & Dendy, 1887: 185, pl.38, fig.5 [Cape Verde Is].

Aulospongus monticularis; Hallmann, 1917: 373 [footnote]; Hooper, 1991: 1307 [note].

Microciona monticularis; Burton, 1956: 132 [Sao Vincente, W. Africa].

Aulospongiella monticularis; Burton, 1956: 141.

MATERIAL. HOLOTYPE: BMNH1887.5.2.20, paratype BMNH1887.5.2.273. Referred to Raspailiidae, *Aulospongus*.

Spongia plumosa Montagu, 1818: 116 [Devon, UK].

Hymeniacidon plumosa; Bowerbank, 1866: 195, figs 141-143.

Pronax plumosa; Gray, 1867: 536.

Microciona plumosa; Bowerbank, 1874: 61-63, pl.24, figs 7-13; Topsent, 1891b: 128 [France].

Myxilla (?) *plumosa*; Ridley & Dendy, 1887: 145-146 [Bahia, Brazil].

Stylostichon plumosa; Topsent, 1891a: 529; Lilly et al., 1953 [Lough Ine, Ireland].

Plumohalichondria plumosa; Kerville, 1901: 175 [Normandy].

Hymedesmia plumosa; Vosmaer, 1935a: 607.

Pronax plumosus; Van Soest & Weinberg, 1980: 10 [Lough Ine, Ireland].

MATERIAL. HOLOTYPE: unknown, fragments BMNH1930.7.3.216, 224. Referred to Anchinoidae, *Pronax*.

Microciona pusilla Carter, 1876: 239, pl.16, figs 51a-d [? tropical]; Carter, 1880c: 437 [name emended to *M. minutula]*; Topsent, 1889: 41, text-fig. 7 [Banc de Campêche].

Rhabderemia pusilla; Topsent, 1892a: 116; Hallmann, 1917a: 399; Dendy, 1922: 85; Pulitzer-Finali, 1983: 533-534, fig.51 [Mediterranean]; Van Soest, 1984b: 108. Van Soest & Hooper, 1993: 323.

MATERIAL. HOLOTYPE: BMNH1902.11.16.32. Referred to Rhabderemiidae, synonym of *Rhabderemia minutula* (Dendy, 1905: 180).

Microciona quinqueradiata Carter, 1880a: 43, 153, pl.4, figs 5a-e [Gulf of Manaar].

cf.*Microciona* prolifera; Vosmaer, 1935a: 608.

MATERIAL. HOLOTYPE: LFM destroyed, no fragment in BMNH. Referred to Raspailiidae, *Cyamon*.

Microciona simplicissima Norman, 1869: 330; Bowerbank, 1874: 198, 204-205, pl.73, figs 16-19 [Shetland]; Vosmaer, 1935a: 607.

Tedania simplicissima; Hanitsch, 1890: 192.

Bubaris simplicissima; de Laubenfels, 1936a: 131.

Not *Leptosia simplicissima* Hentschel, 1911: 359-360, text-fig.40 [Shark Bay, Western Australia].

Not *Protoclathria simplicissima* Burton, 1932a: 321, pl.56, fig.2, text-fig.31 [Falkland Is].

MATERIAL. HOLOTYPE: BMNH1930.7. 30.212. Referred to Axinellidae, *Bubaris*.

Microciona spinulenta Bowerbank, 1866: 124, 132, 133 [Britain]; Gray, 1867: 534; Vosmaer, 1935a: 607.

Pocillon spinulenta; Topsent, 1893b: 34 [plus Isodictya implicita Bowerbank].

MATERIAL. HOLOTYPE: BMNH1930.7. 3.213. Referred to Myxillidae, *Iophon*.

Microciona virgula Sarà & Siribelli, 1960: 77-79, text-fig.22 [Bay of Naples]; Siribelli, 1960: 16-17, text-fig.7A [Naples].

MATERIAL. HOLOTYPE: IMZUN237: 0.5. Synonym of *Antho involvens* (Sarà, 1964: 228-229).

Clathria (Dendrocia) Hallmann, 1920

Dendrocia Hallmann, 1920: 767.

Paradoryx Hallmann, 1920: 767.

Wilsonella in part; sensu Hallmann, 1912: 242 (not Carter, 1885f: 366).

DEFINITION. Single undifferentiated category of smooth auxiliary spicule (style, subtylostyle or modified style) forming plumose or plumoreticulate choanosomal tracts, ectosomal brushes and dispersed between skeletal tracts; echinating acanthostyles usually heavily spined and distributed evenly over skeletal tracts; microscleres include isochelae ranging from typical palmate form (straight shaft, lateral alae fused to shaft), modified palmate forms (thickened, curved shaft, partially detached lateral alae) to anchorate-like forms (alae detached from shaft, shaft with lateral ridge); toxas if present include oxhorns.

TYPE SPECIES. *Clathria pyramida* Lendenfeld, 1888: 222 (by original designation).

REMARKS. Seven species are included in *Clathria (Dendrocia)*, all of which are endemic to temperate Australian waters, with an hypothesised Gondwanan origin.

Clathria (Dendrocia) curvichela
(Hallmann, 1912)
(Figs 104-105)

Wilsonella curvichela Hallmann, 1912: 247-249, pl.34, fig.4, text-fig.51.
Paradoryx curvichela; Hallmann, 1920: 768.
Clathria curvichela; Hooper & Wiedenmayer, 1994: 263.
Not *Microciona curvichela* Vacelet & Vasseur, 1965: 106.

MATERIAL. HOLOTYPE: AMZ59 (part) + E926a (part): 21km S. of St. Francis I., SA, 32°44'S, 133°18'E, 60m depth, coll. FIV 'Endeavour' (dredge).

HABITAT DISTRIBUTION. 60m depth; substrate unknown; S Aust (Fig. 104E).

DESCRIPTION. *Shape.* Branching digitate, 130mm high, 35mm maximum width, with short, cylindrical, bifurcate, anastomosing, tapering branches up to 14mm diameter, and short subcylindrical stalk, 15mm long, 8mm diameter.

Colour. Live colouration unknown, yellowish-brown in ethanol.

Oscules. Minute oscules, up to 1mm diameter, dispersed on lateral margins of branches

Texture and surface characteristics. Smooth, even, compressible.

Ectosome and subectosome. Ectosome not hispid, although peripheral spongin fibres produce small surface projections; subectosomal auxiliary subtylostyles tangential to surface, or protruding through ectosome only a short way.

Choanosome. Choanosomal skeletal architecture almost regularly reticulate, with heavy, thick spongin fibres incompletely divided into primary and secondary components, differentiated only by presence or absence of coring auxiliary megascleres, respectively; spicule tracts in primary fibres vaguely ascend to surface in multispicular bundles; secondary fibres pauci- or aspicular, usually running parallel to surface; all fibres very heavily echinated by acanthostyles, dispersed evenly over fibres; mesohyl matrix heavy but only lightly pigmented, with scattered microscleres.

Megascleres. Choanosomal principal styles absent or undifferentiated from auxiliary spicules.

Subectosomal auxiliary subtylostyles (coring fibres and scattered below membraneous ectosome) straight or slightly curved, hastate, with subtylote, slightly pointed, smooth bases. Length 132-(149.5)-186μm, width 1.5-(3.5)-4μm.

Acanthostyles subtylote, with large and even spination. Length 64-(74.1)-89μm, width 4-(6.8)-8μm.

Microscleres. Isochelae palmate, large, with greatly curved shaft; lateral alae fused with shaft about 3/4 way along ala; front ala ranges from well developed to vestigial; poorly silicified sigma-like forms also present. Length 22-(23.8)-32μm.

Toxas absent.

REMARKS. Hallmann (1912) originally assigned this species to *Wilsonella* because it had only one type of auxiliary spicule coring the fibres and scattered in the subectosomal skeleton. However, it lacks detritus in fibres, and principal spicules, and has modified palmate isochelae (curved, thickened with partially detached lateral alae) and heavily echinated fibres indicates that it belongs with *Dendrocia*. Hallmann (1920) erected *Paradoryx* for this and several other species (*C. oxyphila*, *C. piniformis*, *C. dura* and *C. elegantula*), of which the present species has the most heavily echinated fibres and the most regular fibre reticulation, although slightly plumose near the periphery. Other species of *Dendrocia* have predominantly plumose (or plumo-reticulate) choanosomal skeletons.

Clathria (Dendrocia) dura Whitelegge, 1901
(Figs 106-107, Table 23)

Clathria dura Whitelegge, 1901: 83, 84, 117, pl.11, fig.11; Hooper & Wiedenmayer, 1994: 263.
? *Wilsonella dura*; Hallmann, 1912: 242, 244, 245, 298; Shaw, 1927: 426; Guiler, 1950: 9.
Paradoryx dura; Hallmann, 1920: 768.
cf. *Microciona prolifera*; *sensu* Vosmaer, 1935a: 611, 644.
Not *Antherochalina dura* Lendenfeld, 1887b: 788.
Not *Clathria dura* var. *mollis* Hentschel, 1911: 370.

MATERIAL. LECTOTYPE: AMG3046: (dry) Tuggerah Beach, NSW, 33°18'S, 151°30'E, coll. NSW Fish Commission (trawl). PARALECTOTYPE: AMG3046a: (dry) same locality.OTHER MATERIAL: NSW- AMZ1052.

HABITAT DISTRIBUTION. Ecology unknown; Tuggerah Beach, Balmoral Beach and Port Jackson (NSW) (Whitelegge, 1901), Maria I. (Tas.) (Shaw, 1927; Guiler, 1950) (Fig. 106E).

DESCRIPTION. *Shape.* Flabellate or flabellate-digitate, lobate, planar or multiplanar growth form, 95-110mm high, 85-210mm wide, composed of fused anastomosing or free digits and flattened lobes, on small compressed basal stalk, 8-15mm diameter, and branches bifurcate and taper towards apex.

Colour. Sandy yellow preserved.

Oscules. Oscules mostly confined to lateral margins of branches.

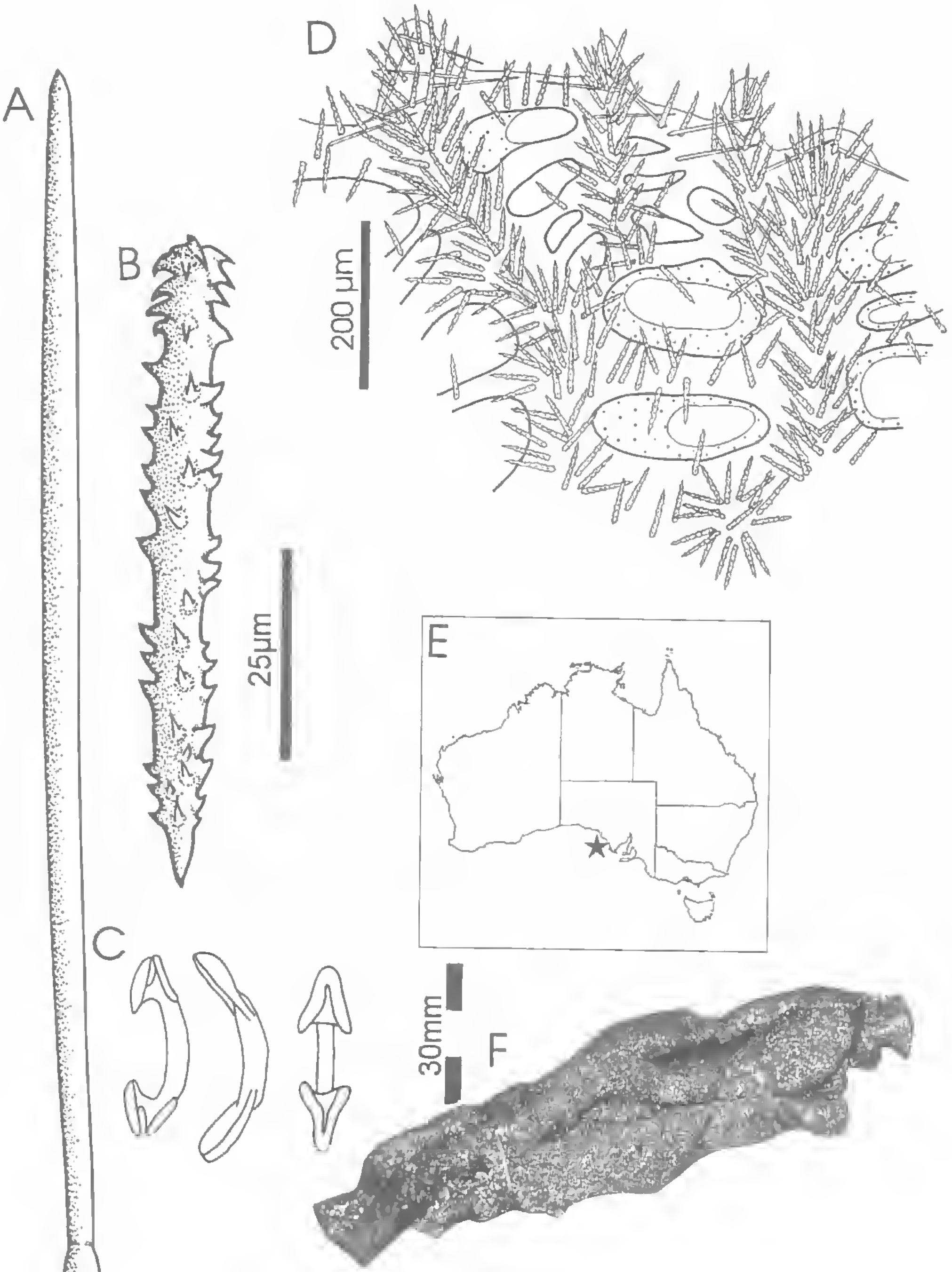

FIG. 104. *Clathria* (*Dendrocia*) *curvichela* (Hallmann) (portion of holotype AMZ59). A, Subectosomal auxiliary subtylostyle. B, Echinating acanthostyle. C, Modified palmate isochelae. D, Section through peripheral skeleton. E, Australian distribution. F, Holotype.

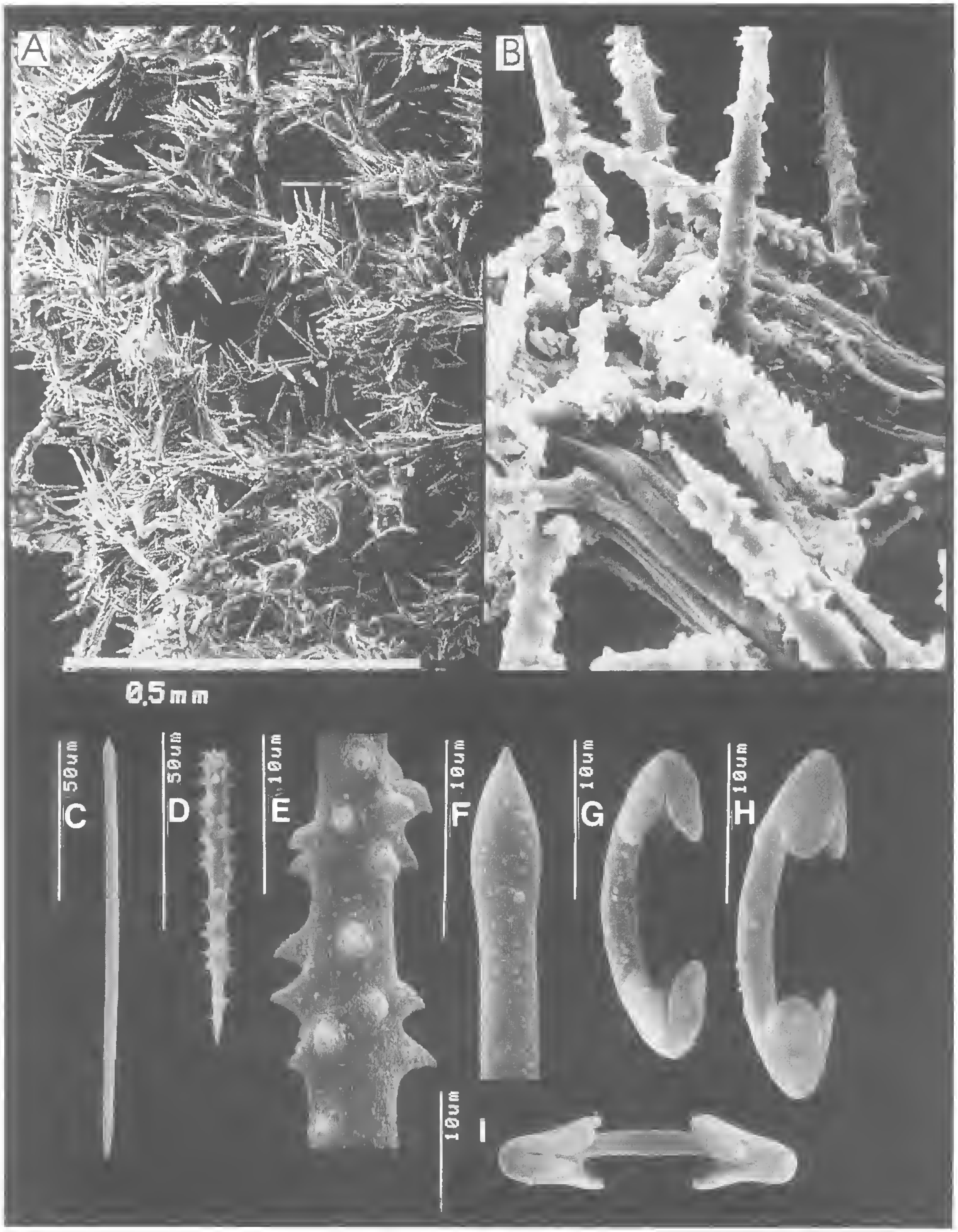

FIG. 105. *Clathria* (*Dendrocia*) *curvichela* (Hallmann) (portions of holotype A-B, AME926a, C-I, AMZ59). A, Choanosomal skeleton. B, Fibre characteristics (x744). C, Subectosomal auxiliary subtylostyle. D, Echinating acanthostyle. E, Acanthostyle spines. F, Base of auxiliary subtylostyle. G-I, Modified palmate isochelae with full (G) or vestigial front alae (I).

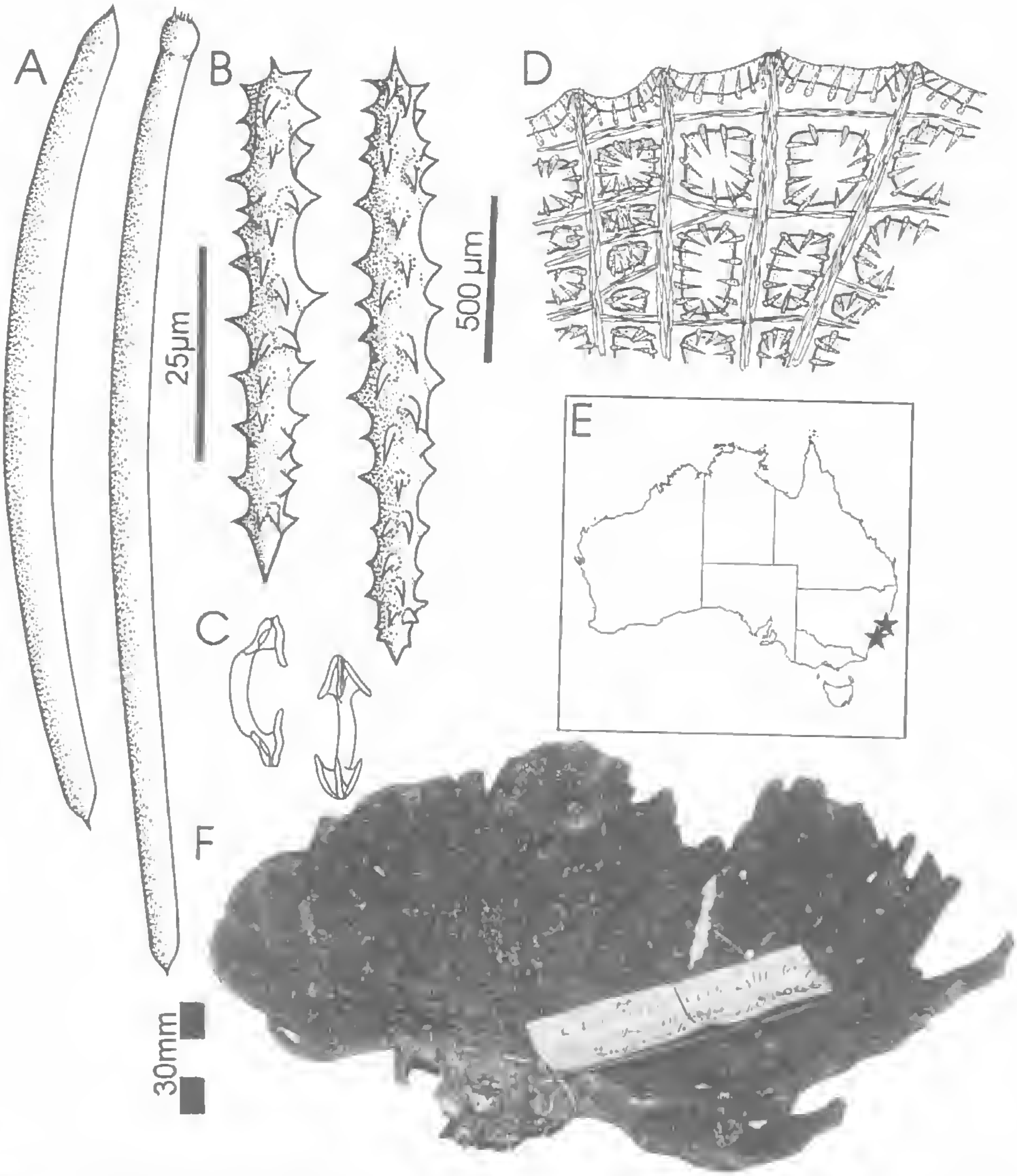

FIG. 106. *Clathria (Dendrocia) dura* Whitelegge (holotype AMG3046). A, Subectosomal auxiliary style/ subtylostyles. B, Echinating acanthostyles. C, Modified palmate isochelae. D, Section through peripheral skeleton. E, Australian distribution. F, Holotype.

Texture and surface characteristics. Firm, flexible; even, microscopically reticulate and porous.

Ectosome and subectosome. Ectosome with nearly continuous palisade of acanthostyles standing erect on peripheral fibres, with plumose brushes of subectosomal auxiliary styles projecting and forming bundles; spicule bundles correspond in position with ascending choanosomal primary spongin fibres; subdermal region also with scattered subectosomal megascleres lying tangential to surface, interdispersed with projecting acanthostyles.

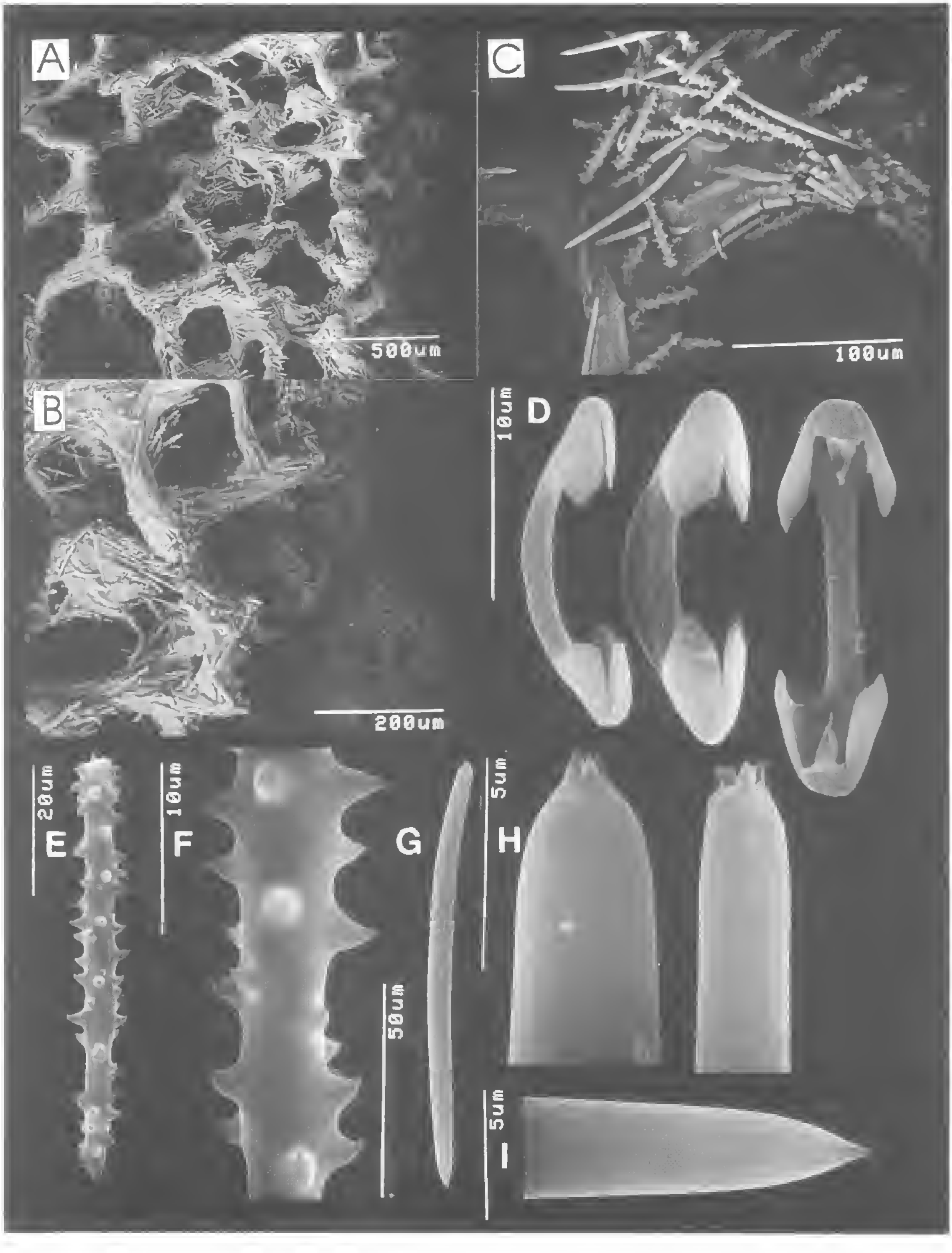

FIG. 107. *Clathria* (*Dendrocia*) *dura* Whitelegge (paratype AMG3046a). A, Choanosomal skeleton. B, Peripheral skeleton. C, Fibre characteristics. D, Modified palmate isochelae. E, Echinating acanthostyle. F, Acanthostyle spination. G, Subectosomal auxiliary style. H-I, Bases and apex of auxiliary styles.

TABLE 23. Comparison between present and published records of *Clathria* (*Dendrocia*) *dura* (Whitelegge). Measurements in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Lectotype (AMG3046)	Paralectotype (AMG3046a)	Specimen (N=1)
Choanosomal principal styles	absent	absent	absent
Subectosomal auxiliary styles	58-(87.4)-105 x 2-(3.9)-6	78-(88.2)-102 x 3-(4.1)-5.5	82-(96.5)-115 x 3-(3.6)-5
Echinating acanthostyles	48-(57.0)-66 x 4-(5.5)-8	56-(64.6)-75 x 4-(5.6)-9	61-(66.3)-75 x 4-(5.1)-8.5
Chelae	17-(18.6)-22	14-(17.4)-19	16-(18.8)-22
Toxas	absent	absent	absent

Choanosome. Choanosomal skeletal architecture irregularly reticulate, with sinuous, relatively thick spongin fibres; fibres incompletely divided into primary ascending, and secondary transverse components; primary fibres with a multispicular core of subectosomal auxiliary styles, identical to those in ectosomal skeleton, together with heavy tracts of acanthostyles secondarily incorporated into fibres; secondary fibres with multi- or paucispicular core of both subectosomal and acanthostyle megascleres; acanthostyles echinate fibres in moderate quantities, at right angles to skeleton, also lying inside the spicule tracts; mesohyl matrix heavy, darkly pigmented, granular with scattered megascleres and microscleres of all kinds.

Megascleres (Table 23). Choanosomal principal megascleres absent or undifferentiated from auxiliary spicules.

Subectosomal auxiliary styles quasidiactinal, curved or straight, hastate, with tapering, rounded, styloid, or pointed, smooth bases.

Acanthostyles rounded or slightly subtylote, with large, evenly dispersed spines.

Microscleres (Table 23). Isochelae abundant, palmate, with lateral alae fused to shaft for only about 1/2 length of ala; shaft greatly curved, thickened ('hunchback'), front ala well developed.

Toxas absent.

Larvae. Incubated parenchymella, up to 270µm in diameter, with heavy mesohyl matrix.

REMARKS. In possessing a single category of structural megasclere this species is assigned to *C.* (*Dendrocia*). Its quasidiactinal megascleres are reminiscent of those found in *C.* (*D.*) *pyramida*; the modified palmate isochelae (curved, thickened, partially detached lateral alae) are similar to those found in other species assigned to *Paradoryx* by Hallmann (1920) (e.g., *C.* (*D.*) *curvichela*); and skeletal architecture and spongin fibre characteristics are reminiscent of those in *C.* (*C.*) *sartaginula*. The presence of acanthostyles incorporated into skeletal spicule tracts is now known to occur in several species, collectively termed here the '*phorbasiformis*' group (including *C.* (*Thalysias*) *phorbasiformis*, *C.* (*T.*) *orientalis*, *C.* (*Dendrocia*) *dura*, *C.* (*D.*) *imperfecta*, *C.* (*D.*) *myxilloides* and *C.* (*Clathria*) *squalorum*), and this feature is analogous to (but not homologous with) that seen in the Crellidae. The presence of acanthostyles in the ectosomal skeleton is also seen in the Crellidae. Whereas species of *Crella* have a thick tangential ectosomal crust of acanthose megascleres, in *C.* (*D.*) *dura* these acanthostyles stand erect on peripheral skeletal fibres, pierced by plumose tracts of smooth subdermal (auxiliary) spicules.

The synonymy cited above for *C.* (*D.*) *dura* requires further comment. Lendenfeld (1887a) described *Antherochalina dura* from Port Jackson, but the species is unrecognisable from his brief description. Lendenfeld's type material was not located in the AM collections, and only a slide of the holotype was found in the BMNH collections (BMNH1886.8.27.684). Apparently a dry specimen of the species was also deposited in the BMNH collections (BMNH1886.8.27.608, possibly the holotype), but this has not yet been rediscovered. Re-examination of the holotype slide confirms that *A. dura* is a synonym of *Phakellia flabellata*, as supposed by Burton (1934a).

Clathria (Dendrocia) elegantula Ridley & Dendy, 1886

(Figs 108-109)

Clathria elegantula Ridley & Dendy, 1886: 474; Ridley & Dendy, 1887: 149, pl.28, figs 3,3a, pl.29, figs 14a-b; Guiler, 1950: 7; Carpay, 1986: 26; Hooper & Wiedenmayer, 1994: 263.

Clathria elegantula var. *occidentalis* Hentschel, 1911: 372-374, text-fig.46.

Wilsonella elegantula; Hallmann, 1912: 241.

Paradoryx elegantula; Hallmann, 1920: 768.

MATERIAL. HOLOTYPE: BMNH1887.5.2.91: Moncoeur I., Bass Strait, Tas, 39°14'S, 146°30'E, coll. HMS 'Challenger' (dredge). HOLOTYPE of var. *occidentalis*: ZMB4445: Top of inner bar, Shark Bay, WA, 25°30'S, 113°03'E, 6-9m depth, coll. W. Michaelsen & R. Hartmeyer (dredge).

HABITAT DISTRIBUTION. 6-76m depth; on sand and shell grit substrate; Bass Strait and E coast (Tas)

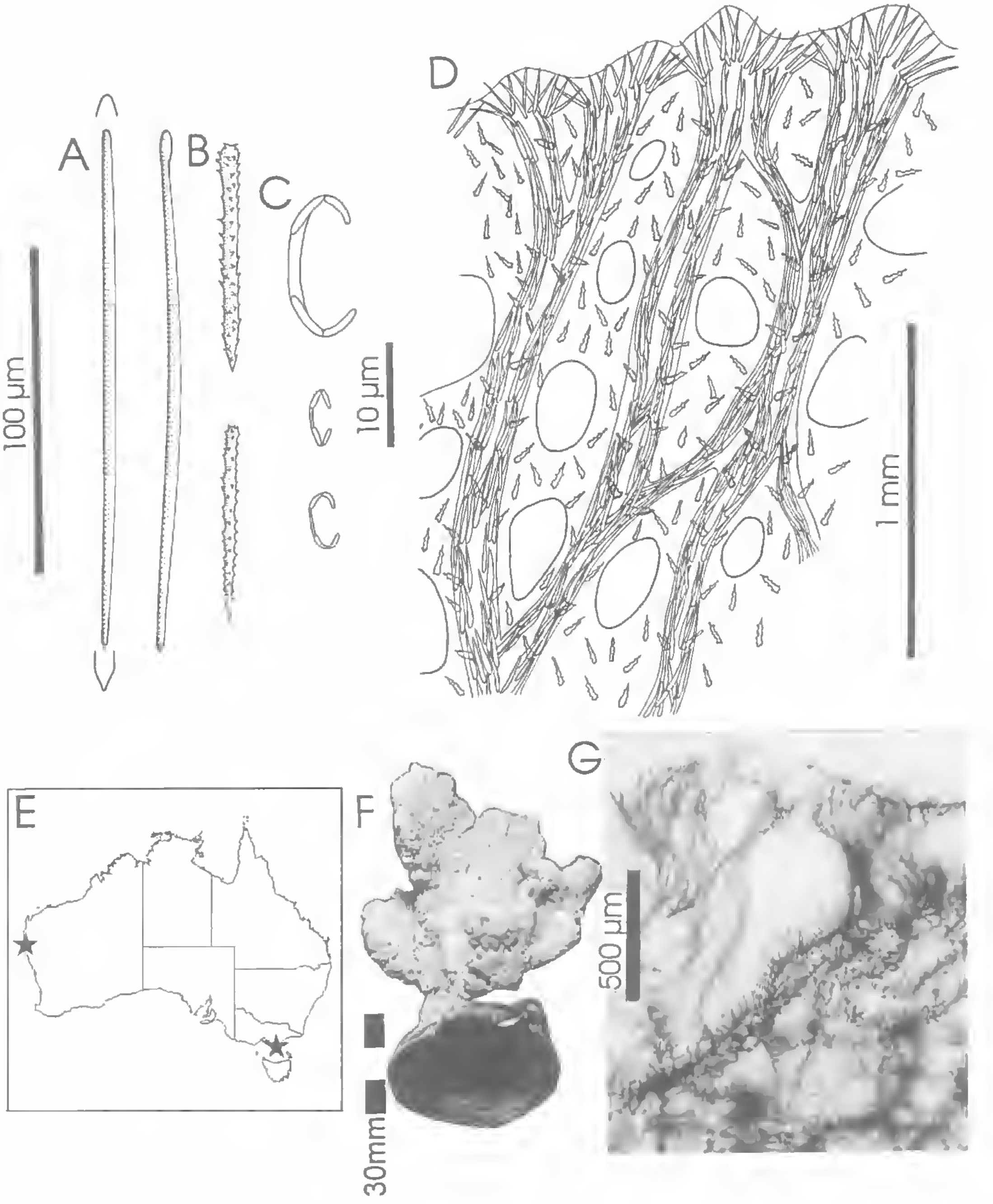

FIG. 108. *Clathria* (*Dendrocia*) *elegantula* Ridley & Dendy (holotype BMNH1887.5.2.91). A, Subectosomal auxiliary style/ subtylostyle. B, Echinating acanthostyles. C, Modified sigmoid palmate isochelae. D, Section through peripheral skeleton. E, Australian distribution. F, Holotype. G, Section of peripheral skeleton of variety *occidentalis* (holotype ZMB4445).

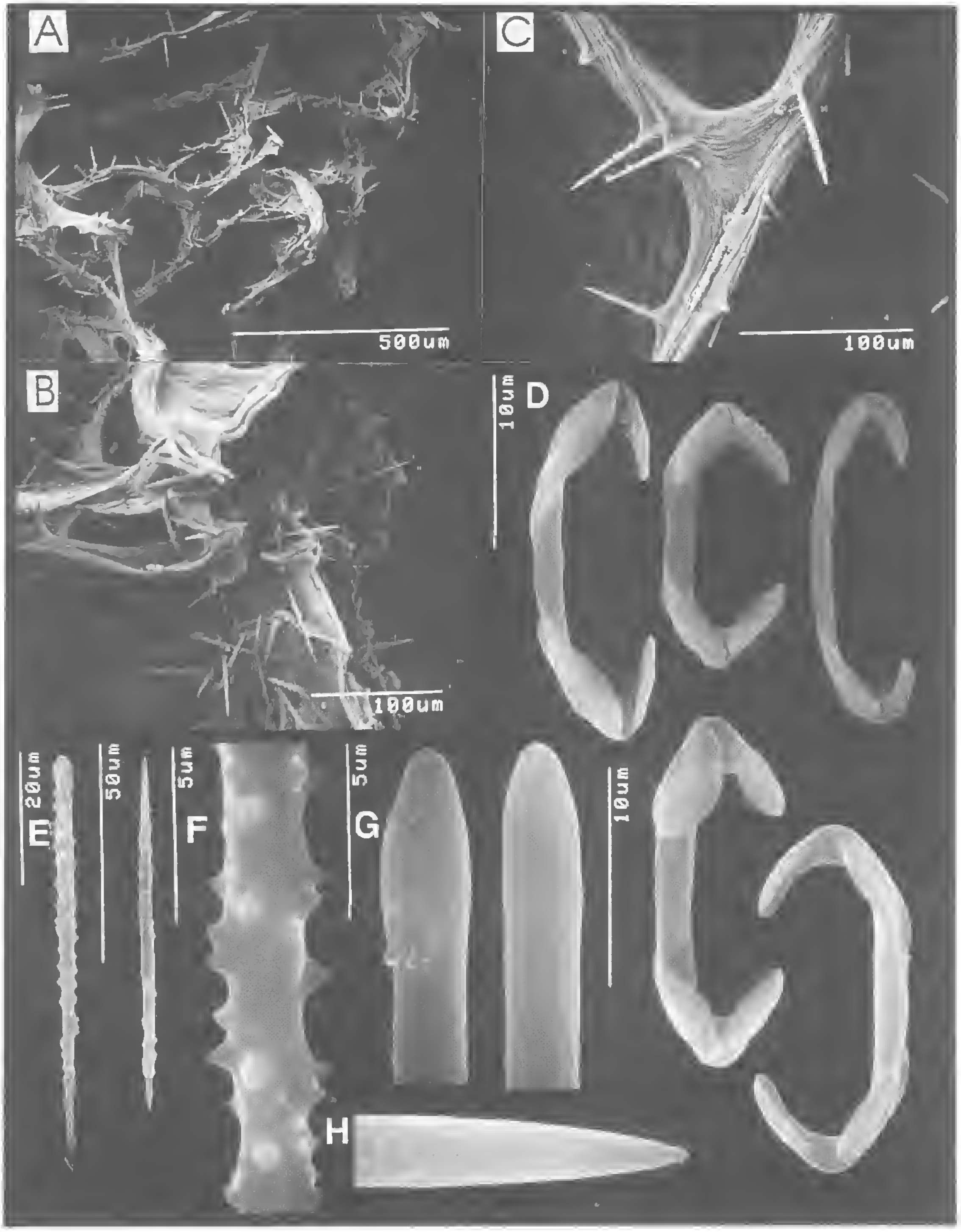

FIG. 109. *Clathria* (*Dendrocia*) *elegantula* Ridley & Dendy (holotype BMNH1887.5.2.91). A, Choanosomal skeleton. B, Peripheral skeleton. C, Fibre characteristics. D, Modified sigmoid palmate isochelae. E, Echinating acanthostyle and modified form. F, Acanthostyle spination. G-H, Bases and apex of subectosomal auxiliary subtylostyles.

(Ridley & Dendy, 1886; Carpay, 1986), central W coast (WA) (Hentschel, 1911) (Fig. 108E).

DESCRIPTION. *Shape.* Massive, lobate fan, 73mm long, 75mm wide, with erect, flattened, digitate lobes, 22-31mm long, 8-20mm wide, lobes with uneven margins, arising from sprawling encrusting base.
Colour. Live colouration unknown, pale beige preserved.
Oscules. Differentiated inhalant and exhalant surfaces of lobes; ostia scattered, 1-2mm diameter, oscules confined to sieve-plates.
Texture and surface characteristics. Harsh; uneven, prominently microconulose, translucent dermal membrane, covering reticulate fibrous surface, stretched between microconules.
Ectosome and subectosome. Fibrous, reticulate ectosomal skeleton, with sparse tangential subectosomal auxiliary subtylostyles lying directly on surface; sinuous plumose tracts of these spicules below, ascending from choanosomal skeleton.
Choanosome. Choanosomal skeleton plumoreticulate, cavernous, with well developed primary and secondary spongin fibres; primary ascending fibres sinuous, almost dendritic, cored by several discrete multi- or paucispicular tracts of subectosomal auxiliary subtylostyles, occupying only small portion of fibre diameter; primary fibres interconnected by reticulate secondary fibres, and terminating in plumose spicule bundles at periphery; secondary transverse fibres pauci- or aspicular, thin; echinating acanthostyles most abundant in axial region, sparse or absent in peripheral skeleton; mesohyl matrix light, with abundant scattered chelae.
Megascleres. Choanosomal principal megascleres absent or undifferentiated from auxiliary spicules.

Subectosomal auxiliary subtylostyles straight, rarely slightly curved, quasidiactinal, hastate points, with tapering, rounded or slightly pointed, smooth bases. Holotype: Length 145-(160.6)-168μm, width 1.5-(2.6)-4μm. (Hentschel's specimen: 133-(142.3)-152μm, width 2-(3.5)-4μm).

Acanthostyles slender, evenly spined, with rounded or slightly subtylote bases, sharp points. Length 53-(64.1)-72μm, width 2-(3.6)-5μm. (Length 52-(68.2)-84μm, width 3-(6.4)-8μm).
Microscleres. Isochelae large, palmate, sigmoid curved, with lateral alae nearly completely fused to shaft, sometimes well developed, sometimes vestigial and reduced to small ridge on shaft; front ala usually reduced. Length 13-(15.4)-17μm. (Length 13-(17.2)-20μm).

Toxas absent.

REMARKS. The nearly dendritic, predominantly plumose skeletal architecture and the concentration of acanthostyles in the axial region are quite distinctive features for this species. These characters, together with the possession of a single category of structural spicule in both fibres and the ectosomal skeleton indicate that the species is best placed in *C.* (*Dendrocia*). In having quasidiactinal modified, vestigial structural megascleres with principal and auxiliary spicules having similar geometry, and vague similarities in skeletal structure, this species is included in the '*oxyphila*' species group (also containing *C.* (*C.*) *raphana*, *C.* (*C.*) *oxyphila* and *C.* (*C.*) *piniformis*). Spongin fibres are also characteristic (whereby each fibre may have several discrete spicule tracts), but in most other respects this species is very similar to *C.* (*D.*) *dura* Whitelegge (both having sinuous spongin fibre systems and heavily echinated fibres). These two species differ in the size of their auxiliary styles (notably straight, longer, more slender, with subtylote bases in *C.* (*D.*) *elegantula*, whereas in *C.* (*D.*) *dura* these spicules are curved, short, thick, with tapering hastate (or sometimes pointed) bases)), and the incorporation of acanthostyles into skeletal fibre tracts in *C.* (*D.*) *dura*.

There is a remarkably close concordance in these features between Bass Strait and Shark Bay populations, despite their widely separated geographical distribution. These samples differ only slightly in the more robust acanthostyles seen in Shark Bay material, but no other morphological differences were seen to justify subspecies separation (Hentschel, 1911).

Clathria (Dendrocia) imperfecta Dendy, 1896

(Figs 110-111)

Clathria imperfecta Dendy, 1896: 35; Ayling et al., 1982: 103; Hooper & Wiedenmayer, 1994: 264.
Wilsonella imperfecta; Hallmann, 1912: 242.

MATERIAL. HOLOTYPE: NMVG2369 (RN376) (fragment BMNH1902.10.18.335): Port Phillip Bay, Vic, 38°09'S, 144°52'E, 36m depth, coll. J.B. Wilson (dredge).

HABITAT DISTRIBUTION. 36m depth; substrate unknown; Port Phillip Bay (Vic) (Fig. 110E).

DESCRIPTION. *Shape.* Erect, bulbous-lobate, with small cylindrical lobate digits.
Colour. Colour in life recorded as dull brown-orange exterior, yellow interior.

Oscules. Minute, less than 2mm diameter, mainly on apex of lobes.

Texture and surface characteristics. Surface irregular, uneven, micropapillose, with subdermal ridges and grooves. Texture is crumb-of-bread, easily torn.

Ectosome and subectosome. Microscopically hispid, with thick brushes of subectosomal auxiliary styles from peripheral skeleton protruding through dermal crust, composed of same megascleres, lying paratangential to or standing erect on surface; subectosomal architecture thickly plumose, arising from ultimate ascending choanosomal fibres.

Choanosome. Choanosomal skeleton irregularly plumo-reticulate, with prominent primary ascending spicule tracts interconnected by irregularly dispersed secondary tracts; fibres weakly developed in spongin but fully cored by subectosomal auxiliary styles and also acanthostyles secondarily incorporated into tracts; fibres moderately echinated; fibre anastomoses form irregular oval-elongate meshes; mesohyl matrix heavy but only lightly pigmented, with auxiliary styles and sparse detritus scattered throughout.

Megascleres. Choanosomal principal styles absent or undifferentiated from auxiliary megascleres.

Subectosomal auxiliary spicules fusiform, mostly straight, occasionally slightly curved towards bases, with tapering, or rounded, or slightly subtylote smooth bases. Length 189-(213.3)-234µm, width 1.5-(4.4)-7.5µm.

Acanthostyles long, rounded or faintly subtylote, with large and evenly distributed spines. Length 102-(114.8)-122µm, width 5-(5.8)-7µm.

Microscleres absent.

Larvae. Oval-elongate parenchymella, 345-412x275-370µm, without larval spicules but with heavy mesohyl and differentiated cells clearly visible.

REMARKS. This species was assigned to *Wilsonella* by Hallmann (1912) because it has only a single category of smooth megasclere, but was tacitly returned to *Clathria* by Hallmann (1920) when he restricted *Wilsonella* to the type. *Clathria (Dendrocia) imperfecta* is more appropriately placed in *Dendrocia* because it lacks detritus incorporated into fibres and has only one undifferentiated category of smooth auxiliary style, whereas *Wilsonella* (*sensu* Hallmann, 1912) and *Paradoryx* (*sensu* Hallmann, 1920) have two categories of auxiliary styles, one found in fibres and the other on the ectosomal skeleton. All three nominal genera lack true principal megascleres. This species is similar to *C. (Thalysias) orientalis*, *C. (T.) phorbasiformis*, *C. (D.) myxilloides* and *C. (D.) dura* in having acanthostyles incorporated into fibres, intermingled amongst the smooth coring megascleres (termed the '*phorbasiformis*' species complex).

Clathria (Dendrocia) myxilloides

Dendy, 1896

(Figs 112-113, Plate 3A)

Clathria myxilloides Dendy, 1896: 35; Hallmann, 1920: 768; Ayling et al., 1982: 104; Hooper & Wiedenmayer, 1994: 264.

Wilsonella myxilloides; Hallmann, 1912: 242.

MATERIAL. HOLOTYPE: NMVG2376 (RN729) (fragment BMNH1902.10.18.334): Port Phillip Bay, Vic, 38°09'S, 144°52'E, coll. J.B. Wilson (dredge). OTHER MATERIAL: S AUST- QM G300613 (NCIQ66C-2202-K, fragment NTMZ3535).

HABITAT DISTRIBUTION. 18m depth; on rock substrate; Port Phillip Bay (Vic), Kangaroo I. (SA) (Fig. 112E).

DESCRIPTION. *Shape.* Massive, subspherical, lobate digitate growth form.

Colour. Orange-red alive (Munsell 5R 5/10), grey-brown in ethanol.

Oscules. Small, less than 3mm diameter, scattered evenly over surface.

Texture and surface characteristics. Harsh, compressible; shaggy, uneven, microconulose, appearing pock-marked alive due to scattering of small oscules.

Ectosome and subectosome. Relatively dense discrete bundles of subectosomal auxiliary styles, identical to those coring the fibres, forming erect palisade on surface. Tracts of isochelae also found in peripheral skeleton, scattered throughout heavily pigmented peripheral spongin; subectosomal region relatively disorganised, paratangential, merging into peripheral choanosomal fibres lying almost immediately subectosomal.

Choanosome. Choanosomal skeletal architecture irregularly plumo-reticulate, without clearly differentiated primary or secondary components although fibre diameter varies considerably and fibres become sinuous towards surface; fibres composed of only light spongin, heavily cored by multispicular tracts of subectosomal auxiliary styles and heavily, irregularly echinated by acanthostyles lying parallel with, or at acute angles to spicule tracts but also secondarily incorporated into fibres; mesohyl matrix light, with smaller,

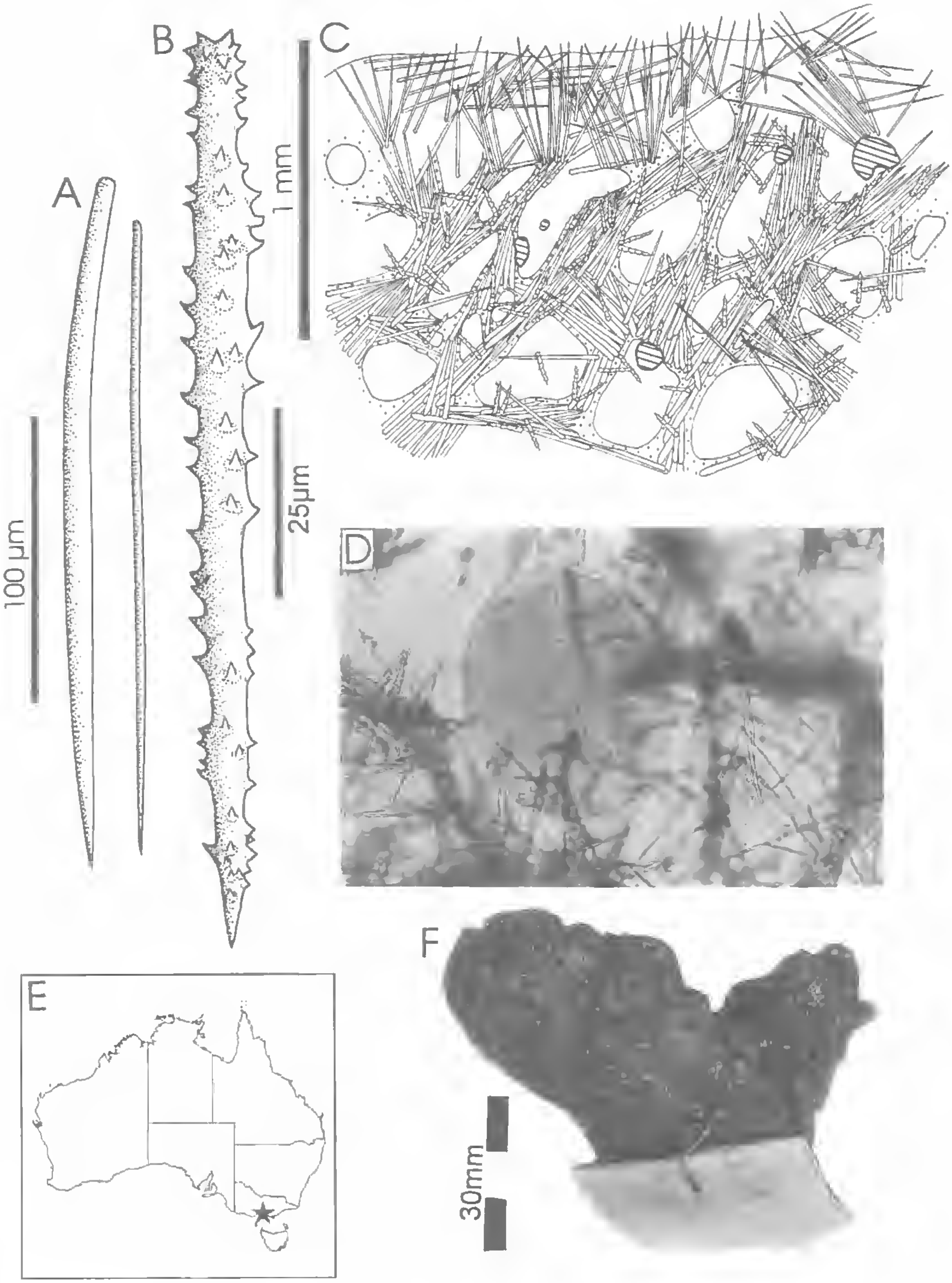

FIG. 110. *Clathria* (*Dendrocia*) *imperfecta* Dendy (holotype NMVG2369). A, Subectosomal auxiliary styles. B, Echinating acanthostyle. C, Section through peripheral skeleton. D, Parenchymella larva *in situ* (diameter 400um). E, Australian distribution. F, Holotype.

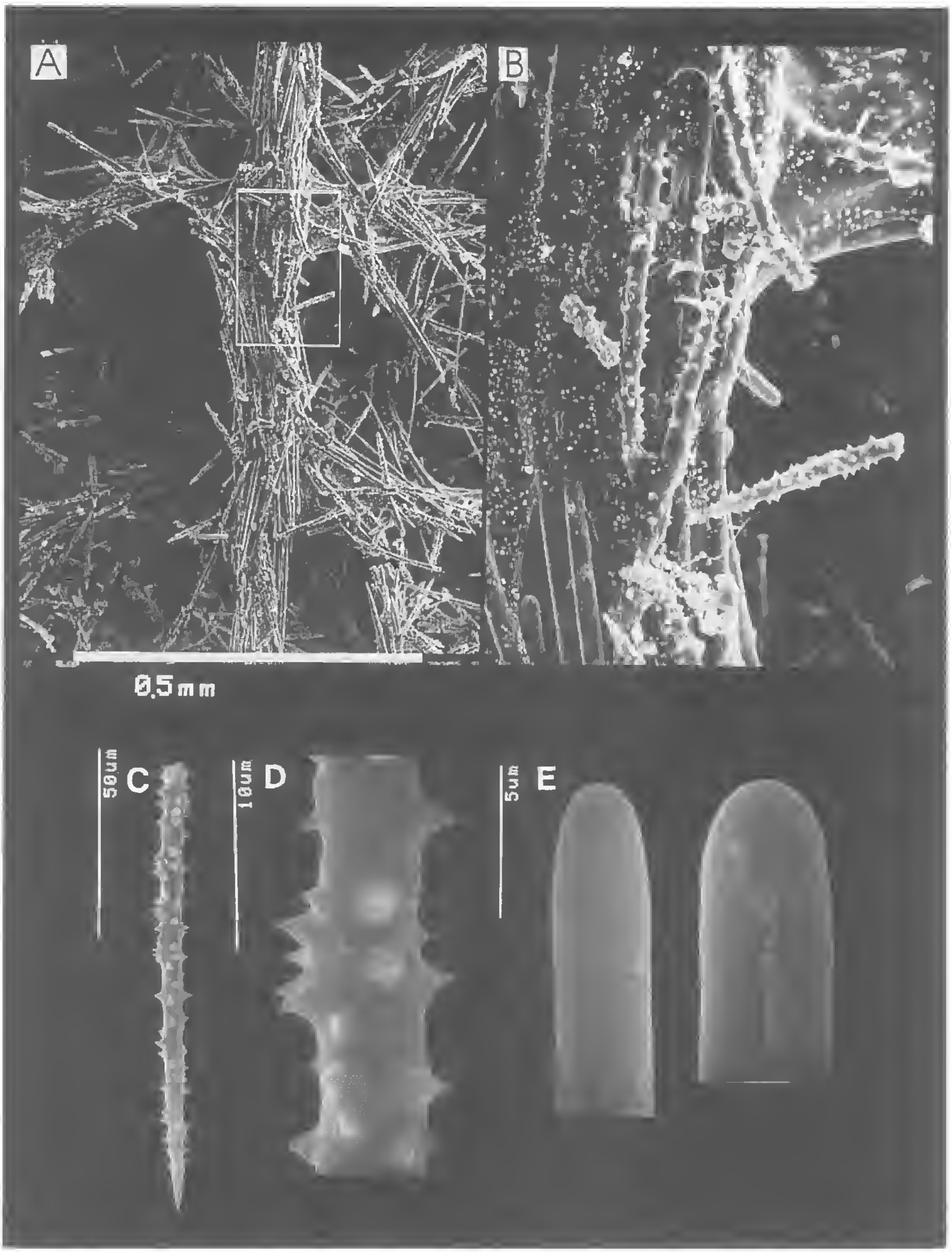

FIG. 111. *Clathria* (*Dendrocia*) *imperfecta* Dendy (holotype NMVG2369). A, Choanosomal skeleton. B, Fibre characteristics (x419). C, Echinating acanthostyle. D, Acanthostyle spination. E, Bases of subectosomal auxiliary styles.

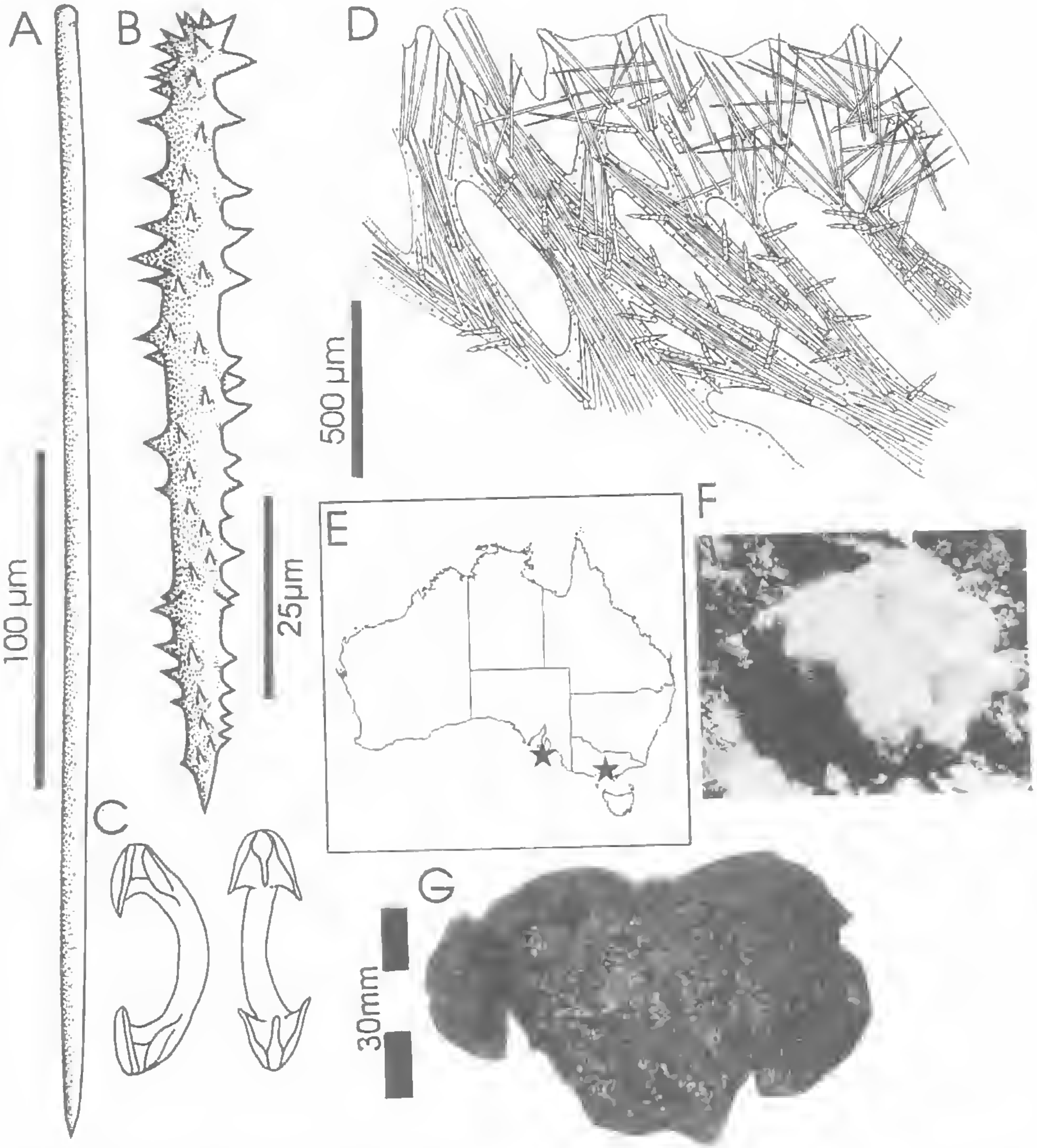

FIG. 112. *Clathria* (*Dendrocia*) *myxilloides* Dendy (holotype NMVG2376). A, Subectosomal auxiliary subtylostyle. B, Echinating acanthostyle. C, Anchorate isochelae. D, Section through peripheral skeleton. E, Australian distribution. F, QMG300613 alive. G, Holotype.

thinner auxiliary spicules, and numerous isochelae organised into tracts surrounding large choanocyte chambers.

Megascleres. Principal choanosomal megascleres absent, or undifferentiated from auxiliary spicules.

Subectosomal auxiliary styles differ slightly in size according to location within skeleton: those coring fibres and in ectosomal skeleton relatively homogenous, straight or slightly curved, hastate, with smooth, tapering or slightly subtylote bases, some appearing quasi-diactinal. Length 287-(311.4)-330µm, width 3.5-(4.9)-6µm; auxiliary styles also scattered between fibres probably younger forms of main structural megascleres, being thin, whispy, hastate, usually curved or

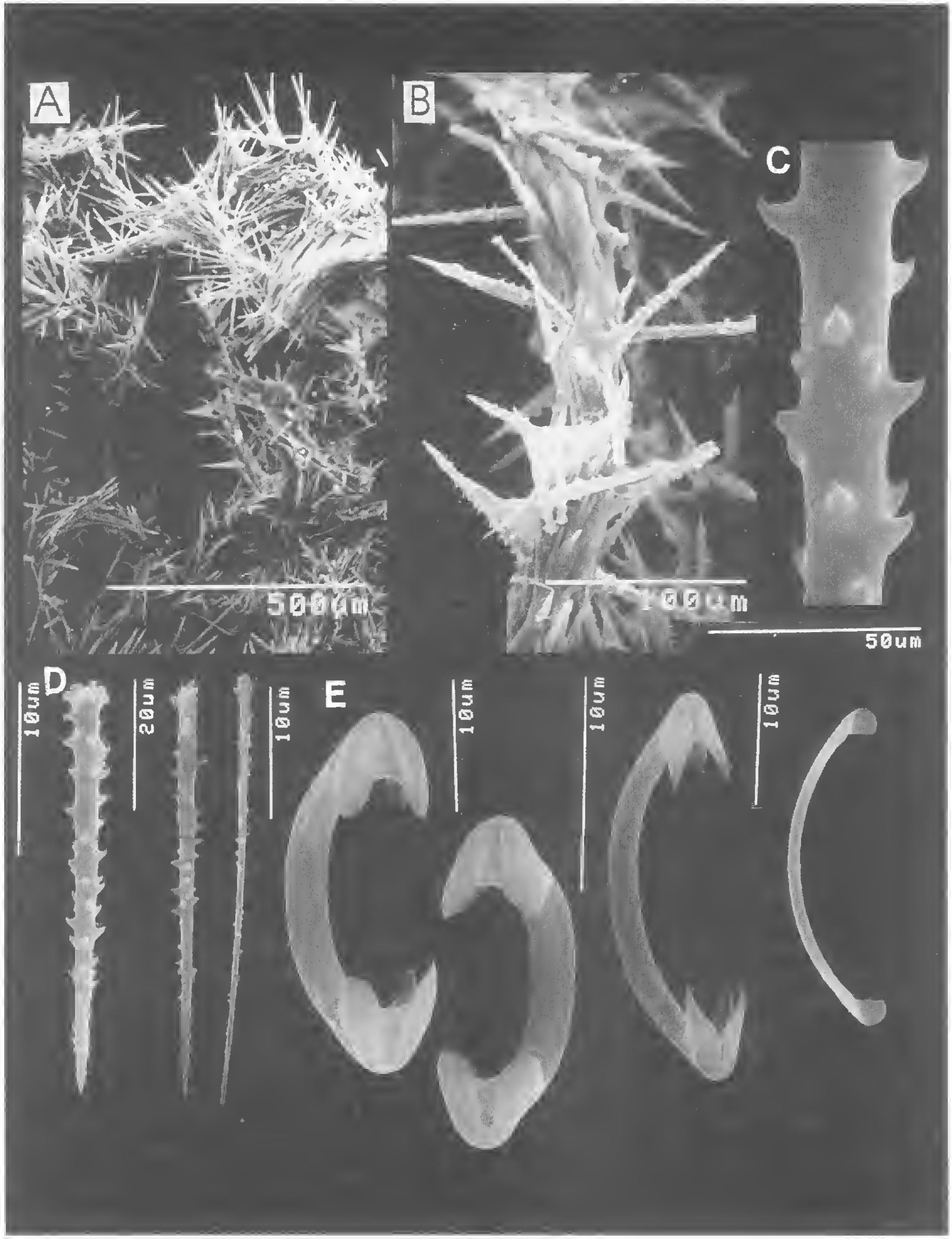

FIG. 113. *Clathria* (*Dendrocia*) *myxilloides* Dendy (holotype NMVG2376). A, Choanosomal skeleton. B, Fibre characteristics. C, Acanthostyle spination. D, Echinating acanthostyles. E, Anchorate, unguiferous and sigmoid isochelae.

sinuous, with rounded or tapering bases. Length 212-(233.0)-284µm, width 2-(2.2)-3µm.

Acanthostyles long, slender, straight or slightly curved near basal end, evenly and heavily spined. Length 84-(112.6)-133µm, width 6-(7.4)-10µm. *Microscleres.* Isochelae relatively large, abundant, anchorate, with well formed lateral alae detached from shaft nearly completely, lateral ridge on shaft (possibly vestigial point of attachment of lateral alae); some modified unguiferous forms with pointed alae, or sigmoid forms with greatly reduced alae also present. Length 21-(24.4)-29µm.

Toxas absent.

REMARKS. This species is similar to *C.* (*D.*) *imperfecta* in growth form and incorporation of some acanthostyles into fibres (see remarks for *C.* (*Thalysias*) *phorbasiformis*). It also shows similarities to *C.* (*D.*) *pyramida* in growth form and megasclere morphology, although all three species differ in isochelae geometry.

Clathria (Dendrocia) pyramida Lendenfeld, 1888

(Figs 114-115, Table 24, Plate 3B)

Clathria pyramida Lendenfeld, 1888: 222; Capon & MacLeod, 1987: 1200; Chernoff, 1987: 160; Hooper et al., 1992: 263; Hooper & Wiedenmayer, 1994: 264.

Wilsonella pyramida; Hallmann, 1912: 240, 244; Shaw, 1927: 426; Guiler, 1950: 9.

Dendrocia pyramida; Hallmann, 1920: 767.

Clathria alata Dendy, 1896: 34; Hentschel, 1911: 375-377, text-fig.48; Hentschel, 1923: 387, fig.356; Ayling et al., 1982: 100; Van Soest, 1984b: 120.

Wilsonella alata; Hallmann, 1912: 241.

Dendrocia alata; Hallmann, 1920: 767.

MATERIAL. LECTOTYPE: AMG9047: Port Jackson, NSW, 33°51'E, 151°16'E, no other details known. PARALECTOTYPE: BMNH1887.1.24.62 (fragment AMG3579): same locality. LECTOTYPE of *C. alata*: NMVG2280 (fragment BMNH1902.10.18.330): Port Phillip Bay, Vic, 38°09'S, 144°52'E, coll. J.B. Wilson (dredge, RN 752). PARALECTOTYPES of *C. alata*: NMVG2281 (fragment AMG2686): same locality (RN 763). NMVG2282 (fragment BMNH1902.10.18.31): Sorrento Jetty, Port Phillip Bay, 38°33'S, 145°21'E (dredge, RN 792). NMVG2283 (fragment BMNH1902.10.18.49): same locality (RN 801). NMVG2284 (fragment BMNH1902.10.18.332): same locality (RN 842). NMVG2285 (fragment BMNH1902.10.18.333): same locality (RN 843). OTHER MATERIAL: VIC- AME298, AMZ1145, AM unreg. (small vial, label 'donated by A Dendy'), AM unreg. (fragment BMNH1887.4.27.103) (small vial, label '*Clathria tethyopsis*, donated by A Dendy, Lendenfeld or Burton MS name'). NSW- AMZ3216, NTMZ2667, QMG304507, QMG304522, QMG304574. S AUST- SAMTS4095 (fragment NTMZ1629), SAMTS6290, QMG300503 (NCIQ66C-2119-T) (fragment NTMZ3520), QMG301354, QMG301358, QMG301374, QMG301382, QMG304041, QMG304049, QMG304051, QMG304053, QMG304054, QMG304063, QMG304064, QMG304069, QMG304070. WA- QM G300604 (NCIQ66C-4271-J), QM G300191 (NCIQ66C-4651-V). (Not AM unreg. (label '*Clathria alba*, Port Jackson, NSW', = Lendenfeld or Burton MS name; = *Crella incrustans*)).

HABITAT DISTRIBUTION. 0.8-25m depth; on sand, rock reef or muddy bottoms; associated with oysters and algal beds, *Spondylus*, *Pinna* and *Chalamus asperrimus* bivalves, rock or wood jetty substrates; Illawarra, Port Jackson, N. Sydney, Port Hacking and Durras I. (NSW); Maria I. (Tas); Port Phillip Bay (Vic); St. Vincent Gulf, Yorke Peninsula and Kangaroo I. (SA); Albany and Pelsart Is, Houtman Abrolhos (WA) (Fig. 114E).

DESCRIPTION. *Shape.* Massive, lobate, lobodigitate, irregular growth form with small lobate surface projections.

Colour. Dark brown or orange-brown live exterior (Munsell 5YR 4/6-5/10), paler choanosome, brown in ethanol.

Oscules. Few, relatively large oscules (up to 8mm diameter) on apex of lobes, each with slightly raised membraneous lip, and with membraneous, divided exhalant canals visible inside oscule; oscules collapse on preservation.

Texture and surface characteristics. Firm, compressible; smooth, relatively even, bulbous, fleshy surface in live state; optically smooth, membraneous surface in preserved state, with irregularly rugose microscopic conulose and lobate projections.

Ectosome and subectosome. Microscopically hispid, with dense crust of subectosomal auxiliary styles forming continuous, erect, regular (straight) or irregular (stellate, paratangential), plumose palisade.

Choanosome. Skeletal architecture irregularly plumo-reticulate, with sinuous spongin fibres ascending to surface in meandering tracts; fibres anastomose more frequently at axis than in peripheral skeleton; peripheral fibres and skeletal tracts often diverge becoming plumose in subectosomal region, or forming a paratangential layer immediately below erect ectosomal skeleton; fibres contain moderately light to very heavy spongin, cored by multispicular, sinuous tracts of subectosomal auxiliary styles; fibres not obviously divided into primary or secondary components, although fibre diameter varies within same sections of skeleton; acanthostyles heavily echinating most fibres, occasionally rare or absent from some; mesohyl matrix very heavy but only lightly pigmented, with abundant isochelae and auxiliary megascleres; microalgae present in mesohyl of some specimens.

Megascleres (Table 24). Choanosomal principal megascleres absent, or at least undifferentiated from auxiliary spicules.

Subectosomal auxiliary styles are thin, hastate, straight or slightly curved towards basal end, usually with smooth, slightly subtylote bases that taper towards end into a small point (partially mucronate), points hastate.

Acanthostyles vary considerably in length, usually club-shaped, subtylote, with large spines mostly confined on base and more-or-less aspinose towards point; spines usually robust.

Microscleres (Table 24). Isochelae large, very abundant, primarily palmate, heavily silicified, usually with thickened and slightly curved shaft, large lateral alae completely fused to shaft resembling 'wings', with front ala free, but sometimes with reduced alae and sigmoid curvature.

Toxas absent.

Larvae. Larvae oval-elongate parenchymella, up to 518x340µm, with larval raphidiform spicules scattered throughout the axis and forming stellate tufts at the posterior pole.

REMARKS. Type material of *Clathria pyramida* and of *C. alata* are virtually identical in their growth form, surface features, spicule geometry, spicule distribution and fibre characteristics, differing only slightly in choanosomal skeletal construction (predominantly plumo-reticulate versus predominantly plumose to slightly plumo-reticulate), and ectosomal structure (either producing a continuous erect palisade (*C. alata s.s.*) or punctuated palisade resulting in stellate plumose brushes (*C. pyramida s.s.*), respectively). But there are no consistent or significant differences between these species in the spongin content of fibres, density of spicule tracts, presence or absence of conecting secondary fibres, or spicule dimensions (Table 24), as supposed by Hallmann (1912: 241). On this basis the two species are merged here. For all other specimens examined the main variability involves the degree to which fibres were compacted (mesh size), the spongin content of skeletal tracts ('fibre' diameter), and spicule dimensions between different geographic populations (Table 24). In this latter regard populations from NSW and WA had relatively larger, more robust acanthostyles than other populations (VIC, SA). In particular, spicules from a small population in the Gulf of St Vincent, SA, were noticeably more poorly silicified and less robust than 'typical' specimens found in all other localities.

In spiculation and skeletal architecture *C.* (*D.*) *pyramida* is remarkably similar to *Crella incrustans* var. *digitata* ('cotype' AME503), although upon careful examination of both species there are obvious differences in skeletal structure (*Crella* with a tangential ectosomal layer), composition of the ectosomal skeleton (styles versus acanthostyles or acanthoxeas), and spicule geometry (quasi-diactinal auxiliary styles versus anisoxeas or quasi-monactinal megascleres, respectively). Nevertheless, these species demonstrate remarkably close convergences in several prominent features making them easily confused in the field and laboratory.

Specimens from the south coast of NSW have peculiar biochemistry and significant biological activity against both gram positive and gram negative bacteria (Hooper et al., 1992). Unlike many other bioactive sponges, however, the activity in *C.* (*D.*) *pyramida* was found to be related to a unique, modified free sugar, 5-Thio-D-mannose (Capon & MacLeod, 1987). This discovery represents the only known occurrence to date of that class of thiosugar in nature, although the compound has a glucose-based synthesised analogue which has been known for several years. Thio sugars have considerable pharmaceutical and medical potential: they inhibit the release of insulin and transport of glucose, and are able to cause reversible inhibition of sperm-cell development without displaying acute toxicity (R. Capon, pers. comm.). The taxonomic significance of those compounds is not clear, but it is possible to speculate on the biological role of those chemicals. Recent evidence (A. Butler, pers.comm.) suggests that *C.* (*D.*) *pyramida* together with a few other species (e.g., *Crella incrustans*) occur in association with (are epizootic on) scallops (*Chlamys asperrima*) from South Australian waters. Chernoff (1987) found that the presence of those epizootics increased the survival of the scallop in both field and caging experiments and it is possible that the sponges provide some sort of chemical defence of the host: thio-mannose sugar may play some sort of role in that defence.

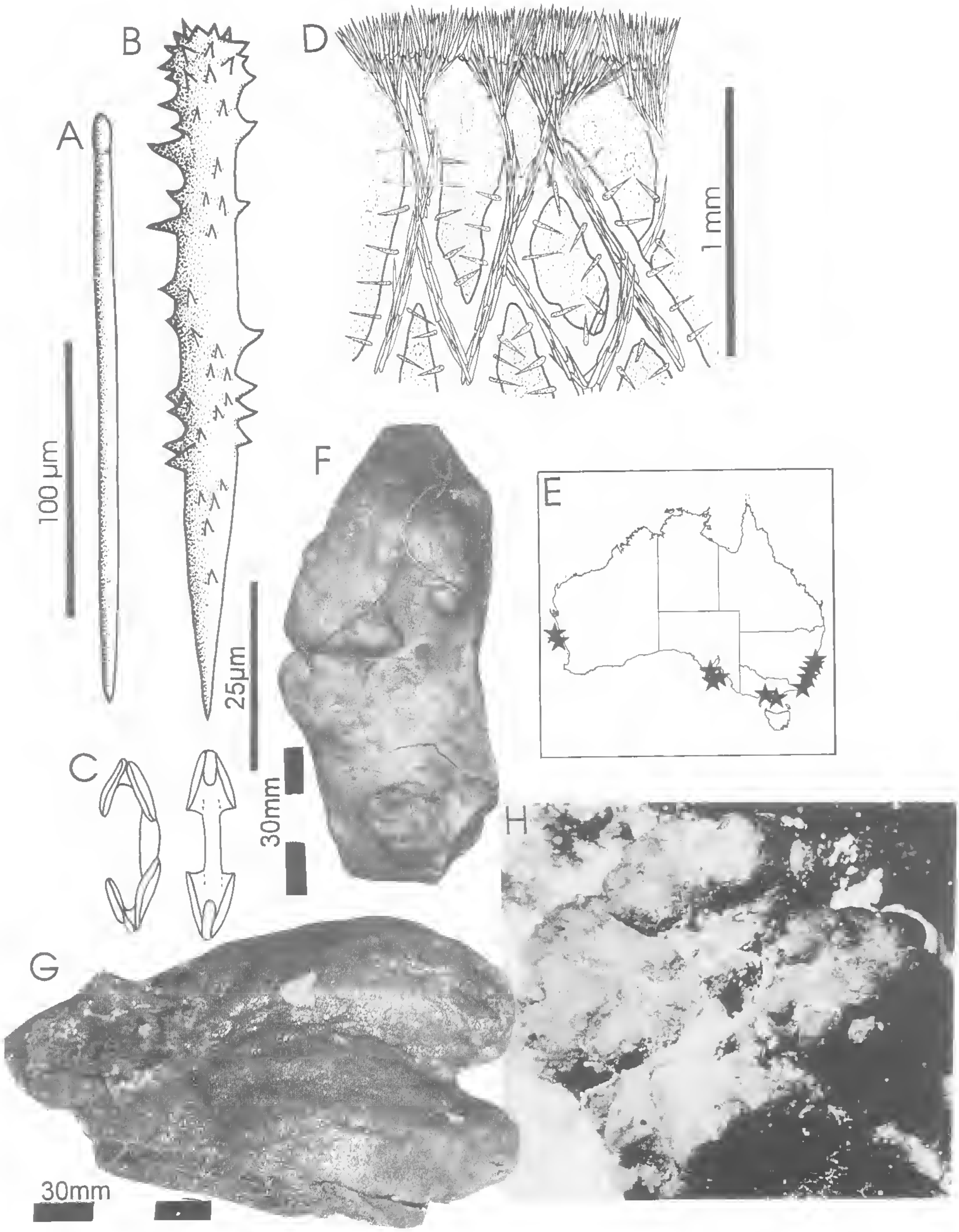

FIG. 114. *Clathria* (*Dendrocia*) *pyramida* Lendenfeld (holotype AMG9047). A, Subectosomal auxiliary subtylostyle. B, Echinating acanthostyle. C, Modified palmate isochelae. D, Section through peripheral skeleton. E, Australian distribution. F, Holotype. G, Paralectotype of *C. alata* NMVG2283. H, QMG300238 *in situ*.

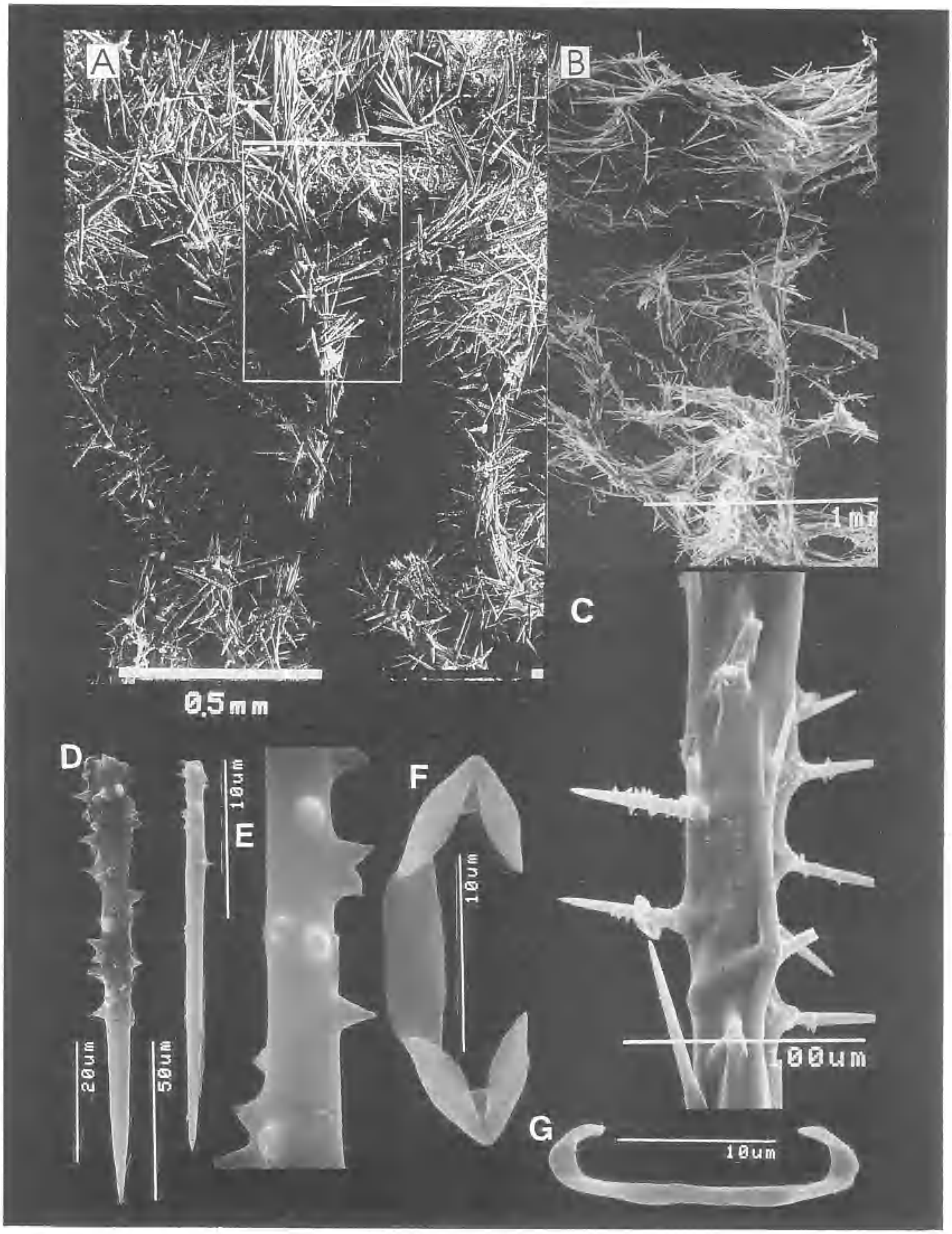

FIG. 115. *Clathria* (*Dendrocia*) *pyramida* Lendenfeld (QMG301358). A, Choanosomal skeleton. B, Peripheral skeleton. C, Fibre characteristics. D, Echinating acanthostyles. E, Acanthostyle spination. F-G, Modified thickened and sigmoid palmate isochelae.

TABLE 24. Comparison between published records and different populations of *Clathria* (*Dendrocia*) *pyramida* Lendenfeld. All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25) (bracket = number of specimens per locality examined).

SPICULE	Lectotype (AMG9047)	Lectotype of *C. Alata* (NMVG2280)	Specimens NSW (N=7)	Specimens VIC (N=10)	Specimens SA (N=16)	Specimens WA (N=2)
Choanosomal principal styles	absent	absent	absent	absent	absent	absent
Subectosomal auxiliary styles	208-(220.6)-231 x 4-(6.4)-8	211-(229.4)-243 x 3-(4.8)-7	190-(209.5)-225 x 4-(5.1)-7	202-(222.6)-247 x 4-(5.9)-9	195-(213.4)-228 x 4-(4.9)-7	214-(227.4)-242 x 4-(5.3)-7
Echinating acanthostyles	87-(99.0)-135 x 8-(10.2)-12	75-(85.2)-118 x 7-(9.2)-11	82-(103.9)-145 x 5-(8.4)-12	68-(89.6)-125 x 4-(7.2)-12	64-(78.6)-90 x 4-(7.4)-11	82-(103.5)-155 x 6-(9.0)-11
Chelae	21-(23.8)-27	23-(24.5)-27	20-(23.6)-27	20-(22.5)-25	17-(22.1)-30	22-(24.3)-27

Clathria (Dendrocia) scabida (Carter, 1885)
(Figs 116-117, Table 25)

Halichondria scabida Carter, 1885b: 112, pl.4, figs 4-5; Carter, 1886g: 449.
Microciona scabida; Dendy, 1896: 31; Hallmann, 1912: 150; Vosmaer, 1935a: 608.
? *Stylotellopsis* or *Clathrissa scabida*; Hallmann, 1912: 151.
Anaata scabita [lapsus]; de Laubenfels, 1936a: 109.
Clathria scabida; Hooper & Wiedenmayer, 1994: 264
Halichondria pustulosa, in part; Carter, 1886g: 450.
Not *Halichondria pustulosa* Carter, 1882a: 285, pl.11, fig.1.

MATERIAL. HOLOTYPE: BMNH1887.7.11.9 (fragment AMG2760): Port Phillip, Vic, 38°09'S, 144°52'E, coll. J.B. Wilson (dredge). OTHER MATERIAL: VIC - NMVRN413, NMVRN1025, NMVRN1038, BMNH1887.7.11.26 (slide AMG-2916).

HABITAT DISTRIBUTION. 38m depth; substrate unknown; Port Phillip and Westernport Bays (Vic) (Fig. 116F).

DESCRIPTION. *Shape*. Low, globular, erect, arborescent, digitate sponge, 80-95mm high, 45-70mm wide, with subspherical, lobate branches, 28-42mm long, 12-28mm diameter, on a short stalk, 22mm long, 12-15mm diameter.

Colour. Live colouration orange-brown, brown exterior and yellow-brown interior preserved.

Oscules. Large oscules, up to 5mm diameter, situated in groups (seive-plates) on all sides of branches; seive-plates sunken, resembling porocalyses of the Tethyidae.

Texture and surface characteristics. Surface uneven, fibrous, with numerous large pores, seive-plates and subdermal canals covered with prominent membraneous skin, raised into small papillae and ridges.

Ectosome and subectosome. Ectosome hispid, with subectosomal auxiliary subtylostyles forming sparse but continuous dermal palisade of erect brushes, sometimes tangential, protruding from surface, piercing heavy crust of isochelae lying on ectosomal membrane; subectosomal region plumose, with sinuous tracts of subectosomal subtylostyles diverging from ends of choanosomal fibres, and with numerous, relatively large subdermal cavities lined by isochelae.

Choanosome. Choanosomal skeleton irregularly plumo-reticulate, with sinuous, heavy, spongin fibres cored by subectosomal auxiliary styles and fewer larger acanthostyles, and echinated by two sizes of acanthostyles; smaller acanthostyles echinate fibres in relatively heavy, even concentrations, whereas larger acanthostyles most common at fibre nodes and echinate fibre terminations in radiating brushes; spongin fibres not divided into primary or secondary components, and fibre anastomoses occur irregularly throughout skeleton; mesohyl matrix very heavy, with abundant isochelae scattered and also congregated around fibres and choanocyte chambers.

Megascleres (Table 25). Choanosomal principal megascleres absent or at least completely undifferentiated from auxiliary spicules.

Subectosomal auxiliary subtylostyles, coring fibres and in dermal membrane, long, thin, mostly straight, hastate, with elongated, subtylote, smooth bases.

Larger acanthostyles subtylote, slightly curved, with sparse but large spines along shaft and base, and usually with an aspinose apex. Smaller acanthostyles subtylote, evenly and heavily spined.

Microscleres (Table 25). Isochelae extremely abundant, anchorate-like, with curved shaft, lateral alae nearly completely detached from shaft, completely free front ala, and lateral ridge on shaft (possibly vestigial point of alae attach-

TABLE 25. Comparison between present and published records of *Clathria* (*Dendrocia*) *scabida* (Carter). Measurements in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Holotype (BMNH1887.7.11.9)	Specimens (N=3)
Choanosomal principal styles	absent	absent
Subectosomal auxiliary styles	201-(237.2)-273 x 3-(4.4)-5.5	196-(226.5)-278 x 2-(3.7)-5
Echinating acanthostyles I	153-(191.6)-219 x 5.5-(7.1)-9	193-(201.1)-221 x 6-(7.3)-9
Echinating acanthostyles II	78-(90.4)-98 x 3-(6.8)-10	82-(95.3)-105 x 5-(6.4)-8
Chelae I (sigmoid)	16-(18.2)-21	19-(20.9)-24
Chelae II (arcuate-like)	24-(29.2)-33	28-(31.4)-34
Chelae III (bipocilla-like)	14-(16.2)-18	18-(19.3)-22
Toxas	35-(72.4)-120 x 1-(1.8)-3 uncommon	70-(121.1)-156 x 1-(2.2)-3 common

ment); reduced chelae also present, unguiferous, with pointed alae.

Toxas oxhorn, with wide central curvature and slightly reflexed arms.

REMARKS. Carter's (1885a) holotype (BMNH1887.7.11.9), and his (1886g) specimen of *H. pustulosa,* BMNH1887.7.11.26 are identical, as suspected from their respective descriptions, whereas *H. pustulosa* from the Falkland Is (Carter, 1882a) is different.

Clathria scabida has skeletal architecture, fibre structure, ectosomal characteristics and spicule geometry characteristic of *Dendrocia*, whereas the presence of a second, larger size class of acanthostyle (which may be incorporated into skeletal spicule tracts as well as echinating the fibre endings and fibre nodes) is unusual to the genus. Possession of hymedesmoid-plumose or plumose skeletal architecture links several microcionids termed the '*scabida*' group (*C.* (*D.*) *scabida*, *C.* (*Microciona*) *similis*, *C.* (*M.*) *hentscheli*, *C.* (*M.*) *tetrastyla*, *C.* (*M.*) *thielei*, *C.* (*Thalysias*) *tingens* sp. nov. and *C.* (*T.*) *distincta*).

Earlier records of this species (Carter, 1885a, 1886g; Hallmann, 1912) differentiate isochelae microscleres into 3 or 4 morphs, but all isochelae in both specimens are not as vastly different as supposed by Carter (1885a). They are not arcuate, as supposed by previous authors, but anchorate with completely detached lateral alae and ridges on the lateral sides of shaft. This is the only known species of *Clathria* (*Dendrocia*) with toxa microscleres.

Clathria (Axociella) Hallmann, 1920

Axociella Hallmann, 1920: 779; Bergquist & Fromont, 1988: 116.
Axosuberites Topsent, 1893a: 179.
Tenaciella Hallmann, 1920: 772.

DEFINITION. Well differentiated axial and extra-axial skeletal architecture (reminiscent of Raspailiidae); axial skeleton markedly compressed, reticulate; extra-axial skeleton radial, plumose or plumo-reticulate composed of large subectosomal auxiliary styles-subtylostyles; specialised ectosomal skeleton present composed of smaller auxiliary spicules; echinating megascleres absent although principal spicules may protrude through fibres at acute angles.

TYPE SPECIES. *Esperiopsis cylindrica* Ridley & Dendy, 1886: 340 (by original designation).

REMARKS. *Axociella* is represented in Australasian waters by six species, one new, all of which have very well differentiated skeletal structures closely resembling the compressed skeletons common in Raspailidae. The existence of microcionids with compressed axial skeletons and differentiated axial and extra-axial skeletons supports the proposal for a closer relationship between Raspailiidae and Microcionidae, as proposed by Hooper (1990a, 1991), and formalised further by Hajdu et al. (1994) in their subordinal classification of Poecilosclerida. Crucial characters differentiating the *Axociella* group from typical Raspailiidae are the possession of chelae and absence any true echinating spicules in the former, versus possession of a specialised ectosomal skeleton (composed of small styles or oxeas in brushes surrounding larger protruding spicules) in the latter (see Hooper, 1991).

Clathria parva Lévi (from S and SW Africa) and *Axosuberites fauroti* Topsent (from the Gulf of Aden), are also referred here to *C.* (*Axociella*) because they have well differentiated axial and extra-axial regions, whereas 3 NZ species (Bergquist & Fromont, 1988) are retained in this group only on a tentative basis since their skeletal structures are not typical of *Axociella.* Other species referred to *Axociella* e.g., de Laubenfels, 1936a) are simply encrusting and/or lack echinating acanthostyles (a secondary loss common amongst Microcionidae and Raspailiidae), and do not belong to *Axociella* as defined here.

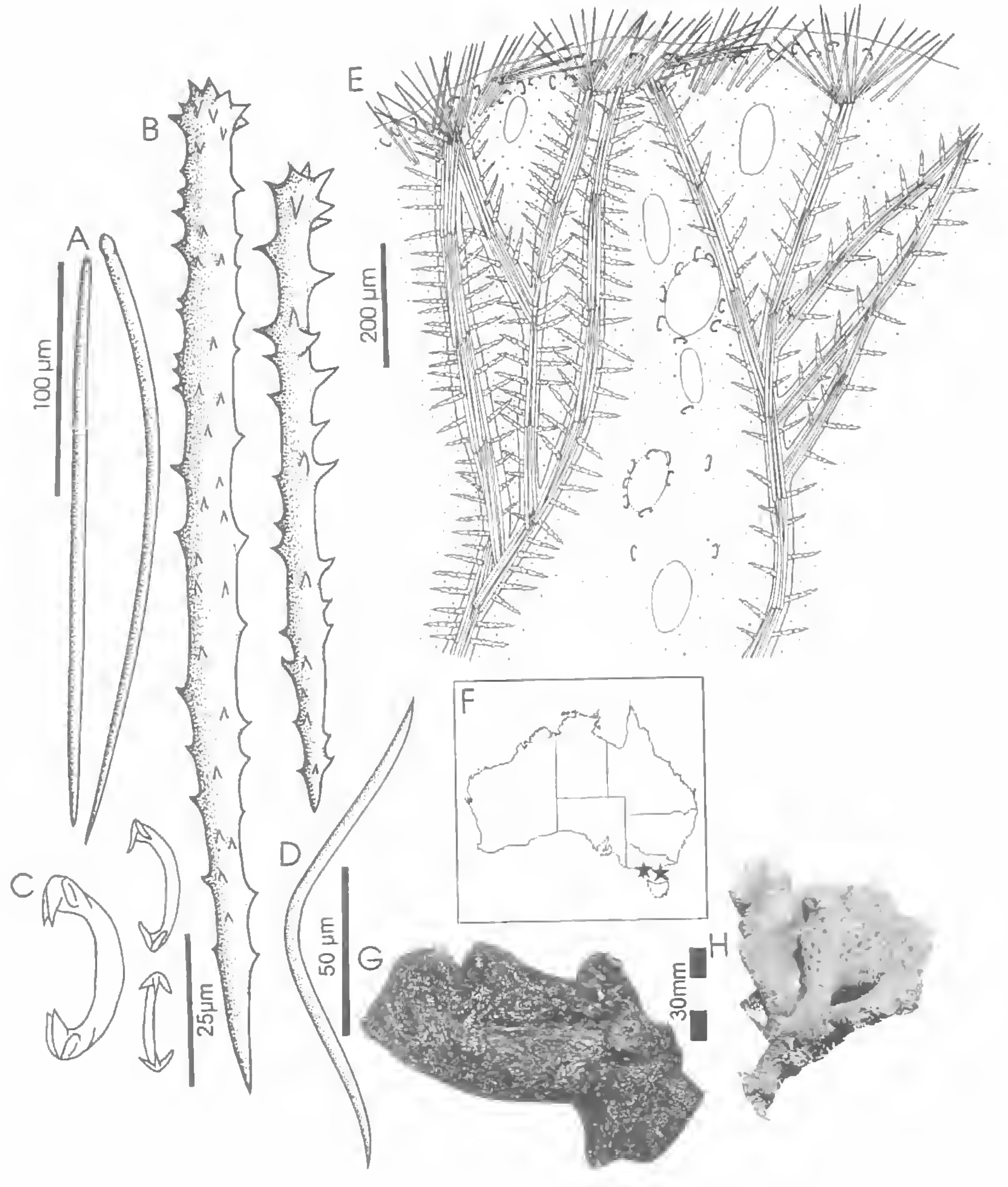

FIG. 116. *Clathria* (*Dendrocia*) *scabida* (Carter) (NMVRN1038). A, Subectosomal auxiliary style/ subtylostyle. B, 2 sizes echinating acanthostyle. C, Anchorate-like isochelae. D, Oxhorn toxas. E, Section through peripheral skeleton. F, Australian distribution. G, Holotype BMNH1887.7.11.9. H, NMVRN1025.

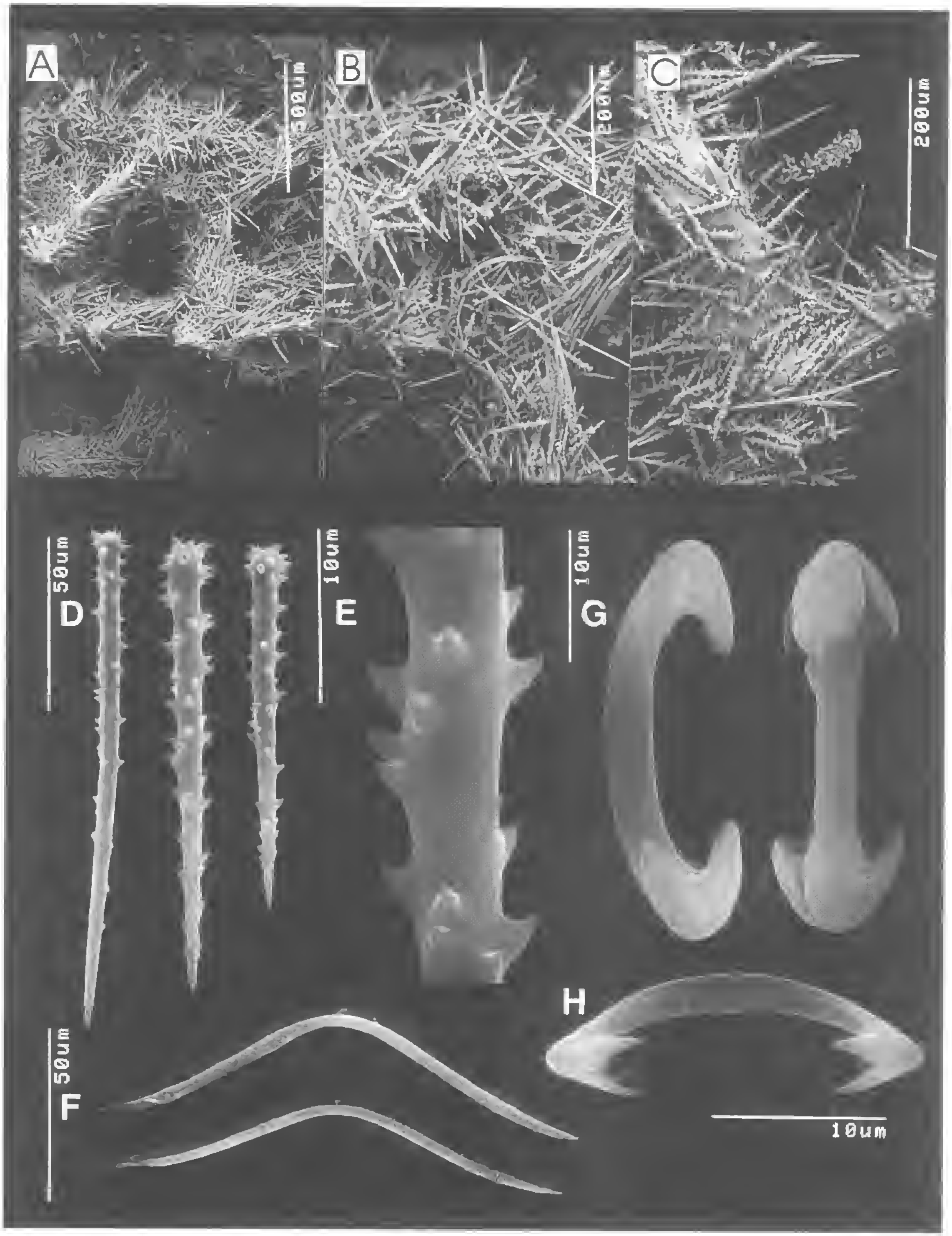

FIG. 117. *Clathria* (*Dendrocia*) *scabida* (Carter) (NMVRN1025). A, Choanosomal skeleton. B, Peripheral skeleton. C, Fibre characteristics. D, Echinating acanthostyles. E, Acanthostyle spination. F, Oxhorn toxas. G, Anchorate isochelae. H, Uniguiferous anchorate isochelae.

Clathria (Axociella) canaliculata
(Whitelegge, 1906)
(Figs 118-119)

Esperiopsis canaliculata Whitelegge, 1906: 471, pl.43, fig.7
Tenaciella canaliculata; Hallmann, 1920: 773, pl.36, figs 1-2, pl.37, fig.1, text-fig.1; Ristau, 1978: 585-586.
Artemisina canaliculata; Ristau, 1978: 585-586.
Rhaphidophlus canaliculata; Van Soest, 1984b: 115.
Clathria canaliculata; Hooper & Wiedenmayer, 1994: 262.

MATERIAL. LECTOTYPE: AMG4325: Off Wata Mooli, Bulgo, Woolongong, NSW, 34°30'S, 151°10'E, 104-126m depth, 01.iii.1900, coll. FIV 'Thetis' (dredge). PARALECTOTYPE: AMZ988: Off Woolongong, NSW, 34°25'S, 151°10'E, 220-224m depth, 01.iii.1900., coll. FIV 'Thetis' (dredge). OTHER MATERIAL: QLD- QMG300460 (fragment NTMZ1562).

HABITAT DISTRIBUTION. Growing in soft sediments, associated with gorgonian beds in deeper waters of the continental shelf; 94-126m depth; Wollongong (NSW), S. Stradbroke I. (SEQ) (Fig. 118G).

DESCRIPTION. *Shape.* Erect, whip-like, cylindrical branching digits, 150-190mm long, with short cylindrical stalk 30-50mm long, 10-15mm diameter, and few thick subcylindrical branches, mostly in 1 plane, bifurcating and occasionally anastomosing.
Colour. Drab grey in ethanol.
Oscules. Small, less than 2mm diameter, dispersed over lateral margins of branches.
Texture and surface characteristics. Firm, flexible; surface smooth, fleshy, velvetty, felt-like, slightly porous, without obvious ornamentation.
Ectosome and subectosome. Thick, erect, plumose brushes of ectosomal auxiliary subtylostyles form dense, continuous palisade on exterior surface; discrete tracts of larger subectosomal auxiliary styles form thick, multispicular, ascending or paratangential brushes supporting ectosomal skeleton.
Choanosome. Partially compressed, open-meshed reticulate axial skeleton and radial extra-axial skeleton, becoming plumose in periphery; skeleton composed of very heavy spongin fibres of large diameter, up to 250μm diameter, forming ovoid meshes, and clearly divided into primary ascending and secondary connecting elements, differing substantially in diameter; fibres cored by multispicular tracts of choanosomal principal styles occupying most of fibre diameter; spicule content of fibres increases towards periphery; secondary fibres less heavily cored; echinating megascleres absent; mesohyl matrix moderately heavywith scattered microscleres, but megascleres largely confined within fibres except at periphery.
Megascleres. Choanosomal principal styles thick, slightly curved or rarely straight, fusiform, with smooth, rounded or very slightly subtylote bases. Length 130-(318.7)-465μm, width 4-(21.2)-26μm.

Subectosomal auxiliary styles long, thick, straight, fusiform, with tapering rounded or very slightly subtylote bases, usually smooth, occasionally microspined. Length 240-(465.0)-590μm, width 10-(12.2)-16μm.

Ectosomal auxiliary subtylostyles straight or slightly curved, with microspined subtylote bases, fusiform points. Length 80-(114.6)-165μm, width 5-(6.1)-8μm.

Microscleres. Palmate isochelae with long lateral alae completely fused to shaft and fused front ala; chelae clearly differentiated into two size classes, the smaller often twisted. Length I: 4-(4.6)-8μm; length II: 14-(17.5)-22μm.

Toxas accolada, usually long, thin, slight central curvature and straight or only slightly reflexed points. Length 18-(220.8)-550μm, width 0.5-(1.9)-3.3μm.

REMARKS. Hallmann (1920) erected *Tenaciella* for this species on the basis that it lacked echinating spicules and had a *Thalysias*-like ectosomal skeleton. Simpson (1968a) found no correlation between these 2 features and histological evidence to support recognition of this genus distinct from *Clathria*. Spicule geometry and the ectosomal skeleton in *C.* (*A.*) *canaliculata* indicate relationship with *Thalysias*, whereas skeletal structure (particularly the radial choanosomal skeleton), is reminiscent of *Raspaila nuda* (Hooper, 1991). The shared skeletal structure in *Axociella* and Raspailiidae support the contention that they are monophyletic, belonging to the suborder Microcionina (Hajdu et al., 1994).

The well developed felt-like ectosomal spiculation and radial subectosomal spicule tracts in the peripheral skeleton of *C.* (*A.*) *canaliculata* is virtually at the opposite end of a continuum from encrusting *Microciona*-like species (with membraneous dermal skeletons). These differences contrast so greatly with species such as *C.* (*M.*) *aceratoobtusa* that it is tempting to maintain generic separation between typical *Microciona* and *Thalysias*-like species, but as demonstrated elsewhere in this work there are too many other microcionid species with intermediate conditions making it impossible to clearly define a generic boundary within this continuum.

Clathria (*Axociella*) *canaliculata* is most closely related to *C.* (*A.*) *cylindrica*, with similar growth form, surface characteristics and skeletal structure. However, this species has slightly compressed open-reticulate axis, radial extra-axis, and continuous plumose ectosome, whereas *C.* (*A.*) *cylindrica* has a greatly compressed close-meshed axis, a radial extra-axis and a sparse, discontinuous, plumose ectosome. Toxa morphology and spicule size also differ substantially between these two species.

Clathria (Axociella) cylindrica
(Ridley & Dendy, 1886)
(Fig. 120-121)

Esperiopsis cylindrica Ridley & Dendy, 1886: 340; Ridley & Dendy, 1887: 79-80, pl.19, figs 2a-b.
Axociella cylindrica; Hallmann, 1920: 780-783, pl.37, figs 2-4, text-fig.2;
Not *Axociella cylindrica*; Sim & Byeon, 1989: 39-40, pl.5, figs 1-2.
Clathria cylindrica; Hooper & Wiedenmayer, 1994: 262.
Not *Rhaphidophlus cylindricus* Kieschnick, 1900: 53, pl.44, fig.10.

MATERIAL. HOLOTYPE: BMNH1887.5.2.96: Off Port Jackson, NSW, 33°51'S, 151°16'E, 60-70m depth, coll. HMS 'Challenger' (dredge). OTHER MATERIAL: NSW- AMZ1527.

HABITAT DISTRIBUTION. Soft sediments; 40-70m depth; Port Jackson, Botany Bay (NSW) (Fig. 120G).

DESCRIPTION. *Shape.* Thin, cylindrical digitate, branching, whip-like, 130-190mm long, 10-20mm diameter, with thin, dichotomously branched, cylindrical or slightly flattened, distally tapering branches, up to 130mm long, 16mm diameter, short stalk and expanded basal attachment.

Colour. Grey-brown in ethanol.

Oscules. Not seen.

Texture and surface characteristics. Firm, flexible, tough consistency; surface even, felt-like, unornamented, prominently hispid.

Ectosome and subectosome. Sparse, plumose brushes of small ectosomal auxiliary subtylostyles form discrete, discontinuous bundles on surface, arising from ends of radial skeletal columns, scattered around the larger, protruding subectosomal auxiliary styles which project some distance through surface.

Choanosome. Skeletal structure with clearly differentiated axial and extra-axial components, markedly compressed in axis and radial in extra-axis; compressed axial skeleton with longitudinal fibres cored by short choanosomal principal subtylostyles, interconnected by thinner pauci- or aspicular fibres; axial spongin fibres heavy, and fibre anastomoses very close-meshed forming elongate reticulation; mesohyl matrix in axis light with abundant loose auxiliary styles dispersed between and congregated around fibres; echinating megascleres absent; radial extra-axial skeleton with large auxiliary styles perpendicular to axis, forming pauci- or multispicular radial (non-plumose) tracts associated with very light, ascending spongin fibres but very few transverse uni- or aspicular connecting fibres; mesohyl matrix in extra-axial region moderately heavy, with few scattered auxiliary megascleres.

Megascleres. Choanosomal principal subtylostyles coring axial fibres relatively short, slightly curved at centre, with smooth subtylote or sometimes evenly rounded bases and fusiform points. Length 215-(311.2)-395μm, width 5-(10.4)-15μm.

Subectosomal auxiliary styles forming extra-axial bundles much longer and thicker than principal spicules, with smooth rounded or tapering (hastate) bases, and fusiform points. Length 424-(559.6)-725μm, width 15-(21.0)-29μm.

Ectosomal auxiliary subtylostyles straight, variable length, with smooth rounded or slightly subtylote bases and fusiform points. Length 208-(361.8)-575μm, width 6-(8.2)-10μm.

Microscleres. Palmate isochelae unmodified, differentiated into two size classes, with long lateral alae entirely fused to shaft and completely fused front ala. Length I: 6-(9.3)-13μm; length II: 19-(22.3)-25μm.

Toxas oxhorn, thick, with wide central curvature and slightly reflexed points. Length 45-(86.2)-130μm, width 2.5-(4.3)-6μm.

REMARKS. The chelae and toxa microscleres show that this species belongs to the Microcionidae, whereas skeletal architecture is most closely related to the Raspailiidae (cf *Raspailia* (*Syringella*) and *Ectyoplasia*). Like *C.* (*A.*) *canaliculata*, this species lacks echinating megascleres, and this was the primary reason why Hallmann (1920) created *Axociella*. Despite contrary arguments by Van Soest (1984b), *Axociella* is considered sufficiently different from *Thalysias* in skeletal construction to be differentiated at the supraspecific level (although not for

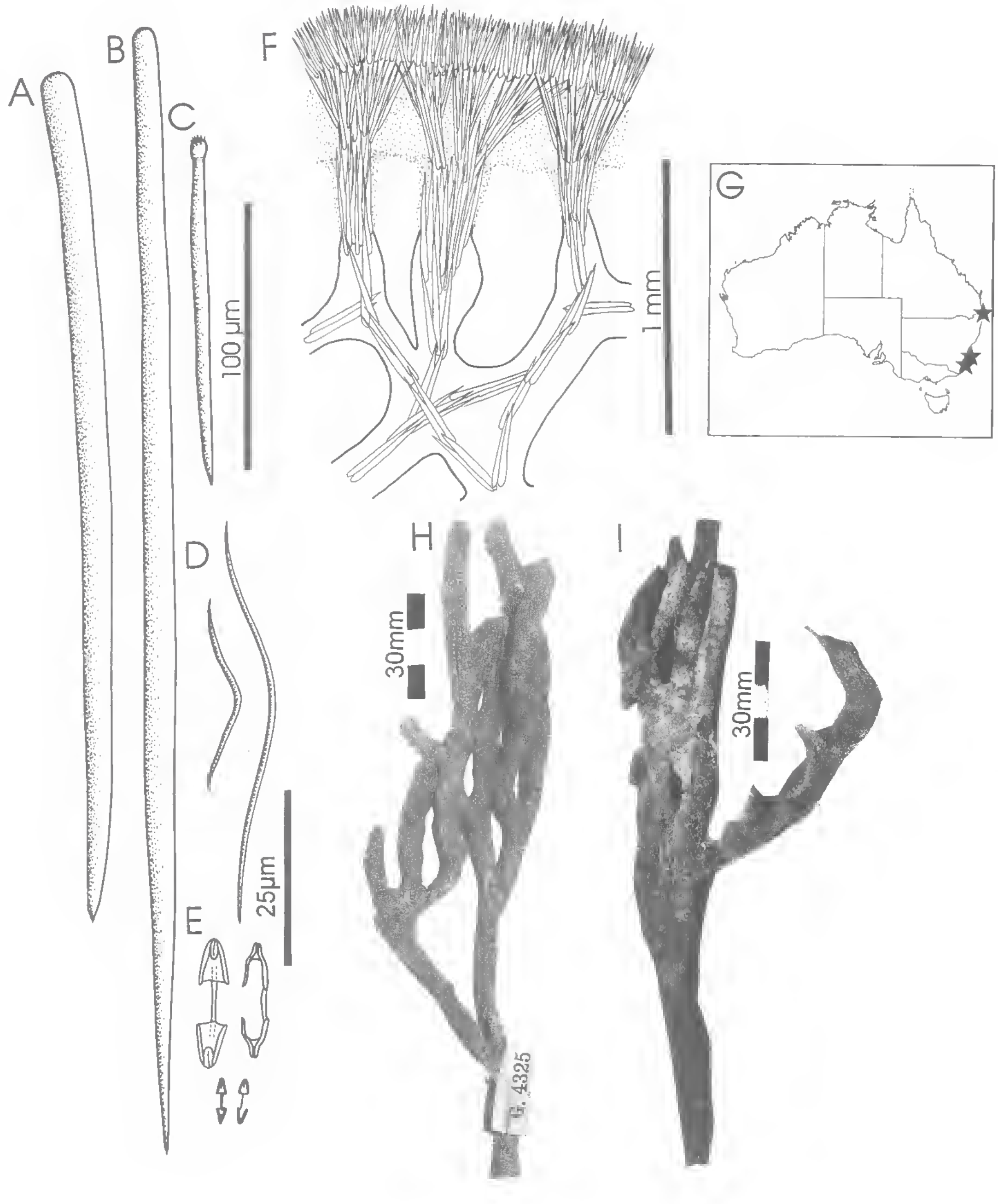

FIG. 118. *Clathria* (*Axociella*) *canaliculata* (Whitelegge) (lectotype AMG4325). A, Choanosomal principal style. B, Subectosomal auxiliary style. C, Ectosomal auxiliary subtylostyle. D, Accolada toxas. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, Lectotype. I, QMG300460.

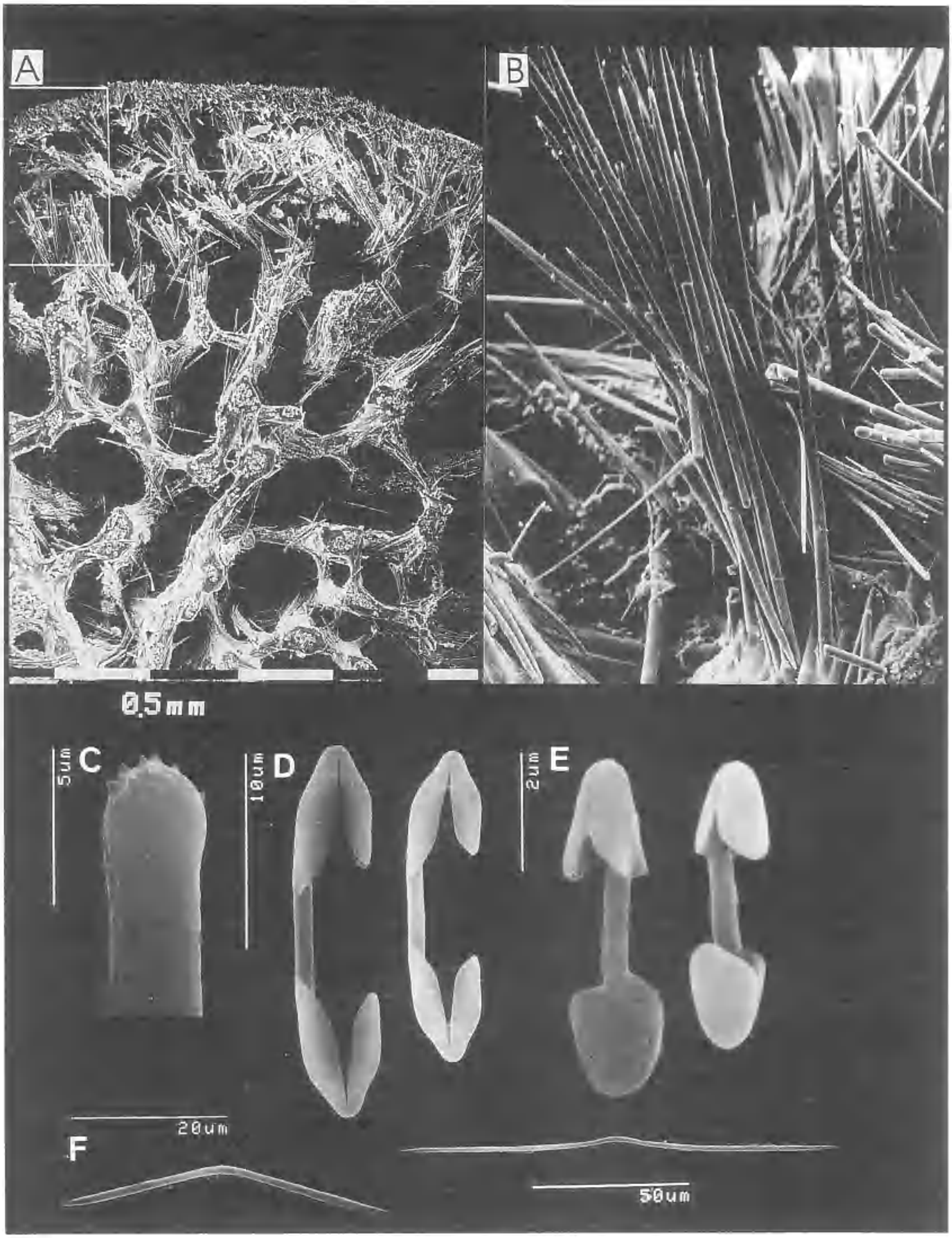

FIG. 119. *Clathria* (*Axociella*) *canaliculata* (Whitelegge) (A, lectotype AMG4325; B-F, specimen QMG300460). A, Choanosomal skeleton. B, Extra-axial fibre characteristics (x144). C, Base of ectosomal auxiliary subtylostyle. D-E, Palmate isochelae. F, Accolada toxas.

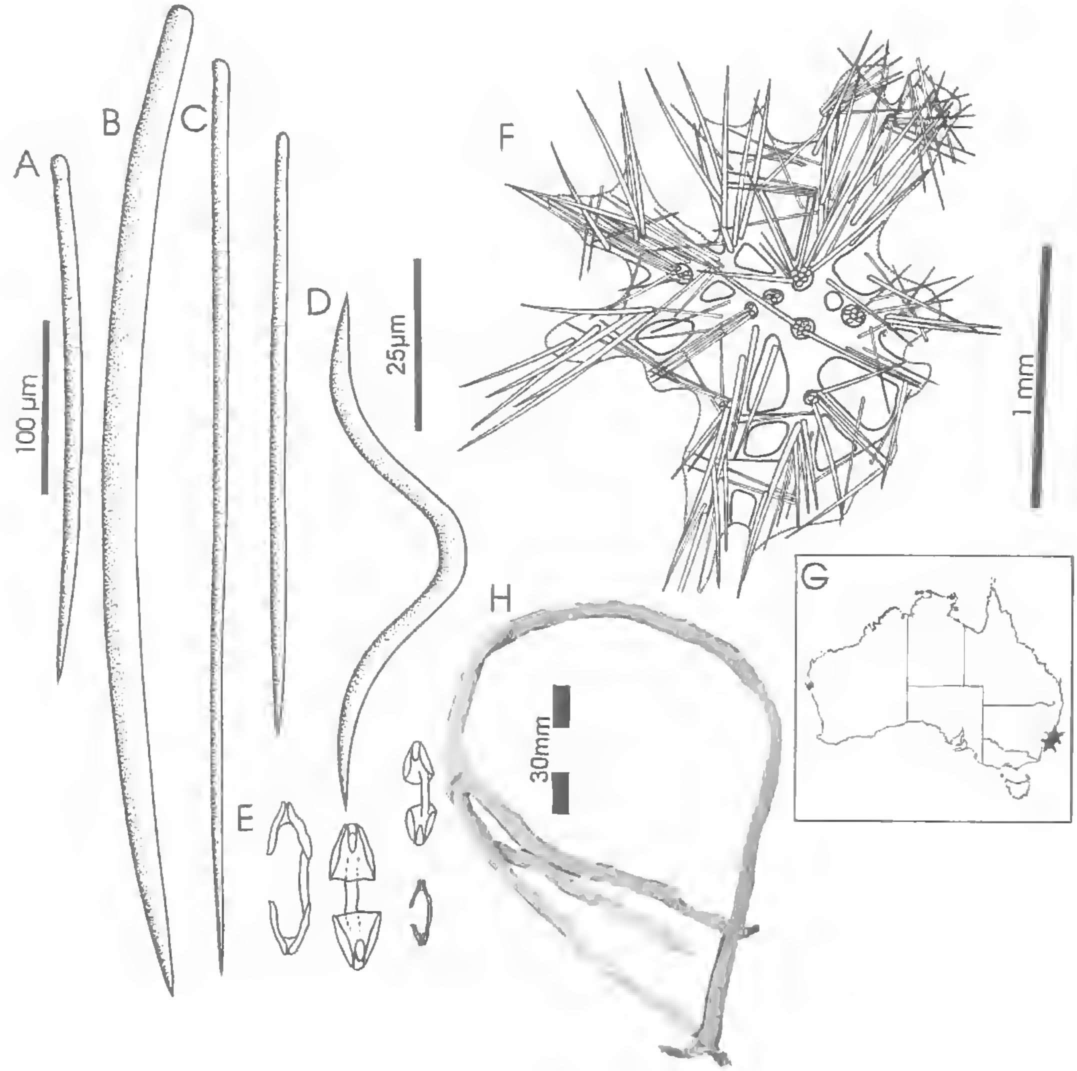

FIG. 120. *Clathria* (*Axociella*) *cylindrica* (Ridley & Dendy) (AMZ1527). A, Choanosomal principal subtylostyle (coring axial fibres). B, Subectosomal auxiliary style (coring extra-axial skeleton). C, Ectosomal auxiliary subtylostyles. D, Oxhorn toxa. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, Holotype BMNH1887.5.2.96.

the reason that it lacks echinating acanthostyles; Simpson, 1968a). Supporting this interpretation is the fact that a specialised *Thalysias* ectosomal skeleton is absent in *C.* (*A.*) *macropora* and *C.* (*A.*) *thetidis*. AMZ1133 from the FIV 'Thetis' expedition, although not described by Hallmann (1912), is very close to *C.* (*A.*) *cylindrica* differing only in having echinating acanthostyles and long thin, almost straight rhaphidiform toxas. This material almost certainly represents a new species but its antiquated condition is too poor to serve as the holotype of a new taxon. *Clathria* (*Axociella*) *cylindrica* also shows some similarities to *C.* (*Thalysias*) *procera* in growth form and having well differentiated axial and extra-axial skeletons, but these species differ in most other respects.

Axociella cylindrica of Sim & Byeon (1989) from Korea does not compare to the Australian population, differing markedly in most features, and is referred here to *Clathria* (*Microciona*) *simae* sp. nov.

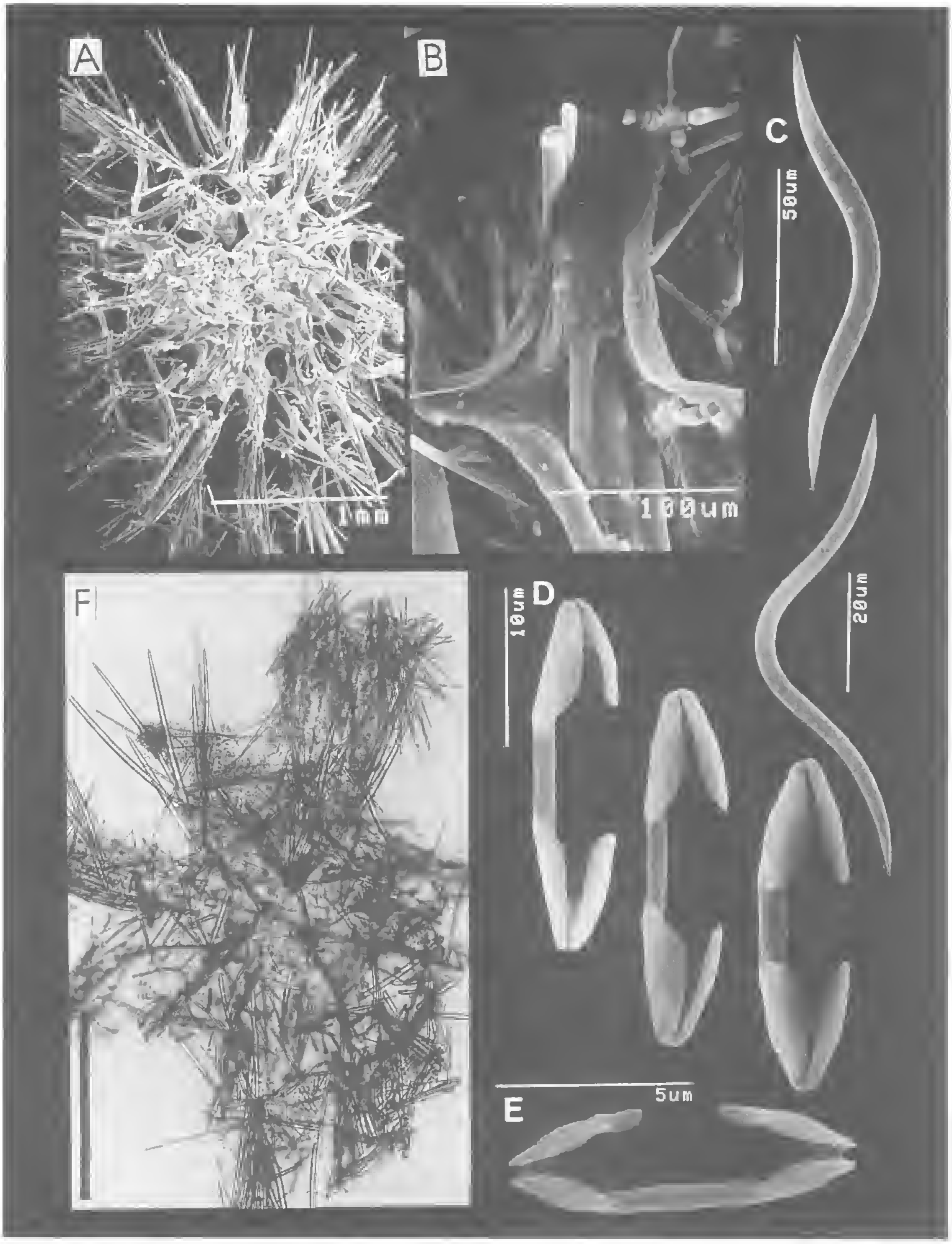

FIG. 121. *Clathria* (*Axociella*) *cylindrica* (Ridley & Dendy) (holotype BMNH1887.5.2.96). A, Choanosomal skeleton. B, Fibre characteristics. C, Oxhorn toxas. D-E, Palmate isochelae. F, Cross-section through branch of AMZ1527.

Clathria (Axociella) nidificata
(Kirkpatrick, 1907)
(Figs 122-123)

Ophlitaspongia nidificata Kirkpatrick, 1907: 274; Kirkpatrick, 1908b: 25, pl.22, fig.6, pl.24, fig.5; Hallmann, 1912: 254; Burton, 1929a: 433; Burton, 1932a: 324; de Laubenfels, 1936a: 120; de Laubenfels, 1954: 162.

Axociella nidificata; Burton, 1940: 116; Koltun, 1964a: 70, pl.12,figs 7-11; Koltun, 1976: 155, 190; Desqueyroux, 1975: 67-68, pl.4, figs 47-50; Hoshino, 1977a: 45-46, table 1.

Clathria (Axociella) nidificata; Hooper & Wiedenmayer, 1994: 263; Mothes & Lerner, 1995: 159-160, figs 22-27, 55.

Ophlitaspongia flabellata Topsent, 1916: 167; Topsent, 1917: 41, pl.1, fig.4, pl.6, fig.2; Burton, 1929: 433; Burton, 1932: 325; Burton, 1934b: 34.

Axociella flabellata; Koltun, 1964a: 70-71, pl.12, figs 12-14; Hoshino, 1977a: 45-46, table 1.

Axociella rameus Koltun,1964a: 71, text-fig.17; Hoshino, 1977a: 45-46, table 1.

MATERIAL. HOLOTYPE: BMNH1908.2.5. 131: Coulman I., Victoria Land, Ross Dependency, Antarctica, 73°30'S, 17°00'E, 200m depth, coll. HMS 'Discovery' (dredge).

HABITAT DISTRIBUTION. On hard substrates; 93-540m depth; Antarctica: BANZARE coast; Budd Coast, Wilkes Land; Kemp Land, Enderby Land; Mawson Peninsula, Oates Land; Coulman I., Victoria Land; Prydz Bay, MacKenzie Bay and Mawson Coast, MacRobertson Land; King Edward Ice Shelf, Enderby Land; Joinville and Elefante Is; Palmer Archipelago; Graham Land; also South Georgia, S. Shetland Is (Fig. 122E).

DESCRIPTION. *Shape*. Erect, claviform-flabellate, narrow stalk.

Colour. Yellow-brown in ethanol.

Oscules. Oscules on upper surface of club, 1-2mm diameter.

Texture and surface characteristics. Texture compressible, tough, harsh surface; surface hispid, conulose, membraneous between conules.

Ectosome and subectosome. Ectosomal skeleton plumose, composed of discrete bundles of subectosomal auxiliary subtylostyles perched on ends of protruding principal spicules, corresponding to surface conules.

Choanosome. Skeleton compressed in axis and plumose in extra-axis; axial region slightly compressed containing heavy spongin fibres cored by plumo-reticulate pauci- or multispicular tracts of choanosomal principal styles; skeletal tracts form oval meshes, up to 250µm diameter; extra-axial tracts plumose, diverging towards periphery, with pauci- or multispicular tracts of choanosomal principal styles coring heavy spongin fibres; styles in peripheral regions of fibres often protrude from fibres at acute angles, but these are identical to principal megascleres and cannot be considered as true echinating spicules; mesohyl matrix moderately heavy, granular, containing abundant toxas, often in bundles, and occasional detritus.

Megascleres. Choanosomal principal styles long, thick, entirely smooth, slightly curved towards base, with slightly subtylote evenly rounded or slightly constricted hastate bases and fusiform points. Length 595-(914.7)-1140µm, width 21-(43.7)-61µm.

Subectosomal auxiliary subtylostyles short, slender, straight, with slightly subtylote microspined bases, fusiform pointed. Length 331-(405.4)-447µm, width 6-(9.4)-12µm.

No echinating spicules.

Microscleres. Chelae absent.

Toxas accolada, thick, variable in length, with prominent but narrow angular central curvature, straight arms and straight or slightly reflexed tips; larger toxas with spined tips, small toxas entirely smooth. Length 98-(286.2)-546µm, width 1.5-(3.2)-5µm.

REMARKS. The synonymy given above follows Koltun (1976). The species appears to vary in growth form, from bushy, branching, reticulate, digitate to flabellate, but skeletal architecture and spicule geometry are relatively consistent. Several echinating acanthostyles were seen in spicule preparations made from the holotype (evenly spined, club-shaped, 94-123x5-9µm), but none were seen in section preparations and it is presumed that these are contaminants, although it is possible that they are present but rare.

The specialised ectosomal skeleton of discrete auxiliary spicule brushes perched over larger principal spicules, and compressed 'axinellid' skeletal construction, are reminiscent of Raspailiidae (e.g., *Aulospongus*), and were it not for the toxas in this species it could be included in Raspailiidae. This species fits best in *Clathria (Axociella)* although it lacks differentiated ectosomal and subectosomal spicules (i.e., it has 1 size class of auxiliary styles). Its toxa and spination should be compared with *C. (A.) georgiaensis* sp. nov. (see below).

Clathria (Axociella) patula sp. nov.
(Figs 124-125)

MATERIAL. HOLOTYPE: NTMZ2909: Between North and East Wallabi Is, Houtman Abrolhos, WA,

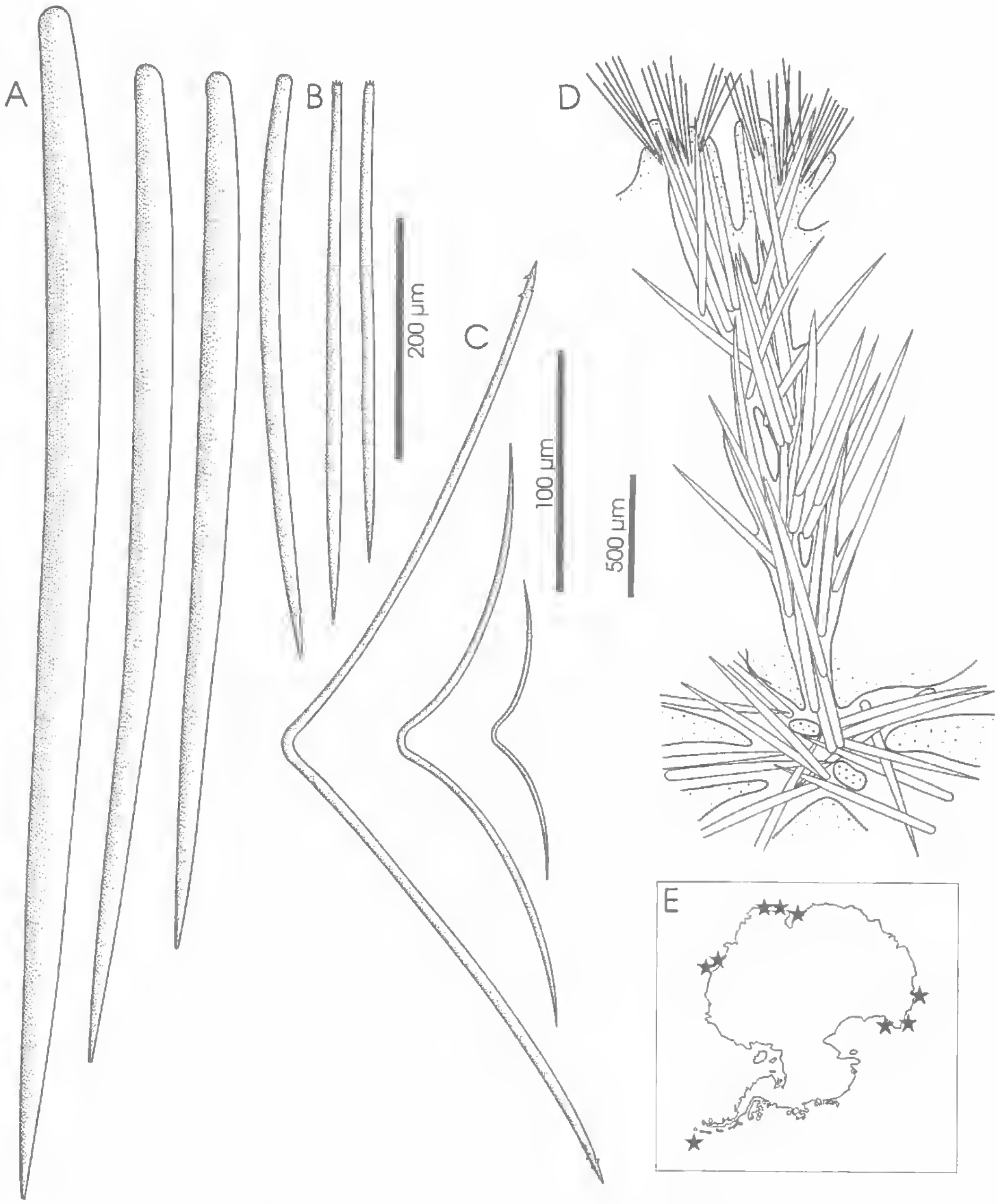

FIG. 122. *Clathria* (*Axociella*) *nidificata* (Kirkpatrick) (holotype BMNH1908.2.5.131). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyles. C, Accolada toxas. D, Section through peripheral skeleton. E, Antarctic distribution.

28°17.9'S, 113°47.8'E, 11.vii.1987, 39m depth, coll. J.N.A. Hooper (beam trawl). PARATYPE: NTMZ2978 (fragment QMG300209): W. of Carnarvon, WA, 24°55.6'S, 112°50.8'E, 14.vii.1987, 85m depth, coll. J.N.A. Hooper (beam trawl). OTHER MATERIAL. WA- QMG304633.

HABITAT DISTRIBUTION. Broken limestone reef, usually in sand sediments; 39-85m depth; Carnarvon and Wallabi Is, Houtman Abrolhos (WA) (Fig. 124G).

DESCRIPTION. *Shape*. Thickly flabellate, palmate-digitate fan, 140-475mm long, 180-310mm

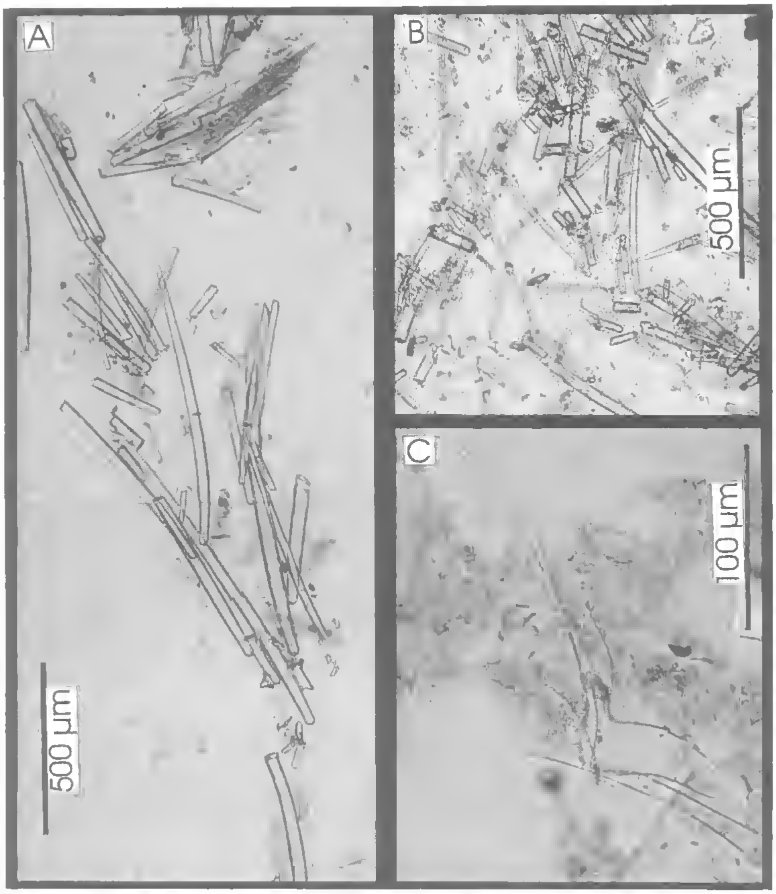

FIG. 123. *Clathria* (*Axociella*) *nidificata* (Kirkpatrick) (holotype BMNH1908.2.5.131). A, Plumose extra-axial skeletal column. B, Plumoreticulate axial skeleton. C, Bundles of toxas.

wide, 6-15mm thick, with even apical margin or long, erect flattened digits arising from apex of fan; digits single or planar branching, 40-70mm wide, bifurcated and tapering, with short, thick cylindrical stalk, 35-63mm long, 15-32mm diameter; lateral margins of fans prominently crenellated, apical margins range from slightly crenellated to prominently digitate.

Colour. Dark red, red-brown or orange-brown alive (Munsell 5R 5/10 - 10R 7/8), grey-brown in ethanol.

Oscules. Small oscules, less than 2mm diameter, scattered over surface.

Texture and surface characteristics. Firm, compressible, flexible; surface uneven, rippled, slightly conulose, with few large digitate projections arising at oblique angles from surface in fan specimens.

Ectosome and subectosome. Thick plumose or paratangential layer of erect auxiliary styles, usually in thick bundles, forming more-or-less continuous palisade on ectosomal skeleton; subectosomal skeleton with plumose brushes of both subectosomal auxiliary styles and choanosomal principal styles supporting ectosomal palisade, arising directly from choanosomal fibres in peripheral skeleton.

Choanosome. Skeletal structure wide-meshed heavily reticulate, slightly compressed axial region and differentiated axial and extra-axial skeletons; axial skeleton composed of heavy spongin fibres, 80-145µm diameter, thickest and bulbous at fibre nodes, 130-200µm diameter, forming relatively wide reticulation of oval or rectangular meshes, 180-360µm diameter; axial fibres cored by both principal styles and subectosomal styles in multispicular brushes of 2-5 spicules; principal spicules also protrude through fibres in plumose bundles, at acute angles, although these cannot be considered as echinating spicules; extra-axial skeleton with wider fibre meshes than axial region, with heavy spongin fibres, 60-120µm diameter, bulbous fibre nodes, 80-140µm diameter, forming elongate or rectangular meshes, 300-470µm diameter, cored by ascending multispicular tracts of intermingled choanosomal principal and subectosomal styles, up to 10 spicules per fibre, and thinner transverse fibres cored by only principal spicules in paucispicular tracts; spicules usually protrude through fibres in plumose bundles, particularly in peripheral skeleton, but true echinating spicules absent; mesohyl matrix heavy but only lightly pigmented, containing abundant microscleres; choanocyte chambers large, oval, 50-130µm diameter.

Megascleres. Choanosomal principal styles variable in length, predominantly long, thick, slightly curved near basal end, evenly rounded smooth

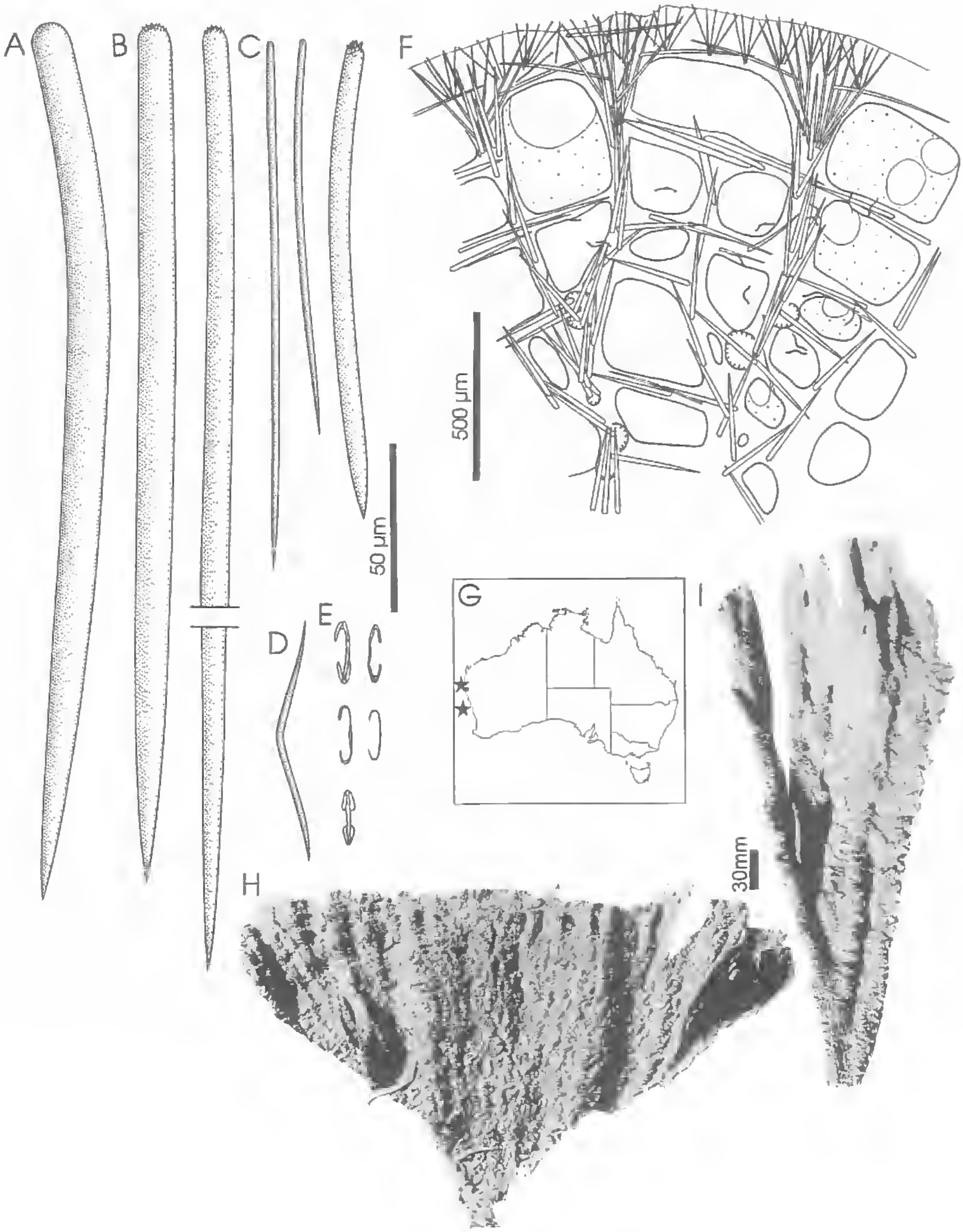

FIG. 124. *Clathria* (*Axociella*) *patula* sp.nov. (holotype NTMZ2909). A, Choanosomal principal style. B, Subectosomal auxiliary styles. C, Ectosomal auxiliary styles. D, Wing-shaped - oxhorn toxa. E, Palmate isochelae. F, Section through peripheral skeleton. G, Known Australian distribution. H, Holotype. I, Paratype.

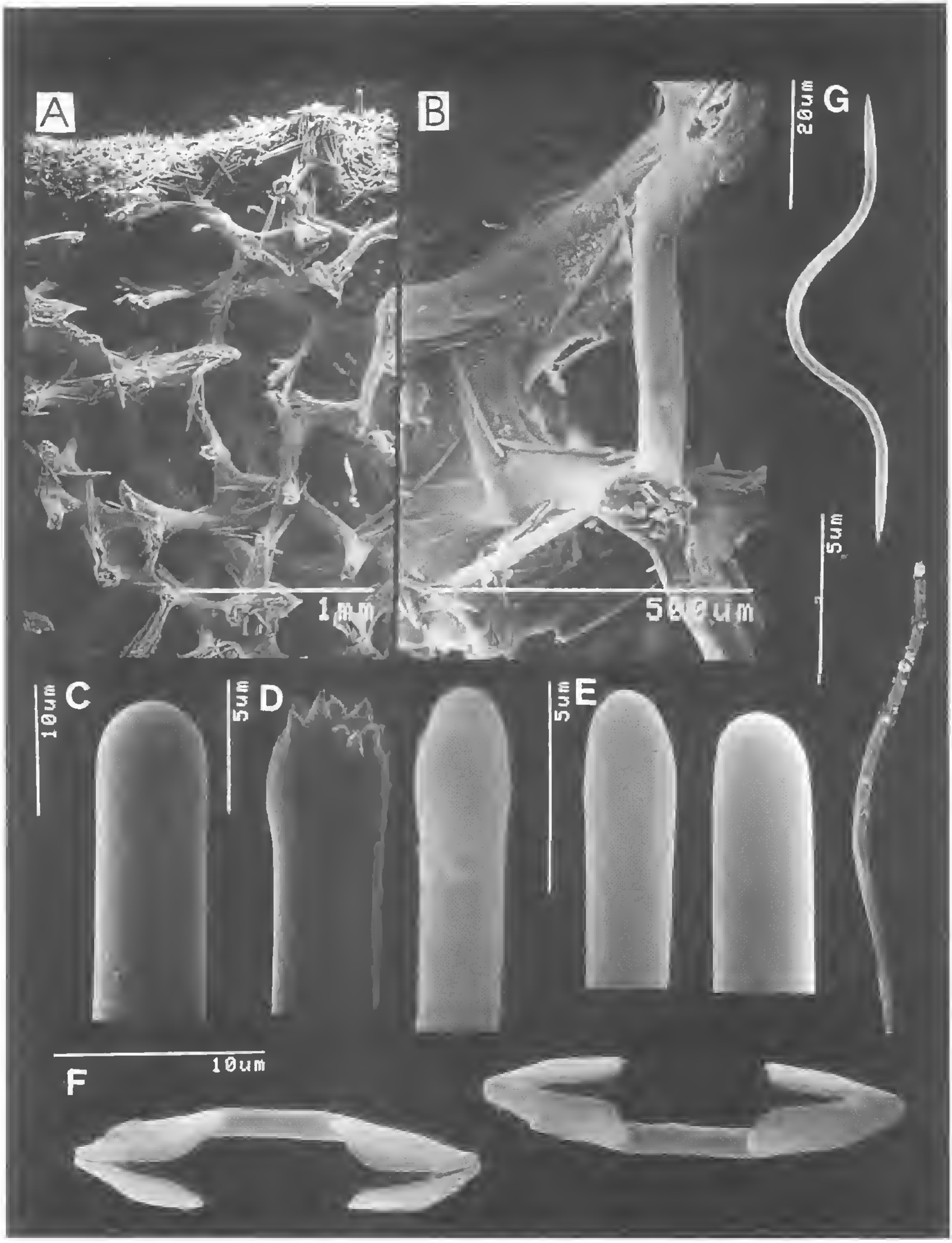

FIG. 125. *Clathria* (*Axociella*) *patula* sp.nov. (holotype NTMZ2978). A, Choanosomal skeleton. B, Fibre characteristics. C-E, Bases of choanosomal principal, subectosomal auxiliary and ectosomal auxiliary spicules. F, Palmate isochelae. G, Oxhorn - wing-shaped toxas.

bases and fusiform points. Length 225-(383.6)-370µm, width 10-(13.2)-15µm.

Subectosomal auxiliary styles long, thinner than principal spicules, straight, with rounded microspined bases, slightly subtylote spined bases, or subtylote smooth bases, and fusiform points. Length 193-(265.2)-303µm, width 5-(7.1)-8µm.

Ectosomal auxiliary styles short, straight or slightly curved near base, relatively thick, with rounded smooth or microspined bases and fusiform points. Length 104-(147.2)-185µm, width 1.5-(3.8)-6µm.

Echinating spicules absent.

Microscleres. Palmate isochelae small, unmodified, with lateral and front alae of approximately equal length; lateral alae fused completely to shaft, front ala entire. Length 14-(15.8)-19µm.

Toxas basically oxhorn, with some intermediate wing-shaped, short, moderately thick, rounded or slightly angular central curvature and slightly reflexed points 57-(69.6)-84µm, width 1-(1.9)-2.5µm.

ETYMOLOGY. Latin *patulus*, spread out; for the flat growth form.

REMARKS. This species could be included in *C. (Thalysias)*, having a thick tangential ectosomal skeleton composed of two discrete size classes of auxiliary styles, but it is most appropriately placed in *C. (Axociella)* given that it has differentiated axial and extra-axial skeletons and lacks any echinating spicules. *C. (Axociella) patula* has a flabellate, planar growth form similar to *C. (T.) cancellaria*, although these species differ substantially in their spicule geometry (the latter having echinating acanthostyles and accolada toxas), different spicule sizes of most categories, and skeletal structures (the latter species with a heavy, evenly reticulate skeleton and abundant echinating acanthostyles).

Clathria (Axociella) thetidis (Hallmann, 1920)
(Figs 126-127, Plate 4B)

Ophlitaspongia thetidis Hallmann, 1920: 779.
Axociella thetidis; de Laubenfels, 1936a: 113.
Clathria thetidis; Hooper & Wiedenmayer, 1994: 263
Esperiopsis cylindrica, in part; Whitelegge, 1906: 470, pl.43, fig.6.
Not *Esperiopsis cylindrica* Ridley & Dendy, 1887: 79.

MATERIAL. LECTOTYPE: AMG9199: Off Woolongong, NSW, 34°25'S, 151°10'E, 104-142m depth, coll. FIV 'Thetis' (dredge). PARALECTOTYPE: AMG9191: Off Wata Mooli, Bulgo, Woolongong, NSW, 34°30'S, 151°12'E, 98-138m depth, coll. FIV 'Thetis' (dredge). OTHER MATERIAL: NSW- QMG303752. S. AUST-AMZ4624.

HABITAT DISTRIBUTION. Deeper offshore reefs; 50-142m depth; Sydney and Woolongong (NSW), SW. Great Australian Bight (SA) (Fig. 126H).

DESCRIPTION. *Shape.* Erect, arborescent or digitate, whip-like growth forms, 190-480mm long, with long thin cylindrical stalk and thinly cylindrical branches, 15-25mm diameter; branching planar or in more than one plane, either irregularly bifurcate or pinnate, with evenly dichotomous bifurcations arising from larger, laterally disposed branches; apical margins of digits taper to fine points.

Colour. Deep red alive (Munsell 2.5R 5/10), grey-brown when dry.

Oscules. Very small, less than 1.5mm diameter, scattered over lateral sides of branches.

Texture and surface characteristics. Firm, flexible; surface optically even, velvetty, microscopically prominently furry, hispid.

Ectosome and subectosome. Ectosome very hispid, with discrete, multispicular plumose brushes of larger (extra-axial) principal styles protruding through surface, with sparsely dispersed, tangential or paratangential tracts of subectosomal auxiliary styles in between principal spicules.

Choanosome. Skeletal architecture reticulate, with compressed axis and plumose extra-axial regions; strong axial compression composed of irregularly reticulate, heavy, large spongin fibres producing oval to elongate meshes, 90-220µm diameter; axial fibres relatively heavy, thick, irregularly anastomosing, with bulbous fibre nodes, cored by comparatively small choanosomal styles; axial fibres incompletely differentiated into primary, uni- or paucispicular, ascending, long, radial fibres, 70-180µm diameter, and secondary, connecting, mostly unispicular, sometimes bi- or aspicular, short fibres, 58-102µm diameter. Axial and extra-axial skeletons strongly differentiated (cf. Hallmann, 1920), with fibres becoming plumose and fibre reticulation more regular towards periphery; extra-axial fibres form elongate-eliptical, wider meshes than axis, 155-510µm diameter; extra-axial fibres diminish in thickness towards peripheral skeleton, whereas coring spicules increase in size and density towards surface; principal styles in both primary and secondary fibres protrude through fibres at oblique angles, in both

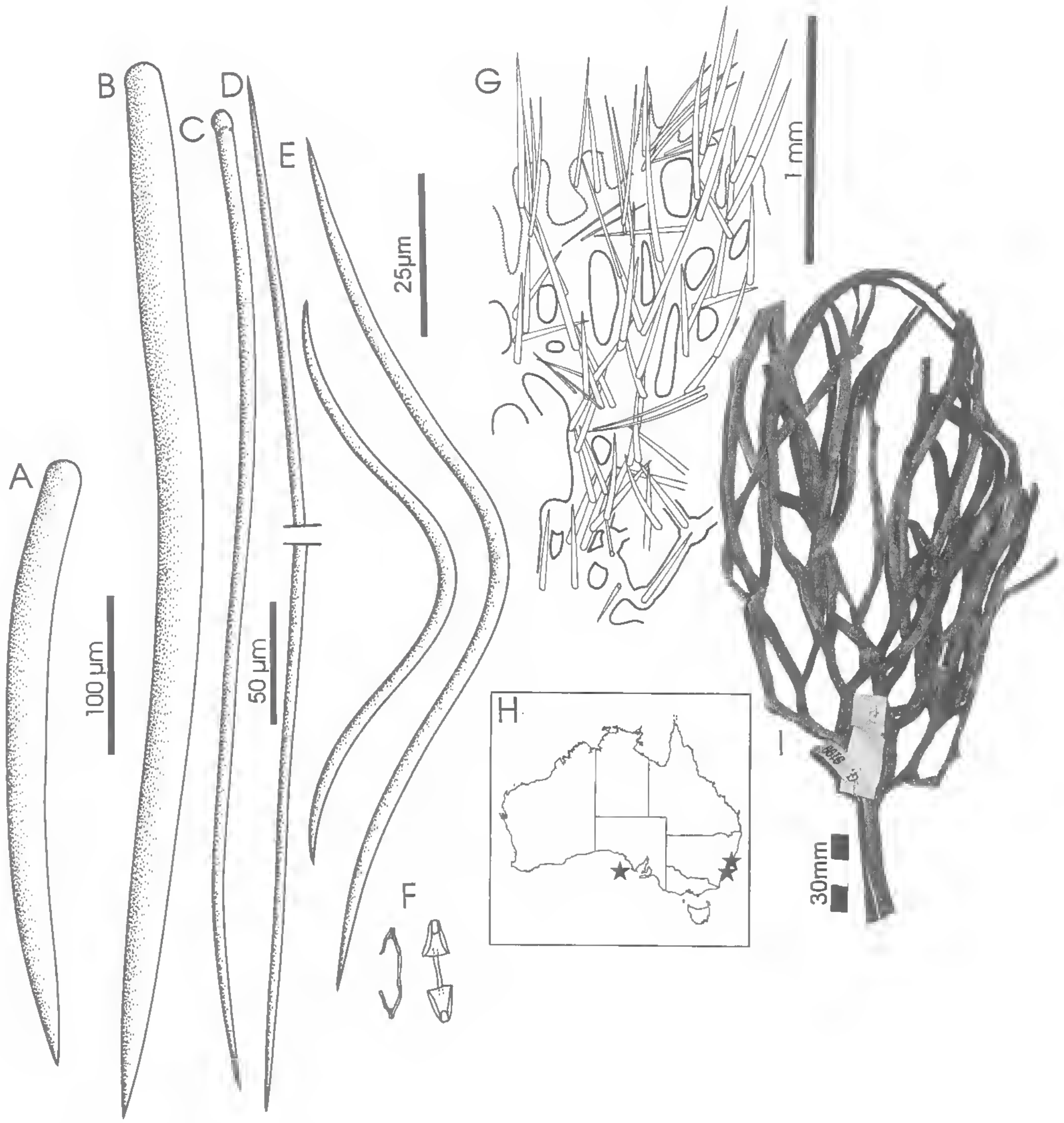

FIG. 126. *Clathria* (*Axociella*) *thetidis* (Hallmann) (holotype AMG9199). A, Choanosomal principal style (axial skeleton). B, Choanosomal principal style (extra-axial skeleton). C, Subectosomal auxiliary subtylostyle. D, Oxeote toxa. E, Wing-shaped toxas. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution. I, Holotype.

the axial and extra-axial regions, but true echinating spicules absent; mesohyl matrix heavy, relatively darkly pigmented; choanocyte chambers paired, oval-elongate, 60-155µm diameter; numerous microscleres and subectosomal auxiliary subtylostyles scattered between fibres.

Megascleres. Choanosomal principal styles divided into two size categories, both fusiform, thick, long or short, slightly curved, with evenly rounded, smooth bases; smaller size found in axial skeleton (length 180-(246.5)-365µm, width 11-(14.2)-20µm), and larger in extra-axial skeleton (length 377-(608.0)-825µm, width 22-(26.4)-35µm.

Subectosomal auxiliary styles long, thin, fusiform, straight, slightly curved or flexuous, with subtylote, smooth or lightly microspined bases. Length 158-(379.1)-585µm, width 3-(5.8)-8µm.

Microscleres. Palmate isochelae abundant, with lateral alae completely attached to shaft and front ala entirely fused. Length 9-(13.4)-16µm.

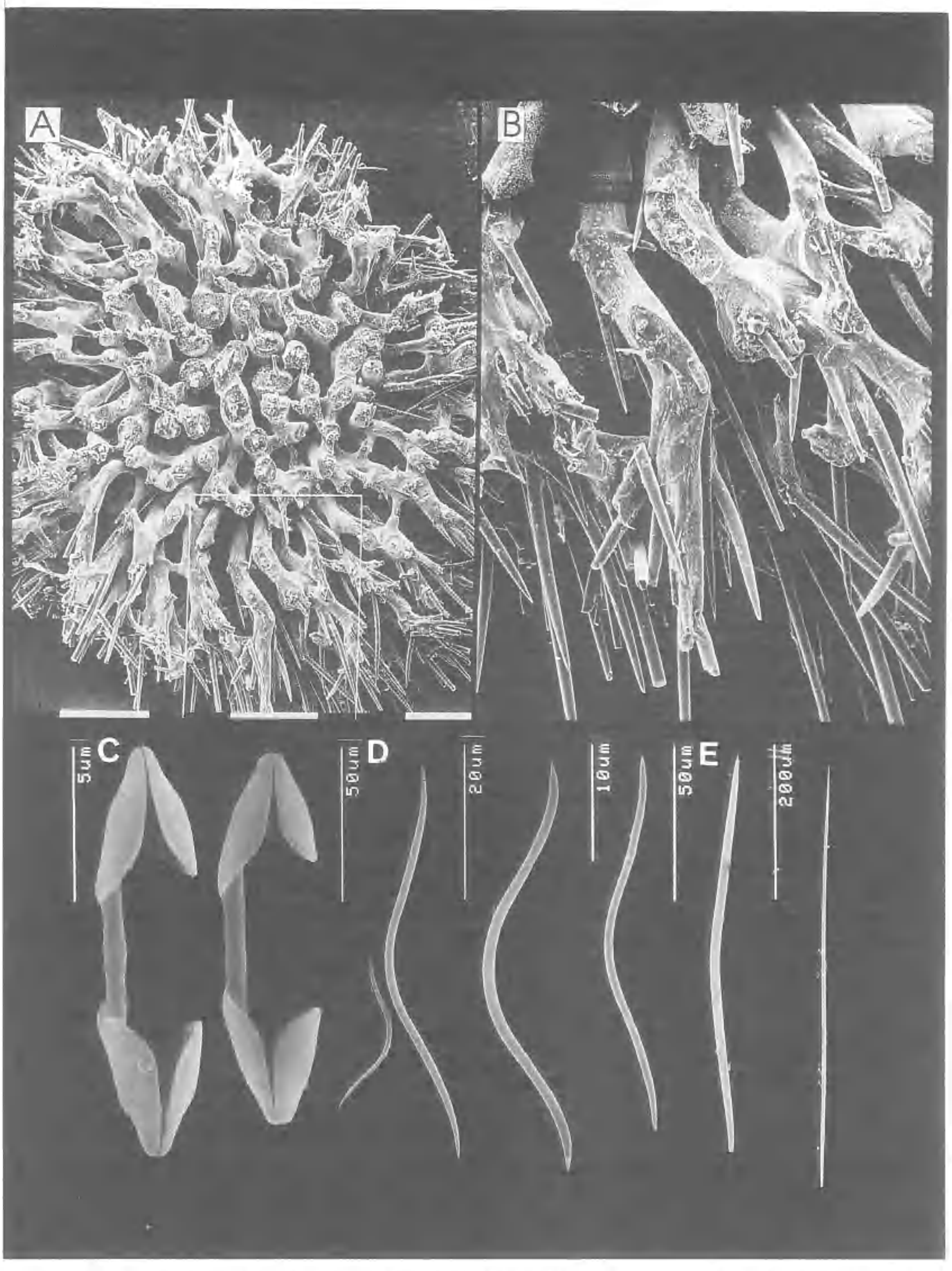

FIG. 127. *Clathria* (*Axociella*) *thetidis* (Hallmann) (QMG303752). A, Choanosomal skeleton. B, Extra-axial fibre and spicule skeleton (x63). C, Palmate isochelae. D, Wing-shaped toxas. E, Oxeote toxas.

Toxas divided into two geometrically different forms: oxeote toxas common, usually found in dragmata dispersed between fibres, long, thin, symmetrical or asymmetrical-sinuous, with slight angular central curvature or completely straight, fusiform points. Length 175-(774.5)-1280µm, width 1.5-(2.4)-5µm; wing-shaped toxas common, thin, with large rounded central curvature, reflexed points. Length 22-(104.4)-168µm, width 1-(2.1)-3.5µm.

REMARKS. This species is not conspecific with *Esperiopsis cylindrica* Ridley & Dendy as supposed by Whitelegge (1906), having different ectosomal skeletal architecture, spicule geometries and spicule sizes; Hallmann (1920) recognised a new species for Whitelegge's material referring it to *Ophlitaspongia* (= *Echinoclathria*) on the basis that it lacked echinating megascleres; de Laubenfels (1936a) assigned it to *Axociella* for the same reason. De Laubenfels was correct in this transfer, although not for his stated reason (that it lacked acanthostyles) but because of its compressed skeletal construction, spicule localisation and spicule geometry. Hallmann's tentative placement of *C. (A.) thetidis* in *Echinoclathria* was probably also based on comparisons with species such as *E. nodosa* (Carter) and to a lesser extent *E. subhispida* (Carter) which, unlike most species of *Echinoclathria*, have a slightly compressed axial skeleton and plumose, plumo-reticulate or radial extra-axial fibres. However, spiculation and spicule localisation within the skeleton of *C. (A.) thetidis* is different from all those species. Similarly, in *C. (A.) thetidis* there are two distinctive size categories of principal megascleres, restricted to either axial or extra-axial fibre skeletons, whereas *Echinoclathria* have homogeneous principal spicules dispersed throughout all skeletal tracts.

Clathria (Axociella) georgiaensis sp.nov.
(Figs 128-129)

Ophlitaspongia thielei Burton, 1932a: 322, pl.55, fig.8, text-fig.32; Koltun, 1964a: 70.
Axociella thielei; de Laubenfels, 1936a: 113 [note].
Not *Hymeraphia thielei* Hentschel, 1912: 377-378.

MATERIAL. HOLOTYPE: BMNH1928.2.15. 219 (fragment AMZ2198): 6.3nm N 89°E to 4nm N 39°E off Jason Light, Cumberland Bay, South Georgia, S. Atlantic, 120-204m depth, RRS 'Discovery', 1928 (otter trawl).

HABITAT DISTRIBUTION. On rocks; 18-236m depth range; Wilkes Land, Australian Antarctic Territory (Fig. 128F); also South Georgia, SW. Atlantic.

DESCRIPTION. *Shape.* Subspherical, massive sponge.
Colour. Grey-brown in ethanol.
Oscules. Up to 2mm diameter, scattered over surface, with slightly raised membraneous lip.
Texture and surface characteristics. Firm, compressible; surface conulose, with meandering ridges producing a clathrous, convoluted mass.
Ectosome and subectosome. Erect plumose brushes of sparse choanosomal principal styles protruding from peripheral skeletal tracts, and paratangential bundles of subectosomal auxiliary subtylostyles in variable abundance, heavier on ends of surface conules, lighter between conules.
Choanosome. Skeletal architecture reticulate, slightly plumo-reticulate near surface, vaguely renieroid reticulate at core; skeleton with differentiated primary ascending spongin fibres cored by multispicular tracts of choanosomal principal styles, with 3-6 spicules per tract, and lighter transverse connecting fibres containing 1-2 spicules per tract, together producing a slightly renieroid skeleton; no marked differentiation between axial or extra-axial regions; fibre reticulation produces cavernous rectangular or triangular meshes, up to 550µm diameter; true echinating spicules absent although principal spicules protrude through fibres at obtuse angles; mesohyl matrix heavy, slightly granular, with abundant chelae and toxas.
Megascleres. Choanosomal principal styles moderately long, slender, straight or slightly curved at centre, rounded smooth bases, fusiform points. Length 390-(446.6)-518µm, width 14-(17.4)-22µm.

Subectosomal auxiliary subtylostyles short, slender, straight, slightly subtylote bases, heavily microspined with large spines, slightly hastate or rounded points. Length 216-(285.2)-348µm, width 5-(7.4)-10µm.

Echinating spicules absent.
Microscleres. Palmate isochelae abundant, relatively small, with lateral and front alae approximately same length, lateral alae fused to shaft, front alae nearly completely detached, virtually no curvature of shaft. Length 9-(13.2)-17µm.

Toxas wing-shaped, thick, variable in length, the thicker ones with wide angular central curvature, curved arms, slightly reflexed points, and terminal spines, thinner ones more sharply curved

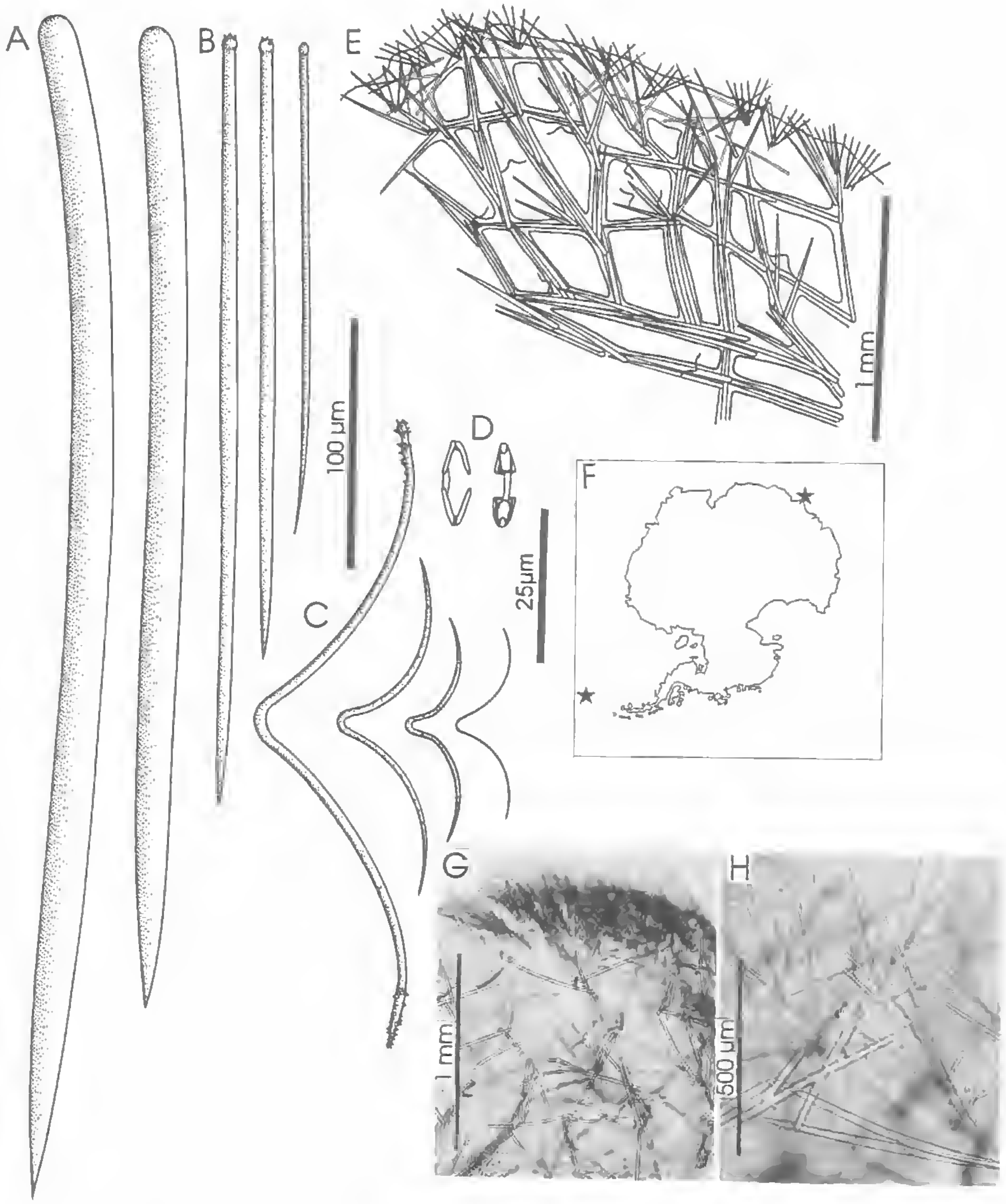

FIG. 128. *Clathria (Axociella) georgiensis* sp. nov. (holotype BMNH1928.2.15.219). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyles. C, Wing-shaped toxas. D, Palmate isochelae. E, Section through peripheral skeleton. F, Antarctic distribution. G, Peripheral spicule tracts. H, Ectosomal skeleton.

at centre, sharply pointed. Length 28-(107.7)-258µm, width 0.5-(1.7)-3.5µm.

REMARKS. This species requires a new name since *C.* (*Microciona*) *thielei* (Hentschel, 1912) has seniority. Previous authors could not agree on its generic assignment: Burton (1932a, 1938b) compared *C.* (*A.*) *georgiaensis* with *Artemisina*, but the possession of a well-structured, slightly compressed choanosomal skeleton indicates that

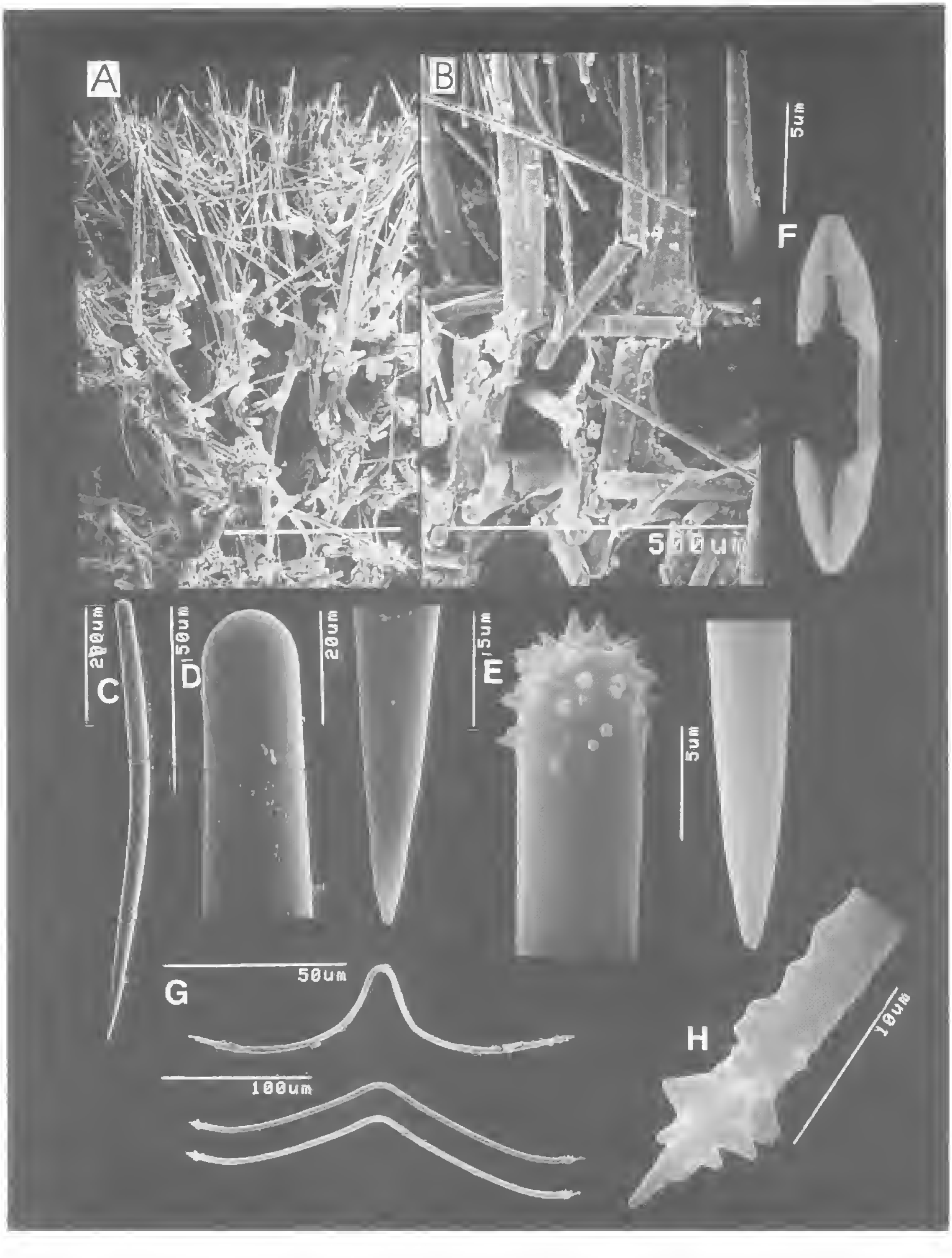

FIG. 129. *Clathria* (*Axociella*) *georgiaensis* sp. nov. (AMZ2198). A, Choanosomal skeleton. B, Fibre characteristics. C, Choanosomal principal style. D, Base and apex of principal spicule. E, Base and apex of subectosomal auxiliary subtylostyle. F, Palmate isochela. G, Wing-shaped toxas. H, Spined toxa point.

placement in *Clathria* is more appropriate. Based on Burton's (1932a) description this species was included in *Echinoclathria* by Hooper & Wiedenmayer (1994), but re-examination of the holotype showed that skeletal structure was not markedly renieroid, there was no difference between principal spicule sizes in the axis and those in the peripheral skeletons, and spicule sizes were magnitudes larger than those found in other *Ecinoclathria* (but much closer to those seen in *Axociella*). De Laubenfels (1936a) also suggested this species should be included in *Axociella* although his reasons for doing so are different (i.e., lack of echinating spicules). Koltun (1964a) also made a general comparison between *C.* (*A.*) *georgiaensis* and *Ophlitaspongia membranacea* Thiele (the latter referred here to *Clathria* (*Thalysias*)), but this comparison is simply based on similarities in toxa morphology, whereas *C.* (*T.*) *membranacea* has two size classes of auxiliary spicules and true echinating spicules (albiet smooth). Toxa measurements recorded by Burton (1932a) for this species differ substantially from those actually seen in the holotype, but in most other characters his description is an accurate representation of the species.

OTHER SPECIES OF *CLATHRIA* (*AXOCIELLA*)

Clathria (Axociella) fauroti (Topsent, 1893)

Axosuberites fauroti Topsent, 1893a: 179-181, fig.3 [Tadjoura, Gulf of Aden]; de Laubenfels, 1936a: 118.

? *Rhaphidophlus fauroti*; Van Soest, 1984b: 130 [possible generic synonymy].

MATERIAL. HOLOTYPE: MNHNDT1859. Arabian Gulf-Red Sea.

Clathria (Axociella) fromontae sp. nov.

Axociella toxitenuis Bergquist & Fromont, 1988, 117-118, pl.55, figs a-c; Dawson, 1993: 36 [index to fauna].

MATERIAL. HOLOTYPE: NMNZPOR120. New Zealand. Note: *C. toxitenuis* Topsent, 1925 has seniority.

Clathria (Axociella) lambei (Koltun, 1955)

Microciona lambei Koltun, 1955a: 49, 67, pl.4, fig.5 [Japan and Okhotsk Seas]; Koltun, 1958: 66-67, text-fig.22 [Kuriles]; Koltun, 1959: 183, pl.29, fig.2, text-fig.143 [USSR].

MATERIAL. HOLOTYPE: ZIL, fragment BMNH1932.11.17.67. NW. Pacific, Japan. Note: Koltun (1955a) attributes this species to Burton (1935c), but it does not appear in that publication.

Clathria (Axociella) macrotoxa Bergquist & Fromont, 1988

Axociella macrotoxa Bergquist & Fromont, 1988: 117, pl.54, figs c-f; Dawson, 1993: 36 [index to fauna].

MATERIAL. HOLOTYPE: NMNZPOR119. New Zealand.

Clathria (Axociella) multitoxaformis Bergquist & Fromont, 1988

Axociella multitoxaformis Bergquist & Fromont, 1988: 118-119, pl.55, figs d-f, pl.56. fig.a; Dawson, 1993: 36 [index to fauna].

MATERIAL. HOLOTYPE: NMNZPOR121. New Zealand.

Clathria (Axociella) parva (Lévi, 1963)

Clathria parva Lévi, 1963: 56-57, text-fig. 64, pl.10D [Cape of Good Hope, South Africa]; Uriz, 1988a: 84-85, pl.21b, text-fig.60 [Namibia].

Not *Clathria parva*; Sim & Byeon, 1989: 39, pl4, figs 3-4 [Korea; dubious conspecificity].

MATERIAL. HOLOTYPE: UCT (fragment MNHNDCL612). S and SE Africa.

Clathria (Isociella) Hallmann, 1920

Isociella Hallmann, 1920: 784; Bergquist & Fromont, 1988: 114.

DEFINITION. Relatively homogeneous isodictyal (triangular meshes) and/or renieroid (rectangular meshes), wide-meshed, main skeleton with primary plumose ascending, multispicular tracts cored by smooth choanosomal styles, interconnected by secondary, uni- or paucispicular tracts cored by same spicules, and choanosomal spicules sometimes diverging and forming plumose brushes at surface; echinating megascleres absent; ectosomal skeleton with single category of auxiliary spicule, tangential, paratangential. Microscleres palmate-derived isochelae and toxas.

TYPE SPECIES. *Clathria macropora*, Lendenfeld, 1888: 221 (= *Phakellia jacksoniana* Dendy, 1897: 236) (by monotypy).

REMARKS. Four species of *Isociella* are known for the Australian fauna, three from tropical WA, NT and Qld., and one temperate species from NSW. Only one other species is known from New Zealand.

Clathria (Isociella) eccentrica (Burton, 1934)

(Figs 130-131, Table 26, Plate 4A)

Ophlitaspongia eccentrica Burton, 1934a: 560, pls 1,8,9, text-fig.12a.

Axociella eccentrica; de Laubenfels, 1936a: 113.

Isociella eccentrica; Bergquist & Tizard, 1967: 186-187, pl.5, fig.1.

Clathria eccentrica; Hooper & Wiedenmayer, 1994: 265.

MATERIAL. HOLOTYPE: BMNH1930.8.13. 109: Crab Spit, Low Isles, Great Barrier Reef, Qld, 16°23'S, 145°34'E, intertidal, 5.iv.1929, coll. Great Barrier Reef Expedition (dredge). OTHER MATERIAL: GREAT

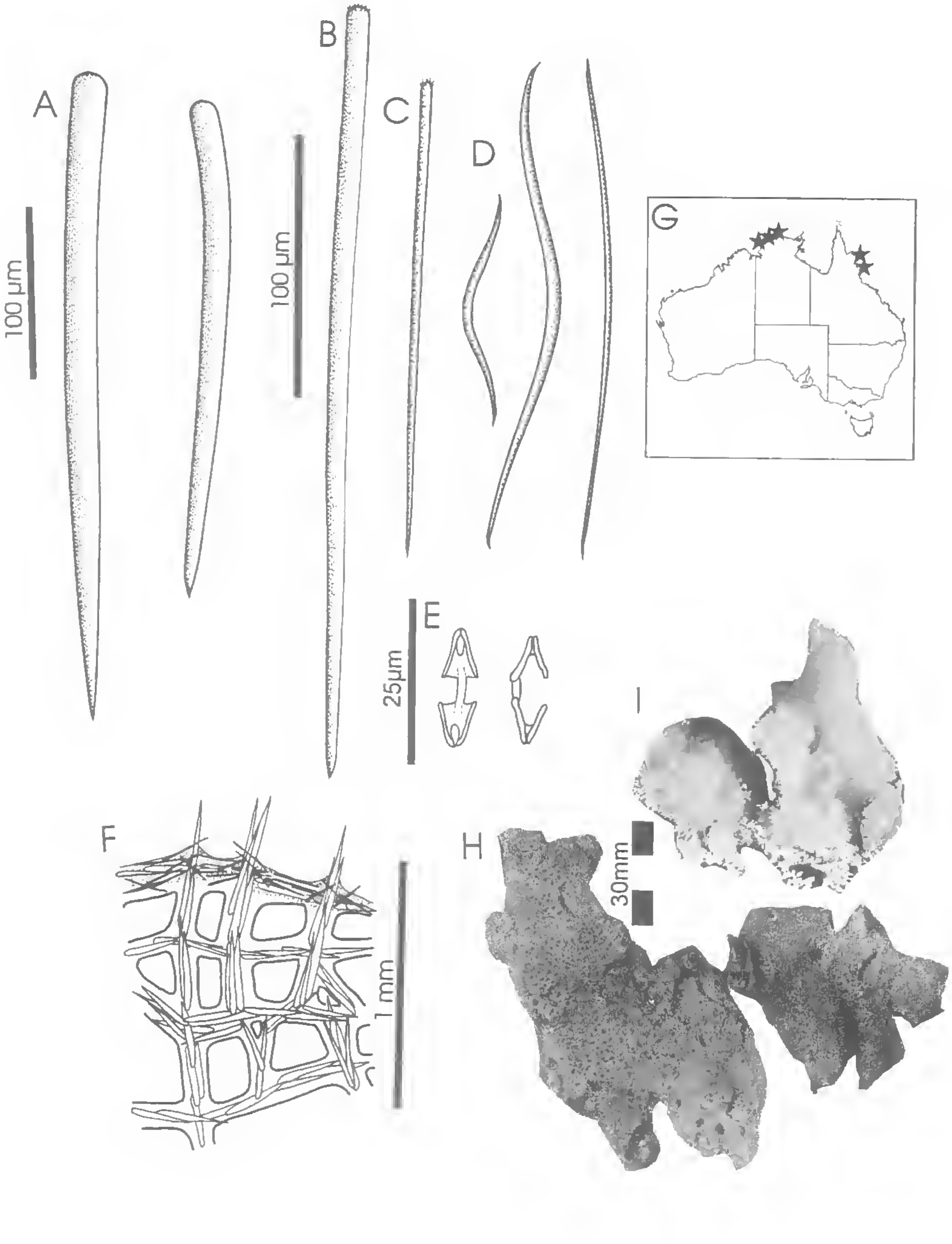

FIG. 130. *Clathria* (*Isociella*) *eccentrica* (Burton) (NTMZ2170). A, Choanosomal principal styles. B-C, Subectosomal auxiliary styles. D, Wing-shaped toxas. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, Holotype BMNH1930.8.13.109. I, NTMZ2139.

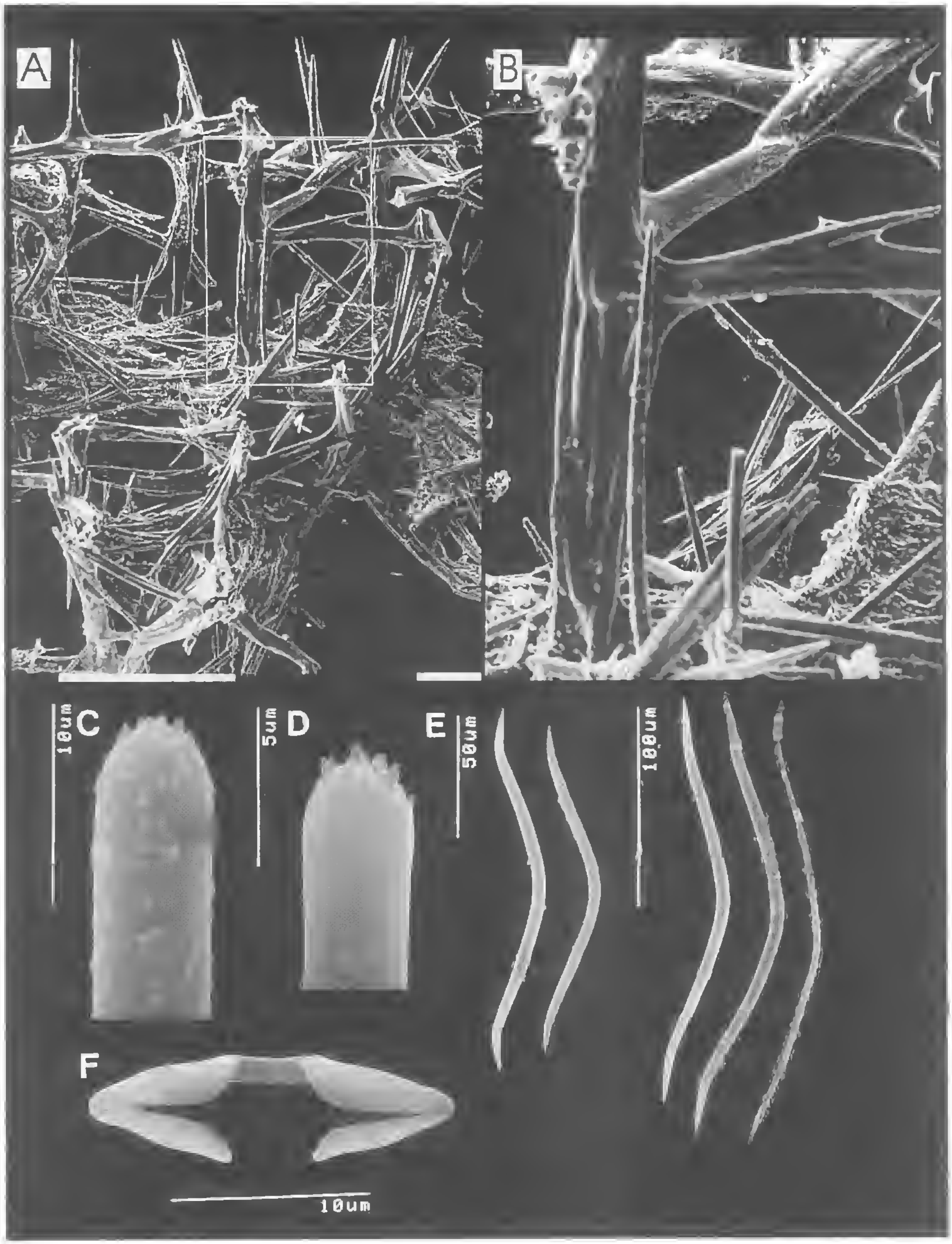

FIG. 131. *Clathria* (*Isociella*) *eccentrica* (Burton) (QMG303266). A, Choanosomal skeleton. B, Fibre characteristics (x135). C-D, Bases of larger and smaller subectosomal auxiliary styles. E, Wing-shaped toxas. F, Palmate isochelae.

TABLE 26. Comparison between present and published descriptions of *Clathria* (*Isociella*) *eccentrica*.Measurements in µm (N=25).

SPICULE	Holotype (BMNH 1930.8.13.109) (GBR,Queensland)	Bergquist & Tizard (1967) (Darwin,NT)	(N=19) (Darwin,NT)	(N=3) (Cobourg Pen.,NT)
Choanosomal styles	318-464 x 8-22	288-440 x 9.1-18	232-(361.7)-540 x 7-(17.4)-30	276-(343.1)-450 x 11-(19.2)-29
Subectosomal styles I	298-457 x 3-9.5	300-470 x 5-8	257-(335.6)-440 x 3-(6.8)-13	284-(373.3)-455 x 4-(6.3)-9
Subectosomal styles II	85-286 x 1.5-5.2	208-220 x 4.0	85-(185.0)-255 x 1-(3.5)-7	141-(191.8)-255 x 2-(3.7)-6
Chelae	15-19	16-17.5	8-(17.4)-23	13-(17.2)-21
Toxas	10-334 x 1.5-10	76-270 x 2.5-6.5	16-(148.0)-283 x 1-(5.4)-11	64-(161.2)-292 x 2-(6.0)-11

BARRIER REEF, QLD - QMG304398, QMG304400, QMG304401. DARWIN REGION, NT - AMZ3109, NTMZ0268, NTMZ0288, NTMZ0158, NTMZ0159, NTMZ2116, NTMZ2139, NTMZ2205, NTMZ2210, QMG300147 (fragment NTMZ2224), QMG300509 (fragment NTMZ2235), NTMZ2416, NTMZ2540, QMG303315, NTMZ2549, NTMZ2557, NTMZ1100, NTMZ0386, NTMZ2170, QMG303266, NTMZ0045, NTMZ1396, NTMZ3274. AMG4291.

HABITAT DISTRIBUTION. Usually on dead or partially dead faviid coral heads, coral rubble, sand and *Halimeda* substrates; most specimens partially sheltered under coral rubble or in crevices; shallow sublittoral distribution; 0-18m depth range; Lizard I. (FNQ), Darwin Harbour, Bynoe Harbour, Trepang Bay, Port Essington, Cobourg Peninsula (NT) (Fig. 130G); also SE. Indonesia (unpublished data).

DESCRIPTION. *Shape.* Bulbous-digitate, massive or semi-encrusting, with irregularly anastomosing, erect or stoloniferous branches; branches irregularly cylindrical, flattened or bulbous; specimens range from thick encrustations 45mm high, 20-30mm diameter, with few bulbous branches on surface, to massive branching growth forms up to 130mm high, 300mm wide, with branch diameter between 15-40mm.

Colour. Dark red (Munsell 5R 3/8), orange-red (5R 6/10), or less commonly bright orange (10R 6/10); pigmentation water miscible, associated with mucous, confined to the ectosomal and subectosomal regions; pigment washed from sponge; subectosomal colouration light brown or beige; grey-brown in ethanol.

Oscules. Large, 4-15mm in diameter, on apex of bulbous digits, usually at extremities of branches; oscules with slightly raised membraneous lips, collapsing upon dessication and preservation; numerous inhalant pores, 0.5-1.0mm diameter, scattered over entire surface.

Texture and surface characteristics. Rubbery, easily compressible, mucusy, but tough, difficult to tear; surface porous, membraneous, minutely microconulose with protruding fibre nodes from peripheral skeleton, with small ridges and depressions connecting adjacent conules; surface usually silt covered.

Ectosome and subectosome. Ectosomal skeleton microscopically hispid, with choanosomal prineipal styles protruding up to 300µm from surface, at regular intervals 150-400µm apart, singly or in paucispicular bundles of 2-4 spicules, with peripheral spongin fibres forming projections and enclosing at least basal portion of protruding spicules; subectosomal auxiliary styles form tangential or paratangential tracts at base of peripheral skeleton, interdispersed between choanosomal principal styles of subrenieroid skeleton; auxiliary spicules sparsely dispersed, rarely protruding through surface, composed of 2 sizes of auxiliary styles without regional localisation; peripheral skeleton undifferentiated from choanosomal skeleton, and choanosomal fibres immediately subdermal.

Choanosome. Irregular subisodictyal, or in places more regular isodictyal, sometimes renieroid reticulation of moderately light spongin fibres, 30-110µm diameter, without any obvious or consistent differentiation between primary or secondary elements; fibres cored by 1-10 rows of choanosomal principal styles entirely enclosed within fibres, occupying entire fibre diameter; spicules diverge only slightly towards periphery whereas at core of skeleton spicules more evenly dispersed within fibres; echinating megascleres absent; fibre anastomoses form irregular, elongate-oval, triangular or sometimes regularly rectangular meshes, 250-850µm diameter; mesohyl matrix light, granular, with abundant microscleres and auxiliary spicules; collagen heaviest at fibre nodes but sparse elswhere; choanocyte chambers oval or elongate, 60-150µm diameter.

Megascleres (Table 26). Choanosomal principal styles straight or slightly curved near base, with smooth rounded or very slightly subtylote bases, fusiform points.

Subectosomal auxiliary subtylostyles thin, usually straight, either with slightly subtylote or rounded bases, and microspined or smooth bases in approximately equal proportions, and with fusiform points; 2 size categories recognised, although undifferentiated in distribution.

Echinating spicules absent.

Microscleres (Table 26). Palmate isochelae abundant, relatively large, unmodified, with long lateral alae completely fused to shaft and entirely fused front ala.

Wing-shaped toxas variable length, relatively thick, with moderate, rounded central curvature, slightly reflexed or straight points; some oxeote toxas also present but rare; toxas frequently occur in dragmata within mesohyl.

Associations. Sometimes smothering live faviid coral heads, produced localised bleaching and necrosis of coral tissues at the point of contact with sponge; probable that this species involved in chemical bioerosion of coralline substrate; most specimens (81%) contained scyllid polychaete worms.

Morphological variation. In growth form, live colouration, surface features, skeletal construction and spiculate geometry this species shows very little apparent variation. Some variation observed for: Detritus incorporated into ectosomal skeleton: abundant (33%), lightly dispersed particles (24%), entirely clear of detritus (43% of specimens). Ectosomal skeleton: strictly tangential (43%), disorganised paratangential (33%), or with both structures on different parts of the surface (24% of specimens). Choanosomal skeleton: characteristically subisodictyal (82%), regularly isodictyal (9%), or regular renieroid construction (9% of specimens). Fibre meshes: cavernous (86%), or close-meshed skeletal reticulation (14% of specimens). Mesohyl matrix: relatively heavy, darkly pigmented (19%), heavy, lightly pigmented (57%), or very light, unpigmented (24% of specimens). Detritus incorporated into mesohyl: seen in only 14% of specimens. Abundance of microscleres: very abundant in tracts or irregularly dispersed throughout the mesohyl (67%), or uncommon (33% of specimens). Auxiliary styles dispersed between fibres within mesohyl: numerous (43%), moderate (19%) or sparse extra-fibre tracts (38% of specimens). Spicule dimensions: spicule dimensions varied considerably between specimens, but this variation was not explained by either geographic distribution or seasonality of collections.

REMARKS. This species is a distinctive component of the tropical Australian intertidal fauna, although it is only known from two disjunct locations (the 'Top End' of the NT and Cairns region, Qld.). No intermediate populations have yet been discovered despite major collections undertaken recently in that region.

This species is well characterised by its haplosclerid-like, predominantly isodictyal skeletal construction, relatively poor development of the extra-fibre skeleton (including the cavernous fibre meshes and relatively light mesohyl matrix), and spicule geometries. The species is also distinctive in the field, mainly by its predominantly bright red colouration and abundant mucus. It has the ability to survive extensive periods of exposure to direct sunlight and air, for up to six hours duration (several times each week during ELWS tides in the Darwin region), and to water temperatures in rockpools which may exceed 40°C. Under such conditions *C. (I.) eccentrica* produces copious quantities of mucus, literally dripping its red pigmentation. Nevertheless, individuals appear to survive these harsh conditions, and necrotic areas of the surface are relatively quickly regenerated or recolonised within several weeks. Despite extensive monitoring of individuals in the Darwin region over many seasons, reproductive products have not yet been recorded, and it is possible that its propogation in the tropics is predominantly clonal.

Clathria (Isociella) macropora Lendenfeld, 1886

(Figs 132-133, Table 27)

Phakellia flabellata Ridley & Dendy, 1886: 478; Ridley & Dendy, 1887: 171, pl.34, figs 2-3, pl.40, fig.6 [preocc.].
Not *Phakellia flabellata* Carter, 1885f: 363.
Clathria macropora, in part, Lendenfeld, 1888: 221; Hallmann, 1920: 768; Bergquist & Fromont, 1988: 110; Hooper & Wiedenmayer, 1994: 265.
Not *Plectispa macropora* Lendenfeld, 1888: 226; Hallmann, 1912: 203, 205, 242.
Not *Clathria macropora*; Whitelegge, 1901: 91.
Not *Wilsonella macropora*; Hallmann, 1912: 203, 240, 242, 205.
Not *Plumohalichondria australis* Whitelegge, 1901: 90, pl.11, fig.14.
Isociella flabellata; Hallmann, 1920: 784-789, pl.39, figs 1-2, pl.40, fig.1, text-fig.3.
Phakellia jacksoniana Dendy, 1897: 236; Whitelegge, 1907: 507.
Isociella jacksoniana; Bergquist & Tizard, 1967: 187.

MATERIAL. HOLOTYPE: AMZ466: Port Stephens, NSW, 32°42'S, 152°06'E, no other details known (label 'Clathria macropora Lend., type'). LECTOTYPE of *P. jacksoniana*: BMNH1887.5.2.9: Port Jackson, NSW, 33°51'S, 151°16'E, 54-90m depth, coll. HMS 'Challenger' (dredge). PARALECTOTYPE of

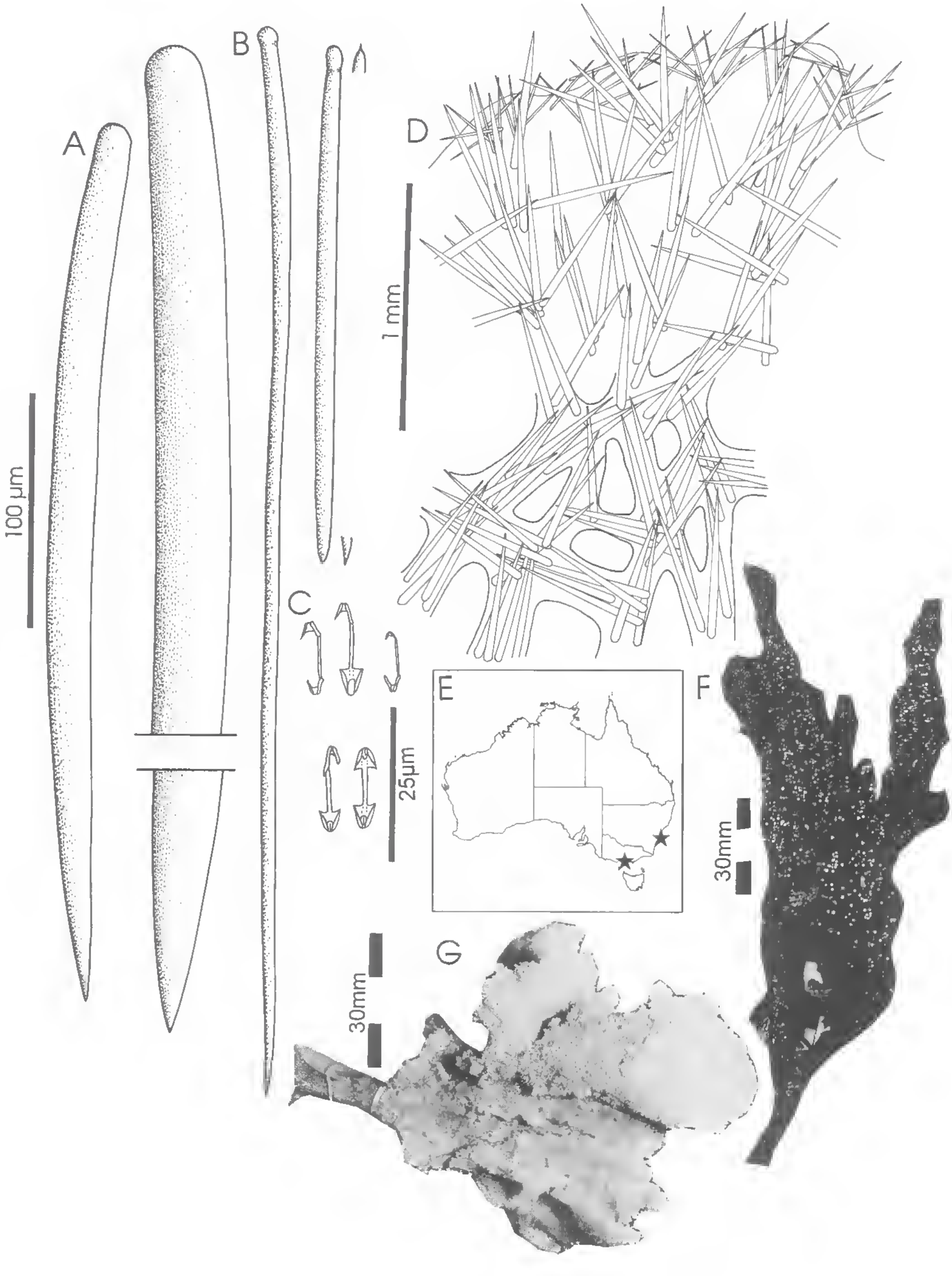

FIG. 132. *Clathria* (*Isociella*) *macropora* Lendenfeld (holotype AMZ466). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyles. C, Modified palmate isochelae. D, Section through peripheral skeleton. E, Australian distribution. F, Holotype. G, Paralectotype of *Phakellia jacksoniana* BMNH1887.5.2.8.

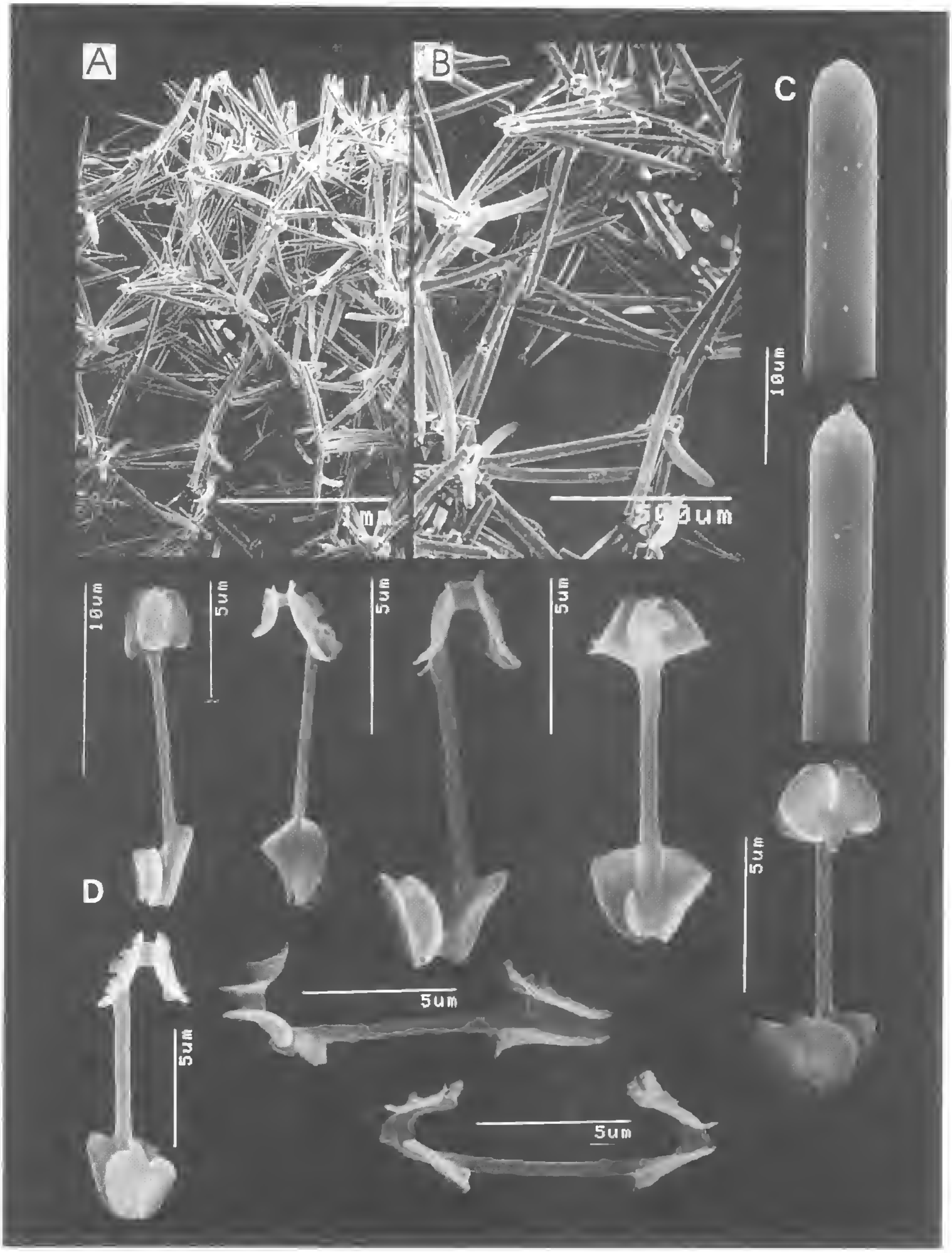

FIG. 133. *Clathria* (*Isociella*) *macropora* Lendenfeld (holotype AMZ466). A, Choanosomal skeleton. B, Semi-renieroid fibres. C, Bases of subectosomal auxiliary styles. D, Modified palmate isochelae.

P. jacksoniana: BMNH1887.5.2.8: same locality. OTHER MATERIAL: VIC - AMZ771.

HABITAT DISTRIBUTION. Subtidal rock reef to deeper offshore reefs, in soft sediments; 12-90m depth; known only from Australia: Port Stephens, Port Jackson (NSW), Port Phillip (Vic) (Fig. 132E).

DESCRIPTION. *Shape*. Irregularly flabellate-digitate or flabellate, planar, 85-170mm long, 55-105mm maximum breadth, with short cylindrical stalk 15-25mm long, 7-15mm diameter, one or more thinly lobate, bifurcated branches, up to 8mm thick, either free or fused to adjacent branches, with rounded, digitate, uneven or shaggy margins.

Colour. Yellow-grey or brown in ethanol.

Oscules. Oscules small, 1-3mm diameter, in special areas (sieve-plates) scattered over surface of branches, with series of stellate subdermal drainage canals surrounding each osculum.

Texture and surface characteristics. Firm, flexible; branches with separate inhalant and exhalant faces; one surface porous, rugose, with irregular longitudinal ridges, microconules or irregular striations; other surface relatively smooth, membraneous.

Ectosome and subectosome. Ectosome membraneous, bispid, with points of choanosomal principal styles protruding through surface, individually or in multispicular plumose bundles; surface skeleton with relatively sparse tangential, paratangential or sometimes plumose erect skeleton of small subectosomal auxiliary styles projecting between principal spicules, sometimes surrounding (in proximity to) principal spicules reminiscent of Raspailiidae.

Choanosome. Choanosomal skeleton with very slightly compressed axis and plumose sub-isodictyal, sometimes renieroid extra-axis. Axial region with moderately heavy spongin fibres, forming tight irregularly reticulate meshes cored by paucispicular tracts of choanosomal principal styles; axis (corresponding to central lamellae and basal stalk) has few ascending, primary tracts, forming multispicular, halichondroid structures, 250-400µm diameter, producing few multispicular, dendritic tracts running from basal stalk to periphery, 50-150µm diameter; extra-axial skeleton sub-isodictyal with plumose spicule tracts bound by collagen (without fibre component), ascending to surface, cored by uni-, pauci- or less frequently multispicular tracts of choanosomal principal styles; primary ascending extra-axial spicule tracts (up to 5 spicules side-by-side) arise perpendicular to axis, interconnected by more-or-less transversely orientated, smaller secondary uni- or paucispicular tracts producing predominantly subisodictyal structure; peripheral spicule tracts more plumose than deeper choanosomal tracts; meshes produced by spicule-fibre anastomoses in extra-axial region triangular or rectangular in shape, 280-560µm diameter; echinating acanthostyles absent; mesohyl matrix contains abundant relatively heavily pigmented spongin, with moderate quantities of auxiliary spicules, and choanocyte chambers oval, 50-198µm diameter.

TABLE 27. Comparison between present and published records of *Clathria* (*Isociella*) *macropora* (Lendenfeld). Measurements in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Holotype (AMZ466)	Paralectotype of *P. jacksoniana* (BMNH 1887.5.2.8)	AMZ771
Choanosomal principal styles	369-(446.4)-552 x 21-(26.6)-35	441-(494.7)-558 x 19-(28.8)-38	350-(462.3)-548 x 11-(24.5)-36
Subectosomal auxiliary styles	191-(287.0)-424 x 4-(6.4)-9	162-(197.1)-226 x 4-(6.7)-9	155-(216.7)-384 x 2.5-(5.9)-9
Echinating acanthostyles	absent	absent	absent
Chelae	8-(12.9)-16	9-(12.0)-14	9-(12.5)-15.5
Toxas	absent	absent	absent

Megascleres (Table 27). Choanosomal principal styles long or short, thick, slightly curved at centre, less often straight, with rounded or slightly tapering, smooth bases, varying from fusiform to hastate points.

Subectosomal auxiliary styles variable in length, thin, straight or very slightly curved, with basal terminations varying from evenly rounded, tapering hastate, quasi-diactinal mucronate or slightly subtylote, and with hastate points.

Echinating spicules absent.

Microscleres (Table 27). Palmate isochelae with highly modified, relatively small alae bearing wing-shaped fluted processes; lateral alae entirely fused to shaft; front ala complete or bifurcated with medial tooth; chelae frequently twisted or occasionally anisochelate.

Toxas absent.

REMARKS. The synonymy of *C. macropora* and *P. jacksoniana* is obvious on type material, but virtually impossible to tell from published descriptions, so the synonymy was overlooked by Hooper & Wiedenmayer (1994). In nearly all features type material of both species is identical although auxiliary spicules in *macropora* are relatively larger.

The name *macropora* is the senior name. Ridley & Dendy's (1886) *flabellata* is a junior homonym of Carter's (1885f) species, and Dendy's (1897) replacement *jacksoniana* now considered to be redundant. Unfortunately *macropora* requires further clarification given that it has been misused and misinterpreted. My interpretation of *macropora* is based solely on the holotype because despite Hallmann's (1912: 166) arguments in defense of Lendenfeld's systematics, there is no doubt that Lendenfeld was dealing mainly with specimens which did not belong to the Microcionidae. *Clathria macropora* is nothing like *Plectispa macropora* (*sensu* Lendenfeld, 1888; holotype AMG9159), which has smooth echinating spicules, identical to those coring fibres, and is referred here to *Holopsamma*. *Clathria macropora* Lendenfeld (1888) (AMZ959) from Port Jackson, NSW and *C. macropora* from Port Chalmers, Qld (BMNH-1950.2.12.60) are specimens of *Crella incrustans* (Crellidae). Three other specimens in the AM collections bearing the name '*macropora*': one specimen from Nelson Bay, New Zealand collected by Arthur Dendy (AM unreg.) is a *Crella* with an ectosomal crust similar to *C. levis* var. *digitata* (AMZ454) (= *C. incrustans*); another (AMZ4035) collected from Dee Why, Sydney (RRIMPFN1338) and the third (AMZ4187 (RRIMPFN1428)) from 'Tumbledown', Jibbon Head, NSW, both from the Roche Collection, are haplosclerid sponges with three dimensional ectosomal skeletons, probably related to *Amphimedon* (Niphatidae).

This taxon was not among several hundreds of specimens from subtidal and deeper water in Port Jackson, Port Stephens and the adjacent coastline (collected by the NSW Environmental Protection Authority and Sydney Water Board benthic monitoring surveys). It is also doubtful that it occurs in New Zealand, as Bergquist & Fromont (1988) questioned Lendenfeld's (1888) record given that it was not subsequently rediscovered during their substantial contemporary collections of the NZ fauna. This is confirmed here from re-examination of Lendenfeld's voucher specimen from Nelson Bay, NZ (mentioned above), which belongs to *Crella*.

Clathria (*Isociella*) *macropora* has distinctive fluting on the teeth isochelae. This feature is barely visible under light microscopy, and therefore it is possible that it may also occur in other species of *Clathria*, which have not yet been studied using SEM, but apparently it is unique to the family. The species also has a slightly compressed axial skeleton partially offset from the diverging, plumose, subisodictyal reticulate extra-axial skeleton, showing vague structural similarities to *Ceratopsion* and *Raspailia* (*Syringella*) (Raspailiidae). This skeletal structure could also justify its inclusion in *C.* (*Axociella*), but it is considered here that the subisodictyal reticulation dominates the skeleton and is more characteristic of *Isociella* than *Axociella*.

Clathria (Isociella) selachia sp. nov.
(Figs 134-135, Plate 3F)

MATERIAL. HOLOTYPE: NTMZ2946: E. side of Steep Point Lighthouse, South Passage, Dirk Hartog I., Shark Bay, WA, 26°08.5'S, 113°10.3'E, 13.vii.1987, 7m depth, coll. J.N.A. Hooper (SCUBA). PARATYPE: QMG300562: same data.

HABITAT DISTRIBUTION. Encrusting on excavated limestone plates, in surge zone; 7m depth; central W coast (WA) (Fig. 134E).

DESCRIPTION. *Shape.* Massively encrusting, bulbous lobate-digitate, holotype 155mm wide, 105mm high, paratype 65mm wide, 60mm high, with thickly flabellate, slightly flattened lobes, up to 55mm thick, 110mm long, mostly fused to adjacent lobes, together forming a bulbous mass.
Colour. Bright red-orange alive (Munsell 10R 6/10), grey-brown in ethanol.
Oscules. Large, up to 8mm diameter, clustered on tops of bulbous lobes or on margins of flattened lobes, slightly raised above surface with membraneous lip.
Texture and surface characteristics. Firm, compressible, moderately difficult to tear; surface fleshy, bulbous, slightly microconulose, membraneous *in situ*, with membrane collapsing upon preservation producing fibrous, reticulate, porous, prominently conulose, shaggy surface.
Ectosome and subectosome. Ectosome membraneous, slightly hispid from protruding choanosomal spicule tracts, with relatively thick paratangential or tangential skeleton of subectosomal auxiliary subtylostyles in multispicular tracts; ectosomal skeleton thickest at apex of surface microconules, perched on ends of ascending choanosomal skeletal tracts.
Choanosome. Choanosomal skeleton plumoreticulate, subisodictyal and subrenieroid, with differentiated primary ascending and secondary transverse spongin fibres and spicule tracts; primary ascending fibres well developed, 65-

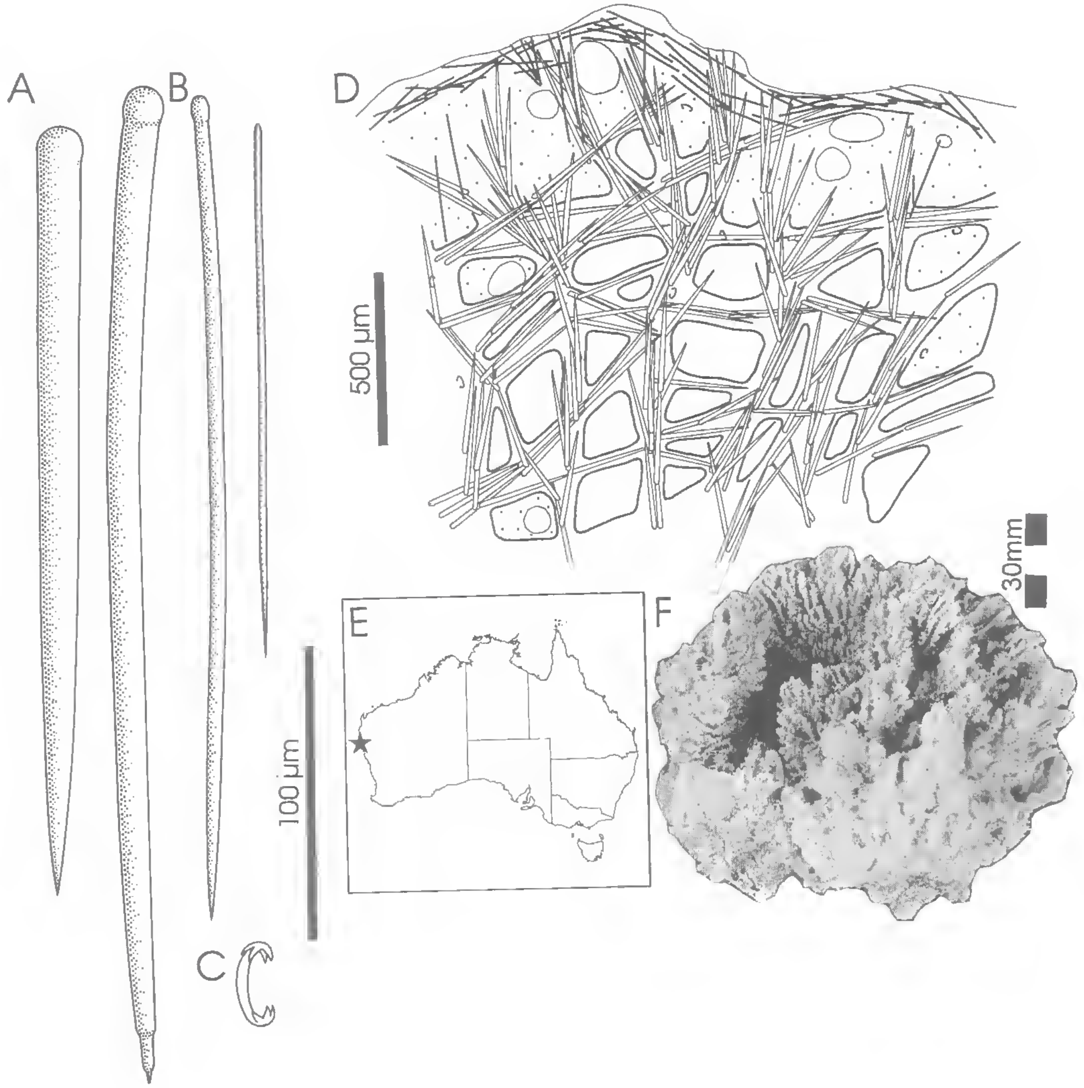

FIG. 134. *Clathria* (*Isociella*) *selachia* sp.nov. (holotype NTMZ2946). A, Choanosomal principal subtylostyles. B, Subectosomal auxiliary subtylostyles. C, Anchorate-like isochela. D, Section through peripheral skeleton. E, Australian distribution. F, Holotype.

120µm diameter, cored by multispicular tracts of larger choanosomal principal subtylostyles, 3-15 spicules per tracts; spicules not occupying entire fibre diameter; primary fibres bifurcate repeatedly, but anastomose only occasionally, producing prominent plumose structure most noticeable at periphery; principal subtylostyles mainly form axial core of spicules but sometimes they protrude through primary fibres producing plumose brushes; primary fibres interconnected at more-or-less regular intervals by well developed uni- or paucispicular spongin fibres, 20-45µm diameter, cored by principal subtylostyles, forming triangular, rectangular or oval meshes, 90-180µm diameter; skeleton slightly more cavernous near periphery, more plumose in structure; fibres heaviest in axis, more subisodictyal in structure; echinating megascleres absent; mesohyl matrix light, nearly unpigmented, with many smaller auxiliary subtylostyles and isochelae dispersed between fibres; generally spicules dispersed between fibres more slender,

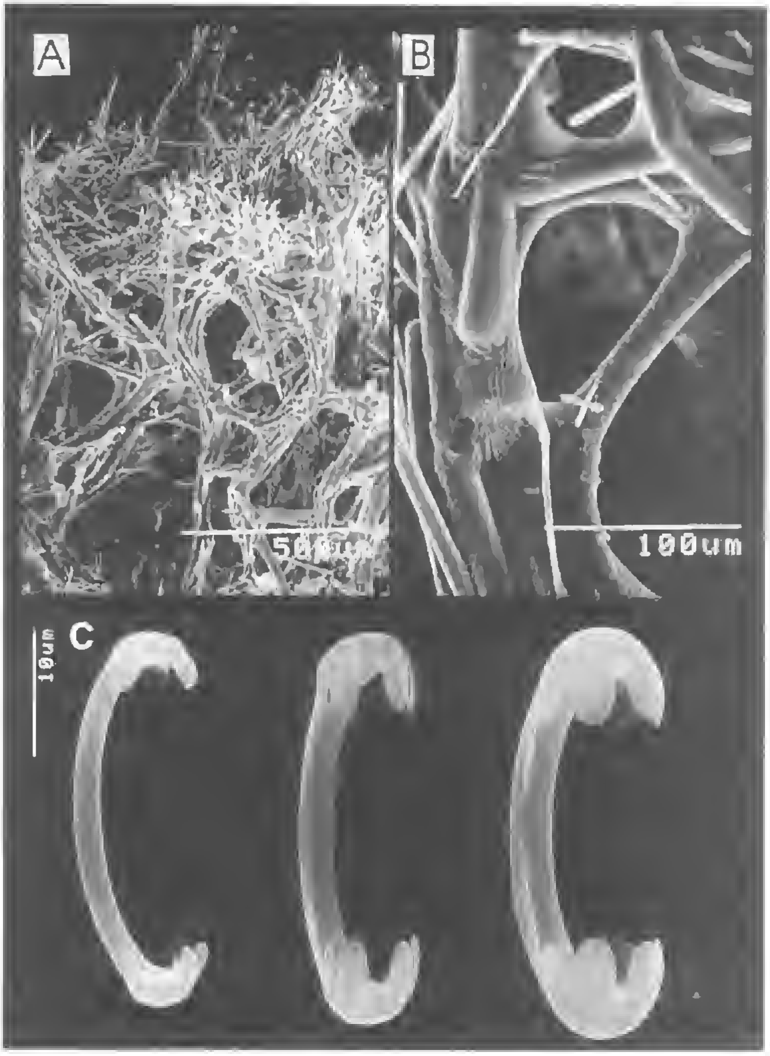

FIG. 135. *Clathria (Isociella) selachia* sp.nov. (holotype NTMZ2946). A, Choanosomal skeleton. B, Fibre characteristics. C, Anchorate isochelae.

sinuous (probably juvenile) than in ectosomal skeleton; choanocyte chambers large, oval, 220-270µm diameter.

Megascleres. Choanosomal principal subtylostyles long, thick, straight or slightly curved towards base, with slightly subtylote or prominently subtylote bases, tapering fusiform or telescoped points. Length 231-(260.6)-303µm, width 8-(11.6)-16µm.

Subectosomal auxiliary subtylostyles relatively long, slender, usually straight, occasionally sinuous, with prominently subtylote bases, tapering fusiform points. Length 125-(213.9)-294µm, width 1-(3.4)-6µm.

Microscleres. Isochelae anchorate -like, with slightly to greatly curved shaft, variable alae development from vestigial, tooth-like producing unguiferous chelae, to spatulate, fused forming lobate alae; lateral alae detached from shaft; front alae incompletely fused to adjacent ala; distal portions of shaft with lateral ridge. Length 26-(31.2)-34µm.

Toxas absent.

ETYMOLOGY. Greek *selachos*, shark, for Shark Bay, WA.

REMARKS. This species belongs to *Clathria*, based on its spiculation, choanosomal skeletal structure, ectosomal skeleton and fibre characteristics. It is assigned here to *C. (Isociella)* given its prominent subisodictyal skeleton, most obvious in the axial region, and lack of echinating spicules. It differs from other *Isociella* in having a predominently plumo-reticulate skeleton in the peripheral region (although subisodictyal in the axis) and in its spicule dimensions.

When this species was first examined it was considered that the anchorate-like isochelae described above might be contaminants from another sponge or from the substrate upon which it grew. But numerous histological preparations made from the holotype, from various regions within the sponge, repeatedly turned up these chelae. Furthermore, examination of chelae *in situ* found them to be scattered both within the surface skeleton, intermingled with the paratangential bundles of auxiliary spicules, and also surrounding choanocyte chambers within the choanosomal mesohyl. They are native to this species, although this is at odds with the current hypothesis concerning the derivation and evolutionary significance of these spicules (Hajdu et al., 1994).

The holotype and paratype were found growing side by side and are probably clones of the same individual.

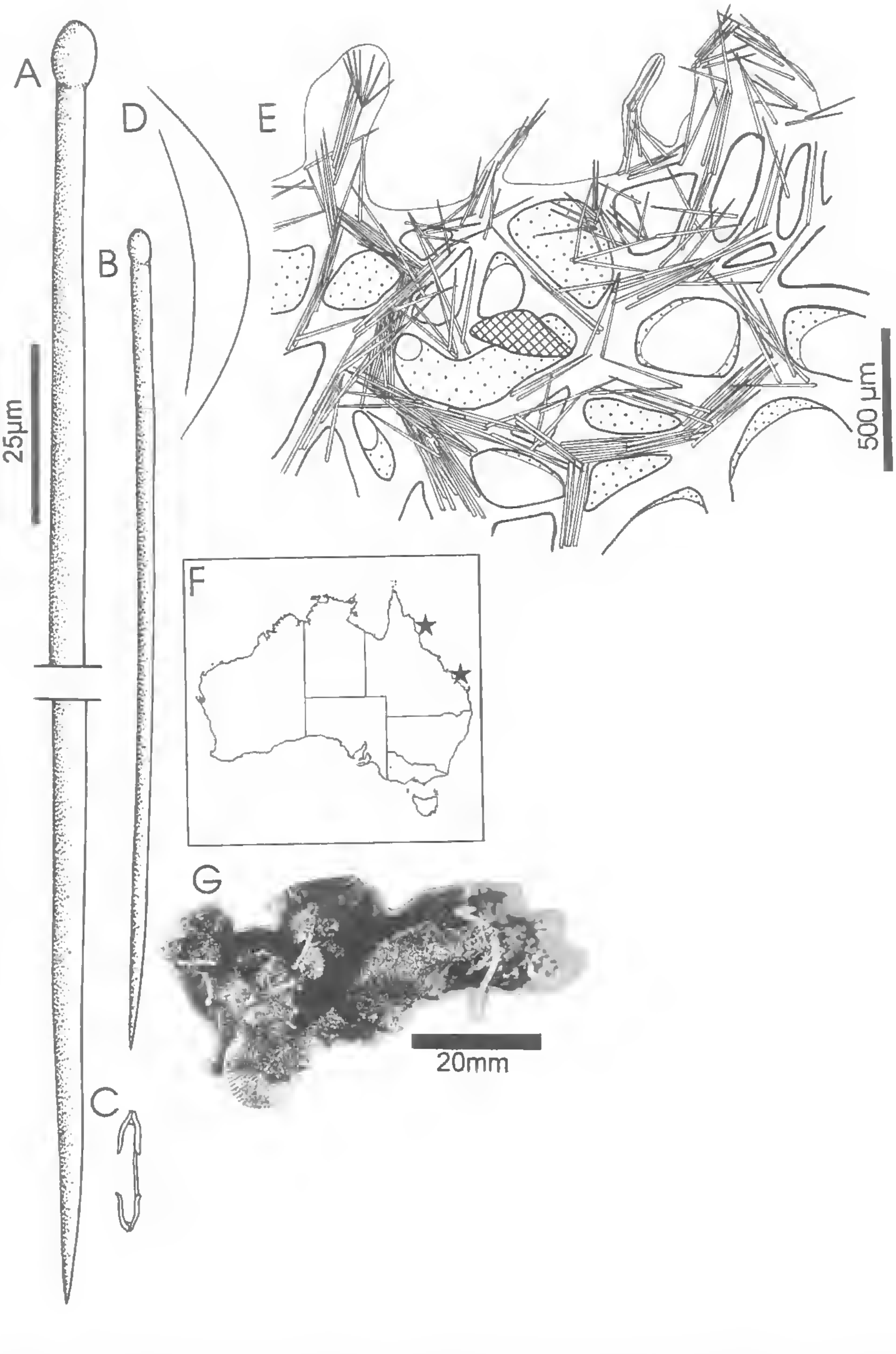

FIG. 136. *Clathria* (*Isociella*) *skia* sp.nov. (holotype QMG300449). A, Auxiliary subtylostyle (coring fibres). B, Ectosomal auxiliary subtylostyle. C, Palmate isochela. D, Raphidiform toxas. E, Section through peripheral skeleton. F, Known Australian distribution. G, Holotype.

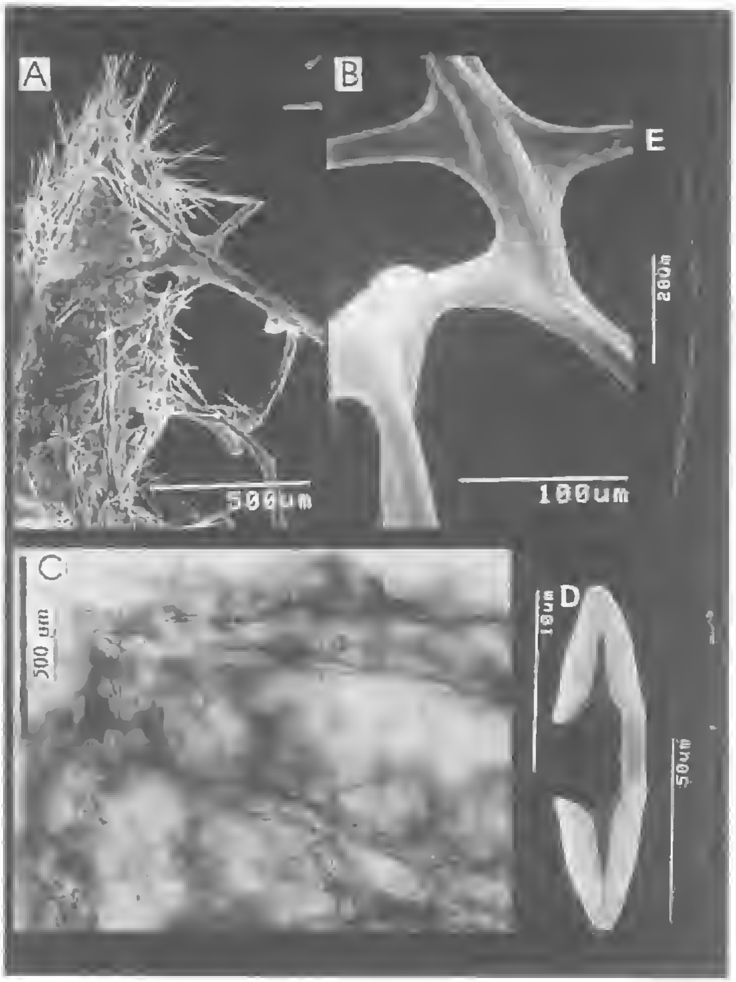

FIG. 137. *Clathria* (*Isociella*) *skia* sp.nov. (holotype QMG300449). A, Ectosomal skeleton. B, Fibre characteristics. C, Skeletal structure. D, Palmate isochela. E, Raphidiform toxas.

Clathria (Isociella) skia sp. nov.
(Figs 136-137, Table 28)

MATERIAL. HOLOTYPE: QMG300449 (fragment NTMZ1522): W. of Sudbury Reef, Cairns region, Great Barrier Reef, Qld, 17°03'S, 146°07.8'E, 33-36m depth, 28.i.1981, coll. A. Kay (trawl). PARATYPE: AMG5043: Masthead I. lagoon, Capricorn-Bunker Group, Great Barrier Reef, Qld, 23°32'S, 151°43'E, 40m depth, no other details known.

HABITAT DISTRIBUTION. Attached to shell fragments or coral rubble, in soft sediments; 33-40m depth; Cairns region (NEQ), Gladstone region (MEQ) (Fig. 136F).

DESCRIPTION. *Shape*. Erect, bulbous-lobate digitate, clathrous sponge, 45-95mm long, 18-35mm diameter, with irregularly and closely anastomosing digits, rounded and irregular margins, branches 8-18mm diameter.

Colour. Live colouration unknown, dark brown in ethanol.

Oscules. Not observed.

Texture and surface characteristics. Firm, compressible; surface macroscopically even, microscopically conulose, hispid, with subectosomal striations.

Ectosome and subectosome. Ectosome with specialised skeleton composed of smaller auxiliary subtylostyles, forming sparse multispicular bundles on surface, arising directly from heavy, darkly pigmented peripheral fibres; tips of primary spongin fibres in peripheral region protrude through surface, producing surface microconules up to 300µm long; majority of peripheral fibres nearly tangential, forming irregular reticulate meshes, cored by multispicular tracts of larger auxiliary spicules (6-10 spicules per tract).

Choanosome. Skeletal architecture is irregularly isodictyal and renieroid reticulate, with clearly differentiated primary, ascending fibres, 60-125µm diameter, cored by pauci- or multispicular fibres of larger auxiliary subtylostyles, up to 8 spicules abreast, interconnected by secondary, transverse, regular or irregular, uni- or paucispicular fibres (22-48µm diameter); spongin fibres heavy; echinating spicules absent, although coring megascleres may protrude through fibres at oblique angles, becoming more plumose towards periphery; fibre anastomoses produce triangular, rectangular or oval meshes, 190-425µm in diameter, becoming more regular near periphery; mesohyl matrix heavy, darkly pigmented, and many scattered auxiliary subtylostyles dispersed between fibres; choanocyte chambers small, oval, 40-85µm diameter.

Megascleres (Table 28). Principal spicules absent.

Auxiliary subtylostyles (coring fibres) long, slender, invariably straight, with prominent, smooth subtylote bases and fusiform points.

Ectosomal auxiliary subtylostyles significantly smaller than coring spicules but otherwise of identical geometry.

Echinating spicules absent.

Microscleres (Table 28). Palmate isochelae uncommon, unmodified, with long lateral alae entirely fused to shaft and front ala completely fused, slightly spatulate.

Toxas raphidiform, extremely thin, slightly curved at centre, sometimes nearly straight or bow shaped, rarely asymmetrical.

ETYMOLOGY. Greek *skias* , dark, dim.

REMARKS. This species is a greatly reduced *Clathria*, lacking true principal spicules, echinating spicules and having containing relatively sparse microscleres. Conversely its spongin fibre system is well developed and fibres are heavy. It is assigned to the *Isociella* group on the basis that its skeletal structure is essentially subisodictyal, and it lacks echinating spicules, but it is admitted that its reduced characteristics make its true affinities speculative.

The sparsely developed ectosomal skeleton, composed of plumose bundles of smaller auxiliary styles, also indicates affinities to the *Thalysias* group, but in most respects (spicule geometry, skeletal structure, fibre development and growth form) it differs from all other species of either *Isociella* and *Thalysias*. *Clathria* (*Isociella*) *skia* was initially thought to be *Amphilectus hispidulus* Ridley, from Torres Strait (FNQ). From both published descriptions of *A. hispidulus* (Ridley, 1884a; Hentschel, 1911) it apparently lacked echinating megascleres, lacked principal spicules and had well developed subisodictyal skeletal structure, but re-examination of the holotype showed that it does have echinating acanthostyles, and differentiated principal and auxiliary megascleres (thus more appropriately included in *Clathria* (*Clathria*); see above), and it also has substantially different fibre characteristics from *C.* (*I.*) *skia* indicating that they are not conspecific.

OTHER SPECIES OF *CLATHRIA* (*ISOCIELLA*)

Clathria (Isociella) incrustans (Bergquist, 1961)

Isociella incrustans Bergquist, 1961a: 42-43, text-figs 15a-b [Ahipara Bay, N. New Zealand; originally assigned to the Suberitidae, Hadromerida]. Bergquist & Fromont, 1988: 114-116, pl.53, figs e-f, pl.54, figs a-b; Dawson, 1993: 36.

MATERIAL. HOLOTYPE: NMNZ unregistered. NZ.

TABLE 28. Comparison between of *Clathria* (*Isociella*) *skia* sp.nov. Measurements in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Holotype (QMG300449)	Paratype (AMG5043)
Choanosomal principal styles	absent	absent
Auxiliary (coring) styles	162-(248.4)-368 x 2.5-(4.5)-8	154-(242.1)-318 x 2-(4.1)-6
Auxiliary (ectosomal) styles	97-(111.9)-129 x 1.5-(2.4)-4	87-(110.2)-132 x 1.5-(2.4)-4
Echinating acanthostyles	absent	absent
Chelae	9-(15.3)-18	14-(16.3)-19
Toxas	72-(104.4)-145 x 0.2-(0.4)-0.8	65-(81.1)-108 x 0.2-(0.5)-0.8

Clathria (Thalysias)
Duchassaing & Michelotti, 1864

Thalysias Duchassaing & Michelotti, 1864: 82.
Rhaphidophlus Ehlers, 1870: 19.
Tenacia Schmidt, 1870: 56.
Echinonema Carter, 1881a: 378.
? *Thalassodendron* Lendenfeld, 1888: 222.
Stylotellopsis Thiele, 1905: 456; de Laubenfels, 1936a: 112.
Colloclathria Dendy, 1922: 74.
Damoseni de Laubenfels, 1936a: 110.

DEFINITION. Specialised ectosomal skeleton composed of two size classes of auxiliary (subtylo)styles, with smaller ectosomal spicules usually overlaying larger subectosomal ones forming a continuous palisade, or discrete bundles, mainly erect, sometimes paratangential, or rarely tangential to surface; choanosomal skeleton without any marked differentiation between axial and extra-axial regions; echinating acanthostyles usually present.

TYPE SPECIES. *Spongia juniperina* Lamarck, 1814: 444 (by synonymy).

REMARKS. Of 137 named species described in, or referred to *Thalysias* or one of its synonyms, 93 are thought to be valid of which 37 are recorded here from Australian waters including 10 new species.

Clathria (Thalysias) abietina (Lamarck, 1814)
(Figs 138-141, Tables 29-30, Plate 4C-D)

Spongia abietina Lamarck, 1814: 450, 377.
Clathria abietina; de Laubenfels, 1954: 141-142, text-fig.90; Hooper & Wiedenmayer, 1994: 267.

Clathria aculeata Ridley, 1884a: 443-444, pl.40, fig.1, pl.42, fig.k; Ridley & Dendy, 1887: 147, 246, 254; Topsent, 1897b: 447; Burton, 1934a: 558; Burton, 1959a: 243; Lévi & Lévi, 1989: 80-81, pl.7, fig.3.

Rhaphidophlus aculeatus; Topsent, 1932: 115, pl.4, fig.10; Vacelet & Vasseur, 1977: 114; Vacelet et al., 1976: 73-74.

Rhaphidophlus cervicornis, in part; Vacelet & Vasseur, 1971: 73.

cf. *Microciona prolifera*; Vosmaer, 1935a: 610, 633, 664.

MATERIAL. LECTOTYPE: MNHNDT634: precise locality unknown (suspected to be 'Australia'; Topsent (1932: 115)). PARALECTOTYPES: MNHNDT3342, 3343: same details. HOLOTYPE of *C. aculeata*: BMNH1882.2. 23.258: Torres Strait, Qld, 9°41'S, 142°17'E, 6-8m depth, coll. HMS 'Alert' (dredge). OTHER MATERIAL. MICRONESIA - USNM 22808, USNM23090. QLD - BMNH1887.5.2.110, QMG300791. DARWIN HARBOUR, NT - NTMZ226, NTMZ426, NT MZ458, NTMZ468, NTMZ498, NTMZ512, NTMZ515, NTMZ886, NTMZ903, NTMZ928, NTMZ955, NTMZ2050, NTMZ2078, NTMZ 2079, NTMZ2085, NTMZ2258, NTMZ2390, NTMZ2391, NTMZ2395, NTMZ2399, NTMZ2611, NTMZ2642, QMG300169, NTMZ2646, QMG304077, NTMZ1943, NTMZ1958, NTMZ 1963, QMG303373, QMG303382, NTMZ2089, NTMZ2161, NTMZ2163, NTMZ2186, NTMZ2191, NTMZ2194, NTMZ2195, NTMZ820, NTMZ835, QMG300414. BYNOE HARBOUR, NT - NTMZ1073, NTMZ2106, QMG303447, QMG303534. SHOAL BAY, NT - QMG303539, QMG303571. TIMOR SEA, NT - NTMZ3090. PORT ESSINGTON, COBOURG PENINSULA, NT - NTMZ68, NTMZ69, NTMZ90, NTMZ1393, NTMZ3304, NTMZ577, NTMZ 1328, NTMZ1329, NTMZ1330, NTMZ1331, NTMZ1332, NTMZ1333, NTMZ1334, NTMZ 1343, NTMZ2500, NTMZ2501, NTMZ2509, NTMZ2510, NTMZ3245, NTMZ3255, NTMZ 3258, NTMZ3260, NTMZ3268, NTMZ3272, NTMZ3277, NTMZ3278, NTMZ3284, NTMZ3289, NTMZ3295, QMG300386, NTMZ1352. ARAFURA SEA, NT - NTMZ2521, NTMZ 2522, NTMZ2523, NTMZ129, NTMZ130, NTMZ138. WESSEL ISLANDS, NT - NTMZ3902, QMG300764 (NCIQ66C-4692-Q), NTMZ3921, NTMZ3930, QMG300757 (NCIQ 66C-4773-F), QMG300508 (NCIQ66C-4772-C), NTMZ3947, QMG300765 (NCIQ66C-4808-R). NORTHWEST SHELF REGION, WA - NTMZ1036, NTMZ1209, NTMZ-1217, NTMZ 1244, NTMZ1272, NTMZ1314, NTMZ1411, NTMZ1423, WAM151-82, WAM155-82 (fragments NTMZ1731, NTMZ1732), NTMZ1770, NTMZ1801, NTMZ1820, NTMZ1824, NTMZ 1852, NTMZ2272, NTMZ2329, NTMZ2349, NTMZ2486, NTMZ3017, NTMZ3030, NTMZ 3031, NTMZ3032, NTMZ3033, NTMZ3396, QMG300448 (NCIQ66C-1517-P), QMG300117 (NCIQ66C1518-Q) (fragments NTMZ3488, NTMZ3489), PIBOC04-595 (fragment QMG300051)

HABITAT DISTRIBUTION. Shallow-water 0-25m depth, predominantly on sides and tops of rock and dead coral heads, invariably exposed to currents. Deeper-water specimens (26-86m depth) mostly associated with exposed rock substrates in gravel, silt or shell-grit substrates; central SW Pacific Ocean (Low Isles, Great Barrier Reef (Burton, 1934a), Torres Strait (Ridley, 1884a; Ridley & Dendy, 1887)); E Indian Ocean (Arafura Sea, Timor Sea, mid-WA coast (present study)); also tropical Indo-west Pacific: central NW. Pacific Ocean (Marshall and Caroline Is (de Laubenfels, 1954), Philippines (Lévi & Lévi, 1989)); W. Indian Ocean (Madagascar (Vacelet et al., 1976, 1977), Red Sea (Burton, 1959a)). Within Australian waters this species extends across the N and NW coasts, from the Cairns region, Torres Strait and Gulf of Carpentaria, Qld, to the Exmouth Gulf region, WA (Fig. 138J). It is only rarely encountered on the E Qld. coast and must be considered a predominantly Indian Ocean species.

DESCRIPTION. *Shape.* Arborescent; thickly cylindrical digitate branches on long or short, thick stalk (3-21mm basal diameter) with expanded basal attachment, never rhizomous; branches rarely anastomosing, branching mostly irregular, bushy, occasionally regular growing in 1 plane, sometimes flagelliform, occasionally expanded, club-shaped; total length and branch diameter variable (50-460mm; 2-22mm, respectively).

Colour. Live colouration highly variable, ranging from maroon, red, orange, yellow, brown to grey; colour in ethanol ranges from black, brown to grey (Munsell values given below); pigments oxidise in air; maroon colouration is highly alcohol soluble; yellow pigmentation more stable in ethanol but easily scratched from surface of living sponge, leaving a maroon or mauve pigmentation beneath; pigmentation extends into periphery of choanosomal mesohyl.

Oscules. Exhalent pores usually very small, 0.6-2.0mm diameter, barely visible optically, dispersed on distal ends of branches surrounded by surface conules, occasionally scattered along entire lateral margins of branches.

Texture and surface characteristics. Firm, barely compressible; branches rubbery whereas stalk more rigid; surface dense, entirely opaque in life, with characteristic regularly scattered surface conules; conules tapering, distally rounded or blunt, usually absent from basal and distal extremities of branches, 2-6mm maximum basal diameter.

Ectosome and subectosome. Very dense, continuous palisade of small ectosomal auxiliary subtylostyles forming discrete brushes overlay-

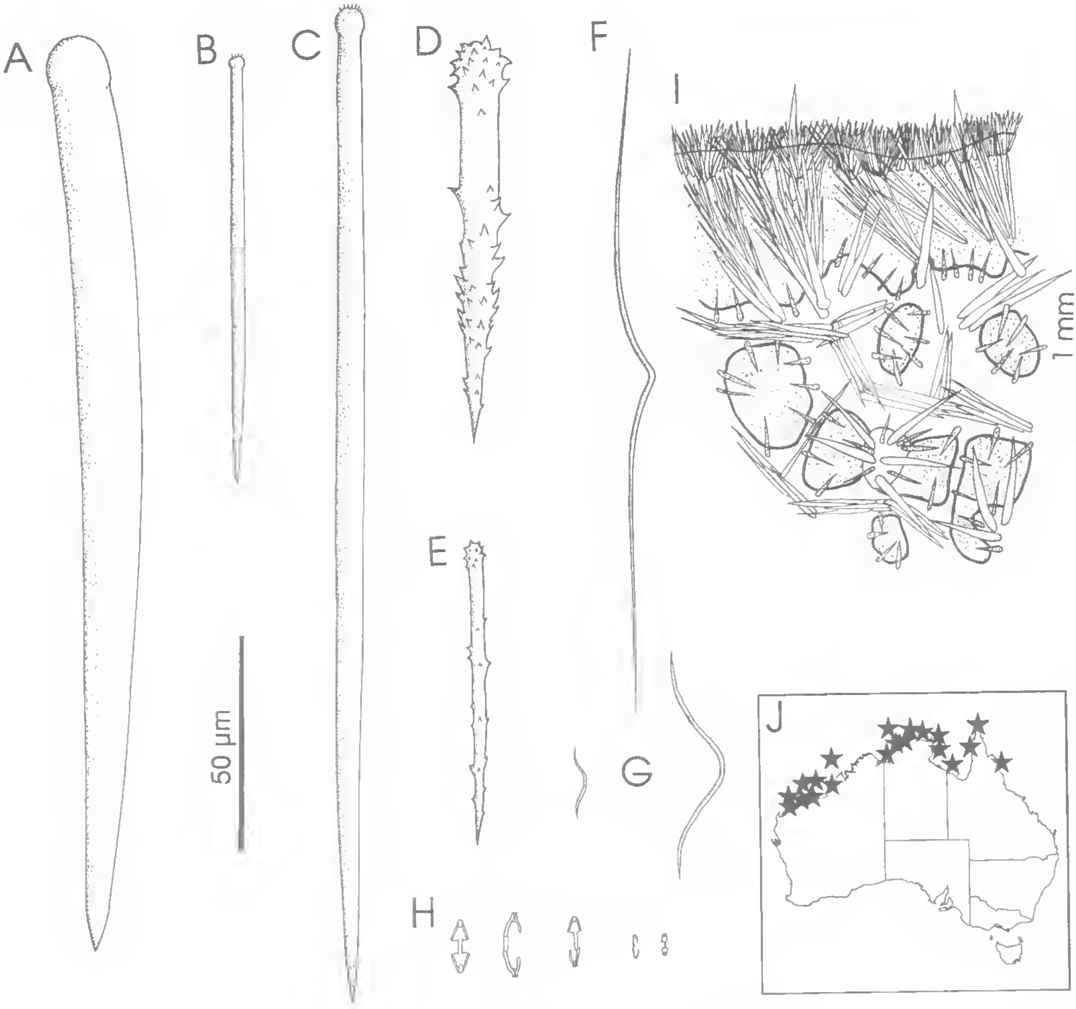

FIG. 138. *Clathria* (*Thalysias*) *abietina* (Lamarck) (holotype MNHNDT634). A, Choanosomal principal subtylostyle. B, Ectosomal auxiliary subtylostyle. C, Subectosomal auxiliary subtylostyle. D-E, Echinating acanthostyles. F, Accolada toxa. G, Wing-shaped toxas. H, Palmate isochelae. I, Section through peripheral skeleton. J, Australian distribution.

ing thickly plumose tracts of larger subectosomal auxiliary subtylostyles in peripheral skeleton (the latter often obscuring ectosomal brushes); subectosomal spicule tracts arise from ultimate choanosomal fibres, intermingled with tufts of principal choanosomal subtylostyles echinating peripheral fibres; principal spicules not extending into ectosomal skeleton; mesohyl matrix heavy and pigmented in both ectosomal and subectosomal regions.

Choanosome. Skeleton irregularly reticulate; heavy spongin fibres, 50-125µm diameter, heavily anastomosing, not divided into primary or secondary elements but forming irregular, close-meshed reticulation; fibre meshes oval to eliptical, 100-350µm diameter; fibres cored by multispicular tracts of larger auxiliary subtylostyles occupying 60-80% of fibre diameter; choanosomal principal subtylostyle uncommon within fibres, mainly found at fibre nodes protruding through fibres individually or in bundles; fibres also echinated by acanthostyles especially on peripheral fibres; mesohyl matrix heavy but only lightly pigmented, slightly granular; choanocyte chambers oval or eliptical,

TABLE 29. Comparison in range of spicule dimensions between present and published records of *Clathria* (*Thalysias*) *abietina*. All measurements are given in µm and denoted as length x width (N=25).

SPICULE	1	2	3	4	5
Principal styles	165-258 x 9-16	230	172-254 x 12.7	172-254	270-320 x 6-15
Subectosomal styles	157-343 x 5-10	350 x 8.5	149-276 x 2-5	120-250 x 2-3	127-387 x 1-20
Ectosomal styles	62-132 x 2-5	-	81-117 x 2-4	-	45-230 x 1-10
Acanthostyles	61-94 x 4-10	90 x 7.9	53-74 x 4-6	50-70 x 7-8	41-109 x 1-19
Chelae I	11-15	12.7	10-14	10-15	8-20
Chelae II	4-6	-	-	-	1-10
Toxas	15-180	63	91-210	45-55	3-345

Material:
1. *Spongia abietina* - holotype MNHN DT634.
2. *Clathria aculeata* Ridley (1884a: 443).
3. De Laubenfels' (1954:141) material USNM 22808, 23090.
4. *Rhaphidophlus cervicornis*, in part, (Vacelet & Vasseur, 1971:96).
5. Present material (N=25).

40-170µm diameter; larger auxiliary styles also dispersed between fibres in disorganised tracts.

Megascleres. Choanosomal principal styles-subtylostyles usually uncommon, short, stout, slightly curved at centre or near base, occasionally straight, with slightly subtylote bases or evenly rounded bases; spicules usually completely smooth, exceptionally with minutely microspined bases, tapering to abruptly (hastate) sharp points. Length 121-(202.7)-300.5µm, width 5-(14.4)-24µm (lectotype 165-(215.5)-258µm x 9.5-(14.3)-15.5µm).

Subectosomal auxiliary subtylosytles straight or slightly curved near base, with prominent subtylote, usually microspined bases, tapering to fusiform points. Length 127-(258.4)-386.9µm, width 1.1-(8.2)-20.1µm (lectotype 157-(274.4)-343µm x 5-(6.7)-10µm).

Ectosomal auxiliary subtylostyles short, thin, invariably straight, with prominently subtylote, typically microspined bases, tapering to fusiform points. Length 44.8-(114.6)-230µm, width 1.1-(3.8)-10.1µm (lectotype 62-(85.5)-132 x 2-(3.4)-5µm).

Echinating acanthostyles moderately long, thick, straight, with prominently subtylote, spined base, virtually aspinose 'neck' (proximal to base), and lightly spined shaft; spines relatively large. Length 40.6-(82.4)-109µm, width 1.1-(7.5)-19µm (lectotype 61-(74.4)-94 x 4-(6.5)-10µm).

Microscleres. Palmate isochelae with long lateral alae completely fused to shaft, shorter entire front alae; two size categories present, both relatively abundant, both with examples of contort shafts (more abundant in smaller form). Length I: 7.9-(12.1)-19.9µm (lectotype 11-(12.5)-14.5µm), length II: 0.5-(5.8)-10µm (lectotype 4-(5)-6µm).

Toxas relatively uncommon with 2 geometric forms; (i) wing-shaped, short, thin, generously curved at central with reflexed points; (ii) accolada toxas long, thin almost straight with small angular central curvature and straight points. Length I: 5-(24.9)-75µm, width 1.8-(2.4)-4.1µm (lectotype 15-(30.8)-61 x 2.0-(2.9)-3.5µm). Length II: 58-(184.6)-345µm, width 0.3-(0.8)-1.5µm (lectotype 65-(120.8)-180 x 0.5-(0.9)-1.2µm).

Larvae. Parenchymella larvae observed in peripheral choanosomal skeleton of about 20 specimens, predominantly during the tropical wet season (February-April) and less so during the pre-dry season (May-July). Larval incubation was distinctly seasonal and occurred more-or-less evenly throughout the population (i.e., irrespective of depth of collection; Fig. 141). Larvae were 600-950µm diameter, elongate-oval in shape and many contained larval megascleres; cilia were not observed (preserved material).

Associations. 3% of specimens had filamentous algae coring fibres in addition to longer auxiliary megascleres.

Variation. Highly variable in live colouration, non-fibre skeletal development, megasclere size, relatively consistent in growth form, surface features, fibre skeleton, spicule geometry. Gross morphology: stalked, bushy, branching in more than 1 plane, branches bifurcate, occasionally anastomosing (46%), planar branching (33%), dendritic planar branching (fans) (14%), or single digits with no or few bifurcations (7% of specimens). Atypical growth forms (few surface conules, few branches, thin branching) found predominently in deeper offshore coastal waters (40m depth). Live colouration: highly variable, no particular pigment considered to be typical, ranging from (i) maroon, evenly pigmentation (Munsell 5R4/10-2.5R4/8-10), (ii) red-maroon, even (5R5/8-10), (iii) bright red-orange, even

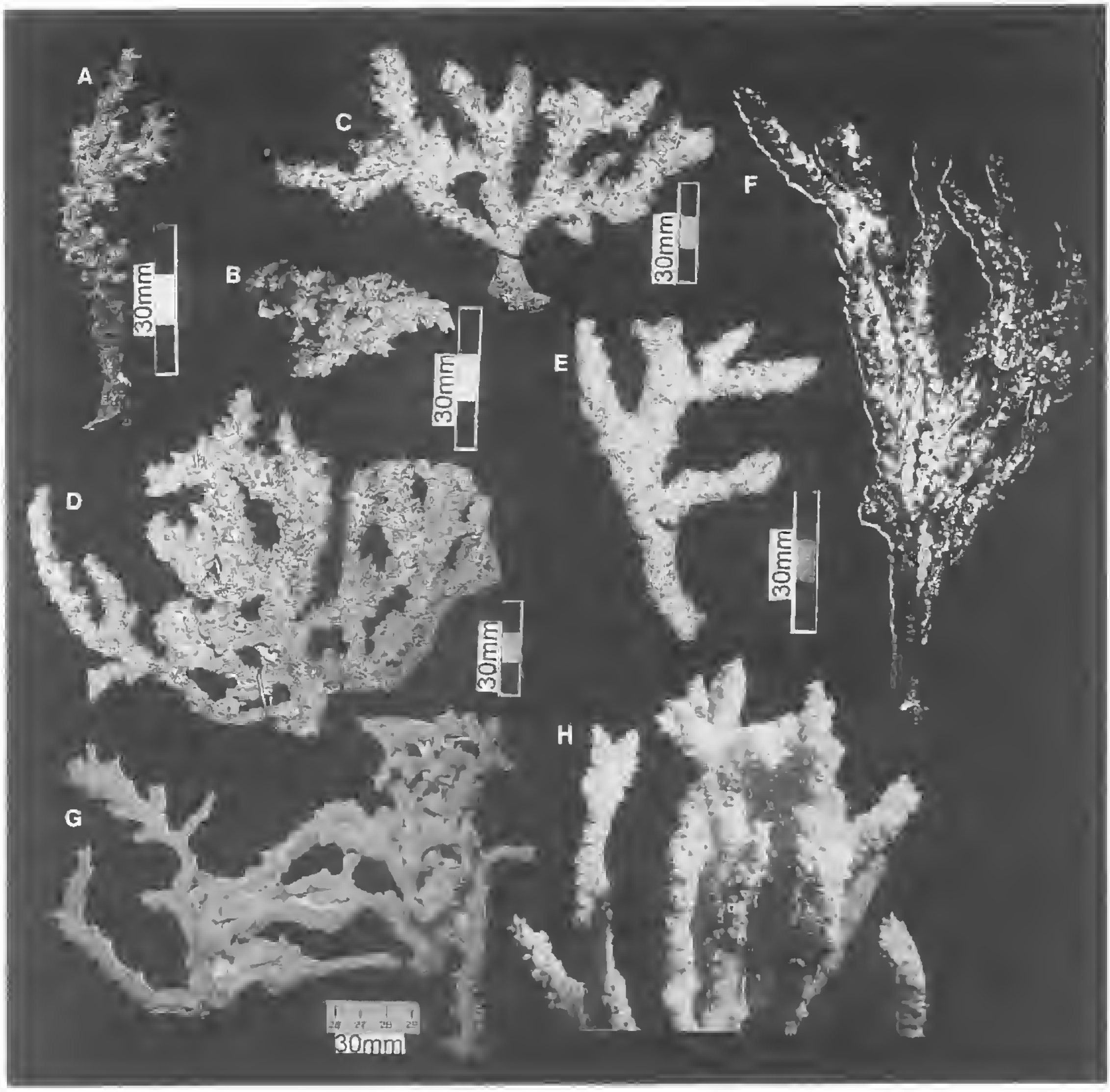

FIG. 139. *Clathria* (*Thalysias*) *abietina* (Lamarck) typical growth forms. A, Lectotype of *C. aculeata* BMNH1882.2.23.258. B, BMNH1887.5.2.110. C, Lectotype MNHNDT634. D, Paralectotype MNHNDT3343. E, Paralectotype MNHNDT3342. F-G, Deeper water specimens NTMZ1820, NTMZ1314. H, Shallow-water specimen NTMZ68.

(5R5/12), (iv) bright orange, even (10R5/12-10R6/10-12-10R7/10), (v) orange-brown, even (10R4/8-10), (vi) orange-yellow, even (7.5YR7/12), (vii) pale brown-pink, even (10R7/4), (viii) light brown, with pink conules (10R7/4, 5R8/4), (ix) light brown, with dark grey-brown conules (2.5YR7/4-5YR7/2-6, 2.5YR6/6-5YR3-5/2), (x) pale brown, even (5YR6/6-5YR7/4-6-5YR8/4), (xi) muddy grey, even (7.5YR7/2-8/2) (xii) yellowish grey, even (2.5Y8/6), (xiii) yellow, even (2.5Y7/8), (xiv) yellow, with pink conules (2.5Y8/6, 10R7/6), (xv) lime-yellow, with dark brown conules (2.5Y7/10, 2.5Y5/2), (xvi) yellow-green mottle (5Y8/12). No obvious relationship between live colouration and depth or substrate type from present data; moreover, specimens with widely different pigmentation observed growing side-by-side (Plate 4D). Subectosomal skeletal development: correlation between branch diameter and extent of development of peripheral skeleton, with 8% of specimens (all thinly

TABLE 30. Summary of results from one-way ANOV's (Model I), testing for variability in spicule lengths and widths between locality, bathymetric and seasonal distributions of *Clathria* (*Thalysias*) *abietina*.

SPICULE	LOCALITY			DEPTH[2]		SEASON[3]		
	(N)	F	Prob.	F	Prob.	(N)	F	Prob.
Choanosomal styles L	(1950)	3.31	P<0.05	2.11	P>0.05	(775)	1.67	P>0.05
W	(1950)	0.54	P>0.05	4.44	P<0.005	(775)	0.26	P>0.05
Subectosomal styles L	(1950)	6.21	P <0.001	10.61	P<0.0005	(775)	2.46	P>0.05
W	(1950)	1.89	P>0.05	4.04	P<0.01	(775)	2.08	P>0.05
Ectosomal styles L	(1950)	0.85	P>0.05	5.48	P<0.001	(775)	4.15	P<0.01
W	(1950)	0.77	P>0.05	1.13	P>0.05	(775)	1.99	P>0.05
Acanthostyles L	(1950)	4.74	P<0.01	5.95	P<0.0005	(775)	1.22	P>0.05
W	(1950)	3.17	P<0.05	4.64	P<0.005	(775)	5.17	P<0.0025
Chelae I L	(1925)	0.48	P>0.05	1.21	P>0.05	(775)	4.04	P<0.01
Chelae II L	(1925)	0.14	P>0.05	2.04	P>0.05	(775)	0.88	P>0.05
Toxas L	(1925)	0.39	P>0.05	2.72	P<0.05	(750)	1.17	P>0.05
W	(1925)	0.42	P>0.05	5.49	P<0.001	(750)	1.33	P>0.05

Number of groups:
1. 3 locality groups (NWS, DAR, CP localities).
2. 4 depth groups (0-4m, 4-10m, 10-40m, 40m depth).
3. 4 seasonal groups (Darwin region only: wet (FMA), pre-dry (MJJ), dry (ASO), pre-wet (NDJ)).

branching) having peripheral choanosomal fibres lying immediately below ectosomal crust, thin paratangential subectosomal region, and acanthostyles echinating peripheral fibres piercing ectosomal skeleton. Development of extra-fibre skeleton: 4% with very abundant juvenile auxiliary subtylostyles distributed throughout mesohyl, 90% with at least some interstitial auxiliary spicules, and 6% of specimens without any interstitial auxiliary spicules dispersed between fibres. Megasclere geometry: Principal spicules range from relatively common (21%), uncommon (61%), or very rare (18% of specimens). Bases of all principal spicules smooth (79%), or up to one-quarter of principal spicules with microspined bases (21% of specimens). Larger auxiliary spicules predominantly subtylote with minutely microspined bases, but 0-74% of spicules may be smooth in any particular specimen. Acanthostyle geometry relatively consistent, although in 5% of specimens two size categories were recognised (although smaller category probably juvenile form of larger and subsequently lumped together in analyses), in 4% they were significantly thinner, and 1% had significantly shorter and stouter acanthostyles than typical forms. Acanthostyle spination slightly variable, from scattered robust, recurved spines (65%), spines arranged in regular longitudinal rows (5%), or minutely microspined (12% of specimens). Microsclere geometry: Proportion of contort to normal morphs of palmate isochelae varied from 0-44% for smaller category, 0-20% for larger. Chelae typically abundant, 7% of specimens isochelae of both classes very rare, 3% smaller category rare but larger abundant, 4% larger category rare but smaller, 1% of specimens isochelae absent entirely. Toxas of both categories very abundant (12%), uncommon (70%), rare (17%), or absent entirely (1% of specimens).

Variability in spicule dimensions: Some spicules (choanosomal principal styles, larger auxiliary subtylostyles, acanthostyles) showed significant variations in dimensions between samples collected from different localities (Tables 29-30), although statistical significance was never high, and no obvious patterns were apparent when groups of specimens from the same localities were compared with other groups. Some spicule categories varied between samples collected from different depths, in some cases with high levels of statistical significance ($P<0.001$) (e.g., larger auxiliary subtylostyles), but no obvious trends apparent. It is probable that effects of differential geographical and bathymetric distributions of specimens are linked due to the preponderance of deeper water samples from the Northwest Shelf region and shallow water samples from the Darwin region, making it im-

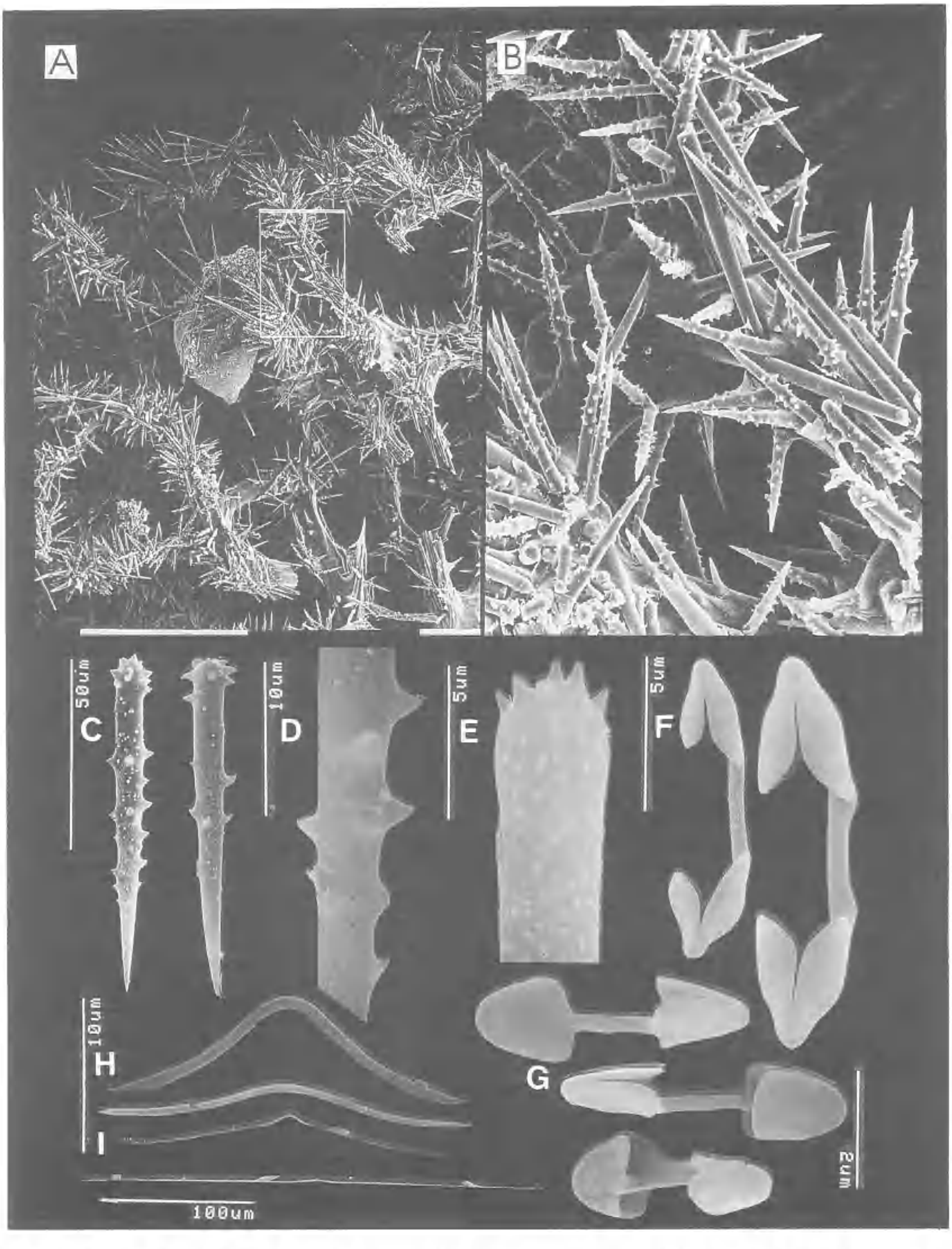

FIG. 140. *Clathria* (*Thalysias*) *abietina* (Lamarck) (A-B, NTMZ2642; C-I, QMG303447). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyles. D, Acanthostyle spines. E, Base of subectosomal auxiliary subtylostyle. F-G, Palmate isochelae. H, Wing-shaped toxas. I, Accolada toxas.

SEASON	TOTAL SAMPLES	SAMPLES WITH LARVAE
WET	15	9
PREDRY	17	3
DRY	19	0
PREWET	17	0
DEPTH		
0-4m	5	0
4-10m	30	7
10-40m	23	5
>40m	11	0

FIG. 141. *Clathria (Thalysias) abietina* (Lamarck) Incidence of incubated larvae within sampled populations from NW Australia.

possible to separate the influences of either factors on this observed variability. Variability of spicule size between samples collected during different seasons were analysed for Darwin samples only (Table 30), with significant differences observed for lengths of ectosomal auxiliary subtylostyles and larger isochelae, and widths of acanthostyles. Data also indicate a higher level of variability in sizes of larger isochelae during the wet season (February-April) than during other seasons, although this result is of uncertain biological significance.

REMARKS. Notwithstanding its considerable morphological variability *C.* (*T.*) *abietina* is easily recognised in the field with distinctive stalked digitate growth form and prominent surface conules. The most similar species in growth form is *C.* (*T.*) *cervicornis* but this has a much thinner, stoloniferous branching morphology, lacks principal megascleres completely, fibres have less spongin, toxas are different in morphology and size, and spicule dimensions are different. Skeletal structure is unusual where larger auxiliary subtylostyles are found in three locations in the skeleton: 1) subectosomal skeletal tracts forming organised plumose tracts supporting the ectosomal skeleton; 2) dispersed between fibres in disorganised tracts; 3) and coring all spongin fibres to the virtual exclusion of principal spicules. Principal styles mainly form plumose brushes protruding from fibres in plumose bundles, functionally representing a second category of echinating spicule.

There are some minor differences between type material and other specimens examined, including a higher proportion of choanosomal principal spicules found echinating fibres, the absence of contort isochelae, and specific details in some spicule dimensions (Table 29). But given the large range of variation in some characters, the relatively large sample sizes from widely dispersed populations, and the antiquity of the dried holotype this variability is insignificant. Re-examination of Ridley's (1884a) holotype of *C. aculeata* confirmed that it is a synonym of *C.* (*T.*) *abietina*, with shape, texture, colour in spirit, spiculation and skeletal architecture virtually identical. Conversely, *C.* (*T.*) *coralliophila* (see below) has different spicule geometry and skeletal architecture, and Burton's (1959a: 243) proposed merger of *C. coralliophila* into *C. aculeata* is rejected.

Specimens described by de Laubenfels (1954) from the central west Pacific differ from Australian populations in that they have a more restricted size range of isochelae (i.e., one size category), relatively small acanthostyles (Table 29), and an ectosomal (peripheral) skeleton almost completely covered by subectosomal spicule brushes (as opposed to ectosomal spicule brushes). In fact de Laubenfels (1954) completely overlooked the presence of ectosomal megascleres, not differentiating between spicules coring fibres from those forming the peripheral skeleton.

Clathria (Thalysias) aphylla sp. nov.
(Figs 142-143, Plate 5D)

MATERIAL. HOLOTYPE - QMG300477 (NCIQ-66C-4640-K): NW. of E. Passage, Easter Group, Houtman Abrolhos, WA, 28°40'S, 113°50'E, 20m depth, 17.ix.1990, coll. NCI (SCUBA).

HABITAT DISTRIBUTION. Staghorn and plate coral fringing reef; 20m depth; known only from the type locality, Houtman Abrolhos (WA) (Fig. 142H).

DESCRIPTION. *Shape.* Thin, leaf-like, foliaceous, convoluted, basically frondose bundles of lamellae covering coral substrate; individual fronds attached directly to substrate, sometimes completely enveloping staghorn corals, or attached via small basal stalk, up to 24mm long, 5mm diameter, or attached to adjacent lamellae; individual lamellae usually flat, elongate, oval or eliptical, up to 65mm long, 2mm thick, with rounded or sinuous, convoluted margins, superficially resembling a *Padina* algae, or palmate-digitate margins, or sometimes curled in vasiform growth forms.
Colour. Dull yellow alive (Munsell 2.5Y 8/8), pale brown in ethanol.
Oscules. Small, on upper surface, less than 2mm diameter, flush with surface.

Texture and surface characteristics. Soft, compressible but difficult to tear; upper osculiferous surface slightly concave, smooth, usually even, occasionally concentrically striated, or producing short fronds of folds on surface; lower porous surface slightly convex, even or slightly striated, with parasitic zoanthids covering parts of surface.

Ectosome and subectosome. Erect or paratangential brushes of ectosomal auxiliary styles forming thin surface layer, with choanosomal principal styles protruding through ectosome perpendicular to surface, singly or several together, extending up to 150µm through surface; choanosomal fibres immediately below ectosome, with reduced subectosomal skeleton; subectosomal auxiliary styles tangential or paratangential, lying immediately below surface underlying ectosomal spicule brushes; mesohyl matrix in peripheral skeleton heavy, darkly pigmented.

Choanosome. Regularly reticulate, slightly renieroid skeleton; without compression or major differences between peripheral skeleton and core; spongin fibres heavy, 20-70µm diameter, not obviously differentiated into primary or secondary elements, cored by multispicular (up to 15 spicules abreast) or paucispicular (2 or more spicules abreast) tracts of principal choanosomal styles; at core of skeleton principal styles confined entirely within fibres whereas in peripheral fibres, principal spicules erect, perpendicular to fibres, protruding through surface in plumose bundles; fibres moderately lightly echinated by acanthostyles, mainly at fibre nodes; fibre meshes mainly rectangular (fibres oval), 90-170µm diameter, with some triangular meshes, relatively even throughout skeleton; mesohyl matrix light, with few scattered megascleres; choanocyte chambers oval to eliptical, 25-40µm diameter, lined by abundant, minute isochelae.

Megascleres. Choanosomal principal styles long, thick, straight or slightly curved towards basal end, rounded or slightly tapering bases, invariably smooth bases, fusiform points. Length 152-(205.1)-252µm, width 4.5-(8.4)-11µm.

Subectosomal auxiliary styles long, slender, straight, with rounded or faintly subtylote smooth bases, fusiform points. Length 208-(258.1)-297µm, width 2-(2.7)-4.5µm.

Ectosomal auxiliary styles short, slender, straight, rounded or slightly subtylote bases, smooth or microspined (or mucronate) bases, fusiform points. Length 162-(178.2)-204µm, width 1-(1.6)-2.5µm.

Echinating acanthostyles relatively long, slender, subtylote, sharply pointed, evenly spined although fewer spines in 'neck' region proximal to base (but not aspinose); spines small, sharp, recurved. Length 45-(86.3)-102µm, width 3-(5.5)-8µm.

Microscleres. Palmate isochelae very abundant, minute, with lateral alae completely fused to shaft and partially fused to front ala. Length 4-(5.1)-6µm.

Toxas not abundant, predominantly v-shaped, variable in size, with angular central curvature and arms bent at approximately right angles to each other, non-reflexed arms, occasionally toxas forceps shaped with pinched central curve and nearly parallel arms. Length 34-(62.3)-106µm, width 0.8-(1.3)-2.5µm.

ETYMOLOGY. Greek *phyllon* , leaf; for the growth form.

REMARKS. This species is a sister of *C.* (*C.*) *angulifera* (Vic. and S Qld), having similar live colour, slightly renieroid skeletal structure (mainly rectangular meshes), similar toxa morphology and chelae size. In particular both species have large v-shaped toxas, and a skeletal architecture that verges on isodictyal (some triangular meshes). However, they are clearly different species showing both obvious and subtle differences in a number of characters. *Clathria* (*T.*) *aphylla* has a very thin, leaf-like growth form (whereas *C.* (*C.*) *angulifera* is thickly lamellate, lobate); very thick, well developed, evenly spaced fibres cored by multispicular tracts of large principal styles (versus widely spaced, vestigial fibres with light spongin, cored by much smaller principal spicules in uni- or paucispicular tracts); a specialised ectosomal skeleton composed of two size classes of auxiliary spicules forming brushes and principal spicules protruding through the surface forming plumose brushes and piercing the ectosome (versus a single category of auxiliary spicule forming a tangential or occasionally paratangential ectosomal skeleton, without participation of principal spicules in the ectosomal skeleton); clearly differentiated principal and auxiliary spicule geometry (versus more subtle differences, mainly in thickness and basal termination); rounded bases of principal and auxiliary megascleres with the smaller microspined (versus subtylote and completely smooth); and substantially larger dimensions for most megascleres. Another species with a similar, slightly renieroid skeleton reminiscent of *C.* (*T.*) *aphylla* is *C.* (*C.*) *hispidula*

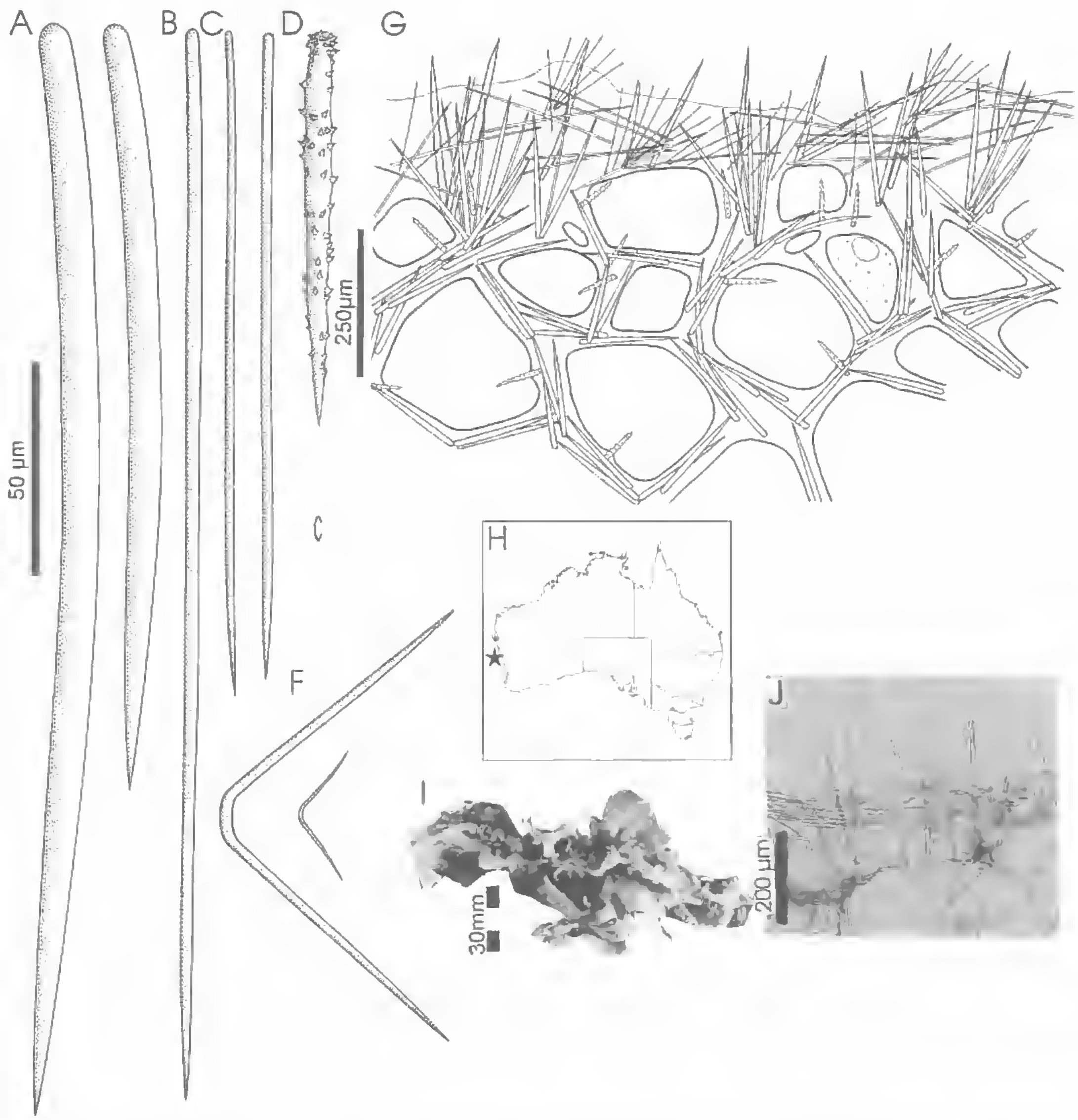

FIG. 142. *Clathria* (*Thalysias*) *aphylla* sp.nov. (holotype QMG300477). A, Choanosomal principal styles. B, Subectosomal auxiliary style. C, Ectosomal auxiliary styles. D, Echinating acanthostyles. E, Palmate isochela. F, V-shaped toxas. G, Section through peripheral skeleton. H, Australian distribution. I, Holotype. J, Protruding choanosomal spicules in ectosomal skeleton.

(from Torres Strait and Shark Bay), which has only one category of auxiliary spicule and different ectosomal structure, wing-shaped toxas, different acanthostyle geometry and specific differences in spicule sizes. All three species probably have sister species relationship based on skeletal architecture, here referred to the '*angulifera*' group.

A few other *Clathria* species also have V-shaped toxas (*C.* (*T.*) *juniperina*) and vaguely isodictyal skeletal structure (e.g., *C.* (*T.*) *hirsuta*), but these differ from *C.* (*T.*) *aphylla* in most other respects and are not considered here to be closely related.

Clathria (Thalysias) arborescens
(Ridley, 1884) (Figs 144-145)

Rhaphidophlus arborescens Ridley, 1884a: 450-451, pl.40, fig.L, pl.42, figs n-n'; Thiele, 1903a: 958.

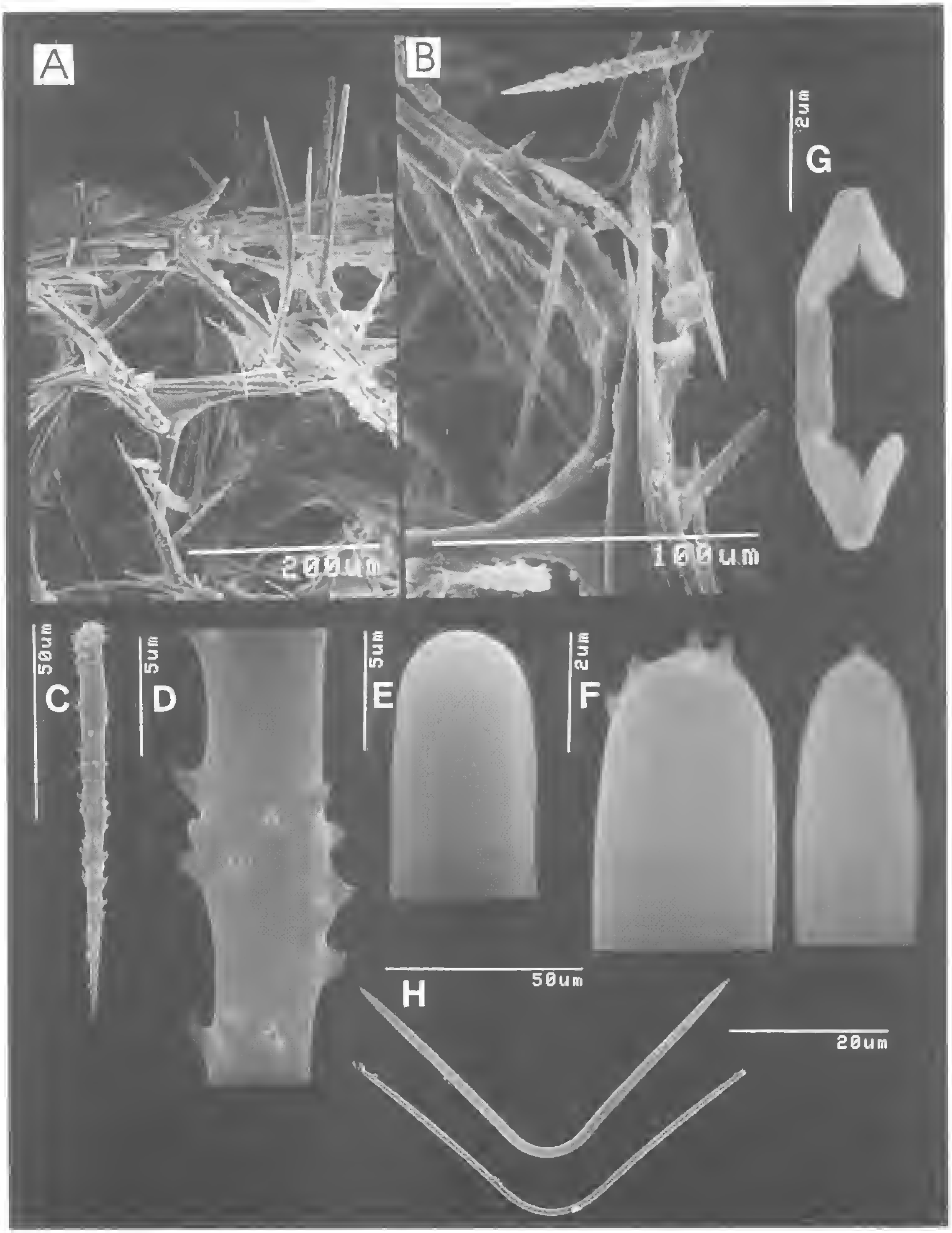

FIG. 143. *Clathria* (*Thalysias*) *aphylla* sp.nov. (holotype QMG300477). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyle. D, Acanthostyle spines. E-F, Base of subectosomal and ectosomal auxiliary styles. G, Palmate isochela. H, V-shaped toxas.

Clathria arborescens; Hooper & Wiedenmayer, 1994: 268.

cf. *Microciona prolifera* tropus *spinosa*; Vosmaer, 1935a: 610, 634.

MATERIAL. HOLOTYPE – BMNH1881.10.21.272: Friday I., Torres Strait, Qld, 10°36'S, 142°10'E, 1.v.1881, coll. HMS 'Alert' (dredge).

HABITAT DISTRIBUTION. Ecology unknown; Torres Strait, Qld (Fig. 144H).

DESCRIPTION. *Shape*. Branching, arborescent, 125mm long, 60mm maximum width of branching, with short stalk, 18mm long, 8mm diameter, no basal attachment (presumed not collected), proliferous bushy, slightly flattened cylindrical branches, up to 12mm diameter, with individual branches up to 55mm long, mostly anastomosing with adjacent branches; branching mostly planar.
Colour. Live colouration unknown, grey-brown in dry state.
Oscules. Not observed.
Texture and surface characteristics. Texture harsh in dry state; surface peel thick, darker than choanosomal skeleton, lightly hispid, with numerous irregular subectosomal striations, irregular conules and low ridges.
Ectosome and subectosome. Ectosomal skeleton with very thick crust of discrete spicule brushes composed of ectosomal auxiliary subtylostyles, occasionally paratangential or tangential to surface, supported below by thick, vaguely plumose, slightly disorganised bundles of larger subectosomal auxiliary subtylostyles arising from terminal choanosomal fibres; subectosomal skeleton lacking any spongin fibres and only light mesohyl matrix; together ectosomal and subectosomal bundles extend up to 800μm from peripheral fibre skeleton, and comprise up to 25% of branch diameter.
Choanosome. Choanosomal skeleton irregularly close-meshed reticulate. Spongin fibres very large, heavy dark yellow-brown, 110-170μm diameter, forming tight oval or elongate meshes, 130-350μm diameter; fibre reticulation without any clear distinction between primary or secondary components, although ascending fibres marginally more abundantly echinated than transverse connecting fibres, and some smaller fibres between major meshes with uni- or paucispicular core; fibres generally all cored by multispicular tracts of choanosomal principal subtylostyles together with subectosomal auxiliary subtylostyles, forming a dense axial core within fibre but occupying only about 50% of fibre diameter; fibres abundantly echinated by relatively large acanthostyles, more-or-less evenly dispersed throughout skeleton (not congregated in periphery as reported by Ridley); choanocyte chambers not observed (dry material).
Megascleres. Choanosomal principal subtylostyles with similar geometry to larger auxiliary spicules, long, straight, usually with subtylote, smooth or microspined bases, rarely rounded bases, with tapering fusiform points. Length 205-(225.3)-262μm, width 8-(9.7)-12μm.

Subectosomal auxiliary subtylostyles more slender but longer than principal spicules, straight or slightly curved towards base, with smooth, slightly constricted bases, fusiform points. Length 210-(251.4)-282μm, width 4-(5.4)-7μm.

Ectosomal auxiliary subtylostyles relatively long, straight or slightly curved towards base, prominently subtylote, with smooth or microspined bases, fusiform points. Length 82-(132.7)-147μm, width 2-(3.3)-4μm.

Echinating acanthostyles long, robust, subtylote, large conical (not recurved) spines, scattered mainly over base and midsection of shaft, frequently with bare point and 'neck'. Length 68-(76.3)-88μm, width 6-(8.2)-11μm.
Microscleres. Palmate isochelae small, frequently contort, single size category, with long lateral alae completely fused to shaft and entire front ala of equal length. Length 6-(10.8)-14μm.

Toxas short, robust, wing-shaped, with generous angular central curvature, recurved and slightly reflexed points Length 27-(41.8)-58μm, width 1.5-(1.8)-2.0μm.

REMARKS. This species is relatively poorly known, recorded so far only from the holotype. But several important characters were seen in the holotype using SEM (Fig. 145), not described by Ridley (1884a). These include: presence of differentiated principal and auxiliary spicules, presence of toxas, spination pattern on acanthostyles, and his spicule dimensions were innaccurate. These characters now provide better clues as to its affinities.

Ridley (1884a) considered this species similar to *C.* (*T.*) *cactiformis* in growth form and skeletal structure. They also both have principal and auxiliary megascleres very similar in geometry (i.e., on first appearances fibres seem to be cored only by auxiliary spicules), but they have many morphological differences. *Clathria* (*T.*) *arborescens* has a substantially better developed ectosomal peel occupying a significant proportion of branch diameter, a close-meshed reticulate

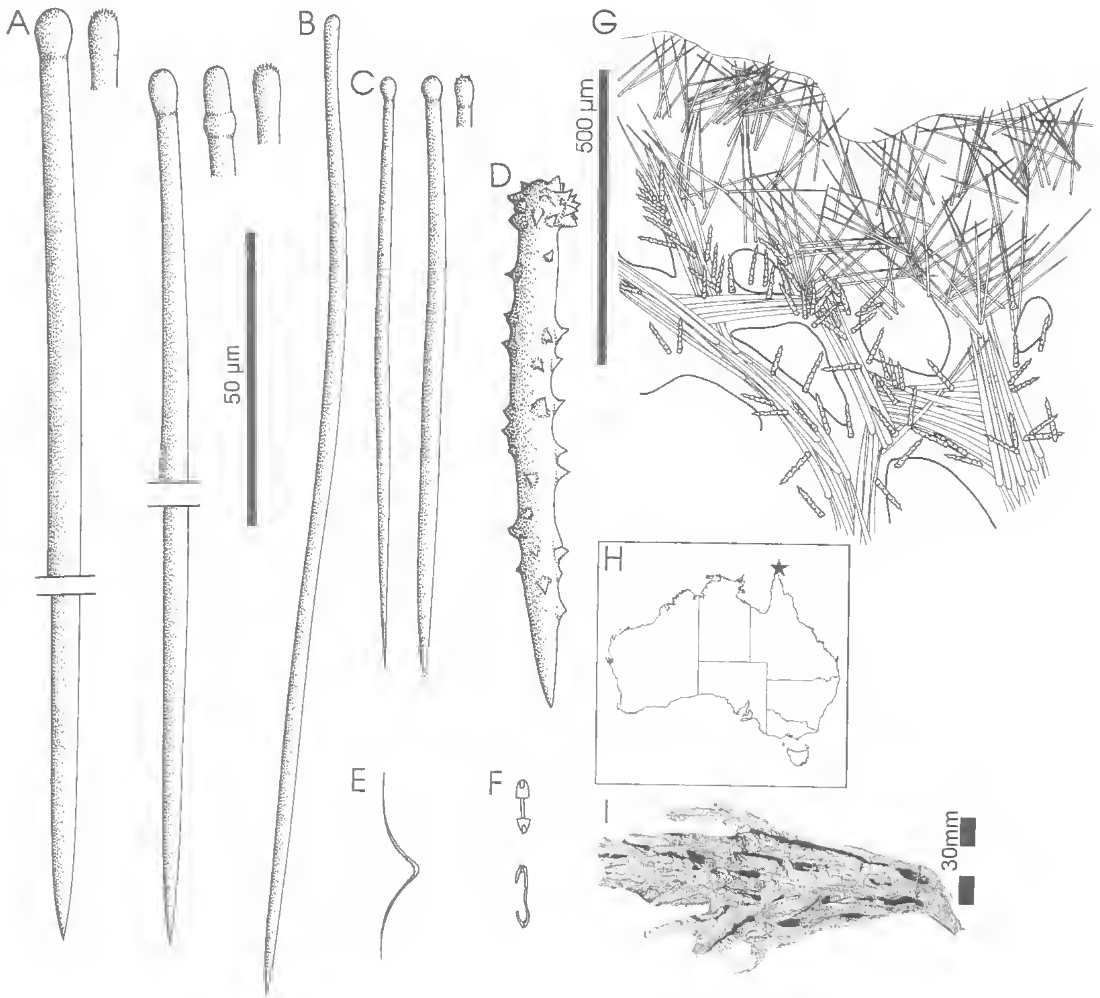

FIG. 144. *Clathria* (*Thalysias*) *arborescens* (Ridley) (holotype BMNH1881.10.21.272). A, Choanosomal principal subtylostyles and bases. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyles. D, Echinating acanthostyle. E, Wing-shaped toxa. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution. I, Holotype.

choanosomal skeleton, very thick fibres all cored by megascleres (*C.* (*T.*) *cactiformis* has a relatively thin ectosomal skeleton, cavernous subectosomal region, wide-meshed choanosomal reticulation, substantially thinner fibres with only primary ones cored). Also, echinating acanthostyles are much larger than those of *cactiformis*, they have erect conical spines rather than hook-like recurved ones, and acanthostyles are found throughout the skeleton rather than mainly on peripheral fibres (although both species have spines absent from both "necks" and points of acanthostyles). Toxa morphology differs markedly between the two, with *arborescens* having only thicker, wing-shaped toxas, and *cactiformis* with mainly very thin, raphidiform, sinuous or accolada toxas but occasionally also with small wing-shaped forms. Spicule dimensions also differ considerably between the two species. Both species belong to the '*juniperina*' species complex (refer to discussion below under *C.* (*T.*) *cactiformis* and *C.* (*T.*) *hirsuta*).

Dendy (1922), Burton & Rao (1932) and Burton (1938a) merged *C. arborescens* with *C.* (*T.*) *procera* on the basis that choanosomal principal megascleres were supposedly excluded from the axis of fibres, but this is not entirely correct (in any case the character is also known to occur in

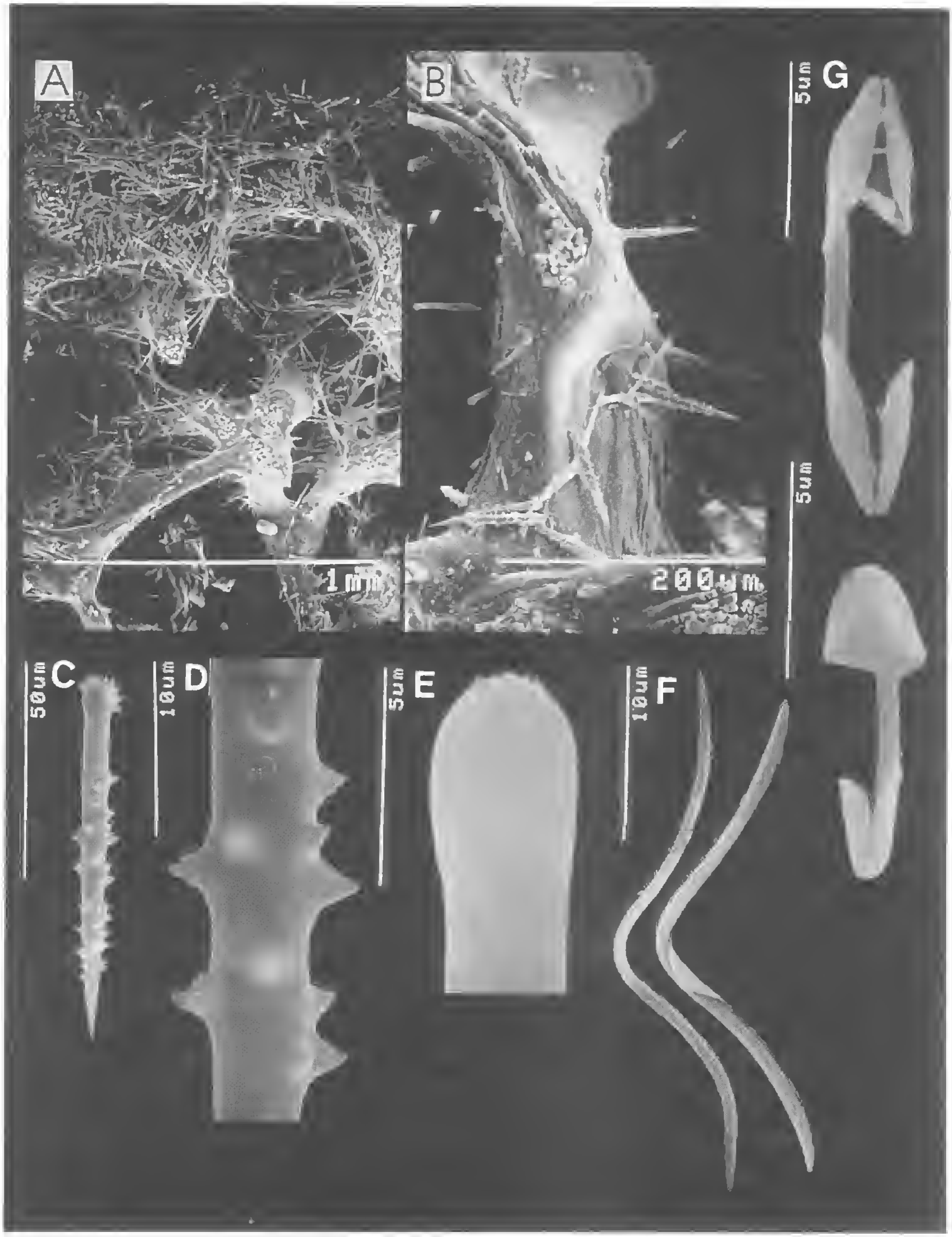

FIG. 145. *Clathria* (*Thalysias*) *arborescens* (Ridley) (holotype BMNH1881.10.21.272). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyle. D, Acanthostyle spines. E, Base of ectosomal auxiliary subtylostyle. F, Wing-shaped toxas. G, Palmate isochelae.

at least eight other species (see below under *C. cactiformis*)). Thiele (1903a) also compared *C.* (*T.*) *arborescens* and *C.* (*T.*) *cervicornis*, for the same reason (i.e., supposed absence of principal spicules), but *C. procera* does have principal spicules (exclusively echinating peripheral fibres), and those in *C.* (*T.*) *arborescens* are intermingled with auxiliary subtylostyles within fibres. Skeletal structure and growth forms also differ considerably between these two taxa.

Clathria (Thalysias) cactiformis (Lamarck, 1814)
(Figs 146-148, Table 31, Plate 4E-F)

Spongia cactiformis Lamarck, 1814: 440, 370
Clathria cactiformis; Rudman & Avern, 1989: 335; Hooper & Wiedenmayer, 1994: 268.
Spongia appendiculata, in part, Lamarck, 1814: 383, 362.
Wilsonella appendiculata; Topsent, 1930: 46, pl.2, fig.3; Topsent, 1933: 22.
Echinonema typicum Carter, 1875: 195 [nomen nudum]; Carter, 1881: 362, 377, 388, 384.
Thalassodendron typica; Lendenfeld, 1888: 223; Hallmann, 1912; 242; Hallmann, 1914a: 267.
Not *Thalassodendron typica*; Whitelegge, 1901: 86.
Clathria typica; Vosmaer, 1885b: 357; Ridley & Dendy, 1887: 153; Dendy, 1889c: 11;]in part] Dendy, 1896: 32; Whitelegge, 1901: 80, 117; Hentschel, 1911: 280, 364-367, text-fig. 43.
Not *Clathria typica* var. *porrecta* Hentschel, 1912: 298, 359-360.
Not *Clathria typica*; Kirkpatrick, 1903: 248-249; Kirkpatrick, 1904: 148; Vacelet & Vasseur, 1971: 94-95, pl.3, fig.5, text-fig. 48.
Wilsonella typica; Hallmann, 1912: 203, 242.
Not *Tenacia typica* var. *porrecta* Hallmann, 1920: 771.
Rhaphidophlus typicus; Hallmann, 1912: 176-177, 184-203, 234, 299, 300, pl.27, pl.28, figs 1-4, pl.29, text-figs 38-42 [et varr]; Shaw, 1927: 424-425; Topsent, 1932: 88, pl.4, fig.4; Burton, 1938a: 12; Guiler, 1950: 8; Vacelet & Vasseur, 1977: 115; Vacelet et al., 1976: 73; Liaaen-Jensen et al., 1982: 170-172.
Echinonema anchoratum Carter, 1881a: 362, 379, 380; Lendenfeld, 1888: 219-220.
Echinonema anchoratum var. *dura* Whitelegge, 1901: 81.
Echinonema anchoratum var. *lamellosa*; Lendenfeld, 1888: 219-220.
Rhaphidophlus anchoratum; Bergquist & Fromont, 1988: 112; Dawson, 1993: 39.
Wilsonella anchoratum var. *lamellosa*; Hallmann, 1912: 211 [imperfectly known].
Not *Echinonema anchorata* var. *lamellosa*; Whitelegge, 1901: 82.
Echinonema flabelliformis Carter, 1885f: 352.
Echinonema pectiniformis Carter, 1885f: 353.
Phakellia ventilabrum var. *australiensis* Carter, 1886g: 379.
Thalassodendron brevispina Lendenfeld, 1888: 225; Whitelegge, 1901: 87.
Clathria favosa Whitelegge, 1907: 498-499.
Clathria indurata Hallmann, 1912: 299.
Clathria acanthodes Hentschel, 1911: 367-370, text-fig.44; Hentschel, 1923: 380, fig.349.
Rhaphidophlus acanthodes; Hallmann, 1912: 177.
Rhaphidophlus sp. 2; Vacelet & Vasseur, 1971: 97-98, text-fig. 52.
cf. *Microciona prolifera*; Vosmaer, 1935a: 609, 628-629, 647, 667.

MATERIAL. LECTOTYPE: MNHNDT580: 'Southern Seas', Peron & Lesueur collection, no other details known. PARALECTOTYPE: MNHNDT3360: same details (= *R. typicus* var. *cactiformis*; Topsent, 1932: 88). LECTOTYPE of *S. appendiculata*: MNHNDT526 (fragment BMNH1953.4.9.83) (dry). PARALECTOTYPE of *S. appendiculata*: MNHNDT-3394: King George Sound (Albany), WA. LECTOTYPE of *T. brevispina*: AMZ931: Port Jackson, NSW, 33°48'S, 151°20'E, coll. R. von Lendenfeld (dredge). SYNTYPE of *E. typicum*: BMNH-1877.5.21.149: Fremantle, WA, 32°03'S, 115°38'E, coll. E. Clifton (dredge). HOLOTYPE of *C. favosa*: AMZ944: Off Port Jackson, NSW, 33°50'S, 151°30'E, 98-100m depth, coll. FIV 'Thetis' (dredge). LECTOTYPE of *R. typicus* var. *proximus*: AMZ930: Henley Beach, St. Vincent Gulf, SA, 34°45'S, 137°57'E, coll. T. Worsnop (dredge). PARATYPE of *R. typicus* var. *obesus*: AMZ937: Tuggerah Beach, NSW, 33°18'S, 151°30'E, coll. NSW Fish Commission (trawl). HOLOTYPE of *R. typicus* var. *geminus*: AMZ928: specific locality unknown, WA, no other details known. HOLOTYPE of *R. typicus* var. *stellifer*: AME648: E. coast of Flinders I., Bass Strait, Tas, 40°01'S, 148°02'E, no other details known. SYNTYPE of *E. anchoratum*: BMNH1886.12.15.423: Port Phillip, Vic, 38°09'S, 144°52'E, no other details known. SYNTYPE of *E. anchoratum* var. *dura* and LECTOTYPE of *C. indurata*: AMG9113; specific locality unknown, WA, no other details known. PARALECTOTYPE of *C. indurata*: AM unreg.: specific locality unknown, WA, no other details known. HOLOTYPE of *E. pectiniformis*: BMNH-1886.12.15.141 (fragment AMG2777): Port Phillip, Vic, 38°09'S, 144°52'E, 40m depth, no other details known. Fragment of HOLOTYPE *C. acanthodes*: ZMB4443: Surf Point, outer bar exit to South Passage, Shark Bay, WA, 26°08'S, 113°08.5'E, 0.5-3.5m depth, coll. W. Michaelsen & R. Hartmeyer (dredge). OTHER MATERIAL. NSW - QMG301403. TAS - AME624, AMZ1415, AMZ2203, QMG311412 (NCIQ66C-3713-A) (fragment NTMZ3811). VICTORIA - AMZ1430, AMZ1158, NMV RN359, NMVRN431, NMVRN436, NMVRN 438, NMVRN551, NMVRN-677, NMVRN797, NMVRN840, NMVRN900, NMVRN959, AMZ3921 (RRIMPFN3527/000/02), AMZ4277 (RRIMPFN1906), NTMZ2832. S AUST - AMZ41, SAM unreg. (fragment NTMZ1657), SAM unreg. (fragment NTMZ 1693), SAM unreg. (fragment NTMZ1628), SW COAST, WA - MNHN unregistered

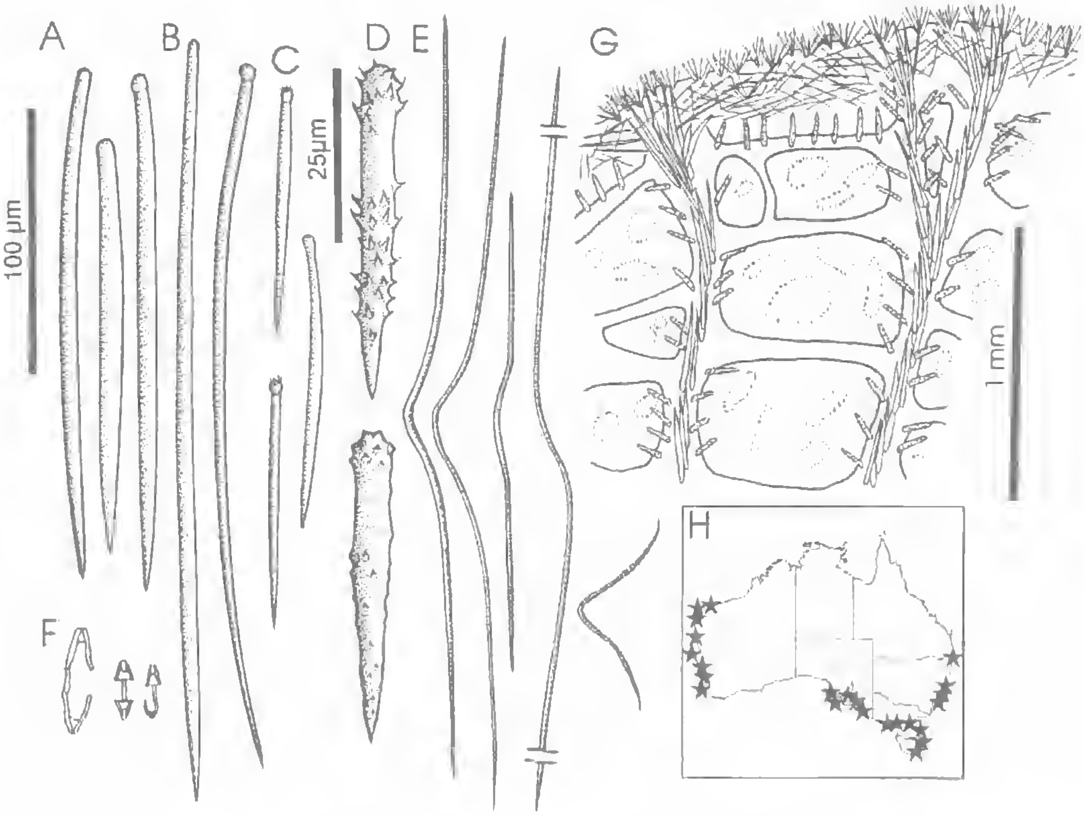

FIG. 146. *Clathria* (*Thalysias*) *cactiformis* (Lamarck) (lectotype MNHNDT580). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyles. C, Ectosomal auxiliary subtylostyles. D, Echinating acanthostyles. E, Sinuous and wing-shaped accolada toxas. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution.

(Peron & Lesueur collection), WAM656-81(1), WAM628-81(1), WAM631-81(1), WAM655-81(1). HOUTMAN ABROLHOS, WA - QMG300731 (NCIQ66C-4213-U), QMG304660, AMZ4331 (RRIMP-ZW62), WAM639-81(1), WAM661-81(1), WAM660-81, QMG300736 (NCIQ66C-4189-T), QMG300733 (NCIQ66C-4197-C), QMG300730 (NCIQ66C-4214-V). NORTHWEST SHELF, WA - WAM133-82, NTMZ1128, NTMZ3018, NCIQ66C-1460-C (fragment NTMZ3347). ERITREA, RED SEA - PIBOCB20-125 (fragment QMG300055). SOMALIA, W. INDIAN OCEAN - PIBOCB12-388 (fragment QMG300060). SEYCHELLES - PIBOC01-140 (fragment QMG300063).

HABITAT DISTRIBUTION. Colonises a wide variety of substrates, including rock reefs, coral-rubble, soft sand, mud sediments, algal beds; shallow subtidal to 100m depth; widely distributed in temperate waters of eastern and western Australian coasts, with incursions into subtropical waters extending to the Port Hedland region on the west coast and Byron Bay on the east coast (Fig. 146H). This species is not yet recorded from the Indonesian archipelago, contrary to Hentschel (1912) — his records being misidentifications (see below) — but it does appear to range across the Indian Ocean, with confirmed records from Madagascar (Vacelet et al., 1971, 1976, 1977), East Africa and Seychelles (present study).

DESCRIPTION. *Shape.* Typically flabellate, planar, stalked, with long bifurcate, occasionally anastomosing digitate processes on margin of fan; gross morphology variable, with or without basal stalk and expanded basal attachment, varying from globular, cylindrical planar digitate, globular digitate, planar flabellate, lamellate branching in more than one plane, or thinly lamellate.

Colour. Live colouration pale orange-brown (Munsell 5YR8/4) to bright red (5R5/10); beige,

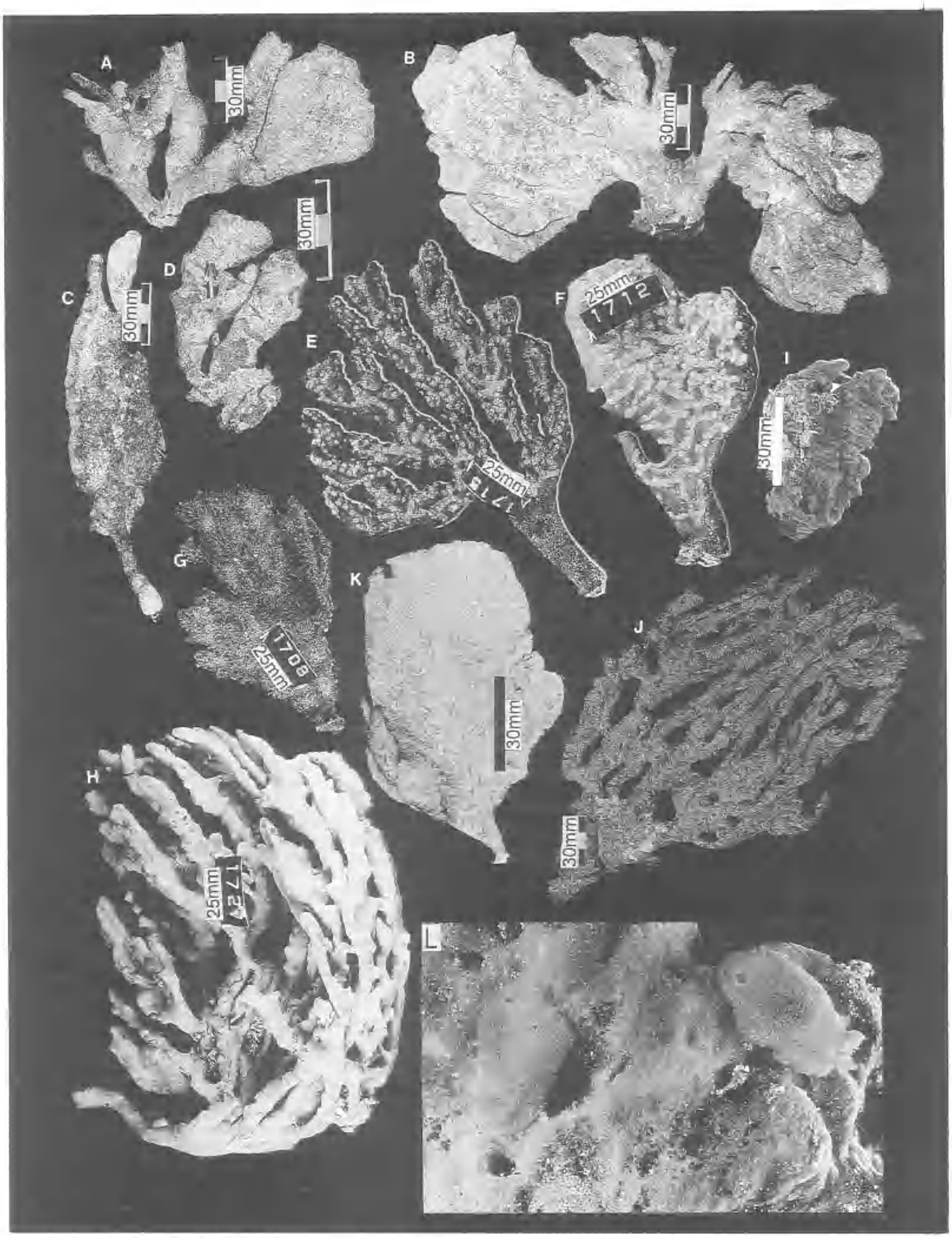

FIG. 147. *Clathria* (*Thalysias*) *cactiformis* (Lamarck) typical growth forms. A, Lectotype MNHNDT580. B, Paralectotype MNHNDT3360. C, Lectotype of *S. appendiculata* MNHNDT526. D, Paralectotype of *S. appendiculata* MNHNDT3394. E-F, Variety *cactiformis* WAM656-81(1), WAM655-81(1). G, Variety *stellifera* NTMZ1708. H, Variety *geminus* WAM639-81(1). I, Somalia specimen PIBOCB12-388. J, Syntype of *E. typicum* BMNH1877.5.21.149. K, QMG300453. L,Variety *obesus* with *Rostanga* feeding (photo W. Rudman) NTMZ2832.

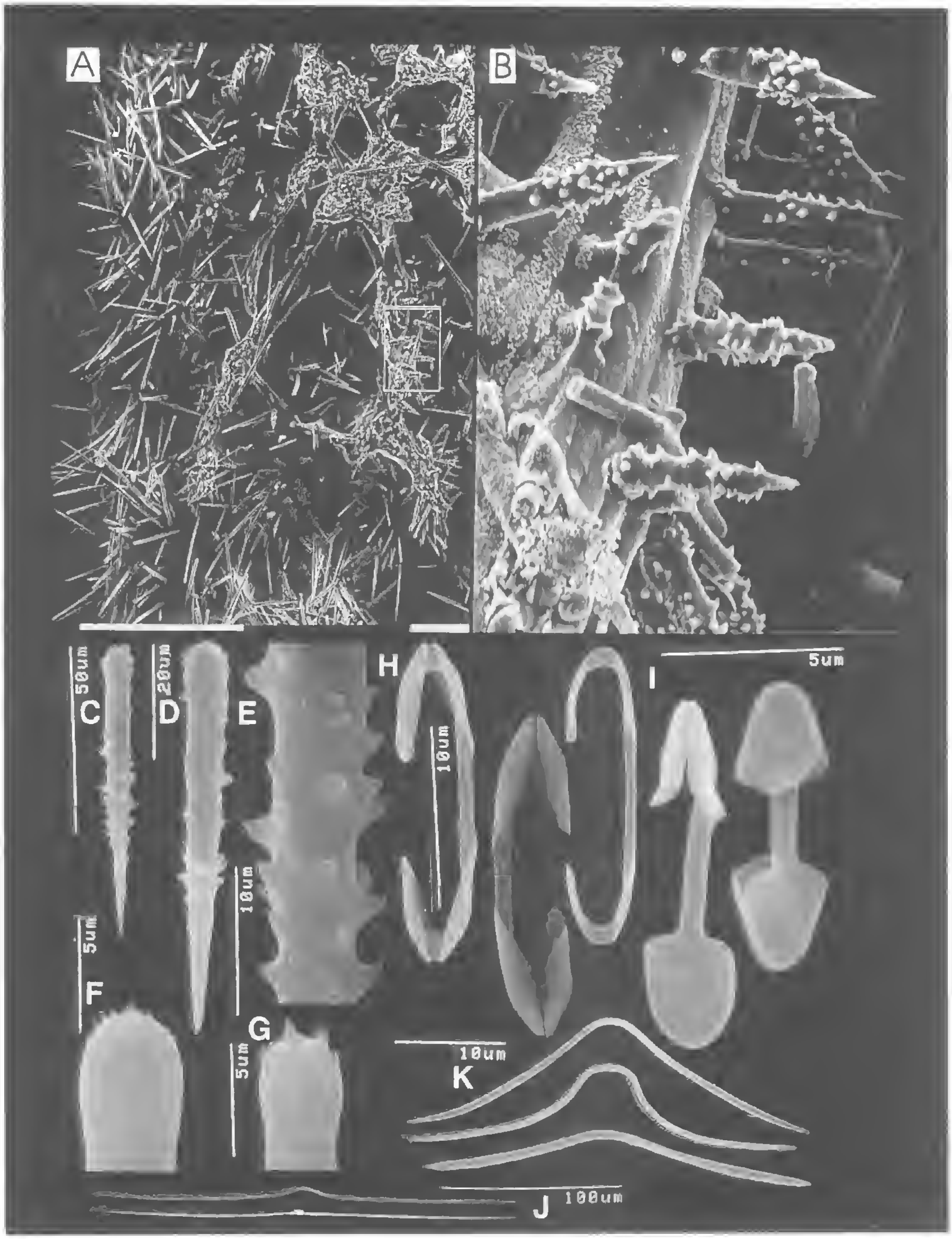

FIG. 148. *Clathria* (*Thalysias*) *cactiformis* (Lamarck) (QMG300225). A, Choanosomal skeleton. B, Fibre characteristics. C-D, Echinating acanthostyles. E, Acanthostyle spines. F-G, Bases of subectosomal and ectosomal auxiliary subtylostyles. H-I, Palmate isochelae. J, Accolada toxas. K, Wing-shaped toxas.

TABLE 31. Comparison between present and published records of *Clathria* (*Thalysias*) *cactiformis* (Lamarck). All measurements are given in µm, denoted as range, or as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Lectotype	Lectotype of *S. appendiculata*	Specimens (N=46)
Choanosomal principal styles	134-(191.2)-232 x 5-(7.6)-11	157-181 x 4.5-6	103.6-(199.2)-314 x 3.2-(9.7)-19.4
Subectosomal auxiliary styles	204-(229.8)-268 x 4-(5.4)-6	191-297 x 4-5.5	115.7-(235.7)-356.6 x 1.6-(6.2)-16.9
Ectosomal auxiliary styles	101-(124.3)-148 x 1.5-(2.5)-3	85-104 x 2-3.5	73.8-(114.7)-162.1 x 1.6-(4.4)-13.6
Echinating acanthostyles	68-(74.4)-79 x 5.5-(8.8)-11	46-57 x 3-4.5	38.2-(61.3)-93.1 x 1.7-(6.7)-13.1
Chelae I	12-(14.7)-18	7-8	8.5-(13.9)-22.2
Chelae II	6-(8.8)-10	15-17	2.5-(7.1)-11
Toxas	113-(201.7)-296 x 0.8-(1.2)-2	82-146 x 0.5-1.0	8-(127.8)-355 x 0.8-(1.3)-2.5

brown, to dark brown in ethanol; ectosomal crust usually lighter colour than choanosomal regions.

Oscules. Oscules typically large (up to 3mm diameter), dispersed over entire sponge surface, or sometimes clumped in special pore areas; oscules usually flush with surface, without raised lip.

Texture and surface characteristics. Firm, compressible, rubbery; surface characteristically fleshy, smooth but uneven, with bumps, ridges, depressions and subdermal striations commonly dispersed over surface; opaque skin-like covering present stretched between adjacent conules in live material; microscopic ridges and microconules abundant.

Ectosome and subectosome. Ectosomal skeleton predominantly heavy, with a dense crust of smaller auxiliary subtylostyles forming mainly erect or less often paratangential brushes; occasionally ectosomal skeleton reduced to relatively thin tangential or paratangential crust; larger subectosomal auxiliary styles perched on ultimate choanosomal fibre endings, forming plumose tracts underlaying brushes of smaller ectosomal spicules, usually protruding through and obscuring ectosomal bundles; subectosomal region cavernous, with well differentiated, widely spaced plumose tracts of larger auxiliary subtylostyles.

Choanosome. Skeleton irregularly reticulate, vaguely radial, with clearly differentiated primary ascending and secondary transverse skeletal components; fibre anastomoses produce widely spaced rectangular meshes formed by ascending primary fibres, containing pauci- or multispicular bundles of choanosomal principal styles which occupy only the central portion of fibres, and uncored secondary fibres; occasionally secondary fibres uni- or paucispicular, usually with an optically diffuse pith reminiscent of dictyoceratid sponges; spongin fibres characteristically thin, without marked differences between primary and secondary fibre diameter, with pigmentation ranging from extremely light, yellow (specimens from Port Phillip, Vic) to extremely heavy and dark brown (material from Port Hedland, WA); echinating acanthostyles very heavy, especially on peripheral fibres immediately below subectosomal skeleton; larger auxiliary subtylostyles usually abundant between fibres, strewn without order within mesohyl; mesohyl matrix relatively light, choanocyte chambers large, oval or elongate, up to 120µm diameter.

Megascleres (Table 31). Choanosomal principal styles morphologically similar to larger auxiliary subtylostyles but relatively shorter, thicker, slightly curved near base, usually with tapering, evenly rounded smooth bases but sometimes slightly subtylote, and fusiform points.

Subectosomal auxiliary subtylostyles nearly completely straight, occasionally slightly curved or sinuous, usually with slightly subtylote smooth bases, less frequently with microspined bases, tapering to fusiform points.

Ectosomal auxiliary subtylostyles more prominently subtylote, slightly curved at centre, with microspined or smooth bases and fusiform points.

Echinating acanthostyles relatively short, stout, prominently subtylote, with large spines mainly dispersed on base and midsection, leaving a bare 'neck' (below basal swelling) and bare point.

Microscleres (Table 31). Larger palmate isochelae variable in abundance, with lateral alae completely fused to shaft, wide gap between lateral and front alae, and fused front ala; usually non-contort. Smaller isochelae common, frequently contort.

Toxas differentiated into two main morphs, larger often found in toxodragmata; accolada toxas most common, long, very thin, slight angular central curvature, straight arms, sometimes sinuous asymmetrical. Small toxas less abundant, relatively thick, widely curved at centre, slightly reflexed points.

Larvae. Reproductive products observed in only four specimens. Incubated parenchymella larvae large, oval to eliptical in shape, 220-420µm diameter, containing well developed centrally aggregated larval styles.

Associations. Heavy infestations of zoophytic organisms observed on surfaces of several specimens (both compound ascidians and zooanthid polyps); numerous microalgal cells seen in sponge mesohyl of few samples; sponge apparently serves as a food source to *Rostanga* sp. nudibranchs (W. Rudman, pers. comm.).

Variation. Extremely variable in some features (e.g., gross morphology, spicule size) but not in others (e.g., surface features, spicule geometry, skeletal structure). Gross morphology: Victorian, Queensland and Indonesian morphs showed greatest differences in growth form, but all specimens retained most other characteristics common to other populations. Ectosomal skeletal structure: typically heavy, erect plumose brushes, well differentiated from subectosomal plumose tracts (52%), moderately developed (34%), or thick tangential ectosomal peel reminiscent of *Crella* (Crellidae) (14% of specimens). Subectosomal skeletal structure: very cavernous, well differentiated ascending plumose (extra-fibre) skeletal tracts (36%), paratangential, immediately subdermal tracts (21%), or intermediate of these conditions (43% of specimens). Choanosomal skeletal structure: irregularly reticulate (64%), regular fibre anastomoses (22%), or predominantly radial to plumose primary fibre architecture (14% of specimens). Fibre meshes: wide, rectangular, with uncored secondary elements (67%), with central pith component (7%), close-meshed, irregularly oval to eliptical fibre reticulation with uncored secondary fibres (7%), or with both cored primary and secondary fibre elements (19% of specimens). Spongin fibres: very light (7%), moderately heavy, yellow (48%), very heavy, yellow (43%), or extremely heavily, dark brown in colour (2% of specimens). Echinating acanthostyles: concentrated on peripheral fibres, more sparsely dipersed on axial fibres (69%), evenly distributed throughout fibres (17%), rare (14% of specimens). Extra-fibre spicules: typically abundant, dispersed without order within mesohyl (74%), very light or absent entirely (24%), or organised into ascending extra-fibre tracts (2% of specimens). Megasclere geometry: Choanosomal principal styles: predominantly fusiform (76%), distinctly hastate (abruptly pointed) points (7%), or mixture of both types of terminations (17% of specimens); bases of spicules predominantly smooth (90%), with both smooth and spined bases (8%), or only microspined bases on choanosomal styles (2% of specimens); bases of spicules tapering, non-tylote (46%), rounded, slightly subtylote (52%), or with both conditions (2% of specimens); megascleres slightly curved (83%), exclusively straight (7%), or both conditions (10% of specimens). Subectosomal auxiliary subtylostyles: tapering, rounded or very slightly subtylote bases (69%), or distinctly subtylote (31% of specimens); exclusively straight (69%), predominantly curved (7%), or both conditions (24% of samples). Ectosomal auxiliary subtylostyles: subtylote (76%), tapering non-tylote (10%) or both conditions (14% of specimens); bases predominantly microspined (71%), exclusively smooth (3%), or with both conditions (26% of specimens); ectosomal spicules slightly curved near base (54%), completely straight (29%), or with examples of both (17% of specimens); most megascleres with fusiform points (95%), or also including few hastate spicules (5% of specimens). Echinating acanthostyles: typically short, fusiform (69%), significantly smaller, stouter (19%), or longer, thinner (12% of specimens); bases subtylote (81%), or distinctly non-tylote (19% of specimens); spines characteristically long, thick, recurved (74%), or reduced, granular spination (26% of specimens). Microsclere geometry: Larger isochelae: common (70%), uncommon (26%), rare (2%), or common but poorly silicified (2% of specimens); contort larger isochelae present but uncommon (10%), present, common (2%), or absent (86% of specimens). Smaller isochelae: abundant (7%), common (62%), uncommon (21%), rare (3%) or absent entirely (7% of specimens); 0-10% of smaller chelae were contort (2%), 10-30% contort (5%), 30-50% contort (12%), 50-70% contort (24%), 70-90% contort (43%), or 100% contort (7% of specimens). Toxas: typically very abundant (82%), common (3%), uncommon (5%), rare (3%), or absent entirely (7% of specimens); only symmetrical toxas present, with large central curvature and relatively straight points (52%), with both symmetrical and asymmetrical, sinuous toxas (41%), or with both these and wing-shaped toxas (7% of specimens).

Variability in spicule dimensions: With few exceptions, and despite apparent morphological incongruence in many other features, spicule dimensions were surprisingly closely comparable between specimens despite that they were collected from widely separated geographic localities. Results were not analysed statistically because bathymetric, habitat and season data were not available for the majority of material. However, scatterplot comparisons between samples found that for each spicule category there were only few anomolous specimens which consistently differed from typical forms of the species. These anomalies are discussed further below.

REMARKS. *Clathria (Thalysias) cactiformis* is predominantly temperate. It is characterised by its typically flabellate or flabello-digitate growth form, a smooth surface with a detachable thick ectosomal peel which is usually paler than the choanosome, relatively thin spongin fibres heavily echinated but poorly cored, and especially its short, thick, squat acanthostyles with a bare neck, bare points and large recurved spines over the remainder of the spicule. There is considerable morphological variability between regional populations (see Variation, above), to some extent vindicating Hallmann's (1912) subdivision of the species into 'varieties' (subspecies), based mainly on differences in growth form. In fact some specimens examined were assigned to this species with hesitation given their diverse external morphologies, but no other consistent skeletal or other characters were found to correlate with these morphotypes. Nevertheless, this taxon is probably composed of several cryptic sibling species (morphospecies) which might only be reliably differentiated using biochemical, genetic and other non-skeletal data.

NMVRN0436 and RN0551 from Port Phillip Bay, Vic. have acanthostyles which are long, evenly spined, spines are sparse and small; echinating spicules occur in heavy concentrations and are evenly dispersed throughout the choanosome, not predominant in the peripheral skeleton; ectosomal skeleton is very well developed and well differentiated from subectosomal plumose tracts; the subectosomal region is noticeably more cavernous than in most typical forms; the choanosome is distinctly plumoreticulate; mesohyl matrix is very heavy and fibres are heavily invested with spongin; the smaller category of isochelae and toxas are absent. In some respects these features correspond to *Spongia appendiculata*, perhaps justifying the retention of that species separately form *cactiformis*, but other general morphological features indicate that these specimens cannot be otherwise reliably separated.

WAM133-82 from the Northwest Shelf of WA has consistently basally spined choanosomal styles, and isochelae are completely unmodified. The ectosome and subectosomal regions are poorly developed and incompletely differentiated, but the specimen is otherwise comparable with typical forms.

Some further comment is necessary on the synonymy above. *Spongia appendiculata* is included here as a new synonym of *C. (T.) cactiformis* (cf. Hooper & Wiedenmayer, 1994) with virtually identical growth form, spicule geometry and skeletal structure as typical forms of this species. However, there are some notable differences between these nominal species, especially in the markedly smaller dimensions of most spicules in *appendiculata*, acanthostyles have a vestigial granular spination, and they are also almost entirely incorporated into the fibres themselves (i.e., enveloped by collagen). These differences are not presently considered sufficient to recognise it as a distinct taxon. Incorporation of echinating acanthostyles into spongin fibres is also known for several other species of *Clathria* (termed here the '*phorbasiformis*' species complex, including *C. (T.) phorbasiformis*, *C. (D.) dura*, *C. (D.) myxilloides*, and others). However, in *Spongia appendiculata* acanthostyles are inserted perpendicular to fibres, much like typical echinating megascleres, but they have 'sunk' into them, whereas in these other species acanthostyles run parallel to fibres and replace or supplement the usual coring spicules.

Clathria acanthodes is considered a synonym of *C. (T.) cactiformis*, despite having slightly different acanthostyle morphology ('neck' often spined). The characters used by Hentschel (1911) to differentiate *C. acanthodes* from other species (i.e., similar geometry between principal and auxiliary spicules, presence or absence of microspines on bases of principal and auxiliary spicules, presence of two size classes of palmate isochelae, and possession of rhaphidiform toxas), are found in most other populations of *C. (T.) cactiformis* and are not considered to be of primary importance in differentiating species. *Clathria typica* var. *porrecta*, also described by Hentschel (1912) from Indonesia, is a synonym of *Clathria (T.) reinwardti* not of *C. (T.) cactiformis* (this syonymy was overlooked by Hooper & Wiedenmayer, 1994). The type material of *Clathria indurata* and *Echinonema anchoratum* var. *dura* from WA have a uni- or paucispicular core of choanosomal styles in secondary fibres, whereas typical populations of *C. (T.) cactiformis* generally have an aspicular secondary fibre system, but otherwise spiculation and architecture is similar between these morphs and they are obvious synonyms.

The species is included in the *juniperina* complex (see discussion of *C.* (*T.*) *hirsuta*) all of which have reduced skeletal and fibre characteristics. This group includes 12 species (with about 20 synonyms): *C.* (*T.*) *arborescens*, *C.* (*T.*) *cactiformis*, *C.* (*T.*) *cervicornis*, *C.* (*T.*) *clathrata*, *C.* (*T.*) *corneolia*, *C.* (*T.*) *craspedia* sp. nov., *C.* (*C.*) *decumbens*, *C.* (*T.*) *fusterna* sp. nov., *C.* (*T.*) *hirsuta*, *C.* (*T.*) *juniperina*, *C.* (*T.*) *rubra* and *C.* (*T.*) *placenta*. Many of these species barely differ in their gross morphologically, and Hallmann (1912) suggested they should be combined into one or few species, but this contention cannot be resolved without access to live populations of all species, to determine accurately their field characteristics, nor on the basis of preserved material.

Clathria (Thalysias) cancellaria (Lamarck, 1814)
(Figs 149-150, Plate 5A)

Spongia cancellaria Lamarck, 1814: 382, 361.
Rhaphidophlus cancellarius; Topsent, 1930: 43, pl.2, fig.6.
Clathria cancellaria; Hooper & Wiedenmayer, 1994: 270.

MATERIAL. HOLOTYPE: MNHNDT528: locality unknown, Peron & Lesueur collection. OTHER MATERIAL: WA – NTMZ1249 (fragment QMG300430), QMG300594 (NCIQ66C-4272-K), QMG300536 (NCIQ66C-4667-O).

HABITAT DISTRIBUTION. Rock substrate, on or under ledges, or exposed on isolated rock in sand substrate; 13-40m depth; known only from Australia: Northwest Shelf, Wallaby Is and Houtman Abrolhos (WA) (Fig. 149H).

DESCRIPTION. *Shape.* Lamellate, massive, mostly planar growth form, with or without basal attachment, consisting of more-or-less fused erect thin digits forming a continuous lamella, 370mm maximum span, with some free or barely anastomosing sections; lamellae are 116-135mm high, 4.5-7mm thick, forming irregular meshes between branch anastomoses, 3-14mm diameter.
Colour. Salmon-pink (Munsell 5RP 8/2) to orange-red alive (5YR 6/10), light grey-brown in ethanol.
Oscules. Small, 2-3mm diameter, mainly between ridges; pores minute, 0.5-1mm diameter, scattered over entire surface.
Texture and surface characteristics. Firm, compressible, difficult to tear. Lamellae prominently striated with longitudinal ridges, grooves and discontinuous conules; margins of lamellae digitate, microconulose.
Ectosome and subectosome. Relatively thin, dense ectosomal crust, 60-95μm thick, composed of erect ectosomal auxiliary subtylostyles forming continuous erect dermal palisade; immediately below ectosome, protruding through palisade, are mostly paratangential subectosomal auxiliary subtylostyles; in thicker, more elongated sections larger auxiliary subtylostyles form plumose ascending tracts supporting ectosomal skeleton, but in most sections they lie paratangential to surface, arising from ends of peripheral choanosomal fibres; subectosomal region relatively cavernous; in growing points of sections in peripheral skeleton elongate conulose protrusions extend from surface for up to 0.5mm, fully cored by dense tracts of subectosomal subtylostyles.
Choanosome. Skeletal architecture irregularly reticulate, without axial or extra-axial differentiation; spongin fibres relatively heavy, imperfectly separated into primary and secondary elements, forming ovoid or elongate, relatively cavernous meshes, 140-680μm diameter; primary fibres, 92-165μm diameter, predominantly ascending, cored by multispicular tracts of choanosomal principal styles occupying about 75% of fibre diameter; secondary fibres uni- to paucispicular, 26-71m diameter, predominantly transverse; all fibres heavily echinated by acanthostyles protrude at various obtuse angles from fibres; mesohyl matix heavy but only lightly pigmented, slightly granular, with abundant larger auxiliary megascleres throughout, sometimes completely obscuring skeletal architecture; choanocyte chambers, small, oval, 42-68μm diameter.
Megascleres. Choanosomal principal styles short, thick, slightly curved towards basal end, with rounded or very slightly subtylote smooth bases, fusiform points. Length 166-(185.5)-218μm, width 7.5-(12.6)-16μm (holotype 161-(198.1)-224 x 6-(12.1)-16μm).

Subectosomal auxiliary subtylostyles long, thick, straight or very slightly curved, with slightly subtylote or rounded bases, usually microspined, fusiform points. Length 134.6-(218.8)-286μm, width 3.5-(6.5)-8.6μm (holotype 148-(229.7)-265 x 3-(5.9)-8μm).

Ectosomal auxiliary subtylostyles short, thin, straight, with prominent subtylote bases, invariably microspined, fusiform points. Length 86-(97.6)-114.5μm, width 2.5-(3.3)-4.5μm (holotype 85-(93.4)-102 x 2-(3.7)-5μm).

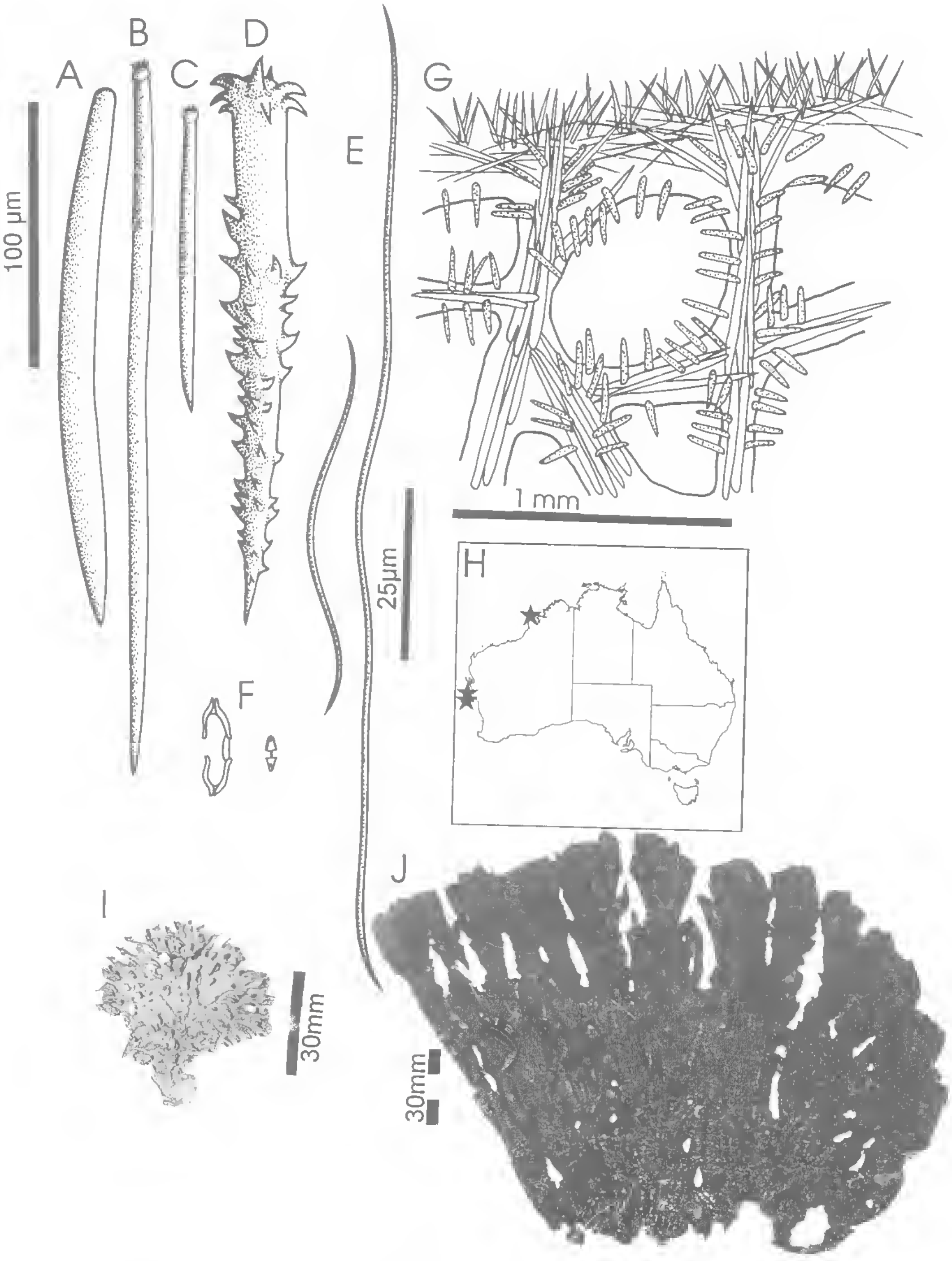

FIG. 149. *Clathria* (*Thalysias*) *cancellaria* (Lamarck) (holotype MNHNDT528). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyle. D, Echinating acanthostyle. E, Accolada and sinuous toxas. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution. I, Holotype. J, NTMZ1249.

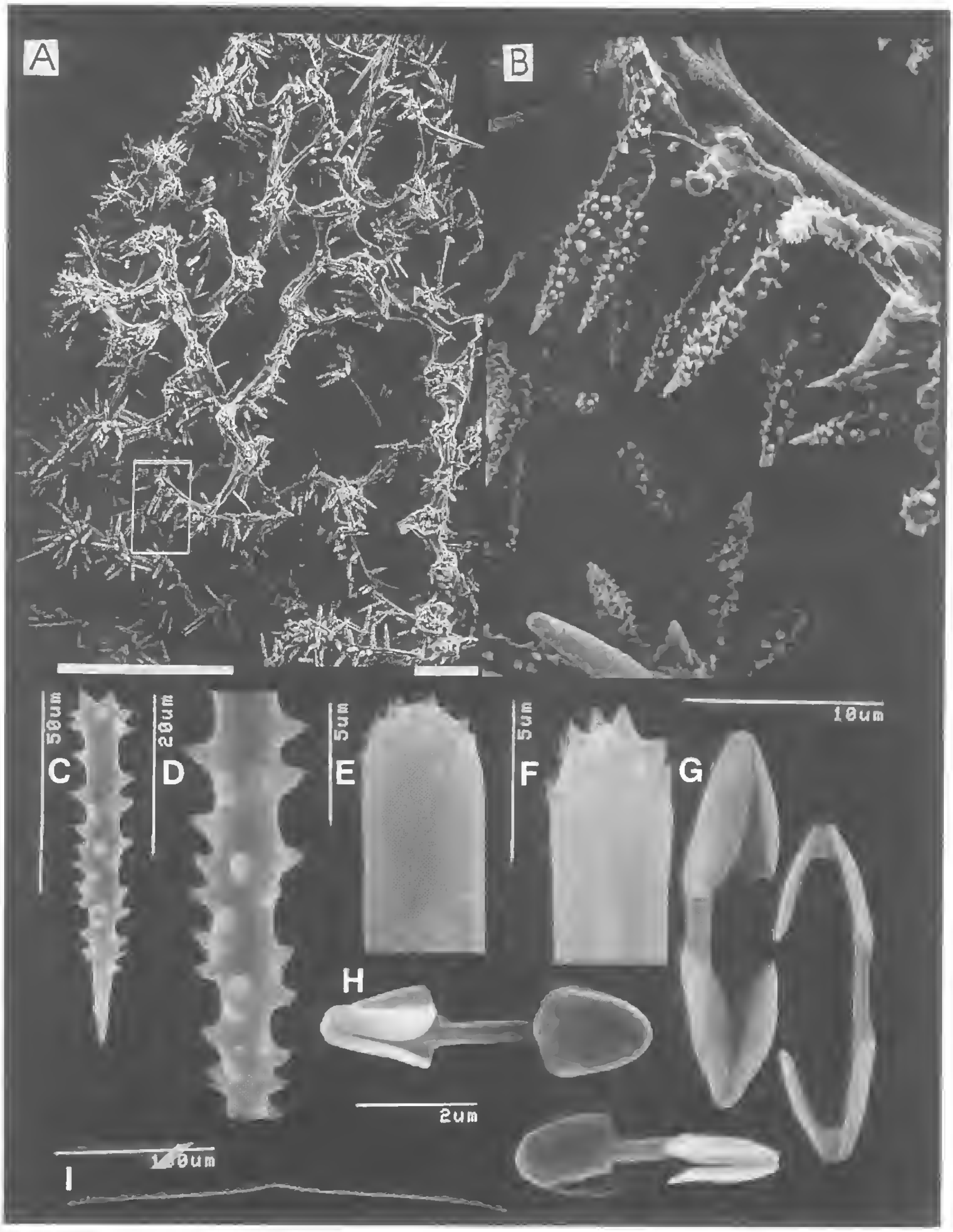

FIG. 150. *Clathria* (*Thalysias*) *cancellaria* (Lamarck) (NTMZ1249). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyle. D, Acanthostyle spines. E-F, Bases of subectosomal and ectosomal auxiliary subtylostyles. G-H, Palmate isochelae. I, Accolada toxas.

Acanthostyles long, thick, with slightly subtylote rounded bases, large spines dispersed over apical and basal extremities, usually with aspinose neck, occasionally evenly spinose; spines conical, barely recurved. Length 67-(79.8)-92.5µm, width 3.8-(8.6)-11.6µm (holotype 62-(80.2)-88 x 3-(8.1)-10µm).

Microscleres. Palmate isochelae divided into two size classes, larger usually unmodified, smaller often contort; long lateral alae completely fused to shaft; front alae complete. Length I: 9-(10.9)-16µm (holotype 9-(12.3)-16µm), length II: 3-(4.4)-8µm (holotype 3-(4.8)-6µm).

Toxas thin, rhaphidiform, accolada to sinuous, varying from small forms with slightly curved centres and slightly reflexed points, to long forms with only very slightly rounded central curvature and straight or slightly reflexed points. Length 11-(121.1)-166µm, width 0.4-(0.8)-1.2µm (holotype 17-(102.3)-186 x 0.5-(1.1)-1.5µm).

REMARKS. *Clathria (Thalysias) cancellaria* is most closely related to the New Caledonian *C. (T.) flabellifera*, both with similar skeletal architecture, spicule geometry and spicule size, and also (vaguely) growth form, surface features and live colouration (Hooper & Lévi, 1993a). The two populations differ in several cryptic characters, which Hooper & Lévi (1993a) suggested were indicative of sibling species relationships rather than population variability. *Clathria (T.) cancellaria* has only a single category of toxa microsclere, resembling neither of the two found in *C. (T.) flabellifera*; it has two size categories of isochelae microsclere (whereas the latter species has only one); acanthostyle spines are much larger, the spicules more robust, and spines are more evenly dispersed over the spicule (whereas those on the latter species are small and found mainly towards the extremities of the spicule); basal spines are present on most of the smaller and larger auxiliary spicules (whereas most auxiliary spicules are completely smooth in the latter species); and spicules of most categories are substantially thicker in the WA population.

Clathria (Thalysias) cancellaria also superficially resembles *C. (T.) raphana* and irregular growth morphs of *C. (T.) coppingeri*, with lamellate, planar growth form, although fibre characteristics, spicule geometry and spicule sizes are otherwise different between all these species. The species has a dense crust of erect ectosomal spicules, very unlike the paucispicular dermal skeleton of *C. (T.) coppingeri*, although both species conform to the *Thalysias* condition in having differentiated ectosomal and subectosomal megascleres.

Clathria (Thalysias) cervicornis (Thiele, 1903)
(Figs 151-152, Table 32, Plate 5B)

Rhaphidophlus cervicornis Thiele,1903a: 959, 968, pl.28, fig.24a-e; Hallmann, 1912: 177; Brondsted, 1934: 22-23, fig.23; Simpson, 1968a: 70, pl.15.
Not *Rhaphidophlus cervicornis*; Vacelet & Vasseur, 1971: 96-97, text-fig.50, pl.4, fig.3.
Thalysias cervicornis; de Laubenfels, 1954: 135-137, text-fig.86.
Clathria cervicornis; Bergquist, 1965: 165-167, fig.14.

MATERIAL. HOLOTYPE: SMF679 (fragments ZMB3141, MNHNDCL2312) Ternate, Moluccas, Indonesia, 0°48'N, 127°23'E, 1894, coll. W. Kükenthal (dredge). OTHER MATERIAL: QLD - QMG300707 (fragment NTMZ4045). CAROLINE IS., CENTRAL W PACIFIC - USNM22892, USNM22905, QMG304828 (NCI OCDN-0488-O).

HABITAT DISTRIBUTION. Usually at base of coral reef slope, on coral rubble, rock or seagrass beds, forming tangled thickets; intertidal - 45m depth; Howick Is (FNQ), (Fig. 151G), Aru Is, Arafura Sea, Moluccas Sea, Marshall Is, Palau Is, Truk Atoll (Chuuk), Ponape.

DESCRIPTION. *Shape.* Stoloniferous, thin, cylindrical branches, 10-25mm diameter forming single digits, erect or creeping over substrate, to dense tangled thickets with numerous, thin, stoloniferous, anastomosing, cylindrical branches, and either small, central, single basal stalk, or multiple points of attachment to substrate via branches.

Colour. Pale orange or orange-red exterior (Munsell 7.5YR 7/10-2.5YR 7/8), bright vermillion or brown interior in life (2.5R 4/2-4/8); grey-brown in ethanol.

Oscules. Large, up to 8mm diameter in life, with large membraneous lip, collapsing when preserved, dispersed mainly on lateral surface of branches in regular rows.

Texture and surface characteristics. Firm, flexible, compressible surface, wiry axis difficult to tear; surface usually optically smooth, even, with subectosomal ridges and drainage canals radiating away from raised oscules, occasionally sparsely conulose, microscopically hispid in life in thicker branches; surface even, glabrous, unornamented when preserved.

Ectosome and subectosome. Ectosomal skeleton a dense palisade of discrete, erect spicule brushes composed of smaller ectosomal auxiliary subtylostyles, supported by underlying, ascending,

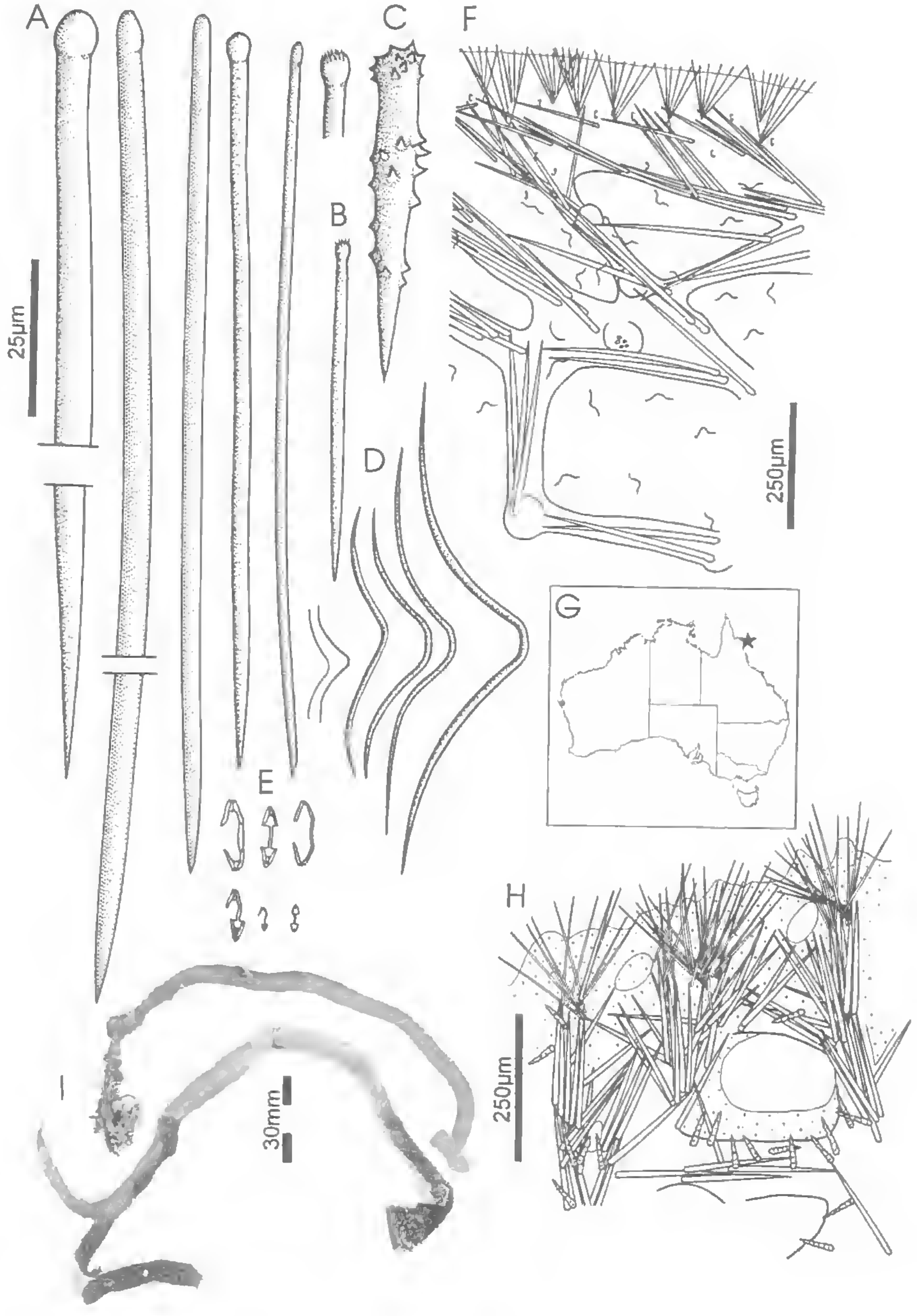

FIG. 151. *Clathria* (*Thalysias*) *cervicornis* (Thiele) (holotype SMF679). A, Subectosomal auxiliary subtylostyles and bases. B, Ectosomal auxiliary subtylostyle. C, Echinating acanthostyle. D, Wing-shaped toxas. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, Ectosomal and subectosomal skeletons (QMG300707) I, QMG300707.

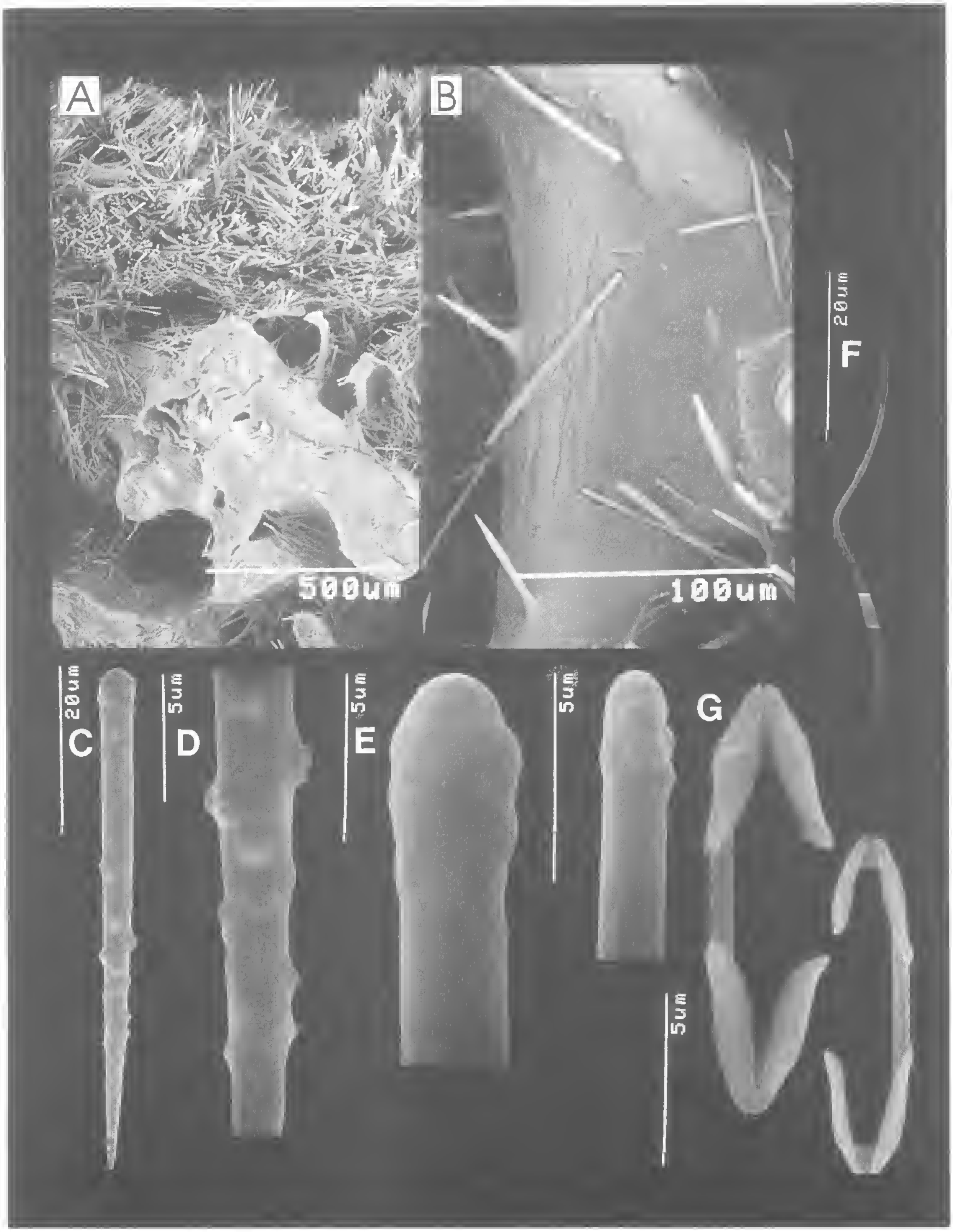

FIG. 152. *Clathria* (*Thalysias*) *cervicornis* (Thiele) (QMG300707), specimen with reduced spiculation. A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyle. D, Acanthostyle spines. E, Polytylote bases of subectosomal auxiliary subtylostyles. F, Wing-shaped toxa. G, Palmate isochelae.

TABLE 32. Comparison between spicule dimensions of *Clathria* (*Thalysias*) *cervicornis*, from present material and published records. All measurements given in µm, as range, or range (and mean), of lengths x widths.

SPICULE	Holotype (SMF679) (Indonesia)	(N=1) (GBR)	(N=3) (Micronesia)	(N=1) (Brondsted,1934) (Aru I.,Indonesia)	(N=1) (de Laubenfels,1954) (Marshall Is.)	(N=1) (Bergquist, 1965; Simpson, 1968a) (Palau Is.)
Principal megascleres	Absent	Absent	Absent	Absent	Absent	Absent
Subectosomal subtylostyles	180-(258.9)-304 x 4-(5.8)-9	232-(274.9)-325 x 4-(4.7)-7	205-(236.7)-262 x 3-(4.3)-6	165-315 x 6-10	265 x 4	135-325 x 2.4-7.6
Ectosomal subtylostyles	112-(128.3)-155 x 2-(3.3)-5	86-(117.4)-151 x 2-(3.2)-4	105-(118.3)-135 x 3-(4.1)-5	160-180	194 x 7	95-132 x 3-4.5
Acanthostyles	48-(62.0)-74 x 3-(5.4)-7	52-(55.6)-61 x 4-(6.3)-9	47-(56.2)-63 x 3-(4.2)-5	60-82 x 2.3-5.9	63-66 x 6	50-73 x 4-6.5
Chelae I	10-(12.4)-15	10-(11.6)-14	absent	12	10	8-13.6
Chelae II	3-(6.3)-9	3-(4.4)-6	absent	Not recorded	Not recorded	Not recorded
Toxas	12-(35.3)-55 x 0.5-(0.9)-1.5	16-(54.5)-112 x 1.0-(1.2)-2.0	absent	40-90	40-50	34-56

plumose tracts of larger subectosomal auxiliary subtylostyles, identical to those coring fibres which also protrude through surface; no fibre component in peripheral skeleton but plumose tracts in subectosomal region arise directly from terminations of ascending primary fibres; together ectosomal and subectosomal skeletons occupy up to 30% of branch diameter.

Choanosome. Skeleton regularly reticulate, with even, rectangular or ovoid, relatively cavernous meshes, 180-270µm diameter; spongin fibres very heavy, 90-125µm diameter, thicker at nodes, up to 200µm diameter, cored by multispicular tracts of subectosomal auxiliary subtylostyles which occupy only 60% of fibre diameter; echinating acanthostyles moderate to lightly dispersed over fibres, predominantly clustered around fibre nodes, sometimes rare or absent completely in some specimens; mesohyl matrix moderately light, with numerous subectosomal auxiliary megascleres scattered between fibres; choanocyte chambers small, oval, 35-55µm diameter.

Megascleres (Table 32). Choanosomal principal megascleres absent or completely undifferentiated from subectosomal spicules.

Subectosomal auxiliary subtylostyles long, slender or robust, straight or slightly curved near point, with prominently subtylote, polytylote, slightly subtylote, or rarely rounded bases, smooth or minutely spined, fusiform points.

Ectosomal auxiliary subtylostyles relatively large, robust, straight, with prominently subtylote bases, usually microspined occasionally smooth, fusiform points.

Echinating acanthostyles moderately short, robust or slender, subtylote, with smooth point and 'neck' below basal swelling; spines moderately large, recurved.

Microscleres (Table 32). Palmate isochelae occur in two size classes, with some smaller contort forms; lateral alae long, completely attached to shaft, front ala entirely fused.

Toxas wing-shaped, long or short, thin, with large central curvature, slightly reflexed points.

REMARKS. This widely distributed Indo-west Pacific species is easily recognisable in the field by its growth form, resembling prolific tangles or thinly branching thickets. In the western Pacific and Indonesian archipelago this species is a prominent member of the fringing coral reef community, commonly found at the base of reef slopes in the rubble and sediment, whereas on the Great Barrier Reef it has been found only in the far northern sector where it is rare and occurs as isolated thin single branches.

The species has consistent skeletal architecture, probably dictated by its persistent cylindrical growth form, and similar spicule dimensions (Table 32), notwithstanding its relatively widespread Indo-west Pacific distribution, although there is some variability in spicule geometries. Specimens from Chuuk lack microscleres and often have very thin megascleres, whereas those in the Great Barrier Reef specimen there is only sparsely echinating acanthostyles. Brondsted's (1934) material is reported to have differentiated principal and auxiliary megascleres — the former with rounded smooth bases coring fibres and the latter with slightly subtylote smooth bases and found exclusively in the ectosomal skeleton or scattered between fibres. Similarly, acanthostyles in

Brondsted's material are evenly spinose, whereas in the holotype these have aspinose 'necks' and points. It is possible that Brondsted's material represents a different species, or it has simply been misdescribed, but no formal diagnosis can be made until his specimens are found and these differences confirmed or refuted.

The presence of a second, smaller category of isochela, and frequent contortion of isochelae have not been recorded previously for this species, although these features were commonly seen in most material examined, including the holotype, and appear to have been overlooked by Thiele (1903a) and subsequent authors. Consequently, there is no justification in separating Moluccan populations from others described by Bergquist, Brondsted, de Laubenfels and Simpson, whereas material described by Vacelet & Vasseur (1971) as *Rhaphidophlus cervicornis* belong to *C.* (*T.*) *abietina*.

Clathria (*Thalysias*) *cervicornis* is closely related to *C.* (*T.*) *corneolia* Hooper & Lévi (from New Caledonia), *C.* (*T.*) *craspedia* sp. nov. (from the Tweed River region) and *C.* (*T.*) *fusterna* sp. nov. (from the Gulf of Carpentaria), all having similarities in their skeletal structure and diversity of spicule types, but with major differences in their growth forms, live colouration and live surface features, some also in their spicule geometries (the latter three species with differentiated principal and auxiliary megascleres), and spicule dimensions. These are discussed further below for the respective species (and see also Hooper & Lévi, 1993a).

Clathria (Thalysias) coppingeri Ridley, 1884
(Figs 153-154, Tables 33-34, Plate 6A)

Spongia juniperina, in part (variety beta only); Lamarck, 1814: 444.
Not *Spongia juniperina* (variety alpha); Lamarck, 1814: 444.
Clathria coppingeri Ridley, 1884a: 445-446, pl.40, figs f-f', pl.42, figs i-i'; Fristedt, 1887: 459; Hallmann, 1912: 215; Hentschel, 1912: 298, 358, 361-362; Topsent, 1932: 99, pl.5, fig.1; Hooper, 1984a: 55; Hooper & Wiedenmayer, 1994: 270.
Thalysias coppingeri; de Laubenfels, 1936a: 105.
Clathria lendenfeldi; Brondsted, 1934: 19-20, text-fig.9.
Not *Clathria coppingeri* var. *aculeata*; Hentschel, 1912: 363.
cf. *Microciona prolifera*; Vosmaer, 1935a: 610, 633.

MATERIAL. LECTOTYPE: BMNH1881.10. 21.246 (dry): Albany I., N. Qld, 10°44'S, 142°37'E, 6-8m depth, coll. HMS 'Alert' (dredge). PARALECTOTYPE: BMNH1881.10. 21.330 (spirit): same locality. SYNTYPES of var. *thuyaeformis*: MNHNDT571, DT3353: precise locality unknown, Indian Ocean, Turgot collection, no other details known (dry). OTHER MATERIAL: QLD - QMG4731 (fragment NTMZ1557). WA - NMV unregistered (fragment NTMZ1493). WA - NTMZ670, NTMZ1152, NTMZ1861, NTMZ1173, NTMZ1155, NTMZ 1221, NTMZ2269, NTMZ2283, NTMZ2301, NTMZ2311, NTMZ2316, NTMZ2317, NTMZ 2363, NTMZ2463, NTMZ3040. INDONESIA - SMF1702 (fragment MNHNDCL2325), SMF1265 (fragment MNHNDCL2251).

HABITAT DISTRIBUTION. Deeper offshore rock reefs, dead coral, coral heads, probably restricted to harder substrates (as indicated by presence of smooth encrusting basal attachment (peduncle); growth form consistently planar and likely that orientation of fan is towards direction of predominent currents; 15-94m depth; Port Headland region, Bedout I., Lacepede Is, Amphinome Shoals, Barracouta Shoals, Northwest Shelf; Ashmore Reef, Sahul Shelf (WA); off Moreton Bay (SEQ) (Ridley, 1884a; Hooper, 1984a; present study) (Fig. 153H); also Aru and Kai Is, Indonesia (Hentschel, 1912; Brondsted, 1934).

DESCRIPTION. *Shape.* Growth form invariably thin, planar reticulate flabellate, 150-460mm long, 185-290mm maximum span, with short thick, cylindrical stalk (22-54mm long, 12-30mm diameter) and small peduncle; branching planar-dendritic reticulate, with ascending radial primary branches and interconnecting secondary branches; branches form tight meshes (4-9mm diameter); primary branch diameter 12-16mm, 6.5-9.5mm midway, 1.5-4mm near apex of fan; connecting branches 1.5-3mm diameter.

Colour. Consistent, unpigmented, light beige-brown in both life and ethanol (Munsell 2.5Y 8/2-5Y 8/4).

Oscules. Not observed in live or preserved material.

Texture and surface characteristics. Firm, barely compressible, particularly on woody basal stalk; surface optically smooth, without conules or other visible processes, little flesh; microscopically hispid, irregular, consisting of tight reticulation of compacted fibres and protruding megascleres.

Ectosome and subectosome. Poorly developed ectosomal skeleton, without obvious spicule brushes but with sparse paratangential smaller ectosomal auxiliary subtylostyles scattered over surface; ascending plumose choanosomal principal styles usually protrude through ectosomal skeleton with bases embedded in peripheral spongin fibres, especially at fibre junctions and on fibre endings; detritus also often present on sur-

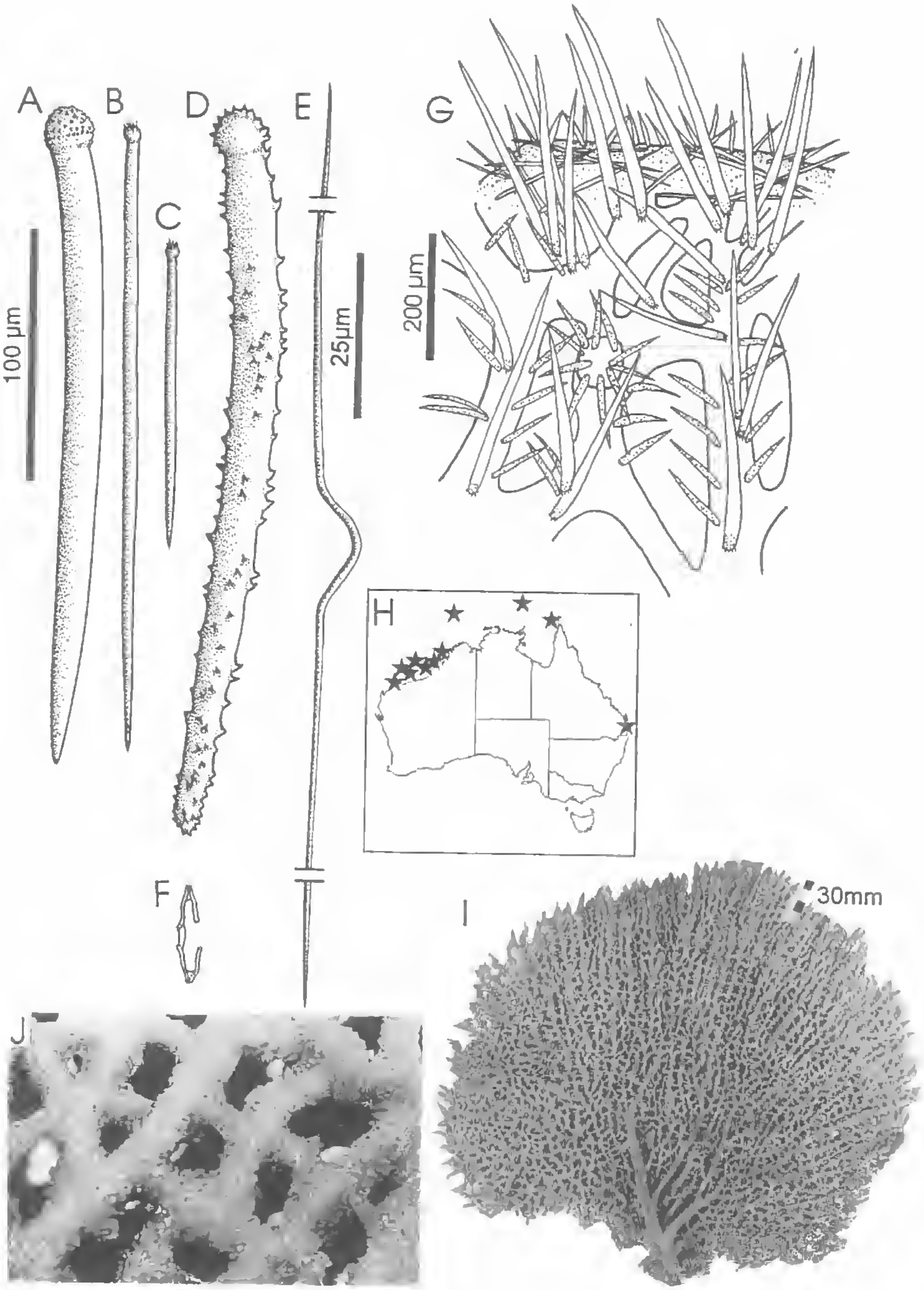

FIG. 153. *Clathria (Thalysias) coppingeri* Ridley (NTMZ670). A, Choanosomal principal subtylostyle. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyle. D, Echinating acanthostyle. E, Accolada toxa. F, Palmate isochelae. G, Section through peripheral skeleton. H, Known Australian distribution. I, NTMZ3040. J, Unregistered live specimen.

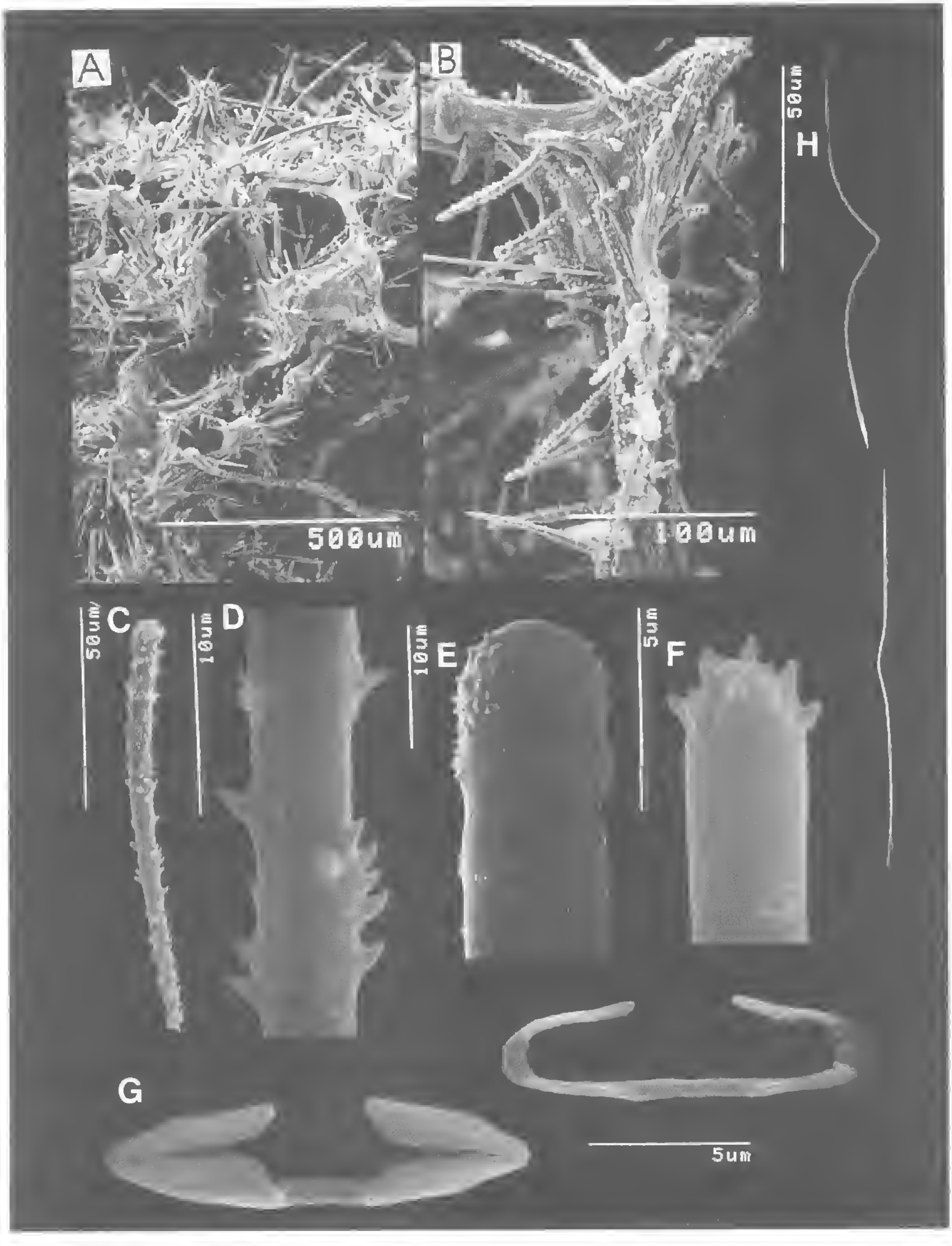

FIG. 154. *Clathria* (*Thalysias*) *coppingeri* Ridley (QMG300106). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyle. D, Acanthostyle spines. E-F, Bases of principal and auxiliary subtylostyles. G, Palmate isochelae. H, Accolada toxas.

TABLE 33. Comparison between present and published records of *Clathria* (*Thalysias*) *coppingeri*. All measurements given in µm, as range, or range (and mean), of lengths x widths (N=25).

SPICULE	Holotype (Ridley, 1884a)	Holotype *S. juniperina* var. beta (MNHNDT571)	Specimens (N=2) (Indonesia) (Hentschel,1912; Brondsted,1934)	Specimens (N=16) (Indian Ocean, Arafura Sea)	Specimen (N=1) (Pacific Ocean)
Choanosomal principal styles	200-340 x 15	179-(254.1)-332 x 9-(16.2)-21	164-340 x 10-20	150-(228.4)-318 x 3.5-(13.6)-26	201-520 x 4-24
Subectosomal auxiliary styles	150-250 x 5-6.3	134-(196.5)-279 x 1.6-(4.6)-8	144-256 x 4-6	136-(202.2)-323 x 1-(4.9)-12	164-362 x 1-9
Ectosomal auxiliary styles	-	75-(108.8)-133 x 1.1-(3.1)-5	-	-	69-(110.8)-142 x 1-(3.7)-7
Echinating acanthostyles	110 x 6.3	66-(99.5)-118 x 1.1-(6.3)-10	50-110	61-(97.3)-150 x 1.2-(6.5)-14	72-149 x 2-10
Chelae	17	10-(13.8)-17	10-17	6-(13.1)-25	7-19
Toxas	-	58-(111.6)-191 x 0.5-(1.4)-2.5	-	28-(140.6)-245 x 0.5-(1.7)-4	39-126

face, sometimes replacing dermal skeleton entirely; subectosomal peripheral skeleton not sharply delineated from deeper choanosomal regions with choanosomal fibres usually immediately subdermal; meshes formed by fibre anastomoses often wider in peripheral skeleton.

Choanosome. Skeletal architecture irregularly reticulate, without differentiation between axial or extra-axial regions; spongin fibres heavy, 40-110µm diameter, without any clear division between primary or secondary elements; fibres form oval or rectangular meshes, 100-220m diameter in axis, 280-405µm diameter near periphery; fibres uncored, usually heavily echinated by both acanthostyles and principal spicules especially at fibre junctions; very few fibres have unispicular core of subectosomal auxiliary megascleres; extra-fibre spicule development minimal, where present consisting of plumose ascending tracts of subectosomal auxiliary subtylostyles; mesohyl matrix light and collagen found mostly around fibre nodes, with few microscleres and sometimes detritus scattered throughout.

Megascleres (Table 33). Principal choanosomal subtylostyles long, thick, slightly curved near the basal end, with slightly subtylote microspined bases, fusiform points; occasionally completely smooth styles, sometimes both lightly spined shafts and bases intermediate between choanosomal spicules and acanthostyles (both echinating fibres).

Subectosomal auxiliary subtylostyles straight, thin, slightly subtylote microspined bases, occasionally smooth, fusiform points.

Ectosomal auxiliary subtylostyles smaller, thinner than subectosomals, invariably with microspined bases.

Acanthostyles variable in size, characteristically curved at centre, lightly spined, spines small, recurved more-or-less evenly dispersed, bases slightly subtylote, points hastate or rounded.

Microscleres (Table 33). Palmate isochelae moderately common, relatively small, never contort, with lateral and front alae of equal size, lateral alae completely fused to shaft, front ala entire, sometimes alae vestigial reduced to a ridge on shaft.

Toxas accolada, very common in some specimens, rare in others, mostly thin, rhaphidiform, long, with slight central curvature, tapering arms, little apical reflexion, less often short and curved.

Associations. Scyllidae polychaete worms (*Typosyllis spongicola*) abundant in 60% of specimens examined, identical to commensals seen in *C.* (*T.*) *reinwardti* and *C.* (*T.*) *lendenfeldi*.

Variation. Growth form and colour relatively consistent. Growth form: consistently planar, stalked, with more-or-less tightly anastomosing branches, although two morphs recognised; typical morph (64% of specimens, including type material) with thicker ascending almost dendritic (primary) branches radiating outwards to produce an arborescent appearance; second morph (36% of specimens, including type material of *S. juniperina*) have even branching, even branch sizes and mesh sizes closely resemble *Echinodictyum cancellatum* (Raspailiidae). Foreign detritus in skeleton: abundant in choanosomal mesohyl of deeper water specimens (70 m depth), rare in samples from shallower habitats (38-46 m depth). Ectosomal skeleton: occasionally well developed, thick, typical of *Thalysias* condition (but also including principal spicules protruding through ectosome) (13% of specimens), more sparsely developed (20%), variable ectosomal development (well formed in some regions, such as surface irregularities, completely absent from other regions) (7%), or consistently poorly developed (60%). Subectosomal skeleton: poorly developed with peripheral choanosomal fibres lying immediately below the surface and thin paratangential spicule tracts (87% of specimens), or well formed (wide) plumose extra-fibre skeleton (13%). Choanosomal skeleton: fibres heavy (67% of specimens), or much lighter in construction (33%). Coring spicules: irregularly reticulate thick spongin fibres largely uncored (81% of specimens), more regularly renieroid-reticulate with thicker fibres cored by paucispicular tracts of choanosomal styles (12%), or fibres mostly cored by choanosomal styles (7%). Fibre diameter: even, consistent throughout skeleton (81% of specimens), with distinct primary (ascending) and secondary (transverse) fibre elements (12%), or noticeably heavier fibres in the axis than in the peripheral skeleton (7%). Echinating spicules: moderately heavy acanthostyles and choanosomal styles forming dense plumose tufts at fibre nodes, producing ascending extra-fibre tracts extending into peripheral skeleton (80% of specimens), or with more poorly developed echinating spicules seemingly dispersed at random throughout skeleton (20%). Mesohyl matrix: light with collagen found mainly around fibre nodes (93% of specimens), or heavy, granular (7%). Megasclere geometry: Principal spicules predominantly basally spined, but with variable proportion of entirely smooth spicules in specimens, ranging from 0-10% of spicules sampled (67% of specimens), 16-30% (27%), up to 56% of spicules (6% of specimens). Larger auxiliary subtylostyles usually with microspined bases, and only 0-10% of spicules sampled (73% of specimens) were smooth, 12-20% with higher proportion basally spined (20%), up to 32% of spicules (7% of specimens). Smaller auxiliary spicules mostly common in histological preparations, although exceptionally producing well-formed dermal structures (93% of specimens), or scarse in both sections and spicule preparations. Microscleres: Isochelae abundant (26% of specimens), common (33%), rare (21%), or absent entirely (20%). Toxas: abundant (26% of specimens), common (20%), rare (47%) or absent (6%).

Variability in spicule dimensions: Discounting the anomolous southern Queensland specimen (QMG4731) discussed further below, spicule dimensions were relatively consistent throughout the species' geographical distribution (Table 33). For all categories of megascleres, spicule length was on average higher for the Queensland specimen than samples from the northwest and west coast, whereas the mean width of most megascleres, and the length of isochelae were relatively more homogeneous between all samples. Toxas were also significantly shorter in the southern Queensland specimen. Analysed by locality, variation in spicule lengths and widths did not conform to any obvious latitudinal gradient in sample distribution (the three major sampling localities for this species were 19°, 16°and 12°S latitudes) for the west coast material ($P>0.05$), for all spicule types, although the inclusion of Queensland material (27°S) in analyses did reveal significant differences (commonly at $P<0.005$) in all spicule categories except isochelae (Table 34). Excluding Queensland material (collected at 94 m depth), there were no significant differences in mean spicule lengths or widths between specimens collected from 38-46m or 70-90m depth ranges ($P>0.05$) for all spicule categories except acanthostyles.

REMARKS. This species has a characteristic planar, flabellate growth form similar to *C.* (*C.*) *loveni* Fristedt (1887: 459) (from North America) and *C.* (*C.*) *ulmus* Vosmaer (1880: 151; 1935a: 633) (from an unknown locality). Previous descriptions omitted to mention thin, raphidiform toxas or presence of two size categories of auxiliary megascleres (Table 33). These were seen in all type and recent material, and possession of two size categories of auxiliary spicules places the species in the *Clathria* (*Thalysias*) group although it is atypical of most other species in having only rudimentary ectosomal structure, with sparse spicule brushes.

This species belongs to the *spicata* complex (Hallmann, 1912; Hooper et al., 1990) based on skeletal architecture (virtual absence of coring megascleres in fibres, inclusion of choanosomal principal spicules echinating fibres, imperfect differentiation of principal and auxiliary megascleres, the semi-plumose (or spicate) arrangement of choanosomal megascleres protruding through fibres, and dense echination of peripheral fibres). Included in this group are: *C.* (*T.*) *lenden-*

TABLE 34. Summary of results of one-way ANOV's (Model I), testing for variability in spicule lengths and widths between locality and bathymetric distribution of *Clathria* (*Thalysias*) *coppingeri*.

SPICULE	LOCALITY[1]			DEPTH[2]	
	(N)	F	Prob.	F	Prob.
Choanosomal styles L	(350)	12.56	$P<0.0005$	3.21	$P>0.05$
W	(350)	2.89	$P<0.05$	2.33	$P>0.05$
Subectosomal styles L	(350)	8.18	$P<0.0005$	2.75	$P>0.05$
W	(350)	0.29	$P>0.05$	0.03	$P>0.05$
Ectosomal styles L	(350)	8.87	$P<0.0005$	2.76	$P>0.05$
W	(350)	0.52	$P>0.05$	0.06	$P>0.05$
Acanthostyles L	(350)	9.95	$P<0.0005$	6.39	$P<0.025$
W	(350)	0.37	$P>0.05$	0.82	$P>0.05$
Chelae L	(275)	0.69	$P>0.05$	0.02	$P>0.05$
Toxas L	(325)	11.48	$P<0.0005$	0.03	$P>0.05$
W	(325)	0.78	$P>0.05$	0.02	$P>0.05$

Number of groups:
1. 4 locality groups (27, 19, 16, 12°S latitude)
2. 2 depth groups (38-46m, 70-90m depth)

feldi, *C.* (*T.*) *major*, *C.* (*C.*) *caelata*, *C.* (*C.*) *inanchorata*, *C.* (*T.*) *clathrata*, *C.* (*T.*) *costifera* (including the nominate species *Clathria spicata*, *C. bispinosa*, *C. whiteleggei* and *Ophlitaspongia membranacea*, which have since been shown to be conspecific with other species of the *spicata* group; Hooper et al., 1990)). This assemblage of species does not appear to constitute a natural taxon because it cuts across a classification based on other (possibly more important) characters (viz. *Clathria* and *Thalysias*). Nevertheless, all species are very close in fibre construction and spicule geometry, and in fact *C.* (*T.*) *coppingeri* and *C.* (*T.*) *lendenfeldi* can only be easily differentiated on the basis of their respective growth forms, which is very characteristic for the former, but relatively variable in the latter species (see Hooper et al., 1990).

The single known specimen from southern Queensland differs in many respects from other populations, accounting for most of the variability documented above. In shape it is close to Lamarck's (1814) variety *thuyaeformis* (Topsent, 1932: pl.5, fig.1), whereas most samples examined resemble type material (Fig. 153I-J). This specimen also has a well developed ectosomal skeleton (consisting mainly of larger subectosomal megascleres which surround the bases of protruding choanosomal styles); true (smaller) ectosomal auxiliary spicules have hastate points (whereas in typical material they are fusiform); ectosomal spicules occur in light paratangential bundles near the surface (versus not forming brushes); fibres are lightly cored by paucispicular tracts of choanosomal styles, which produce an irregular renieroid reticulation (whereas most specimens have aspicular fibres); acanthostyles are only sparsely spined, and together with choanosomal styles, always form ascending extra-fibre tracts within the skeleton. This specimen was initially assigned to *C.* (*T.*) *coppingeri* with some hesitation, but there is no doubt that it belongs to this species and probably represents the southernmost extent of its geographical range.

There is a nomenclatural complexity that requires brief comment. Wiedenmayer (1989) suggested that the senior 'variety' name of *S. juniperina* (viz. *thuyaeformis*) had priority over Ridley's (1884a) subsequent species name, but this is not accepted here. Lamarck (1814 described several distinct 'varieties' of *S. juniperina*, for which he used Greek symbols but not a trinomen. It was Topsent (1932) who subsequently elevated Lamarck's 'variety β' to a subspecific rank by using it in a trinomen (ICZN Article 45fii), using the name *thuyaeformis* as a noun whereas it was previously used as an adjective by Lamarck. This subsequent designation is therefore considered to be infrasubspecific, not subspecific (ICZN, Article 45f), and does not take precedence over Ridley's (1884a) species designation. Further support of this opinion is that *S. juniperina thuyaeformis* is a composite taxon as some of Lamarck's syntypes belong to different species. Thus the choice of the name *coppingeri* over *thuyaeformis* is also supported by ICZN Article 57g, and the pragmatic argument that Ridley's (1884a) name has now become well known for this species.

Clathria (Thalysias) coralliophila (Thiele, 1903)
(Figs 155-156, Table 35, Plate 5C)

Rhaphidophlus coralliophilus Thiele, 1903a: 959, 968, pl.28, fig.25a-d.
Rhaphidophlus coralliophila; Hallmann, 1912: 177.
Tenacia coralliophila; Burton, 1934a: 560.
Clathria coralliophila; Hooper & Wiedenmayer, 1994: 270.
cf. *Microciona prolifera*; Vosmaer, 1935a: 611, 645.

MATERIAL. LECTOTYPE: SMF1784 (fragment ZMB3145): Ternate, Moluccas, Indonesia, 0°48'N, 127°23'E, 1894, coll. W. Kükenthal (dredge). PARALECTOTYPE: SMF787 (fragment MNHNDCL2309): same locality. OTHER MATERIAL: QLD - BMNH1930.8.13.107. PNG - QMG300377 (NCIQ66C-4518-A).

HABITAT DISTRIBUTION. Growing on on *Seriotopora* coral, bivalves and dead coral substrates; shallow intertidal to 8m depth; Low Is (NEQ) (Fig. 155H); also Moluccas, Indonesia; Motupore I., S. PNG.

DESCRIPTION. *Shape.* Thin, thick, or massively encrusting, covering up to 80mm^2 surface.

Colour. Red, dark orange or pale pinkish alive (Munsell 5R 8/2 - 10R 6/10), grey in ethanol.

Oscules. Large, up to 4mm diameter, scattered over surface, slightly raised above surface with membraneous lip.

Texture and surface characteristics. Firm, compressible; surface even, smooth, fleshy, without obvious sculpturing, microscopically hispid.

Ectosome and subectosome. Well developed, dense, continuous palisade of ectosomal auxiliary spicule brushes in 1 or more plumose layers (several consecutive brushes of spicules overlaying one another); ectosomal skeleton supported by well developed series of discrete subectosomal plumose brushes, the latter not protruding through ectosome; subectosomal region cavernous with numerous plumose brushes of larger auxiliary subtylostyles.

Choanosome. Skeletal structure ranges from thin basal layer of spongin on substrate (hymedesmoid), to large, erect, non-anastomosing, single fibre nodes arising from encrusting basal layer of spongin (microcionid); basal (hymedesmoid) fibres very heavily echinated by erect choanosomal principal styles and acanthostyles; digitate (microcionid) fibre nodes cored by erect multispicular tracts of choanosomal principal spicules, congregated especially on ends of fibre nodes, forming plumose brushes and producing a series of ascending plumose or occasionally anastomosing tracts; subectosomal tracts mostly perpendicular, less commonly longitudinal in thinner sections, always plumose; echinating acanthostyles concentrated primarily in basal part of skeleton, rarely near surface, forming very dense erect layers on basal (hymedesmoid) fibres; mesohyl matrix moderately heavy, granular, abundant subectosomal auxiliary styles dispersed between choanosomal spicules; choanocyte chambers small, oval or elongate, 120-250µm diameter.

Megascleres (Table 35). Choanosomal principal styles long or short, slightly curved, with rounded or only slightly subtylote, smooth bases, tapering to sharp fusiform points; barely differentiated from subectosomal auxiliary spicules, being only marginally thicker and more curved and with predominantly smooth bases.

Subectosomal auxiliary subtylostyles relatively long, straight, thin, sharply pointed, with mostly microspined subtylote bases.

Ectosomal auxiliary subtylostyles short, relatively thick, slightly curved, usually with subtylote microspined bases.

Acanthostyles relatively long, thin, subtylote with aspinose necks, spines slender, long, slightly recurved.

Microscleres (Table 35). Palmate isochelae very abundant, in two size classes, the smaller often contort; larger with lateral alae marginally smaller than front ala, with lateral alae not completely fused to shaft, and front ala widely separated from lateral alae.

Toxas very abundant, short, thin, mostly wing-shaped with slightly curved centre and slightly unreflexed points, sometimes u-shaped with nearly straight arms and slight central curvature.

Larvae. Incubated larvae large, spherical parenchymella, up to 425µm diameter, with light matrix and no larval spicules.

REMARKS. The presence of two size classes of isochelae microscleres, some with geometric modifications, was not previously described for this species, but in other spicule measurements Thiele's (1903a) and Burton's (1934a) specimens agree closely. The two type specimens differ slightly in their gross morphology, and this provides some evidence to illustrate the effect of growth form directly determining skeletal development. Whereas the lectotype is thinly encrusting and hymedesmoid in architecture, the paralectotype is thick and has a very well developed microcionid choanosomal structure, with ascending fibre nodes closely resembling *C. (Microciona) seriata* (*sensu* Simpson, 1968a).

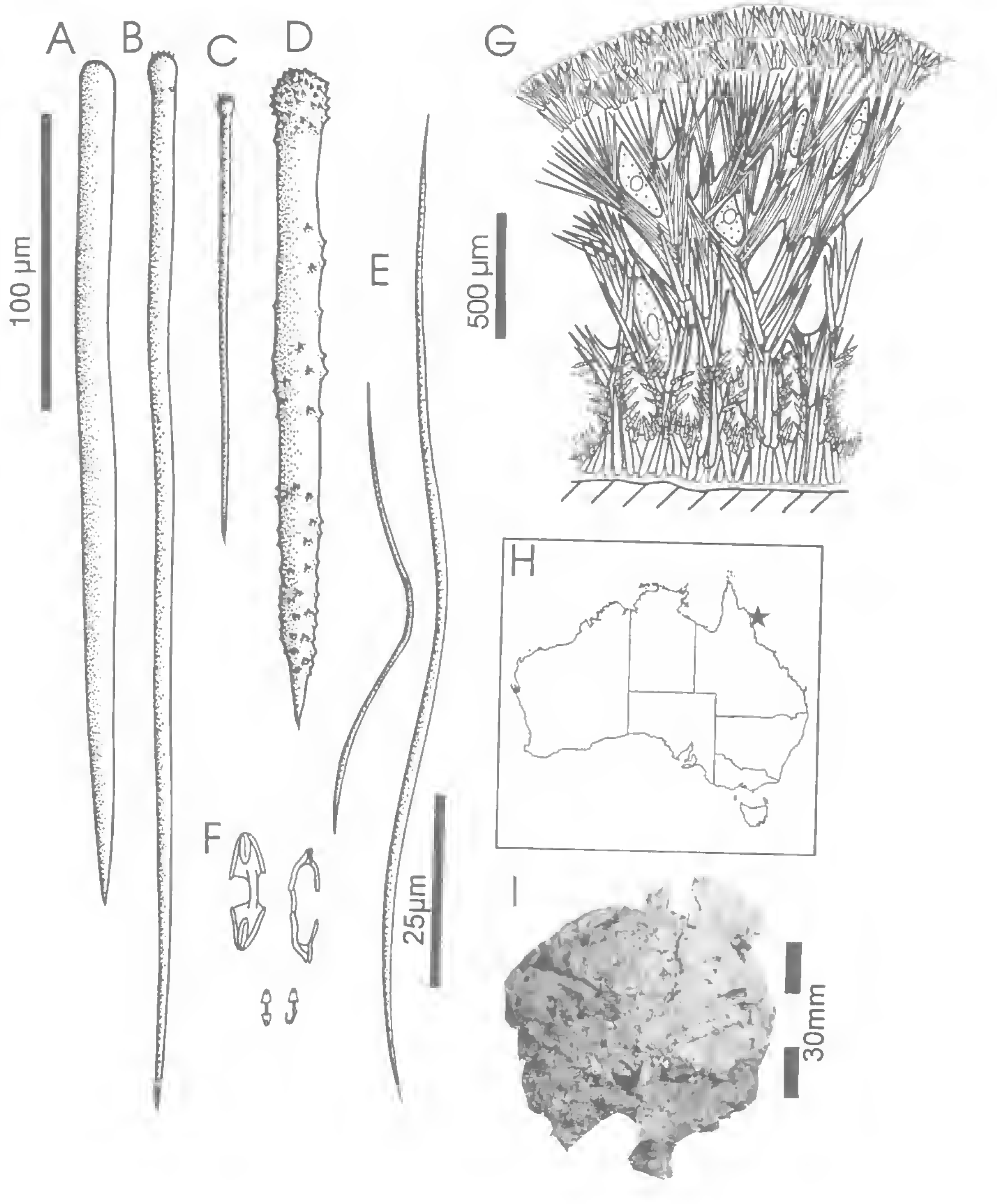

FIG. 155. *Clathria* (*Thalysias*) *coralliophila* (Thiele) (lectotype SMF1784). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyle. D, Echinating acanthostyle. E, Wing-shaped - U-shaped toxas. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution. I, Burton (1934) BMNH1930.8.13.107.

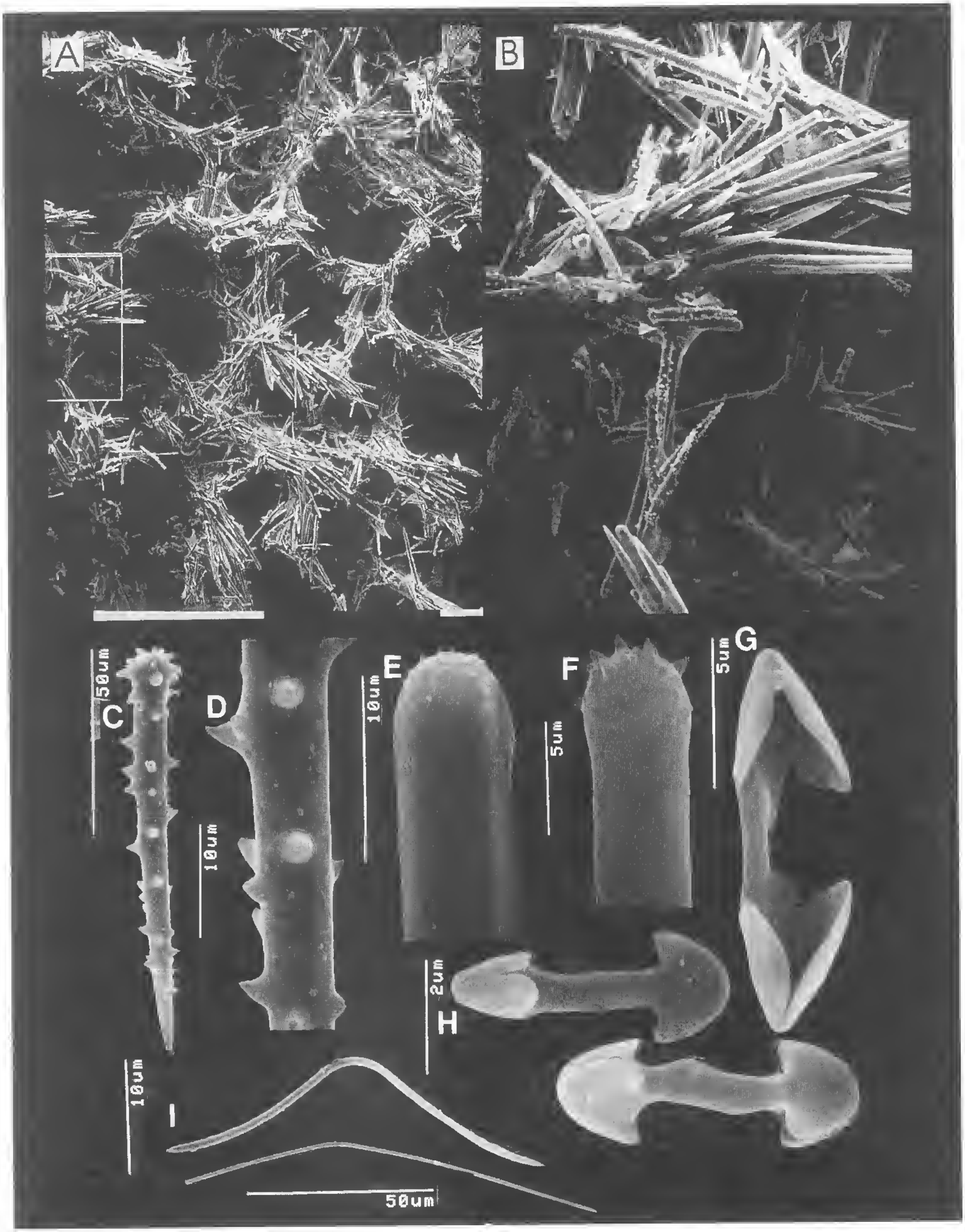

FIG. 156. *Clathria* (*Thalysias*) *coralliophila* (Thiele) (BMNH1930.8.13.107). A, Choanosomal skeleton. B, Fibre characteristics (x219). C, Echinating acanthostyle. D, Acanthostyle spines. E-F, Bases of subectosomal and ectosomal auxiliary subtylostyles. G-H, Palmate isochelae. I, Wing-shaped and u-shaped toxas.

TABLE 35. Comparison between present and published records of *Clathria* (*Thalysias*) *coralliophila* (Thiele). All measurements are given in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Lectotype (SMF1784)	Paralectotype (SMF787)	GBR (BMNH 1930.8.13.107)	PNG (NCIQ66C4518A)
Choanosomal principal styles	145-(252.8)-406 x 7-(10.5)-13	164-(279.8)-349 x 10-(11.5)-14	285-(347.5)-408 x 12-(13.8)-15	224-(345.2)-452 x 10-(12.4)-15
Subectosomal auxiliary styles	321-(355.4)-390 x 5-(7.3)-11	233-(302.7)-350 x 6-(7.2)-9	312-(390.4)-488 x 5-(7.9)-10	223-(347.3)-430 x 5-(7.2)-9
Ectosomal auxiliary styles	104-(150.1)-208 x 2-(3.1)-4	102-(115.8)-134 x 2-(3.2)-4	118-(140.9)-174 x 2-(3.1)-4.5	109-(121.5)-138 x 2-(3.5)-5
Echinating acanthostyles	48-(56.3)-71 x 4-(5.2)-6	52-(66.8)-78 x 3-(5.2)-8	84-(95.0)-105 x 4-(6.3)-8	76-(85.8)-95 x 5-(6.6)-8
Chelae I	2-(4.6)-8	3-(5.3)-8	2-(4.4)-8	3-(5.1)-8
Chelae II	11-(13.1)-16	11-(12.8)-15	11-(13.5)-17	10-(12.1)-15
Toxas	18-(76.6)-118 x 0.5-(0.9)-1.2	6-(35.2)-84 x 0.5-(0.7)-1.0	68-(140.3)-244 x 0.5-(1.4)-2	32-(125.5)-211 x 0.5-(1.2)-2

Were it not for the presence of a specialised ectosomal skeleton this specimen would be included in the *Microciona* group, illustrating the difficulty in recognising generic concepts solely on the basis of skeletal architecture: leptoclathriid, hymedesmoid or microcionid (e.g., the concepts of *Leptoclathria*, *Microciona*, *Clathria*).

Specimens from the Great Barrier Reef and Papua New Guinea also differ from the Indonesian population in having some larger spicules (notably toxas, principal styles and acanthostyles; Table 35), but generally spicule size and spicule geometry are comparable between all specimens, and there is no doubt that these populations are conspecific.

This species is related to the New Caledonian *C.* (*T.*) *araiosa*, differing in the distribution of spines on acanthostyles and auxiliary spicules, and specific dimensions of megascleres (which are generally smaller in *C.* (*T.*) *araiosa*), and Hooper & Lévi (1993a) suggested that these similarities in skeletal architecture and spicule geometry may be indicative of a sibling species relationship.

Clathria (Thalysias) costifera Hallmann, 1912
(Figs 157-158)

Clathria costifera Hallmann, 1912: 215-218, pl.31, fig.2, text-fig. 44; Vosmaer, 1935a: 648; Guiler, 1950: 6; Hooper & Wiedenmayer, 1994: 270.
Pseudanchinoe costifera; de Laubenfels, 1936a: 109.

MATERIAL. HOLOTYPE: AME650: E. coast of Flinders I., Bass Strait, Tas, 40°01'S, 148°02'E, coll. FIV 'Endeavour' (dredge). OTHER MATERIAL: S. AUST - AME1035 (dry). VIC - QMG300666 (NCIQ66C-3633-P) (fragment NTMZ3798).

HABITAT DISTRIBUTION. Rock reef; 15-60m depth; Bass Strait (Tas), Furneaux Is (Vic), Kingston (SA) (Fig. 157G).

DESCRIPTION. *Shape*. Large, thinly flabellate, plannar, 170-220mm high, 120-270mm wide, with small cylindrical basal stalk, 24-55mm long, 18-38mm diameter, corrugated apical margins.

Colour. Dark red alive (Munsell 2.5R4/10); grey-brown in ethanol.

Oscules. Small, up to 2.5mm diameter, scattered over entire surface, not apparently confined to any particular region.

Texture and surface characteristics. Harsh, firm, compressible, flexible; surface rugose with prominent striations, raised ridges and subectosomal grooves running longitudinally and radially.

Ectosome and subectosome. Dense ectosomal skeleton consisting of erect plumose brushes of smaller ectosomal auxiliary subtylostyles forming a continuous palisade on surface; subectosomal skeleton plumose with erect brushes of larger auxiliary subtylostyles arising and diverging from ends of choanosomal spicules in peripheral fibre skeleton; subectosomal megascleres protrude into and partially intermixed with smaller ectosomal spicules although both spicule categories with distinctly localised distribution.

Choanosome. Choanosomal skeletal architecture irregularly reticulate, with heavy fibres and ascending primary and transverse secondary fibre components; primary fibres have paucispicular core of both choanosomal principal and subectosomal auxiliary megascleres, and choanosomal styles also protrude through fibres to form ascending, plumose brushes near periphery; secondary fibres entirely aspicular; echinating acanthostyles relatively sparse at core, slightly more numerous towards peripheral skeleton; mesohyl matrix moderately light, with few megascleres scattered between fibres.

Megascleres. Choanosomal principal styles long or short, moderately slender, straight or only slightly curved at centre, with rounded or slightly subtylote smooth bases, fusiform points. Length 110-(189.6)-305µm, 4-(5.8)-7µm width (holotype 129-315 x 6-9µm).

Subectosomal auxiliary subtylostyles slender, straight or very slightly curved near basal end, with smooth well developed subtylote bases, fusiform points. Length 296-(321.3)-342µm, width 3-(3.8)-5µm (holotype 198-336 x 3-7µm).

Ectosomal auxiliary subtylostyles slender, straight or slightly curved at centre, with prominently subtylote smooth bases, fusiform points. Length 117-(152.2)-175µm, width 2-(2.6)-4µm (holotype 112-158 x 2-3.5µm).

Echinating acanthostyles slender, usually slightly curved at centre, with subtylote bases, fusiform points, rudimentary spination, small spines, aspinose 'neck'region proximal to base. Length 76-(85.4)-95µm, width 4-(4.3)-5µm (holotype 56-92 x 4-7µm).

Microscleres. Isochelae absent.

Toxas accolada, abundant, long, thin or rhaphidiform, with slightly angular central curvature, straight arms, unreflexed points, sometimes completely straight. Length 176-(215.2)-264µm, width 0.5-(0.8)-1.0µm (holotype 110-315 x 0.5-1.2µm).

REMARKS. Vosmaer's (1935a) remark that *C.* (*T.*) *costifera* was a synonym of *C.* (*C.*) *caelata* is not supported here, although both species do belong to Hallmann's (1912) '*spicata*' group (with spicules protruding from fibres in plumose brushes). They differ in toxa geometry (rhaphidiform accolada versus thicker accolada plus oxhorn, respectively), and *C.* (*C.*) *caelata* has only a single size category of auxiliary spicule (whereas *C.* (*T.*) *costifera* obviously belongs to *C.* (*Thalysias*) in having two categories).

Although apparently initially identified only by superficial comparison with the holotype (according to its specimen label), another specimen found in general collections of the AM(E1035) also belongs to this species. The more recent material described above from the Furneaux Islands is surprisingly only the third known record for this large, conspicuous, brightly coloured species. It differs only slightly from the holotype in having abundant, very small sand grains scattered throughout the mesohyl, and accolada toxas that are nearly straight (oxeote) or have only very slight, angular, central curvature (whereas in the holotype they are more generously curved).

Clathria (Thalysias) craspedia sp. nov.
(Figs 159-160, Plate 5E-F)

MATERIAL. HOLOTYPE: QMG301436: Wommin Reef, S. of Cook Island, Tweed Heads, NSW, 28°12.1'S, 153°34.8'E, 22m depth, 04.ii.1993, coll. J.N.A. Hooper & S.D. Cook (SCUBA). PARATYPE: QMG301452: Guy Rock, NW. side of Cook I., Tweed Heads, NSW, 28°11.7'S, 153°34.6'E, 15m depth, 04.ii.1993, coll. J.N.A. Hooper & S.D. Cook (SCUBA).

HABITAT DISTRIBUTION. In sand, coral rubble coral substrata at base of granite boulders; 15-22m depth; Tweed River region (NSW) (Fig. 159G).

DESCRIPTION. *Shape*. Growth form erect, lamellate, digitate or bulbous-lobate, 120-230mm long, 8-50mm diameter, partially burrowed into soft sediments with rhizomous root-like attachments found below the surface; digits slightly flattened, irregularly shaped, usually branching, typically anastomosing with or entirely fused to adjacent digits forming contiguous lamellae, occasionally isolated, single, completely attached or only partially attached to substrate, with tapering and frequently bifurcate apex.

Colour. Yellow-orange (Munsell 7.5YR 7/10) to red-brown alive (10R 6/10), grey-brown in ethanol.

Oscules. Large, 2-5mm diameter, slightly raised above surface, with membraneous lip, scattered over lateral margins of digits or on apex of digits.

Texture and surface characteristics. Firm, compressible, flexible; surface fleshy, mostly smooth, relatively even in cylindrical specimens, or with crenellated margins in erect bulbous specimens.

Ectosome and subectosome. Ectosomal skeleton composed of relatively dense but discrete bundles of smaller ectosomal auxiliary styles, supported beneath by paratangential, occasionally plumose brushes of larger subectosomal auxiliary subtylostyles arising from terminal choanosomal spongin fibres; mesohyl matrix light in choanosome but more darkly pigmented in peripheral skeleton.

Choanosome. Regularly reticulate, wide-meshed, with heavy spongin fibres differentiated into primary and secondary elements, but no axial compression or differentiation between axial and extra-axial regions of skeleton; fibre diameter relatively homogeneous throughout skeleton, with fibres distinguished mainly by numbers of coring spicules, whereas fibre nodes prominently bulbous, up to 160µm diameter; primary ascending fibres, 45-90µm diameter, cored by 4-8

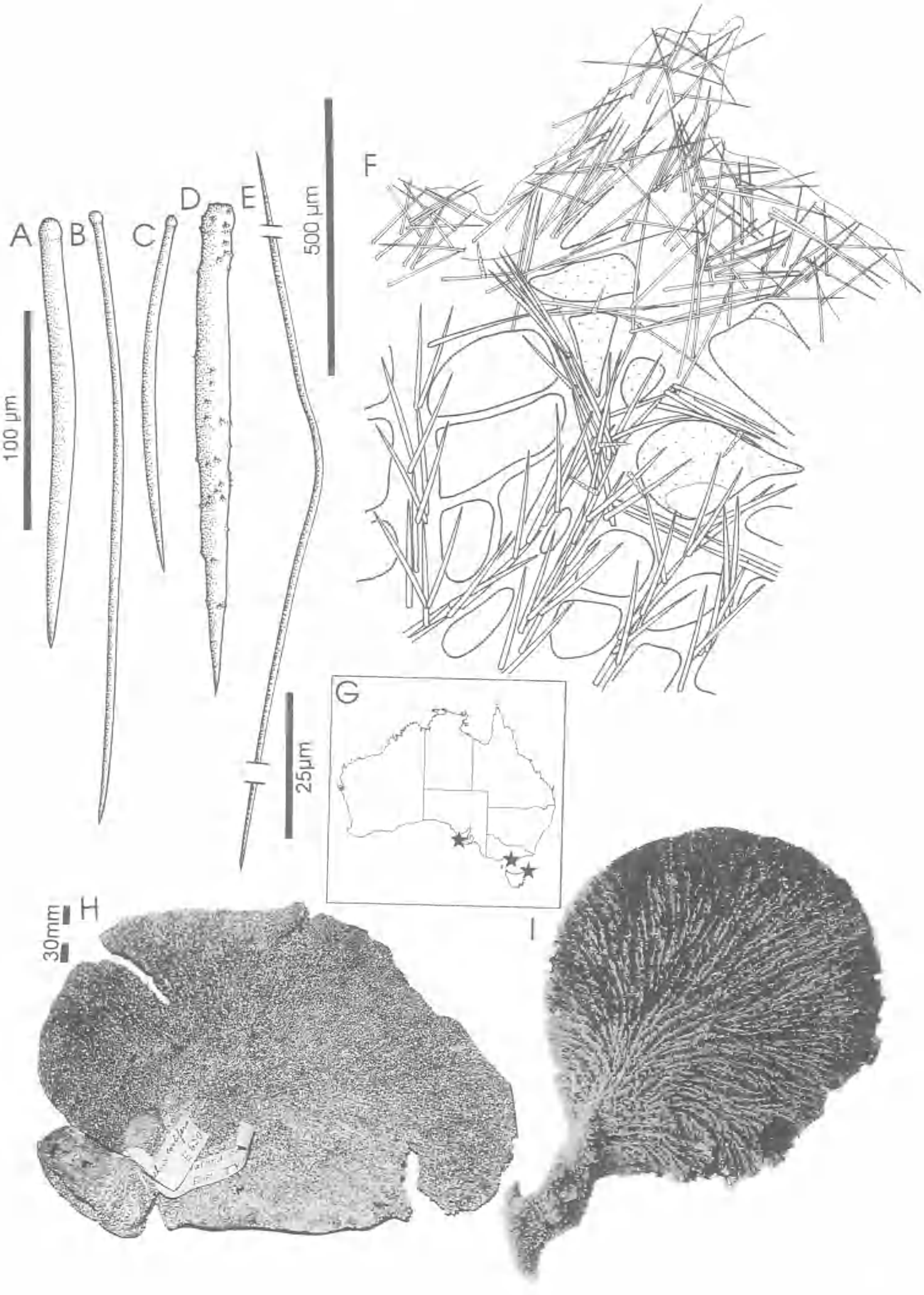

FIG. 157. *Clathria* (*Thalysias*) *costifera* Hallmann (holotype AME650). A, Choanosomal principal subtylostyle. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyle. D, Echinating acanthostyle. E, Accolada toxa. F, Section through peripheral skeleton. G, Australian distribution. H, Holotype. I, Live NTMZ3798.

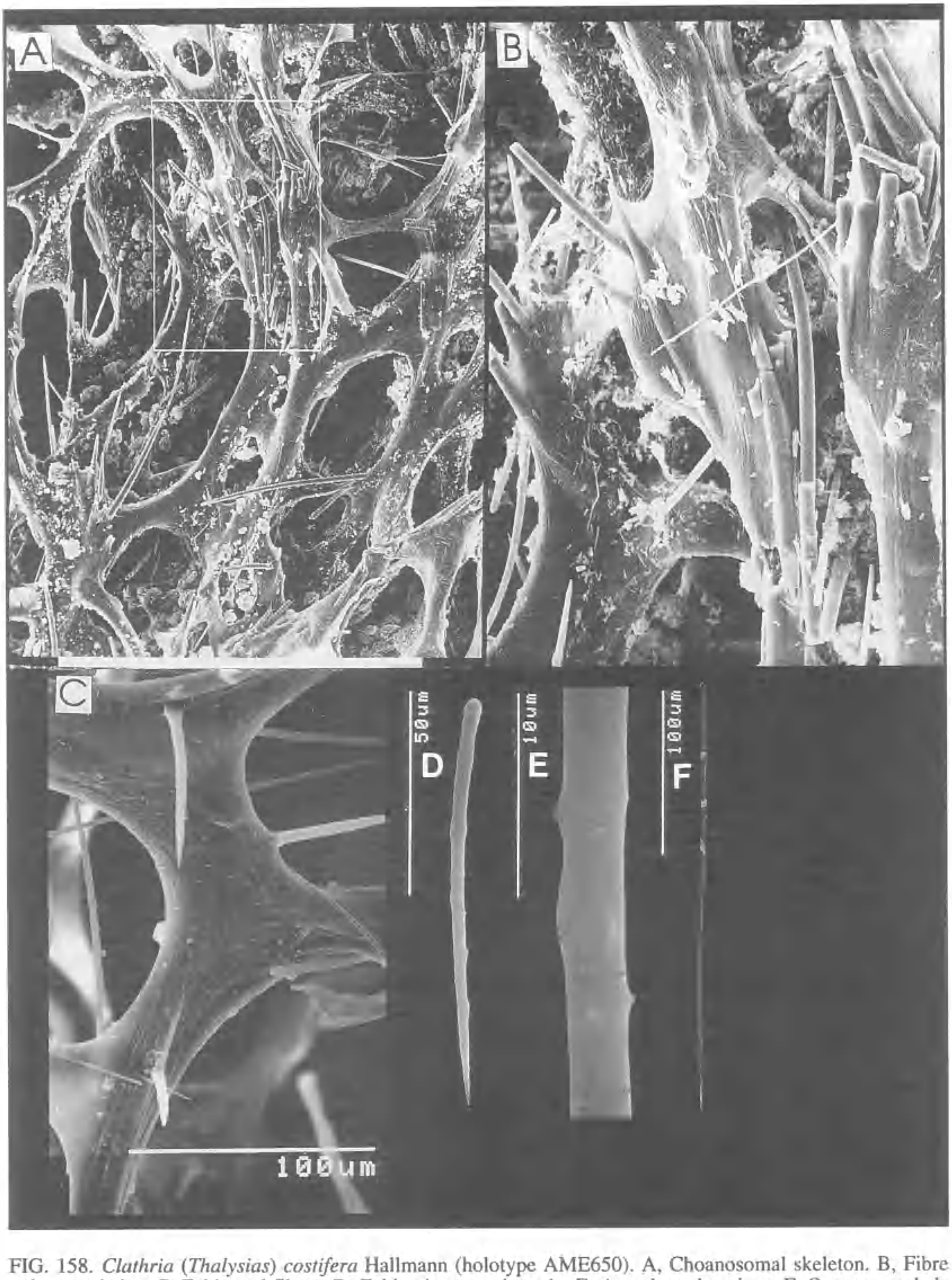

FIG. 158. *Clathria* (*Thalysias*) *costifera* Hallmann (holotype AME650). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinated fibres. D, Echinating acanthostyle. E, Acanthostyle spines. F, Oxeote accolada toxas.

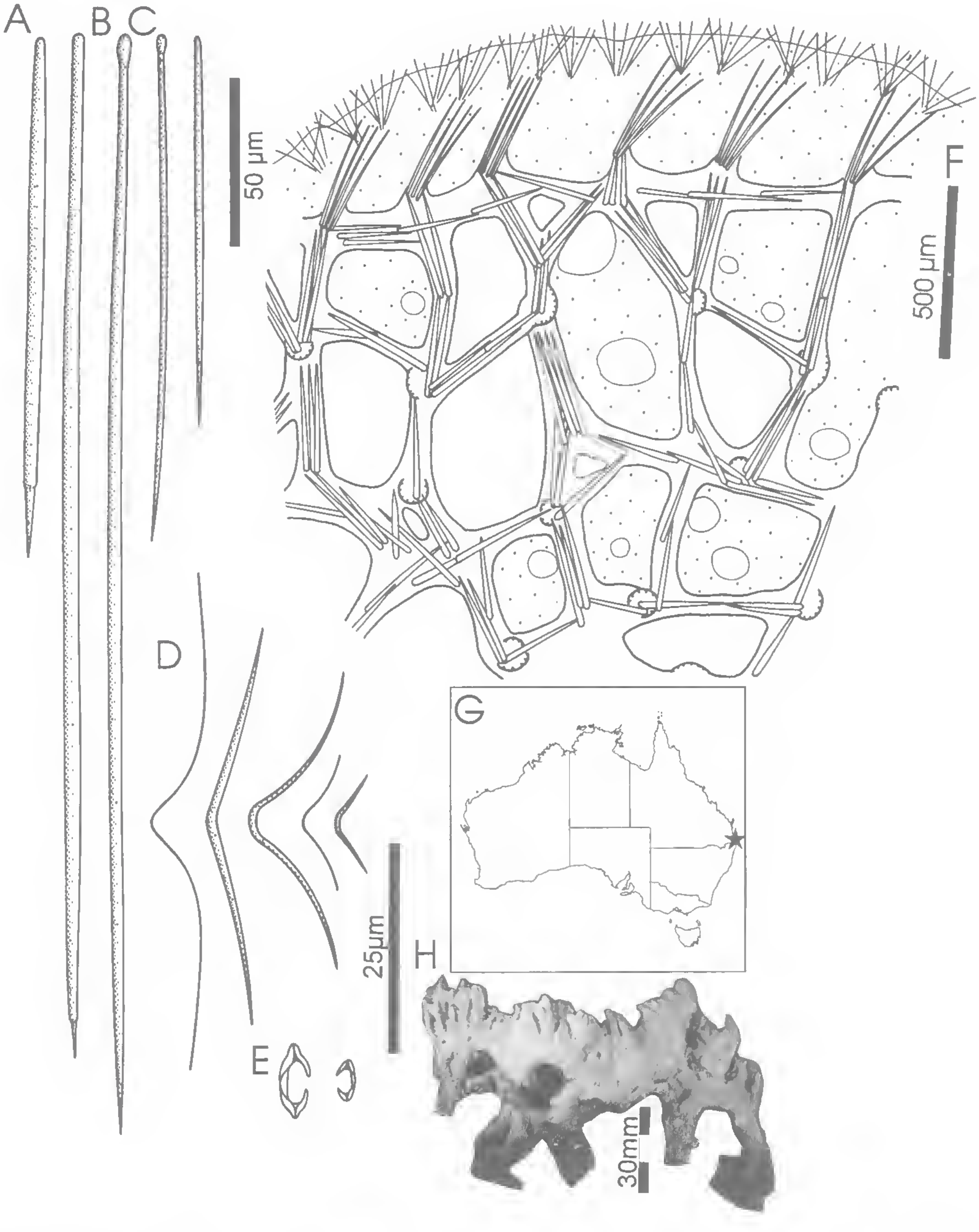

FIG. 159. *Clathria* (*Thalysias*) *craspedia* sp.nov. (paratype QMG301452). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyle/ style. D, Wing-shaped toxas. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, Paratype.

spicules abreast; secondary mainly transverse, connecting fibres, 40-65µm diameter, with 1-3 spicules abreast; fibre reticulation forms cavernous, triangular or oval meshes, 180-360µm diameter; echinating acanthostyles absent; mesohyl matrix heavy but only lightly pigmented

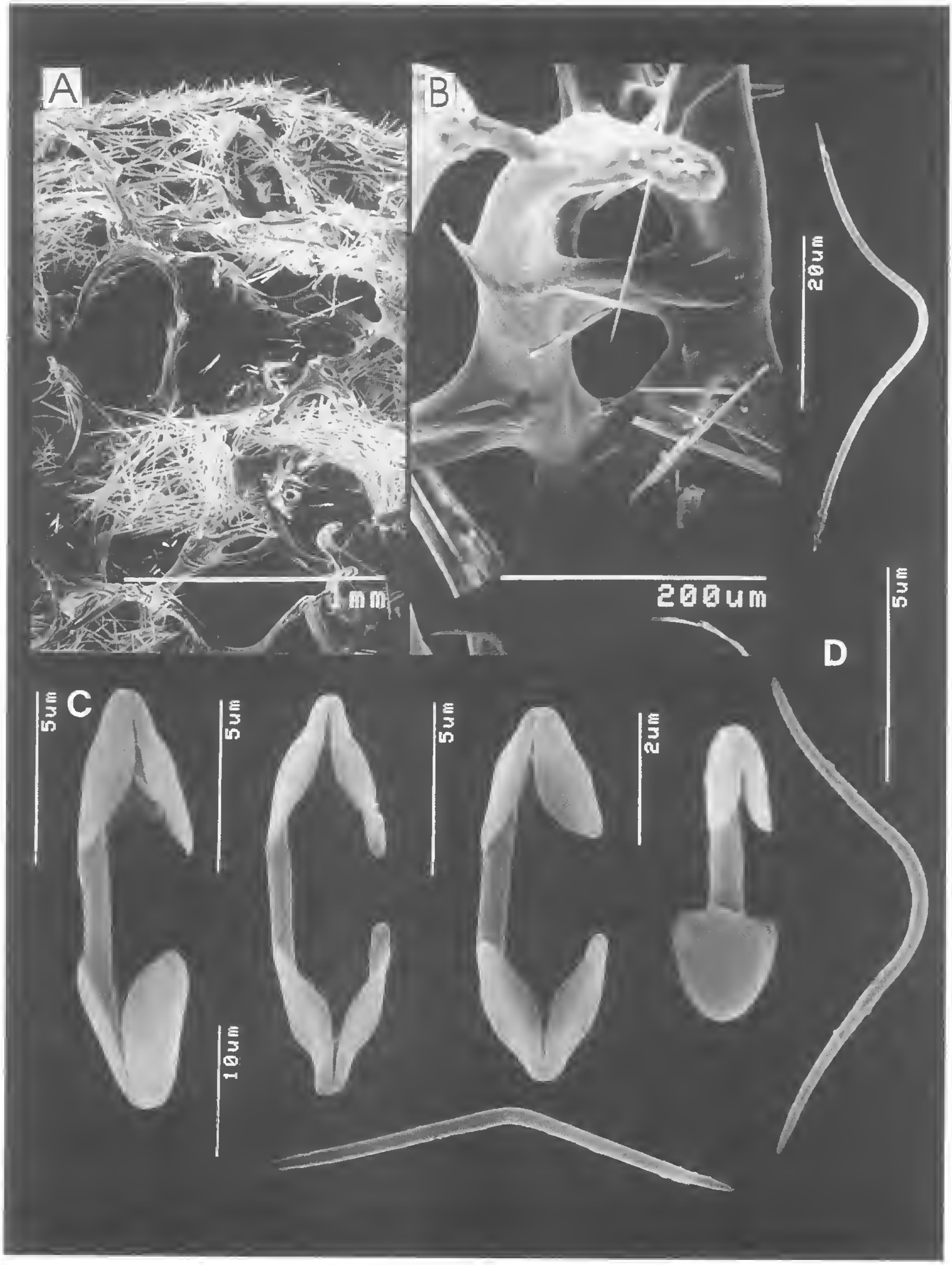

FIG. 160. *Clathria (Thalysias) craspedia* sp.nov. (holotype QMG301436). A, Choanosomal skeleton. B, Fibre characteristics. C, Palmate isochelae. D, Wing-shaped toxas.

thoughout choanosome, with numerous auxiliary spicules scattered between fibres; choanocyte chambers oval, 30-45µm diameter.

Megascleres. Choanosomal principal styles long or short, slender, straight, with evenly rounded smooth bases, telescoped points. Length 103-(221.4)-305µm, width 3-(4.1)-6µm.

Subectosomal auxiliary subtylostyles long, slender, straight, with smooth subtylote bases, fusiform points. Length 255-(316.6)-361µm, width 2.5-(3.8)-4.5µm.

Ectosomal auxiliary styles short, slender, straight, with smooth subtylote or evenly rounded bases, fusiform points. Length 107-(135.4)-174µm, width 1.5-(2.3)-3µm.

Echinating megascleres absent.

Microscleres. Palmate isochelae in single size class but variable length, with front ala slightly longer than lateral alae, lateral alae fused completely to shaft, front ala entire, and apex of spicule characteristically constricted, pointed. Length 5-(10.7)-14µm.

Toxas moderately short, thick, wing-shaped, with rounded or slightly angular central curvature, non-reflexed arms. Length 16-(42.7)-76µm, width 0.8-(1.9)-2.5µm.

ETYMOLOGY. Greek *kraspedon*, edge or border; occuring in the transition zone between the Solanderian and Peronian biogeographic provinces.

REMARKS. This is a sibling species of *C.* (*T.*) *cervicornis*, initially referred to that species based on skeletal structure and spicule types; it is separate by its different growth forms, surface features, live colouration and several subtle but important skeletal characters (i.e., *C.* (*T.*) *craspedia* lacks echinating megascleres, the bases of all megascleres have different terminations such as telescoped points, smooth subtylote swellings, principal and auxiliary megascleres are differentiated within fibres, and isochelae have a terminal tooth-like constriction). These differences in skeletal characters might be intraspecific variability, and the 4 populations (i.e., including *C.* (*T.*) *fusterna* sp. nov. and *C.* (*T.*) *corneolia*) may represent a single, widely dispersed species. I consider major differences in growth forms, surface features and live colouration are consistently correlated to skeletal differences, supporting distinct taxa for the Tweed River and Gulf of Carpentaria populations (*C.* (*T.*) *fusterna* below and Hooper & Lévi, 1993a). Whereas *C.* (*T.*) *cervicornis* is habitually long, thin, cylindrical, digitate, attached to the substrate at one or few points, and characteristically forms extensive tangles or thickets.

Clathria (Thalysias) darwinensis sp. nov.
(Figs 161-162, Plate 6B)

MATERIAL. HOLOTYPE - QMG303375: Stephen's Rock, West Arm, Darwin Harbour, NT, 12°29.2'S, 130°47.0'E, 19m depth, 24.ix.1993, coll. J.N.A. Hooper, L.J. Hobbs & B. Alvarez (SCUBA).

HABITAT DISTRIBUTION. Coral pinnacle near mouth of estuary, high sediment, turbid water; 19m depth; Darwin Harbour (NT) (Fig. 161H).

DESCRIPTION. *Shape.* Arborescent, very thinly branching, reminiscent of an *Axinella* (Axinellidae), 290mm high, 340mm maximum breadth of branches, with short basal stalk and point of attachment, 85mm long, 35mm diameter; main branches long, subcylindrical, up to 22mm diameter, slightly flattened, producing numerous smaller branches, up to 14mm diameter, convoluted, bulbous branch nodes, and branches repeatedly bifurcate, decreasing in size, towards tapering, pointed branch tips.

Colour. Pale cream alive (Munsell 5YR 8/2), darker yellow-brown in air, pale brown in ethanol.

Oscules. Small, on lateral sides of branches, up to 3mm diameter, surrounded by slightly raised membraneous lip.

Texture and surface characteristics. Soft, compressible, flexible branches, more harsh in ethanol; surface optically hispid, fleshy alive, even, bulbous, turgid, non-porous, but contracting greatly in ethanol producing porous, microconulose, uneven, irregular surface with scattered sharp conules.

Ectosome and subectosome. Ectosome dominated by long, single, erect principal styles at regular intervals on surface, 400-500µm apart, extending 300-450µm from surface, surrounded at base by paratangential tracts of both larger and smaller auxiliary subtylostyles, sometimes in plumose brushes surrounding base of principal spicule, more often in tangential or paratangential tracts; echinating acanthostyles also erect peripheral fibres, protruding through surface; subectosomal skeleton usually reduced with peripheral choanosomal fibres immediately below ectosome, whereas on surface conules auxiliary spicules produce more-or-less erect bundles associated with protruding principal spicules; no obvious localisation of smaller (ectosomal) or larger (subectosomal) auxiliary spicules, both appearing to be intermingled in surface brushes; mesohyl matrix moderately heavy in ectosomal skeleton.

Choanosome. Choanosomal skeleton irregularly reticulate, more regular (subreneiroid) in peripheral region, slightly compressed at axis; spongin fibres heavier in axis (110-160µm diameter) than at periphery (60-90µm diameter), producing wide-meshed reticulation and slight axial compression; fibres imperfectly divided into primary and secondary elements; primary fibres ascend to surface with little or no bifurcation and relatively few transverse connecting fibres, producing a nearly subreneiroid peripheral skeleton; primary fibres cored by 2-5 principal spicules, confined entirely to centre of each fibre, not protruding through fibres except at surface; secondary fibres short, more-or-less transverse, cored by 1-3 principal spicules abreast, interconnecting primary fibres mainly in axial region of skeleton, producing oval or elongate fibre meshes, generally smaller at core (120-190µm diameter) than periphery (170-240µm diameter); fibres moderately heavily echinated by acanthostyles, evenly distributed over fibres although possibly more abundant on exterior surface of fibres, especially in peripheral skeleton; mesohyl matrix moderately light, including some auxiliary spicules scattered between fibres; choanocyte chambers small, oval, 12-24µm diameter.

Megascleres. Choanosomal principal styles long, robust, slightly curved near base, entirely smooth, evenly rounded bases without any tylote swelling, long, tapering, fusiform points. Length 188-(301.8)-492µm, width 4-(12.8)-21µm.

Subectosomal auxiliary subtylostyles long, slender, straight, slightly subtylote microspined bases, fusiform points. Length 210-(282.2)-365µm, width 3-(4.3)-6µm.

Ectosomal auxiliary subtylostyles short, slender, straight, slightly subtylote microspined bases, fusiform points. Length 115-(135.3)-153µm, width 1.5-(2.1)-2.5µm.

Echinating acanthostyles long, slender, straight or slightly curved at centre, slightly subtylote bases, evenly spined except for aspinose 'neck' proximal to base; spines large, recurved, sharp; points sharp or slightly rounded, spinose. Length 96-(104.8)-116µm, width 3-(5.6)-11µm.

Microscleres. Palmate isochelae abundant, single size class, unmodified, with lateral and front alae approximately same length, long, lateral alae entirely fused to shaft, front ala detached along lateral margin. Length 15-(16.8)-18µm.

Toxas abundant, wing-shaped, thick, variable in length, with wide central curvature, slightly reflexed arms. Length I: 73-(111.2)-124µm, width 2-(3.8)-8µm; length II: 17-(26.2)-36µm, width 0.5-(1.7)-2.0µm.

ETYMOLOGY. For the type locality.

REMARKS. *Clathria (T.) darwinensis* is similar to *C. (T.) lendenfeldi*, *C. (C.) inanchorata* and *C. (T.) coppingeri* of the *spicata* group having choanosomal principal spicules protruding through peripheral spongin fibres forming a hispid surface. It differs from these species, and to some extent the concept of the *spicata* group, having smooth principal styles enclosed within spongin fibres, only protruding through fibres at the surface, and with all fibres more-or-less fully cored by principal spicules. This species is also similar to *C. (C.) transiens* in ectosomal structure (with prominent, individually protruding, smooth principal spicules), and also in having a vaguely sub-renieroid skeletal architecture, and toxa morphology, but the two differ in their acanthostyle geometry (in *C. (T.) darwinensis* these are long, slender, unevenly spined, with large, recurved spines, whereas in *C. (C.) transiens* they are short, unspined, or evenly lightly spined with vestigal spines), possession of 2 size classes of auxiliary styles (versus one size class), thinly branching gross morphology (versus bulbous branches), and spicule dimensions.

Clathria (Thalysias) dubia (Kirkpatrick, 1900)
(Figs 163-164)

Microciona dubia Kirkpatrick, 1900a: 128, 136, 141, pl.12, fig.3,3a, pl.13, fig.2a-f.
Cionanchora dubia; de Laubenfels, 1936a: 108.
Clathria dubia; Hooper & Wiedenmayer, 1994: 270.
cf.*Microciona prolifera*; Vosmaer, 1935a: 608, 643.

MATERIAL. HOLOTYPE: BMNH1898.12. 20.37: Flying Fish Cove, Christmas I., Indian Ocean, 10°25.5'S, 105°40'E, coll. Mr Andrews (dredge).

HABITAT DISTRIBUTION. Coral rubble; probably intertidal; Christmas I. (Indian Ocean) (Fig. 163H).

DESCRIPTION. *Shape.* Thickly encrusting lamella, 12mm diameter, on eroded bivalve shell.

Colour. Yellow preserved.

Oscules. Not seen.

Texture and surface characteristics. Compressible; optically smooth surface.

Ectosome and subectosome. Ectosome microscopically hispid, with bundles of ectosomal auxiliary megascleres protruding through surface, forming a relatively thick dermal palisade, arising from subdermal brushes of subectosomal

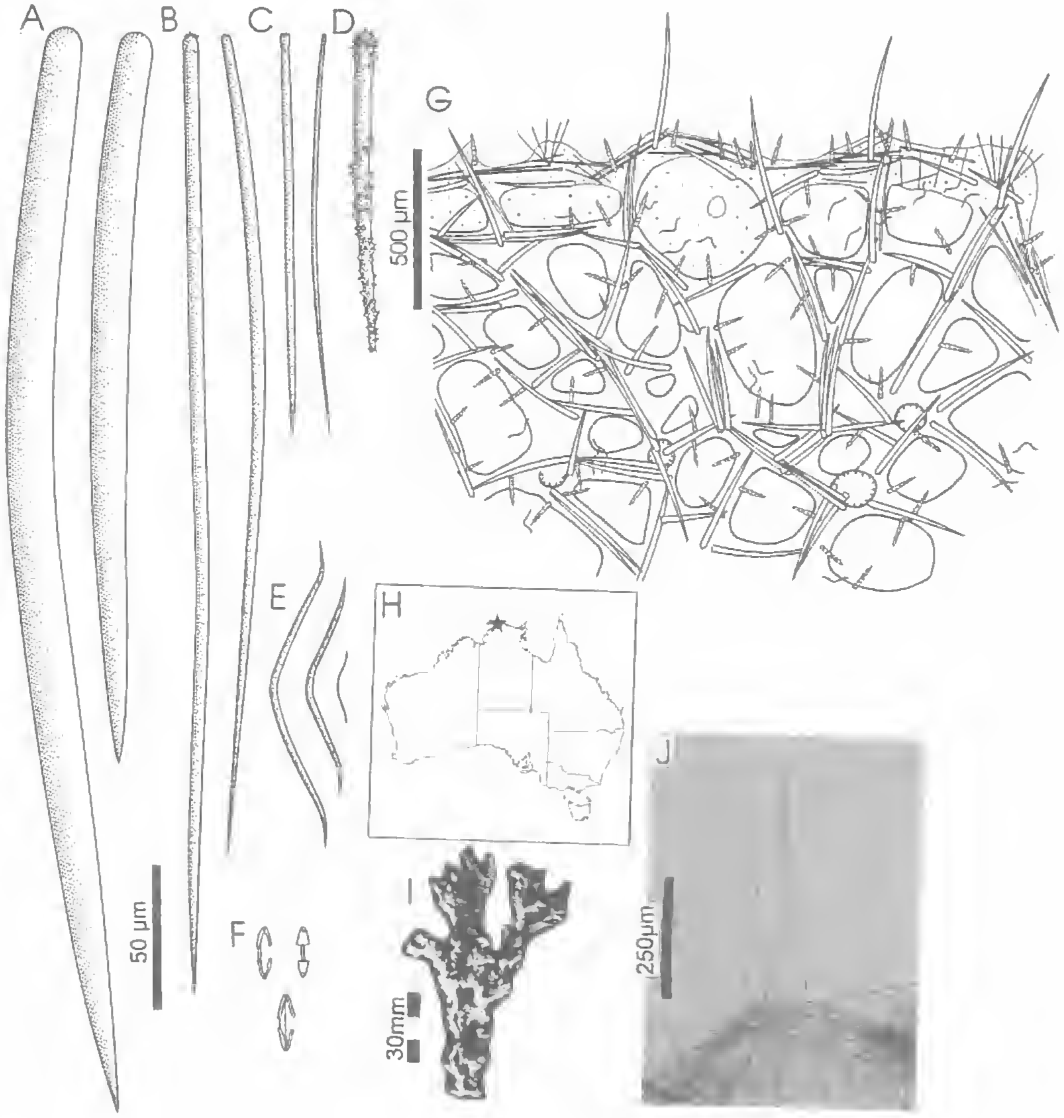

FIG. 161. *Clathria* (*Thalysias*) *darwinensis* sp.nov. (holotype QMG303375). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyles. C, Ectosomal auxiliary subtylostyle/ styles. D, Echinating acanthostyle. E, Wing-shaped toxas. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution. I, Holotype. J, Ectosoml specialization.

spicules; subectosomal skeletal architecture plumose, with subectosomal auxiliary subtylostyles arising from ends of choanosomal megascleres.

Choanosome. Choanosomal skeletal hymedesmoid, with a thin layer of spongin lying on substrate, in which bases of erect choanosomal principal subtylostyles and acanthostyles are embedded; small amounts of detritus scattered within skeleton; mesohyl matrix relatively heavy.

Megascleres. Choanosomal principal subtylostyles long or short, slightly curved, usually with prominently microspined bases, occasionally smooth, bases subtylote, points fusiform. Length 132-(195.6)-292µm, width 7-(10.6)-16µm.

Subectosomal auxiliary subtylostyles long, straight, with prominent subtylote, microspined

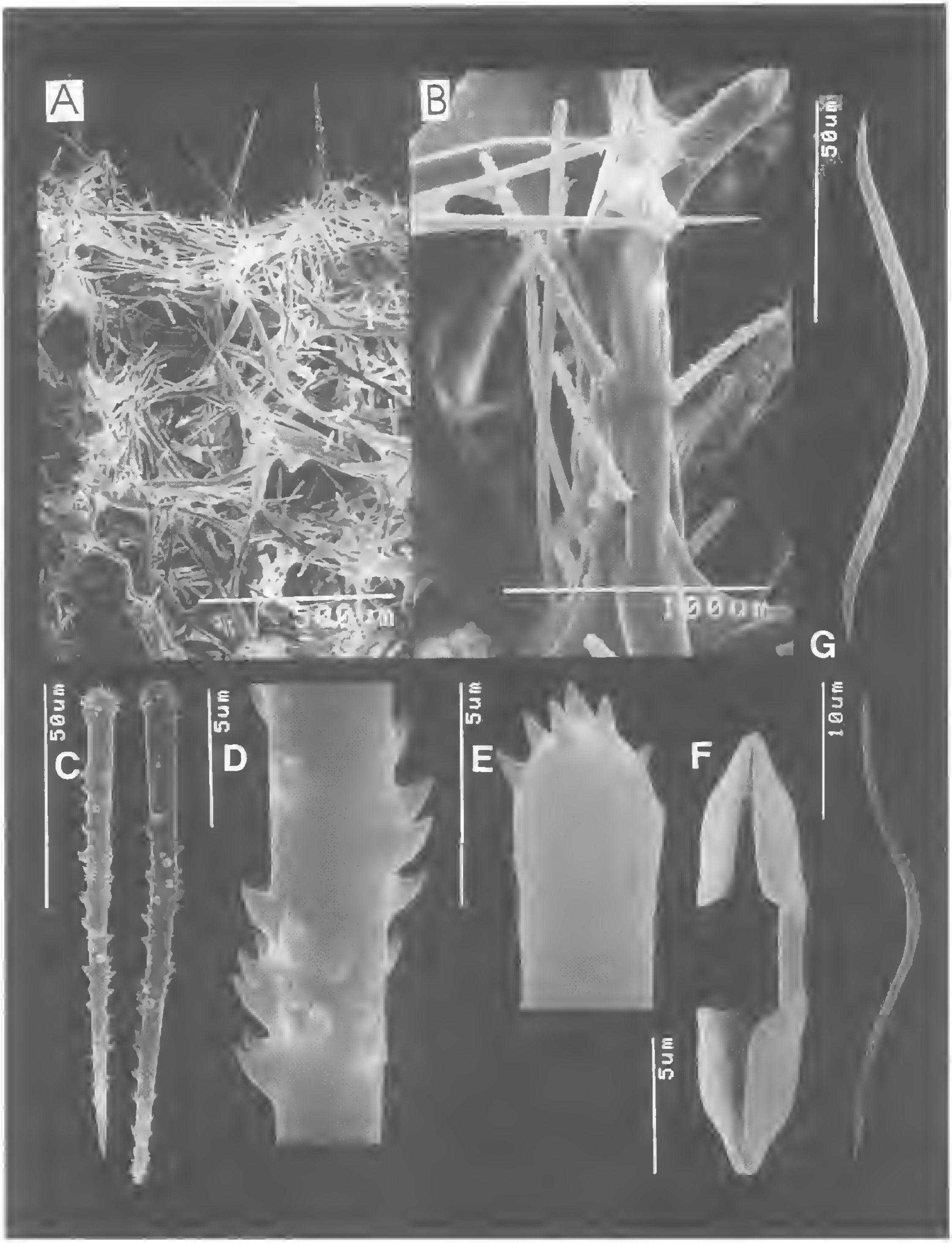

FIG. 162. *Clathria* (*Thalysias*) *darwinensis* sp.nov. (holotype QMG303375). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyles. D, Acanthostyle spines. E, Base of ectosomal auxiliary subtylostyle. F, Palmate isochela. G, Wing-shaped toxas.

bases, fusiform points. Length 218-(280.8)-314µm, width 4.5-(5.9)-7µm.

Ectosomal auxiliary subtylostyles straight, with well formed tylote, microspined bases, fusiform points. Length 86-(110.2)-153µm, width 3-(3.9)-5µm.

Acanthostyles short, thick, tapering club-shaped, with large recurved spines on basal portion of shaft, aspinose point; spines on basal swelling often bifurcate, greatly recurved. Length 35-(46.4)-54µm, width 5-(8.2)-11µm.

Microscleres. Isochelae modified palmate, very small, often anisochelate, with lateral alae completely fused to shaft, front ala often bifurcate or trifurcate, producing multiple, partially fused teeth. Length 2-(4.8)-8µm.

Toxas divided into two morphs - I: very short, ? oxhorn, relatively thick, slightly curved at centre, with slightly reflexed points. Length 4-(6.6)-9µm, width 0.5-(1.1)-1.5µm. II: Accolada, long, thin, with gently rounded or angular curvature, with straight points. Length 112-(195.2)-295µm, width 0.5-(1.4)-2µm.

REMARKS. De Laubenfels (1936a) assigned this species to *Cionanchora* because it supposedly had anchorate (rather than palmate) isochelae, although differing in no other respect from typical species of *Clathria* (*Thalysias*). Scanning electron micrographs show that these chelae have modified lateral alae completely fused to the shaft and front alae often split into several 'teeth', producing an anchorate-like appearance, but they are obviously palmate in origin. The species is well characterised by it megasclere and microsclere geometry, although the species is so far known only from a single specimen from Christmas Island.

Clathria (Thalysias) erecta (Thiele, 1899)
(Figs 165-166, Table 36)

Rhaphidophlus erectus Thiele, 1899: 14-15, pl.2, fig2; Thiele, 1903a: 957; Hallmann, 1912: 177; Lévi, 1961a: 136-137, text-fig.10, pl.1.
cf. *Microciona prolifera*; Vosmaer, 1935a: 611.

MATERIAL. LECTOTYPE: NMB19 (fragment BMNH1908.9.24.163): Kema, Minahassa, Celebes (Sulawesi), Indonesia, 2°S, 120°30'E, coll. P. & F. Sarasin (dredge). PARALECTOTYPE: NMB18 (fragment BMNH1930.7.1.7): same data. OTHER MATERIAL: NT - NTMZ3113 (fragment QMG-300579), NTMZ3146 (fragment QMG300219). INDONESIA - SMF1788.

HABITAT DISTRIBUTION. Coral reef and coral rubble; 16-20m depth; known Australian distribution: Parry Shoals, Timor Sea (Fig. 165H); also Moluccas and Sulawesi, Indonesia (Thiele, 1899, 1903a), Vietnam (Lévi, 1961a).

DESCRIPTION. *Shape.* Elongate, arborescent, 90-240mm high, with a short cylindrical stem, 25-75mm long, 15-25mm diameter, bifurcate and relatively thick cylindrical branches, up to 35mm diameter, or lamellate, fused, erect digitate branching pattern.

Colour. Orange to dull brown alive (Munsell 5YR 7/10 - 7.5YR 7/6), beige in ethanol.

Oscules. Numerous, small, up to 2mm diameter, scattered over all sides of branches, below surface conules.

Texture and surface characteristics. Firm, flexible, compressible; highly conulose, rugose surface, pocked with holes and drainage canals.

Ectosome and subectosome. Thin but prominent discrete brushes of small auxiliary subtylostyles standing more-or-less perpendicular to surface; subectosomal region cavernous, with plumose tracts of larger subectosomal auxiliary, and choanosomal principal megascleres supporting ectosomal skeleton and protruding through surface.

Choanosome. Very irregularly reticulate, cavernous, with very large primary fibres running longitudinally through branches, up to 140µm diameter, interconnected by smaller tangled secondary fibres, up to 70µm diameter, producing vaguely triangular skeletal meshes, up to 450µm diameter; both primary and secondary fibres heavy, fully cored by multispicular tracts of choanosomal principal styles, and lightly echinated by acanthostyles, the latter slightly more abundant at fibre nodes; mesohyl matrix moderately heavy, with auxiliary megascleres dispersed between fibres.

Megascleres (Table 36). Choanosomal principal styles characteristically curved near basal end, hastate pointed, with rounded or faintly subtylote, smooth bases.

Subectosomal auxiliary subtylostyles long, thick, straight, fusiform pointed, faintly subtylote smooth bases, or minutely microspined bases.

Ectosomal auxiliary subtylostyles small, slender, prominently subtylote, with microspined bases.

Acanthostyles long, thick, with subtylote bases, fusiform points, heavily spined on base and point but unspined neck; spines characteristically large, recurved, heavily concentrated at point of spicule.

Microscleres (Table 36). Palmate isochelae in two size classes, the smaller sometimes contort.

TABLE 36. Comparison between present and published records of *Clathria (Thalysias) erecta* (Thiele). Measurements in μm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Holotype (NMB19)	(Lévi, 1961) (Vietnam)	Specimens (2) (Timor Sea)
Choanosomal principal styles	174-(224.6)-292 x 9-(13.7)-19	190-300 x10-22	142-(197.7)-259 x 6-(10.9)-14
Subectosomal auxiliary styles	194-(241.2)-285 x 4-(6.3)-8	255-310 x 6-7	165-(226.9)-262 x 4-(6.6)-9
Ectosomal auxiliary styles	92-(138.5)-198 x 3-(4.2)-5	100-200 x 3-5	85-(102.7)-134 x 3-(4.2)-6
Echinating acanthostyles	64-(72.6)-78 x 6-(6.8)-8	80-95 x 9-10	61-(68.5)-75 x 5-(6.7)-8
Chelae I	4-(6.1)-8	?	4-(6.3)-9
Chelae II	12-(13.4)-15	10-17	10-(12.2)-14
Toxas	12-(197.0)-265 x 0.8-(1.1)-1.5	120-160 x ?	25-(138.5)-204 x 0.5-(1.2)-1.5

Toxas accolada, relatively long, thin, with small, angular central curvature, or rounded centrally, straight arms and reflexed points; juvenile forms resemble oxhorn toxas.

Larvae. Incubated parenchymella larvae small, spherical, 140-190μm diameter, with light mesohyl matrix and larval toxas dispersed within axis.

REMARKS. This species is a sibling of *C.* (*T.*) *reinwardti* based on similarities in skeletal structure (even-meshed, cavernous primary and secondary tracts), geometry of some spicules (smooth, curved principal styles; robust subectosomal auxiliary subtylostyles; slender accolada toxas with slightly angular central curvature; 2 sizes of isochelae), and live colouration (orange-brown). They differ significantly in growth form (*C. erecta* is arborescent, thickly branching; *C. reinwardti* has only thin or slightly thick cylindrical branches), surface features (prominent surface conules versus completely smooth or irregularly rugose surface), and acanthostyle geometry (tapering, sharply pointed and subtylote bases versus rounded 'points' and only slightly subtylote or rounded bases). Spicule dimensions are also comparable (Tables 36, 39). These differences are consistent for the six known specimens of *C.* (*T.*) *erecta* and for the present these species are maintained as distinct.

Another species, *C.* (*T.*) *fasciculata* Wilson, from Indonesia and the central west Pacific (Wilson, 1925; de Laubenfels, 1954), is also very similar to both *C.* (*T.*) *erecta* and *C.* (*T.*) *reinwardti* in the diversity and geometry of its spicules, but it differs again in growth form (being bushy, flattened branching), skeletal structure (more irregularly reticulate) and toxa morphology (includes asymmetrical sinuous forms). It is possible that all three species are extreme morphological variants of a single species, in which case *reinwardti* would have priority, but all these morphological differences are consistent within each growth form type (morphospecies) and probably represent fixed genetic differences.

Clathria (*T.*) *erecta* is also vaguely similar to *C.* (*T.*) *vulpina* in the overall structure of spongin fibre skeleton and spicule skeleton, both species having a characteristic, more-or-less triangular skeletal network of fibre meshes fully cored by principal styles, although this fibre reticulation is much more regular in the latter species. This structural feature is prominent and their inferred similarities are immediately obvious upon casual observation, but the two species differ from each other in most other respects.

The presence of two size classes of isochelae, including contort forms, has not been recorded previously for *C.* (*T.*) *erecta* but are consistently present in all specimens including the type material. Thiele's (1899, 1903a) Indonesian specimens are identical to the Timor Sea specimens in most respects (see Table 36), whereas Lévi's (1961a) material from Vietnam differs slightly in growth form (compare Lévi's (1961a) Plate 1 with Fig. 165I-J of the present study), and spicule dimensions are relatively larger.

Clathria (Thalysias) fusterna sp. nov.
(Figs 167-168)

MATERIAL. HOLOTYPE: QMG303240: NE. Cape Grenville, Shelburne Bay, Qld., 11°03'S, 143°14'E, 27m depth, 04.iv.1993 (dredge). PARATYPES: QMG300862: NW. of Vrilya Point, Gulf of Carpentaria, Qld, 11°12.7'S, 142°05.9'E, 21m depth, 30.xi.1991 (dredge). QMG301008: NW. of Port Musgrave, Gulf of Carpentaria, Qld, 11°18.9'S, 140°55.8'E, 41m depth, 27.xi.1991 (dredge). OTHER MATERIAL: GULF OF CARPENTARIA, - QMG301013, QMG303462. RED SEA - PIBOC04-17 (fragment QMG300064).

HABITAT DISTRIBUTION Soft sediments, mud, shell grit; 21-58m depth; Shelburne Bay, Torres Strait and Gulf of Carpentaria (FNQ), Gove Peninsula (NT) (Fig. 167H); also Eritrea, Red Sea (present study).

DESCRIPTION. *Shape*. Erect, club-shaped growth form 190-280mm long, with long thin, cylindrical stalk, 80-150mm long, up to 12mm

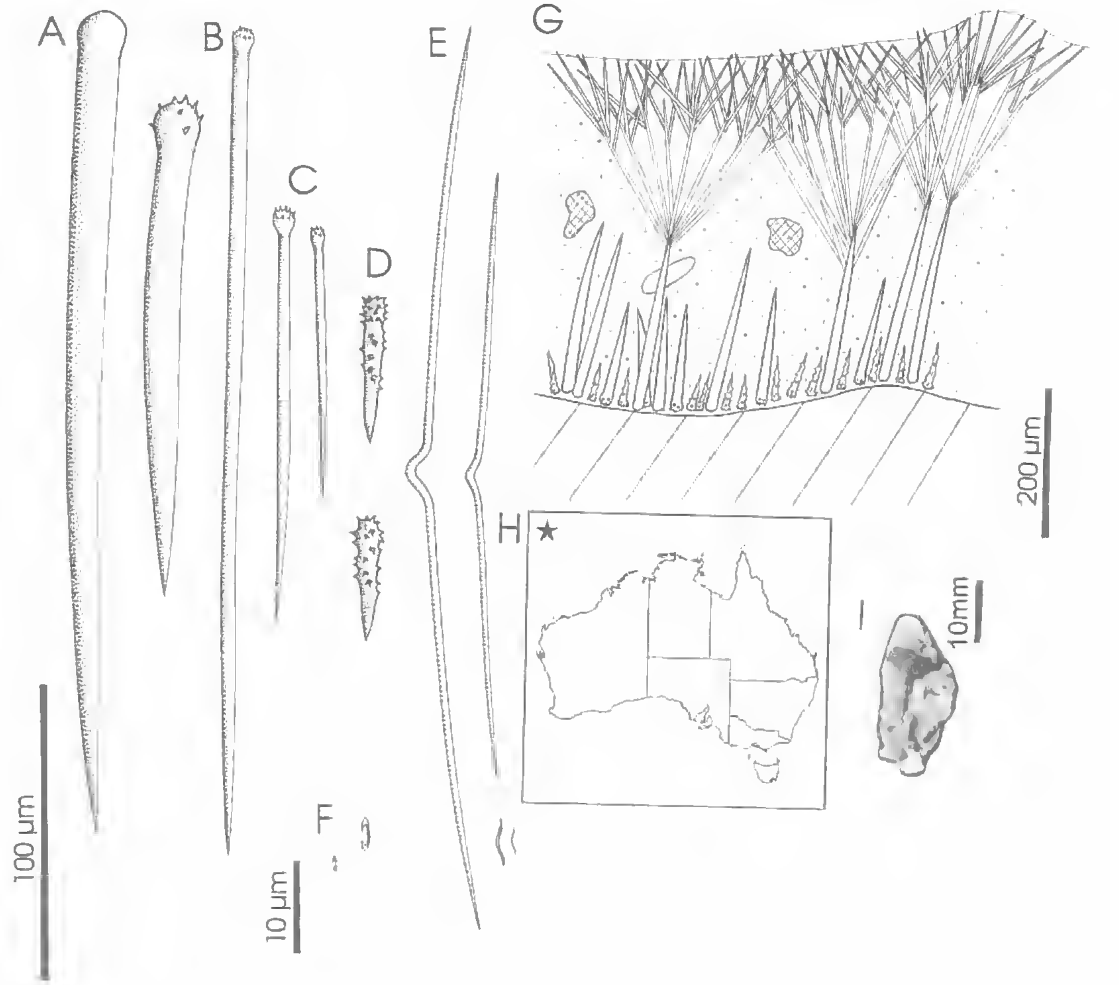

FIG. 163. *Clathria* (*Thalysias*) *dubia* (Kirkpatrick) (holotype BMNH1898.12.20.37). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyles. D, Echinating acanthostyles. E, Accolada and oxhorn toxas. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution. I, Holotype.

diameter, bifurcating several times towards base becoming filamentous, rhizomous (for embedding in soft sediments); rhizomous roots encrusted with sand and shell fragments; apex of club usually large, 50-100mm diameter, 60-110mm long, composed of fused, tightly anastomosing digits; adjacent digits fused with dense fleshy surface; apex of digits tapering slightly pointed.

Colour. Grey-brown on-deck (Munsell 2.5Y 8/2), grey in ethanol.

Oscules. Few small pores, 0.5mm diameter, possibly oscules, scattered near apex of digits (seen in preserved material only).

Texture and surface characteristics. Stalk tough, wiry, flexible, apex of club softer, more compressible but with firm axis; slightly convoluted surface with sparse conules, up to 3mm high, low ridges or occasional folds on anastomosing digits.

Ectosome and subectosome. Dense ectosomal skeleton composed of discrete bundles of smaller ectosomal auxiliary subtylostyles supported below by paratangential or plumose brushes of subectosomal auxiliary subtylostyles; mesohyl matrix moderately lightly pigmented in ectosomal skeleton; ectosomal and subectosomal spicule skeletons very dense but together comprise only 10-20% of branch diameter.

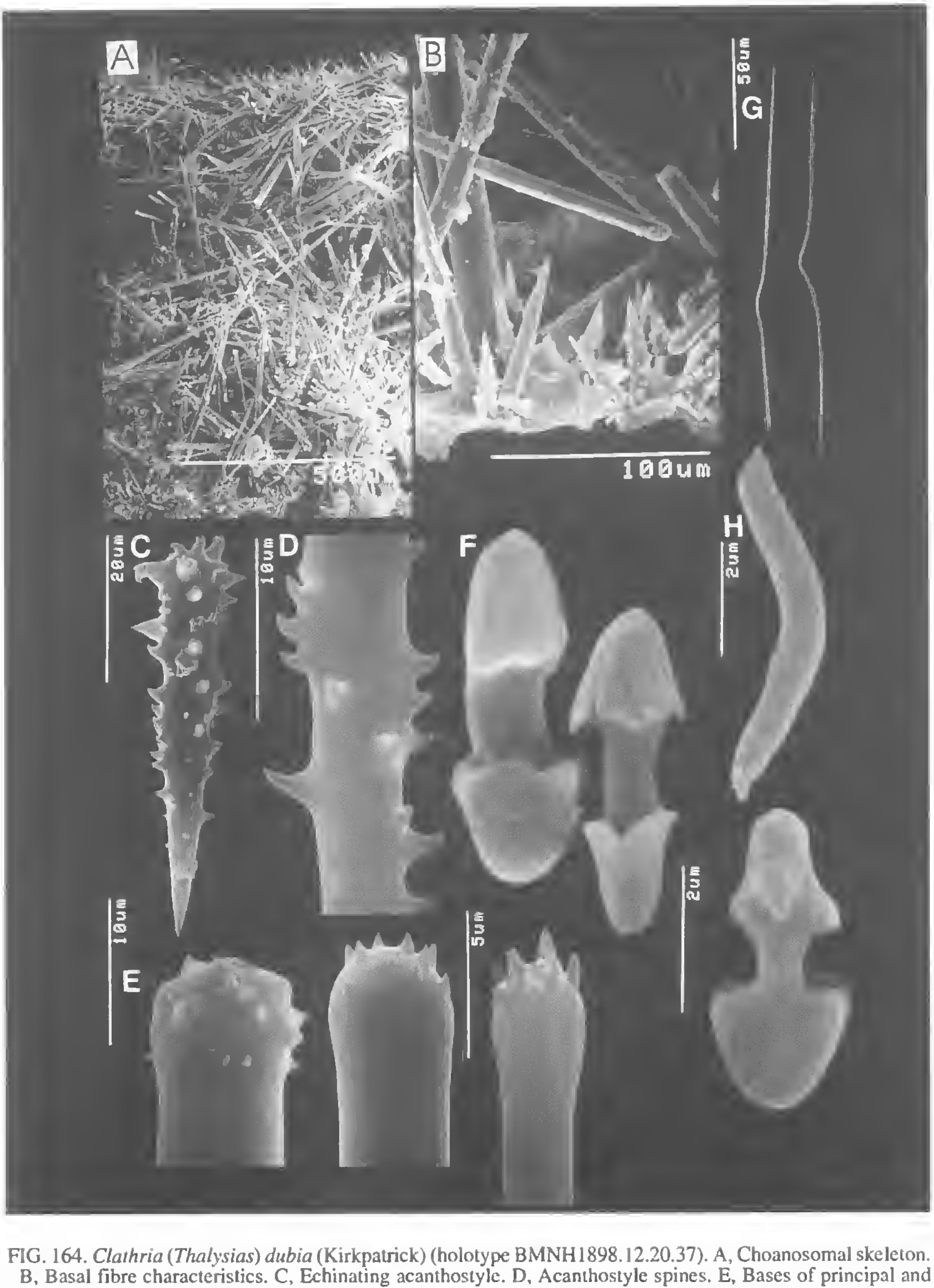

FIG. 164. *Clathria* (*Thalysias*) *dubia* (Kirkpatrick) (holotype BMNH1898.12.20.37). A, Choanosomal skeleton. B, Basal fibre characteristics. C, Echinating acanthostyle. D, Acanthostyle spines. E, Bases of principal and auxiliary subtylostyles. F, Modified palmate isochelae. G, Accolada toxas. H, Juvenile oxhorn toxa.

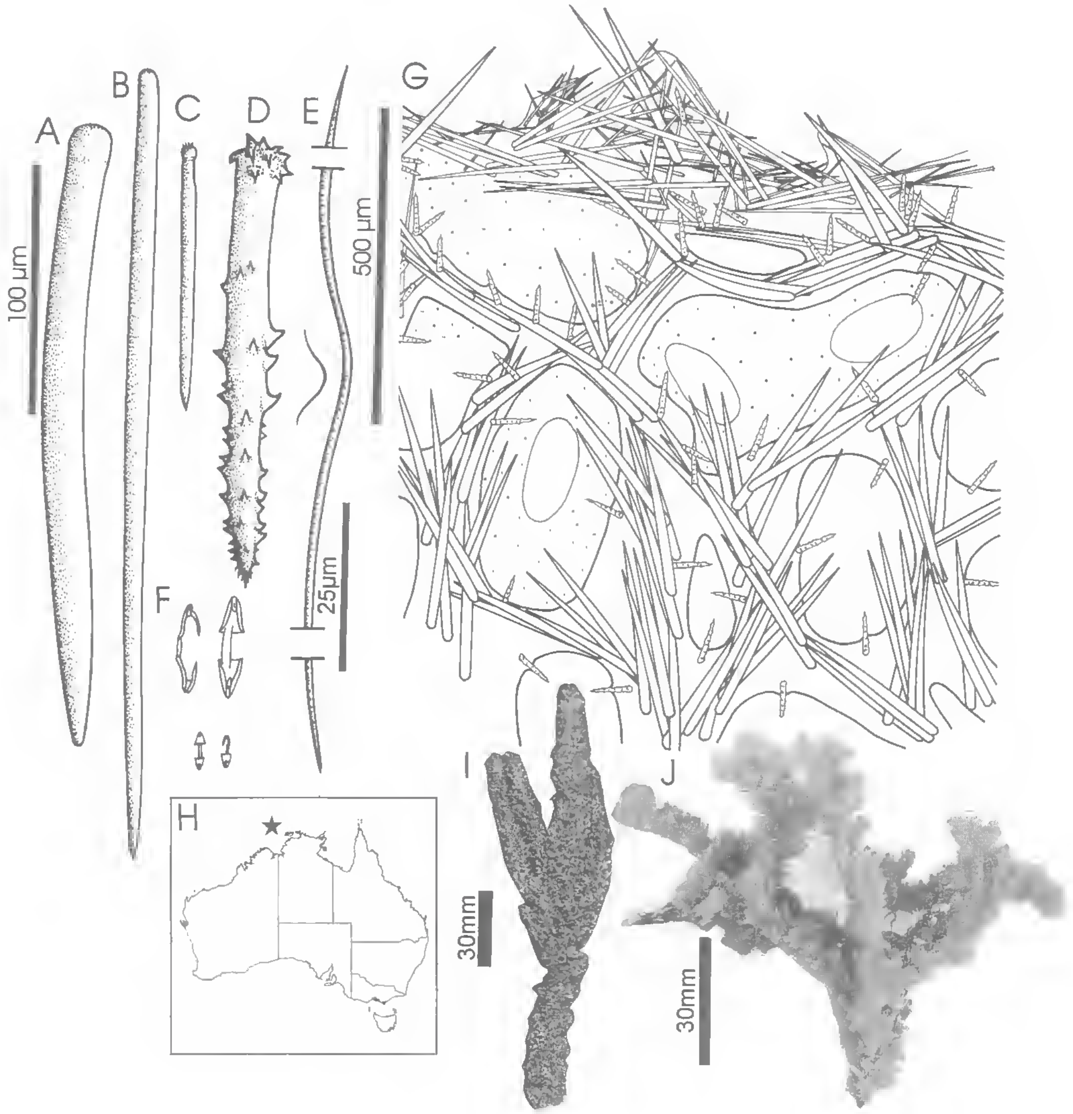

FIG. 165. *Clathria* (*Thalysias*) *erecta* (Thiele) (holotype NMB19). A, Choanosomal principal subtylostyle. B, Subectosomal auxiliary style. C, Ectosomal auxiliary subtylostyle. D, Echinating acanthostyle. E, Accolada toxas. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution. I, Holotype. J, NTMZ3113.

Choanosome. Heavily reticulate architecture; spongin fibres short, thick, 90-200µm diameter, heavily collagenous, forming tight oval or rectangular meshes, 150-400µm diameter; fibres not obviously differentiated into primary or secondary elements, but meshes slightly more cavernous in peripheral skeleton than in axis; fibres virtually fully cored by multispicular tracts of both subectosomal auxiliary subtylostyles and choanosomal principal styles, together occupying 80-90% fibre diameter, interconnected by very large, bulbous fibre nodes, 160-400µm diameter; fibre nodes contain larger bundles of spicules than in connecting fibres, indicating that fibres ascending through branches are heavier than fibres running from axis to peripheral skeleton; echinating acanthostyles abundant, concentrated mainly on fibre nodes; mesohyl

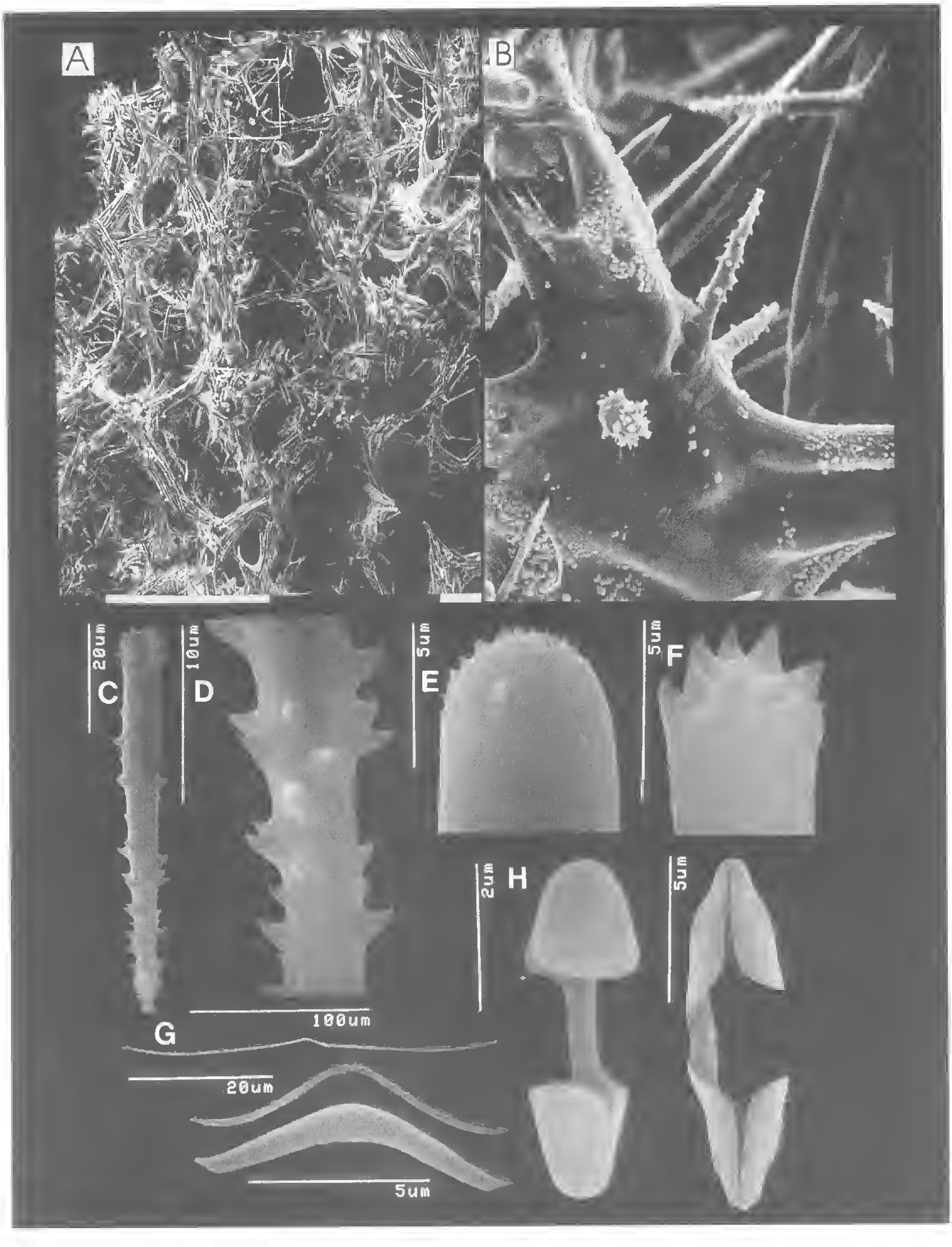

FIG. 166. *Clathria* (*Thalysias*) *erecta* (Thiele) (QG300219). A, Choanosomal skeleton. B, Fibre characteristics (x389). C, Echinating acanthostyle. D, Acanthostyle spines. E-F, Bases of subectosomal and ectosomal auxiliary subtylostyles. G, Accolada and juvenile toxas. H, Palmate isochelae.

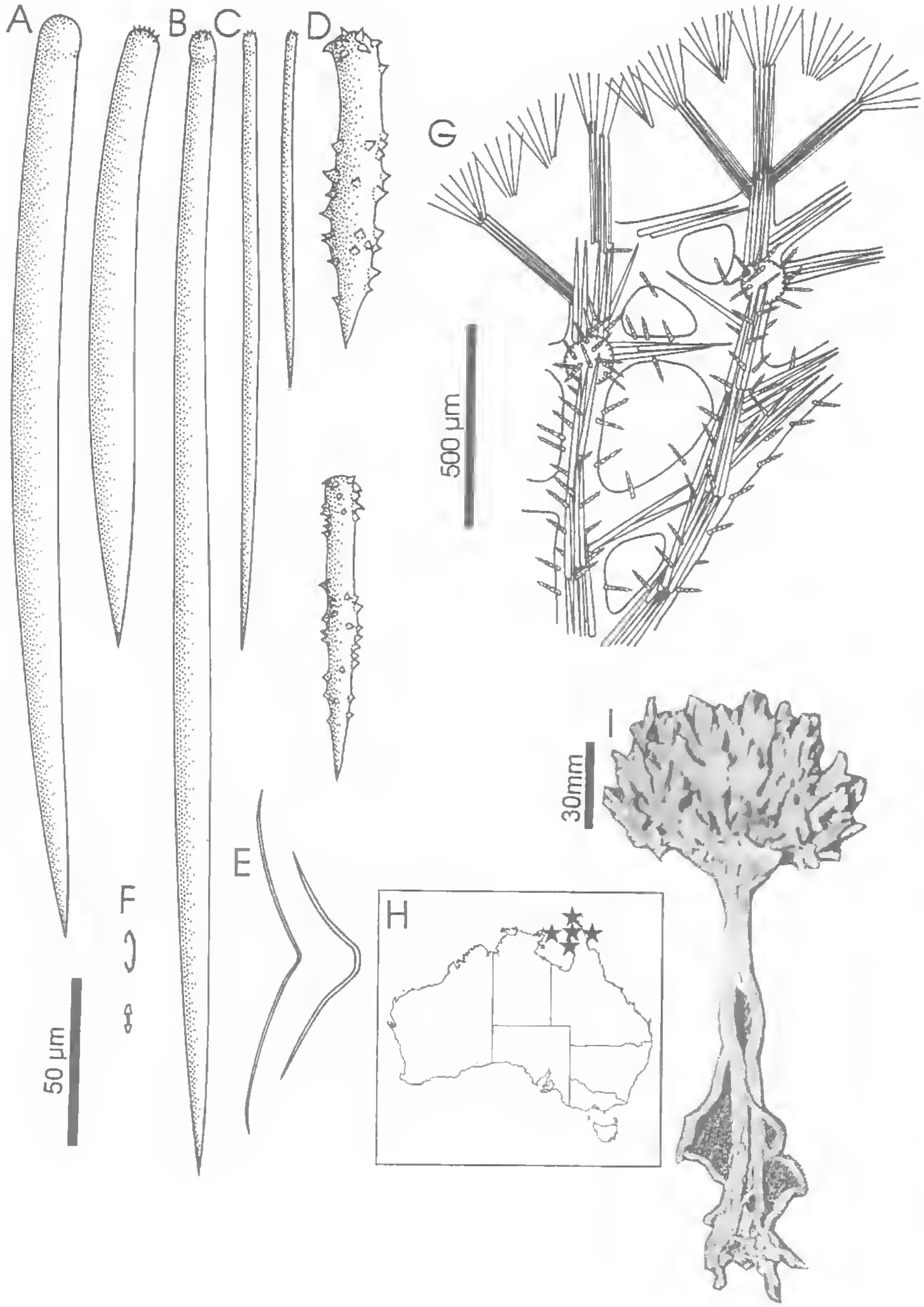

FIG. 167. *Clathria* (*Thalysias*) *fusterna* sp.nov. (paratype QMG301008). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyles. D, Echinating acanthostyles. E, Wing-shaped toxas. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution. I, Holotype QMG303240.

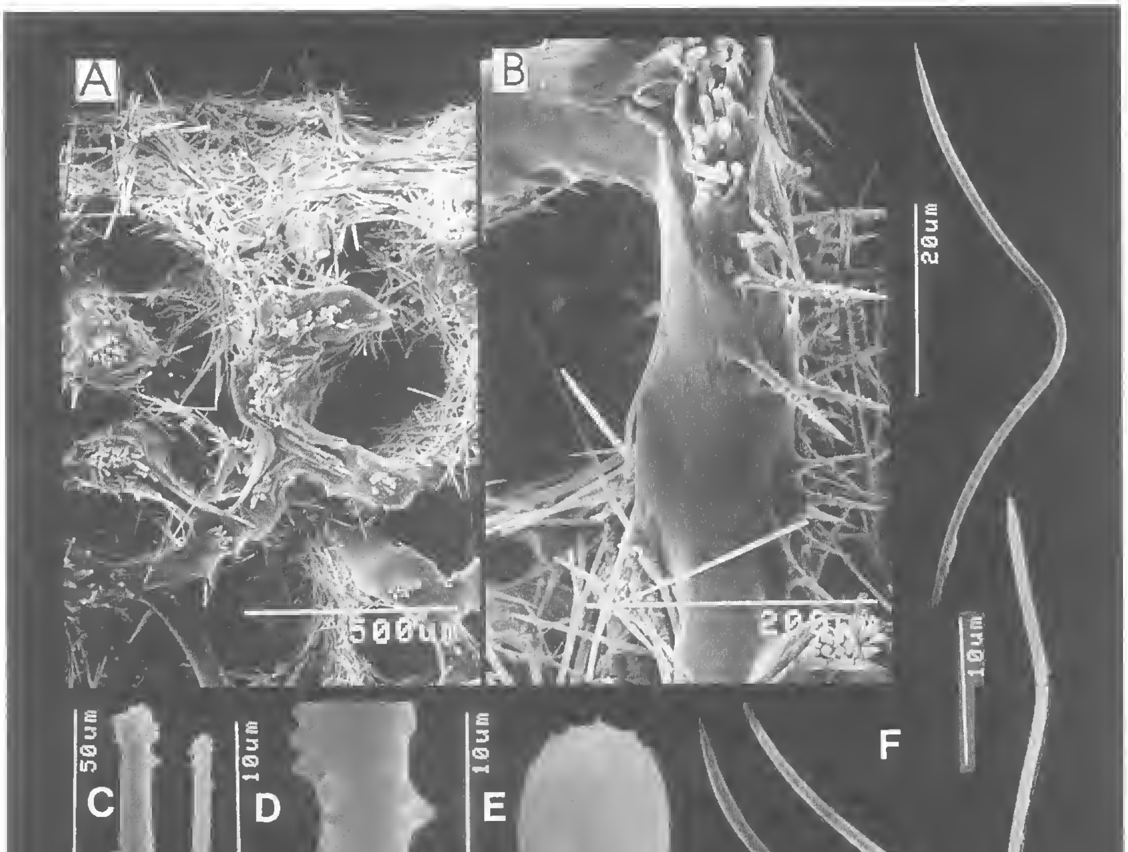

FIG. 168. *Clathria* (*Thalysias*) *fusterna* sp.nov. (paratype QMG300862). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyles. D, Acanthostyle spines. E, Base of choanosomal principal subtylostyle. F, Wing-shaped toxas. G, Palmate isochelae.

martrix heavy, with few auxiliary spicules scattered between fibres but abundant microscleres lining small oval choanocyte chambers, 20-45µm diameter.

Megascleres. Choanosomal principal styles robust short or long, thickest towards middle of spicule, straight or slightly curved towards pointed end, with slightly constricted bases, smooth or faintly microspined, fusiform points. Length 185-(264.3)-355µm, width 5-(13.9)-25µm.

Subectosomal auxiliary subtylostyles long, thick or thin, mostly straight, with subtylote microspined bases, only occasionally smooth bases, and fusiform points. Length 211-(369.2)-385µm, width 4-(9.5)-12µm.

Ectosomal auxiliary subtylostyles short, straight or slightly curved near basal end, subtylote microspined bases, fusiform points. Length 99-(127.7)-163µm, width 2-(3.2)-4µm.

Echinating acanthostyles thick, robust, relatively short, heavily spined but with bare neck and point; spines moderately large, conical erect (not recurved). Length 73-(82.8)-96µm, width 3-(7.4)-12µm.

Microscleres. Palmate isochelae abundant, small, single size class, some contort, with lateral and front alae approximately equal length, lateral alae completely fused to shaft, front ala entire, slight constriction at apex of chela. Length 5-(11.8)-14µm.

Toxas wing-shaped, relatively thick, with slightly angular central curve, arms at wide angles from centre, straight or slightly reflexed points. Length 18-(41.4)-63µm, width 1.5-(1.9)-2.5µm.

ETYMOLOGY. Latin *fusterna*, club or knotty part of a tree.

REMARKS. This species is possibly a very atypical, highly specialised population of *C.* (*T.*) *cervicornis* with a specialised, peculiar growth form adapted to living in soft sediments (long stalk, rhizomous roots, club-shaped apex). Its live colouration, gross skeletal structure and spicule diversity are closely comparable with typical populations of *C.* (*T.*) *cervicornis*. However, there are subtle differences in skeletal characteristics that consistently differentiate the two populations: possession of differentiated principal and auxiliary spicules (whereas *cervicornis* has undifferentiated structural megascleres), acanthostyle spines are erect, conical (not recurved), a single size class of palmate isochelae (not two), and slightly subtylote bases on principal and auxiliary spicules (not prominently subtylote as in most *C. cervicornis*). These subtle differences correlate with the major differences in growth forms and are consequently considered here to justify the recognition of the Gulf of Carpentaria population as a distinct species in a species complex of four: the cylindrical *C.* (*T.*) *cervicornis* from the Indo-Malay - western Pacific region; the lamellate *C.* (*T.*) *craspedia* sp. nov. from the southern Solanderian province of Australia, and the New Caledonian species *C.* (*T.*) *corneolia* (see Hooper & Lévi, 1993a). This species is discussed further in the remarks under *C.* (*T.*) *craspedia*.

Clathria (Thalysias) hallmanni sp. nov.
(Figs 169-170, Plate 6C)

MATERIAL. HOLOTYPE: NTMZ2218: Vesteys Beach, Fannie Bay, Darwin, NT, 12°26.2'S, 130°49.9'E, intertidal, 21.i.1985, coll. J.N.A. Hooper.

HABITAT DISTRIBUTION. Encrusting under beach rock and coral rubble; intertidal pools; NT (Fig. 169H).

DESCRIPTION. *Shape.* Thinly encrusting, up to 1.5mm thick, extending approximately 7cm across rock and dead coral substrata.

Colour. Dark grey-brown orange-brown in life (Munsell 2.5R 5/4); pale grey in ethanol.

Oscules. Minute, less than 1mm diameter, scattered evenly over surface.

Texture and surface characteristics. Spongy, easily torn from substrate; surface has a dull slimy appearance due to production of small amounts of clear mucous upon exposure to air; surface optically smooth, even, without conules, ridges or canals, and encrustation conforms exactly with contours of substrate.

Ectosome and subectosome. Opaque in life, slightly pellucid, subdermal canals or cavities not visible; ectosomal skeleton with extensive plumose brushes of small auxiliary subtylostyles, through which protrude ascending, plumose tracts of larger subectosomal auxiliary subtylostyles; moderate quantities of detritus in ectosomal skeleton; subectosomal region extensive, occupying 70% of sponge thickness, composed of mostly paratangential tracts of larger auxiliary subtylostyles gradually ascending and diverge at surface.

Choanosome. Skeletal architecture hymedesmoid in choanosomal (basal) region, but distinctly plumose towards peripheral skeleton; spongin fibres consist of a basal layer of spongin lying against substrate, 18-35µm thick, with bases of choanosomal principal subtylostyles and acanthostyles embedded in spongin and standing perpendicular to substrate; choanosomal principal subtylostyles morphologically close to subectosomal auxiliary subtylostyles, and so difficult to determine exactly where basal mineral skeleton ends and where subectosomal skeleton begins, but extra-fibre multispicular tracts appear to begin close to basal layer; moderately common acanthostyles echinate basal spongin, whereas principal megascleres less common; choanocyte chambers 35-48µm diameter; mesohyl matrix heavy, granular, with small amounts of detritus

Megascleres. Choanosomal principal subtylostyles long, fusiform, with slightly constricted bases or subterminal bases, entirely smooth or with low apical conules (? vestigial spines), and typically slightly curved towards basal end. Length 312-(385.5)-419.5µm, width 8-(9.3)-11µm.

Subectosomal auxiliary subtylostyles long, thin, fusiform, straight, almost indistinguishable from choanosomal megascleres but with prominent spined subtylote bases. Length 284.5-(362.2)-450µm, width 2-(3.2)-4.5µm.

Ectosomal auxiliary subtylostyles short, thin, fusiform, with microspined subtylote bases. Length 94-(121.2)-151µm, width 0.8-(1.4)-2.5µm.

Acanthostyles subtylote, fusiform, relatively evenly spined although spines less heavily concentrated in 'neck' region, proximal to base, heavier on apical and distal extremities; spines relatively small, weakly formed. Length 52-(59.5)-72µm, width 3-(4.5)-6.5µm.

Microscleres. Palmate isochelae relatively common, variable in size but not easily differentiated into two size classes, unmodified, with lateral alae entirely fused to shaft, approximately equal in length to front ala, and entirely free from front ala except in juvenile forms. Length 5-(10.8)-17µm.

Toxas accolada, moderately common, long, thin, almost straight, with only slight angular central curvature, straight arms, straight (unreflexed) points. Chord length 174-(208.0)-481µm, width 0.4-(0.8)-2.0µm.

Associations. Single known specimen growing next to encrusting sponges (*Renieria*, *Haliclona*, *Mycale*), polychaete worm tubes (*Pomatoleios kraussii*) and simple ascidians.

ETYMOLOGY. For E.R. Hallmann in recognition of his contributions to Australasian microcionids.

REMARKS. It is difficult to define *C.* (*T.*) *hallmanni* in any single unique character apart from the close resemblance between choanosomal principal and subectosomal auxiliary subtylostyles. As far as can be ascertained from personal knowledge of the Australasian sponge fauna and Indo-west Pacific literature its field characteristics are unique. It is acknowledged that many older published descriptions of encrusting microcionids, especially those from the Indo-Malay archipelago, rarely include details on live colouration or surface details. But none of these species match the present one in spicule geometry either. Consequently, *C.* (*T.*) *hallmanni* can be differentiated from other encrusting (hymedesmoid) *Clathria* (*Thalysias*) species in: grey-brown live colour; even (unornamented) surface, i.e., lacking subectosomal drainage canals commonly found in thinly encrusting species; plumose ectosomal and subectosomal skeletal structure as well as extensive paratangential tracts composed of both sorts of auxiliary spicules in the periphery; entirely smooth, relatively short and thin choanosomal subtylostyles, barely different from the subectosomal auxiliary subtylostyles except for pattern of spination; evenly spinous acanthostyles, unmodified palmate isochelae, and thin, nearly straight toxas with unreflexed arms. None of these features are unique or particularly distinctive by themselves but their combination is unique for this new taxon.

Clathria (Thalysias) hesperia sp. nov.

(Figs 171-172, Plate 6D-E)

MATERIAL. HOLOTYPE: QMG300213 (fragment NTMZ3041): N. of Amphinome Shoals, Northwest Shelf, WA, 19°19.7-23.3'S, 119°08.8-12.2'E, 50m depth, 19.vii.1987, coll. J.N.A. Hooper (beam trawl). PARATYPE: NTMZ3327 (NCIQ66C-1407-U, fragment QMG304991): 1.8km N. of Bessieres I, Anchor Is, Exmouth Gulf, WA, 21°30.6'S, 114°45.4'E, 17m depth, 23.viii.1988, coll. D. Low Choy & NCI (SCUBA).

HABITAT DISTRIBUTION. Coral rubble and deeper rock reefs exposed amongst gravel and shell grit substrates; 17-50m depth; NW. coast (WA) (Fig. 171G).

DESCRIPTION. *Shape.* Thickly flabellate, simple planar fans resembling a *Phakellia*, or slightly cup-shaped with convoluted, concentric, smaller lamellae inside larger lamellae, resembling species of *Cymbastela* (Axinellidae); margins pointed digitate (paratype) or convoluted folded (holotype); lamellae up to 380mm wide, 235mm high, 15mm thick; holotype probably lying on, or parallel to, substrate, with con-

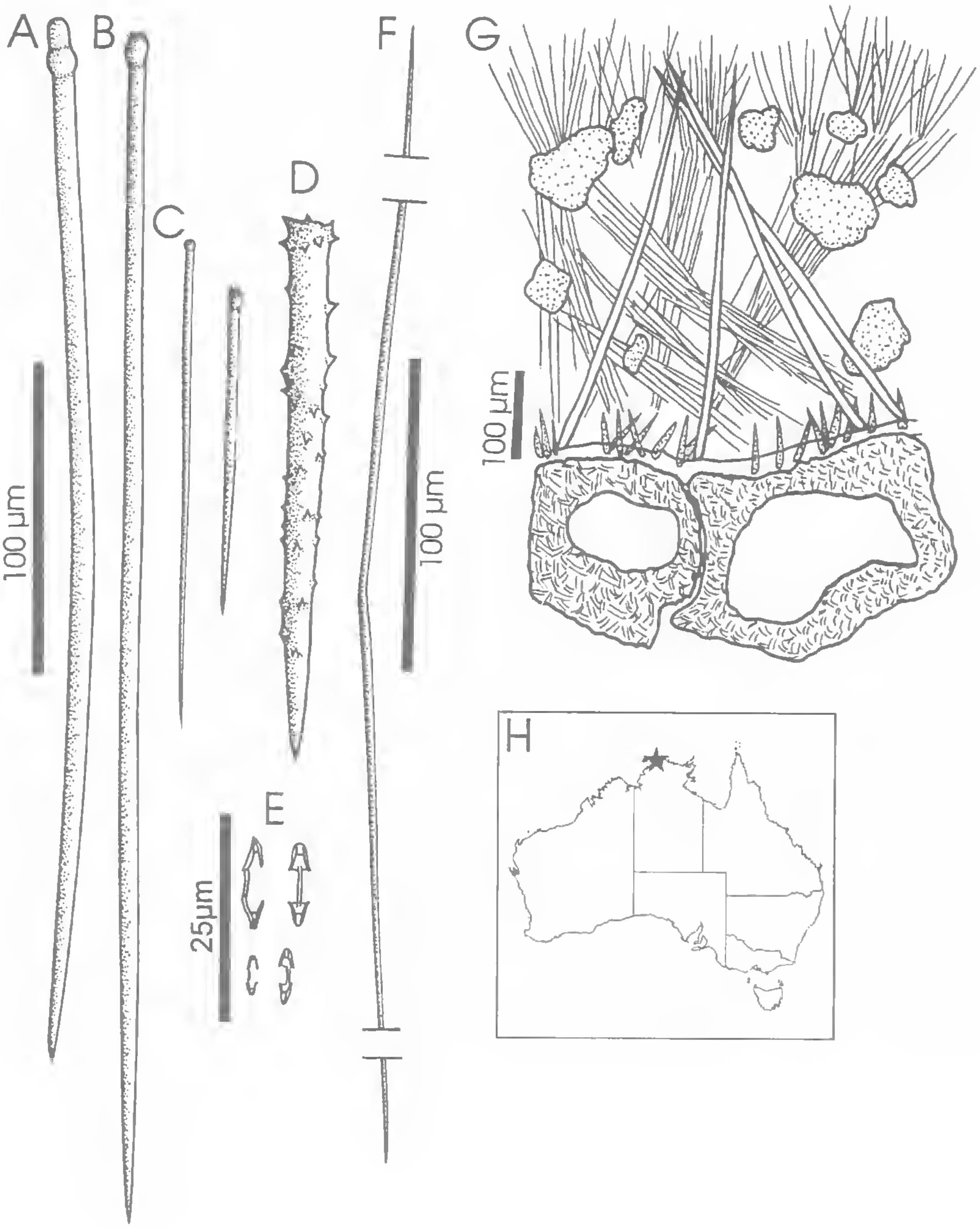

FIG. 169. *Clathria* (*Thalysias*) *hallmanni* sp.nov. (holotype NTMZ2218). A, Choanosomal principal subtylostyle. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyle. D, Echinating acanthostyle. E, Palmate isochelae. F, Accolada toxa. G, Section through peripheral skeleton (hatched area coralline substrate). H, Australian distribution.

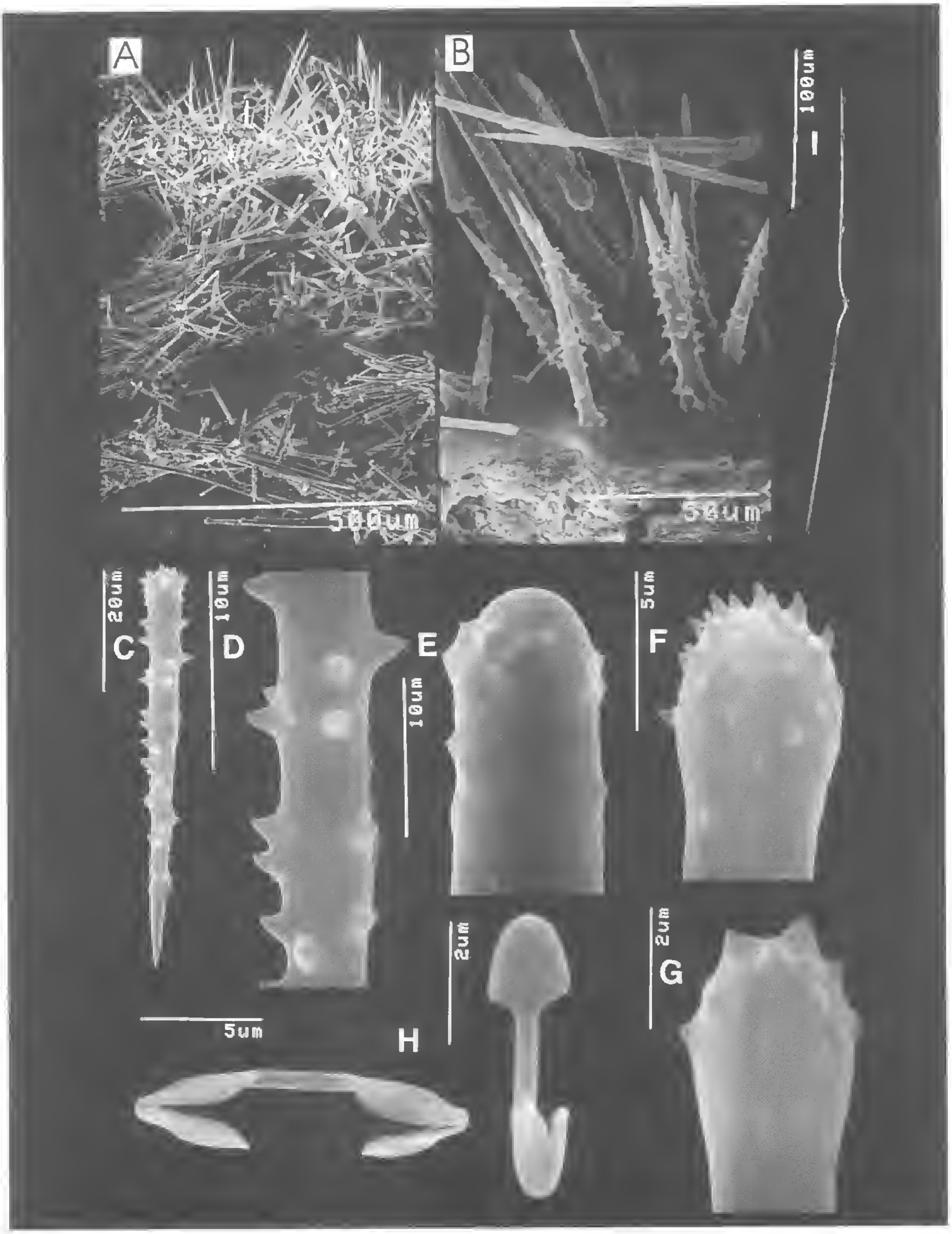

FIG. 170. *Clathria (Thalysias) hallmanni* sp.nov. (holotype NTMZ2218). A, Choanosomal skeleton through thick region. B, Hymedesmoid basal skeleton. C, Echinating acanthostyle. D, Acanthostyle spines. E-G, Bases of principal and auxiliary subtylostyles. H, Palmate isochelae. I, Accolada toxas.

voluted, concentric ridges or small digitate processes arising from upper surface; paratype erect, perpendicular to substrate, with folded ridged running longitudinally; both specimens with differentiated osculiferous (upper) and porous surfaces, latter relatively even, smooth.

Colour. Pale orange-red alive (Munsell 5R 8/4), khaki-brown in ethanol.

Oscules. Small, up to 3mm diameter alive, smaller in preserved specimen, slightly raised above surface, with membraneous lip, only found on 1 surface of lamellae.

Texture and surface characteristics. Firm, harsh, flexible, slightly compressible, difficult to tear, lower surface smooth, even, upper surface more conulose (with terminal oscules), longitudinal folds, ridges or convoluted folds and small digits.

Ectosome and subectosome. Discrete surface brushes produce specialised ectosomal skeleton; brushes composed of ectosomal auxiliary subtylostyles on outer surface forming thick, erect bundles but not continuous palisade, with 1 or several choanosomal principal styles also protruding through surface associated with ectosomal brushes; subectosomal auxiliary subtylostyles intermingled with ectosomal spicules but originating slightly lower in peripheral skeleton; subectosomal region greatly reduced with peripheral choanosomal fibres lying immediately below ectosome; mesohyl matrix moderately heavy in peripheral region.

Choanosome. Choanosomal skeleton almost regularly renieroid reticulate although renieroid pattern severely disrupted by heavy concentrations of echinating spicules (both principal styles and acanthostyles); spongin fibres very well developed, dark brown, imperfectly divided into primary (90-140µm diameter) and secondary (25-45 diameter), and very large fibre nodes (up to 220µm diameter); primary ascending fibres cored by multispicular tracts of principal styles, 2-5 spicules abreast, with spicules protruding slightly through fibres, particularly at fibre meshes, producing nearly plumose tracts; secondary more-or-less transverse fibres relatively short, interconnecting primary elements, cored by 1-3 spicules abreast; spicules occupy only 40-70% of fibre diameter for secondary and primary fibres, respectively; near peripheral skeleton principal styles distinctly plumose, with those on ultimate fibres contributing to ectosomal structure, whereas at core skeleton more renieroid reticulate; echinating acanthostyles very abundant, particularly at fibre nodes, also contributing to ectosomal spicule brushes, with only small portion of base of acanthostyle embedded in spongin fibre and consequently protruding a long way into choanosomal mesohyl; fibre meshes oval or squarish, more cavernous in periphery (45-115µm diameter) than at core (170-250µm diameter); choanocyte chambers oval, 35-55µm diameter, often lined by isochelae; mesohyl matrix moderately heavy but only lightly pigmented.

Megascleres. Choanosomal principal styles straight or slightly curved near centre, with rounded or very slightly subtylote bases, bases usually smooth, occasionally microspined, long tapering fusiform points. Length 162-(187.3)-213µm, width 8-(11.1)-14µm.

Subectosomal auxiliary subtylostyles straight or very slightly curved near basal end, slightly subtylote bases lightly microspined, fusiform points. Length 121-(138.1)-168µm, width 4-(4.6)-5.5µm.

Ectosomal auxiliary subtylostyles only slightly shorter than subectosomal spicules but consistently thinner, with smooth subtylote bases, fusiform points. Length 97-(121.1)-147µm, width 2-(2.9)-4.5µm.

Echinating acanthostyles long, slender, mostly straight, sometimes slightly curved near point, with subtylote bases, fusiform points, heavily spined on bases, shaft and points, aspinose on 'neck' proximal to base; spines short, sharp, recurved. Length 97-(103.6)-112µm, width 4-(5.3)-6µm.

Microscleres. Palmate isochelae very abundant, poorly silicified, sigmoid, with short, sharp, vestigial unguiferous alae. Length 11-(13.7)-15µm.

Toxas absent.

ETYMOLOGY. Latin *hesperius*, western; from WA.

REMARKS. This species is borderline between *Clathria* and *Thalysias* given that the ectosomal skeleton consists of spicule brushes composed of auxiliary spicules of relatively homogenous lengths (i.e., not clearly differentiated into smaller auxiliary spicules supported by larger auxiliary spicules, characteristic of other *Thalysias*). Nevertheless, ectosomal and subectosomal spicules can be consistently differentiated by their thickness as well as the absence or presence of microspines on their base, respectively, even though there is no marked difference in length between the two categories.

Clathria (T.) hesperia has a distinctive lamellate growth form with differentiated osculiferous and porous faces. Its skeleton is a mixture of plumose tracts (reminiscent of *C. (M.) coccinea*, particularly its plumose fibre nodes, or the

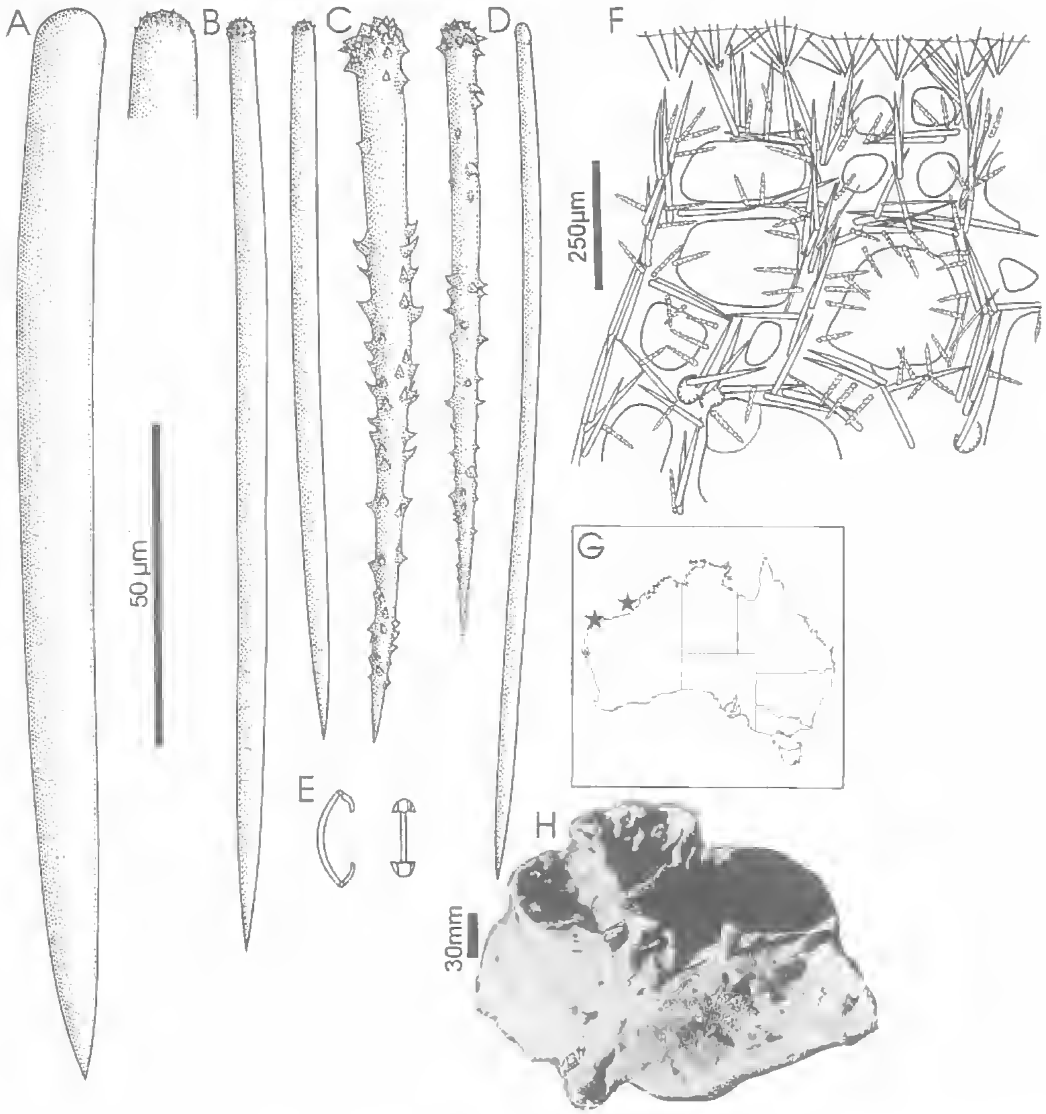

FIG. 171. *Clathria* (*Thalysias*) *hesperia* sp.nov. (paratype NTMZ3327). A, Choanosomal principal style and base. B, Subectosomal auxiliary subtylostyles. C, Echinating acanthostyles. D, Ectosomal auxiliary subtylostyle. E, Modified palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, Holotype QMG300213.

'*scabida*' species group with principal spicules protruding through the peripheral skeleton), with an underlying renieroid reticulate skeleton. Palmate isochelae are vestigial, unguiferous, sigmoid reminiscent of *C.* (*T.*) *michaelseni* (which is an encrusting, hymedesmoid species, has toxas, and differs from this species in virtually every other respect).

Clathria (Thalysias) hirsuta Hooper & Lévi, 1993 (Figs 173-175, Table 37, Plate 6F, 7A)

Clathria (*Thalysias*) *hirsuta* Hooper & Lévi, 1993a: 1259-1264, figs 19-20, table 10; Hooper & Wiedenmayer, 1994: 270.

MATERIAL. HOLOTYPE: QMGL2746 (fragment NTMZ1551): Cairns region, Qld, 16°56'S, 146°00'E, 1982, coll. A. Kay (trawl). PARATYPES: QMGL2750

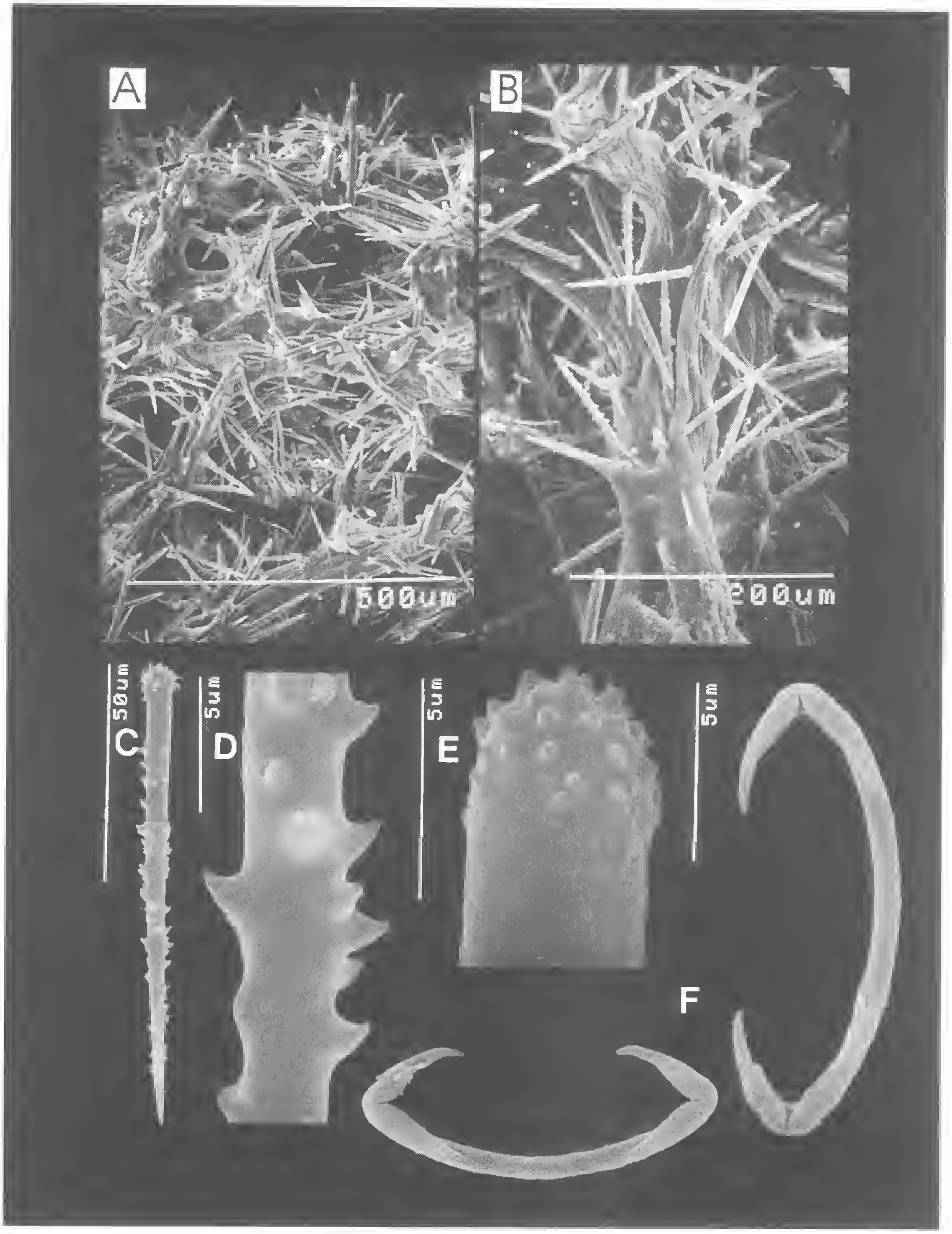

FIG. 172. *Clathria* (*Thalysias*) *hesperia* sp.nov. (holotype QMG300213). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyle. D, Acanthostyle spines. E, Base of subectosomal auxiliary subtylostyle. F, Reduced sigmoid palmate isochelae.

(fragment NTMZ1555), QMGL2754 (fragment NTMZ1560): Cairns region, Qld, 16°56'S, 146°00'E, coll. A. Kay (trawl). OTHER MATERIAL: QLD - QMG300328 (NCIQ66C-1893-X; fragment NTMZ3513), NTMZ3494, QMG303040, QMG-304767, QMG300081, QMG303971. NSW - QMG300771 (NCIQ66C-1185-F). NEW CALEDONIA - QMG301274, QMG301325, QMG301340.

HABITAT DISTRIBUTION. Rock, dead coral and coral rubble substrates, usually on broken substrates, sides of bommies, or in gullies; 7-30m depth; Shelburne Bay, Howick Is (FNQ), Whitsunday Is (NEQ), Noosa Heads, Stradbroke I. (SEQ), Solitary Is (N. NSW) (Fig. 173O). Also New Caledonia lagoon (Hooper & Lévi, 1993a).

DESCRIPTION. (See Hooper & Lévi, 1993a).

DIAGNOSIS (Table 37). Tubular, lobo-digitate, reticulate-honeycombed, excavated growth forms superficially resembling *Phakellia cavernosa*; bright red (or orange-red) conules, paler pink or white between conules, prominent subdermal drainage canals; large oscules scattered between surface projections; texture firm, compressible, slightly arenaceous; surface prominently conulose, conules pointed (or rounded, fleshy); ectosome with irregular, tangential or paratangential layer of intermixed ectosomal and subectosomal subtylostyles (or with light palisade of smaller auxiliary styles forming erect brushes arising from ends of larger auxiliary spicules); thick choanosomal fibres immediately below ectosome (or subectosome cavernous); choanosomal skeleton irregularly reticulate (or regularly renieroid reticulate), with fibre skeleton dominant over spicule skeleton; primary fibres multispicular, running longitudinally through branches, ascending to surface, interconnected by shorter uni- or paucispicular secondary fibres, cored by both shorter choanosomal principal styles and longer subectosomal auxiliary styles; acanthostyles dispersed evenly over fibres; choanosomal principal styles straight, with smooth, rounded or slightly subtylote bases and fusiform points; subectosomal auxiliary subtylostyles long, slender, straight, fusiform, with rounded or subtylote, smooth or microspined bases (or with simply rounded, smooth bases); ectosomal auxiliary subtylostyles short, straight, very slender, subtylote smooth or microspined bases (or with simply rounded, smooth bases); acanthostyles small, subtylote, light or vestigial spines, aspinose 'neck' proximal to base; palmate isochelae small, unmodified, imperfectly divided into two size categories; lateral alae completely fused to shaft, completely detached from front ala for whole of length, longer than front ala; toxas accolada and wing-shaped morphs, very thin, sometimes slightly sinuous, rarely raphidiform, only slightly curved at centre, with straight non-reflexed arms or only slightly reflexed points (or exclusively raphidiform with small angular central curve and straight arms).

REMARKS. *Clathria* (*T.*) *hirsuta* was originally described and illustrated from both New Caledonian and Queensland populations (Hooper & Lévi, 1993a), in which it was reported that the New Caledonian population possessed ectosomal auxiliary subtylostyles (i.e., belonging to *Thalysias*) whereas Queensland specimens did not (i.e., belonged to *Clathria*). Since this publication several more samples have been collected along the Queensland coast and Great Barrier Reef (Fig. 173O) in which specialised ectosomal spicules were discovered. Conversely, isochelae were originally reported only from the Queensland populations but absent in New Caledonian samples, but these have now also been observed in a recent sample collected from Noumea (albiet rare). Other differences between these two populations are discussed in Hooper & Lévi (1993a). Two 'atypical' specimens from SE. Australia (QMG300328, G300771) (which are included in the diagnosis above, in brackets) further illustrate the considerable variability of this species (toxas are only raphidiform, auxiliary spicules lack tylote bases, and a structured ectosomal skeleton is present (Figs 174-175)). These specimens are reminiscent of the 'reduced' New Caledonian population.

At first glance this species lacks any remarkable or unique feature that stands it apart from other *Clathria* (*Thalysias*), but it possesses an unusual combination of characters not seen in any other species. It is superficially similar to *C.* (*T.*) *vulpina* in growth form, but spiculation and fibre characteristics are quite different between the two species. Its skeletal architecture and spiculation is also very similar to *C.* (*T.*) *schoena* (i.e., USNM22404; which may be different again from *Rhaphidophlus schoenus* of authors; e.g., Simpson, 1968a; Alcolado, 1980; Van Soest, 1984b), but these species differ significantly in their growth form, spongin fibre architecture and ectosomal characteristics. *Clathria* (*T.*) *hirsuta* has very lightly spined acanthostyles, comparable with those of *C.* (*T.*) *transiens*, and it is also closely related to that species in its fibre characteristics and spiculation, although they

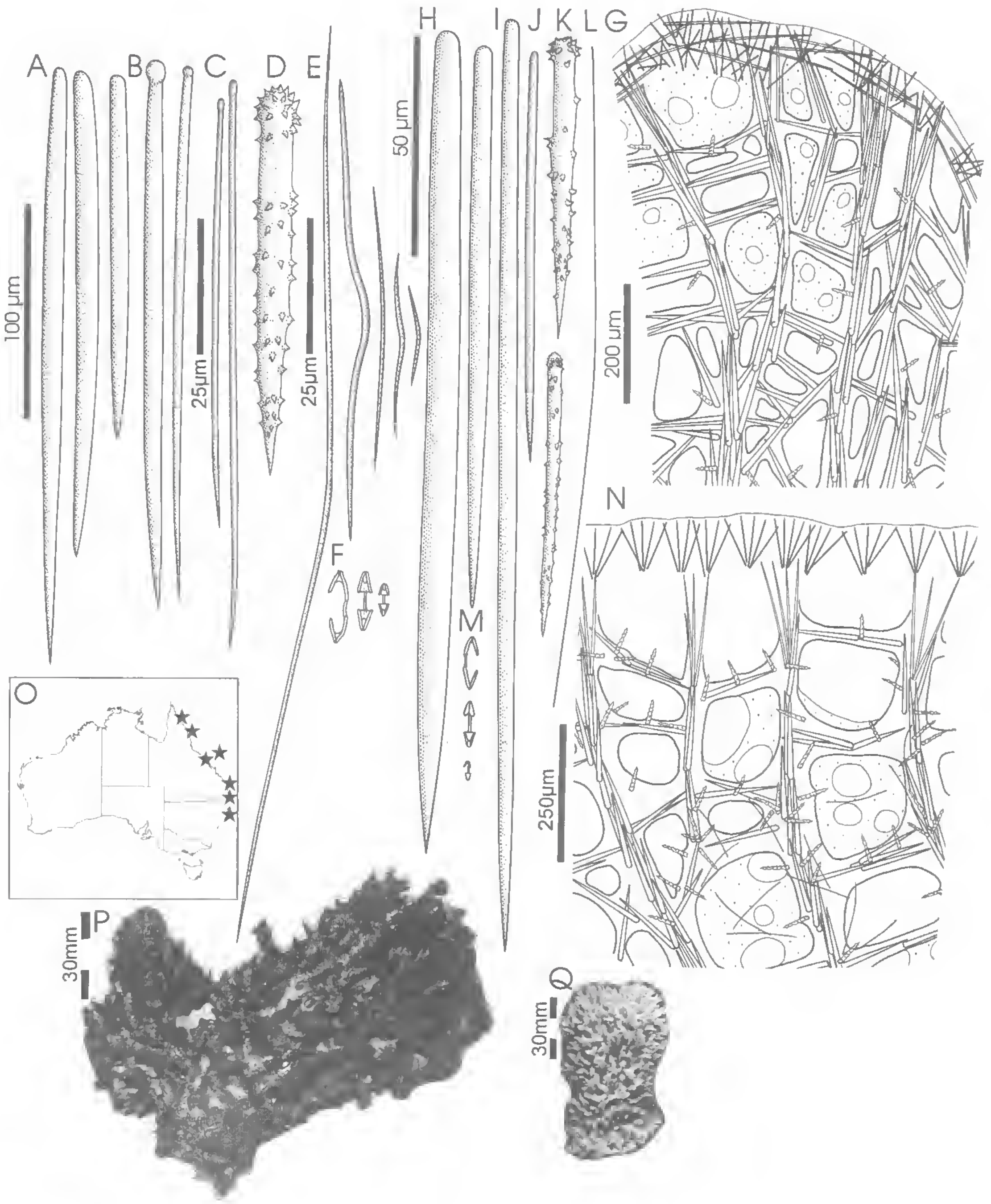

FIG. 173. *Clathria* (*Thalysias*) *hirsuta* Hooper & Levi comparison between typical and reduced populations (A-G, paratype QMGL2750; H-M, QMG300771). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyles. C, Ectosomal auxiliary subtylostyles. D, Echinating acanthostyle. E, Accolada and wing-shaped toxas. F, Palmate isochelae. G, Section through typical skeleton. H, Choanosomal principal styles. I, Subectosomal auxiliary style. J, Ectosomal auxiliary style. K, Echinating acanthostyles. L, Raphidiform toxa. M, Palmate isochelae. N, Section through reduced specimen. O, Known Australian distribution. P, Holotype QMGL2746. Q, Atypical QMMG300328.

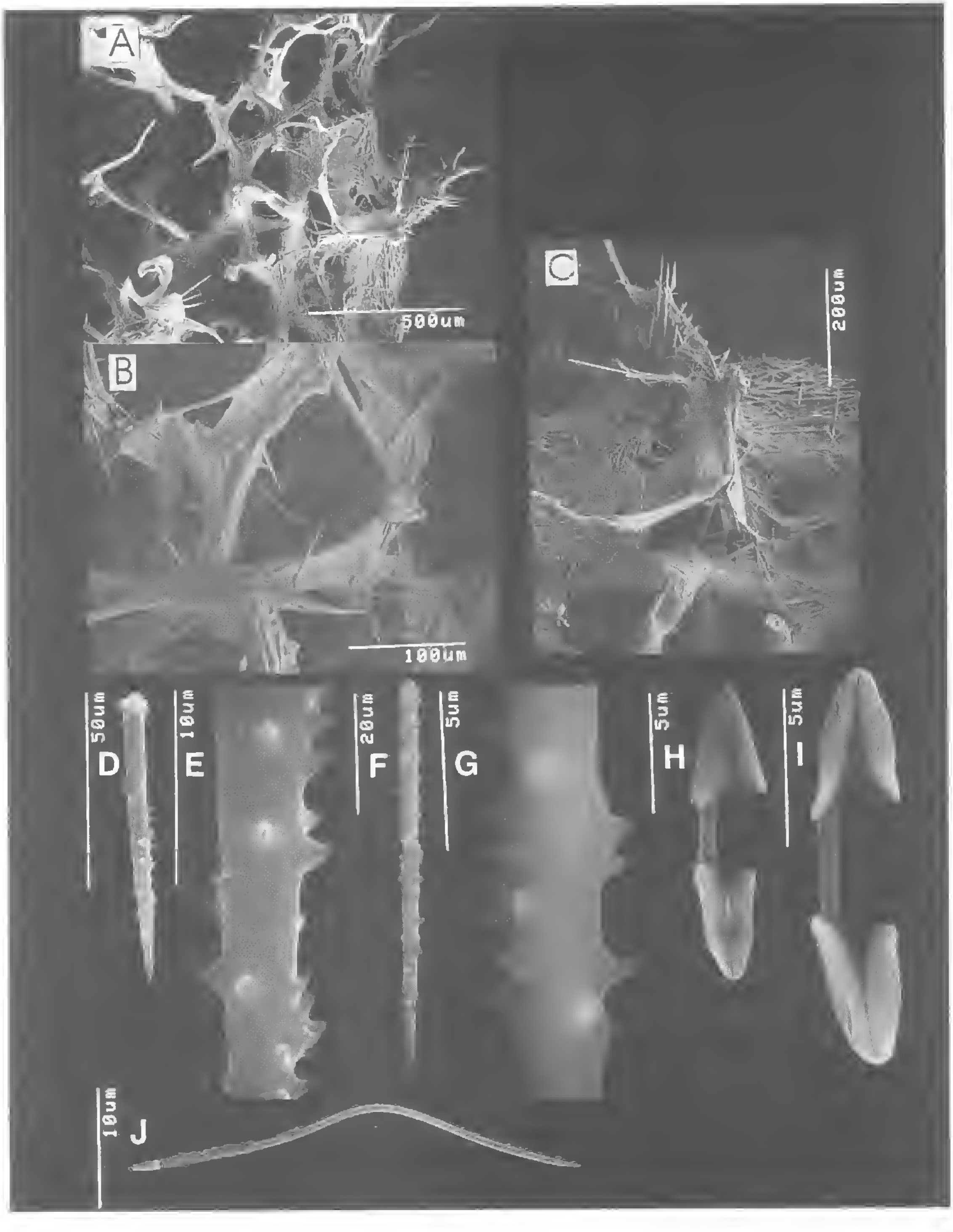

FIG. 174. *Clathria* (*Thalysias*) *hirsuta* Hooper & Levi typical population (A-C, F-G, QMG300081; D-E, H-J, paratype QMGL2750). A, Choanosomal skeleton. B, Fibre characteristics. C, Ectosomal skeleton. D-E, Echinating acanthostyle and spines (Cairns population). F, Echinating acanthostyle and spines (Moreton Bay population). H-I, Palmate isochelae. J, Raphidiform - accolada toxa.

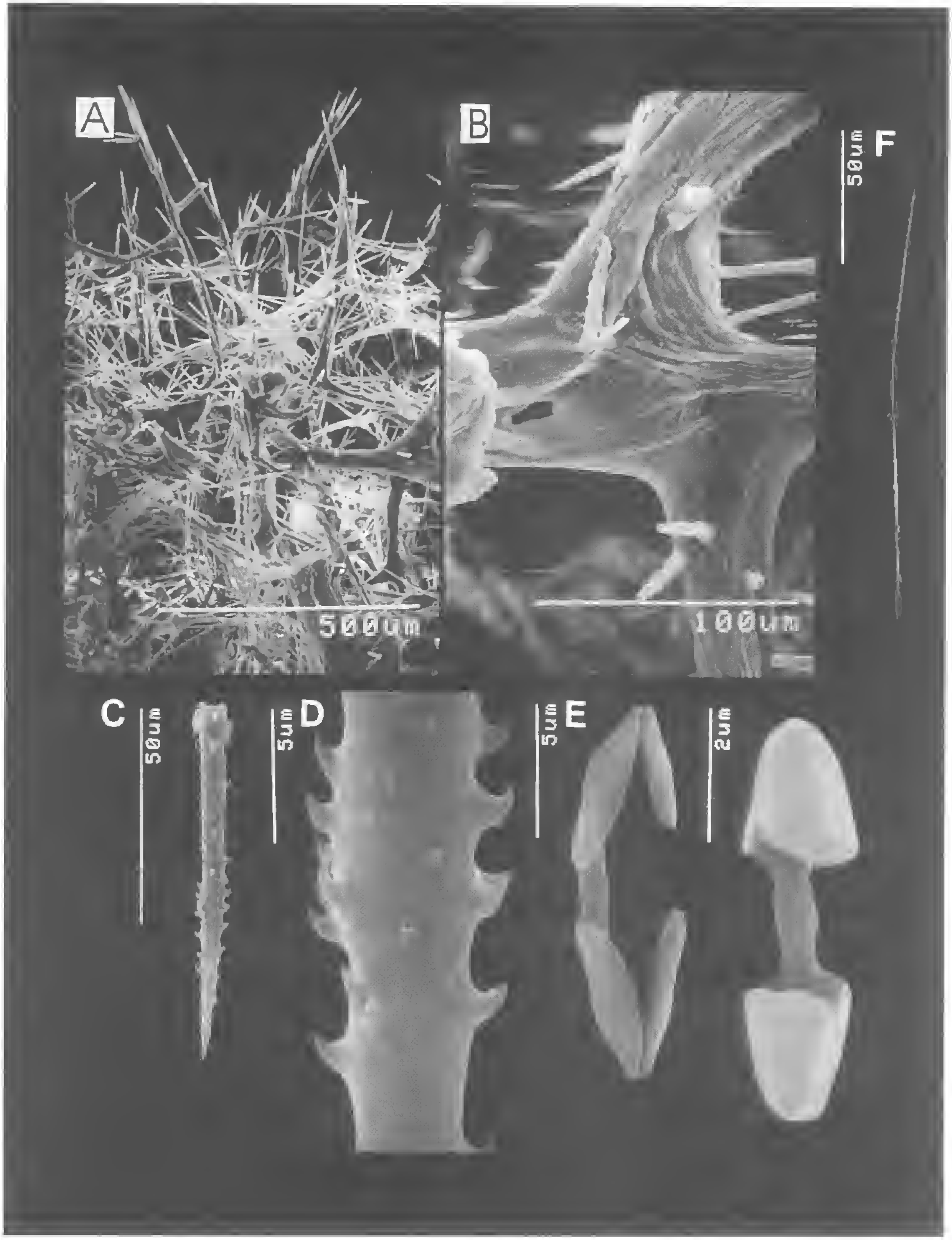

FIG. 175. *Clathria* (*Thalysias*) *hirsuta* Hooper & Levi atypical QMG300771. A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyle. D, Acanthostyle spines. E, Palmate isochelae. F, Raphidiform toxa.

TABLE 37. Comparison between Australian and New Caledonian populations of *Clathria (Thalysias) hirsuta* Hooper & Lévi. measurements in µm, denoted as range (and mean) of spicule length x spicule width (N=25).

SPICULE	Holotype (QMGL2746) (Cairns region)	Specimens (N=6) (Queensland)	Specimens (N=3) (New Caledonia)
Choanosomal principal styles	163-(178.3)-194 x 4-(7.8)-12	132-(155.2)-195 x 3-(5.8)-12	96-(141.4)-168 x 2-(4.8)-8
Subectosomal auxiliary styles	179-(241.8)-284 x 1.5-(3.4)-5	141-(216.9)-293 x 1.5-(3.1)-5	163-(204.3)-248 x 1.8-(3.1)-4.0
Ectosomal auxiliary styles	absent	74-(100.1)-115 x 1.5-(2.1)-3	72-(92.0)-111 x 0.8-(1.9)-2.5
Echinating acanthostyles	37-(57.8)-73 x 2-(4.4)-7	41-(60.4)-79 x 2.5-(4.4)-8	34-(51.9)-72 x 2-(3.5)-5
Chelae I	3-(4.8)-6	3-(4.3)-6	6-9, rare
Chelae II	9-(10.8)-12	9-(11.5)-14	10-12, rare

differ considerably in growth form and geometry of choanosomal styles.

Clathria (T.) hirsuta belongs to the *juniperina* group. These species have choanosomal (coring) megascleres which are only slightly differentiated from the subectosomal auxiliary spicules, an irregular heavy fibre skeleton, and rhaphidiform toxas, but each species differs in one or more other significant features. More detailed comparisons between *C. (T.) hirsuta* and other members of the *juniperina* group, are given by Hooper & Lévi (1993a).

Most specimens of *Clathria (T.) hirsuta* have a nearly vestigial ectosomal skeleton, unlike most of the other *juniperina* species, with ectosomal and subectosomal spicules intermingled in paratangential tracts on the surface, and consequently their placement in either *Thalysias* or *Clathria* is equivocal. However, the two atypical specimens from SE Australia mentioned above have much better structured ectosomal skeletons than most other known samples (Fig. 175), more reminiscent of the usual *Thalysias* condition. Moreover, the possession of two categories of auxiliary spicules in most specimens indicates that it belongs with *C. (Thalysias)*, whereas those without specialised ectosomal spicules could be included in *Clathria (Clathria)*. This is further evidence to question the distinction between these taxa at the generic level.

Clathria (Thalysias) juniperina
(Lamarck, 1814)
(Figs 176-177)

Spongia juniperina Lamarck, 1814: 444; Lamarck, 1816: 373.

Clathria juniperina; Hooper & Wiedenmayer, 1994: 270.

Not *Pandaros juniperina*; Duchassaing & Michelotti, 1864: 90, pl.19, fig.3.

Not *Thalysias juniperina*; de Laubenfels, 1936a: 105-107 (see synonymy for *T. virgultosa* below).

Rhaphidophlus clathratus; Hallmann, 1912: 209; Topsent, 1920b: 17-18; Topsent, 1932: 97, pl.5, fig.6, text-fig.3.

Not *Tenacia clathrata* Schmidt, 1870: 56, 80.

MATERIAL. LECTOTYPE: MNHNDT570: SW. coast of Australia, Peron & Leseur collection. PARALECTOTYPE - MNHNDT3354: same details.

HABITAT DISTRIBUTION. Dead coral and rock substrates; shallow subtidal to 10m depth; SW coast WA (Fig. 176J).

DESCRIPTION. *Shape.* Growth form ranging from thickly encrusting to frondose, lamellate, clathrous, with or without free or anastomosing branches.

Colour. Bright red to deep red alive, brown dry.

Oscules. Not observed

Texture and surface characteristics. Harsh, firm in dry state; surface characteristics range from relatively smooth, even, with white subdermal canals in encrusting forms, to irregularly microconulose or clathrous in more massive forms.

Ectosome and subectosome. Ectosomal skeleton crust-like, easily detachable, relatively thin but dense palisade of erect or paratangential brushes supported by paratangential tracts of larger subectosomal auxiliary megascleres immediately below surface; peripheral fibres immediately subectosomal with vaguely ascending multispicular subectosomal tracts arising to surface.

Choanosome. Choanosomal skeleton irregularly reticulate, with very heavy spongin fibres forming oval meshes; fibres usually with paucispicular core of subectosomal auxiliary styles occupying only a small proportion of fibre diameter, and fewer choanosomal principal styles which are entirely enclosed in, or project from fibres; in some cases fibres completely uncored, whereas others contain abundant, disorganised auxiliary megascleres; fibres typically heavily echinated, some enveloping echinating megascleres entirely, some fibres without echinating megascleres; mesohyl matrix light,

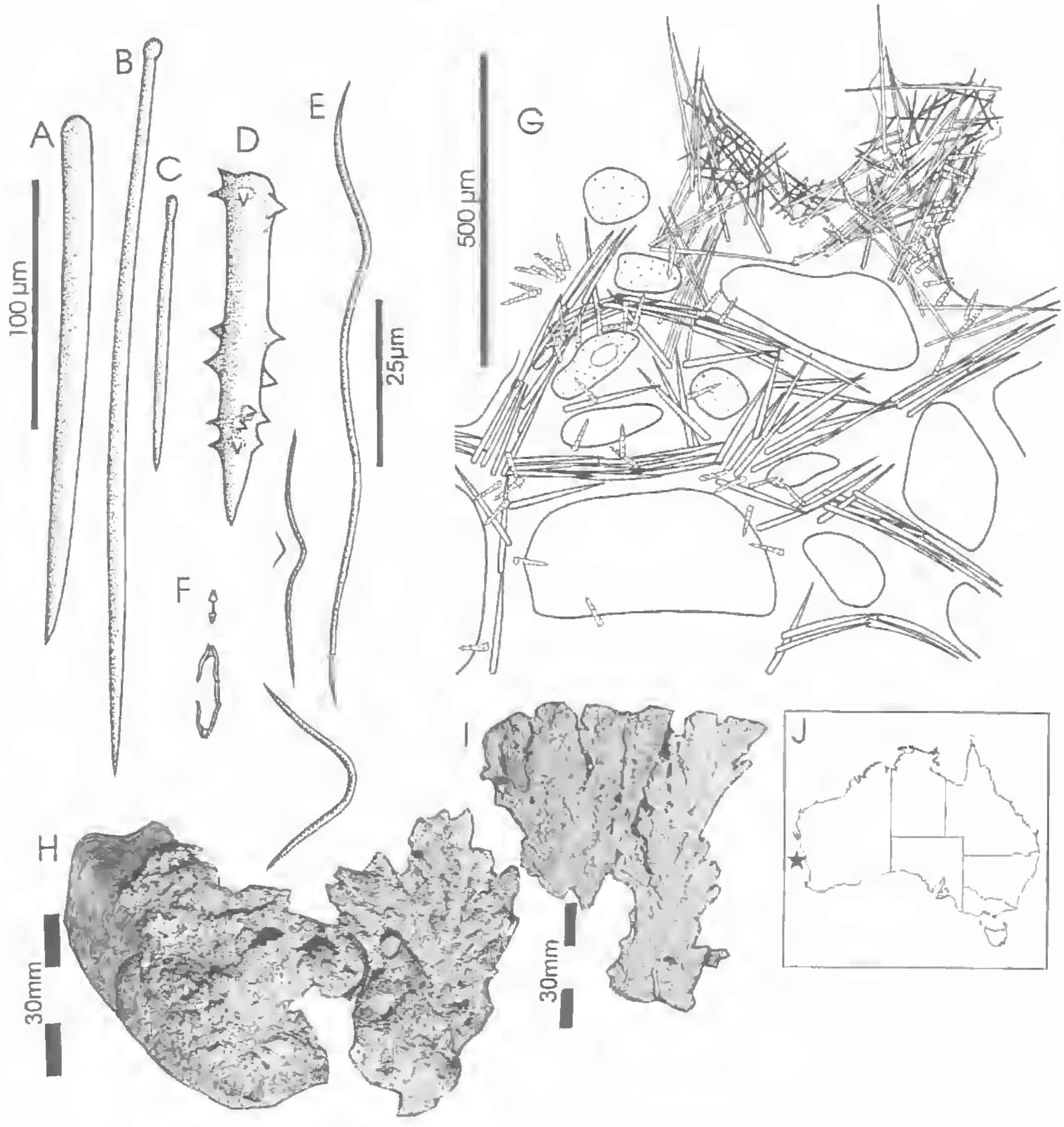

FIG. 176. *Clathria (Thalysias) juniperina* (Lamarck) (lectotype MNHNDT570). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyle. D, Echinating acanthostyle. E, Sinuous, accolada and U-shaped toxas. F, Palmate isochelae. G, Section through peripheral skeleton. H, Lectotype. I, Paralectotype MNHNDT3354. J, Australian distribution.

with numerous choanosomal styles dispersed between fibres.

Megascleres. Choanosomal principal styles straight or slightly curved near basal end, with smooth, rounded or very slightly subtylote bases. Length 170-(244.4)-280µm, width 9-(10.1)-12Known only from Australia: m.

Subectosomal auxiliary subtylostyles straight or curved, sometimes with multiple curves (sinuous), with smooth subtylote bases. Length 169-(253.5)-310µm, width 4-(5.4)-6.5µm.

Ectosomal auxiliary subtylostyles with prominent subtylote, smooth bases. Length 93-(102.3)-110µm, width 2-(3.7)-4.5µm.

Acanthostyles small, stubby, with rounded or only slightly subtylote bases, with few spines and extensive aspinose regions on necks and points;

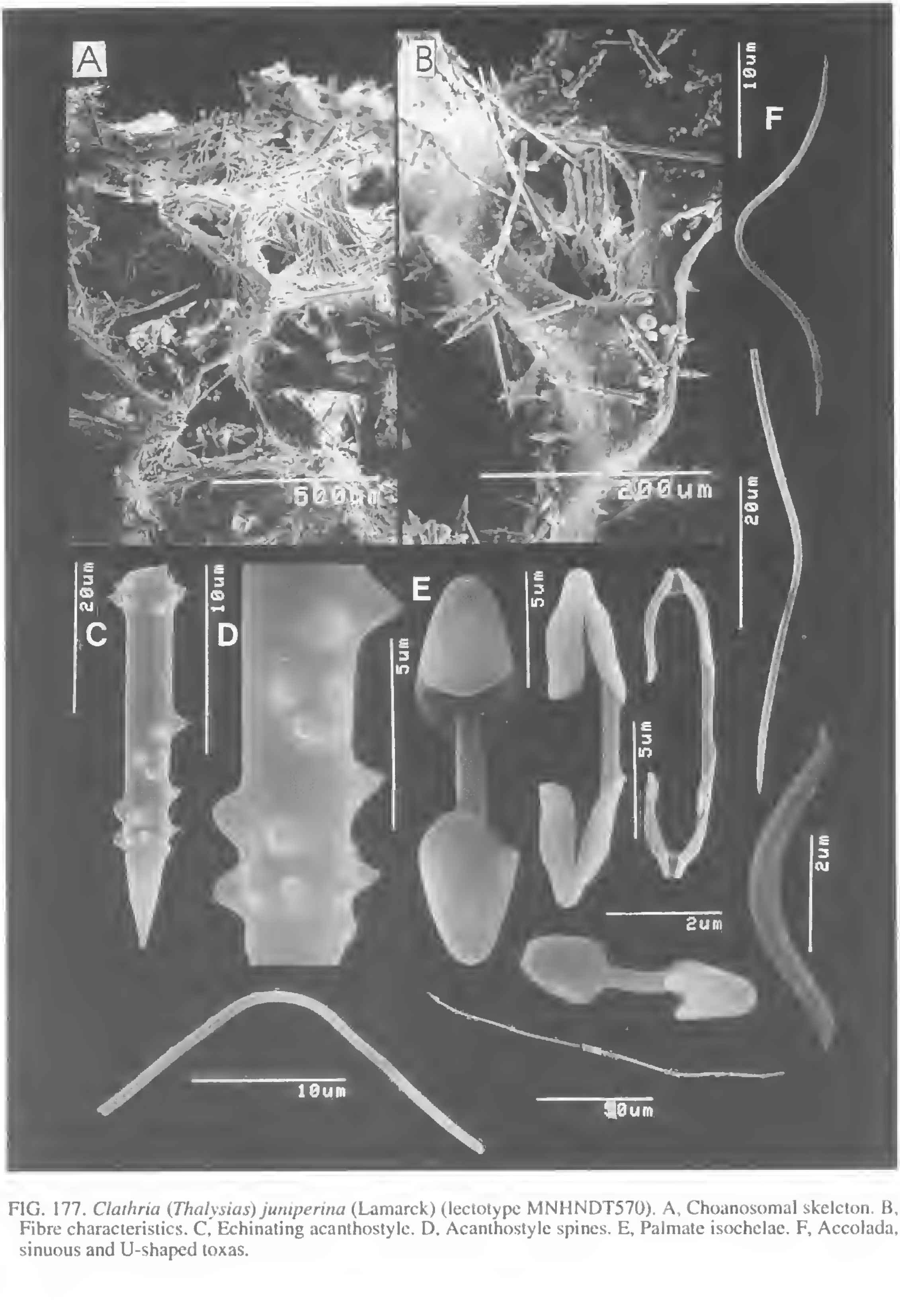

FIG. 177. *Clathria* (*Thalysias*) *juniperina* (Lamarck) (lectotype MNHNDT570). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyle. D, Acanthostyle spines. E, Palmate isochelae. F, Accolada, sinuous and U-shaped toxas.

spines large, bulbous, erect. Length 45-(57.0)-65µm, width 5-(6.1)-8µm.

Microscleres. Palmate isochelae unmodified, incompletely differentiated into two size classes; lateral alae entirely fused to shaft, approximately same length as front ala and completely detached from front ala. Length I: 6-(7.1)-9µm, length II: 12-(13.8)-16.5µm.

Toxas very variable in length, mostly thin, ranging from accolada forms with large central curvature and slightly reflexed points, large curvature and simply u-shaped, to asymmetrical sinuous forms. Length 55-(122.4)-180µm, width 0.8-(1.1)-1.5µm.

REMARKS. *C.* (*T.*) *juniperina* differs from that of Hartman (1955), Simpson (1968a), Wiedenmayer (1977) and Van Soest (1984b), who included *Spongia juniperina*, *Spongia virgultosa*, *Clathria copiosa*, *Microciona plana* and *Clathria clathrata* in synonymy. That 'species' concept was based on Caribbean populations, with only a single record from the E. Indian Ocean (i.e., nominotypical population of *Spongia juniperina*) inferring a widely disjunct geographical distribution. Three explanations are possible: 1) W. Indian Ocean and Caribbean populations are not conspecific but represent two cryptic sibling species populations with similar morphology; 2) the published province of the original material ('Indian Ocean, possibly Australia'; Topsent, 1932) is erroneous; 3) the species is widely distributed 'cosmopolitan' and these disjunct populations are conspecific. The latter two hypotheses are rejected (specimen labels record one of the types from SW Australia), so the first is considered to be the most probable explanation.

The present interpretation is that *C.* (*T.*) *juniperina* is restricted to the Indo-west Pacific (and the synonymy given above), whereas the the most senior name for the Caribbean population is *C.* (*T.*) *virgultosa* (including several other nominal species in synonymy; see *C.* (*T.*) *virgultosa* below). This conclusion conflicts with Topsent's (1932) revision of the relevant (preserved) type material, but this present action is more preferrable than the unlikely alternative that such widely disjunct populations are conspecific.

Clathria (*T.*) *juniperina* is similar to *C.* (*T.*) *cactiformis* and several other species included here in a '*juniperina*' species complex (spanning the groups *Clathria* and *Thalysias*; see comments for *C.* (*T.*) *cactiformis*), which has a depauperate skeleton (fibres shed some or all of their coring spicules) and principal and auxiliary spicules are similar in geometry.

Clathria (Thalysias) kieschnicki Hooper, in Hooper & Wiedenmayer, 1994

Rhaphidophlus cylindricus Kieschnick, 1900: 569, pl.44, fig.10.

Not *Esperiopsis cylindrica* Ridley & Dendy, 1886: 340.

Clathria (*Thalysias*) *kieschnicki* Hooper, in Hooper & Wiedenmayer, 1994: 271.

MATERIAL. None. Holotype PMJ missing; (F. Wiedenmayer, pers. comm.).

HABITAT DISTRIBUTION. Ecology unknown; Thursday I., Torres Strait (FNQ).

DESCRIPTION. *Shape.* Bifurcate digitate, with short cylindrical stem, up to 40mm long, branches tapering towards apex, up to 80mm long.

Colour. Live colouration unknown, ash-grey in ethanol.

Oscules. Small, scattered between surface conules.

Texture and surface characteristics. Fragile; surface with prominent, irregularly distributed conules, and detachable skin-like crust.

Ectosome and subectosome. Ectosome relatively thick, with discrete plumose bundles of ectosomal auxiliary subtylostyles, forming a continuous palisade, below which plumose tracts of subectosomal auxiliary subtylostyles protrude through ectosome.

Choanosome. Choanosomal skeletal architecture irregularly reticulate, with heavy, lamellated spongin fibres, 60-160µm diameter, not obviously divisible into primary or secondary elements, forming ovoid meshes, 90-150µm diameter; fibres cored by irregular multispicular tracts of choanosomal principal styles and also fewer subectosomal auxiliary subtylostyles; echinating acanthostyles abundant, evenly distributed.

Megascleres. Choanosomal principal styles straight or slightly curved, with smooth bases. Length 90-180µm, width 9-15µm.

Subectosomal auxiliary subtylostyles straight, with microspined bases. Length up to 270µm, width up to 18µm.

Ectosomal auxiliary subtylostyles are fusiform, straight or slightly curved, with microspined bases. Length 135-230µm, width 4-8µm.

Acanthostyles subtylote, with bare necks. Length up to 135µm, width up to 18µm.

Microscleres. Palmate isochelae. Length 15µm.

Toxas thin (but of unknown geometry), occurring in trichodragmata or singly. Length 70-100μm.

REMARKS. This species is poorly characterised because Kieschnick's (1900) description is brief and does not differentiate it from other arborescent, branching *Clathria* (*Thalysias*). From his description spicule geometries (which were never figured), and growth form are similar to *C.* (*T.*) *abietina*, but its true affinities remain a mystery given that the holotype is missing from PMJ collections. Maurice Burton (note on BMNH1887.5.2.104 specimen label) suggested that it was similar to *C.* (*T.*) *filifera*, but any relationship is unsubstantiated. The specific name *cylindrica* is preoccupied by *C.* (*Axociella*) *cylindrica* (Ridley & Dendy, 1886).

Clathria (Thalysias) koltuni Hooper, in Hooper & Wiedenmayer, 1994

Stylotellopsis antarcticus Koltun, 1964a: 66, text-fig.16.
Not *Anchinoe toxifera antarctica* Topsent, 1917: 43, pl.4, fig.5, pl.6, fig5.
Clathria (*Thalysias*) *koltuni* Hooper, in Hooper & Wiedenmayer, 1994: 271.

MATERIAL. None: 'Syntypes' (ZIL 10637, 11437) (not seen).

HABITAT DISTRIBUTION. Substrate unknown; 610-860m depth; Budd Coast, Wilkes Land, Antarctica.

DESCRIPTION. *Shape*. Thinly encrusting, up to only 1mm thick.
Colour. Red alive.
Oscules. Not seen.
Texture and surface characteristics. Even surface.
Ectosome and subectosome. Erect choanosomal principal subtylostyles protruding through surface with bundles of smaller auxiliary subtylostyles dispersed around principal spicules.
Choanosome. Hymedesmoid, with choanosomal principal and subectosomal auxiliary subtylostyles erect on basal spongin; bundles of echinating acanthostyles clumped around erect structural megascleres.
Megascleres. Choanosomal principal subtylostyles long, straight, fusiform, with subtylote bases and evenly microspined in basal third of spicule. Length 400-750μm, width 26-36μm.

Ectosomal and subectosomal auxiliary styles very long, slender, straight, fusiform, with microspined subtylote bases. Length 430-630μm, width 8-12μm.

Echinating acanthostyles short, club-shaped, fusiform, with prominent subtylote base and evenly spined over entire length of spicule. Length 100-260μm, width 10-14μm.
Microscleres. Absent.

REMARKS. This species is a lipochelous *Clathria*, but it is uncertain from Koltun's (1964a) brief description what subgenus it belongs to. It is retained in *Thalysias* (following Hooper & Wiedenmayer, 1994). It differs from other hymedesmoid species (especially those previously referred to *Pseudanchinoe*), in spicule dimensions and spicule ornamentation, but has few other noteworthy features. *antarcticus* is preoccupied by *C.* (*M.*) *antarctica* (Topsent, 1917).

Clathria (Thalysias) lendenfeldi
Ridley & Dendy, 1886
(Figs 178-179, Plate 7B-E)

Clathria lendenfeldi Ridley & Dendy, 1886: 474; Ridley & Dendy, 1887: 148, pl.28, fig.5, pl.29, fig.6, pl.47, fig.5; Whitelegge, 1889: 186; Whitelegge, 1901: 86; Whitelegge, 1907: 492-494; Burton & Rao, 1932: 334; Rudman & Avern, 1989: 335; Hooper et al., 1990: 126-133, figs 1, 2, 4, 6; Hooper & Wiedenmayer, 1994: 271.
Not *Clathria lendenfeldi*; Brondsted, 1934: 19-20, text-fig.19.
Thalysias lendenfeldi; de Laubenfels, 1936a: 105.
Microciona lendenfeldi; Dawson, 1993: 37.
Spongia abietina, in part, Lamarck, 1814: 450.
Echinonema anchoratum var. *lamellosa*; Whitelegge, 1901: 82.
Not *Echinonema anchoratum* var. *lamellosa* Lendenfeld, 1888: 219.
Clathria spicata Hallmann, 1912: 210; Dendy, 1922: 65-66, pl.5, fig.2, pl.13, fig.4a-f; Burton, 1959a: 244.
Clathria diechinata Hallmann, 1912: 211; 1914a: 268 [nomen nudum].
Thalysias spicata; de Laubenfels, 1936a: 105.
Clathria whiteleggii Dendy, 1922: 67, pl.7, fig.1, pl.13, figs 5a-f; Burton, 1931a: 344-345; Burton, 1959a: 245; Lévi, 1963: 66.
Thalysias whiteleggei; de Laubenfels, 1936a: 105.
Clathria coppingeri var. *aculeata* Hentschel, 1912: 363.
Rhaphidophlus bispinosus Whitelegge, 1907: 503-504.
Clathria bispinosa; Hallmann, 1912: 177,211.
cf. *Microciona prolifera*; Vosmaer, 1935a: 610, 636, 669.

MATERIAL. HOLOTYPE: BMNH1887.5.2. 107: off Port Jackson, NSW, 33°40'S, 151°40'E, HMS

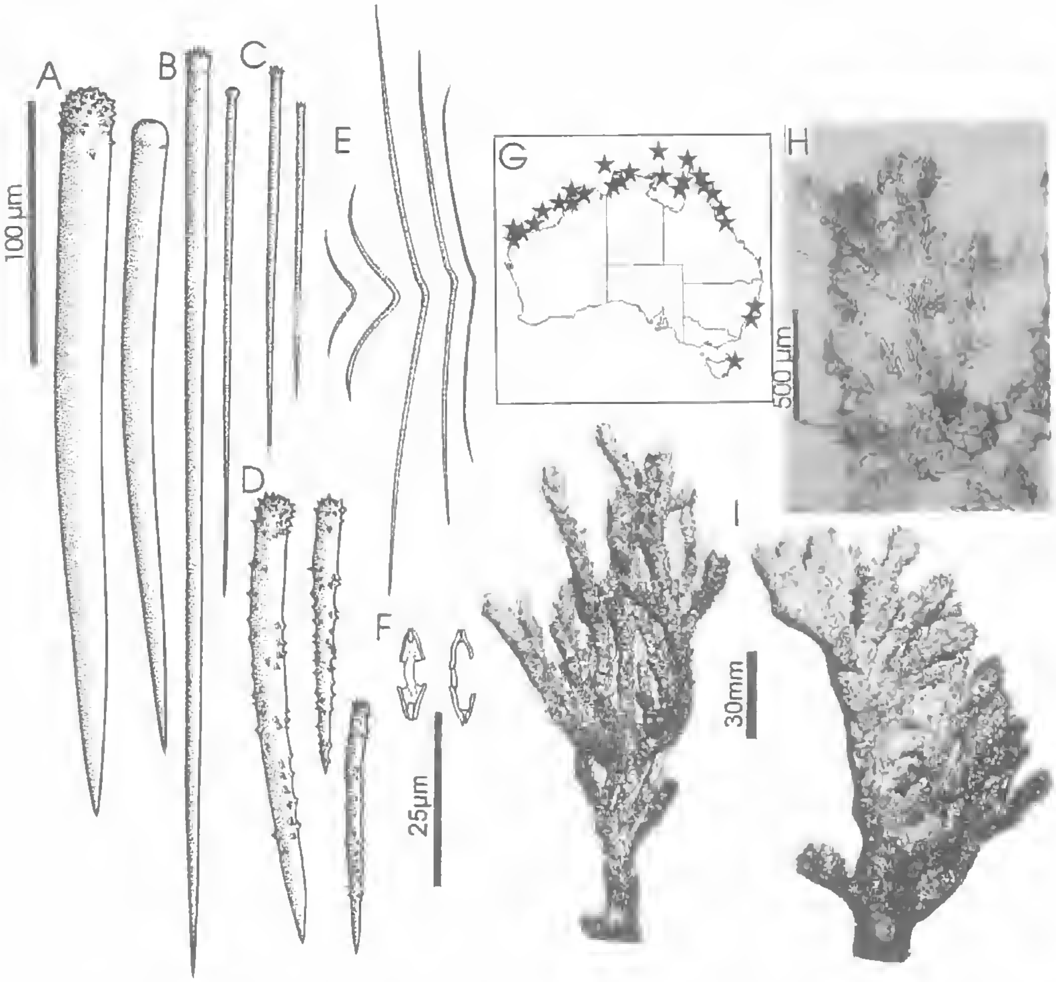

FIG. 178. *Clathria* (*Thalysias*) *lendenfeldi* Ridley & Dendy (NTMZ2095). A, Choanosomal principal subtylostyles. B, Subectosomal auxiliary subtylostyles. C, Ectosomal auxiliary subtylostyles. D, Echinating acanthostyles. E, Wing-shaped and accolada toxas. F, Palmate isochelae. G, Australian distribution. H, Section through peripheral skeleton. I, Trawled specimens from NW Australia.

'Challenger' (dredge). OTHER MATERIAL (refer to Hooper et al., 1990 for list of additional specimens used in this study): QLD - QMG303025, QMG303039, QMG304777, QMG305138, QMG300784, QMG300830, QMG303507, QMG303523, QMG304946. NT - NTMZ2821. WA - NTMZ3060, NTMZ3384, QMG310535 (NCIQ66C-1518-Q) (fragment NTMZ3489), QMG310423 (NCIQ66C-1291-T) (fragment NTMZ3463), QMG310423 (NCIQ66C-1318-X) (fragment NTMZ3468). TAS - QMG311436 (NCIQ66C-3745-M) (fragment NTMZ3822). ANDAMAN SEA, THAILAND - NTMZ3657, NTMZ3659. RED SEA - PIBOC04-11 (fragment QMG300057). SOMALIA, EAST AFRICA - PIBOCB12-367 (fragment QMG300062).

HABITAT DISTRIBUTION. Rock reefs and dead coral heads; intertidal to 108m depth; widespread Indo-Pacific; Port Jackson, Botany Bay (NSW); Shelburne Bay, Howick Is, Direction Is, Gulf of Carpentaria (FNQ); Cairns, East Frankland Is, Pandora Bay (NEQ); Darwin Harbour, Bynoe Harbour, Melville I., Beagle Gulf, Port Essington, Cobourg Peninsula, Cootamundra Shoals, Wessel Is (NT); Broome, Port Hedland, Bedout I., Dampier Archipelago, Monte Bello Is, Exmouth Gulf, Northwest Cape, Amphinome Shoals, Northwest Shelf (WA); Bicheno (Tas)(Fig. 178G); also Gulf of Manaar (Burton & Rao, 1932), Aru Is, Indonesia (Hentschel, 1912), Cargados Carajos (Dendy, 1922), Gulf of Aden (Burton, 1959a), Arabian coast (Burton, 1959a), Andaman Sea (present study),

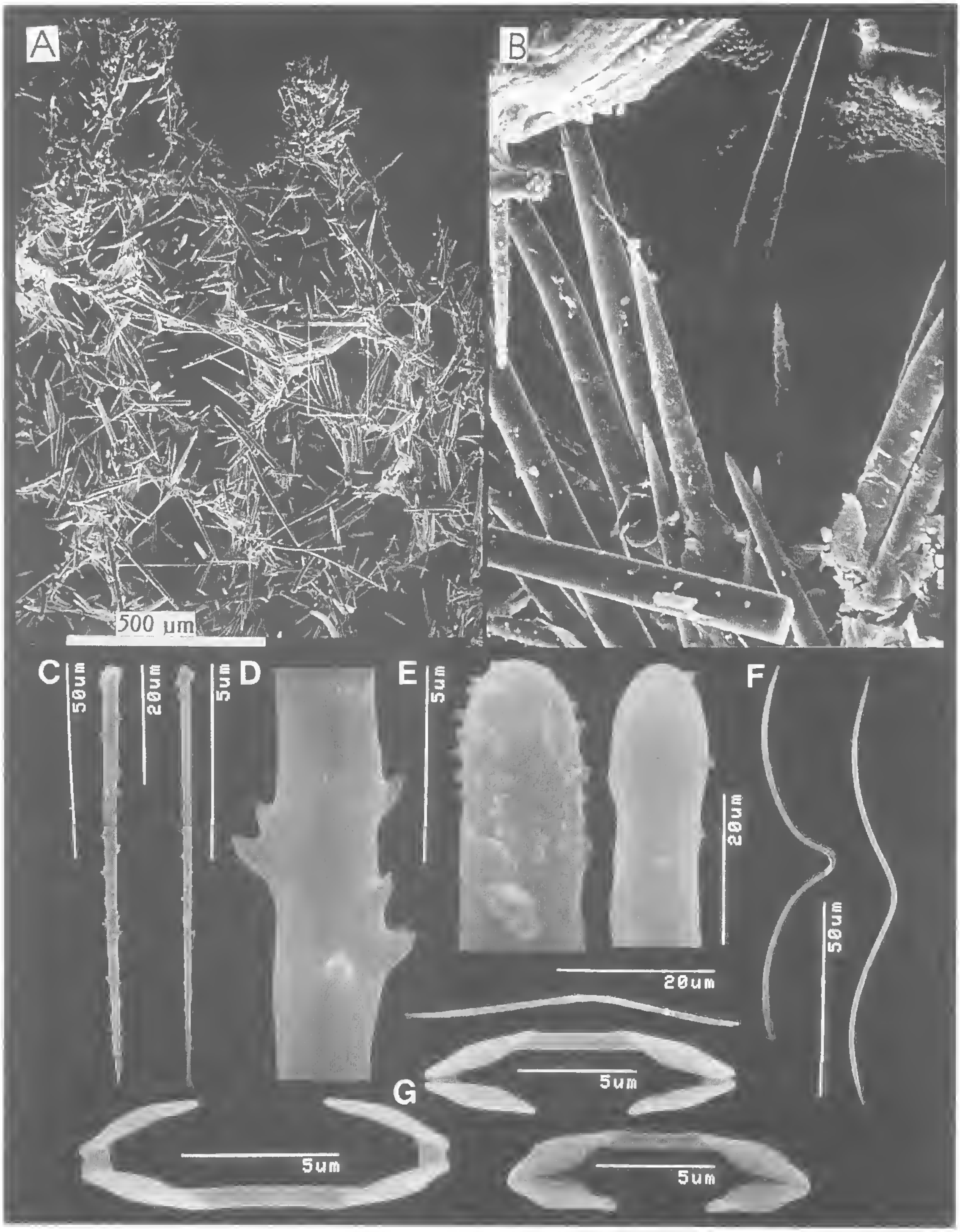

FIG. 179. *Clathria* (*Thalysias*) *lendenfeldi* Ridley & Dendy (A-B, NTMZ2701; C-G, QMG303039). A, Choanosomal skeleton. B, Fibre characteristics (x424). C, Echinating acanthostyles. D, Acanthostyle spines. E, Bases of principal and auxiliary subtylostyles. F, Wing-shaped and accolada toxas. G, Palmate isochelae.

Red Sea and Somalia (present study), Saya de Malha (Dendy, 1922) to the Natal coast (Burton, 1931a).

DESCRIPTION. (See Hooper et al., 1990).

DIAGNOSIS. Variable growth form ranging from bushy clathrous reticulate-branching to bushy lamellate planar digitate fans, usually with woody basal stalk and cylindrical branches; vivid red to pale red-brown alive in shallow waters to slightly turquiose or unpigmented in deeper waters; oscules small, congregated into special pore areas on points of digits or scattered between surface processes; surface usually microconulose; ectosome ranging from sparsely scattered smaller auxiliary spicules to dense, erect, continuous crust; choanosomal principal subtylostyles also protrude through surface; subectosomal skeleton poorly developed, paratangential, composed of larger auxiliary subtylostyles; choanosomal skeleton irregularly reticulate, heavy spongin fibres divided into primary (ascending) and secondary (transverse) components, producing regular or irregular meshes; fibre-meshes heavier in axis; fibres generally uncored, some with uni- or paucispicular tracts of principal spicules, and abundantly echinated by both acanthostyles and principal subtylostyles especially at fibre junctions ('spicate'); choanosomal principal subtylostyles long, curved or straight, sharply pointed, usually with heavily spined bases (119-(229.6)-492μm x 1.8-(12.9)-35μm); subectosomal auxiliary subtylostyles long, straight, fusiform, slightly subtylote, microspined bases (136-(241.5)-404μm x 2-(4.6)-15μm); ectosomal auxiliary subtylostyles short, thin, straight, fusiform, with microspined subtylote bases (62-(123.4)-198μm x 2-(3.0)-10μm); acanthostyles slender, long or short, fusiform, slightly subtylote, evenly and lightly spined, spines small, recurved (49-(88.1)-151μm x 2-(6.4)-14μm); palmate isochelae small, rarely modified, narrow lateral alae completely fused to shaft, approximately same length as front ala; lateral alae completely and widely separated from front ala (6-(12.5)-25μm long); toxas accolada to wing-shaped, very thin (hair like); larger toxas usually accolada, straight, with slight but sharp angular central curvature and unreflexed arms; smaller toxas usually wing-shaped, with large central curvature and slightly reflexed arms; toxas found singly and in bundles (dragmata) (7-(136.4)-361μm x 0.4-(1.3)-3.6μm).

REMARKS. Variation has been comprehensively investigated from many living specimens and type material (Hooper et al., 1990). The synonymy above also includes several new synonyms added to the species since that earlier paper. This species is a cryptic sibling species of *C.(T.) major*, differing only substantially by its hair-like toxas, sharply pointed auxiliary megascleres, statistical differences in spicule dimensions and various biochemical features (Hooper et al., 1990), and both are members of Hallmann's (1912) '*spicata*' group.

Clathria (Thalysias) major Hentschel, 1912
(Figs 180-181)

Clathria frondifera var. *major* Hentschel, 1912: 361.
Clathria (Thalysias) major; Hooper et al., 1990: 133-135, figs 1, 3, 5, 6; Hooper & Wiedenmayer, 1994: 272.

MATERIAL. HOLOTYPE: SMF977 (fragment MNHNDCL2303): Straits of Dobo, Aru I., Indonesia, 6°S, 134°50'E, 40m depth, 20.iii.1908, coll. H. Merton (dredge). OTHER MATERIAL: (Hooper et al., 1990) WA - NTMZ3338, NTMZ3360, CSIROEMG001.

HABITAT DISTRIBUTION. Rock reefs and dead coral heads; intertidal to 82m depth; Bedout I., Port Hedland, Mary Anne I., Direction Is, Exmouth Gulf (WA); Bynoe Harbour, Darwin Harbour, Port Essington (NT) (Fig. 180H); also Aru Is, Indonesia (Hentschel, 1912).

DESCRIPTION. (See Hooper et al., 1990).

DIAGNOSIS. Variable growth forms ranging from low, foliose, bushy, subspherical, clathrous digitate, to flabellate or digitate fans, usually with long basal stalk and flattened or irregularly cylindrical branches; bright red to orange-red alive; oscules small, congregated into special pore areas on lateral sides of branches or between surface conules; flabellate specimens may have *Phakellia*-like pores grouped into stellate pore-areas; surface irregularly microconulose with close-set subdermal ridges and striations; ectosomal skeleton ranges from very few tangentially placed ectosomal auxiliary subtylostyles to dense, erect or paratangential brushes of ectosomal spicules; subectosomal skeleton plumose, paratangential tracts of larger auxiliary subtylostyles; both larger auxiliary and principal spicules protrude through surface singly or in plumose bundles; choanosomal skeleton irregularly reticulate; fibre characteristics, skeletal structure and distribution of megascleres and microscleres identical to *C. (T.) lendenfeldi*;

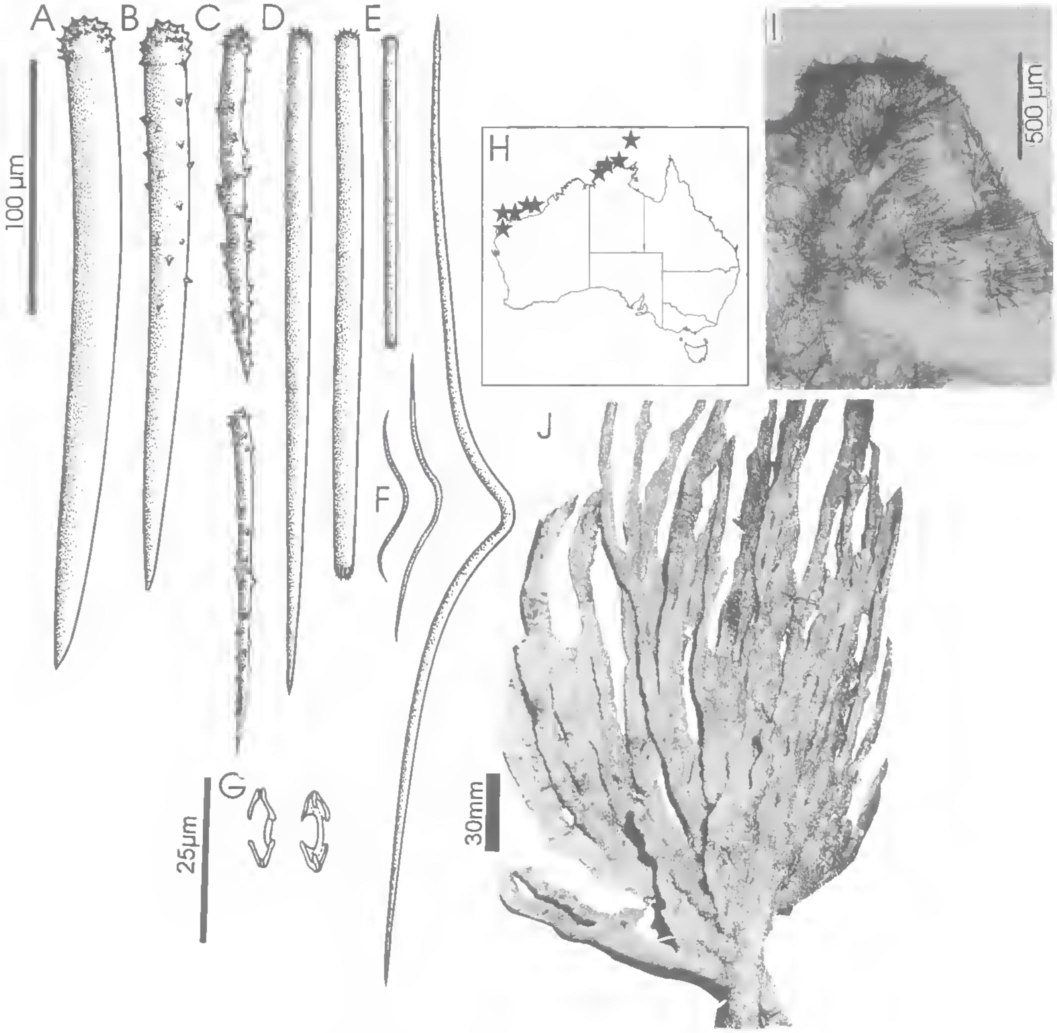

FIG. 180. *Clathria* (*Thalysias*) *major* Hentschel (specimen NTMZ858). A, Choanosomal principal subtylostyle. B, Intermediate principal-echinating subtylostyle. C, Echinating acanthostyles. D, Subectosomal auxiliary styles/ quasi-tornote. E, Ectosomal auxiliary style/ quasi-tornote. F, Wing-shaped and accolada toxas. G, Palmate isochelae. H, Australian distribution. I, Section through peripheral skeleton. J, Trawled specimens from NW. Australia.

choanosomal principal styles thick, slightly curved, fusiform, rounded or subtylote, usually with microspined bases, sometimes smooth (187-(250.5)-38µm x 5-(15.1)-36µm); subectosomal auxiliary subtylostyles long, straight, fusiform pointed, usually subtylote, microspined bases, or commonly with rounded apex (quasi-tornotes) also bearing microspines (156-(287.8)-439µm x 2-(5.7)-14µm); ectosomal auxiliary subtylostyles short, straight, subtylote microspined bases, usually with rounded apex (quasi-tornotes) and terminal spines (84-(136.8)-193µm x 2-(3.8)-9µm); acanthostyles relatively slender, long or short, fusiform, subtylote, with large spines on base and apex but nearly aspinose 'neck' (77-(112.7)-144µm x 3-(7.8)-15µm); palmate isochelae small, unmodified, wide lateral alae completely fused to shaft, approximately same

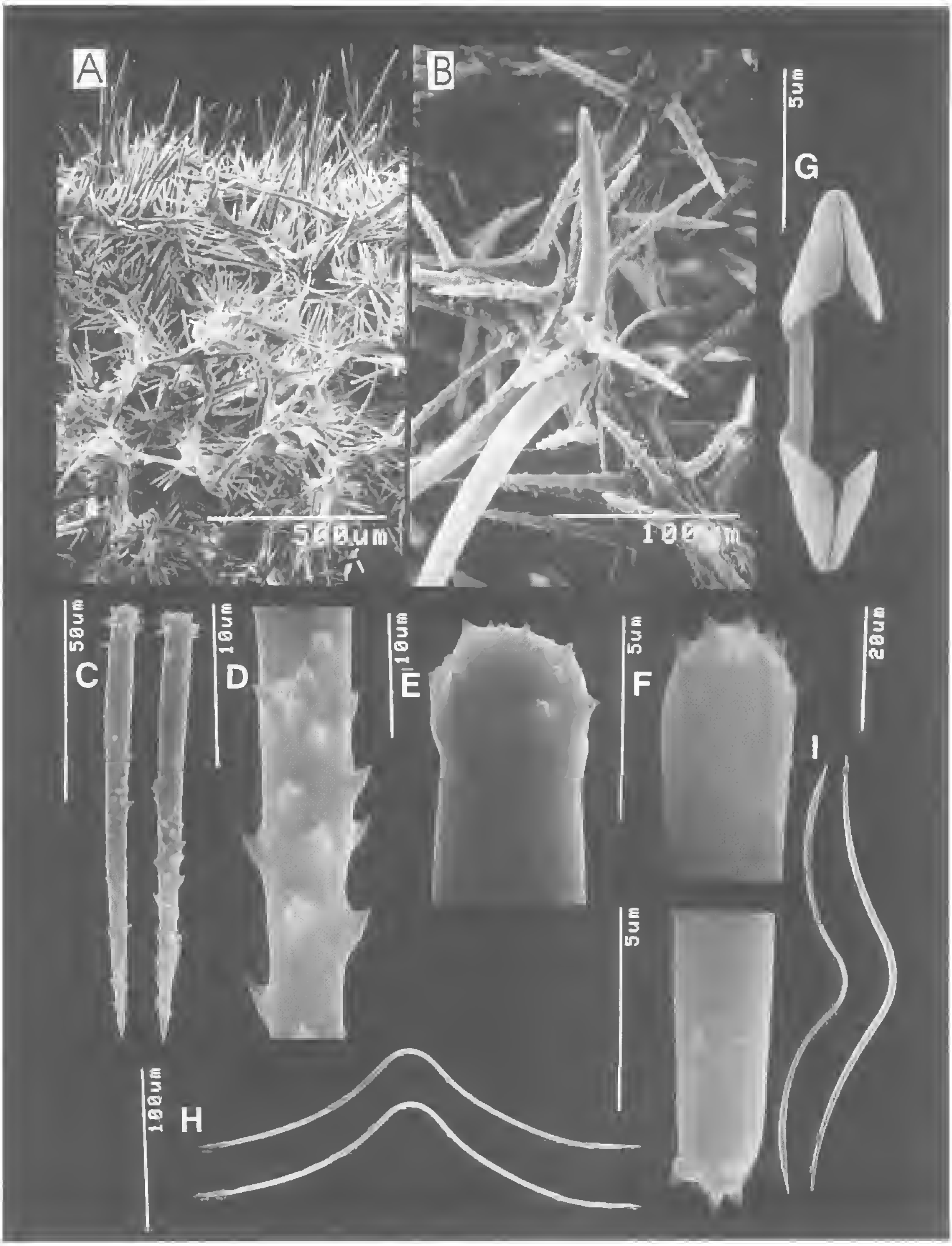

FIG. 181. *Clathria* (*Thalysias*) *major* Hentschel (QMG300153). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyles. D, Acanthostyle spines. E-F, Bases and apex of principal and auxiliary subtylostyles. G, Palmate isochelae. H-I, Accolada toxas.

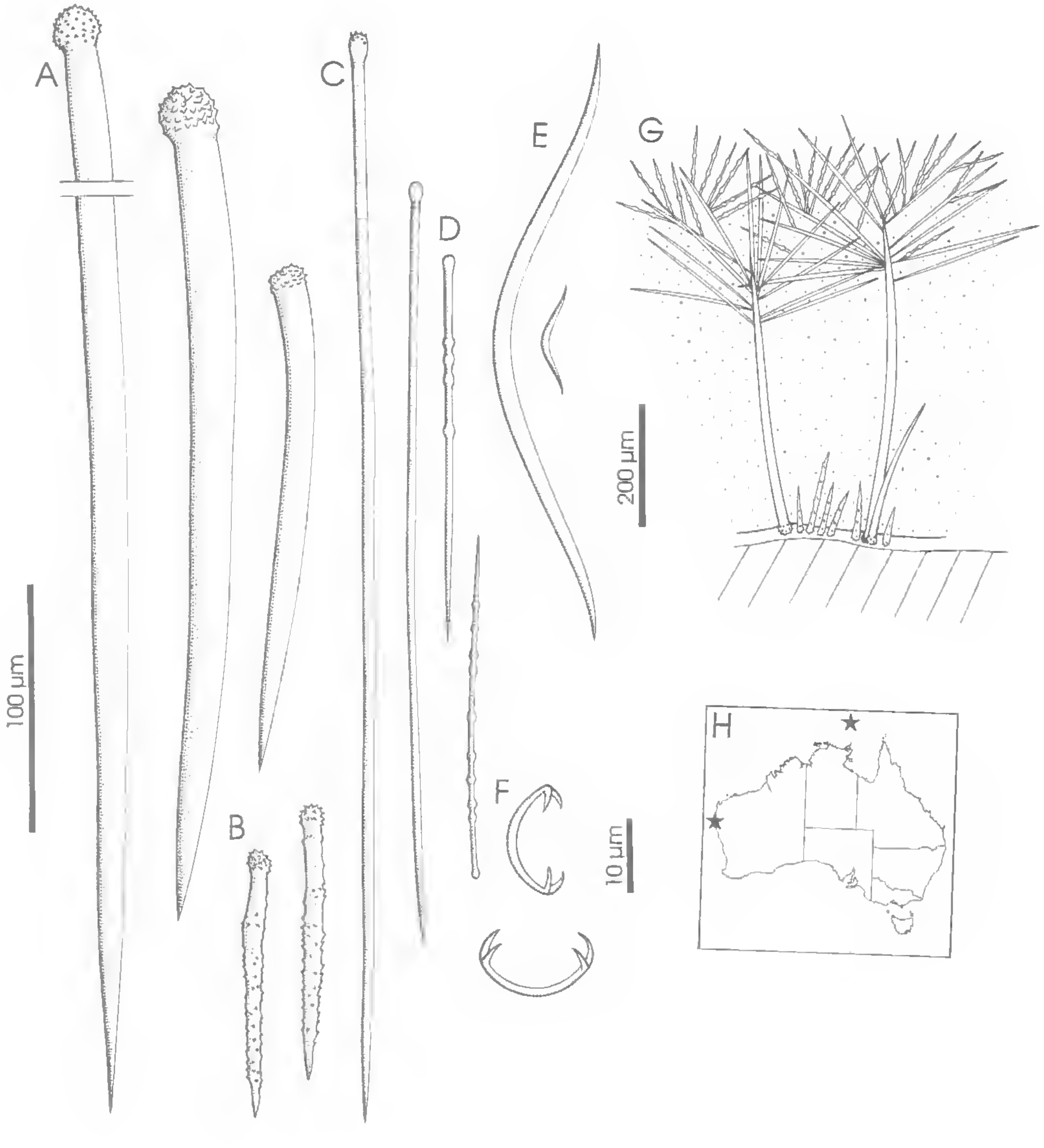

FIG. 182. *Clathria* (*Thalysias*) *michaelseni* (Hentschel) (fragment of holotype SMF969T). A, Choanosomal principal subtylostyles. B, Echinating acanthostyles. C-D, Subectosomal auxiliary subtylostyles and polytylote forms. E, Oxhorn - U-shaped toxas. F, Sigmoid anchorate-like isochelae. G, Section through peripheral skeleton. H, Australian distribution.

length as front ala; lateral alae completely separated but close to front ala (6-(10.4)-16µm long); toxas accolada or wing-shaped, the former long, very thick, with large rounded central curvature, straight or reflexed arms, the latter short, thin, widely curved at centre with reflexed arms (27-(108.9)-390µm x 0.6-(2.3)-5µm).

REMARKS. The species is a cryptic sibling of *C.* (*T.*) *lendenfeldi* with a sympatric but more restricted distribution. In gross morphology, surface features, live colouration and in many of its skeletal characters *C.* (*T.*) *major* is indistinguishable from its sibling. However, they can be reliably differentiated by spines on the points of many of the auxiliary spicules (especially most of the smaller ones), marginally thicker and longer toxas, and statistically (but not absolute) larger size of most other megascleres in *C.* (*T.*) *major*. The importance of these apparently 'relatively minor' morphological differences is indicated by clear differences between the two species in their biochemical fingerprints (Hooper et al., 1990).

In a recent survey of several Western Australian species, *C.* (*T.*) *major* was found to contain significant quantities of the chemical 2,6-dibromophenol of potential commercial importance as an 'iodoform' or 'fresh sea' flavour used in the production and marketing of commercial prawns (F. Whitfield, CSIRO, pers.comm.).

Clathria (Thalysias) michaelseni
(Hentschel, 1911)
(Fig. 182)

Hymeraphia michaelseni Hentschel, 1911: 351-352, text-fig.34; Hentschel, 1912: 385.
Damoseni michaelseni; de Laubenfels, 1936a: 110.
Clathria michaelseni; Hooper & Wiedenmayer, 1994: 272.

MATERIAL. HOLOTYPE: HM (not seen). Fragment of holotype SMF969T: 5 km NW. of Denham, Shark Bay, WA, 25°52'S, 113°28'E, 3m depth, 12.vi.1905, coll. W. Michaelsen & R. Hartmeyer (dredge).

HABITAT DISTRIBUTION. Bivalve and worm tubes, sand, coral and *Halimeda* bed substrata; 3-14m depth; central W coast (WA) (Hentschel, 1911); also Arafura Sea (Hentschel, 1912) (Fig. 182H).

DESCRIPTION. *Shape.* Thinly encrusting.

Colour. Live colouration unknown, brown in ethanol.

Oscules. Unknown.

Texture and surface characteristics. Firm; smooth unornamented surface.

Ectosome and subectosome. Star-shaped plumose brushes of intermingled ectosomal and subectosomal auxiliary subtylostyles on surface; most auxiliary spicules perpendicular to surface, with choanosomal principal megascleres protruding through.

Choanosome. Hymedesmoid skeletal structure, with choanosomal principal subtylostyles and smaller echinating acanthostyles embedded in and perpendicular to basal spongin; mesohyl matrix moderately heavy, without detritus.

Megascleres. Choanosomal principal subtylostyles long, fusiform, slightly curved, subtylote, with microspined bases. Length 188-(381.6)-646μm, width 10-(14.6)-19μm.

Subectosomal auxiliary subtylostyles long, thin, fusiform, prominently subtylote, lightly microspined, occasionally with smooth bases. Length 307-(403.6)-482μm, width 3-(4.4)-6μm.

Ectosomal auxiliary subtylostyles, short, thin, straight, prominently subtylote, smooth bases, usually polytylote shafts. Length 141-(162.4)-197μm, width 2-(2.9)-4μm.

Acanthostyles long, thin, slightly subtylote, with lightly microspined base and central portions, aspinose points and neck regions. Length 96-(108.8)-125μm, width 3-(6.6)-8μm.

Microscleres. Isochelae sigmoid (bidentate) anchorate, with small alae attached only at their bases. Length 15-(17.2)-19μm long.

Toxas oxhorn or u-shaped, variable in size, relatively thick, gently curved at centre and with reflexed points or only slightly reflexed points. Length 38-(122.6)-239μm, width 1-(3.5)-6μm.

REMARKS. Hentschel (1911) initially overlooked the presence of toxas in this species, although later described by him in specimens from Aru Is, Indonesia (Hentschel, 1912), but these were also seen in the holotype redescribed above. Hentschel (1911, 1912) also overlooked the presence of two categories of auxiliary spicules indicating its assignment in *C.* (*Thalysias*) rather than *C.* (*Clathria*). Spicule dimensions seen in type material also vary slightly from those published by Hentschel (1911).

This species is well differentiated from other thinly encrusting (hymedesmoid) microcionids in having bidentate sigmoid isochelae, for which de Laubenfels (1936a) created *Damoseni*. The recognition of de Laubenfels' genus is not upheld since this feature is homoplastic, also known to occur in other microcionids (e.g., *C.* (*C.*) *nexus* Koltun, with an erect ramose growth form), and other poecilosclerids (e.g., *Strongylacidon stelliderma* Carter).

Clathria (Thalysias) phorbasiformis sp. nov.
(Figs 183-184, Plate 7F-G)

MATERIAL. HOLOTYPE: NTMZ2138: Dudley Point, East Point Aquatic Life Reserve, Darwin Harbour, NT, 12°25.0'S, 130°49.1'E, intertidal, 27.ix.1984, coll. J.N.A. Hooper. PARATYPES: NTMZ2203: same locality, 23.xi.1984. NTMZ2418: same locality, 12°24.5'S, 130°48.0'E, 3m depth, 14.viii.1985, coll. J.N.A. Hooper (snorkel). OTHER MATERIAL: NT - NTMZ2214: same locality as type

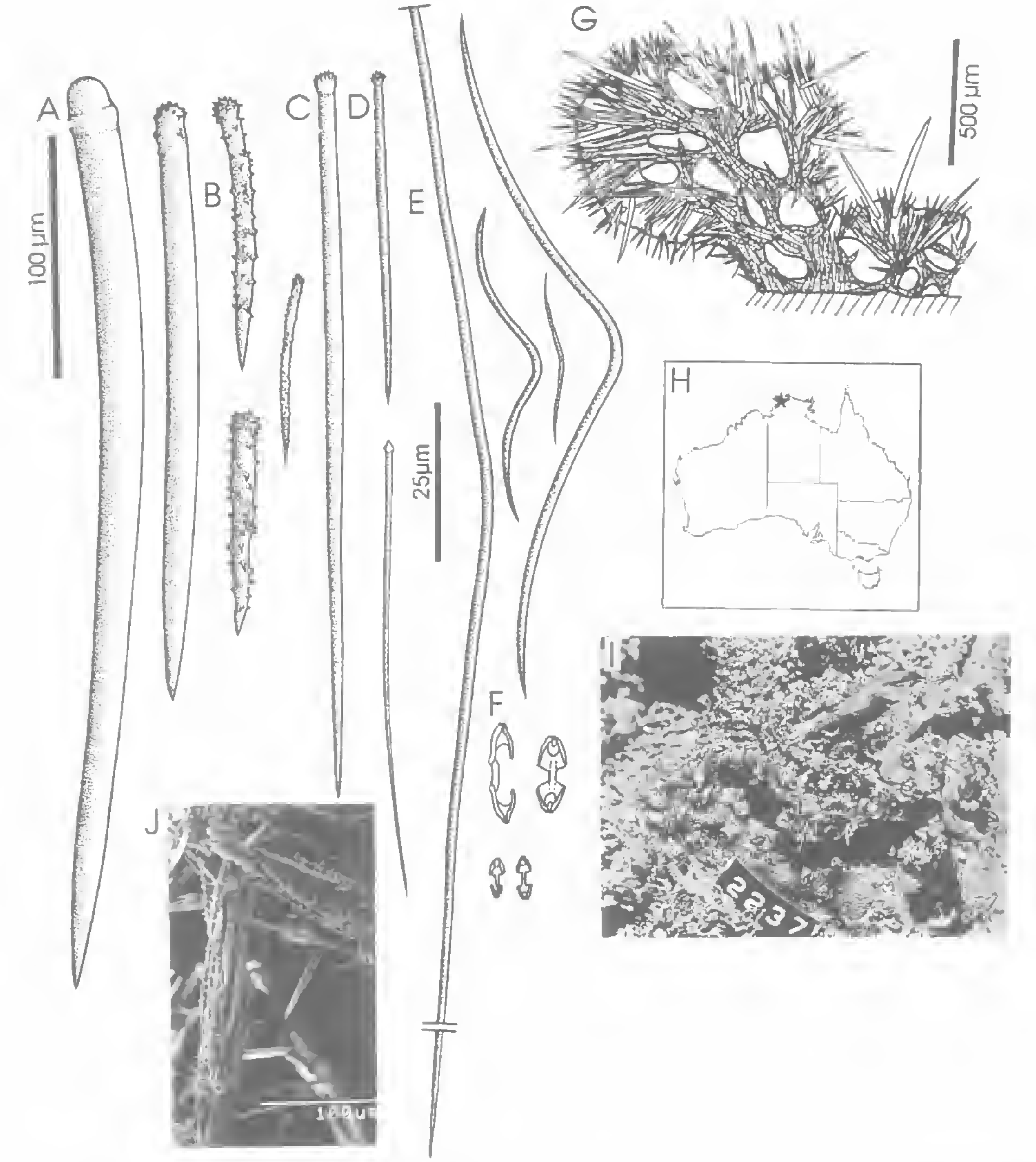

FIG. 183. *Clathria (Thalysias) phorbasiformis* sp.nov. (holotype NTMZ2138). A, Choanosomal principal subtylostyles. B, Echinating acanthostyles. C, Subectosomal auxiliary subtylostyle. D, Ectosomal auxiliary subtylostyles. E, Wing-shaped and accolada toxas. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution. I, NTMZ2237. J, Acanthostyles incorporated into spongin fibres.

material, 8.i.1985, QMG300149 (fragment NTMZ2223), QMG300150 (fragment NTMZ2237).

HABITAT DISTRIBUTION. Encrusting on laterite rock, dead coral, exposed at ELWS tides, under dead coral boulders or in crevises and pools; intertidal; Darwin Harbour (NT) (Fig. 183H).

DESCRIPTION. *Shape.* Thickly encrusting, 0.7-1.3cm thick, producing thin cylindrical

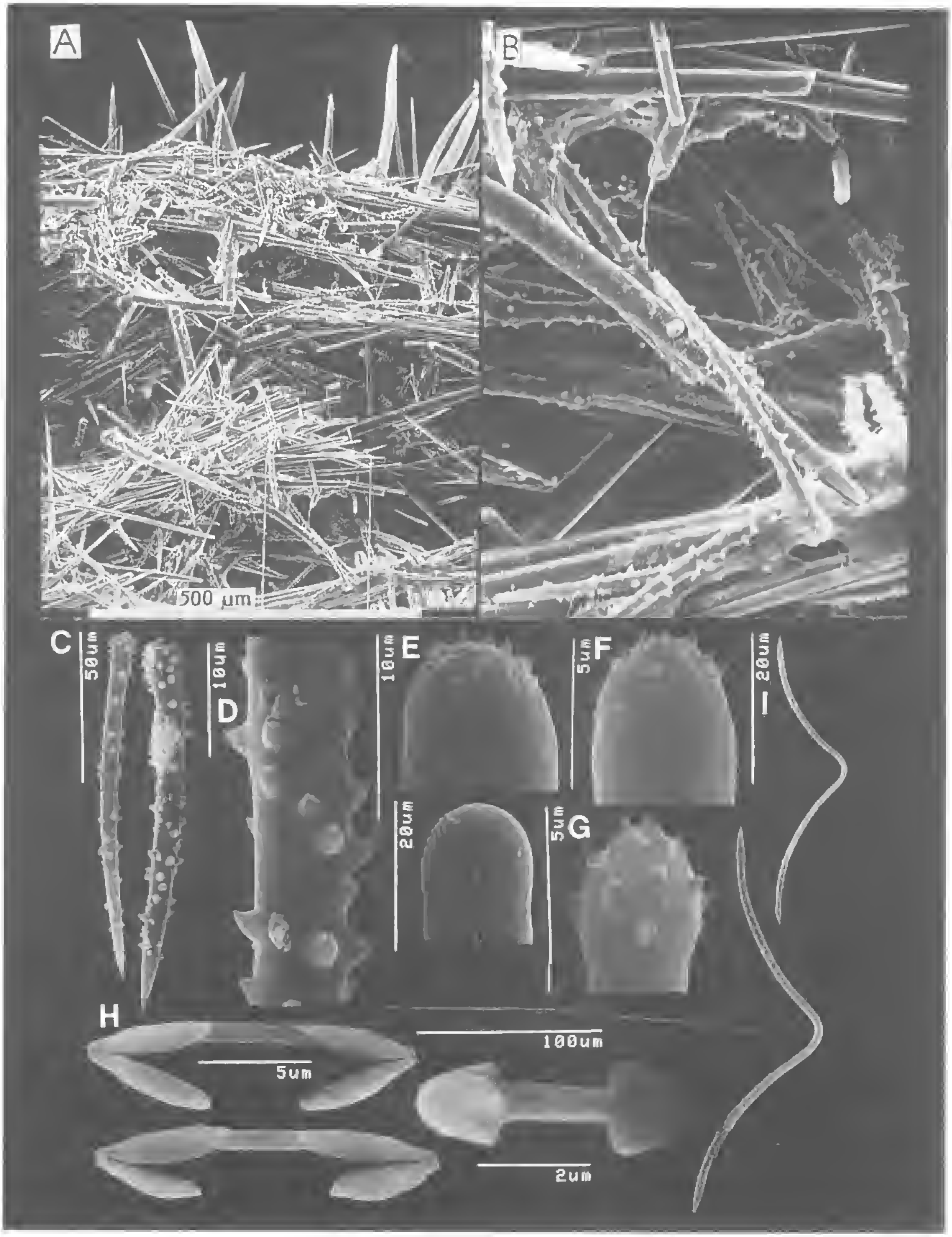

FIG. 184. *Clathria (Thalysias) phorbasiformis* sp.nov. (QMG300150). A, Choanosomal skeleton. B, Fibre characteristics (x400). C, Echinating acanthostyles. D, Acanthostyle spines. E-G, Bases of principal and auxiliary subtylostyles. H, Palmate isochelae. I, Wing-shaped and accolada toxas.

stoloniferous digitate non-anastomosing stoloniferous processes, up to 6mm in diameter, which may or may not re-attach to substrate.

Colour. Orange-brown to brick-orange alive (Munsell 2.5 YR 7/6-8); grey-brown in ethanol.

Oscules. No oscules visible optically alive or preserved, but numerous minute pores, 0.1-0.25mm diameter, scattered over surface seen at higher magnification.

Texture and surface characteristics. Texture firm, compressible; abundant clear mucus produced upon exposure to air; surface optically smooth, microscopically hispid, even, or small ridges and low conules following contours of substrate; digitate surface processes may have more prominent sculpturing superficially resembling *C. (T.) reinwardti*.

Ectosome and subectosome. Usually dense ectosomal skeleton, only slightly opaque or pellucid between surface conules, with subectosomal cavities and canals barely visible below surface (alive); ectosome microscopically hispid, with points of choanosomal principal styles protruding, singly or in plumose brushes, with thickest brushes in areas where ultimate choanosomal fibres in peripheral region closest to surface; specialised ectosomal skeleton well developed, with discrete brushes of smaller ectosomal auxiliary subtylostyles forming continuous palisade; relatively thick but variable layer of spongin and detritus also on ectosome; clear regional and structural differentiation between ectosomal and subectosomal skeletons; subectosomal region variable in thickness dependent on proximity of peripheral fibres to surface, containing plumose columns of larger auxiliary subectosomal subtylostyles, not associated with fibres, but often bound together by collagen; subectosomal skeletal columns originate from ends of choanosomal principal megasclcres, which in turn echinate fibres of peripheral skeleton in plumose tufts or singly.

Choanosome. Thick growth forms – Skeletal architecture vaguely plumo-reticulate; spongin fibres relatively light, irregularly anastomosing, fully cored by acanthostyles, lying in rows of 3-5 megascleres abreast (i.e., entirely incorporated into spongin fibres lying in parallel spicule tracts); principal subtylostyles only rarely seen coring fibres, and acanthostyles only rarely echinate fibres (i.e., lie at right angles to fibres); spongin fibres predominantly echinated by principal subtylostyles, in plumose tufts or singly, particularly abundant at fibre nodes; fibre anastomoses form oval or elongate meshes, 250-800μm diameter; fibres thicker in deeper areas of choanosome (70-100μm diameter) than in periphery (55-80μm diameter); major portion of branch diameter consists of extra-fibre plumose tracts of subectosomal auxiliary megascleres with choanosomal reticulate skeletal comprising less than half of branch diameter; extra-fibre plumose spicule tracts originate approximately half-way along length of perpendicular choanosomal styles, or in thicker sections they originate at ends of principal megascleres; extra-fibre plumose spicule tracts ascend to, diverge, and pierce ectosomal skeleton; mesohyl matrix only lightly pigmented, variable in density, usually heavier near periphery; extra-fibre spicules mostly occur in well defined tracts with few scattered randomly throughout mesohyl.

Thinly encrusting growth forms – hymedesmoid skeletal construction with basal layer spongin lying on substrate, uncored but very heavily echinated by both acanthostyles and choanosomal subtylostyles standing perpendicular to substrate; subectosomal spicule tracts arise from distal half of erect choanosomal megascleres, diverging and ascending to surface in plumose brushes, surmounted by plumose brushes of ectosomal auxiliary spicules at periphery.

Megascleres. Choanosomal principal subtylostyles fusiform, tapering to long points, slightly curved near the basal end or occasionally straight, with subtylote, mostly smooth bases, occasionally roughened subapically or slightly tubercular. Length 245.2-(425.8)-583.1μm, width 10.2-(19.5)-33.8μm.

Subectosomal auxiliary subtylostyles long, fusiform, mostly straight, with subtylote microspined or occasionally smooth bases. Length 275-(386.2)-485.3μm, width 4.0-(9.6)-18.8μm.

Ectosomal auxiliary subtylostyles relatively short, straight or whispy, slender, with subtylote, relatively heavy basal microspination. Length 70.0-(140.5)-261.2μm, width 1.2-(4.0)-6.9μm.

Acanthostyles fusiform, straight or slightly curved near base, slightly subtylote, evenly spined but characteristically free of spines at points; spines large, recurved. Length 95.4-(115.4)-132.4μm, width 4.6-(8.4)-12.7μm.

Microscleres. Palmate isochelae abundant, subdivided into 2 size categories, smaller ones sometimes contort; lateral alae completely attached to shaft, approximately same length as front ala but completely detached from it. Length I: 10-(14.9)-21.9μm, length II: 2.5-(5.6)-9.2μm.

Toxas moderately abundant, vaguely separated into 2 forms although intermediates occur: smaller wing-shaped toxas relatively thick, generously curved at centre with slightly reflexed, abruptly pointed ends; accolada toxas long, nearly straight, with slight central curvature and slight or no apical reflexion. Length 30-(95.1)-222.9μm, width 0.5-(1.4)-2.5μm.

Associations. Growing in dense clumps amongst algae (*Gellidium*), with stoloniferous branches intertwined, occasionally attached to algae itself; some specimens growing over, or next to other encrusting sponges (*Placospongia*, *Mycale*, *Antho* (*Plocamia*)), compound ascidians, and coralline algae.

ETYMOLOGY. Like *Phorbas* (Anchinoidae).

REMARKS. This species incorporates most echinating acanthostyles into spongin fibres, either together with one or few principal subtylostyles enveloped by spongin, or excluding principal megascleres completely. This feature is consistent except for one thinly encrusting specimen that lacks a reticulate fibre skeleton, in which case acanthostyles stand perpendicular to substrate. Principal spicules are mostly outside fibres, perpendicular to (echinating) fibres and fibre nodes, and protruding through the surface. This is reminiscent of Hallmann's *spicata* group (see *C.* (*T.*) *coppingeri*).

Incorporation of echinating acanthostyles secondarily into fibres has been observed in some specimens of *C.* (*Dendrocia*) *dura*, *C.* (*D.*) *imperfecta*, and to a lesser degree *C.* (*D.*) *myxilloides*, but these instances are infrequent, inconsistent (i.e., seen in some sections of the skeleton but not in others), and probably aberrant. A similar phenomenon has been described for *C.* (*T.*) *orientalis* by Brondsted (1934) but this too is atypical for the species (whereby the larger auxiliary subtylostyles usually core fibres). Analogous structures are described in other poecilosclerids, particularly for the families Anchinoidae and Crellidae, but in these species acanthostyles also comprise the 'principal' structural spicules.

Clathria (*Thalysias*) *phorbasiformis* differs from other species in the '*phorbasiformis*' complex in gross morphology and spicule geometry. In live surface features and colouration it some resemblance to thickly encrusting *C.* (*T.*) *reinwardti*, although spicule geometry, spicule size, skeletal architecture and fibre characterisitics are clearly different between them.

Clathria (Thalysias) placenta
(Lamarck, 1814)
(Figs 185-186)

Spongia placenta Lamarck, 1814:374; 1815:356.
Wilsonella placenta; Topsent, 1930:24, pl.3, fig.8.
Clathria placenta; Hooper & Wiedenmayer, 1994: 273.
Not *Microciona placenta*; de Laubenfels, 1954:146-147, text-fig.94.

MATERIAL. HOLOTYPE: MNHNDT552: King I., Bass Strait, Tas, 39°50'S, 144°00'E, Peron & Lesueur collection.

HABITAT DISTRIBUTION. Ecology unknown; Bass Strait, Tasmania (Fig. 185G).

DESCRIPTION. *Shape*. Thick, flabellate growth form, 180mm high, 170mm wide, up to 10mm thick, with even margin; probably originally with basal stalk but now detached.

Colour. Grey-brown dry.

Oscules. Not seen.

Texture and surface characteristics. Harsh, flexible, brittle in dry state; surface relatively even, with longitudinal annular striations running from basal stalk to margin of fan, and raised fibre reticulations forming polygonal pattern.

Ectosome and subectosome. Ectosome almost completely detached fromdry type specimen, but where present appears to be sparse, plumose, erect or paratangential palisade of ectosomal styles arising from ascending subectosomal spicule tracts, the latter embedded in peripheral skeleton; choanosomal fibres immediately subectosomal.

Choanosome. Choanosomal skeleton irregularly reticulate with primary (ascending) and secondary (transverse) fibres; primary fibres (105-175μm diameter) cored by multispicular tracts of subectosomal auxiliary styles, occupying up to 60% fibre diameter, tracts becoming plumose peripherally; secondary fibres (35-88μm diameter) without coring spicules; all fibres heavily echinated by small acanthostyles sometimes nearly enveloped in spongin; fibre anastomoses form irregular oval and rectangular meshes (145-510μm diameter); mesohyl matrix light, with few loose megascleres dispersed between fibres.

Megascleres. Choanosomal principal megascleres absent or completely undifferentiated from subectosomal spicules.

Subectosomal auxiliary styles thin, straight, slightly curved or slightly sinuous, with smooth rounded bases and sharp fusiform points. Length 175-(237.5)-285μm, width 5-(6.6)-8μm.

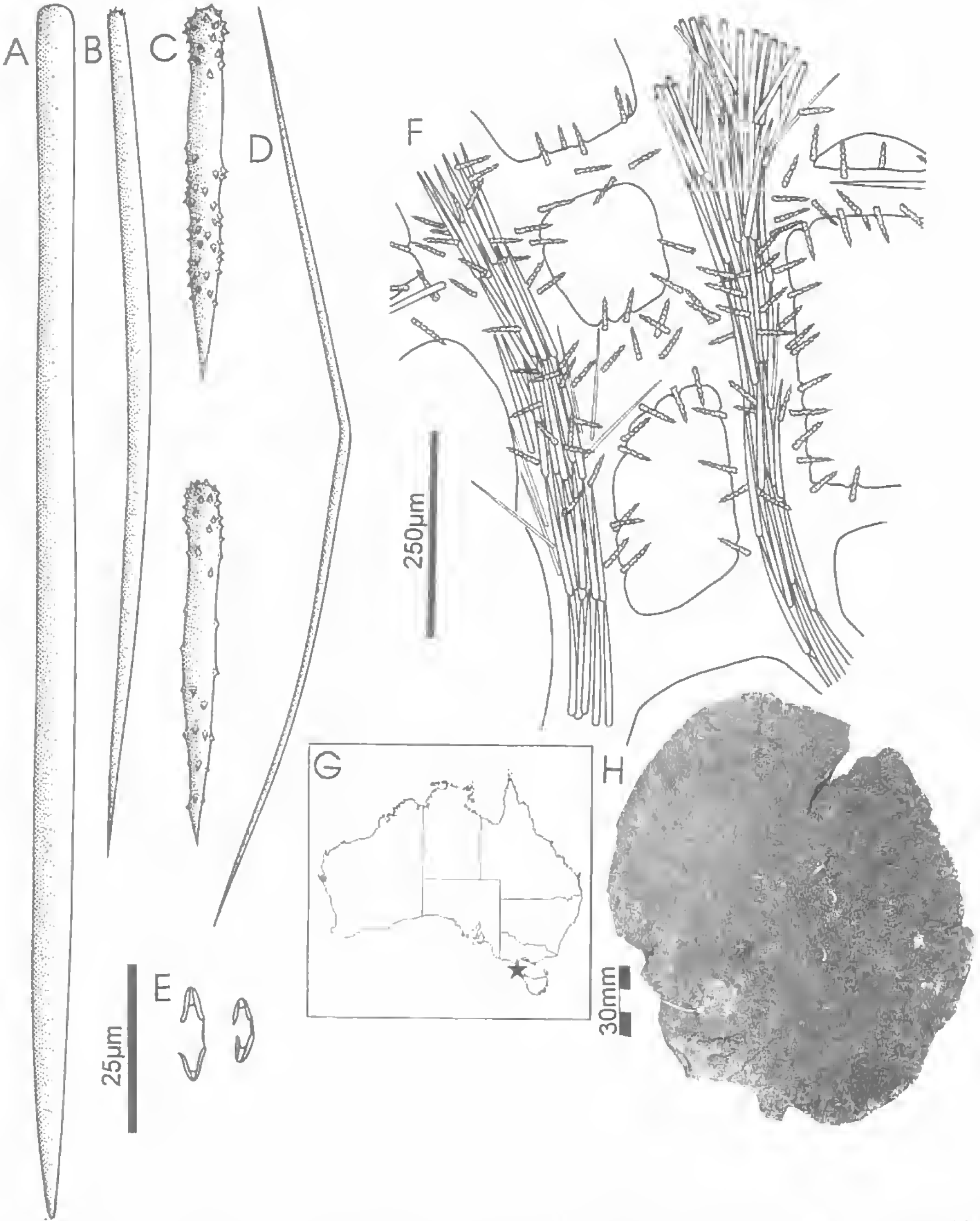

FIG. 185. *Clathria* (*Thalysias*) *placenta* (Lamarck) (holotype MNHNDT552). A, Subectosomal auxiliary subtylostyle. B, Ectosomal auxiliary subtylostyle. C, Echinating acanthostyles. D, Accolada toxa. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, Holotype.

Ectosomal auxiliary styles straight or slightly curved near apical end, with rounded microspined bases, fusiform points. Length 115-(138.1)-156µm, width 2-(2.6)-4µm.

Acanthostyles short, slender, subtylote, fusiform pointed, spined only on base and near apical end, with smooth regions at "neck" (proximal to base) and point. Length 52-(54.4)-58µm, width 3.5-(4.2)-6µm.

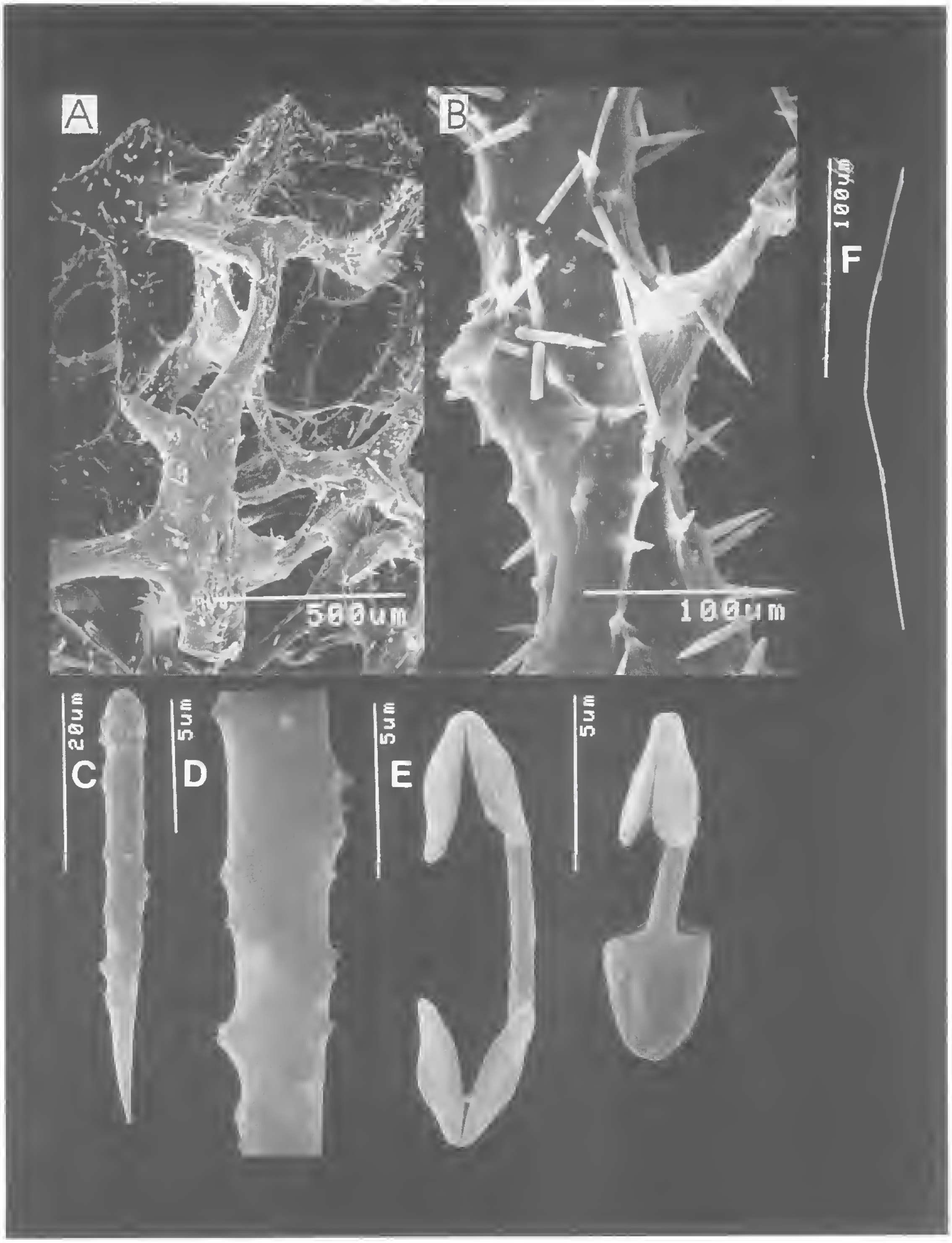

FIG. 186. *Clathria* (*Thalysias*) *placenta* (Lamarck) (holotype MNHNDT552). A, Skeleton, ectosome detached. B, Fibre characteristics. C, Echinating acanthostyle. D, Acanthostyle spines. E, Palmate isochelae. F, Accolada toxas.

Microscleres. Palmate isochelae small, with some contort forms, small alae less than 30% of shaft length, lateral alae completely fused to shaft, front ala completely detached. Length 8-(10.7)-14µm.

Toxas accolada, moderately long, thick, with only very slight central curvature and straight points. Length 105-(119.5)-148µm, width 1.0-(1.4)-2.0µm.

REMARKS. Lamarck's (1814) holotype from Bass Strait and de Laubenfels'(1954) sample USNM22908 from Truk, Caroline Is are not conspecific; the latter becomes *C.* (*T.*) *lematolae* sp. nov. The Truk sample is only similar to *C. placenta* in having fibres cored by subectosomal auxiliary spicules instead of principal spicules (i.e., the principal and larger auxiliary spicules are undifferentiated in their geometry). In most other details the two species can be readily distinguished (the Chuuk sample has an encrusting growth form, an extremely smooth surface, skeletal structure is hymedesmoid including possession of a very extensive subectosomal skeleton, occupying almost half of the sponge diameter, acanthostyles are about twice the size of those in *C. placenta* with much more robust spination, toxas are slightly accolada but moreso wing-shaped, megascleres are mostly subtylote, and dimensions of most spicules differ).

Topsent (1930) implied that *C.* (*T.*) *placenta*) was similar to *C.* (*Wilsonella*) *australiensis* (Carter), but this is certainly not true (the two having very different skeletal structures, spicule geometries and absence of foreign detritus in the skeleton of *C.* (*T.*) *placenta*). *Clathria* (*T.*) *placenta* is a member of the '*juniperina*' complex having a reduced spicule skeleton (whereby fibres shed some or all their spicules, in this case only from the secondary fibres), and principal and auxiliary spicule of similar geometry (refer to discussion under *C.* (*T.*) *cactiformis*).

Clathria (Thalysias) procera (Ridley, 1884)

(Figs 187-188, Table 38)

Rhaphidophlus procerus Ridley, 1884a:451-452, pl.39, fig.k, pl.42, fig.o; Burton, 1931a:343, pl.23, fig.2.

Clathria procera; Dendy, 1922:64, pl.2, figs 6-7; Burton, 1938a:28-29; Burton, 1959a:243; Lévi, 1963:66; Bergquist, 1967:164-165, text-fig.3; Thomas, 1973:34-35, pl.2, fig.5, pl.7, fig.3; Bergquist, 1977:65; Hooper & Wiedenmayer, 1994: 273.

Tenacia procera; Burton & Rao, 1932:340; Burton, 1934a:559; Burton, 1934b:28.

Rhaphidophlus spiculosus Dendy, 1889b:75, 86, 87, 99, pl.4, fig.4 [Gulf of Manaar, Ceylon]; Dendy, 1922:64.

Clathria spiculosa; Dendy, 1905:171-173, pl.8, fig.2 [Gulf of Manaar, Ceylon]; Hentschel, 1912:363,364; Hallmann, 1912:177; Dendy, 1916a:46, 95, 128-129 [Okhamandal, Kattiawar].

Clathria spiculosa var. *ramosa*; Hentschel, 1912:363-364.

Not *Clathria spiculosa* var. *macilenta*; Hentschel, 1912:364 [Aru I., Arafura Sea].

Echinonema gracilis Ridley, 1884a:617, pl.54, fig.l; Dendy, 1922:64.

Rhaphidophlus gracilis; Ridley & Dendy, 1887:152, 242, 252; Topsent, 1892b:24.

Clathria gracilis; Dendy, 1905:171; Vosmaer, 1935a:634.

Not *Rhaphidophlus arborescens* Ridley, 1884a:450-451, pl.40, fig.L, pl.42, fig.n; Burton & Rao, 1932:340.

cf. *Microciona prolifera*; Vosmaer, 1935a:610, 634, 669.

MATERIAL. HOLOTYPE: BMNH1882.2.23. 313: Off East Point, Port Darwin, NT, 12°24.5'S, 130°48.0'E, 14-22m depth, coll. HMS 'Alert' (dredge). PARATYPE: BMNH1882.2.23.311: same locality. HOLOTYPE of *R. spiculosus*: BMNH1889.1.21.5 (fragment BMNH1954.2.23.101): Gulf of Manaar, Sri Lanka, 8°N, 78°E. PARATYPE of *R. spiculosus*: BMNH1887. 8.4.31: same locality. HOLOTYPE of *E. gracilis*: BMNH1882.10.17.111: Providence Island, Seychelles Is, Indian Ocean, 9°14'S, 51°02'E, 48m depth (dredge). HOLOTYPE of *C. spiculosa* var. *ramosa*: SMF1698 (fragment MNHNDCL 2304): Straits of Dobo, Aru I., Arafura Sea, Indonesia, 6°S, 134°50'E, 20.iii.1908, 40m depth coll. H. Merton (dredge). OTHER MATERIAL: QLD- NTMZ3983, QMG 301032, QMG303514-QMG304392, QMG304771. NT- NTMZ2604, QMG303582. WA- NTMZ1308. INDIAN OCEAN - BMNH1907.2.1.63, BMNH 1954.2.23.113, BMNH1954.2.23.114.

HABITAT DISTRIBUTION. On loose, soft substrates (sand, mud, gravel, shell grit) associated with shallow-water or deeper offshore reefs; 11-78m depth; widespread throughout the Indian Ocean and Indo-west Pacific: Gulf of Carpentaria, Low Is, Direction Is, Snake Reef, Turtle Is (FNQ); Bynoe Harbour, Darwin Harbour, Cape Wessel, Arafura Sea (NT); Port Hedland (WA)(Fig. 187H); also Scottburgh, Natal (Burton, 1931a; Lévi, 1963), Cargados Carajos, Seychelles, Amirante, Red Sea and Arabian Sea (Ridley, 1884a; Ridley & Dendy, 1887; Dendy, 1922; Burton & Rao, 1932; Burton, 1959a; Thomas, 1973b); Tuticorin, Cape Comorin, Palk Straits, and Madras Straits, Gulf of Manaar (Burton & Rao, 1932; Burton, 1938a), Aru Is, Indonesia (Hentschel, 1912), Hawaii (Bergquist, 1967; 1977).

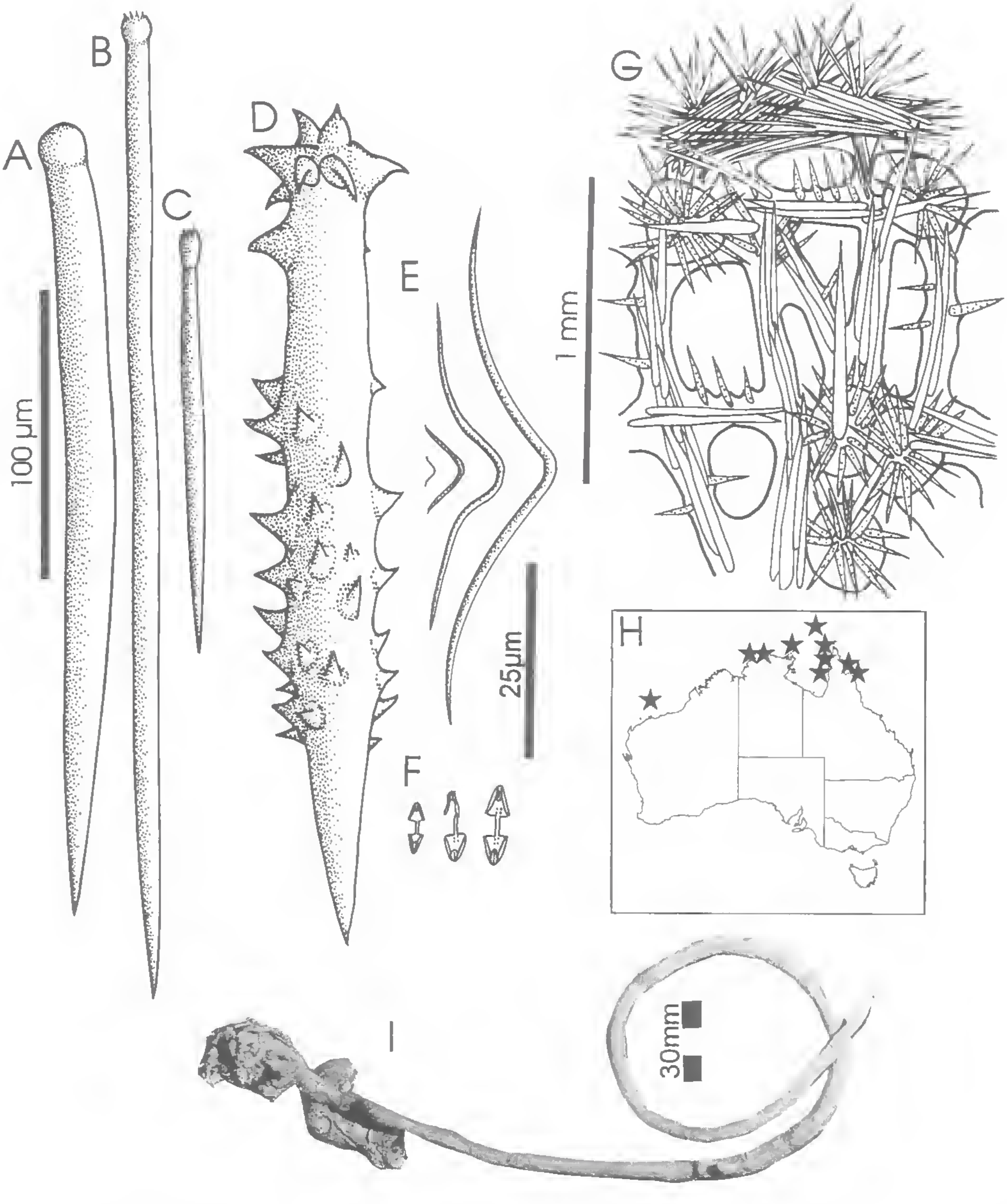

FIG. 187. *Clathria* (*Thalysias*) *procera* (Ridley) (NTMZ1308). A, Choanosomal principal subtylostyle. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyle. D, Echinating acanthostyle. E, Wing-shaped and U-shaped toxas. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution. I, Holotype BMNH1882.2.23.313.

DESCRIPTION. *Shape*. Long, single or bifurcate cylindrical digits, whip-like, very slightly flattened laterally, 230-640mm long; stalk tapers in both directions from thick central region 4-14mm diameter, to woody base 4-6mm diameter, and rounded points 6-13mm diameter; apex with single or no bifurcation is single; point of attachment to substrate expanded, rhizomous; gross morphology superficially resembles *Junceela* gorgonian whip-coral.

TABLE 38. Comparison between present and published records of spicule dimensions for *Clathria (Thalysias) procera* (Ridley). Measurements in μm (N=25).

SPICULE	Holotype (BMNH1882.2.23.313)	Specimens (N=8)	*Clathria spiculosa* var. *ramosa* (SMF1698)	Specimen (N=1) (Burton, 1938)	Specimen (N=1) (Thomas, 1973b)
Choanosomal styles	322-(334.2)-348 x 11-(13.2)-16 (common)	248-(283.2)-309 x 16-(18.2)-22 (uncommon)	263-288 x 15-18 (rare)	220-360 x 13	201-310 x 4-12
Subectosomal styles	318-(334.2)-358 x 8-(9.2)-11	342-(367.1)-393 x 8-(11.3)-14	276-345.5 x 9.2-12.5	280 x 8	210-294 x 4-8
Ectosomal styles	172-(258.4)-295 x 3-(5.6)-7	124-(178.2)-290 x 2-(3.8)-5	112.3-235.6 x 2.2-5.8	180-200 x 6	100
Acanthostyles	91-(99.2)-110 x 8-(11.0)-13	89-(104.1)-114 x 7-(11.6)-16	72-98.9 x 9-12.1	present	58-75 x 4-9
Chelae I	12-(15.3)-18	13-(15.6)-19	14.5-19.2	16	12-16
Chelae II	4-(6.6)-10	6-(8.3)-10	6-10.5	9	-
Toxas	18-(60.5)-122 x 0.8-(1.3)-1.5	31-(101.2)-145 x 0.9-(1.2)-1.8	62-142 x 1.2-2	45-56	<147

Colour. Pale orange alive (Munsell 5YR 8/6), pale grey in ethanol.

Oscules. Not visible in either live or preserved specimens.

Texture and surface characteristics. Firm, only very slightly compressible but flexible, with obvious stiff axis; basal region woody, more rigid than central or apical regions; surface optically smooth, without conules or other surface processes, microscopically hispid with minute subdermal canals and grooves.

Ectosome and subectosome. Well developed series of erect spicule brushes forming a continuous palisade, composed of ectosomal auxiliary subtylostyles; ectosomal brushes embedded on ultimate fibres, with echinating acanthostyles and choanosomal principal styles protruding through bases of each spicule brush; subectosomal auxiliary subtylostyles form tangential or paratangential tracts below ectosomal skeleton; choanosomal principal styles embedded in peripheral fibres form diverging brushes contributing to subectosomal skeleton; mesohyl of peripheral skeleton heavier and more darkly pigmented than deeper regions of choanosome; subectosomal region relatively cavernous, occupying up to 50% of sponge diameter (less in basal stalk region).

Choanosome. Skeletal architecture distinctly axially compressed, with moderately heavy, yellow spongin fibres forming tight anastomoses near core, becoming more plumose (or merely diverging) towards periphery; fibres imperfectly divided into ascending primary fibres (40-75μm diameter) and transverse secondary components (130-210μm diameter); primary fibres multispicular, cored by subectosomal auxiliary subtylostyles occupying up to 90% of fibre diameter; secondary fibres less heavily cored, occasionally unispicular; fibre reticulation producing irregularly oval or eliptical meshes at core (110-275μm diameter), becoming wider, more rectangular at periphery (230-425μm diameter); echinating acanthostyles more heavily concentrated on peripheral fibres and at fibre nodes; choanosomal principal megascleres uncommon or even rare in some regions of skeleton, absent entirely from the fibre core, mostly found in peripheral skeleton echinating fibres and supporting ectosomal skeleton; mesohyl matrix relatively light in axial region with many loose subectosomal auxiliary megascleres scattered between fibres.

Megascleres (Table 38). Choanosomal principal subtylostyles straight or slightly curved at centre, with smooth slightly subtylote or rounded bases, fusiform points; principal subtylostyles differ from auxiliary subtylostyles in relatively thicker diameter with thickest part at centre of spicule, less pronounced basal constrictions, and smooth bases.

Subectosomal auxiliary subtylostyles fusiform, relatively long, straight or only slightly curved, tapering to sharp points, with distinct basal constrictions and prominent subtylote swelling; bases predominantly microspined, microspines long.

Ectosomal auxiliary subtylostyles similar to larger auxiliary megascleres but relatively short, thin, prominently subtylote, invariably microspined.

Echinating acanthostyles large, subtylote, heavily spined bases and central regions, aspinose at points and 'necks' proximal to base; spines large, robust, recurved.

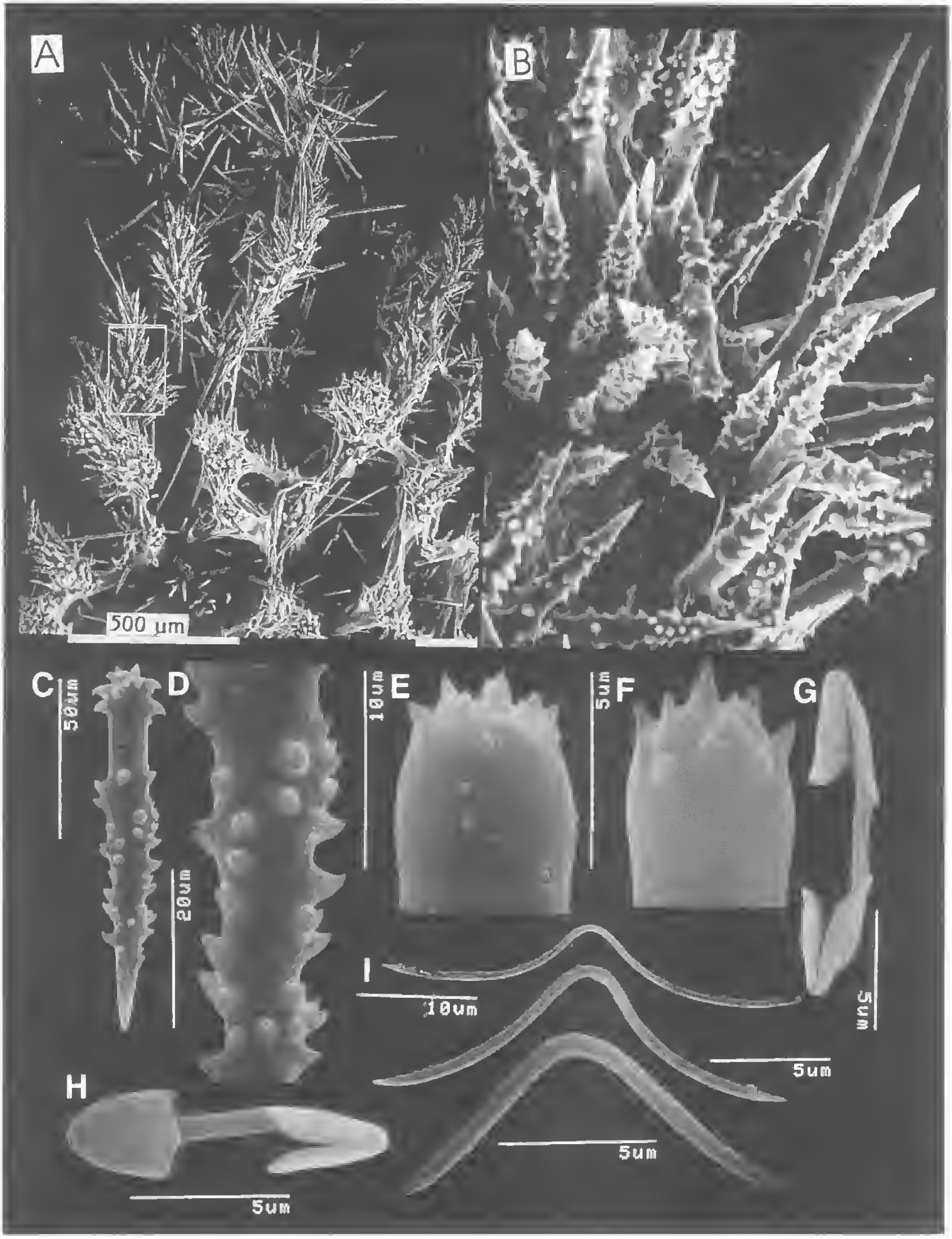

FIG. 188. *Clathria* (*Thalysias*) *procera* (Ridley) (QMG300166). A, Choanosomal skeleton. B, Fibre characteristics (x294). C, Echinating acanthostyle. D, Acanthostyle spines. E-F, Base of subectosomal and ectosomal auxiliary subtylostyles. G-H, Palmate and modified isochelae. I, Wing-shaped and u-shaped toxas.

Microscleres (Table 38). Palmate isochelae incompletely divided into 2 size categories, both abundant, larger unmodified, smaller often contort (58-72% of spicules); lateral alae completely fused to shaft; front ala shorter and completely detached from lateral alae.

Toxas wing-shaped and u-shaped, thin, variable in length, with pronounced central curvature, slightly reflexed or straight points.

REMARKS. In live colour, surface characteristics, texture, gross morphology, spiculation and skeletal architecture this species is quite distinctive. In particular it has sparse choanosomal principal styles found only outside (echinating) peripheral fibres; subectosomal auxiliary megascleres coring fibres; axial compression of central fibres and the diverging, wide-meshed reticulation in the peripheral skeleton; and echinating megascleres are concentrated on peripheral fibres and spongin fibre nodes. This latter feature is also found in *C.* (*T.*) *cactiformis* although the 2 species are not conspecific as supposed by Burton & Rao (1932), where *C.* (*T.*) *cactiformis* has an aspicular secondary fibre skeleton and lacks any axial compression. The principal megascleres echinating fibres and absence of principal spicules from within the fibre core indicates it belongs to Hallmann's (1912) *spicata' group*.

Records of *C. procera* subsequent to Ridley (1884a) make no mention of choanosomal principal spicules echinating peripheral fibres, although this feature is characteristic for the species. Conversely, authors following Dendy (1922) note that there are two classes of auxiliary megascleres, both of similar length but different thickness, the thicker ones coring fibres and the thinner ones scattered in the mesohyl, but this distinction was not corroborated from re-examination of any material.

Hallmann (1912), Dendy (1922), Burton & Rao (1932), Burton (1938a) and subsequent authors included a number of other species as synonyms of *C.* (*T.*) *procera*, but most of these synonymies are not supported here. *Clathria spiculosa* var. *macilenta* is certainly different from *C.* (*T.*) *procera* and is clearly a synonym of *C.* (*T.*) *reinwardti*. In contrast, *Clathria spiculosa* var. *ramosa* Hentschel (SMF1698) is conspecific with *C. procera*, having closely comparable skeletal structure, spicule geometry and spicule size (Table 38), although growth form differs slightly from typical morphs (being arborescent, with a woody cylindrical stalk and numerous, thin, evenly cylindrical branches bifurcating but not anastomosing, and bifurcate branch tips superficially resembling *Seriotopora* coral). There is some doubt about the conspecificity of some other specimens identified as *C.* (*T.*) *spiculosa* by Dendy (1889b, 1905, 1922) and *C.* (*T.*) *procera* by Burton (1931a, 1938a) and Thomas (1973b), in particular the clathrous and lamellate morphs. These specimens all differ from typical forms in their skeletal architecture, although their spicule geometries are all fairly similar and for this reason they are retained here in synonymy for the time being.

Contrary to Burton & Rao (1932) and Vosmaer (1935a) *C.* (*T.*) *arborescens* is a distinct species from *C.* (*T.*) *procera*, both species differing substantially in their spicule geometry, spicule sizes and skeletal architecture. *Clathria reinwardti* var. *palmata* Ridley is conspecific with *C. frondifera* (= *C.* (*T.*) *vulpina*), as suggested by Bergquist & Tizard (1967), and not with *C.* (*T.*) *procera*, as supposed by Burton & Rao (1932). *Clathria* (*Thalysias*) *topsenti* is similar in many respects to *C.* (*T.*) *procera*, but shows virtually no axial compression of the choanosomal skeleton, spicule geometry is clearly different, and the two species are not considered to be synonyms.

Clathria (Thalysias) ramosa
(Kieschnick, 1896)
(Figs 189)

Rhaphidophlus ramosus Kieschnick, 1896:533; Kieschnick, 1900:569-570, pl.45, figs 47-50.
Clathria ramosa; Hooper & Wiedenmayer, 1994: 273.
Not *Clathria ramosa* Lindgren, 1897:482-483; Lindgren, 1898:308-309, pl.17, fig.9, pl.18, fig.15, pl.19, fig.16; Hentschel, 1912:367.
Not *Thalysias ramosa*; de Laubenfels, 1936a:105.
Not *Colloclathria ramosa* Dendy, 1922:74-76.

MATERIAL. HOLOTYPE: PMJ Porif.92: Thursday I., Torres Strait, Qld, 10°35'S, 142°13'E, no other details known (presently missing from collections; Wiedenmayer, pers.comm.)

HABITAT DISTRIBUTION. Ecology unknown; known only from Torres Strait, Qld.

DESCRIPTION. *Shape.* Arborescent, bushy, with small stalk and small lobate, conical branches, between which stretches a transparent dermal membrane.

Colour. Yellow-brown in preserved state.

Oscules. Unknown.

Texture and surface characteristics. Harsh; rugose.

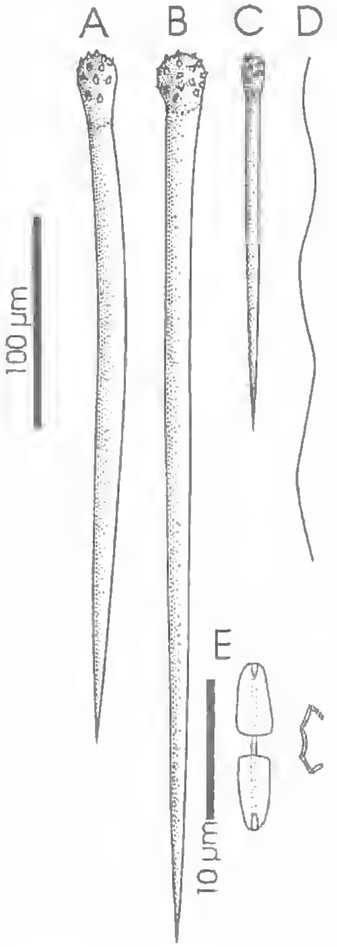

FIG. 189. *Clathria (Thalysias) ramosa* (Kieschnick) (redrawn from Kieschnick, 1900). A, Choanosomal principal subtylostyle. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyle. D, Sinuous toxa. E, Palmate isochelae.

Ectosome and subectosome. Ectosomal skeleton composed of discrete brushes of small auxiliary subtylostyles.

Choanosome. Choanosomal skeleton irregularly reticulate, with heavy spongin fibres divided into primary and secondary components differing significantly in diameter; fibres only lightly cored by choanosomal principal subtylostyles within axis of skeleton, occasionally absent; fibres usually more heavily cored towards periphery; echinating acanthostyles abundant; character of soft parts unknown.

Megascleres. Choanosomal principal subtylostyles prominently subtylote, straight or slightly curved, with basal spination. Length 150-480µm, width 13-24µm.

Subectosomal auxiliary subtylostyles long, thin, prominently subtylote with microspined bases. Dimensions unknown.

Ectosomal auxiliary subtylostyles identical in geometry to larger auxiliary spicules. Dimensions unknown.

Acanthostyles cylindrical, club-shaped, evenly spined, subtylote. Length up to 150µm, width 9-13µm.

Microscleres. Palmate isochelae in 2 size classes. Length up to 13µm.

Toxas thin, sinuous, raphidiform. Dimensions unknown.

REMARKS. This species is barely recognisable other than belonging to *Clathria* and having a specialised ectosomal skeleton (i.e., *C.* (*Thalysias*)) which is both implied in Kieschnick's (1900) description and his tacit inclusion of the species in *Rhaphidophlus*. Until the presently missing holotype is re-examined, the affinities of this species remain uncertain.

Clathria (Thalysias) reinwardti Vosmaer, 1880

(Figs 190-192, Table 39, Plate 8A-B)

Clathria reinwardti Vosmaer, 1880:152; Vosmaer, 1935a:610, 632, 639; Bergquist & Tizard, 1967:184-186, pl.4, fig.2; Bergquist et al., 1971:102-106; Van Soest, 1989:223, fig.34; Hooper & Wiedenmayer, 1994: 273.

Clathria reinwardti var. *subcylindrica* Ridley, 1884a:446-448.

Rhaphidophlus reinwardti; Kelly Borges & Bergquist, 1988:141-143, figs 3-4, pl.3f.

Clathria typica var. *porrecta* Hentschel, 1912:298, 359-360.

Tenacia typica var. *porrecta* Hallmann, 1920:771.

Clathria spiculosa var. *macilenta* Hentschel, 1912:364.

Not *Clathria reinwardti* var. *palmata* Ridley, 1884a:447.

MATERIAL. HOLOTYPE: RMNH(MLB)120 (not seen): Moluccas, Indonesia, no other details known. HOLOTYPE of *C. spiculosa* var. *macilenta*: SMF1514 (fragments MNHNDCL2242, 2250): Straits of Dobo, Aru I., Arafura Sea, Indonesia, 6°S, 134°30'E, 40m depth, 20.iii.1908, coll. H. Merton (dredge). LECTOTYPE of *C. reinwardti* var. *subcylindrica* - BMNH1881.10.21.260: Thursday I., Torres Strait, Qld, 10°35'S, 142°13'E, vii.1881, coll. HMS 'Alert' (dredge). PARALECTOTYPE of *C. reinwardti* var. *subcylindrica* - BMNH1882.2.23.183: Prince of Wales Channel, Torres Strait, Qld, 10°35'S, 142°13'E, vii.1881 coll. HMS 'Alert' (dredge). HOLOTYPE of

C. typica var. *porrecta*: SMF1653 (fragment MNHNDCL2228): Straits of Dobo, Aru I., Arafura Sea, Indonesia, 6°S, 134°50'E, 22.iii.1908, 12m depth, coll. H. Merton (dredge). OTHER MATERIAL: NT - AMZ3099, AMZ4311 (RRIMP-0917); NTMZ176, NTMZ177, NTMZ270; NTMZ1094, NTMZ2080, NTMZ2121, NTMZ2206, NTMZ 2211, NTMZ2227, NTMZ2232, NTMZ2264, NTMZ2389, NTMZ2423, NTMZ2543, NTMZ 2545, NTMZ2554, QMG300179 (NTMZ2717), NTMZ472, NTMZ228, NTMZ435, NTMZ2174, NTMZ2197, QMG303260, NTMZ3150, NTMZ55, NTMZ77, NTMZ348, NTMZ350, NTMZ359, NTMZ361, NTMZ362, NTMZ363, NTMZ364, NTMZ441, NTMZ1364, NTMZ 1371, NTMZ1378, NTMZ2493, NTMZ2514, NTMZ3299, NTMZ3308, NTMZ570, NTMZ 586, NTMZ574, NTMZ1327, NTMZ2502, NTMZ3242, NTMZ3247, NTMZ3251, NTMZ 3254, NTMZ3256, NTMZ3264, NTMZ3271, NTMZ3275, NTMZ3279, NTMZ3288, NTMZ 3296. NTMZ3310, NTMZ324, NTMZ333, NTMZ602, NTMZ38, NTMZ40, NTMZ50, QMG300753 (NCIQ66C-4677-Y, fragment NTMZ3906). WA - QMG301121, QMG301135, QMG301169, NTMZ3336 (NCIQ66C-1450-C). QLD- QMG300824, QMG304085, NTMZ4018, NTMZ4021, NTMZ4022, QMG303014, NTMZ4043. INDONESIA - QMG303687 (NCIOCDN-1285-H), SMF1589, PNG- NTMZ2561, NTMZ2562, NTMZ2563, NTMZ2564, QMG300371 (NCIQ66C-4495-A), QMG300375 (NCIQ66C-4516-Y), QMG 300383 (NCIQ66C-4547-J), QMG303104. PHILIPPINES – QMG300344, QMG300304 (NCIQ66C-5727-Q). MICRONESIA - QMG304835. VIETNAM – QMG300045.

HABITAT DISTRIBUTION. Predominantly found on coral rubble and dead coral substrata, fringing coral reefs or lagoon faunas, occasionally growing on live coral on the reef crest; mostly found in turbid, shallow subtidal-intertidal waters between 0-10m depth, occasionally deeper. Speculated that association with dead coral substrates indicates some role in reef bioerosion; widely distributed throughout Indo-west Pacific: Darwin Harbour, Parry Shoals, Timor Sea, Port Essington, Orontes Reef, Trepang Bay, Cobourg Peninsula, Wessel Is (NT); Hibernia Reef, Cartier I., Sahul Shelf, Direction I. (WA); Gulf of Carpentaria, Cockburn Is, Cape York, Shelburne Bay, Blanchard Reef, Adolphus I. (FNQ) (Fig. 190H); also Cebu, Negros Orientale, Philippines (present study), Chuuk, Caroline Islands (present study), Hon Rai I., Vietnam (present study), Solomon Is (Bergquist et al., 1971), Motupore I., PNG (Kelly Borges & Bergquist, 1988; present study), Aru Is, Sulawesi, Lesser Sumba Is, Indonesia (Vosmaer, 1935a; Van Soest, 1989, present study).

DESCRIPTION. *Shape.* Typically simple digitate, stoloniferous, cylindrical or occasionally laterally compressed branches (7-25mm diameter), forming meandering digits with multiple points of attachment to substrate; no differentiation between branches and stalk, with branches attaching directly to substrate; branches frequently anastomose with adjacent branches sometimes forming complex intertwined digits; free branches mostly simple, rarely bifurcate; several thickly encrusting, bulbous specimens also collected, presumably immature growth stages.

Colour. Very light orange (Munsell 5YR 8/4), orange-brown (7.5YR 8/2-4), orange-red-brown (2.5YR 7/8), light brown (10R 7/4), to grey-white (2.5Y 8/2) pigmentation alive, orange-brown (5YR 8/4) to grey-white (2.5Y 8/2) in ethanol; ectosomal membrane varies from colourless (opaque), to grey (2.5Y 8/2); subectosomal and choanosomal regions generally darker than periphery, usually clearly visible through ectosomal membrane when alive.

Oscules. Abundant, relatively large (560-2760µm diameter), predominant on lateral sides of branches; oscules slightly raised with prominent membraneous lip (often orange pigmented) surrounding aperture; generally thicker specimens have larger oscules raised further above surface and more prominent subectosomal sculpturing; oscules collapse in air.

Texture and surface characteristics. Soft, compressible, flexible, moderately easy to tear; surface smooth, pellucid, semi-translucent in life, with prominent stellate subectosomal channels radiating towards oscules, particularly in thicker specimens, more even surface ornamentation in thinner specimens; ectosomal membrane collapses upon dessication and preservation, becoming roughened and pocked with ridges and cavities.

Ectosome and subectosome. Thin layer of smaller ectosomal auxiliary subtylostyles form discrete brushes erect on surface, in a continuous palisade, supported by long or short subectosomal plumose tracts from peripheral fibre skeleton; ectosomal region generally poorly collagenous but variable in thicker specimens; subectosomal region cavernous with lacunae (120-660µm diameter) supported paucispicular plumose tracts of subectosomal auxiliary subtylostyles, no fibres, but moderate quantities of collagen between spicule tracts; plumose tracts of choanosomal principal styles also near periphery in some cases protruding through ectosomal skeleton.

Choanosome. Skeletal architecture irregularly or semi-regularly reticulate, with anastomosing spongin fibres (40-120µm diameter) forming curved oval, straight triangular or rectangular meshes (50-470µm diameter) in choanosome;

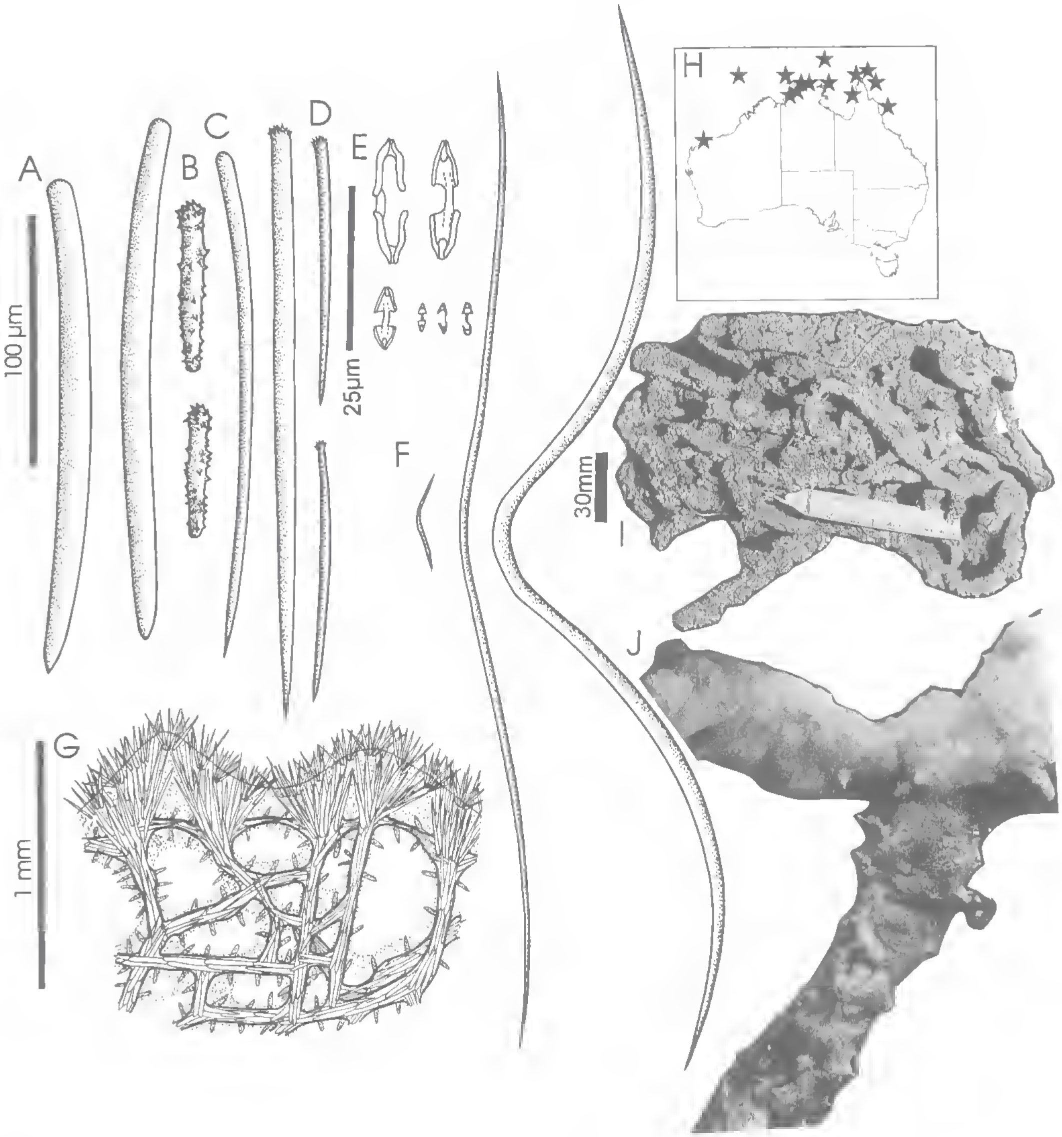

FIG. 190. *Clathria* (*Thalysias*) *reinwardti* Vosmaer (NTMZ2174). A, Choanosomal principal styles. B, Echinating acanthostyles. C, Subectosomal auxiliary styles. D, Ectosomal auxiliary styles. E, Palmate isochelae. F, Larger accolada toxas and juvenile oxhorn-like toxa. G, Section through peripheral skeleton. H, Australian distribution. I, Paralectotype of variety *subcylindrica* BMNH1882.2.23.183. J, NTMZ77.

fibre meshes generally more irregular near core than periphery; no clear distinction between primary and secondary fibres; fibres light, always fully cored by choanosomal principal styles, with dense echinating acanthostyles on surface; abundant auxiliary spicules scattered between fibres; mesohyl matrix light, poorly pigmented, surrounding ovoid to eliptical choanocyte chambers (130-250µm diameter); specimens from turbid, muddy intertidal habitats incorporate moderate amounts of inorganic detritus into mesohyl but not into fibres.

Megascleres (refer to Table 39 for dimensions). Choanosomal principal styles slightly curved at centre, short, thick, invariably with smooth rounded bases, hastate or occasionally strongylote points.

TABLE 39. Comparison between spicule dimensions (in µm) between type specimens and other material of *Clathria* (*Thalysias*) *reinwardti* Vosmaer from different localities (N=25).

SPICULE	1	2	3	4	5	6	7	8	9
Choanosomal styles	155-345 (stout)	223-305 x 5-16	135-215 x 6-10	111-(195.1)-280 x 5-(11.8)-21	131-(201.6)-273 x 6-(12.4)-18	146-(192.9)-236 x 7-(11.1)-16	110-(190.3)-259 x 7-(11.4)-21	116-(195.6)-279 x 8-(13.1)-21	148-(200.5)-264 x 9-(15.9)-21
Subectosomal styles	135-305 (spined)	155-323 x 3-12	170-211 x 3-9	113-(235.5)-337 x 3-(6.8)-16	141-(246.1)-326 x 3-(7.6)-11	141-(219.7)-301 x 3-(5.9)-11	113-(236.1)-337 x 4-(6.7)-14	146-(233.0)-317 x 5-(7.2)-13	137-(238.6)-317 x 5-(7.6)-13
Ectosomal styles	120-130 (slender)	97-181 x 3-7	84-102 x 3-6	66-(102.3)-170 x 2-(3.9)-8	85-(106.5)-162 x 2-(4.1)-7	82-(104.1)-157 x 2-(3.6)-7	66-(100.7)-166 x 2-(3.9)-7	69-(102.7)-170 x 4-(5.1)-8	73-(92.8)-139 x 4-(3.9)-8
Acanthostyles	50-70 x 6.3	54-82 x 3-10	59-74 x 4-11	31-(59.1)-79 x 3-(7.4)-13	45-(64.7)-78 x 3-(7.4)-12	42-(60.1)-72 x 3-(6.6)-10	39-(57.9)-79 x 3-(7.5)-13	31-(58.2)-77 x 5-(7.9)-13	35-(60.3)-76 x 6-(8.7)-12
Chelae I	13-19	10-19	12-15	10-(14.4)-21	10-(14.0)-19	10-(14.3)-18	10-(14.2)-19	10-(14.9)-21	11-(13.9)-19
Chelae II	-	4-8	4-8	2-(6.1)-9	2-(5.4)-9	2-(6.0)-9	2-(5.8)-9	4-(6.6)-9	4-(6.4)-9
Toxas	-	22-174 x 0.5-2	52-246 x 0.5-2	8-(121.2)-237 x 0.5-(1.2)-3.1	12-(119.3)-186 x 0.5-(1.2)-2.5	9-(102.5)-173 x 0.5-(1.2)-2.5	16-(125.8)-236 x 0.5-(1.3)-3.0	12-(124.1)-228 x 0.5-(1.2)-2.5	24-(115.6)-186 x 0.5-(1.1)-2.0

Source:
1. Holotype (Vosmaer, 1880). 2. Lectotype of var. *subcylindrica* (BMNH1881.10.21.260). 3. Lectotype var. *macilenta* (SMF 1514). 4. Northern Territory specimens. 5. Papua New Guinea specimens. 6. Indonesian specimens. 7. Philippines specimens. 8. Micronesian specimen. 9. Vietnam specimen

Subectosomal auxiliary styles straight or sometimes slightly curved near basal end, relatively thick, with fusiform, sharp points, sometimes telescoped or mucronate, and rounded or slightly subtylote, usually faintly microspined bases.

Ectosomal auxiliary styles morphologically similar to subectosomal spicules, but markedly shorter, thinner, fusiform, sharply pointed or mucronate, straight, with slight subtylote basal swellings and profusely microspined bases.

Echinating acanthostyles short, stout, with rounded, bluntened points, slightly subtylote bases, unevenly spined with aspinose 'neck' proximal to base; spines heaviest on base and points, spines broad at base, sharp, recurved.

Microscleres (refer to Table 39 for dimensions). Palmate isochelae in 2 size classes, both abundant, scattered throughout mesohyl and lining choanocyte chambers; long lateral alae completely fused to shaft, completely detached from front ala; front ala entire; some smaller forms with contort shaft; some larger forms with median spikes on interior of shaft.

Toxas basically accolada although juvenile forms resemble oxhorns; extremely thin, hair-like, long, slight central curvature, slightly reflexed or with straight points; distributed singly or in trichodragmata throughout mesohyl.

Larvae. 28% of specimens examined contained incubated parenchymella larvae in varying stages of development; larvae oval to elliptical, 180-825µm long, 80-400µm wide; smaller larvae identical in colouration to adult mesohyl, larger larvae relatively darkly pigmented with larval styles and toxas, mostly at periphery, and mature larvae well differentiated in cellular structure with a layer of cells surrounding periphery; cilia not observed (preserved material). No obvious reproductive period for *C.* (*T.*) *reinwardti* because sexual reproductive products present in samples from May to January (i.e., all seasons except wet season) from Darwin and Cobourg Peninsula regions (Fig. 192); larval size not correlated with seasonality with larvae in various stages of maturity encountered throughout year; apparent absence of reproductive products during wet season probably only due to low number of samples collected during February-April, and possible that this species produces viviparous larvae all year.

Associates. Virtually every specimen examined (94% of material) harboured Scyllidae polychaete worms (*Typosyllis spongicola*), lying between fibre meshes longitudinally within branches. The relationship between *C.* (*T.*) *reinwardti* and *T. spongicola* is probably widespread and facultative because specimens from all localities and material collected in 1965 (Bergquist & Tizard, 1967) and 1974 (AMZ4311) also contained infestations of this polychaete.

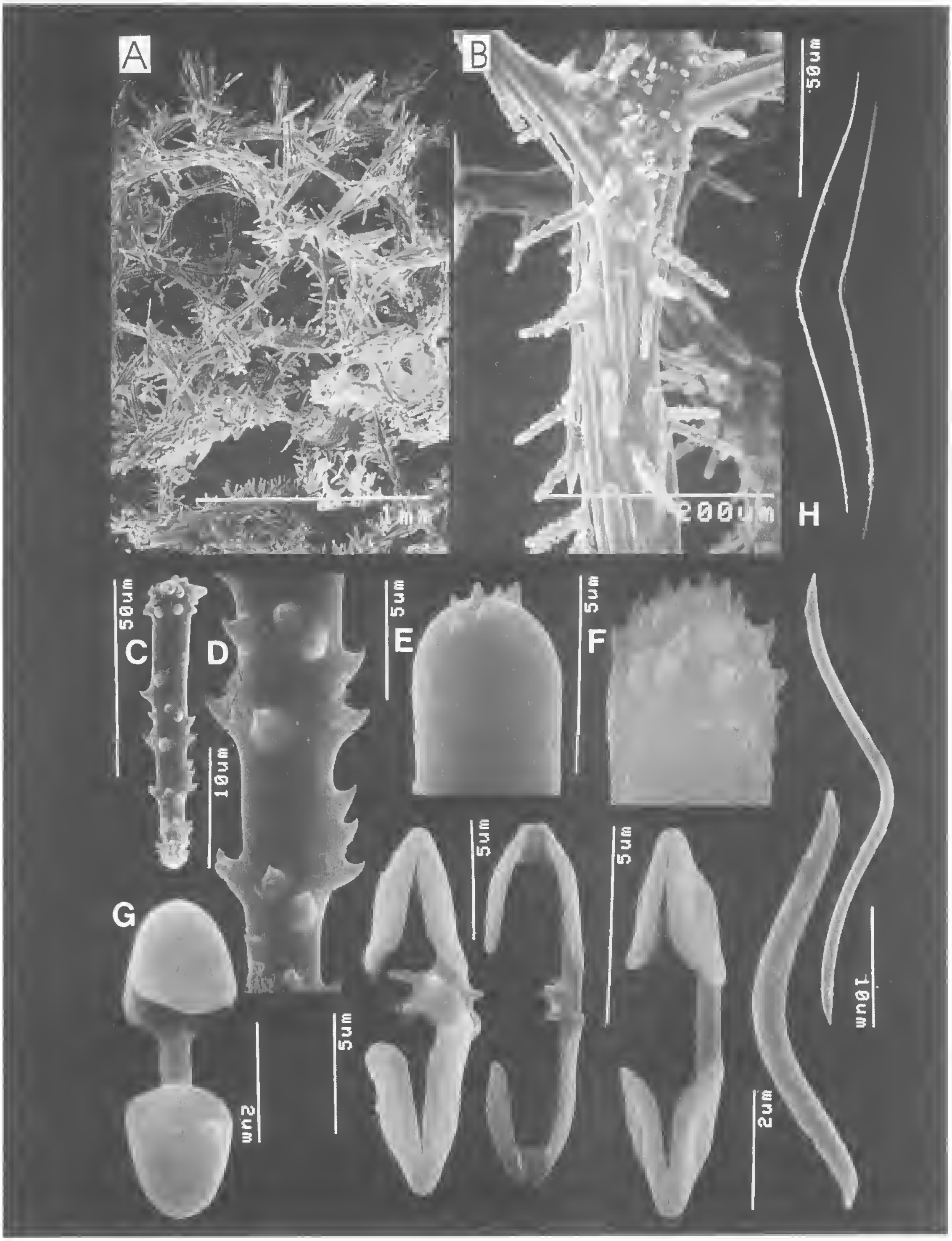

FIG. 191. *Clathria* (*Thalysias*) *reinwardti* Vosmaer (specimen QMG303260). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyle. D, Acanthostyle spines. E-F, Base of subectosomal and ectosomal auxiliary styles. G, Palmate and modified isochelae. H, Accolada toxas and juvenile oxhorn-like toxa.

SEASON	TOTAL SAMPLES	SAMPLES WITH LARVAE
WET	3	0
PREDRY	26	8
DRY	23	7
PREDRY	15	5

FIG. 192. *Clathria (Thalysias) reinwardti* Vosmaer. Seasonal production of incubated larvae in the NT.

Variation. Shape: characteristic, consistent although some variability in number of branch bifurcations, thickness of branches, degree of lateral flattening; 3 morphs recognised: thin and evenly cylindrical; laterally flattened; or thickly cylindrical with knobbed and uneven surface; no correlation found between variability in skeletal architecture or spiculation and growth form; see Kelly Borges & Bergquist (1988) for further details on variability in growth form and colouration. *Colour*: relatively consistent range from grey, orange-brown to red-brown; density of pigmentation may be related to exposure and water clarity where deeper and more turbid water populations are generally less heavily pigmented and shallow populations are brighter coloured *Skeletal structure*: Ectosomal skeleton typically dense, continuous, discrete spicule brushes, occasionally thin, paratangential ectosomal crust. Subectosomal skeleton cavernous with long plumose, non-echinated spicule tracts (51%) or with choanosomal fibres close to surface (49%). Choanosomal skeleton typically irregularly reticulate, heavy and compact, with fully cored fibres forming rectangular meshes; but 4% of specimens with curved fibres forming oval-eliptical meshes; 2% with cavernous skeletons throughout and very few thin fibres and spicule tracts; 4% regularly reticulate with ladder-like fibre anastomoses. Spicule skeleton lying outside fibres dense (48%) with abundant loose spicules strewn throughout mesohyl, moderate (32%), or very light (20%) with few extra-fibre spicules. Mesohyl matrix typically light (47% of specimens), moderate (25%), heavy but only lightly pigmented (18%), or heavy, dark brown pigmented (10%). *Megascleres*: Subectosomal auxiliary subtylostyles typically with microspined bases although most specimens had at least some smooth ones (0-4% of megascleres were entirely smooth (in 4% of specimens), 5-10% (15%), 11-20% (34%), 21-30% (15%), 31-40% (15%), up to 64% (17%)). Choanosomal principal styles and smaller auxiliary ectosomal subtylostyles invariably with smooth and microspined bases, respectively. Echinating acanthostyles dense, very heavily echinating fibres (17%), moderate (43%), light (17%) or very lightly echinating (23%). *Microscleres*: Modified contort forms of palmate isochelae present in most specimens (although not previously recorded in this species), with proportion of twisted larger isochelae ranging from 0% of spicules (46% of specimens), 1-4% (39%), 5-10% (13%), up to 20% (2%); in smaller isochelae proportion of twisted forms 0% of spicules (13% of specimens), 1-4% (29%), 5-10% (34%), up to 20% (24%); toxas varied in abundance from very common in specimens (30% of specimens), common (36%), uncommon (26%) or rare (8%).

Variability in spicule dimensions: Although some variability recorded in mean spicule dimensions for samples from different localities these were not statistically significant for any spicule categories ($P > 0.05$); similarly spicule dimensions were relatively homogeneous for samples collected during different seasons, although only a small sample size was taken during the wet season.

REMARKS. Vosmaer (1880) erected *C. (Thalysias) reinwardti* for a specimen from the Moluccas incorrectly identified as *Spongia cannabina* Esper, but his original diagnosis was incorrect. Ridley (1884a) subsequently described two specimens (as var. *subcylindrica*) from Torres Strait where they were reportedly abundant. Vosmaer (1935a) redescribed the spiculation of the holotype which agreed closely with Ridley's diagnosis, and hence emended the definition of this species. From present data and published results of Kelly-Borges & Bergquist (1988) it is shown that *C. (T.) reinwardti* is a dominant species of the intertidal and shallow subtidal fringing reef communities throughout the tropical Indo-west Pacific, particularly prevalent in more turbid waters.

Aside from Kelly-Borges & Bergquist (1988) the species has been described as lacking any ectosomal specialisation (viz. *Clathria* condition), whereas careful histological sectioning shows that it has a classical ectosomal skeleton of two distinct size categories of auxiliary megascleres, localised in the ectosomal and subectosomal regions respectively (viz. *Thalysias* condition). Bergquist & Tizard (1967) suggested that toxas were not previously recorded because they are very slender and tend to be associated with larvae. However, all specimens examined in this study contained toxas, irrespective of

FIG. 193. *Clathria* (*Thalysias*) *ridleyi* (Lindgren) (fragment of holotype BMNH1929.11.26.20). Section through peripheral skeleton.

locality, seasonality or possession of larvae. Toxas are typically most abundant in the mesohyl matrix, occurring as both toxodragmata and as single spicules; they are probably also characteristic of the adult sponge. Bergquist et al. (1971) suggested that the brick red colour and irregular lumpy surface were characteristic for this species, whereas most specimens seen by the author *in situ* were predominantly pale orange-brown, with smooth, turgid, membraneous surface and only very shallow subectosomal drainage canals radiating from large pores. Irregular and corrugated surface features were observed only in a small proportion of live samples, although these surface features are common in dessicated material soon after collection.

This species may be confused with *C.* (*T.*) *erecta*, differing only slightly in gross morphology and surface ornamentation, and having a similar skeletal structure, whereas comparison of spicule geometry and spicule sizes can distinguish the two species. Its spicule geometry is similar to *C.* (*T.*) *fasciculata*, but this has a bushy clathrous growth form and different skeletal structure (e.g., pronounced fascicular columns comprising the main skeletal tracts). In its nearly regular retuculate, rectangular skeletal structure *C.* (*T.*) *reinwardti* resembles to some extent *C.* (*T.*) *vulpina* (which has an open reticulate tubular and lamellate growth form (and to which Bergquist & Tizard (1967) referred the variety *C. reinwardti* var. *palmata*)). *Clathria reinwardti* can be differentiated from all these species by its characteristic acanthostyle morphology, growth form, size and geometry of toxas, and ectosomal-subectosomal features. The species also differs from *C.* (*T.*) *procera* and *C.* (*T.*) *spiculosa* with similar growth form in choanosomal architecture, spicule geometry and fibre characteristics.

Clathria (Thalysias) ridleyi
(Lindgren, 1897) (Fig. 193)

Rhaphidophlus sp; Ridley, 1884a:452-453.
Rhaphidophlus ridleyi Lindgren, 1897:483; Dendy, 1896:44; Lindgren, 1898:283, 310, 311, pl.17, fig.8, pl.18, fig.14, pl.19, fig.17; Hallmann, 1912:187; Van Soest, 1984b:115.

Tenacia ridleyi; Lévi, 1961b:522-524, text-fig.14.
Clathria ridleyi; Hooper & Wiedenmayer, 1994: 273.
cf. *Clathria ramosa*; Vosmaer, 1935a:611, 642, 669.

MATERIAL. HOLOTYPE: NHRM (fragment BMNH1929.11.26.20): near Membalong, SW. of Belitung I., Java Sea, Indonesia, 3°09'S, 107°38'E, coll. C. Aurivillius (beach debris).

HABITAT DISTRIBUTION. Depth 10-14 m; on dead or live coral substrate; Torres Strait (FNQ) (Ridley, 1884a); also Java Sea (Lindgren, 1897), and Taganak I., Philippines (Lévi, 1961b).

DESCRIPTION. *Shape.* Ramose, with thin cylindrical bifurcating and anastomosing branches, short stalk.

Colour. Red alive.

Oscules. Unknown.

Texture and surface characteristics. Harsh; surface highly ornamented and hispid, bearing ridges and conules.

Ectosome and subectosome. Ectosome relatively thin, with single layer of plumose spicule brushes, composed of intermingled ectosomal and subectosomal auxiliary subtylostyles.

Choanosome. Choanosomal skeleton irregularly reticulate, with light spongin fibres forming rectangular meshes and with both primary and secondary components; primary vaguely ascending fibres have multispicular core of 8-10 rows of choanosomal principal styles, whereas secondary elements less heavily cored; acanthostyles dispersed evenly over fibres.

Megascleres. Choanosomal principal styles slightly curved, with rounded, smooth non-tylote bases. Length 150-300µm, width 8-15µm.

Subectosomal auxiliary subtylostyles straight, usually with microspined bases. Length up to 300µm, width up to 12.5µm.

Ectosomal auxiliary subtylostyles are identical in morphology to subectosomal spicules. Length up to 120µm, width up to 4µm.

Acanthostyles subtylote, with blunt or rounded, profusely microspined points, with aspinose 'necks' proximal to base. Length 68-75µm, width 5-9.5µm.

Microscleres. Palmate isochelae unmodified, single size category. Length 9-18µm.

Toxas not recorded in Ridley's or Lindgren's material, but described as raphidiform by Lévi, with slight central curvature and no apical flexion. Length 80-110µm.

REMARKS. Lindgren (1897, 1898) erected this species for Ridley's (1884a) unnamed specimen from Torres Strait, differentiating it from other ramose *Clathria* (*Thalysias*) in skeletal architecture, fibre characteristics, and *Ectyoplasia*-like acanthostyles (with recurved spines on the apex of spicules). However, the species is barely recognisable other than belonging to *Clathria* (*Thalysias*). Only a slide preparation of a skeletal section was located in the BMNH (Fig. 193), showing few distinctive characteristics. Acanthostyles with apical spines have also been recorded for *C.* (*T.*) *mutabilis* and *C.* (*T.*) *topsenti*, and it is possible that this species is related to, or synonymous with one of these. Lévi (1961b) recorded *C.* (*T.*) *ridleyi* from the Philippines, noting some similarities in growth form and surface characteristics with *C.* (*T.*) *erecta*, although spicule geometry and skeletal arrangement differ between the two species.

Clathria (Thalysias) rubra
(Lendenfeld, 1888) (Figs 194-195)

Echinonema rubra Lendenfeld, 1888:221; Whitelegge, 1902a:212.
Clathria rubra; Hooper & Wiedenmayer, 1994: 272.
Thalassodendron paucispina Lendenfeld, 1888:224-225; Whitelegge, 1901:86-87.
Rhaphidophlus paucispinus; Hallmann, 1912:176-188, 195, 202, 203, 300, pl.25, figs 1-2, pl.26, fig.1, text-fig.36; Guiler, 1950:8.
Tenacia paucispina; Hallmann, 1920:770.
Not *Tenacia paucispina*; Burton, 1934a:559.
Thalassoendron rubens var. *dura*, in part; Lendenfeld, 1888:224; Whitelegge, 1901:87.
Thalassodendron rubens var. *lamella*, in part; Lendenfeld, 1888:224, pl.7; Whitelegge, 1901:87.
Not *Thalassodendron rubens* Lendenfeld, 1888:223.
Clathria multipora Whitelegge, 1907:496, pl.45, fig.23.
cf. *Microciona prolifera*; Vosmaer, 1935a:637, 610, 670.

MATERIAL. HOLOTYPE: AMG9048 (presently missing): Port Jackson, NSW, 33°51'S, 151°16'E. PARATYPE of *E. rubra*: AMG9049: unknown locality (label 'Clathria pumila var. rubra Lend, type ?'). LECTOTYPE of *T. paucispina*: AMG9121a: Port Jackson, NSW, 33°51'S, 151°16'E (dry, label 'Thalysias paucispinus; type'). PARALECTOTYPES of *T. paucispina*: AMG9121b: same locality (dry, label 'cotype'). BMNH1887.1.27.1, 1954.2.10.71, 1954.2.12.54 (fragments AMG3557): same locality. AMZ961 (dry; presently missing): same locality. LECTOTYPE of *T. rubens* var. *lamella*: AMZ459: Port Jackson, NSW, 33°51'S, 151°16'E (wet). PARALECTOTYPES of *T. rubens* var. *lamella*: AMZ461: same locality (wet, fragment from figured specimen), BMNH1887.4.27.124 (1954.2.10.70): same locality (dry). BMNH1887.1.24.28 (fragment ZMB1147): same locality (wet). HOLOTYPE of *T. rubens* var. *dura*: AMG9123: same locality (dry). PARATYPES

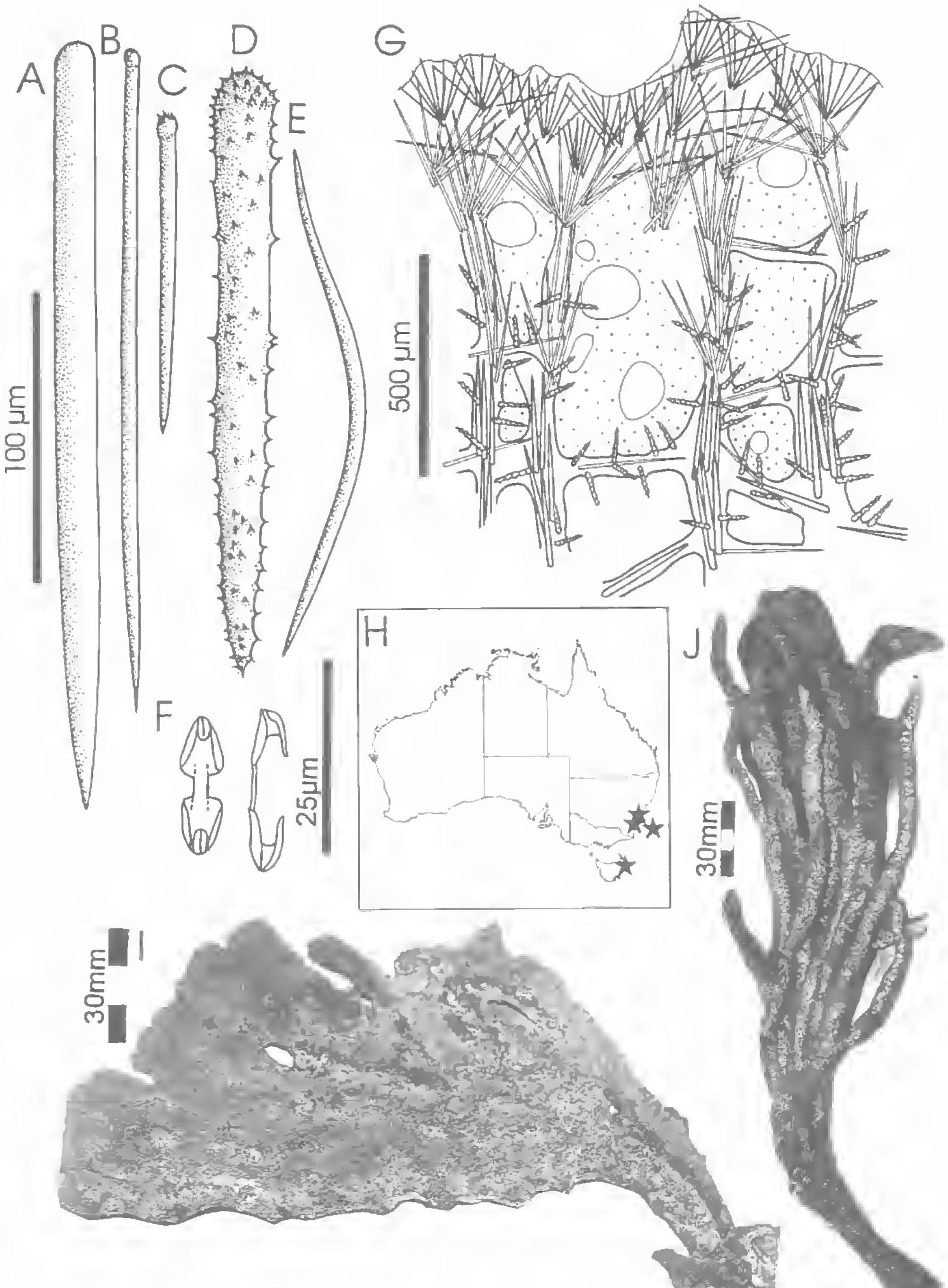

FIG. 194. *Clathria* (*Thalysias*) *rubra* (Lendenfeld) (A-F, lectotype AMG9121; G, paralectotype BMNH1887.1.27.1). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyle. D, Echinating acanthostyle. E, U-shaped toxa. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution. I, Lectotype. J, Paralectotype of *C. multipora* AMZ723.

of *T. rubens* var. *dura*: BMNH1887.1.24.2 (wet), BMNH1887.4.27.112 (1954.2.12.42): same locality (dry). LECTOTYPE of *C. multipora*: AMZ722: Off Botany Bay, NSW, 34°S, 151°11'E, 80-92m depth, coll. FIV 'Thetis' (dredge; label 'Rhaphidophlus paucispinus, var. multiporus'). PARALECTOTYPE of *C. multipora*: AMZ723: same locality. OTHER MATERIAL: NSW- AMZ458, AMZ117, AMZ4809, AMZ814, AM unregistered (label 'ex. Port Jackson, NSW, coll. A Dendy').

HABITAT DISTRIBUTION. On rock reef, shell-grit or gravel substrates; 20-90m depth; Port Jackson, Botany Bay, Shoalhaven Bight (NSW); Maria I. (Tas) (Fig. 194H).

DESCRIPTION. *Shape.* Thick, flabellate-lamellate or branching growth forms up to 250mm long, 100mm wide, 30mm thick, usually with short basal stalk up to 60mm long, 25mm diameter; lamellate-flabellate morphs growing in 1 or more planes, even margins; ramose forms with cylindrical tapering digits or with closely anastomosing branches; intermediate flabellate-digitate growth forms with uneven palmate digitate margins.

Colour. Live colouration unknown, preserved material dark-brown or grey-brown, usually with paler grey surface crust.

Oscules. Moderately large, up to 4mm diameter, confined to areas on lateral or apical margins of branches.

Texture and surface characteristics. Harsh, compressible, flexible when preserved; surface smooth, with or without small conules, often with well developed subectosomal ridges and oscular areas.

Ectosome and subectosome. Surface with distinct crust or peel; ectosomal skeleton ranges from very dense, well developed continuous palisade of erect plumose brushes, to sparse, with covering of erect discrete brushes dispersed over surface, sometimes on same specimen; subectosomal skeleton interdispersed with ectosomal brushes, consisting of plumose tracts of larger subectosomal auxiliary subtylostyles arising from ends of peripheral choanosomal fibres, protrude through and/or lying paratangential to ectosomal layer.

Choanosome. Skeletal architecture more-or-less regularly reticulate, very heavy spongin fibres forming wide elongate-oval meshes (200-550µm diameter), imperfectly differentiated into primary (pauci- or multispicular) fibres (up to 160µm diameter) and secondary (uni- or paucispicular) fibres (up to 110µm diameter); fibres substantially heavier and more regularly reticulate at core, more radial and plumo-reticulate towards periphery; peripheral fibres terminate in plumose tufts of choanosomal and subectosomal megascleres, supporting ectosomal skeleton; fibres cored by choanosomal principal styles occupying only 10-40% of fibre diameter; mesohyl matrix heavy but only lightly pigmented, containing few loose subectosomal and choanosomal megascleres dispersed between fibres; echinating acanthostyles sparse, confined mostly to larger fibres; choanocyte chambers oval, 50-80µm diameter.

Megascleres. Choanosomal principal styles relatively robust, usually slightly curved at centre or near basal end, with rounded or very slightly subtylote, smooth bases, and fusiform points. Length 168-(204.4)-295µm, width 9-(10.9)-14µm.

Subectosomal auxiliary subtylostyles long, slender, straight, with slightly subtylote, smooth or microspined bases, and fusiform points. Length 202-(227.1)-281µm, width 5-(6.6)-8µm.

Ectosomal auxiliary subtylostyles short, slender, straight or slightly curved near basal end, with subtylote spined bases and slightly hastate points. Length 105-(125.4)-154µm, width 3-(4.4)-5µm.

Acanthostyles subtylote, tapering cylindrical, fusiform, with evenly distributed spines or fewer spines at 'neck' proximal to base, spines small, straight, erect. Length 75-(84.3)-98µm, width 4-(6.8)-8µm.

Microscleres. Palmate isochelae of a single size class, large, unmodified, with lateral alae longer than front ala; lateral alae completely attached to shaft but detached from front ala along lateral margin. Length 17-(20.1)-24µm.

Toxas u-shaped, thick, with only slight central curvature and tapering, non-reflexed points. Length 45-(54.7)-82µm, width 1.5-(2.1)-3µm.

REMARKS. This species is very similar to *C.* (*T.*) *cactiformis* in having a similar range of variability of growth forms and surface features, and on this basis Vosmaer (1935a) suggested they may be synonymous. However, *C.* (*T.*) *rubra* is substantial different from *C.* (*T.*) *cactiformis* in spicule geometries (particularly principal styles, acanthostyle spination, toxa morphology), spicule sizes, fibre characteristics (where all fibres are cored in this species but only the primary ascending fibres are cored in *C.* (*T.*) *cactiformis*), and the presence of plumose tufts of choanosomal principal styles, projecting through and echinating peripheral spongin fibres in *C.* (*T.*)

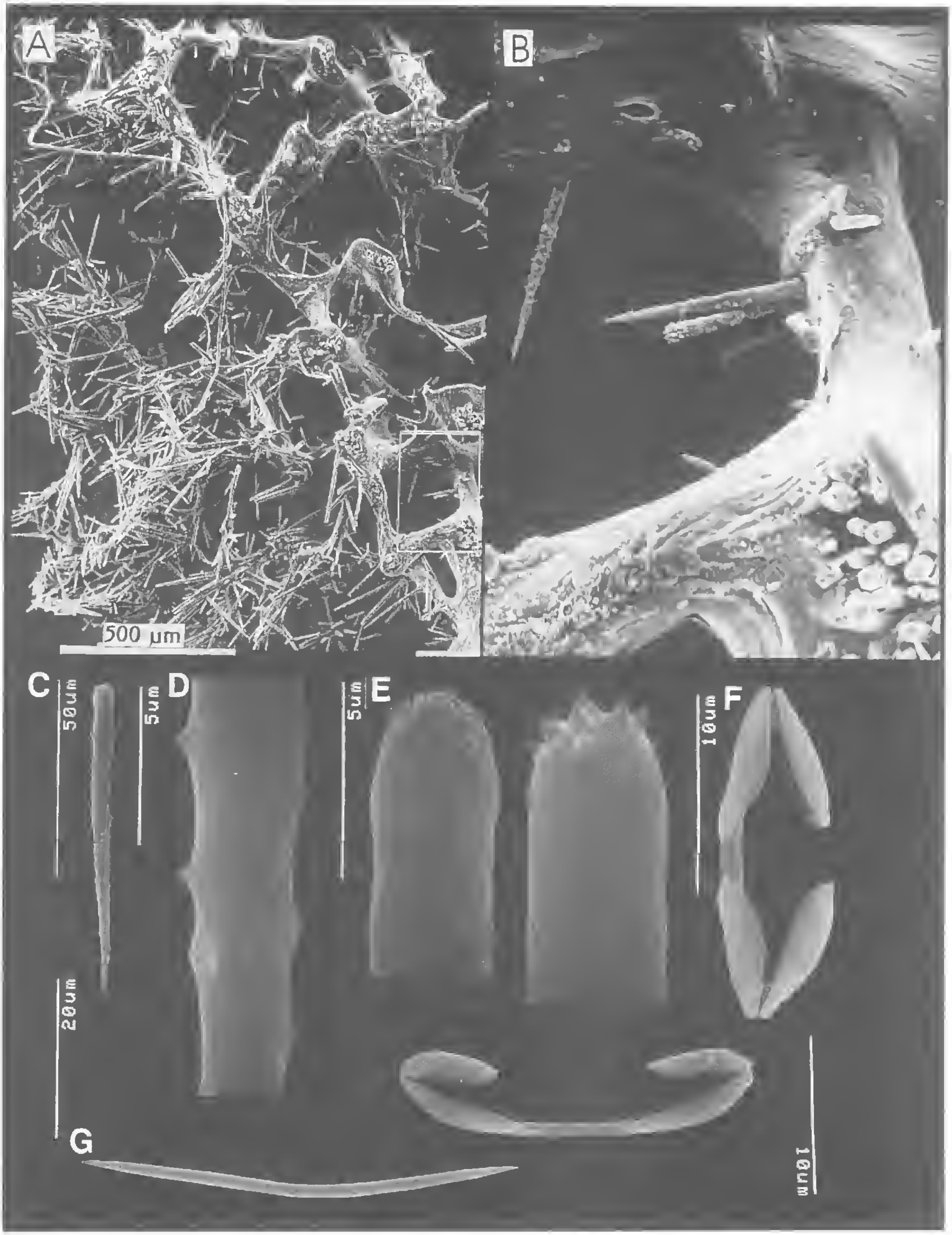

FIG. 195. *Clathria* (*Thalysias*) *rubra* (Lendenfeld) (A-B, AMZ458; C-G, lectotype AMG9121). A, Choanosomal skeleton. B, Fibre characteristics (x283). C, Echinating acanthostyle. D, Acanthostyle spines. E, Base of auxiliary subtylostyles. F, Palmate isochelae. G, U-shaped toxa.

cactiformis, whereas in *C.* (*T.*) *rubra* these spicules are usually confined entirely within fibres (except on peripheral fibres where they form small bundles). A key character distinguishing *C.* (*T.*) *rubra* from other species is possession of small, peculiar u-shaped (oxea-like) toxas, consistent in all specimens, very different from accolada toxas in *C.* (*T.*) *cactiformis*. The species is a member of the '*juniperina*' species complex having a reduced skeleton (whereby fibres shed some or all their spicules) (see discussions under *C.* (*T.*) *cactiformis* and *C.* (*T.*) *hirsuta*).

Judging from the number of specimens of this species collected by the early trawling expeditions (Lendenfeld, Dendy, Whitelegge, Hallmann) it appears to have been a prominant member of the SE. Australian temperate sponge fauna. However, it has not been recollected for many decades, despite recent collections in both shallow and deeper waters off Sydney (EPA and NSW Water Board), and its status is uncertain.

Clathria (Thalysias) cf. rubra
(Lendenfeld, 1888)
(Figs 196)

cf. *Echinonema rubra* Lendenfeld, 1888:221.
Tenacia paucispina; Burton, 1934a:559.

MATERIAL. SPECIMEN: GREAT BARRIER REEF, QUEENSLAND - BMNH1930.8.13.108: Penguin Channel, off Alexander Bay, 16°15'S, 145°31'E, 20-31m depth, 24.ii.1929, coll. GBR Expedition (dredge).

HABITAT DISTRIBUTION. On rock and shell gravel; 20-31m depth; known Australian distribution: Cairns region (FNQ) (Fig. 196H).

DESCRIPTION. *Shape.* Arborescent, cylindrical branches 3-5mm diameter, branches bifurcate and anastomose producing a tangled mass.

Colour. Live colouration unknown, brown in ethanol.

Oscules. Unknown.

Texture and surface characteristics. Firm, compressible; slightly conulose surface.

Ectosome and subectosome. Erect, discrete brushes of ectosomal auxiliary subtylostyles forming thin, discontinuous palisade on surface, with sparse, paratangential subectosomal skeleton composed of larger auxiliary subtylostyles and long principal subtylostyles protruding from peripheral fibres supporting ectosomal skeleton; principal subtylostyles also occasionally protruding through surface; terminal spongin fibres branch immediately below surface; mesohyl matrix heavy in peripheral skeleton.

Choanosome. Skeletal architecture irregularly reticulate; very heavy spongin fibres forming wide, oval or elongate reticulate meshes (150-350µm diameter), more cavernous in periphery than at core; spongin fibres imperfectly divided into primary, mostly ascending, multispicular fibres (60-80µm diameter) and secondary, mostly transverse, paucispicular fibres (25-60µm diameter); echinating acanthostyles relatively sparse in deeper choanosome, more-or-less concentrated on exterior side of fibres and at fibre nodes; mesohyl matrix heavy, granular, with numerous microscleres and auxiliary spicules scattered throughout mesohyl between fibres; choanocyte chambers oval, up to 80µm diameter.

Megascleres. Choanosomal principal subtylostyles slender, straight or slightly curved near base, slightly subtylote smooth or faintly microspined bases, fusiform sharply pointed or occasionally telescoped points. Length 174-(266.7)-346µm, width 5-(7.7)-10µm.

Subectosomal auxiliary subtylostyles straight, slender, subtylote microspined or smooth bases, fusiform points. Length 219-(262.0)-358µm, width 3-(4.5)-6µm.

Ectosomal auxiliary subtylostyles very slender, straight, subtylote smooth or microspined bases, fusiform points. Length 121-(152.8)-181µm, width 2-(3.3)-4µm.

Acanthostyles long, slender, subtylote, evenly spined except for partially aspinose area at 'neck' proximal to base, spines small, recurved. Length 73-(82.3)-93µm, width 4-(4.8)-7µm.

Microscleres. Palmate isochelae large, unmodified. Length 15-(16.8)-19µm.

Toxas intermediate between wing-shaped and u-shaped, relatively thick, with gently rounded central curvature and reflexed points. Length 18-(43.6)-106µm, width 0.8-(1.8)-4.0µm.

REMARKS. Burton's (1934a) *Tenacia paucispina* from the Great Barrier Reef is similar to *C.* (*T.*) *rubra* but there is some doubt about its conspecificity. Burton (1934a) indicated that it was most similar to *Clathria multipora* Whitelegge, subsequently demoted to a variety (or subspecies) of *C.* (*T.*) *rubra* by Hallmann (1912), but comparison between Burton's specimen and type material (see *C.* (*T.*) *rubra*; Figs 194-195) shows differences in the geometry of particular spicules (toxas, acanthostyles, bases of principal styles) and in some spicule sizes. Burton (1934) did not describe his specimen, and simply noted that his

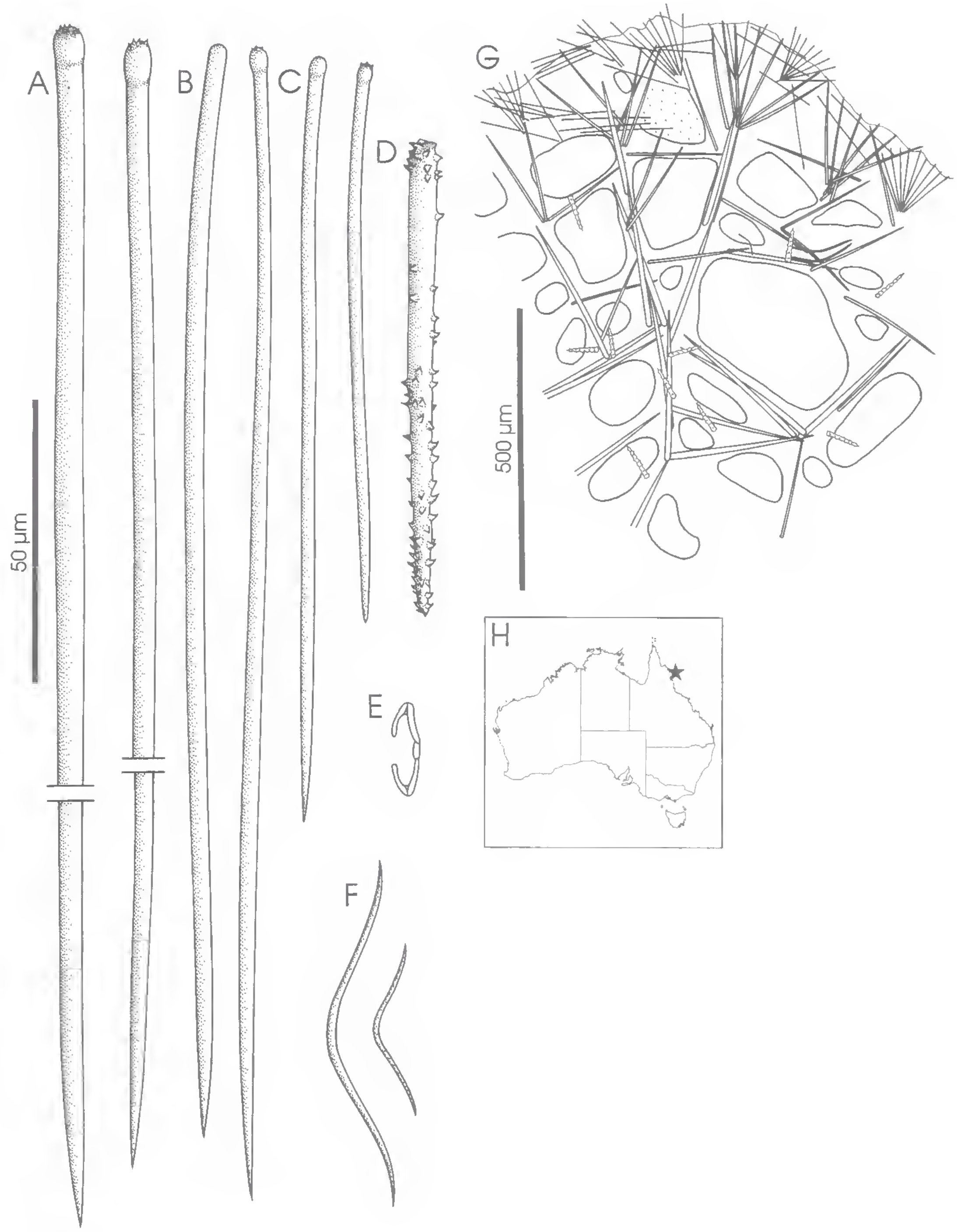

FIG. 196. *Clathria* (*Thalysias*) cf. *rubra* (Lendenfeld) (BMNH1930.8.13.108). A, Choanosomal principal subtylostyles. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyles. D, Echinating acanthostyle. E, Palmate isochela. F, Wing-shaped toxas. G, Section through peripheral skeleton. H, Australian distribution.

specimen consisted of a 'tangled, anastomosing mass of angular ... nodulose branches, each 3-5mm diameter'. Even with a fragment of Burton's specimen it is uncertain whether it is *rubra* or a new taxon.

Clathria (Thalysias) spinifera
(Lindgren, 1897)
(Figs 197-198, Table 40)

Rhaphidophlus filifer var. *spinifera* Lindgren, 1897:483; Lindgren, 1898:311, pl.17, fig.7, pl.19, fig.18.
Rhaphidophlus spinifer; Thiele, 1903a:958, pl.28, fig. 23; Hallmann, 1912:177.
Clathria spinifera; Hooper & Wiedenmayer, 1994: 274.
Not *Clathria spinifera* Sarà, 1978:67-70, text-figs 41-43; Desqueyroux-Faundez & Moyano, 1987:50 .
cf. *Microciona prolifera*; Vosmaer, 1935a:611.

MATERIAL. LECTOTYPE: ZMUU (not seen) (fragments BMNH1929.11.26.6, NHNDCL 2427): specific locality unknown, Java Sea, Indonesia, no other details known. PARALECTOTYPES: ZMUU (not seen): Off Phan Thiet, Vietnam, South China Sea, 11°05'N, 108°50'E, 45m depth, coll. Capt. Svensson (dredge). OTHER MATERIAL: INDONESIA - SMF1815 (fragment MNHNDCL2378). WA- NTMZ1750 (fragment QMG300493).

HABITAT DISTRIBUTION. Rocky reef and associated sand, shell-grit and gravel beds; 45-84m depth; Port Hedland (WA) (Fig. 197H); S China Sea and Java Sea (Lindgren, 1897), Moluccas (Thiele, 1903a).

DESCRIPTION. *Shape.* Arborescent, digitate, stalked sponge, 225mm long, 230mm wide, with slightly flattened cylindrical branches, 5-12mm diameter (although junctions of anastomoses usually thicker), usually fused and anastomosing except at distal end; basal stalk cylindrical, woody, 55mm long, 15mm diameter.

Colour. Light red-brown to grey-brown alive (Munsell 5YR 7/4) with olive-brown mottle (2.5YR 7/4), and flecks of black and copper-green on surface (possibly due to oxidation of pigments after collection); dark chocholate brown in ethanol.

Oscules. Infrequently seen, scattered, not localised to any particular region, flush with surface, 0.5-2mm diameter.

Texture and surface characteristics. Basal stalk firm, almost rigid, branches firm, compressible, highly flexible; surface minutely rugose with distinct, shiny surface crust with numerous irregularly distributed microconules, dissected by minute ridges and canals.

Ectosome and subectosome. Moderately well developed ectosomal skeleton, with more-or-less continuous palisade of discrete spicule brushes composed of smaller ectosomal auxiliary subtylostyles; some detritus on ectosomal skeleton and collagen heavier and more darkly pigmented in periphery than in core; subectosomal skeleton mostly erect, plumose, occasionally tangential or paratangential to surface crust, with individual megascleres arising from subectosomal brushes invariably protruding through surface, composed of larger auxiliary megascleres arising from plumose brushes of principal styles on ultimate choanosomal fibres; ectosome and subectosomal regions together comprise only small proportion of total branch diameter; principal styles and acanthostyles echinating peripheral fibres extend close to ectosomal crust but rarely protrude beyond ectosome.

Choanosome. Skeletal architecture contains both plumo-reticulate spongin fibres and plumose spicule tracts outside fibres; no differentiation of axial and extra-axial regions of choanosome although peripheral skeleton predominantly plumose; spongin fibres moderately heavy, 58-110μm diameter (heavier in Indonesian specimen); fibres form oval to elongate meshes, 95-460μm diameter, and fibre skeleton becomes increasingly plumose towards periphery; fibres indistinctly divisible into primary and secondary systems, both approximately equal diameter demarkated only by coring spicules; neither category of fibre cored by spicules for more than 60% of fibre diameter; primary ascending fibres multispicular with 2-6 principal styles per tract, many protruding through fibres at acute angles (pseudo-echinating) for less than half their length, forming plumose structures; secondary connecting fibres often transverse, rarely with more than 2 spicules per tract contained entirely within fibres; echinating acanthostyles heavy (lighter in Indonesian specimen), particularly abundant on fibre nodes (together with protruding principal styles) forming characteristic stellate-plumose echinations; towards periphery plumose brushes of principal styles protrude through fibres completely, forming multispicular tracts, and from midway along these brushes or at their points arise ascending tracts of subectosomal auxiliary megascleres; mesohyl matrix heavy, moderately lightly pigmented, containing few loose auxiliary megascleres.

Megascleres (refer to Table 40 for dimensions). Choanosomal principal styles robust, short, thick, usually curved at centre, slightly hastate (abrupt-

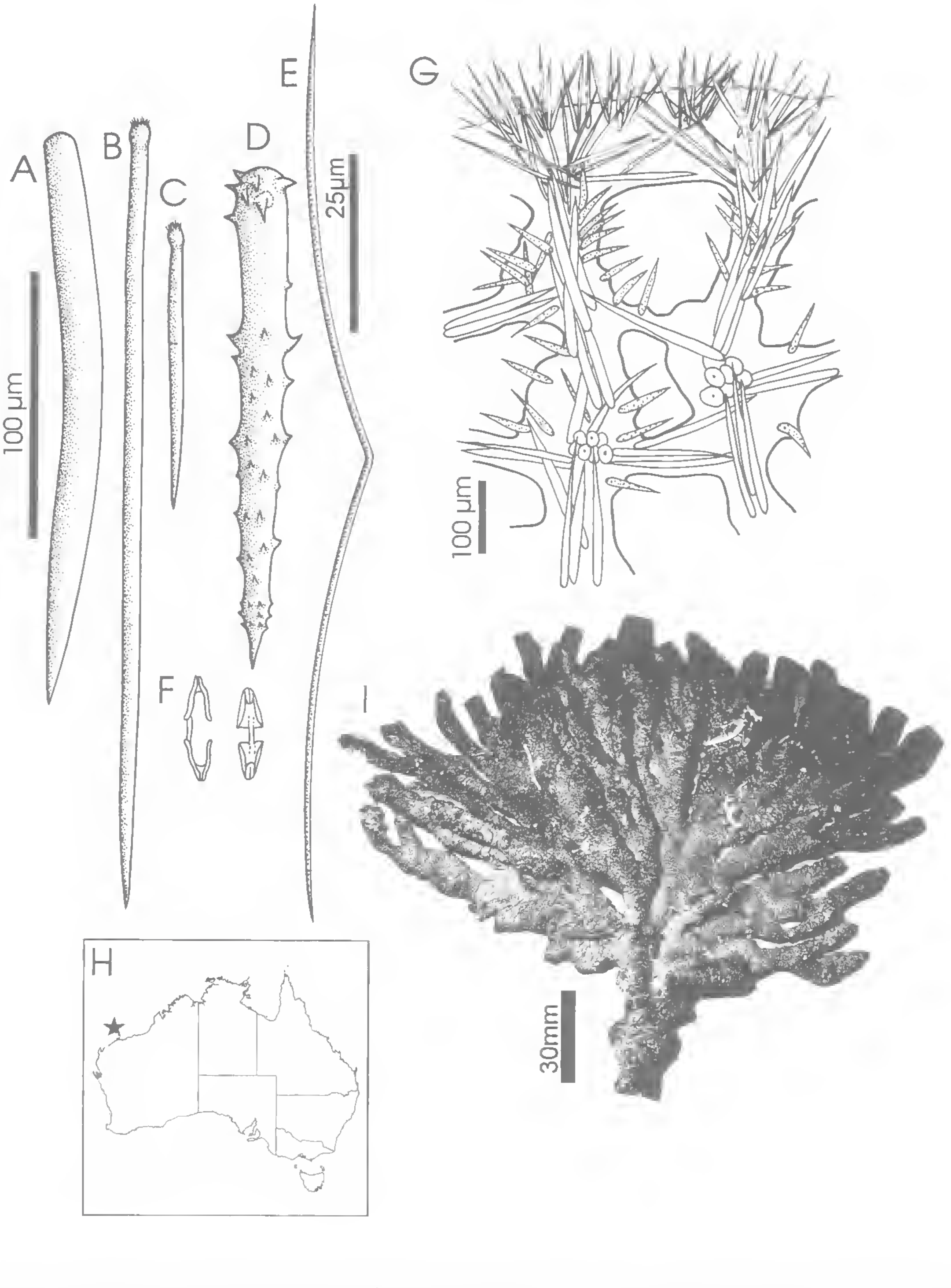

FIG. 197. *Clathria* (*Thalysias*) *spinifera* (Lindgren) (SMF1815). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyle. D, Echinating acanthostyle. E, Accolada toxa. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution. I, NTMZ1750.

TABLE 40. Comparison between spicule dimensions for type and other material of *Clathria* (*Thalysias*) *spinifera* (Lindgren). Measurements in µm, and cited as range (and mean) (N=25).

SPICULE	Fragment of holotype (BMNH 1929.11.26.6)	Specimen (N=1) (Thiele, 1903a) (Indonesia)	NTMZ1750 (NW Australia)
Choanosomal styles	153-(196.9)-242 x 8-(11.4)-14	183-(206.0)-242 x 12-(16.1)-18	155-(187.2)-200 x 8-(16.2)-20
Subectosomal styles	203-(233.8)-256 x 5-(6.8)-8	168-(258.2)-291 x 5-(6.9)-9	172-(196.4)-210 x 4-(6.4)-8.5
Ectosomal styles	97-(132.0)-171 x 3-(3.8)-5	92-(115.5)-151 x 3-(4.9)-6	96-(132.2)-158 x 2-(4.5)-6
Acanthostyles	75-(84.8)-93 x 6-(7.6)-9	69-(72.3)-77 x 7-(9.1)-11	102-(108.6)-114 x 5-(8.6)-9
Chelae	14-(14.7)-16	13-(15.2)-17	11-(13.9)-16
Toxas	26-(79.7)-124 x 0.5-(0.9)-1.5	50-(149.0)-194 x 0.8-(1.2)-1.5	32-(84.2)-119 x 0.5-(0.8)-1.2

ly) pointed, with rounded bases, rarely subtylote, mostly smooth (holotype and Indonesian specimen) or 50% spined (WA specimen).

Subectosomal auxiliary subtylostyles long, thick, straight, tapering fusiform pointed, with slightly subtylote bases, usually minutely microspined, occasionally smooth.

Ectosomal auxiliary subtylostyles short, straight or slightly curved near base, with more pronounced subtylote bases, invariably microspined, fusiform points.

Acanthostyles are relatively long, slender, sharply fusiform pointed, with subtylote bases, evenly spined except for 'neck' proximal to base and extreme point; spines large, recurved.

Microscleres (refer to Table 40 for dimensions). Palmate isochelae abundant, relatively small, unmodified, of a single size category; Indonesian specimen and holotype have typical palmate isochelae (relatively large front and lateral alae, front ala spatulate) whereas WA specimen has poorly silicified chelae, with poorly defined alae, superficially resemble small sigmas (lateral alae completely fused to shaft appearing virtually only as a ridge, front ala narrow, recurved at tip).

Toxas accolada, very thin, slight central curvature, long slightly curved arms, little or no apical reflexion.

REMARKS. The Port Hedland specimen, described above, shows some differences from both Lindgren's and Thiele's material: spongin fibres are lighter; echinating acanthostyles are heavier on fibres; isochelae are poorly silicified, slightly sigmoid and have ill-defined alae; acanthostyles are slightly longer; principal styles are shorter and up to 50% have spined bases (Table 40). Conversely, skeletal structure, fibre characteristics, the distribution of spicules throughout fibres and spicule geometries are virtually identical.

Clathria (*Thalysias*) *spinifera* has unusual fibre characteristics with only bases of principal styles enclosed in primary spongin fibres (forming multispicular ascending plumose tracts), and fully enclosed in secondary fibres (forming paucispicular transverse connecting tracts). Together these fibres produce an irregular renieroid-reticulation. Points of principal styles, especially in ascending spicule tracts, usually protrude through spongin fibres emphasising a plumose skeletal structure. This feature is more prominent in the Australian specimen than in Indonesian material and is reminiscent of Hallmann's (1912) '*spicata*' group (see remarks for *C.* (*T.*) *lendenfeldi*), and the '*coccinea*' group (e.g., *M. coccinea* Bergquist (1961a:38), *M. rubens* Bergquist (1961a:38), *M. scotti* Dendy (1924a:352), and *M. parthena* de Laubenfels (1930:27)). Both the '*spicata*' and '*coccinea*' groups of species have extra-fibre tracts composed of choanosomal principal megascleres. In the '*spicata*' group those tracts occur exclusively outside fibres, and usually ascend to the ectosomal region, whereas in the '*coccinea*' group tufts of principal styles congregate around fibre nodes, and they do not usually protrude beyond that region: *C.* (*T.*) *spinifera* shows a condition intermediate to both groups.

Clathria (Thalysias) styloprothesis sp. nov.
(Figs 199-200)

[*Echinonema typicum*] Carter, 1878:163 (*nomen nudum*).
Not *Echinonema typicum* Carter, 1881a:362.
Unidentified sponge-algae associate, 'possibly undescribed'; Scott et al., 1984:291-293.

MATERIAL. HOLOTYPE: WAM649-81(1) (fragment NTMZ1729): Goss Passage, off Beacon Is, Wallabi Group, Houtman Abrolhos, WA, 28°28'S, 113°46'E, 30m depth, 7.iv.1978, coll. B.R. Wilson (trawl). PARATYPE: PIBOC-04-345 (fragment QMG300043): N. edge of Pelsart Is, Houtman Abrolhos, WA, 28°47.2'S, 113°58.5'E, 22m depth, 10.vii.1987, coll. V.B. Krasochin, USSR RV 'Akademik Oparin' (SCUBA).

FIG. 198. *Clathria* (*Thalysias*) *spinifera* (Lindgren) (A-G,J, NTMZ1750; I, fragment of holotype BMNH1929.11.26.6). A, Choanosomal skeleton. B, Fibre characteristics (x389). C, Echinating acanthostyles. D, Acanthostyle spines. E-G, Bases of choanosomal and auxiliary styles. H, Accolada toxa. I-J, Palmate and modified isochelae.

HABITAT DISTRIBUTION. Rock, sand and coralline substrata; 22-30m depth; Houtman Abrolhos and SW. coast (WA) (Fig. 199G).

DESCRIPTION. *Shape.* Flabellate, irregularly vasiform, with relatively long lamellae, up to 130mm high, 125mm maximum breadth, and cylindrical basal stalk, 18mm long, 6mm diameter; lamellae moderately thin, up to 5mm maximum thickness, with rounded or uneven, bifurcate margins.

Colour. Live colouration unknown, yellow-brown in ethanol.

Oscules. Sparse, scattered over external surface, up to 2mm diameter; exhalant pores minute, dispersed over entire surface, giving ectosome slightly reticulate appearance.

Texture and surface characteristics. Texture rubbery, compressible; surface optically smooth, slightly uneven, with subdermal striations and grooves visible only near margins of lamellae.

Ectosome and subectosome. Thin, disorganised ectosomal crust composed of acanthostyles erect on peripheral fibres, intermingled with paratangential or erect plumose brushes of auxiliary styles of 2 sizes (larger ones less common than smaller ones), together forming nearly continuous palisade of erect spicule brushes on surface; subectosomal skeleton absent entirely; choanosomal skeleton immediately subdermal.

Choanosome. Skeleton structure irregularly reticulate, with very thick 'fibres' formed almost exclusively by *Codiophyllum* algal filaments, 70-156µm diameter, with only a superficial layer of spongin covering surface of algal filaments; coring spicules excluded entirely from within 'fibres', although some auxiliary subtylostyles lie on surface of 'fibre' and many echinating acanthostyles embedded within surface and erect on 'fibre'; 'fibre' (algal filament) meshes usually form large nodes, and in peripheral skeleton nodes usually have tangential layer of subectosomal subtylostyles lying on surface; 'fibres' sinuous, extending into peripheral skeleton, with ectosomal crust perched over 'fibre' ends; mesohyl matrix very light, with few microscleres scattered between meshes, and small oval choanocyte chambers, 49-86µm diameter.

Megascleres. Choanosomal principal styles absent.

Subectosomal auxiliary subtylostyles relatively uncommon, straight, relatively thick, fusiform, with slightly constricted, smooth bases. Length 211-(253.8)-292µm, width 3-(5.2)-8µm.

Ectosomal auxiliary subtylostyles most common, straight or slightly curved at centre, thick, fusiform, with smooth subtylote bases. Length 92-(128.5)-148µm, width 4-(6.2)-7.5µm.

Acanthostyles extremely abundant, short, thick, with slightly swollen subtylote bases, evenly spined except for aspinose points; some modified to acanthostrongyles; spines large, slightly recurved at point. Length 48-(56.4)-63µm, width 3.5-(7.2)-9µm.

Microscleres. Isochelae abundant, palmate, unmodified, of a single size category; lateral alae entirely fused to shaft, often reduced to small 'wings', front ala completely detached from lateral alae. Length 10.5-(13.2)-16µm.

Toxas wing-shaped, short, relatively thick, slight angular central curves, slightly reflexed arms. Length 8-(43.5)-96µm, width 1.0-(1.8)-2.5µm.

Associates. Probable obligatory symbiotic relationship with red algae (Halymeniaceae), possibly *Codiophyllum* (identified from a superficial comparison with published descriptions and figures in Scott et al., 1984); algal filaments replace spongin fibres entirely, or alternatively, sponge parasitic on algae, penetrating into deepest layers of cortex of blades; association well documented (Scott et al., 1984), with similar associations known for some other microcionids (*Antho opuntioides* (Lamarck) and *A. frondifera* (Lam.); Topsent, 1929).

ETYMOLOGY. Greek *protheco-* from Topsent's (1929) term 'styloprothèse' referring to the incorporation of algal filaments into the skeleton, displacing spongin fibres.

REMARKS. This species is similar to *C.* (*T.*) *cactiformis* in acanthostyle geometry, and in fact a specimen of this species mentioned by Carter (1878) from the 'west coast of Australia' was originally named *Echinonema typicum* (a junior synonym of *C.* (*T.*) *cactiformis*). Carter's material has not been found in BMNH collections, but his description mentions the sponge-algae relationship as being a 'pseudomorph' of the free living sponge. Carter's (1878) original report of *Echinonema typicum* is not valid (*nomen nudum*), and his subsequent description of the species (Carter, 1881a) is based on different material from his 1878 notice of the species. Hence the name '*typicum*' is not available for this species.

The external morphology of *Clathria* (*Thalysias*) *styloprothesis* appears to be identical to the red algae *Codiophyllum flabelliforme* (Sonder), redescribed and figured in detail by Scott et al. (1984) from the WA coast (lat. 28°-35°S, 5-21m depth), particularly in the thickness

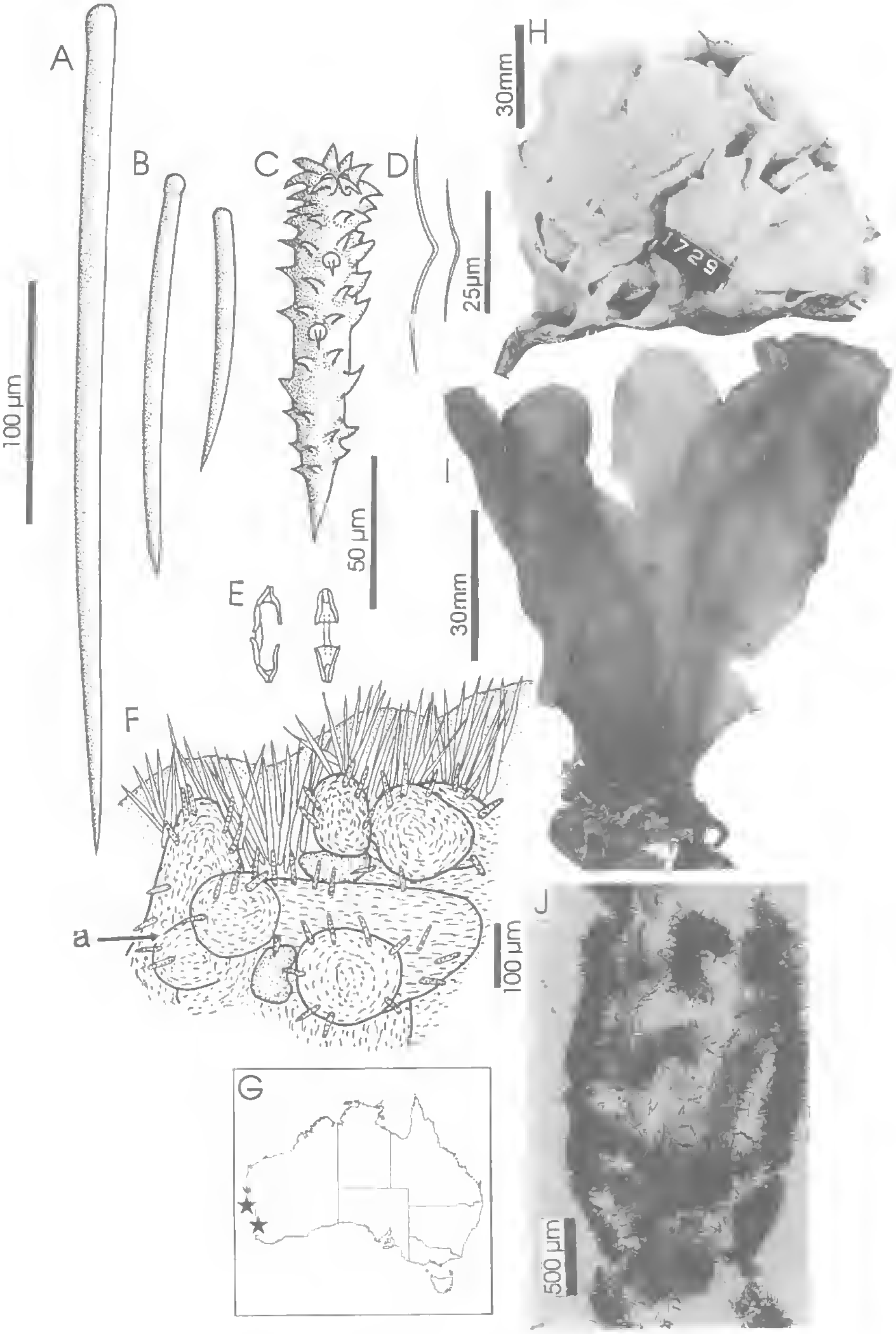

FIG. 199. *Clathria* (*Thalysias*) *styloprothesis* sp.nov. (holotype WAM649-81(1)). A, Subectosomal auxiliary subtylostyle. B, Ectosomal auxiliary subtylostyles. C, Echinating acanthostyle. D, Wing-shaped toxas. E, Palmate isochelae. F, Section through peripheral skeleton (a=algal filament). G, Australian distribution. H, Holotype. I, Paratype PIBOC04-345 (fragment QMG300043). J, Cross-section through algal lamella (pale area) showing spicules and collagen (darker areas).

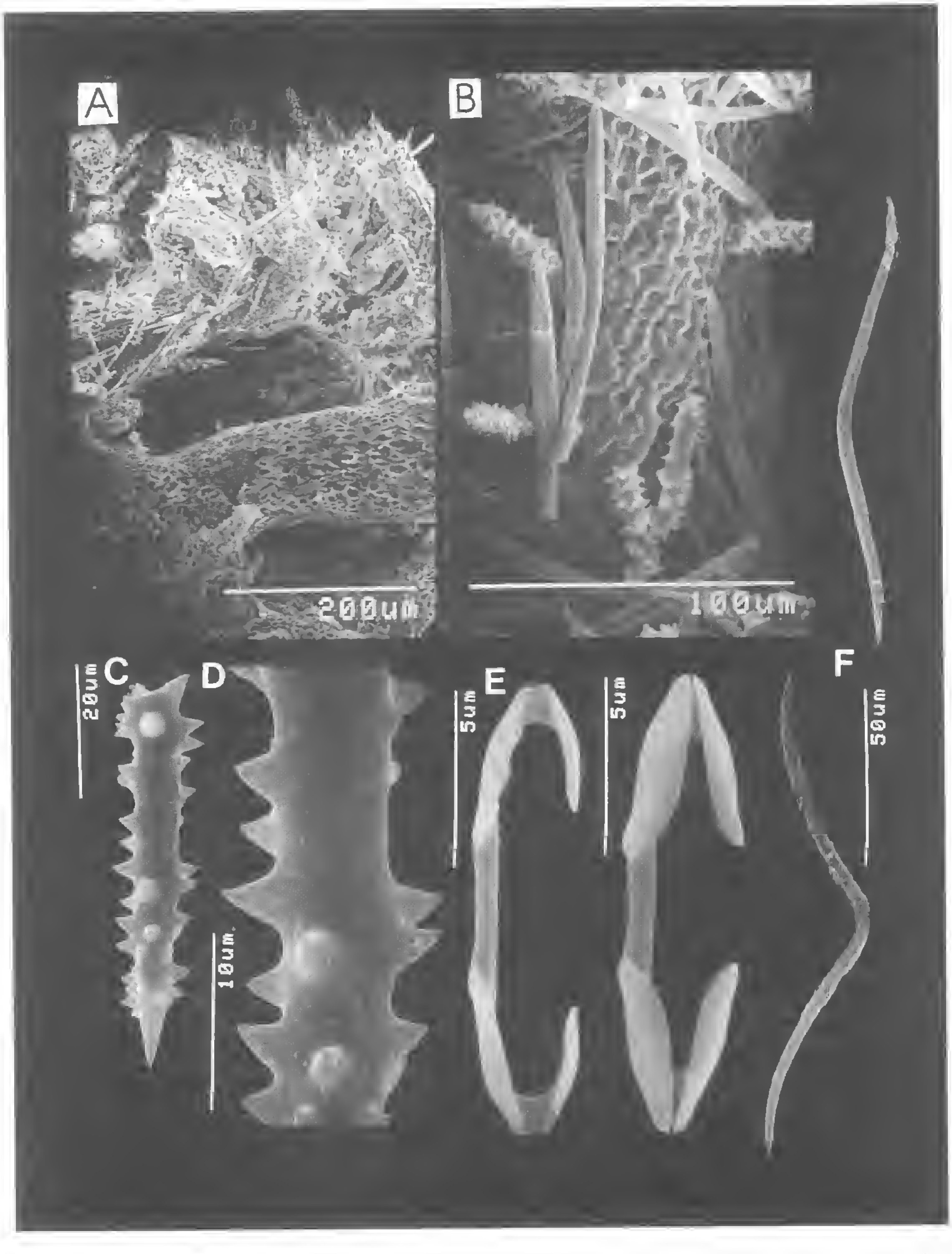

FIG. 200. *Clathria* (*Thalysias*) *styloprothesis* sp.nov. (paratype PIBOC04-345 (QMG300043)). A, Algal filaments and sponge spicules at periphery. B, Spicules embedded in filaments. C, Echinating acanthostyle. D, Acanthostyle spines. E, Palmate isochelae. F, Wing-shaped toxas.

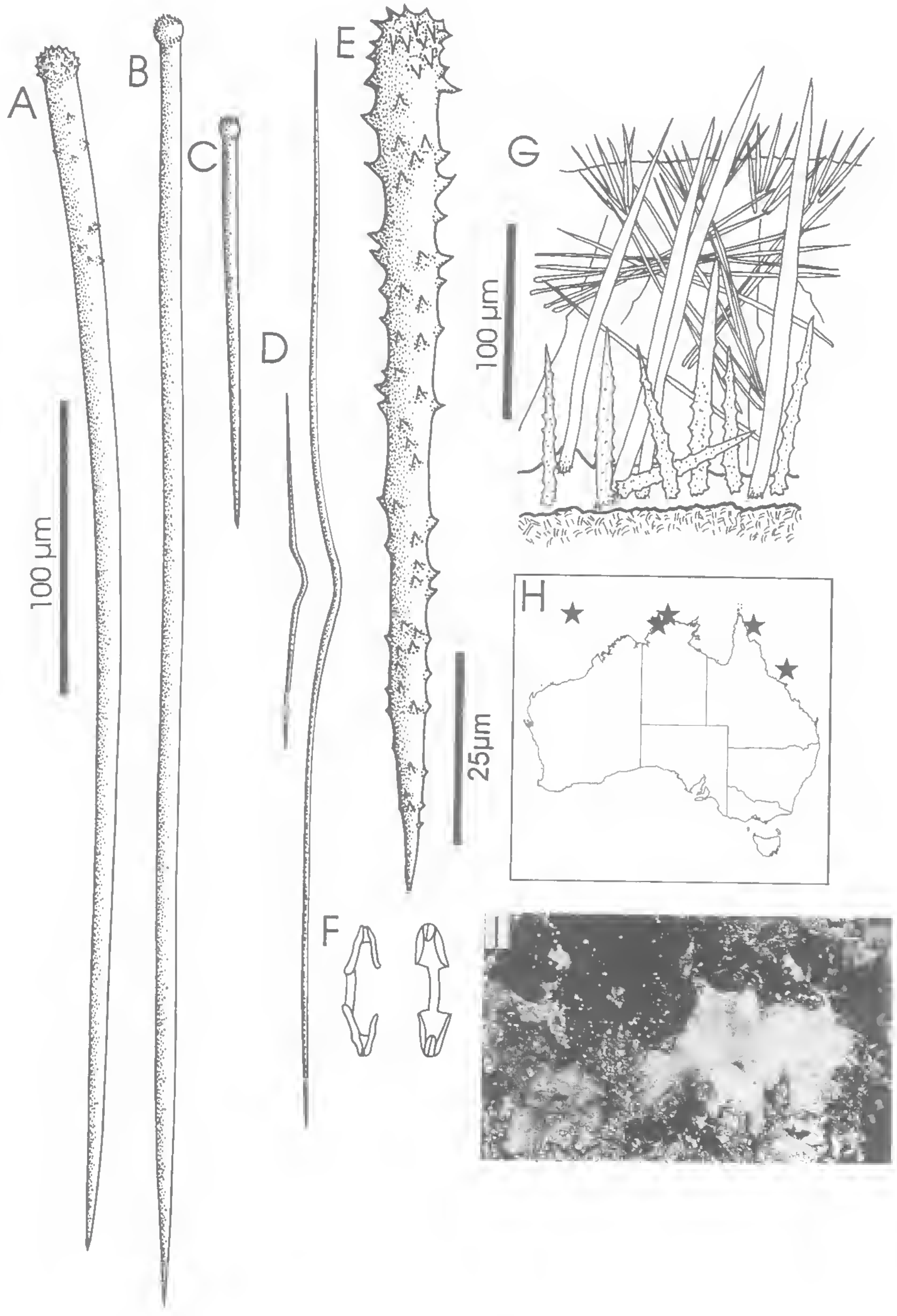

FIG. 201. *Clathria* (*Thalysias*) *tingens* sp.nov. (holotype NTMZ2202). A, Choanosomal principal subtylostyle. B, Subectosomal auxiliary subtylostyle. C, Ectosomal auxiliary subtylostyle. D, Accolada toxas. E, Echinating acanthostyle. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution. I, Incrusting holotype *in situ* growing next to *Iotrochota baculifera*.

and cortication of algal filaments. Scott et al. (1984) consider that this relationship involves an algae which has been invaded by a sponge, in which case *C. (T.) styloprothesis* is merely a thinly encrusting, excavating and opportunistic sponge species. By comparison, Topsent (1929) suggested that, in a similar case, the algal filaments are incorporated into the sponge ('styloprothèse'). In his material the algal filaments were much thinner and acanthostyles varied from forms with rounded points (strongyloids), to *Endectyon*-like (Raspailiidae) forms with relatively smooth bases and spined points (see *Antho opuntioides* and *A. frondifera* below, respectively), both of which formed a secondary renieroid reticulate skeleton.

Clathria (Thalysias) styloprothesis differs from *C. (T.) cactiformis* in the geometry and dimensions of its spicules, particularly microscleres, as well as incorporating algal filaments into fibres. In this latter respect it is easily differentiated from other microcionids, although this statement is based on the assumption that the algal-sponge relationship is species specific, and that flabellodigitate sponges (or algae) with short squat acanthostyles, similar in geometry to those found in *C. (T.) cactiformis*, are conspecific.

Clathria (Thalysias) tingens sp. nov.
(Figs 201-203, Plate 8C-D)

MATERIAL. HOLOTYPE: NTMZ2202: Dudley Point, East Point Aquatic Life Reserve, Darwin, NT, 12°25.0'S, 130°49.1'E, intertidal, 23.xi.1984, coll. J.N.A. Hooper. PARATYPES - NTMZ2231: same locality, 8.iii.1985. NTMZ2530: Orontes Reef, mouth of Port Essington, Cobourg Peninsula, NT, 11°03.6'S, 132°05.4'E, 11m depth, 17.ix.1985, coll. J.N.A. Hooper (SCUBA). OTHER MATERIAL: WA-QMG301154. NT- QMG300141 (fragment NTMZ2111). QLD - QMG303826, QM unreg.

HABITAT DISTRIBUTION. Intertidal laterite rock, dead coral reef flats, in rock pools, encrusting on underside of dead faviid coral boulders, and on coral reef slopes in deeper waters, sheltered on the sides of faviid coral boulders or *Acropora* thickets; 0-32m depth; known only from Australia: Darwin Harbour, Port Essington, Cobourg Peninsula (NT); Hibernia Reef, Sahul Shelf (WA); Raine I. (FNQ), Hook Reef (MEQ) (Fig. 201H).

DESCRIPTION. *Shape.* Thickly encrusting, 5-30mm thick, gelatinous lobate, following contours of substrate with prominent surface folding and ridge-like sculpturing.

Colour. Ectosome pale pink and white mottle to pale red-orange alive (Munsell 5RP 8/4-2.5R 8/4); pigmentation below surface dark or bright red-brown (Munsell 2.5R 5/6-5/8); superficial pigmentation easily abraded from surface leaving a sponge resembling a bleeding wound; even grey-brown in ethanol.

Oscules. Pores not visible in either live or preserved specimens.

Texture and surface characteristics. Compressible, gelatinous, slimy *in situ*, producing abundant clear mucous upon exposure to air; surface optically smooth, lobate, with occasional folds and minute subectosomal canals and ridges, although striations not prominent; mottled or speckled external appearance superficially resembles a compound ascidian.

Ectosome and subectosome. Minutely hispid, light, poorly differentiated series of ectosomal and subectosomal auxiliary spicule brushes pierce surface; choanosomal principal megascleres protrude through ectosome in thin encrustations but not in thicker sections; both ectosomal and subectosomal spicule brushes form plumose or stellate bouquets below peripheral skeleton but development variable, ranging from a dense continuous palisade in thicker regions to sparse, irregular paratangential bundles of spicules in thinner sections; thinly encrusting paratype (NTMZ2530) with simple tangential ectosomal skeleton composed of both sizes of auxiliary spicules; subectosomal skeleton with larger auxiliary subtylostyles forming extensive, plumose, and discrete paratangential tracts originating close to substrate, ultimately diverging and piercing ectosomal skeleton; individual subectosomal auxiliary subtylostyles also scattered throughout mesohyl; mesohyl matrix in peripheral skeleton heavy, granular, containing numerous pigmented spherulous cells with granular inclusions concentrated in periphery, together with occasional calcareous and siliceous foreign particles.

Choanosome. Skeletal architecture hymedesmoid, with spongin fibres reduced to a basal layer, up to 30μm thick, lying on coralline substratum, with bases of choanosomal principal styles and acanthostyles embedded and perpendicular to substrate; no folding of basal spongin or fibre nodes observed; choanosomal skeleton occupies only small percentage of sponge thickness with major portion being extensive plumose subectosomal and ectosomal skeletons in periphery of sections; mesohyl substantially lighter in deeper choanosomal skeleton, closer to substrate, than in peripheral skeleton; choanosomal chambers 52-65μm diameter.

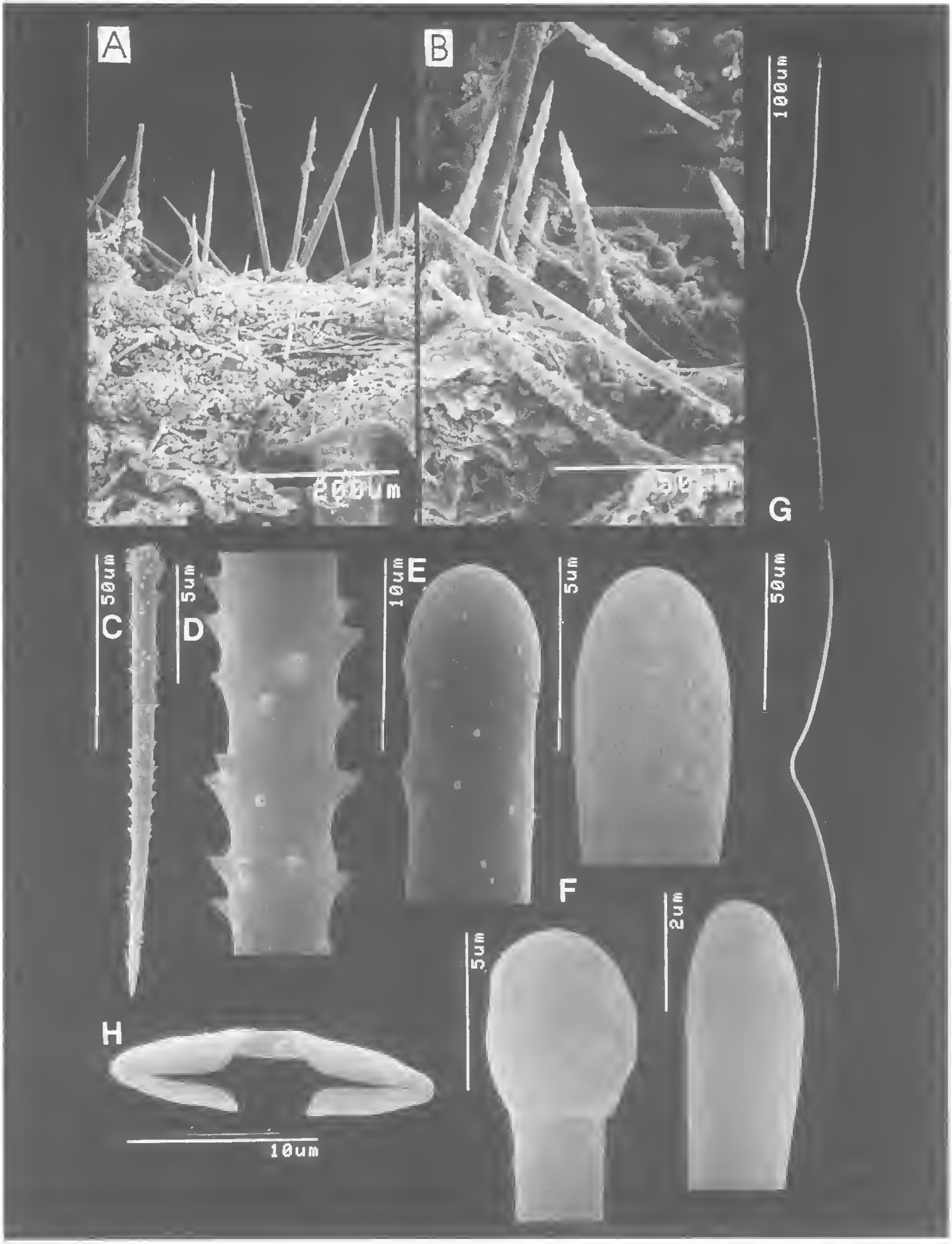

FIG. 202. *Clathria* (*Thalysias*) *tingens* sp.nov. (QMG301154, Indian Ocean). A, Hymedesmoid skeleton. B, Spicules embedded in detritus and collagen. C, Echinating acanthostyle. D, Acanthostyle spines. E-F, Bases of choanosomal and auxiliary styles. G, Accolada toxas. H, Palmate isochelae.

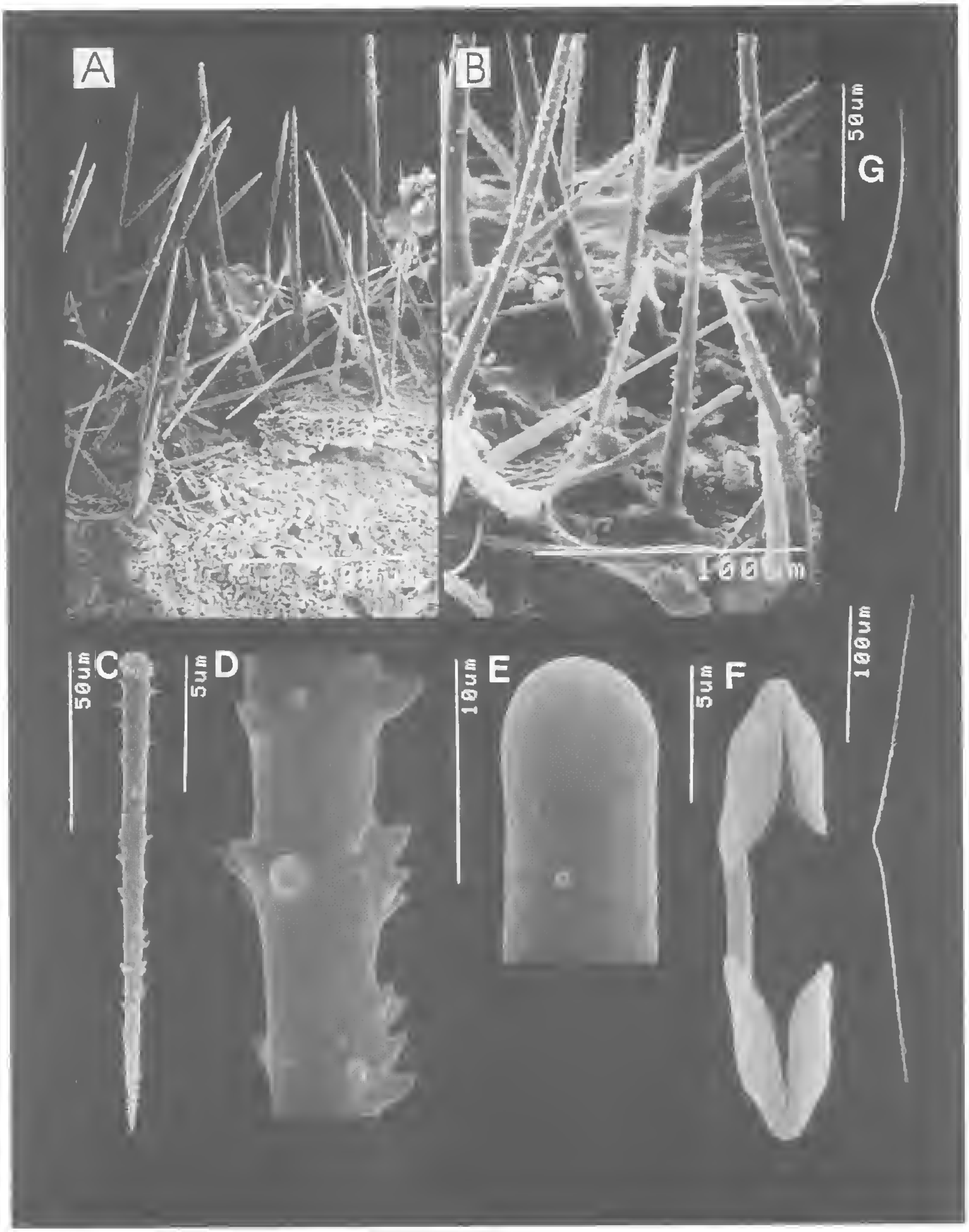

FIG. 203. *Clathria* (*Thalysias*) *tingens* sp.nov. (QMG303826, Pacific Ocean). A, Hymedesmoid skeleton. B, Erect echinating and principal spicules embedded in basal fibres and coralline substratum. C, Echinating acanthostyle. D, Acanthostyle spines. E, Base of auxiliary subtylostyle. F, Palmate isochelae. G, Accolada toxas.

Megascleres. Choanosomal principal megascleres long, thick subtylostyles, with distinctive curvature towards basal end, prominent tylote bases abundantly microspined, tapering towards fusiform point. Length 198.5-(374.3)-524.0µm, width 8-(12.9)-19.1µm.

Subectosomal auxiliary subtylostyles long, relatively thin, mostly straight, fusiform pointed, prominent tylote bases usually microspined but also with variable proportion of smooth or polytylote bases (4-16% of spicules). Length 259.3-(377.4)-502.5µm, width 4.5-(7.2)-10.5µm.

Ectosomal auxiliary subtylostyles short, slender, straight, fusiform, with less prominent tylote bases, usually microspined occasionally smooth. Length 117.9-(170.0)-208.6µm, width 2.3-(3.8)-5.6µm.

Acanthostyles long, slender, straight, subtylote, fusiform pointed, evenly spined, spines small, sharp, slightly recurved. Length 79.9-(108.3)-150.9µm, width 4.6-(8.0)-12.6µm.

Microscleres. Palmate isochelae abundant, unmodified, with lateral and front alae approximately smae length, front ala completely detached along lateral margin, lateral alae fused to shaft. Length 9.7-(15.3)-20.7µm.

Toxas common or abundant, accolada, short or long, invariably thin, with very slight to moderate central curvature and straight or very slightly reflexed points. Length 37.4-(183.4)-341.7m, width 0.8-(1.9)-3.2µm.

Associations. Growing next to, or covering other encrusting sponges (*Iotrochota*, *Placospongia*, *Ulosa*, *Mycale*), compound and simple ascidians, and coralline algae.

ETYMOLOGY.Latin *tingens*, refering to its superficially tinted pink live colouration.

REMARKS. *Clathria* (*Thalysias*) *tingens* is similar to *C.* (*T.*) *toxifera* in spicule geometry and spicule dimensions, but differs in the geometry of its acanthostyles (evenly spined), choanosomal principal styles (markedly curved basal region, bearing spination on the base and 'neck' region proximal to the base), and toxa morphology (possession of accolada toxas). In addition, live colour, differential pigmentation between ectosomal and choanosomal regions, and surface sculpturing are also diagnostic for this species. In having an easily abraded dermal pigment, the present species is reminiscent of the pink *C.* (*Wilsonella*) *tuberosa*, and yellow morphs of *C.* (*T.*) *abietina*, both from NW Australia, and the yellow *C.* (*T.*) *venosa* from the West Indies. *Clathria* (*Thalysias*) *tingens* should also be compared with *C.* (*Microciona*) *hymedesmioides* Van Soest from Curaçao in secondary colouration, hymedesmoid skeletal architecture (seen in thinly encrusting portions of *C.* (*T.*) *tingens*), and similarities in the morphology of some of their spicule categories. De Laubenfels (1954:135) recorded a specimen of *C.* (*T.*) *cervicornis* from the Marshall Is, which also had differentiated ectosomal (pale orange-brown) and choanosomal pigmentation (brilliant vermillion), although these two species differ in most other respects (e.g., growth form, skeletal architecture and spicule geometry). There are some geometric differences in spicules between Indian Ocean and Pacific Ocean specimens (Figs 202-203), but these are minor.

Clathria (Thalysias) toxifera (Hentschel)

(Figs 204-205, Plate 8E)

Hymeraphia toxifera Hentschel, 1912:382-383, pl.20, fig.40.
Microciona toxifera; Burton, 1938a:31, pl.5, fig.30; Vacelet & Vasseur, 1977:116.
Clathria toxifera; Hooper & Wiedenmayer, 1994: 274.
Not *Stylostichon toxiferum* Topsent, 1913a:621.

MATERIAL. HOLOTYPE: SMF967T: Bei Mimnen, Aru I., Arafura Sea, Indonesia, 6°S, 134°50'E, 15m depth, 8.iv.1908, coll. H. Merton (dredge). OTHER MATERIAL: NT-NTMZ2136, NTMZ2198, NTMZ2204, NTMZ2213, NTMZ2219 (fragment QMG300506), NTMZ2222, NTMZ2233 (fragment QMG300149), NTMZ2421, NTMZ2544, NTMZ2555, QMG303296, NTMZ2217, NTMZ2074b, NTMZ2173, NTMZ2504, NTMZ1348, NTMZ3909. WA- QMG301186. THAILAND - NTM Z3681.

HABITAT DISTRIBUTION. Intertidal laterite rock, dead coral reef flats, in rock pools, on sublittoral faviid coral heads, usually exposed at ELWS tides; usually encrusting under dead faviid coral boulders, in cavities, or on metal debris (aluminium and steel) scattered over coral reefs; 0-20m depth; common intertidal encrusting sponge throughout Indo-Pacific; Darwin Harbour, Port Essington, Cobourg Peninsula, Wessel Is (NT); Hibernia Reef, Sahul Shelf (WA) (Fig. 204H); also Aru Is, Indonesia (Hentschel, 1912), Ko Samui, Gulf of Thailand (present study), Madras (Burton, 1938a).

DESCRIPTION. *Shape.* Thinly encrusting, 1-5mm thick, often covering substantial areas of subtrata.

Colour. Pale orange-brown to darker red-brown alive (Munsell 5YR 7/6 - 2.5R 4/10), with whitish stellate subdermal drainage canals running over surface; colourations darkens upon exposure to air, brown to beige-grey in ethanol.

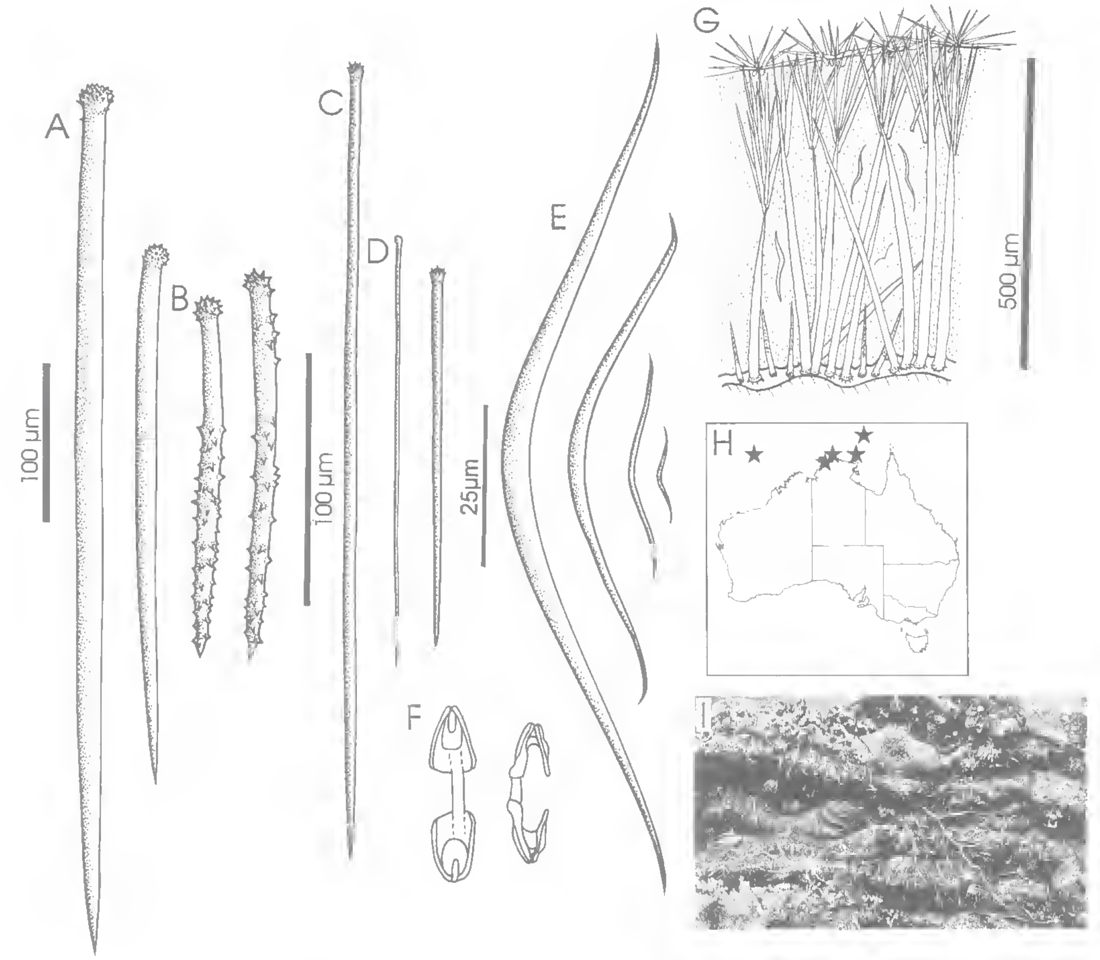

FIG. 204. *Clathria* (*Thalysias*) *toxifera* (Hentschel) (NTMZ2213). A, Choanosomal principal subtylostyles. B, Echinating acanthostyles. C, Subectosomal auxiliary subtylostyle. D, Ectosomal auxiliary subtylostyles. E, Wing-shaped toxas. F, Palmate isochelae. G, Section through hymedesmoid skeleton. H, Australian distribution. I, NTMZ2198 *in situ*.

Oscules. Oscules minute, 150-450µm diameter, scattered over surface, raised slightly above surface (on ends of conulose) or flush with surface (at nodes of drainage canals).

Texture and surface characteristics. Firm, hispid, compressible in thicker regions; surface uneven, roughened, usually following contours of substrate, with raised projections, meandering ridges and cavities in thicker growths, or more even and with only slightly sculptured surface in thinner growths; surface with prominent subectosomal drainage canals radiating towards oscules, but these collapse, and stellate surface sculpturing disappears upon preservation; sponges produce slight clear mucous when exposed to air.

Ectosome and subectosome. Ectosome slightly translucent or opaque in life, minutely hispid; spicule brushes paratangential or erect, composed of 2 layers: outer layer with smaller ectosomal subtylostyles, inner layer of larger subectosomal auxiliary subtylostyles; both layers appear intermingled but closer examination shows brushes of larger spicules originate deeper within mesohyl, whereas layer of smaller brushes occur only near periphery; points of choanosomal principal subtylostyles also protrude through surface brushes, up to 300µm in thin sections, whereas in thicker sections principal megascleres barely pierce surface, surrounded at their points by ectosomal spicule brushes in classical *Thalysias* architecture; development of ectosomal skeleton variable, ranging from continuous dense palisade of spicule brushes in thicker growths, to sparse, irregularly paratangential, discrete brushes in thinner sections; foreign debris sometimes incorporated into ectosomal skeleton with particles surrounded by spicule brushes. In subectosomal region are also thin longitudinal bands, forming dense tracts, composed of subectosomal auxiliary subtylostyles usually congregated around erect principal spicules, running tangential or paratangential to ectosome; subectosomal tracts diverge near periphery to form plumose subectosomal brushes underlying ectosomal skeleton; in thin sections plumose tracts originate approximately halfway along length of principal spicules whereas in thicker sections subectosomal brushes do not diverge until peripheral skeleton; subectosomal region 0.5-3mm thick containing abundant, moderately heavily pigmented.

Choanosome. Choanosomal skeletal hymedesmoid in thinner sections with single megascleres embedded in basal spongin lying flat on substratum, or microcionid in thicker regions with basal spongin slightly raised nodes (='fibres'); peripheral skeletal architecture distinctly plumose; choanosomal principal megascleres and echinating acanthostyles perpendicular to substrate with bases embedded in basal spongin or in erect fibre nodes where present; basal spongin moderately heavy, yellow-brown, lying directly on calcareous substrate, 8-20µm thick in hymedesmoid sections, up to 45µm in microcionid sections; few choanocyte chambers observed only in thicker sections, 13-55µm diameter, usually lined by toxas and/or isochelae.

Megascleres. Choanosomal principal subtylostyles range greatly in length, thickest near base, usually slightly curved at centre, all with prominently swollen bases, most heavily microspined or granular, rarely completely smooth (0-16% of spicules in individual specimens), all with fusiform tapering points. Length 194.0-(368.7)-685.1µm, width 5.1-(14.1)-25.5µm.

Subectosomal auxiliary subtylostyles long, thin, fusiform, straight, with distinctly swollen tylote bases, usually lightly microspined, less frequently smooth ((0-10% of spicules in individual specimens). Length 228.2-(354.3)-494.3µm, width 2.0-(6.5)-12.9µm.

Ectosomal auxiliary subtylostyles short, straight, fusiform, less markedly tylote than larger auxiliary subtylostyles, with smooth or basal spines. Length 123.3-(171.1)-229.6µm, width 1.5-(3.6)-6.6µm.

Acanthostyles thick, slightly curved towards basal end, with subtylote bases, long tapering points, mostly evenly, lightly spined except for bare 'neck' proximal to base, spines large, recurved, sharply pointed. Length 121.9-(154.5)-208.0µm, width 3.0-(7.9)-14.0µm.

Microscleres. Palmate isochelae usually abundant (uncommon in 14% of samples), moderately large, of a single size, unmodified (although more heavily silicified in 15% of specimens), with front ala detached from and generally shorter than lateral alae, lateral alae completely fused to shaft. Length 10-(22.6)-30µm.

Toxas verging on oxhorn, very abundant, relatively thick but variable in length, with wide central curvature and straight or only slightly reflexed points. Length 16-(89.8)-241µm, width 0.8-(2.9)-5µm.

Associations. Growing over or in proximity to other encrusting sponges (*Desmanthus*, *Mycale*, *Ulosa*, *Haliclona*, *Petrosia*, and other microcionids), compound ascidians, coralline algae, *Platygyra* and faviid corals, barnacles (*Chthamalus*), and metal debris (aluminium cans) on the reef flat (with some evidence of etching on the metal substrate). It is probable that the species plays an active role in coral bioerosion.

REMARKS. This species is perfectly recognisable from Hentschel's (1912) original description and material described here from Northern Territory, Western Australia and Thai waters do not differ markedly from the Indonesian population. Conversely, we do not know any details of Burton's (1938a) specimen from Madras since he merely repeated *verbatim* the original description, spicule measurements and figures from Hentschel (1912).

Live colour, surface features, spicule size and spicule ornamentation differentiate *C.* (*T.*) *toxifera* from other encrusting *Clathria* (*Thalysias*) but there are no unique structural differences. The older literature mostly concerns preserved material, only rarely describing species' *in situ* characters, and most encrusting microcionids have few unique morphological features. Consequently, differentiation between encrusting microcionids relies mainly on details

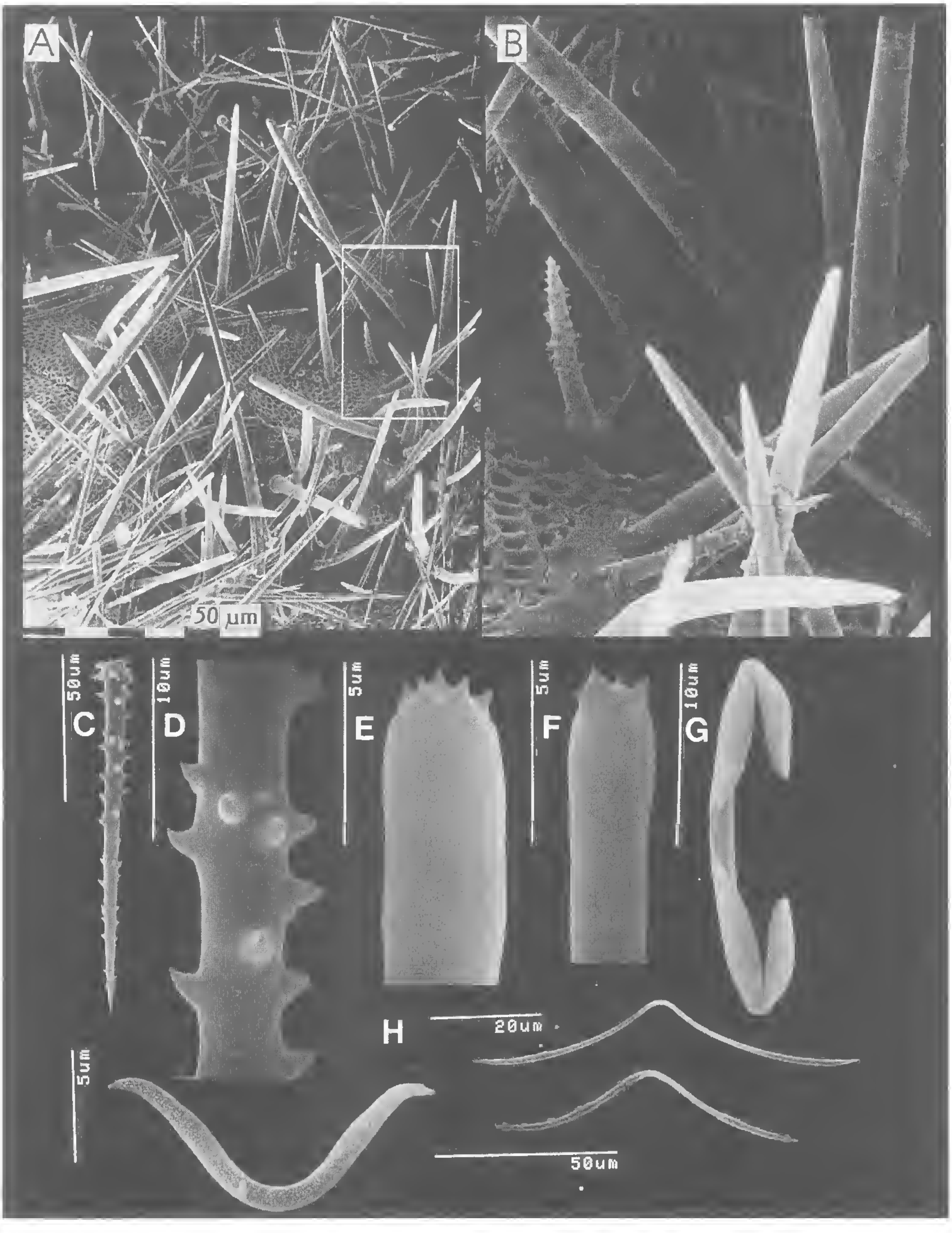

FIG. 205. *Clathria* (*Thalysias*) *toxifera* (Hentschel) (QMG301186). A, Hymedesmoid skeleton. B, Spicules embedded in basal spongin and coralline substratum (x435). C, Echinating acanthostyle. D, Acanthostyle spines. E-F, Bases of auxiliary subtylostyles. G, Palmate isochelae. H, Wing-shaped toxas and juvenile oxhorn-like toxa.

of the mineral skeleton, particularly spicule geometries.

The possession of stellate subectosomal surface sculpturing (i.e., subectosomal drainage canals radiating towards oscules) is known for *C.* (*T.*) *venosus*, and to a lesser extent *C.* (*T.*) *virgultosa* (*sensu* Wiedenmayer, 1977:143), both from the Caribbean. But this feature cannot be given too much taxonomic importance given that it represents an ecological adaptation: viz. in thinly encrusting sponges subectosomal canals represent the primary means of water circulation whereas in thicker specimens the primary aquiferous system is predominantly internal. In any case *C.* (*T.*) *toxifera* differs from the Caribbean species in spicule geometry and ornamentation and spicule sizes.

Clathria (*Thalysias*) *toxifera* should also be compared with other encrusting microcionids from the Indo-Malay and Indo-Pacific region which have hymedesmoid architecture. These include numerous species from the Arafura Sea: *C.* (*T.*) *aruensis* (Hentschel, 1912:381), *C.* (*T.*) *calochela* (Hentschel, 1912), *C.* (*T.*) *distincta* (Thiele, 1903a), *C.* (*T.*) *longitoxa* (Hentschel, 1912), *C.* (*Microciona*) *rhopalophora* (Hentschel, 1912), *C.* (*M.*) *hentscheli* nom. nov., *C.* (*M.*) *similis* (Thiele, 1903a), *C.* (*M.*) *tetrastyla* (Hentschel, 1912) and *C.* (*M.*) *thielei* (Hentschel, 1912) (all of which lack isochelae). Species from other localities are: *C.* (*T.*) *michaelseni* (Hentschel, 1911) from Shark Bay, WA (with sigmoid anchorate-like (bidentate) isochelae); *C.* (*M.*) *aceratoobtusa* (Carter, 1886g) from the Mergui Archipelago, Burma, and from Shark Bay, WA (Hentschel, 1911) (with smooth echinating megascleres); *C.* (*M.*) *affinis* (Carter, 1880a), *C.* (*M.*) *bulboretorta* (Carter, 1880a), *C.* (*M.*) *fascispiculifera* (Carter, 1880a) (with sigmoid palmate isochelae), and *C.* (*M.*) *quadriradiata* (Carter, 1880a), all from the Gulf of Manaar, Sri Lanka; *C.* (*T.*) *dubia* (Kirkpatrick, 1900a) from Christmas I., Indian Ocean (with anchorate-like isochelae); *C.* (*C.*) *pellicula* Whitelegge (1897) from the Ellice Is, Pacific Ocean; *C.* (*T.*) *eurypa* (de Laubenfels, 1954) from Palau Is, and Suva, Fiji (Tendal, 1969:40) (with 2 categories of isochelae). All those taxa differ from the present species in various details of spicule size, spicule diversity, geometry and ornamentation. Some of these species are redescribed in the present work whereas others will be redescribed in a forthcoming monograph on the Indo-Malay microcionids (Hooper et al., in prep.). From re-examination of the relevant type material of each of these species, and from a detailed précis of the literature, it is clear that there are many encrusting species still undescribed, and that many of those already described are in urgent need of revision.

Clathria (Thalysias) vulpina (Lamarck, 1814)
(Figs 206-209, Tables 41-42, Plate 8F)

Spongia vulpina Lamarck, 1814:449; Lamarck, 1814:376

Rhaphidophlus vulpina; Ridley, 1884a:615.

Rhaphidophlus vulpinus; Topsent, 1932:110, pl.5, fig.3.

Clathria vulpina; Hooper & Lévi, 1993a:1246-1250, figs 11-12, table 6; Hooper & Wiedenmayer, 1994: 274.

Halichondria frondifera Bowerbank, 1875:288-289

Amphilectus frondifera; Vosmaer, 1880:115.

Clathria frondifera; Ridley, 1884a:448-449, 612, pl.42, fig.i, pl.53, fig.j; Ridley & Dendy, 1887:149, 160, 178, 246, 254; Topsent, 1892b:23, pl.1, fig.4; Lindgren, 1897:480, 483; Lindgren, 1898:309-310; Dendy, 1916a:128; Dendy, 1922:65; Hentschel, 1912:360-361; Row, 1911:382, 389, 396; Burton, 1938a:27-28, pl.3, fig.21; Burton, 1959:243; Lévi, 1961c:21-22; Thomas, 1970b:206-207, text-fig.11; Thomas, 1973:33-34, pl.2, fig.6, pl.8, fig.4; Tanaka et al., 1976:801-805; Tanaka et al., 1977:767-772; Tanaka et al., 1978:1283; Thomas, 1979a:26-27, pl.2, fig.1; Hoshino, 1981:161; Liaaen-Jensen et al., 1982:171.

Clathria frondifera var. *seto-tubulosa*; Wilson, 1925:439.

Clathria frondifera var. *dichela*; Hentschel, 1912:360-361.

Tenacia frondifera var. *dichela*; Hallmann, 1920:771.

Tenacia frondifera; Burton & Rao, 1932:337-339; Burton, 1934a:559; Lévi, 1961b:521-522, text-figs 12,13.

Rhaphidophlus frondifera; Thiele, 1903a:958, text-fig.23.

Thalysias frondifera; de Laubenfels, 1954:138-139, text-fig.88.

Clathria dichela; Vacelet et al., 1976:71, pl.3, fig.b; Vacelet & Vasseur, 1977:114.

Rhaphidophlus dichela; Van Soest, 1984b:115.

Clathria corallitincta Dendy, 1889b:85, pl.4, fig.8; 1916b:128; Dendy, 1922:65.

Rhaphidophlus seriatus Thiele, 1899:14, pl.1, fig.6, pl.5, fig.7.

Clathria reinwardti var. *palmata*; Ridley, 1884a:447; Bergquist & Tizard, 1967:186.

? *Clathria typica*; Vacelet & Vasseur, 1971:94.

Not *Rhaphidophlus filifer* var. *spinifera*; Lindgren, 1898:311-312, pl.17, fig.7, pl.19, fig.18; Thiele, 1903a:958.

Not *Clathria nuda*; Hentschel, 1912:298, 359, 364-365, pl.19, fig.28.

Not *Clathria frondifera* var. *major*; Hentschel, 1912:361.

cf. *Microciona prolifera*; Vosmaer, 1935a:609, 629.

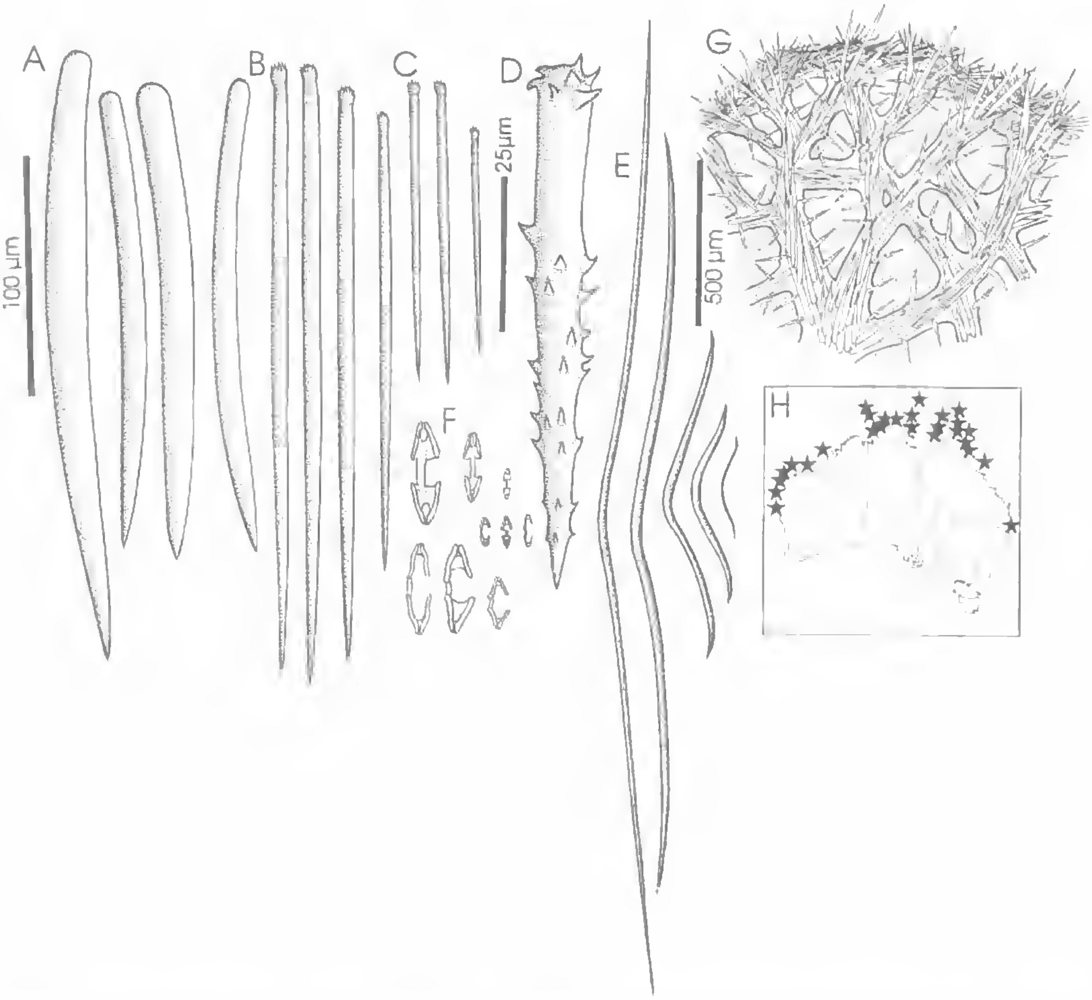

FIG. 206. *Clathria* (*Thalysias*) *vulpina* (Lamarck) (holotype MNHNDT639). A, Choanosomal principal styles. B, Subectosomal auxiliary styles. C, Ectosomal auxiliary styles. D, Echinating acanthostyle. E, Accolada - wing-shaped toxas. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution.

MATERIAL. HOLOTYPE: MNHNDT639: "? Australia", Peron & Lesueur collection. Fragments of HOLOTYPE *H. frondifera*: BMNH1877.5.21.1351-2: Gaspar Straits, off Belitung I., Indonesia, 3°10'S, 107°15'E. HOLOTYPE and PARATYPE of *C. frondifera* var. *setotubulosa*: USNM21256, 21257: specific locality unknown, Philippines. HOLOTYPE of *T. frondifera* var. *dichela*: SMF1673 (fragment MNHNDCL2230): Straits of Dobo, Aru I., Indonesia, 6°S, 134°50'E, 16m depth, 20.iii.1908, coll. H. Merton (dredge). HOLOTYPE and PARATYPE of *R. seriatus*: NMB16, 17 (fragments BMNH1908.9.24.165-166, ZMB2897): Kema, off Minahassa, Celebes (Sulawesi), Indonesia, 2°50'S, 123°30'E, 30m depth, 1895, coll. P. & F. Sarasin (dredge). HOLOTYPE of *C. reinwardti* var. *palmata*: BMNH1881.10.21.264: Bird I., Torres Strait, Qld, 11°42'S, 143°05'E, coll. HMS 'Alert' (dredge). HOLOTYPE of *C. corallitincta*: BMNH1889.1.21.17 - Gulf of Manaar, Ceylon (Sri Lanka), 8°50'N, 79°40'E, coll. E. Thurston (dredge). OTHER MATERIAL (Hooper & Lévi, 1993a for additional list): INDONESIA - QMG303689 (NCIOCDN-1388-S), QMG303682 (NCIOCDN-1252-U). PHILIPPINES - QMG300298 (NCIQ66C-5715-C), QMG300310 (NCIQ66C-5716-C), QMG300321, QMG300332. PNG- QMG300368 (NCIQ66C-4446-X). VIETNAM - PIBOC05-191 (fragment QMG300047). MADAGASCAR - PIBOCB12-200 (fragment QMG300056). NT- QMG303587, QMG303323, QMG303378, NTMZ3918, NTMZ3931, QMG300760 (NCIQ66C-4776-I), QMG300560 (NCIQ66C-4825-L). WA -

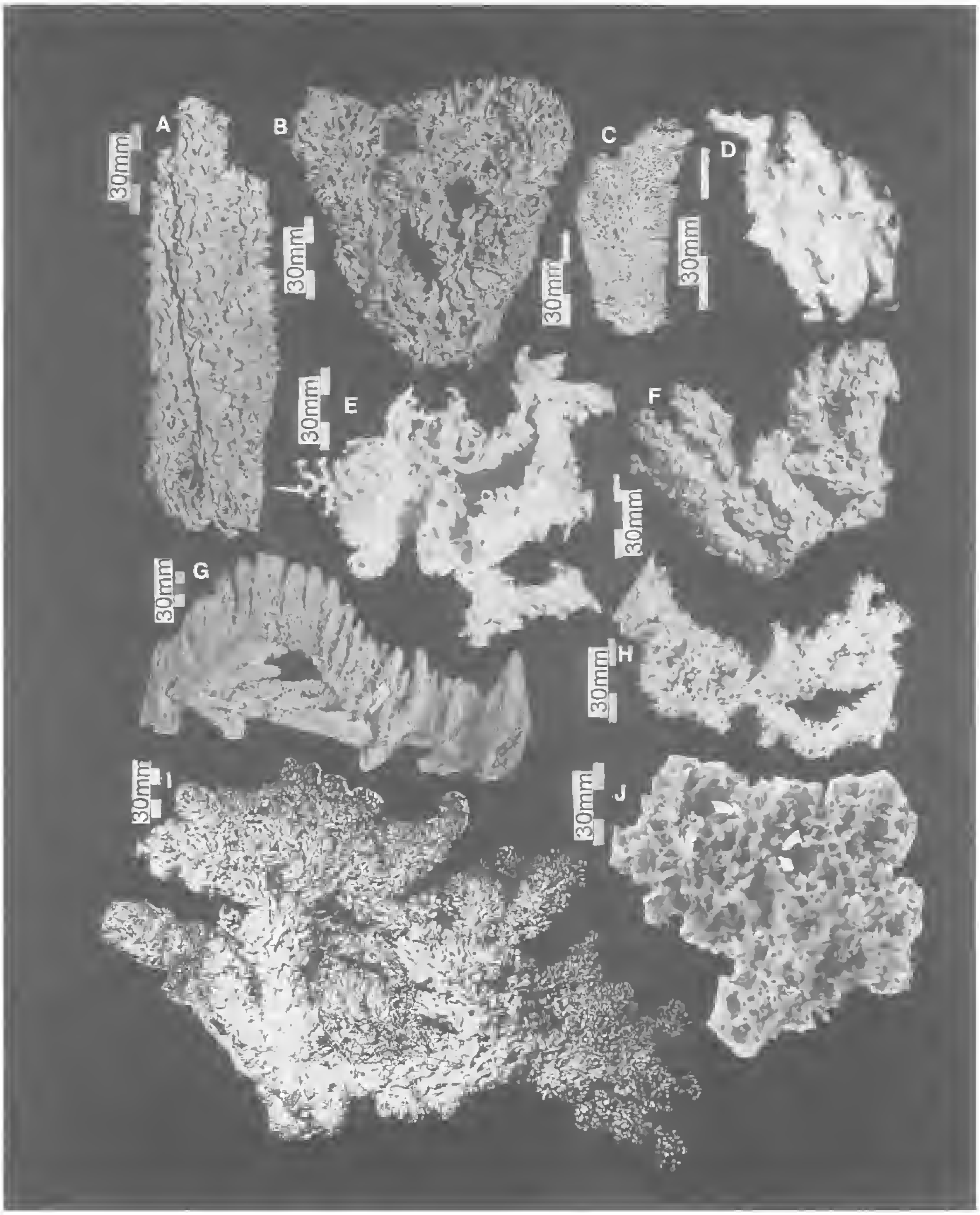

FIG. 207. *Clathria* (*Thalysias*) *vulpina* (Lamarck) typical growth forms. A, Holotype MNHNDT639. B, Ridley's (1884) "Alert" specimen of *C. frondifera* BMNH1881.10.21.288. C, Holotype of *C. reinwardti* var. *palmata* BMNH1881.10.21.264. D, Holotype *C. corallitincta* BMNH1889.1.21.17. E, Holotype *R. seriatus* NMB16. F, Holotype *C. frondifera* var. *setotubulosa* USNM21257. G, Holotype *C. frondifera* var. *dichela* SMF1673. H, Hentschel's (1912) Aru I. specimen SMF1699B. I, NTMZ1810, deeper water, NW Australia . J, QMG300047, shallow water, Gulf of Thailand .

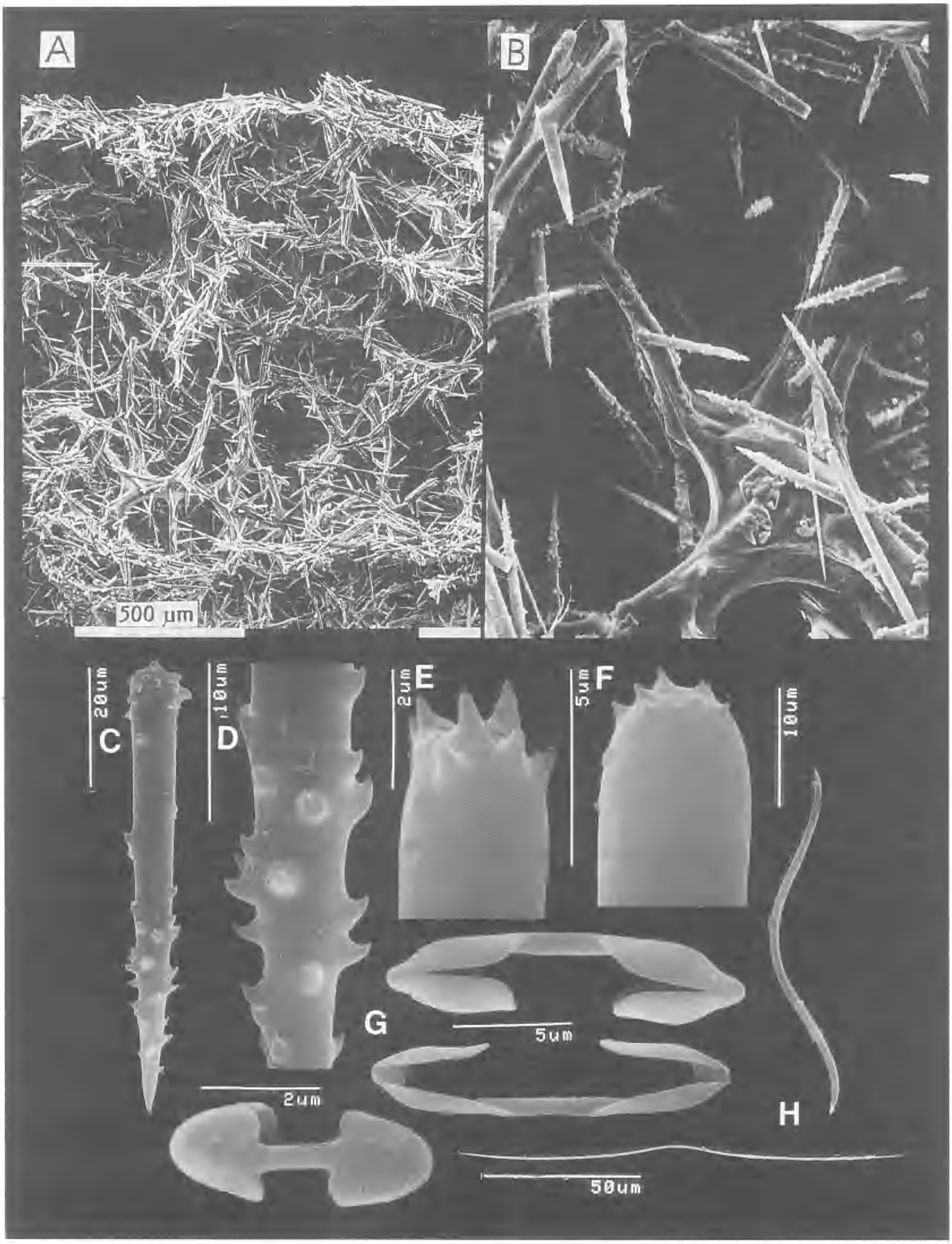

FIG. 208. *Clathria* (*Thalysias*) *vulpina* (Lamarck) (NTMZ2691). A, Choanosomal skeleton. B, Fibre characteristics (x260). C, Echinating acanthostyle. D, Acanthostyle spines. E-F, Bases of auxiliary subtylostyles. G, Palmate isochelae. H, Accolada - wing-shaped toxas.

MONTH	TOTAL SAMPLES	SAMPLES WITH LARVAE
JANUARY	4	0
FEBRUARY	3	0
MARCH	4	0
APRIL	9	0
MAY	9	0
JUNE	3	0
JULY	3	0
AUGUST	5	0
SEPTEMBER	9	9
OCTOBER	19	19
NOVEMBER	12	0
DECEMBER	6	0

FIG. 209. *Clathria* (*Thalysias*) *vulpina* (Lamarck) Incidence of larval production in NT populations.

PIBOC04-457 (fragment QMG300053). QLD- QMG303522, QMG300861, QMG303038, QMG304758, QMG304409, QMG304370, QMG303898. NSW- QMG301376, QMG301385, QMG301405.

HABITAT DISTRIBUTION. Mostly on rock or dead coral reefs, exposed to currents or sheltered between coral heads; 0-80m depth; widely distributed throughout Indo-west Pacific; Bynoe Harbour, Darwin Harbour, Orontes reef, Melville I., Wessel Is (NT); Shark Bay, Carnarvon, Barrow I., Exmouth Gulf, Port Hedland, Monte Bello Is, Amphinome Shoals (WA); Gulf of Carpentaria, Thursday I., Bird I., Home Is, Green I., Frankland Is, Low Is, Cook Reef, Shelburne Bay, Howick Is, Lizard I. (FNQ); Hook Reef (MEQ); Byron Bay (N. NSW) (Fig. 206H); also Mozambique (Thomas, 1979a), Madagascar (Vacelet et al., 1971, 1976, 1977; present study), Amirante Is (Ridley & Dendy, 1887), Seychelle Is (Ridley & Dendy, 1887; Thomas, 1979a), Aldabra Is (Lévi, 1961c), Red Sea (Topsent, 1892b; Burton, 1959a), Kattiawar W. coast of India, Madras, Gulf of Manaar and Sri Lanka (Dendy, 1889b, 1916b; Lindgren, 1897; Burton, 1938a; Thomas, 1970b), Mergui Archipelago and Andaman Is (Burton & Rao, 1932), Straits of Malacca, Malaysia and Gaspar Straits (Bowerbank, 1875), Aru Is, Arafura Sea, Java Sea and Sulewasi, Indonesia (Thiele, 1889; Lindgren, 1898; Hentschel, 1912; present study), Hon Rai I., Vietnam (present study), Negros Orientale, Bohol Sea, Mindinao, and S. Philippines (Wilson, 1925; Lévi, 1961b; present study), Guam, Micronesia (de Laubenfels, 1954), S. Japan (Hoshino, 1981), New Caledonia (Hooper & Lévi, 1993a), Madang, Papua New Guinea (present study)

DESCRIPTION. *Shape.* Tubulo-digitate, variable in size ranging from small single digits (80mm high) to massive multiple digitate lobes attached on a common base (450mm high); digits cavernous, insubstantial, composed of tight or loosely anastomosing sub-branches (trabeculae).

Colour. Deep mauve-red (Munsell 2.5R 6/4) to pinkish red alive (2.5R 8/4) in shallow water specimens; pigmentation usually absent in deeper water specimens, beige brown alive (7.5YR 8/4).

Oscules. Oscules scattered between surface conules, not confined to any particular region, 2-6mm diameter, raised slightly above surface with distinct membraneous lip; ostia 0.4-2.2mm diameter flush with surface.

Texture and surface characteristics. Soft, rubbery, compressible; surface usually with small tapering digitate or spiny processes arising from free branches; surface also ornamented by minute grooves and striations, irregularly folded and cavernous; when intact ectosomal membrane stretched across adjacent branches, through which subectosomal canals can be seen.

Ectosome and subectosome. Conspicuous palisade of tangential, paratangential and erect spicule brushes composed of smaller auxiliary subtylostyles, with choanosomal principal megascleres protruding through surface, overlaying prominent plumose subectosomal spicule tracts; ectosomal skeletal density variable even within a single specimen.

Choanosome. Choanosomal skeleton regular or subrenieroid reticulation of ascending, primary spongin fibres (60-135μm diameter) and transverse connecting fibres (25-39μm diameter); fibre anastomoses form rectangular to square meshes lined by oval choanocyte chambers (22-58μm); fibres heavy, slightly heavier in axis than towards periphery; primary fibres cored by multispicular tracts of both choanosomal principal and subectosomal auxiliary megascleres, and coring spicules occupy less than 66% of primary fibre diameter; secondary fibres paucispicular, and coring spicules comprise only 50% of fibre diameter; echinating acanthostyles usually abundant, and choanosomal principal styles also echinate fibre endings in peripheral skeleton, individually or forming plumose brushes, supporting plumose tracts of subectosomal auxiliary spicules and ultimately ectosomal brushes above; auxiliary megascleres also scattered between fibres.

Megascleres. Choanosomal principal styles curved near base, thick, hastate or fusiform pointed, occasionally mucronate, with rounded, non-tylote, smooth bases. Length 113.3-(184.4)-253.0μm, width 3.6-(11.2)-19.4μm (holotype 156.5-(173.8)-193.3 x 10.1-(13.1)-15.9μm).

TABLE 41. Summary of results of one-way ANOV's (model I), testing for variability in spicule lengths and widths of *Clathria* (*Thalysias*) *vulpina*, between groups subdivided on the basis of locality, season and bathymetric distribution.

SPICULE	LOCALITY[1]			SEASON[2]			DEPTH[3]		
	(N)	F	Prob.	(N)	F	Prob.	(N)	F	Prob.
Choanosomal styles L	(850)	3.78	P<0.001	(600)	0.69	P>0.05	(675)	1.49	P>0.05
W	(850)	*3.94*	P<0.001	(600)	1.48	P>0.05	(675)	0.17	P>0.05
Subectosomal styles L	(850)	1.82	P>0.05	(600)	1.06	P>0.05	(675)	0.55	P>0.05
W	(850)	1.28	P>0.05	(600)	1.01	P>0.05	(675)	0.70	P>0.05
Ectosomal styles L	(850)	1.27	P>0.05	(600)	0.20	P>0.05	(675)	0.33	P>0.05
W	(850)	0.88	P>0.05	(600)	0.23	P>0.05	(675)	0.52	P>0.05
Acanthostyles L	(850)	*6.68*	P<0.0005	(600)	1.73	P>0.05	(675)	0.69	P>0.05
W	(850)	1.18	P>0.05	(600)	0.29	P>0.05	(675)	0.96	P>0.05
Chelae I L	(850)	*2.80*	P<0.01	(600)	0.43	P>0.05	(675)	1.04	P>0.05
Chelae II L	(850)	0.12	P>0.05	(600)	0.18	P>0.05	(675)	0.56	P>0.05
Toxas L	(850)	*2.83*	P<0.01	(600)	0.36	P>0.05	(675)	0.81	P>0.05
W	(850)	0.40	P>0.05	(600)	0.09	P>0.05	(675)	0.04	P>0.05

Number of groups:
1. 7 locality groups (Northwest Shelf, Darwin, Cobourg Peninsula, Great Barrier Reef, Indonesia, Philippines, Guam).
2. 4 seasonal groups (wet (FMA), pre-dry (MJJ), dry (ASO), pre-wet (NDJ), for Darwin & Cobourg Peninsula material only).
3. 4 depth groups (0-4m, 4-10m, 10-40m, 40m depth).

Subectosomal auxiliary subtylostyles mostly straight, less often slightly curved near base, only slightly subtylote, frequently microspined, less often smooth, fusiform pointed. Length 123.6-(221.4)-310.9µm, width 1.0-(4.7)-10.4µm (holotype 148.2-(196.8)-231.8 x 3.6-(6.1)-8.8µm).

Ectosomal auxiliary subtylostyles styles straight, short, thin, subtylote, invariably microspined, fusiform pointed. Length 64.2-(99.1)-161.1µm, width 1.0-(3.3)-6.9µm (holotype 65.9-(87.8)-116.4 x 1.1-(3.4)-6.1µm).

Acanthostyles subtylote, fusiform sharply pointed, spined on base and midsection of shaft but aspinose on 'neck' proximal to base and point; spines large, recurved, sharp. Length 51.8-(73.1)-94.7µm, width 1.1-(6.6)-11.6µm (holotype 59.7-(74.3)-86.6 x 4.5-(7.8)-10.7µm).

Microscleres. Palmate isochelae abundant, scattered throughout the mesohyl, in 2 size classes with very few intermediate sizes; contort forms extremely rare seen in few specimens; chelae relatively poorly silicified, lateral and front alae approximately same length; front ala completely detached from lateral alae, which are fused completely to shaft. Length I: 7.1-(12.4)-17.5µm (holotype 9.1-(12.8)-17.1µm), length II: 1.1-(3.8)-6.9µm (holotype 1.1-(3.7)-6.1µm).

Toxas common to uncommon, distributed singly or in toxodragmata throughout mesohyl, seen particularly surrounding choanocyte chambers; toxas commonly accolada (long, thin, rhaphidiform, with little or no central curvature or apical flexion), to less commonly wing-shaped (short, thin, widely curved centrally, without flexed points). Length 7.2-(97.9)-199.5µm, width 0.5-(1.2)-3.2µm (holotype 16.7-(55.8)-94.6 x 0.6-(1.7)-2.3µm).

Larvae and reproductive periodicity. 28% of all specimens examined (including material reported by Hooper & Lévi, 1993a) contained incubated (viviparous) parenchymella larvae in various stages of development; young larvae spherical, more mature larvae oval-elongate, 170-420µm diameter; cilia not observed (preserved material); undifferentiated forms (170-340µm diameter) contain whispy juvenile megascleres in axis, with mesohyl matrix similar in colouration to adult; more advanced larvae (230-420µm diameter) contain juvenile styles and toxas at centre, isochelae towards periphery, and distinct ectosomal layer of differentiated cells. In Northern Territory populations sexual

TABLE 42. Latitudinal gradients in spicule dimensions for populations of *Clathria* (*Thalysias*) *vulpina*. Measurements (in µm) are mean lengths (L) and widths (W) 1SE.

SPICULE	LOCATION/LATITUDE							
	NCAL 22°S	NWS 19°S	GBR 16°S	DAR 12°S	CP 11°S	INDO 6°S	PHIL 10°N	MICRO 14°N
(N)	(175)	(275)	(250)	(300)	(300)	(175)	(125)	(125)
Choanosomal styles L	156.8±9.2	167.6±10.9	169.7±10.9	189.9±9.6	185.6±9.7	185.8±9.7	197.9±10.1	196.9±13.5
W	6.2±0.9	11.0±1.7	8.0±0.9	11.5±1.3	11.4±1.3	10.7±0.9	12.0±1.4	7.9±0.8
Acanthostyles L	51.1±2.8	73.1±4.0	69.0±2.3	74.4±3.7	72.3±3.9	73.1±3.4	77.9±3.9	53.2±2.5
W	3.5±1.0	7.1±0.9	5.5±0.9	6.6±0.8	6.6±0.8	6.7±1.5	6.6±0.8	5.9±0.4
Chelae L	-	11.7±0.9	10.8±0.4	12.9±0.9	12.3±0.9	11.9±1.1	12.6±0.7	13.3±0.7
Toxas L	79.3±17.2	79.1±21.8	66.8±19.3	94.1±22.2	111.7±18.2	96.4±18.6	104.4±26.2	129.8±23.9
W	0.6±0.2	1.2±0.2	1.2±0.2	1.2±0.2	1.2±0.2	1.2±0.2	1.0±0.2	0.9±0.2

Location: NCAL = New Caledonia; NWS = Northwest Shelf,WA; GBR = northern Great Barrier Reef,Qld; DAR = Darwin region,NT; CP = Cobourg Peninsula region,NT; INDO = Southeast Indonesia; PHIL = southern Philippines; MICRO = Marianas & Caroline Islands, Micronesia.

reproduction was distinctly seasonal, with incubated larvae only seen in samples collected during September-October (dry season) (Fig. 209).

Associations. 24% of all specimens sampled had polychaete infestations by *Typosyllis spongicola* (with at least one worm in mesohyl); other epiphytic and epizootic associations not observed.

Variation. Two morphs differentiated - 83% with spinous (rounded or sharply pointed) surface processes, and 17% without surface processes superficially resembling *Hyattella intestinalis* (Lamarck) (Dictyoceratida) - but growth form apparently unrelated to water depth, season or geography of samples. Presence or absence of pigmentation directly related to water depth. Variable ectosomal development, with 52% of specimens having paratangential-tangential skeletons of intermingled ectosomal and subectosomal auxiliary spicules and choanosomal styles protruding through ectosome; 31% of specimens had tangential skeletons in some sections of ectosome and erect spicule brushes in other areas (e.g., on points of surface processes); 17% had a continuous, erect palisade of plumose spicule brushes (i.e., true *Thalysias* condition). 58% of specimens had thin paratangential subectosomal skeleton of larger auxiliary megascleres arising directly from ultimate choanosomal fibres; 28% had distinctly plumose tracts of subectosomal spicules, outside of fibres, supporting ectosomal skeleton; 14% had long plumose subectosomal spicule brushes and cavernous peripheral skeleton. 64% of specimens had regular choanosomal skeleton forming square (renieroid) or sometimes triangular (isodictyal) meshes at core, more irregular in periphery, whereas 36% were regularly (sub)renieroid-reticulate throughout skeleton, forming cavernous meshes. Fibre characteristics consistent; fibres heavy (59%) or moderately heavy (41% of specimens); primary fibres ascending (radial) (17%), transverse or longitudinal through branches (35%), or without any apparent pattern (48% of specimens); mesohyl matrix lightly pigmented (41%), abundant, moderately heavily pigmented (17%), or heavily pigmented (28% of specimens). Choanosomal principal styles rare in 3% of specimens, largely replaced by subectosomal auxiliary spicules in fibres; proportion of subectosomal styles with smooth bases ranged from 0-4% of spicules sampled (7% of specimens), 5-10% (20%), 11-20% (24%), 21-30% (21%), 31-40% (14%), up to 76% of spicules (14% of specimens); acanthostyles heavy echinating (71%) or sparsely echinating (24% of specimens). Contort isochelae abundant (7%), common (90%) or rare (3% of specimens); larger contort chelae seen in only 10% of specimens (between 4-8% of spicules sampled); smaller contort chelae in 7% of specimens (2-10% of spicules); toxas very common (28%), common (45%), uncommon (24%) or rare (3% of specimens).

Variability in spicule dimensions: Intraspecific variability was relatively high for most spicule categories, but variability was not attributed to seasonal or bathymetric distributions of samples (for all northwest Australian populations combined) (i.e., variation was equally consistent within and between groups). Conversely, populations collected from various localities (Northwest Shelf, Darwin, Cobourg Peninsula, Great Barrier Reef, Indonesia, Philippines, Guam, New Caledonia) showed significant statistical differences in dimensions of some spicules (choanosomal styles, acanthostyles, larger isochelae, toxas) (Table 42). Analysis of mean spicule size versus latitude (Table 41) showed certain trends in latitudinal gradients whereby spicule sizes diminish at higher latitudes. This is similar to the trend observed by Hooper & Bergquist (1992) for *Cymbastela* (Axinellidae).

REMARKS. *Clathria (Thalysias) vulpina*, better known under its junior synonym of *Clathria frondifera*, is a widely distributed, predominantly Indian Ocean species and a major component of the tropical macrobenthos. The cavernous, insubstantial tubulo-digitate growth form, regularly rectangular skeletal construction and deep red colouration are characteristic for the species, although spicule geometry is unremarkable. The holotype is identical to NW. Australian material, and it is probable that original material collected by Perron & Lesseur was obtained from WA (although not specified by Lamarck, 1814). Neither Ridley (1884a), Wilson (1925) nor Topsent (1932) recorded toxas in the holotype, but these spicules are definitely present, relatively abundant albiet thin. Topsent (1932) compared the species with *C.* (*T.*) *clathrata* (Schmidt) and suggested that although spiculation was closely comparable, the two species could be differentiated by the presence of basal spination on both categories of auxiliary megascleres and the absence of toxas in *C.* (*T.*) *vulpina*. These characters are shown here to be of little systematic importance and erroneous, respectively, but these two species are otherwise differentiated by their skeletal construction and growth form.

Wilson (1925) also noted that *C.* (*T.*) *vulpina* showed considerable intraspecific variation in growth form (and size), but his statement overemphasises this apparent variation. From the numerous published records of this species from Australasian and Indo-Malay regions in particular (most appearing under the name of *C. frondifera*), it is apparent that this species has a number of consistent and characteristic features including its cavernous growth form, regular (sub)renieroid choanosomal skeletal structure and individual spicule geometries, whereas ectosomal development is much more variable. To illustrate this variability, of the previously published material, Wilson's (1925) variety of *C. setotubulosa* from the Philippines and de Laubenfels'(1954) specimen of *C. frondifera* from Guam have well developed *Thalysias* special ectosomal skeletons (i.e., distinctly smaller auxiliary subtylostyles producing an erect palisade). By comparison, Dendy's (1905) material from Sri Lanka lacks any specialised ectosomal structure, although there are two sizes of auxiliary spicules dispersed throughout the mesohyl and lying tangential to the surface. Using this species as a case-in-point, Wilson's (1925) presented pertinent arguments on the difficulty in clearly differentiating *Clathria* and *Thalysias* species based on this variability in ectosomal development, given that the formal definition of the two taxa rests on this feature, and these arguments are supported here in demoting *Thalysias* to subgenus status.

This species was briefly redescribed from New Caledonian specimens (Hooper & Lévi, 1993a), but no details on synonymy, population variability or living populations were given. The New Caledonian population is the most easterly recorded population and present material differs slightly from that described by Hooper & Lévi (1993a). The synonymy presented above is mostly new, corroborated by re-examination of the relevant type material, although *Clathria corallitincta* Dendy (1889b) was already merged with *C. frondifera* by Dendy (1905), who also commented on the fact that ectosomal skeletal development varied substantially in the Gulf of Manaar population. Similarly, *Clathria reinwardti* var. *palmata* Ridley was synonymised with this species by Bergquist & Tizard (1967), and that decision is supported in the present study. *Rhaphidophlus seriatus* Thiele (1899) from Sulewasi has lighter spongin and more fully cored fibres than typical populations of *C.* (*T.*) *vulpina*, whereas the two species are identical in most other respects (spicule geometry, skeletal architecture, growth form), and there is no justification in maintaining the two species separately.

Conversely, *Rhaphidophlus filifer* var. *spinifera* Lindgren, proposed as a synonym of *C. frondifera* by Thiele (1903a), is rejected here given that they differ substantially in most characters and *C.* (*T.*) *spinifera* is maintained as a good species (see description above). Burton's (1938a) assertion that Hentschel's (1912) *Clathria nuda* from the Arafura Sea was also a synonym of this species is not upheld here. It has an almost regular radial (extra-axial) construction, nearly completely lacks echinating acanthostyles, has only a single size of isochelae, and has substantially thicker toxas with different geometry than those seen in *C.* (*T.*) *vulpina*.

Clathria (Thalysias) wesselensis sp. nov.
(Figs 210-211, Plate 9A)

MATERIAL. HOLOTYPE - NTMZ3952 (fragment QMG300702): S. of W. Rimbija I., Cape Wessel, NT, 11°01.0'S, 136°44.2'E, 15m depth, 17.xi.1990, coll. J.N.A. Hooper (SCUBA). PARATYPE QMG300361 (NCIQ66C-4761-Q): N. side Cumberland Strait, Wessel Is, Gove Peninsula, NT, 11°27.6'S, 136°28.7'E, 13m depth, 14.xi.1990, coll. NCI (SCUBA).

HABITAT DISTRIBUTION. Fringing coral reefs, gentle slope, coral rubble, rich sponge beds, high sedimentation and turbidity; 13-15m depth; known only from Australia: Wessel Is (NT) (Fig. 210H).

DESCRIPTION. *Shape.* Massive, club-shaped, up to 145mm high, with or without short, cylindrical basal stalk, 35mm long, 25mm diameter, expanded at apex, up to 75mm diameter, slightly flattened on upper surface.
Colour. Pale red-orange alive (Munsell 5R 7/6), khaki brown in ethanol.
Oscules. Large, up to 12mm diameter in life but contracted in ethanol, on apex of upper surface conules, surrounded by large, orange, transparent, membraneous lips up to 30mm high, collapsing in air.
Texture and surface characteristics. Compressible, fibrous, basal skeleton firm, flexible.
Ectosome and subectosome. Thick crust of ectosomal auxiliary subtylostyles erect on surface, in discrete plumose bundles, forming continuous palisade, incorporating some scattered sand grains, and abundant, granular, dark brown collagen in peripheral skeleton; subectosomal skeleton thick, plumose brushes of large subectosomal auxiliary subtylostyles supporting ectosomal brushes, arising from ends of peripheral choanosomal fibres; subectosomal region extensive; ectosomal and subectosomal skeletons detachable, up to 250μm thick.
Choanosome. Skeletal structure irregularly reticulate, slightly more compressed at core than in periphery; spongin fibres moderately light, 65-130μm diameter, predominantly longitudinal in sections (radial in sponge), not clearly divisible into primary or secondary elements except in axial region; primary fibres in peripheral skeleton long, close-set and parallel towards core, widely spaced and diverging near surface, becoming plumose at periphery, infrequently anastomosing along length but frequently bifurcating, especially closer to surface; primary fibres in axial region of skeleton close-set, short, irregularly interconnected by short secondary fibres, 30-50μm diameter; all fibres cored by choanosomal principal subtylostyles (but barely different in morphology from auxiliary spicules); primary longitudinal fibres cored by multispicular tracts of principal spicules, up to 25 abreast, occupying less than 60% fibre diameter; secondary fibres cored by uni- or paucispicular tracts of principal spicules, occupying up to 40% of fibre diameter; all primary fibres heavily echinated by small acanthostyles but sparse on secondary fibres; mesohyl matrix heavy, granular, lightly pigmented, with abundant microscleres and some auxiliary megascleres scattered between fibres; choanocyte chambers large, oval, 50-75μm diameter, lined by isochelae; some detritus incorporated into mesohyl but mainly in peripheral skeleton.
Megascleres. Choanosomal principal subtylostyles long, slender, straight, with subtylote bases, usually microspined, tapering fusiform points. Length 307-(358.3)-395μm, width 4-(5.4)-7μm.

Subectosomal auxiliary styles very similar in geometry but slightly shorter, more slender than principal spicules; long, slender, straight, subtylote smooth or microspined bases, fusiform points. Length 207-(248.8)-265μm, width 2-(2.7)-4μm.

Ectosomal auxiliary subtylostyles short, slender, straight, subtylote smooth or occasionally microspined bases, fusiform points. Length 151-(172.8)-186μm, width 1.5-(2.1)-3μm.

Echinating acanthostyles short, slender, straight or slightly curved near distal end, subtylote, sharply pointed or blunt, more-or-less evenly spined; spines long, slender, prominently recurved. Length 78-(84.4)-95μm, width 3-(3.9)-4.5μm.

Microscleres. Palmate isochelae very abundant, moderately large, single size class, front and lateral alae approximately same length, lateral alae completely fused to shaft, front ala detached along lateral margin. Length 14-(17.2)-20μm.

Toxas very abundant, very slender; longer accolada toxas with slight angular curvature at centre, straight arms Length I: 146-(306.8)-415μm, width 0.5-(1.2)-2.0μm.; shorter wing-shaped toxas moderately rounded at centre, reflexed arms. Length II: 33-(52.9)-72μm, width 0.5-(0.8)-1.5μm.

Reproductive products. Numerous, small, eliptical embryos present in holotype, 150-185μm

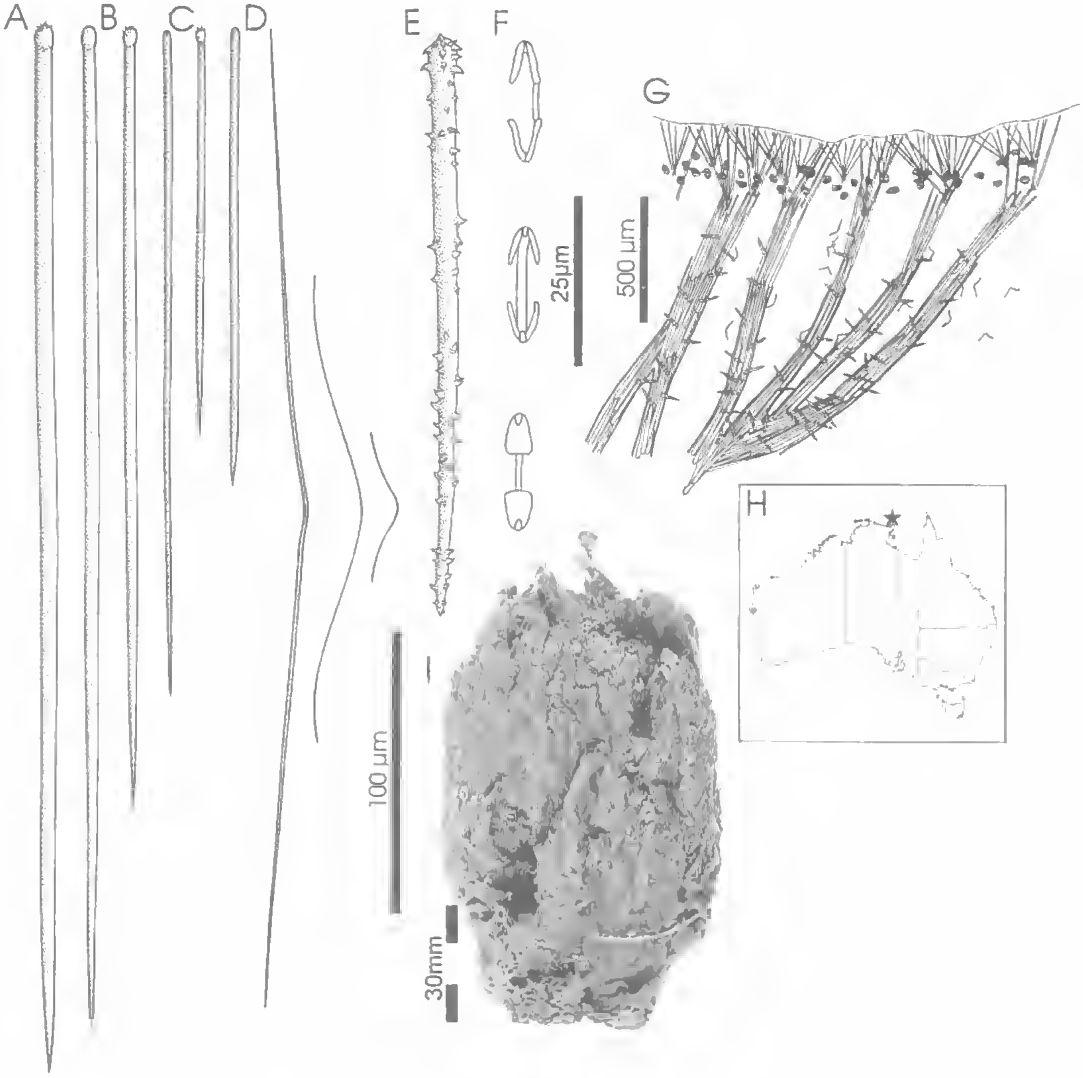

FIG. 210. *Clathria* (*Thalysias*) *wesselensis* sp.nov. (holotype NTMZ3952). A, Choanosomal principal subtylostyles. B, Subectosomal auxiliary subtylostyles. C, Ectosomal auxiliary subtylostyles. D, Accolada and wing-shaped toxas. E, Echinating acanthostyle. F, Palmate isochelae. G, Section through peripheral skeleton. H, Australian distribution. I, Holotype.

long, with extensive cellular differentiation but no observable larval spicules.

REMARKS. This species is similar to others in the '*juniperina*' species complex having principal spicules barely differentiated from auxiliary spicules (see remarks for *C.* (*T.*) *cactiformis* above). *Clathria* (*T.*) *wesselensis* sp. nov. differs from most of these species in having all its fibres cored. By comparison, *C.* (*T.*) *juniperina* has fibres cored mainly by subectosomal auxiliary spicules, largely (but not completely) replacing principals as the primary coring spicules. In other species of the '*juniperina*' group this character is further developed whereby principal spicules are completely excluded from some or all fibres, such as in *C.* (*T.*) *cervicornis* in which principal spicules have been lost completely, or *C.* (*T.*) *cactiformis* and *C.* (*T.*) *placenta* where only primary fibres are cored by principal spicules and

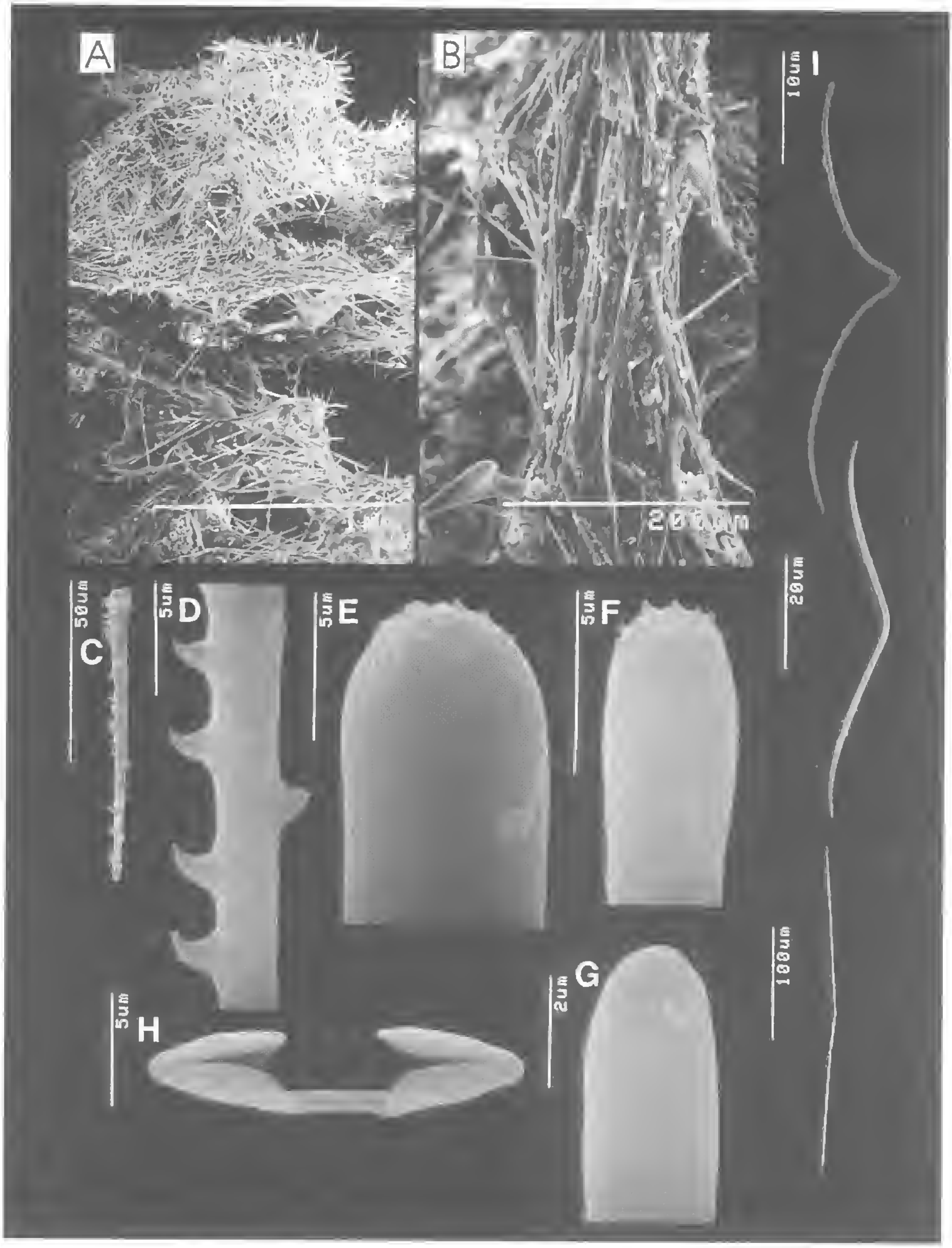

FIG. 211. *Clathria* (*Thalysias*) *wesselensis* sp.nov. (paratype QMG300361). A, Choanosomal skeleton. B, Fibre characteristics. C, Echinating acanthostyle. D, Acanthostyle spines. E-G, Bases of principal and auxiliary styles. H, Palmate isochela. I, Wing-shaped and accolada toxas.

secondary fibres are completely clear. In this respect the present species is most similar to *C.* (*T.*) *arborescens*, differing substantially in gross morphology, geometry of acanthostyles and toxas, most spicule dimensions, and having principal spicules longer than auxiliary spicules. Both these occupy the base of the '*juniperina*' species group (i.e., principal spicules are present but reduced in primary fibres), whereas species such as *C.* (*T.*) *cervicornis* are most derived having lost their principal spicules completely.

OTHER SPECIES OF *CLATHRIA* (*THALYSIAS*)

Clathria (Thalysias) amabilis (Thiele, 1905)

Stylotellopsis amabilis Thiele, 1905:456-457, text-fig.72a-d [Punta Arenas]; Burton, 1932a:326 [Falkland Is]; Burton, 1940:115 [Argentina]; Koltun, 1964a:66 [Antarctica]; Sarà, 1978:64-66 [Tierra del Fuego].

Rhaphidophlus amabilis; Van Soest, 1984b:129 [generic synonymy].

MATERIAL. HOLOTYPE: ZMB3309. SE. Pacific rim, SW. Atlantic, Antarctica.

Clathria (Thalysias) anomala (Burton, 1933)

Rhaphidophlus anomalus Burton, 1933:252-253, fig.3 [Natal]; Lévi, 1963:67 [Natal].

MATERIAL. Holotype: NM1410. South Africa.

Clathria (Thalysias) araiosa

Hooper & Lévi, 1993

Clathria (*Thalysias*) *araiosa* Hooper & Lévi, 1993a:1256-1259, figs 17-18, table 9 [New Caledonia].

MATERIAL. HOLOTYPE: QMG300694 (fragments NTMZ3886, ORSTOMR1370). SW Pacific.

Clathria (Thalysias) arteria

(de Laubenfels, 1954)

Axociella arteria de Laubenfels, 1954:148-149, text-fig.96 [NW. Ponape].

MATERIAL. HOLOTYPE: USNM22876. central W. Pacific.

Clathria (Thalysias) aruensis

(Hentschel, 1912)

Hymeraphia aruensis Hentschel, 1912:381, pl.20, fig. 38 [Aru I., Arafura Sea].

Eurypon (*Hymeraphia*) *aruensis*; Lévi, 1958:27.

MATERIAL. HOLOTYPE: SMF955T. Indonesia.

Clathria (Thalysias) basiarenacea (Boury-Esnault, 1973)

Rhaphidophlus basiarenacea Boury-Esnault, 1973:287, fig.49 [San Antonio Bay, Brazil]

MATERIAL. HOLOTYPE: MNHNDNBE972. SW Atlantic.

Clathria (Thalysias) bitoxifera (Koltun, 1970)

Axociella bitoxifera Koltun, 1970:202-204, text-fig.29, pl.8, figs 1-2 [Kurile-Kamchatka Trench, NW. Pacific].

MATERIAL. HOLOTYPE: ZIL. NW Pacific.

Clathria (Thalysias) calochela

(Hentschel, 1912)

Hymeraphia calochela Hentschel, 1912:383-385, pl.20, fig.41 [Aru I., Arafura Sea].

MATERIAL. HOLOTYPE: SMF1679. Indonesia.

Clathria (Thalysias) coriocrassus

(Bergquist & Fromont, 1988)

Rhaphidophlus coriocrassus Bergquist & Fromont, 1988:111-112, pl.51, figs e-f, pl.52, figs a-b; Dawson, 1993:39 [index to fauna].

MATERIAL. HOLOTYPE: NMNZPOR113. New Zealand.

Clathria (Thalysias) corneolia

Hooper & Lévi, 1993

Clathria (*Thalysius*) *corneolia* Hooper & Lévi, 1993a:1253-1256, figs 15-16, table 8 [New Caledonia].

MATERIAL. HOLOTYPE: QMG300691 (fragments NTMZ3877, ORSTOMR527). SW. Pacific.

Clathria (Thalysias) cratitia (Esper, 1797)

Spongia cratitia Esper, 1797:195, 196, 221, pl.53 ['East Indies'].

Rhaphidophlus cratitius; Ehlers, 1870:18-19, 31; Ridley, 1884a:450-451; Ridley & Dendy, 1887:151-152; Noll, 1888:51; Thiele, 1899:13; Thiele, 1903a:957-959 [Ternate, Moluccas]; Hallmann, 1912:177, 187.

Thalysias cratita; de Laubenfels, 1954:137-138, text-fig.87 [NW. Ponape, Caroline Is].

Microciona cratitia; Hartman, 1955:176-177.

Desmacidon cratitla; Vosmaer, 1880:159.

MATERIAL. HOLOTYPE: Unknown. Indonesia, central W. Pacific.

Clathria (Thalysias) cullingworthi

Burton, 1931

Clathria cullingworthi Burton, 1931a:345, pl.23, figs 3-4, text-fig.4 [Natal coast]; Lévi, 1963:66.

Thalysias cullingworthi; de Laubenfels, 1936a:105.

MATERIAL. HOLOTYPE: NM1270 (fragments BMNH1933 7.4.68-70). South Africa.

Clathria (Thalysias) delaubenfelsi

(Lévi, 1963)

Rhaphidophlus delaubenfelsi Lévi, 1963:60-62, text-fig.70 [Cape of Good Hope].

MATERIAL. HOLOTYPE: MNHNDCL618. South Africa.

Clathria (Thalysias) amirantiensis sp. nov.

Colloclathria ramosa Dendy, 1922:74-76, pl.7, fig.2, pl.14, fig.4 [Amirante, Coetivy and Seychelles, Indian Ocean].

Rhaphidophlus ramosus; Van Soest, 1984b:99, 115.

Not *Rhaphidophlus ramosus* Kieschnick, 1896:533; Kieschnick, 1900:569-570, pl.45, figs 47-50.

Not *Clathria ramosa* Lindgren, 1897:482-483.

MATERIAL. HOLOTYPE: BMNH1921.11.7. 64.Note: *C.* (*T.*) *ramosa* (Kieschnick, 1896) has priority. NW. Indian Ocean.

Clathria (Thalysias) distincta (Thiele, 1903)

Hymeraphia distincta Thiele, 1903a:956-957, fig. 21 [Ternate, Moluccas]; Hentschel, 1912:378-379.

MATERIAL. Holotype: SMF789T. Indonesia.

Clathria (Thalysias) encrusta Kumar, 1925

Clathria encrusta Kumar, 1925:221, fig.4 [India].

Thalysias encrusta; de Laubenfels, 1936a:105.

MATERIAL. HOLOTYPE: IMP196/1. India.

Clathria (Thalysias) eurypa (de Laubenfels, 1954)

Dictyociona eurypa de Laubenfels, 1954:143, fig.91 [Palau Is].

Microciona eurypa; Bergquist, 1965:164, 165, figs 21a-b [Palau Is]; Tendal, 1969:40-41 [Suva, Fiji].

Rhaphidophlus eurypa; Van Soest,1984b:115.

MATERIAL. HOLOTYPE: USNM22922. Central SW and NW Pacific.

Clathria (Thalysias) fascicularis Topsent, 1889

Clathria fascicularis Topsent, 1889:35-37, fig.3 [Banc de Campeche]

Pseudanchinoe fascicularis; de Laubenfels, 1936a:109.

Rhaphidophlus fascicularis; Van Soest, 1984b:108, 111, 122, table 4.

Clathria dentata Topsent,1889:37-38, fig.4A [Banc de Campeche].

MATERIAL. HOLOTYPE: MNHN missing (Van Soest, 1984b:108). NE Atlantic.

Clathria (Thalysias) fasciculata Wilson, 1925

Clathria fasciculata Wilson,1925:442, pl.42, fig.6, pl.49, figs 7-8 [Sulawesi, Indonesia]; de Laubenfels, 1954:140-141, text-fig.89 [Truk, Caroline Is]; Tanita, 1963:124; Tanita, 1964:21; Bergquist, 1965:167-168 [Palau Is]; Tanita, 1968:47; Hoshino, 1971:24; Hoshino, 1981:161; Caberoy, 1981:20-21; Van Soest, 1989b:1-2, fig. 47.

Thalysias fasciculata; de Laubenfels, 1936a:105.

MATERIAL. HOLOTYPE: USNM21326. Indonesia, Philippines, central W Pacific, Japan.

Clathria (Thalysias) filifera (Ridley & Dendy, 1886)

Rhaphidophlus filifer Ridley & Dendy, 1886:475; Ridley & Dendy, 1887:152, 247, 255, pl.28, fig.2, pl.46, fig.9 [Masbate, Philippines]; Thiele, 1899:13-15; Kirkpatrick, 1900a:136; Thiele, 1903a:958; Dragnewitsch, 1905:3, 16-17; Dragnewitsch, 1906:441 [Singapore]; Whitelegge, 1907:503; Weltner, 1910a:33; Ferrer Hernández, 1914:4, 42.

Not *Rhaphidophlus filifer*; Topsent, 1897b:425, 447; Desqueyroux-Faundez, 1981:758, table2.

Not *Rhaphidophlus filifer*; Lindgren, 1898:283, 311, 312, pl.17, fig.7, pl.19, fig.17a-e'.

Not *Rhaphidophlus filifer* var. *spinifera*; Lindgren, 1897:483; Hallmann, 1912:187; Lévi, 1960a:55.

Not *Rhaphidophlus filifer* var. *mutabilis*; Topsent, 1897b:447-448, pl.20, fig.24, pl.21, fig.33.

Not *Rhaphidophlus filifer* var. *cantabrica*; Orueta, 1901:331-335, text-figs 1-5, pls 3-4.

cf. *Microciona prolifera*; Vosmaer, 1935a:637.

MATERIAL. HOLOTYPE: BMNH1887.5.2. 104. Philippines, Indo-Malay region.

Clathria (Thalysias) flabellata (Burton, 1936)

Rhaphidophlus flabellata Burton, 1936:145, fig.4 [Oudekraal, South Africa]; Lévi, 1963:67 [note].

MATERIAL. HOLOTYPE: BMNH1935.10. 21.3. South Africa.

Clathria (Thalysias) flabellifera Hooper & Lévi, 1993

Clathria (*Thalysias*) *flabellifera* Hooper & Lévi, 1993a:1250-1253, figs 13-14, table 7 [New Caledonia].

MATERIAL. HOLOTYPE: QMG300693 (fragments NTMZ3884, ORSTOMR1416). SW Pacific.

Clathria (Thalysias) hartmani (Simpson, 1966)

Axociella hartmani Simpson, 1966:2393; Simpson, 1968a:63-65, pl.15, text-figs 6-7, table 24 [San Juan I., Washington].

MATERIAL. HOLOTYPE: PMNH. NE Pacific.

Clathria (Thalysias) hechteli sp. nov.

Microciona microchela Hechtel, 1965:41-42, text-fig.7 [Port Royal, Jamaica]; Wintermann-Kilian & Kilian, 1984:134 [Colombia].

Not *Dictyociona microchela*; de Laubenfels, 1953a:528.

cf. *Rhaphidophlus schoenus*; Van Soest, 1984b:122.

MATERIAL. HOLOTYPE: PMNH 5040. PARATYPE USNM24498. Caribbean. *C.* (*C.*) *microchela* (Stephens, 1916) has priority.

Clathria (Thalysias) isodictyoides (Van Soest, 1984)

Rhaphidophlus isodictyoides Van Soest, 1984b:118-120, pl.8, fig.6, text-fig.47, table 4 [Curaçao].

MATERIAL. HOLOTYPE: ZMAPOR4781. Caribbean.

Clathria (Thalysias) jolicoeuri (Topsent, 1892)

Rhaphidophlus jolicoeuri Topsent, 1892c:25 [Banyuls, Mediterranean]; Topsent, 1893d:446; Topsent, 1894a:19; Loisel, 1898:38; Topsent & Olivier, 1943:2 [Monaco]; Topsent, 1925:658-660, text-fig.14 [Gulf of Naples]; Lévi, 1960b:55,65 [Dakar, N. Atlantic, Mediterranean, Naples and Monaco]; Boury-Esnault, 1971:327 [Banyuls];

Pulitzer-Finali, 1983:610; Pansini & Pronzato, 1985:5 [Mediterranean].
Tenacia jolicoeuri; Lévi, 1959:133-134, text-fig.26 [Sao Tome, Gulf of Guinea].
cf.*Microciona prolifera*; Vosmaer, 1935a:641.

MATERIAL. HOLOTYPE: MOM (fragment BMNH1953.11.9.42). NW Atlantic, Mediterranean.

Clathria (Thalysias) kilauea (de Laubenfels, 1951)

Axocielita kilauea de Laubenfels, 1951a:262-263, text-fig.9 [Coconut I., Hawaii].
Axociella kilauea; Hechtel, 1965:43-44 [note].

MATERIAL. HOLOTYPE: USNM22779. Central Pacific.

Clathria (Thalysias) lambda (Lévi, 1958)

Leptoclathria lambda Lévi, 1958:38, text-fig.35 [Marmar, Red Sea].

MATERIAL. HOLOTYPE: MNHN missing. Red Sea.

Clathria (Thalysias) lematolae sp. nov.

Microciona placenta; de Laubenfels, 1954:146-147, text-fig.94.
Not *Spongia placenta* Lamarck, 1814:374.

MATERIAL. HOLOTYPE: USNM22908. Central west Pacific. *C. placenta* (Lamarck, 1814) has seniority.

ETYMOLOGY: For the type locality.

Clathria (Thalysias) linda (de Laubenfels, 1954)

Axocielita linda de Laubenfels, 1954:156-158, text-fig.102 [Ailing-lap-lap, Truk].
Axociella linda; Hechtel, 1965:43-44 [note].

MATERIAL. HOLOTYPE: USNM22860. NW central Pacific.

Clathria (Thalysias) lissoclada (Burton, 1934)

Rhaphidophlus lissocladus Burton, 1934b:32-33, 51-52, pl.4, fig.1, text-figs 4-5, 16 [Falkland Is]; Lévi, 1963:62, pl.9, figs H,J, text-fig.71 [Cape of Good Hope, South Africa].

MATERIAL. HOLOTYPE: ZRS955 (fragment BMNH1933.3.17.176). PARATYPES BMNH 1933.3.17.30, 31, 32, 38, 154. South Africa, SW Atlantic.

Clathria (Thalysias) longitoxa (Hentschel, 1912)

Hymerophia longitoxa Hentschel, 1912:381, pl.20, fig.39 [Aru I., Arafura Sea].
Microciona longitoxa; Burton, 1938a:30-31, pl.5, fig.29 [Madras, India]; Burton, 1959a:248 [Gulf of Aden].

MATERIAL. HOLOTYPE: SMF1683. NE Indian Ocean, Indonesia, Arabian Gulf.

Clathria (Thalysias) maunaloa (de Laubenfels, 1951)

Microciona maunaloa de Laubenfels, 1951a:260-261, text-fig.6 [Coconut and Hawaii Is, Hawaii]; de Laubenfels, 1957:240 [Oahu, Hawaii]; Bergquist, 1977:65 [Hawaii].

MATERIAL. HOLOTYPE: USNM22775. Central Pacific.

Clathria (Thalysias) membranacea (Thiele, 1905)

Ophlitaspongia membranacea Thiele, 1905:450-451, figs 67, 105 [Juan Fernandez Is]; Burton, 1932a:321-322 [Falkland Is]; Burton, 1940:112 [Uruguay]; Desqueyroux-Faundez & Moyano, 1987:49 [Chile, Juan Fernandez Is, Falkland Is].
? *Clathria membranacea*; Hallmann, 1912:253.
Axociella membranacea; de Laubenfels, 1936a:113 [note]; Hechtel, 1965:43 [note].

MATERIAL. HOLOTYPE: ZMB3303 (paratypes ZMB3304, BMNH1930.11.28.21). SW Atlantic, SE Pacific.

Clathria (Thalysias) micropunctata (Burton & Rao, 1932)

Tenacia micropunctata Burton & Rao, 1932:340-341, text-fig.9 [Tuticorin, India].
Thalyseurypon micropunctata; de Laubenfels, 1936a:107 [note].
Eurypon micropunctata; de Laubenfels, 1953a:526.

MATERIAL. HOLOTYPE: IMP788/1. India.

Clathria (Thalysias) minuta (Van Soest, 1984)

Rhaphidophlus minutus Van Soest, 1984b:115-116, text-fig.45, table 4 [Curaçao]; Kobluk & Van Soest, 1989:1216; Meesters et al., 1991:195 [Curaçao, Bonaire]; Muricy et al., 1991:1187 [SE. Brazil].

MATERIAL. HOLOTYPE: ZMAPOR4796. Caribbean.

Clathria (Thalysias) mutabilis (Topsent, 1897)

Rhaphidophlus filifer var. *mutabilis* Topsent, 1897b:447, pl.20, fig.24, pl.21, fig.33 [Ambon, Banda Sea].
Rhaphidophlus mutabilis; Desqueyroux-Faundez, 1981:743, figs 49-54, 116.

MATERIAL. HOLOTYPE: MHNGC-12/27 (fragment MNHNDT1834). Indonesia.

Clathria (Thalysias) naikaiensis (Hoshino, 1981)

Eurypon naikaiensis Hoshino, 1981:153-155, pl.6, fig.8, text-fig.8 [Sasajima, Japan].

MATERIAL. HOLOTYPE: MMBSSIS090-4-a. Japan.

Clathria (Thalysias) nervosa (Lévi, 1963)

Axociella nervosa Lévi, 1963:65-66, pl 9E, text-fig.75 [South Africa].
Rhaphidophlus nervosus; Van Soest, 1984b:115 [generic synonymy].

MATERIAL. HOLOTYPE: MNHNDCL623. South Africa.

Clathria (Thalysias) nuda Hentschel, 1912

Clathria nuda Hentschel, 1912:298, 359, 364-365, pl.19, fig.28 [Aru I., Arafura Sea].
Tenacia nuda; Hallmann, 1920:771.
Thalysias nuda; de Laubenfels, 1936a:105.
cf. *Microciona prolifera* tropus *senta*; Vosmaer, 1935a:649.

MATERIAL. HOLOTYPE: SMF1576 (fragment MNHNDCL2278). Indonesia.

Clathria (Thalysias) ongulensis (Hoshino, 1977)

Axociella ongulensis Hoshino, 1977a:45, text-fig.3, pl.1, fig.3 [fossil demosponge; W. Ongul I., Lutzow-Holm Bay, Antarctica].

MATERIAL. HOLOTYPE: MMBS. Antarctica.

Clathria (Thalysias) orientalis (Brondsted, 1934)

Rhaphidophlus orientalis Brondsted, 1934:20-22, text-figs 20-22 [Aru I., Arafura Sea].

MATERIAL. HOLOTYPE: Unknown. Indonesia.

Clathria (Thalysias) originalis (de Laubenfels, 1930)

Esperiopsis originalis de Laubenfels, 1930:27; de Laubenfels, 1932:70-72, text-fig.38 [California].

Axocielita originalis; Lee & Gilchrist, 1985:24-32 [biochemistry]; Sim & Bakus, 1986:11 [California]; Bakus & Green, 1987:71 [S California].

MATERIAL. HOLOTYPE: USNM21441, paratype BMNH1929.8.22.54. NE Pacific.

Clathria (Thalysias) oxeota (Van Soest, 1984)

Rhaphidophlus oxeotus Van Soest, 1984b:120-122, text-fig.48, table 4 [Curaçao].

MATERIAL. HOLOTYPE: ZMAPOR4880. Caribbean.

Clathria (Thalysias) oxitoxa Lévi, 1963

Clathria oxitoxa Lévi, 1963:54-56, text-fig.62 [Humansdorp, South Africa].

Rhaphidophlus oxitoxa; Van Soest, 1984b:115, 122.

MATERIAL. HOLOTYPE: MNHNDCL610. South Africa.

Clathria (Thalysias) pachyaxia (Lévi, 1960)

Axociella pachyaxia Lévi, 1960b:763-764, text-fig.16, [Senegal, W. Africa].

MATERIAL. HOLOTYPE: MNHNDCL787. NW Africa.

Clathria (Thalysias) robusta (Dendy, 1922)

Microciona strepsitoxa var. *robusta* Dendy, 1922:60-61 [Amirante I.].

Tenacia robusta; Burton & Rao, 1932:339-340 [Singapore].

Not *Clathria robusta* Koltun, 1959:186, pl.25, fig.5, text-fig.147; Van Soest & Stone, 1986:47.

MATERIAL. HOLOTYPE: BMNH1921.11.7.49. W Indian Ocean, Indo-Malay region.

Clathria (Thalysias) schoenus (de Laubenfels, 1936)

Clathria copiosa var. *curacaoensis* Arndt, 1927:148, pl.1, fig.3, text-fig.9 [Curaçao].

Aulospongus schoenus de Laubenfels, 1936a:100, pl.13, fig.3 [Dry Tortugas, Florida].

Thalysias schoenus; Simpson, 1968a:56, pls 13-14, text-fig.5 [Florida]; Randall & Hartman, 1968:223 [West Indies]; Alcolado, 1980:4 [Cuba].

Rhaphidophlus schoenus; Van Soest, 1984b:112-113, pl.8, figs 1-4, text-fig.44, table 4 [Curaçao, Bonaire, Puerto Rico]; Chen & Mok, 1993: 278 [probable misidentification, Taiwan].

Not *Microciona microchela* Hechtel, 1965:41, text-fig.7 [Curaçao, Bonaire, Puerto Rico, Jamaica].

MATERIAL. HOLOTYPE: USNM22404. Carribean.

Clathria (Thalysias) tener Carter, 1887

Thalysias tener Carter, 1887a:70 [Mergui Archipelago].

MATERIAL. HOLOTYPE: IMFN14 ('Reniera fibrosa') (fragment BMNH1887.6.1.9). Andaman Sea. Imperfectly known.

Clathria (Thalysias) topsenti (Thiele, 1899)

Rhaphidophlus filifer, in part, Topsent, 1897b:425, 447, pl.20, fig.22 [Ambon, Indonesia]; Desqueyroux-Faundez, 1981:758, table 2.

Not *Rhaphidophlus filifer* Ridley & Dendy, 1886:475.

Rhaphidophlus topsenti Thiele, 1899:15, pl.2, fig.3 [Sulawesi, Indonesia]; Whitelegge, 1907:503; Hallmann, 1912:177.

cf. *Microciona prolifera*; Vosmaer, 1935a:611, 643

MATERIAL. HOLOTYPE: NMB20 (dry) (fragments ZMB2903, BMNH1908.9.14.167). Indonesia.

Clathria (Thalysias) tricurvatifera (Carter, 1876)

Thalysias tricurvatifera Carter, 1876:311-312 [Cape St. Vincent, Hebrides].

MATERIAL. HOLOTYPE: unknown, (fragment BMNH1954.3.9.244). NE Atlantic. Imperfectly known.

Clathria (Thalysias) venosa (Alcolado, 1984)

Microciona venosa Alcolado, 1984:6 [Cuba]; Kobluk & Van Soest, 1989:1216.

Rhaphidophlus venosus; Meesters et al., 1991:194-195 [Curaçao, Bonaire].

Rhaphidophlus raraechelae Van Soest, 1984b:116-118, pl.8, fig.5, text-fig.46, table 4 [Curaçao]; Pulitzer-Finali, 1986:151 [West Indies].

MATERIAL. HOLOTYPE: Cuba. Holotype of *raraechelae*: ZMAPOR4874. Caribbean.

Clathria (Thalysias) virgultosa (Lamarck, 1814)

Spongia virgultosa Lamarck, 1814; Duchassaing & Michelotti, 1864:86, pl.23, fig.3.

Thalysias virgultosa; Duchassaing & Michelotti, 1864:86, pl.23, fig.3 [St. Thomas, Caribbean]; Tortonese, 1962:3; de Laubenfels, 1936a:104, 106; Hartman, 1955:173; Lévi, 1960a:52.

Microciona plana Carter, 1876:238, 472.

Clathria copiosa Topsent, 1889:40-41, fig.6; Topsent, 1894b:30, 36; Hentschel, 1912:367.

Thalysias copiosa; de Laubenfels, 1936a:106.

Clathria jugosa; Wilson, 1902:37.

Tenacia clathrata Schmidt, 1870:56, 80 [Antilles, Caribbean]; Carter, 1875:195; Hallmann, 1920:769; de Laubenfels, 1936a:106; Desqueyroux-Faundez & Stone, 1992: 73 [list].

Clathria clathrata; Vosmaer, 1880:153; Ridley & Dendy, 1887:147; Wilson, 1902:397; Alcolado, 1976:5.

Not *Rhaphidophlus clathratus*; Hallmann, 1912:209; Topsent, 1920b:17-18; Topsent, 1932:97, pl.5, fig.6, text-fig.3.

Pandaros juniperina; Duchassaing & Michelotti, 1864:90, pl.19, fig.3; de Laubenfels, 1936a:106.

Thalysias juniperina; de Laubenfels, 1936a:105-107; Hartman, 1955:171-177; Lévi, 1960a:52; Simpson, 1968a:47, 98, pls 11-12, text-fig.4, tables 18-20, 43; Randall & Hartman, 1968:218,223; Wiedenmayer, 1977:140, 142-143, 255, pl.29, figs 3-5, pl.30, figs 1-3, text-figs 146-147; Carballeira, Shalabi & Maldonado, 1990: 235.

Microciona juniperina; Hartman, 1955:171; [?] Wells et al., 1960:216-217, text-figs 13,28; Alcolado, 1980:10; Storr, 1964:42; Wintermann-Kilian & Kilian, 1984:135.

Rhaphidophlus juniperinus; Van Soest, 1984b:109-111, pl.7, fig.11, text-fig.43, table 4; Meesters et al., 1991:195.

Not *Spongia juniperina* Lamarck, 1814:444; Lamarck, 1816:373.

Not *Microciona clathrata* Whitelegge, 1907:493 [see *C. biclathrata*].

Microciona prolifera; Pearse & Williams, 1951: 135.

cf. *Microciona prolifera*; Vosmaer, 1935a:608-611, 627, 628, 667, 630, 638, 644.

MATERIAL. HOLOTYPE: Fragments of holotype of *S. virgultosa*: MNHNDNBE1344, 1338, BMNH1928.11.12.50, BMNH1928.11. 12.85, BMNH1954.2.20.67, USNM31049, TMPOR70, 87, IZUGCE38.766. Fragments of holotype of *C. (T.) clathrata*: BMNH 1870.5.3.156, 39. Caribbean, NE Atlantic.

TRANSFERS

List of other species described in *Thalysias* but now transferred to another genus.

Spongia carbonaria Lamarck, 1814:375; 1816:357.

Thalysias carbonaria; Duchassaing & Michelotti, 1864:83, pl.17, fig, pl.19, fig.2 [St.Thomas]; Carter, 1882a:282, pl.11, fig.11 [Antigua, West Indies]; Tortonese, 1962:3.

Pellina carbonaria; Bergquist, 1965:157.

Adocia carbonaria; Wiedenmayer, 1977:255, 257, tables 50-51; Van Soest et al., 1983:198.

MATERIAL. HOLOTYPE: MNHNDNBE1340 (fragment: MNHNDNBE1324, BMNH1928. 11.12.44, 56). Referred to Haplosclerida, Chalinidae, *Haliclona*.

Thalysias coccinea Duchassaing & Michelotti, 1864:84, pl.18, fig.5 [St.Thomas].

Spirastrella coccinea; Wiedenmayer, 1977:255, table 50; Van Soest et al., 1983:204.

MATERIAL. LECTOTYPE: BMNH1928. 11.12.46. PARALECTOTYPE ZMAPOR2076. Referred to Hadromerida, Spirastrellidae.

Thalysias hians Duchassaing & Michelotti, 1864:86, pl.16, fig.1 [St. Thomas, Caribbean; originally designated as *hyano*, but corrected in erratum].

MATERIAL. HOLOTYPE: missing (Van Soest et al., 1983:203).] Unrecognisable.

Thalysias ignis Duchassaing & Michelotti, 1864:83, pl.18, figs 1-2 [St.Thomas, Caribbean].

Tedania ignis; Wiedenmayer, 1977:255, table 50; Van Soest et al., 1983:204.

MATERIAL. LECTOTYPE: TM POR 72 (fragment BMNH1928.11.12.437), paralectotype ZMAPOR2373 (fragment MNHNDNBE1341). Referred to Tedaniidae.

Thalysias massalis Carter, 1886a:50 [Port Phillip, Vic].

Reniera massalis; Dendy, 1895:236.

MATERIAL. HOLOTYPE: BMNH1886.12. 15.433. Referred to Haplosclerida, Chalinidae.

Thalysias proxima Duchassaing & Michelotti, 1864:84, pl.18, fig.3 [Antilles, Caribbean].

Neofibularia proxima; Wiedenmayer, 1977:255, table 50.

Xestospongia proxima; Van Soest et al., 1983:204.

MATERIAL. LECTOTYPE: TMPOR74 (fragments BMNH1928.11.12.45, USNM31047, MNHNDNBE1342). Referred to Haplosclerida, Petrosiidae.

Thalysias repens Duchassaing & Michelotti, 1864 [St. Thomas, Virgin Is]; Carter, 1882a:282, pl.11, text-fig.10 [Puerto Cabello and Antigua, West Indies].

Xestospongia subtriangularis; Wiedenmayer, 1977:257, table 51.

MATERIAL. SYNTYPES: BMNH (3 specimens, unregistered). Referred to Haplosclerida, Petrosiidae.

Thalysias rugosa Duchassaing & Michelotti, 1864:84, pl.18, fig.4 [St. Thomas, Virgin Is]; Wiedenmayer, 1977:251, 253, tables 48, 49 [note].

Xestospongia subtriangularis; Van Soest et al., 1983:204.

MATERIAL. LECTOTYPE: ZMAPOR2372. Referred to Haplosclerida, Petrosiidae.

Thalysias [as Thalisias] saxicava Duchassaing & Michelotti, 1864:87 [St. Thomas, Virgin Is, Caribbean].

MATERIAL. HOLOTYPE: no extant type material (Wiedenmayer, 1977; Van Soest et al., 1983)].Unrecognisable.

Dictyocylindrus sessilis Carter, 1880a:38, pl.4, fig.2 [Gulf of Manaar, Ceylon].

Aulospongus sessilis; Dendy, 1905:176 [note].

MATERIAL. HOLOTYPE: LFM destroyed. Unrecognisable.

Thalysias subtriangularis Duchassaing, 1850; Duchassaing & Michelotti, 1864:85, pl.17, fig.1 [St. Thomas, Caribbean]; Carter, 1879:287 [Kerguelen Is]; Carter, 1885c:196; Dendy, 1889a:58.

? *Isodictya mirabilis* Bowerbank; Carter, 1878:159.

? *Schmidtia aulopora*; Ridley, 1881:127-129 [SW Chile].

Xestospongia subtriangularis; Wiedenmayer, 1977:255, table 50; Van Soest et al., 1983:199, 204.

MATERIAL. LECTOTYPE: BMNH1928.11. 12.47; lectotype of var. *lyriformis*: ZMAPOR2375, paralectotype of var. *lyriformis*: ZMAPOR2376. Referred to Haplosclerida, Petrosiidae.

Haliphysema tubulatum Bowerbank, 1873c:29 [India].
Aulospongus tubulatus; Norman, 1878:267; Dendy, 1905:176, text-fig.5 [Ceylon]; Dendy, 1922:61; Burton & Rao, 1932:347 [Tuticorin, India]; de Laubenfels, 1936a:101 [note].
Axinella tubulata; Dendy, 1889b:89, pl.5, fig.2.

MATERIAL. HOLOTYPE: BMNH not found (poorly preserved fragments BMNH1887.5.21. 1331, 1332). Uncertain placement; possible Raspailiidae.

Thalysias varians Duchassaing & Michelotti, 1864:86, pl.13, fig.6 [St. Thomas, Caribbean].
Anthosigmella varians; Topsent, 1918:557; de Laubenfels, 1957:242-243; Pang, 1973:47-50, text-fig.14 [Jamaica; plus synonymy]; Wiedenmayer, 1977:255, table 50; Van Soest et al., 1983:204.

MATERIAL. LECTOTYPE: TM POR 71 (fragments USNM31048, MNHNDNBE1343); paralectotype of var. *varians*: ZMAPOR2377 (fragment BMNH1928.11.12.49); lectotype of var. *encrustans*: BMNH1928.11.12.48. Referred to Hadromerida, Spirastrellidae.

Echinonema vasiplicata Carter, 1882b:114 [Swan River, WA]; Dendy, 1889a:44.
Echinodictyum mesenterinum; Ridley, 1884b:185.
Echinodictyum bilamellatum; Dendy & Frederick, 1924:504.

MATERIAL. HOLOTYPE: BMNH1887.5.21.1853. referred to Raspailiidae, synonym of *Echinodictyum mesenterinum* (Lamarck). SYNTYPES: MNHNDT661, 3425, 3427. Referred to Hadromerida, Spirastrellidae.

Antho Gray, 1867

Refer to subgenera for synonymy.

TYPE SPECIES. *Myxilla involvens* Schmidt, 1864: 37 (by monotypy).

DEFINITION. Two distinct skeletal components: (1) primary (basal or axial) renieroid (rectangular) or isodictyal (triangular) choanosomal skeleton composed of acanthostyles and/or acanthostrongyles; (2) secondary (extra-axial, subectosomal) skeleton composed of smooth choanosomal styles forming dendritic, plumose, subisodictyal or plumoreticulate tracts, or simply echinating main spicule tracts; secondary skeleton usually arising from nodes of renieroid skeleton, or ascending upwards from basal spongin fibres, with or without axial compression; spongin fibres relatively poorly developed; additional category of echinating acanthostyles present or absent; ectosomal skeleton tangential, paratangential or plumose tracts of 1 or 2 categories of auxiliary styles; microscleres diverse forms of isochelae and toxas.

REMARKS. Under Van Soest & Stone's (1986) system all microcionids having a renieroid (and/or isodictyal) basal (or axial) skeleton composed of acanthose megascleres are grouped in *Antho*. This system is supported here with subgenera recognised on structure and composition of the renieroid skeleton (1) *A.* (*Antho*) (with predominantly (acantho)styles forming the renieroid skeleton, less often acanthostrongyles, without echinating acanthostyles); (2) *A. (Plocamia)* (with predominantly (acantho)strongyles forming the renieroid skeleton, less often acanthostyles, and a special category of echinating acanthostyles overlap the main skeleton); (3) *A. (Isopenectya)* (with an axially compressed and extra-axially renieroid reticulate skeleton composed of 2 forms of choanosomal spicules inside spongin fibres, overlaid by a second extra-axial plumose skeleton. *Isopenectya* (s.s.) could also be included in *Echinoclathria*, given the close resemblance in growth form and renieroid skeletal structure with *E. leporina*, but in *A. (Isopenectya)* the renieroid skeleton is of sparsely spined principal styles (differentiated from the larger smooth styles of the extra-axial skeleton), with differentiated axial (compressed) and an extra-axial (renieroid) regions, overlaid by a second extra-axial (plumose) skeleton composed of larger, smooth principal styles. In *Echinoclathria*, megascleres of the renieroid skeleton are exclusively smooth, and the larger, smooth principal styles which form a radial skeleton are only found on the surface, embedded in peripheral fibres. *Antho* and *Echinoclathria*, differ from other microcionids in having a renieroid skeleton and it is possible that *Echinoclathria* is a highly derived form of *Antho* (loss of spinated principal spicules, loss of extra-fibre skeleton, loss of spined acanthostyles (geometrically different from principal spicules)).

Antho (Antho) Gray, 1867

Antho Gray, 1867: 524; Lévi, 1960a: 57.
Anomoclathria Topsent, 1929: 26 (not Topsent, 1932: 103).
Anthoarcuata Bakus, 1966: 431.
Dictyoclathria Topsent, 1920b: 18.
Dyctioclathria Ferrer-Hernandez, 1921: 172 [lapsus].
Isociona Hallmann, 1920: 768.
Jia de Laubenfels, 1930: 28.
Plocamilla; in part, Burton, 1935a: 402; Pulitzer-Finali, 1973: 40 (not Topsent, 1928a: 63).
Quizciona de Laubenfels, 1936a: 111.

TYPE SPECIES. *Myxilla involvens* Schmidt, 1864: 37 (by monotypy).

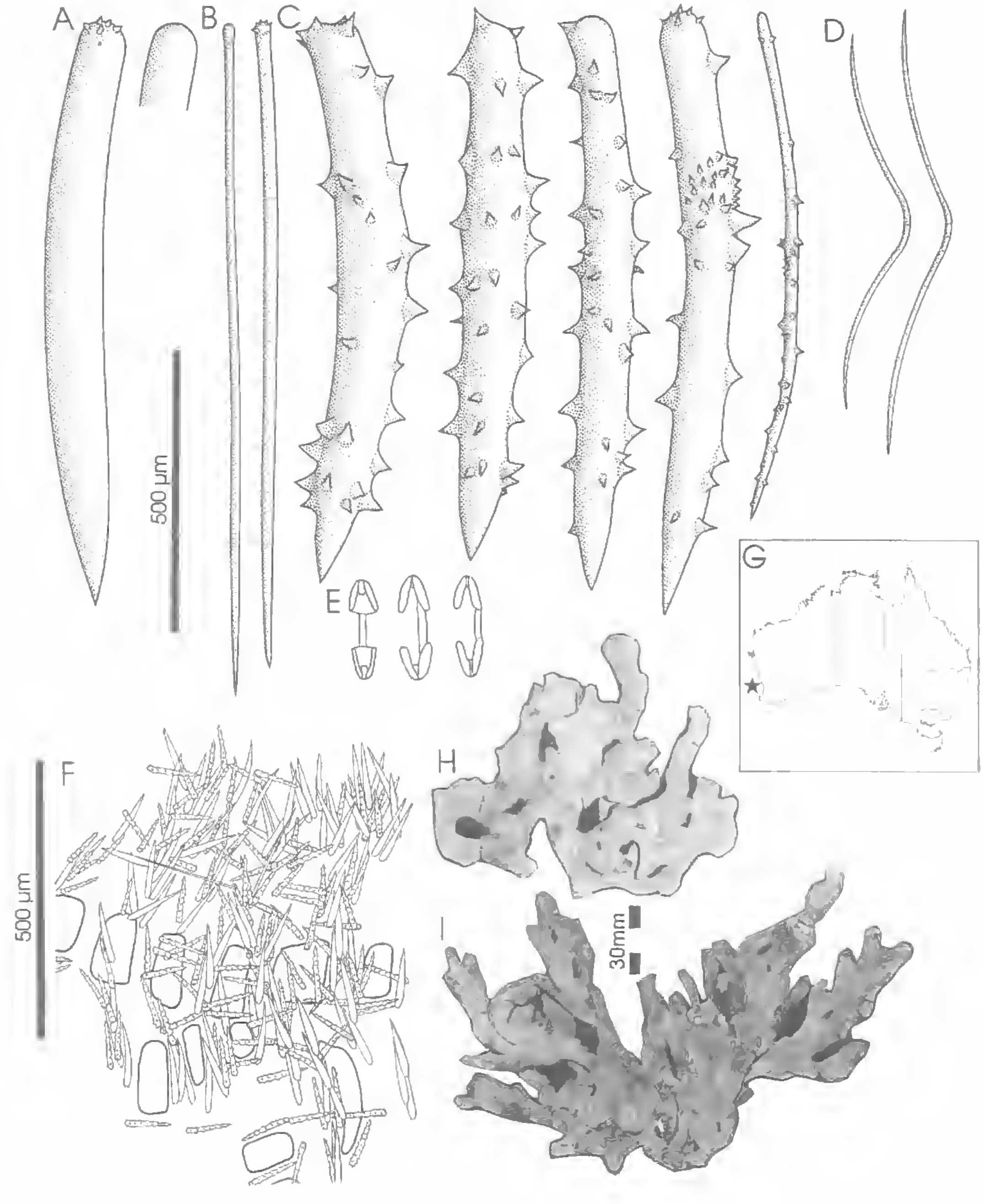

FIG. 212. *Antho* (*Antho*) *opuntioides* (Lamarck) (lectotype MNHNDT654). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyles. C, Acanthostyles of renieroid skeleton. D, Wing-shaped toxas. E, Palmate isochelae. F, Section through peripheral skeleton. G, Known Australian distribution. H, Lectotype. I, Paralectotype MNHNDT3418.

DEFINITION. Primary basal renieroid (and/or isodictyal) choanosomal skeleton composed of acanthostyles and/or acanthostrongyles; secondary extra-axial (subectosomal) skeleton plumose, plumoreticulate, or simply composed of choanosomal styles echinating (project from) basal renieroid skeleton; spongin fibres poorly developed; special category of echinating acanthostyles absent; ectosomal skeleton with tangential, paratangential, or plumose tracts of 1 size of auxiliary styles or subtylostyles; microscleres include diverse forms of isochelae and toxas.

REMARKS. Twenty one species have been included in, or referred to, *Antho* (*Antho*), although only 11 are widely accepted, 2 of which are known from Australia.

Antho (Antho) opuntioides (Lamarck, 1815) (Figs 212-213)

Unidentified sponge; Turgot, 1758: pl.24, fig.e.
Alcyonium opuntioides Lamarck, 1815: 164.
Anomoclathria opuntioides; Topsent, 1929: 21-26, text-figs 1-9.
Antho opuntioides; Hooper & Wiedenmayer, 1994: 255.
Not *Anomoclathria opuntioides* var. *frondifera*; Topsent, 1929: 26-29, text-figs 10-14; Topsent, 1932: 103, pl.1, figs 6-7.

MATERIAL. LECTOTYPE: MNHNDT654: Precise locality unknown, SW. Australia, Peron & Lesueur collection. PARALECTOTYPES - MNHNDT3416, 3418: same data.

HABITAT DISTRIBUTION. Unknown; known only from type locality (Fig. 212G).

DESCRIPTION. *Shape*. Lobate, digitate growth form, up to 255mm high, 375mm wide, 230mm thick, bifurcating cylindrical or slightly flattened branches, up to 120mm long, 18mm maximum diameter, occasionally anastomosing, slightly bulbous branch nodes, tapering or rounded branch tips.

Colour. Live colouration unknown, grey in dry state.

Oscules. Small pores up to 2mm diameter, possibly oscules, scattered over sides of branches.

Texture and surface characteristics. Harsh, brittle in dry state, even, unornamented surface.

Ectosome and subectosome. No ectosomal membrane intact (dry material), although remnants of sparse, tangential and paratangential skeleton composed of subectosomal auxiliary subtylostyles scattered near periphery; points of choanosomal styles and acanthostyles in peripheral skeleton protrude through surface; entire peripheral skeleton dense, virtually undifferentiated from deeper choanosomal skeleton (although spicule tracts with more sparse spongin component in periphery than at core), clearly dominated by close-set renieroid reticulation of acanthostyles.

Choanosome. Skeleton with two distinct components: plumose extra-axial skeleton composed of multispicular or paucispicular continuous tracts of large choanosomal principal styles extending from centre of skeleton to ectosome; renieroid skeleton regular, tight meshed, rectangular and triangular meshes, 80-150µm diameter, even mesh size throughout skeleton; spongin fibres heavier, slightly more compressed at centre of skeleton than in periphery, with oval meshes 60-135µm diameter; echinating spicules absent; mesohyl matrix light, with scattered microscleres; choanocyte chambers not seen (dry specimens).

Megascleres. Smooth choanosomal principal styles of plumose skeleton robust, short, thick, slightly curved at centre, with rounded smooth or occasionally very faintly microspined bases, fusiform points. Length 84-(98.7)-108µm, width 4-(11.2)-14µm.

Acanthose choanosomal styles of renieroid skeleton straight or slightly curved at centre, evenly spinose except for aspinose points and sometimes aspinose base; spines large, recurved, sharply pointed. Length 93-(104.5)-112µm, width 8-(13.3)-16µm.

Subectosomal auxiliary subtylostyles long, slender, straight, smooth or microspined bases, fusiform orr occasionally with telescoped points. Length 102-(118.4)-152µm, width 2-(3.4)-4.5µm.

Microscleres. Palmate isochelae large, unmodified, with lateral and front alae approximately equal length, lateral alae completely used to shaft, front ala detached along entire length. Length 16-(19.4)-21µm.

Toxas wing-shaped, generously curved at centre, with only slightly reflexed points. Length 36-(68.9)-148µm, width 1.5-(2.1)-3.0µm.

REMARKS. I initially thought this species conspecific with *C.* (*T.*) *styloprothesis* (see above), based on Topsent's (1929) description of 'styloprothèse', whereby spongin fibres are replaced by algal filaments, but the two species differ in spicule geometry and skeletal architecture (see also *A.* (*P.*) *frondifera* below). It differs from the allied *A.* (*A.*) *tuberosa* in growth form,

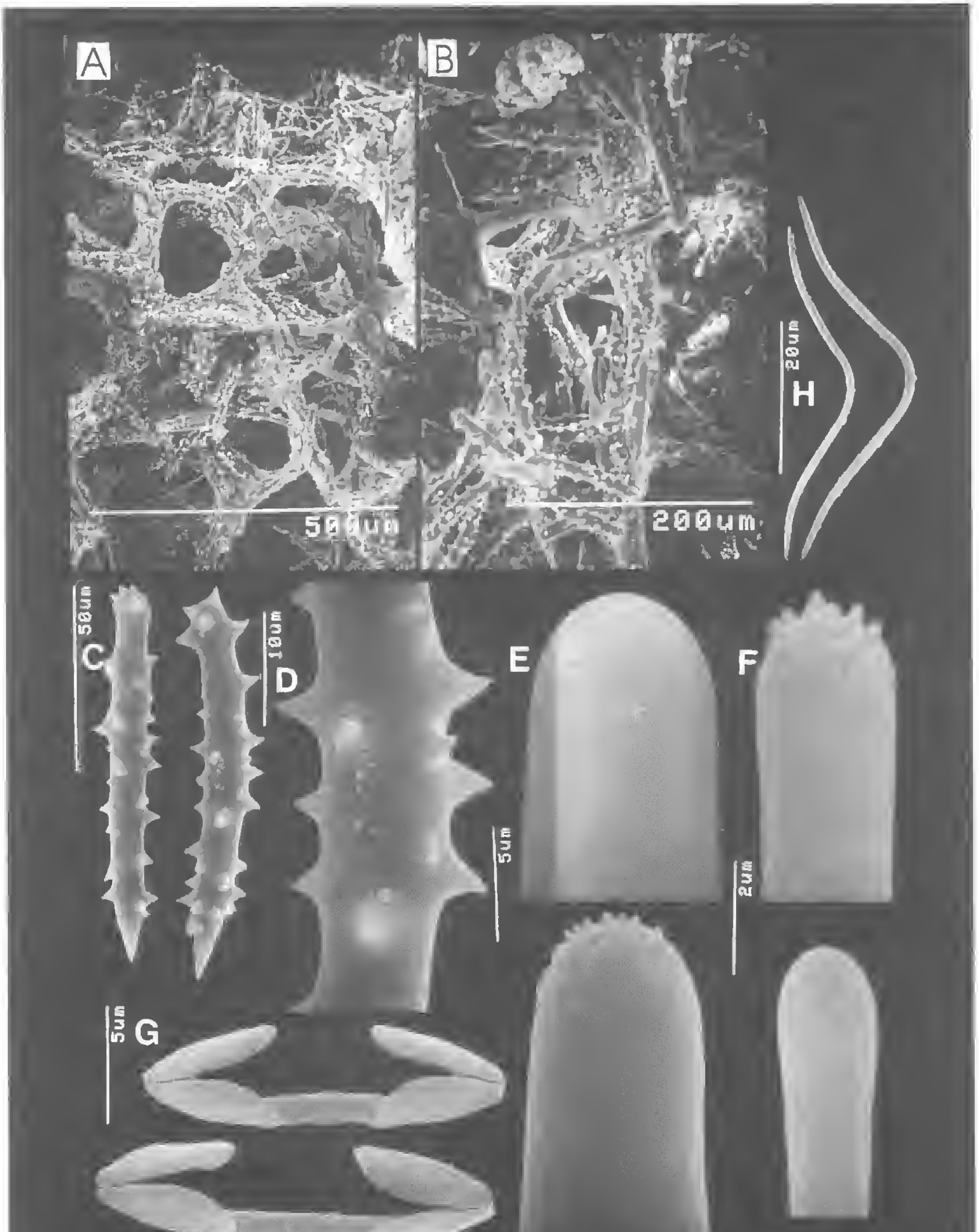

FIG. 213. *Antho* (*Antho*) *opuntioides* (Lamarck) (paralectotype MNHNDT3418). A, Choanosomal skeleton. B, Characteristics of fibre and renieroid skeleton. C, Acanthostyles of renieroid skeleton. D, Acanthostyle spines. E-F, Bases of principal and auxiliary styles. G, Palmate isochelae. H, Wing-shaped toxas.

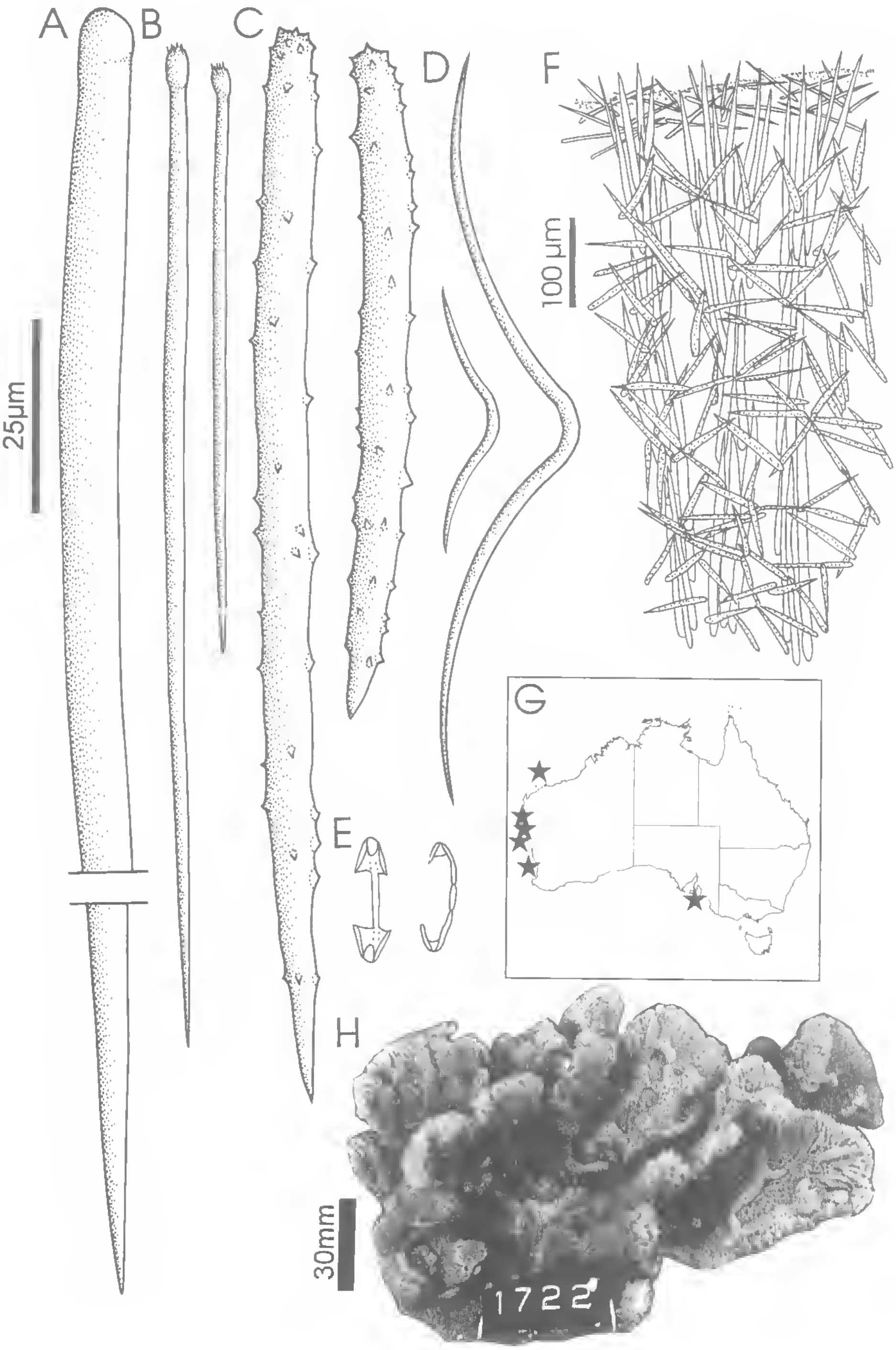

FIG. 214. *Antho* (*Antho*) *tuberosa* (Hentschel) (fragment of holotype ZMB4417). A, Choanosomal principal subtylostyle. B, Subectosomal auxiliary subtylostyles. C, Acanthostyles of renieroid skeleton. D, Wing-shaped toxas. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, WAM648-81(1).

spicule geometry (particularly its acanthostyle morphology), and spicule sizes (refer to discussion in *A.* (*A.*) *tuberosa*).

Antho (Antho) tuberosa (Hentschel, 1911)

(Figs 214-215, Plate 9B-C)

Lissodendoryx tuberosa Hentschel, 1911: 326-328, text-fig.21.

Isociona tuberosa; Hallmann, 1920: 768; Burton & Rao, 1932: 341-342.

Antho tuberosa; Hooper & Wiedenmayer, 1994: 255.

Clathria hartmeyeri Hentschel, 1911: 379-381, text-fig.50.

Thalysias hartmeyeri; de Laubenfels, 1936a: 105.

cf. *Microciona prolifera*; Vosmaer, 1935a: 611, 648, 664.

MATERIAL. HOLOTYPE: HM (fragment ZMB4417): 4km SW. of Denham, Shark Bay, WA, 25°56.5'S, 113°30.0'E, 3m depth, 10.vi.1905, coll. W. Michaelsen & R. Hartmeyer (dredge).OTHER MATERIAL: WA- WAM645-81(1) (fragment NTMZ1722) QMG300203 (fragment NTMZ2958), NTMZ3214 (fragments PIBOC04-352, QMG300044), QMG300678 (NCIQ66C-4229-N), NTMZ1466. S AUST- SAMTS4050 (fragment NTMZ1637).

HABITAT DISTRIBUTION. Encrusting on macrophytes, coralline algae, corals, or other sponges; 3-40m depth; Shark Bay, Straggler Rocks, Houtman Abrolhos, Port Hedland (WA); Port Noarlunga (SA) (Fig. 214G); Gonjam, Madras, India (Burton & Rao, 1932).

DESCRIPTION. *Shape.* Variable, thinly encrusting, up to 3mm thick, lobo-digitate, up to 25mm high, 42mm wide, 28mm thick, with rounded margins, or lobate, flabellate, with several flattened digits joined to a common base, and with curved, even or sinuous margins, without a basal stalk, 79mm high, 120mm maximum width, lobes between 18-32mm wide, up to 15mm thick.

Colour. Bright red (Munsell 2.5R 5/10), dark red (5R 4/10) or slightly yellow-red alive (2.5YR 8/8); yellow-brown or light brown in ethanol.

Oscules. Indetectable in thinly encrusting specimen, scattered on lateral and upper surfaces of lobate specimens, up to 2.5mm diameter; surface minutely porous on lobate-flabellate specimen, pores 0.5-1.2mm diameter.

Texture and surface characteristics. Texture compressible; surface optically even (encrusting-lobate specimens) or striated and pitted, with ridges most prominent near margins (flabellate specimen).

Ectosome and subectosome. Hispid, with tracts of smooth choanosomal styles from plumose skeleton protruding singly or in brushes; smaller subectosomal auxiliary subtylostyles form tangential tracts (encrusting specimen), paratangential tracts (lobate specimen), or distinct plumose brushes on ectosome, surrounding protruding choanosomal styles (flabellate specimen); subectosomal region undifferentiated from choanosomal skeleton; smaller acanthose choanosomal styles of renieroid skeleton terminate in uni- or paucispicular brushes just below surface; mesohyl matrix in peripheral region light, unpigmented.

Choanosome. Two distinct skeletal components: renieroid skeleton regular (encrusting-lobate specimens) or irregular (flabelliform specimen), rectangular and triangular meshes, tight meshed with mesh size 42-125µm diameter; meshes more open in lobate specimens (92-197µm) and flabellate specimens (97-208µm maximum diameter); vaguely differentiated primary and secondary components of skeleton, best developed in flabellate specimens, with primary ascending (multispicular) and secondary transverse (uni- or bispicular) tracts of smaller acanthose choanosomal megascleres; encrusting and lobate specimens mesh size decreases and skeleton more compact, with poorer differentiation of primary and secondary lines; plumose skeleton of larger, smooth, choanosomal principal styles forming pauci- or multispicular tracts; plumose tracts continuous, originating from basal attachment extending to peripheral skeleton in encrusting-lobate material, but not obviously continuous in flabellate specimens, prominent only near periphery; true echinating acanthostyles absent; mesohyl matrix light, containing few loose extra-fibre spicules; spongin fibres 45-108µm diameter relatively light, only barely differentiated from mesohyl matrix in flabellate specimens (with only primary ascending elements and small interconnecting secondary fibre components obvious); spicule skeleton only minimally associated with fibre skeleton, each forming more-or-less independent support systems; choanocyte chambers relatively large, 155-652µm diameter, ovoid, often paired, lined by isochelae and rarer toxas.

Megascleres. Smooth choanosomal principal subtylostyles of plumose skeleton slightly curved, fusiform, with tapering, rounded or subtylote smooth bases, occasionally slightly microspined; very variable in length. Length 164-(213.0)-337µm, width 6.5-(9.9)-14.0µm (holotype 126-295 x 6.5-9µm).

Acanthose choanosomal styles of renieroid skeleton slightly curved or straight, subtylote,

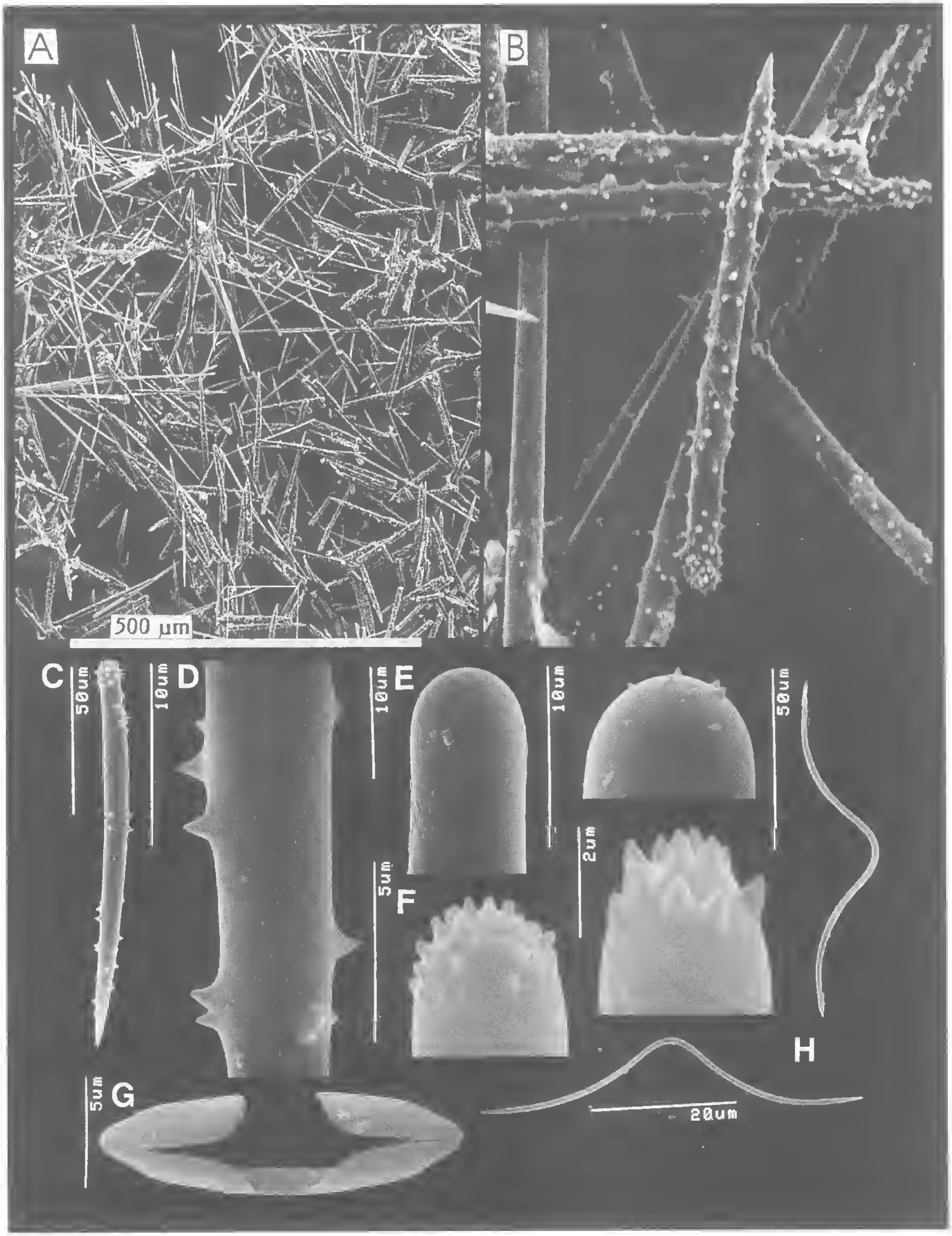

FIG. 215. *Antho (Antho) tuberosa* (Hentschel) (NTMZ3214). A, Choanosomal skeleton. B, Renieroid reticulate secondary skeleton. C, Acanthostyle of renieroid skeleton. D, Acanthostyle spines. E-F, Bases of principal and auxiliary styles. G, Palmate isochelae. H, Wing-shaped toxas.

fusiform, with evenly distributed small spines; acanthose choanosomal spicules include intermediates between larger smooth megascleres of plumose skeleton and entirely spined spicules of renieroid skeleton. Length 86-(114.9)-136μm, width 3.5-(6.3)-10.0μm (holotype 63-128 x 2.5-6μm).

Subectosomal auxiliary subtylostyles of peripheral skeleton straight or slightly curved, single size category, thin, fusiform, with rounded or subtylote bases, usually microspined. Length 100-(177.4)-274μm, width 1.8-(3.1)-4.5μm (holotype 129-214 x 2.5-4μm).

Microscleres. Palmate isochelae common, unmodified, variable in size between specimens; lateral and front alae approximately equal length, lateral alae entirely fused to shaft, front ala only partially detached from lateral alae. Length 6-(13.5)-18μm (holotype 10-15μm).

Toxas wing-shaped, relatively common, ranging from small thin forms to long relatively thick forms, all with evenly rounded, wide central curvature, and straight or very slightly reflexed points. Length 37-(94.5)-232μm, width 0.8-(1.8)-3.6μm (holotype 6-58 x 0.8-1.8μm).

Larvae. Larger flabellate-lobate specimen (WAM645-81(1)) contained ovoid-elongate, incubated embryos, 210-240μm diameter, with some cellular differentiation and few larval megascleres.

Associations. Several specimens had parasitic zooanthids on surface.

REMARKS. This species is relatively polymorphic in growth form, the extent to which the renieroid skeleton is compacted and size of isochelae, but more consistent in choanosomal and ectosomal skeletal architecture, spicule geometry, and to some extent spicule dimensions. However, there is no doubt that all specimens examined are conspecific, their similarities far more obvious than their apparent differences, especially in comparison to its sibling species *A.* (*A.*) *opuntioides* (from SW. Australia) and *A.* (*A.*) *lithophoenix* (from NW. Pacific). The lobate-encrusting specimen from SA shows the greatest departure from the holotype, particularly in spicule dimensions.

Hentschel (1911) described this species with a renieroid skeleton enclosed, to a greater or lesser extent, within spongin fibres, but the holotype does not substantiate this. In flabellate specimens fibres are more obviously associated with plumose skeletal tracts cored by smooth choanosomal styles, whereas the renieroid meshes appear independent of spongin fibres. Similarly, Hentschel did not describe toxas from the holotype but they are present being most abundant in SW WA flabellate-lobate specimens.

Burton & Rao (1932) suggested that *A.* (*A.*) *tuberosa* was probably conspecific with *Clathria hartmeyeri*, indicating that it differed only in the encrusting growth form, lighter mesohyl matrix and in supposedly lacking smooth subtylostyles. Although the latter assertion is incorrect the holotype of *C. hartmeyeri* has not yet been discovered in any museum and this synonymy cannot be corroborated. From Hentschel's (1911) description of *C. hartmeyeri* it appears to be identical to the flabellate-lobate form of *A.* (*A.*) *tuberosa* and this synonymy is accepted.

Antho (*A.*) *tuberosa* is the type species of *Isociona* Hallmann's (1920), which Van Soest (1984b) merged with *Antho*. In the strict sense (i.e., comparing *A.* (*A.*) *tuberosa* and *A.* (*A.*) *involvens*) the two genera are close in skeletal architecture, but *A.* (*A.*) *tuberosa* has entirely monactinal megascleres, whereas *A.* (*A.*) *involvens* has basal (renieroid) monactinal and/or diactinal spicules (acanthostyles, acanthostrongyles). Also included in *Isociona* is *Plocamia lithophoenix* de Laubenfels (1927) which is very similar to *A.* (*A.*) *tuberosa* in skeletal structure, spicule diversity and spicule geometry, differing only in the basal spines on choanosomal styles plumose skeleton and specific spicule dimensions (smooth choanosomal styles 152-238x11-15μm, acanthose choanosomal styles 129-166x8-14μm, subectosomal subtylostyles 133-293x3-6μm, palmate isochelae 18-26μm, and toxas 18-178x0.8-3μm). Both these and *A.* (*A.*) *opuntioides* are sibling species showing many skeletal and spicule similarities.

OTHER SPECIES OF *ANTHO* (*ANTHO*)

Antho (Antho) brattegardi Van Soest & Stone, 1986

Antho brattegardi Van Soest & Stone, 1986: 42-44, figs 1-3 [Norway]

MATERIAL. HOLOTYPE: ZMAPOR5190. PARATYPE BMNH1982.9.6.1. NE. Atlantic. species of *Jia* de Laubenfels.

Antho (Antho) brondstedi Bergquist & Fromont, 1988

Antho brondstedi Bergquist & Fromont, 1988: 97, pls 46d-f, 47a-c [New Zealand]; Dawson, 1993: 44 [index to fauna].

MATERIAL. HOLOTYPE: NMNZPOR111. New Zealand.

Antho (Antho) dichotoma (Esper, 1794)

Spangia dichatama Esper, 1794: 202, pl.10 [Norway]; Ehlers, 1870: 8-9 [re-examination of type-material].

Not *Spongia dichotoma*; Johnston, 1842: 97; Topsent, 1920b: 21.

Raspailia dichotoma; Ehlers, 1870: 8.

Clathria dichotoma; Arnesen, 1903: 21-22, pl.3, fig.4, pl.6, fig.8 [Norway]; Thiele, 1903b: 394; Koltun, 1959: 184, pl.29, fig.1, text-fig.145 [USSR]; Stephens, 1916: 234; Stephens, 1921: 21 [Ireland].

Not *Spongia dichotoma* Lamarck, 1814: 448 [missing Topsent, 1933: 46, 56].

Dictyoclathria dichotoma; Topsent, 1920b: 21-22 [Horns Riff, Denmark]; Burton, 1930a: 501.

Raspailia maebii; Schmidt, 1875: 120 [Norway]; Thiele, 1903b: 394.

Dictyocylindrus abyssorum Carter, 1876: 232, pl.12, fig.3, pl.15, fig.25a-b [N. of Scotland].

Clathria abyssarum; Vosmaer, 1880: 154 [Faroe Is, N.Atlantic]; Arndt, 1913: 119.

Raspailia abyssorum; Fristedt, 1885: 48, pl.4, fig.1.

Antha dichatama; Alander, 1942: 63 [Sweden]; Van Soest & Stone, 1986: 44 [Norway].

MATERIAL. HOLOTYPE: unknown; holotype of *D. abyssorum*: BMNH1898.5.7.39. NE. Atlantic.

Antho (Antho) graceae (Bakus, 1966)

Burtananchora lacunosa; de Laubenfels, 1961: 195-197.

Not *Myxilla lacunosa* Lambe, 1892: 70-71.

Anthaarcuata graceae Bakus, 1966: 431-432, text-fig.3 [San Juan Archipelago, Washington]; Ristau, 1978: 5737 [California]; Lee & Gilchrist, 1985: 24-32 [biochemistry].

Antho graceae; Van Soest, 1984b: 7 [generic synonymy].

MATERIAL. HOLOTYPE: USNM161848. NE. Pacific.

Antho (Antho) hallezi (Topsent, 1904)

Heteroclathria hallezi Topsent, 1904b: 94; Burton, 1935a: 403.

Plocamia hallezi; de Laubenfels, 1936a: 78.

MATERIAL. HOLOTYPE: MOM (fragment MNHNDT1884). NE Atlantic.

Antho (Antho) heterospiculata(Brondsted, 1924)

Microciana heterospiculata Brondsted, 1924: 465, text-fig.20 [Colville Channel, NZ].

Quizciona heteraspiculata; de Laubenfels, 1936a: 111.

Not *Micraciana heteraspiculata*; Bergquist, 1961a: 39 [probably = *Clathria mortensenii* Brondsted].

MATERIAL. HOLOTYPE: UZM (not found) (fragment BMNH1901.12.26.13). New Zealand.

Antho (Antho) involvens (Schmidt, 1864)

Myxilla involvens Schmidt, 1864: 37, 45, pl.4, fig.6 [Adriatic]; Heller, 1864: 48.

Hymedesmia involvens; Schmidt, 1866: 16.

Antho involvens; Gray, 1867: 524; Topsent, 1928a: 11; Topsent & Olivier, 1943: 2 [Monaco]; Burton, 1956: 133 [W. Africa]; Lévi, 1960a: 57, 76-80, text-figs 19-22 [var. *incanstans*; Atlantic, Mediterranean]; Vacelet, 1960: 267 [Mediterranean]; Vacelet, 1961: 41 [Corsica, Mediterranean]; Sarà, 1961: 48 [Adriatic]; Sarà & Siribelli, 1962: 10, 36, 48; Lévi, 1963: 62-63, text-fig.72 [Mossel Bay, South Africa]; Sarà, 1964: 228-229 [Ligurian Sea, Mediterranean]; Poggiano, 1965: 3, 7; Rützler, 1965: 33-34 [Adriatic Sea]; Borojevic et al., 1968: 25; Descatoire, 1969: 196; Vacelet, 1969: 206 [Mediterranean]; Boury-Esnault, 1971: 326; Riedl, 1971: 1139 [ecology]; Pulitzer-Finali, 1977: 63 [Bay of Naples]; Rodriguez Solórzano & Rodriguez Babiò, 1979: 56-58, text-fig.13 [var. *inconstans*; Galicia, Spain]; Pulitzer-Finali, 1983: 567-568, 610 [Mediterranean]; Boury-Esnault & Lopes, 1985: 195-196, fig.44 [Azores]; Pansini, 1987: 170 [Alboran Sea]; Uriz et al., 1992: 104 [Balearic Is]; Solórzano et al., 1991: 177 [Galicia, Spain]; Ackers, Moss & Picton, 1992: 139 [Ireland].

Desmacodes involvens; Vosmaer, 1880: 108; Vosmaer, 1885: 235.

Myxilla banyulensis, in part; Topsent, 1892b: 23; Topsent, 1902: 351, 363, 366; Cotte, 1903: 423.

Clathria morisca Schmidt, 1864: 37, 45 [Adriatic]; Schmidt, 1868: 9, 41, 43, pl.2, fig.7 [Mediterranean]; Vosmaer, 1880: 150-151 [Algiers]; Topsent, 1902: 329.

Dictyoclathria morisca; Topsent, 1920b: 18-21; Topsent, 1928a: 301-302, pl.3, fig.3 [Porto Santos, Azores]; Lévi, 1959: 134, text-fig.27, pl.5, fig.1 [Rio de Oro, Gulf of Guinea]; Lévi, 1960b: 761-762, text-fig.15 [var. *anisotyla*; SW. Cape of Naze, W. Africa]; Sarà, 1960a: 462 [Ischia, Mediterranean]; Desqueyroux-Faundez & Stone, 1992: 35 [index].

Placamia incanstans Topsent, 1925: 661-664, text-fig.15 [Gulf of Naples]; Topsent, 1939: 6; Pulitzer-Finali, 1983: 610 [list].

Plocamilla inconstans; Burton, 1935a: 402.

Holoplocamia inconstans; de Laubenfels, 1936a: 75.

Antho inconstans; Ackers et al., 1992: 140 [Ireland].

Isodictya beani Bowerbank, 1866: 274, 334, 335 [Britain]; Gray, 1868: 164; Schmidt, 1870: 77; Bowerbank, 1874: 147, pl.58, figs 1-6.

Dictyaclathria beanii; Arndt, 1935: 81.

Amphilectus beanii; Vosmaer, 1880: 115.

Clathria beanii; Ridley, 1881: 485, 486; Bowerbank, 1882: 13, 23, 150; Topsent, 1890c: 203.

Myxilla beanii; Topsent, 1892c: 23; Topsent, 1894a: 8, 9, 25; Hanitsch, 1894: 179.

Artemisina mediterranea Babic, 1921: 87 [Adriatic]; Babic, 1922: 258-259, text-fig.B; Burton, 1930a: 528; Lévi, 1960a: 57, 76-80; Maldonado, 1992: 1154 [possible synonym of *A.* (*P.*) *navizelanica*].

Microciona virgula Sarà & Siribelli, 1960: 77-79, text-fig.22 [Bay of Naples]; Siribelli, 1960: 16-17, text-fig.7A [Naples]; Sarà, 1964: 228-229 [Mediterranean].

? *Artemisina paradoxa* Babic, 1921: 87; Babic, 1922: 260-261, pl.8, fig.6, text-fig.c [Adriatic]; Topsent, 1925: 660; Lévi, 1960a: 85-86 [Adriatic]; Ristau, 1978: 585-586 [note on affinities].

Clathria paradoxa; Burton, 1930a: 528.
Antho paradoxa; Pulitzer-Finali, 1983: 610.
? *Raspailia incrustans* Svarcevskij, 1906: 52, pl.5, fig.6, pl.7, fig.1.

MATERIAL. HOLOTYPE: LMJG (fragment BMNH1867.3.11.92), fragments of holotype of *C. morisca*: MNHNDT2170, BMNH1868.3.2.21. NW. Atlantic, Mediterranean, NW Africa, South Africa. This is probably a species complex (Ackers et al., 1992) contesting the synonymy between *involvens* and *inconstans*.

Antho (Antho) oxeifera(Ferrer-Hernandez, 1921)

Clathria oxeifera Ferrer-Hernández, 1921: 171, pl.1 [Mediterranean]; Lévi, 1960a: 84-85 [incertae sedis; Mediterranean]; Pulitzer-Finali, 1983: 610 [list].
Labacea oxeifera; de Laubenfels, 1936a: 125 [?].
Antho oxeifera; Uriz & Maldonado, 1993: 359-362, figs 6-9 [W. Mediterranean].

MATERIAL. HOLOTYPE: Madrid. Mediterranean.

Antho (Antho) paucispina Sarà & Siribelli, 1962

Antho paucispina Sarà & Siribelli, 1962: 48-51, text-fig.12 [Mediterranean]; Pulitzer-Finali, 1983: 610.

MATERIAL. Holotype: IZUG. Mediterranean.

Antho (Plocamia) Schmidt, 1870

Plocamia Schmidt, 1870: 62.
Dirrhopalum Ridley, in Ridley & Duncan, 1881: 477.
Plocamiopsis Topsent, 1904a: 155.
Heteroclathria Topsent, 1904b: 93.
Lissoplocamia Brondsted, 1924: 470.
Plocamilla Topsent, 1928a: 63; Lévi, 1960a: 80.
Anomoclathria; in part, Topsent, 1932: 103 (not Topsent, 1929: 26).
Holoplocamia de Laubenfels, 1936a: 75.

TYPE SPECIES. *Plocamia gymnazusa* Schmidt, 1870: 62 (by subsequent designation of Burton, 1935a: 401)).

DEFINITION. Regular basal or axial renieroid (and/or isodictyal) skeleton of acanthostrongyles (less frequently acanthostyles), with or without spongin fibres; renieroid tracts may be echinated by acanthostyles at spongin fibre nodes; basal renieroid skeleton overlays leptoclathriid or microcionid main skeleton composed of echinating (acantho-)styles and/or choanosomal styles, standing perpendicular to base or axis, joining with echinating megascleres to produce ascending plumose skeletal tracts; extra-axial (subectosomal) skeleton plumose, dendritic, or subisodictyal, composed of choanosomal styles, originating from substrate or simply confined to periphery, forming tangential, paratangential or plumose extra-axial tracts; ectosomal skeleton with or without specialised spiculation (1 or 2 categories of auxiliary styles); microscleres include diverse forms of isochelae and toxas.

REMARKS. Twenty one species have been referred to *Plocamia* or one of its synonyms; all are valid. However, *A.* (*P.*) *erecta* is poorly known, and other species may eventually merge, particularly the 5 Indian Ocean species (Table 43). Only 2 species are known from Australasia.

Antho (Plocamia) frondifera (Lamarck, 1814)
(Figs 216-217, Table 43)

Spongia frondifera Lamarck, 1814: 445; Lamarck, 1816: 374.
Anomoclathria frondifera; de Laubenfels, 1936a: 108.
Antho frondifera; Hooper & Wiedenmayer, 1994: 256.
Anomoclathria opuntioides var. *frondifera*; Topsent, 1929: 26-29, text-figs 10-14; Topsent, 1932: 103, pl.1, figs 6-7.
Hymeniacidon cliftoni Bowerbank, 1862a: 773, pl.30, fig.9; Bowerbank, 1864: 276, figs 70, 291.
Acarnia cliftoni; Gray, 1867: 515.
Not *Alcyonium opuntioides* Lamarck, 1815: 164.

MATERIAL. LECTOTYPE: MNHNDT565: Precise locality unknown, suspected to be SW. Australia (Turgot collection). PARALECTOTYPE: MNHNDT3356: same details. HOLOTYPE of *H. cliftoni*: BMNH1877.5.21.608 (fragments BMNH1877.5.21.616, 1185, 218): Precise locality unknown, SW Australia, coll. H. Clifton.

HABITAT DISTRIBUTION. Ecology unknown; SW Australia (WA) (Fig. 216G).

DESCRIPTION. *Shape.* Lobate, thickly flabellate, digitate fans, 95-160mm long, up to 25mm thick, with uneven, digitate margins and irregular lobate surface ('macroconules') up to 6mm thick. No stalk remaining, if initially present.
Colour. Grey or grey-brown in dry state.
Oscules. Large, up to 4mm diameter, scattered evenly over surface and lateral margins of digits, with remnants of stellate drainage canals converging on each oscule.
Texture and surface characteristics. Harsh, brittle in dry state. Uneven, lumpy surface with distinct collagenous crust.
Ectosome and subectosome. Ectosomal skeleton membraneous, heavily collagenous in places (although rarely intact in dry specimens), with some embedded detritus and sparse tangential and paratangential tracts or single auxiliary subtylostyles scattered near periphery, sometimes forming bundles protruding through ectosome; points of (smooth) choanosomal principal styles from ascending plumose tracts protrude only slightly

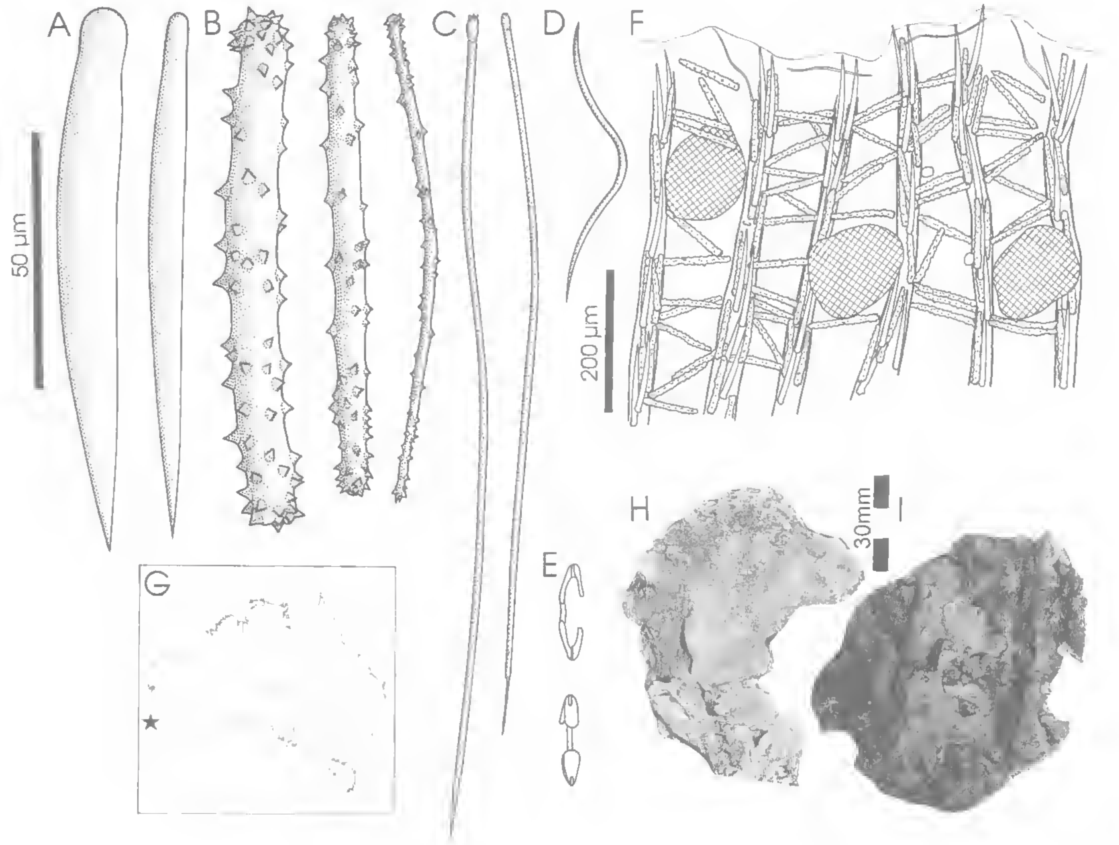

FIG. 216. *Antho* (*Plocamia*) *frondifera* (Lamarck) (lectotype MNHNDT565). A, Choanosomal principal subtylostyles. B, Acanthostrongyles of renieroid skeleton. C, Subectosomal auxiliary subtylostyles. D, Wing-shaped toxa. E, Palmate isochelae. F, Section through peripheral skeleton. G, Australian distribution. H, Lectotype. I, Paralectotype MNHNDT3356.

through collagenous surface membrane; subectosomal skeleton virtually undifferentiated from choanosome, although peripheral choanosomal styles of plumose skeleton slightly more dense, diverging, than tracts in skeletal core.

Choanosome. Skeleton with 2 distinct components: ascending plumose and basal/axial renieroid (in some places isodictyal) skeletons; plumose skeleton witth pauci- or multispicular tracts of smooth choanosomal principal styles ascending to surface, rarely branching or anastomosing; tracts associated with, but not necessarily coring, heavy, dark brown, spongin-coated algal filaments (ostensibly *Ficus* (Topsent, 1932)), which dominates skeleton; filaments up to 250µm diameter, 300-400µm apart, branching, diverging from base of sponge through sponge surface; renieroid skeleton composed of 1 or 2 acanthostrongyles abreast forming square or triangular meshes up to 120µm diameter, even mesh size throughout skeleton, overlaying plumose skeleton; some detritus scattered between renieroid skeletal meshes, usually coated with spongin; mesohyl not intact although some granular collagen containing microscleres scattered between spicule meshes; choanocytes not observed.

Megascleres. Choanosomal principal styles entirely smooth, short, robust, slightly curved at centre, with rounded or slightly subtylote bases, fusiform points. Length 88-(103.4)-118µm, width 4-(8.1)-13µm.

Acanthostrongyles of the renieroid skeleton thick or thin, rounded or slightly subtylote at both

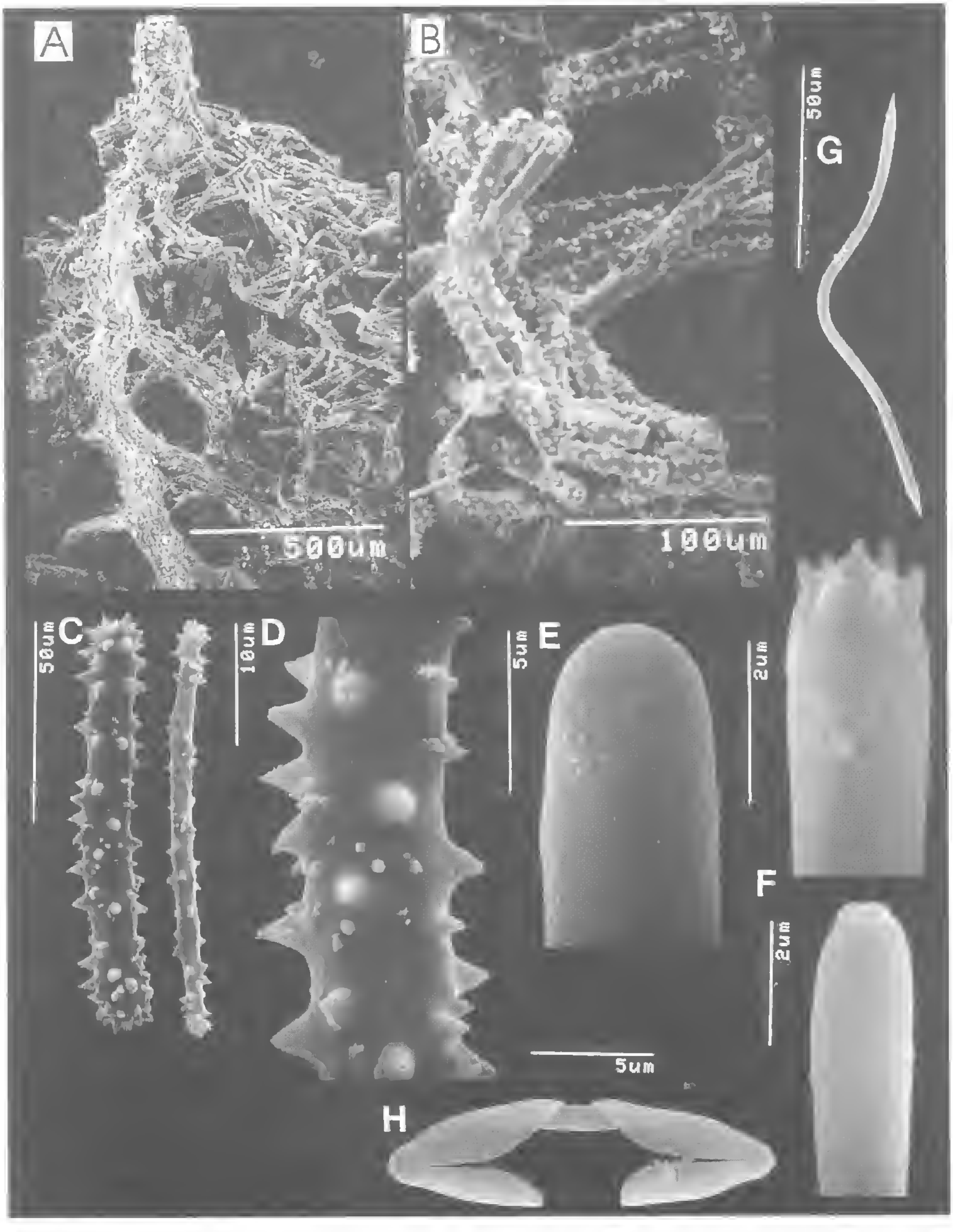

FIG. 217. *Antho* (*Plocamia*) *frondifera* (Lamarck) (paralectotype MNHNDT3356). A, Choanosomal skeleton. B, Fibre characteristics. C, Acanthostrongyles of renieroid skeleton. D, Acanthostrongyle spines. E-F, Bases of principal and auxiliary subtylostyles. G, Wing-shaped toxas. H, Palmate isochela.

TABLE 43. Comparison between species of *Antho (Plocamia)*. Measurements in µm.

CHAR-ACTER	*A.(P.) ridleyi* (Hentschel) Holotype (SMF1709)	*A.(P.) ridleyi* (Hentschel) Specimens (N=13)	*A.(P.) frondifera* (Lamarck) Holotype (MNHNDT 565)	*A.(P.) coriacea* (Bowerbank)[1]	*A.(P.) elegans* (Ridley & Dendy)[2]	*A.(P.) manaarensis* (Dendy)[3]	*A.(P.) novizelanicum* (Ridley)[4]	A.(A.) circonflexa (Lévi)[5]	*A.(P.)burtoni* (Lévi)[6]
Shape	encrusting	encrusting-lobate	flabellate	(encrusting)	digitate	digitate	digitate	encrusting	encrusting
Choanosomal styles	212-388 x 14-20	183-562 x 7-25	88-118 x 4-13	120-660 x 11-16.4	160-550 x 8.2-15	475 x 20.6	500 x 25	150-450 x 10	100-350 x 5-7
Renieroid spicules	92-104 x 6.5-10 (strongyles	99-142 x 4.5-15 (strongyles	85-103 x 3-14 (strongyles	62-117 x 7.9 (strongyles)	70-120 x 3-10 (strongyles	234 x 19 (strongyles)	177 x 15.8 (strongyles)	130-170 x 10 (styloid)	75-100 x 7 (strongyles)
Ectosomal spicules	129-209 x 1.8-4	100-252 x 1-6	-	130	-	-	-	-	-
Subectosomal spicules	298-388 x 4-7	231-473 x 2.5-13	120-184 x 1-2.5	425-430 x 2.7	150-460 x 2-6	316.7 x 6.3	190-360 x 2-4.7	150-400	190-260 x 2-3
Echinating spicules	170-202 x 8-13	107-248 x 5-15	-	75-158 x 7.9-12	140-180 x 5-11	114 x 9.5	272.4 x 17.4	80-120	'present'
Chelae	11-18	8-19	15-20	14-16	14-20	19	19	10-12	13-14
Toxas I	24-46 x 0.8-1.2	21-86 x 1-4	40-116 x 1-2	20-30 x 1-3	44-200 x ? (spined)	70 x 2.5	63.3 x 2.1	25-70 x 8	15-75 x 0.5-2
Toxas II	82-211 x 2-4 (spined)	63-354 x 2-11 (spined)	-	190-230 x 2.7-10 (spined)	-	-	-	-	85-130 x 3 (spined)

Sources:
1. Ridley & Duncan (1881: 481); Dendy (1922: 76); Lévi (1960a: 81). 2. Ridley & Dendy (1887: 158); Dendy (1922: 77); Lévi (1960b: 760); Pulitzer-Finali (1973: 35). 3. Ridley & Duncan (1881: 482). 4. Ridley & Duncan (1881: 483). 5. Lévi (1960a: 81). 6. Lévi (1952: 53)

ends, heavily spined particularly at points, spines large, conical or slightly recurved, sharply pointed. Length 85-(95.2)-103µm, width 3-(7.8)-14µm.

Subectosomal auxiliary subtylostyles long, very slender, curved at centre or sinuous, subtylote usually microspined bases, fusiform or occasionally telescoped points. Length 120-(135.9)-184µm, width 1-(1.7)-2.5µm.

Microscleres. Palmate isochelae large, unmodified, with front and lateral alae approximately same length, lateral alae entirely fused to shaft, front ala detached along lateral margin. Length 15-(17.4)-20µm.

Toxas wing-shaped, short, moderately thick, with large central curvature and slightly reflexed points. Length 40-(67.6)-116µm, width 1-(1.3)-2µm.

REMARKS. Spongin fibres are excluded from the skeleton and replaced entirely by algal filaments ('styloprothesis'; Topsent, 1929), although each filament contains a thin cover of collagen on its surface with embedded spicules. Of the 3 microcionid species demonstrating this symbiosis *A. (A.) opuntioides*, and *A. (P.) frondifera* are the major structural partners in the symbiotic relationship, whereas *C. (T.) styloprothesis* is probably a cryptic, invasive sponge and the algal symbiont provides the growth form structure. *Antho (P.) frondifera* is most similar to *A. (A.) opuntioides*, differing in spicule geometry (acanthostrongyles versus acanthostyles in the renieroid skeleton), and spicule dimensions (Table 43). Neither species has been subsequently recorded since the early 1800s.

Antho (Plocamia) ridleyi (Hentschel, 1912)
(Figs 218-220, Table 43, Plate 9D-E)

Plocamia ridleyi Hentschel,1912: 387-388, pl.20, fig.44.
Holoplocamia ridleyi; de Laubenfels, 1936a: 75.
Antho ridleyi; Hooper & Wiedenmayer, 1994: 256.

MATERIAL. HOLOTYPE: SMF1709 (fragment MNHNDCL2183): Mimien Bay, Aru I., Arafura Sea, Indonesia, 6°S, 134°50'E, 15m depth, 8.iv.1908, coll. H. Merton (dredge). OTHER MATERIAL: NT- NTMZ0299, NTMZ2108, NTMZ2110, NTMZ2112, NTMZ2131, NTMZ2142, NTMZ2201, QMG300146 (fragment NTMZ2212), NTMZ2221, QMG300507 (fragment NTMZ2230), QMG303295, NTMZ2556, NTMZ2378. WA- QMG301185.

TABLE 43. (continued)

CHARACTER	*A.(P.) delaubenfelsi* (Little)[7]	*A.(P.) illgi* (Bakus)[8]	*A.(P.) inconstans* (Topsent)[9]	*A.(P.) penneyi* (de Laubenfels)[10]	*A.(P.) plena* (Sollas)[11]	*A.(P.) lambei* (Burton)[12]	*A.(P.) barbadensis* (Van Soest)[13]	*A.(P.) gymnazusa* (Schmidt)[14]	*A(P.) ornata* (Dendy)[15]
Shape	encrusting	encrusting	encrusting	encrusting	flabellate	encrusting	encrusting	encrusting	encrusting
Choanosomal styles	199-306 x 15	225-884 x 18-37	190-340 x 13-17	385 x 12	1004 x 44-49	687 x 16-19	200-500 x 8	213-248 x 4	372 x 14
Renieroid spicules	112-153 x 9 (strongyles)	120-283 x 10-30 (strongyles	130-150 x 10-12 (strongyles	122 x 7 (strongyles)	184 x 12 (strongyles	100 x 8 (strongyles	159-301 x 5-8 (styles)	479 x 6 (strongyles	68-136 x 8-10 (stongyles)
Ectosomal spicules	-	-	-	-	-	-	-	-	-
Subectosomal spicules	-	159-733 x 4-17	230-290 x 4-5	-	368 x 10	176 x 3	220-304 x 1.5-3	99 x 6	-
Echinating spicules	-	177-358 x 10-29	'present'	97 x 9	245 x 24.5	183 x 9-13	57-73 x 3-4.5	-	172 x 10
Chelae	11-16	17-27	16-20	12	7-14	13	6-9	19	-
Toxas I	48-103	11-133	50-200 x 3	30-80 x 0.5-2	7-10	65	40-108	82 x 3	-
Toxas II	-	-	-	-	-	-	-	-	-

Sources:
7. Little (1963: 45). 8. Bakus (1966: 440); Simpson (1968a:43). 9. Topsent (1925: 662). 10. de Laubenfels (1936a: 76). 11. Sollas (1879: 44). 12. Bakus (1966); Lambe (1895: 124). 13. Van Soest (1984b: 125). 14. Ridley in Ridley & Duncan (1881: 478). 15. Dendy (1924: 351)

HABITAT DISTRIBUTION. Holotype collected from a sand substrate, encrusting on an *Oceanapia* species (Niphatidae; incorrectly identified as *Phloedictyon fistulosa* (Bowerbank)); other specimens collected from subtidal laterite rock and coral reefs, associated with dead coral substrate, usually growing on the underside of coral rubble; restricted intertidal distribution to only 3m depth; known Australian distribution: Darwin Harbour (NT); Hibernia Reef, Sahul Shelf (WA) (Fig. 218I); also Aru Is, Indonesia (Hentschel, 1912).

DESCRIPTION. *Shape.* Thinly, thickly or bulbous-encrusting, 2-14mm thick, forming extensive overgrowths on coral substrata.

Colour. Live colouration consistent, even bright red or blood red (Munsell 5R 5-3/10), turning grey or pinkish grey in ethanol (5R 8/2-4).

Oscules. Large oscules on exterior of bulbous lobes, 0.4-1.6mm diameter, with slightly raised membraneous lip; minute pores, up to 150µm diameter scattered evenly over surface; pores and oscules contract upon dessication.

Texture and surface characteristics. Firm, barely compressible, easily crumbled alive; no mucous produced upon exposure to air; surface optically smooth, irregularly bulbous, mostly clear of silt *in situ*; surface lobes in thinly encrusting specimens collapse upon dessication or preservation, but thicker specimens retain shape.

Ectosome and subectosome. Surface microscopically hispid, with points of smooth choanosomal principal styles protruding and surrounded by plumose brushes of mostly smaller ectosomal auxiliary subtylostyles (with fewer larger subectosomal megascleres contributing to ectosomal skeleton); subectosomal region structurally variable; thinly encrusting specimens with peripheral skeleton not clearly delineated from choanosomal skeleton, containing only thick tangential or paratangential tracts, up to 140µm diameter, composed of larger subectosomal auxiliary subtylostyles; in thicker bulbous specimens subectosomal region cavernous, containing numerous plumose, stellate brushes composed of both of choanosomal and subectosomal megascleres, clearly distinguished from the renieroid component of choanosomal skeleton; subectosomal auxiliary megascleres also in deeper choanosomal skeleton, together with smooth choanosomal principal styles, together forming vaguely ascending, multispicular, extra-fibre tracts, 25-65µm diameter.

Choanosome. Skeletal structure with 3 distinct components: hymedesmoid skeleton, with basal layer of spongin fibre lying on substrate, 60-240µm thick, with smooth choanosomal principal styles and echinating acanthostyles perpendicular to substrate; renieroid skeleton forming regularly reticulation of acanthostrongyles, overlaying hymedesmoid basal skeleton, in pauci- or multispicular tracts (vaguely ascending) and uni- or paucispicular (irregularly transverse) tracts, producing triangular (isodictyal) or rectangular (renieroid) meshes, 60-150µm diameter, without any obvious spongin fibre component; echinating acanthostyles, occurring singly or in plumose brushes, at major nodes of renieroid skeleton, sometimes also forming irregularly plumose, discontinuous, ascending tracts; subisodictyal extra-fibre skeleton well developed in thicker specimens but rudimentary (irregularly dispersed) in thinly encrusting specimens; subisodictyal skeleton composed of both smooth choanosomal principal styles and subectosomal auxiliary subtylostyles forming barely continuous subisodictyal tracts extending from leptoclathriid basal skeleton to peripheral region, becoming more plumose or dendritic towards periphery; mesohyl matrix heavy but virtually unpigmented, surrounding renieroid meshes; choanocyte chambers circular to oval, 63-95µm diameter; mesohyl matrix in both basal and peripheral regions more heavily pigmented than in choanosomal region, and microscleres also more abundant near surface.

Megascleres. Choanosomal principal styles long, thick, slightly curved, with rounded or slightly subtylote bases, smooth or with lightly microspined bases, fusiform points. Length 183-(317.9)-562µm, width 6.5-(14.8)-25µm (holotype 212-388 x 14-20µm).

Acanthostrongyles of renieroid skeleton short, thick, straight or slightly curved, with either symmetrical subtylote bases, or asymmetrical ends (subtylote bases, rounded or slightly subtylote points); usually evenly microspined, spines small, conical, sharply pointed. Length 98-(120.6)-142µm, width 4.5-(10.1)-15µm (holotype 92-104 x 6.5-10µm).

Subectosomal auxiliary subtylostyles long, thin, fusiform, straight, with prominent tylote, subtylote or polytylote bases, bases microspined or less commonly smooth. Length 231-(372.9)-473µm, width 2.5-(5.9)-12.5µm (holotype 298-388 x 4-7µm).

Ectosomal auxiliary subtylostyles identical in geometry but smaller than large auxiliary megascleres, with tylote or subtylote, smooth or microspined bases. Length 100-(192.7)-252µm, width 1.1-(3.3)-6.5µm (holotype 129-209 x 1.8-4µm).

Echinating acanthostyles long, thick, fusiform, slightly curved, with subtylote, lightly microspined bases, entirely smooth shafts or proximal half of shafts covered with small spines (these spicules possibly small morphs of principal styles). Length 107-(194.1)-248µm, width 5-(10.1)-15µm (holotype 170-202 x 8-13µm).

Microscleres. Palmate isochelae abundant, single size category, unmodified, with front and lateral alae approximately same length, lateral alae completely fused to shaft, front ala detached from front alae along lateral margin. Length 8-(12.5)-19µm (holotype 11-18µm).

Toxas wing-shaped, incompletely differentiated into 2 size classes: smaller thin, extensive rounded central curvature, straight or slightly reflexed points; larger thick, sharply angular or slightly rounded central curvature, straight or very slightly reflexed arms characteristically bearing terminal bulbous swelling and a single apical spine surrounded by smaller spines. Length I: 21-(44.3)-86µm, width 1-(1.9)-4.1µm (holotype 24-46 x 0.8-1.2µm); length II: 62-(169.2)-355µm, width 2-(4.7)-10.6µm (holotype 82-211 x 2-4µm).

Larvae. Parenchymella larvae oval-elongate, 195-410µm long, 135-330µm wide, orange-brown alive, incompletely ciliated with a bare posterior pole. Younger larvae poorly differentiated in cellular construction, but containing clearly visible, longitudinally disposed, whispy sinuous monactinal megascleres. Older larvae have distinct, oval, cellular differentiation, radially disposed thin tylostyles, and small toxas and isochelae.

Incubated larvae were abundant in 33% of specimens, collected between January and May 1985 in the Darwin region, but absent from samples collected during latter part of year (Fig. 220). Probable reproductive period is wet-early dry seasons (January to June) but determination of complete reproductive period was not possible as samples could not be taken every month).

Associations. All NT specimens were encrusting dead faviid coral heads, growing next to, or over other sponges (e.g., *Stelletta*, *Mycale*, *Placospongia*, *Ulosa*, *Clathria*), coralline algae and ascidians.

Variation. Ectosomal structure variable, ranging from *Clathria* condition (with thin or thick tangential crust; 17%), *Thalysias* condition (with a stellate plumose ectosomal architecture; 50%), to merely paratangential (with elements of both structures; 33%). Subectosomal region cavernous (with plumose tracts of choanosomal and/or subectosomal megascleres; 67%), to merely tangential or paratangential (without subdermal cavities; 33%). Extra-axial (non-renieroid) skeleton ranges from subisodictyal, distinctly plumose, ascending, diverging towards periphery

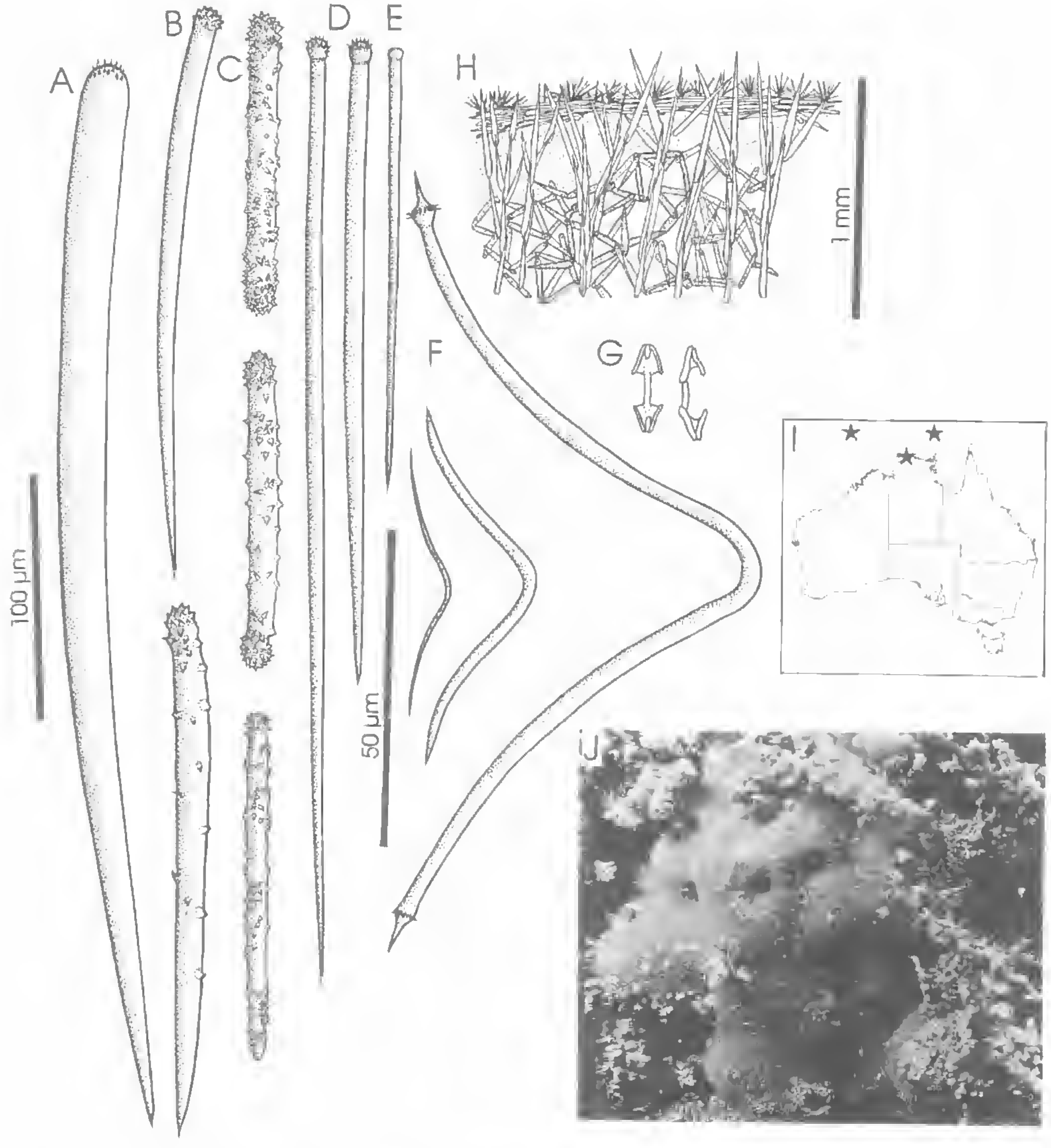

FIG. 218. *Antho* (*Plocamia*) *ridleyi* (Hentschel) (NTMZ2142). A, Choanosomal principal style. B, Echinating acanthostyles. C, Acanthostrongyles of renieroid skeleton. D, Subectosomal auxiliary subtylostyles. E, Ectosomal auxiliary subtylostyle. F, Accolada and wing-shaped toxas. G, Palmate isochelae. H, Section through peripheral skeleton. I, Australian distribution. J, NTMZ299.

(58%), to irregularly disposed, mostly longitudinal extra-fibre tracts (48%). Echinating acanthostyles form plumose ascending structures (50%) or irregularly dispersed (50%). Spicule geometry consistent although spicule dimensions varied slightly for all specimens (holotype had smaller toxas and acanthostrongyles than NW Australian material).

REMARKS. This species is relatively common in cryptic habitats on shallow intertidal reefs in the Darwin region, and it is therefore surprising that it has not been found elsewhere in NW. Australia despite extensive sampling in similar habitats along the N. coast. Dendy (1922) merged *Plocamia ridleyi* with *Plocamilla coriacea* from the N. Atlantic and Mediterranean, but this

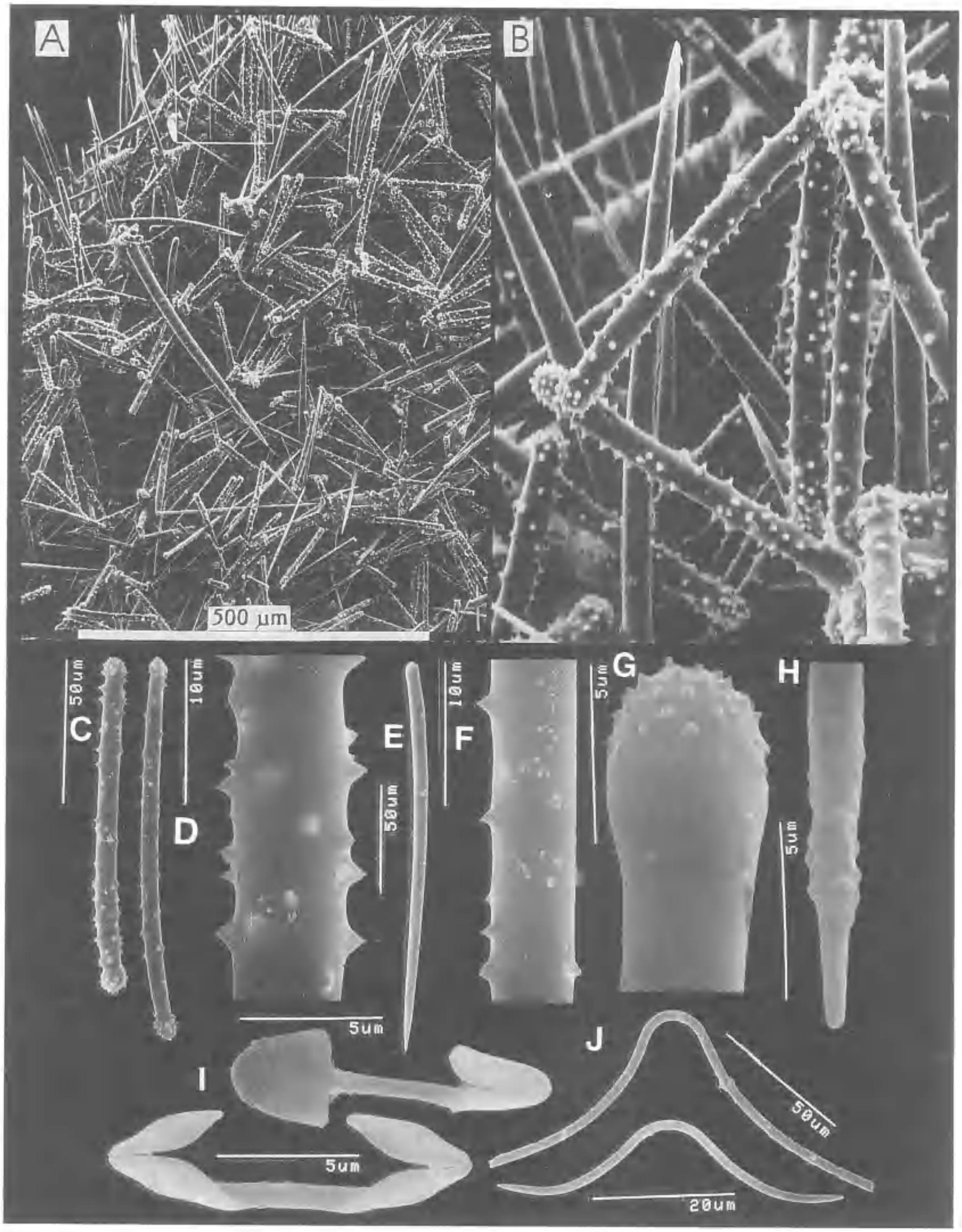

FIG. 219. *Antho* (*Plocamia*) *ridleyi* (Hentschel) (QMG301185). A, Choanosomal skeleton. B, Renieroid skeleton (x437). C, Acanthostrongyles of renieroid skeleton. D, Acanthostrongyle spines. E, Echinating acanthostyle. F, Acanthostyle spination. G, Base of subectosomal auxiliary subtylostyle. H, Spined toxa point. I, Palmate isochelae. J, Accolada and wing-shaped toxas.

SEASON	TOTAL SAMPLES	NO. SAMPLES WITH LARVAE
WET	3	3
PREDRY	1	0
DRY	7	0
PREWET	4	2

FIG. 220. *Antho (Plocamia) ridleyi* (Hentschel). Incidence of incubated parenchymella larvae in NT specimens.

synonymy is clearly wrong. In their spicule diversity and growth form the two taxa are similar (Table 43), whereas comparisons between field observations on living populations of *A.* (*P.*) *ridleyi* (present study) and *A.* (*P.*) *coriacea* (Ackers, Moss & Picton, 1992: 141) show that the two species have quite different surface features, live colouration, and some differences in spicule dimensions (Table 43) indicating at most a possible sibling species relationship.

The separate category of echinating acanthostyles, a renieroid skeleton composed of diactinal or quasi-diactinal spicules, and a more-or-less plumose (non-renieroid), subisodictyal skeleton of smooth choanosomal and subectosomal spicules are typical of *Antho* (*Plocamia*). However, *Antho* and *Plocamia* are barely differentiated on that basis and they are formally merged here. Some *Plocamia* have a mixture of both acanthostyles and acanthostrongyles in the renieroid skeleton (Lévi, 1960a). Megascleres echinating fibre nodes may vary from true acanthostyles, with different geometry from other choanosomal spicules (*A.* (*P.*) *barbadensis* (Van Soest, 1984b)), or smooth styles which are differentiated from choanosomal megascleres only by their marginally smaller size and light, irregular spination (most species including *A.* (*P.*) *ridleyi*, *A.* (*P.*) *elegans* (Ridley & Dendy, 1886) and *A.* (*P.*) *coriacea* (Bowerbank, 1874)), or echinating megascleres may be entirely undifferentiated from choanosomal styles or absent (e.g., *A.* (*P.*) *novizelanicum* (Ridley, in Ridley & Duncan, 1881), *A.* (*P.*) *penneyi* (de Laubenfels, 1936a), *A.* (*P.*) *frondifera* (Lamarck)). Similarly, the extra-axial (non-renieroid) skeleton varies between specimens. Some thinly encrusting species, such as *A.* (*P.*) *ridleyi*, *A.* (*P.*) *delaubenfelsi* (Little, 1963) and *A.* (*P.*) *burtoni* (Lévi, 1952) have choanosomal styles embedded in the basal spongin fibre and in the renieroid fibre nodes, ascending all the way to surface in more-or-less plumose tracts. Other species (e.g., *A.* (*P.*) *illgi* (Bakus, 1966)) have plumose tracts of choanosomal styles mainly in the peripheral skeleton with the remainder of the skeleton being simply renieroid. *Antho* (*Plocamia*) *ridleyi* differs substantially from the other known Australian species *A.* (*P.*) *frondifera* in spicule geometry (particularly in having spined points on the larger toxas), spicule dimensions (Table 43), growth form and lacking algal filaments in the skeleton ('styloprothesis').

OTHER SPECIES OF *ANTHO* (*PLOCAMIA*).

Antho (Plocamia) barbadensis (Van Soest, 1984)

Plocamilla barbadensis Van Soest, 1984b: 125-126, text-fig.50 [Barbados, West Indies].

Antho barbadensis; Van Soest & Stentoft, 1988: 123 [Barbados].

MATERIAL. HOLOTYPE: ZMAPOR3832. Province: Caribbean.

Antho (Plocamia) burtoni (Lévi, 1952)

Plocamilla burtoni Lévi, 1952: 53-54, text-fig.17 [Senegal, W. Africa]; Lévi, 1960b: 760 [note].

MATERIAL. HOLOTYPE: MNHN missing. Province: NW. Africa.

Antho (Plocamia) circonflexa (Lévi, 1960)

Plocamilla circonflexa Lévi, 1960a: 81-83, text-figs 24-25 [Brest, France]; Sarà & Siribelli, 1960: 80 [Bay of Naples, Mediterranean]; Sarà & Siribelli, 1962: 51 [Gulf of Naples]; Descatoire, 1966: 242, text-fig.6B [Glenan Archipelago, Brittany]; Pulitzer-Finali, 1983: 610 [list].

MATERIAL. HOLOTYPE: MNHN missing. NE. Atlantic, Mediterranean.

Antho (Plocamia) coriacea (Bowerbank, 1874)

Isodictya coriacea Bowerbank, 1874: 136, 228, pl.76, figs 7-12 [Britain].

Dirrhopalum coriaceum; Ridley, 1881: 481, pl.29, figs 3-7 [Ireland].

Plocamia coriacea; Hanitsch, 1894: 173 [Britain]; Dendy, 1922: 76-77 [Amirante, Indian Ocean].

Plocamilla coriacea; Topsent, 1928a: 63; Burton, 1935a: 402; Burton, 1959b: 44 [Iceland]; Lévi, 1960a: 80-81, text-fig.23 [Roscoff, English Channel; Atlantic]; Sarà & Siribelli, 1962: 51 [with question; Gulf of Naples]; Poggiano, 1965: 3,7; Pulitzer-Finali, 1983: 610 [list]; Solórzano et al., 1991: 177 [Galicia, Spain]; Ackers, Moss & Picton, 1992: 141-142 [Ireland].

Holoplocamia coriacea; de Laubenfels, 1936a: 75.

MATERIAL. Holotype: BMNH1877.5.21. 761/1910.1.1.251. NE. Atlantic, Mediterranean, E. Africa.

Antho (Plocamia) delaubenfelsi (Little, 1963)

Holoplocamia delaubenfelsi Little, 1963: 45-48, text-fig.18 [Gulf of Mexico].

MATERIAL. HOLOTYPE: USNM23596. NE Pacific.

Antho (Plocamia) elegans(Ridley & Dendy, 1886)

Plocamia elegans Ridley & Dendy, 1886: 475 [var.]; Ridley & Dendy, 1887: 158-159, pl.29, fig.9, pl.31, fig.1 [var. *elegans*; Azores]; Topsent, 1892a: 117, pl.7, fig.11 [var. *elegans*; Azores]; Topsent, 1904a: 155 [var. *elegans*; Azores].

Plocamia elegans; Dendy, 1922: 77-78 [Cargados Carajos, Indian Ocean]; Topsent, 1928a: 64.

Plocamilla elegans; Burton, 1935a: 402; Pulitzer-Finali, 1973: 35-41 [Azores].

Plocamilla coriacea var. *elegans*; Lévi, 1960b: 760-761, text-fig.13 [W. coast of Africa].

Holoplocamia elegans; de Laubenfels, 1936a: 75.

MATERIAL. HOLOTYPE: BMNH1887.5.2.109. NE Atlantic, E & W Africa.

Antho (Plocamia) erecta(Ferrer-Hernandez, 1923)

Plocamia erecta Ferrer-Hernández, 1923: 248, text-figs 1-3 [Spain].

Plocamilla erecta; Burton, 1935a: 402.

Holoplocamia erecta; de Laubenfels, 1936a: 75 [Santander, Atlantic].

Antho erecta; Lévi, 1960a: 80.

MATERIAL. HOLOTYPE: Madrid. NE Atlantic.

Antho (Plocamia) gymnazusa (Schmidt, 1870)

Plocamia gymnazusa Schmidt, 1870: 62-63, pl.4, fig.17 [Florida]; Burton, 1935a: 401; de Laubenfels, 1936a: 76.

Dirrhopalum gymnazon; Ridley, 1881: 478-479, pl.29, figs 1-2.

MATERIAL. HOLOTYPE: BMNH1870.5.3.70 (fragment MNHNDCL1105L). Caribbean.

Antho (Plocamia) illgi (Bakus, 1966)

Plocamilla illgi Bakus, 1966: 440-443, pl.1A, figs 6a-j [San Juan Archipelago, Washington]; Simpson, 1968a: 43-47, 93, text-fig.3 [San Juan Is, Washington]; Lee & Gilchrist, 1985: 24-32 [biochemistry]; Bakus & Green, 1987: 73-74 [S.California].

MATERIAL. HOLOTYPE: USNM23737. NE Pacific.

Antho (Plocamia) lambei (Burton, 1935)

Plocamia manaarensis, in part; Lambe, 1895: 124 [California]; Lambe, 1900: 161.

Not *Dictyocylindrus manaarensis* Carter, 1880a: 37.

Heteroclathria lambei Burton, 1935a: 403.

Plocamilla zimmeri Bakus, 1966: 512.

MATERIAL. HOLOTYPE: USNM6331. NE Pacific.

Antho (Plocamia) lithophoenix
(de Laubenfels, 1927)

Plocamia lithophoenix de Laubenfels, 1927: 268.

Isociona lithophoenix; de Laubenfels, 1932: 99-100, text-fig.59 [California]; Burton, 1935a: 400 [note]; Dickinson, 1945: 23, pl.35, figs 69-70, pl.36, figs 71-72 [Pacific Grove, California].

Antho lithophoenix; Van Soest, 1984b: 129 [generic synonymy for *Isociona*]; Lee & Gilchrist, 1985: 24-32 [biochemistry]; Sim & Bakus, 1986: 11 [California].

MATERIAL. HOLOTYPE: USNM21460, paratype BMNH1929.8.22.42. NE Pacific.

Antho (Plocamia) manaarensis (Carter, 1880)

Dictyocylindrus manaarensis Carter, 1880a: 34, pl.4, fig.1 [Gulf of Manaar, Ceylon].

Dirrhopalum manaarense; Ridley, 1881: 482.

Plocamia manaarensis; Dendy, 1905: 179, pl.8, fig.1 [Gulf of Manaar, Ceylon]; Burton & Rao, 1932: 355 [Laccadive Sea, Mangalore and Karwar, India].

Not *Plocamia manaarensis*; Lambe, 1895: 124, pl.2, figs 11a-g [California].

Plocamilla manaarensis; Burton, 1935a: 402; Burton, 1959a: 252-253 [Arabian Sea]; Bakus, 1966: 512.

MATERIAL. HOLOTYPE: LFM destroyed (fragment BMNH1986.4.29.1b). India, Arabian Sea.

Antho (Plocamia) novizelanica (Ridley, 1881)

Dirrhopalum novizelanicum Ridley, 1881: 483-485, pl.29, figs 8-16 [Bay of Islands, New Zealand].

Plocamilla novizelanicum; Burton, 1935a: 402.

Plocamilla novizelanica; Lévi & Lévi, 1983a: 965-966, text-fig.27 [S. of New Caledonia]; [?] Uriz, 1988a: 90-91, text-fig.65 [Namibia; ? affinity].

Holoplocamia novizelanica; de Laubenfels, 1936a: 75.

Plocamia novizelanicum; Bergquist & Fromont, 1988: 120-122, pl.56, fig.f, pl.57, figs a-b [New Zealand]; Dawson, 1993: 38 [index to fauna].

Not *Plocamilla* cf. *novizelanica*; Maldonado, 1992: 1154, fig. 11-12, table 5 [Alboran Sea; ? affinity].

MATERIAL. HOLOTYPE: BMNH1964.1.1.1. SW Pacific (N.Z, New Caledonia); ?SW Africa, Mediterranean.

Antho (Plocamia) ornata (Dendy, 1924)

Bubaris ornata Dendy, 1924a: 351, pl.14, figs 25-27.

Plocamia ornata; Burton, 1928: 129.

Axoplocamia ornata; Burton, 1935a: 402.

MATERIAL. HOLOTYPE: BMNH missing (fragments BMNH1923.10.1.126, 322). W Indian Ocean.

Antho (Plocamia) penneyi (de Laubenfels, 1936)

Holoplocamia penneyi de Laubenfels, 1936a: 76 [Tortugas, Florida].

Antho penneyi; Van Soest & Stentoft, 1988: 126 [table].

MATERIAL. HOLOTYPE: USNM22460. Caribbean.

Antho (Plocamia) plena (Sollas, 1879)

Plocamia plena Sollas, 1879: 44, pls 6-7 [W Africa]; Topsent, 1894: 21.

Holoplocamia plena; de Laubenfels, 1936a: 75 [note].

Clathria plena; Vosmaer, 1880: 154 [Angola].

Dirrhopalum plenum; Ridley, 1881: 480-481.

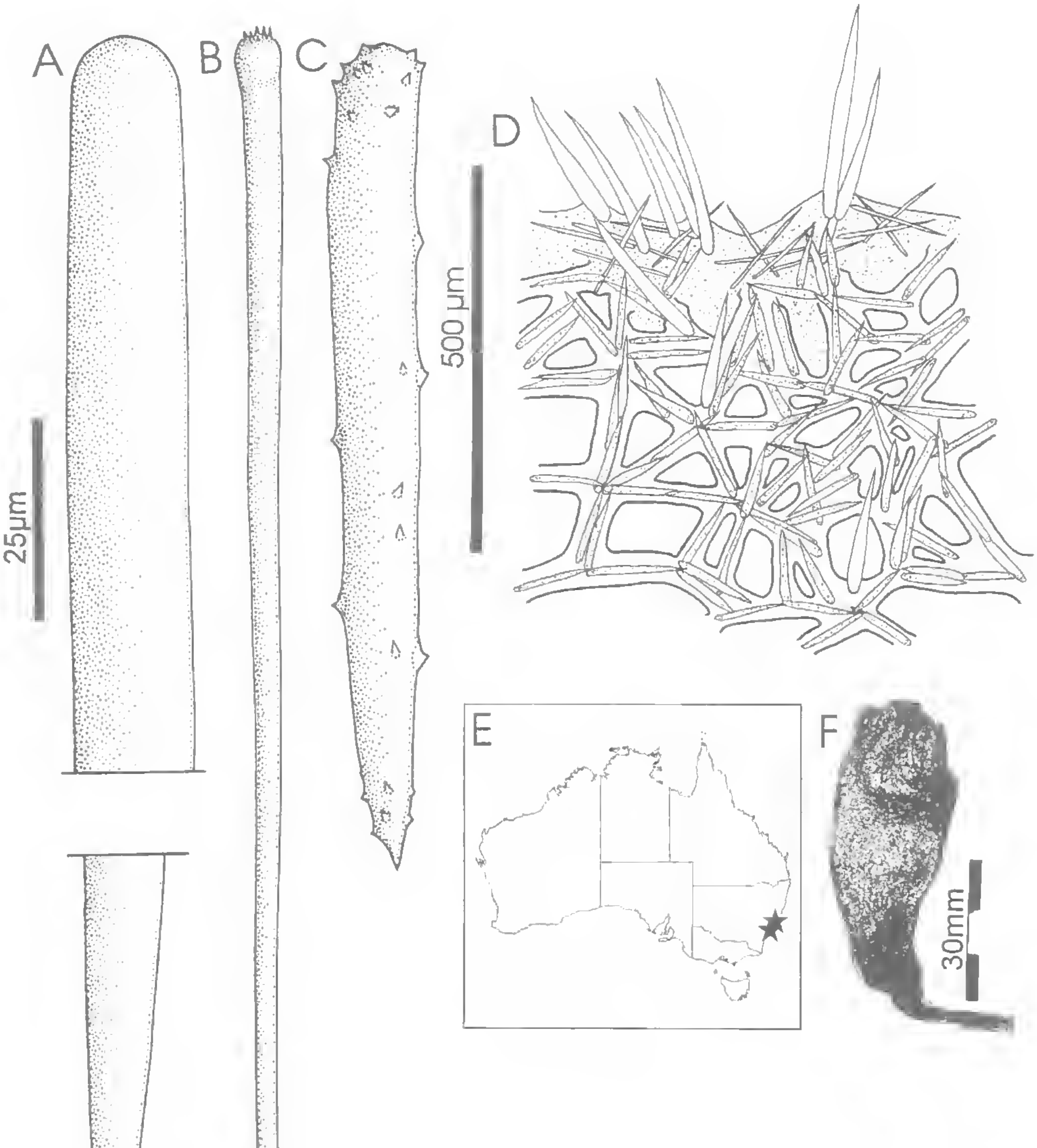

FIG. 221. *Antho* (*Isopenectya*) *chartacea* (Whitelegge) (holotype AMZ436). A, Choanosomal principal style. B, Subectosomal auxiliary subtylostyle. C, Acanthostyle of renieroid skeleton. D, Section through peripheral skeleton. E, Australian distribution. F, Holotype.

MATERIAL. HOLOTYPE: Bristol (fragment BMNH1909.8.15.3). W Africa.

Antho (Plocamia) prima (Brondsted, 1924)

Lissoplocamia prima Brondsted, 1924: 470, fig.24a-d [North Cape, New Zealand]; Topsent, 1928a: 63; Lévi, 1963: 63, fig. 73 [S.Africa].

Plocamia prima; Bergquist & Fromont, 1988: 122, pl.57c-e.

MATERIAL. HOLOTYPE: possibly UZC. South Africa, NZ.

Antho (Plocamia) signata (Topsent, 1904)

Plocamiopsis signata Topsent, 1904a: 155-157, pl.14, fig.1 [Azores]; Topsent, 1928a: 306-307, pl.10, fig.20 [et var. *mitis*; W. of Flores, Azores]; Burton, 1935a: 402 [note].

MATERIAL. HOLOTYPE: MOM (fragment BMNH1930.7.1.36). NE Atlantic.

Antho (Isopenectya) Hallmann, 1920

Isopenectya Hallmann, 1920: 789.
Clathriella Burton, 1935c: 73; Koltun, 1959: 186.

TYPE SPECIES. *Clathria chartacea* Whitelegge, 1907: 497 (by monotypy).

DEFINITION. Three skeletal components: (1) renieroid reticulation of acanthose styles, (2) overlayed by isodictyal or subisodictyal reticulation of smooth styles coring spongin fibres, (3) surmounted by plumose or radial extra-axial skeleton of larger smooth styles, perpendicular to axis, in peripheral region; skeleton may be slightly compressed at core, spongin fibres only moderately developed; echinating megascleres absent; ectosomal skeleton with single category of auxiliary subtylostyle forming tangential or paratangential tracts; microscleres absent.

REMARKS. *Isopenectya* contains 4 species, 3 from the SW Pacific and 1 from the NW Pacific. All lack microscleres but this is interpreted as secondary loss.

Antho (Isopenectya) chartacea (Whitelegge, 1907)

(Figs 221-222, Plate 9F)

Clathria (?) *chartacea* Whitelegge, 1907: 497.

Isopenectya chartacea; Hallmann, 1920: 789.

Antho chartacea; Rudman & Avern, 1989: 335; Hooper & Wiedenmayer, 1994: 255.

Antherochalina perforata Lendenfeld, 1887b: pl.22, fig.44.

Not *Antherochalina perforata*, in part; Lendenfeld, 1887b: 788; Lendenfeld, 1888: 89-90.

MATERIAL. HOLOTYPE: AMZ436: Off Coogee, NSW, 33°45'S, 151°20'E, 98-100m depth, date of collection unknown, coll. FIV 'Thetis' (trawl). HOLOTYPE of *A. perforata*: BMNH1886.8.27.459: Broughton I., Port Stephens, NSW, 32°36'S, 152°19'E, other details unknown.OTHER MATERIAL. NSW- NTMZ2831, AMZ3605, AMZ3604, AMZ3606, AMZ4216 (RRIMPFN1339), AMZ4256 (RRIMPFN1435), AMZ4255 (RRIMPFN1434), AMZ3207, AMZ3162, AMZ4569 (RRIMP-59PJP), QMG303711, QMG303713.

HABITAT DISTRIBUTION. 12-100m depth; rock platform, heads or outcrops on sand substrate; known only from Australia: Port Stephens, Botany Bay, Coogee, Long Reef, Dee Why, N. Sydney, Port Hacking, Cronulla, Manly (NSW) (Fig. 221E).

DESCRIPTION. *Shape.* Thinly flabellate, up to 80mm long, 55mm wide, with long, thickly cylindrical stalk, very thin lamellae, up to 8mm thick, with slightly digitate or evenly rounded margins.

Colour. Bright red-orange alive (Munsell 5R 5/10 - 10R 6/10), pale brown in ethanol.

Oscules. Not observed.

Texture and surface characteristics. Firm, barely compressible, flexible, slightly spiky; optically smooth, even surface.

Ectosome and subectosome. Ectosome prominently hispid, with pauci- or multispicular plumose brushes of larger, smooth choanosomal principal styles protruding through surface, forming a vestigial radial extra-axial skeleton, arising from pauci- or multispicular tracts of (marginally) smaller smooth principal styles in subectosomal region; subectosomal auxiliary subtylostyles tangential, paratangential, or rarely plumose, at base of protruding choanosomal spicule brushes; peripheral skeleton relatively cavernous in comparison to the central choanosomal skeleton, with moderately heavy mesohyl matrix.

Choanosome. Skeletal structure with 3 distinct components: (1) slightly compressed spongin fibres forming close-meshed anastomoses at core of skeleton, more cavernous towards surface, (2) renieroid skeleton composed of acanthose styles, overlaying other structures; (3) longitudinal, ascending tracts of smooth principal styles, marginally smaller than those protruding through surface, forming subisodictyal tracts at core, more plumose in periphery, and usually (but not invariably) associated with larger spongin fibres; spongin fibres in axial skeleton heavy, 48-82µm diameter, producing irregularly oval or elongate meshes, 32-120µm diameter, cored by uni- or bispicular tracts of smaller, smooth choanosomal principal styles; fibres closer to surface, 19-42µm diameter, regularly anastomosing, wide-meshed, 75-162µm diameter, forming regularly renieroid (triangular) spicule meshes and oval or elongate fibre meshes, cored by uni- or bispicular tracts of smaller acanthose styles; plumose extra-fibre skeleton composed of uni-, pauci- or multispicular ascending tracts of smooth choanosomal styles standing perpendicular to axis, becoming increasingly plumose, larger, and typically multispicular towards periphery; echinating megascleres absent; mesohyl matrix lightly pigmented, with few auxiliary spicules scattered throughout; choanocyte chambers elongate-oval, 36-75µm diameter.

Megascleres. Smooth choanosomal principal styles long, thick, slightly curved or straight, with rounded or very slightly subtylote bases, rarely with basal microspination, fusiform points. Length 117-(232.4)-312µm, width 6-(11.8)-15µm (holotype 168-274x13-17µm).

Acanthose choanosomal styles of renieroid skeleton short, thick, fusiform, slightly curved or straight, with rounded or slightly subtylote bases, lightly microspined bases and points, with fewer spines scattered on shaft, occasionally completely smooth shaft. Length 74-(86.1)-112µm, width 4-(7.2)-8.5µm (holotype 92-127x9-12.5µm).

Subectosomal auxiliary subtylostyles short, thin, usually straight, with prominent subtylote, typically microspined bases, hastate points, abrupt points, or sometimes telescoped or bifid points. Length 134-(183.6)-203µm, width 2.5-(2.9)-3.8µm (holotype 163-243x2-4.5µm).

Echinating megascleres absent.

Microscleres. Absent.

Larvae. Viviparous, parenchymella larvae oval to elongate, 340-420x180-360µm, with central core of juvenile styles, well differentiated cellular construction.

Associations. Obligatory (?) host for nudibranch *Rostanga* sp. (AMC150065) (W. Rudman, pers.comm.).

REMARKS. Hallmann (1920) erected *Isopenectya* for this species based on a renieroid skeleton, with two categories of choanosomal styles, without echinating acanthostyles, and without microscleres. The type species has affinities with *Antho* but differs from other 'plocamid' microcionids (with myxillid-like renieroid skeletons) (viz. *Antho s.s.*, *Dirrhopalum*, *Plocamilla*, *Plocamiopsis*, *Labacea*, *Isociona*, and *Isociella*) in having a compressed axis and more-or-less plumose extra-axial skeletons cored by smooth choanosomal (principal) styles, in one or more size categories, together with the usual renieroid structure overlaying the remainder of the skeleton composed of acanthose (or sometimes smooth) styles different from principal spicules.

This species superficially resembles *Ophlitaspongia tenuis* (Carter) (= *Echinoclathria leporina* (Lamarck)) mainly due to the emphasis of the compressed central skeleton and subrenieroid skeletal structure in both species, whereas megascleres forming these skeletons are quite different. Choanosomal megascleres in *A.* (*I.*) *chartacea* are differentiated: small acanthose styles forming the renieroid skeleton (not echinating fibres), small smooth styles forming a secondary radial ascending skeleton, and larger smooth styles forming the peripheral perpendicular skeleton. By comparison, in *E. leporina* there is a smaller size class of smooth principal style both coring and echinating heavy spongin fibres, forming a renieroid skeletal structure, and a second, larger class of smooth principal style forming a sparse radial or plumose peripheral skeleton (embedded in peripheral fibres). This latter structure links the two groups. *E. riddlei* sp. nov., is also similar in skeletal structure but lacks spined spicules in renieroid skeleton and has a vestigial extra-fibre skeleton perched on the outer surface. *Antho* (*I.*) *chartacea* should be contrasted with the renieroid *Amphinomia* (Raspailiidae), which also has acanthose structural spicules (Hooper, 1991).

Antho (Isopenectya) punicea sp. nov.
(Figs 223-224, Plate 10A)

MATERIAL. HOLOTYPE: QMG304399: Mrs Watson's Bay, midway in bay, Lizard I., Qld, 14°39.5'S, 145°26.7'E, 18m depth, 10.iv.1994, coll. J.N.A. Hooper et al., SCUBA.

HABITAT DISTRIBUTION. Sand, coral rubble, *Halimeda* bed substrata, in depression in sand; 18m depth; Lizard I. (FNQ) (Fig. 223E).

DESCRIPTION. *Shape*. Bushy, subspherical, bulbous clump, 195mm long, 142mm maximum width, 138mm maximum height, composed of individual, erect, digitate projections, each up to 16mm diameter, 75mm high, forming reticulated structure, attached to coral rubble and *Halimeda* on base.

Colour. Dull red alive (Munsell 5R 6/8), light brown in ethanol.

Oscules. Small, up to 2mm diameter, mainly on lateral sides of digits, situated at junction of sur-

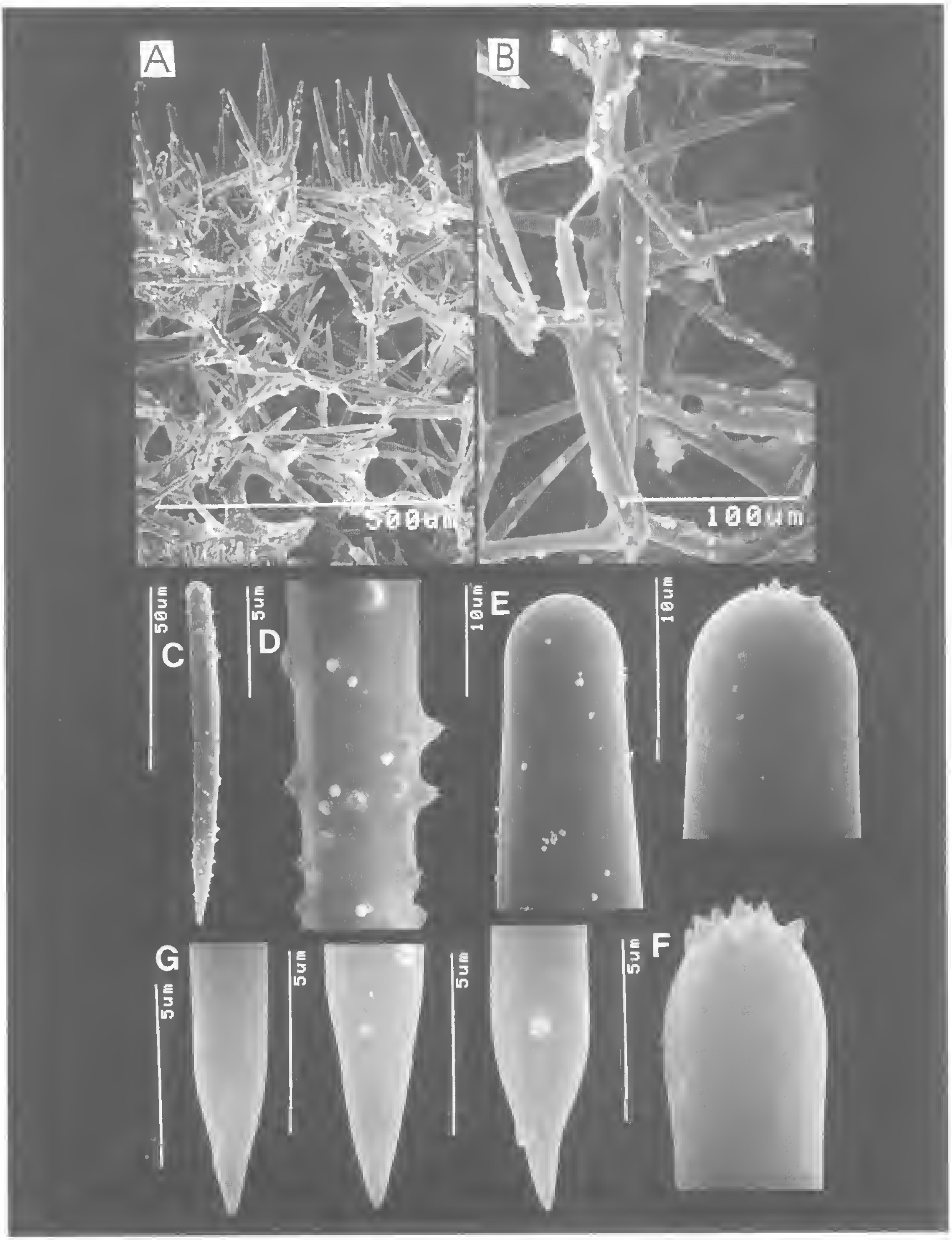

FIG. 222. *Antho* (*Isopenectya*) *chartacea* (Whitelegge) (QMG303711). A, Choanosomal skeleton. B, Fibre characteristics. C, Acanthostyle of renieroid skeleton. D, Acanthostyle spines. E-F, Bases of principal and auxiliary subtylostyles. G, Variability in auxiliary spicule points.

face aquiferous canals, surrounded by collapsible membraneous lip.

Texture and surface characteristics. Firm, compressible, not easily torn; surface turgid in life, with distinctive ectosomal membrane, arterial-like longitudinal aquiferous canals obvious on external surface, branching and interconnecting, opening into common oscules, porous surface between canals; canals, ridges and oscules collapse in air, producing reticulate surface upon dessication; produces abundant red mucus upon exposure.

Ectosome and subectosome. Surface prominently hispid, with longer choanosomal principal styles embedded in peripheral fibres, arising from ascending primary, plumose spicule tracts, extending through surface for most of their length; subectosomal auxiliary subtylostyles tangential, occasionally paratangential, confined to exterior collagenous layer below ectosome, occasionally protruding through surface in plumose brushes; mesohyl matrix heavy in peripheral region.

Choanosome. Skeleton without any compression or marked differentiation between core or subectosomal regions; 3 distinct skeletal components: (1) renieroid skeleton composed of both acanthose styles and smaller smooth principal styles in uni-, bi- or paucispicular tracts, coring small, light spongin fibres up to 25µm diameter, producing rectangular or triangular meshes up to 90µm diameter; (2) plumose, diverging skeleton of smaller smooth choanosomal principal styles in multispicular ascending tracts, diverging towards periphery producing nearly radial skeletal tracts; (3) and with larger, smooth principal styles embedded in peripheral skeleton perpendicular to surface; echinating megascleres absent; mesohyl matrix light, without microscleres but few whispy (? juvenile) auxiliary subtylostyles scattered between fibre meshes; choanocyte chambers small, oval, 25-45µm diameter.

Megascleres. Smooth choanosomal principal styles long or short, slender, slightly curved at centre, with rounded, predominantly smooth bases, occasionally microspined, telescoped points. Length 86-(155.6)-235µm, width 2.5-(3.3)-4µm.

Acanthose styles of renieroid skeleton slender, slightly curved towards base, rounded, sparsely microspined bases, sparsely spined shaft, spines small, erect, conical; points of spicules fusiform. Length 88-(114.9)-153µm, width 2-(3.6)-6µm.

Subectosomal auxiliary subtylostyles variable in length and thickness but only comprising a single category; bases subtylote, microspined, tuberculate (granular) or occasionally smooth, points fusiform or slightly telescoped; whispy juvenile forms present scattered throughout mesohyl. Length 78-(169.8)-296µm, width 0.5-(1.6)-3µm.

Echinating spicules absent.

Microscleres. Absent.

ETYMOLOGY. Latin *puniceus* , reddish.

REMARKS. The bulbous growth form, red colour and production of abundant mucus is common to many other Indo-west Pacific microcionids (such as *C.* (*Isociella*) *eccentrica*, *C.* (*Thalysias*) *vulpina*, *C.* (*T.*) *hirsuta*, *Echinoclathria axinelloides*, and *Echinochalina* (*Protophlitaspongia*) *bargibanti*), but this species belongs to *Antho* (*Isopenectya*) having a renieroid skeleton composed (mainly) of a special category of acanthose styles (geometrically different from choanosomal spicules), a secondary, diverging, plumose skeleton of smaller, smooth choanosomal styles, and larger smooth choanosomal styles embedded in the peripheral skeleton. This latter character is reminiscent of *Echinoclathria*, and it could be argued for its inclusion in this genus on this basis, but the possession of 3 distinctive skeletal structures and acanthose spicules forming the renieroid skeleton support its inclusion in *Antho*.

Antho (*I.*) *punicea* differs from *A.* (*I.*) *chartacea* in growth form, absence of axial skeletal compression, spicule geometry and spicule sizes. The bases of auxiliary spicules in this species are also unusual, varying from swollen bases with prominent terminal spines, granular tubercular swellings, or occasionally completely smooth.

Antho (Isopenectya) saintvincenti sp. nov.
(Figs 225-226)

MATERIAL. HOLOTYPE: SAMS710(TS4035) (fragments QMG300486, NTMZ1671): Lead Light, Port Stanvac, St. Vincent Gulf, SA, 35°06'S, 138°27'E, 7m depth, 16.xi.1977, coll. J. Window & H. Rapp (SCUBA).

HABITAT DISTRIBUTION. Substrate unknown; 7m depth; St. Vincent Gulf (SA) (Fig. 225F).

DESCRIPTION. *Shape.* Erect, arborescent, lamellate-digitate sponge, 235mm long, 130mm wide, with flattened or slightly cylindrical digits, up to 80mm long, 11mm diameter (cylindrical portions), or up to 20mm diameter, 8mm thick (lamellate portions of digits), repeatedly bifurcate, rarely anastomosing, expanding towards

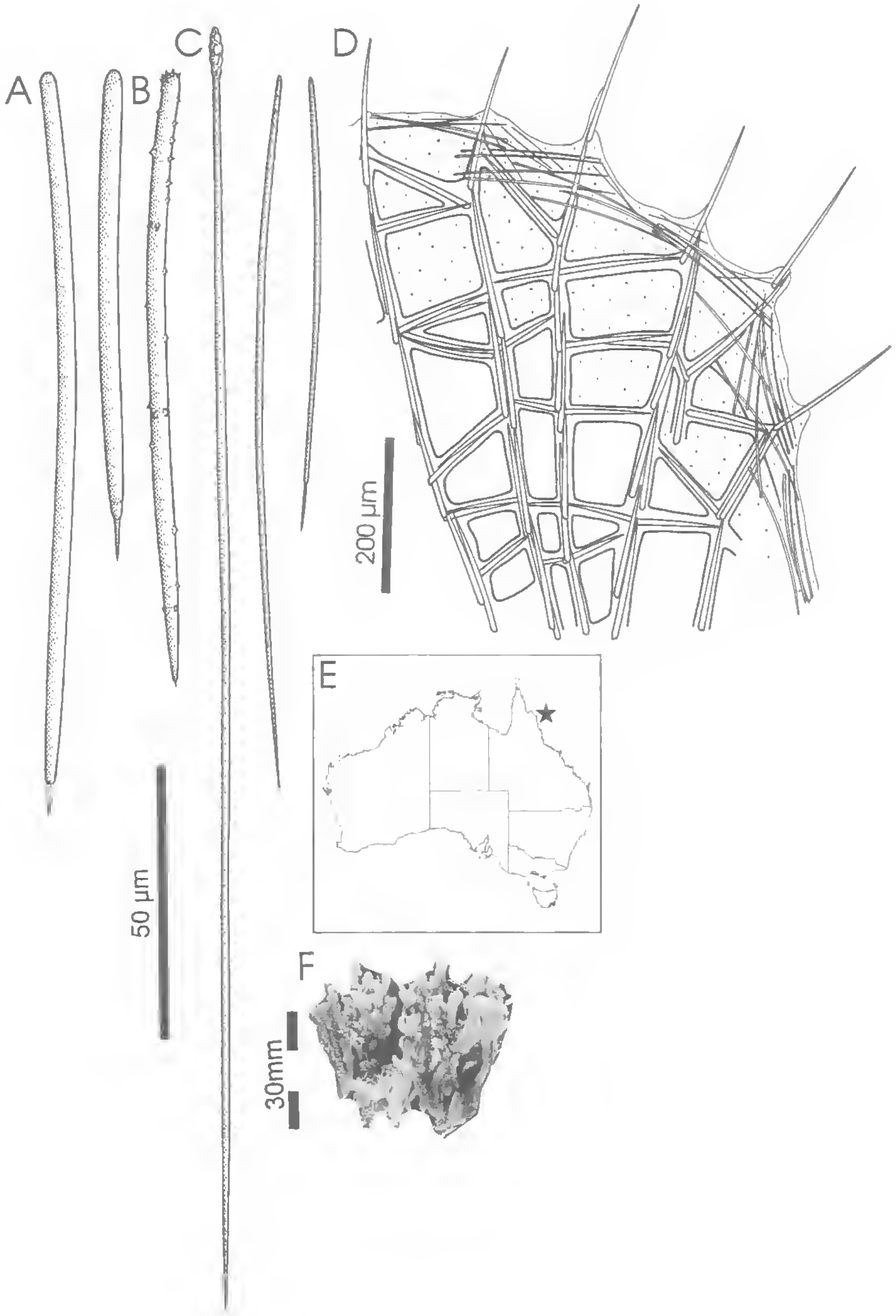

FIG. 223. *Antho* (*Isopenectya*) *punicea* sp.nov. (holotype QMG304399). A, Choanosomal principal styles. B, Acanthostyle of renieroid skeleton. C, Subectosomal auxiliary subtylostyles. D, Section through peripheral skeleton. E, Known Australian distribution. F, Holotype.

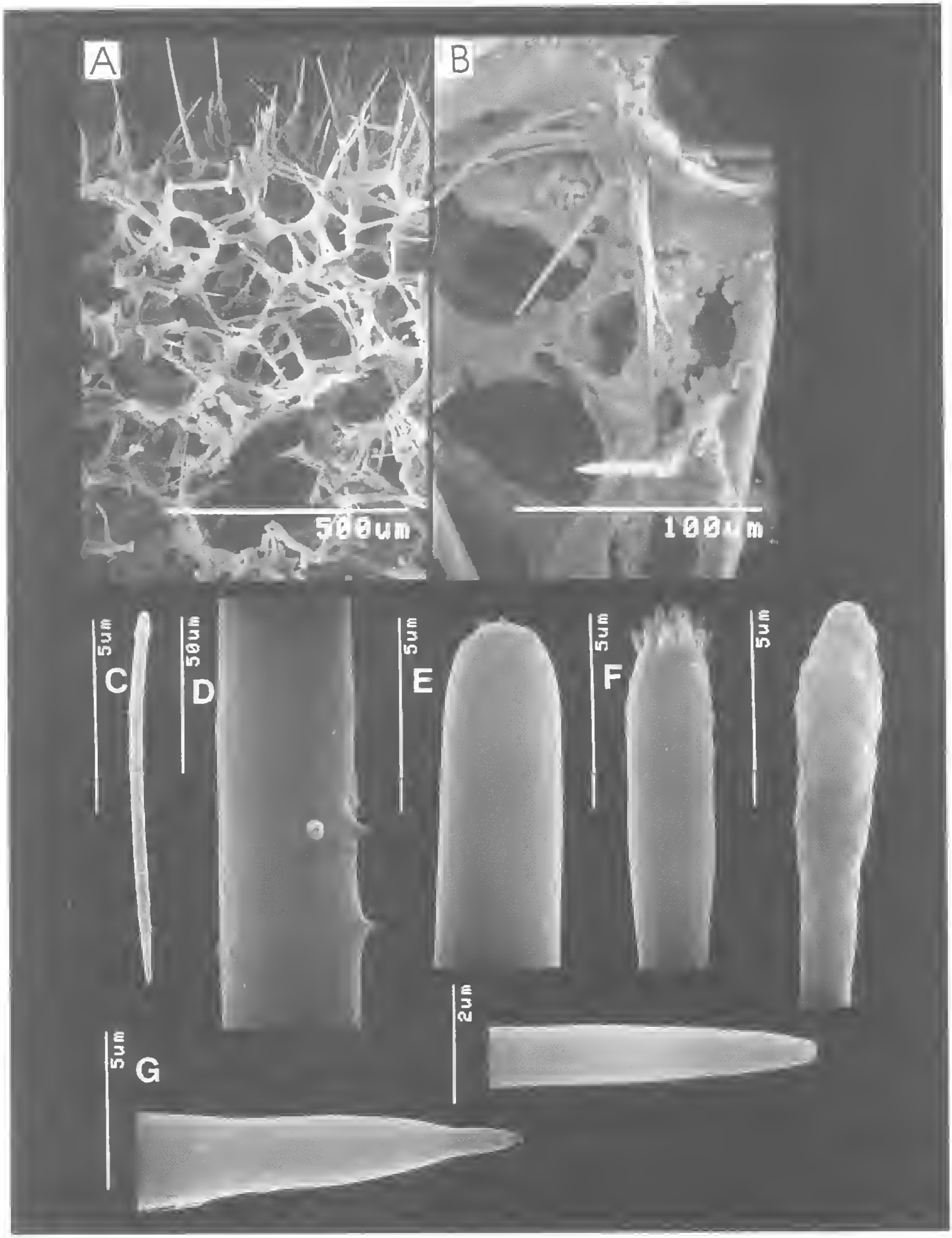

FIG. 224. *Antho* (*Isopenectya*) *punicea* sp.nov. (holotype QMG304399). A, Choanosomal skeleton. B, Fibre characteristics. C, Acanthostyle of renieroid skeleton. D, Acanthostyle spines. E-F, Bases of principal and auxiliary subtylostyles. G, Points of subectosomal auxiliary subtylostyles.

spatula-like ends; short cylindrical basal stalk, 45mm long, 8mm diameter, and expanded basal attachment.

Colour. Beige-brown in ethanol.

Oscules. Small, probably contractile, 1-2mm diameter in preserved state, on edges of flattened digits.

Texture and surface characteristics. Firm, compressible, flexible; surface smooth, even, unornamented, finely porous in preserved state.

Ectosome and subectosome. Ectosome membraneous, microscopically hispid, with larger, smooth principal styles protruding through surface individually or in sparse, erect, plumose brushes arising from terminal subisodictyal spicule tracts; subectosomal auxiliary subtylostyles also protruding through surface in association with longer principal styles, in paratangential or plumose tracts; mesohyl matrix in peripheral skeleton light, poorly pigmented.

Choanosome. Skeleton regularly renieroid reticulate, slightly more compressed at core than periphery, with 3 components; (1) renieroid skeleton composed of differentiated axial and extra-axial regions; axial fibres heavy, homogeneous, without clearly differentiated primary or secondary elements, 40-60μm diameter, slightly more bulbous at fibre nodes, 70-90μm diameter; all axial fibres cored by uni- or paucispicular tracts of acanthose principal styles forming rectangular or less often triangular meshes, 70-100μm diameter; extra-axial fibres lighter, with differentiated primary, ascending fibres, 20-40μm diameter, cored by paucispicular tracts of both acanthose principal styles and smaller, smooth principal styles, becoming increasingly plumose towards surface, projecting from fibre nodes in particular as plumose brushes; primary fibres interconnected by uni- or paucispicular tracts of acanthose principal styles coring light spongin fibres, 15-30μm diameter; (2) plumose, diverging skeleton of smaller smooth choanosomal principal styles intermixed with acanthose spicules in primary ascending tracts, diverging towards periphery, together producing nearly radial skeletal tracts; (3) larger, smooth principal styles in plumose brushes protruding through surface, embedded in ascending primary fibres; echinating megascleres absent; mesohyl matrix heavy but only lightly pigmented, with both fully formed and raphidiform subectosomal auxiliary subtylostyles scattered between fibre meshes; choanocyte chambers small, oval, 40-50μm diameter.

Megascleres. Smooth choanosomal principal styles of plumose and radial surface skeleton long or short, thick or slender, slightly curved at centre, rounded or slightly subtylote, smooth bases, fusiform points, entirely smooth shaft. Length 78-(115.4)-156μm, width 4-(6.9)-10μm.

Acanthose styles of renieroid skeleton short, thick, slightly curved at centre, subtylote microspined bases, fusiform pointed, evenly microspined shaft, spines small, granular. Length 76-(84.6)-98μm, width 4.5-(5.9)-8μm.

Subectosomal auxiliary subtylostyles short or long, slender or raphidiform, straight or slightly curved at centre, prominently subtylote, smooth bases, fusiform points. Length 66-(115.7)-198μm, width 1-(1.7)-3μm.

Microscleres. Absent.

ETYMOLOGY. For the type locality.

REMARKS. This species resembles both *Antho* and *Echinoclathria*, having a renieroid architecture and larger, smooth principal styles protruding through the surface. Like *A.* (*I.*) *punicea* it is included in *Antho* because it has a special category of acanthose styles (geometrically different from choanosomal spicules) forming the renieroid skeleton, and a secondary, diverging, plumose skeleton of smaller, smooth choanosomal styles. *Antho* (*I.*) *saintvincenti* differs from *A.* (*I.*) *punicea* in its flattened or cylindrical-digitate, arborescent growth form, reminiscent of *Echinoclathria chalinoides*, although spiculation and skeletal architecture differ substantially.

OTHER SPECIES OF *ANTHO* (*ISOPENECTYA*)

Antho (Isopenectya) primitiva (Burton, 1935)

Clathriella primitiva Burton, 1935c: 73-4, text-fig.6 [Sea of Japan]; Koltun, 1958: 67 [Kuriles]; Koltun, 1959: 186, text-fig.148 [USSR].

MATERIAL. HOLOTYPE: BMNH1938.7.4.93 (fragment BMNH1932.11.17.69). NW Pacific.

Echinoclathria Carter, 1885

Echinoclathria Carter, 1885f: 355.
Ophlitaspongia; of authors; (not Bowerbank, 1866: 14).

TYPE SPECIES. *Echinoclathria tenuis* Carter, 1885f: 355 (by subsequent designation of Burton, 1934a: 562), =*Spongia leporina* Lamarck, 1814: 444.

DEFINITION. Two distinct skeletal components: (1) predominantly renieroid reticulate main skeleton cored by smaller, smooth principal

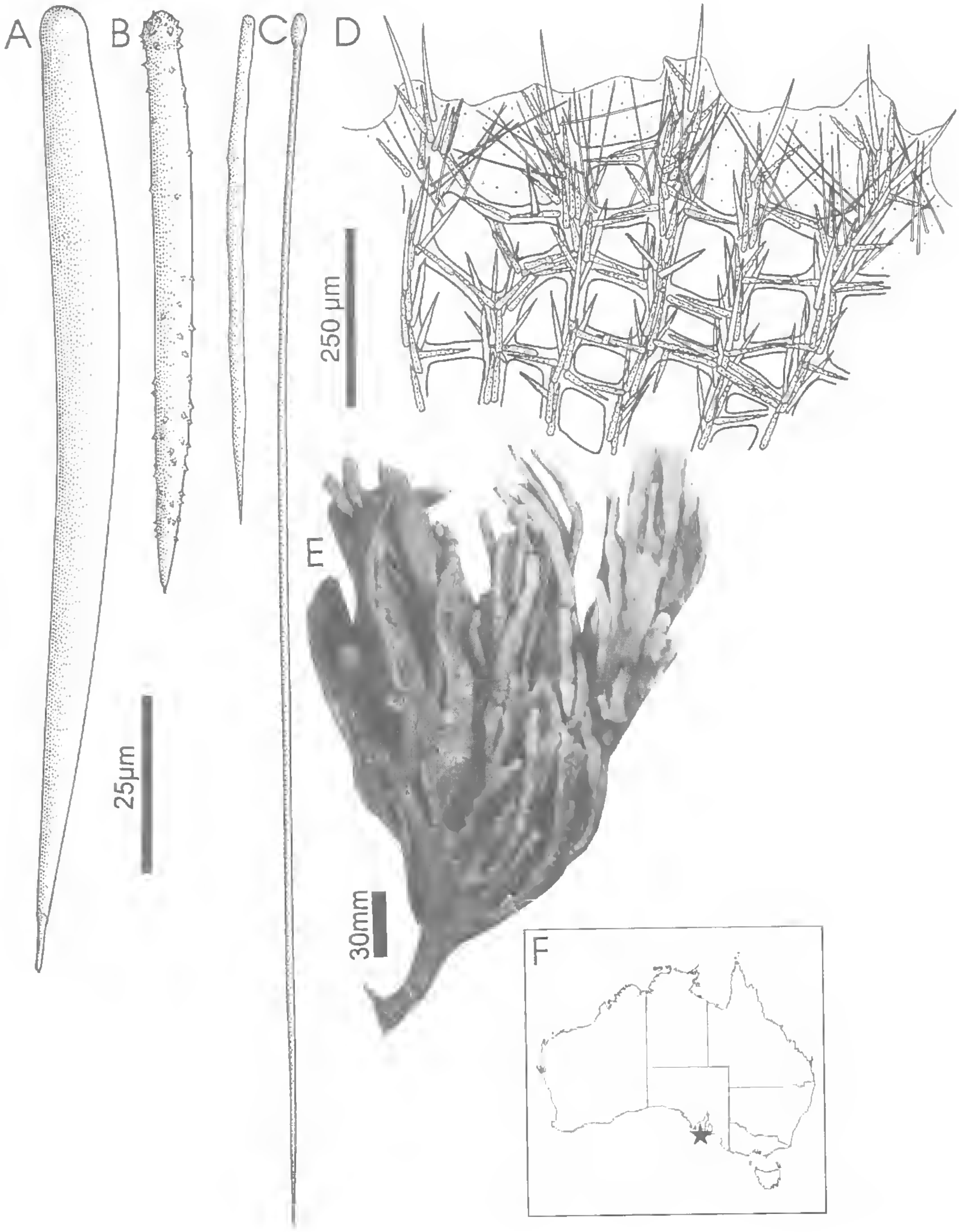

FIG. 225. *Antho* (*Isopenectya*) *saintvincenti* sp.nov. (holotype SAMTS4035). A, Choanosomal principal style. B, Acanthose subtylostyle and modified style of renieroid skeleton. C, Subectosomal auxiliary subtylostyle. D, Section through peripheral skeleton. E, Holotype. F, Australian distribution.

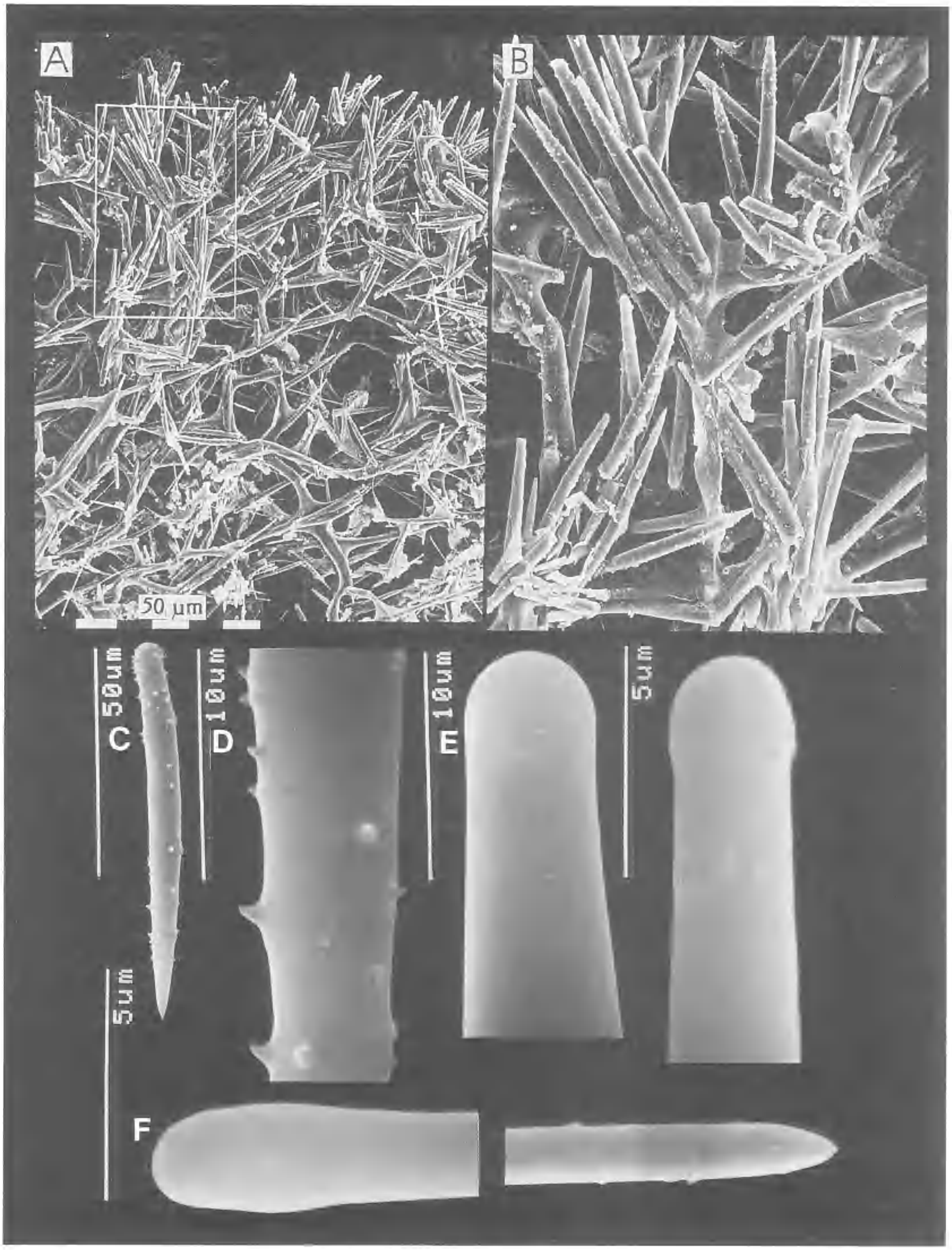

FIG. 226. *Antho* (*Isopenectya*) *saintvincenti* sp.nov. (holotype SAMTS4035). A, Choanosomal skeleton. B, Fibre characteristics (x303). C, Acanthose subtylostyle of renieroid skeleton. D, Acanthostyle spines. E, Bases of principal subtylostyles. F, Base and point of subectosomal auxiliary subtylostyles.

styles, echinated by identical spicules (occasionally absent), typically very well developed spongin fibres sometimes slightly compressed at axis, more openly reticulate towards periphery; and (2) a vestigial radial extra-axial skeleton perched on the external surface, barely extending into choanosome, consisting of larger, smooth principal spicules, with identical geometry to those at core, forming radial or plumose brushes on surface; ectosomal skeleton with single size class of auxiliary subtylostyle lying paratangentially or embedded perpendicular to surface; microscleres include toxas and palmate isochelae.

REMARKS. Sixty nine species have been included in *Echinoclathria* (or one of its synonyms), but only 23 are appropriately referred here. Fourteen species are known from Australia, most restricted to temperate coasts, 5 are new.

Echinoclathria is similar to *Antho* (*Isopenectya*), as noted above, differing in having only 2 skeletal components: a relatively homogeneous renieroid choanosomal skeleton composed of smaller, smooth principal spicules, and vestigial radial extra-axial skeleton on the external surface. *Isopenectya* has in addition a renieroid skeleton of acanthose spicules, and the smooth principal styles form longitudinal tracts extending all the way from the axis to the surface and beyond. Difficulties occur when trying to place species that have reduced structural characters: *A.* (*I.*) *punicea* sp. nov. with spined renieroid spicules; *E. riddlei* sp. nov. with smooth renieroid spicules; both species with a reduced extra-fibre skeleton.

Within *Echinoclathria* most of the variability centres around the development of the extra-fibre skeleton. In some species (e.g., *E. leporina*, *E. confragosa*) there are obvious size differences between principal styles coring fibres in the choanosome and those protruding through the surface, whereas in others (e.g., *E. nodosa*) there is no obvious size differences between principal styles at the core and those at the periphery, although structurally these are similar to the first condition. In others (e.g., *E. egena*, *E. waldoschmitti*) there is further reduction whereby the extra-fibre skeleton is virtually absent and all spicules are vestigial, poorly silicified.

Groupings based on growth form (Hallmann, 1912) show little relationship to groupings made on skeletal characteristics. Thus previous classifications for *Echinoclathria* are rejected here.

Echinoclathria axinelloides (Dendy, 1896)
(Figs 227-228, Plate 10B)

Ophlitaspongia axinelloides Dendy, 1896: 39; Hallmann, 1912: 268-270, pl.36, fig.3, text-fig.58; Burton, 1934a: 599.

Echinochalina axinelloides; de Laubenfels, 1936a: 119.

Echinoclathria axinelloides; Carpay, 1986: 22; Hooper & Wiedenmayer, 1994: 279.

MATERIAL. HOLOTYPE: NMVG2318 (fragment BMNH1902.10.18.342): Port Phillip, Vic, 38°09'S, 144°52'E, 36m depth, coll. J.B. Wilson (dredge). OTHER MATERIAL: VIC- AMZ802, AMZ1593. TAS- QMG300269 (NCIQ66C-3655-O) (fragment NTMZ3804).

HABITAT DISTRIBUTION. Rock reef; 20-36m depth; Port Phillip Bay (Vic); Furneaux Is (Tas) (Fig. 227D).

DESCRIPTION. *Shape.* Erect, club-shaped or arborescent, up to 115mm long, 75mm wide, with thick subcylindrical branches or slightly flattened lamellae, up to 34mm diameter, with rounded even margins, long thick basal stalk, 25-40mm long, 15mm diameter, slightly expanded basal attachment.

Colour. Colour deep red alive (Munsell 2.5R 4/10), pale brown in ethanol.

Oscules. Numerous, moderately small, 2-4mm diameter, mainly on lateral margins of lamellae or on 1 side of branches, slightly raised with membraneous lip.

Texture and surface characteristics. Firm, compressible, rubbery in life; surface optically smooth, minutely reticulated, with distinct membraneous covering.

Ectosome and subectosome. Membraneous, with minutely reticulate, skin-like membrane stretched over surface, microscopically hispid from protruding choanosomal styles forming well developed, multispicular plumose brushes just below surface producing a more-or-less continuous palisade; surface spicule brushes heavier at surface than at core of skeleton; fewer subectosomal auxiliary styles paratangential to surface in association with oscules.

Choanosome. Skeleton more-or-less dendroreticulate, slightly sub-renieroid or irregularly reticulate in some parts, composed of heavy, well developed spongin fibre system incompletely separated into plumose primary and vestigial transverse secondary components; primary fibres (75-148μm diameter) multispicular, cored by distinctly plumose tracts of choanosomal principal styles, whereas secondary fibres (38-72μm

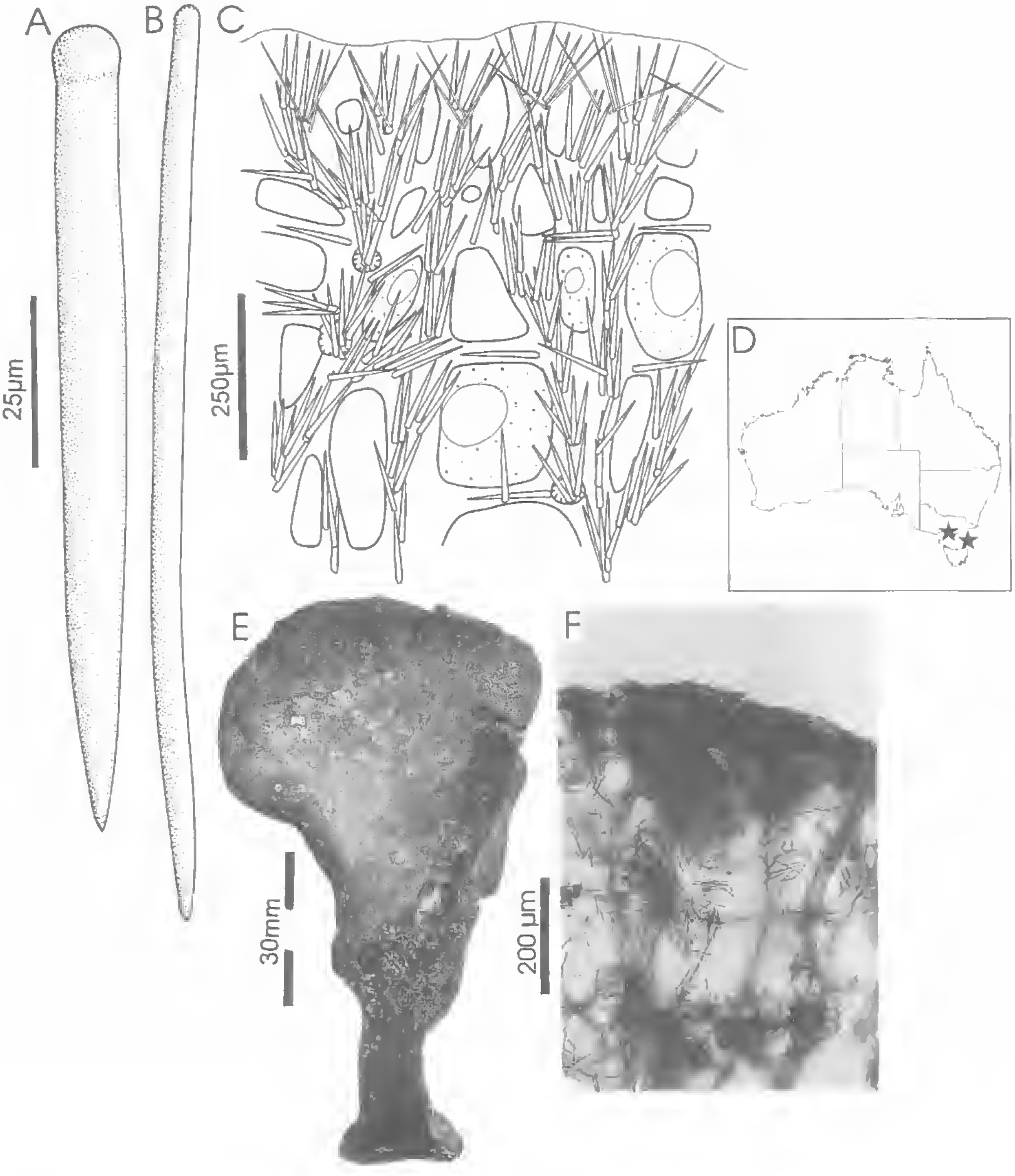

FIG. 227. *Echinoclathria axinelloides* (Dendy) (holotype NMVG2318). A, Principal subtylostyle (coring and echinating fibres). B, Subectosomal auxiliary style. C, Section through peripheral skeleton. D, Australian distribution. E, Holotype. F, Larva *in situ*.

diameter) uni-, bi- or occasionally aspicular; echinating styles sparsely dispersed on fibres mainly confined to primary fibres; fibre anastomoses form oval, elongate or rectangular meshes, 38-195µm diameter, more compact in peripheral skeleton, relatively cavernous towards axis (130-275µm diameter), fibre nodes slightly enlarged, bulbous; choanosomal fibres and spicule tracts become more regular and more compacted towards periphery; mesohyl matrix relatively heavy, granular, with oval to eliptical choanocyte chambers (56-216µm diameter), with both choanosomal and subectosomal megascleres scattered between fibres.

Megascleres. Choanosomal principal styles and subtylostyles, coring and echinating fibres short, thick, straight, with smooth, evenly rounded or very slightly tapering, constricted bases, slightly hastate points, and approximately 5-15% modified to diactinal or quasi-diactinal forms. Length 76-(109.8)-148µm, width 4-(9.8)-14.5µm.

Subectosomal auxiliary styles straight, slightly curved, or rarely sinuous, relatively thick, with smooth, rounded or very slightly subtylote bases, fusiform or slightly telescoped points. Length 96-(144.3)-187µm, width 2.5-(4.1)-5µm.

Microscleres. Absent.

Larvae. Viviparous, parenchymella larvae oval to elongate, 155-275x120-170µm, without larval spicules.

REMARKS. This species differs from other Australasian *Echinoclathria* in its growth form and rubbery texture, having a well developed ectosomal membrane covering a thick ectosomal palisade of principal styles, a dendro-reticulate skeletal structure verging on subrenieroid, its fibre characteristics and spiculation. It is most similar to *E. nodosa* in spicule geometry and gross skeletal architecture although differs in most other respects. Hallmann (1912) suggested his specimen (AMZ802) differed from Dendy's (1896) description having greater fibre diameter, less extensive spicule tract development, and a denser ectosomal skeleton, but comparison between both specimens showed them to be clearly conspecific (i.e., supposed discrepancies were a consequence of Dendy's incomplete description). The collector of AMZ1593 is unknown; the AM register indicates Port Phillip, Vic. That specimen contained numerous small parenchymella larvae.

According to Burton (1934a) the Saville Kent collection contains this species, but this record is questionable as the specimens have not been discovered in the BMNH collections.

Echinoclathria bergquistae sp. nov.
(Figs 229-230, Plate 10C)

MATERIAL. HOLOTYPE: QMG303872: S. of Triangle Reef, Hook Reef, Whitsunday Is region, 19°49.2'S, 149°07.1'E, 28m depth, 09.xii.1993, coll. J.N.A. Hooper & L.J. Hobbs (SCUBA). PARATYPE: QMGL952 (fragment NTMZ1534): E. of Murdock I., Howick Group, Great Barrier Reef, 14°36'S, 145°03'E, 14m depth, 18.ix.1979, coll. A. Kay (trawl).

HABITAT DISTRIBUTION. Coral reef, coral rubble; 14-28m depth; Howick Reefs (FNQ); Hook Reef (MEQ) (Fig. 229F).

DESCRIPTION. *Shape.* Erect or clumped, clathrous digitate mass, 90-110mm high, 65-150mm wide, attached directly to substrate without basal stalk, composed of fused lobate or vaguely cylindrical digits, up to 55mm long, 30mm wide.

Colour. Bright red alive (Munsell 2.5R 5/10), pale brown in ethanol.

Oscules. Small, up to 3mm diameter, with slightly raised membraneous lip alive, scattered on exterior surface of lobate digits.

Texture and surface characteristics. Soft, compressible, fibrous, difficult to tear, produces slight, clear mucus alive (on deck), stains ethanol orange; surface highly clathrous with large, flattened lobate or pointed conules covering exterior surface of digits, 5-15mm long, up to 5mm wide; surface porous in preserved state, membraneous alive.

Ectosome and subectosome. Surface prominently hispid with longer, smooth choanosomal principal styles embedded in peripheral fibres, extending nearly 70% of their full length through surface; near bases of protruding principal styles are relatively heavy multispicular tracts of subectosomal auxiliary subtylostyles, usually tangential to surface; mesohyl matrix in peripheral skeleton heavy but only lightly pigmented; choanosomal fibres extend directly to surface.

Choanosome. Skeleton irregularly renieroid reticulate, slightly compressed at axis, with renieroid structure partially obscured by both larger principal styles echinating and subectosomal auxiliary subtylostyles scattered throughout mesohyl; spongin fibres large, 40-60µm diameter, well developed but only lightly invested with spongin, without any marked differences between thickness of fibres at core or surface; ascending fibres approximately same thickness as transverse fibres but generally longer and containing more coring spicules; ascending fibres pauci- or multispicular, cored by smaller choanosomal principal styles, with 2-5 spicules per tract; transverse connecting fibres generally shorter, containing the same spicules, 1-3 spicules per tract, and both fibres sparsely echinated by same spicules; fibre anastomoses produce elongate-oval meshes; axial fibre

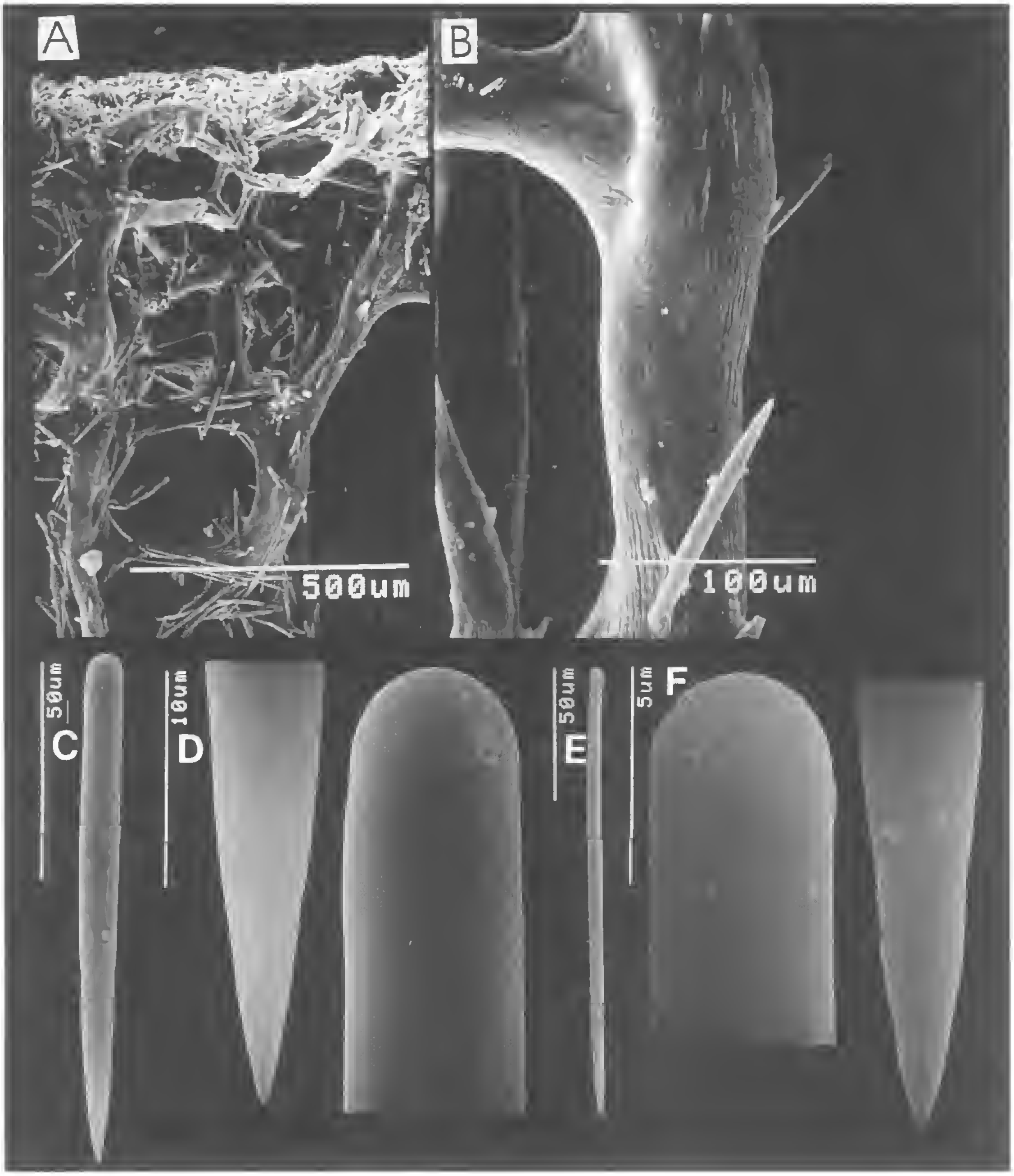

FIG. 228. *Echinoclathria axinelloides* (Dendy) (holotype NMVG2318). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal style. D, Ends of principal style. E, Subectosomal auxiliary style. F, Ends of auxiliary style.

reticulation slightly more compressed than peripheral skeletal network, with meshes up to 90μm diameter in axis, 160μm diameter near surface; in addition to renieroid skeleton of smaller principal styles, larger principal styles also core ascending fibres and echinate fibre nodes especially closer to surface, forming sparse plumose bundles; mesohyl matrix heavy but only lightly pigmented, containing numerous toxas; choanocyte chambers oval, 35-55μm diameter.

Megascleres. Choanosomal principal styles (coring and echinating fibres) variable in length, straight or slightly curved at centre, with rounded bases, predominantly smooth but occasionally microspined, fusiform points. Length 71-(149.8)-309µm, width 2.5-(5.6)-12µm.

Subectosomal auxiliary subtylostyles long, slender, straight, subtylote, smooth or less commonly microspined bases, fusiform points; numerous smaller and raphidiform styles also scattered through mesohyl presumably being younger forms. Length 203-(356.7)-480µm, width 2-(3.7)-6µm.

Microscleres. Palmate isochelae not common, relatively large, with short thin alae, lateral alae completely fused to shaft, front ala nearly completely detached from lateral alae, shaft straight. Length 18-(24.2)-32µm.

Toxas wing-shaped, relatively thick, with slightly rounded central curvature, slightly reflexed points. Length 32-(49.7)-68µm, width 0.5-(1.9)-3.0µm.

ETYMOLOGY. For Dame Professor Patricia Bergquist for her work on Indo-Pacific sponges.

REMARKS. Generic placement is not straight forward, with affinities to *Echinoclathria* and *Antho* (*Isopenectya*). The smaller, smooth choanosomal principal styles coring and echinating all spongin fibres, producing an irregularly renieroid reticulation, a vestigial radial skeleton of larger, smooth principal styles protruding through the surface, and a slightly compressed axial region are typical of *Echinoclathria*, and in this respect the species is similar to *E. leporina*. However, the larger principal styles coring the ascending spongin fibres, occasionally echinating fibre nodes, is reminiscent of *Antho* (*Isopenectya*). It is included in *Echinoclathria* because the ascending tracts of larger principal styles do not form a subisodictyal skeleton; rather, these spicules end abruptly at fibre nodes in sparse plumose brushes and usually do not form continuous tracts. This evidence it weak and illustrates the difficulty in separating some species in both genera.

This species is distinct from other *Echinoclathria* in toxa morphology and plumose brushes/tracts of larger principal styles within the choanosome.

Echinoclathria chalinoides (Carter, 1885)
(Figs 231-232)

Axinella chalinoides Carter, 1885f: 358; Carter, 1886g: 377 [et varr *glutinosa*, *cribrosa*].

Axinella cladoflagellata Carter, 1886g: 377.

Echinochalina chalinoides; de Laubenfels, 1936a: 119.

Ophlitaspongia chalinoides; Dendy, 1896: 36.

Echinoclathria chalinoides; Hooper & Wiedenmayer, 1994: 279.

Not *Ophlitaspongia chalinoides*; Hallmann, 1912: 270-272, text-fig.59.

MATERIAL. LECTOTYPE: BMNH1886.12. 15.401 (dry): Port Phillip, Vic, 38°09'S, 144°52'E, coll. J.B. Wilson (dredge). PARALECTOTYPES: BMNH1886.12.15.402 (dry) (fragment AMG2900a): same locality. BMNH1886.12.15.403 (dry) (fragment AMG2900b): same locality. HOLOTYPE of *A. cladoflagellata*: BMNH1886.12.15.407: same locality as lectotype.

HABITAT DISTRIBUTION. Ecology unknown; Port Phillip (Vic) (Fig. 231D).

DESCRIPTION. *Shape.* Arborescent branching, up to 250mm long, 170mm maximum width, with small basal stalk up to 45mm long, 22mm diameter, long cylindrical branches up to 105mm long, 9mm diameter, slightly flattened, bifurcating repeatedly, rarely anastomosing.

Colour. "Dull brick-red" alive (Carter, 1885e), pale brown in ethanol and dry.

Oscules. Large, up to 4mm diameter, scattered mainly on lateral sides of branches, with series of radial subectosomal drainage canals radiating towards each oscule, and slightly raised membraneous lip.

Texture and surface characteristics. Soft, compressible but difficult to tear, flexible branches, more rigid stalk; surface slightly microconulose, with fine surface network of radiating spicules associated with aquiferous system.

Ectosome and subectosome. Membraneous, with points of larger principal styles protruding through surface, singly or in paucispicular brushes, for up to 30% of their length, and also with subectosomal auxiliary styles lying paratangential to surface; subectosomal region slightly cavernous, meshes up to 450µm diameter, substantially more wider-meshed than in axial region skeleton.

Choanosome. Skeletal architecture dendroreticulate, vaguely subrenieroid and more regular towards periphery than axis, composed of heavy, well developed spongin fibres, 25-70µm diameter, thicker and slightly bulbous at fibre

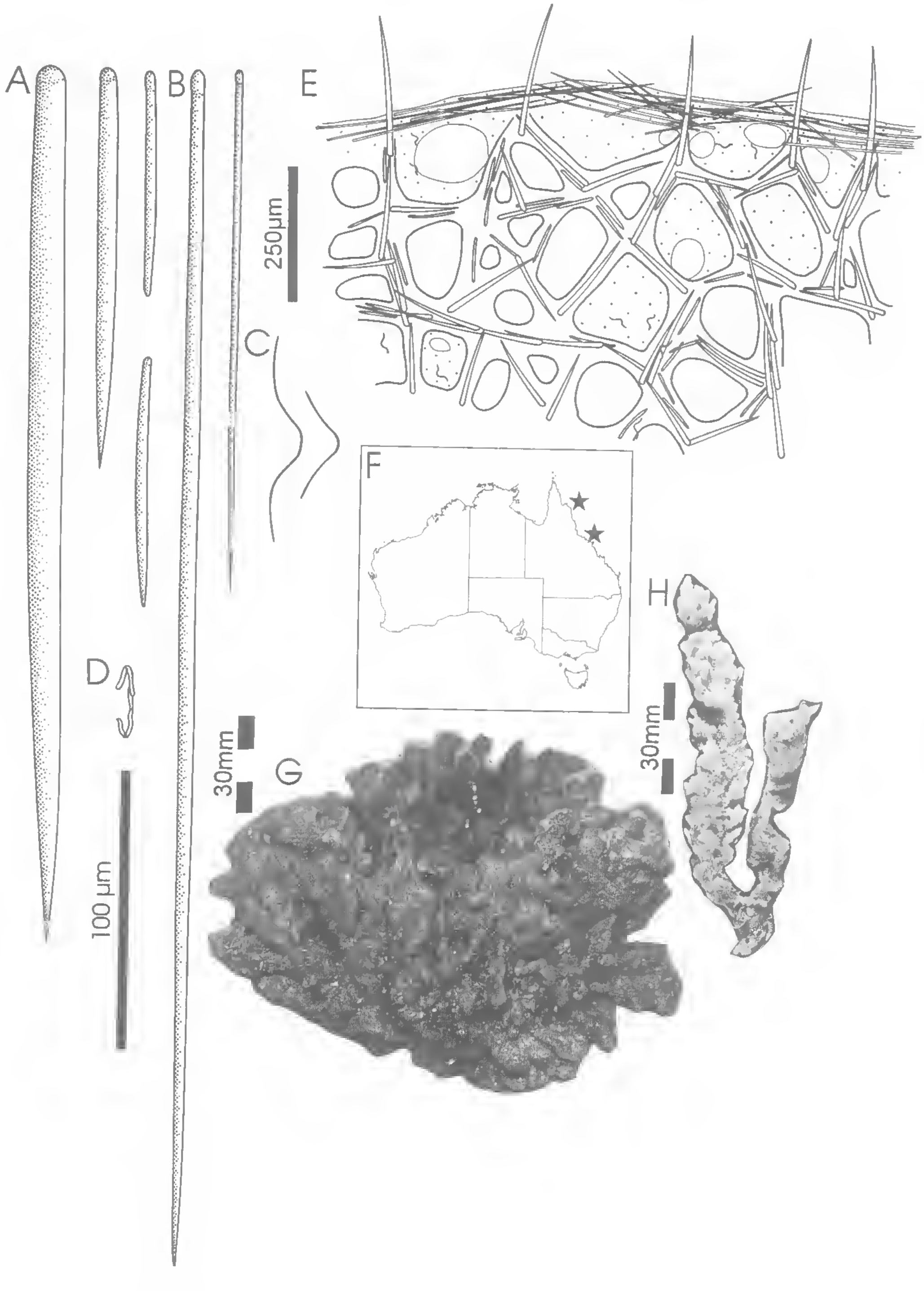

FIG. 229. *Echinoclathria bergquistae* sp.nov. (holotype QMG303872). A, Principal style/ subtylostyles (coring and echinating fibres). B, Subectosomal auxiliary subtylostyles. C, Wing-shaped toxas. D, Palmate isochela. E, Section through peripheral skeleton. F, Known Australian distribution. G, Paratype QMGL952. H, Holotype.

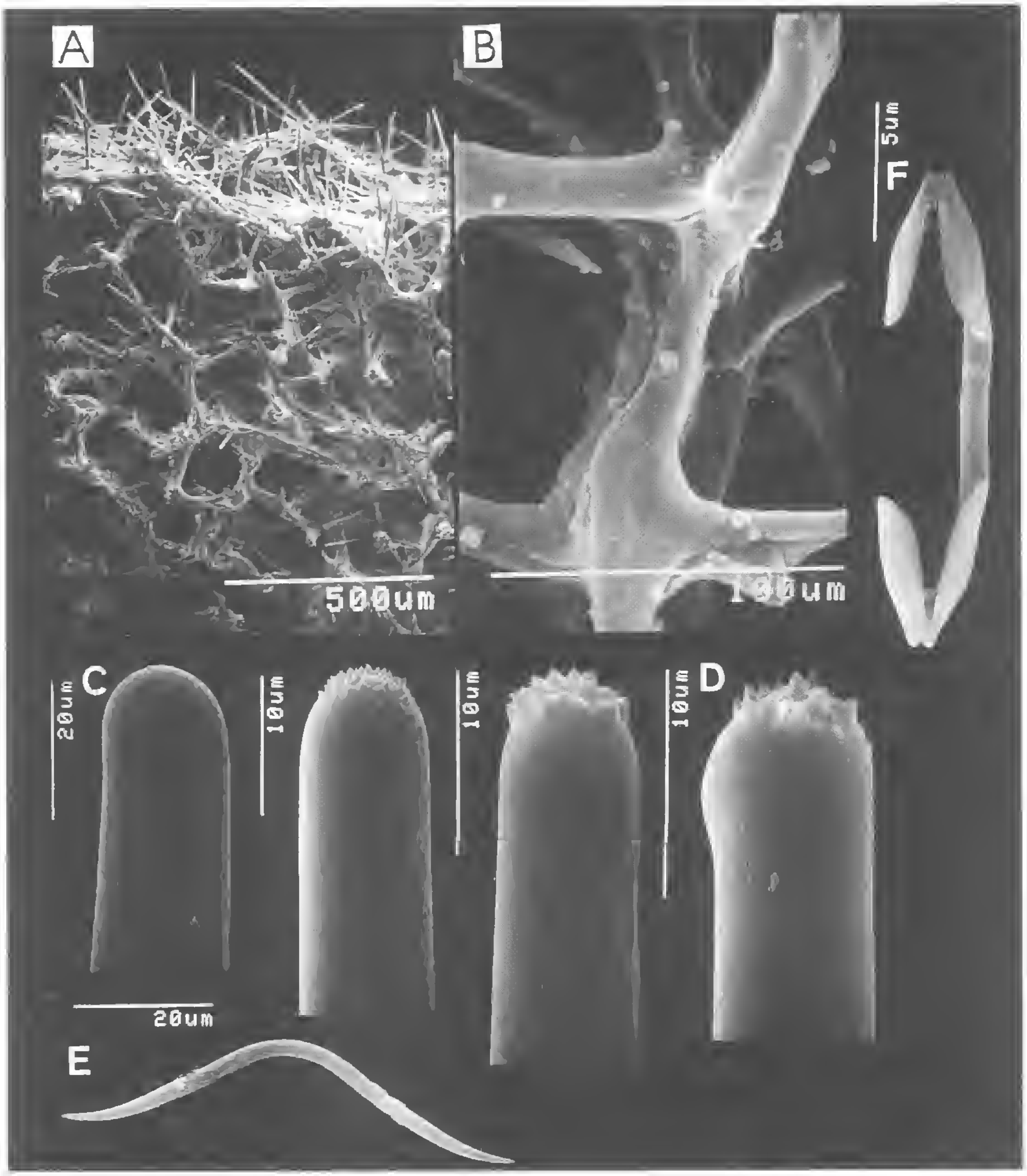

FIG. 230. *Echinoclathria bergquistae* sp.nov. (holotype QMG303872). A, Choanosomal skeleton. B, Fibre characteristics. C-D, Bases of principal and auxiliary styles. E, Wing-shaped toxa. F, Palmate isochela.

nodes, without any marked differentiation between primary and secondary components but substantially compressed in axis and diverging near surface; ascending fibres slightly sinuous, larger than transverse fibres, containing pauci- or multispicular core of more-or-less plumose tracts of choanosomal styles; in periphery these tracts form radial bundles and composed predominantly of longer spicules whereas towards core of skeleton coring spicules generally smaller and contained mainly within fibres; transverse connecting fibres uni-, bi- or aspicular; echinating

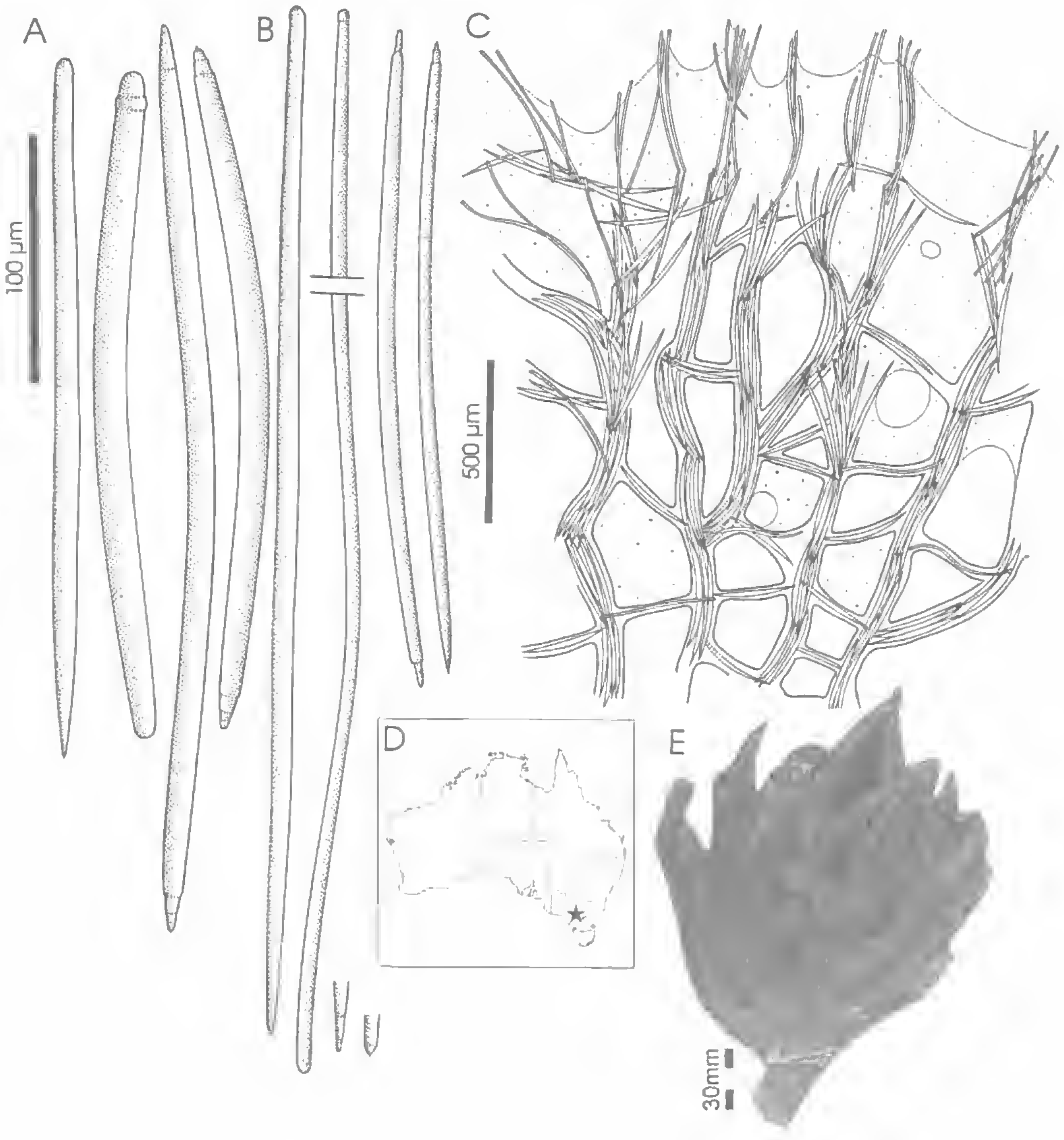

FIG. 231. *Echinoclathria chalinoides* (Carter) (lectotype BMNH1886.12.15.401). A, Principal styles and anisostyles (coring and echinating fibres). B, Subectosomal auxiliary styles and anisostyles. C, Section through peripheral skeleton. D, Australian distribution. E, Lectotype.

megascleres not definitely present, although choanosomal principal styles protrude through fibres at oblique angles ('quasi-echinating'); fibre anastomoses form circular, polygonal or triangular meshes, 90-320µm diameter in axis; mesohyl matrix heavy but only lightly pigmented, with ovoid choanocyte chambers (90-120µm diameter), and numerous subectosomal auxiliary styles dispersed throughout.

Megascleres. Choanosomal principal styles, anisostyles or anisoxeas (asymmetrical), thin, slightly curved at centre, occasionally straight, entirely smooth, bases rounded or slightly tapering, sometimes subtylote or telescoped, with has-

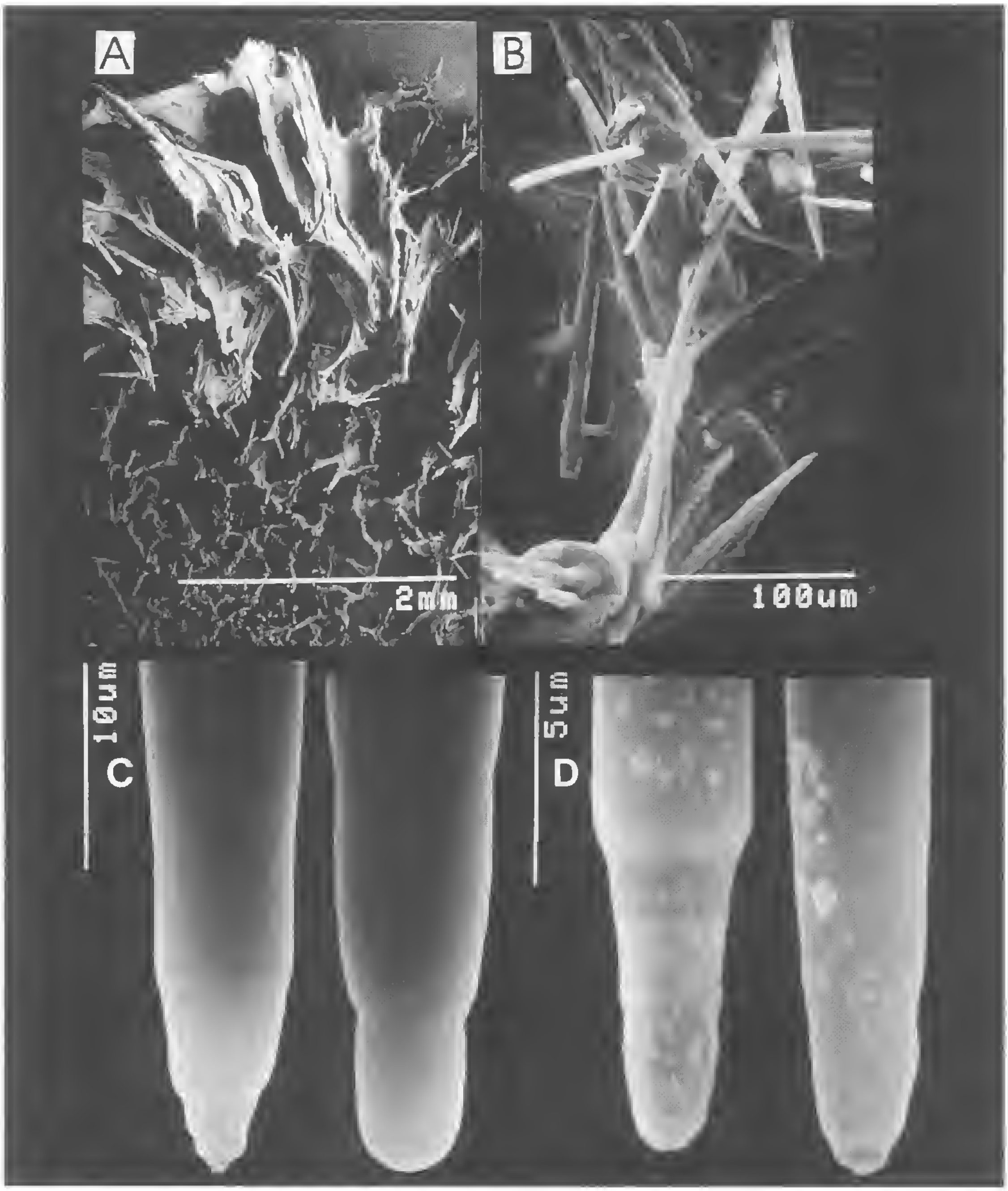

FIG. 232. *Echinoclathria chalinoides* (Carter) (lectotype BMNH1886.12.15.401). A, Choanosomal skeleton. B, Fibre characteristics. C-D, Bases of principal and auxiliary anisostyles.

tate or telescoped points, rarely completely modified to quasidiactinal forms (symmetrical ends). Length 176-(264.7)-325μm, width 8-(10.8)-13μm.

Subectosomal auxiliary styles, anisostyles or anisoxeas with similar geometry to principal spicules but generally longer, more slender, straight or occasionally slightly curved or sinuous, with smooth rounded bases, sometimes

telescoped, fusiform or telescoped points. Length 243-(315.5)-365µm, width 4-(5.3)-8µm.
Microscleres. Absent.

REMARKS. This species is restricted to the type material following re-examination of a number of other specimens assigned here (Hallmann, 1912) which were misidentifications. Hallmann's (1912: 270) concept and illustrations are rejected here. It is presumed that he based his descriptions on several older AM specimens from Port Phillip, allegedly donated to the Museum by Carter but their spiculation and skeletal structures are quite different from the types (see *E. subhispida*).

Echinoclathria chalinoides has a markedly compressed axial skeleton composed of heavy fibres and close-meshed spicule tracts together forming a dendro-reticulate skeleton; the skeleton becomes very wide-meshed near the surface, composed of poorly developed fibres and spicule tracts become more plumose; and coring/echinating spicules are predominantly anisostyles. Dendy (1896) suggested that it was a synonym of *E. subhispida* given their similarities in having a *Haliclona*-like branching growth form, distribution of oscules on lateral margins, soft compressible texture, and very heavy spongin fibres producing a compressed axial skeleton. However, there are major differences between these species in spicule geometries and skeletal architectures showing that they are not closely related.

Echinoclathria confragosa (Hallmann, 1912)
(Figs 233-234)

Ophlitaspongia confragosa Hallmann, 1912: 255-257, pl.35, fig.2, text-fig.53.
Axociella confragosa; de Laubenfels, 1936a: 113.
Echinoclathria confragosa; Hooper & Wiedenmayer, 1994: 279.

MATERIAL. HOLOTYPE: AMZ992 (dry): Shoalhaven Bight, NSW, 34°49'S, 151°04'E, 30-90m depth, 1.vii.1911, coll. FIV 'Endeavour' (trawl).

HABITAT DISTRIBUTION. Epizootic on Bryozoa; 30-90m depth; S. coast (NSW) (Fig. 233F).

DESCRIPTION. *Shape.* Irregularly digitate, lamellate branches, up to 50mm high, 5mm thick, arising from semi-encrusting base; branches vary from cylindrical to flattened lamellate, bifurcating and anastomosing, forming loose reticulate mass, with shaggy lobate surface projections on points of branches.
Colour. Grey-brown in dry state.
Oscules. Not seen.
Texture and surface characteristics. Firm, compressible, brittle, fibrous; surface porous, pitted, slightly arenaceous.
Ectosome and subectosome. Membraneous ectosome, microscopically hispid, with principal subtylostyles erect on peripheral fibres, singly or in bundles of up to 3 spicules, protruding through surface for most of their length and forming a sparse, vestigial, radial extra-axial skeleton; subectosomal auxiliary styles form tangential and paratangential tracts on surface; thickness of ectosomal skeleton ranges from tangential (three spicules abreast) to paratangential (tracts of up to 20 spicules at obtuse angles to surface, forming low microconules).
Choanosome. Irregularly renieroid reticulate skeleton, more-or-less homogenous throughout; spongin fibres thin, relatively light, 18-48µm diameter, without any obvious differentiation between primary or secondary components; fibres cored by uni- or paucispicular tracts of choanosomal principal styles, occasionally aspicular, echinated by choanosomal styles sparsely and irregularly dispersed over fibres; fibre meshes predominantly rectangular (=renieroid), less often oval or triangular (=isodictyal), 112-345µm diameter, slightly more cavernous at core and more compacted in peripheral regions of skeleton; mesohyl matrix heavy but only lightly pigmented, oval choanocyte chambers 52-110µm diameter; numerous microscleres, subectosomal auxiliary styles, and also few choanosomal styles scattered between fibres.
Megascleres. Choanosomal principal subtylostyles (coring and echinating fibres) short, thick, straight, with smooth, slightly constricted subtylote bases, almost hastate points, slightly rounded, telescoped or pointed. Length 142-(164.8)-197µm, width 5-(9.6)-12µm.

Subectosomal auxiliary styles long, thin or thick, straight, slightly curved or sinuous, with smooth, slightly subtylote or rounded bases, fusiform points, sometimes slightly telescoped. Length 136-(214.4)-291µm, width 3.5-(5.1)-6µm.
Microscleres. Palmate isochelae abundant, small, poorly silicified, lateral alae completely fused to shaft, front ala detached from lateral alae for most of length, both alae sculptured with marginal ridges; shaft without any curvature. Length 8-(10.6)-14µm.

Toxas oxhorn, small, thick, with slight to moderate, evenly rounded central curvature, straight arms, slightly reflexed points. Length 32-(58.2)-95µm, width 1-(2.2)-3.5µm.

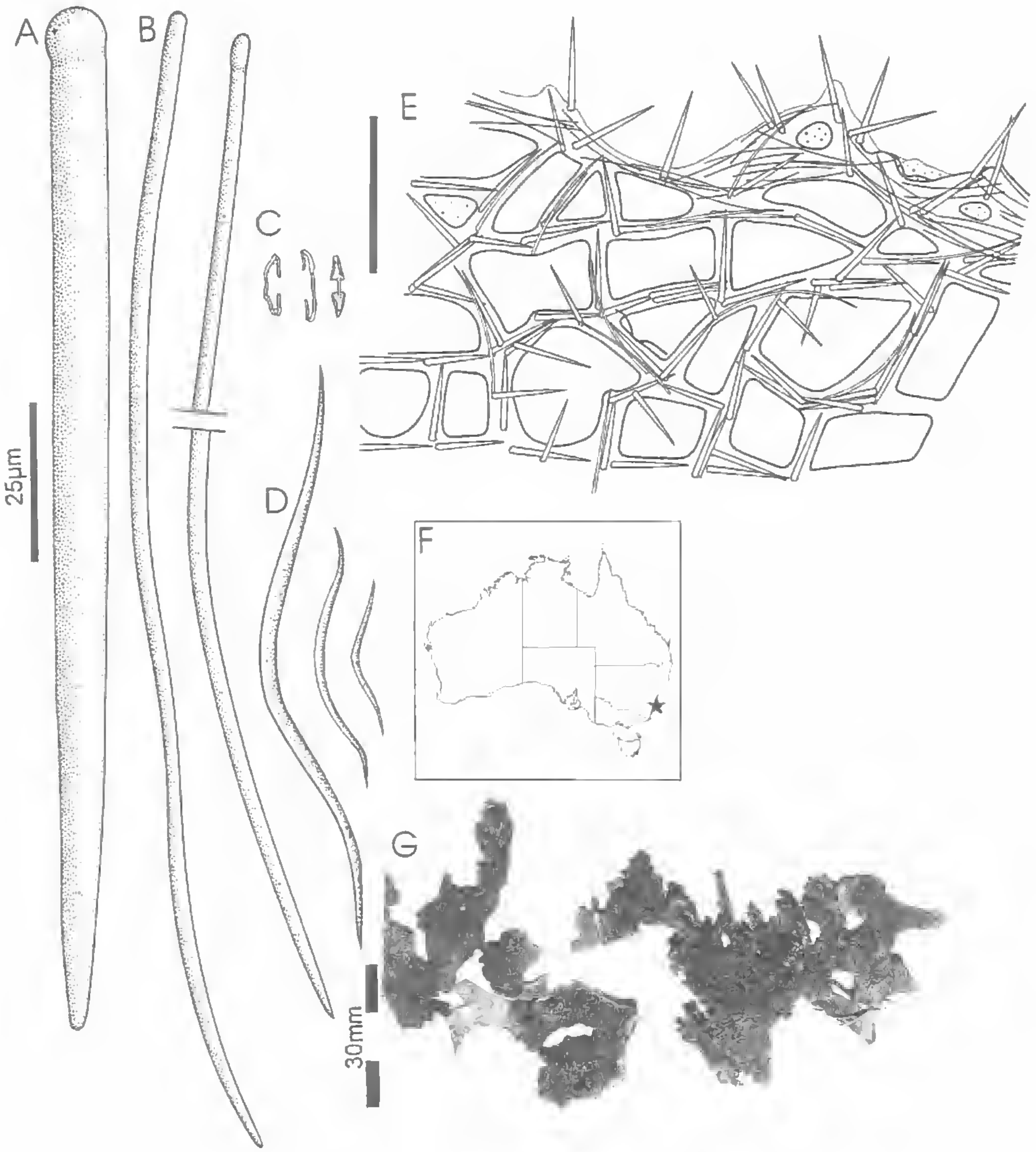

FIG. 233. *Echinoclathria confragosa* (Hallmann) (holotype AMZ992). A, Principal subtylostyle (coring and echinating fibres). B, Subectosomal auxiliary style and subtylostyle. C, Palmate isochelae. D, Oxhorn toxas. E, Section through peripheral skeleton. F, Australian distribution. G, Holotype.

REMARKS. *Echinoclathria confragosa* is only known only from a single specimen which differs notably from all other species in several important respects: encrusting lamellate-digitate growth form; more-or-less homogeneous renieroid (*Haliclona*-like) skeletal architecture (see also *E. notialis* sp. nov.); retaining only the vestiges of a radial extra-axial skeleton on the extreme outer edge of the ectosomal region; having a relatively thick tangential and paratangential ectosomal skeleton covering most of the surface; and distinctive oxhorn toxa morphology.

Echinoclathria digitata (Lendenfeld, 1888)

(Figs 235-236, Plate 10D)

Thalassodendron digitata Lendenfeld, 1888: 223.
Echinochalina digitata; Thiele, 1903a: 962; Hooper & Wiedenmayer, 1994: 277.

MATERIAL. HOLOTYPE: Missing from AM and BMNH collections. NEOTYPE: QMG304763: NW. of Snake Reef, Howick Gp., Great Barrier Reef, Qld, 14°28.6'S, 145°04.6'E, 21m depth, 03.ix.1994, coll. J.A. Kennedy (trawl).

HABITAT DISTRIBUTION. Soft substrata inter-reef region; 21m depth; Torres Strait and Howick Reefs (FNQ) (Fig. 235E).

DESCRIPTION. *Shape*. Bushy, clathrous mass of erect, bifurcate digits 54mm high, 76mm wide; digits short, stout, claviform, subcylindrical, bulbous, expanding and slightly flattened towards apical extremities, up to 32mm long, 6mm wide, bifurcating several times, occasionally anastomosing, with 1 or more blind branches; mass growing from a semi-encrusting common base.

Colour. Bright red alive (Munsell 5R 4/10), grey-brown in ethanol.

Oscules. Small, up to 3mm diameter, on apex of each digit.

Texture and surface characteristics. Firm, compressible, flexible, fibrous; surface bulbous, prominently microconulose, hispid.

Ectosome and subectosome. Membraneous, granular collagenous heavier than in choanosomal mesohyl, with protruding primary fibres from ascending choanosomal skeleton and plumose bundles of principal subtylostyles erect on surface producing hispid ectosome; sparse tracts of thinner auxiliary styles tangential to surface.

Choanosome. Skeletal architecture more-or-less renieroid reticulate, with heavy spongin fibres producing wide-meshed rectangular reticulation; primary ascending fibres long, multispicular 60-90μm diameter, interconnected by numerous, shorter, secondary fibres, 30-55μm diameter cored by 1 or few principal spicules; fibres sparsely echinated by principal subtylostyles, identical to but marginally thicker than those coring fibres, confined mostly to distal margins (periphery) of fibres; fibre anastomoses produce cavernous meshes, 80-320μm diameter; mesohyl matrix sparse in choanosome, lightly pigmented, granular, containing numerous whispy auxiliary styles and fewer microscleres; choanocyte chambers elongate 20-30μm diameter.

Megascleres. Principal subtylostyles coring and sparsely echinating fibres short, moderately thick, straight or slightly curved at centre, entirely smooth, with slightly subtylote bases, bluntened or slightly telescoped points. Length 186-(214.4)-238μm, width 4-(4.6)-7μm.

Auxiliary styles very similar in geometry to principal spicules except for being much thinner, whispy, and lacking subtylote bases); auxiliary styles straight or sinuous, rounded bases, pointed or telescoped points. Length 182-(204.2)-246μm, width 1.5-(1.9)-2.5μm.

Microscleres. Palmate isochelae small, unmodified, long lateral alae approximately same length as front ala, entirely fused to shaft, front alae nearly completely detached. Length 10-(11.7)-13μm.

REMARKS. Lendenfeld's (1888) original material is not extant in the collections of either the AM or BMNH, but we know from his brief description that the species has a growth form reminiscent of *Ciocalypta* (Halichondrida) and spiculation of *Echinoclathria* or *Echinochalina*. The specimen described here from the Howick Islands group, close to the type locality of Torres Strait, agrees completely with Lendenfeld's (1888) brief description and is nominated neotype of this species.

Echinoclathria digitata is similar to *E. bergquistae* in its digitate growth form and having a cavernous, predominantly renieroid, reticulate skeletal architecture. It differs from *E. bergquistae* in geometry and dimensions of all its spicules, lacking toxa microscleres, and having relatively homogeneous megascleres throughout the skeleton, coring and echinating tracts and scattered interstitially. In possessing relatively homogeneous megascleres *E. digitata* also resembles *E. levii*, although the latter has completely different skeletal architecture, growth form and toxa microscleres.

Echinoclathria egena Wiedenmayer, 1989

(Figs 237-238, Plate 10E)

Echinoclathria egena Wiedenmayer, 1989: 64-66 pl.6, fig.8, pl.24, fig.6, pl.25, figs 1-2, text-fig.44; Hooper & Wiedenmayer, 1994: 279.

MATERIAL. HOLOTYPE: NMVF51978: Winter Cove, E. side of Deal I., Kent Group, Bass Strait, Tas, 39°29'S, 147°20'E, 26.iii.1981, 3-6m depth, coll. F. Wiedenmayer et al. (SCUBA). OTHER MATERIAL: TAS- QMG300669 (NCIQ66C-3721-L) (fragment NTMZ3817).

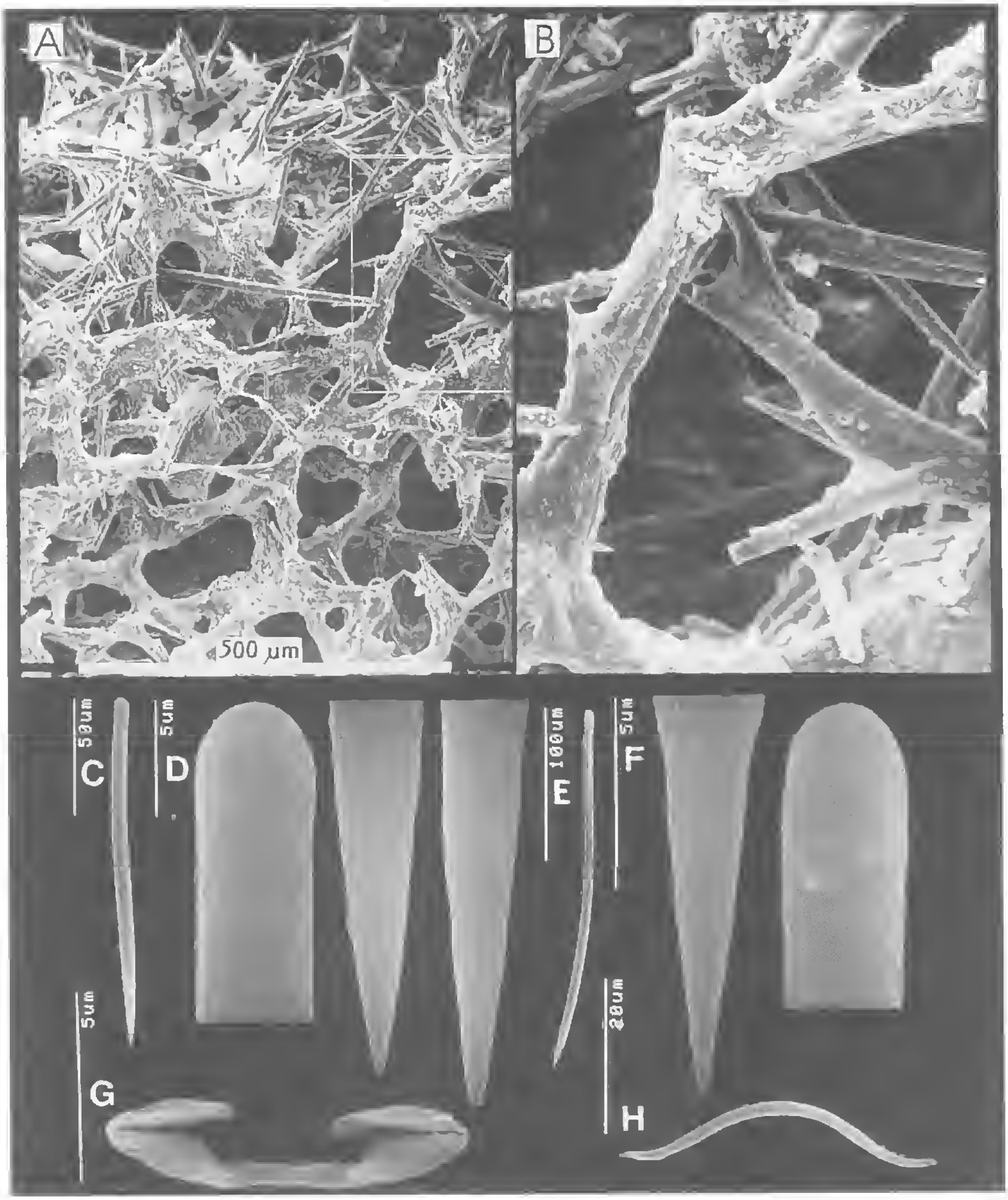

FIG. 234. *Echinoclathria confragosa* (Hallmann) (holotype AMZ992). A, Choanosomal skeleton. B, Fibre characteristics (x288). C, Choanosomal principal subtylostyle (coring and echinating fibres). D, Ends of principal subtylostyles. E, Subectosomal auxiliary style. F, Ends of auxiliary spicules. G, Palmate isochela. H, Oxhorn toxa.

HABITAT DISTRIBUTION. On granite boulders and rock reef in sand substrate; 3-6m depth; Kent Is, E. St Patrick's Head (Tas) (Fig. 237D).

DESCRIPTION. *Shape.* Erect, digitate, ranging from young forms thickly encrusting basal mat, up to 5mm thick, with irregularly bifurcate and

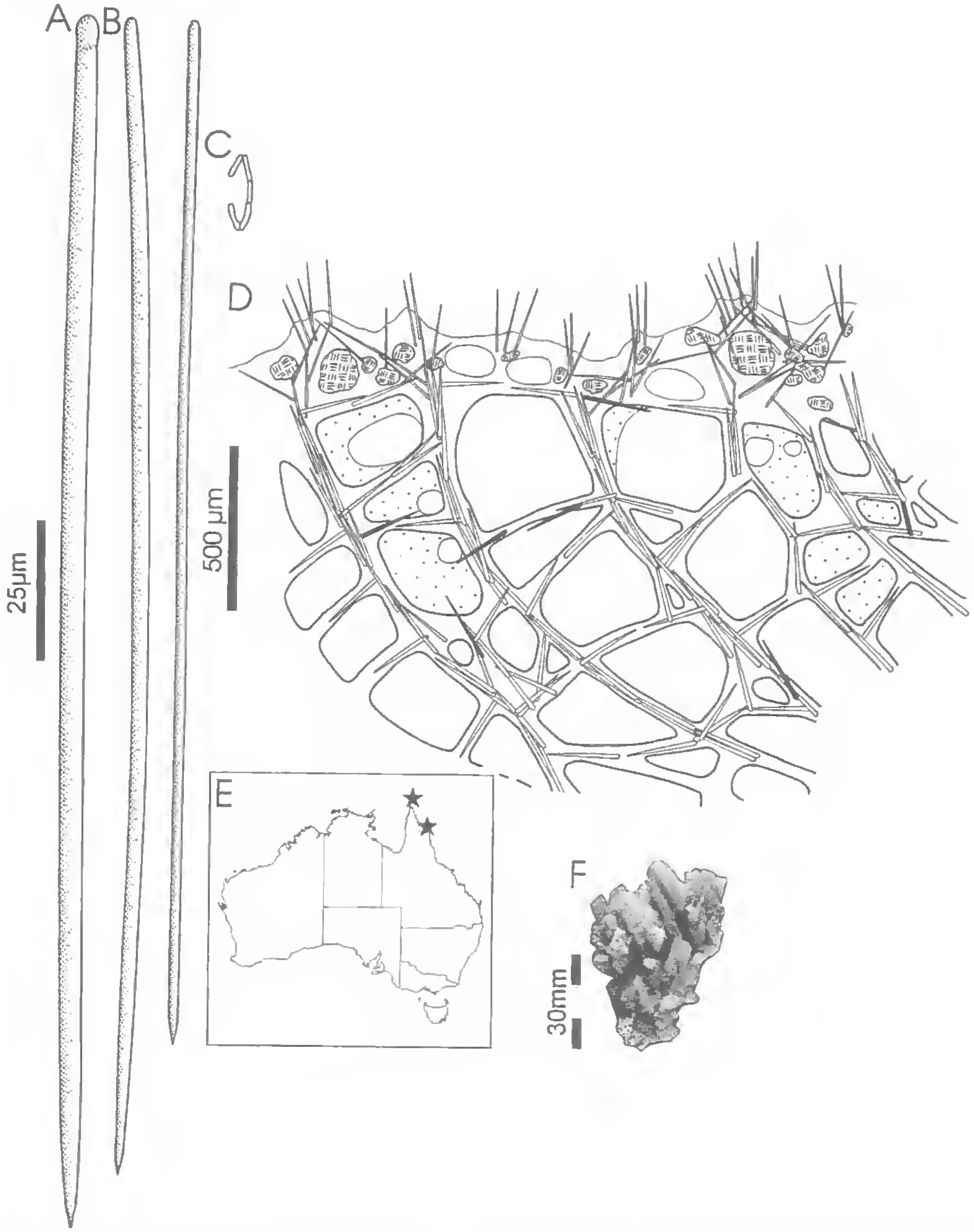

FIG. 235. *Echinoclathria digitata* (Lendenfeld) (neotype QMG304763). A, Principal subtylostyle (coring and echinating fibres). B, Subectosomal auxiliary styles. C, Palmate isochela. D, Section through peripheral skeleton. E, Australian distribution. F, Neotype.

occasionally anastomosing lobo-digitate branches, up to 38mm long, 5mm diameter, to arborescent branching, up to 220mm long, 115mm breadth, cylindrical branches up to 17mm diameter, with bulbous terminal and subterminal processes along branch length, and with short stalk, up to 50mm long, 21mm diameter, and enlarged basal attachment.
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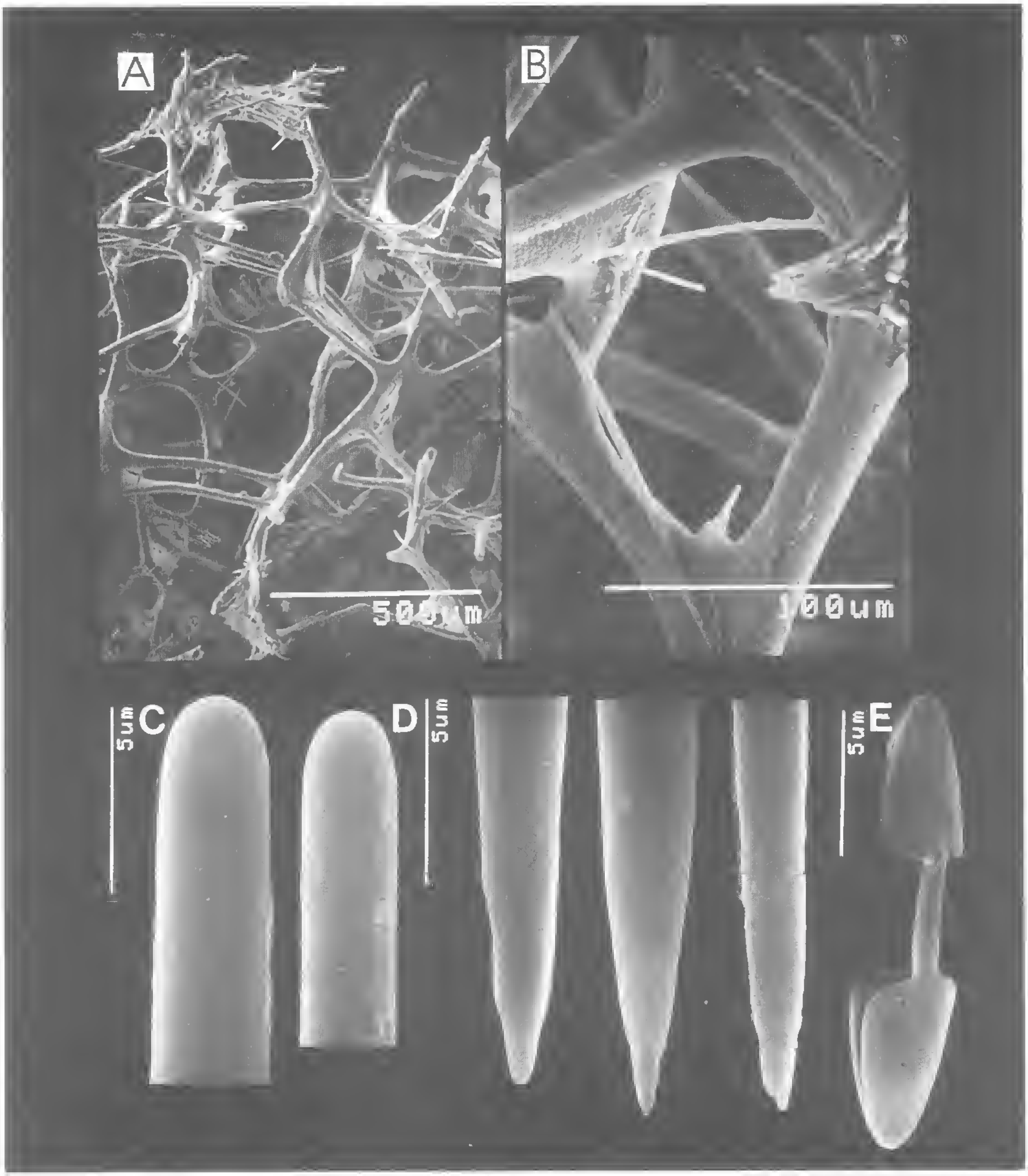


FIG. 236. *Echinoclathria digitata* (Lendenfeld) (neotype QMG304763). A, Choanosomal skeleton. B, Fibre characteristics. C-D, Bases and points of auxiliary styles. E, Palmate isochela.

Colour. Dull orange-brown alive (Munsell 5 YR7-8/12), beige-brown in ethanol.

Oscules. Large oscules, up to 2mm diameter, mainly on lateral sides of branches, particularly on edges of lobate bulbs along branches, less common on basal mat; oscules usually raised on small conical projections with slight membraneous lip.

Texture and surface characteristics. Compressible rubbery texture, difficult to tear; surface contorted, macroscopically even but microscopically reticulate.

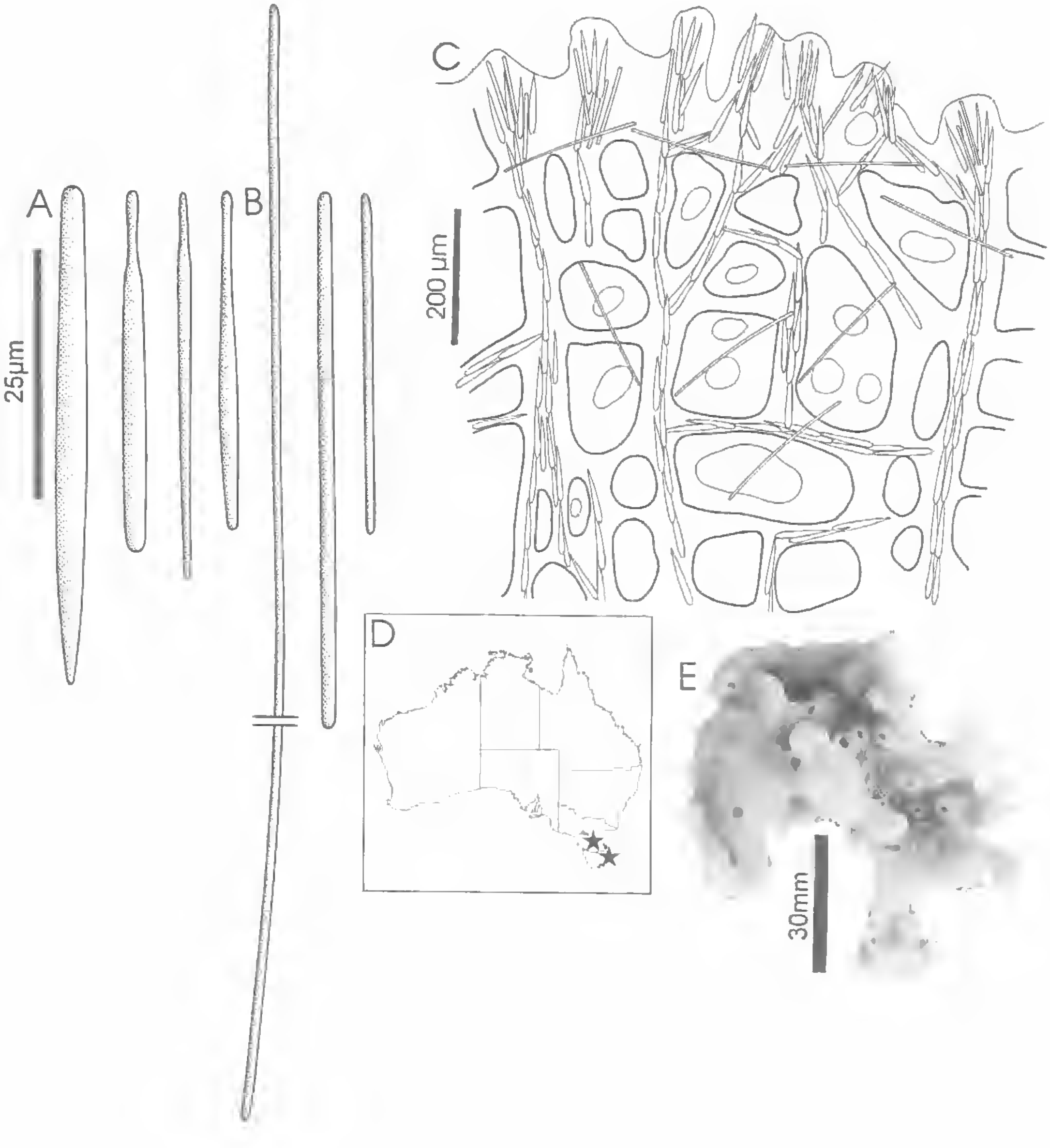


FIG. 237. *Echinoclathria egena* Wiedenmayer (holotype NMV51978). A, Principal styles/ subtylostyles (coring and quasi-echinating fibres). B, Subectosomal auxiliary anisostyles/ quasi-strongyles. C, Section through peripheral skeleton. D, Australian distribution. E, Holotype.

Ectosome and subectosome. Fibrous, micropapillose ectosome, with well developed surface fibres lying paratangential to surface, and with sparse subectosomal auxiliary megascleres lying on or just below surface, orientated tangential or paratangential to it; peripheral fibres swollen, bud-like, containing sparse core of plumose brushes of choanosomal principal styles, which rarely protrude beyond surface; subectosomal auxiliary megascleres not found directly in peripheral skeleton but some way below it.

Choanosome. Skeletal architecture regular, dendro-reticulate, slightly renieroid, with heavy spongin fibres divided into primary ascending

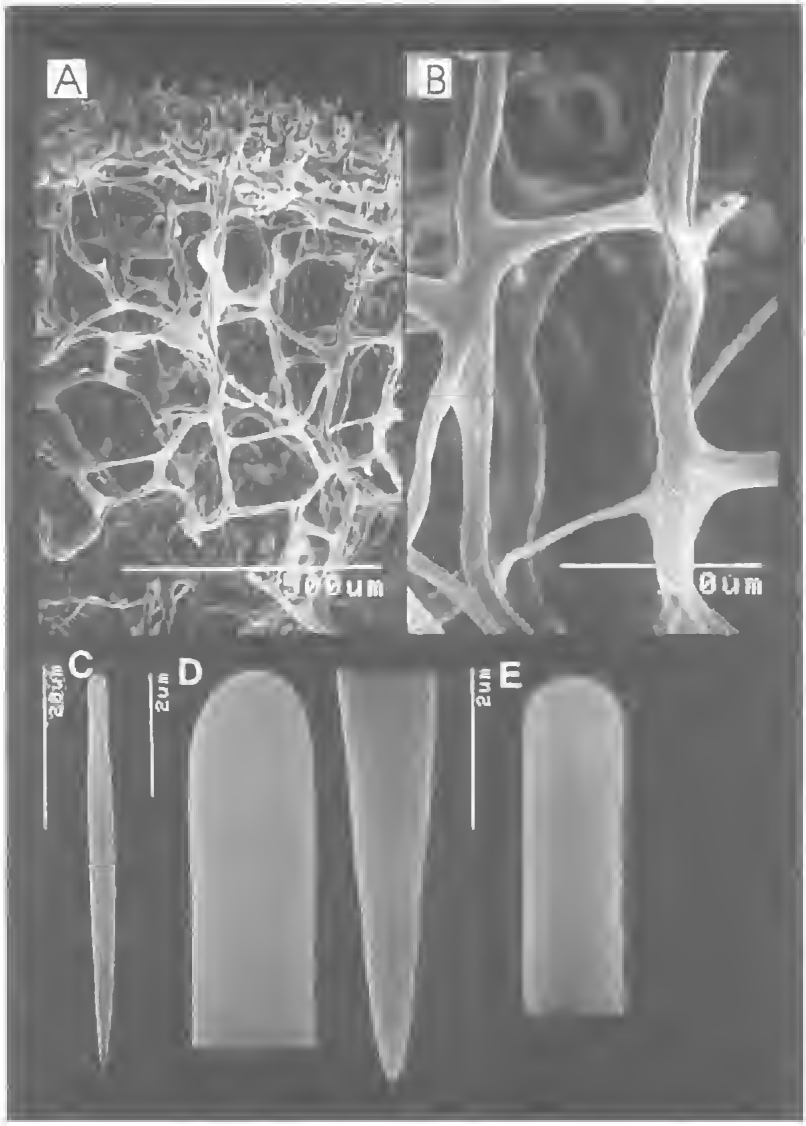


FIG. 238. *Echinoclathria egena* Wiedenmayer (QMG300669). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal subtylostyle. D, Ends of principal spicules. E, Base of subectosomal auxiliary stongylote style.

elements, cored by uni- or multispicular tracts of choanosomal principal subtylostyles, fibres becoming swollen and compressed towards periphery (27-52μm diameter), and secondary transverse, usually aspiculose fibres (16-40μm diameter); true echinating spicules absent, but choanosomal principal styles occasionally protrude through spongin fibres at oblique angles; fibre anastomoses form more rectangular cavernous meshes deeper within choanosome (270-420μm diameter), whereas meshes towards peripheral skeleton become more compacted and oval (70-90μm diameter); fibres commonly stratified near periphery, with granular spongin; subectosomal auxiliary megascleres only sparsely dispersed within mesohyl; peripheral fibres also contain abundant microalgae.

Megascleres.
Choanosomal principal subtylostyles and styles (coring and quasi-echinating fibres) small, thin, straight, with smooth, tapering, slightly subtylote or rounded bases, fusiform or slightly telescoped points. Length 38-(47.7)-53μm, width 2.3-(2.5)-3.1μm.

Subectosomal auxiliary megascleres thin, straight, or rarely sinuous, strongylote styles (asymmetrical, anisostyles), with evenly rounded points and slightly thicker bases. Length 88-(158.2)-178μm, width 1-(1.5)-2.4μm.

Microscleres. Absent.

Larvae. Viviparous parenchymella larvae, 150-195μm diameter, in various stages of development througout mesohyl.

REMARKS. This species is placed with Burton's (1959a) group of flabellate, massive, ramose *Echinoclathria* sponges lacking microscleres (*axinelloides*, *chalinoides*, *inornata*, *leporina*, *nodosa*; none of which are synonyms contrary to Burton's (1959a: 247) opinion). It differs from these species in having much smaller, almost vestigial choanosomal styles and lacking true echinating spicules. It is close to *E. confragosa* in growth form, and *E. nodosa* in skeletal architecture and fibre characteristics, but differs from these species in spicule geometry and compression of peripheral spongin fibres. It should also be compared with *E.*

leporina which has heavily spiculose fibres and ectosomal skeleton, whereas spiculation of *E. egena* is very much reduced, virtually vestigial.

Echinoclathria inornata (Hallmann, 1912)
(Figs 239-240)

Ophlitaspongia inornata Hallmann,1912: 265-268, pl.36, fig.2, text-fig.57; de Laubenfels, 1954: 163; Coombe et al., 1987: 381; Chong et al., 1987: 85.

MATERIAL. HOLOTYPE: AM "cf. E826" (in same specimen jar as *O. tenuis*): 24km S.of St. Francis Is, Nuyts Archipelago, SA, 32°31'S, 133°18'E, 60m depth, coll. FIV 'Endeavour' (dredge).OTHER MATERIAL: WA- WAM622-81(1) (fragment NTMZ1714). S AUST- SAMTS4055 (fragment NTMZ1656), AME938, AME768.

HABITAT DISTRIBUTION. Rock reef; 31-60m depth; Rottnest I. (WA); Nuyts Archipelago and Port Noarlunga (SA) (Fig. 239E).

DESCRIPTION. *Shape.* Erect arborescent digitate or club-shaped sponges, 55-270mm high, 25-65mm maximum width, with irregular cylindrical or lobate branches, bifurcate, expanded and bulbous at their ends, 7-25mm diameter; long cylindrical basal stalk, 12-35mm long, up to 15mm diameter, enlarged basal attachment.

Colour. Live colouration unknown, pale brown or yellowish grey in ethanol.

Oscules. Small, 1-2mm diameter, only seen on upper portions of digits.

Texture and surface characteristics. Firm, compressible, difficult to tear; surface membraneous in places, porous in poorly preserved material, uneven, lumpy towards extremities of branches.

Ectosome and subectosome. Surface membraneous, microscopically hispid, with longer choanosomal principal styles protruding through surface, individually or in multispicular brushes, arising from ends of ascending primary spicule tracts within choanosome; subectosomal auxiliary subtylostyles form tangential or paratangential bundles lying just below ectosome, surrounding bases of protruding principal spicules; choanosomal fibres immediately subectosomal; mesohyl matrix in peripheral skeleton heavy, granular.

Choanosome. Skeleton irregularly renieroid reticulate, with slightly compressed axis and plumo-reticulate extra-axial regions; spongin fibres in axial region relatively homogeneous, thick, 60-90μm diameter, bulbous, not clearly divided into primary or secondary elements; axial fibres contain only 1-2 smaller principal styles per tract, producing nearly regular renieroid skeleton, whereas fibres running longitudinally through branches (seen in cross-section in skeletal preparations) are multispicular, partially obscuring renieroid appearance of axial skeleton; axial fibre anastomoses form tight oval meshes, 40-90μm diameter, and echinating acanthostyles sparsely dispersed; extra-axial skeleton with more poorly developed spongin fibres, clearly divided into primary and secondary elements; primary fibres ascending, 30-50μm diameter, bifurcating and anastomosing, cored by 1-3 smaller principal styles and very heavily echinated by the same spicules, particularly near surface; secondary connecting, transverse fibres 20-40μm diameter, 1-2 spicules per tract, occasionally aspicular, also heavily echinated; extra-axial fibre meshes not bulbous as in axial region, forming large oval cavernous meshes up to 250μm diameter; ascending primary fibres also contain tracts of long, sinuous subectosomal auxiliary subtylostyles secondarily incorporated into fibres; spongin fibres closer to surface much thinner than axial fibres but very heavily echinated, eventually producing plumose bundles of larger principal styles protruding through surface; mesohyl matrix heavy, granular, with few extra-fibre spicules; choanocytes large, oval, 55-90μm diameter.

Megascleres. Choanosomal principal styles (coring and echinating fibres) long or short, relatively thick, slightly curved towards basal end, rounded or faintly subtylote bases, predominantly smooth, rarely slightly microspined bases, fusiform points. Length 88-(124.2)-199μm, width 3-(6.8)-10μm.

Subectosomal auxiliary subtylostyles long, slender, straight, slightly curved or sinuous, prominently subtyolote, smooth or microspined bases, hastate points. Length 170-(205.6)-235μm, width 0.5-(1.9)-3μm.

Microscleres. Raphidiform toxas uncommon, found in only 2 of 5 specimens (presumably associated with larvae; impossible to retain intact on SEM stubs); very long, hair-like, with slight angular central curvature, straight arms, straight points. Length 205-(225.4)-238μm, width up to 0.5μm.

Associations. Three of the five known specimens of this species are covered with a zoanthid, allegedly a cornulariid (Hallmann, 1912).

REMARKS. Hallmann (1912) erected this species mainly by comparison with *E. leporina* (as *O. tenuis*), remarking on their close

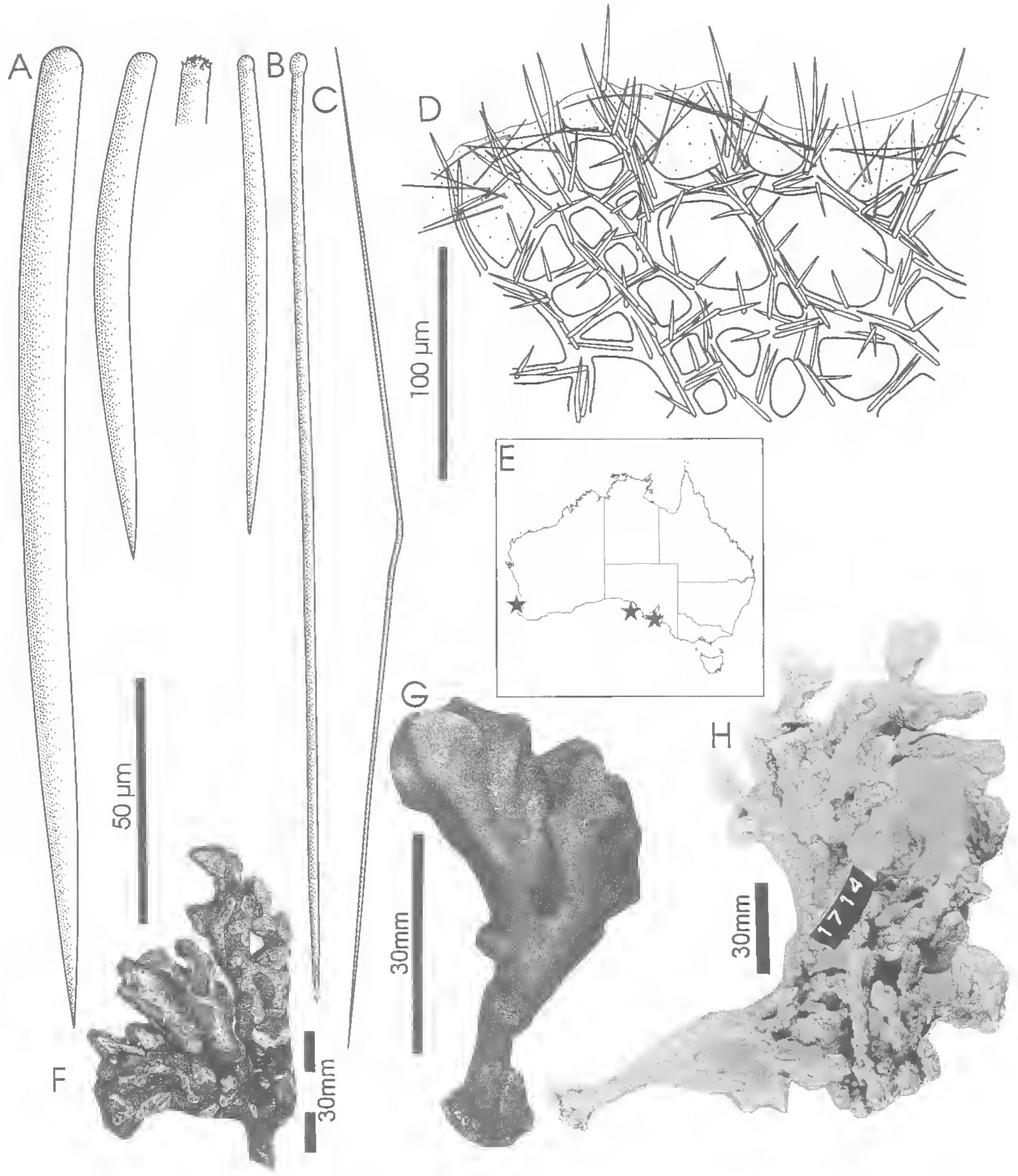


FIG. 239. *Echinoclathria inornata* (Hallmann) (holotype AM"cf.E826"). A, Principal styles/ subtylostyles (coring and echinating fibres). B, Subectosomal auxiliary subtylostyle. C, Raphidiform toxa. D, Section through peripheral skeleton. E, Australian distribution. F, Holotype. G, SAMTS4055. H, WAM622-81(1).

similarities. Hooper & Wiedenmayer (1994) used Hallmann's observations to suggest their synonymy, whereas the types and other material indicate that the Sw and SE populations are consistently different and are distinct species.

The skeleton of *E. inornata* is dominated by echinating principal spicules, particularly on peripheral fibres, moreso than any other species. These echinating spicules tend to obscure the characteristic unispicular ascending and

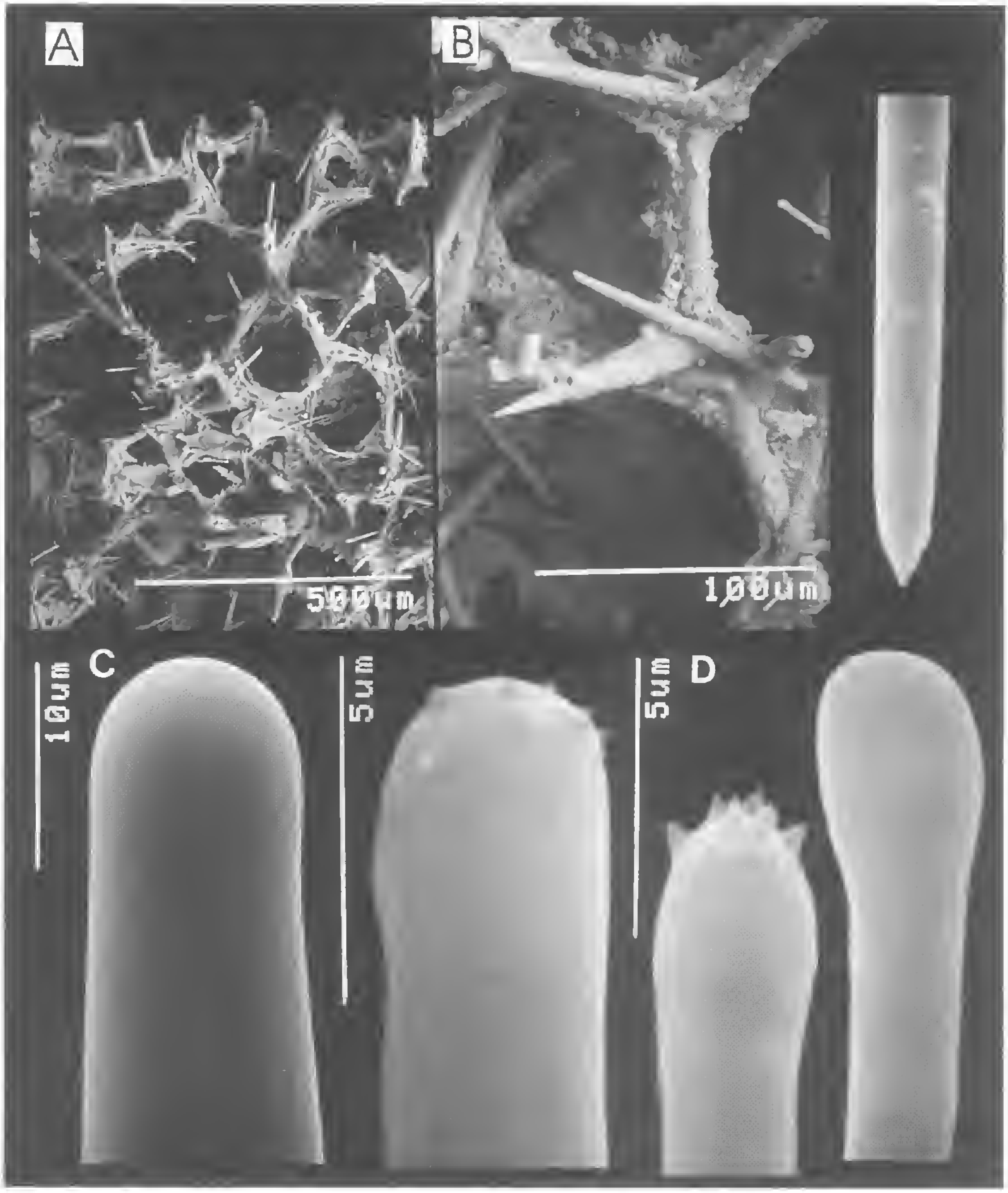


FIG. 240. *Echinoclathria inornata* (Hallmann) (holotype AM"cf.E826"). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal styles. D, Ends of subectosomal auxiliary subtylostyles.

transverse tracts, whereas in *E. leporina* tracts are consistently pauci- or multispicular and echinating spicules are sparse. *Echinoclathria inornata* also has a thick palmate-digitate or lobate-digitate growth form (whereas *E. leporina* is thinly flabellate), principal megascleres are generally larger, and some specimens of *E. inornata* have thin raphidiform toxas (although these are not consistently present and might be associated with larvae).

Echinoclathria leporina (Lamarck, 1814) (Figs 241-242)

Spongia leporina Lamarck, 1814: 444, 373.
Echinoclathria leporina; Topsent, 1932: 101, pl.6, fig.1; de Laubenfels, 1936a: 119; de Laubenfels, 1954: 163; Wiedenmayer, 1989: 61-63, pl.6, fig.1, pl.24, figs 4-5, text-fig.42; Carpay, 1986: 24; Hooper & Wiedenmayer, 1994: 279.
Ophlitaspongia leporina; Burton, 1934a: 558, 562, 599.
Echinoclathria tenuis Carter, 1885f: 355.
Ophlitaspongia tenuis; Dendy, 1896: 37; Hallmann, 1912: 261-265, pl.35, fig.1, text-fig.56; Topsent, 1932: 101, pl.6, fig.1; Burton, 1934a: 558, 562, 599.
Not *Clathria tenuis* Hentschel, 1911: 377-379, text-fig.49; Parish, Jakobsen, Coombe & Bacic, 1991: 56-64.
Phakellia papyracea Carter, 1886g: 379.
Antherochalina tenuispina Lendenfeld, 1887b: 789; Hallmann, 1912: 265; Burton, 1934a: 558.

MATERIAL. HOLOTYPE: MNHNDT567: 'Australian Seas', Peron & Lesueur collection. HOLOTYPE of *E. tenuis*: BMNH1886.12.15.147: Port Phillip Heads, Vic, 40m depth, 38°17'S, 144°39'E, coll. J.B. Wilson (dredge). LECTOTYPE of *P. papyracea*: BMNH1886.12.15.231 (dry) (fragment AMG2907: same locality. PARALECTOTYPE of *P. papyracea*: BMNH1886.12.15.232 (dry): same locality. HOLOTYPE of *A. tenuispina*: BMNH1886.8.27.448 (dry) (fragment AMG3467): Westernport Bay, Vic, 38°26'S, 145°08'E. OTHER MATERIAL: S AUST- AME826. VIC- NMVRN1075, AMZ518, AMZ1167. NSW- AMZ1642, AME820. TAS- AMZ2136, AMZ2210.

HABITAT DISTRIBUTION. 5-42m depth in shallow coastal waters on rock reef substrate; known only from Australia: Coogee (NSW); Port Phillip, Westernport Bay (Vic); N. coast (Tas); Cape Martin (SA) (Fig. 241D).

DESCRIPTION. *Shape*. Persistently very thin, flabellate digits, up to 330mm high, 190mm wide, 2-8mm thick, ranging from single elongate planar fans with evenly rounded margins, to bifurcate palmate digits growing in more than 1 plane, with uneven margins; usually with long or short cylindrical basal stalk, up to 65mm long, 18mm diameter.

Colour. Pale red or red-orange alive (Munsell 2.5R 5/8-5/10), light brown in ethanol.

Oscules. Relatively small, up to 2.5mm diameter, dispersed over margins of digits, without associated subectosomal drainage canals.

Texture and surface characteristics. Firm, flexible, moderately difficult to tear; surface even, without pronounced sculpturing; some with distinct radial growth lines on lamellae.

Ectosome and subectosome. Microscopically hispid, with larger sizes of principal style/subtylostyle protruding through surface for up to 100μm, singly or in brushes, forming a vestigial plumose or radial extra-axial skeleton in peripheral region, and with a distinct tangential layer of subectosomal auxiliary subtylostyles, in pauci- or multispicular tracts, underlying erect principal spicule brushes; mesohyl matrix moderately heavy, particularly near outer margin of peripheral skeleton.

Choanosome. Skeletal architecture with 3 components differentiated: (1) irregularly isodictyal, slightly compressed axis; (2) more open-reticulate renieroid or subrenieroid extra-axial region; and (vestigial) plumose or radial skeleton in the peripheral region; axial skeleton with single, thickened central core of heavy fibres, vaguely separated into primary ascending pauci- or multispicular fibres, 28-65μm diameter, and secondary, mostly transverse uni- or paucispicular fibres, 28-36μm diameter; primary fibres plumose, arborescent, producing radial tracts; secondary fibres regularly renieroid; fibres cored and sparsely echinated by smaller choanosomal principal styles/subtylostyles in choanosomal skeleton (larger in peripheral skeleton); echinating principal spicules located predominantly on primary fibres; fibre anastomoses in axis form predominantly triangular meshes (=isodictyal), less often rectangular or oval meshes, 75-180μm diameter, obviously more compressed in axis than at periphery; peripheral fibres form more regular, rectangular meshes (=renieroid); primary spicule tracts mostly confined to within fibres in axial skeleton, becoming increasingly plumose, protruding through fibres, in peripheral skeleton; mesohyl matrix heavy but only lightly pigmented; choanocyte chambers ovoid, 43-112μm diameter, with sparsely dispersed subectosomal auxiliary megascleres particularly in peripheral skeleton.

Megascleres. Choanosomal principal styles and subtylostyles long or short (larger in peripheral region than in axis), thick, straight or slightly curved, with smooth, evenly rounded, or slightly tapering subtylote bases, sometimes quasi-oxeote, rarely microspined bases, usually with fusiform points. Length 62-(185.3)-305μm, width 4-(9.6)-14μm.

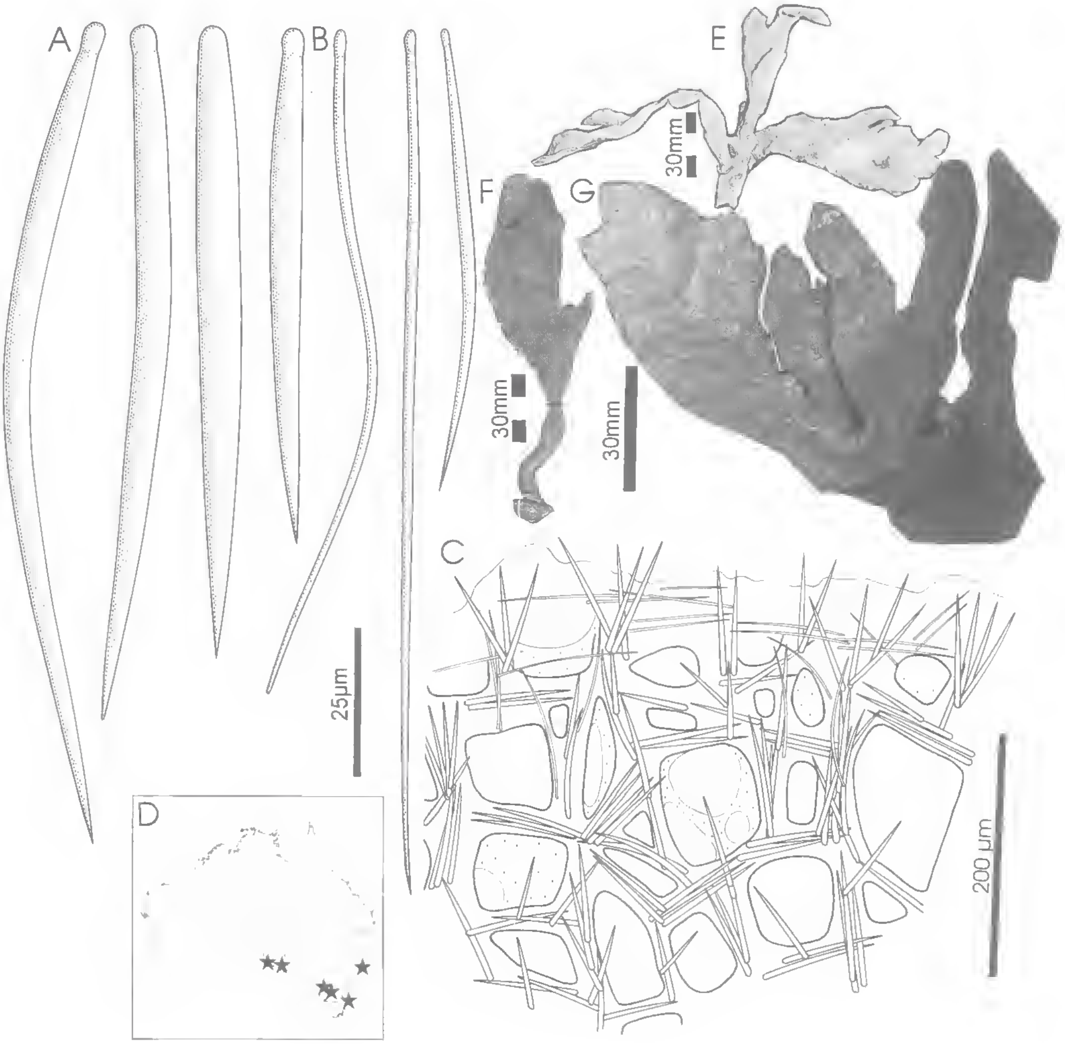


FIG. 241. *Echinoclathria leporina* (Lamarck) (holotype MNHNDT567). A, Principal styles/ subtylostyles (coring and echinating fibres). B, Subectosomal auxiliary subtylostyles. C, Section through peripheral skeleton. D, Known Australian distribution. E, Holotype. F, Holotype of *E. tenuis*. G, Holotype of *A. tenuispina*.

Subectosomal auxiliary subtylostyles long, thin, straight, slightly curved, or frequently sinuous, with predominantly smooth, occasionally microspined, subtylote bases, hastate points. Length 148-(265.8)-321µm, width 1.5-(3.1)-4.2µm.

Microscleres. Absent.

REMARKS. This species is better known under the junior names *Echinoclathria* or *Ophlitaspongia tenuis*. In growth form it is remarkably close to *A.* (*Isopenectya*) *chartacea*. This similarity, also noted by Hallmann (1912), is emphasised by their respective renieroid and isodictyal skeletal architecture, compression of the axial skeleton and fibre characteristics, whereas other characters indicate that similarities may be convergent and functionally related to flabellate growth form. Major features which differentiate the two species are the possession of 3 distinct skeletal structures (renieroid, plumose-isodictyal and peripheral skeletons) in *A.* (*I.*) *chartacea*, the

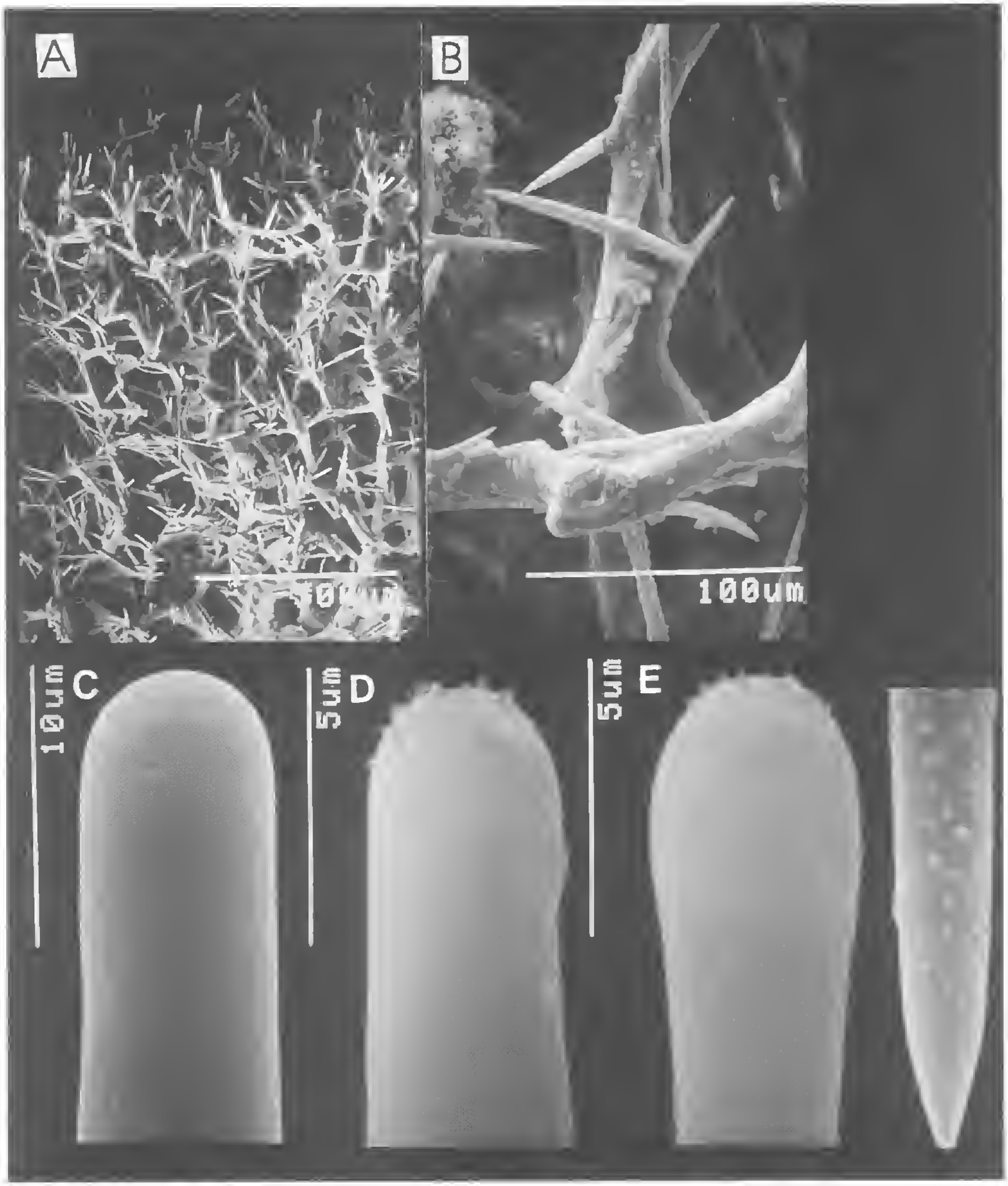


FIG. 242. *Echinoclathria leporina* (Lamarck) (holotype MNHNDT567). A, Choanosomal skeleton. B, Fibre characteristics. C, Larger principal style (protruding through surface). D, Smaller principal styles (in renieroid skeleton). E, Ends of subectosomal auxiliary subtylostyle.

presence of acanthose choanosomal styles forming the renieroid skeleton, and much larger smooth choanosomal styles protruding through the ectosome. Choanosomal styles in *E. leporina* are homogeneous, entirely smooth shafts, and the renieroid/ isodictyal skeleton is cored and echinated by the same smooth principal spicules, with differentiated primary and secondary fibre structures, there is less pronounced axial compression, larger, entirely smooth principal spicules are embedded only in the peripheral skeleton, barely extending into the choanosome, and there is no clear differentiation between renieroid/ isodictyal and plumose skeletons as in *Antho*. The two species may be confused and hence care has been taken in checking all available voucher specimens to ascertain conspecificity.

Echinoclathria leporina is probably widespread throughout temperate SE Australia although some published records (in the *Zoological Record*) are not corroborated by voucher samples and are not included in the present synonymy.

Echinoclathria levii sp. nov.

(Figs 243-244, Plate 10F)

MATERIAL. HOLOTYPE: QMG300675 (NCIQ66C-3764-I) (fragment NTMZ3832): Trap Reef, Bicheno, Tas., 41°51.7'S, 148°18.6'E, 30m depth, 26.ii.1990, coll. NCI (SCUBA).

HABITAT DISTRIBUTION. Large boulder reef; 30m depth; E. coast (Tas) (Fig. 243F).

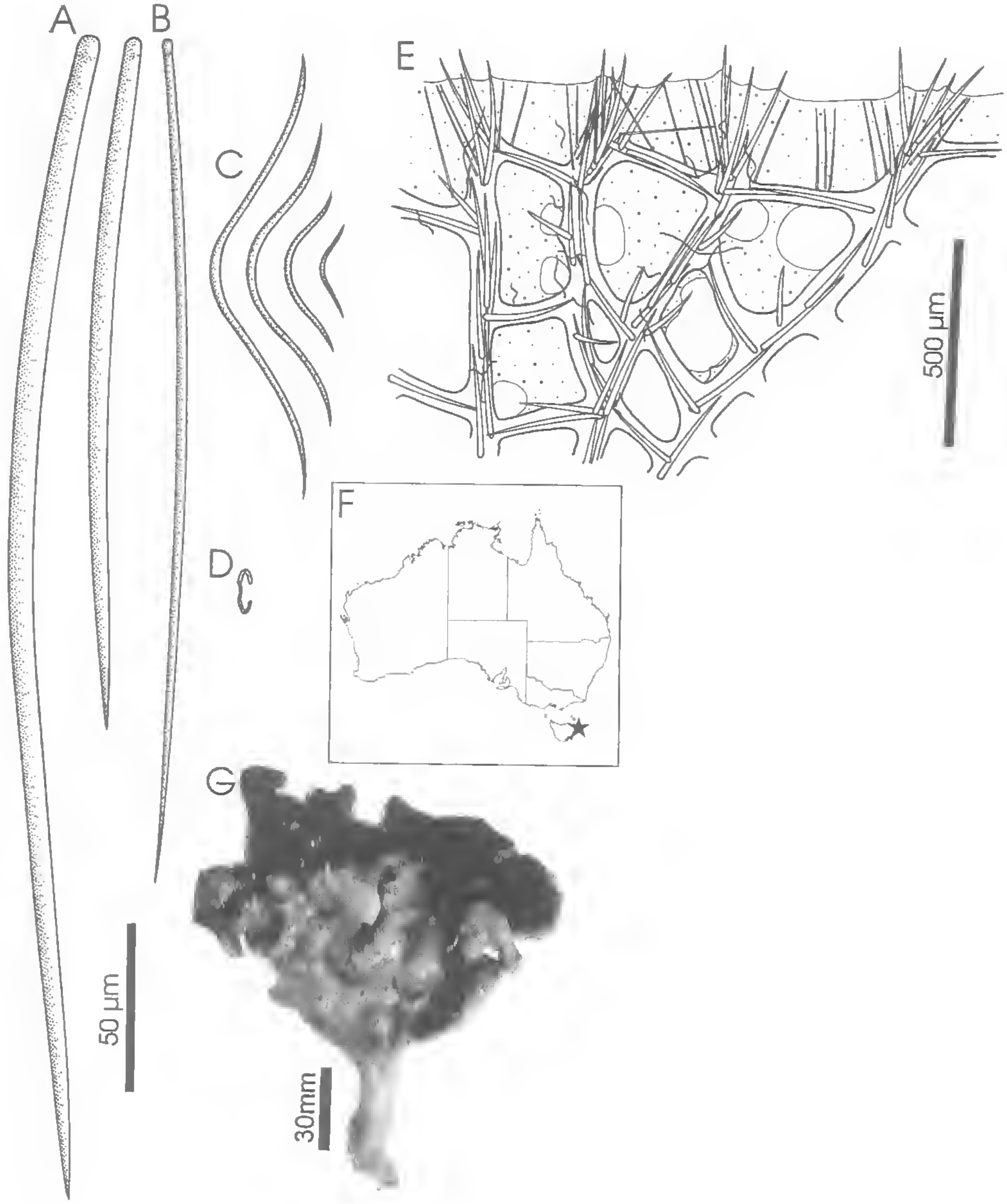
DESCRIPTION. *Shape*. Erect, thickly flabellate fan in several planes, 155mm long, 135mm wide, each lamella 7-12mm thick, up to 80mm wide, margins irregularly digitate or palmate-digitate, with digits up to 30mm long, 5mm diameter; irregular digits and small lamellae ('buds') also arising from lateral sides of fan; stalk long, thickly cylindrical, 45mm long, 9mm diameter, with expanded basal attachment.
Colour. Dark red-orange alive (Munsell 5R 5/10), brown in ethanol.
Oscules. Large, up to 2.5mm diameter, scattered over 1 side of fan, without any obvious membraneous lip, collapsing in air.
Texture and surface characteristics. Stalk stiff, lamella firm, flexible, slightly compressible; surface membraneous, optically hispid, relatively even, slightly lumpy but without any conules or other ornamentation.
Ectosome and subectosome. Surface microscopically hispid, with longer principal styles protruding through surface in thick, bushy, erect brushes arising from ascending choanosomal fibres in peripheral skeleton; subectosomal auxiliary subtylostyles in sparse tangential brushes on surface; mesohyl matrix heavy but only lightly pigmented in peripheral skeleton.
Choanosome. Skeleton with 2 components: irregularly renieroid renieroid reticulate and plumo-reticulate, without any marked axial compression but clearly differentiated axial and extra-axial regions; (1) axial skeleton more-or-less renieroid, with heavy spongin fibres divided into primary and secondary elements; primary fibres ascending, 70-90μm diameter, cored by pauci- or multispicular tracts of generally smaller choanosomal principal styles; secondary fibres transverse, short, thinner 30-40μm diameter, interconnecting primary fibres, cored by unispicular tracts of smaller principal styles; fibre anastomoses in axial region produce cavernous oval or elongate meshes, 150-250μm diameter, fibre nodes heavy, slightly bulbous, containing multispicular tract ascending through longitudinal plane of lamellae; axial fibres sparsely echinated by smaller principal styles, mainly at fibre nodes; (2) extra-axial skeleton distinctly plumo-reticulate, with disctinctly different primary and secondary spongin fibre systems; primary ascending fibres very thick, up to 130μm diameter, cored by multispicular tracts of smaller and larger choanosomal principal subtylostyles ascending to surface; spicule tracts become heavier, more plumose towards periphery; size of principal subtylostyles coring fibres generally increase towards surface; secondary, connecting fibres in extra-axial skeleton small, less than 30μm diameter, uni- or aspicular; echinating spicules in extra-axial region mostly obscured by ascending plumose spicule tracts; mesohyl matrix heavy, with numerous auxiliary megascleres (sometimes also incorporated into fibres) and numerous toxas scattered throughout; choanocyte chambers small, oval, 40-60μm diameter.

Megascleres. Choanosomal principal styles (coring and echinating fibres) long or short, moderately slender, slightly curved at centre, with smooth, rounded or slightly subtylote bases, fusiform points. Length 172-(244.4)-341μm, width 5-(6.1)-7μm.

Subectosomal auxiliary styles relatively short, slender, slightly curved at centre, with slightly subtylote, smooth bases, fusiform or hastate-rounded points. Length 154-(187.8)-205μm, width 2-(3.1)-4.5μm.

Microscleres. Palmate isochelae small, with lateral alae longer than front ala, completely fused to shaft, front ala wide, curved, nearly completely detached from lateral alae; shaft straight. Length 13-(14.8)-16μm.

Toxas oxhorn (although smaller wing-shaped forms also present), thick, with prominent, wide, even central curvature, slightly reflexed arms,



.FIG. 243. *Echinoclathria levii* sp.nov. (holotype QMG300675). A, Principal subtylostyles (coring and echinating fibres). B, Subectosomal auxiliary subtylostyle. C, Oxhorn toxas. D, Palmate isochela. E, Section through peripheral skeleton. F, Known Australian distribution. G, Holotype.

slightly reflexed points. Length 23-(91)-135µm, width 1-(1.4)-3µm.

ETYMOLOGY. For Professor Claude Lévi, MNHN Paris, for his contributions to Indo-Pacific sponges.

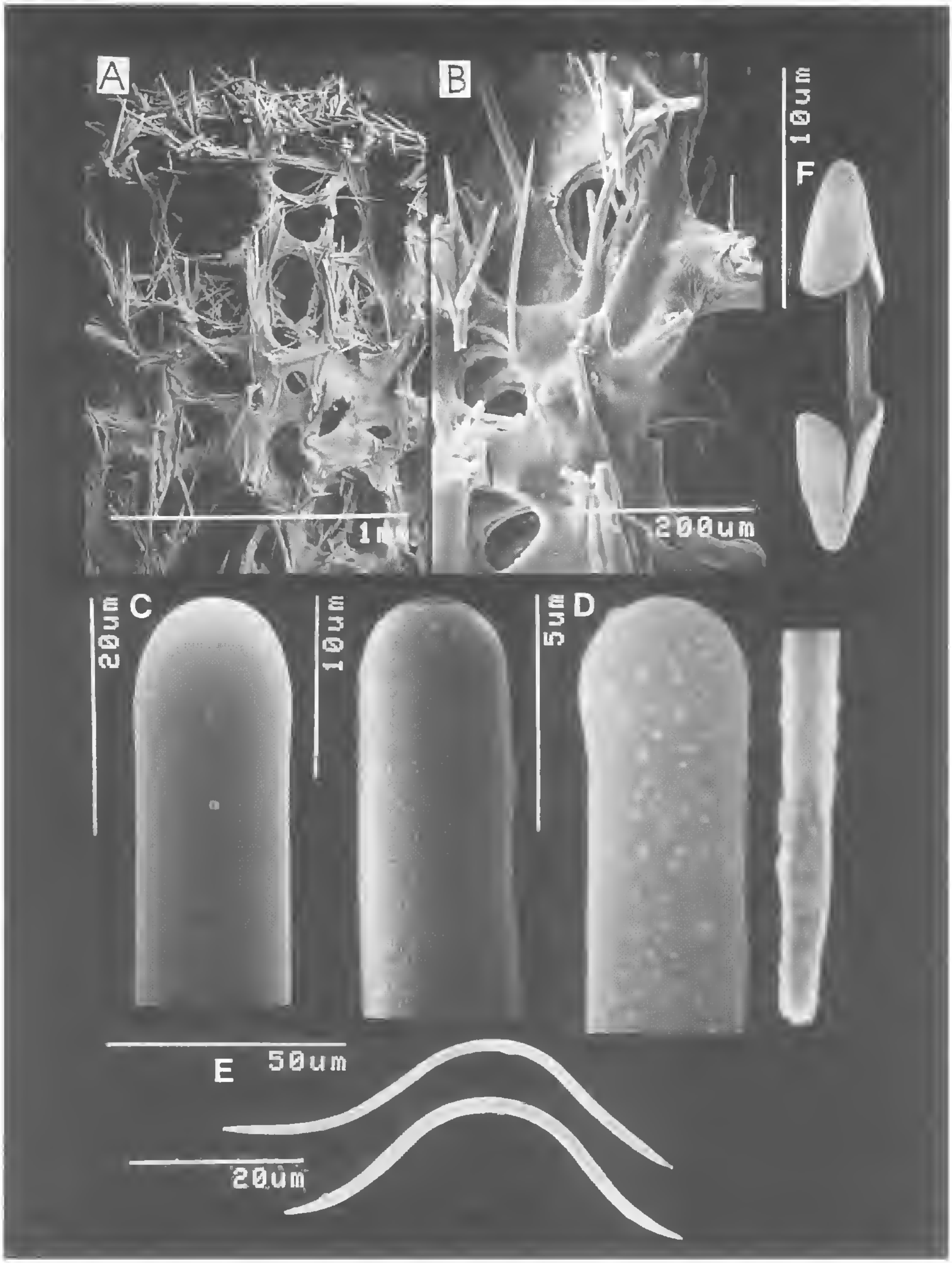


FIG. 244. *Echinoclathria levii* sp.nov. (holotype QMG300675). A, Choanosomal skeleton. B, Fibre characteristics. C-D, Ends of principal and auxiliary spicules. E, Oxhorn toxas. F, Palmate isochela.

REMARKS. This species is an unusual *Echinoclathria* having well developed extra-axial plumo-reticulate skeleton in which the thick plumose spicule tracts completely dominate the thin unispicular connecting fibres, partially obscuring the renieroid skeleton (seen only clearly at the core of the skeleton). Although the thickness of the plumo-reticulate and renieroid portions of the skeleton varies from place to place within the sponge (the former dominant towards the edge of lamellae or surface digits (growing edges) and the latter predominant towards the basal stalk region), it is a prominent feature of skeletal structure. This species also differs from related flabellate species such as *E. ridddlei* sp. nov. and *E. leporina* in having distinctive oxhorn toxas (cf. no toxas), megasclere dimensions (cf. substantially smaller, thinner megascleres), and a thickly flabellate, palmate-digitate growth form (cf. thinner flabellate lamellae).

Echinoclathria nodosa Carter, 1885
(Figs 245-246)

Echinoclathria nodosa Carter, 1885f: 356; Ridley & Dendy, 1887: 160; Carpay, 1986: 25; Hooper & Wiedenmayer, 1994: 280.
Ophlitaspongia nodosa; Dendy, 1896: 37.
Litaspongia nodosa; de Laubenfels, 1954: 162.

MATERIAL. HOLOTYPE: BMNH1886.12.15.96 (fragment AMG2770): Port Phillip, Vic, 38°09'S, 144°52'E, 8m depth, coll. unknown (dredge). OTHER MATERIAL: VIC- NMVRN264, NMVRN628.

HABITAT DISTRIBUTION. Sand and shell grit, 8-38m depth; Port Phillip (Vic) (Fig. 245E).

DESCRIPTION. *Shape.* Bulbous-digitate, up to 55mm long, 30mm maximum width, 35mm breadth, small cylindrical basal stalk 5-15mm long, 10mm diameter; with bifurcate and occasionally anastomosing, irregularly cylindrical, slightly swollen branches, up to 22mm long, 8mm diameter.

Colour. Bright red to crimson alive, dark brown in ethanol.

Oscules. Numerous small oscules, up to 2mm diameter, scattered between surface conules.

Texture and surface characteristics. Soft, compressible, difficult to tear; surface nodulose, granular.

Ectosome and subectosome. Membraneous, with protruding spongin fibres from ascending peripheral skeleton, and points of principal styles protruding beyond surface in sparse plumose brushes or individually, not forming continuous palisade; subectosomal auxiliary styles form sparse paratangential, tangential or occasionally erect layers below protruding skeleton of principal spicules.

Choanosome. Skeleton dendro-reticulate, more-or-less renieroid and homogeneous throughout, without any axial compression and only slight differentiation between peripheral skeleton and core (the former with plumose primary tracts becoming increasingly dense towards periphery, the latter evenly renieroid with relatively sparse spicule skeleton); heavy spongin fibres dominate skeleton, clearly differentiated into primary and secondary components; primary fibres, 35-65µm diameter, ascending, multispicular with 3-8 spicules per fibre, spicules confined to within fibres at core but become plumose in subectosomal and peripheral regions; secondary fibres uni- or paucispicular, 15-40µm diameter, predominantly transverse; fibre nodes usually bulbous, up to 80µm diameter; fibres cored by choanosomal principal styles and sparsely echinated by same spicules; echinating spicules confined mainly to core of skeleton, less common in periphery; fibre meshes triangular, rectangular or rhomboidal, 150-270µm diameter, slightly more cavernous in subectosomal region than at core; mesohyl matrix light, unpigmented, with few interstitial spicules; choanocyte chambers small, oval, 15-25µm diameter.

Megascleres. Choanosomal principal styles short, thick, straight or very slightly curved at centre, smooth, evenly rounded bases, occasionally slightly subtylote, fusiform points; sometimes modified to quasi-oxeote spicules. Length 109-(128.6)-164µm, width 6-(8.4)-13µm.

Subectosomal auxiliary styles long, slender, straight or very slightly curved at centre, smooth rounded bases or very slightly subtylote, long tapering fusiform points. Length 116-(161.1)-242µm, width 2-(3.6)-6µm.

Microscleres. Absent.

REMARKS. Similar to *E. thielei* and *E. notialis* sp. nov. this species lacks noticeable size differences between principal styles coring choanosomal fibres and those protruding through ectosome. It has bulbous branching growth form; bulbous fibre nodes in the skeleton are similar to *E. levii* sp. nov. It is also reminiscent of *E. axinelloides* in its spicule skeleton, which becomes increasingly dense and plumose towards the surface, but this resemblance is superficial, whereas characters such as growth form, bulbous fibres,

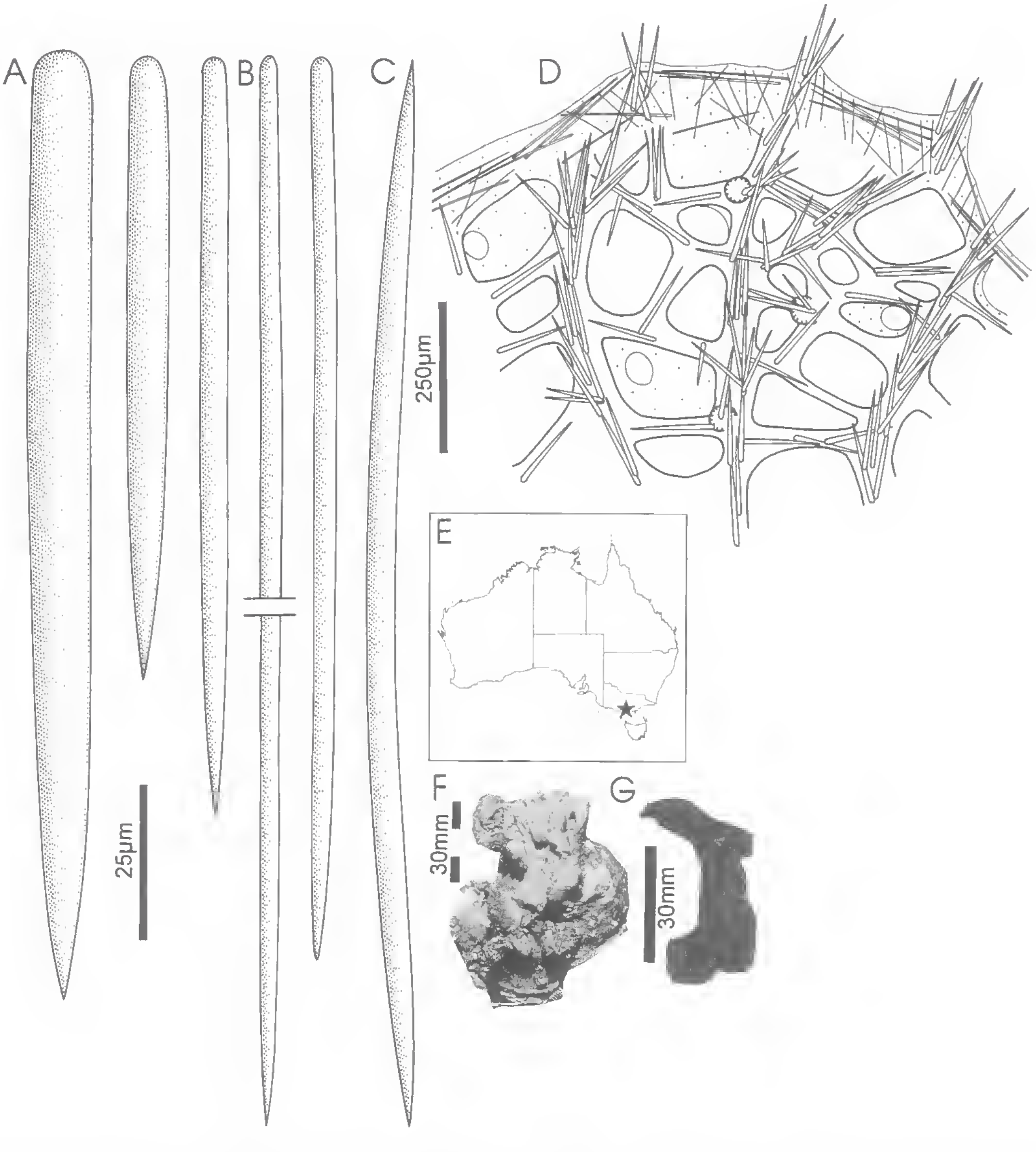


FIG. 245. *Echinoclathria nodosa* Carter (holotype BMNH1886.12.15.96). A, Principal styles (coring and echinating fibres). B, Subectosomal auxiliary styles. C, Abherrant principal spicule. D, Section through peripheral skeleton. E, Known Australian distribution. F, Holotype. G, Specimen NMVRN264.

absence of microscleres, and the geometry and size of both categories of megascleres together differentiate it within the genus.

Echinoclathria notialis sp. nov.

(Figs 247-248, Plate 11A)

MATERIAL. HOLOTYPE: QMG300614 (NCIQ66C-2243-F) (fragment NTMZ3541): American River, Kangaroo I., SA, 35°46.9'S, 137°46.5'E, 6m depth, 31.i.1989, coll. NCI (SCUBA).

HABITAT DISTRIBUTION. Rock reef, sand, mussell beds; 6m depth; Kangaroo I. (SA) (Fig. 247D).

DESCRIPTION. *Shape.* Erect, massive, club-shaped, bulbous-digitate, 75mm high, 85mm diameter; digits subcylindrical, bulbous, up to 45mm long, 38mm diameter, rounded margins,

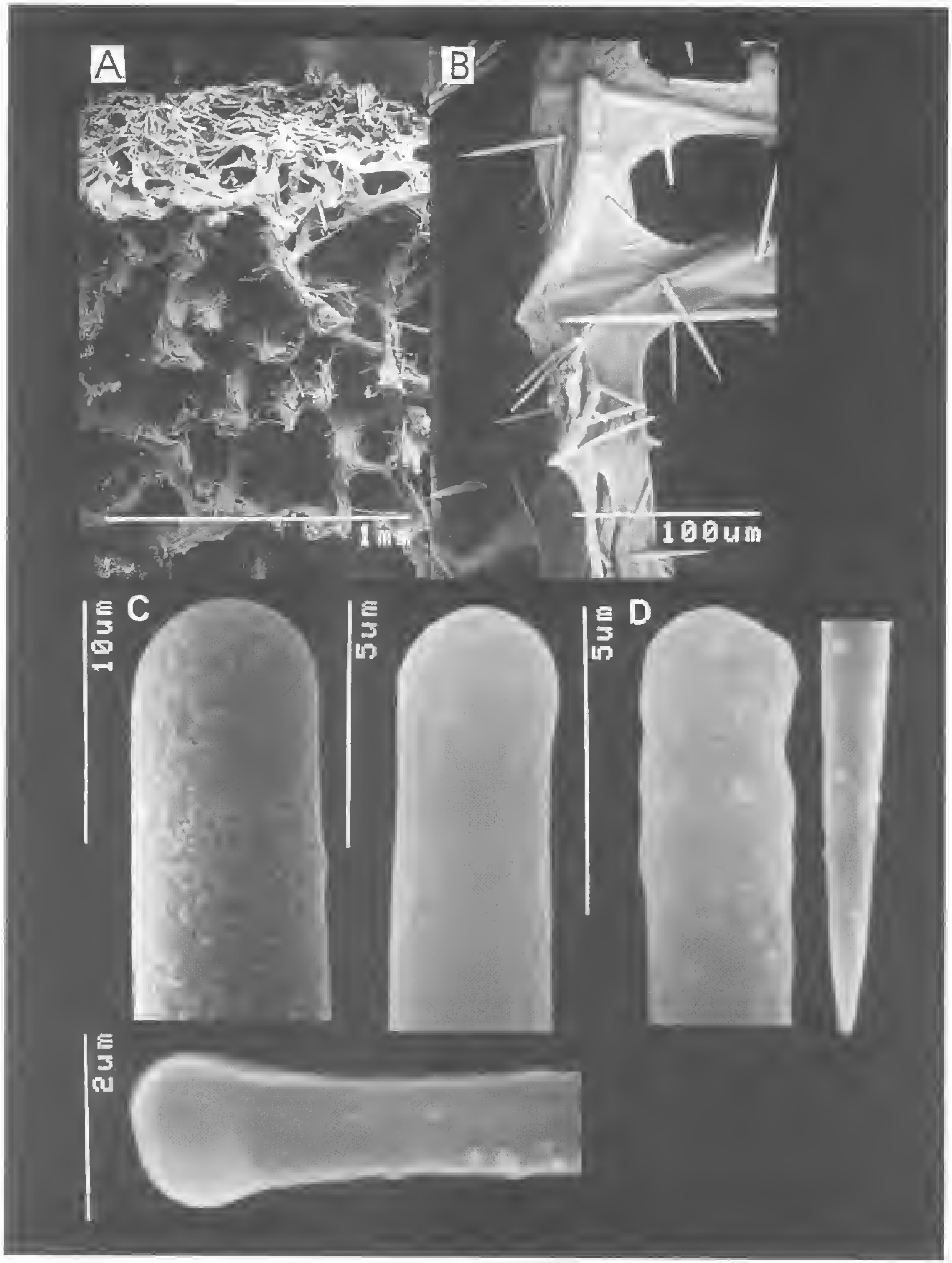


FIG. 246. *Echinoclathria nodosa* Carter (NMVRN264). A, Choanosomal skeleton. B, Fibre characteristics. C-D, Ends of principal and auxiliary spicules.

fused to adjacent digits; attached directly to substrate, no stalk or basal 'holdfast'.

Colour. Pale red-brown alive (Munsell 5R 5/6), pale brown in ethanol.

Oscules. Large, 3-6mm diameter, on apex or subapex of digits, raised above surface with prominent membraneous lip.

Texture and surface characteristics. Firm, compressible, relatively easily torn; surface with prominent surface conules when alive (mostly white and offset from darker ectosome), each conule bearing fine trace of radiating subectosomal auxiliary spicules which collapse upon exposure to air and preservation; in air surface membrane collapses, surface becomes highly porous (each pore up to 1mm diameter, scattered evenly over surface), superficially resembling a red-brown *Acropora* coral.

Ectosome and subectosome. Fibrous, with tips of ascending primary fibres protruding a long way through surface, with bundles of choanosomal spicules also protruding slightly from ends of

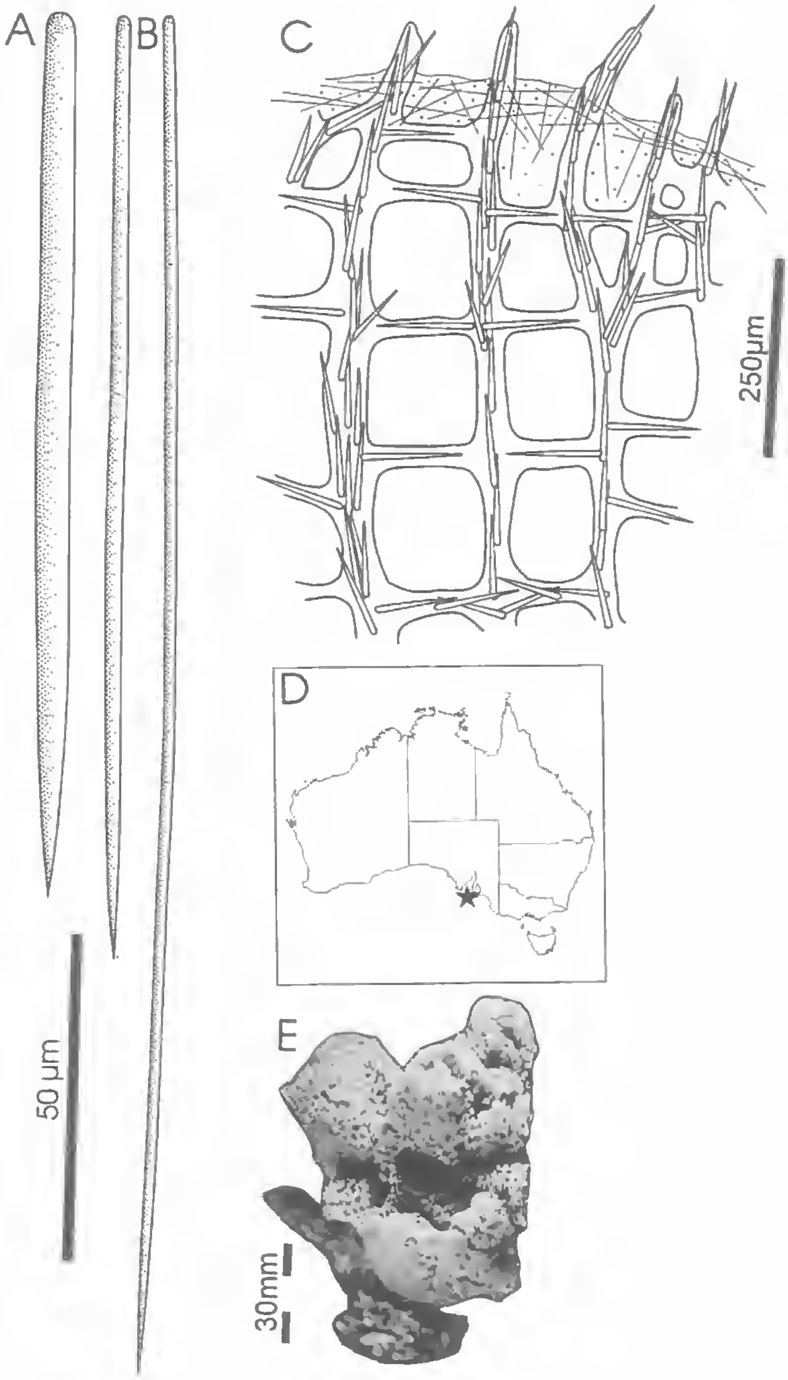


FIG. 247. *Echinoclathria notialis* sp.nov. (holotype QMG300614). A, Principal styles (coring and echinating fibres). B, Subectosomal auxiliary style. C, Section through peripheral skeleton. D, Australian distribution. E, Holotype.

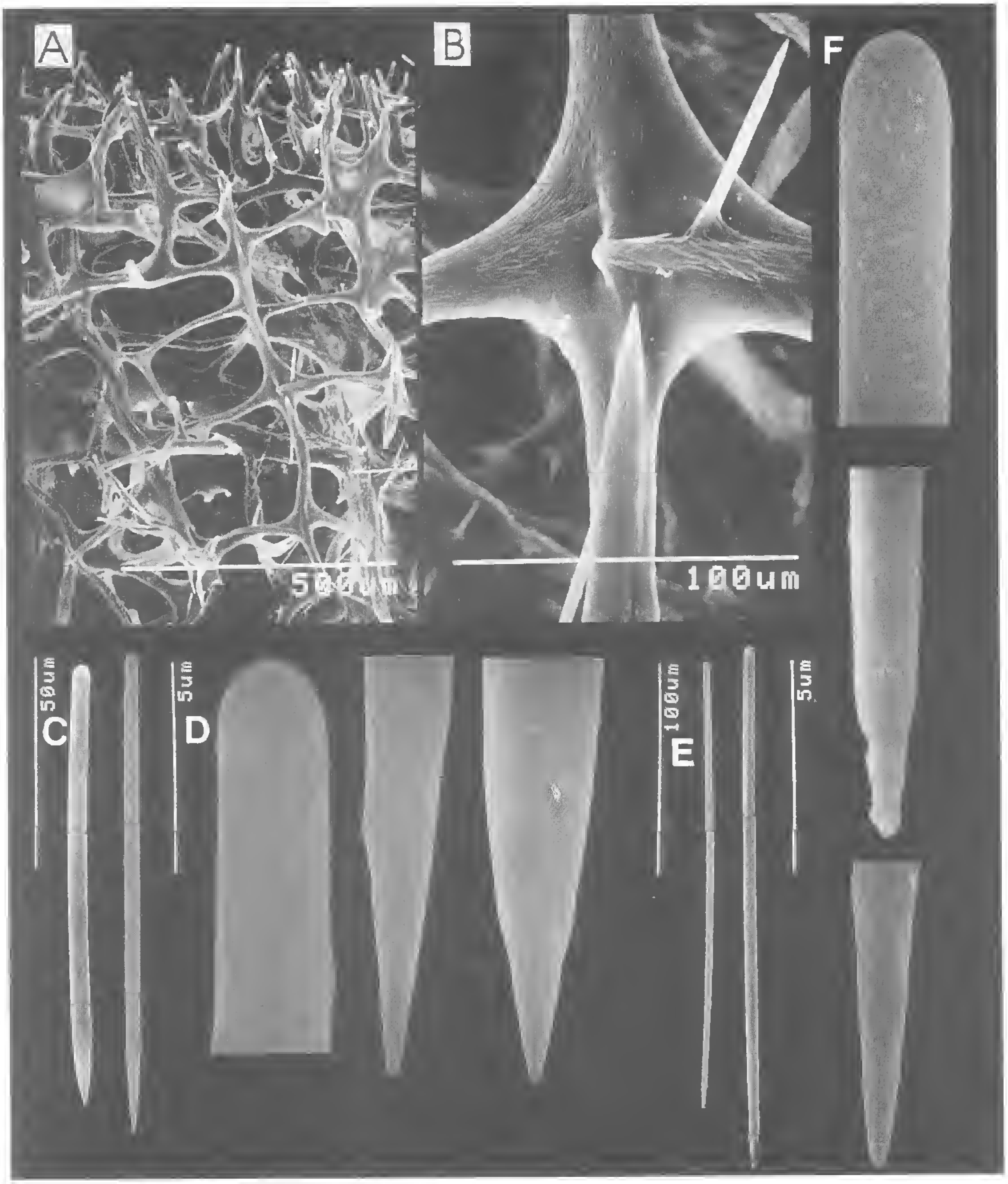


FIG. 248. *Echinoclathria notialis* sp.nov. (holotype QMG300614). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal styles. D, Ends of principal styles. E, Subectosomal auxiliary styles. F, Ends of auxiliary styles.

primary fibres; moderately heavy tracts of subectosomal auxiliary styles lying tangential, paratangential or erect on surface; auxiliary spicules heaviest between protruding fibres, presumably surrounding surface pores and collapsing upon exposure to air and preservation.

Choanosome. Skeleton regularly renieroid reticulate, relatively homogenous skeletal tracts, without any differentiation between axial and extra-axial regions; spongin fibres moderately well developed, 15-25µm diameter; fibre meshes cavernous throughout, rectangular, square or occasionally triangular, 125-250µm diameter; few obvious differences between ascending and transverse fibres; ascending fibres cored by 1 or few choanosomal principal styles, occasionally more near surface of sponge, with tracts becoming multispicular, plumose in ectosomal and protruding fibres; transverse fibres with similar spicule content; all fibres sparsely echinated by smooth principal styles, identical to those inside fibres; echinating spicules predominant at fibre nodes; mesohyl with abundant, mesohyl matrix only lightly pigmented, subectosomal auxiliary styles scattered throughout; choanocyte chambers small, round or oval, 30-50µm diameter.

Megascleres. Choanosomal principal styles (coring and echinating fibres) short, slender, straight, smooth rounded bases, fusiform or slightly telescoped points. Length 107-(123.6)-151µm, width 1.5-(2.7)-4µm.

Subectosomal auxiliary styles long, slender, straight, rounded smooth bases, fusiform or prominently telescoped points. Length 123-(163.2)-191µm, width 1-(1.9)-2.5µm.

Microscleres. Absent

ETYMOLOGY. Greek *notos*, south.

REMARKS. In growth form, texture, colouration, surface sculpturing and conules *E. notialis* is quite different from all other *Echinoclathria*, yet its skeletal structure, spicule geometry and distribution of spicules are more difficult to differentiate from other species. Skeletal differences are a matter of degree rather than absolute (which seems to be a feature of the genus), including regularity of the renieroid skeletal reticulation (no axial compression; cf. *E. confragosa*), homogeneity of fibre meshes (without any marked differences between ascending and transverse tracts), and virtually unispicular spicule tracts throughout the skeleton (except at the surface where they become multispicular and slightly plumose; cf. *E. inornata*). The new species differs from all these others in most other respects. In fibre development, density of spicule tracts coring fibres, and possession of both fibres and terminal principal spicule brushes protruding through the surface this species is most similar to *E. subhispida*, differing substantially in spicule geometry, spicule size, skeletal architecture and field characteristics (see *E. subhispida* below).

It is not known if the live surface ornament (small white conules covered by a fine trace of radiating auxiliary spicules, overlaying surface pores) is unique to the genus as many named species are only known from preserved material.

Echinoclathria parkeri sp. nov.

(Figs 249-250)

MATERIAL. HOLOTYPE: SAMTS4091 (fragments NTMZ1601, QMG300473): 20km due W. of Outer Harbour, Adelaide, St. Vincent Gulf, SA, 34°45'S, 138°20'E, 23-25m depth, 23.iv.1975, coll. J. McPhalain. PARATYPE: SAMTS4097 (fragments NTMZ1649, QMG300128): same locality.

HABITAT DISTRIBUTION. Gravel, rock reef; 23-25m depth; St. Vincent Gulf (SA) (Fig. 249E).

DESCRIPTION. *Shape.* Massive, subspherical-bushy or erect digitate growth forms, 75-130mm high, 45-70mm wide, with short, irregularly cylindrical, bulbous lamellae, up to 50mm long, 20mm diameter, expanded at apex, partially fused to adjacent branches, with small, irregularly cylindrical or subconical digits arising from apex of lamellae and basal mass, up to 15mm long, 9mm wide, tapering at apex.

Colour. Colour alive dark or bright red, dark brown in ethanol.

Oscules. Numerous small oscules, up to 3mm diameter, apical or subapical on surface digits.

Texture and surface characteristics. Firm, compressible, not easily torn, harsh due to incorporation of detritus and bivalve shells into lamellae; surface rugose, porous on preserved state, with irregularly dispersed conules.

Ectosome and subectosome. Membraneous, fibrous, with terminal fibres protruding slightly and larger principal styles protruding a long way through surface, in plumose brushes or singly; subectosomal auxiliary subtylostyles relatively dense, usually erect, forming plumose or paratangential tracts on surface; mesohyl in ectosomal region heavy, granular, darkly pigmented.

Choanosome. Skeleton irregularly renieroid reticulate, slightly compressed in axis, slightly plumose at surface; spongin fibres very heavy, irregularly anastomosing, incompletely divided into primary and secondary fibre systems; axial skeleton with very heavy primary fibres, 90-120µm diameter, running longitudinally (through longitudinal sections of surface digits), ascending to apex of digits, interconnected by heavy but shorter, thinner secondary fibres, 42-95µm diameter, with slightly bulbous nodes at their junction, 155-195µm diameter; fibre anastomoses in axial skeleton close-meshed, 60-155µm diameter; primary axial fibres cored by multispicular tracts of shorter choanosomal principal styles, secondary fibres unispicular, occasionally paucispicular; all fibres echinated by smaller principal styles; extra-axial skeleton more cavernous, fibre meshes 110-360µm diameter, with more-or-less evenly reticulate fibres and irregularly renieroid reticulate spicule tracts; extra-axial primary fibres heavy, thick, 65-95µm diameter, clearly ascending and arising perpendicularly from primary fibres in axis, multispicular, with spicule tracts composed of smaller and larger principal styles diverging increasingly towards periphery; secondary connecting fibres heavy, short, mainly transverse, 18-43µm diameter, unispicular; echinating spicules moderately common in extra-axis; mesohyl matrix heavy, darkly pigmented, containing many scattered subectosomal auxiliary styles mostly near surface; choanocyte chambers oval, 30-50µm diameter.

Megascleres. Choanosomal principal styles (coring and echinating fibres) long or short, relatively thick, slightly curved at centre, with smooth, rounded or slightly subtylote bases, fusiform points. Length 124-(196.6)-312µm, width 5-(7.1)-10µm.

Subectosomal auxiliary subtylostyles thin (occasionally raphidiform), straight, slightly curved or sinuous, smooth subtylote bases, fusiform points. Length 123-(238.4)-355µm, width 1.5-(2.9)-4.5µm.

Microscleres. Chelae absent.

Toxas accolada, moderately short, thin, with slightly rounded central curvature, straight arms, straight points. Length 63-(129.4)-175µm, width 0.5-(1.6)-2.5µm.

ETYMOLOGY. For the late Dr Shane Parker of the SA Museum, bryozoologist, sponge enthusiast, ornithologist and gentleman.

REMARKS. This species differs from other *Echinoclathria* in toxa geometry, growth form, skeletal structure and spicule dimensions. The massive, more-or-less bulbous-digitate growth form is similar to *E. notialis* sp. nov., although *E. parkeri* is irregularly digitate, lacks the specialised surface sculpturing and porous reticulation peculiar to the prominently bulbous *E. notialis*. Its skeletal architecture is also slightly similar to *E. subhispida*, both having heavy fibres, multispicular primary (ascending) tracts and greatly reduced secondary (transverse) tracts, but those of *E. parkeri* are consistently unispicular and renieroid in construction whereas in *E. subhispida* secondary fibres are aspicular. The two species differ in growth form, fibre thickness, spicule geometry and size. Only one other species (*E. inornata*) has toxas that approach the accolada geometry of *E. parkeri*. In *E. inornata* toxas are much longer, raphidiform, with slight angular central curvature whereas in *E. parkeri* they are short and have rounded central curvature (these two species also differ in most other respects). *Echinoclathria parkeri* has the heaviest spongin fibres of all species, and its skeletal architecture is also dominated by the longitudinal, multispicular fibres running through digits, with the renieroid component of the skeleton not as obvious as in most species of *Echinoclathria*.

Echinoclathria riddlei sp. nov.
(Figs 251-252, Plate 11B)

MATERIAL. HOLOTYPE: QMG305005 (NCIQ66C-3637-I) (fragment NTMZ3801): Channel between Chappell I. and Badger I., Furneaux Is, Bass Strait, 40°16.8'S, 147°54.4'E, 15m depth, 22.ii.1990, coll. M. Riddle, NCI (SCUBA). PARATYPE: QMG300271 (NCIQ66C-3752-T) (fragment NTMZ3827): Trap Reef, Bicheno, E. coast Tas., 41°51.7'S, 148°18.6'E, 30m depth, 27.ii.1990, coll. NCI. OTHER MATERIAL: TAS- QMG300664 (NCIQ66C-3556-H) (fragment NTMZ3781).

HABITAT DISTRIBUTION. Rock reef, *Ecklonia* kelp and *Sargassum* beds; 15-30m depth; Furneaux Is, Kent Is, Bass Strait, Bicheno (Tas) (Fig. 251D).

DESCRIPTION. *Shape.* Thinly flabellate, up to 190mm long, 150mm maximum width, with long or short, cylindrical basal stalk, 30-75mm long, up to 18mm diameter, and expanded basal attachment; fan very thin walled, 1-4mm thick, flat, growing face-on to current, or convoluted growing in several planes; margins of fan digitate, palmate-digitate or heavily convoluted, never even.

Colour. Red or orange-brown alive (Munsell 2.5R 5/10 - 5YR 7/10), pale brown in ethanol.

Oscules. Minute, 0.5mm diameter, scattered over interior face of convoluted fan (holotype), or on osculiferous face of flat fans.

Texture and surface characteristics. Soft, slightly compressible, flexible; surface smooth, perfectly even, without any sculpturing, or with only faint ridges on surface near margins of convoluted fan; surface porous in preserved state, collagenous alive.

Ectosome and subectosome. Ectosome microscopically hispid with protruding large

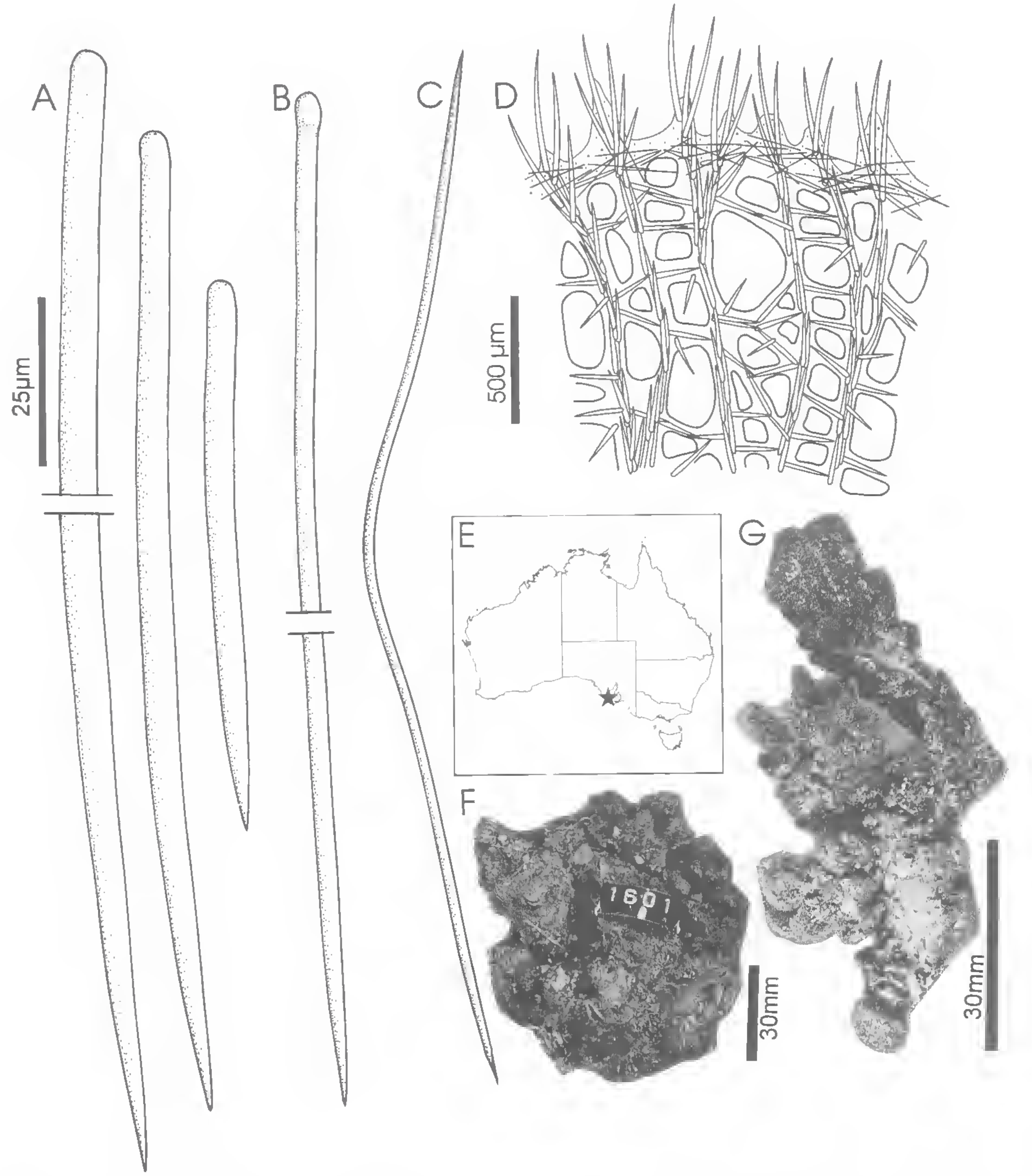


FIG. 249. *Echinoclathria parkeri* sp.nov. (holotype SAMTS4091). A, Principal styles (coring and echinating fibres). B, Subectosomal auxiliary subtylostyle. C, Accolada toxa. D, Section through peripheral skeleton. E, Australian distribution. F, Holotype. G, Paratype SAMTS4097.

choanosomal principal subtylostyles embedded on outer edge of peripheral skeleton, extending up to 300µm from surface, surrounded by irregular bundles of smaller thin subtylostyles lying tangential, paratangential or rarely forming brushes on ectosome; mesohyl matrix light in subectosomal region, ectosome membraneous.

Choanosome. Skeletal architecture renieroid reticulate, without any division between axial or peripheral regions except for larger principal

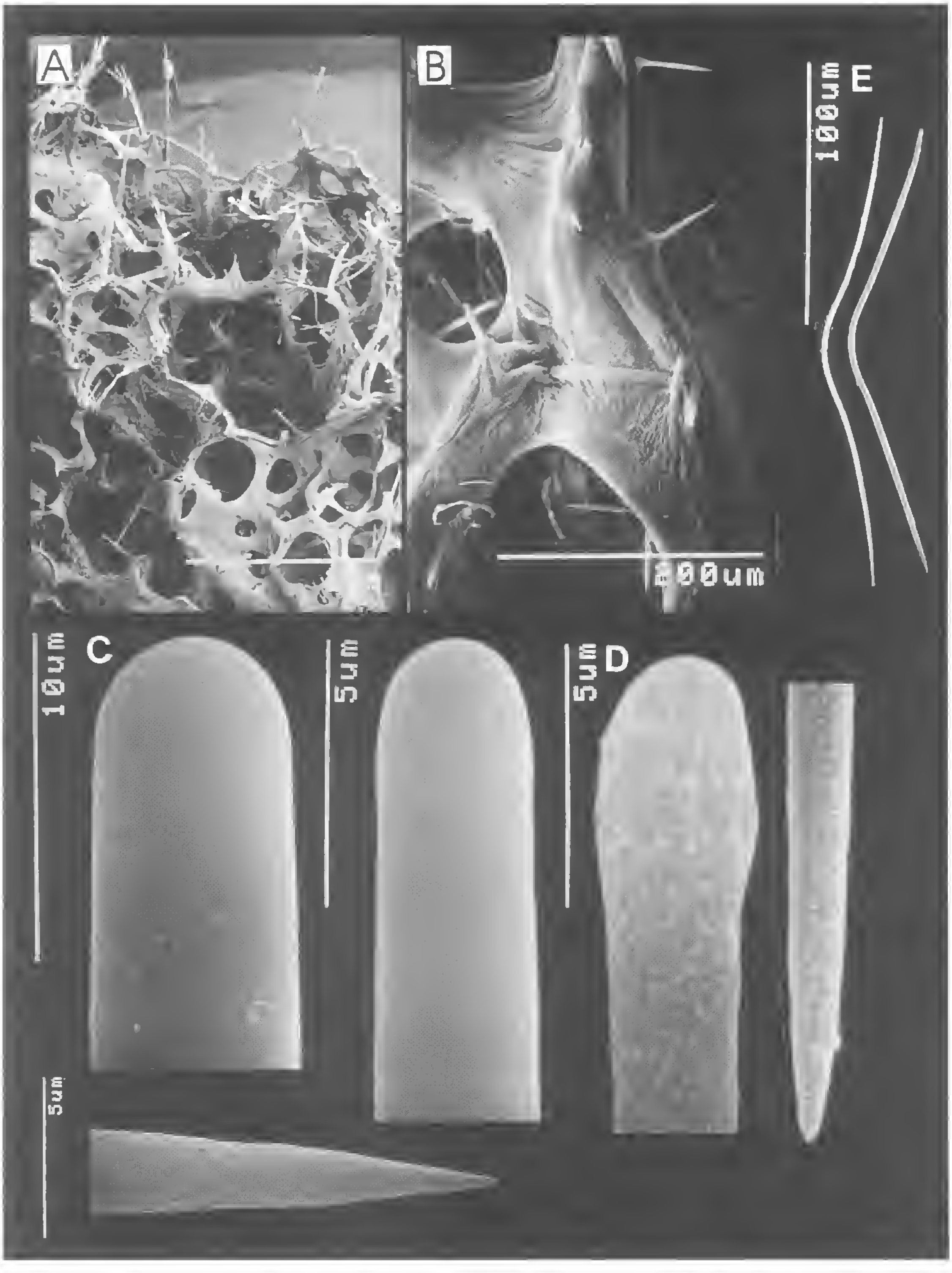


FIG. 250. *Echinoclathria parkeri* sp.nov. (holotype SAMTS4091). A, Choanosomal skeleton. B, Fibre characteristics. C-D, Ends of principal and auxiliary styles. E, Accolada toxas.

spicules protruding through surface; spongin fibres light, imperfectly divided into primary and secondary elements; primary fibres ascending, 30-40μm diameter, cored by pauci- or multispicular tracts of smaller subectosomal auxiliary subtylostyles; secondary fibres connecting primary elements, mainly transverse, 10-20μm diameter, cored by uni- or paucispicular tracts of smaller principal spicules; primary and secondary fibre anastomoses form rectangular, irregular, or occasionally triangular meshes, 40-80μm diameter; fibres echinated by smaller principal styles, mainly at core of skeleton, whereas in peripheral skeleton primary spicule tracts become plumose with principal spicules protruding through fibres at acute angles; mesohyl matrix light, unpigmented; choanocyte chambers small, oval, 15-45μm diameter.

Megascleres. Choanosomal principal subtylostyles long or short (the longer ones confined to the ectosomal skeleton), thick, slightly curved at centre, rarely straight, with smooth or microspined subtylote bases, entirely smooth shafts, fusiform points. Length 84-(146.4)-348μm, width 4-(6.8)10-μm.

Subectosomal auxiliary styles long, straight, slender, with prominently subtylote bases, smooth or slightly microspined, points that are fusiform, hastate or slightly telescoped. Length 127-(191.9)-282μm, width 1-(1.9)-3μm.

Microscleres. Absent.

ETYMOLOGY. Named for Dr Martin Riddle for collecting this and many other undescribed sponge species throughout Australasia during the AIMS NCI contract 1984-1991, and providing the author with many opportunities to collect from remote sites throughout the Indo-west Pacific.

REMARKS. This species has a very thinly flabellate growth form and renieroid skeletal structure similar to *Antho* (*I.*) *chartacea*, with which it was initially confused. However, *A. chartacea* has 3 distinct skeletal components: the smaller, smooth choanosomal principal styles forming the renieroid skeleton in the compressed axis and ascending to the surface in longitudinal tracts, the larger, smooth principal styles embedded in terminal ascending tracts, and the entirely spined styles forming extra-axial renieroid skeletal tract; principal styles are longer and thicker, with evenly rounded smooth bases, and tracts extend all the way into the choanosomal skeleton; auxiliary spicules are shorter, the skeletal meshes are more cavernous and the skeletal meshes comprising the renieroid skeleton are relatively homogenous. By comparison, *E. riddlei* sp. nov. has its principal styles with an entirely smooth shaft, bases are smooth or microspined (and spines are morphologically quite different from those in *A. chartacea*), bases of principal spicules are subtylote, the longer principal styles are embedded only in external surface (i.e., there is no secondary, longitudinal subisodictyal skeleton), skeletal meshes are much closer, fibres are poorly developed and heterogeneous (differentiated into primary and secondary elements), and points of auxiliary spicules do not vary in their terminations as do those of *A. chartacea*. These two species may be confused in the field, and their convergent field characteristics further illustrates the difficulty in objectively defining a generic boundary between *Antho* and *Echinoclathria*.

Echinoclathria subhispida Carter, 1885
(Figs 253-254)

Echinoclathria subhispida Carter, 1885f: 356 [et var. *subhispida*]; Ridley & Dendy, 1887: 160; Hooper & Wiedenmayer, 1994: 280.
Ophlitaspongia subhispida; Dendy, 1896: 36; Hallmann, 1912: 257-260, pl.36, fig.1, text-figs 54-55.
Echinoclathria gracilis Carter, 1885f: 356.
Thalassodendron viminalis Lendenfeld, 1888: 225.
? *Echinoclathria viminalis*; in part, Whitelegge, 1901: 87-88.
Not *Thalassodendron viminalis*; Whitelegge, 1902a: 214-215.
Not *Echinochalina glabra*; Thomas, 1977: 115-116.
Ceraochalina multiformis; Whitelegge, 1902b: 287.
Ophlitaspongia chalinoides, in part, Hallmann, 1912: 270-272, text-fig.59.
Not *Axinella chalinoides* Carter, 1885f: 358.

MATERIAL. LECTOTYPE: BMNH1886.12. 15.70: Port Phillip, Vic, 38°09'S, 144°52'E, other details unknown. PARALECTOTYPE: BMNH1886.12.15.-73: same locality. LECTOTYPE of *E. gracilis*: BMNH1886.12.15.45 (fragment AMG2768): Port Phillip Heads, Vic, 38°17'S, 144°39'E, 40m depth, coll. J.B. Wilson (dredge). PARALECTOTYPE of *E. gracilis*: BMNH1886.12.15.90 (fragment AMG2773): same locality. LECTOTYPE of *T. viminalis*: AMZ948 (dry): Illawarra region, NSW, 34°32'S, 150°50'E, other details unknown (label 'Distylinia viminalis (Thalassodendron); type'). PARALECTOTYPE of *T. viminalis*: BMNH1887.4.27.116 (dry) (fragments AMG3589, ZMB7135): same locality. OTHER MATERIAL: VIC- AMZ922, AMZ797, AMZ1141, AMZ1142, AMZ1144, AMZ1763. S AUST- QMG300240 (NCIQ66C-2194-Z) (fragment NTMZ3534).

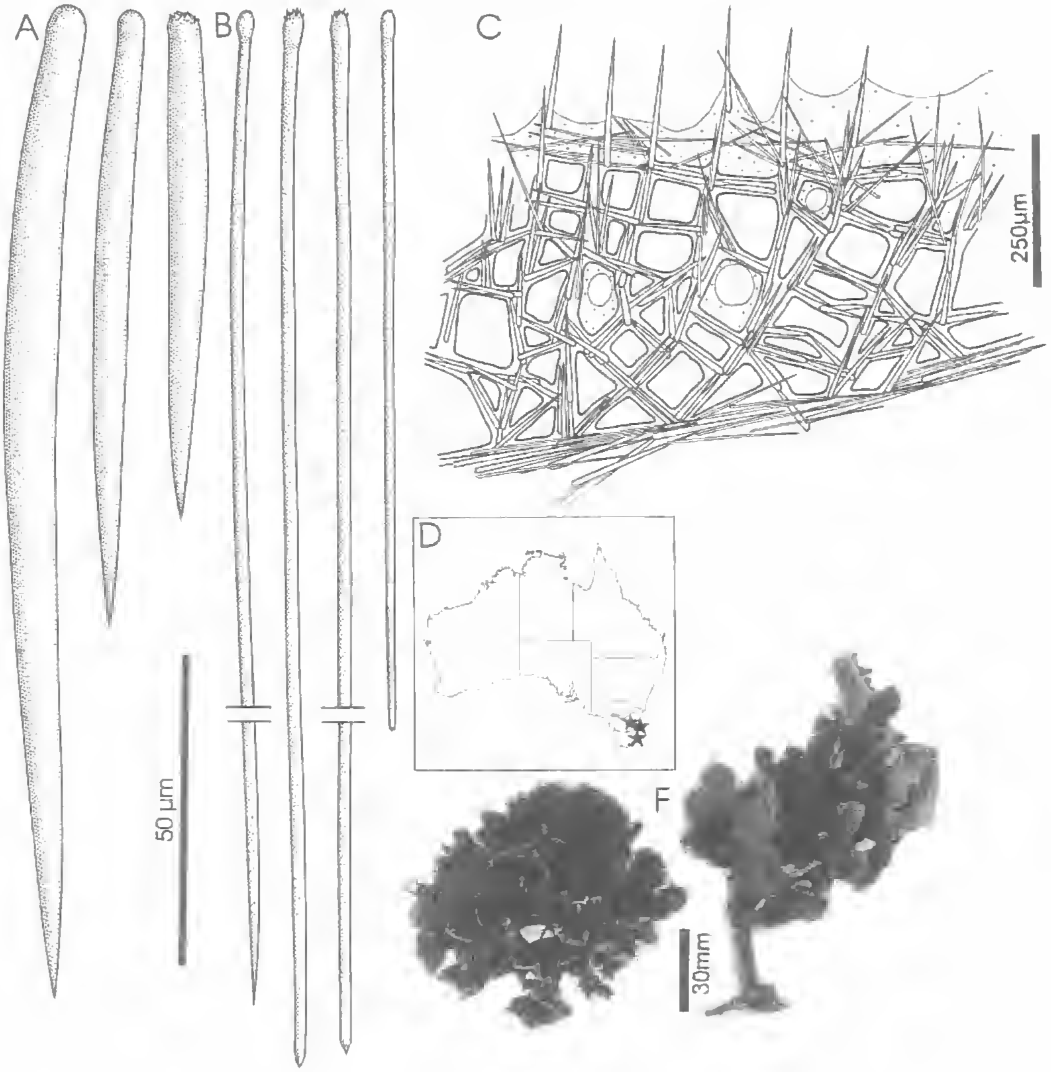


FIG. 251. *Echinoclathria riddlei* sp.nov. (holotype QMG305005). A, Principal subtylostyles (coring and echinating fibres). B, Subectosomal auxiliary subtylostyles. C, Section through peripheral skeleton. D, Australian distribution. F, Holotype (at right) and unregistered specimen from same locality.

HABITAT DISTRIBUTION. Rock reef, sand, seagrass substrata; 38-440m depth; Port Phillip (Vic); Kangaroo I. (SA); Illawarra (NSW) (Fig. 253H).

DESCRIPTION. *Shape.* Erect, digitate, up to 220mm high, 90mm maximum width; digits long, whip-like, thinly cylindrical or slightly flattened, up to 120mm long, 12mm maximum thickness, repeatedly bifurcate, rarely anastomosing, with rounded, flattened, or bifid apical margins, occasionally palmate; short basal stalk, 15-65mm long, 18mm maximum diameter and expanded basal attachment.

Colour. Red to dark red alive; brown, dark red-brown to maroon in ethanol.

Oscules. Large oscules, up to 4mm diameter, scattered on lateral margins of branches, slightly raised on small conules, slightly stellate or irregular in shape.

Texture and surface characteristics. Digits compressible, rubbery, flexible; surface optically smooth, even except for microscopic conules

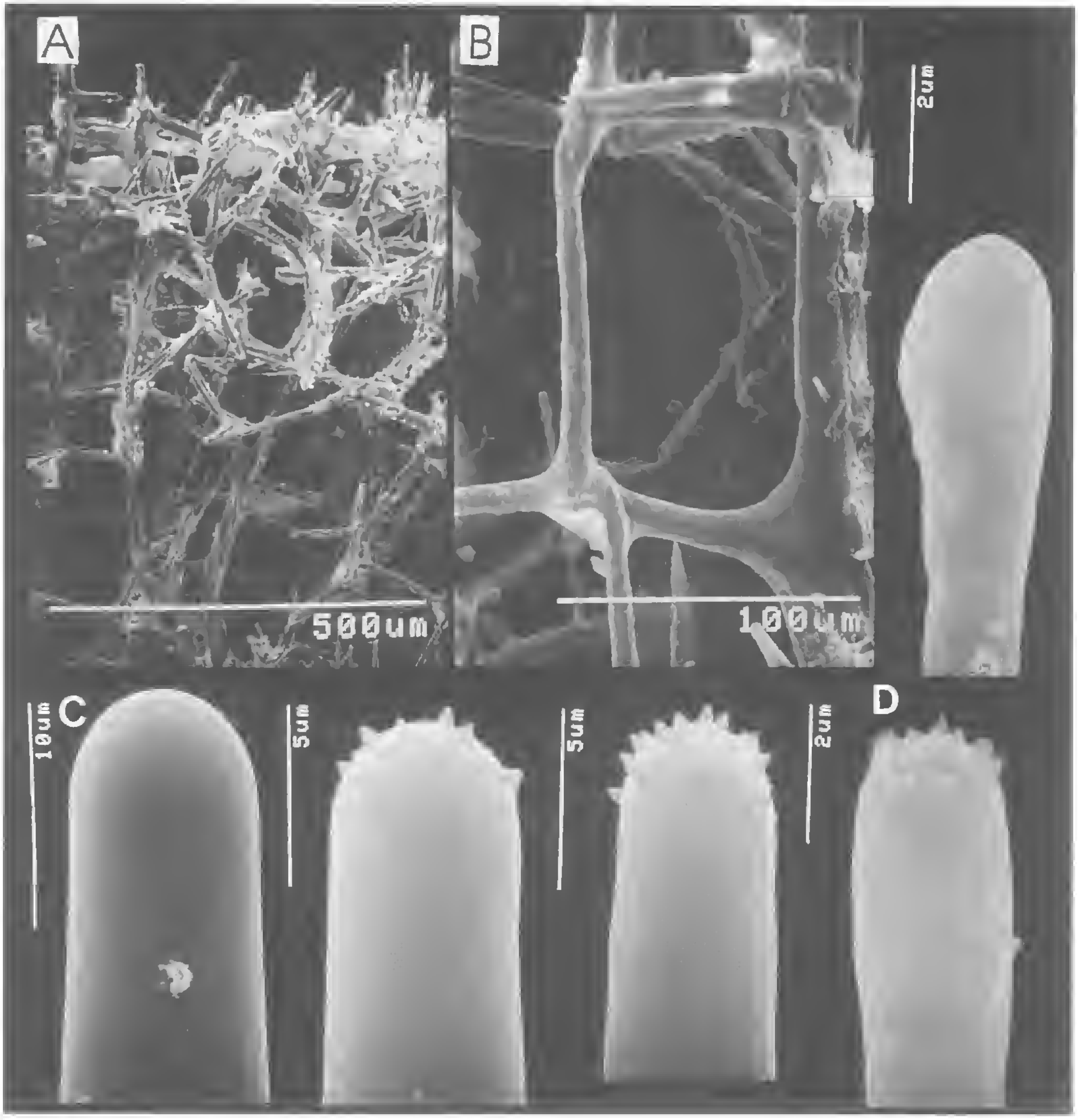


FIG. 252. *Echinoclathria riddlei* sp.nov. (paratype QMG300271). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal subtylostyles. D, Subectosomal auxiliary subtylostyles.

bearing apical oscules on lateral margins of digits.

Ectosome and subectosome. Surface membraneous, microscopically hispid, with points of longer choanosomal principal styles protruding slightly through surface, singly or in paucispicular plumose brushes, arising from terminal fibres, and fibres themselves also protrude through surface; few subectosomal auxiliary styles scattered tangential or paratangential to ectosome.

Choanosome. Skeleton regularly dendro-reticulate, composed of heavy spongin fibres more compressed in axial than extra-axial regions; axis irregularly reticulate, heavy fibres incompletely differentiated into primary and secondary elements, 46-182µm diameter, with markedly bulbous axial fibre nodes; extra-axial skeleton nearly perfectly regular, dendro-reticulate, with clearly differentiated primary ascending, radial, paucispicular fibres branching at outer surface (30-62µm diameter), interconnected at regular intervals by thinner transverse, aspicular or rarely unispicular secondary fibres (18-53µm diameter); primary fibres both cored and echinated by choanosomal principal styles, slightly smaller than those at the surface; echinating spicules marginally more abundant on peripheral fibres; fibre anastomoses form oval or elongate meshes in axis (160-295µm diameter), square, rectangular or oval meshes towards periphery (125-290µm diameter); mesohyl matrix heavy but only lightly pigmented, large ovoid choanocyte chambers 75-110µm diameter, numerous loose choanosomal styles and fewer subectosomal auxiliary megascleres scattered between fibres.

Megascleres. Choanosomal principal styles (coring and echinating fibres) moderately short, thick, slightly curved or straight, with smooth, tapering, constricted and slightly subtylote bases, fusiform points. Length 75-(131.3)-168µm, width 4-(5.4)-7µm.

Subectosomal auxiliary subtylostyles long, thin, straight or slightly curved at centre, with smooth subtylote bases, fusiform points. Length 89-(183.1)-235µm, width 1-(2.2)-3µm.

Microscleres. Isochelae absent.

Toxas wing-shaped to oxeote, thin with slightly rounded or slightly angular central curvature, straight arms, straight or slightly reflexed points. Length 30-(72.5)-95µm, width 0.8-(1.2)-1.5µm.

Larvae. Viviparous, spherical or elongate parenchymella larvae, 180-280x150-210µm, heavily pigmented, and with toxas and juvenile styles dispersed.

REMARKS. AMZ948 of Whitelegge (1902b) and Hallmann (1912), was labelled '*Ceraochalina multiformis* var. *dura* Lendenfeld (no. 332)', but is now labelled (in Hallmann's handwriting) '*Distylinia viminalis* Lendenfeld, ?type of *Thalassodendron viminalis*'. However, the holotype of var. *dura* (with a surviving fragment AMG3456) is different (cf. Lendenfeld, 1887b). This variety was also described from Port Chalmers, New Zealand (the only locality cited in the original description), containing oxea megascleres (cf. Whitelegge, 1902b). Thus, AMZ948 is not a syntype contrary to Lendenfeld's (1887b) descriptions. The specimen *Thalassodendron viminalis* Lendenfeld, no.365 missing from AM (pers. obs.) was rejected as type by Whitelegge (1902b), who made it the holotype of his *E. intermedia*. Consequently, *T. viminalis* is a junior synonym of *Echinoclathria subhispida* var. *viminalis*. Further discussion on *T. viminalis* and *E. intermedia* are given below under *E. intermedia*. Some material (AMZ1141, 1142, 1144, 1763) described by Hallmann (1912) as *E. chalinoides* also belong to *E. subhispida*. based on different spiculation and skeletal architecture.

This species differs from most other *Echinoclathria* in its renieroid fibre skeleton (i.e., rectangular meshes) rather than dendro-reticulate spicule skeleton, but this is because the transverse, connecting spicule tracts in secondary fibres are either absent or vestigial, leaving only the primary ascending spicule tracts (more-or-less plumose, branching) dominating the mineral skeleton. Size differences between principal styles protruding through the surface and those coring and echinating choanosomal fibres is only marginal (the former slightly larger), whereas in most *Echinoclathria* this feature is more pronounced. Reductions of these characters in *E. subhispida* are not good reasons to exclude it from this genus. This species is similar to *E. notialis* sp. nov. in microscopic surface features (having spongin fibres and sparse spicule brushes protruding through the surface), and in skeleton dominated by spongin fibres (as opposed to well-developed spicule tracts). However, *E. notialis* has a bulbous-digitate growth form (cf. a digitate, *Haliclona*-like habit in *E. subhispida*), lacks toxas (cf. wing-shaped toxas), has substantially smaller spicules, lacks any (or has very little) compression of the axial skeleton (cf. well-differentiated axial and extra-axial fibres), has virtually no difference in size between principal spicules coring fibres and those protruding through the surface (cf. clear localisation of larger spicules in the peripheral skeleton), and both ascending and transverse fibres are cored by greatly reduced, predominantly unispicular tracts (cf. ascending fibres have well developed, multispicular spicule tracts whereas transverse fibres are often aspicular in *E. subhispida*).

OTHER SPECIES OF *ECHINOCLATHRIA*

Echinoclathria arborea (Tanita, 1968)

Litaspongia arborea Tanita, 1968: 49-50, pl.1, fig.7, text-fig.9 [Ariake Sea].

Not *Echinoclathria arborea*; Hallmann, 1912: 202.

MATERIAL. HOLOTYPE: MMBS. Japan.

Echinoclathria arcifera (Schmidt, 1880)

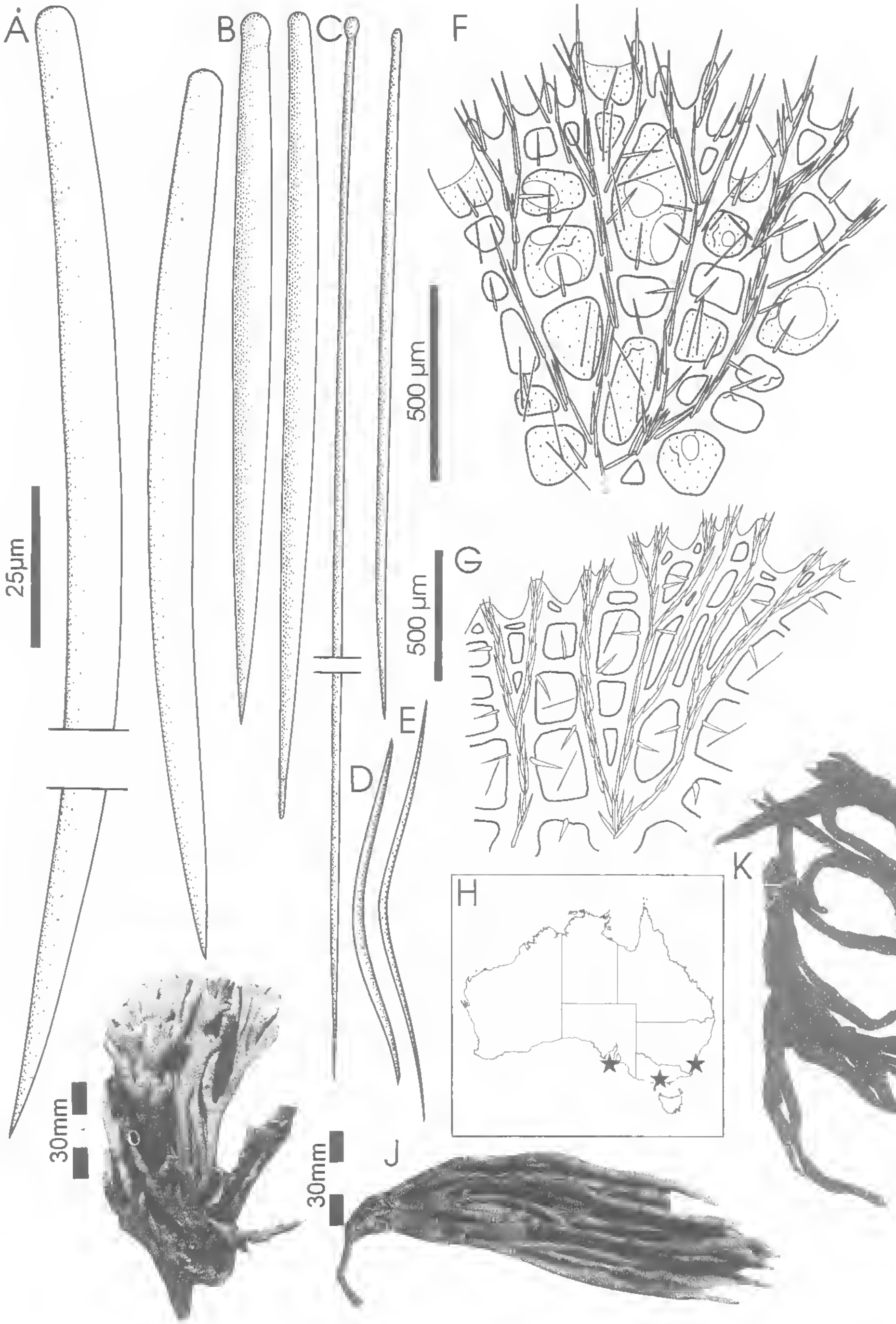


FIG. 253. *Echinoclathria subhispida* Carter (B-C,E-F, holotype BMNH1886.12.15.70; A,D,G, holotype of *T. viminalis* AMZ948). A-B, Principal styles/ subtylostyles (coring and echinating fibres). C, Subectosomal auxiliary subtylostyles. D-E, Wing-shaped/ oxeote toxas. F-G, Sections through peripheral skeleton. H, Australian distribution. I, Holotype. J, Holotype *E. gracilis*. K, Holotype *T. viminalis*.

Tenacia arcifera Schmidt, 1880: 81, pl.10 [Gulf of Mexico]; Hallmann, 1920: 771.
Ophlitaspongia arcifera; Burton, 1959a: 247 [key to species].

MATERIAL. HOLOTYPE: LMUG. Caribbean.

Echinoclathria atlantica Sarà, 1978

Echinoclathria atlantica Sarà, 1978: 76-79, text-figs 49-51 [Cape Domingo, Tierra del Fuego]; Desqueyroux-Faundez & Moyano, 1987: 50 [Tierra del Fuego, Argentina].

MATERIAL. HOLOTYPE: IZUG34, fragment MNHNDCL2739. SW. Atlantic.

Echinoclathria beringensis (Hentschel, 1929)

Phakellia papyracea, in part; Lambe, 1892: 76 [Alaska].
Phakellia beringensis Hentschel, 1929: 975.
Echinoclathria beringensis; de Laubenfels, 1954: 164 [note].
Echinoclathria schmitti de Laubenfels, 1942: 264 [Baffin Bay, Arctic].

MATERIAL. HOLOTYPE: USNM. Arctic.

Echinoclathria contexta Sarà, 1978

Echinoclathria contexta Sarà, 1978: 79-82, text-figs 52-53 [Tierra del Fuego]; Desqueyroux-Faundez & Moyano, 1987: 49 [Tierra del Fuego.

MATERIAL. HOLOTYPE: IZUG 170, fragment MNHNDCL2749. SW. Atlantic.

Echinoclathria dichotoma (Lévi, 1963)

Ophlitaspongia dichotoma Lévi, 1963: 59, pl.9G, text-fig.68 [South Africa].

MATERIAL. HOLOTYPE: MNHNDCL615. South Africa.

Echinoclathria digitiformis (Row, 1911)

Ophlitaspongia digitiformis Row, 1911: 351-353, pl.37, figs 14-15 [Shab-ul-Shubak, Red Sea].
Echinochalina digitiformis; de Laubenfels, 1936a: 119 [note].

MATERIAL. HOLOTYPE: BMNH1912.2.164. Red Sea.

Echinoclathria hjorti Arnesen, 1920

Echinoclathria hjorti Arnesen, 1920: 21-22, pl.2, fig.5, pl.5, fig.3 [off Cape Bojador, Sahara, N. Atlantic].
Axociella hjorti; de Laubenfels, 1936a: 119 [note].
Ophlitaspongia hjorti; Burton, 1959b: 43-44 [Iceland].

MATERIAL. HOLOTYPE: ZMUU. NW. Africa, NE. Atlantic.

Echinoclathria minor (Burton, 1959)

Ophlitaspongia minor Burton, 1959a: 246, text-fig.27 [Arabian Sea; key to species]; Sim & Kim, 1988: 24, pl.1, figs 1-2 [S. Korea, doubtful conspecificity].

MATERIAL. HOLOTYPE: BMNH1936.3.4. 609. Arabian Gulf.

Echinoclathria mutans (Sarà, 1978)

Ophlitaspongia mutans Sarà, 1978: 73-76, text-figs 47-48 [Cape San Sebastiano, Cape Domingo, Tierra del Fuego]; Desqueyroux-Faundez & Moyano, 1987: 50 [Tierra del Fuego, Argentina].

MATERIAL. HOLOTYPE: IZUG124, fragment MNHNDCL2750. SW. Atlantic.

Echinoclathria noto (Tanita, 1963)

Ophlitaspongia nato Tanita, 1963: 124-125, pl.4, fig.3, text-fig.3 [Sea of Japan]; Tanita, 1964: 17-18, 21, pl.1, fig.4 [Japan]; Tanita, 1965: 48 [Sea of Japan]. Sim & Kim, 1988: 24-25 [Korea]; Sim & Byeon, 1989: 37 [Korea].

MATERIAL. HOLOTYPE: MMBS. Japan, Korea.

Echinoclathria oxeata(Bergquist & Fromont, 1988)

Ophlitaspongia oxeata Bergquist & Fromont, 1988: 113, pl.52, figs c-e [New Zealand]; Dawson, 1993: 38 [index to fauna].

MATERIAL. HOLOTYPE: NMNZPOR117. New Zealand.

Echinoclathria reticulata(Bergquist & Fromont, 1988)

Ophlitaspongia reticulata Bergquist & Fromont, 1988: 113-114, pl.52, fig. f, pl.53, figs a-c [New Zealand]; Dawson, 1993: 38 [index to fauna].

MATERIAL. HOLOTYPE: NMNZPOR118. New Zealand.

Echinoclathria translata(Pulitzer-Finali, 1977)

Ophlitaspongia translata Pulitzer-Finali, 1977: 63, text-figs 20-22 [Tyrrhenian Sea].

MATERIAL. HOLOTYPE: BMNH1977.7.6.9. Mediterranean.

Echinoclathria waldoschmitti de Laubenfels, 1954

Echinoclathria waldoschmitti de Laubenfels, 1954: 163-164, text-fig.106 [Kuop Atoll, W Pacific].

MATERIAL. HOLOTYPE: USNM23092. NW Pacific

TRANSFERS

Other species described in *Echinoclathria* but now transferred to other genera.

Ophlitaspongia fucoides Bowerbank, 1876: 771, pl.80 [Shark Bay, WA].
Terpiosella fucoides; Burton, 1930b: 675.

MATERIAL. HOLOTYPE: BMNH1877.5.21.8. Note: referred to Suberitidae.

Holopsamma Carter, 1885

Holopsamma Carter, 1885c: 211
Plectispa Lendenfeld, 1888: 225.
Aulena; in part, Lendenfeld, 1888: 228; (not Lendenfeld, 1885c: 309).
[*Halme*] Lendenfeld 1885c: 285 (preocc.).

TYPE SPECIES. *Holopsamma crassa* Carter, 1885c: 211 (by subsequent designation of de Laubenfels, 1936a: 98).

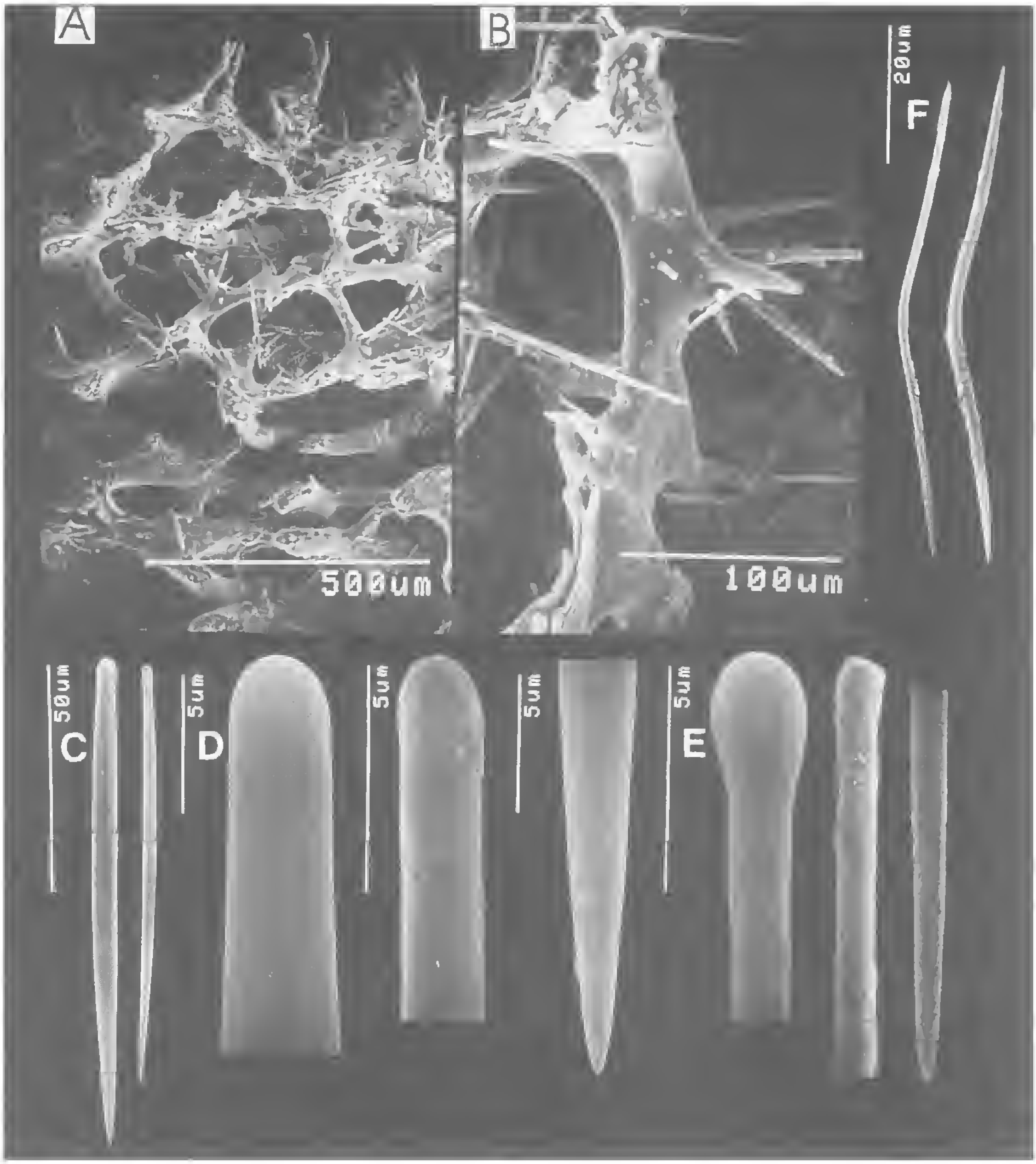


FIG. 254. *Echinoclathria subhispida* Carter (holotype BMNH1886.12.15.70). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal styles/ subtylostyles. D-E, Ends of principal and auxiliary subtylostyles. F, Wing-shaped - oxeote toxas.

DEFINITION. Honeycombed reticulate growth form of tightly anastomosing flattened fibre-branches (lacunae); choanosomal skeleton simply reticulate, without any axial compression or differentiation between axial and extra-axial skeletons; principal spicules core and echinate fibres, those inside fibres sometimes partially or completely replaced by detritus although those echinating fibres usually always present.

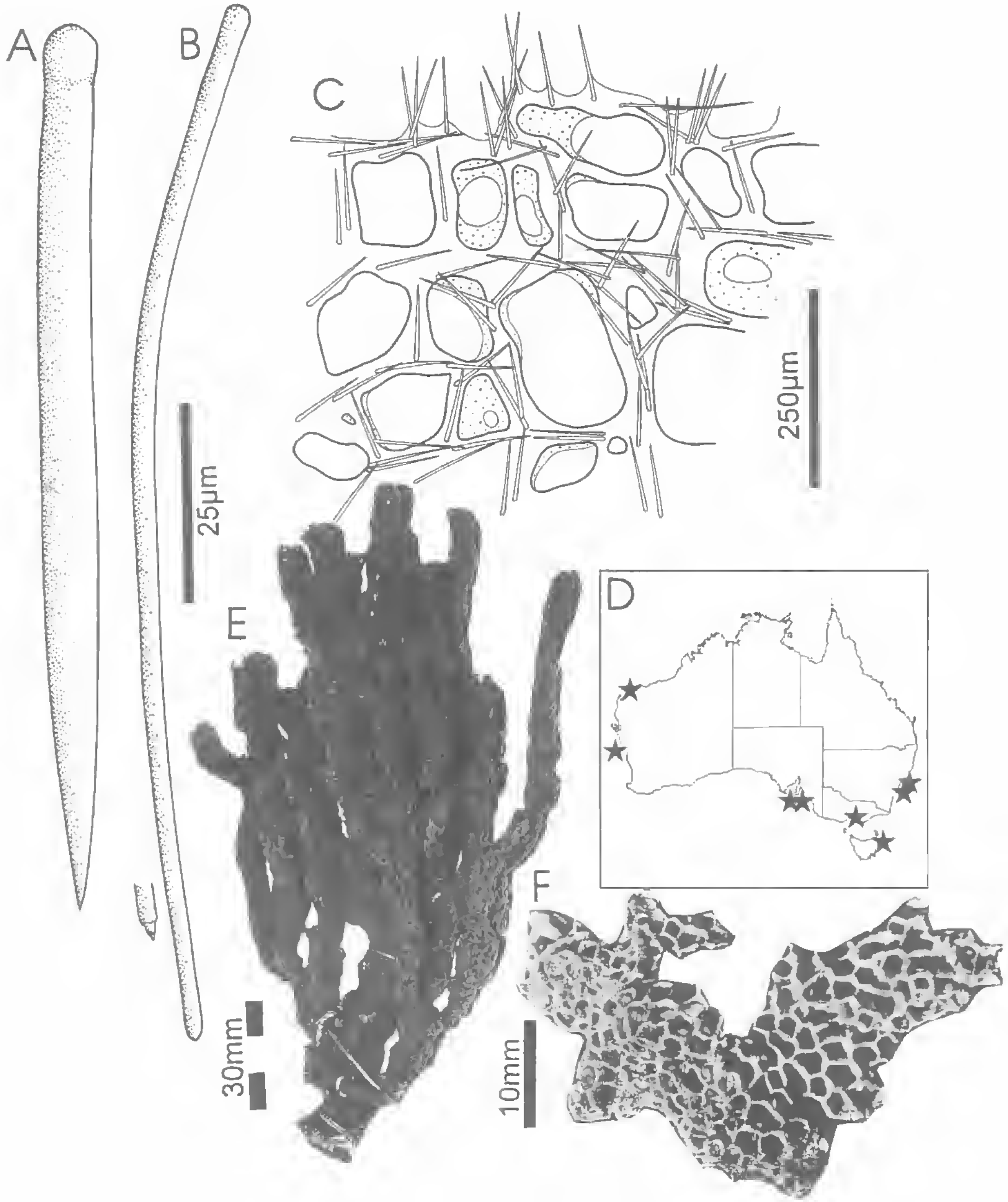


FIG. 255. *Holopsamma arborea* (Lendenfeld) (holotype AMZ946/G9160). A, Principal subtylostyle (coring and echinating fibres). B, Subectosomal auxiliary style and points. C, Section through peripheral skeleton. D, Known Australian distribution. E, Holotype. F, NTMZ2907.

REMARKS. *Holopsamma* and *Echinoclathria* have been confused throughout the literature and *Echinoclathria*, *Ophlitaspongia*, *Plectispa*, *Halme* have been used interchangeably for all species. *Holopsamma* is separated from *Echinoclathria* by its honeycombed reticulate growth

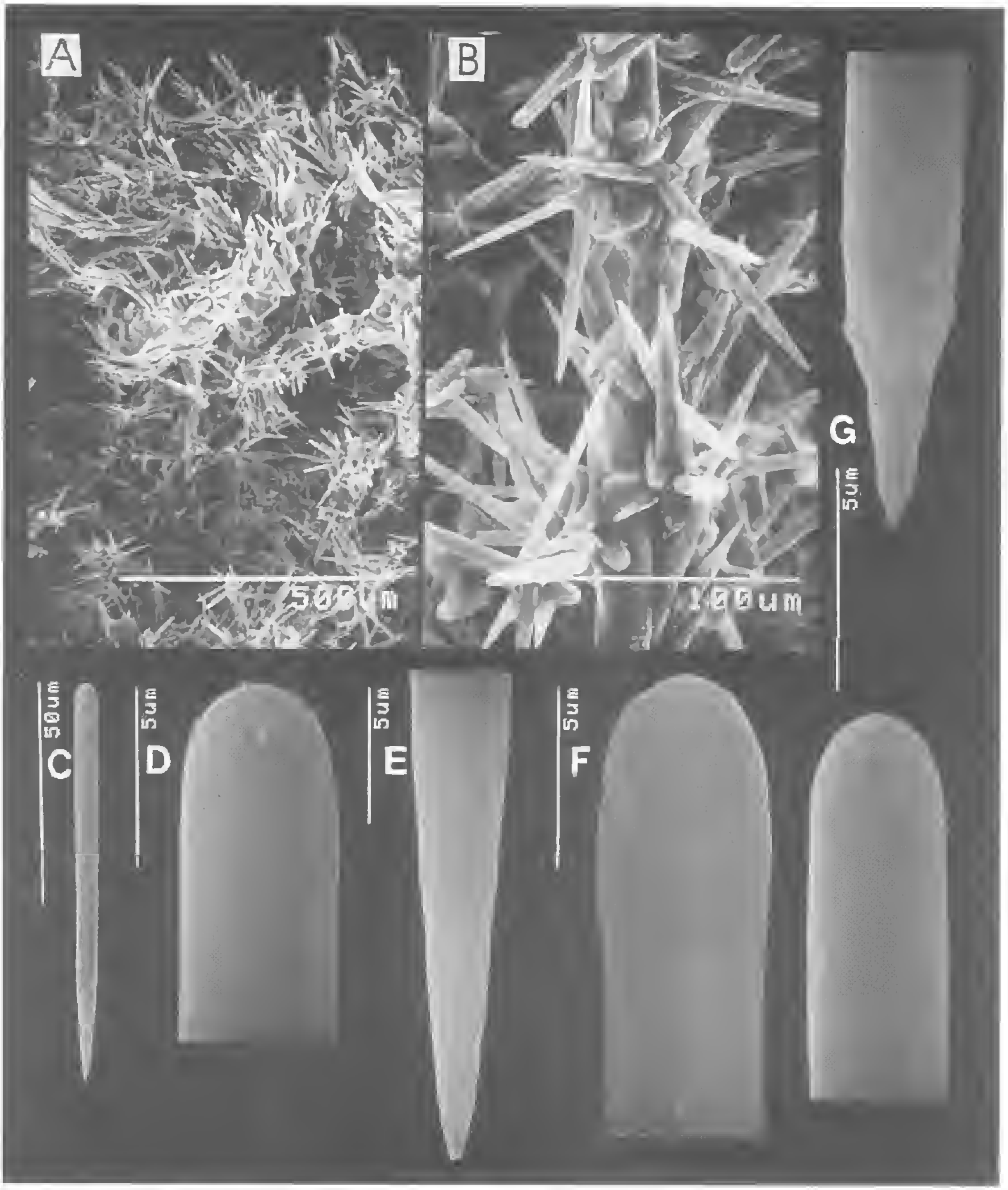


FIG. 256. *Holopsamma arborea* (Lendenfeld) (QMG303756). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal style. D-F, Ends of principal style. G, Ends of auxiliary style.

form, homogeneous fibre reticulation, single size class of choanosomal spicule found both inside fibres and echinating fibres (i.e., lacking the larger, extra-axial styles found in the peripheral skeleton of most *Echinoclathria*): when type species are compared it is surprising why these genera have been confused. Twenty four species have been referred to this genus, of which 10 are well established and live in Australian waters; they are probably part of the Gondwanan fauna.

Holopsamma arborea (Lendenfeld, 1888)
(Figs 255-256, Plate 11C)

Plectispa arborea Lendenfeld, 1888: 226.
Echinoclathria arborea; Hallmann, 1912: 202, 280-282, pl.29, fig.2, text-fig.63.
Holopsamma arborea; Hooper & Wiedenmayer, 1994: 281.
Not *Clathria* (*Plectispa*) *arborea*; Whitelegge, 1901: 65, 88, 89, pl.11, figs 15-15a; Hallmann, 1912: 211 [nomen nudum].
Not *Litaspongia arborea* Tanita, 1968: 49.
Not *Thalassodendron reticulata* Lendenfeld, 1888: 227; Whitelegge, 1902a: 212.
Echinoclathria elegans; Whitelegge, 1901: 90.
Not *Plectispa elegans* Lendenfeld, 1888: 226.
Not *Clathria multipes* Whitelegge, 1901: 88.
? *Echinoclathria laxa*; de Laubenfels, 1954: 164.

MATERIAL. HOLOTYPE: AMZ946/G9160 (dry): Illawarra, NSW, 34°32'S, 150°50'E, other details unknown (old specimen label 'Halme alborea, type or cotype', new label 'Echinoclathria arborea Lendf. ? type').OTHER MATERIAL: NSW- QMG303756, QMG303760, QMG303797, QMG303808. VIC-QMG311287 (NCIQ66C-3499-T) (fragment NTMZ3772). TAS- QMG311450 (NCIQ66C-3759-A) (fragment NTMZ3826). S AUST- QMG300239 (NCIQ66C-2148-Z) (fragment NTMZ3526). WA-QMG300192 (fragment NTMZ2907), NTMZ3368.

HABITAT DISTRIBUTION. Widely distributed in temperate coastal waters usually on rocky reefs; shallow subtidal-50m depth; Illawarra, N. & S. Sydney (NSW); Westernport Bay (Vic), Bicheno (Tas), Kangaroo I. (SA), Houtman Abrolhos, Barrow I. (WA) (Fig. 255D).

DESCRIPTION. *Shape*. Arborescent, cavernous-reticulate, tubulo-digitate sponge, up to 450mm long, with short basal stalk, up to 35mm long, 18mm diameter, and single or multiple, regularly or irregularly cylindrical branches which repeatedly bifurcate and occasionally anastomose; branches 120-330mm long, 15-38mm diameter, often tapering towards ends.

Colour. White or off-white alive, grey or grey-brown in ethanol.

Oscules. Large, up to 7mm diameter, recessed between honeycomb surface meshes, surrounded by membraneous lip.

Texture and surface characteristics. Firm, compressible, flexible branches, slightly harsh surface; surface regularly or irregularly honeycomb reticulate, with fibre-branches (lacunae) forming close hexagonal meshes, 8-22mm diameter; lacunae ridge-like, projecting up to 10mm above surface, with thin membrane stretched between adjacent lacunae.

Ectosome and subectosome. Ectosome membraneous, collagenous, with few subectosomal auxiliary megascleres lying tangential or paratangential to surface, and single or paucispicular plumose brushes of principal styles protruding through surface; subectosomal skeleton undifferentiated from choanosomal skeleton, immediately below surface.

Choanosome. Skeletal architecture regularly reticulate, with relatively light, small spongin fibres differentiated into ascending primary, pauci- or multispicular (30-52μm diameter), and transverse bi-, uni- or rarely aspicular connecting elements (12-22μm diameter); fibre anastomoses form oval to elongate meshes, 60-140μm diameter; fibres cored and echinated by choanosomal principal styles, and echinating spicules most common on peripheral fibres; mesohyl matrix light, virtually unpigmented, with few scattered subectosomal auxiliary spicules between fibres; choanocyte chambers small, oval, 22-35μm diameter.

Megascleres. Choanosomal principal styles or subtylostyles short, thick, with tapering or slightly subtylote bases, typically smooth, sometimes vestigially microspined bases, points tapering fusiform. Length 78-(104.8)-118μm, width 4-(5.6)-7.5μm.

Subectosomal auxiliary megascleres thin, straight or slightly curved at centre, rounded smooth bases and telescoped hastate-pointed or rounded strongylote points sometimes resembling anisostrongyles. Length 109-(133.2)-143μm, width 1.5-(2.2)-2.5μm.

Microscleres. Absent.

REMARKS. There is only a single type specimen in the AM collections, despite Hallmann's (1912: 282) remarks to the contrary, and I must assume that the double-registered AMZ946/G9160 is a holotype and not part of a type series (syntype). No other specimens with true affinities to *H. arborea* were found in the AM collections although there are several specimens labelled *Clathria* or *Plectispa arborea* that Hallmann may have been referring to, but these do not belong here (see remarks for *C. multipes*).

This species is distinctive in the field in its nearly pure white colour, thinly cylindrical digitate branches (often bifurcate or arborescent in older specimens), and regular, close-meshed honeycomb reticulation (whereas in most other species the surface reticulation is generally wider and the lacunae thicker). This species is closest to *H. ramosa* and *H. macropora*, with comparable spicule geometry and skeletal architecture, but differs in fibre diameter, spicule size and field characteristics.

Holopsamma crassa Carter, 1885
(Figs 257-258, Plate 11D)

Holopsamma crassa Carter, 1885c: 211; Hooper & Wiedenmayer, 1994: 281.
Aulena crassa Lendenfeld, 1889a: 101-102, pl.8, figs 1,2, 5, 6, 22, 23, pl.9, figs 5,9.
Echinoclathria crassa; Hallmann, 1912: 287.
Not *Antherochalina crassa* Lendenfeld, 1887b: 787.
Halme micropora Lendenfeld, 1885e: 303; Lendenfeld, 1889a: 461, pl.9, fig.12, pl.11, fig.4.
Halme globosa Lendenfeld, 1885c: 303; Lendenfeld, 1889a: 456-457, pl.9, fig.11.
Echinoclathria globosa; Carpay, 1986: 24; Wiedenmayer, 1989: 63-64, pl.6, figs 2-5, 7, text-fig.43.

MATERIAL. LECTOTYPE: BMNH1886.12.15.313: Port Phillip, Vic, 38°09'S, 144°52'E, 38m depth, coll. J.B. Wilson (dredge). PARALECTOTYPES: BMNH1886.12.15.314, 316, 410, 485: same locality. LECTOTYPE of *H. globosa*: BMNH1886.8.27.71 (fragment AMG3753): Port Phillip, Vic, 38°09'S, 144°52'E, 38m depth, coll. J.B. Wilson (dredge) (only remaining syntype of two. LECTOTYPE of *H. micropora*: BMNH1886.8.27.89 (fragments BMNH1886. 12.15.90, AMG3779): Illawarra, NSW, 34°33'S, 150°55'E, no other details known. PARALECTOTYPE of *H. micropora*: AMG8828 (dry): same locality.OTHER MATERIAL: QLD-QMG303235. S AUST- QMG301379, SAMTS4082 (fragment NTMZ1678), SAMTS4085 (fragments QMG300472, NTMZ1599), SAMTS4057 (fragment NTMZ1664), QMG310777 (NCIQ66C-2143-U) (fragment NTMZ3524), QMG310804 (NCIQ66C-2192-X) (fragment NTMZ3532).

HABITAT DISTRIBUTION. Rock reef, sand and kelp bed substrata; 2-38m depth; Stradbroke I., Moreton Bay (SEQ); Byron Bay, Illawarra, (NSW); Port Phillip Bay, Westernport Bay (Vic); Bass Strait (Tas); Investigator Strait, St. Vincent Gulf, Kangaroo I., Port Noarlunga, Great Australian Bight (SA) (Fig. 257E).

DESCRIPTION. *Shape.* Massive, subcylindrical, or lobate-digitate honeycomb reticulate sponge, 75-150mm diameter, with enlarged, flattened, slightly elongated basal attachment.
Colour. Yellow-brown to cream coloured alive (Munsell 2.5Y 8/6 or paler), brown in ethanol.
Oscules. Large, up to 6mm diameter, slightly recessed within reticulate meshes, surrounded by thin membraneous lip in life.
Texture and surface characteristics. Texture varies according to amount of detritus in skeleton, ranging from flexible, soft, compressible, to distinctly brittle, arenaceous; surface reticulate, lacunose, consisting of irregularly meandering ridges forming large meshes producing characteristic honeycomb growth form, in life covered by moderately thin, translucent dermal membrane stretched between adjacent ridges.
Ectosome and subectosome. Ectosome heavily arenaceous, with a thick sandy external cortex covered by a fine membraneous ectosomal skeleton usually containing a tangential layer of auxiliary spicules, in tracts or scattered singly across surface, but easily detached when surface membrane collapses upon preservation (hence and not seen in some specimens); subectosomal region undifferentiated from choanosome, fibres immediately subectosomal.
Choanosome. Skeletal architecture irregularly reticulate, with heavy, relatively homogeneous spongin fibres, up to 200µm diameter, lamellated and virtually fully cored by sand grains, with or without a core of choanosomal principal styles; fibres usually always echinated by principal styles, sometimes echinating spicules reduced in heavily arenaceous specimens; mesohyl matrix heavy, darkly pigmented, granular, also containing foreign particles and some auxiliary megascleres scattered between fibres; mesohyl cavernous in places, with cavities up to 260µm diameter, and elongate choanocyte chambers 80-120µm diameter usually obscured by detritus.
Megascleres. Choanosomal principal styles coring and echinating fibres short, thin, straight, with rounded or tapering smooth bases, fusiform, sharply pointed. Length 53-(67.4)-81µm, width 1.2-(4.1)-6µm.

Subectosomal auxiliary spicules long, slender, strongylote styles, straight or slightly curved or sinuous, with slightly subtylote bases, evenly rounded or bifid points. Length 188-(234.1)-261µm, width 1.5-(3.9)-6µm.
Microscleres. Palmate isochelae small, straight shaft, long, thick lateral alae fully fused to shaft, nearly completely detached from front ala, front ala shorter than lateral alae. Length 8-(11.6)-15µm.

Toxas absent.
Larvae. Viviparous parenchymella larvae spherical or subspherical, 320-410µm diameter, with vestigial quasidiactinal megascleres scattered throughout mesohyl.

REMARKS. Under *Echinoclathria globosa* Wiedenmayer (1989) provided a detailed dicussion of additional type specimens of each nominal species he examined (whereas only the specimens that have a direct bearing upon the

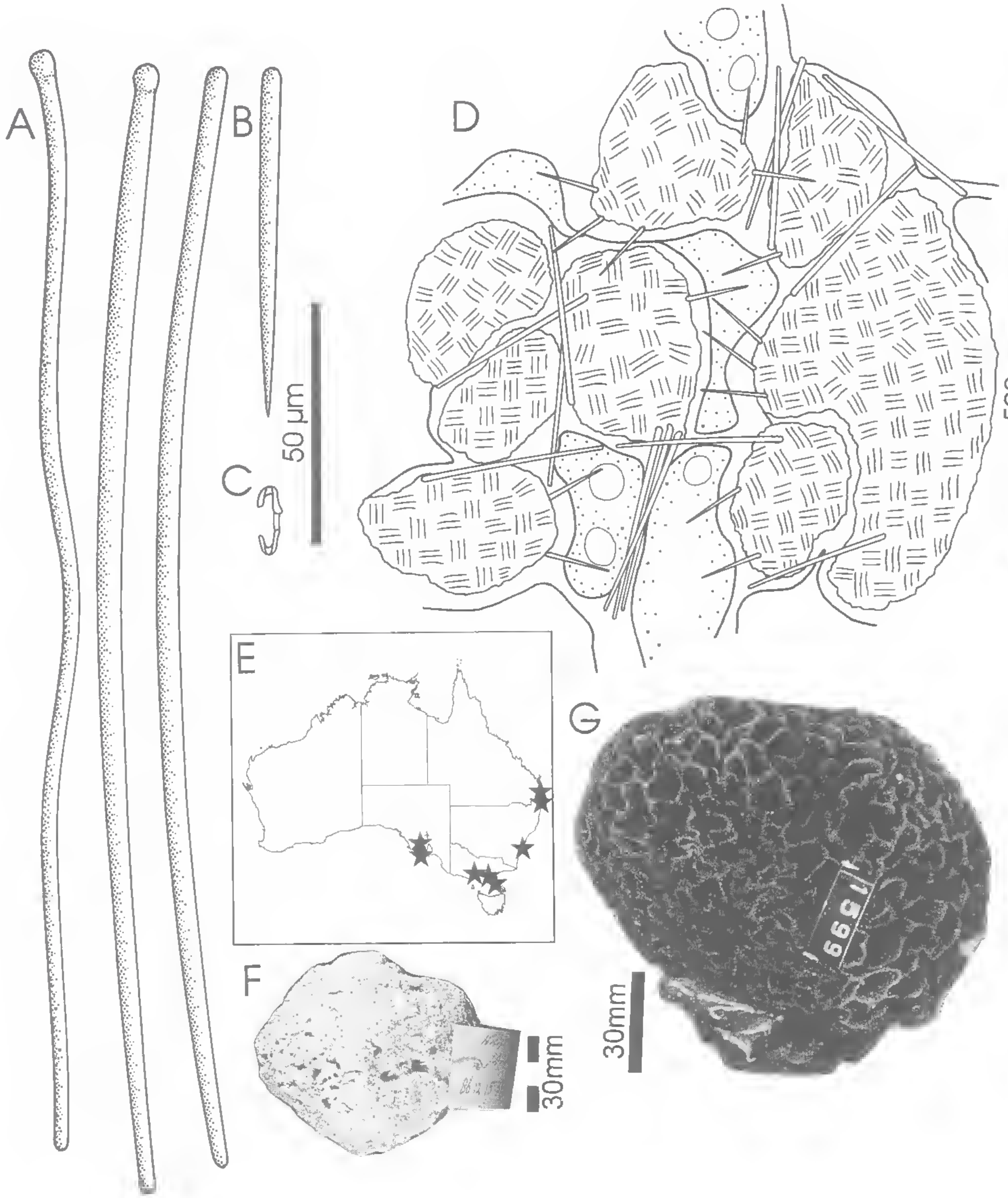


FIG. 257. *Holopsamma crassa* Carter (lectotype BMNH1886.12.15.313). A, Subectosomal auxiliary subtylostyles/ strongylotes. B, Principal style (coring and echinating fibres). C, Palmate isochela. D, Section through peripheral skeleton. E, Known Australian distribution. F, Lectotype. G, SAMTS4085.

identity of this species were examined in this study). The polymorphic concept of this species was slightly overstated by Wiedenmayer (1989) and it does have a distinct identity. He also described only auxiliary spicules present in the species whereas all specimens examined have at least some echinating principal styles in the skeleton, even if most of the other spicules have been displaced by sand. In fact, most of the described variability in *H. crassa* is a conse-

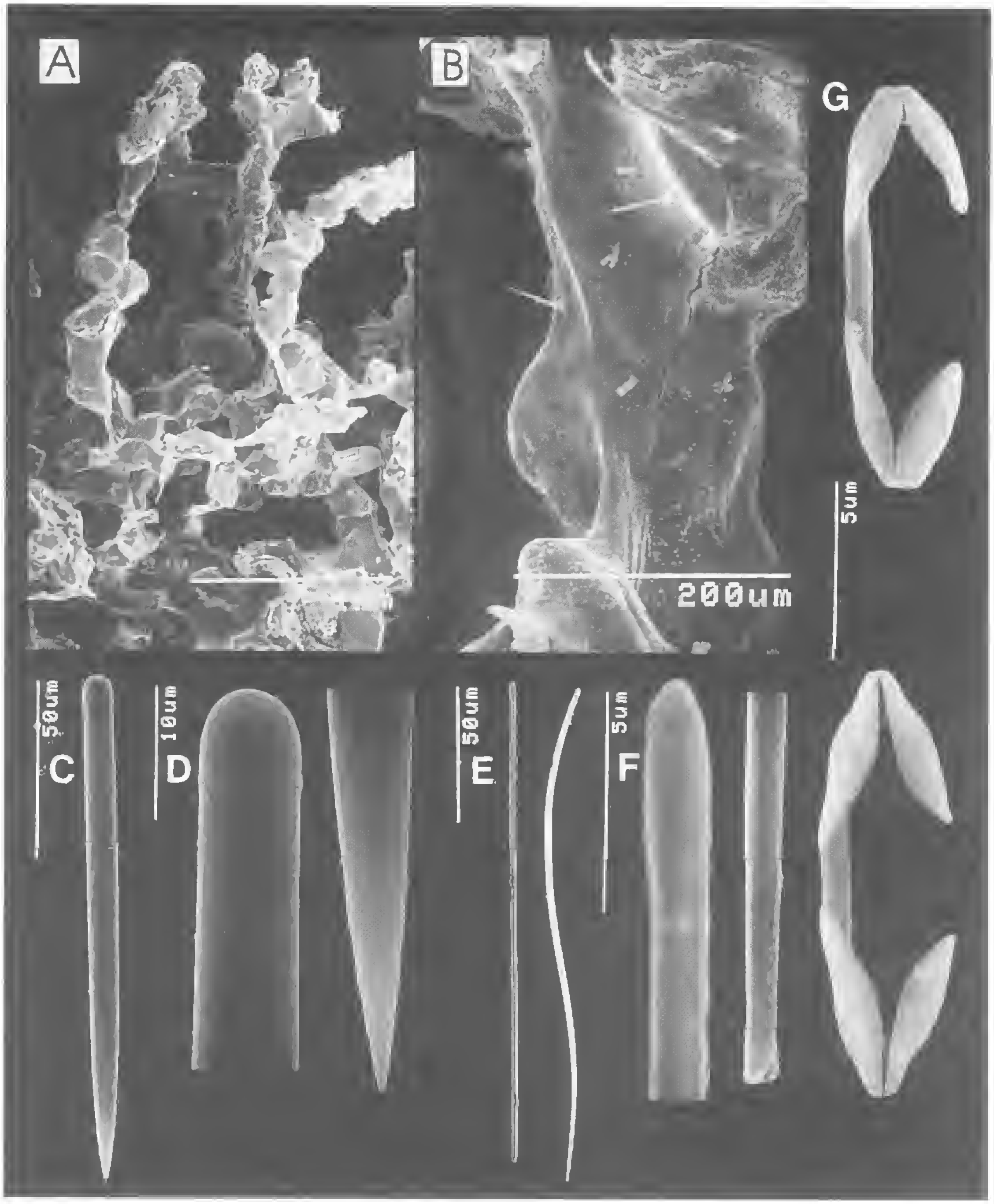


FIG. 258. *Holopsamma crassa* Carter (QMG303235). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal style. D-E, Ends of principal and auxiliary spicules. F, Base and bifid point of auxiliary spicule. G, Palmate isochelae.

quence of the amount of sand incorporated into the skeleton, which appears to be directly related to the loss of spicules from within fibres and also reflected in the external 'honeycomb' reticulate appearance of the sponge. With the nomination of a lectotype of *H. crassa* by Hooper & Wiedenmayer (1994) the senior name of Carter (1885c) now takes precedence over Lendenfeld's (1885c) name *H. globosa* (which allegedly appeared several months later; Wiedenmayer, 1989). Wiedenmayer (1989) did not take this step due to the ambiguity of Carter's original description, and the lack of a lectotype designation for *H. crassa* from a composite series of 31 syntypes (consisting of at least five different species belonging to three families).

Holopsamma crassa is well characterised by its external morphology (superficially resembling a faviid coral), texture (close to *Xestospongia exigua*; Petrosiidae), and skeletal characteristics (superficially resembling the arenaceous 'keratose' sponges), but variability in these features can be illustrated by comparing 3 specimens from the St Vincent Gulf region. SAMTS4057 was almost entirely permeated by sand grains, obscuring most of the fibres and mesohyl matrix (with only echinating principal styles as obvious components of the sponge's spiculation). SAMTS4085 had very heavy spongin fibres, heavily arenaceous fibre core, and a heavy, darkly pigmented mesohyl matrix superficially resembling a verongid sponge. Both these specimens had fine, sharp ridges forming the external honeycomb reticulation, with a bryozoan lace-like external reticulation in the preserved state. Both these specimens also had very few indigenous megascleres, and were initially confused with a dictyoceratid or verongid species (Fig. 258B). SAMTS4082 contained numerous subectosomal auxiliary megascleres scattered throughout the mesohyl, choanosomal styles echinating lightly arenaceous fibres in moderate quantities, and rounded edges on ridges forming the external reticulation producing a more robust, honeycomb reticulate structure.

Holopsamma crassa is most similar to *H. laminaefavosa*, and it is conceivable that they belong to a single species. They are retained here as distinct species in order to highlight their differences and not submerge them, although additional non-skeletal characters are needed to confirm or refute the validity of these taxa. *Holopsamma crassa* has a brownish live colouration; the lacunae forming its external honeycomb reticulate ridges are more robust, recessed more deeply, and meshes have only a light membraneous ectosomal covering between them; there is a more prominent sandy cortex; principal spicules are fusiform, sharply pointed; auxiliary strongylote styles have rounded or bifid points; and chelae are present. *H. laminaefavosa* is white alive; shallow meshes formed by the surface honeycomb reticulation are connected by a well formed tympanized membrane stretched between adjacent ridges; principal styles have telescoped points; auxiliary spicules have rounded or slightly hastate points; and chelae are absent. Wiedenmayer (1989) also suggested that the growth form of *H. crassa* was reminiscent of *Phoriospongia reticulum* Marshall, although the spiculation of the latter is quite different (strongyles, subtylotes and sigmas).

Holopsamma elegans (Lendenfeld, 1888)
(Figs 259-260)

Plectispa elegans Lendenfeld,1888: 226.
Echinoclathria elegans; Hallmann, 1912: 203.
Holopsamma elegans; Hooper & Wiedenmayer, 1994: 282.
Not *Echinoclathria elegans*; Whitelegge, 1901: 90.
Not *Antherochalina elegans* Lendenfeld, 1887b: 787.

MATERIAL. HOLOTYPE: BMNH1887.4.27.98: Port Jackson, NSW, 33°51'S, 151°16'E, other details unknown.

HABITAT DISTRIBUTION. Ecology unknown; Port Jackson (NSW) (Fig. 259D).

DESCRIPTION. *Shape*. Honeycomb reticulate mass of irregularly cylindrical, thin digitate branches, up to 145mm long, 25mm diameter, with branches composed of tight-meshed fibre bundles up to 5mm wide.

Colour. Unknown live colouration, grey-brown dry.

Oscules. Large, up to 7mm diameter in dry state, within surface lacunae.

Texture and surface characteristics. Harsh, brittle in dry state; honeycomb reticulate surface, lacunae smooth.

Ectosome and subectosome. Membraneous, minutely hispid, with abundant subectosomal auxiliary subtylostyles erect on surface in plumose brushes; choanosomal fibres immediately subectosomal.

Choanosome. Irregularly reticulate skeletal structure, with differentiated multispicular primary, ascending fibres, up to 200μm diameter, and numerous transverse, pauci- or aspicular secondary fibres, up to 70μm diameter; echinating principal styles sparse, scattered only over ascending fibres; spongin fibres heavy; fibre meshes rounded, 30-150μm diameter; choanocyte chambers not seen (poor dry material).

Megascleres. Choanosomal principal styles long, robust, straight or very slightly curved at centre, evenly rounded, entirely smooth bases, fusiform or slightly telescoped points. Length 78-(90.3)-105µm, width 4-(4.6)-6µm.

Subectosomal auxiliary subtylostyles long, slender, slightly curved near basal end, subtylote smooth bases, tapering rounded or quasi-strongylote points. Length 90-(141.2)-255µm, width 1.0-(1.6)-2.5µm.

Microscleres. Absent.

REMARKS. This species is known only from the poor, dry holotype from Port Jackson. It is possibly a synonym of *H. arborea*, based on similiarities in their spicule geometrics, although there are some differences in their respective skeletal structures. The species also shows similarities to *H. crassa*, *H. macropora*, *H. ramosa* and *H. rotunda* in having strongylote points on auxiliary spicules, although all species differ in most other respects.

Holopsamma favus (Carter, 1885)
(Figs 261-262)

Echinoclathria favus Carter, 1885e: 292; Ridley & Dendy, 1887: 160-161, pl.31, figs 4-5; Dendy, 1896: 40; Hallmann, 1912: 276-277, text-fig.61; Wiedenmayer, 1989: 59-60, pl.5, fig.10, pl.24, fig.2, text-fig.40; Carpay, 1986: 23.
Axociella favus; de Laubenfels, 1954: 164.
Holopsamma favus; Hooper & Wiedenmayer, 1994: 282.
Not *Echinoclathria favus* var. *arenifera*; Carter, 1885f: 350.
Spongia cellulosa; Ellis & Solander, in part; Lamarck, 1814: 373; Topsent, 1932: 20, pl.1, fig.3.
Not *Spongia cellulosa* Esper, 1797.
Echinoclathria carteri Ridley & Dendy, 1886: 476; Ridley & Dendy, 1887: 162, pl.29, fig.12, pl.31, fig.3; Hallmann, 1912: 284-285, text-fig.65.
Holopsamma carteri; Hooper & Wiedenmayer, 1994: 281.
Axociella carteri; de Laubenfels, 1936a: 119.
Echinoclathria macropora; Whitelegge, 1907: 504.
Not *Echinoclathria macropora* Whitelegge, 1901: 89, 117.
Not *Plectispa macropora* Lendenfeld, 1888: 226.

MATERIAL. HOLOTYPE: BMNH1887.5. 13.35: Port Phillip, Vic, 38°09'S, 144°52'E, other details unknown. HOLOTYPE of *E. carteri*: BMNH1887.5.2.751: Off Port Jackson, NSW, 33°51'S, 151°16'E, HMS 'Challenger' (dredge). PARATYPE of *E. carteri*: BMNH1887.5.2.44: same details.

OTHER MATERIAL: TASMANIA - MNHNDT556 [specimen of *S. cellulosa sensu* Lamarck]. WESTERN AUSTRALIA - NTMZ3211, NTMZ3226, NTMZ3498.

HABITAT DISTRIBUTION. Growing on bivalves, seagrass, rock reefs, vertical rock walls of cave, in sand and shell-grit substrata; 3-333m depth; known only from Australia: Port Jackson, Shoalhaven Bight (NSW); Port Phillip Bay, Westernport Bay (Vic); King I., Bass Strait (Tas); Houtman Abrolhos, Monte Bello Is (WA) (Fig. 261E).

DESCRIPTION. *Shape.* Elongate digitate, contort cylindrical or lobate-cylindrical honeycomb reticulate sponge, forming masses up to 380mm high, 450mm wide, composed of bifurcate, usually non-anastomosing branches, with individual branches up to 160mm long, 20-45mm diameter; branches formed by close-meshed fibre bundles (lacunae) producing a characteristic honeycomb surface; multiple points of attachment to substrate, without basal stalk or expanded point of attachment.

Colour. External surface usually red-orange or orange-brown in life (Munsell 7.5YR 7/10-12), paler orange below surface, deeper water samples honey-brown, in ethanol specimens turn yellow-brown or dark brown.

Oscules. Small, no more than 2mm diameter, within meshes of surface reticulation.

Texture and surface characteristics. Soft, compressible, rubbery, difficult to tear; regular, close-meshed honeycomb reticulate surface; meshes (alveoles) small, rounded or elongate formed by surface lacunae, up to 4mm diameter, more-or-less regular, usually smaller than meshes within deeper regions of sponge.

Ectosome and subectosome. Membraneous, with thin transparent ectosomal membrane stretched across adjacent lacunae at surface of sponge; points of principal styles from ascending choanosomal skeleton protrude slightly producing hispid surface, and paucispicular bundles or single auxiliary subtylostyles lying paratangential to surface; peripheral lacunae rounded or bulbous, not flattened.

Choanosome. Skeleton regularly or irregularly reticulate, cavernous; spongin fibres well developed, more-or-less differentiated into primary ascending and secondary transverse elements; primary fibres 35-60µm diameter, cored by pauci- or multispicular, plumose or oblique tracts of principal styles and small quantities of foreign detritus; secondary fibres up to 20µm diameter, unispicular or aspiculose; fibres sparsely echinated by principal styles evenly dispersed throughout skeleton; fibre anastomoses form round to polygonal meshes, 20-100µm diameter;

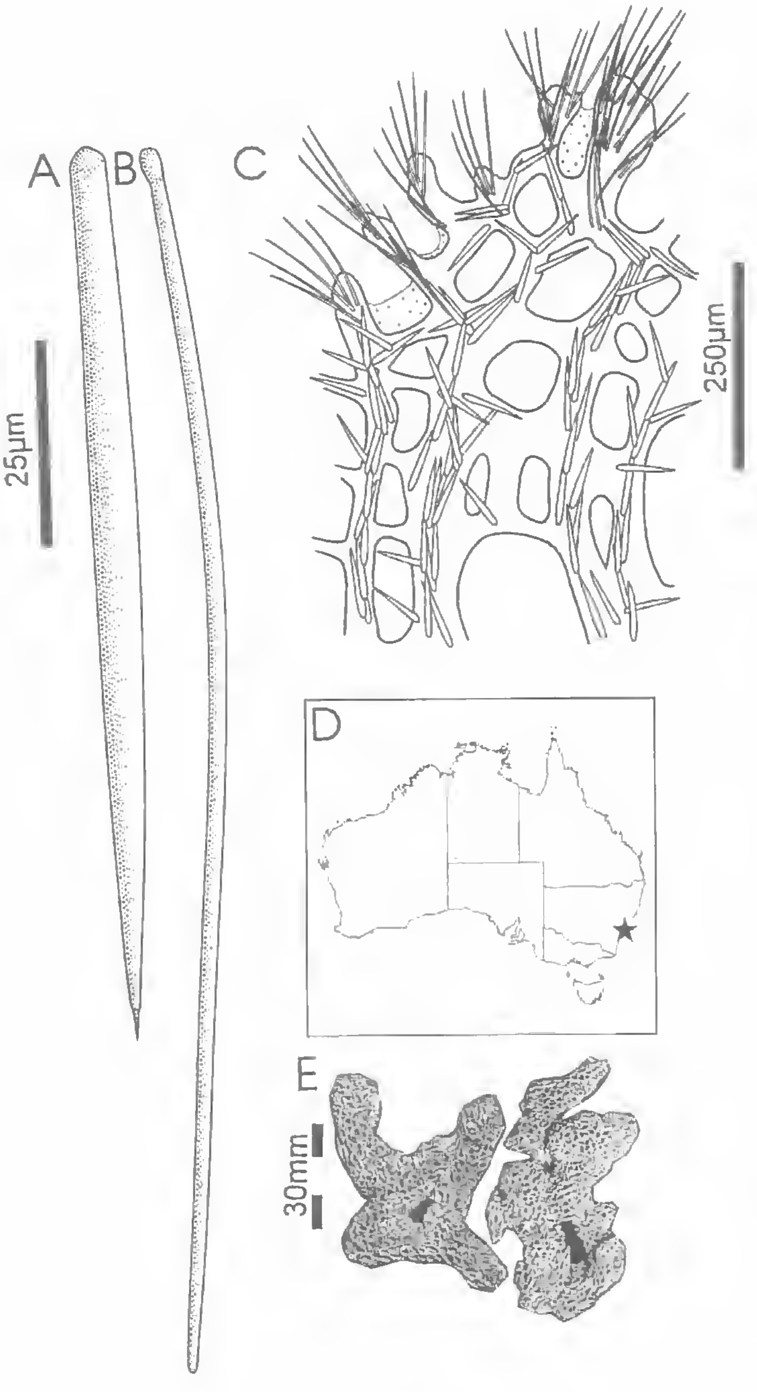


FIG. 259. *Holopsamma elegans* (Lendenfeld) (holotype BMNH1887.4.27.98). A, Principal style (coring and echinating fibres). B, Subectosomal auxiliary subtylostyle. C, Section through peripheral skeleton. D, Known Australian distribution. E, Holotype.

mesohyl matrx light, with abundant principal and auxiliary megascleres strewn between fibre meshes; auxiliary spicules predominantly in deeper regions of choanosomal mesohyl, less abundant in peripheral skeleton; choanocyte chambers large, elongate-oval, 35-55µm diameter.

Megascleres. Principal styles coring and echinating fibres straight or faintly curved at centre, relatively thick, entirely smooth, with rounded, tapering or occasionally anisoxeote bases, fusiform points. Length 69-(96.4)-132µm, width 2-(4.8)-7µm.

Subectosomal auxiliary subtylostyles long, thin, mostly straight, with slightly constricted bases, usually hastate, slightly rounded or slighty telescoped points, sometimes subtylostrongylote with barely differentiated ends. Length 132-(120.7)-174µm, width 1.4-(1.9)-2.1µm.

Microscleres. Palmate isochelae sparse, small, with long lateral alae entirely fused to straight shaft, front ala shorter, often with expanded, spoon-shaped alae. Length 8-(11.9)-15µm.

Toxas absent.

REMARKS. *Holopsamma favus* has a red-orange external live colouration (most species of *Holopsamma* are pale or white), a cartilaginous, algae-like, contort lobate-digitate habit (most are globular or evenly cylindical-digitate), palmate isochelae (most lacking chelae), skeletal architecture consisting of slightly differentiated as-

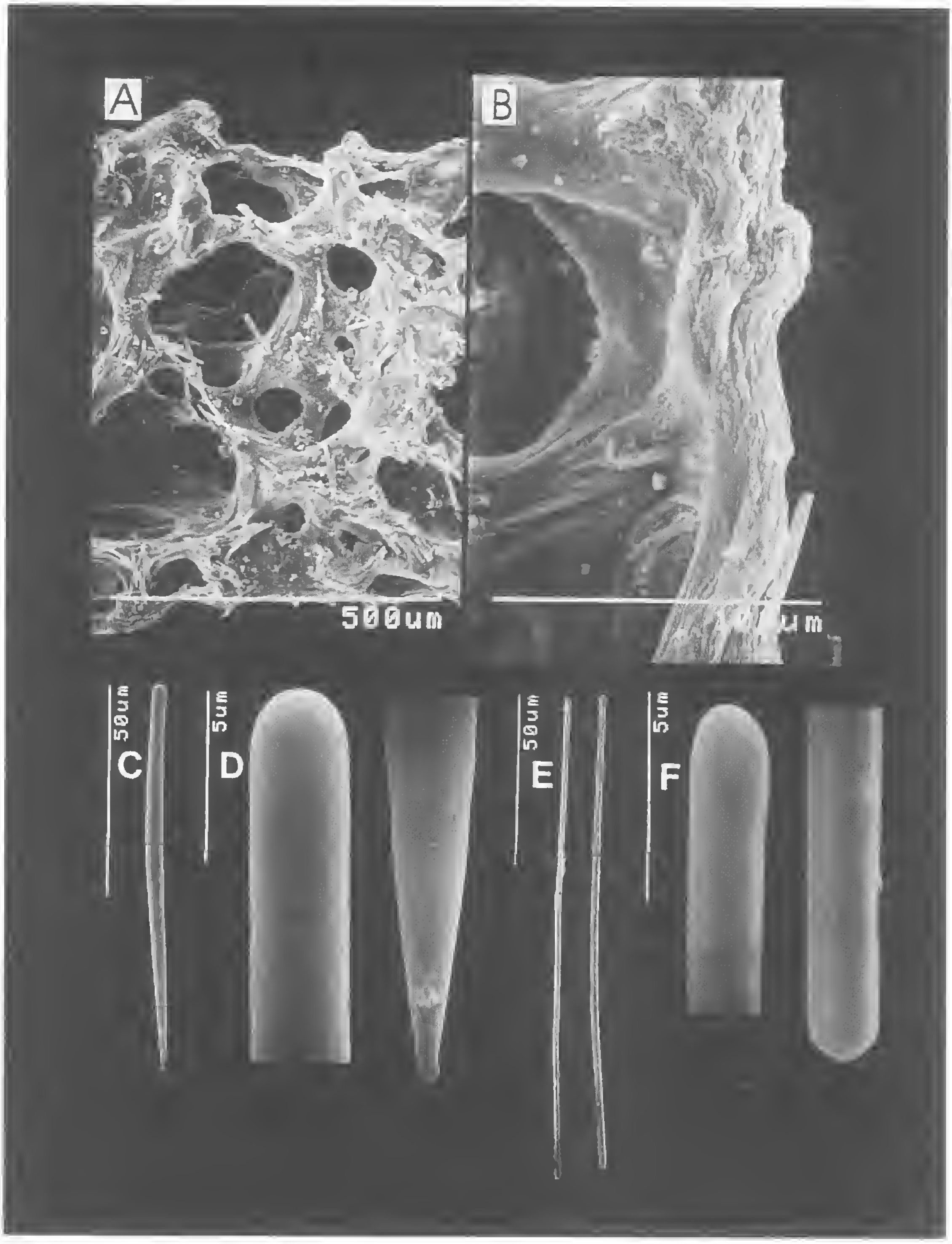


FIG. 260. *Holopsamma elegans* (Lendenfeld) (holotype BMNH1887.4.27.98). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal style. D, Ends of principal style. E, Subectosomal auxiliary strongylote styles. F, Ends of auxiliary spicule.

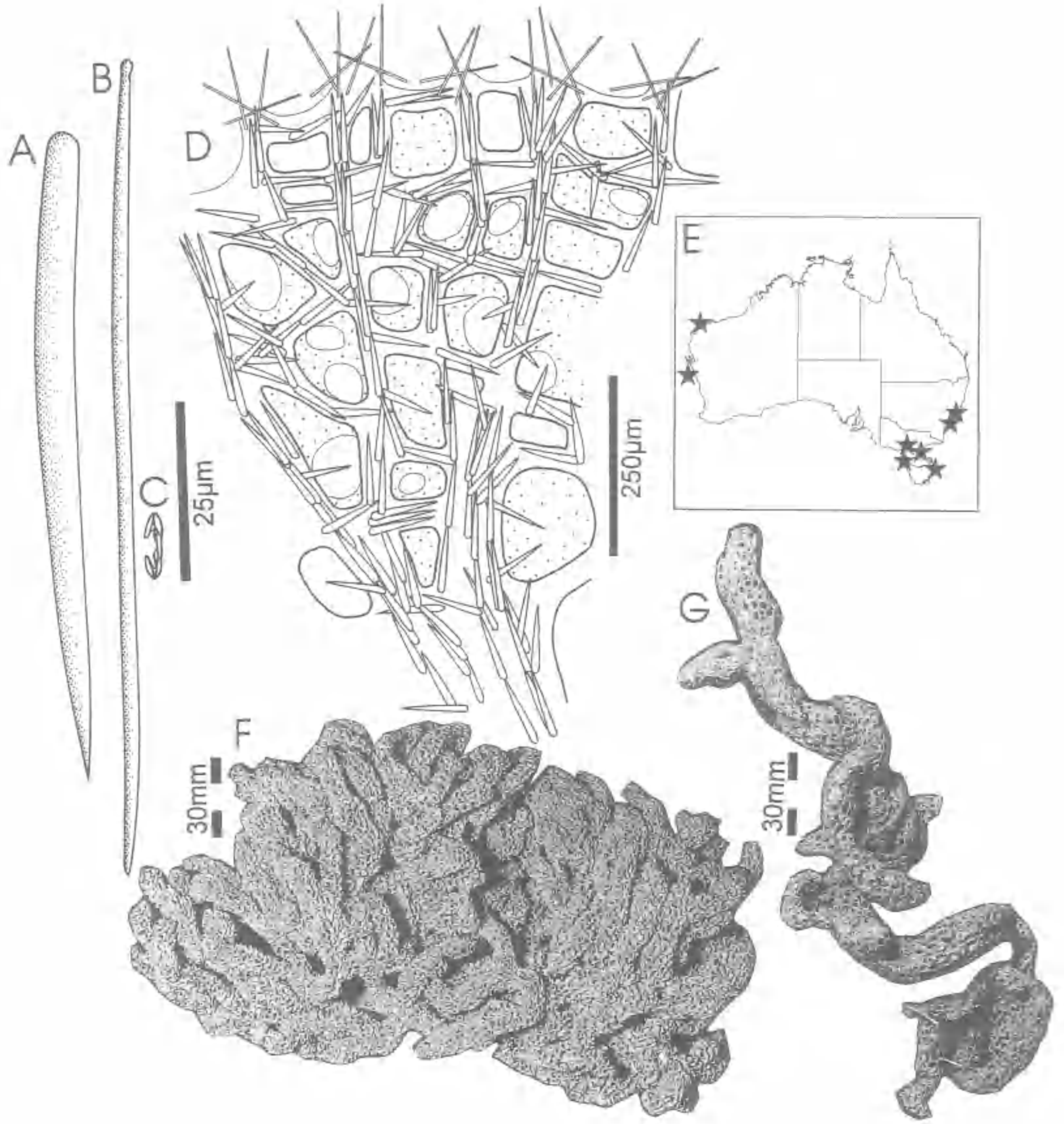


FIG. 261. *Holopsamma favus* (Carter) (holotype BMNH1887.5.13.35). A, Principal style (coring and echinating fibres). B, Subectosomal auxiliary subtylostyle. C, Palmate isochela. D, Section through peripheral skeleton. E, Known Australian distribution. F, Holotype. G, Paratype of *E. carteri*.

cending and transverse fibres in reticulation (most have relatively homogeneous spongin fibres), and dominance of spicules over detritus within fibres (most are much more heavily arenaceous than *H. favus*). Comparing their respective type specimens it is obvious that *H. carteri* is a synonym of *H. favus*, given their identical growth forms, megasclere spicule geometry and spicule size, and dominance of spicule over detritus within fibres (although these similarities were overlooked by several recent authors; Carpay, 1986; Wiedenmayer, 1989; Hooper & Wiedenmayer, 1994). Wiedenmayer (1989) indicated that the pale red-orange live colouration was typical and consistent for this species, but this is only confirmed for shallow water specimens, whereas deeper water material is reportedly paler, honey-brown (e.g., Ridley &

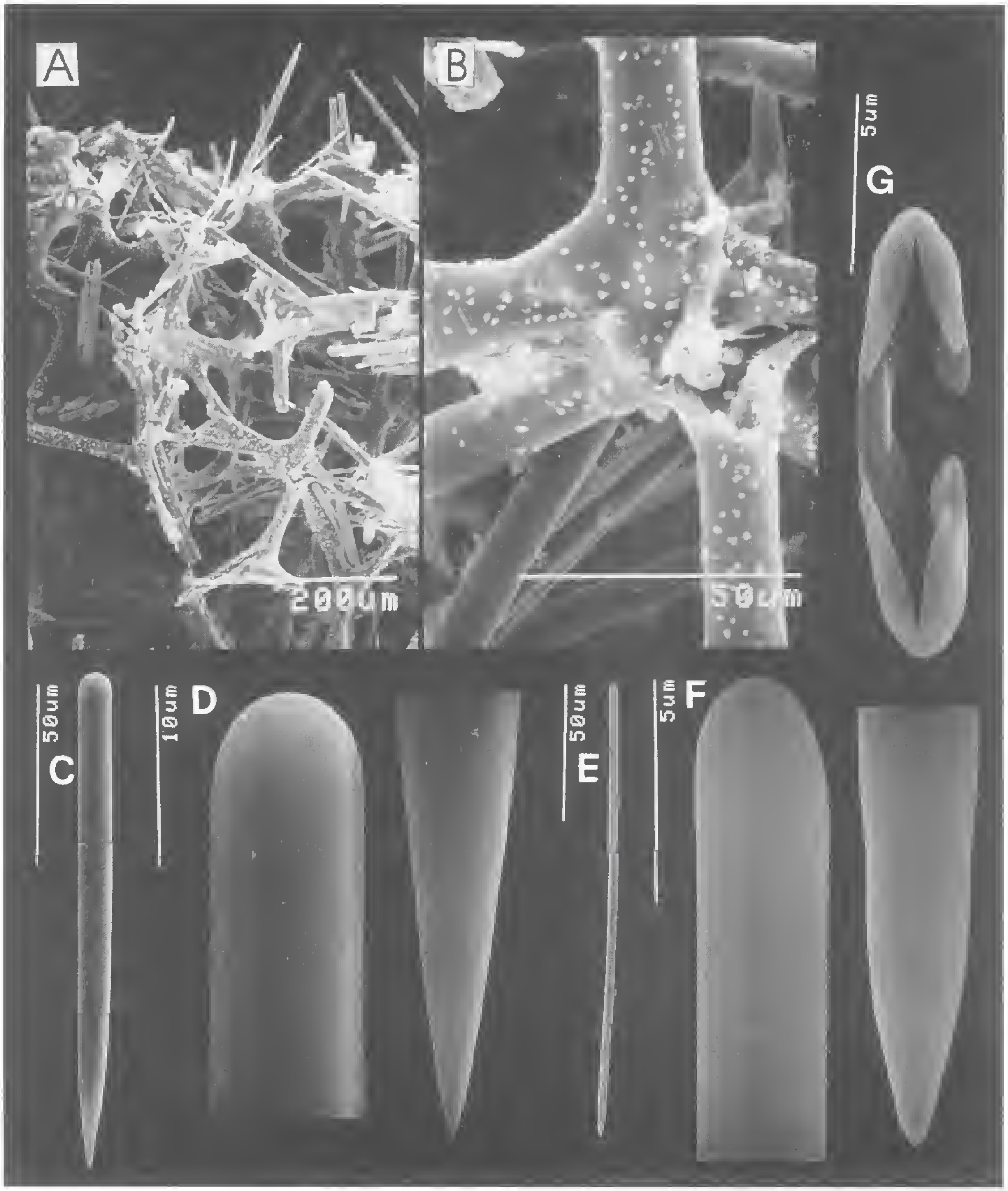


FIG. 262. *Holopsamma favus* (Carter) (NTMZ3211). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal style. D, Ends of principal style. E, Auxiliary style. F, Ends of auxiliary spicule. G, Palmate isochela.

Dendy, 1887; Hallmann, 1912). Similarly, some specimens were reported to shed their palmate isochelae microscleres (Wiedenmayer, 1989), making confident identification difficult. Nevertheless, although none of the material described by Dendy, Hallmann, Whitelegge, Carpay and others has yet been examined their descriptions match fairly closely those of the type specimens to be confident of conspecificity.

This species is a common component of the benthic fauna in Bass Strait (Wiedenmayer, 1989), and the pecimens from the Houtman Abrolhos and Monte Bello Islands indicate a more widespread distribution.

Holopsamma laminaefavosa Carter, 1885 (Figs 263-264, Plate 11E)

Holopsamma laminaefavosa Carter, 1885c: 212; Hooper & Wiedenmayer, 1994: 282.
Echinoclathria laminaefavosa; Wiedenmayer, 1989: 60-61, pl.5, fig.11, text-fig.41; Carpay, 1986: 24.
Halme nidus-vesparum Lendenfeld, 1885c: 288, pl. 26, figs 1-2, pl.27, fig.4-5,7, pl.28, figs 8-9,11, pl.29, figs 12-13; Lendenfeld, 1888: 157; Lendenfeld, 1889a: 457, pl.11, figs 1, 7, 9-10, 15-18; Whitelegge, 1889: 184.
Halme gigantea Lendenfeld,1886a: 847-9 [et varr *intermedia*, *macropora*, *micropora*].
Aulena gigantea; Lendenfeld, 1888: 230-232 [et varr *intermedia*, *macropora*]; Lendenfeld, 1889a: 97, pl.8, figs 3,4, 7, 8, 18, 29, pl.9, figs 2-4; Whitelegge, 1889: 187; Whitelegge, 1901: 93, 118; Whitelegge, 1907: 504; Hallmann, 1912: 268, 285-287; Burton, 1938a: 20; Guiler, 1950: 10.
Not *Halme micropora* Lendenfeld, 1885c: 303; Lendenfeld, 1889a: 461, pl.9, fig.12, pl.11, fig.4.
Halme laxa Lendenfeld, 1886a: 845-7 [et varr *digitata*, *minima*].
Aulena laxa; Lendenfeld, 1888: 228-230; Lendenfeld, 1889a: 95-97, pl.8, figs 10-12, 15, 20-21, pl.9, fig.1; Whitelegge, 1889: 187; Hallmann, 1912: 287; Hallmann, 1914a: 268; Burton, 1938a: 20.
? *Aulena laxa*; Dragnewitsch, 1906: 442.
Echinoclathria laxa; Hallmann, 1912: 287.
Halme irregularis Lendenfeld, 1889a: 49, 453-5, pl.9, fig.8, pl.11, fig.3 [et varr *micropora*, *lamellosa*].
Echinoclathria favus var. *arenifera* Carter, 1885f: 350.
Echinoclathria arenifera; Dendy, 1896: 40-41; Hallmann, 1912: 287; Wiedenmayer, 1989: 60-61.
cf. *Plectispa arborea* Lendenfeld, 1888: 226; de Laubenfels, 1954: 164.

MATERIAL. LECTOTYPE: BMNH1886.12.15.312 (dry) (fragments BMNH1886.12.15.311, AMG2879): Port Phillip, Vic, 38°09'S, 144°52'E, coll. J.B. Wilson (dredge). PARALECTOTYPES: BMNH1886.12.15.-420 (dry): same locality. BMNH1886.12.15.490 (dry): same locality. BMNH1886.12.15.49 (dry) (fragment AMG2875): same locality. BMNH1886.12.15.419 (dry): same locality. LECTOTYPE of *H. nidus-vesparum*: BMNH1886.8.27.73 (fragment BMNH1886.8.27.74): Port Jackson, NSW, 33°51'S, 151°16'E. PARALECTOTYPE of *H. nidus-vesparum*: AMG8899: same locality. HOLOTYPE of *H. laxa*: BMNH1886.12.13.24: Port Jackson, NSW, 33°51'S, 151°16'E. LECTOTYPE of *H. laxa digitata*: BMNH1886.8.27.266 (fragment AMG3652): Port Jackson, NSW, 33°51'S, 151°16'E (label 'Psamella digitata'). PARALECTOTYPES of *H. laxa digitata*: AMZ121-124 (dry) (fragments AMG3759, ZMB6396): same locality. AMZ120: same locality. AMG9125 (dry): same locality. LECTOTYPE of *H. laxa minima*: BMNH1886.8.27.75 (fragments BMNH1886.8.27.76-77): Port Jackson, NSW, 33°51'S, 151°16'E. PARALECTOTYPES of *H. laxa minima*: AMZ125: same locality. AMG9157 (dry) (fragment AMG3780): same locality. HOLOTYPE of *H. gigantea*: BMNH1886.12. 13.19: 'E. coast of Australia'. LECTOTYPE of *H. gigantea intermedia*: BMNH1886.8.27.91 (fragment BMNH1886.8.27.92): Broughton I., NSW, 32°36'S, 152°19'E. PARALECTOTYPES of *H. gigantea intermedia*: BMNH-1886.8.27.79 (dry) (fragments BMNH1886.8.27.80, AMG3762, ZMB1177): Port Jackson, NSW, 33°51'S, 151°16'E. AMA5544 (dry): same locality. AMZ117: same locality. LECTOTYPE of *H. gigantea macropora*: BMNH1886.8.27.85 (fragment BMNH-1886.8.27.86): Port Jackson, NSW, 33°51'S, 151°16'E. PARALECTOTYPES of *H. gigantea macropora*: BMNH1886.8.27.83 (dry) (fragments BMNH1886.8.27.84, AMZ714, AMG3760, AMG2878): same locality. AMG9158 (dry): same locality. BMNH1886.12.15.312 (dry): same locality. HOLOTYPE of *H. gigantea micropora*: BMNH-1886.8.27.81 (dry) (fragments BMNH 1886.8.27.82, AMG3761): Illawarra, NSW, 34°33'S, 150°55'E. LECTOTYPE of *H. irregularis micropora*: BMNH-1886.2.15.491 (fragment AMG2875): Port Phillip, Vic, 38°09'S, 144°52'E. PARALECTOTYPE of *H. irregularis micropora*: BMNH1886.12.15.504 (fragment AMG2874): same locality. LECTOTYPE of *H. irregularis lamellosa*: BMNH1886.12.15.490 (dry) (fragment AMG2876): Port Phillip, Vic, 38°09'S, 144°52'E. PARALECTOTYPES of *H. irregularis lamellosa*: BMNH1886.12.15.419, 420 (dry): same locality.

OTHER MATERIAL: QLD- QMG303957. NSW- QMG301399, QMG301441, AMZ2225. VIC- NCIQ66C-3402-O (fragment NTMZ3852).

HABITAT DISTRIBUTION. Rocky reefs, sand and shell grit substrata; 3-80m depth; Bass Strait, Maria I., Blackman's Bay (Tas); Port Phillip Bay, Westernport Bay (Vic); Byron Bay, Jervis Bay, Port Jackson, Port Stephens, Maroubra, Barranjoey, Illawarra, Broughton I., Sandon Bluffs (NSW); Noosa Heads, Tweed River (SEQ) (Fig. 263D). The reported localities of Torres Strait (FNQ) (Lendenfeld, 1888), and Palua Brani, Singapore (Dragnewitsch, 1906) are suspect.

DESCRIPTION. *Shape.* Massive, lobate, cylindrical-digitate, honeycomb reticulate growth forms, up to 385mm long, 240mm wide at basal attachment, with individual digits free at apical end, up to 210mm long, 75mm diameter, usually fused at base, forming globular lobate

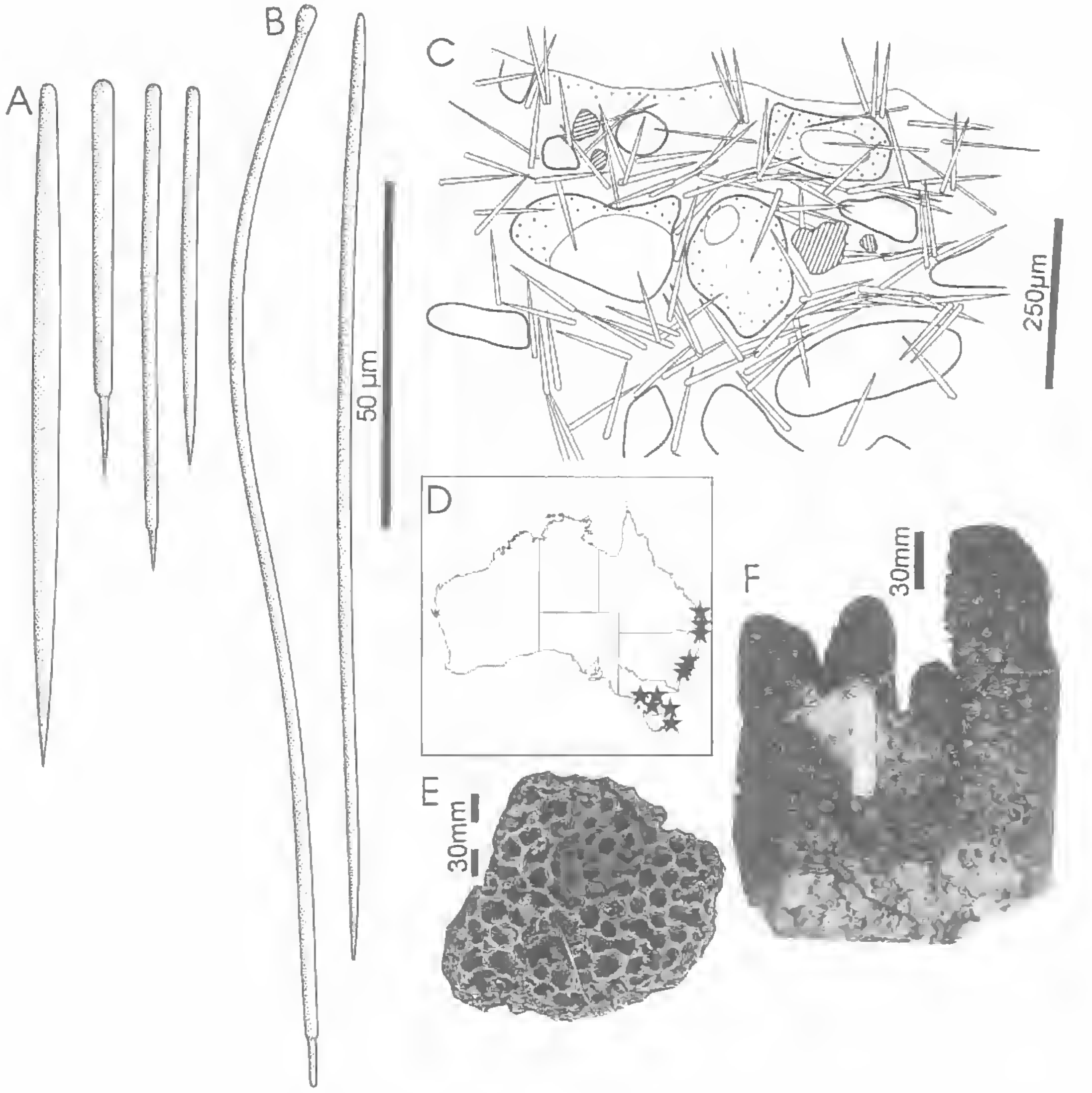


FIG. 263. *Holopsamma laminaefavosa* Carter (holotype BMNH1886.12.15.312). A, Principal style (coring and echinating fibres). B, Subectosomal auxiliary subtylostyle/ style. C, Section through peripheral skeleton. D, distribution. E, Holotype. F, QMG301441.

mass; attached directly to substrate, no expanded point of attachment.

Colour. White alive, brown, sandy brown or dark orange-brown in ethanol.

Oscules. Large, up to 7mm diameter, mostly on apex of digits but also in between some meshes of lacunae.

Texture and surface characteristics. Flexible digits, harsh, arenaceous, lacunae brittle; surface composed of regular, slightly raised ridges formed by honeycomb reticulation of lacunae; meshes produced by reticulation of lacunae typically widely spaced, 4-13mm apart, cavities formed by meshes relatively shallow, covered by thick tympanised membrane stretched across adjacent ridges.

Ectosome and subectosome. Membraneous, heavily arenaceous, without a well defined tangential spicule skeleton, but often with points of ascending principal styles protruding through surface in sparse bundles, below which are scattered individual auxiliary spicules; subectosomal

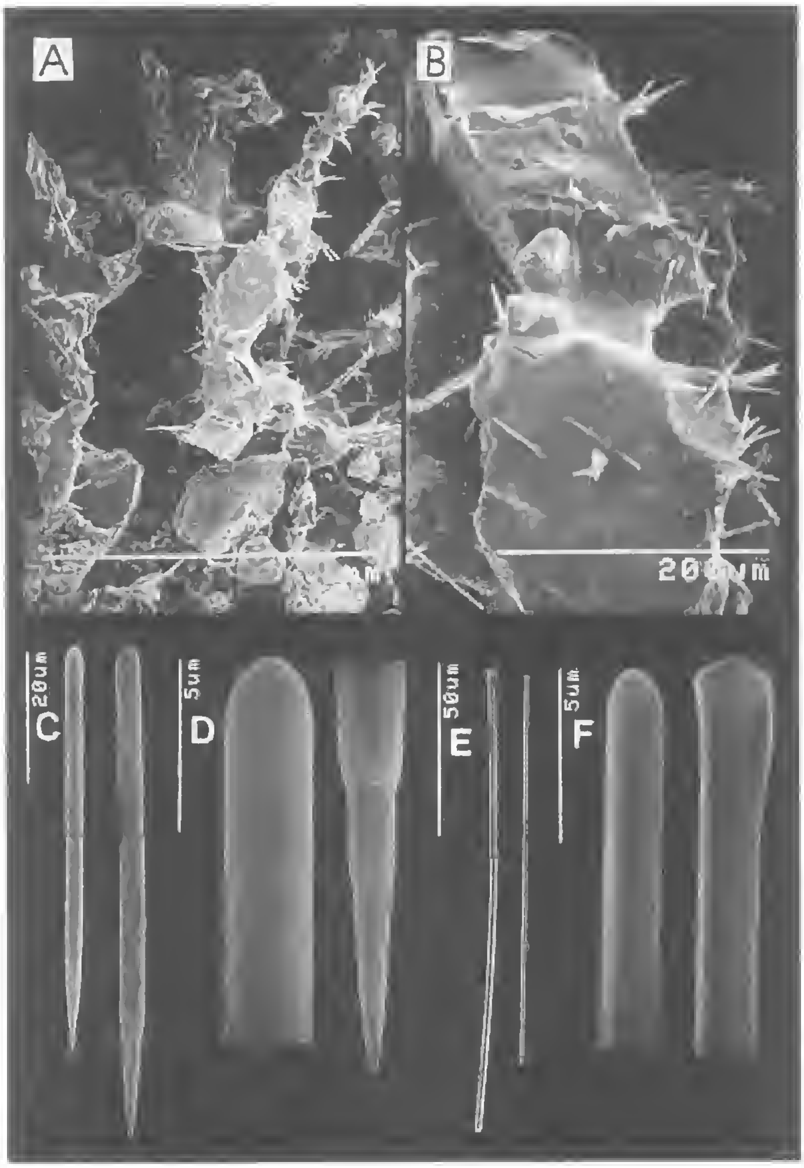


FIG. 264. *Holopsamma laminaefavosa* Carter (QMG303957). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal styles. D, Ends of principal style. E, Auxiliary styles. F, Ends of auxiliary spicule.

region undifferentiated from choanosome, fibres immediately subectosomal.

Choanosome. Skeleton irregularly reticulate, with very heavy spongin fibres forming radiating lamellae, fibres radiating and diverging slightly towards periphery, and more-or-less differentiated into primary ascending and secondary transverse components; fibre anastomoses form close or open meshed reticulations, 40-730μm diameter, without any consistent size differences between meshes at core or periphery; primary fibres usually cored by detritus and sparse tracts of choanosomal principal styles, and echinated by pauci- or multispicular tracts of same principal styles; coring and echinating spicules together produce plumose or oblique, vaguely ascending tracts, usually heaviest on peripheral fibres; principal styles may be absent entirely from fibre core in heavily arenaceous specimens; secondary tracts arenaceous or entirely clear of detritus, in the latter case tracts of principal spicules clearly seen; mesohyl matrix usually darkly pigmented, usually with subectosomal auxiliary megascleres dispersed throughout; choanocyte chambers oval to elongate, 50-90μm diameter, often obscured by detritus.

Megascleres. Choanosomal principal styles coring and echinating fibres short, straight, relatively thick, with tapering (hastate) or rounded smooth bases, telescoped or occasionally fusiform points. Length 52-(86.4)-115μm, width 2-(4.1)-7μm.

Subectosomal auxiliary megascleres strongylote styles, long, thin, straight or flexuous, with rounded or slightly subtylote bases, rounded, telescoped or sometimes hastate points. Length 128-(174.3)-195μm, width 1-(2.8)-4μm.

Microscleres. Absent.

REMARKS. This species is similar to *H. crassa* in growth form, skeletal structure and more-or-less in spiculation, although both species may show considerable variation between regional populations in these features; they are also sympatric although they have not yet been found on the same reefs (present study). This polymorphism has been described in detail by Hallmann (1912; as *Echinoclathria gigantea*) and Wiedenmayer (1989; as *E. laminaefavosa*), and the numerous synonyms erected for this species by Lendenfeld (1885-1889) testify to the confusion that this variability can produce. Similarly, the range of variability within each species may overlap such that observable differences may be not be sufficient to consistently differentiate all populations, and it is conceivable that the two species may be synonyms. Nevertheless, *H. laminaefavosa* differs from *H. crassa* mainly in having a white colouration underwater; a shallow meshed surface honeycomb reticulation with a well formed tympanized membrane stretched between adjacent surface ridges; principal styles have telescoped points; and chelae are absent (see remarks for *H. crassa*). The species has been well illustrated by Lendenfeld (1885c; 1889a) under its numerous synonyms, and more recently by Wiedenmayer (1989). Wiedenmayer (1989) and others indicated that some specimens lack a spicule skeleton, with spicules being replaced by foreign detritus, but this cannot be corroborated from material examined in this study.

Holopsamma macropora (Lendenfeld, 1888)
(Figs 265-266)

Plectispa macropora Lendenfeld,1888: 226.
Wilsonella macropora; Hallmann, 1912: 240.
Holopsamma macropora; Hooper & Wiedenmayer, 1994: 283.
Not *Echinoclathria macropora* Whitelegge, 1901: 65, 89, 117; Whitelegge, 1902a: 212; Hallmann, 1912: 277.
Not *Echinoclathria macropora* Whitlegge, 1907: 504.
Not *Clathria macropora*; Whitelegge, 1901: 91.

MATERIAL. HOLOTYPE: AMG9159 (dry): Port Jackson, NSW, 33°51'S, 151°16'E (published locality of Torres Strait incorrect).OTHER MATERIAL: S AUST- SAMTS4094 (fragments QMG300476, NTMZ1622).

HABITAT DISTRIBUTION. Rock reef; 15-25m depth; Port Jackson (NSW); St. Vincent Gulf (SA) (Fig. 265E).

DESCRIPTION. *Shape.* Small, lobate-digitate, honeycomb reticulate sponge, 80-100mm high, 85-140mm wide, with irregular, bulbous surface lobes up to 30mm high, 35mm diameter.

Colour. Live colouration unknown, light brown dry, dark brown in ethanol.

Oscules. Small, up to 3mm in preserved state, scattered within meshes of surface lacunae.

Texture and surface characteristics. Firm, compressible, flexible; surface honeycomb reticulation close-meshed, meshes 3-6mm diameter, surface fibre bundles (lacunae) with scattered microconules on exterior edges, relatively deep meshes.

Ectosome and subectosome. Surface microscopically hispid with points of principal styles protruding through surface, usually in plumose multispicular brushes; subectosomal auxiliary spicules tangential to surface in sparse bundles or individually, associated with protruding spicule brushes; choanosomal fibres immediately subectosomal.

Choanosome. Skeletal architecture reticulate, increasingly plumose or plumo-reticulate near periphery, with a clearly differentiated primary and secondary fibre skeletons; primary ascending fibres very heavy, up to 120µm diameter, vaguely stratified, containing plumose uni-, pauci- or multispicular tracts of choanosomal principal styles, generally increasing in density towards periphery but overall sparsely cored; secondary transverse fibres relatively heavy, up to 55µm diameter, very short, interconnecting close-set ascending fibres, usually aspicular, rarely unispicular; some fibres also cored by auxiliary spicules; all fibres abundantly echinated by principal styles, particularly at core of skeleton; spicule tracts within fibres become increasingly plumose towards periphery; fibre anastomoses form small oval or elongate meshes, 25-126µm diameter; mesohyl matrix very lightly pigmented and auxiliary spicules scattered between fibres, particularly towards periphery; some detritus also incorporated into mesohyl but usually not into fibre skeleton; choanocyte chambers oval, 20-65µm diameter.

Megascleres. Choanosomal principal styles or subtylostyles coring and echinating fibres straight, moderately thin, with slightly constricted, subtylote or rounded, smooth bases, tapering to fusiform points. Length 49-(68.4)-96µm, width 3-(3.9)-6µm.

Subectosomal auxiliary megascleres range from strongylote subtylostyles to tornotes; usually long, thin, straight or slightly curved with blackened axial canals, sometimes setaceous, sinuous, with rounded or hastate points. Length 123-(166.1)-184µm, width 1.5-(3.2)-4µm.

Microscleres. Palmate isochelae uncommon, many smaller forms twisted, with very short alae,

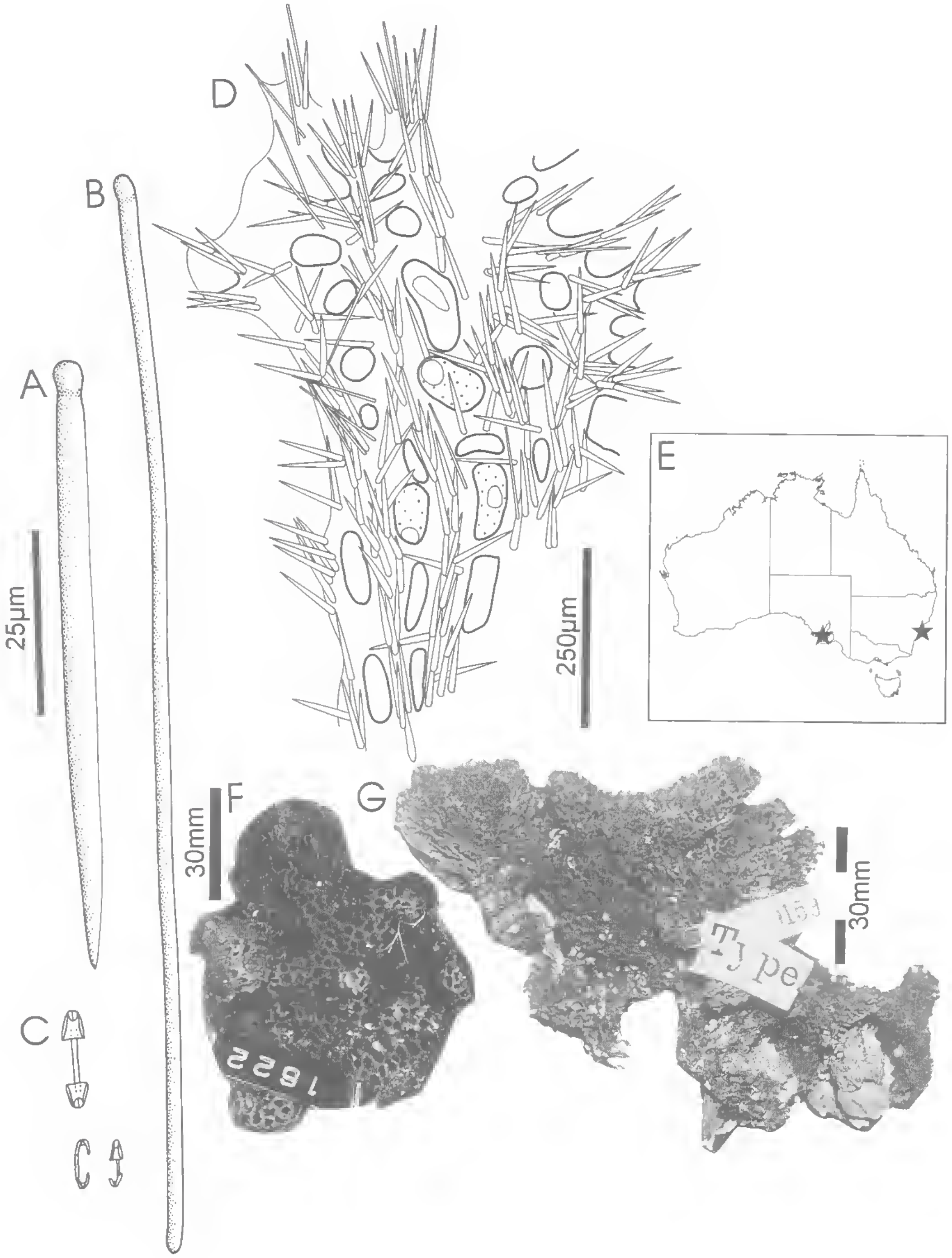


FIG. 265. *Holopsamma macropora* (Lendenfeld) (holotype AMG9159). A, Principal subtylostyle (coring and echinating fibres). B, Subectosomal auxiliary strongylote style. C, Palmate isochelae. D, Section through peripheral skeleton. E, Australian distribution. F, SAMTS4094. G, Holotype.

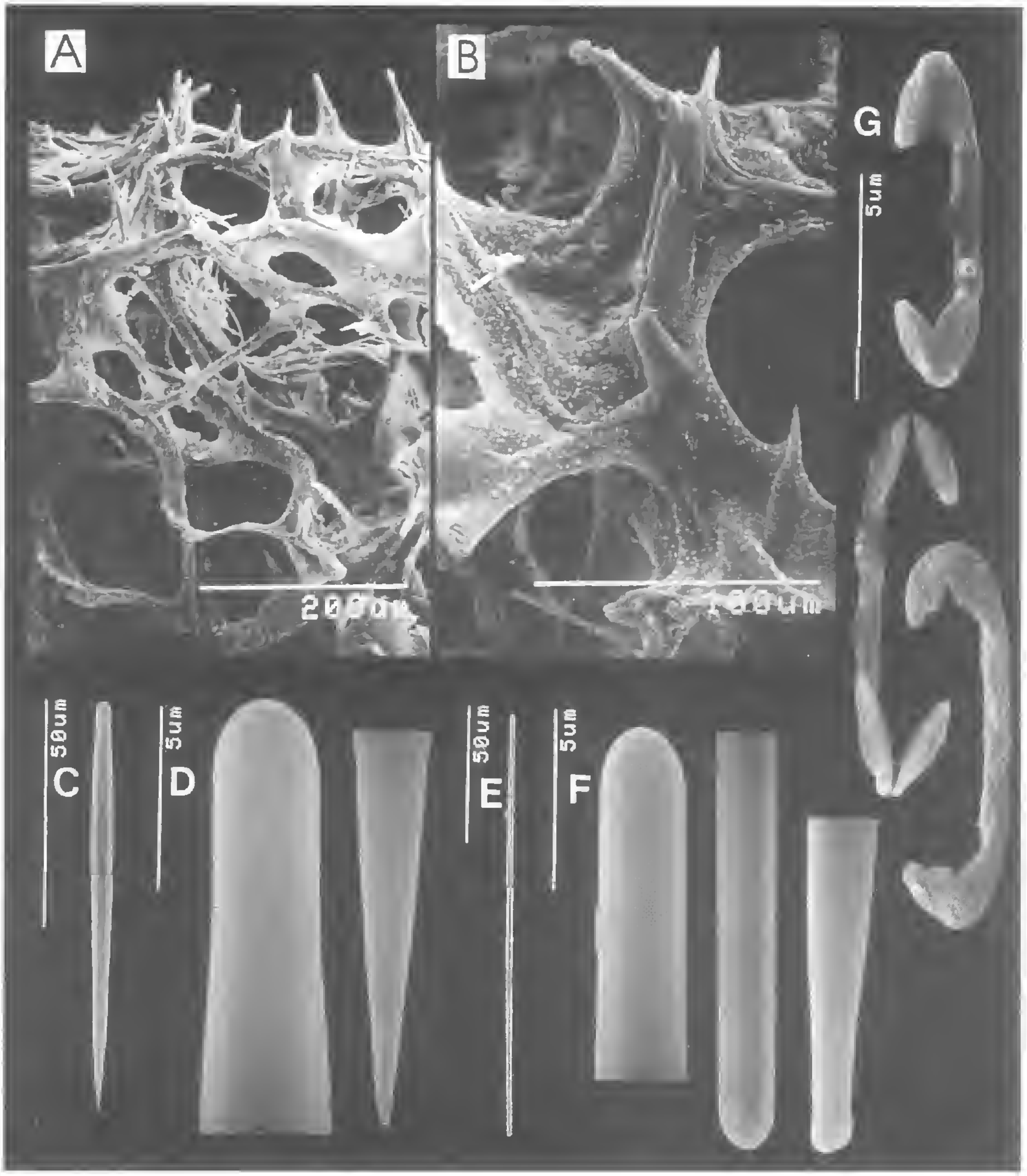


FIG. 266. *Holopsamma macropora* (Lendenfeld) (holotype AMG9159). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal styles. D, Ends of principal subtylostyle. E, Auxiliary strongylote style. F, Ends of auxiliary spicule. G, Palmate isochelae.

straight shaft, lateral alae completely fused to shaft, front ala usually partially, or sometimes wholly fused to lateral alae. Length 4-(9.3)-12μm.

Toxas absent.

REMARKS. The two specimens are the only validated records for the species. Other records quoted as '*macropora*' by Lendenfeld and Whitelegge are spurious (see remarks for *Plectispa*). From Lendenfeld (1888) and Whitelegge

(1901, 1902a, 1907) the species has been misinterpreted such that the holotype was referred (sight unseen) to *Wilsonella* by Hallmann (1912). This error is a direct result of Lendenfeld's (1888) inaccurate description and probably also the confusion resulting from his continual usage of *macropora* for several supposedly unrelated species (see remarks for *Clathria* (*Axociella*) *macropora*).

The holotype belongs to *Holopsamma*, with the characteristic honeycombed reticulate growth form and smooth echinating spicules (not acanthose as supposed by Lendenfeld (1888) and Hallmann (1912)), whereas all other alleged syntypes of *Plectispa macropora* belong to different species. In growth form *H. macropora* shows similarities to *H. laminaefavosa*, and to a lesser extent *H. favus*. In spiculation and skeletal construction it is reminiscent of specimens referred to *H. laminaefavosa* by Wiedenmayer (1989) and to a lesser extent *H. ramosa* (Hallmann, 1912) (i.e., those specimens with a diverging choanosomal skeleton which becomes increasingly dense towards the periphery). It is possible that *H. macropora* is simply a non-arenaceous morph of *H. laminaefavosa* although there are differences in spicule geometry and spicule dimensions to suggest that they are different species. In particular, the possession of long setaceous quasi-diactinal auxiliary megascleres (which also core fibres, are scattered throughout the mesohyl and associated with spicule brushes on the surface) do not appear in these other species; isochelae are also definitely present in *H. macropora* (albiet uncommon in both the holotype and SA specimen), although they were not recorded in the original description of the species by Lendenfeld (1888), whereas microscleres are definitely not present in *H. laminaefavosa*.

The type locality was given as Torres Strait by Lendenfeld (1888) but it is probably actually from Port Jackson, NSW (as noted on the AM register).

Holopsamma pluritoxa (Pulitzer-Finali, 1982)
(Figs 267-268)

Echinoclathria pluritoxa Pulitzer-Finali, 1982: 108-109, text-figs 18-19.

Holopsamma pluritoxa; Hooper & Wiedenmayer, 1994: 283.

MATERIAL. HOLOTYPE: MSNG 46938 (not seen): Heron I., Great Barrier Reef, Qld, 23°26'S, 151°55'E, 8.xii.1979, coll. A.J. Bruce (by hand). OTHER MATERIAL: QLD- QMG6786 (fragments QMG300471, NTMZ1588).

HABITAT DISTRIBUTION. 3-8m depth, on sand, shell grit and coral rubble substrates; Moreton Bay, Heron I. (Fig. 267E).

DIAGNOSIS OF HOLOTYPE. Honeycombed reticulate growth form; irregularly reticulate skeleton with pale spongin fibres 20-100μm diameter, fibre meshes 300-500μm diameter, fibres sparsely cored by thin choanosomal principal subtylostyles (270-320x4-9μm); echinating spicules absent; strongylote subectosomal auxiliary subtylostyles scattered throughout mesohyl (230-250x2-3μm); abundant toxas wing-shaped or slightly oxhorn (10-188x1-4μm); palmate isochelae unmodified (13.5μm) (Pulitzer-Finali, 1982).

DESCRIPTION. *Shape*. Subspherical-lobate, shaggy and irregularly honeycombed reticulate construction, 55mm wide, 40mm long.

Colour. Live colouration unknown, light grey-brown in ethanol.

Oscules. Not seen.

Texture and surface characteristics. Soft, compressible; surface reticulate fibre bundles in peripheral regions slightly flattened, with micropapillose, shaggy points.

Ectosome and subectosome. Surface microscopically hispid, with plumose brushes of choanosomal principal styles protruding, interdispersed with subectosomal auxiliary megascleres lying tangential or paratangential to surface; subectosomal skeleton plumoreticulate.

Choanosome. Skeleton irregularly plumo-reticulate, with poorly developed spongin fibres, 20-155μm diameter, forming irregular ovoid to elongate meshes, 145-500μm diameter; fibres contain pauci- to multispicular tracts of choanosomal principal styles, without any division of primary or secondary fibre components, forming plumose ascending structures which coalesce and diverge to produce fibre anastomoses; fibres not echinated although choanosomal principal styles may protrude obliquely; mesohyl matrix relatively heavy, darkly pigmented, granular, with numerous toxas and scattered subectosomal auxiliary megascleres; choanocyte chambers large, oval, 40-90μm.

Megascleres. Choanosomal principal styles straight or slightly curved, with smooth, rounded or slightly subtylote bases, fusiform points. Length 167-(217.2)-289μm, width 4-(5.1)-7μm.

Subectosomal auxiliary megascleres straight, asymmetrical, varing from quasistrongyles with

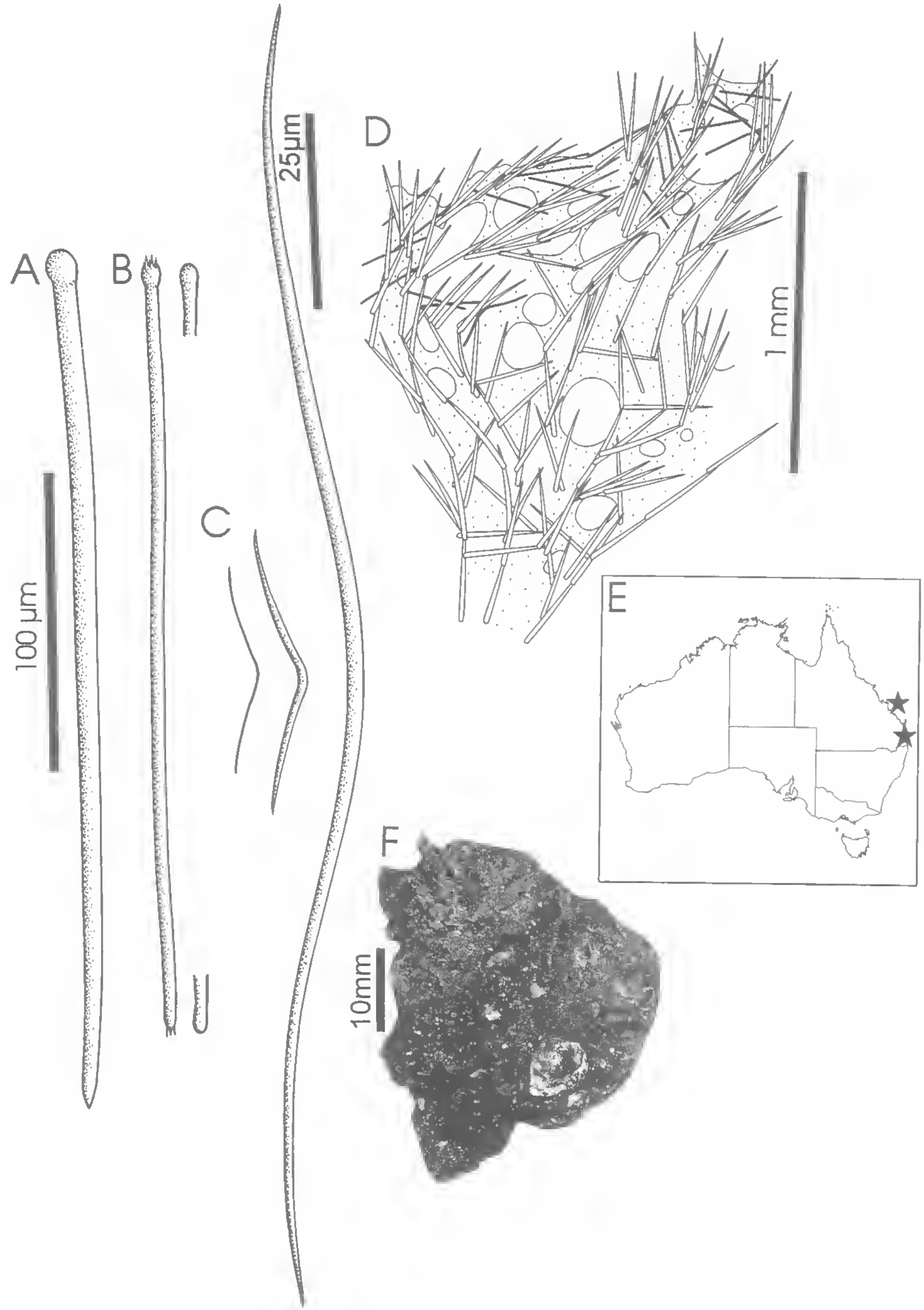


FIG. 267. *Holopsamma pluritoxa* (Pulitzer-Finali) (QMG300471). A, Principal subtylostyle (coring and echinating fibres). B, Subectosomal auxiliary subtylostyle. C, Accolada toxas. D, Section through peripheral skeleton. E, Australian distribution. F, Lateral view.

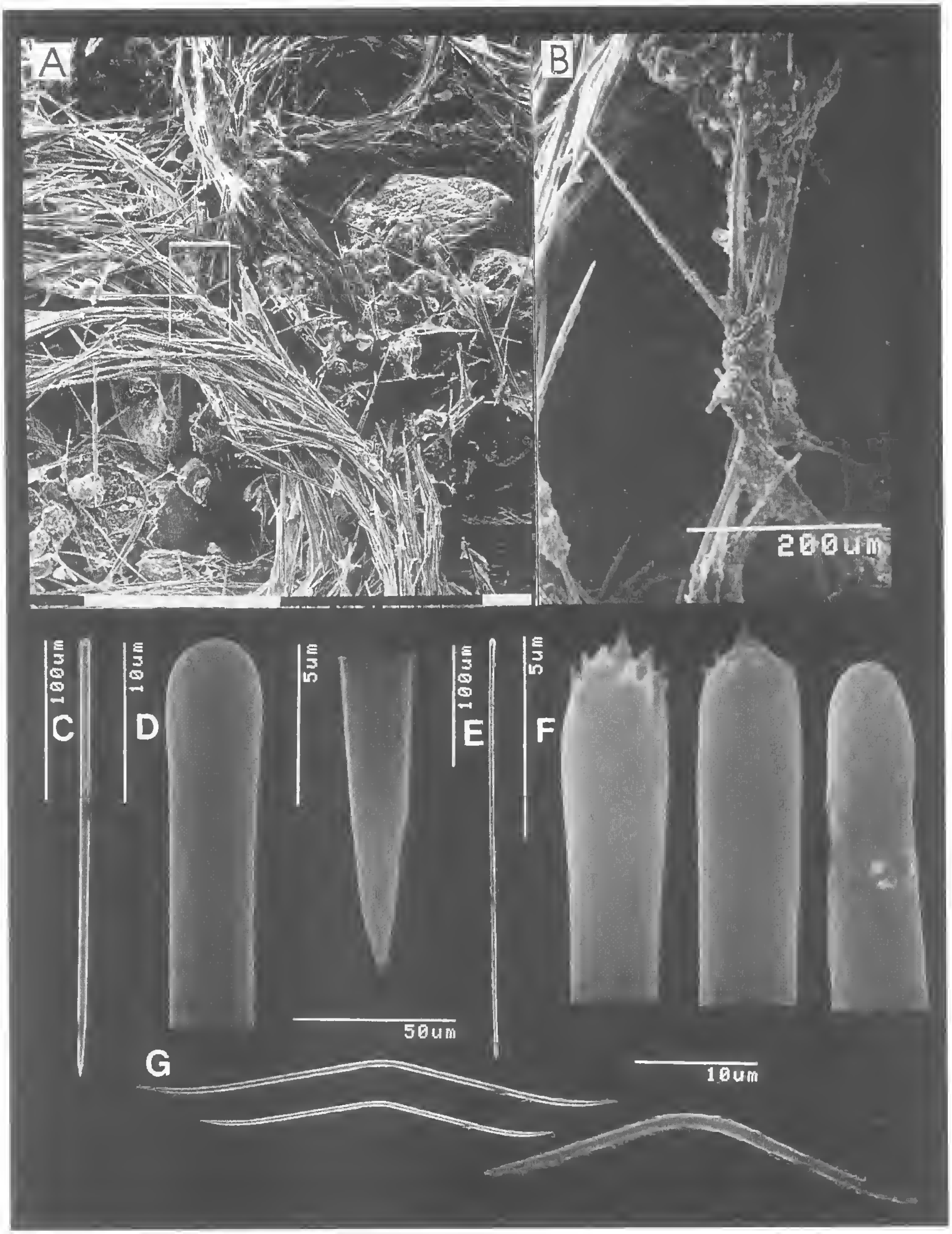


FIG. 268. *Holopsamma pluritoxa* (Pulitzer-Finali) (QMG300471). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal subtylostyles. D, Ends of principal subtylostyle. E, Auxiliary strongylote subtylostyle. F, Ends of auxiliary spicules. G, Accolada toxas.

smooth rounded extremities, to quasitylotes with subtylote microspined points. Length 195-(218.8)-262µm, width 2-(2.8)-4µm.

Microscleres. Isochelae absent.

Toxas wing-shaped, variable in size, thin or thick, with rounded slight, or large central curvature, straight or slightly reflexed points, arbitrarily divisible into two size classes. Length I: 8-(26.7)-30µm, width 0.5-(0.8)-1µm; length II: 65-(177.0)-250µm, width 1.5-(2.3)-4µm.

REMARKS. This species is unusual in its fibre characteristics and skeletal architecture, lacking true echinating spicules, and having quasidiactinal auxiliary megascleres. The specimen from Moreton Bay also differs in some respects from the holotype from Heron I. (known from the original diagnosis; type not seen). The skeletal architecture of the specimen is more obviously plumoreticulate than reticulate (reminiscent of *Stylinos*; Halichondriidae), ectosomal structure is distinctly plumose (reminiscent of *Lissodendoryx*; Myxillidae; ectosomal structure was not mentioned by Pulitzer-Finali, 1982), and isochelae are absent (abundant in the holotype). In other respects the two specimens are obviously conspecific having virtually identical spicule geometries, growth forms and surface features although Pulitzer-Finali's (1982) description is incomplete.

Holopsamma ramosa (Hallmann, 1912)
(Figs 269-270)

Echinoclathria ramosa Hallmann, 1912: 277-279, pl.30, fig.3, text-fig.62.

Axociella ramosa; de Laubenfels, 1936a: 119.

Holopsamma ramosa; Hooper & Wiedenmayer, 1994: 283.

Echinoclathria macropora; Whitelegge, 1901: 89, 117.

Not *Plectispa macropora* Lendenfeld, 1888: 226.

Not *Echinoclathria macropora*; Whitelegge, 1907: 504.

MATERIAL. LECTOTYPE: AMZ949 (dry): Swansea, off Lake Macquarie, NSW, 33°11'S, 151°59'E, depth unknown, coll. FIV 'Thetis' (trawl). PARALECTOTYPE: AMZ40: 64km W. of Kingston, SA, 36°50'S, 139°05'E, 60m depth, coll. FIV 'Endeavour' (trawl).OTHER MATERIAL: S AUST- SAMTS4105 (fragments QMG300487, NTMZ1695).

HABITAT DISTRIBUTION. Rock reef and sandy substrata; 8-60m depth; Lake Macquarie (NSW), Kingston SE., Nuyts Archipelago (SA) (Fig. 269E).

DESCRIPTION. *Shape.* Profusely bushy, arborescent branching, honeycomb reticulate sponge, up to 165mm high, 220mm wide, with small basal stalk and expanded point of attachment; branches numerous, bifurcate, occasionally anastomosing, relatively thin, cylindrical or slightly laterally compressed, up to 75mm long, 32mm diameter.

Colour. Grey-brown to dark brown in ethanol.

Oscules. Moderately large, up to 5mm diameter, scattered between honeycombed lacunae.

Texture and surface characteristics. Harsh, slightly rubbery; fibre bundles form more-or-less regular hexagonal or elongated meshes, 1-3mm diameter.

Ectosome and subectosome. Membraneous, with points of sparse principal styles protruding through surface, but generally smooth, nonhispid; sparse subectosomal auxiliary megascleres tangential to ectosome, never protruding through surface.

Choanosome. Skeletal architecture irregularly reticulate, with small, heavy, evenly compressed spongin fibres, 23-95µm diameter, divided into primary longitudinal and vaguely ascending, and secondary connecting components; primary fibres contain uni- or paucispicular tracts of choanosomal principal subtylostyles; secondary fibres mostly aspicular, rarely unispicular; fibre meshes close-set near core, 35-85µm diameter, more cavernous towards periphery, 112-220µm diameter; tendency for peripheral fibres to contain spicule tracts of styles in more-or-less-plumose brushes; fibres sparsely echinated by principal subtylostyles particularly on distal margins of peripheral fibres (cf. Hallmann, 1912); mesohyl matrix heavy, darkly pigmented, with scattered subectosomal auxiliary megascleres; choanocyte chambers small, oval, up to 50µm diameter.

Megascleres. Choanosomal principal styles straight, short, relatively thick, with tapering, constricted, smooth, slightly subtylote bases, slightly fusiform sharp points. Length 75-(100.7)-144µm, width 4.5-(6.8)-8.5µm.

Subectosomal auxiliary subtylostyles or quasistrongyles (asymmetrical) straight or curved at centre, thin, with smooth, slightly subtylote bases and rounded points. Length 122-(139.8)-157µm, width 1.5-(2.7)-4µm.

Microscleres. Palmate isochelae small, poorly silicified, with approximately 30% contort forms, small alae, lateral alae fused entirely to shaft, front ala completely detached, straight shaft. Length 7-(10.2)-12µm.

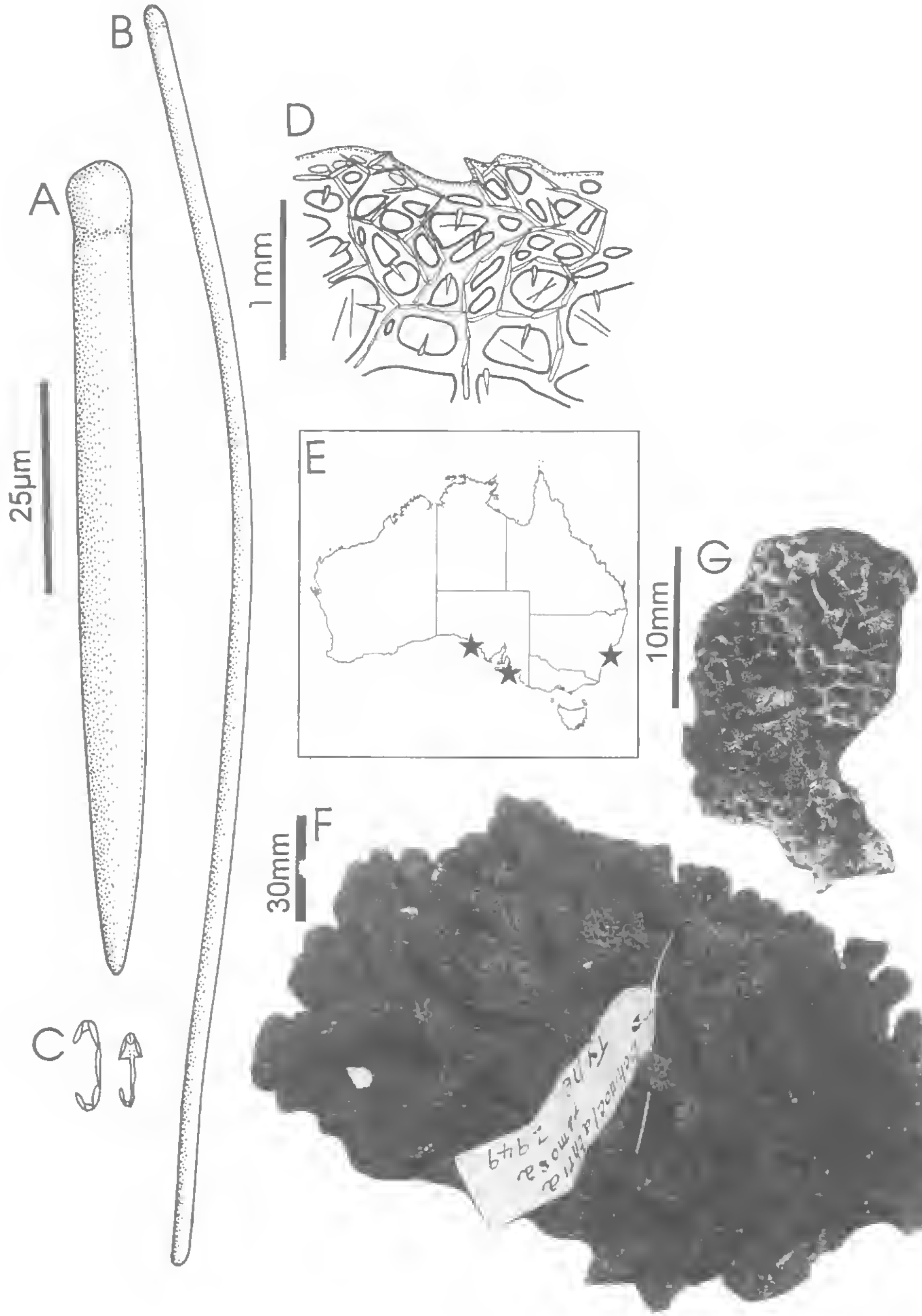


FIG. 269. *Holopsamma ramosa* (Hallmann) (holotype AMZ949). A, Principal subtylostyle (coring and echinating fibres). B, Subectosomal auxiliary subtylostyle. C, Palmate isochelae. D, Section through peripheral skeleton. E, Known Australian distribution. F, Holotype. G, SAMTS4105.

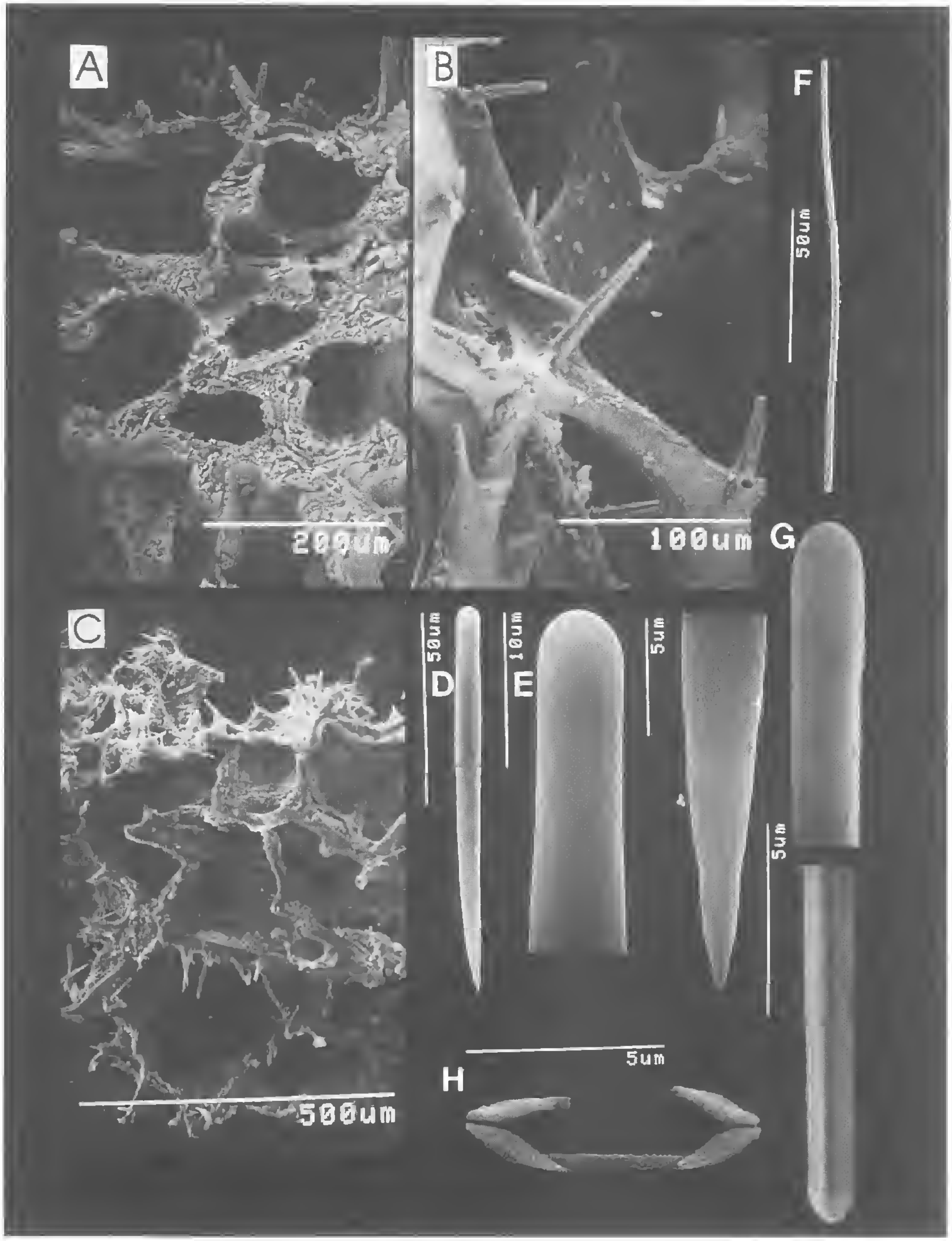


FIG. 270. *Holopsamma ramosa* (Hallmann) SAMTS4105). A, Choanosomal fibre characteristics. B, Echinating principal style on fibres. C, Choanosomal skeleton. D, Principal subtylostyle. E, Ends of principal subtylostyle. F, Auxiliary subtylostyle. G, Ends of auxiliary spicule. H, Palmate isochela.

REMARKS. Hallmann (1912) suggested that spicule dimensions were highly variable in this species, particularly choanosomal styles, but in comparison with other *Holopsamma* species these are in fact relatively homogeneous. Similarly, palmate isochelae are probably native to this species because they were found in all material examined, although Hallmann did not describe them in the dry lectotype. Spicule geometry and certain aspects of skeletal architecture indicate that *H. ramosa* is allied to *H. macropora* and *H. arborea*, differing mainly in growth form, spicule dimensions and the presence of microscleres. Indeed Hallmann (1912) erected *H. ramosa* for Whitelegge's (1901) specimen of *Echinoclathria macropora* (as distinct from *Plectispa macropora* Lendenfeld, 1888), but there has obviously been some confusion in the interpretation of the latter species. Any proposed merger of *H. macropora*, *H. arborea* and *H. ramosa* is not presently supported on the basis of existing material.

Holopsamma rotunda (Hallmann, 1912)
(Figs 271-272)

Echinoclathria rotunda Hallmann, 1912: 282-284, pl.30, fig.1, text-fig.64.
Axociella rotunda; de Laubenfels, 1936a: 119 [note].
Holopsamma rotunda; Hooper & Wiedenmayer, 1994: 284.

MATERIAL. LECTOTYPE: AMZ154: Off Swansea, Lake Macquarie, NSW, 33°11'S, 151°59'E, coll. FIV 'Endeavour' (dredge). PARALECTOTYPE: AME1272 (dry): same locality.OTHER MATERIAL. QLD- QMGL2165. VIC- QMG300275 (NCIQ66C-3288-P) (fragment NTMZ3865).

HABITAT DISTRIBUTION. Substrate unknown; up to 330m depth; Lake Macquarie (NSW); off Fraser I. (SEQ); Portsea (Vic) (Fig. 271E).

DESCRIPTION. *Shape.* Massive, subspherical, globular, honeycomb reticulate sponge, up to 155mm high, 90mm maximum diameter, with short basal stalk and expanded point of attachment; sponge insubstantial, hollow internally.

Colour. Dark blue-grey alive (Munsell 2.5B 6/2), dark brown in ethanol.

Oscules. Large, up to 6mm diameter, scattered between lacunae.

Texture and surface characteristics. Firm, compressible alive, harsh in dry state; open, porous, tubular external construction; honeycombed surface fibre bundles produce very thin, flattened, erect lamellae with regular meshes, up to 4mm diameter.

Ectosome and subectosome. Membraneous, with points of principal subtylostyles protruding through surface in sparse plumose brushes, few subectosomal auxiliary subtylostyles tangential to and below surface.

Choanosome. Skeletal architecture distinctly plumo-reticulate, with ascending multi- or paucispicular primary fibres, interconnected by pauci- or aspicular secondary fibres; fibres relatively light, 43-92µm primary fibre diameter, 18-56µm secondary fibre diameter, prominently flattened; fibre anastomoses form almost regular, circular or oval meshes, 38-96µm diameter, more compacted towards periphery than at core; fibres cored and echinated by single category of choanosomal principal subtylostyle; echinating megascleres predominant on (although not confined to; cf. Hallmann, 1912) distal edges of fibres; primary spicule tracts increasingly plumose towards periphery; mesohyl heavy in ectosomal region, relatively light in deeper choanosomal region, containing sparsely dispersed subectosomal auxiliary subtylostyles; choanocyte chambers small, oval, up to 55µm diameter.

Megascleres. Choanosomal principal subtylostyles straight or slightly curved at centre, relatively long, thick, with tapering, constricted, smooth, subtylote bases, fusiform pointed or slightly telescoped points. Length 85-(107.5)-138µm, width 4-(7.2)-9.5µm.

Subectosomal auxiliary subtylostyles thin, straight, slightly curved or sometimes sinuous, slightly subtylote bases, varying from asymmetrical strongylote with rounded points or styloid with tapering points. Length 123-(152.3)-196µm, width 2.5-(2.9)-4µm.

Microscleres. Palmate isochelae abundant, unmodified, with long lateral alae completely attached to shaft, shorter front ala partially fused to lateral alae, straight shaft. Length 8-(10.7)-12µm.

REMARKS. *Holopsamma rotunda* has an insubstantial, hollow morphology, paper thin, lamellate fibre bundles ('lacunae'), and regularly lamellate fibre reticulation with prominent flattened fibres, whereas in spicule geometry it could match most other species, particularly *H. crassa*, *H. elegans*, *H. macropora* and *H. ramosa* (i.e., with strongylote points on auxiliary spicules). So far the species is only known only from two type specimens, a poorly preserved deep water specimen from the E. continental shelf (represented only by a fragment), and a more recent

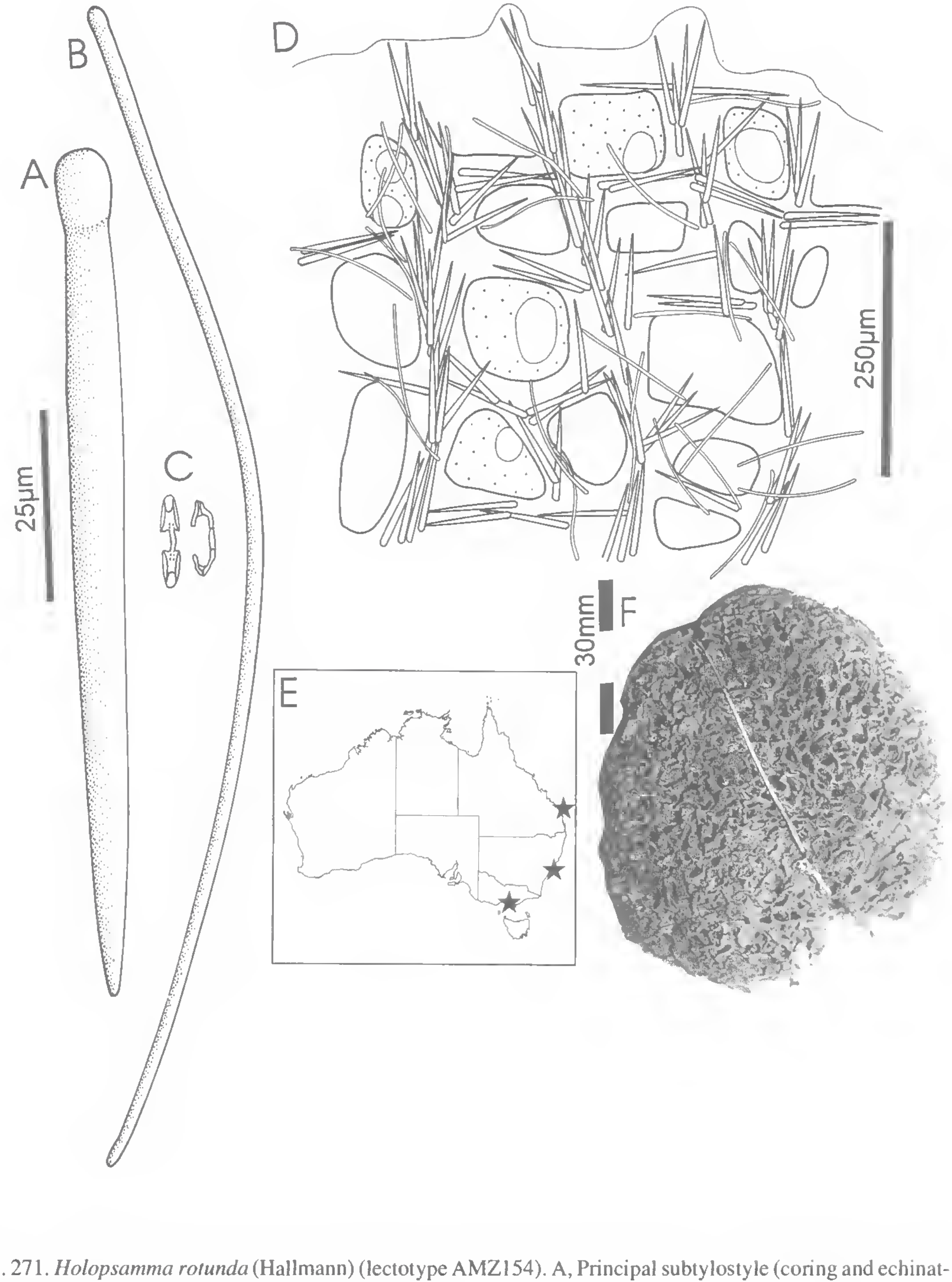


FIG. 271. *Holopsamma rotunda* (Hallmann) (lectotype AMZ154). A, Principal subtylostyle (coring and echinating fibres). B, Subectosomal auxiliary subtylostyle. C, Palmate isochelae. D, Section through peripheral skeleton. E, Known Australian distribution. F, Lectotype.

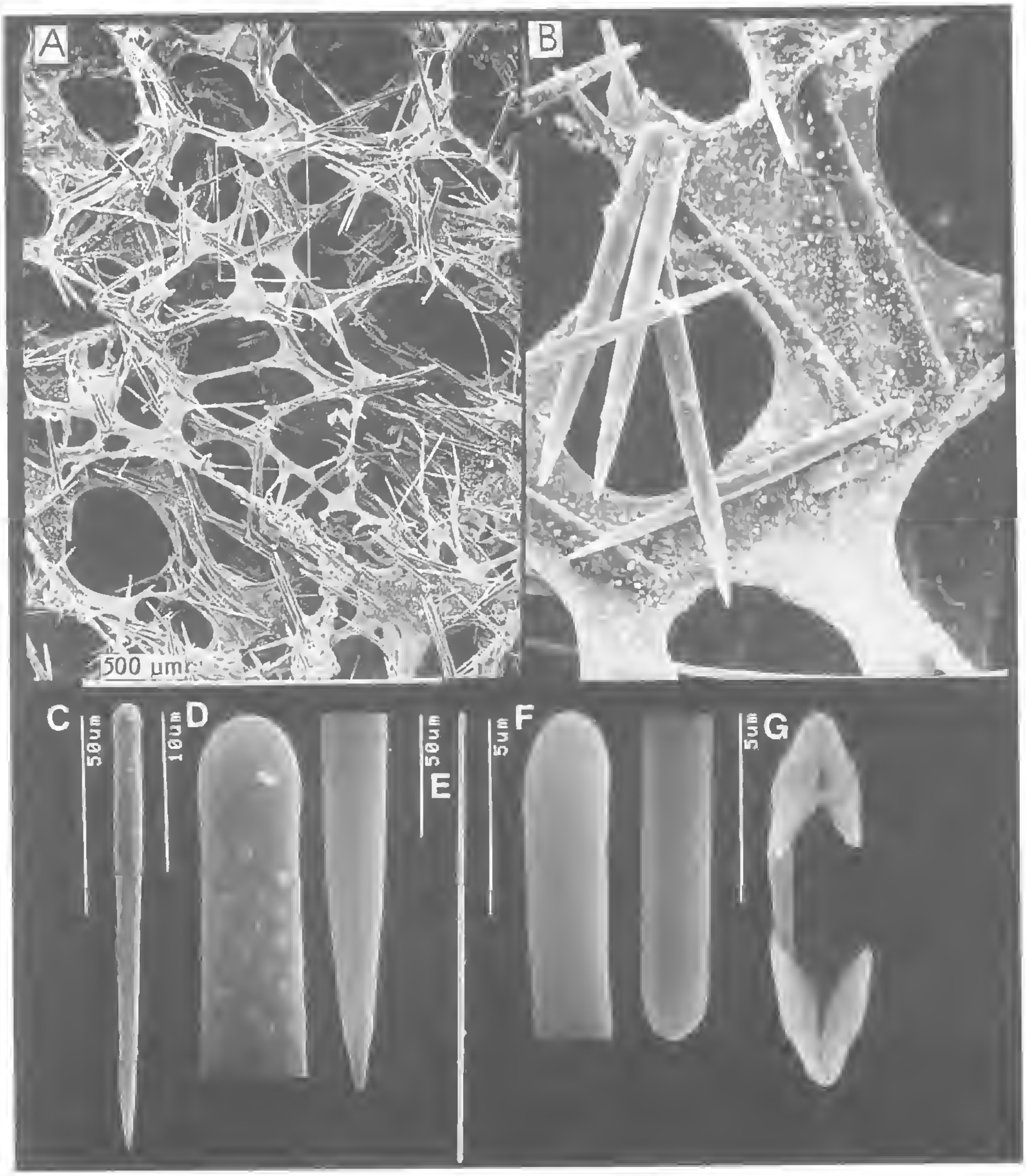


FIG. 272. *Holopsamma rotunda* (Hallmann) (QMG300275). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal subtylostyle. D, Ends of principal subtylostyle. E, Auxiliary subtylostyle. F, Ends of auxiliary spicule. G, Palmate isochela.

collection from Portsea, Victoria (unfortunately also now only represented by a fragment). The deeper water specimen differs from the others in having some detritus scattered throughout the mesohyl, and also lacking any clear division between ascending and transverse fibre elements, but otherwise it is clearly conspecific. Hallmann (1912) did not record a locality for the type but specimen labels and registers indicate Lake Macquarie, NSW.

Holopsamma simplex
(Lendenfeld, 1885)
(Figs 273-274)

Halme simplex Lendenfeld, 1885c: 301-303, pl.26, fig.3, pl.27, fig.6.
Holopsamma simplex; Hooper & Wiedenmayer, 1994: 284.

MATERIAL. LECTOTYPE: AMG8822 (dry): Torres Strait, Qld, 9°41'S, 142°17'E, no other details known. PARALECTOTYPE: BMNH1886.8.27.68 (dry) (fragment AMG3778): off Port Jackson, NSW.

HABITAT DISTRIBUTION. Substrate unknown, 10-20m depth; Torres Strait (FNQ); Port Jackson (NSW) (Fig. 273D).

DESCRIPTION. *Shape.* Thickly encrusting sponges, reportedly up to 20mm thick, with lobate margins and a maximum lateral spread of 100mm; surviving portion of lectotype is 30mm diameter and 10mm thick.
Colour. Live colouration apparently brown, beige-brown in dry state.
Oscules. Undifferentiated from honeycomb reticulate trabeculae.
Texture and surface characteristics. Surviving portion of lectotype brittle, partially crumbled when dry; surface minutely porous, partially arenaceous; close reticulation of rounded branches or 'lacunae' form interweaved ridges on encrusting base produced by irregularly honeycombed reticulate surface fibres.
Ectosome and subectosome. Membraneous, with thick sand cortex; no specialised spicules or spongin fibres visible on surface; subectosome arenaceous.

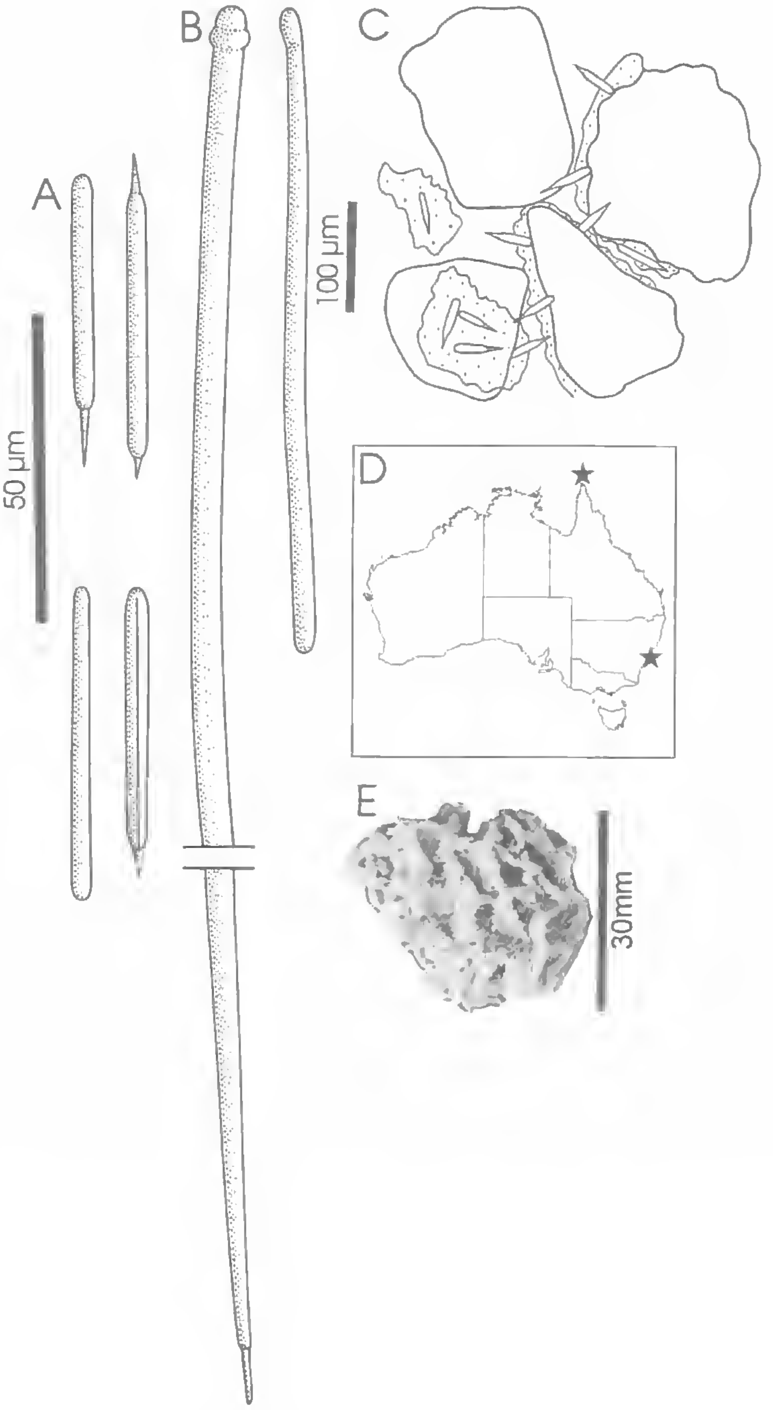


FIG. 273. *Holopsamma simplex* (Lendenfeld) (lectotype AMG8822). A, Principal styles (coring and echinating fibres). B, Subectosomal auxiliary subtylostyles. C, Section through peripheral skeleton. D, Known Australian distribution. E, Lectotype.

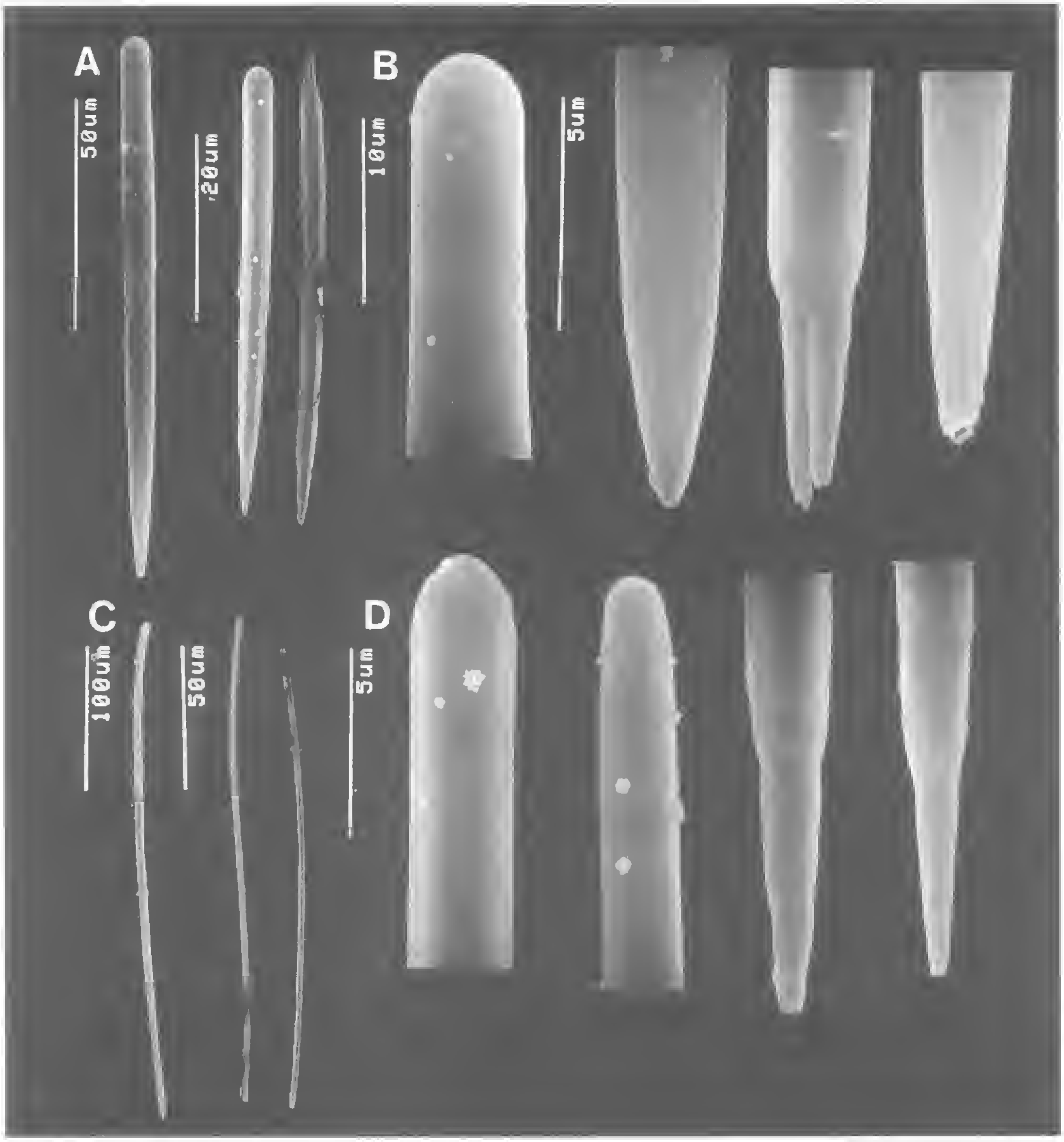


FIG. 274. *Holopsamma simplex* (Lendenfeld) (lectotype AMG8822). A, Principal styles. B, Ends of principal styles. C, Auxiliary styles/ subtylostyles. D, Ends of auxiliary styles.

Choanosome. Skeleton completely arenaceous, consisting of densely packed sand grains side-by-side, bonded together with abundant brown collagen; fibres absent; collagen covers surface of individual sand grains with smooth choanosomal principal styles embedded in and protruding from (? echinating) this basal layer, or sand grains may be free within mesohyl; subectosomal auxiliary subtylostyles scattered throughout mesohyl; choanocyte chambers not observed.

Megascleres. Choanosomal principal styles small, smooth, straight, with smooth, rounded or very slightly swollen bases, usually with telescoped points, sometimes slightly fusiform. Length 43-(50.8)-62μm, width 3-(4.1)-5μm.

Subectosomal auxiliary spicules thin subtylostyles, occasionally quasi-strongyles, straight,

slightly curved or sinuous, with asymmetrical ends. Length 68-(84.8)-99µm, width 2-(2.7)-3.5µm.
Microscleres. Absent.

REMARKS. This species is known only from two relatively poor type specimens. Lendenfeld's (1885c: 303) published geographical distribution for this species, supposedly including also Port Phillip Bay, Vic, NT waters, and Mauritius, is unsubstantiated by voucher material and not accepted here. This species is similar to *E. (Protophlitaspongia) bispiculata* in geometry of principal megascleres, and with several other arenaceous *Holopsamma* species (i.e., *H. favus*, *H. crassa*, *H. laminaefavosa*, *H. felixi*), although in *H. simplex* fibres cannot be differentiated from aggregated sand grains.

Holopsamma sp. indet.
(Fig. 275, Plate 11F)

MATERIAL. QMG300620 (NCIQ66C-2389-N) (fragment NTMZ3563): Marion Reef, off Edithburgh, S. Yorke Peninsula, SA, 38°08.5'S, 137°48.0'E, 6m depth, 10.ii.1989, coll. NCI.

HABITAT DISTRIBUTION. 6m depth; on algae covered rock reef; SAust (Fig. 275B).

DESCRIPTION. *Shape.* Groups of subspherical, bulbous lobes fused together, each composed of honeycombed reticulate lamellae producing a delicate Bryozoan-like lace.
Colour. Pale red-brown alive (Munsell 10R 7/8), brown in ethanol.
Oscules. Large, up to 6mm diameter, on apex of lobes; small ostia 1-2mm diameter scattered amongst surface lacunae.
Texture and surface characteristics. Harsh; surface membraneous, with distinct concentric ridges, slightly arenaceous layer on outer edge of ridges, fleshy between ridges.
Ectosome and subectosome. No ectosomal spicule skeleton; ectosome prominently arenaceous, fleshy below surface; ectosomal sand particles dispersed in association with primary ascending fibres.
Choanosome. Irregularly reticulate skeletal structure, with broad fibres up to 400µm diameter, partially or fully cored with detritus; mesohyl matrix very heavy; no native spicules; choanocyte chambers oval to elongate, 20-55µm diameter.
Megascleres. Absent.
Microscleres. Absent.

REMARKS. This single specimen is similar to several *Holopsamma* species (e.g., *H. crassa*, *H. laminaefavosa*) in being able to shed its spicules completely and replacing these with foreign detritus, particularly sand particles. Wiedenmayer (1989) discusses these arenaceous species in detail and the difficulty in assigning them to any particular taxon. On the basis of its growth form, fibre characteristics and skeletal architecture the specimen could be assigned to one of several species, and for the time being its specific identity is left indeterminate.

Echinochalina
Thiele, 1903

Refer to subgenera for synonymy.

TYPE SPECIES. *Ophlitaspongia australiensis* Ridley, 1884a: 442 (by subsequent designation of Hallmann, 1912: 288)).

DEFINITION. Monactinal, quasi-monactinal or thin diactinal auxiliary megascleres tangential or erect on ectosome; choanosomal skeleton irregularly reticulate; fibres cored by tracts of auxiliary megascleres, identical to those in ectosomal skeleton, and echinated by principal megascleres varying from true monactinal, quasi-diactinal to true diactinal forms, smooth or acanthose; microscleres may include palmate isochelae and toxas.

REMARKS. Twenty six species have been included in *Echinochalina*, of which 20 are valid, of which 16 live in Australian waters including 5 new species. All species are known from the Indo-west Pacific region (Hooper & Lévi, 1993a).

The genus contains 2 groups: one (*Echinochalina* (*Echinochalina*)) with true monoactinal spicules, showing superficial affinities with *Holopsamma* (having honeycomb reticulate growth forms) and the Raspailiidae (fibre characteristics), and the other with quasi-diactinal or secondarily modified diactinal megascleres (*Echinochalina* (*Protophlitaspongia*)) superficially resembling Niphatidae (Haplosclerida). Both groups are linked by the common possession of auxiliary megascleres coring fibres and principal megascleres echinating fibres.

Echinochalina (Echinochalina)
Thiele, 1903

Echinochalina Thiele, 1903a: 961; *sensu* Hallmann, 1912: 288.

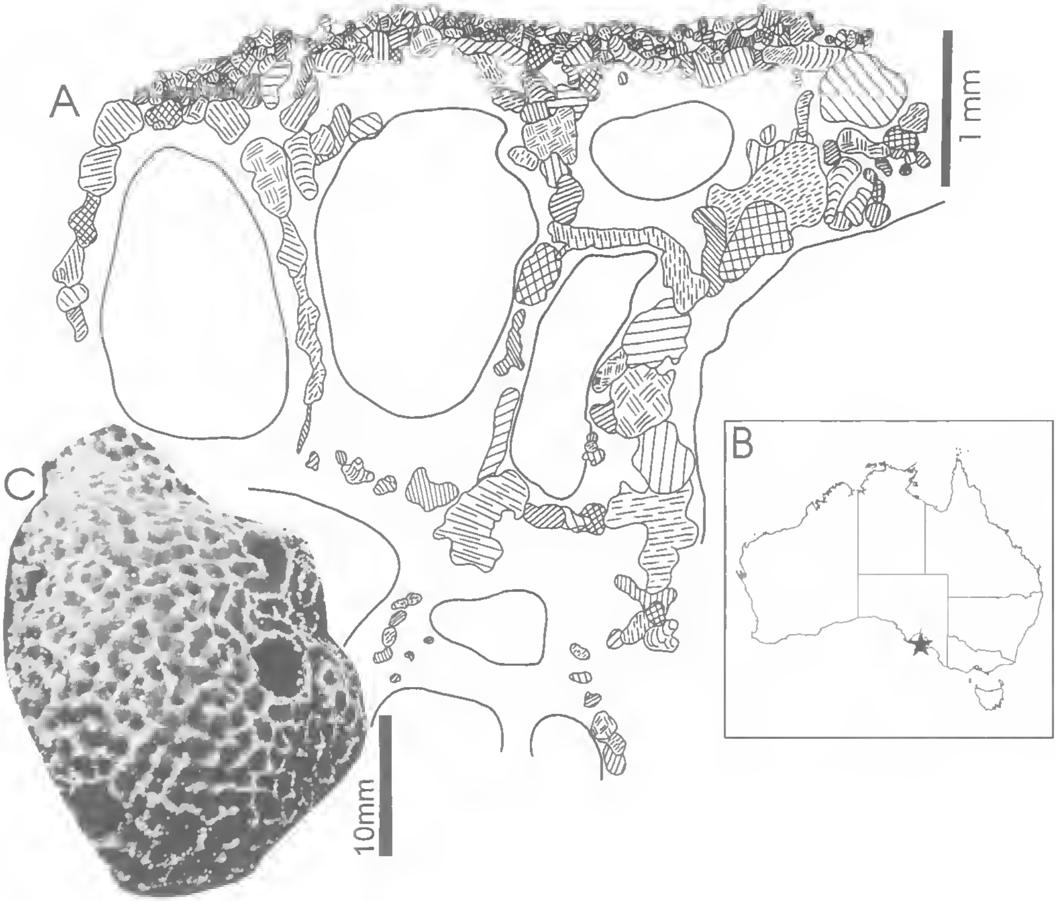


FIG. 275. *Holopsamma* sp. indet. (QMG300620). A, Choanosomal skeletal structure. B, Australian distribution.

Tablis de Laubenfels, 1936a: 76.
[*Echinoclathria*]; Uriz, 1988: 89.

TYPE SPECIES. *Ophlitaspongia australiensis* Ridley, 1884a: 442.

DEFINITION. Monactinal, quasi-monactinal or secondarily derived true diactinal auxiliary megascleres core fibres, and monactinal principal spicules echinate fibres.

Echinochalina (Echinochalina) anomala
Hallmann, 1912
(Figs 276-277)

Echinochalina glabra, in part; Whitelegge, 1907: 507.
Not *Echinoclathria glabra* Ridley & Dendy, 1887: 163.
Echinochalina anomala Hallmann, 1912: 292-294, text-fig.68; Hooper & Wiedenmayer, 1994: 276.
Tablis anomala; de Laubenfels, 1936a: 76.
cf. *Echinochalina anomala* Burton, 1934a: 563.

MATERIAL. HOLOTYPE: AMG10548 (dry): Off Woolongong, NSW, 34°25'S, 151°10'E, 110-112m depth, coll. FIV 'Thetis' (dredge). PARALECTOTYPES - AMG10549 (dry): same locality. AMG10550 (dry): same locality. AMG10551 (dry): same locality.

HABITAT DISTRIBUTION. 110-112m depth; substrate unknown; S. coast (NSW) (Fig. 276D).

DESCRIPTION. *Shape*. Massive, clathrous-honeycomb reticulate sponge, 125mm long, 75mm maximum width, composed of numerous, small, flattened fibre-branches, up to 12mm long, 4mm diameter, anastomosing and bifurcating

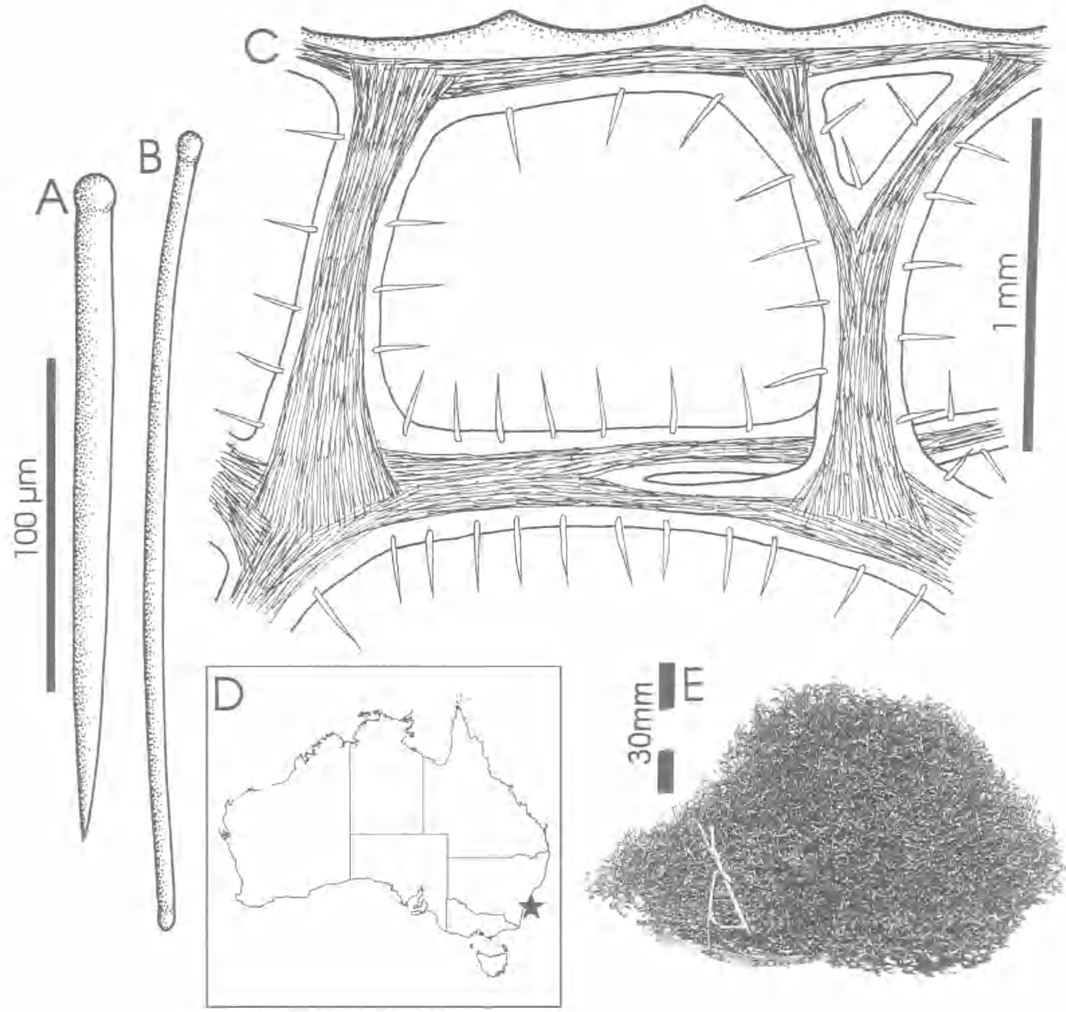


FIG. 276. *Echinochalina* (*Echinochalina*) *anomala* Hallmann (holotype AMG10548). A, Principal subtylostyle (echinating fibres). B, Auxiliary subtylostyle/ quasistrongyle (coring fibres and interstitial). C, Section through peripheral skeleton. D, Known Australian distribution. E, Holotype.

forming tangled mass, attached directly to substrate.

Colour. Live colouration unknown, grey-brown in dry state.

Oscules. Not observed.

Texture and surface characteristics. Firm, harsh in dry state; surface fibres flattened, paper-like, porous reticulate with fibre-branches forming wide-meshed reticulation up to 3mm diameter.

Ectosome and subectosome. Membraneous, stretched across adjacent surface fibre-branches, with tangential auxiliary megascleres sparsely dispersed within ectosome, singly or less frequently in paucispicular bundles, and protruding echinating principal styles protruding through surface; choanosomal fibres immediately below ectosome.

Choanosome. Irregularly reticulate skeletal structure; primary spongin fibres large, heavy, 230-360µm diameter, irregularly interconnected by relatively thinner secondary fibres, 95-145µm diameter, forming cavernous meshes, 430-1090µm diameter; all fibres cored by multispicular tracts of auxiliary megascleres

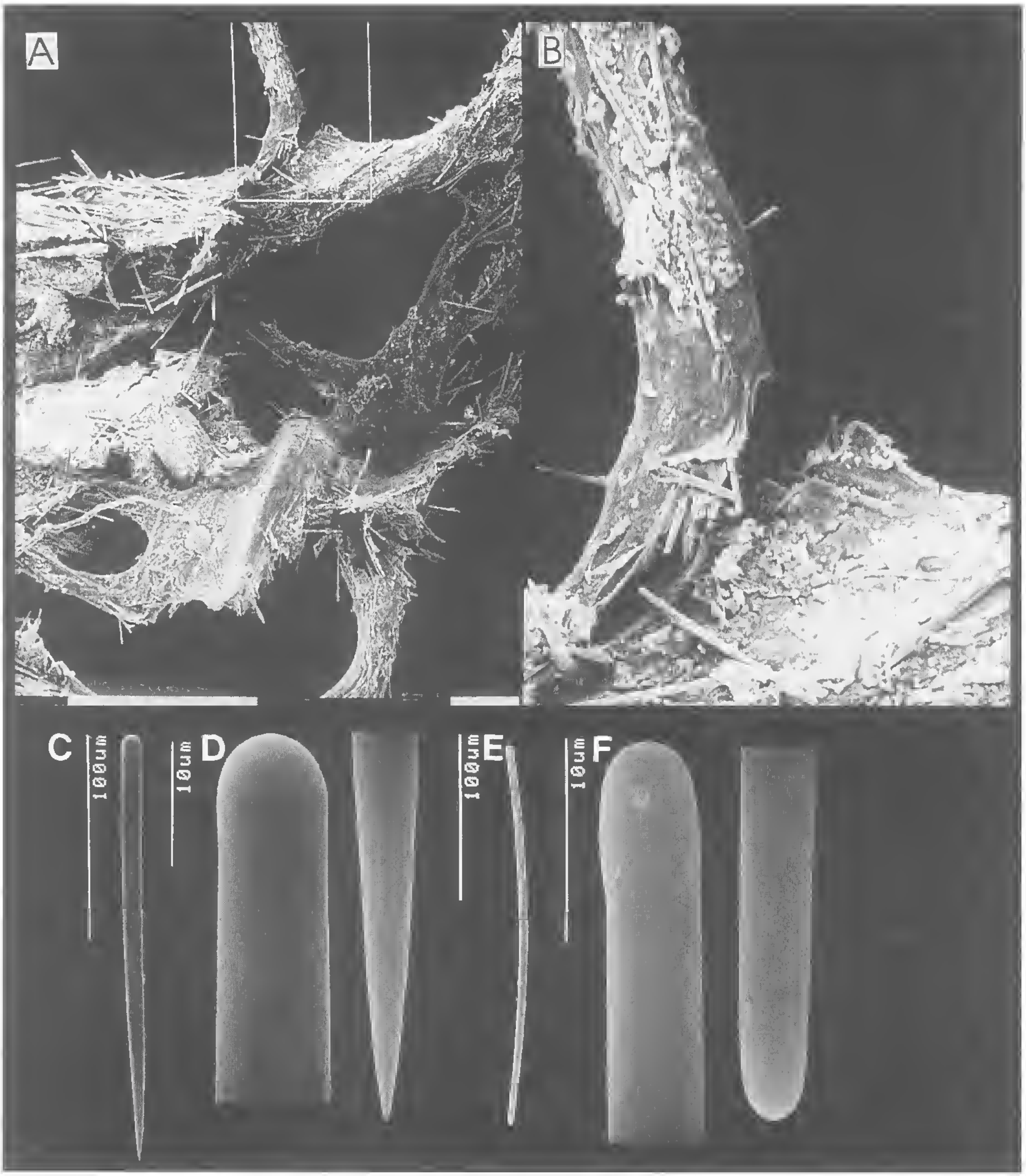


FIG. 277. *Echinochalina* (*Echinochalina*) *anomala* Hallmann (holotype AMG10548). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal subtylostyle. D, Ends of principal spicule. E, Auxiliary subtylostyle. F, Ends of quasi-diactinal auxiliary spicule.

occupying most of fibre diameter; fibres moderately heavily echinated by principal styles dispersed evenly over surface; mesohyl matrix light, containing numerous dispersed subectosomal auxiliary spicules; choanocyte chambers not observed (dry material).

Megascleres. Principal styles echinating fibres relatively thick, straight or slightly sinuous, with smooth, slightly subtylote bases, fusiform points.

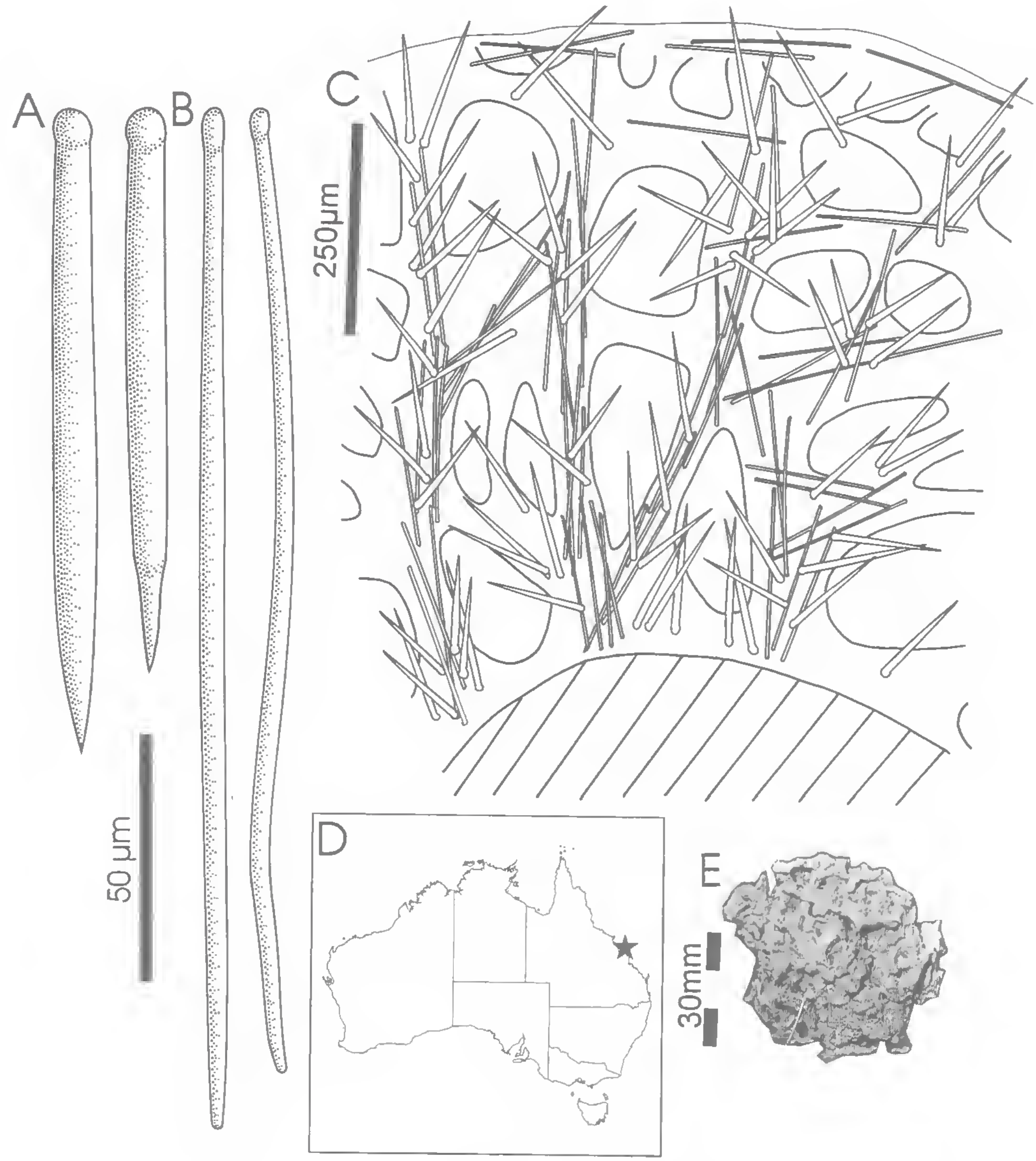


FIG. 278. *Echinochalina* (*Echinochalina*) *australiensis* (Ridley) (holotype BMNH1881.10.21.299). A, Principal subtylostyles (echinating fibres). B, Auxiliary subtylostyle/ tornostyles (coring fibres and interstitial). C, Section through peripheral skeleton. D, Australian distribution. E, Holotype.

Length 160-(189.9)-236µm, width 7-(9.3)-11µm.

Auxiliary megascleres coring fibres and found interstitially long, thin, straight, entirely smooth, varying from nearly symmetrical quasi-strongyles to asymmetrical tornostyles with slightly subtylote bases and rounded points. Length 165-(215.4)-277µm, width 2-(4.3)-6.5µm.

Microscleres. Absent.

REMARKS. Burton (1934a) assigned a specimen from Eagle I. (Cairns section, Great Barrier Reef) to *E.* (*E.*) *anomala* but his material was not found in the BMNH. Moreover, Burton's figure does not resemble the holotype so that his record is dubious.

Skeletal fibre reticulation of *E.* (*E.*) *anomala* is reminiscent of *Echinodictyum* (Raspailiidae), with very widely spaced fibre-meshes, and with fibres of large diameter which are heavily cored by megascleres. Unlike most *Echinodictyum* species, however, which have a greater emphasis on the mineral skeleton over the organic fibres, and which have true diactinal coring spicules, the fibres of *E.* (*E.*) *anomala* are prominent and heavily cored by quasi-diactinal megascleres. The honeycomb reticulate growth form of *E.* (*E.*) *anomala* is similar to *E.* (*E.*) *barba* (both reminiscent of *Holopsamma*) differing mainly in the geometry of its principal megascleres, differences in fibre construction and spicule dimensions.

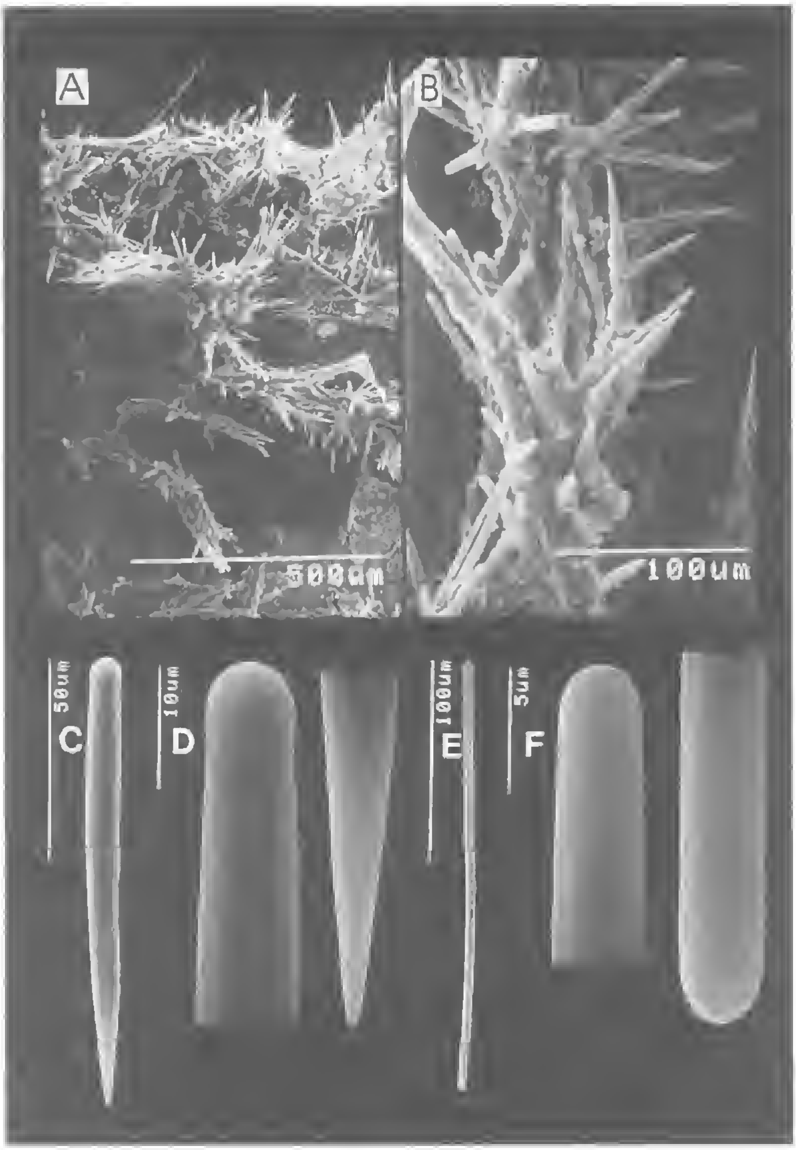


FIG. 279. *Echinochalina* (*Echinochalina*) *australiensis* (Ridley) (holotype BMNH1881.10.21.299). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal subtylostyle. D, Ends of principal spicule. E, Auxiliary spicule. F, Ends of quasi-diactinal auxiliary spicule.

Echinochalina (Echinochalina) australiensis (Ridley, 1884)
(Figs 278-279)

Ophlitaspongia australiensis Ridley, 1884a: 442-443, pl.42, figs c,c'.
Echinochalina australiensis; Thiele, 1903a: 961-962; Hooper & Wiedenmayer, 1994: 276.

MATERIAL. HOLOTYPE: BMNH1881.10. 21.299: Port Molle, Qld, 20°16'S, 148°42'E, 1.v.1881, HMS 'Alert' (dredge). OTHER MATERIAL: SMF1855 (fragment MNHNDCL2265).

HABITAT DISTRIBUTION. Rock and coral rubble substrata; 24m depth; Airlie region (NEQ) (Fig. 278D); also Moluccas, Indonesia.

DESCRIPTION. *Shape.* Massive, branching, clathrous, honeycomb reticulate growth form, 55mm diameter, fibre-branches flattened, up to 12mm long, 5mm wide, with cavernous, angular meshes up to 10mm diameter.

Colour. Pale brown dry.

Oscules. Small, up to 4mm diameter, between adjacent fibre bundles.

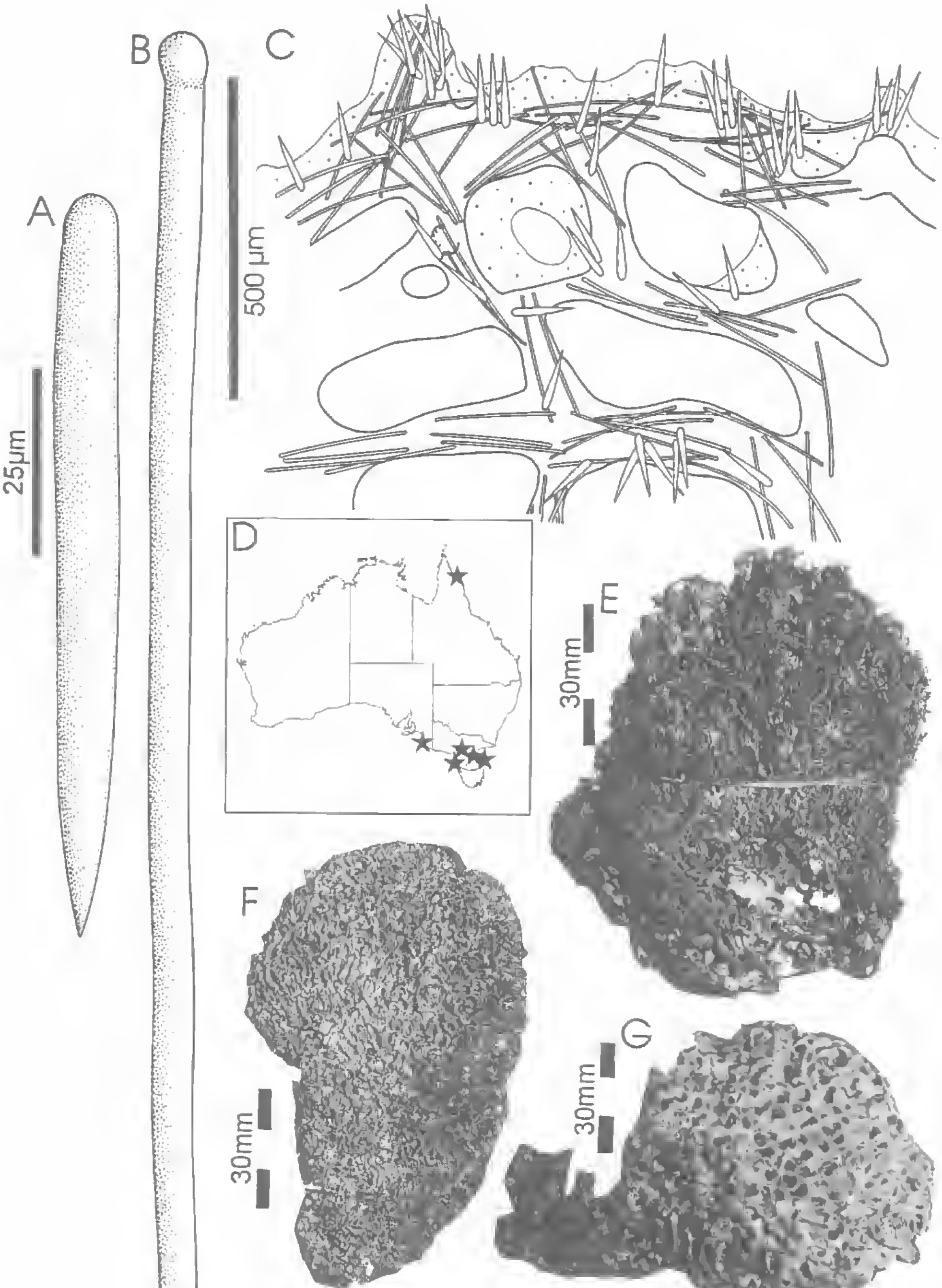


FIG. 280. *Echinochalina* (*Echinochalina*) *barba* (Lamarck) (AMZ44). A, Principal style (echinating fibres). B, Auxiliary subtylostyle/ quasistrongyle (coring fibres and interstitial). C, Section through peripheral skeleton. D, Known Australian distribution. E, Paralectotype MNHNDT3411. F, Lectotype of *S. favosa*. G, Holotype of *E. glabra*.

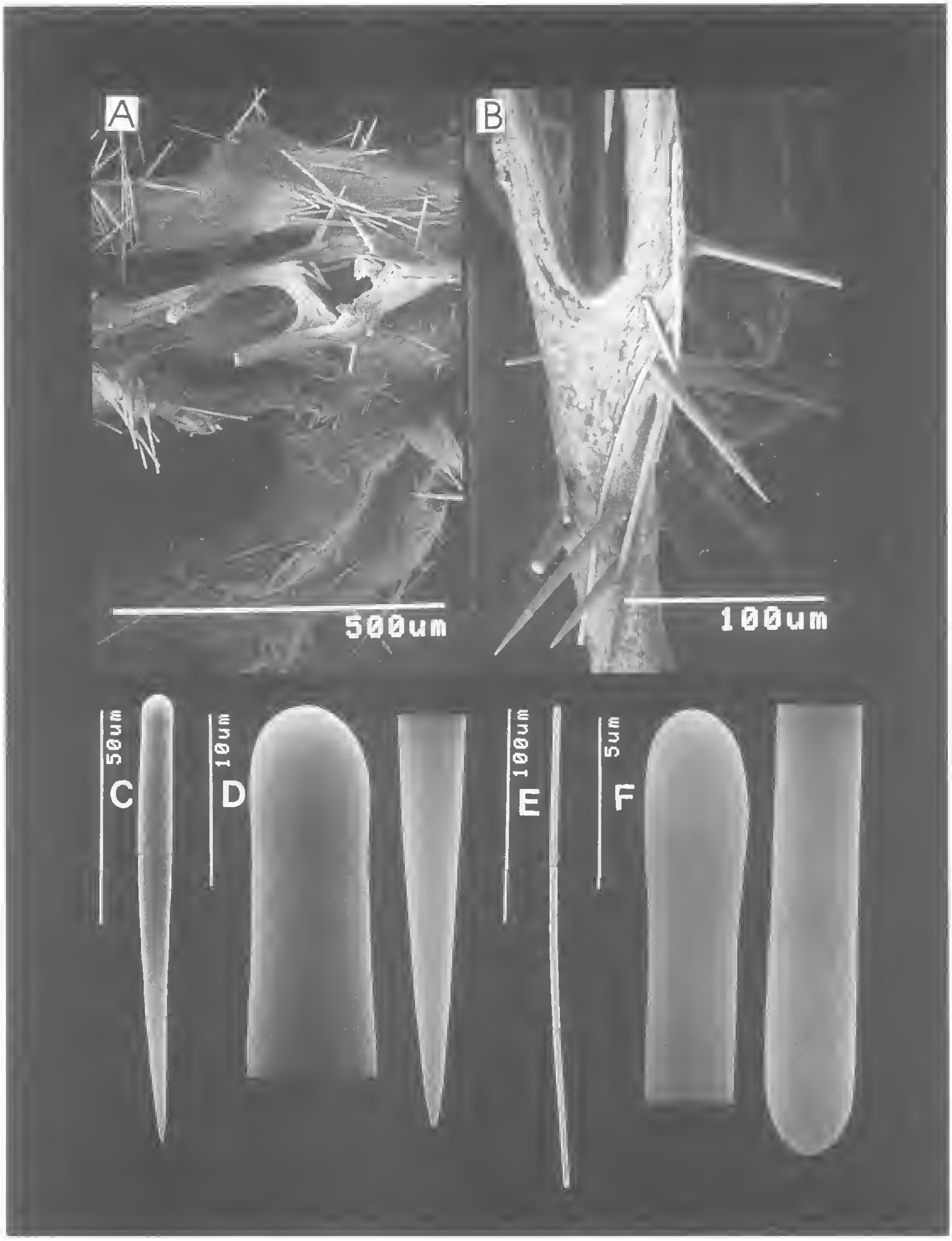


FIG. 281. *Echinochalina* (*Echinochalina*) *barba* (Lamarck) (QMG300274). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal subtylostyle. D, Ends of principal spicule. E, Auxiliary spicule. F, Ends of quasi-diactinal auxiliary spicule.

Texture and surface characteristics. Firm, harsh dry; conulose surface produced by anastomosing fibre bundles ('lacunae'), interconnected by translucent ectosomal membrane stretched between adjacent conules.

Ectosome and subectosome. Membraneous, with thinner choanosomal, undulating fibres lying immediately below ectosome, approximately 53µm diameter, cored by paucispicular tracts of auxiliary megascleres, and with irregular layer of auxiliary megascleres scattered tangential to surface.

Choanosome. Vaguely regularly reticulate skeleton, composed of primary, distinctly ascending, multispicular fibres, 100-140µm diameter, interconnected at irregular intervals by numerous transverse, paucispicular, secondary fibres, approximately 70µm diameter; fibre anastomoses form rounded or elongate, narrow meshes up to 270µm diameter; fibres cored by auxiliary megascleres, sparsely echinated by principal subtylostyles; mesohyl matrix heavy but only lightly pigmented, with sparsely dispersed auxiliary megascleres between fibres; choanocyte chambers ovoid, 20-25µm diameter.

Megascleres. Principal subtylostyles (echinating fibres) straight, smooth, tapering, rounded or slightly subtylote bases, fusiform or slightly telescoped points. Length 83-(111.2)-131µm, width 6-(7.2)-9.5µm.

Auxiliary megascleres (coring fibres and interstitial) straight, thin, subtylostyles, tornostyles or quasi-stongyles, with smooth, rounded, or very slightly subtylote bases, tapering-rounded points. Length 147-(178.2)-192µm, width 1.5-(3.4)-4.5µm.

Microscleres. Absent.

REMARKS. Ridley (1884a) reported toxas (up to 42µm long, 2µm wide) but these were not found in either the holotype or in Thiele's (1903) material and they are probably contaminants. *E.* (*E.*) *australiensis*, like most members of the genus, has few diagnostic characteristics, superficially resembling *Echinodictyum cavernosum* (Raspailiidae) and *C.* (*Thalysias*) *vulpina* in growth form, with a heavy, well developed reticulate, *Clathria*-like, horny fibre skeleton cored by auxiliary spicules and echinated by principal spicules. It differs from other *Echinochalina* in spicule dimensions, well-developed skeletal structure and these fibre characteristics.

Echinochalina (Echinochalina) barba
(Lamarck, 1814)
(Figs 280-281, Plate 12A)

Spongia barba Lamarck,1814: 372, 354; Topsent, 1930; 15-16, pl.4,fig.6.
Echinochalina barba; Hooper & Wiedenmayer, 1994: 276.
Spongia favosa Lamarck, 1814: 373; Topsent, 1930: 19, pl.1, fig.5.
Echinoclathria glabra Ridley & Dendy, 1886: 476; Ridley & Dendy, 1887: 163, pl.29, fig.11, pl.31, fig.2; Dendy, 1896: 40.
Tablis glabra; de Laubenfels, 1936a: 76.
Echinochalina glabra; Thiele, 1903a: 962; Hallmann, 1912: 275, 290-292, text-fig.67; Burton, 1934a: 600; [?] Thomas, 1977: 115-116, text-figs 1F-G.
Not *Echinochalina glabra*; Whitelegge, 1907: 504.

MATERIAL. LECTOTYPE: MNHNDT561: unknown locality. PARALECTOTYPE: MNHNDT3411: unknown locality. LECTOTYPE of *S. favosa*: MNHNDT557 (fragment BMNH1954.2.20.9): Near King I., Tas, 39°50'S, 144°00'E, 1803, Peron & Lesueur collection. PARALECTOTYPE of *S. favosa*: MNHNDT 3401 (fragment BMNH1954.2. 20.37): same locality. HOLOTYPE of *E. glabra*: BMNH 1887.5.2.63: Bass Strait, Tas, 39°10.3'S, 146°37'E, 76m depth, 2.iv.1874, coll. HMS 'Challenger' (dredge). OTHER MATERIAL: QLD-QMGL711 (fragment NTMZ1531). TAS- QMG300274 (NCIQ66C-3543-R) (fragment NTMZ3849), QMG311312 (NCIQ66C3542-Q) (fragment NTMZ3853). S AUST- AMZ44.

HABITAT DISTRIBUTION. Sand, shell grit, rock or coral rubble substrata, kelp beds; 0-76m depth; Moncoeur I., Port Phillip Bay (Vic); King I., Deal I., Bass Strait (Tas); Kingston SE. (SA); Flinders Is (FNQ) (Fig. 281D). Thomas' (1977) reported locality of Andaman Sea is dubious from his description.

DESCRIPTION. *Shape.* Massive, subcylindical, honeycomb reticulate sponge, up to 155mm long, 75mm wide, consisting of thin, flattened, irregularly anastomosing, reticulate fibre bundles; fibre anastomoses form meshes 3-5mm diameter.

Colour. Light grey-brown exterior, beige interior alive (Munsell 7.5Y8/6), yellowish brown in ethanol.

Oscules. Small, up to 3mm diameter, recessed, dispersed between surface fibre bundles.

Texture and surface characteristics. Spongy, slightly rubbery, compressible, difficult to tear; surface of fibre bundles smooth, even, glabrous, porous and reticulate elsewhere, surface membrane stretched across adjacent fibre bundles.

Ectosome and subectosome. Thinly membraneous, with irregularly dispersed

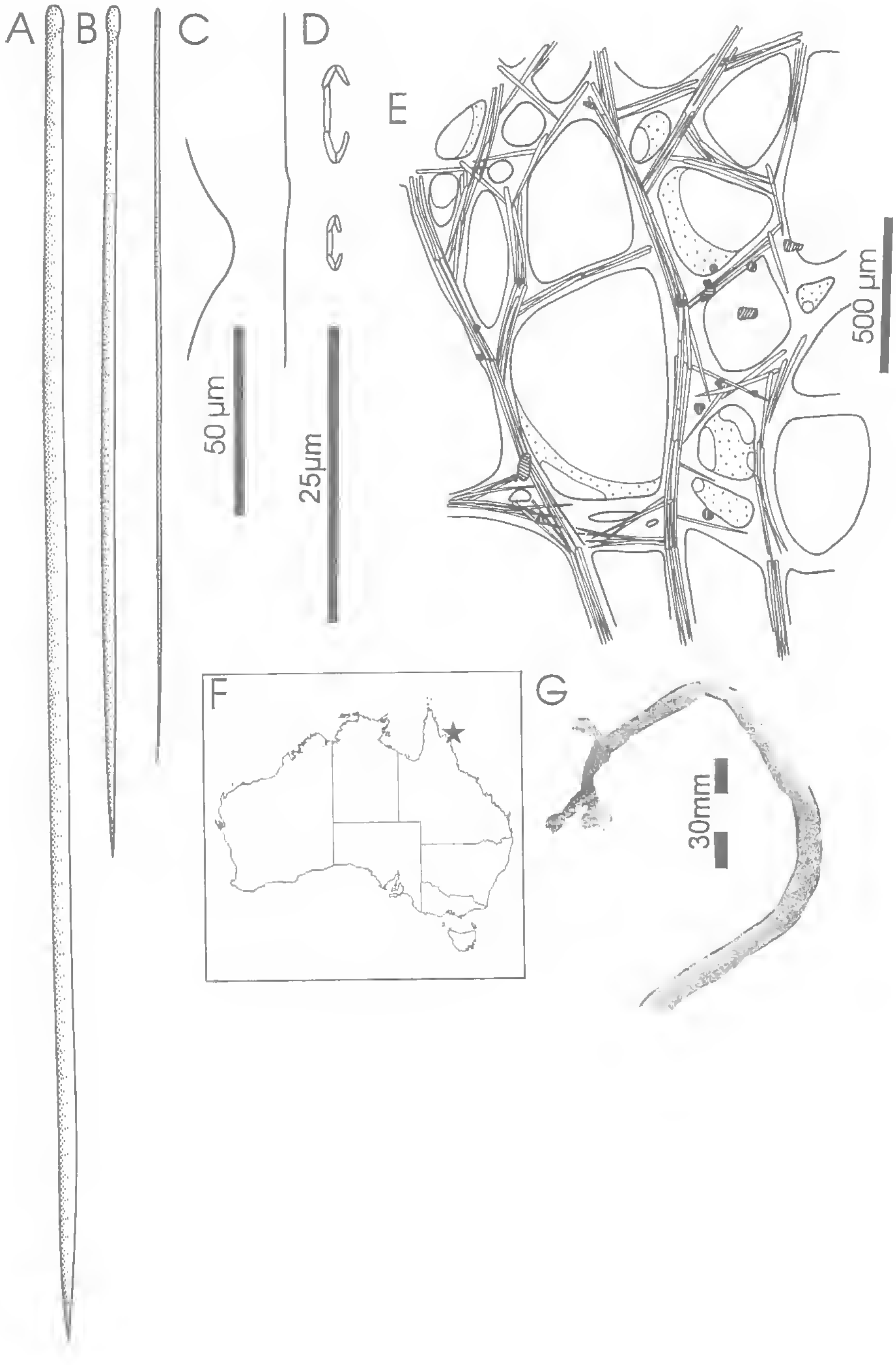


FIG. 282. *Echinochalina* (*Echinochalina*) *felixi* sp.nov. (holotype QMG304741). A, Auxiliary subtylostyle (coring fibres and interstitial). B, Principal subtylostyles (echinating fibres). C, Wing-shaped and accolada toxas. D, Palmate isochelae. E, Section through peripheral skeleton. F, Known Australian distribution. G, Holotype.

auxiliary megascleres lying tangential to surface and irregular, paucispicular, plumose brushes of principal spicules erect on peripheral fibres, barely protruding through ectosome; choanosomal fibres immediately subdermal.
Choanosome. Irregularly reticulate skeletal structure, with primary, vaguely ascending, distinctly meandering paucispicular fibres, 52-120µm diameter, interconnected by aspicular or less frequently paucispicular, irregularly anastomosing, secondary fibres, 37-75µm diameter; fibres cored by auxiliary megascleres, moderately echinated by principal subtylostyles especially on peripheral fibres; fibre anastomoses form nearly regular regular oval meshes, 165-370µm diameter; mesohyl matrix heavy, moderately lightly pigmented, with numerous auxiliary megascleres dispersed between fibres; choanocyte chambers oval to eliptical, 38-145µm diameter.
Megascleres. Principal subtylostyles (echinating fibres) short, thick, straight or very slightly curved, with smooth, tapering, distinctly subtylote bases, fusiform points. Length 62-(94.3)-115µm, width 5-(7.1)-8.5µm.

Auxiliary megascleres (coring fibres and interstitial) straight, quasi-diactinal subtylostrongyles, rarely strongyles, with smooth, slightly subtylote bases and rounded points. Length 147-(189.2)-214µm, width 1.5-(3.3)-4.5µm.
Microscleres. Absent.

REMARKS. *Echinochalina barba* has a honeycombed reticulate construction similar to that of *E.* (*E.*) *anomala* and reminiscent of *Holopsamma* species, but in which the surface is very smooth and fleshy (superficially resembling an *Acanthella* (Axinellidae)). Both *E. anomala* and *E. barba* also have asymmetrical (quasi-diactinal) auxiliary megascleres coring fibres, whereas in most other *Echinochalina* these are more obviously monactinal. In *E.* (*E.*) *barba* fibre anastomoses are relatively closely compacted and principal styles (echinating fibres) are short, tapering, subtylote, whereas *E.* (*E.*) *anomala* has a cavernous construction and long, more-or-less rounded principal megascleres.

Echinochalina (Echinochalina) felixi sp. nov. (Figs 282-283)

MATERIAL. HOLOTYPE: QMG304741: NE of Eagle I., E. of Turtle Is group, Cairns section Great Barrier Reef, 14°39.8'S, 145°19.2'E, 3.ix.1994, 19m depth, coll. J. Kennedy, DPI RV "Gwendolyn May", trawl.

HABITAT DISTRIBUTION. Soft substrata inter-reef region; 19m depth; Turtle Is (FNQ) (Fig. 282F).

DESCRIPTION. *Shape.* Long, thinly cylindrical, fragile digit, 180mm long, up to 60mm diameter tapering towards base; embedded in soft substrata by small, cylindrical, basal root-like processes, up to 21mm long, 3mm diameter.
Colour. Beige-grey alive (Munsell 2.5Y 7/2), light brown in ethanol.
Oscules. Not observed.
Texture and surface characteristics. Firm, compressible; surface fibrous, macroscopically even, microscopically porous, honeycomb reticulate.
Ectosome and subectosome. Fibrous, with peripheral spongin fibres tangential to surface, forming circular meshes up to 2.5mm diameter, membraneous ectosome stretched between adjacent fibres; outer surface of peripheral fibres with small blind fibre endings and protruding spicules, both visible under low magnification; auxiliary subtylostyles scattered on membraneous ectosome, singly or in small bundles; subectosomal skeleton undifferentiated from choanosome.
Choanosome. Reticulate skeletal structure; fibres more-or-less homogeneous, 40-85µm diameter cored by auxiliary subtylostyles in multispicular tract of up to 6 spicules abreast; fibres long, generally curved or sinuous, anastomosing, regularly bifurcate; shorter connecting fibres uni- or paucispicular; fibre meshes cavernous oval or eliptical, 170-490µm diameter; fibres sparsely echinated by smaller principal subtylostyles; mesohyl matrix heavy, granular, cored by few microscleres and auxiliary megascleres; choanocyte chambers small, oval, 20-35µm diameter.
Megascleres. Principal subtylostyles (echinating fibres) short, slender, straight, subtylote, smooth bases, tapering fusiform points. Length 207-(242.2)-278µm, width 3-(3.3)-4.5µm.

Auxiliary subtylostyles (coring fibres and dispersed in mesohyl) long, very slender, straight, slightly subtylote, smooth bases, tapering fusiform or sometimes bluntened points. Length 285-(314.8)-345µm, width 3.5-(4.3)-5µm.
Microscleres. Palmate isochelae unmodified, front and lateral alae approximately equal length, lateral alae completely fused to shaft, front alae partially fused to lateral alae, straight shaft. Length 6-(10.1)-12µm.

Toxas include both wing-shaped and slightly accolada forms, ranging from thin to raphidiform, often broken in preparations. Length 40-(65.8)-96µm, width 0.8-(1.7)-2.5µm.

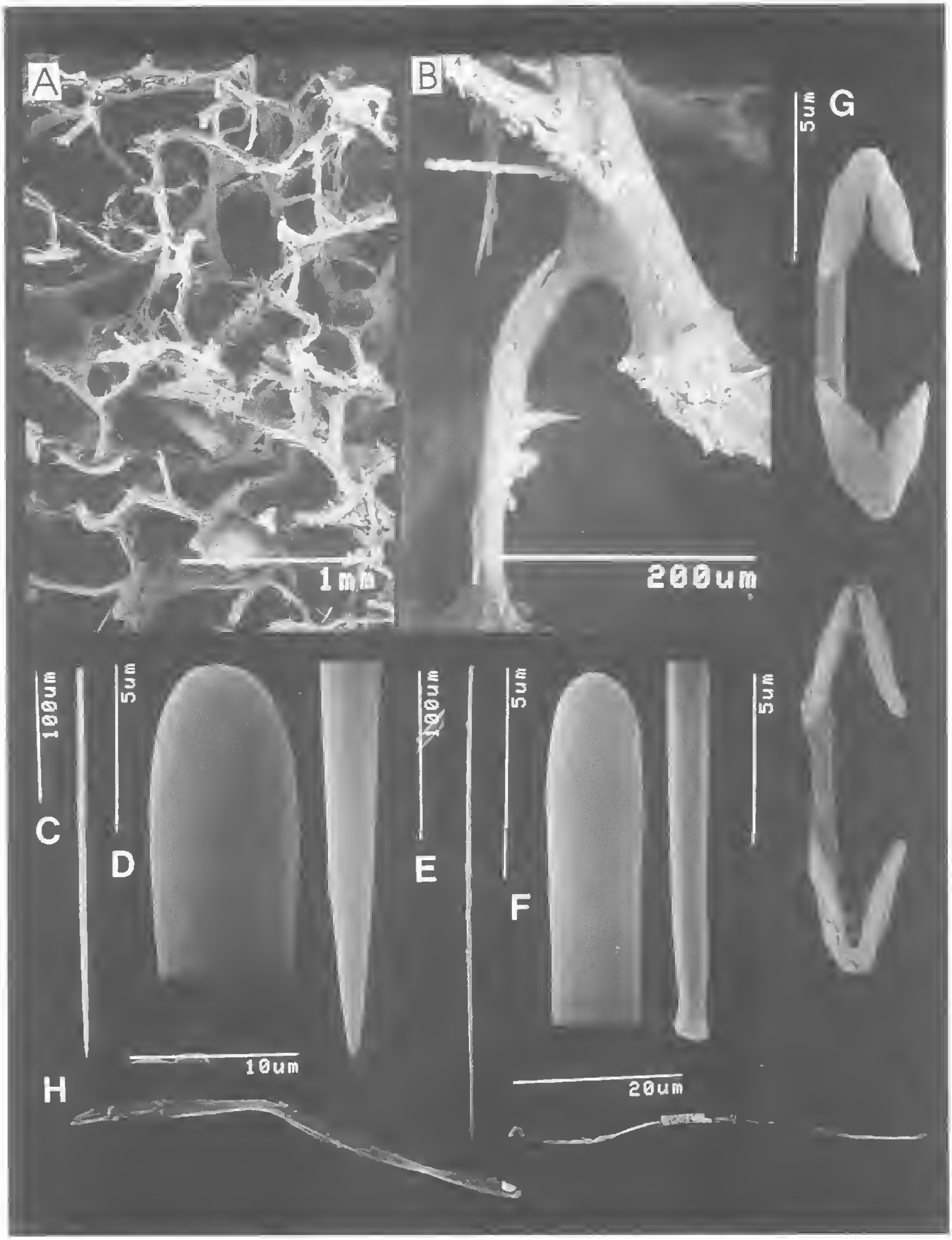


FIG. 283. *Echinochalina* (*Echinochalina*) *felixi* sp.nov. (holotype QMG304741). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal subtylostyles. D, Ends of principal spicule. E, Auxiliary subtylostyle. F, Ends of auxiliary spicule. G, Palmate isochelae. H, Fragments of wing-shaped and accolada toxas.

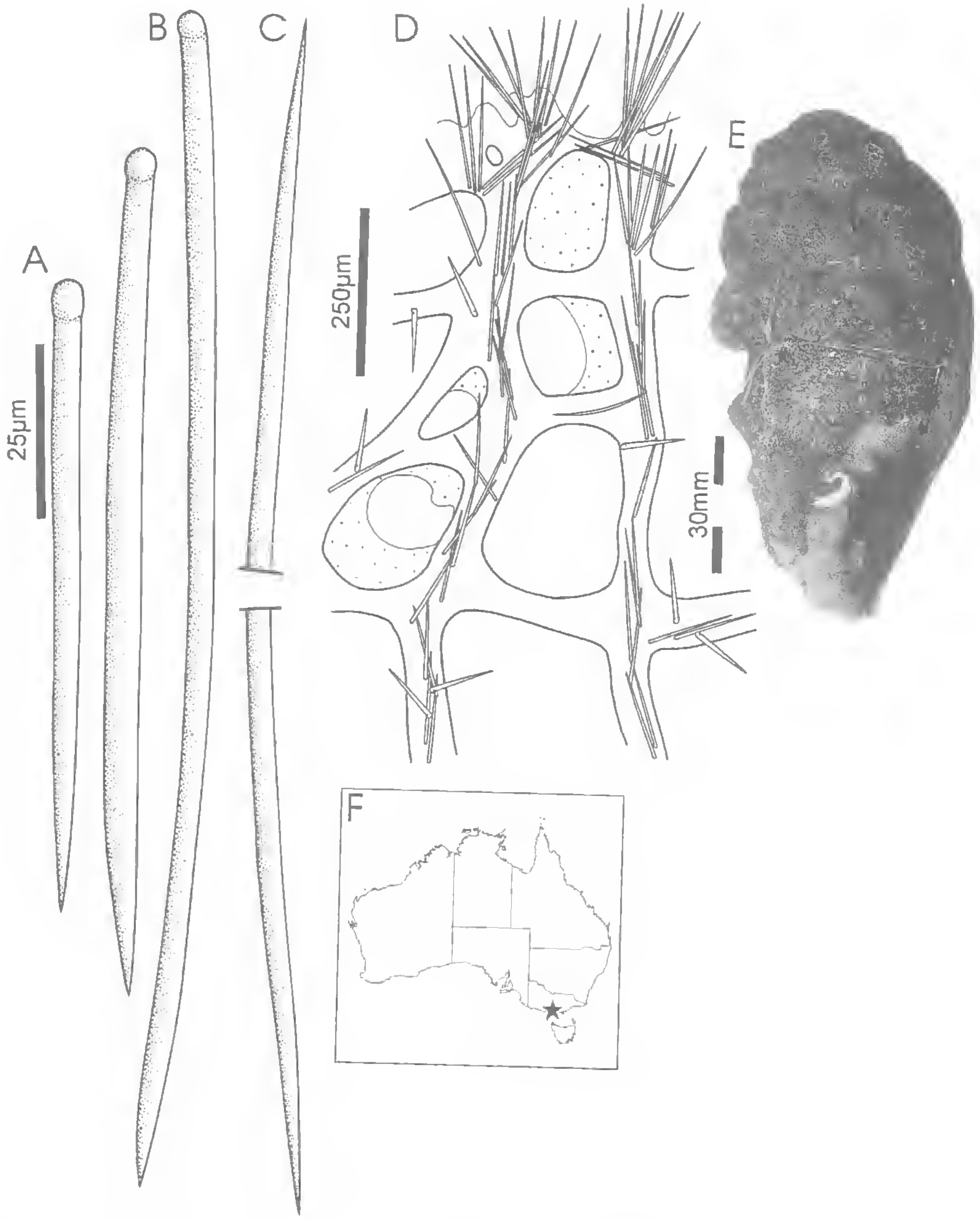


FIG. 284. *Echinochalina* (*Echinochalina*) *gabrieli* (Dendy) (holotype NMVG2359). A, Principal subtylostyles (echinating fibres). B, Auxiliary subtylostyle (coring fibres and interstitial). C, Oxeote toxa. D, Section through peripheral skeleton. E, Holotype. F, Known Australian distribution.

ETYMOLOGY. For Dr Felix Wiedenmayer, Naturhistorisches Museum Basel, for his contributions to Australian sponges.

REMARKS. *Echinochalina felixi* is unusual having very thin megascleres and a cavernous reticulate construction, similar to *E. digitata* al-

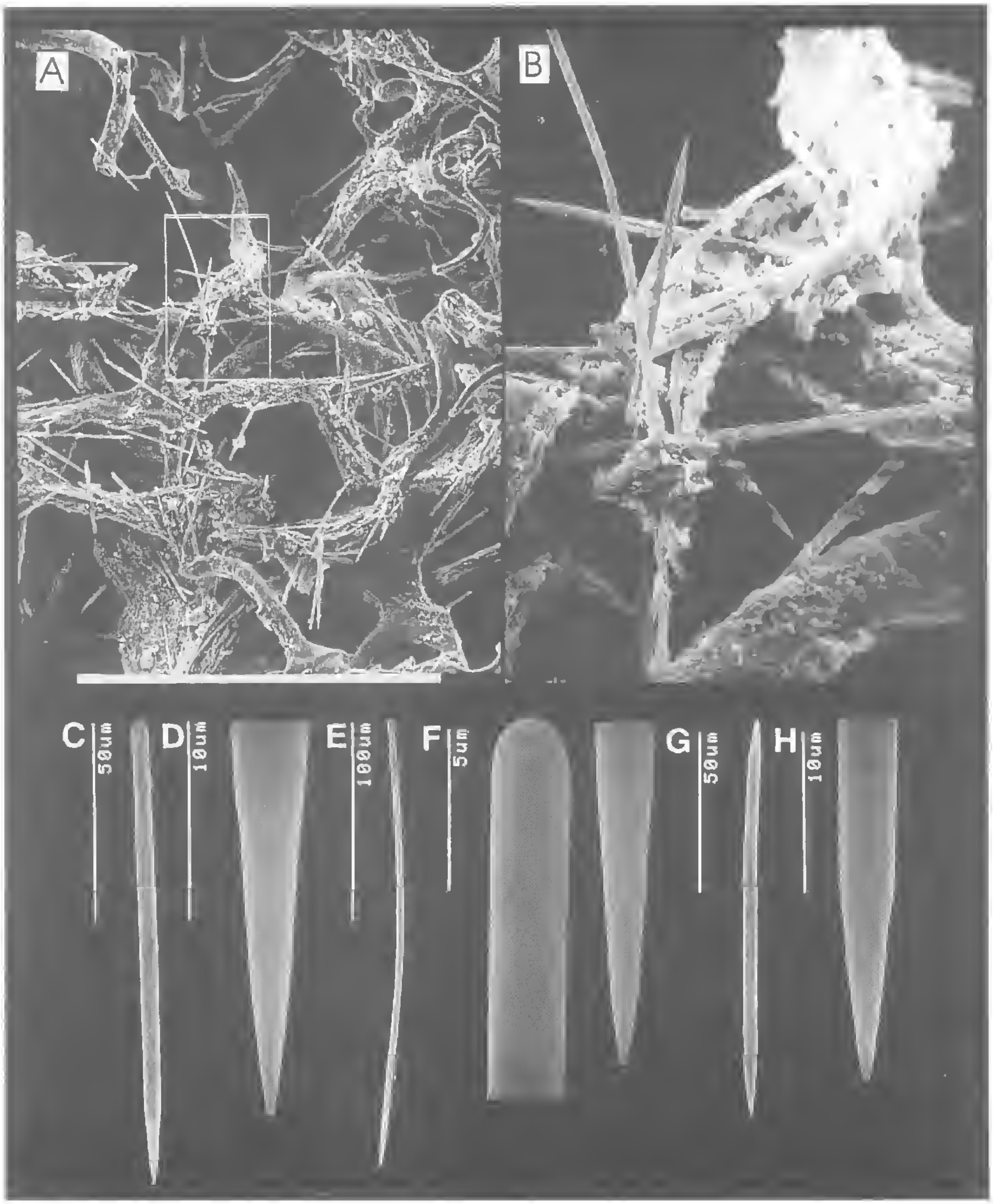


FIG. 285. *Echinochalina* (*Echinochalina*) *gabrieli* (Dendy) (holotype NMVG2359). A, Choanosomal skeleton. B, Fibre characteristics (x419). C, Principal style. D, Ends of principal style. E, Auxiliary style. F, Ends of auxiliary spicule. G, Oxeote toxa. H, Point of toxa.

though in that species fibres are both cored and echinated by principal styles, whereas in *E. felixi* auxiliary styles core fibres, growth form is cylindrical digitate, and toxas are present.

Echinochalina (Echinochalina) gabrieli
(Dendy, 1896)
(Figs 284-285)

Ophlitaspongia gabrieli Dendy, 1896: 38-39.
Echinochalina gabrieli; de Laubenfels, 1936a: 119; Hooper & Wiedenmayer, 1994: 277.

MATERIAL. HOLOTYPE: NMVG2359 (fragment BMNH1902.10.18.341): Port Phillip Bay, Vic, 38°09'S, 144°52'E, 11-13m depth, coll. J.B. Wilson (dredge).

HABITAT DISTRIBUTION. Encrusting of shell fragments; 11-13m depth; Port Phillip (Vic) (Fig. 284F).

DESCRIPTION. *Shape.* Massive, lobate, semi-encrusting on detritus, 130mm long, 65mm wide, up to 45mm thick, with low bulbous lobes scattered over surface.

Colour. Brown in ethanol.

Oscules. Single, large apical oscule, up to 3.5mm diameter, on each surface lobe.

Texture and surface characteristics. Firm, compressible, easily torn; surface lobate-bulbous, uneven, microscopically rugose, reticulate, granular.

Ectosome and subectosome. Membraneous, skin-like ectosomal skeleton, minutely hispid with points of auxiliary styles protruding through surface in pauci- or multispicular plumose brushes, some arising from ascending choanosomal skeletal tracts, others unattached to peripheral fibres and free within mesohyl; sparse tangential tracts of auxiliary styles below surface.

Choanosome. Irregularly reticulate skeleton, with thin but well developed spongin fibres forming primary, more-or-less ascending, and secondary connecting tracts; primary fibres, 40-70μm diameter, cored by multi- or paucispicular tracts of auxiliary styles in plumose or disorganised arrangement; secondary connecting fibres, 15-32μm diameter aspicular or unispicular, curved, meandering throughout core of choanosomal skeleton producing oval, elongate, cavernous meshes, 180-310μm diameter, becoming more regular, rectangular and cavernous towards peripheral region of skeleton, with meshes 180-360μm diameter; peripheral fibres slightly more compacted; spicule tracts heavier in subectosomal skeleton than at core; primary fibres sparsely echinated by principal styles; mesohyl matrix heavy, moderately heavily pigmented, numerous principal styles dispersed between fibres; choanocyte chambers elliptical, 62-135μm diameter.

Megascleres. Principal styles echinating fibres straight, short, relatively thick, with smooth, rounded or slightly constricted, subtylote bases and nearly hastate points. Length 102-(117.7)-138μm, width 3.8-(5.5)-6.5μm.

Auxiliary styles, coring fibres and interstitial, straight or slightly curved, thin, relatively long, fusiform, with smooth, rounded or very slightly subtylote bases. Length 142-(213.1)-264μm, width 1.8-(2.7)-4.5μm.

Microscleres. Isochelae absent.

Toxas moderately uncommon, oxeote, with slight angular central curvature, straight points. Length 90-(116.9)-135μm, width 1.5-(2.2)-2.5μm.

Larvae. Viviparous, oval-elongate parenchymella, 225-375x190-210μm, dark orange, heavily collagenous, containing oxeote toxas and juvenile styles.

REMARKS. De Laubenfels (1936a) referred this species to *Echinochalina* (*sensu* Hallmann, 1912) having fibres cored by megascleres geometrically equivalent to auxiliary spicules, whereas styles echinating fibres have a geometry equivalent to principal megascleres of other Microcionidae. Dendy's (1896) description differed in spicule dimensions from my observations of the type. Oxeote toxas, much smaller than those described by Dendy, are predominantly in association with numerous larvae, and it is possible that those spicules are merely juvenile quasidiactinal morphs of (auxiliary) coring megascleres. The species differs from others in its spicule geometry and size, in particular the toxa morphology, and skeletal structure whereby spicule tracts increase in density towards the peripheral skeleton.

Echinochalina (Echinochalina) intermedia
(Whitelegge, 1902)
(Figs 286-287, Table 44, Plate 12B)

? *Echinoclathria viminalis*; in part, Whitelegge, 1901: 87-88.
Not *Thalassodendron viminalis* Lendenfeld, 1888: 225.
Echinoclathria intermedia; in part, Whitelegge, 1902a: 214-215; Dendy, 1922: 71, pl.2, fig.8.
Echinochalina intermedia; Hallmann, 1912: 294-295, text-fig.69; Shaw, 1927: 427; Burton, 1934a: 563; Hooper & Lévi, 1993a: 1273-1277, figs 27-28, table 12; Hooper & Wiedenmayer, 1994: 277.

MATERIAL. HOLOTYPE: AM: Lendenfeld's No. 365 (missing). NEOTYPE: QMG300025: Inner Gneerings, off Mooloolaba, 26°39'S, 153°10'E, 25m depth, 10.xii.1991.

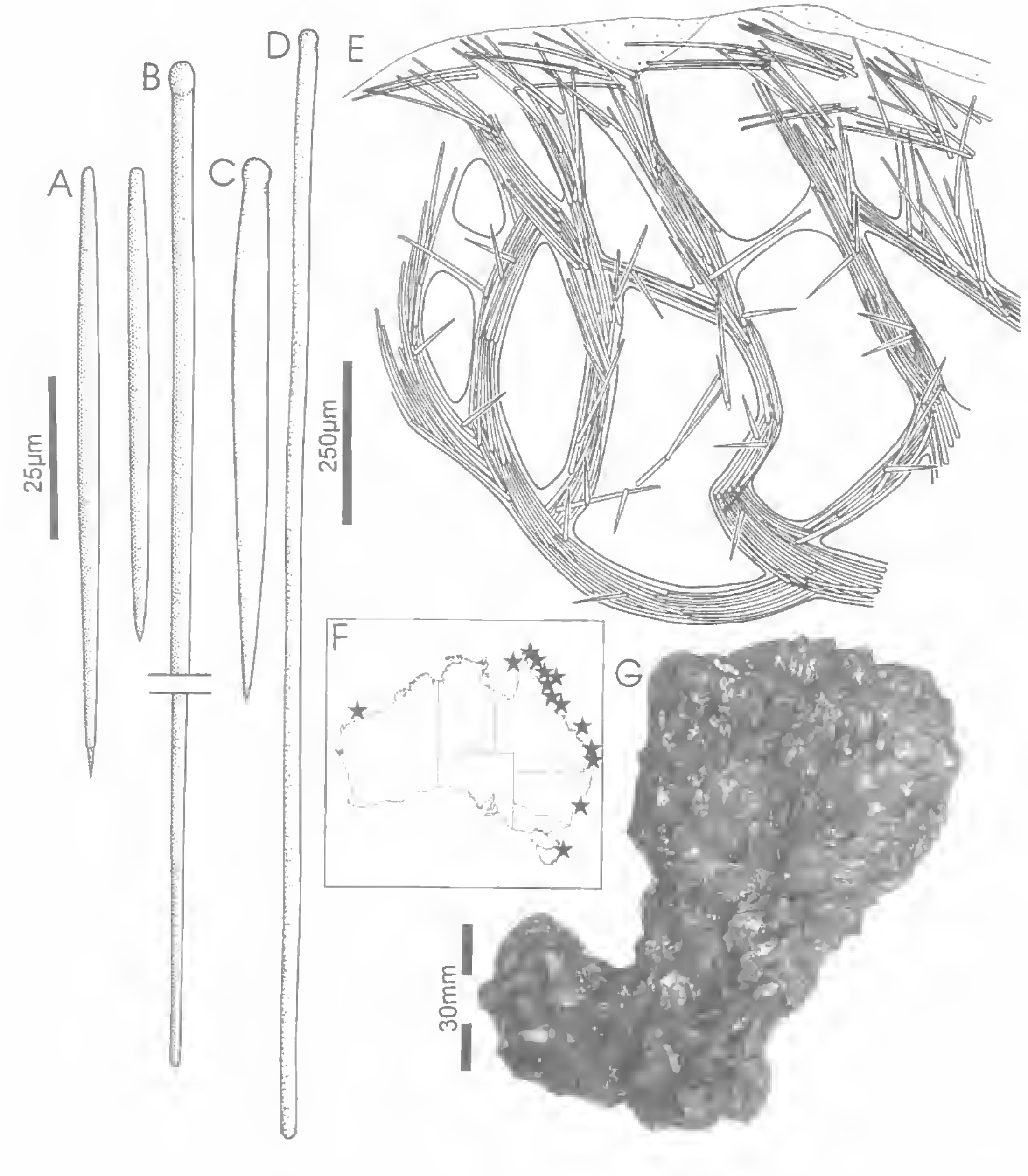


FIG. 286. *Echinochalina* (*Echinochalina*) *intermedia* (Whitelegge) (neotype QMG300025). A, Principal styles (echinating fibres). B, Auxiliary subtylostyle/ tornostyle (coring fibres and interstitial). C-D, Principal and auxiliary subtylostyle of Hallmann (1912) specimen. E, Section through peripheral skeleton. F, Australian distribution. G, Neotype.

OTHER MATERIAL: (see Hooper & Lévi, 1993, for a list of additional material used in this study): QLD-QMG304757, QMG304293, QMG304388, QMG303863, QMG304025, QMG303984, QMG300834, QMG300865. INDONESIA - NCIOCDN-1306-F (fragment QMG303688).

HABITAT DISTRIBUTION. Sand, rock and coral rubble substrata; 8-50m depth; Lizard I., Day Reef,

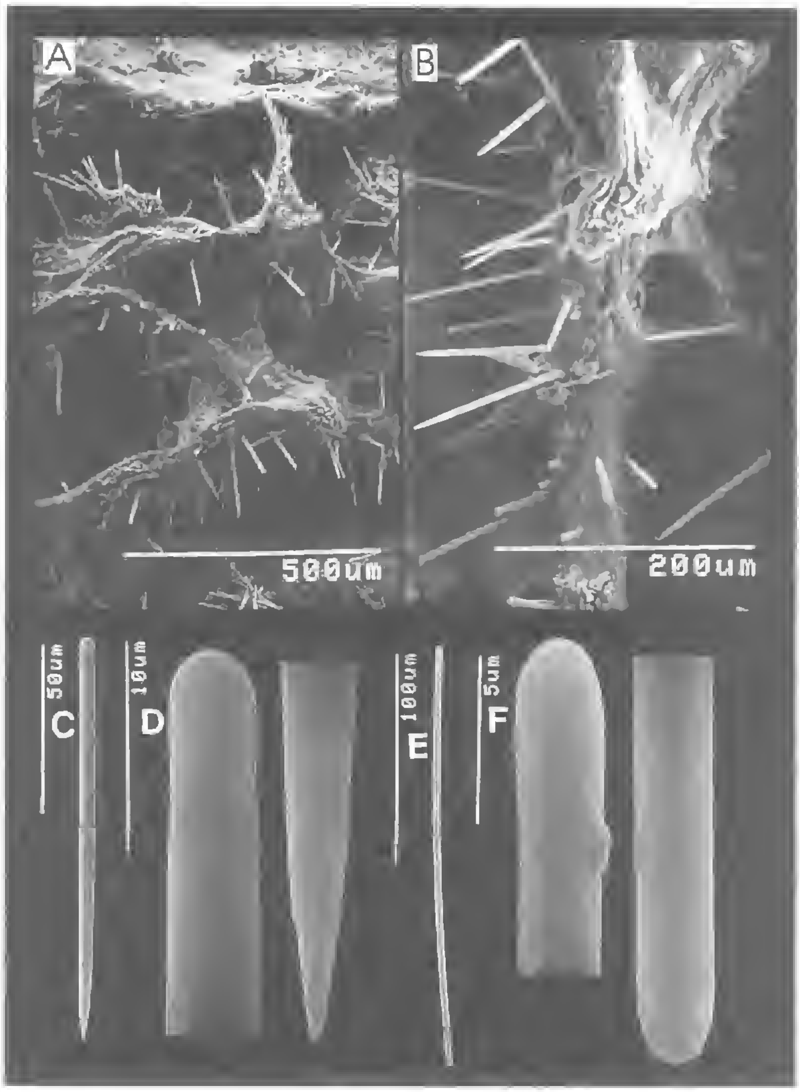


FIG. 287. *Echinochalina* (*Echinochalina*) *intermedia* (Whitelegge) QMG300834). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal style. D, Ends of principal style. E, Auxiliary subtylostyle/ tornostyle. F, Ends of auxiliary spicule.

Direction Is, Howick Is, Snake Reef, Frankland Is, Sudbury Reef, Stanley Reef, Gulf of Carpentaria (FNQ); Hook Reef (NEQ); Mooloolaba, Moreton Bay (SEQ); Illawarra (NSW); E. coast (Tas); Dampier Archipelago, Northwest Shelf (WA) (Fig. 286F); also New Caledonia (Hooper & Lévi, 1993a), Cargados Carajos, Indian Ocean (Dendy 1922); Sulawesi, Indonesia (present study).

DESCRIPTION OF NEOTYPE. Massive, lobate, bulbous-digitate, 105mm high, 65mm maximum breadth; convoluted bulbous, cavernous surface in life, collapsing to form sharp ridges and conules upon preservation; texture soft, compressible, mucusy; pale orange-brown alive, brown in ethanol. Ectosome membraneous, with tangential and paratangential tracts of auxiliary spicules scattered, barely protruding through surface; ectosome heavily collagenous, darker than choanosomal mesohyl; choanosomal skeleton irregularly reticulate, with long primary fibres, 90-130µm diameter, meandering through choanosome, becoming more plumoreticulate near periphery, cored by multispicular tracts of whispy auxiliary spicules, interconnected by short, aspicular or paucispicular secondary fibres, 40-70µm diameter, producing elongate or eliptical, cavernous meshes up to 450µm diameter; fibres sparsely echinated by principal spicules; mesohyl matrix heavy, with abundant auxiliary spicules scattered between fibres; choanocyte chambers large, oval, up to 60µm diameter. Principal styles short, thick, straight, smooth tapering or slightly subtylote bases, hastate or slightly telescoped points (72-95x2.5-4.5µm). Auxiliary spicules subtylostyles or tornostyles, long, slender, straight, slightly subtylote smooth bases, rounded points (178-206x2-3.5µm). Microscleres absent.

DESCRIPTION. (See Hooper & Lévi, 1993a).

DIAGNOSIS (Table 44 for spicule dimensions). Lobo-digitate with flattened branches and fibre bundles on surface, forming vaguely 'honeycombed' clathrous, reticulate growth form; pale orange-brown alive; large oscules mainly on apex of surface bulbs; surface conulose with low ridges and grooves, paler translucent

TABLE 44. Comparison in spicule dimensions between populations of *Echinochalina (Echinochalina) intermedia* (Whitelegge). Measurements in µm (N=25). Comparative data from material examined here and Hooper & Lévi (1993a).

Population (Latitude)	Auxiliary subtylostyles (coring fibres)	Principal styles (echinating fibres)
Neotype (QMG 300025) (26°S)	178-(190.7)-206 x 2-(2.6)-3.5	72-(85.1)-95 x 2.5-(3.1)-4.5
New Caledonia (22°S)	169-(175.3)-189 x 1.2-(1.9)-2.5	64-(87.1)-113 x 2.0-(2.8)-4.0
Great Barrier Reef (17-19°S)	184-(193.8)-205 x 2.0-(3.1)-5.0	85-(93.8)-110 x 4-(5.2)-6
Southern Qld (26°S)	184-(196.2)-208 x 1.5-(2.2)-3	72-(88.3)-101 x 2.5-(2.9)-4
NW Shelf WA (20°S)	89-(148.2)-180 x 1.5-(2.5)-4.0	92-(126.5)-149 x 4-(5.7)-7
Cargados Carajos[1] (16°S)	200 x 3	110 x 7
Illawarra, NSW[2] (34°S)	140-185 x 4	80-150 x 9
Sulawesi, Indonesia (1°N)	177-(183.2)-198 x 1.5-(1.9)-2.5	60-(82.7)-113 x 2.0-(3.2)-4

Source: 1. Dendy (1922). 2. Hallmann (1912).

skin-like membrane covering, darker below; ectosome membraneous with tangential or occasionally paratangential sparse tracts of auxiliary spicules, lightly arenaceous, and sparse plumose brushes of auxiliary megascleres from ascending choanosomal fibres protruding short distance through surface predominantly on surface conules; choanosomal skeleton irregularly plumo-reticulate, spongin fibres well developed; primary fibres lightly cored by multispicular tracts of auxiliary megascleres becoming increasingly plumose towards periphery; secondary connecting fibres uni-, pauci- or aspicular; all fibres irregularly echinated by sparse principal styles, mainly on primary fibres; fibre anastomoses form irregular elongate, oval, eliptical or rarely rectangular meshes, meshes more cavernous in periphery than at core; mesohyl matrix heavy, numerous auxiliary spicules and detritus scattered between fibres; principal styles echinating fibres short, thick, straight, almost hastate, with smooth, rounded, tapering, or less frequently with very slightly subtylote bases; auxiliary megascleres coring fibres and dispersed within mesohyl long, thin, mostly straight, with rounded smooth bases, varying from styles, tornostyles or less often strongyles, usually with blackened axial canals, with rounded or slightly hastate points; microscleres absent.

REMARKS. This species was redescribed mainly from New Caledonian material (Hooper & Lévi (1993a). It is very characteristic in the field with a clathrous, 'honeycombed' reticulate growth form and pale orange-brown colour, and differs from other species in having an irregular plumo-reticulate skeletal architecture, poorly developed spongin fibres cored by a dense multispicular axis of primary spicule tracts and light pauci- or aspicular tracts in secondary fibres, and hastate choanosomal (auxiliary) styles core fibres. Hooper & Lévi (1993a) note that the geometry of auxiliary spicules in this species varies between regional populations, ranging from exclusively styles in the original type material (now lost; Whitelegge, 1901, 1902a) and the Northwest Shelf of WA (Hooper & Lévi, 1993a), to virtually all strongyles in material from Mooloolabah including the neotype (present study) and Cargados Carojos (Dendy, 1922). New Caledonian population differs from others in having more abundant detritus and much more slender echinating styles, whereas growth form, skeletal architecture and spicule geometry are relatively homogeneous for the species.

Echinochalina intermedia is used in the sense of Hallmann (1912) and Dendy (1922), because the synonymy of this species is still confused, and the validity of type material of *Thalassodendron viminalis* and *Echinochalina intermedia* require further clarification. Lendenfeld (1888: 225) erected *T. viminalis* for a specimen from Illawarra, NSW, whereas Whitelegge (1901: 87) found the original description incorrect based on a misidentified cylindrical branching specimen belonging to *Echinoclathria subhispida*. Whitelegge (1901) redescribed the species based on a clathrous specimen (No. 365, confirmed missing from AM collections), which he subsequently designated holotype of *intermedia* (Whitelegge, 1902a: 214). However, he also redescribed a second specimen for the species (Lendenfeld's No. 332), which unfortunately belongs to *E. subhispida*. Both Lendenfeld's and Whitelegge's actions have created confusions, and, moreover, Lendenfeld's manuscript names and numbers on slides and specimens in the AM and BMNH do not completely correlate with the published descriptions (see remarks for *E. subhispida*). I accept *E. intermedia* in the sense of Hallmann (1912), and designate a neotype for this species from the material described above, the most 'typical' being QMG300025 from Mooloolaba, SE. Qld.

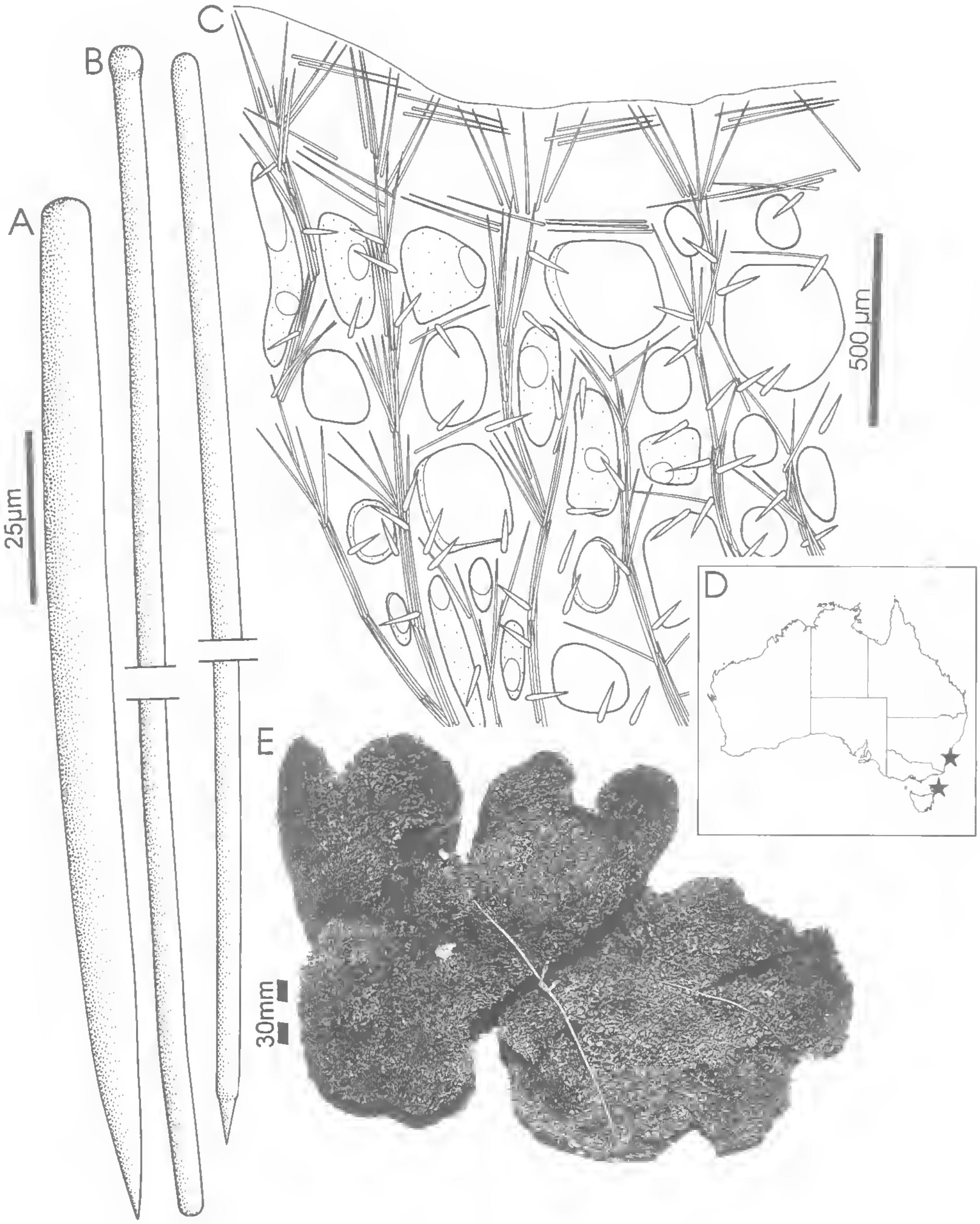


FIG. 288. *Echinochalina* (*Echinochalina*) *reticulata* Whitelegge (holotype AMZ950). A, Principal style (echinating fibres). B, Auxiliary subtylostyle/ tornostyle (coring fibres and interstitial). C, Section through peripheral skeleton. D, Australian distribution. E, Neotype.

Echinochalina (Echinochalina) reticulata
Whitelegge, 1907
(Figs 288-289)

Echinochalina reticulata Whitelegge, 1907: 506, pl.45, fig.25; Hallmann, 1912: 289-290, pl.30, fig.2, text-fig.66 (et var.); Hooper & Wiedenmayer, 1994: 278.
Tablis reticulata; de Laubenfels, 1936a: 76.

MATERIAL. LECTOTYPE: AMZ950: Off Wollongong, NSW, 34°26'S, 150°53'E, 110-112m depth, coll. FIV 'Thetis' (dredge). PARALECTOTYPES: AMZ715: same locality. AMZ23 (dry): E. coast of Flinders I., 40°01'S, 148°02'E, 29.vii.1909, coll. FIV 'Endeavour' (dredge; 'cotype' of var. *crassa*). AME646 (dry): same locality ('cotype' of var. *crassa*). (Other material presently missing: AMZ153, 716, 717).

HABITAT DISTRIBUTION. Soft substrata; 110-112m depth; Wollongong (NSW); Flinders I. (Tas) (Fig. 288D).

DESCRIPTION. *Shape.* Massive, rounded, globular, lobo-digitate to thickly flabellate, up to 240mm long, 255mm wide, 150mm thick, with honeycomb reticulate construction produced by closely anastomosing, very thin membraneous, lamellate, apically pointed, fibre bundles.
Colour. Brown to grey-brown in ethanol.
Oscules. Large, up to 5mm diameter, scattered within lacunae of surface honeycomb reticulation.
Texture and surface characteristics. Firm, flexible, harsh in dry state; surface honeycomb reticulate, lamellae very thin, membraneous and uneven.
Ectosome and subectosome. Membrancous, tangentially disposed auxiliary megascleres lying below surface, in pauci- or multispicular tracts, pierced by sparse plumose bundles of auxiliary spicules from ascending choanosomal tracts.
Choanosome. Irregularly reticulate skeletal structure, verging on subisodictyal, with differentiated primary and secondary spongin fibre systems; fibres relatively light, mostly flattened, meandering or sinuous; primary fibres, 65-112μm diameter, pauci- or multispicular, running longitudinally through lamellae, intersected at regular intervals and obtuse angles by secondary fibres, 22-40μm diameter, mostly uncored, occasionally unispicular; fibres anastomoses form cavernous eliptical meshes, 175-570μm diameter; fibres cored by auxiliary megascleres, moderately heavily echinated by principal spicules; mesohyl matrix heavy but only lightly pigmented, with numerous auxiliary megascleres scattered between fibres; choanocyte chambers large, oval, 45-75μm diameter.
Megascleres. Principal styles echinating fibres straight, thick, with smooth, tapering, rounded or slightly subtylote bases, fusiform points. Length 108-(139.8)-196μm, width 6-(8.9)-11μm.

Auxiliary megascleres coring fibres straight, slightly curved or sinuous, thin, ranging from hastate subtylostyles to asymmetrical tornostyles or sometimes strongyles, with rounded or slightly subtylote bases, rounded or telescoped points. Length 146-(252.0)-336μm, width 2.5-(4.1)-5.5μm.
Microscleres absent.
Larvae. Viviparous, small, oval parenchymella, 80-110μm diameter, with heavy matrix.

REMARKS. In growth form, particularly its flattened spongin fibres, the holotype resembles the Caribbean *Pandaros acanthifolium* (Duchassaing & Michelotti), whereas Hallmann's variety *crassa* is more reminiscent of honeycomb reticulate species of *Holopsamma*. However, in spiculation and skeletal architecture both morphs are identical and conspecific. *Pandaros* and *Echinochalina* differ substantially in their spicule geometries, whereby *Pandaros* has smooth or acanthose principal styles coring and echinating fibres, equivalent to those of *Holopsamma*, *E. reticulata* has auxiliary styles coring fibres and principal styles echinating fibres, typical of the *Echinochalina* condition. The species differs from other *Echinochalina* in spicule geometry, particularly the endings of auxiliary subtylostyles, spicule size, possession of flattened fibres, and a nearly isodictyal skeletal architecture, whereas in growth form it is similar to *E.* (*E.*) *barba*.

Echinochalina (Echinochalina) ridleyi
(Dendy, 1896) (Figs 290-291)

Echinodictyum ridleyi Dendy, 1896: 44-45.
? *Clathrissa* or *Stylotellopsis ridleyi*; Hallmann, 1912: 151.
Echinochalina ridleyi; Hooper, 1991: 1348; Hooper & Wiedenmayer, 1994: 278.

MATERIAL. LECTOTYPE: NMVG2409: Port Phillip Bay, Vic, 38°09'S, 144°52'E, 40m depth, coll. J.B. Wilson (dredge). PARALECTOTYPES: NMVG2410: same locality, 38m depth. BMNH1902.10.18.363: same locality, 38m depth. BMNH1902.10.18.364, 57: same locality, 40m depth.

HABITAT DISTRIBUTION. Substrate unknown; 38-40m depth; Port Phillip (Vic) (Fig. 290D).

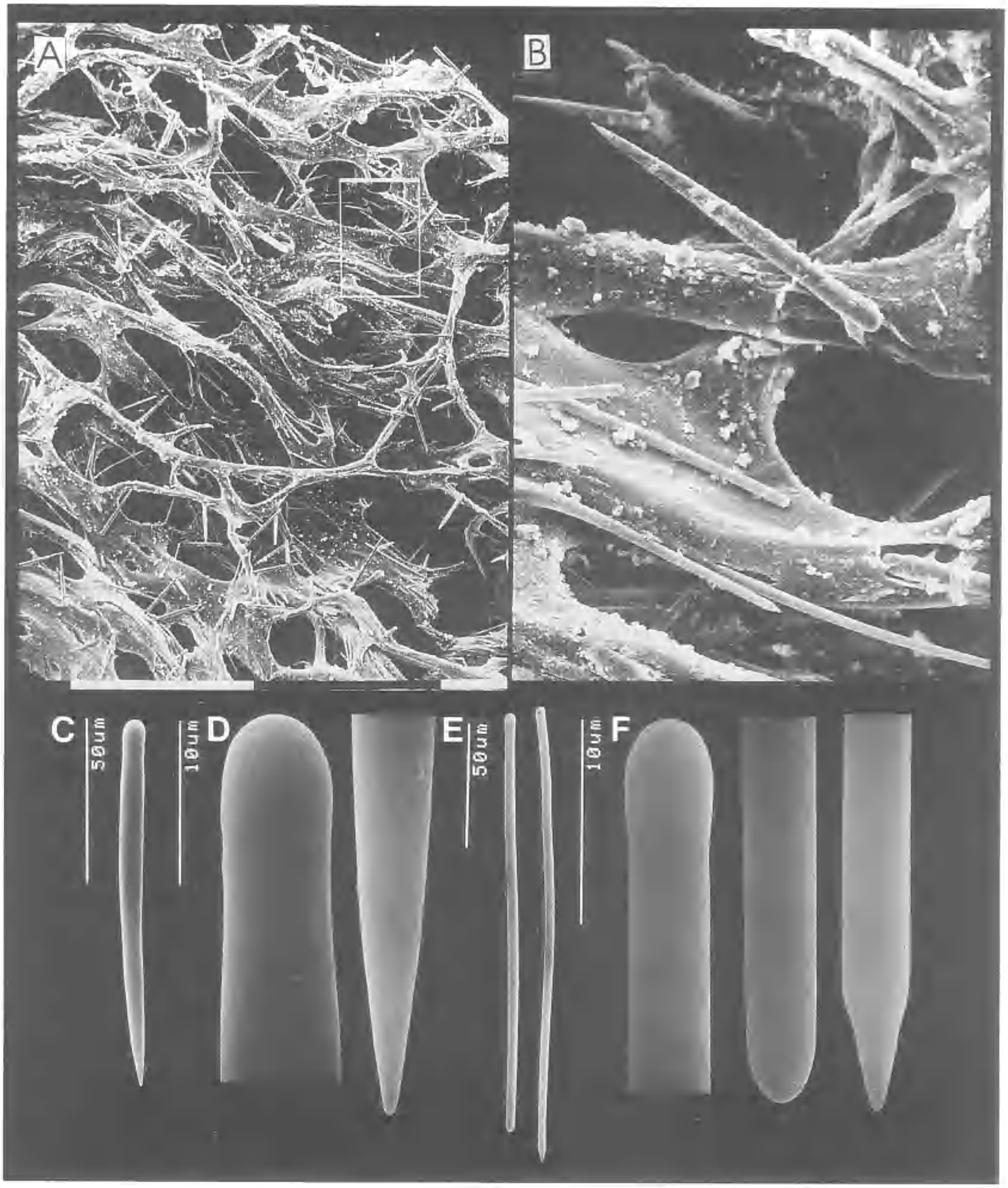


FIG. 289. *Echinochalina* (*Echinochalina*) *reticulata* Whitelegge (holotype AMZ950). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal subtylostyle. D, Ends of principal spicule. E, Auxiliary subtylostyle/tornostyle. F, Ends of auxiliary spicule.

DESCRIPTION. *Shape.* Stalked, digitate, club-shaped, 85-165mm long, 50-80mm maximum width, with thick cylindrical stalk, 18-32mm long, 12-17mm diameter, bulbous digitate apex composed of more-or-less flattened, fused lamellae, up to 18mm wide, together producing bushy, flattened flabelliform or claviform growth.

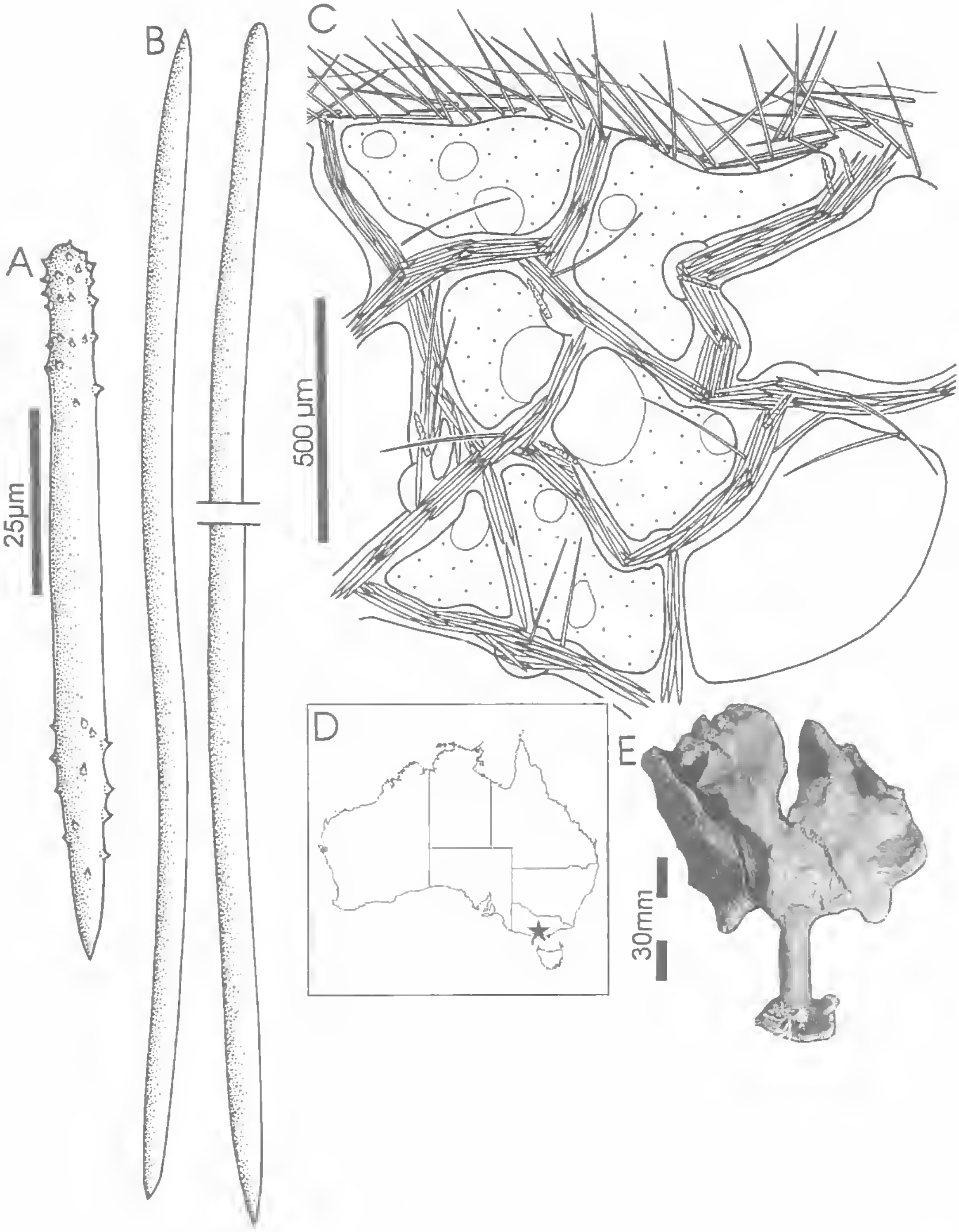


FIG. 290. *Echinochalina* (*Echinochalina*) *ridleyi* (Dendy) (lectotype NMVG2409). A, Principal acanthostyle (echinating fibres). B, Auxiliary tornostyle/ oxeote (coring fibres and interstitial). C, Section through peripheral skeleton. D, Known Australian distribution. E, Lectotype.

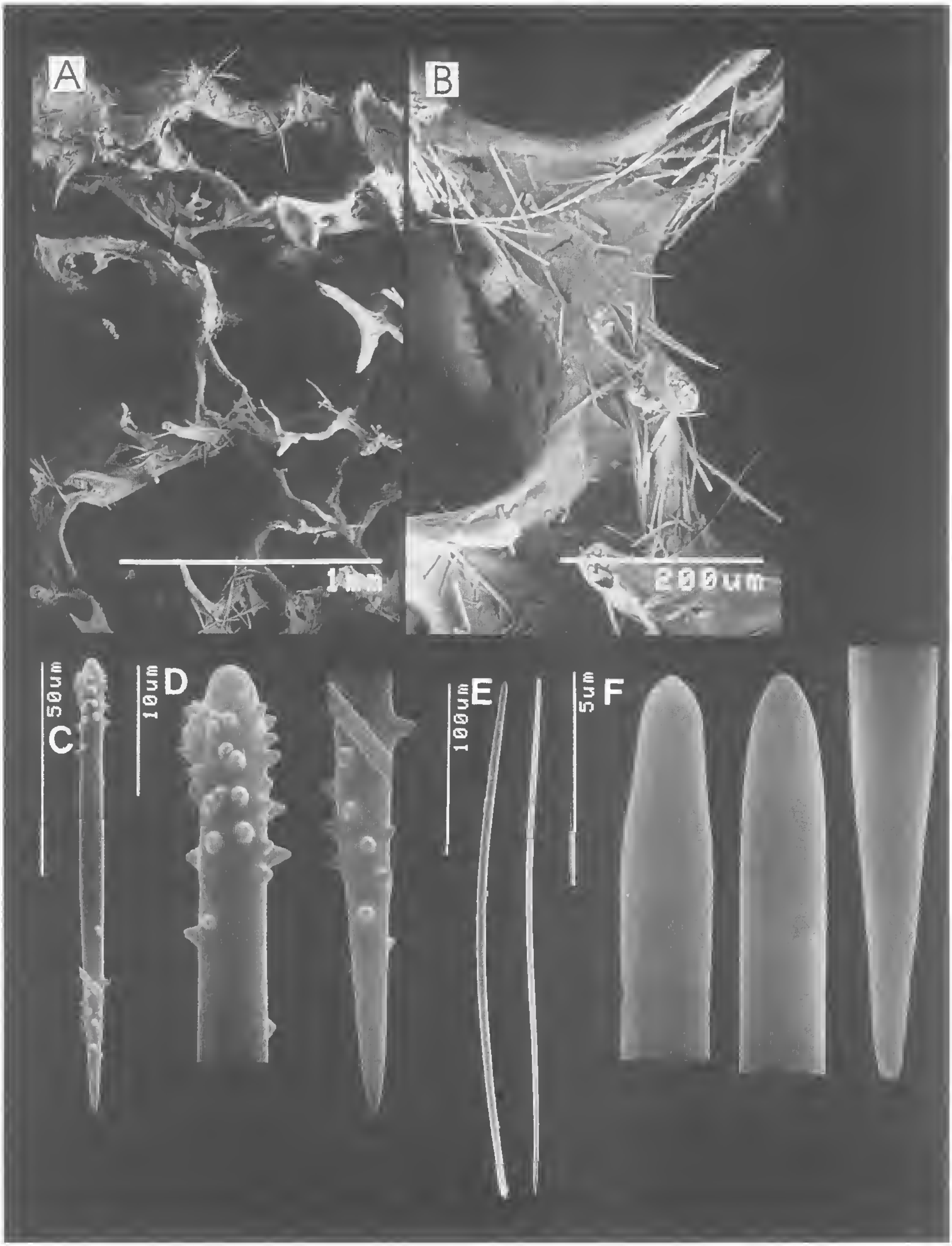


FIG. 291. *Echinochalina* (*Echinochalina*) *ridleyi* (Dendy) (lectotype NMVG2409). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal acanthostyle. D, Ends of principal spicule. E, Auxiliary tornostyle/ oxeote. F, Ends of auxiliary spicule.

Colour. Reportedly pale red-brown to red-orange in life, pale brown in ethanol.

Oscules. Not observed.

Texture and surface characteristics. Firm, compressible, flexible; surface optically smooth with distinct skin-like dermis.

Ectosome and subectosome. Membraneous, microscopically hispid with multispicular, erect and paratangential tracts of auxiliary spicules, singly or in sparse plumose brushes, arising from peripheral choanosomal fibres and protruding through surface; choanosomal fibres immediately below ectosome.

Choanosome. Plumo-reticulate skeletal structure, with incompletely differentiated, meandering, primary and secondary spongin fibres; primary fibres heavy, 52-116μm diameter, vaguely ascending, multispicular, spicules arranged in loose whispy tracts occupying most of fibre diameter, becoming increasingly plumose towards periphery; secondary, connecting fibres, 18-43μm diameter, pauci-, uni- or aspicular, producing cavernous, oval or elongate meshes, 75-365μm diameter; fibres cored by auxiliary megascleres, sparsely echinated by principal spicules; mesohyl matrix heavy but only lightly pigmented, with numerous auxiliary megascleres dispersed between fibres; choanocyte chambers large, oval to elongate, 90-120μm diameter.

Megascleres. Principal acanthostyles echinating fibres small, straight, relatively thick, with tapering rounded bases, spined apical and basal extremities, fusiform points; spines small, conical, erect. Length 87-(104.1)-116μm, width 5-(5.8)-7μm.

Auxiliary spicules coring fibres long, thin, straight, slightly curved or sinuous, sometimes raphidiform, with variable terminations ranging from hastate oxeas, tornotes, quasi-monactinal tornostyles, or subtylostyles. Length 184-(261.3)-314μm, width 2-(4.1)-6.5μm.

Microscleres Absent.

REMARKS. Dendy (1896) initially assigned this species to *Echinodictyum* (Raspailiidae) having diactinal coring, monactinal echinating megascleres, extra-axial styles, and a more-or-less reticulate architecture. However, the spicules which actually core these fibres range from true diactinal to true monactinal forms, without obvious axial and extra-axial differentiation in their distribution. The skeletal architecture verges on plumose, not prominently reticulate as is found in most *Echinodictyum* species, and fibres are much heavier than those noremally found in species of that genus (see Hooper, 1991). Including this species in *Echinochalina* requires broadening the generic definition to allow for the inclusion of spined echinating styles, but these spicules appear to be true principal megascleres (as opposed to a special category of echinating acanthostyles such as those found in *Clathria*, for example). In any case, Simpson (1968a) and others have shown that acanthose verses smooth megascleres may be of minor consequence at higher systematic levels in Microcionidae, and in other respects the species fits well with the present concept of *Echinochalina*. The species has closest affinities to *E. spongiosa*, also having acanthose principal spicules, though differing substantially in growth form, spicule geometry and spicule dimensions.

Echinochalina (Echinochalina) spongiosa
(Dendy, 1896)
(Figs 292-293)

Echinodictyum spongiosum Dendy, 1896: 45; Hallmann, 1912: 151.

Echinochalina spongiosum; Hooper, 1991: 1348; Hooper & Wiedenmayer, 1994: 278.

MATERIAL. LECTOTYPE: NMVG2452: Sorrento Jetty, Port Phillip Bay, Vic, 38°21'S, 144°42'E, 20m depth, coll. J.B. Wilson (dredge). PARALECTOTYPE: BMNH1902.10.18.58, 365: same locality.

HABITAT DISTRIBUTION. Substrate unknown; 12m depth; Port Phillip (Vic) (Fig. 292D).

DESCRIPTION. *Shape.* Thickly encrusting, massive, subspherical sponge, 65mm diameter, attached directly to substrate.

Colour. Reportedly grey in life, pale brown in ethanol.

Oscules. Not observed.

Texture and surface characteristics. Firm, compressible, spongy; surface shaggy, covered with large, mostly irregular, lobate papillae, low ridges and abundant striations.

Ectosome and subectosome. Membraneous, lightly arenaceous ectosome, with irregular plumose brushes of auxiliary megascleres barely protruding through surface arising from peripheral choanosomal fibres.

Choanosome. Plumo-reticulate skeletal structure, verging on plumose-dendritic in periphery, without any obvious differentiation into primary or secondary fibres or tracts; fibres at core of skeleton light, whispy, multispicular, sinuous, reticulate, 22-54μm diameter, interconnected at irregular intervals by smaller multispicular fibres,

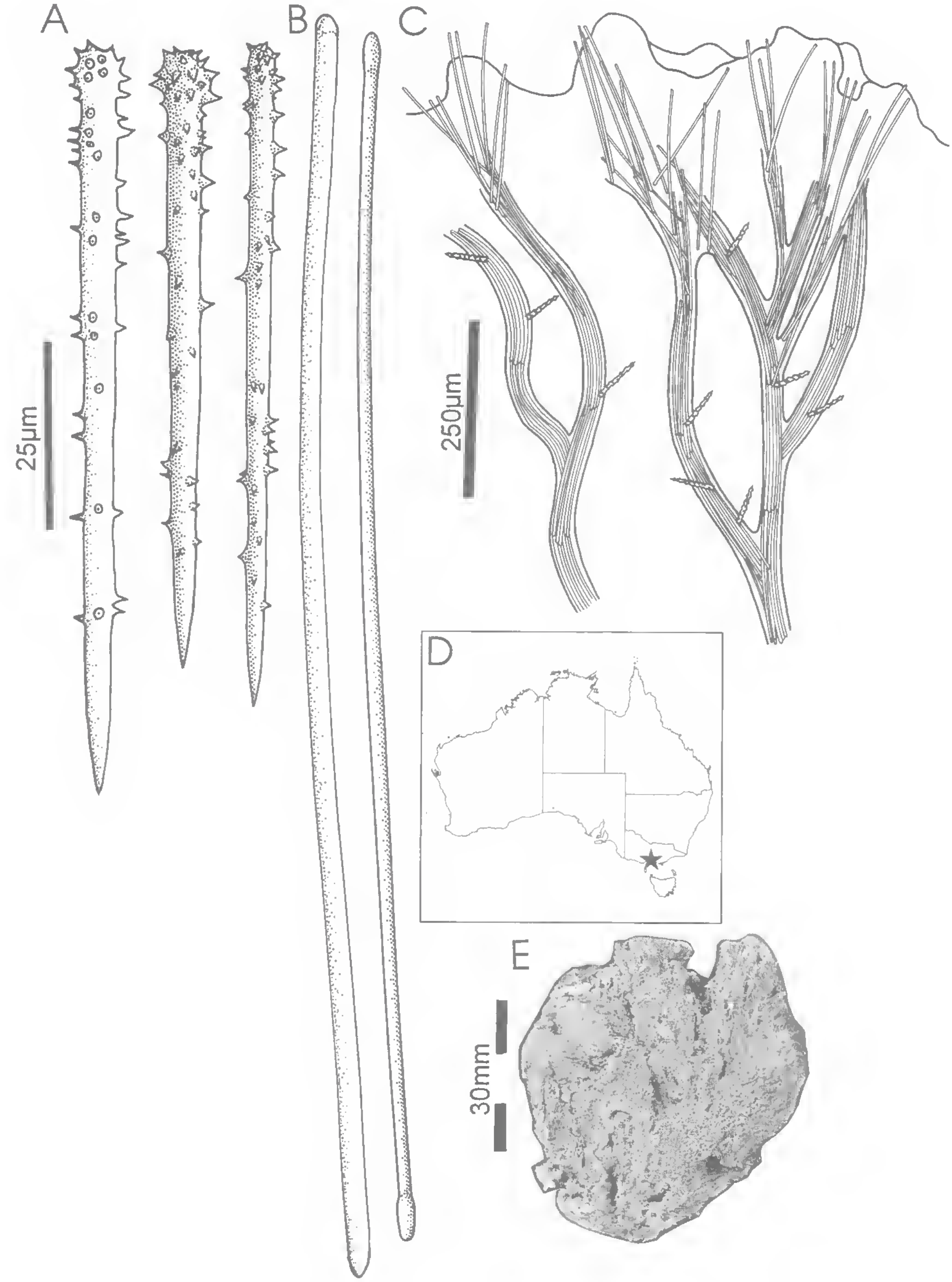


FIG. 292. *Echinochalina* (*Echinochalina*) *spongiosa* (Dendy) (lectotype NMVG2452). A, Principal acanthostyles (echinating fibres). B, Auxiliary tornostyles (coring fibres and interstitial). C, Section through peripheral skeleton. D, Known Australian distribution. E, Lectotype.

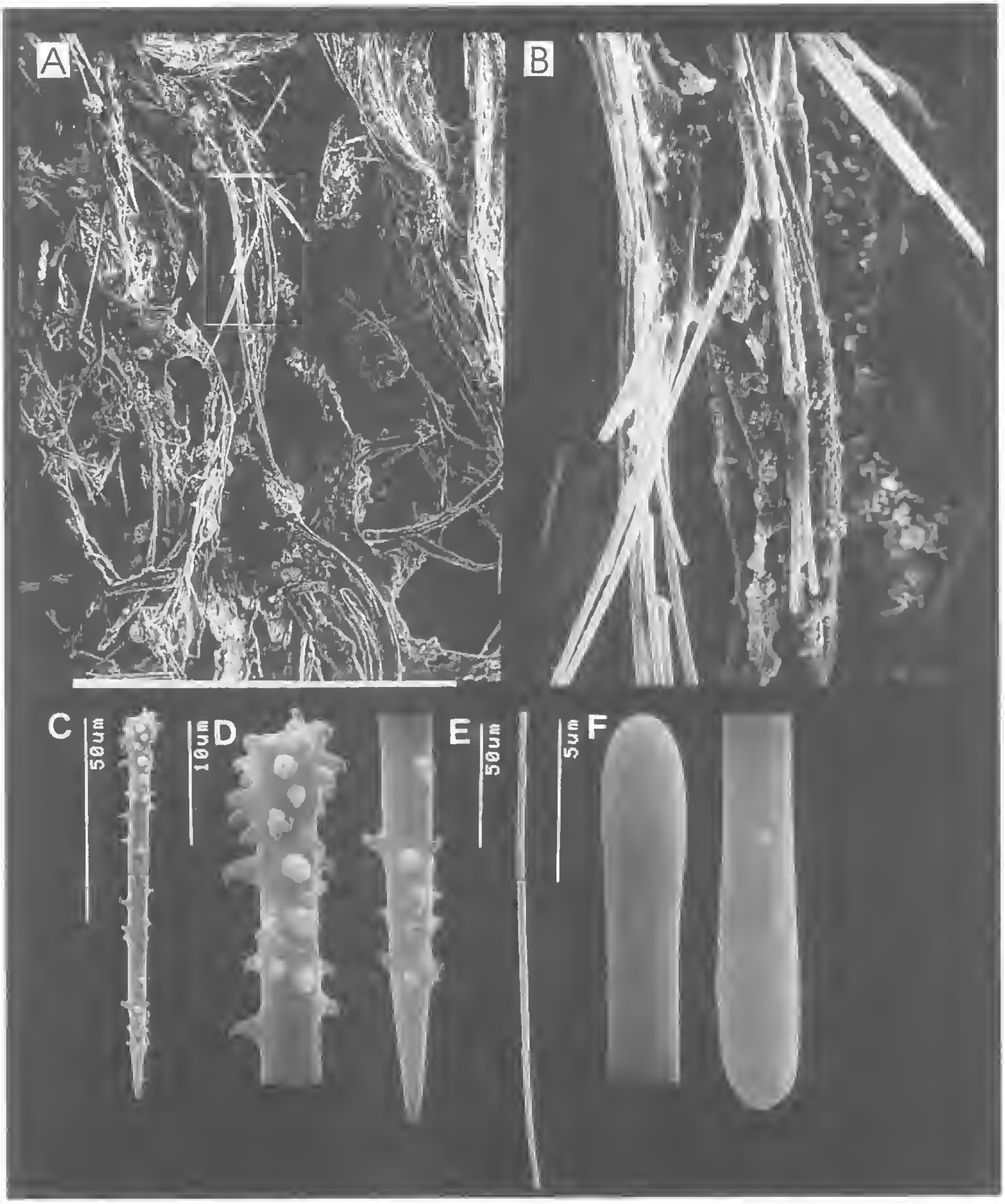


FIG. 293. *Echinochalina* (*Echinochalina*) *spongiosa* (Dendy) (lectotype NMVG2452). A, Choanosomal skeleton. B, Fibre characteristics (x475). C, Principal acanthostyle. D, Ends of principal spicule. E, Auxiliary tornostyle. F, Ends of auxiliary spicule.

8-18µm diameter, forming irregular ovoid, rectangular or elongate meshes, 65-118µm diameter; fibres increasingly plumose, more paucispicular towards periphery, terminating on or near surface as single spicules; skeletal tracts in periphery occupy most of fibre diameter, rang-

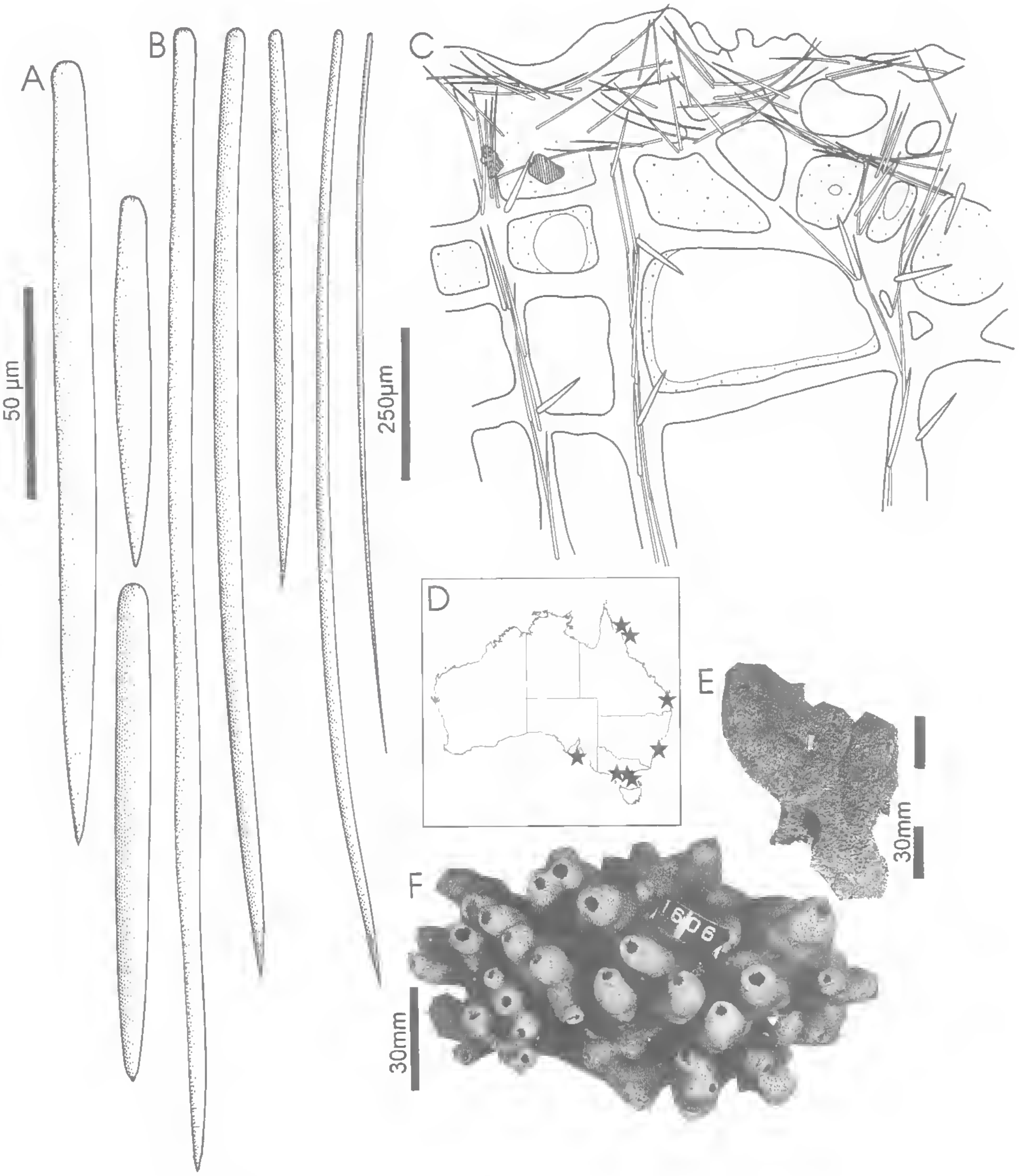


FIG. 294. *Echinochalina* (*Echinochalina*) *tubulosa* (Hallmann) (lectotype BMNH1925.11.1.568). A, Principal styles (echinating fibres). B, Auxiliary styles (coring fibres and interstitial). C, Section through peripheral skeleton. D, Known Australian distribution. E, Paratype. F, SAMTS4018.

ing from 12-35µm diameter, fibre meshes cavernous, elongate, 240-660µm diameter; all fibres cored by auxiliary megascleres, sparsely echinated by principal spicules; mesohyl matrix very heavy, dark yellow-orange pigmented, with moderate numbers of auxiliary spicules scattered between fibres; choanocyte chambers small, oval, 15-54µm diameter.

Megascleres. Principal styles echinating fibres straight, relatively thin, subtylote, with light spines concentrated mainly on base and near points, fusiform, bare points. Length 82-(92.3)-98µm, width 2.5-(4.4)-5.5µm.

Auxiliary spicules coring fibres thin, mostly straight, sometimes slightly curved or sometimes sinuous, varying from tornostyles, strongyles or tornotes with rounded or subtylote extremities. Length 166-(187.6)-214µm, width 1.5-(3.2)-4.2µm.

Microscleres absent.

REMARKS. *Echinochalina* (*E.*) *spongiosum* was originally assigned to *Echinodictyum*, like *E.* (*E.*) *ridleyi*, having diactinal coring and monactinal echinating spicules, but *E.* (*E.*) *spongiosum* was even more atypical of *Echinodictyum* in its skeletal architecture, having an almost completely plumose skeleton, with only vestiges of reticulate construction. The species is easily assigned to *Echinochalina* even though it has acanthose (versus completely smooth) principal styles echinating fibres (see remarks for *E.* (*E.*) *ridleyi*), differing from *E.* (*E.*) *ridleyi* in growth form, spicule geometry and spicule dimensions.

Echinochalina (Echinochalina) tubulosa
(Hallmann, 1912)
(Figs 294-295, Plate 12C)

Ophlitaspongia tubulosa Hallmann, 1912: 272-275, pl.35, fig.3, text-fig.60.
Echinochalina tubulosa; de Laubenfels, 1936a: 119; Hooper & Wiedenmayer, 1994: 278.
Echinoclathria tubulosa; Wiedenmayer, 1989: 66, pl.6, fig.9, pl.25, figs 3-4, text-fig.45.

MATERIAL. LECTOTYPE: BMNH1925.11.1.568: Westernport Bay, Vic, 38°26'S, 145°08'E, coll. J. Gabriel (dredge). PARALECTOTYPES: AME1271 (dry): Precise locality unknown, Illawarra region, NSW. AMZ155 (dry): same locality.OTHER MATERIAL: QLD- QMG304737, QMGL864 (fragment NTMZ1528), QMGL2759 (fragment NTMZ1566). TAS- QMG300265 (NCIQ66C-3558-J) (fragment NTMZ3783). S AUST- SAMTS4018 (fragments NTMZ1606, QMG300475).

HABITAT DISTRIBUTION. Sand, rock and coral rubble substrata; 15-32m depth; Turtle Is, Agincourt Reefs (FNQ); Moreton I. (SEQ); Illawarra (NSW); Westernport Bay (Vic); Kent Is, Bass Strait (Tas); Kangaroo I. (SA) (Fig. 294D).

DESCRIPTION. *Shape.* Tubulo-digitate, massive, erect, up to 120mm high, attached directly to substrate, with erect, regularly cylindrical or irregular, stoloniferous, thin or thick, bulbous digits tapering towards their extremities, up to 45mm high, 22mm diameter.

Colour. Bright orange, yellow-orange, or vermilion-red alive (Munsell 10R 6/10 - 2.5R 5/10), pale brown in ethanol.

Oscules. Large, up to 10mm diameter, at apex or subapical on each digit.

Texture and surface characteristics. Firm, rubbery, compressible, flexible digits; surface even, porous, microscopically rugose fibre bundles.

Ectosome and subectosome. Membraneous, with dense paratangential layer of auxiliary styles lying below, occasionally protruding through surface, in irregular plumose formations, with or without light arenaceous ectosomal layer; choanosomal fibres immediately below ectosome.

Choanosome. Regularly isodictyal to irregularly reticulate skeletal architecture, with poorly differentiated primary and secondary fibres; primary ascending fibres thin, 42-93µm diameter, heavy, paucispicular, sometimes uni- or aspicular, occasionally meandering, sinuous, often ascending directly to periphery, interconnected at irregular intervals by thin, more-or-less transverse, uni- or aspicular secondary fibres, 18-35µm diameter; secondary fibres branch and anastomose amongst themselves, forming oval, rectangular or triangular, relatively cavernous meshes, 124-650µm diameter; fibres cored by predominantly longer and thinner auxiliary megascleres, never forming more than paucispicular tracts, usually becoming plumose towards periphery; fibres echinated by shorter, stouter principal spicules; mesohyl matrix heavy but only lightly pigmented, with numerous thin auxiliary spicules dispersed between fibres and occasionally also small quantities of inorganic debris; choanocyte chambers large, oval, 72-113µm diameter.

Megascleres. Principal styles echinating fibres styles straight, short, relatively thick, with smooth, evenly rounded bases or less frequently slightly subtylote bases, almost hastate points. Length 74-(96.5)-128µm, width 4-(6.6)-8.5µm.

Auxiliary styles coring fibres and interstitial long, thin, straight or slightly curved hastate styles, occasionally modified to asymmetrical styloids, tornotes or strongyles, rarely sinuous. Length 108-(226.1)-305µm, width 1-(2.2)-4.5µm.

Microscleres absent.

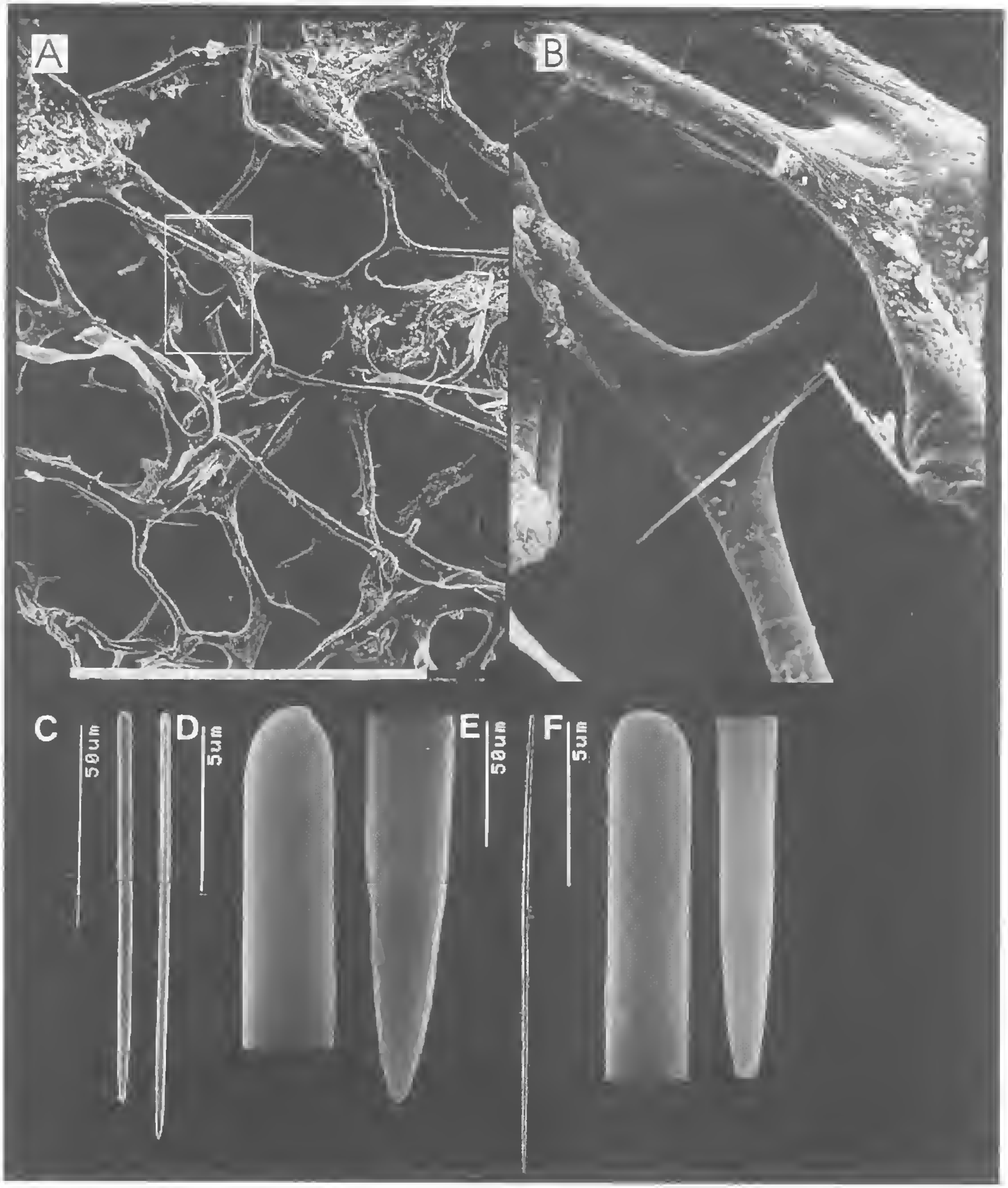


FIG. 295. *Echinochalina* (*Echinochalina*) *tubulosa* (Hallmann) (QMG300265). A, Choanosomal skeleton. B, Fibre characteristics (x498). C, Principal styles. D, Ends of principal spicule. E, Auxiliary style. F, Ends of auxiliary spicule.

Larvae. Incubated parenchymella larvae in 1 specimen, oval, small 62-170μm diameter, containing abundant collagen but no larval spicules.

Associations. One specimen contained numerous algal filaments within fibres, almost completely obscuring spicules within fibre skeleton; Wieden-

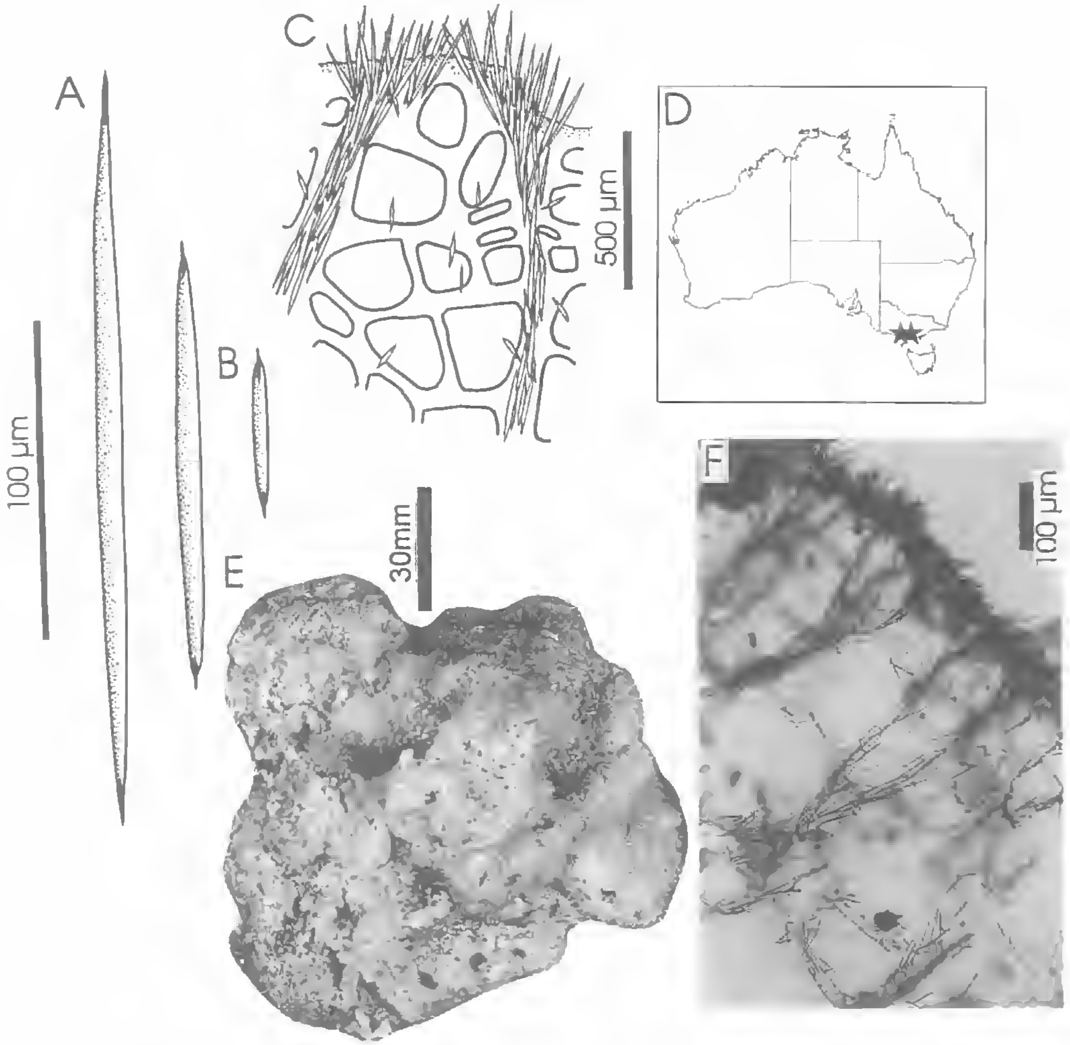


FIG. 296. *Echinochalina* (*Protophlitaspongia*) *bispiculata* (Dendy) (lectotype NMVG2319). A, Auxiliary oxeas (coring fibres and interstitial). B, Principal oxea (echinating fibres). C, Section through peripheral skeleton. D, Known Australian distribution. E, Lectotype. F, Fibre skeletal structure.

mayer (1989) also noted microsymbionts in his material from Bass Strait.

REMARKS. This species shows some variability, particularly in organisation of skeletal structure (ranging from regularly isodictyal fibre network to irregularly reticulate), palmate isochelae were abundant in 1 specimen from SA (but presumed to be contaminants), and position of oscules (terminally or subtermally on digits), otherwise there is no doubt that all these specimens belong to *E.* (*E.*) *tubulosa*. The longer, thinner styles coring fibres and shorter, thicker styles echinating fibres indicate that it belongs to *Echinochalina*. Interpretation of these features is of primary importance in generic placement. This species has been included with *Ophlitaspongia* (=*Echinoclathria*) (Hallmann, 1912), or *Echinoclathria* (=*Holopsamma*) (Wiedenmayer, 1989), based on misinterpretation of these genera and that megascleres coring and echinating fibres were geometrically identical. However, it is clear that longer, thinner auxiliary styles are most commonly found inside fibres, whereas shorter, thicker principal styles are most frequently found echinating fibres, even though few intermediate examples of both spicule types can be found coring or echinating fibres. Contrary to Hallmann (1912: 274), I infer that spicules coring fibres in this species are equivalent to auxiliary megascleres of the Microcionidae, and the thicker echinating styles are derived from principal spicules, and thus the most appropriate placement is with *Echinochalina*. Hallmann (1912) remarked on the resemblance and possible close relationship between this species and *E. (Protophlitaspongia) bispiculata*, although spicule geometry is very different.

OTHER SPECIES OF *ECHINOCHALINA (ECHINOCHALINA)*

Echinochalina (Echinochalina) isochelifera (Uriz, 1988)

Echinoclathria isochelifera Uriz, 1988: 89-90, pls 22b, 42c, 36b-d, text-fig.64 [Namibia].

MATERIAL. HOLOTYPE: ABIP7B-6A. SW. Africa.

Echinochalina (Echinochalina) melana Van Soest & Stentoff, 1988

Echinochalina sp. Hartman in Lewis, 1965: in table.

Echinochalina melana Van Soest & Stentoff, 1988: 123-125, pl.12, fig.1, text-fig. 60 [Barbados, West Indies].

MATERIAL. HOLOTYPE: ZMAPOR5509. Caribbean.

Echinochalina (Protophlitaspongia)
Burton, 1934

Protophlitaspongia Burton, 1934a: 562.

[Not *Protophlitaspongia*; de Laubenfels, 1954: 96; Pulitzer-Final, 1986: 138].

TYPE SPECIES. *Siphonochalina bispiculata* Dendy, 1895: 246 (by original designation).

DEFINITION. Diactinal or quasi-monactinal auxiliary megascleres core fibres, with diactinal or quasi-monactinal principal spicules echinating fibres.

REMARKS. In this subgenus structural megascleres (coring and echinating fibres) appear to be diactinal, unlike all other microcionids, but they are interpreted here as being highly modified monactinal spicules allowing its inclusion in the Microcionidae. This interpretation is supported by the more-or-less plumose ascending, primary spicule tracts, true echinating megascleres, isochelae and toxa microscleres in several species, and obvious (i.e., less modified) monactinal ectosomal spicules in several species, indicating affinities with *Echinochalina*. The coring and echinating megascleres are equated here with auxiliary and principal spicules, respectively, of typical *Echinochalina*. Dendy (1896) included the type species in the Haplosclerida, but remarked on its unique spicule arrangement, particularly the ectosomal structure and fibre echination. Burton (1934a) assigned the type to Microcionidae, for similar reasons as those outlined above, whereas de Laubenfels (1936a) referred it to the Desmacididae because, he suggested, the hastate diactinal megascleres resembled those of *Guitarra* and *Liosina*, although it lacked poecilosclerid microscleres. *Echinochalina (P.) bispiculata* is included in this subgenus since it has a paratangential ectosomal skeleton composed of auxiliary megascleres, reticulate spongin fibres and echinating principal spicules, whereas other species described by de Laubenfels (1936a) (*P. aga*, *P. ada* and *P. antillana*) are more appropriately placed in Desmacididae and Haplosclerida (see remarks for *Protophlitaspongia* under Genera Included).

Eight species are now included in the subgenus, 2 known exclusively from New Caledonia and the remainder from eastern Australia. (Table 46; Hooper & Lévi, 1993a: 1279).

Echinochalina (Protophlitaspongia) bispiculata
(Dendy, 1895)
(Figs 296-297, Table 45)

Siphonochalina bispiculata Dendy,1895: 246.

Diplodermia bispiculata; Hallmann, 1912: 255.

Protophlitaspongia bispiculata; Burton, 1934a: 562.

Echinochalina bispiculata; Hooper & Lévi, 1993a: 1279; Hooper & Wiedenmayer, 1994: 277.

MATERIAL. LECTOTYPE: NMVG2319: 5-6km from Point Lonsdale, Port Phillip Heads, Vic, 38°20.5'S, 144°35.6'E, 34-38m depth, 1894, coll. J.B. Wilson (dredge). PARALECTOTYPE: NMVG2320 (fragment BMNH1902.10.18.14.110): same locality. OTHER MATERIAL: VIC – QMG304102.

HABITAT DISTRIBUTION. Rock reef; 34-38m depth; Port Phillip (Vic) (Fig. 296D).

DESCRIPTION. *Shape*. Massive, subspherical, irregularly lobate, 90mm maximum diameter, with short bulbous surface lobes, or subcylindrical, flattened digitate sponge, 160mm long, 28mm wide, 15mm thick.

Colour. Pale yellow-brown in ethanol.

Oscules. Small, 2-3mm diameter, scattered over surface, particularly on apex of surface lobes.

Texture and surface characteristics. Soft, compressible, slightly rubbery; surface optically even, minutely reticulate.

Ectosome and subectosome. Microscopically hispid ectosome with scattered plumose brushes of long, thin auxiliary oxeas, arising from the points of peripheral fibres and paratangential to surface; choanosomal fibres immediately below surface although spicule tracts more plumose in peripheral skeleton than at core.

Choanosome. Regularly reticulate to subisodictyal skeletal structure, with well developed fibres divided into primary and secondary elements; primary fibres ascending, multispicular, 60-95µm diameter, forming distinctly plumose tracts within core of fibre, interconnected at more-or-less regular intervals by slightly thinner secondary fibres, transverse, uni-, pauci- or aspicular fibres, 20-43µm diameter; fibres relatively light, cored by long, thin auxiliary oxeas and echinated by short, stout principal oxeas; fibre anastomoses form cavernous ovoid meshes, 180-540µm diameter; mesohyl matrix heavy but only lightly pigmented, with moderate quantities of auxiliary spicules dispersed between fibres; choanocyte chambers large, oval to elongate, 60-130µm diameter.

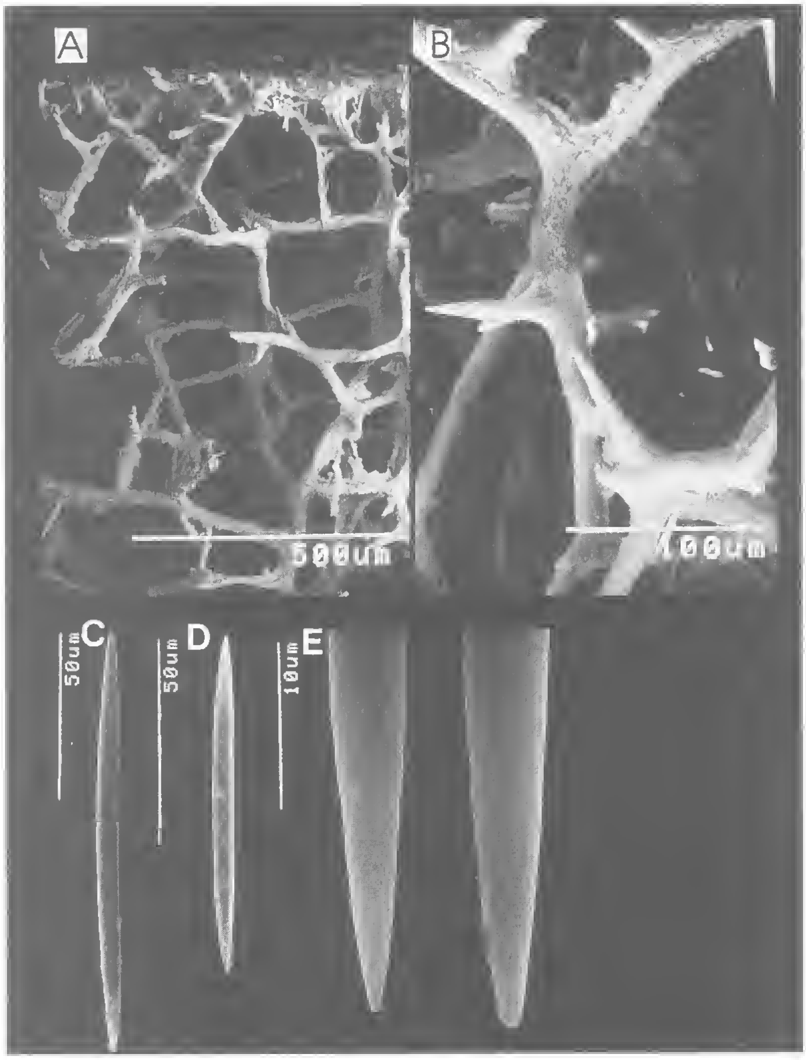


FIG. 297. *Echinochalina* (*Protophlitaspongia*) *bispiculata* (Dendy) (QMG304102). A, Choanosomal skeleton. B, Fibre characteristics. C, Auxiliary oxea. D, Principal oxea. E, Ends of oxeas.

Megascleres (Table 45). Principal megascleres echinating fibres straight, short, thick, invariably smooth, hastate oxeas, with abruptly pointed or telescoped ends.

Auxiliary megascleres coring fibres long, thin, straight, hastate or rarely fusiform oxeas.

Microscleres absent.

Larvae. Incubated parenchymella larvae small spherical, with heavy mesohyl matrix, 210-240µm diameter, no larval megascleres.

REMARKS. Of all *E.* (*Protophlitaspongia*) this species is the most reminiscent of Haplosclerida in skeletal characteristics (e.g., three dimensional ectosomal architecture like *Hemigellius* (Niphatidae); choanosomal fibre construction similar to *Callyspongia* (Callyspongiidae)). *Echinochalina* (*P.*) *bispiculata* is slightly similar to *E.* (*P.*) *oxeata* but that species lacks true geometric differentiation between coring and echinating spicules and has a different growth form (Table 46).

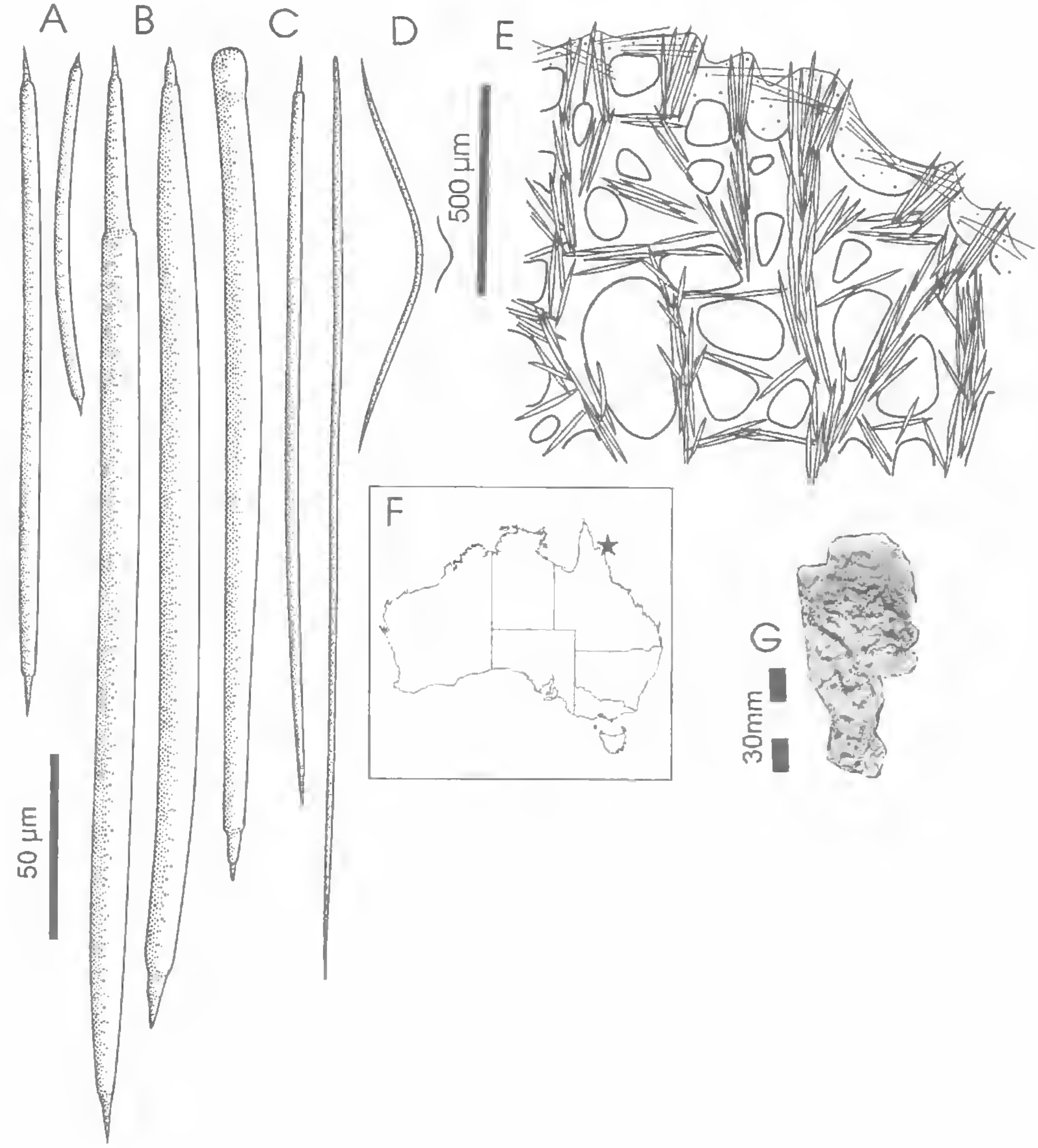


FIG. 298. *Echinochalina* (*Protophlitaspongia*) *collata* sp.nov. (holotype QMG304120). A, Principal oxea (echinating fibres). B, Auxiliary oxeas (coring fibres and interstitial). C, Ectosomal subtylostyle/ anisoxea. D, Wing-shaped toxas. E, Section through peripheral skeleton. F, Australian distribution. G, Holotype.

Echinochalina (Protophlitaspongia) collata
sp. nov.
(Figs 298-299, Table 45, Plate 12D)

MATERIAL. HOLOTYPE: QMG304120: Blue Lagoon, Lizard I., Cairns section, Great Barrier Reef, Qld, 14°41.0'S, 145°27.5'E, 9m depth, 3.iv.1994, coll. J.N.A. Hooper & S.Cook (SCUBA).

HABITAT DISTRIBUTION. Coral pinnacles; 9m depth; Lizard I. (FNQ) (Fig. 298F).

DESCRIPTION. *Shape*. Thickly encrusting, up to 12mm thick, bulbous in places on surface following contours of substrate.

Colour. Dark red alive (Munsell 2.5R 4/10), light brown in ethanol.

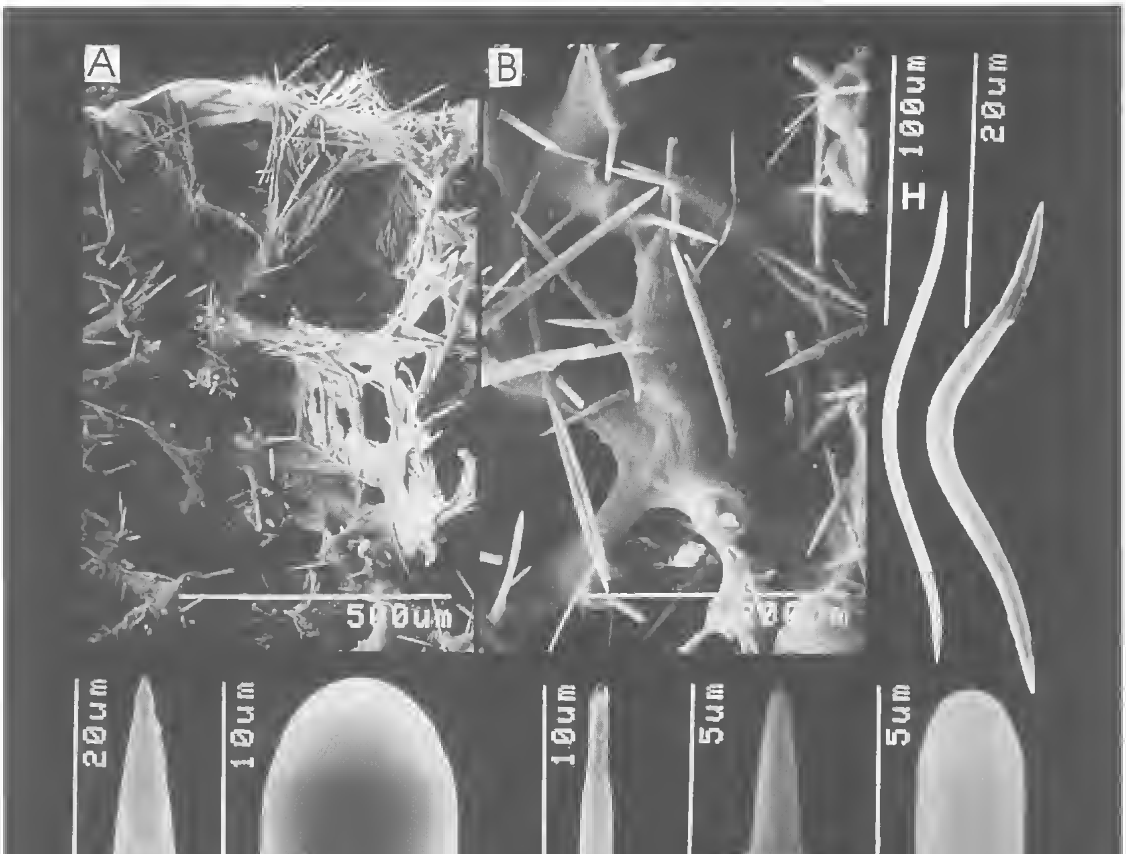


FIG. 299. *Echinochalina* (*Protophlitaspongia*) *collata* sp.nov. (holotype QMG304120). A, Choanosomal skeleton. B, Fibre characteristics. C-D, Ends of auxiliary anisoxea and style. E, Ends of principal oxea. F-G, Ends of ectosomal anisoxea and style. H, Wing-shaped toxas.

TABLE 45. Comparison in spicule dimensions between species of *Echinochalina* (*Protophlitaspongia*). Measurements in micrometres (N=25); comparative data from Hooper & Lévi (1993).

SPICULE	*E.(P.) laboutei* Hooper & Lévi (QMG300685) (New Caledonia)	*E.(P.) bargibanti* Hooper & Lévi (QMG301270) (New Caledonia)	*E.(P.) favulosa* sp.nov. (QMGL2166) (SE Qld)	*E.(P.) isaaci* sp.nov. (QMG305051) (GBR,Qld)	*E.(P.) ostrata* (Burton) (BMNH1930.8.13.45) (GBR,Qld)	*E. collata* sp.nov. (QMG304120) (GBR,Qld.)	*E. tuberosa* sp.nov. (typical morph) (QMG300039) (SE. Qld.)	*E. tuberosa* sp.nov. (digitate morph) (QMG300030) (SE. Qld.)
Auxiliary (coring) oxeas	52-(75.1)-108 x 1.8-(2.9)-4.0	55-(73.3)-98 x 0.8-(1.9)-3.0	101-(121.2)-166 x 3.5-(6.1)-7.0	252-(265.2)-287 x 3-(3.6)-4.5	128-(132)164 x 3.5-(4.2)-7.0	197-(235.6)-326 x 6-(8.7)-11	102-(123.9)-158 x 3-(4.6)-7	94-(101.7)-163 x 1.5-(3.8)-7.5
Ectosomal auxiliary styles	115-(156.2)-194 x 1.0-(1.7)-2.5	144-(216.1)-278 x 1.0-(2.4)-3.5	absent	212-(234.0)-262 x 2-(2.8)-3	absent	212-(237.2)-264 x 1.5-(2.2)-3	114-(187.7)-215 x 1.5-(2.2)-3	142-(181.9)-228 x 1.5-(2.2)-3
Principal (echinating) oxeas	28-(33.5)-42 x 2.0-(2.5)-4.0	32-(46.7)-58 x 1.0-(2.0)-2.5	57-(79.7)-122 x 4.5-(6.2)-7.5	118-(142.7)-162 x 2-(3.4)-4	absent	94-(148.0)-188 x 1.5-(4.2)-6	54-(71.2)-84 x 2-(2.8)-4	67-(76.2)-88 x 1.5-(2.4)-3.5
Chelae	absent	14-(15.5)-21	9-(10.7)-14	absent	absent	absent	absent	absent
Toxas	absent	absent	absent	absent	absent	14-(73.2)-118 x 1-(1.6)-2	18-(44.1)-64 x 0.5-(0.9)-1.5	31-(44.9)-62 x 0.5-(1.1)-1.5

Oscules. Very small, 1-2mm diameter, on apex of larger surface bulbs, surrounded by radiating subectosomal drainage canals.

Texture and surface characteristics. Harsh, firm, compressible; surface microconulose, minutely shaggy, conules close-set, less than 2mm high, surface silty in situ with radiating drainage canals clear of silt.

Ectosome and subectosome. Slightly plumose, multispicular brushes of auxiliary spicules from primary choanosomal tracts protrude through surface mainly on ends of conules; bundles of ectosomal auxiliary styles tangential to surface; abundant detritus and collagen in ectosomal layer.

Choanosome. Irregularly reticulate skeletal structure, very heavy spongin fibres relatively homogeneous throughout skeleton, 45-120μm diameter, forming oval or elongate meshes, 120-440μm diameter, without marked difference in mesh size between periphery and core of skeleton; ascending primary fibres cored by multispicular tracts of auxiliary spicules but occupying only about 50% of fibre diameter, interconnected by uni- or paucispicular secondary, transverse fibres; fibres sparsely echinated by thinner oxeas (? principal spicules) protruding at acute angles through fibres; mesohyl matrix heavy, with moderate numbers of auxiliary megascleres and toxa microscleres dispersed between fibres; choanocyte chambers large, elongate, 30-60μm diameter.

Megascleres (refer to Table 45 for dimensions). Principal (?) spicules echinating fibres short oxeas, thin, straight or slightly curved at centre, with telescoped points.

Auxiliary spicules coring fibres vary from true oxeas to true styles, with many intermediates, long, thick, straight or slightly curved at centre, points usually telescoped.

Ectosomal auxiliary styles or anisoxeas long, thin, whispy, straight or slightly curved, with rounded or spiked base and fusiform or telescoped points.

Microscleres (Table 45). Toxas intermediate between oxhorn and wing-shaped, thin, slightly curved at centre, slightly reflexed points.

ETYMOLOGY. Latin *collatus* (L.), extended, diffuse; for the growth form.

REMARKS. This species is unusual in its thickly encrusting growth form, conulose surface, multispicular tracts occupying only about 50% of fibre diameter, prevalence of telescoped points and asymmetrical spicules. It is most similar to, and probably a sibling species of, *E.* (*P.*) *tuberosa* in having a special category of ectosomal styles and oxhorn toxas, although spicule geometry and spicule sizes are substantially different between these species. Further comparisons between species of *E.* (*Protophlitaspongia*) are given in Table 46.

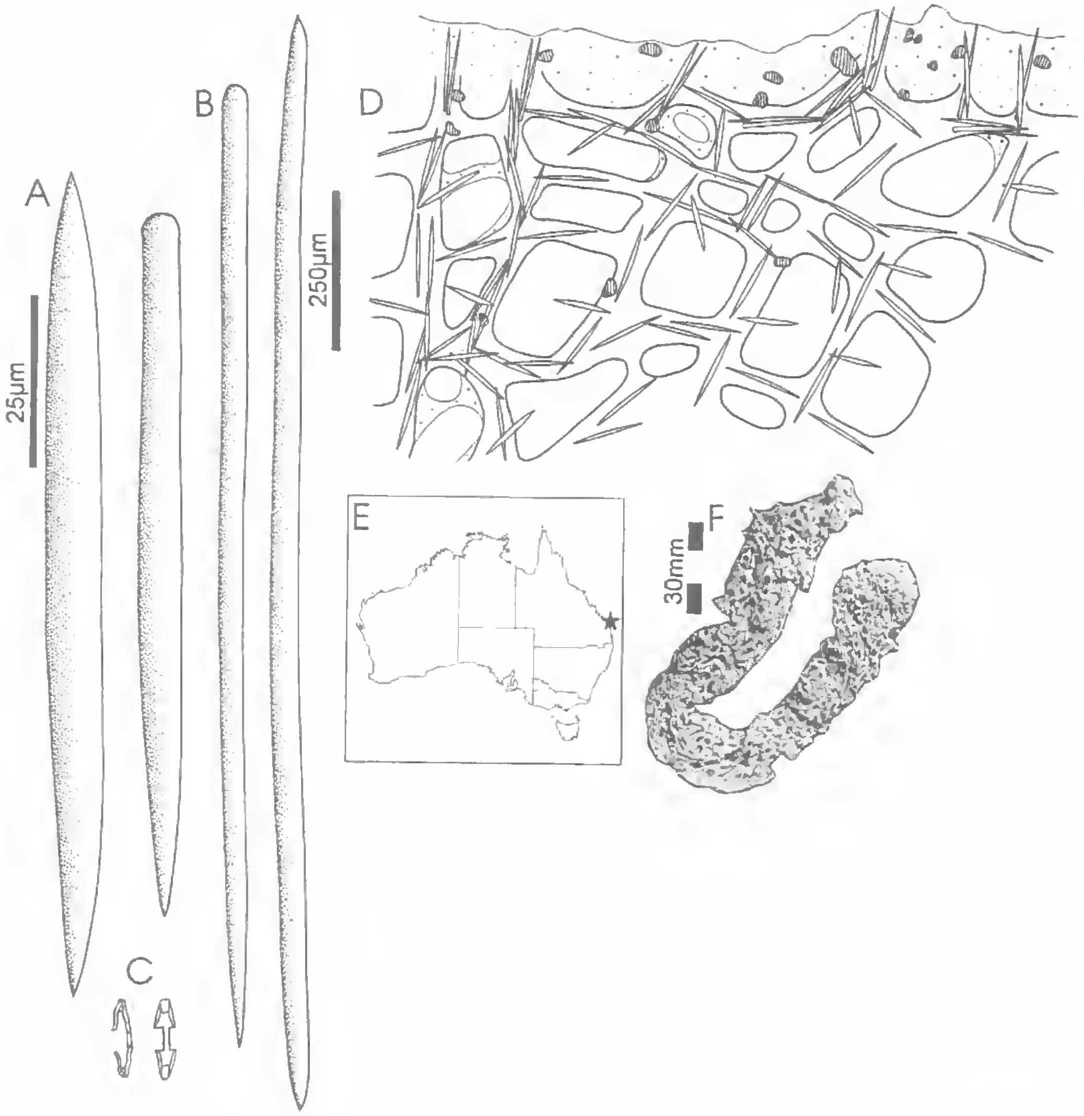


FIG. 300. *Echinochalina* (*Protophlitaspongia*) *favulosa* sp.nov. (holotype QMGL2166). A, Principal oxea and style (echinating fibres). B, Auxiliary oxea and style (coring fibres and interstitial). C, Palmate isochelae. D, Section through peripheral skeleton. E, Australian distribution. F, Holotype.

Echinochalina (Protophlitaspongia) favulosa
sp. nov.
(Figs 300-301, Table 45)

MATERIAL. HOLOTYPE: QMGL2166: Off Noosa Heads, Qld, 26°31'S, 153°48'E, 480m depth, 13.ix.1980, coll. QFS Craigman Survey (trawl).

HABITAT DISTRIBUTION. Sand and shell grit substrata; 480m depth; Noosa region (SEQ) (Fig. 300E).

DESCRIPTION. *Shape.* Irregularly branching, cylindrical sponge, 195mm long, up to 33mm diameter, without apparent basal attachment; branches bifurcate few times.

Colour. Live colouration unknown, grey-brown ethanol.

Oscules. Large, up to 5mm diameter, on lateral margins and ends of branches.

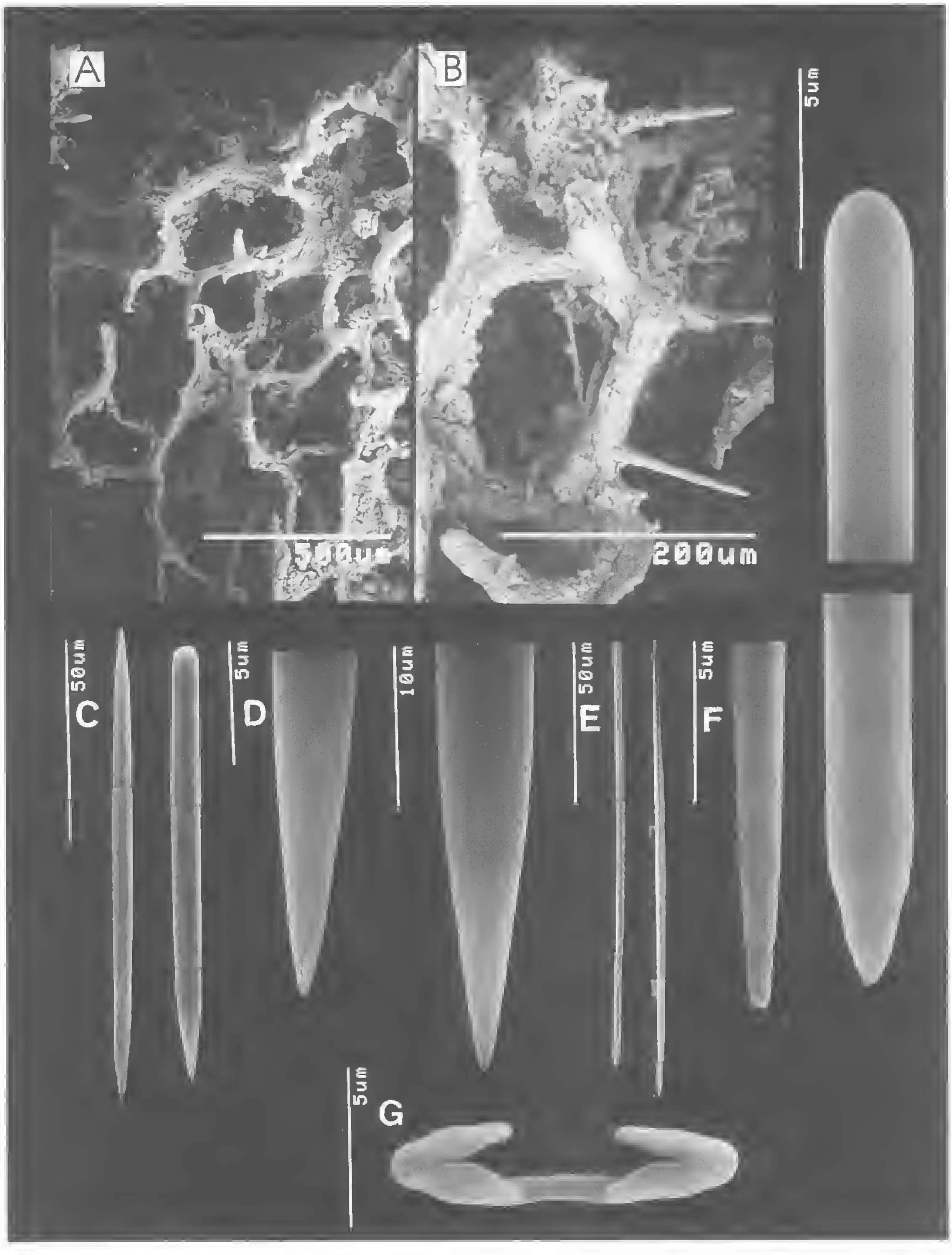


FIG. 301. *Echinochalina* (*Protophlitaspongia*) *favulosa* sp.nov. (holotype QMGL2166). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal oxea and style. D, Ends of principal spicules. E, Auxiliary style and oxea. F, Ends of auxiliary spicules. G, Palmate isochela.

Texture and surface characteristics. Soft, compressible; surface 'honeycomb' reticulate, highly porous, uneven, conulose.

Ectosome and subectosome. Membraneous, minutely conulose surface with erect, paucispicular brushes of auxiliary megascleres arising from choanosomal spicule tracts protruding into surface conules but rarely through surface; some detritus scattered over surface; choanosomal fibres immediately below ectosomal skeleton.

Choanosome. Regularly reticulate, subisodictyal skeletal architecture composed of more-or-less ascending, multi- or paucispicular, primary fibres, 22-43µm diameter, interconnected at irregular intervals by transverse, uni-, pauci- or aspicular fibres, 14-25µm diameter; fibres cored by longer auxiliary megascleres and moderately echinated by shorter, principal spicules; fibre anastomoses form relatively wide, elongate or hexagonal meshes, 92-236µm diameter; mesohyl matrix heavy, relatively darkly pigmented, granular, with auxiliary and principal megascleres dispersed between fibres; choanocyte chambers small ovoid to elongate, 22-46µm diameter.

Megascleres (Table 45). Principal megascleres echinating fibres relatively short, thick, straight, hastate oxeas, sometimes slightly telescoped, occasionally quasi-monactinal (asymmetrical ends), rarely styles, only marginally shorter than coring spicules.

Auxiliary spicules coring fibres long, slender, straight, hastate oxeas, often with telescoped points, occasionally modified to quasi-monactinal forms, rarely true styles, longer forms generally thinner.

Microscleres (Table 45). Palmate isochelae abundant, small, with approximately 15% twisted forms, lateral alae completely fused to shaft, front ala partially detached from lateral alae, shaft straight.

Toxas absent.

ETYMOLOGY. For its honeycomb reticulate growth form.

REMARKS. This species is unusual for its *Holopsamma*-like honeycomb reticulate growth form, having palmate isochelae, both principal and auxiliary spicules ranging in geometry from (predominantly) oxeas to styles, with asymmetrical intermediate geometries, and coring and echinating spicules differing only marginally in their length and thickness. The possession of isochelae microscleres in the present species supports the inclusion of the genus in the Poecilosclerida, although it is still feasible that this species, and *Protophlitaspongia*, may be more appropriately assigned to the poecilosclerid Desmacididae (de Laubenfels (1936a) and followed by Pulitzer-Finali (1986)), but little support for its inclusion in the haplosclerid Niphatidae (as proposed for *Isodictya* by Hajdu et al., 1994b).

Echinochalina (Protophlitaspongia) isaaci
sp. nov. (Figs 302-303, Table 45, Plate 12E)

MATERIAL. HOLOTYPE: QMG305051: W side Oyster Reef, Cairns section, Great Barrier Reef, Qld, 16°38.4'S 145°54.7'E 20m depth, 21.ii.1995, coll. J.N.A. Hooper (SCUBA). PARATYPE: QMG305464: W. side Gannett Cay, Swain Reef, Mackay section, Great Barrier Reef, Qld., 21°58.68'S, 152°28.34'E, 22m depth, 24.vii.1995, coll. J.N.A. Hooper & P. Tomkins (SCUBA). OTHER MATERIAL: QLD- QMG305398, QMG305430, QMG305504.

HABITAT DISTRIBUTION. Fringing coral reefs, coral pinnacles, outer reef slopes, on dead coral; 20-33m depth; Oyster Reef (FNQ); Swain Reefs (MEQ) (Fig. 302E).

DESCRIPTION. *Shape.* Arborescent, digitate, branching, up to 150mm high, with conical cylindrical branches, up to 80mm long, 15mm diameter, bifurcate at tips and expanded towards apex of branches in life, collapses producing flattened branches in ethanol; basal stalk up to 25mm long, 12mm diameter, with expanded basal attachment.

Colour. Pale orange-brown alive (Munsell 5R 7/8), light brown in ethanol.

Oscules. Large, up to 15mm diameter alive, on apex of each digit, surrounded by raised membraneous lip, collapses completely in ethanol leaving no visible trace of oscule on external surface.

Texture and surface characteristics. Soft, spongy alive, firm, compressible, rubbery in ethanol; fleshy alive, with longitudinal striations and ridges running from terminal oscule along sides of digits, collapsing when preserved producing concave striations and pits on sides of digits.

Ectosome and subectosome. Well developed, discrete brushes of ectosomal auxiliary subtylostyles arising from ends of ascending choanosomal tracts; ectosome more heavily collagenous than choanosome, lightly pigmented; subectosomal skeleton slightly cavernous, with widely spaced peripheral fibres and skeletal tracts

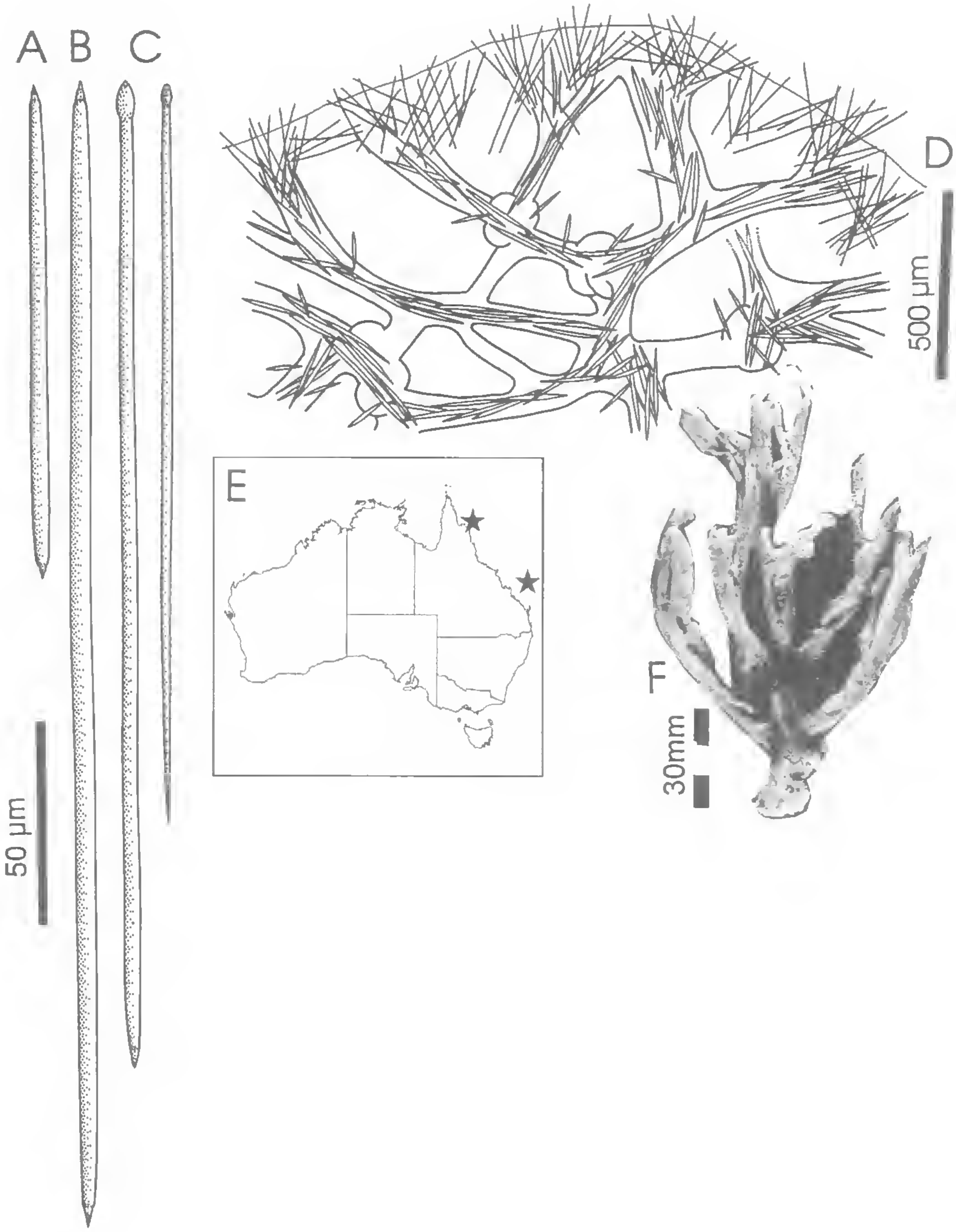


FIG. 302. *Echinochalina* (*Protophlitaspongia*) *isaaci* sp.nov. (holotype QMG305051). A, Principal oxea (echinating fibres). B, Auxiliary oxea (coring fibres and interstitial). C, Ectosomal auxiliary subtylostyles. D, Section through peripheral skeleton. E, Australian distribution. F, Holotype.

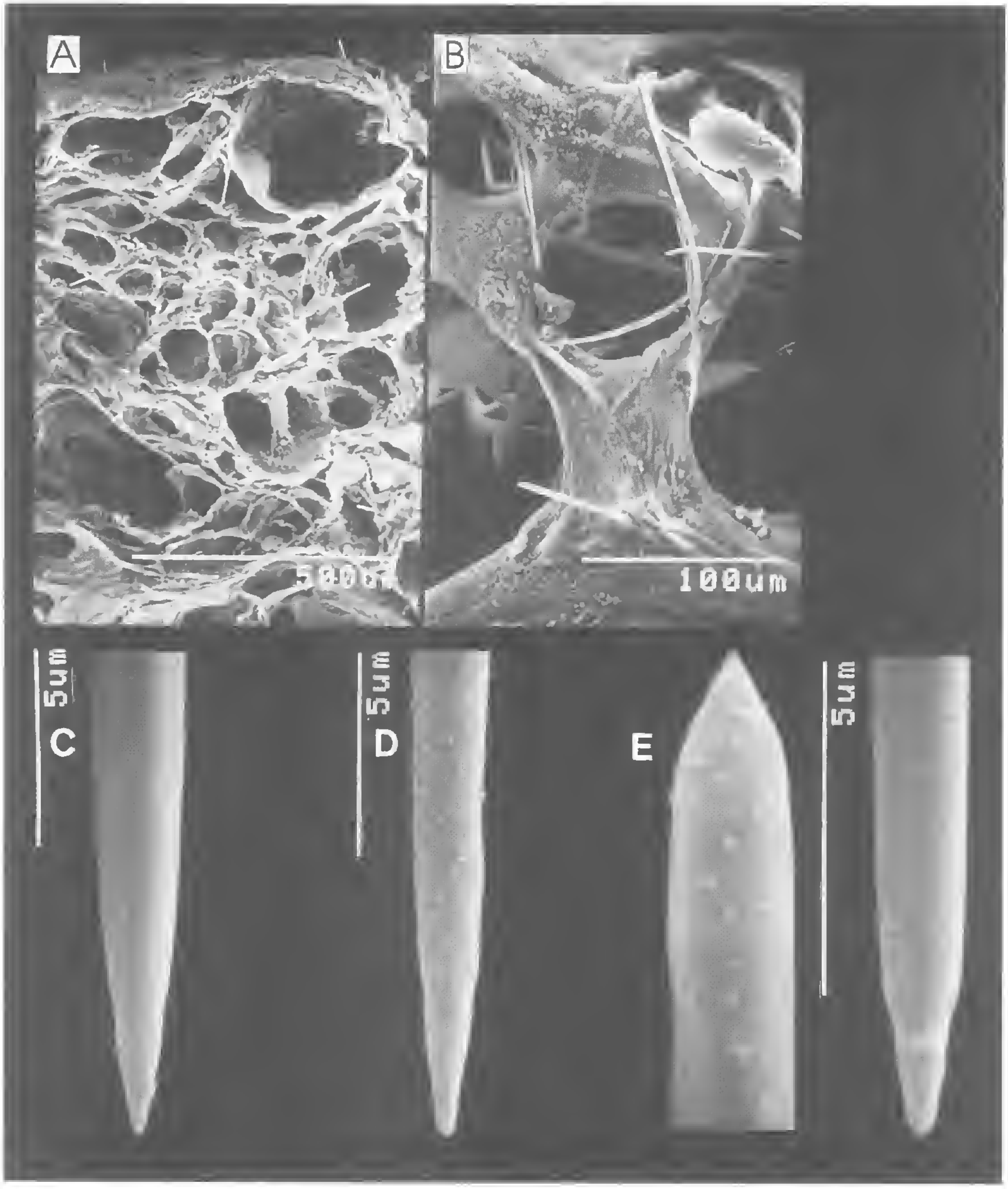


FIG. 303. *Echinochalina* (*Protophlitaspongia*) *isaaci* sp.nov. (paratype QMG305464). A, Choanosomal skeleton. B, Fibre characteristics. C, Point of principal oxea. D, Point of auxiliary oxea. E, Ends of auxiliary anisoxea.

becoming progressively more plumose towards periphery.

Choanosome. Irregularly reticulate, wide-meshed fibre skeleton, cavernous choanosomal structure; fibres relatively homogeneous in size and distribution, 40-70μm diameter, without any marked differences between primary and secondary fibres; fibres light; fibre meshes wide, oval to elongate, up to 650μm diameter, slightly more cavernous in peripheral skeleton than at core;

ascending primary fibres cored by pauci- or multispicular tracts of auxiliary oxeas; smaller connecting secondary fibres, predominantly transverse through skeleton, cored by unispicular tracts of auxiliary oxeas, occasionally aspicular; fibres at core of skeleton sparsely echinated by principal oxeas; mesohyl matrix light, virtually unpigmented, with sparse auxiliary oxeas scattered between fibres; choanocyte chambers large, oval, up to 60µm diameter.

Megascleres (Table 45). Principal oxeas echinating fibres short, slender, straight, usually with telescoped points.

Auxiliary oxeas coring fibres long, slender, straight, usually with telescoped points.

Ectosomal auxiliary subtylostyles long, slender, straight, with slightly swollen bases, sometimes pointed at apex, with fusiform or slightly telescoped points.

Microscleres. Absent.

ETYMOLOGY. In memory of Isaac Cook, son of Stephen Cook, collector of many of the samples studied here.

REMARKS. This species has a cavernous, irregularly reticulate skeletal structure with relatively poorly developed fibre system and mostly dominated by more-or-less plumose tracts coring major fibres. The ectosomal skeleton is particularly well developed, moreso than other species of *E.* (*Protophlitaspongia*), whereas the echinating spicule skeleton is very sparse, nearly vestigial. The species is most closely related to *E.* (*P.*) *bargibanti* in its growth form and aspects of its skeletal structure but they differ substantially in their respective live field characters, coring spicule skeleton, and spicule sizes. The species is compared further with other *E.* (*Protophlitaspongia*) in Table 46.

Echinochalina (Protophlitaspongia) oxeata
(Burton, 1934) (Fig. 304, Table 45)

Protophlitaspongia oxeata Burton, 1934a: 562, text-fig.128.

Echinochalina oxeata; Hooper & Lévi, 1993a: 1279; Hooper & Wiedenmayer, 1994: 278.

MATERIAL. HOLOTYPE: BMNH1930.8. 13.45: Papuan Pass, Cooktown region, Great Barrier Reef, Qld, 15°47'S, 145°48'E, 40m depth, coll. GBR Expedition (dredge).

HABITAT DISTRIBUTION. On foraminifera and coral fragments, 40m depth; Cooktown (FNQ) (Fig. 304C).

DESCRIPTION. *Shape*. Branching, cylindrical sponge 3-5mm diameter, now fragmented; branches bifurcate near ends.

Colour. Light brown in ethanol.

Oscules. Small, 1-2mm diameter, on lateral sides of branches.

Texture and surface characteristics. Tough, elastic; surface smooth, even, porous.

Ectosome and subectosome. Membraneous, with sparse, more-or-less erect bundles of auxiliary oxeas from ascending choanosomal tracts protruding through surface; choanosomal fibres immediately below ectosome.

Choanosome. Irregularly reticulate skeleton with differentiated primary and secondary spongin fibres; primary fibres ascending, pauci- or multispicular, 35-55µm diameter, interconnected by transverse, uni- or aspicular secondary fibres, up to 22µm diameter; fibre anastomoses produce large, cavernous, oval meshes in peripheral skeleton, up to 550µm diameter, smaller, oval close-meshed reticulation at core of skeleton, up to 145µm diameter; all spicule tracts occupy only small proportion of fibre diameter; differentiated echinating megascleres absent although auxiliary spicules may protrude through fibres at acute angles; mesohyl matrix heavy but only lightly pigmented, containing numerous auxiliary spicules scattered between fibres; choanocyte chambers large, oval 45-95µm diameter.

Megascleres (Table 45). Principal oxeas coring fibres short, slender, straight or slightly curved at centre, with hastate or slightly telescoped points, occasionally modified to styles.

Microscleres absent.

REMARKS. This species has reduced spiculation, lacking either echinating (principal) spicules or ectosomal styles. In spongin fibre structure, distribution of spicules within fibres, ectosomal spiculation, it is close to *E.* (*P.*) *bispiculata*. Hooper & Lévi's (1993a: 1279) *E.* (*P.*) *oxeata* from Moreton Bay is not conspecific with the holotype of *E.* (*P.*) *tuberosa*, whereas *E.* (*P.*) *oxeata* is restricted to the type specimen.

Echinochalina (Protophlitaspongia) tuberosa
sp. nov.
typical growth form
(Figs 305-306, Table 45 Plate 12F)

MATERIAL. HOLOTYPE: QMG300039: Inner Gneerings Shoals, off Mooloolaba, SE. Qld, 26°38.5'S, 153°09.5'E, 10m depth, 10.xii.1991, coll. J.N.A Hooper & S.D. Cook (SCUBA). PARATYPE: QMG300082: Shag Rock, N. Stradbroke I., Moreton

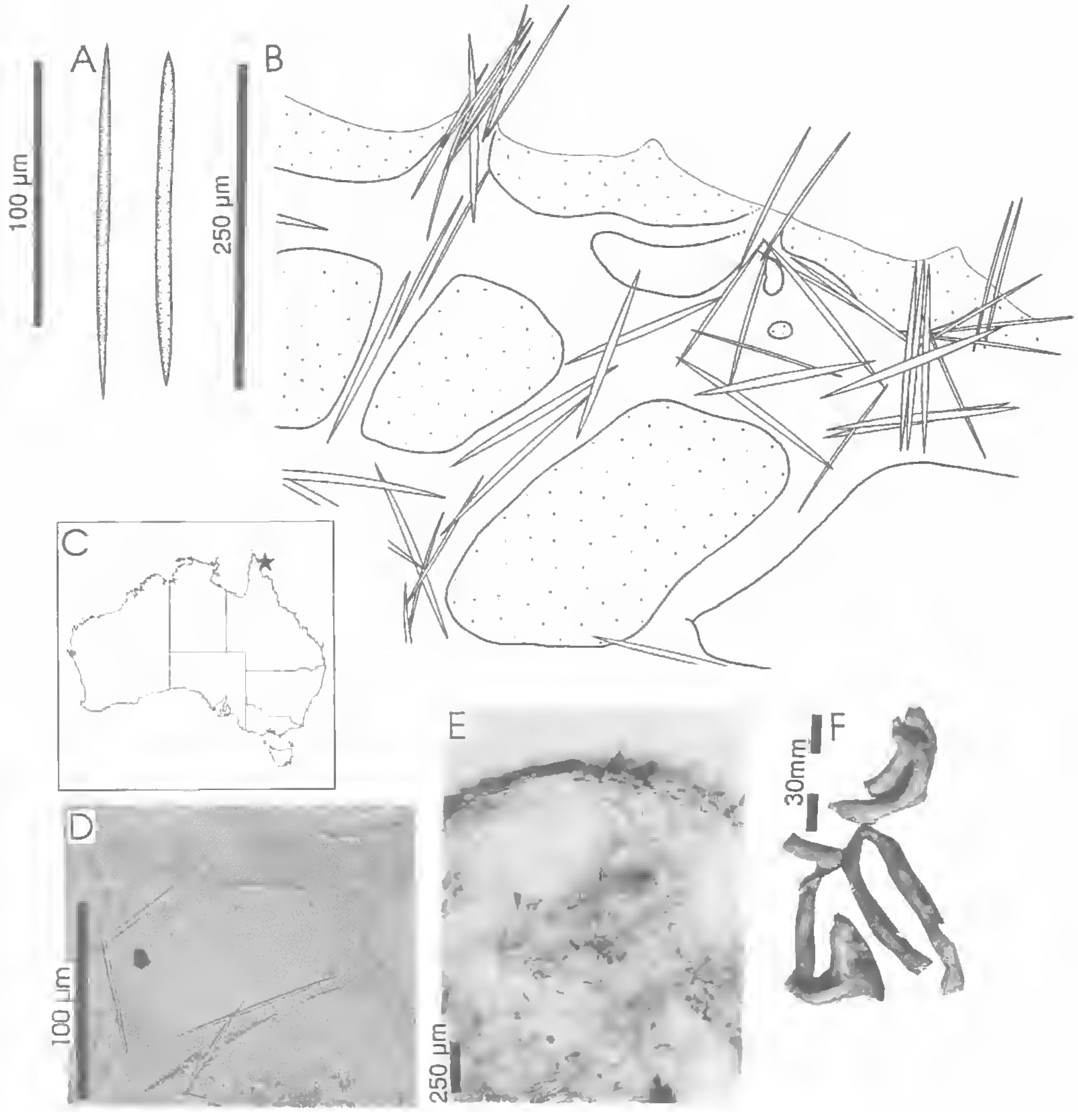


FIG. 304. *Echinochalina* (*Protophlitaspongia*) *oxeata* (Burton) (holotype BMNH1930.13.45a). A, Auxiliary oxeas. B, Section through peripheral skeleton. C, Australian distribution. D, Fibre characteristics. E, Choanosomal skeleton. F, Holotype.

Bay, SE. Qld, 27°25.0'S, 153°31.4'E, 15m depth, 05.ii.1992, coll. J.N.A. Hooper & J. Wilkinson (SCUBA). OTHER MATERIAL: QLD- QMG304015.

HABITAT DISTRIBUTION. Rock and coral reef, usually sheltered under ledges; 9-25m depth; Stradbroke I., Moreton Bay, Mooloolaba (SEQ) (Fig. 305F).

DESCRIPTION. *Shape.* Thickly encrusting with bulbous-digitate surface projections forming lobate-digitate or bulbous sponge, up to 120mm long, 70mm wide, 55mm thick.

Colour. Bright red to pale red alive (Munsell 2.5R 4-5/10), brown in ethanol.

Oscules. Small, up to 3mm diameter, scattered at base of surface bulbs, between adjacent bulbs, each with prominent membraneous lip.

Texture and surface characteristics. Firm, slightly hispid; surface uneven with prominent bulbous

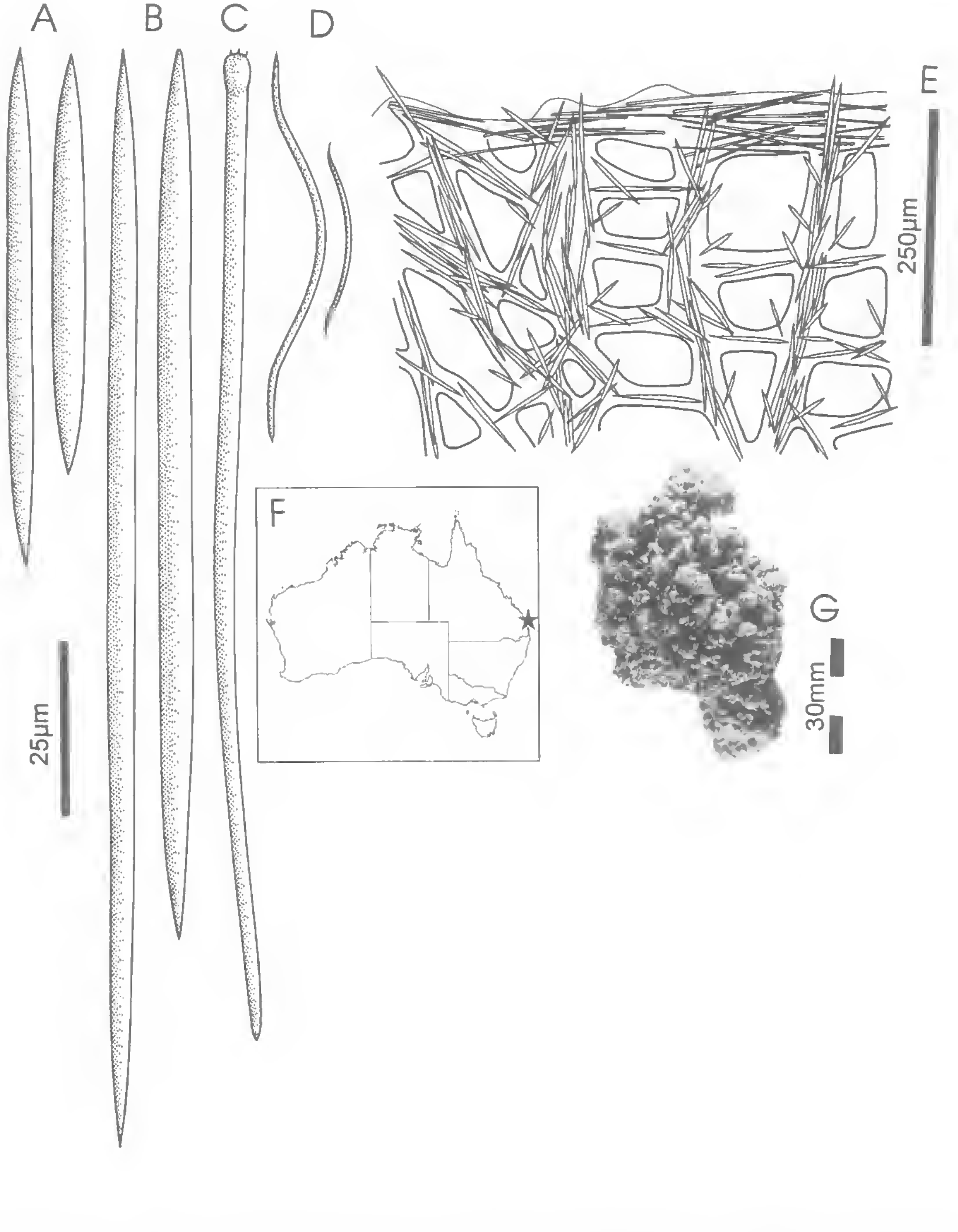


FIG. 305. *Echinochalina* (*Protophlitaspongia*) *tuberosa* sp.nov., typical morph (holotype QMG300039). A, Principal oxeas (echinating fibres). B, Auxiliary oxeas (coring fibres and interstitial). C, Ectosomal auxiliary subtylostyle. D, Oxhorn toxas. E, Section through peripheral skeleton. F, Australian distribution. G, Holotype.

FIG. 306. *Echinochalina* (*Protophlitaspongia*) *tuberosa* sp.nov., typical morph (holotype QMG300039). A, Choanosomal skeleton. B, Fibre characteristics. C, Principal oxea. D, Base of principal spicule. E, Auxiliary oxea. F, Base of auxiliary spicule. G, Ectosomal auxiliary style. H, Ends of ectosomal spicule. I, Oxhorn toxa.

protruberances, up to 9mm high, 5mm diameter, inflated at ends.

Ectosome and subectosome. Relatively thick paratangential brushes composed of ectosomal auxiliary subtylostyles perched on surface, overlying protruding principal oxeas from peripheral, ascending choanosomal skeletal tracts;

choanosomal fibres immediately below ectosome.

Choanosome. Regularly reticulate skeletal structure, without any marked compression at core, with nearly renieroid fibre skeleton and plumoreticulate spicule tracts diverging towards periphery; spongin fibres heavy, without noticeable size differences between primary or secondary fibres, 20-60μm diameter; all fibres cored by auxiliary oxeas and moderately heavily echinated by principal oxeas, particularly at fibre nodes; primary fibres with ascending multispicular tracts of auxiliary oxeas terminating in sparse bundles at surface; secondary fibres pauci- or unispicular in peripheral skeleton, uni- or bispicular at core of skeleton; fibre anastomoses produce square or round, relatively even meshes throughout skeleton, 70-150μm diameter; mesohyl matrix moderately heavy, with few auxiliary spicules scattered between fibres; choanocyte chambers small, oval, 25-40μm diameter.

Megascleres (Table 45). Principal oxeas echinating fibres short, thick, straight, with fusiform or slightly telescoped points.

Auxiliary oxeas coring fibres, long, slender, straight or slightly curved at centre, with tapering fusiform or slightly telescoped points.

Ectosomal auxiliary subtylostyles long, very slender, whispy, usually curved at centre, base subtylote, usually microspined, point hastate.

Microscleres (refer to Table 45 for dimensions). Toxas oxhorn, short, thick, wide central curvature, points only slightly reflexed.

Digitate growth form
(Figs 307-308, Table 45)

MATERIAL. QMG300030: Outer Gneerings Shoals, off Mooloolaba, SE. Qld, 26°39'S, 153°10'E, 25m depth, 10.xii.1991, coll. J.N.A. Hooper & S.D. Cook (SCUBA).

DIAGNOSIS. *Shape.* Arborescent, tubulo-digitate growth form, 65mm high, 78mm wide, cylindrical or slightly flattened, repeatedly bifurcate, occasionally anastomosing branches, 3-5mm diameter, slightly swollen at extremities; sponge attached to substrate by expanded, short basal attachment.

Colour. Same as typical form.

Oscules. Small, up to 2mm diameter, on lateral sides of branches.

Texture and surface characteristics. Firm, compressible, slightly rubbery; surface of branches smooth, macroscopically even, microscopically slightly hispid.

Ectosome and subectosome. Thick, erect bundles of ectosomal auxiliary subtylostyles forming discrete plumose brushes on surface, usually at ends of ascending choanosomal spicule tracts, intermingled with protruding auxiliary coring oxeas; subectosomal region relatively thick, spiculose, with no fibre component.

Choanosome. Regularly reticulate skeletal structure without marked compression of axis.

Mega- and Microscleres. As for typical form.

ETYMOLOGY. For the bulbous encrusting form.

REMARKS. There are several notable differences between the bulbous-encrusting, shallower water (typical) morph and the deeper water, digitate morph that warrant their separate description above (i.e., growth form, ectosomal development), but there is little doubt that they are conspecific given similarities in their skeletal structure, fibre characteristics, spicule geometry, spicule dimensions.

This species resembles *E.* (*P.*) *bispiculata* in growth form (both bulbous, massive), fibre characteristics (regularly reticulate), and geometry of coring and echinating megascleres. However, *E.* (*P.*) *tuberosa* has a special category of auxiliary style forming a thick ectosomal skeleton (whereas *E.* (*P.*) *bispiculata* simply has protruding auxiliary oxeas from the peripheral choanosomal fibre skeleton), toxa microscleres (versus no microscleres), and different spicule dimensions (see Table 46). The species is also related to *E.* (*P.*) *laboutei*, particularly the digitate morph, in having special auxiliary styles forming the ectosomal skeleton, and similar fibre characteristics with multispicular primary ascending fibres and uni-, pauci- or aspicular secondary fibres, whereas *E.* (*P.*) *laboutei* lacks toxa microscleres, has a compressed central axial fibre skeleton and generally has aspicular fibres.

OTHER SPECIES OF *ECHINOCHALINA* (*PROTOPHLITASPONGIA*)

Echinochalina (Protophlitaspongia) bargibanti Hooper & Lévi, 1993

Echinochalina (*Protophlitaspongia*) *bargibanti* Hooper & Lévi, 1993a: 1280-1283, figs 31-32 [New Caledonia].

MATERIAL. HOLOTYPE: QMG301270. SW. Pacific.

Echinochalina (Protophlitaspongia) laboutei Hooper & Lévi, 1993

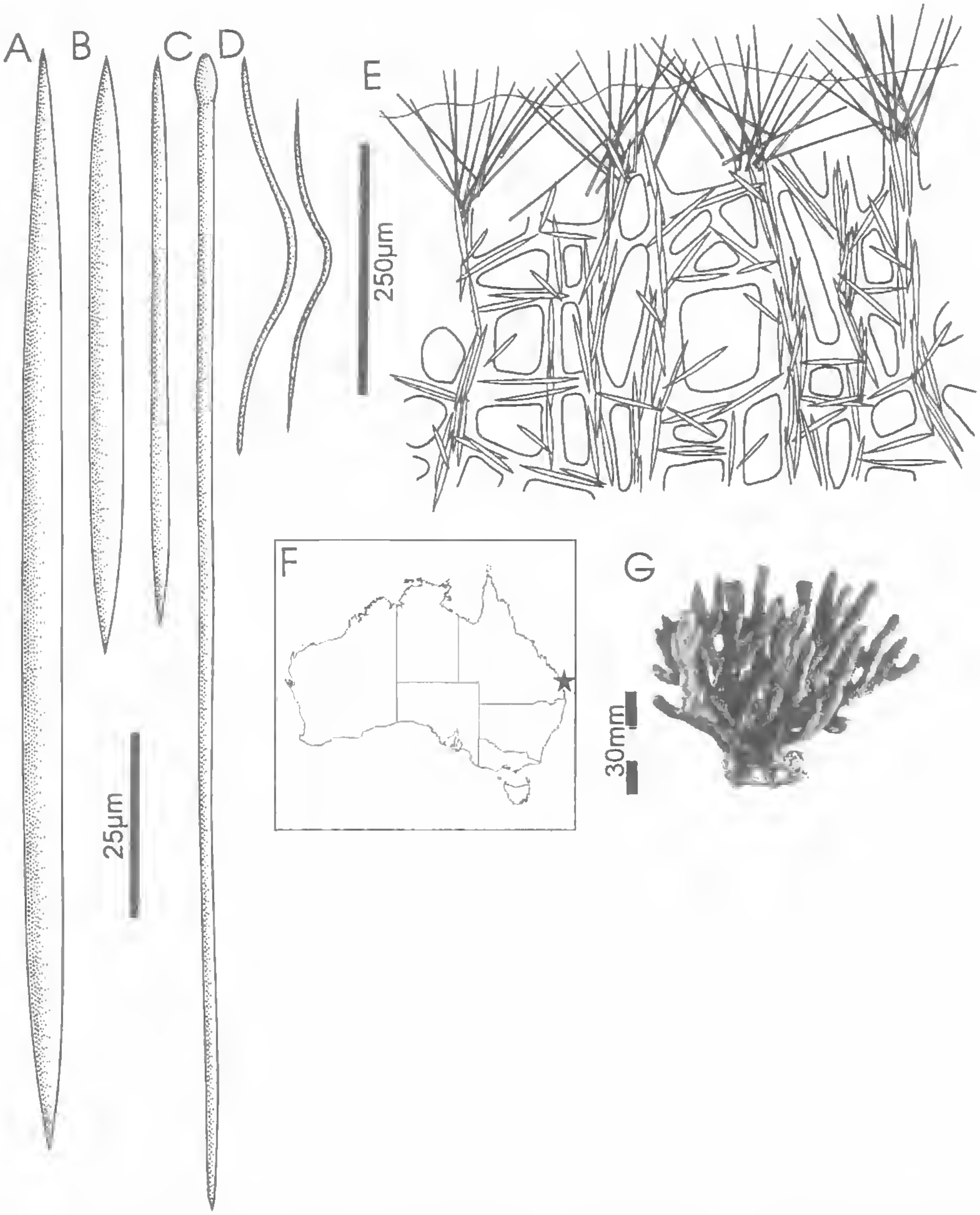


FIG. 307. *Echinochalina* (*Protophlitaspongia*) *tuberosa* sp.nov., digitate morph (specimen QMG300030). A, Auxiliary oxea (coring fibres and interstitial). B, Principal oxeas (echinating fibres). C, Ectosomal auxiliary subtylostyle. D, Oxhorn toxas. E, Section through peripheral skeleton. F, Australian distribution. G, Digitate specimen.

Echinochalina (*Protophlitaspongia*) *laboutei* Hooper & Lévi, 1993a: 1277-1280, figs 29-30 [New Caledonia].

MATERIAL. HOLOTYPE: QMG300685. SW. Pacific.

Artemisina Vosmaer, 1885

Artemisina Vosmaer, 1885a: 25; Ridley & Dendy, 1887: 112; Topsent, 1894a: 12; Lundbeck, 1905: 110; Burton, 1930a: 501, 528-531; de Laubenfels,

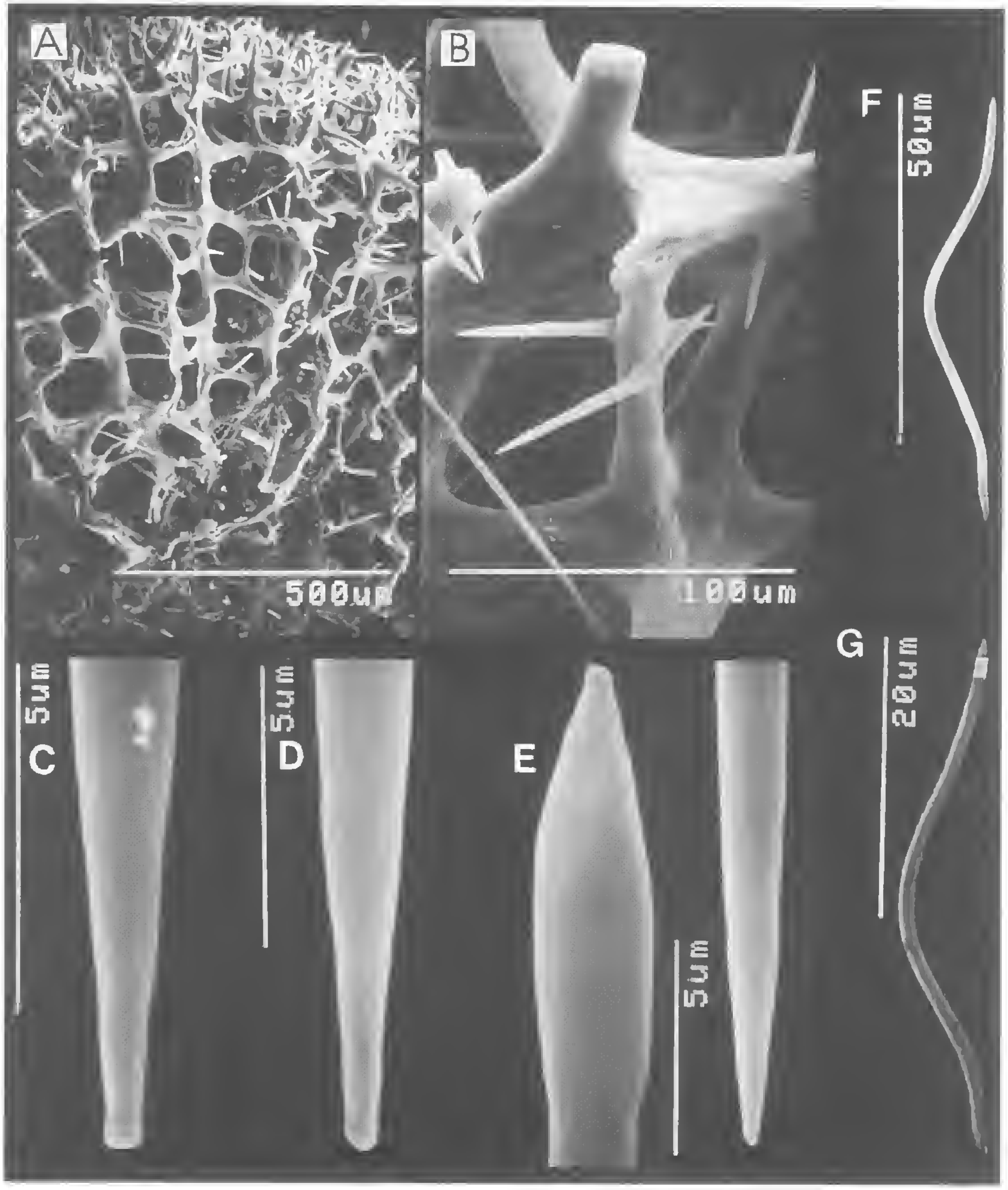


FIG. 308. *Echinochalina* (*Protophlitaspongia*) *tuberosa* sp.nov., digitate morph (specimen QMG300030). A, Choanosomal skeleton. B, Fibre characteristics. C, Point of principal oxea. D, Point of auxiliary oxea. E, Ends of auxiliary style. F-G, Oxhorn toxas.

1936a: 117; Lévi, 1960a: 61, 83; Ristau, 1978: 585; Van Soest, 1984b: 122, 130.
Artenisina; Burton, 1934b: 54 [lapsus].
Qasimella Thomas, 1974: 311.

TYPE SPECIES. *Artemisina suberitoides* Vosmaer, 1885a: 25 (by monotypy) (junior synonym of *Suberites arciger* Schmidt, 1870: 47 (Burton, 1930a: 528)).

DEFINITION. Without choanosomal fibres or indefinite fibres, whereas skeletal architecture vaguely ascending longitudinal tracts of spicules bound by abundant collagen, cored by smooth choanosomal principal subtylostyles in a more-or-less confused halichondroid reticulation of vaguely multispicular ascending and scattered transverse megascleres; echinating megascleres absent; subectosomal peripheral skeleton more radially arranged; ectosome membraneous, skin-like, with smooth styles of a single size category protruding through surface, forming paratangential or erect, discrete spicule bundles; microscleres palmate or arcuate isochelae and toxas with smooth or spined points.

Artemisina apollinis (Ridley & Dendy, 1886)
(Figs 309-310)

Amphilectus apollinis Ridley & Dendy, 1886: 350; Ridley & Dendy, 1887: 125, pl.19, fig.10, pl.25, fig.2.
Artemisina apollinis; Lundbeck, 1905: 114-116, pl.13, fig.4; Kirkpatrick, 1908b: 34, pl.20, fig.4; Hentschel, 1914: 70; Topsent, 1917: 62, pl.4, fig.6, pl.6, fig.7; Burton, 1929a: 431; Hentschel, 1929: 876, 939; Burton, 1930a: 529; Burton, 1932a: 323; Koltun, 1964a: 73; Desqueyroux, 1975: 66, pl.4, figs 42-46; Koltun, 1976: 188; Hooper & Wiedenmayer, 1994: 256.
Artemisina dianae Topsent, 1907: 70-72; Topsent, 1908: 22, pl.3, fig.4, pl.5, fig.1; Vosmaer, 1935a: 630.

MATERIAL. HOLOTYPE: BMNH1887.5. 2.140: Royal Sound, Kerguelen, 40-120m depth. HOLOTYPE of *A. dianea*: MNHN DT1666.

HABITAT DISTRIBUTION. Rock reefs and soft substrata; 18-380m depth; widespread boreal and antiboreal: Antarctica - MacRobertson Land, Australian Antarctic Territory (Koltun, 1976), Graham Land, William II Coast, Victoria Land (Desqueyroux-Faundez, 1975) (Fig. 309F), Gauss Station, Winter Quarters, South Georgia (Hentschel, 1914; Kirkpatrick, 1908b), Kerguelen Is (Ridley & Dendy, 1886, 1887; Koltun, 1976). Circum-polar (Koltun, 1964a). Arctic - East Greenland (Lundbeck, 1905), South Shetland Is (Topsent, 1907, 1908), Iceland, North Sea (Hentschel, 1929).

DESCRIPTION. *Shape.* Flattened, oval, cushion-shaped, up to 50mm long, 38mm wide, 19mm thick.
Colour. Grey-brown preserved.
Oscules. Not seen.
Texture and surface characteristics. Soft, compressible, friable; surface uneven, folded, shaggy, conulose, cavernous, with skin-like ectosomal membrane stretched across adjacent conules.
Ectosome and subectosome. Variably developed spicule brushes forming more-or-less continuous palisade on surface, sometimes also tangential or paratangential; plumose brushes of subectosomal auxiliary spicules with few choanosomal principal spicules protruding through surface from underlying skeleton.
Choanosome. Skeletal architecture irregularly reticulate or renieroid reticulate in places with rectangular and triangular meshes, up to 280μm diameter, made of uni- or paucispicular tracts of choanosomal principal styles; skeletal tracts not definitely differentiated into primary or secondary elements although ascending tracts contain 2-4 spicules abreast and connecting, usually transverse tracts contain 1-2 spicules per row; fibres absent and spicules bound by light collagen; mesohyl matrix heavy, with numerous microscleres dispersed.
Megascleres. Choanosomal principal styles long, slender, rounded smooth bases, occasionally slightly subtylote, with fusiform points, straight or slightly curved towards basal end. Length 352-(407.3)-458μm, width 11-(14.0)-17μm.

Subectosomal auxiliary styles long, slender, straight, with slightly subtylote, lightly microspined bases, occasionally smooth, tapering to fusiform points. Length 209-(244.6)-293μm, width 3-(4.4)-7μm.
Microscleres. Palmate isochelae small, well silicified, unmodified. Length 8-(12.3)-16μm.

Toxas wing-shaped, variable in length and thickness, with sharply angular, deep central curvature, long straight arms on larger spicules, or slightly recurved arms on smaller spicules; largest with microspined points. Length 24-(123.2)-264μm, width 0.8-(2.3)-5μm.

REMARKS. Ridley & Dendy (1887) stated that this species had a halichondroid reticulate skeleton whereas the type shows the skeleton to be much more regular, renieroid-reticulate in places. Synonymy of *A. dianae* and *A. apollinis*, proposed by Koltun (1964a, 1976) is doubtful, as is the assumption that the species is bipolar (i.e., possible two or more sibling species). Their respective type specimens are similar, with only slight differences in spicule sizes, spicule geometries and skeletal structures, and consequently Koltun's proposed synonymy is maintained here.

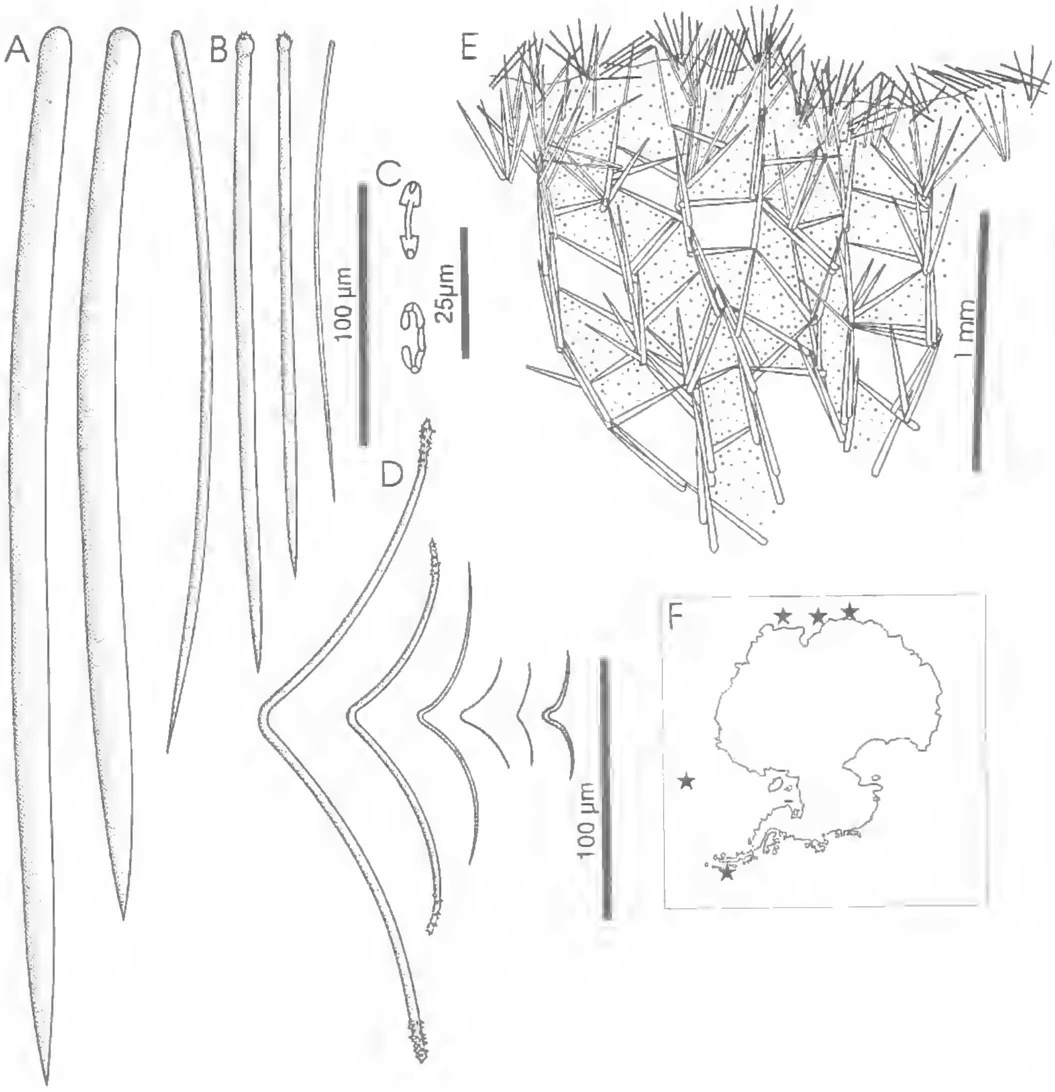


FIG. 309. *Artemisina apollinis* (Ridley & Dendy) (syntype BMNH1887.5.2.140). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyles. C, Palmate isochelae. D, Wing-shaped toxas. E, Section through peripheral skeleton. F, Australian distribution.

Artemisina jovis Dendy, 1924 (Fig. 311)

Artemisina jovis Dendy, 1924a: 343, pl.12, fig.6; Burton, 1930a: 530; Koltun, 1964a: 74-75; Bergquist & Fromont, 1988: 119-120, pl.56, figs b-c; Dawson, 1993: 36; Hooper & Wiedenmayer, 1994: 257.

MATERIAL. HOLOTYPE: BMNH1923.10. 1.112: 5km east of North Cape, New Zealand, 138m depth. PARATYPES: BMNH1923. 10.1.315, 316.

HABITAT DISTRIBUTION. Hard benthos; 45-138m depth; Antarctica - Wilkes Land, AAT (Koltun, 1964a) (Fig. 311E); also North Cape and Three Kings Is, New Zealand (Dendy, 1924a; Bergquist & Fromont, 1988).

DESCRIPTION. *Shape*. Flabellate, stalked, bifurcate digitate margins, 120-300mm high, 80-110mm wide, 8mm thick lamellae.
Colour. Greyish in ethanol.
Oscules. Oscules up to 6mm diameter, with slightly raised margins, clustered on osculiferous face of sponge.

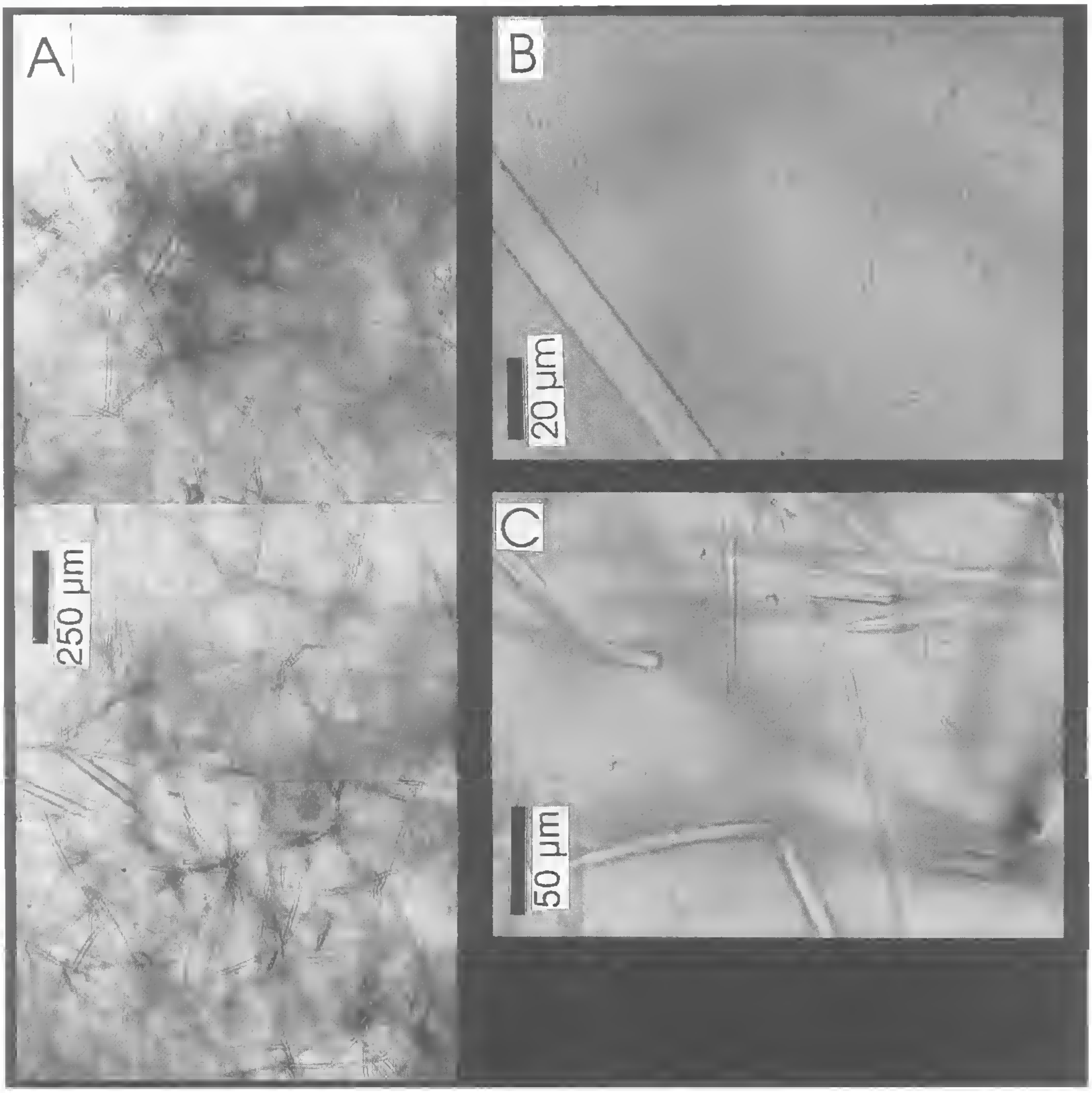


FIG. 310. *Artemisina apollinis* (Ridley & Dendy) (syntype BMNH1887.5.2.140). A, Skeletal structure. B, Palmate isochelae. C, Wing-shaped toxas.

Texture and surface characteristics. Firm, compressible; inhalant surface smooth, slightly undulating, with clearly visible porous ectosomal membrane stretched across pitted subectosomal region; exhalant surface osculiferous.

Ectosome and subectosome. Erect plumose brushes of subectosomal auxiliary styles producing continuous palisade at surface but markedly cavernous in subectosomal region.

Choanosome. Nearly regularly renieroid reticulate skeletal architecture composed of uni-, pauci- and multispicular tracts of choanosomal principal styles producing triangular meshes up to 350µm diameter, enclosed within moderately light collagen; fibres absent; spicule tracts relatively homogeneous, undifferentiated into primary or secondary elements; mesohyl matrix heavy, darkly pigmented, containing abundant microscleres.

Megascleres. Choanosomal principal styles large, robust, straight or slightly curved near basal end, fusiform pointed, with smooth rounded or very slightly subtylote bases. Length 361-(390.3)-448µm, width 12-(19.2)-26µm.

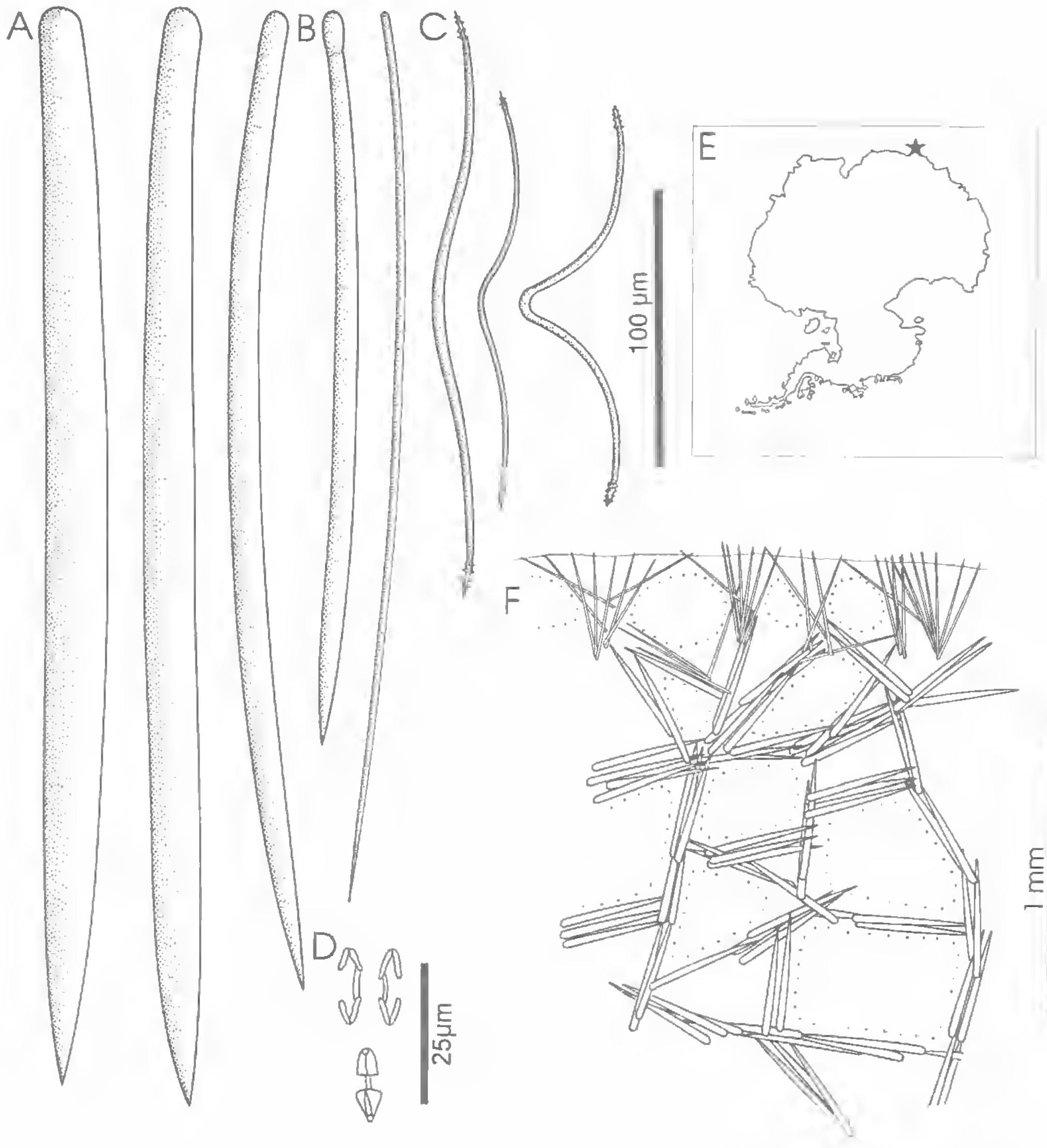


FIG. 311. *Artemisina jovis* Dendy (holotype BMNH1923.10.1.112). A, Choanosomal principal styles. B, Subectosomal auxiliary subtylostyles. C, Accolada - wing-shaped toxas. D, Palmate isochelae. E, Australian distribution. F, Section through peripheral skeleton.

Subectosomal auxiliary styles slender, short, fusiform pointed, straight or slightly curved near basal end, with smooth round bases. Length 234-(290.6)-375µm, width 3-(7.1)-10µm.

Microscleres. Palmate isochelae unmodified, abundant, well silicified. Length 10-(12.5)-16µm.

Toxas intermediate accolada-wing shaped, long, slender, with slightly rounded central curvature, slightly reflexed arms, microspined points. Length 98-(155.2)-215µm, width 1.5-(2.4)-4µm.

REMARKS. The type material revealed some discrepancies from published descriptions of both Dendy (1924a) and Bergquist & Fromont (1988), indicating variability between specimens. In particular skeletal meshes, described as being differentiated into ascending and transverse components, are virtually homogeneous in the holotype, and skeletal structure described by Bergquist & Fromont (1988) as plumose is regularly renieroid reticulate with no plumose component in the holotype. Spicule sizes also differ marginally from those described by Dendy (1924a). *Artemisina jovis* is very similar to *A. apollinis* in its skeletal structure, differing only substantially in growth form, toxa size and to a certain degree toxa geometry, and size and spination of other megascleres.

Artemisina plumosa Hentschel, 1914
(Fig. 312)

Artemisina plumosa Hentschel, 1914: 70-72, pl.4, fig.5, pl.6, fig.1 [et var. *lipochela*]; Burton, 1929a: 431 [Antarctica]; Burton, 1930a: 530; Koltun, 1964a: 73, pl.11, figs 1-8; Koltun, 1976: 190; Hooper & Wiedenmayer, 1994: 257.

Artemisina strongyla Hentschel, 1914: 72-73, pl.6, fig.2.

MATERIAL. HOLOTYPE: HM (fragments BMNH-1933.7.20.3, ZMB4762): Off Wilhelm II Coast, Antarctica.

HABITAT DISTRIBUTION. Soft substrata; 125-2269m depth; Antarctica - Enderby Land, Sabrina Coast, Princess Elizabeth Land, Wilhelm II Coast, Australian Antarctic Territory (Koltun, 1976) (Fig. 312F); also Falkland Is, Adelie Coast (Koltun, 1964a), Gauss Station (Hentschel, 1914; Burton, 1929a).

DESCRIPTION. *Shape*. Small, erect, bulbous, club-shaped, 28mm high, 25mm diameter.

Colour. Grey-brown in ethanol.

Oscules. Not observed.

Texture and surface characteristics. Firm, harsh texture; irregulary reticulate conulose.

Ectosome and subectosome. Plumose bundles of choanosomal principal styles protruding, forming nearl continuous palisade on surface; subectosomal auxiliary styles tangential or paratangential to surface, sparse, dispersed between protruding bundles of choanosomal styles.

Choanosome. Exlusively plumose near peripheral skeleton, slightly more reticulate, less organised in deeper parts of choanosome, with multispicular ascending tracts of choanosomal styles, without spongin fibres, most obvious near peripheral region of skeleton; length and width of spicule tracts reduced at core with diminished skeletal organisation whereby only pauci- or small multispicular tracts form skeletal reticulation at core, with square or triangular meshes, up to 300μm diameter; mesohyl matrix heavy, lightly pigmented, smooth, containing very abundant microscleres throughout.

Megascleres. Choanosomal principal styles long, robust, fusiform pointed, smooth, with rounded bases and typically slightly curved near basal end. Length 305-(378.2)-472μm, width 11-(13.7)-18μm.

Subectosomal auxiliary styles or tornostyles short, thin, straight, with slightly subtylote bases, smooth or microspined bases, rounded, hastate or mucronate points often with small spines, or sometimes with single small terminal spine, or quasi-diactinal asymmetrical ends. Length 181-(196.7)-268μm, width 3-(6.1)-8μm.

Microscleres. Palmate isochelae very abundant, moderately large, well silicified, occasionally contort. Length 8-(13.2)-16μm.

Toxas intermediate accolada-wing shaped, varying from minute to very large, typically with large angular central curvature, slightly reflexed arms, microspined points. Length 36-(140.1)-296μm, width 0.8-(2.5)-5μm.

REMARKS. *Artemisina plumosa* differs from other species in having quasi-diactinal auxiliary megascleres, including some with basal spination. Its toxas are also much larger and more prominently spined than the other 3 antarctic species described here, and skeletal architecture is heavily reticulate at core and exclusively plumose near periphery.

Hentschel (1914) and Koltun (1964a) recorded a second category of large choanosomal style, with similar geometry to principal spicules but nearly twice their length (800-2160x21-44μm), but these were not seen in the fragment of the holotype examined.

Artemisina tubulosa Koltun, 1964
(Figs 313-314)

Artemisina tubulosa Koltun, 1964a: 74, text-fig.18; Hooper & Wiedenmayer, 1994: 257.

MATERIAL. HOLOTYPE: BMNH1963.7. 29.52: Mawson Coast, Australian Antarctic Territory, 100m depth.

HABITAT DISTRIBUTION. Hard benthos; 100m depth; Australian Antarctic Territory (Fig. 313F).

DESCRIPTION. *Shape*. Tubulo-digitate, hollow, cylindrical, 100mm long, 30mm diameter.

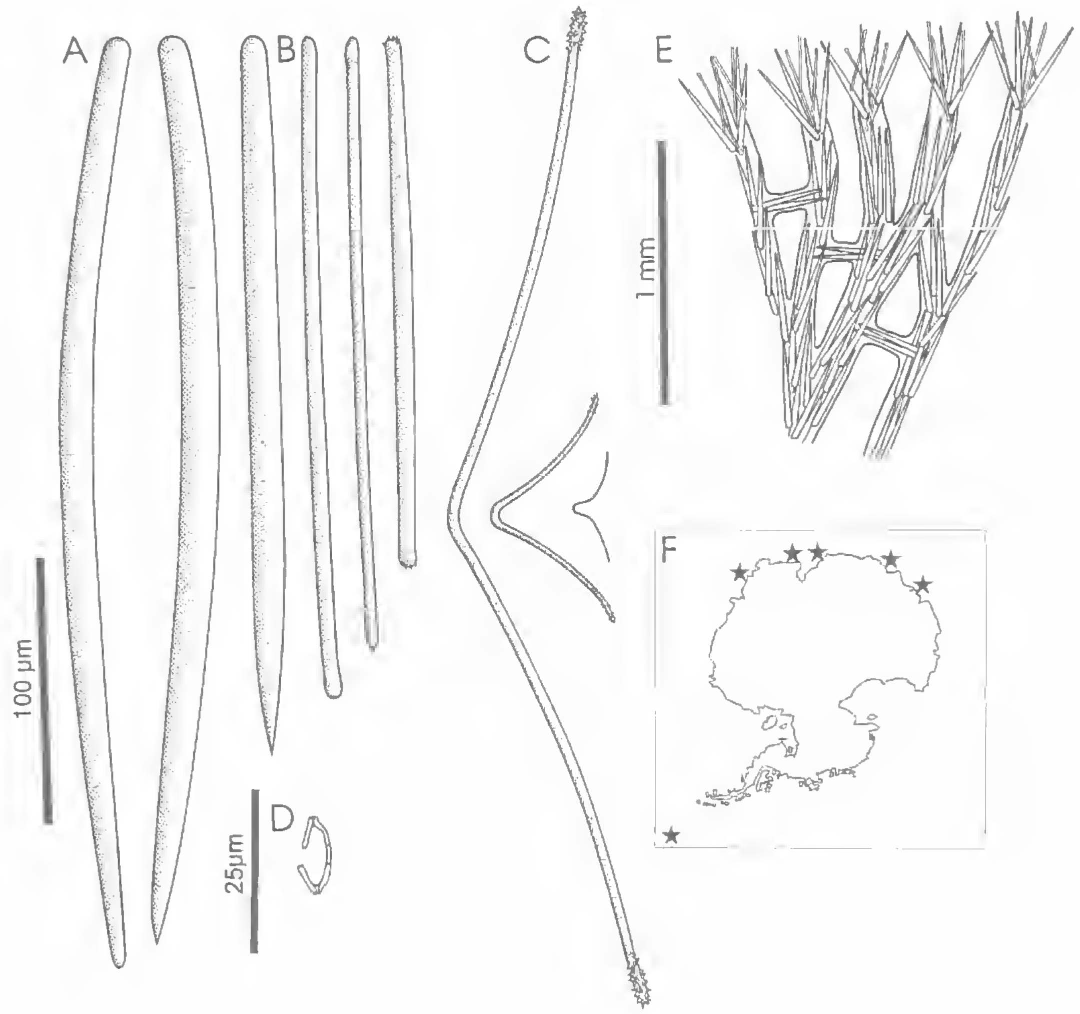


FIG. 312. *Artemisina plumosa* Hentschel (fragment of holotype BMNH1933.7.20.3). A, Choanosomal principal styles. B, Subectosomal auxiliary styles/ tornotes. C, Accolada - wing-shaped toxas. D, Palmate isochela. E, Section through peripheral skeleton. F, Australian distribution.

Colour. Beige-brown in ethanol.

Oscules. Not seen.

Texture and surface characteristics. Firm, harsh; surface microconulose, goose-flesh, pitted.

Ectosome and subectosome. Hispid, with plumose bundles of choanosomal principal styles protruding through surface in multispicular bundles; subectosomal auxiliary styles tangential or paratangential, scattered over surface, also with detritus embedded in surface.

Choanosome. Reticulate skeletal architecture, with large multispicular tracts of choanosomal principal spicules ascending to surface, and irregular uni-, paucispicular or smaller, transverse multispicular tracts interconnecting main tracts, together producing a nearly myxillid-like triangular reticulation, with meshes up to 800µm diameter; spongin fibres absent, with spicule tracts bonded together by collagen; mesohyl matrix heavy but only lightly pigmented, with numerous microscleres scattered between fibres.

Megascleres. Choanosomal principal styles thick, fusiform, rounded bases, smooth, slightly curved near basal end. Length 705-(778.8)-874µm, width 18-(30.2)-39µm.

Subectosomal auxiliary styles short, thin, mostly straight, with rounded or very slightly subtylote or occasionally polytylote bases, typically microspined, and with blunt hastate microspined points. Length 384-(456.3)-494µm, width 6-(8.4)-11µm.

Microscleres. Palmate isochelae abundant, moderately large, well silicified, unmodified. Length 12-(15.8)-19µm.

Toxas intermediate accolada-wing shaped, long, thick, angular central curvature, spined points. Length 602-(674.2)-824µm, width 4-(6.4)-9µm.

REMARKS. *Artemisina tubulosa* is similar to *A. plumosa* in skeletal architecture and spicule geometry, and the two are probably at least sibling species. Whereas *A. tubulosa* has microspined base on some of the auxiliary spicules it lacks diactinal modifications to those spicules as found in *A. plumosa*. Similarly, skeletal structure is also prominently reticulate, with large spicule tracts clearly differentiated into primary and secondary elements, whereas those of *A. plumosa* are exclusively plumose in the peripheral skeleton.

OTHER SPECIES OF *ARTEMISINA*

Artemisina archegona Ristau, 1978

Artemisina archegona Ristau, 1978b: 585-587, text-figs 2F, 3F, 6C-D [Carmel, California].

MATERIAL. HOLOTYPE: USNM24528. Province: NE Pacific.

Artemisina arciger (Schmidt, 1870)

Suberites arciger Schmidt, 1870: 47, pl.5, fig.6.

Artemisina suberitoides Vosmaer, 1885a: 25-26, pl.1, fig.16, pl.4, figs 11-14, pl.5, figs 51-55 [Arctic]; Ridley & Dendy, 1887: 112 [off Nova Scotia]; Fristedt, 1887: 430, pl.24, figs 15-17; Whiteaves, 1901: 17; Lundbeck, 1905: 113.

Artemisina arcigera; Lundbeck, 1905: 110-114, pl.1, figs 9-11, pl.13, fig.3; Arndt, 1913: 115; Topsent, 1913b: 47, pl.1, fig.6; Rezvoi, 1925: 197, [var. *spiceps*; Arctic]; Burton, 1930a: 528-529 [type-species]; Hentschel, 1929: 876, 938 [Arctic].

Artemisina arciger; Burton, 1959b: 42 [Iceland]; Van Soest & Stone, 1986: 47 [note].

MATERIAL. HOLOTYPE: LMJG, fragment BMNH1870.5.3.90; holotype of *suberitoides*: ZMA POR443, fragments BMNH1901.1.1604, 1351. Province: NW. Atlantic, NE. Atlantic, Arctic.

Artemisina elegantula Dendy, 1924

Artemisina elegantula Dendy, 1924a: 344 [N.of New Zealand]; Burton, 1930a: 531; Bergquist & Fromont, 1988: 120; Dawson, 1993: 36 [index]; Lévi, 1994: 36, fig.206, pl.7, fig.1 [S. of New Caledonia].

MATERIAL. HOLOTYPE: BMNH1923.10. 1.113. New Zealand, New Caledonia.

Artemisina erecta Topsent, 1904

Artemisina erecta Topsent, 1904a: 214-215, pl.5, fig.18, pl.15, fig.10 [Azores]; Burton, 1930a: 530.

MATERIAL. HOLOTYPE: MOM. NE. Atlantic.

Artemisina hispanica Ferrer-Hernnádez, 1918

Artemisina hispanica Ferrer-Hernández, 1918: 536-538, fig.3, text-fig.5 [Santander]; Lévi, 1960a: 83 [Santander, Mediterranean]; Burton, 1930a: 530.

MATERIAL. HOLOTYPE: Madrid. Mediterranean.

Artemisina indica (Thomas, 1974)

Qasimella indica Thomas, 1974: 311-312, text-fig.1 [Gulf of Manaar].

MATERIAL. HOLOTYPE: CMFRIT84/1, paratype CMFRIT84/2. N. central Indian Ocean.

Artemisina melana Van Soest, 1984

Artemisina melana Van Soest, 1984b: 122-124, pl.8, figs 7-8, text-fig.49 [Curaçao]; Zea, 1987: 173, text-fig.61, pl.11, figs 3-4 [Columbian Caribbean].

MATERIAL. HOLOTYPE: ZMAPOR4881, paratype ZMAPOR4882, 4883. Caribbean.

Artemisina stipitata Koltun, 1958

Artemisina stipitata Koltun, 1958: 52-53, text-fig.10 [Kurile Strait].

MATERIAL. HOLOTYPE: BMNH1963.7. 29.39. NW. Pacific.

Artemisina transiens Topsent, 1890

Artemisina transiens Topsent, 1890b: 66 [nomen nudum]; Topsent, 1892a: 94, pl.2, fig.5, pl.4, fig.8, pl.9, fig.18 [Atlantic coast of France]; Ferrer-Hernández, 1914: 3; Burton, 1930a: 529-530; Lévi, 1960a: 83-84 [Asturies, Mediterranean].

MATERIAL. HOLOTYPE: MOM. NE. Atlantic, Mediterranean.

Artemisina vulcani Lévi, 1963

Artemisina vulcani Lévi, 1963: 64-65, pl.9F, text-fig.74 [South Africa].

MATERIAL. HOLOTYPE: MNHNDCL622. South Africa.

TRANSFERS

List of other species described in *Artemisina* but now transferred to another genus.

Paresperia intermedia Burton, 1930a: 501 [Norway].

Artemisina intermedia; Van Soest, 1984b: 130 [possible generic synonymy].

Esperiopsis intermedia; Van Soest & Stone, 1986: 45

MATERIAL. HOLOTYPE: BMNH1910.1. 1.912. Note: referred to Desmacididae, *Esperiopsis*.

Amphilectus pilosus Ridley & Dendy, 1886: 350; Ridley & Dendy, 1887: 126-127, pl.19, fig.5, pl.25, fig.3 [Kerguelen Is; Marion I.].

Lissodendoryx pilosus; Topsent, 1901: 20.

Megaciella pilosa; Hallmann, 1920: 772; Van Soest, 1984b: 128 [possibly Myxillidae].

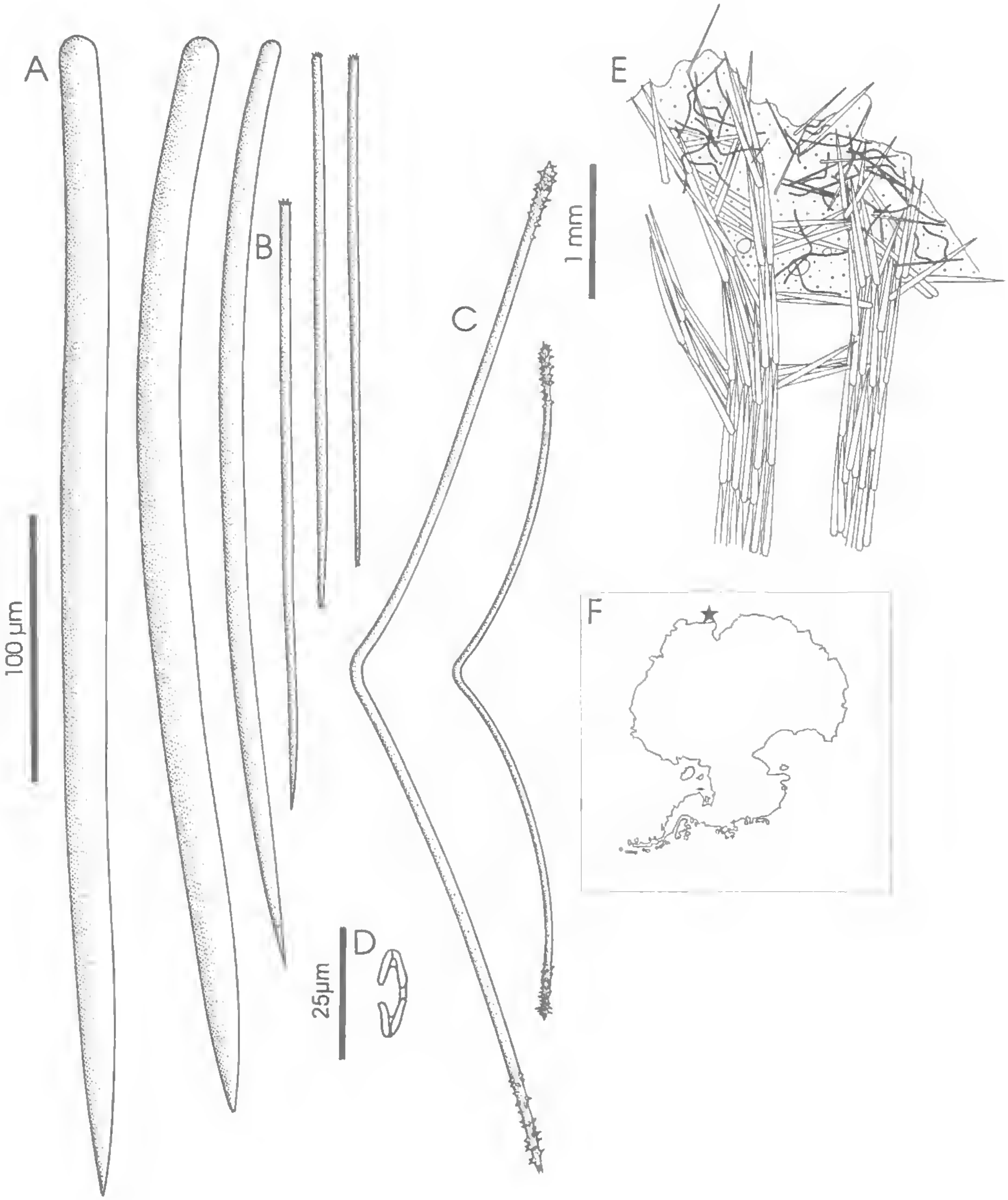


FIG. 313. *Artemisina tubulosa* Koltun (holotype BMNH1963.7.27.52). A, Choanosomal principal styles. B, Subectosomal auxiliary styles. C, Accolada - wing-shaped toxas. D, Palmate isochela. E, Section through peripheral skeleton. F, Australian distribution.

Artemisina pilosus; Ristau, 1978: 585-586 [note on affinities].

MATERIAL. HOLOTYPE: BMNH1887.5.2. 124. Note: referred to Iophonidae, *Megaciella*.

Artemisina tylota Boury-Esnault, 1973: 286-287, text-fig.48 [Brazilian Basin].

Cornulum tylota; Van Soest, 1984b: 124.

MATERIAL. HOLOTYPE: MNHNDNBE943. Note: referred to lophonidae, *Cornulum*. *Incertae sedis*

Pandaros Duchassaing & Michelotti, 1864

Pandaros Duchassaing & Michelotti, 1864: 88; Schmidt, 1870: 59; de Laubenfels, 1936a: 123; Wiedenmayer, 1977: 143; Van Soest, 1984b: 127.

TYPE SPECIES. *Pandaros acanthifolium* Duchassaing & Michelotti, 1864: 90 (by subsequent designation ofde Laubenfels, 1936a: 123).

DEFINITION. Well-developed choanosomal skeletal reticulation of spongin fibres woven into flattened anastomosing branches, or forming continuous sheets without any regular architecture; fibres cored by auxiliary styles, subtylostyles to tylostyles, predominantly smooth, distributed within fibres in criss-cross fashion; fibres echinated by rare acanthostyles, rarely smooth styles; few anisotornotes, verging on oxeas, scattered throughout mesohyl; sparsely dispersed tangential subectosomal auxiliary spicules dispersed throughout peripheral skeleton; microscleres absent.

REMARKS. No Australian species.

SPECIES OF *PANDAROS*

Pandaros acanthifolium Duchassaing & Michelotti, 1864

Pandaros acanthifolium Duchassaing & Michelotti, 1864: 90, pl.20, fig.2 [St.Thomas, Virgin Is]; de Laubenfels, 1936a: 123 [Florida]; Hechtel, 1965: 45; Wiedenmayer, 1977: 144, pl.30, figs 4-5, text-fig.148 [Bimini, Bermudas]; Schmitz et al., 1981: 853-865 [biochem.]; Van Soest, 1984b: 127-128, text-fig.51 [Curaçao]; Pulitzer-Finali, 1986: 149, fig.68 [West Indies]; Zea, 1987: 175, pl.4, fig.4, text-fig.62 [Columbian Caribbean].

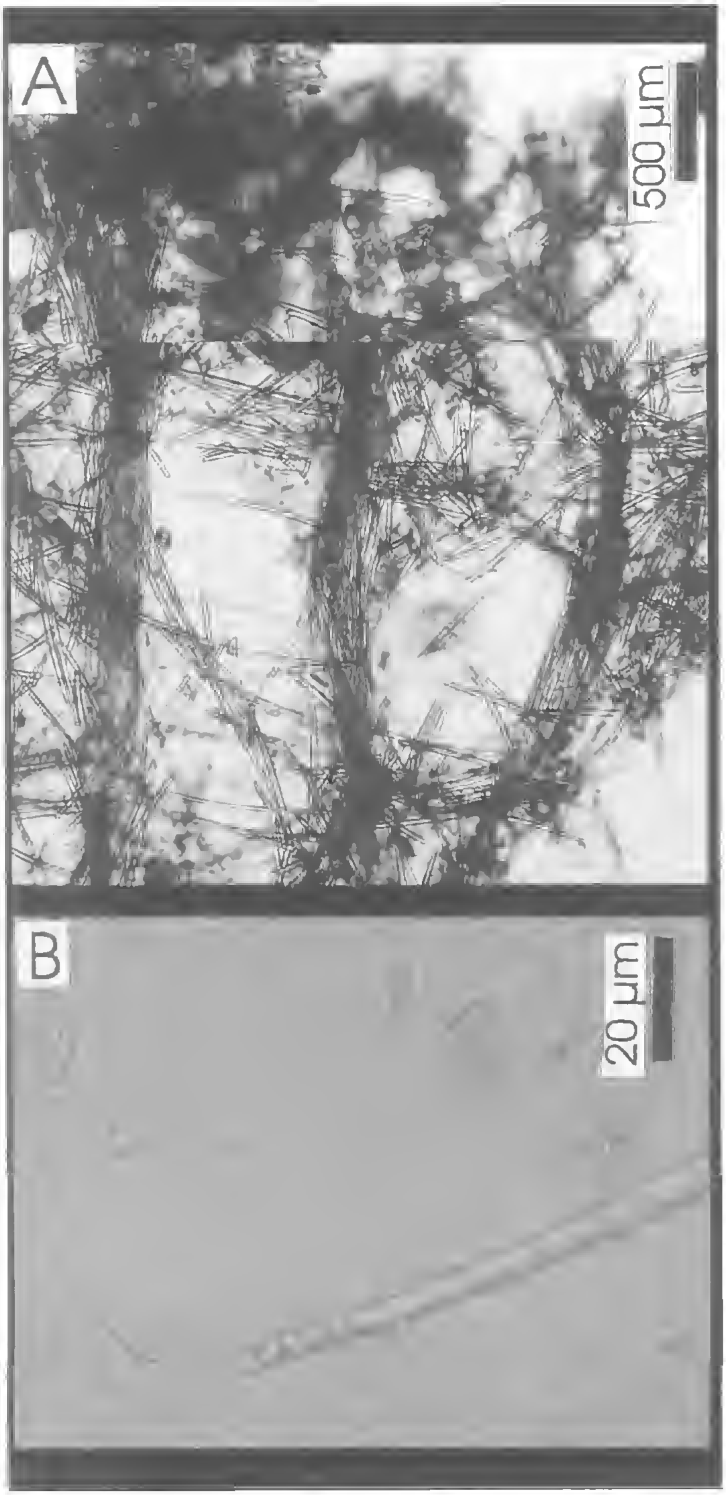


FIG. 314. *Artemisina tubulosa* Koltun (holotype BMNH1963.7.27.52). A, Skeletal structure. B, Palmate isochelae and spined toxas.

Pandaros arbusculum, in part, Duchassaing & Michelotti, 1864: 88, pl.18, fig.6 [St.Thomas, Virgin Is].

Thalyseurypon conulosa Hechtel, 1965: 44, pl.6, fig.1, text-fig.9 [Port Royal; Jamaica]; Alcolado, 1976: 5 [Cuba].

MATERIAL. LECTOTYPE: TMPOR57 (fragments USNM31020, MNHNDNBE1309, BMNH1928.11.12.16), paralectotype: IZUGCE38.762 (fragment BMNH1928.11.12.15); holotype of *T. conulosa*: YPM5042. Caribbean.

Pandaros kasumiensis (Tanita, 1965), uncertain placement

Raspailia kasumiensis Tanita, 1965: 67, text-figs 1-2 [Japan]; Hoshino, 1970: 23, text-figs 3(2), 2(4); Hoshino, 1971: 24.

Thalyseurypon kasumiensis; Hoshino, 1981: 159-161, text-fig.70 [Japan].

? *Pandaros kasumiensis*, Hooper, 1988b: 353, 766.

MATERIAL. HOLOTYPE: MMBSSIS-052. NW. Pacific.

TRANSFERS

List of other species described in *Pandaros* but now transferred to another genus.

Pandaros angulosa Duchassaing & Michelotti, 1864: 89, pl.19, fig.4 [St. Thomas, Virgin Is].

Mycale (Aegogropila) angulosa; Van Soest, 1984b: 16-19, pl.1, figs 5-6, text-fig.3 [plus synonymy]; Pulitzer-Finali, 1986: 130-133, figs 52-55.

Not *Mycale angulosa*; de Laubenfels, 1936a: 116.

Zygomycale parishii, in part; de Laubenfels, 1956: 3; Hechtel, 1965: 48, pl.5, fig.3; Alcolado, 1980: 4.

MATERIAL. LECTOTYPE: TMPOR54 (fragments USNM31021, MNHNDNBE1310, BMNH1928.11.12.20). referred to Mycalidae, *Mycale*.

Pandaros arbusculum Duchassaing & Michelotti, 1864: 88, pl.18, fig.6 [St. Thomas, Virgin Is].

Ptilocaulis sp. aff. *spiculifer* (Lamarck,1814); Wiedenmayer, 1977: 153, 251.

Ptilocaulis arbusculum; Van Soest et al., 1983: 204.

MATERIAL. LECTOTYPE: ZMAPOR1728, paralectotype ZMAPOR1729. referred to Axinellidae, *Ptilocaulis*.

Pandaros lugubris Duchassaing & Michelotti, 1864: 89 [St. Thomas, Virgin Is].

Echinodictyum lugubre; Wiedenmayer, 1977: 255; Pulitzer-Finali, 1986: 106-107.

MATERIAL. LECTOTYPE: TMPOR55 (fragments USNM31023, MNHNDNBE1312, BMNH1928.11.12.21). referred to Raspailiidae.

Pandaros pennata Duchassaing & Michelotti, 1864: 88, pl.20, fig.3 [St. Thomas, Virgin Is].

Echinodictyum pennatum; Wiedenmayer, 1977: 251, 255.

MATERIAL. LECTOTYPE: TMPOR58 (fragments USNM31024, MNHNDNBE1313, BMNH1928.11.12.22), paralectotype: ZMA POR1731. referred to Raspailiidae, *Echinodictyum*.

Pandaros walpersii Duchassaing & Michelotti, 1864: 90, pl.20, fig.4, text-fig.2D [St. Thomas, Virgin Is].

Ptilocaulis walpersi; Wiedenmayer, 1977: 255.

Spongia spiculifera Lamarck, 1814: 449.

Ptilocaulis spiculifera; Pulitzer-Finali, 1986: 103-104 [West Indies].

MATERIAL. LECTOTYPE: TMPOR56 (fragments USNM31025, MNHNDNBE1314, BMNH1928.11.12.17), paralectotype: IZUGCE 38.763. referred to Axinellidae, *Ptilocaulis*.

DISCUSSION

Classification. Microcionidae contains 7 genera, 12 subgenera and 459 valid species of which 148 are recorded in the Australian fauna. The present work describes 31 new species from Australia, and 3 from other localities for misidentified taxa, 18 new names for preoccupied taxa, and 162 new taxonomic combinations. Many species are also new records for Australia and many are illustrated for the first time. Nevertheless, there are likely many more species still undescribed in this region considering that the encrusting fauna has not yet been comprehensively sampled.

This revised classification is based on a re-evaluation of all characters, including an analysis of their consistency within populations of several species, and places primary importance on skeletal structure and localisation of spicule types to particular regions in the skeleton. This contrasts with previous schemes which gave priority to characters such as patterns of skeletal architecture (e.g., Lévi, 1960a), megasclere form and distribution within the skeleton (Hallmann, 1920), ectosomal structure and composition (Van Soest, 1984a), microsclere geometry and diversity (e.g., de Laubenfels, 1936a), or combining all these characters into a a consensus matrix with a consequent proliferation of genera (e.g., Bergquist & Fromont, 1988).

Re-examination of the type species of 73 nominal genera included in Microcionidae at one time or another found that many had been misdescribed, or important characters overlooked, with the consequence that previous interpretations of genera are mostly incorrect. Furthermore, many of these nominal genera are not valid in a phylogenetic sense given that their supposed apomorphic characters are unstable (inconsistent) within otherwise closely related species. These earlier classifications had extraordinary high levels of homoplasy (Hooper, 1990a), partly a consequence of relying on single morphological characters (which when used in isolation cut across a classification based on other single characters). I use combinations of characters to develop a phylogeny.

At the species level several characters are prone to ecophenotypic variability (notably growth form, effect of water depth on colour, loss of microscleres, reduced silification and variability in spicule dimensions across broad geographical ranges), whereas most other skeletal characters are more consistent within populations of single species. It is proposed that small cryptic differences in skeletal characters are indicative of divergent, sibling species relationships, with some empirical support from biochemical and genetic data (Hooper et al., 1991).

Phylogenetic analysis. Hypothesised phylogenetic relationships based on coded, multistate (Table 47) data matrices were generated using PAUP 3.0 (Swofford, 1991), and CONTREE was used to obtain consensus information from these analyses as outlined by Hooper & Lévi (1994). Determinations of plesiomorphies were largely made through outgroup comparision (Raspailiidae), but these interpretations are complicated by the prevalance of analogous characters throughout Porifera (or misinterpretation of homology by authors). Consequently some information from the fossil record is considered below to assist in determining character polarity.

(1) Skeletal structure: Ordovician *Saccospongia* had a clathrous, fibrous reticulate skeleton, cored by axially compressed and extra-axially plumose spicule tracts, with coring spicules also protruding through fibre endings in plumose bundles (Finks, 1967). A similar structure in some living poecilosclerids, such as *Esperiopsis* (Hooper & Lévi, 1989), which also have a 'lithistid' (desma-bearing) basal skeleton — a condition relatively widespread during the Ordovician (Finks, 1970) — imply that the axial compressed condition may be plesiomorphic for living *Clathria* (*Axociella*) and many *Raspailia* (Raspailiidae).

The use of Raspailiidae as an outgroup of Microcionidae is based on their proposed sister-group relationship (Hooper, 1991), sharing a similar range of skeletal structures (including hymedesmoid, microcionid, renieroid, reticulate and compressed architectural types), echinating acanthostyles and ectosomal specialisation. These structural similarities are considered to have a phylogenetic basis (with some empirical support from biochemical and genetic data; Hooper et al., 1992) rather than merely representing convergence of a few characters. Raspailiidae was previously included in order Axinellida based solely on possession of axial skeletal compression in some species (Bergquist, 1978), but this character is of dubious value when used alone occurring in many other poecilosclerids.

(2) Ectosomal skeleton: The 'sclerosponge' *Calcifibrospongia* has a tangential (isodictyal) ectosomal skeleton of strongyles lying on or just below the exopinacoderm (Hartman, 1979); Vacelet (1985) and Van Soest (1984a) suggested that this feature links it with the Haplosclerida, particularly the Haliclonidae. This would infer that a tangential ectosomal skeleton is plesiomorphic for the haplosclerids. However, similar features in some Microcionidae represent parallel development (e.g., quasi-diactinal ectosomal spicules in some *Holopsamma*, quasi-diactinal structural spicules in *Echinochalina*). The tangential layer of amphitylotes in the Myxillidae is unique to the group (e.g., *Lissodendoryx*), upon which Van Soest (1984b) based his classification, but the myxillid (tangential amphitylote) ectosomal skeleton in *Acarnus* is enigmatic since its microscleres are typical of Microcionidae. Thus Hooper (1988, 1990a) considered that microscleres were more easily modified, acquired independently or lost in the Poecilosclerida than was the ectosomal skeleton, which in this case defined the Myxillidae. Hajdu et al. (1994) thought that microsclere geometry was far more conservative than that of megascleres (which might be more susceptible to phenotypic influences). Less obvious is the polarity of the sequence *Clathria-Dendrocia-Thalysias*, varying from a virtually aspicular ectosome to a dense, continuous palisade of erect megascleres. I suggest that the latter condition is more plesiomorphic based on the 'raspailiid ectosomal condition' (i.e., smaller auxiliary spicules surrounding bases of protruding larger subectosomal spicules) being common to the outgroup Raspailiidae, and diminishment of ectosomal structure or loss of spicules representing a secondary derivation.

(3) Spicule axes: It could be argued that oxeote (diactinal) megascleres represent the ancestral condition in this family because they appeared in the Cambrian (Rigby, 1986), whereas styloid (monactinal) spicules are not known earlier than the Ordovician. However, in Microcionidae oxeotes (in *E.* (*Protophlitaspongia*) for example) represent recent derivations from styloid forms (much like the derived tetractinal styloid modifications in *Acarnus* (Myxillidae); Van Soest et al., 1991).

TABLE 46. Comparison between species of *Echinochalina (Protophlitaspongia)* in major morphological characters. Measurements in µm.

CHARACTER	*E. bispiculata* (Dendy)	*E. oxeata* (Burton)	*E. laboutei* Hooper & Lévi	*E. bargibanti* Hooper & Lévi	*E. favulosa* sp.nov.	*E. tuberosa* sp.nov.	*E. isaaci* sp.nov.	*E. collata* sp.nov
Fibre skeleton structure	irregularly reticulate, detritus cavernous in axis, more compact in periphery	irregularly reticulate, distinct primary and secondary fibres	heavily condensed axis, regularly reticulate extra-axis	regularly reticulate throughout, cavernous meshes	irregularly reticulate, wide meshes, much detritus	egularly plumo-reticulate, diverging near periphery, meshes even throughout	regularly reticulate, wide even meshes diverging near periphery	irregularly reticulate, even meshes, fibres 2% cored
Collagen in mesohyl	rich	rich	poor	poor	abundant	moderate	very light	abundant
Fibre mesh shape (and size)	elongate or oval (180-450)	cavernous, oval (145-550)	elongate (50-250)	square or rounded (80-180)	elongate (100-300)	square or round (70-150)	elongate (370-650)	oval or elongate (120-440)
Fibre diameter	20-50	22-55	15-90	8-40	20-50	20-60	40-70	45-120
Spicules in skeletal tracts	abundant	mod. sparse	mod. sparse	very sparse	mod. abundant	mod. abundant	mod. abundant	abundant
Spicule silification	well silicified	well silicified	poorly silicified	poorly silicified	well silicified	well silicified	well silicified	well silicified
Coring spicules in primary fibres	multispicular	pauci- or multispicular	bi- or paucispicular	uni- or paucispicular	pauci- or rarely multispicular	multispicular	pauci- or multispicular	multispicular
Coring spicules in secondary fibres	uni- or aspicular	uni- or aspicular	aspicular	unispicular	uni- or aspicular	uni- or paucispicular	unispicular or aspicular	uni- or paucispicular
Growth form	massive-lobate, tubular digits on surface	branching, cylindrical, digitate	cylindrical digitate, arborescent	clumped lobate-digitate	erect, cylindrical digit,honey-combed surface	digitate, lobate-digitate, or encrusting digitate	erect, arborescent, cylindrical digits	thickly encrusting, bulbous surface

(4) Spicule ornamentation: Hypercalcified sponges ('sclerosponges') were major contributors to reef building during the Palaeozoic and Mesozoic (Hartman & Goreau, 1975; Hartman, 1979), with extant species (in Merliida and Ceratoporellida) having entirely acanthose choanosomal megascleres (verticillate acanthostyles). Vacelet (1985) suggested that sclerosponges were polyphyletic having affinities with many demosponge groups, and if living species represent relict ancestral groups of Demospongiae, then there is argument to suggest that acanthose megascleres are ancestral. Conversely, smooth monaxons were predominant in Palaeozoic and Mesozoic sponges such as *Saccospongia* (Rigby, 1986), in which case the smooth condition may be more primitive. This is a subject of continual speculation, both hypotheses equally supported by tenable arguments (e.g., Van Soest, 1984a, 1987). Within Microcionidae it is considered that acanthose spicules are plesiomorphic, shared by most species, whereas smooth spicules represent a derived secondary loss of spination. This interpretation is consistent with similar determination for Raspailiidae (Hooper, 1991).

(5) Echinating spicules: Echinating spicules are known for 7 families of Poecilosclerida and may represent a synapomorphy for the suborders Microcionina and Myxillina (Hajdu et al., 1994) (i.e. absent from the base group Mycalina). Not all genera within these families have them and their absence is interpreted as a (derived) secondary loss (with the corollary that echinating spicules in Microcionidae is retention of an ancestral character). Similarly, smooth echinating or pseudo-echinating spicules, such as in *Echinoclathria* and *Echinochalina*, have probab-

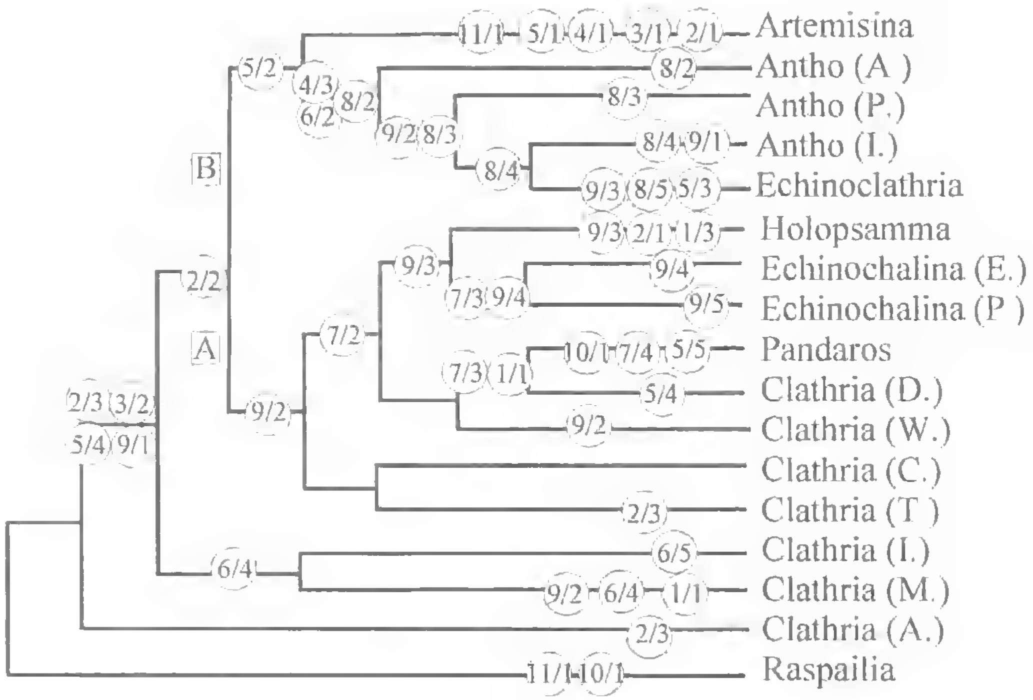


FIG. 315. Hypothesised relationships between genera of Microcionidae based on computer-generated phylogenetic analysis using parsimony (PAUP 3.0; Swofford, 1991). Each number on the cladogram (x/y) corresponds to a character and character state respectively (Table 47) and represents an evolutionary change from a plesiomorphic to an apomorphic state. The tree is derived from a consensus of 9 possible minimum length trees, based on an unweighted, unordered, multistate character set (consensus information = 0.609), with plesiomorphy determined by outgroup comparisons with the Raspailiidae.

ly lost their spination and are a derived condition because in most species they are spined.

(6) Chelae morphology: Hajdu et al. (1994a) subordinal classification of Poecilosclerida largely based on modifications to chelae (i.e., Microcionina with only palmate forms, Myxillina with modified bi- or tridentate modifications, Mycalina with sigmancistra derivatives). Palmate chelae were thought to be ancestral given their prevalence throughout Poecilosclerida and co-occurrence with other forms of chelae, whereas arcuate chelae were derived from archetypal palmate morphology. Similarly anchorate chelae were thought to have arisen from arcuate modifications to the primitive palmate archactypes. Lateral ridges on the shaft of anchorate chelae were interpreted by Hajdu et al. (1994a) as the beginning of two other (new) lateral alae (i.e. acquisition of new structures), which occasionally meet in the middle of the shaft to produce a continuous ridge along the length of the spicule. An alternative view is that these ridges may be the remnants of the point of attachment between the lateral alae and shaft (i.e., a reduction from the existing fused structure). If this latter interpretation is correct (and it is energetically more probable than the acquisition of a new structure), then anchorate chelae may

TABLE 47. List of characters and character states used to judge apomorphy in the construction of the cladogram of relationships between genera of Microcionidae based on outgroup comparisons with members of the family Raspailiidae. States marked with an asterisk indicate pleisiomorphic condition(s) and discussed in the Analysis of Morphometric Characters. Consistency Index (CI) is indicated for each character obtained from parsimony ananlysis (Swafford, 1991)

1. Growth form specialisation. (CI = 1.0) *1*. encrusting or bulbous-encrusting growth forms. *2*.* massive, branching, lobate, flabellate, vasiform or tubular growth forms. *3*. specialised honeycomb-reticulate growth forms composed of tightly anastomosing flattened fibre-branches (lacunae).

2. Ectosomal skeleton specialisation. (CI = 0.6) *1*. membraneous,skin-like exterior, with single category of (subectosomal) auxiliary spicule extending from choanosomal skeleton protruding through surface forming discrete paratangential or erect brushes. *2*. with single category of (subectosomal) auxiliary spicule on surface forming tangential,paratangential or plumose tracts. *3*. with two categories of auxiliary spicules,smaller ectosomal spicules generally overlaying larger subectosomal spicules forming discrete bundles or continuous palisade on surface. *4*.* with specialised ectosomal skeleton composed of smaller auxiliary spicules surrounding bases of protruding larger subectosomal spicules.

3. Subectosomal skeleton structure. (CI=0.5) *1*. radial,with perpendicular bundles or single spicules supporting ectosome. *2*.* plumose, plumoreticulate, or disorganised tracts of spicules in peripheral skeleton.

4. Differentiation within choanosomal skeleton. (CI = 0.667) *1* choanosomal skeleton more-or-less undifferentiated, unstructured. *2*. choanosomal skeleton well structured, hymedesmoid to reticulate, but lacking any differentiated components. *3*.* choanosomal skeleton well structured, predominantly reticulate, differentiated into two distinct components.

5. Fibre development and skeletal architecture. (CI = 0.714) *1*. choanosomal skeleton without spongin fibres (or indefinite fibres), with spicules forming more-or-less disorganised halichondroid, vaguely ascending, longitudinal reticulate tracts. *2*. choanosomal skeleton with poorly developed spongin fibres, primary (basal or axial) renieroid component cored by acanthose principal spicules,secondary plumose, subisodictyal or plumoreticulate component cored by smooth principal spicules. *3*. choanosomal skeleton with well developed spongin fibres, primary skeleton compressed, renieroid, cored smaller smooth principal styles, secondary skeleton vestigial or greatly reduced, consisting only of larger smooth principal styles embedded in peripheral fibres forming sparse radial tracts. *4*. choanosomal skeleton with well developed spongin fibres forming more-or-less evenly reticulate or plumo-reticulate meshes throughout in massive forms, or thick basal layer of spongin and hymedesmoid structure in encrusting forms. *5*. choanosomal skeleton with well developed spongin fibres woven into flattened reticulate branches or forming continuous sheets without any regular architecture, cored by criss-cross of auxiliary styles. *6*.* choanosomal skeleton with well developed spongin fibres forming compressed reticulate axis and well differentiated radial, plumose or plumo-reticulate extra-axis.

6. Compression of choanosomal skeleton. (CI = 0.8) *1*. choanosomal skeleton without any marked axial compression or differentiated axial and extra-axial regions. *2*. choanosomal skeleton without marked axial compression but well differentiated axial and extra-axial (radial, plumose or plumoreticulate) regions. *3*.* choanosomal skeleton with noticeably compressed axis and well differentiated axial and extra-axial (radial, plumose or plumoreticulate) regions. *4*. choanosomal skeleton hymedesmoid or microcionid, with basal layer of spongin lying on substrate (with or without ascending, non-anastomosing fibre nodes), and bases of principal spicules standing perpendicular to substrate. *5*. choanosomal skeleton evenly renieroid or isodictyal reticulate throughout with well developed spongin fibres cored by smooth principal styles.

7. Derivation of spicules coring fibres. (CI = 0.75) *1*.* choanosomal fibres or skeletal tracts cored by one or more category of principal spicules. *2*. choanosomal fibres or skeletal tracts cored by auxiliary spicules but partially or wholly replaced by detritus. *3*. choanosomal fibres or skeletal tracts cored by auxiliary spicules identical to those in ectosomal and subectosomal skeletons. *4*. choanosomal fibres or skeletal tracts cored by auxiliary spicules different from those in peripheral skeleton.

8. Differentiation of primary and secondary skeletal components. (CI = 1.0) *1*.* primary and secondary skeletons undifferentiated. *2*. primary skeleton renieroid cored by axially or basally compressed tracts of acanthostyles,secondary skeleton cored by smooth principal styles in plumose, subisodictyal or plumoreticulate tracts. *3*. primary skeleton renieroid cored by axially or basally compressed tracts of acanthostrongyles,secondary skeleton cored by smooth principal styles in plumose, subisodictyal or plumoreticulate tracts. *4*. primary skeleton axially compressed spongin fibres cored by renieroid tracts of sparsely spined principal styles intermingled with plumose or plumoreticulate tracts of smooth principal styles, overlaid by secondary extra-axial plumose skeleton cored by larger smooth principal styles. *5*. primary renieroid reticulate skeleton cored by smooth principal styles and echinated by identical spicules, with secondary radial extra-axial skeleton on exterior edge of skeleton only cored by larger smooth principal styles.

9. Derivation of echinating spicules. (CI = 0.444) *1*. echinating spicules absent. *2*.* special category of (acantho)styles present echinating fibres, differentiated from principal spicules. *3*. echinating spicules styles or acanthostyles undifferentiated from principal spicules coring spongin fibres. *4*. echinating spicules styles or acanthostyles representing principal spicules, but different from those coring fibres. *5*. echinating spicules oxeas or anisoxeas representing principal spicules, but different from those coring fibres.

10. Modifications to chelae microscleres. (CI = 0.5) *1*. chelae absent. *2*.* isochelae palmate. *3*. isochelae arcuate-like. *4*. isochelae anchorate-like.

11. Ornamentation of toxa microscleres. (CI = 0.667) *1*. toxas absent. *2*.* toxas with predominantly smooth points. *3*. toxas with predominantly spined points.

preceed arcuate chelae in the series from palmate to bidentate- or tridentate-derived chelae. However, the practical problem with the Hajdu et al. (1994a) proposal is that there is no sharp distinction between these three chelae types, being one of grade (and perhaps not of clade). Frequent modifications to chelae can be seen in all three chelae morphs (curvature and thickening of the shaft, possession of unguiferous forms, reduction of alae to 'teeth', fusion or detachment of alae from shaft, anchorate chelae without lateral ridges or palmate chelae with vestigial, ridge-like alae), such that the terms 'arcuate' and 'anchorate' become a matter of degree rather than an absolute descriptor.

Several Microcionidae genera have been established solely on the basis of bidentate- or tridentate-derived isochelae, including arcuate and bidentate sigmoid chelae (*Anaata*, *Anthoarcuata*, *Bipocillopsis*, *Damoseni*, *Dendrocia*, *Paradoryx*, *Qasimella*, *Wetmoreus*) and anchorate forms (*Cionanchora*, *Folitispa*). However most do not have true arcuate or anchorate chelae (as defined by Hajdu et al., 1994a), given that the lateral alae are not fully formed and still fused with the shaft for a greater proportion of their length, or the taxa do not belong in Microcionidae. *Dendrocia*, *Bipocillopsis* and *Damoseni* are pivotal to the interpretation and are discussed further below.

Within Microcionidae several species have different chelae geometries but have homologous skeletal features (e.g., with megasclere geometry and skeletal stucture that indicates close affinities to each other). The Australian endemic genus *Clathria* (*Dendrocia*) has a nearly complete series of chelae extending from 'typical' palmate isochelae in one species (with completely fused lateral alae and straight shaft), modified palmate chelae seen in most species (i.e., with thickened curved shaft and partially detached lateral alae, verging on 'arcuate') to anchorate-like chelae seen in two species (i.e. in which there are completely detached lateral alae and lateral ridges on the shaft). In other morphological characters species are very similar. The existence of this nearly complete transformation series within one genus raises the possibility that 'anchorateness' (or the detachment of lateral alae from the shaft of chelae) may have occurred more than once within the Poecilosclerida (an hypothesis discounted by Hajdu et al. (1994a), who suggested that anchorate and arcuate modifications to chelae were homologous within a single phylogeny containing bidentate-derived taxa). Interpretation of this transformation continuum in *Clathria* (*Dendrocia*) from 'typical' palmate to detached 'anchorate' chelae suggests that detachment of the lateral alae from the shaft of the spicule, leaving the residual 'scar' or lateral ridge along the shaft, may be a simple reduction process occurring more than once in the group, and that 'anchorateness' may not be homologous throughout the order. Other examples, such as the strongly unguiferous sigmoid chelae of *Bipocillopsis* and *Damoseni*, of indeterminable arcuate or anchorate derivation, are less easily accountable and might validly be excluded from this family. However, the latter genus also has oxhorn toxas which supports its present inclusion in Microcionidae.

De Laubenfels' (1936a) solution to this problem (in which species with modified isochelae have skeletons and spiculation otherwise structurally and geometrically identical to those containing palmate chelae), was to assign every occurrence of a modified chela to a new genus, with the consequence that there were nearly as many genera as species in some families. De Laubenfels' (1936a) classification had extraordinary high levels of homoplasy and the inferred relationships based on isochelae geometry cut across classifications based on both skeletal architecture (e.g., Hallmann, 1912, 1920) and ectosomal characteristics (e.g., Van Soest, 1984b). This proposal was rejected by most contemporary authors. Hooper (1990a) provided an alternative proposal that considered modified isochelae to be homoplastic, and a classification based primarily on this feature was both unparsimonious and incongruent with other structural and geometric features within the Poecilosclerida. Hajdu et al. (1994a) correctly noted that many cases of 'arcuateness' and 'anchorateness' in the literature of Poecilosclerida have not been subsequently substantiated by re-examination of original material using techniques other than routine light microscopy (e.g. many turned out to be merely modified palmate forms), and this is also true for most recorded instances within the Microcionidae. However, from evidence presented here it is likely that 'anchorateness' and 'arcuateness' may be a homoplasy for the Poecilosclerida, and consequently Hajdu et al. (1994a) major reorganisation of the Poecilosclerida requires further refinement, as to family composition.

(7) Toxa morphology: Van Soest et al. (1991) set a precedent for interpretation of toxa geometry in which oxhorn-like toxas (including wing-shaped toxas) were considered to be an-

cestral because they are shared by outgroups such Myxillidae, whereas accolada-like toxas (including raphidiform and oxeote toxas) are more derived.

(8) Growth form: Microcionids in areas of environmental extremes, or cryptic habitats where competition for space and other resources may be high, may show a trend in reduction of skeletal characters. In these cases it is common to find fibres reduced to a simple, heavy basal layer of spongin lying on the substrate (e.g., *C. (Microciona)*). Although some relict (possible ancestor) groups such as 'sclerosponges' have a similar growth form, particularly those species which lose their basal calcareous skeletons (e.g., deficient *Merlia*), it is considered here that in most cases an encrusting habit and a reduced basal skeleton is a derived condition and adaptive strategy, enabling colonization and survival in intertidal and cryptic habitats. Moreover, it is certain that this feature has arisen independently many times and in many different sponge groups. Within Microcionidae there are several specialised growth forms, such as 'honeycomb' reticulate characteristic of *Holopsamma*, with may have some systematic value, whereas other growth forms occur throughout Porifera and are more difficult to interpret phylogenetically.

Phylogenetic analysis (Fig. 315) shows two fundamental groups of genera (A, B) differentiated primarily by their skeletal structure (character 6), complexity or differentiation of the skeleton (character 4), and presence or absence, respectively, of a secondary renieroid reticulate skeleton overlaying the primary (reticulate, plumo-reticulate, plumose or hymedesmoid) skeleton (character 5). One group (B) containing *Artemisina*, *Antho* and *Echinoclathria* has suggested myxillid-like features, most possessing a secondary renieroid skeleton. The other group (A) containing *Clathria*, *Echinochalina*, *Holopsamma* and *Pandaros* has suggested similarities to raspailiids, including skeletal structure of typical genera (e.g., compare *Clathria (Axociella)* and *Raspailia*) and atypical genera (e.g. compare *Echinochalina (Echinochalina)* and *Echinodictyum*). It is suggested that the 'raspailoid' group (A) retains more ancestral features common to the outgroup, whereas the 'myxilloid' group (B) is more derived.

Within group (A) there are three taxa indicated as possibly polyphyletic (*C. (Wilsonella)*, *C. (Dendrocia)*, *Pandaros*). The first two may be simply more derived than other *Clathria* at the base of the tree, or they may represent full genera. The latter explanation is rejected given that the characters inferring polyphyly (partial substitution of coring megascleres by detritus in *C. (Wilsonella)*, and loss of principal spicules completely in *C. (Dendrocia)*) are homoplasious representing convergences via functional acquisition or secondary loss of particular features rather than significant apomorphies, and their status is recognised only at the subgenus level. The third taxon, *Pandaros*, is incertae sedis. It is an anomolous, monotypic genus with greatly reduced fibre and spicular characteristics, not represented in the Indo-Pacific, and probably best considered a highly modified *Clathria*-like species stemming from the *Clathria* group.

The use of subgeneric taxa within this classification, following the precedent adopted for the Raspailiidae (Hooper, 1991), is admittedly partially artificial given the existence of these homoplasies, but no alternative is presently available that allows both the construction of a sound phylogenetic hypothesis as well as the production of a useful, working classification for this large family of sponges (given especially the relatively poor character set that exists for sponges in general). Within *Antho* and *Clathria* the use of subgeneric taxa provides a convenient means to manage large groups of species within these genera, despite the possibility that some of the subgeneric criteria are of dubious phylogenetic value (e.g., possession of acanthose strongyles in place of acanthose styles in *A. (Antho)* and *A. (Plocamia)*, respectively; presence of detritus within fibres in *C. (Wilsonella)*; encrusting habit and plumose fibre nodes in *C. (Microciona)*). Conversely, other subgenera have a more sound phylogenetic basis and are more easily justified within the classification presented here (e.g., stylote versus oxeote structural megascleres in *E. (Echinochalina)* and *E. (Protophlitaspongia)*; presence or absence of ectosomal specialisation in *C. (Thalysias)* and *C. (Clathria)*). Within *Clathria* there are many species-groups that could be used to subdivide these taxa further (e.g., '*spicata*', '*procera*' '*phorbasiformis*' groups; see also Hooper et al., 1991; Hooper & Lévi, 1994). Many of these groups contain species that span across several subgenera and as such are of limited usefulness in phylogenetic reconstruction, but they are most useful in interpretation of sister-group relationships in a biogeographical context (Hooper & Lévi, 1994), and these species groups will be considered further in a more detailed study Indo-west Pacific microcionids,

TABLE 48. List of species included in Microcionidae with their current taxonomic assignments.

SPECIES	ORIGINAL GENUS	CURRENT ASSIGNMENT
abietina Lamarck	*Spongia*	*C.* (*Thalysias*)
abrolhosensis sp.nov.	-	*C.* (*Wilsonella*)
abyssarum Carter	*Dictyocylindrus*	synonym of *A.*(*Antho*) *dichotoma* (Esper)
acanthifolium Duchassaing & Michelotti	*Pandaros*	*Pandaros*
acanthodes Hentschel	*Clathria*	synonym of *C.* (*Thalysias*) *cactiformis* (Lamarck)
acanthostyli Hoshino	*Thalysias*	*C.* (*Clathria*)
acanthotoxa Stephens	*Eurypon*	*C.* (*Clathria*)
acanthotoxa Lévi & Lévi [preocc.]	*Microciona*	see *C.* (*Microciona*) *claudei* nom.nov.
aceratoobtusa Carter	*Microciona*	*C.* (*Microciona*)
aculeata Ridley	*Clathria*	synonym of *C.* (*Thalysias*) *abietina* (Lamarck)
adioristica de Laubenfels	*Dictyociona*	*C.* (*Microciona*)
affinis Carter	*Microciona*	*C.* (*Microciona*)
affinis Topsent [preocc.]	*Hymerophia*	see *C.* (*Microciona*) *campecheae* nom.nov.
africana Lévi	*Microciona*	*C.* (*Microciona*)
alata Dendy	*Clathria*	synonym of *C.* (*Dendrocia*) *pyramida* Lendenfeld
amabilis Thiele	*Stylotellopsis*	*C.* (*Thalysias*)
ambigua Bowerbank	*Microciona*	*Plocamionida* (Anchinoidae)
amiranteiensis nom.nov.	[for *Colloclathria ramosa* Dendy]	*C.* (*Thalysias*)
anchorata Carter	*Dictyocylindrus*	*C.* (*Clathria*)
anchoratum Carter	*Echinonema*	synonym of *C.* (*Thalysias*) *cactiformis* (Lamarck)
angularis Sarà & Siribelli	*Microciona*	*C.* (*Microciona*)
angulifera Dendy	*Clathria*	*C.* (*Clathria*)
angulosa Duchassaing & Michelotti	*Pandaros*	*Mycale* (Mycalidae)
anomala Burton	*Rhaphidophlus*	*C.* (*Thalysias*)
anomala Hallmann	*Echinochalina*	*E.* (*Echinochalina*)
anonyma Burton	*Microciona*	*C.* (*Microciona*)
antarctica Topsent	*Anchinoe*	*C.* (*Microciona*)
antarcticus Koltun [preocc.]	*Stylotellopsis*	synonym of *C.* (*Thalysias*) *koltuni* Hooper
anthoides Lévi	*Clathria*	*C.* (*Clathria*)
antyaja Burton & Rao	*Dendrocia*	*C.* (*Clathria*)
aphylla sp.nov.	-	*C.* (*Thalysias*)
apollinis Ridley & Dendy	*Amphilectus*	*Artemisina*
appendiculata Lamarck	*Spongia*	synonym of *C.* (*Thalysias*) *cactiformis* (Lamarck)
araiosa Hooper & Lévi	*Clathria* (*Thalysias*)	*C.* (*Thalysias*)
arborea Tanita	*Litospongia*	*Echinoclathria*
arborea Lendenfeld	*Plectispa*	*Holopsamma*
arborescens Ridley	*Rhaphidophlus*	*C.* (*Thalysias*)
arbuscula Row	*Ophlitaspongia*	*C.* (*Clathria*)
arbusculum Duchassaing & Michelotti	*Pandaros*	*Ptilocaulis* (Axinellidae)
archegona Ristau	*Artemisina*	*Artemisina*
arcifera Schmidt	*Tenacia*	*Echinoclathria*
arciger Schmidt	*Suberites*	*Artemisina*
arcuophora Whitelegge	*Clathria*	*C.* (*Clathria*)
arenifera Carter	*Echinoclathria*	synonym of *Holopsamma laminaefavosa* Carter
armata Bowerbank	*Microciona*	*C.* (*Microciona*)
arteria de Laubenfels	*Axociella*	*C.* (*Thalysias*)
aruensis Hentschel	*Hymerophia*	*C.* (*Thalysias*)
ascendens Cabioch	*Microciona*	*C.* (*Microciona*)
asodes de Laubenfels	*Eurypon*	*C.* (*Clathria*)
assimilis Topsent	*Clathria*	*C.* (*Microciona*)
ataxa Bergquist & Fromont	*Dictyociona*	*C.* (*Clathria*)
atlantica Sarà	*Echinoclathria*	*Echinoclathria*
atrasanguinea Bowerbank	*Microciona*	*C.* (*Microciona*)
australiensis Carter	*Wilsonella*	*C.* (*Wilsonella*)
australiensis Ridley	*Ophlitaspongia*	*E.* (*Echinochalina*)

SPECIES	ORIGINAL GENUS	CURRENT ASSIGNMENT
australis Lendenfeld	*Clathria*	synonym of *Crella incrustans* var. *arenacea* (Carter) (Crellidae)
australis Whitelegge	*Plumo-halichondria*	synonym of *Crella incrustans* (Carter) (Crellidae)
axinelloides Dendy	*Ophlitaspongia*	*Echinoclathria*
axociona Lévi	*Clathria*	*C.* (*Clathria*)
barba Lamarck	*barba*	*E.* (*Echinochalina*)
barbadensis Van Soest	*Plocamilla*	*Antho* (*Plocamia*)
barleei Bowerbank	*Isodictya*	*C.* (*Clathria*)
bargibanti Hooper & Lévi	*E.* (*Proto-phlitaspongia*)	*E.* (*Proto-phlitaspongia*)
basiarenacea Boury-Esnault	*Rhaphidophlus*	*C.* (*Thalysias*)
basifixa Topsent	*Ophlitaspongia*	*C.* (*Microciona*)
basilana Lévi	*Clathria*	*C.* (*Clathria*)
basispinosa Burton	*Microciona*	synonym of *C.* (*Microciona*) *antarctica* (Topsent)
beanii Bowerbank	*Isodictya*	synonym of *A.* (*Antho*) *involvens* (Schmidt)
bergquistae sp. nov.	-	*Echinoclathria*
beringensis Hentschel	*Phakellia*	*Echinoclathria*
biclathrata nom.nov.	[for *Microciona clathrata* Whitelegge]	*C.* (*Clathria*)
bihamigera Waller	*Microciona*	*Pronax* (Anchinoidae)
bispiculata Dendy	*Siphonochalina*	*E.* (*Proto-phlitaspongia*)
bispinosus Whitelegge	*Rhaphidophlus*	synonym of *C.* (*Thalysias*) *lendenfeldi* Ridley & Dendy
bitoxa Burton	*Hymantho*	*C.* (*Microciona*)
bitoxifera Koltun	*Axociella*	*C.* (*Thalysias*)
borealis nom.nov.	[for *Clathria robusta* Koltun]	*C.* (*Clathria*)
brattegardi Van Soest & Stone	*Antho*	*A.*(*Antho*)
brepha de Laubenfels	*Aaata*	*C.* (*Microciona*)
brevispina Lendenfeld	*Thalassodendron*	synonym of *C.* (*Thalysias*) *cactiformis* (Lamarck)
brondstedi nom.nov.	[for *Hymedesmia pennata* Brondsted]	*C.* (*Microciona*)
brondstedi Bergquist & Fromont	*Antho*	*A.*(*Antho*)
bulboretorta Carter	*Microciona*	*C.* (*Microciona*)
bulbosa Hooper & Lévi	*Clathria*	*C.* (*Clathria*)
bulbotoxa Van Soest	*Clathria* (*Microciona*)	*C.* (*Microciona*)
burtoni nom.nov.	[for *Clathria prolifera* Burton]	*C.* (*Clathria*)
burtoni Lévi	*Plocamilla*	*Antho* (*Plocamia*)
cactiformis Lamarck	*Spongia*	*C.* (*Thalysias*)
caelata Hallmann	*Clathria*	*C.* (*Clathria*)
caespes Ehlers	*Scopalina*	unrecognisable
caespitosa Carter	*Echinonema*	*Plumohalichondria* (Anchinoidae)
calla de Laubenfels	*Axociella*	*C.* (*Microciona*)
calochela Hentschel	*Hymeraphia*	*C.* (*Thalysias*)
calopora Whitelegge	*Clathria*	*C.* (*Clathria*)
calypsa Boury-Esnault	*Clathria*	*C.* (*Clathria*)
campecheae nom.nov.	[for *Hymeraphia affinis* Topsent]	*C.* (*Microciona*)
canaliculata Whitelegge	*Esperiopsis*	*C.* (*Axociella*)
cancellaria Lamarck	*Spongia*	*C.* (*Thalysias*)
cantabrica Orueta	*Rhaphidophlus*	*C.* (*Clathria*)
carbonaria Lamarck	*Spongia*	*Haliclona* (Chalinidae)
coriocrassus Bergquist & Fromont	*Rhaphidophlus*	*C.* (*Thalysias*)
carnosa Bowerbank	*Microciona*	*C.* (*Microciona*)
carteri Topsent	*Clathria*	synonym of *C.* (*Clathria*) *foliacea* Topsent
carteri Ridley & Dendy	*Echinoclathria*	synonym of *Holopsamma favus* (Carter)
cercidochela Vacelet & Vasseur	*Clathriopsamma*	*C.* (*Wilsonella*)
cervicornis Thiele	*Rhaphidophlus*	*C.* (*Thalysias*)
chalinoides Carter	*Axinella*	*Echinoclathria*
chartacea (Whitelegge)	*Clathria*	*Antho* (*Isopenectya*)
chelifera Hentschel	*Spanioplon*	*C.* (*Clathria*)
chelifera Lévi [preocc.]	*Microciona*	see *C.* (*Microciona*) *tunisiae* nom.nov.
circumflexa Lévi	*Plocamilla*	*Antho* (*Plocamia*)

SPECIES	ORIGINAL GENUS	CURRENT ASSIGNMENT
cladoflagellata Carter	*Axinella*	synonym of *Echinoclathria chalinoides* (Carter)
clathrata Schmidt	*Tenacia*	synonym of *C.* (*Thalysias*) *virgultosa* (Lamarck)
cloudei nom.nov.	[for *Microciona acanthatosa* Lévi & Lévi]	*C.* (*Microciona*)
cleistochela Topsent	*Clathria*	*C.* (*Microciona*)
coccinea Berquist	*Microciona*	*C.* (*Microciona*)
coccinea Duchassaing & Michelotti	*Thalysias*	*Spirastrella* (Spirastrellidae)
collata sp.nov.	-	*E.* (*Protophlitaspongia*)
conectens Hallmann	*Wilsonella*	*C.* (*Clathria*)
compressa Schmidt	*Clathria*	*C.* (*Clathria*)
concentrica Lendenfeld	*Antherochalina*	*Cymbastela* (Axinellidae)
confragosa Hallmann	*Ophlitaspongia*	*Echinoclathria*
conica Lévi	*Clathria*	*C.* (*Clathria*)
contexta Sarà	*Echinoclathria*	*Echinoclathria*
contorta Bergquist & Fromont	*Dictyociona*	*C.* (*Clathria*)
copiosa Topsent	*Clathria*	synonym of *C.* (*Thalysias*) *virgultosa* (Lamarck)
copiosa var. *curacaoensis* Arndt	*Clathria*	synonym of *C.* (*Thalysias*) *schoenus* (de Laubenfels)
coppingeri Ridley	*Clathria*	*C.* (*Thalysias*)
coppingeri var. *aculeata*	*Clathria*	synonym of *C.* (*Thalysias*) *lendenfeldi* Ridley & Dendy
corallitincta Dendy	*Clathria*	synonym of *C.* (*Thalysias*) *vulpina* (Lamarck)
coralloides Olivi	*Spongia*	*C.* (*Clathria*)
corallorhizoides Fristedt	*Clathria*	synonym of *Lissodendoryx complicata* (Lundbeck) (Myxillidae)
coriacea Bowerbank	*Isodictya*	*Antho* (*Plocamia*)
corneolia Hooper & Lévi	*Clathria* (*Thalysias*)	*C.* (*Thalysias*)
corona Lieberkühn	*Halichondria*	synonym of *C.* (*Clathria*) *coralloides* (Olivi)
corticata var. *elegans* Lendenfeld	*Sigmatella*	synonym of *C.* (*Wilsonella*) *australiensis* (Carter)
clathrata Whitelegge [preocc.]	*Microciona*	see *C.* (*Clathria*) *biclathrata* nom.nov.
claviformis Hentschel	*Clathria*	*C.* (*Wilsonella*)
cliftoni Bowerbank	*Hymeniocidon*	synonym of *Antho* (*Plocamia*) *frondifera* (Lamarck)
coralliophilus Thiele	*Rhaphidophlus*	*C.* (*Thalysias*)
costifera Hallmann	*Clathria*	*C.* (*Thalysias*)
craspedia sp. nov.	-	*C.* (*Thalysias*)
crassa Lendenfeld	*Antherochalina*	*C.* (*Clathria*)
crassa Carter	*Holopsamma*	*Holopsamma*
cratitia Esper	*Spongia*	*C.* (*Thalysias*)
ctenichela Alander	*Microciona*	*C.* (*Microciona*)
curvichela Hallmann	*Wilsonella*	*C.* (*Dendrocia*)
curvichela Vacelet & Vasseur [preocc.]	*Microciona*	see *C.* (*Microciona*) *vaceletia* nom.nov.
cullingworthi Burton	*Clathria*	*C.* (*Thalysias*)
curvispiculifera Carter	*Microciona*	? *C.* (*Clathria*) virtually unrecognisable
cylindrica Ridley & Dendy	*Esperiopsis*	*C.* (*Axociella*)
cylindrica sensu Sim & Byeon	*Axociella*	see *C.* (*Microciona*) *simae* sp.nov.
cylindricus Kieschnick [preocc.]	*Rhaphidophlus*	synonym of *C.* (*Thalysias*) *kieschnicki* Hooper
darwinensis sp.nov.	-	*C.* (*Thalysias*)
dayi Lévi	*Clathria*	*C.* (*Clathria*)
decumbens Ridley	*Clathria*	*C.* (*Clathria*)
delaubenfelsi Lévi	*Rhaphidophlus*	*C.* (*Thalysias*)
delaubenfelsi Little	*Holoplocamia*	*Antho* (*Plocamia*)
delicata Lambe	*Clathria*	synonym of *C.* (*Clathria*) *prolifera* (Ellis & Solander)
dendyi Berquist & Fromont	*Microciona*	*C.* (*Microciona*)
densa Burton	*Microciona*	*C.* (*Microciona*)
dentata Topsent	*Clathria*	synonym of *C.* (*Thalysias*) *fascicularis* Topsent
depressa Sarà & Melone	*Clathria*	*C.* (*Clathria*)

SPECIES	ORIGINAL GENUS	CURRENT ASSIGNMENT
dianae Schmidt	*Suberites*	*C.* (*Microciona*)
dianae Topsent	*Artemisina*	synonym of *Artemisina apollinis* (Ridley & Dendy)
dichotoma Esper	*Spongia*	*A.*(*Antho*)
dichotoma Lévi	*Ophlitaspongia*	*Echinoclathria*
diechinata Hallman	*Clathria*	synonym of *C.* (*Thalysias*) *lendenfeldi* Ridley & Dendy
digitata Lendenfeld	*Thalyssodendron*	*Echinoclathria*
digitiformis Row	*Ophlitaspongia*	*Echinoclathria*
discreta Thiele	*Microciona*	*C.* (*Clathria*)
distincta Thiele	*Hymeraphia*	*C.* (*Thalysias*)
ditoxa Stephens	*Eurypon*	*C.* (*Microciona*)
dives Topsent	*Microciona*	? *Plumohalichondria* (Anchinoidae)
dubia Kirkpatrick	*Microciona*	*C.* (*Thalysias*)
duplex Sarà	*Clathria*	*C.* (*Microciona*)
dura Whitelegge	*Clathria*	*C.* (*Dendrocia*)
dura var. *mollis* Hentschel	*Clathria*	synonym of *C.* (*Clathria*) *squalorum* Wiedenmayer
eccentrica Burton	*Ophlitaspongia*	*C.* (*Isociella*)
echinata Alcolado	*Axociella*	*C.* (*Microciona*)
echinonematissima Carter	*Wilsonella*	*C.* (*Clathria*)
egena Wiedenmayer	*Echinoclathria*	*Echinoclathria*
elastica Lévi	*Clathria*	*C.* (*Clathria*)
elastica Sarà [preocc.]	*Clathria*	see *C.* (*Clathria*) *sarai* nom.nov.
elegans Vosmaer	*Clathria*	? *C.* (*Clathria*) virtually unrecognisable
elegans Lendenfeld	*Antherochalina*	*Raspailia* (Raspailiidae)
elegans Lendenfeld	*Plectispa*	*Holopsamma*
elegans Ridley & Dendy	*Plocamia*	*Antho* (*Plocamia*)
elegantula Ridley & Dendy	*Clathria*	*C.* (*Dendrocia*)
elegantula Dendy	*Artemisina*	*Artemisina*
elliptichela Alander	*Microciona*	*C.* (*Microciona*)
encrusta Kumar	*Clathria*	*C.* (*Thalysias*)
ensiae sp.nov.	-	*C.* (*Wilsonella*)
erecta Ferrer-Hernandez	*Plocamia*	*Antho* (*Plocamia*)
erecta Topsent	*Artemisina*	*Artemisina*
erectus Thiele	*Rhaphidophlus*	*C.* (*Thalysias*)
eurypa de Laubenfels	*Dictyociona*	*C.* (*Thalysias*)
fallax Bowerbank	*Microciona*	*C.* (*Microciona*)
fascicularis Topsent	*Clathria*	*C.* (*Thalysias*)
fasciculata Wilson	*Clathria*	*C.* (*Thalysias*)
fascispiculifera Carter	*Microciona*	*C.* (*Microciona*)
fauroti Topsent	*Axosuberites*	*C.* (*Axociella*)
favosa Whitelegge	*Clathria*	synonym of *C.* (*Thalysias*) *cactiformis* (Lamarck)
favosa Lamarck	*Spongia*	synonym of *E.* (*Echinochalina*) *barba* (Lamarck)
favulosa sp.nov.	-	*E.* (*Protophlitaspongia*)
favus Carter	*Echinoclathria*	*Holopsamma*
favus var. *arenifera* Carter	*Echinoclathria*	synonym of *Holopsamma laminaefavosa* Carter
felixi sp.nov.	-	*E.* (*Echinochalina*)
ferrea de Laubenfels	*Fisherispongia*	*C.* (*Wilsonella*)
fictitia Bowerbank	*Microciona*	*Phorbas* (Anchinoidae)
filifer Ridley & Dendy	*Rhaphidophlus*	*C.* (*Thalysias*)
filifer var. *cantabrica* Orueta	*Rhaphidophlus*	*C.* (*Clathria*) *cantabrica* (Orueta)
filifer var. *mutabilis* Topsent	*Rhaphidophlus*	*C.* (*Thalysias*) *mutabilis* (Topsent)
filifer var. *spinifera* Lindgren	*Rhaphidophlus*	see *C.* (*Thalysias*) *spinifera* (Lindgren)
flabellata Topsent	*Ophlitaspongia*	synonym of *C.* (*Axociella*) *nidificata* (Kirkpatrick)
flabellata Riley & Dendy	*Phakellia*	synonym of *C.* (*Isociella*) *macropora* Lendenfeld
flabellata Burton	*Rhaphidophlus*	*C.* (*Clathria*)
flabellifera Hooper & Lévi	*Clathria* (*Thalysias*)	*C.* (*Thalysias*)
flabelliformis Carter	*Echinonema*	synonym of *C.* (*Thalysias*) *cactiformis* (Lamarck)
foliacea Topsent	*Clathria*	*C.* (*Clathria*)
foliascens Vacelet & Vasseur	*Clathria*	*C.* (*Clathria*)
foraminifera Burton & Rao	*Aulenella*	*C.* (*Wilsonella*)

SPECIES	ORIGINAL GENUS	CURRENT ASSIGNMENT
fraudata Bowerbank	*Microciana*	C. (*Micraciana*)
frageti Vacelet	*Microciana*	C. (*Micraciana*)
fromontae nom.nov.	[for *Axaciella toxitenuis* Bergquist & Fromont]	C. (*Axociella*)
frondiculata Schmidt	*Reniera*	C. (*Clathria*)
frandifera Lamarck	*Spangia*	*Antho* (*Placamia*)
frondifera Bowerbank	*Halichondria*	synonym of C. (*Thalysias*) *vulpina* (Lamarck)
frondifera var. *setatubulasa* Wilson	*Clathria*	synonym of C. (*Thalysias*) *vulpina* (Lamarck)
frondifera var. *dichela* Hentschel	*Clathria*	synonym of C. (*Thalysias*) *vulpina* (Lamarck)
frandifera var. *major* Hentschel	*Clathria*	see C. (*Thalysias*) *major* Hentschel
fucaides Bowerbank	*Ophlitaspangia*	*Terpiosella* (Suberitidae)
fusterna sp.nov.	-	C. (*Thalysias*)
gabrieli Dendy	*Ophlitaspangia*	E. (*Echinochalina*)
georgiaensis nom.nov.	[for *Ophlitaspongia thielei* Burton]	C. (*Axociella*)
gigantea Lendenfeld	*Halme*	synonym of *Halopsamma laminaefavosa* Carter
glabra Ridley & Dendy	*Echinoclathria*	synonym of E. (*Echinochalina*) *barba* (Lamarck)
glabasa Lendenfeld	*Halme*	synonym of *Holopsamma crassa* Carter
garganaides Dendy	*Echinodictyum*	C. (*Clathria*)
gracea Bakus	*Anthoarcuota*	A. (*Antho*)
gracilis Ridley	*Echinonema*	synonym of C. (*Thalysias*) *procera* (Ridley)
gracilis Carter	*Echinoclathria*	synonym of *Echinoclathria subhispida* Carter
gradalis Topsent	*Clathria*	C. (*Microciona*)
grisea Hentschel	*Leptasia*	C. (*Microciona*)
gymnazusa Schmidt	*Placamia*	*Antho* (*Plocamia*)
haematodes de Laubenfels	*Micraciana*	C. (*Microciona*)
hallezi Topsent	*Heteraclathria*	A. (*Antho*)
hallmanni sp.nov.	-	C. (*Thalysias*)
haplatoxa Topsent	*Leptoclathria*	C. (*Micraciona*)
hartmani Simpson	*Axocielita*	C. (*Thalysias*)
hartmeyeri Hentschel	*Clathria*	synonym of A. (*Antha*) *tuberosa* (Hentschel)
hechteli nom.nov.	[for *Microciana microchela* Hechtel]	C. (*Thalysias*)
hentscheli nom.nov.	[for *Hymeraphia lendenfeldi* Hentschel]	C. (*Microciana*)
hesperia sp.nov.	-	C. (*Thalysias*)
heteraspiculata Brondsted	*Microciona*	A. (*Antho*)
heterotaxa Hentschel	*Microciona*	C. (*Microciana*)
hexaganapora Lévi	*Clathria*	C. (*Clathria*)
hians Duchassaing & Michelotti	*Thalysias*	unrecognisable
hispanica Ferrer-Hernandez	*Artemisina*	*Artemisina*
hirsuta Hooper & Lévi	*Clathria* (*Thalysias*)	C. (*Thalysias*)
hispidula Ridley	*Amphilectus*	C. (*Clathria*)
hjorti Arnesen	*Echinoclathria*	*Echinoclathria*
harrida Row	*Ophlitaspongia*	C. (*Clathria*)
hymedesmiaides Van Soest	*Clathria* (*Microciona*)	C. (*Microciona*)
ignis Duchassaing & Michelotti	*Thalysias*	*Tedania* (Tedaniidae)
illawarrae sp.nov.	-	C. (*Micraciona*)
illgi Bakus	*Plocamilla*	*Antho* (*Plocamia*)
imperfecta Dendy	*Clathria*	C. (*Dendrocia*)
inanchorata Ridley & Dendy	*Clathria*	C. (*Clathria*)
incrustans Bergquist	*Isociella*	C. (*Isociella*)
incrustans Carter	*Echinonema*	*Crella* (Crellidae)
incrustans Svarcevskij	*Raspailia*	? synonym of A. (*Antho*) *involvens* (Schmidt)
indica Dendy	*Clathria*	C. (*Clathria*)
indica Thomas	*Qasimella*	*Artemisina*
indistincta Bowerbank	*Hymedesmia*	synonym of *Plocamionida ambigua* (Bowerbank) (Anchinoidae)
indurata Hallmann	*Clathria*	synonym of C. (*Thalysias*) *cactiformis* (Lamarck)
inhacensis Thomas	*Clathria*	C. (*Clathria*)
inornata Hallmann	*Ophlitispangia*	*Echinoclathria*
intermedia Kirk	*Clathria*	C. (*Clathria*)

SPECIES	ORIGINAL GENUS	CURRENT ASSIGNMENT
intermedia Whitelegge	*Echinoclathria*	*E.* (*Echinochalina*)
intermedia Burton	*Paresperia*	*Esperiapsis* (Desmacididae
intexta Carter	*Micraciana*	*Rhabderemia* (Rhabderemiidae)
involvens Schmidt	*Myxilla*	*A.*(*Antha*)
irregularis Burton	*Marleyia*	*C.* (*Clathria*)
irregularis Lendenfeld	*Halme*	synonym of *Holopsamma laminaefavosa* Carter
isaaci sp.nov.	-	*E.* (*Prataphlitaspongia*)
isachelifera Uriz	*Echinoclathria*	*E.* (*Echinochalina*)
isodictyoides Van Soest	*Rhaphidaphlus*	*C.* (*Thalysias*)
ixauda Lévi	*Microciona*	*C.* (*Microciona*)
jacksoniana Dendy	*Phakellia*	synonym of *C.* (*Isociella*) *macrapora* Lendenfeld
jecusculum Bowerbank	*Hymeniacidon*	*C.* (*Microciona*)
johnsoni de Laubenfels	*Carnulum*	*Cornulum* (Coelosphaeridae)
jolicaeuri Topsent	*Rhaphidophlus*	*C.* (*Thalysias*)
jovis Dendy	*Artemisina*	*Artemisina*
jugasa Wilson	*Clathria*	synonym of *C.* (*Thalysias*) *virgultosa* (Lamarck)
juncea Burton	*Clathria*	*C.* (*Clathria*)
juniperina (var. A) Lamarck	*Spangia*	*C.* (*Thalysias*)
juniperina (var. B) Lamarck	*Spangia*	synonym of *C.* (*Thalysias*) *cappingeri* Ridley
kasumiensis Tanita	*Raspailia*	? *Pandaros* uncertain placement
kentii Bowerbank	*Microciona*	*C.* (*Microciona*)
kieschnicki Hooper	*Clathria* (*Thalysias*)	*C.* (*Thalysias*)
kilauea de Laubenfels	*Axocielita*	*C.* (*Thalysias*)
koltuni Hooper	*Clathria* (*Thalysias*)	*C.* (*Thalysias*)
kylista Hooper & Lévi	*Clathria*	*C.* (*Clathria*)
labautei Hooper & Lévi	*E.* (*Pratophlitaspongia*)	*E.* (*Protaphlitaspongia*)
labyrinthica Schmidt	*Reniera*	*C.* (*Clathria*)
laciniosa Bowerbank & Norman	*Isadictya*	synonym of *C.* (*Clathria*) *barleei* (Bowerbank)
laevigata Lambe	*Clathria*	*C.* (*Clathria*)
laevis Bowerbank	*Microciona*	*C.* (*Microciona*)
laevissima Dendy	*Hymedesmia*	*C.* (*Micraciana*)
lajorei de Laubenfels	*Anaata*	*C.* (*Microciona*)
lambda Lévi	*Leptaclathria*	*C.* (*Thalysias*)
lambei Koltun	*Microciona*	*C.* (*Axociella*)
lambei Burton	*Heteroclathria*	*Antho* (*Plocamia*)
laminaefavosa Carter	*Holopsamma*	*Holopsamma*
laxa Lendenfeld	*Halme*	synonym of *Holopsamma laminaefavosa* Carter
leighensis nom.nov.	[for *Microciana rubens* Bergquist]	*C.* (*Microciana*)
lematalae sp.nov.	[for *Micraciana placenta* sensu de Laubenfels]	*C.* (*Thalysias*)
leporina Lamarck	*Spangia*	*Echinaclathria*
levii Sarà & Siribelli	*Microciona*	*C.* (*Microciana*)
levii sp. nov.	-	*Echinoclathria*
levis Lendenfeld	*Echinanema*	synonym of *Crella incrustans* (Carter) (Crellidae)
lendenfeldi Ridley & Dendy	*Clathria*	*C.* (*Thalysias*)
lendenfeldi Hentschel [preocc.]	*Hymeraphia*	see *C.* (*Microciona*) *hentscheli* nom.nov.
linda de Laubenfels	*Axocielita*	*C.* (*Thalysias*)
lindgreni nom.nov.	[for *Clathria ramosa* Lindgren]	*C.* (*Wilsanella*)
lipochela Burton	*Clathria*	*C.* (*Clathria*)
lissacladus Burton	*Rhaphidophlus*	*C.* (*Thalysias*)
lissasclera Bergquist & Fromont	*Clathria*	*C.* (*Clathria*)
lithaphaenix de Laubenfels	*Plocamia*	*A.*(*Antho*)
litos Hooper & Lévi	*Clathria* (*Clathriapsamma*)	*C.* (*Wilsanella*)
lizardensis sp.nov.	-	*C.* (*Microciona*)
lobata Vosmaer	*Clathria*	*C.* (*Clathria*)
lobosa Lendenfeld	*Clathriapsamma*	synonym of *C.* (*Wilsanella*) *australiensis* (Carter)
longichela Topsent	*Clathria*	synonym of *C.* (*Clathria*) *anchorata* (Carter)
langispiculum Carter	*Microciana*	*C.* (*Micraciana*)
longistyla Burton	*Micraciana*	*C.* (*Microciana*)
longitoxa Hentschel	*Hymeraphia*	*C.* (*Thalysias*)
loveni Fristedt	*Clathria*	*Mycale* (Mycalidae)

SPECIES	ORIGINAL GENUS	CURRENT ASSIGNMENT
lugubris Duchassaing & Michelotti	*Pandaras*	*Echinodictyum* (Raspailiidae)
macrochela Lévi	*Micraciona*	*C.* (*Microciana*)
macroisochela Lévi	*Clathria*	*C.* (*Clothria*)
macropora Lendenfeld	*Clathria*	*C.* (*Isociella*)
macrapara Lendenfeld	*Plectispa*	*Halopsamnia*
macrataxa Bergquist & Fromont	*Axaciella*	*C.* (*Axociella*)
madrepora Dendy	*Clathria*	synonym of *C.* (*Clathria*) *spangodes* Dendy
maeandrino Ridley	*Clathria*	*C.* (*Clathria*)
major Hentschel	*Clathria*	*C.* (*Thalysios*)
manaarensis Carter	*Dictyocylindrus*	*Antho* (*Placamia*)
marissuperi Pulitzer-Finali	*Clathria*	*C.* (*Clathria*)
massalis Carter	*Thalysias*	*Reniera* (Chalinidae)
maunalan de Laubenfels	*Microciona*	*C.* (*Thalysias*)
mediterranea Babic	*Artemisina*	synonym of *A.*(*Antho*) *involvens* (Schmidt)
melana Van Soest & Stentoft	*Echinochalina*	*E.* (*Echinochalina*)
melana Van Soest	*Artemisina*	*Artemisina*
membranocea Thiele	*Ophlitaspangia*	*C.* (*Thalysias*)
menoui Hooper & Lévi	*Clathria*	*C.* (*Clathria*)
meyeri Bowerbank	*Ophlitaspangia*	*C.* (*Clathria*)
michaelseni Hentschel	*Hymeraphia*	*C.* (*Tholysias*)
micrachela Stephens	*Eurypon*	*C.* (*Clathria*)
micrachela Hechtel [preocc.]	*Microciano*	see *C.* (*Thalysios*) *hechteli* nom.nov.
micracianides Carter	*Pluma-halichondria*	*Plocamionida* (Anchinoidae)
microjaanna de Laubenfels	*Microciana*	*C.* (*Microciona*)
micranesia de Laubenfels	*Microciona*	*C.* (*Microciana*)
micropara Lendenfeld	*Halme*	synonym of *Halopsamma crassa* Carter
micrapunctata Burton & Rao	*Tenacio*	*C.* (*Thalysios*)
micraxa Desqueyroux	*Clathria*	*C.* (*Clathria*)
microxea Vacelet & Vasseur	*Paratenaciella*	*C.* (*Micraciana*)
mima de Laubenfels	*Ophlitaspongia*	*C.* (*Micraciona*)
minar Burton	*Ophlitaspangia*	*Echinaclathria*
minuta Van Soest	*Rhophidaphlus*	*C.* (*Thalysias*)
minutula Carter	*Micraciona*	*Rhabderemia* (Rhabderemiidae)
mixta Hentschel	*Clathria*	*C.* (*Wilsonella*)
mollis Kirkpatrick	*Clathria*	*Pranax* (Anchinoidae)
manticularis Ridley & Dendy	*Axinella*	*Aulospongus* (Raspailiidae)
morisca Schmidt	*Clathria*	synonym of *A.* (*Antho*) *invalvens* (Schmidt)
mortensii Brondsted	*Clothria*	*C.* (*Clathria*)
mosulpia Sim & Byeon	*Clathria*	*C.* (*Clathria*)
mutabilis Topsent	*Rhaphidophlus*	*C.* (*Tholysias*)
multifarmis Whitelegge	*Ceraochalina*	synonym of *Echinoclathria subhispido* Carter
multipes Hallmann	*Clathria* (*Plectispa*)	*C.* (*Clathria*)
multipora Whitelegge	*Clathria*	synonym of *C.* (*Thalysias*) *rubra* (Lendenfeld)
multitoxafarmis Bergquist & Fromont	*Axociella*	*C.* (*Axociella*)
murphyi sp. nov.	-	*C.* (*Clathria*)
mutans Sarà	*Ophlitaspangia*	*Echinoclathrio*
mutulo Bowerbank	*Halichondria*	synonym of *C.* (*Clathria*) *barleei* (Bowerbank)
myxillaides Dendy	*Clathria*	*C.* (*Dendrocia*)
naikoiensis Hoshino	*Eurypan*	*C.* (*Thalysias*)
namibiensis Uriz	*Microciona*	*C.* (*Microciona*)
nervosa Lévi	*Axociella*	*C.* (*Thalysias*)
nexus Koltun	*Bipocillapsis*	*C.* (*Clathrio*)
nidificata Kirkpatrick	*Ophlitaspangia*	*C.* (*Axaciella*)
nidus-vesparum Lendenfeld	*Halme*	synonym of *Holapsamma laminaefavosa* Carter
nourlungae sp.nov.	-	*C.* (*Clothria*)
nadosa Carter	*Echinaclathria*	*Echinoclathria*
narmani Burton	*Hymantha*	*C.* (*Micraciana*)
notialis sp. nov.	-	*Echinaclathria*
noto Tanita	*Ophlitaspongia*	*Echinaclothria*
novaezealandiae Brondsted	*Micraciona*	*C.* (*Microciona*)

SPECIES	ORIGINAL GENUS	CURRENT ASSIGNMENT
novizelanica Ridley	*Dirrhopalum*	*Antho* (*Plocamia*)
nuda Hentschel	*Clathria*	*C.* (*Thalysias*)
obliqua George & Wilson	*Esperiopsis*	*C.* (*Clathria*)
oculata Burton	*Clathria*	*C.* (*Clathria*)
ongulensis Hoshino	*Axociella*	*C.* (*Thalysias*)
opuntioides Lamarck	*Alcyonium*	*A.* (*Antho*)
orientalis Brondsted	*Rhaphidophlus*	*C.* (*Thalysias*)
originalis de Laubenfels	*Esperiopsis*	*C.* (*Thalysias*)
ornata Dendy	*Bubaris*	*Antho* (*Plocamia*)
oroides Schmidt	*Clathria*	*Agelas* (Agelasidae)
osismica Cabioch	*Microciona*	*C.* (*Microciona*)
ostacina Rafinesque	*Spongia*	synonym of *C.* (*Clathria*) *prolifera* (Ellis & Solander)
oxeata Bergquist & Fromont	*Ophlitaspongia*	*Echinoclathria*
oxeata Burton	*Protophlitaspongia*	*E.* (*Protophlitaspongia*)
oxeifera Ferrer-Hernandez	*Clathria*	*A.*(*Antho*)
oxeotus Van Soest	*Rhaphidophlus*	*C.* (*Thalysias*)
oxitoxa Lévi	*Clathria*	*C.* (*Thalysias*)
oxneri Topsent	*Hymedesmia*	*C.* (*Clathria*)
oxyphila Hallmann	*Wilsonella*	*C.* (*Clathria*)
pachyaxia Lévi	*Axociella*	*C.* (*Thalysias*)
pachystyla Lévi	*Clathria*	*C.* (*Clathria*)
papilla Bowerbank	*Ophlitaspongia*	synonym of *C.* (*Microciona*) *seriata* (Grant)
papillosa Thiele	*Clathria*	*C.* (*Clathria*)
papyracea Carter	*Phakellia*	synonym of *Echinoclathria leporina* (Lamarck)
paradoxa Babic	*Artemisina*	? synonym of *A.* (*Antho*) *involvens* (Schmidt)
parkeri sp. nov.	-	*Echinoclathria*
parthena de Laubenfels	*Microciona*	*C.* (*Microciona*)
partita Hallmann	*Clathria*	*C.* (*Clathria*)
parva Lévi	*Clathria*	*C.* (*Axociella*)
patula sp.nov.	-	*C.* (*Axociella*)
paucispicula Burton	*Rhapidophlus*	*C.* (*Clathria*)
paucispina Lendenfeld	*Thalassodendron*	synonym of *C.* (*Thalysias*) *rubra* (Lendenfeld)
paucispina Sarà & Siribelli	*Antho*	*A.*(*Antho*)
pauper Brondsted	*Clathria*	*C.* (*Clathria*)
pectiniformis Carter	*Echinonema*	synonym of *C.* (*Thalysias*) *cactiformis* (Lamarck)
pellicula Whitelegge	*Clathria*	*C.* (*Clathria*)
pelligera Schmidt	*Clathria*	*Dictyonella* (Dictyonellidae)
pennata Lambe	*Desmacella*	*C.* (*Microciona*)
pennata Brondsted [preocc.]	*Hymedesmia*	see *C.* (*Microciona*) *brondstedi* nom.nov.
pennata Duchassaing & Michelotti	*Pandaros*	*Echinodictyum* (Raspailiidae)
penneyi de Laubenfels	*Holoplocamia*	*Antho* (*Plocamia*)
perforata Lendenfeld	*Antherochalina*	synonym of *Antho* (*Isopenectya*) *chartacea* (Whitelegge)
perforata in part Lendenfeld	*Antherochalina*	*C.* (*Clathria*)
phorbasiformis sp.nov.	-	*C.* (*Thalysias*)
pilosus Ridley & Dendy	*Amphilectus*	*Megaciella* (Iophonidae)
placenta Lamarck	*Spongia*	*C.* (*Thalysias*)
placenta de Laubenfels [preocc.]	*Microciona*	see *C.* (*Thalysias*) *lematolae* sp.nov.
planum Carter	*Microciona*	*C.* (*Microciona*)
plena Sollas	*Plocamia*	*Antho* (*Plocamia*)
plinthina de Laubenfels	*Microciona*	*C.* (*Microciona*)
plumosa Montagu	*Spongia*	*Pronax* (Anchinoidae)
plumosa Hentschel	*Artemisina*	*Artemisina*
pluritoxa Pulitzer-Finali	*Echinoclathria*	*Holopsamma*
plurityla Pulitzer-Finali	*Clathria*	*C.* (*Clathria*)
piniformis Carter	*Dictyocylindrus*	*C.* (*Clathria*)
plana Carter	*Microciona*	synonym of *C.* (*Thalysias*) *virgultosa* (Lamarck)
poecilosclera Sarà & Siribelli	*Microciona*	*C.* (*Microciona*)
polita Ridley	*Hymedesmia*	*C.* (*Microciona*)
prima Brondsted	*Lissoplocamia*	*Antho* (*Plocamia*)
primitiva Koltun	*Microciona*	*C.* (*Microciona*)
primitiva Burton	*Clathriella*	*Antho* (*Isopenectya*)
procera Ridley	*Rhaphidophlus*	*C.* (*Thalysias*)

SPECIES	ORIGINAL GENUS	CURRENT ASSIGNMENT
procumbens sensu Brondsted	*Clathria*	synonym of *Ascetta procumbens* Lendenfeld (Calcarea)
productitoxa Hoshino	*Thalysias*	*C.* (*Clathria*)
prolifera Ellis & Solander	*Spongia*	*C.* (*Clathria*)
prolifera Burton [preocc.]	*Clathria*	see *C.* (*Clathria*) *burtoni* nom.nov.
proxima Lundbeck	*Hymedesmia*	*C.* (*Microciona*)
proxima Duchassaing & Michelotti	*Thalysias*	*Xestospongia* (Petrosiidae)
pseudonapya de Laubenfels	*Clathriopsamma*	*C.* (*Wilsonella*)
pugio Lundbeck	*Hymedesmia*	*C.* (*Microciona*)
punicea sp.nov.	-	*Antho* (*Isopenectya*)
pusilla Carter	*Microciona*	synonym of *Rhabderemia minutula* (Carter) (Rhabderemiidae)
pustulosa Carter	*Halichondria*	*C.* (*Microciona*)
pyramida Lendenfeld	*Clathria*	*C.* (*Dendrocia*)
pyramidalis Brondsted	*Microciona*	*C.* (*Clathria*)
quadriradiata Carter	*Microciona*	*C.* (*Microciona*)
quercifolia Keller	*Antherochalina*	*Phakellia* (Axinellidae)
quinqueradiata Carter	*Microciona*	*Cyamon* (Raspailiidae)
rameus Koltun	*Axociella*	synonym of *C.* (*Axociella*) *nidificata* (Kirkpatrick)
ramosus Kieschnick	*Rhaphidophlus*	*C.* (*Thalysias*)
ramosa Lindgren [preocc.]	*Clathria*	see *C.* (*Wilsonella*) *lindgreni* nom.nov.
ramosa Dendy [preocc.]	*Colloclathria*	see *C.* (*Thalysias*) *amiranteiensis* nom.nov.
ramosa Hallmann	*Echinoclathria*	*Holopsamma*
ramsayii Lendenfeld	*Thorecta*	synonym of *C.* (*Wilsonella*) *australiensis* (Carter)
raphanus Lamarck	*Spongia*	*C.* (*Clathria*)
raphida sensu Hechtel	*Clathria*	synonym of *Cliona rhaphida* Boury-Esnault (Clionidae)
raraechelae Van Soest	*Rhaphidophlus*	synonym of *C.* (*Thalysias*) *venosa* (Alcolado)
rarispinosa Hechtel	*Microciona*	synonym of *C.* (*Microciona*) *calla* (de Laubenfels)
rectangulosa Schmidt	*Clathria*	*C.* (*Clathria*)
reinwardti Vosmaer	*Clathria*	*C.* (*Thalysias*)
reinwardti var. *palmata* Ridley	*Clathria*	synonym of *C.* (*Thalysias*) *vulpina* (Lamarck)
reinwardti var. *subcylindrica* Ridley	*Clathria*	synonym of *C.* (*Thalysias*) *reinwardti* Vosmaer
renieroides Lendenfeld	*Antherochalina*	synonym of *Phakellia flabellata* (Carter) (Axinellidae)
repens Duchassaing & Michelotti	*Thalysias*	synonym of *Xestospongia subtriangularis* (Duchassaing) (Petrosiidae)
reticulata Lendenfeld	*Clathriopsamma*	*C.* (*Wilsonella*)
reticulata Bergquist & Fromont	*Ophlitospongia*	*Echinoclathria*
reticulata Whitelegge	*Echinochalina*	*E.* (*Echinochalina*)
rhaphidotoxa Stephens	*Clathria*	*C.* (*Clathria*)
rhopalophora Hentschel	*Hymeraphia*	*C.* (*Microciona*)
riddlei sp. nov.	-	*Echinoclathria*
ridleyi Lindgren	*Rhaphidophlus*	*C.* (*Thalysias*)
ridleyi Hentschel	*Plocamia*	*Antho* (*Plocamia*)
ridleyi Dendy	*Echinodictyum*	*E.* (*Echinochalina*)
robusta Dendy	*Microciona*	*C.* (*Thalysias*)
robusta Koltun [preocc.]	*Clathria*	see *C.* (*Clathria*) *borealis* nom.nov.
rotunda Hallmann	*Echinoclathria*	*Holopsamma*
rubens Lendenfeld	*Thalassodendron*	*C.* (*Clathria*)
rubens Bergquist [preocc.]	*Microciona*	see *C.* (*Microciona*) *leighensis* nom.nov.
rubens var. *dura* Lendenfeld	*Thalassodendron*	synonym of *C.* (*Thalysias*) *rubra* (Lendenfeld)
rubens var. *lamella* Lendenfeld	*Thalassodendron*	synonym of *C.* (*Thalysias*) *rubra* (Lendenfeld)
rubra Lendenfeld	*Echinonema*	*C.* (*Thalysias*)
rugosa Hooper & Lévi	*Clathria* (*Clathriopsamma*)	*C.* (*Wilsonella*)
rugosa Duchassaing & Michelotti	*Thalysias*	synonym of *Xestospongia subtriangularis* (Duchassaing) (Petrosiidae)
saintvincenti sp.nov.	-	*Antho* (*Isopenectya*)

SPECIES	ORIGINAL GENUS	CURRENT ASSIGNMENT
sarai nom.nov.	[for *Clathria elastica* Sarà]	*C.* (*Clathria*)
saraspinifera nom.nov.	[for *Clathria spinifera* Sarà]	*C.* (*Clathria*)
sartaginula Lamarck	*Spongia*	*C.* (*Clathria*)
saxicava Duchassaing & Michelotti	*Thalysias*	unrecognisable
scabida Carter	*Halichondria*	*C.* (*Dendrocia*)
schoenus de Laubenfels	*Clathria*	*C.* (*Thalysias*)
scotti Dendy	*Clathria*	*C.* (*Microciona*)
selachia sp.nov.	-	*C.* (*Isociella*)
seriata Grant	*Spongia*	*C.* (*Microciona*)
seriatus Thiele	*Rhaphidophlus*	synonym of *C.* (*Thalysias*) *vulpina* (Lamarck)
sessilis Carter	*Dictyocylindrus*	unrecognisable
shirahama Tanita	*Clathria*	*C.* (*Clathria*)
sigmoidea Cuartas	*Microciona*	*C.* (*Microciona*)
signata Topsent	*Plocamiopsis*	*Antho* (*Plocamia*)
simae sp.nov.	[for *Axociella cylindrica* sensu Sim & Byeon]	*C.* (*Microciona*)
similis Thiele	*Hymeraphia*	*C.* (*Microciona*)
similis Stephens [preocc.]	*Microciona*	see *C.* (*Microciona*) *stephensae* nom.nov.
similis sensu Uriz	*Eurypon*	see *C.* (*Microciona*) *urizae* nom.nov.
simplex Lendenfeld	*Halme*	*Halopsamma*
simplicissima Norman	*Microciona*	*Bubaris* (Axinellidae)
simpsoni Van Soest	*C.* (*Microciona*)	synonym of *C.* (*Microciona*) *echinata* (Alcolado)
skia sp.nov.	-	*C.* (*Isociella*)
spicata Hallmann	*Clathria*	synonym of *C.* (*Thalysias*) *lendenfeldi* Ridley & Dendy
spiculosus Dendy	*Rhaphidophlus*	*C.* (*Thalysias*)
spiculosa var. *macilenta* Hentschel	*Clathria*	synonym of *C.* (*Thalysias*) *reinwardti* Vosmaer
spiculosus var. *ramosa* Hentschel	*Clathria*	synonym of *C.* (*Thalysias*) *procera* (Ridley)
spinarcus Carter & Hope	*Microciona*	*C.* (*Microciona*)
spinatoxa Hoshino	*Microciona*	*C.* (*Microciona*)
spinifera Lindgren	*Rhaphidophlus*	*C.* (*Thalysias*)
spinifera Sarà [preocc.]	*Clathria*	see *C.* (*Clathria*) *saraspinifera* nom.nov.
spinispicula Tanita	*Clathria*	*C.* (*Clathria*)
spinosa Wilson	*Microciona*	*C.* (*Microciona*)
spinulenta Bowerbank	*Microciona*	*Iophon* (Iophonidae)
spongigartina de Laubenfels	*Aaata*	*C.* (*Microciona*)
spongiosa Burton	*Clathria*	synonym of *C.* (*Clathria*) *spongodes* Dendy
spongiosa Dendy	*Echinodictyum*	*E.* (*Echinochalina*)
spongodes Dendy	*Clathria*	*C.* (*Clathria*)
squalorum Wiedenmayer	*Clathria*	*C.* (*Clathria*)
stipitata Koltun	*Artemisina*	*Artemisina*
striata Whitelegge	*Clathria*	*C.* (*Clathria*)
strongyla Hentschel	*Artemisina*	synonym of *Artemisina plumosa* Hentschel
stephensae nom.nov.	[for *Microciona similis* Stephens]	*C.* (*Microciona*)
strepsitoxa Hope	*Microciona*	*C.* (*Microciona*)
strepsitoxa var. *robusta* Dendy	*Microciona*	*C.* (*Thalysias*) *robusta* (Dendy)
styloprothesis sp.nov.	-	*C.* (*Thalysias*)
suberitoides Vosmaer	*Artemisina*	synonym of *Artemisina arciger* (Schmidt)
subhispida Carter	*Echinoclathria*	*Echinoclathria*
subtriangularis Duchassaing	*Thalysias*	*Xestospongia* (Petrosiidae)
surculosa Esper	*Spongia*	? *C.* (*Clathria*) virtually unrecognisable
svarchevskyi de Laubenfels	*Microciona*	synonym of *C.* (*Microciona*) *armata* (Bowerbank)
tenebratus Whitelegge	*Rhaphidophlus*	synonym of *C.* (*Clathria*) *striata* Whitelegge
tener Carter	*Thalysias*	? *C.* (*Thalysias*) imperfectly known
tenuifibra Whitelegge	*Clathria*	synonym of *C.* (*Clathria*) *rubens* (Lendenfeld)
tenuis Stephens	*Microciona*	*C.* (*Microciona*)
tenuis Carter	*Echinoclathria*	synonym of *Echinoclathria leporina* (Lamarck)
tenuispina Lendenfeld	*Antherochalina*	synonym of *Echinoclathria leporina* (Lamarck)

SPECIES	ORIGINAL GENUS	CURRENT ASSIGNMENT
tenuissima Stephens	*Eurypon*	*C.* (*Microciona*)
terranovae Dendy	*Clathria*	*C.* (*Clathria*)
tetrastyla Hentschel	*Hymeraphia*	*C.* (*Microciona*)
textile Carter	*Cornulum*	*C.* (*Clathria*)
thetidis Hallmann	*Ophlitaspongia*	*C.* (*Axociella*)
thielei Hentschel	*Hymeraphia*	*C.* (*Microciona*)
thielei Burton [preocc.]	*Ophlitaspongia*	see *C.* (*Axociella*) *georgiaensis* nom.nov.
tingens sp.nov.	-	*C.* (*Thalysias*)
topsenti Thiele	*Rhaphidophlus*	*C.* (*Thalysias*)
tortuosa Uriz	*Clathria*	*C.* (*Clathria*)
toxifera Hentschel	*Hymeraphia*	*C.* (*Thalysias*)
toxiferum Topsent [preocc.]	*Stylostichon*	see *C.* (*Microciona*) *antarctica* (Topsent)
toximajor Topsent	*Clathria*	*C.* (*Microciona*)
toxipraedita Topsent	*Clathria*	*C.* (*Clathria*)
toxirecta Sarà & Siribelli	*Microciona*	*C.* (*Microciona*)
toxistricta Topsent	*Clathria*	*C.* (*Clathria*)
toxistyla Sarà	*Microciona*	*C.* (*Clathria*)
toxitenuis Topsent	*Clathria*	*C.* (*Microciona*)
toxitenuis Bergquist & Fromont [preocc.]	*Axociella*	see *C.* (*Axociella*) *fromontae* nom.nov.
toxivaria Sarà	*Microciona*	*C.* (*Clathria*)
toxotes Schmidt	*Scopalina*	*C.* (*Clathria*)
transiens Hallmann	*Clathria*	*C.* (*Clathria*)
transiens Topsent	*Artemisina*	*Artemisina*
translata Pulitzer-Finali	*Ophlitaspongia*	*Echinoclathria*
tricurvatifera Carter	*Thalysias*	? *C.* (*Thalysias*) imperfectly known
tuberculata Burton	*Stylostichon*	synonym of *C.* (*Microciona*) *antarctica* (Topsent)
tuberosa Bowerbank	*Microciona*	*C.* (*Wilsonella*)
tuberosa Hentschel	*Lissodendoryx*	*A.*(*Antho*)
tuberosa sp.nov.	-	*E.* (*Protophlitaspongia*)
tuberosocapitata Topsent	*Hymeraphia*	*Discorhabdella* (Hymedesmiidae)
tubulatum Bowerbank	*Haliphysema*	? *Aulospongus* (Raspailiidae)
tubulosa Hallmann	*Ophlitaspongia*	*E.* (*Echinochalina*)
tumulosa Bowerbank	*Microciona*	*C.* (*Microciona*)
tubulosa Koltun	*Artemisina*	*Artemisina*
tunisiae nom.nov.	[for *Microciona chelifera* Lévi]	*C.* (*Microciona*)
tylota Boury-Esnault	*Artemisina*	*Cornulum* (Iophonidae)
typica Kirkpatrick	*Clathria*	*C.* (*Clathria*)
typicum Carter	*Echinonema*	synonym of *C.* (*Thalysias*) *cactiformis* (Lamarck)
typica var. *porrecta* Hentschel	*Clathria*	synonym of *C.* (*Thalysias*) *reinwardti* Vosmaer
ulmus Vosmaer	*Clathria*	*C.* (*Clathria*)
unica Cuartas	*Clathria*	*C.* (*Clathria*)
urceolata Desor	*Spongia*	synonym of *C.* (*Clathria*) *prolifera* (Ellis & Solander)
urizae nom.nov.	[for *Eurypon similis* sensu Uriz]	*C.* (*Microciona*)
vacelettia nom.nov.	[for *Microciona curvichela* Vacelet & Vasseur]	*C.* (*Microciona*)
varians Duchassaing & Michelotti	*Thalysias*	*Anthosigmella* (Spirastrellidae)
vasiformis de Laubenfels	*Thalyseurypon*	*C.* (*Clathria*)
vasiplicata Carter	*Echinonema*	synonym of *Echinodictyum mesenterinum* (Lamarck) (Raspailiidae)
venosa Alcolado	*Microciona*	*C.* (*Thalysias*)
ventilabrum var. *australiensis*	*Phakellia*	synonym of *C.* (*Thalysias*) *cactiformis* (Lamarck)
vesparium Lamarck	*Alcyonium*	*Spheciospongia* (Spirastrellidae)
viminalis Lendenfeld	*Thalassodendron*	synonym of *Echinoclathria subhispida* Carter
virgula Sarà & Siribelli	*Microciona*	synonym of *A.* (*Antho*) *involvens* (Schmidt)
virgultosa Lamarck	*Spongia*	*C.* (*Thalysias*)
vulcani Lévi	*Artemisina*	*Artemisina*
vulpina Lamarck	*Spongia*	*C.* (*Thalysias*)
waldaschmitti de Laubenfels	*Echinoclathria*	*Echinoclathria*
walpersii Duchassaing & Michelotti	*Pandaros*	synonym of *Ptilocaulis spiculifera* (Lamarck) (Axinellidae)
wesselensis sp.nov.	-	*C.* (*Thalysias*)

incorporating the Indonesian and Micronesian faunas (in prep.).

My phylogeny, based primarily on structural features of the skeleton, conflicts with that of Hajdu et al., 1994. Their hypothesis is based on the premise that microgeometry is less likely to be influenced by modification during the course of evolution than structural features. I emphasise skeletal structure and skeletal differentiation as primary characters in the evolution of Microcionidae. My classification allows inclusion of arcuate and anchorate modified chelae (which would otherwise be included in Myxillina). Identical structural features, primarily, and megasclere geometry, secondarily, in species with arcuate or anchorate chelae may indicate evolutionary similarity, whereas it is debatable whether or not observed modifications to chelae are homologous or merely convergent.

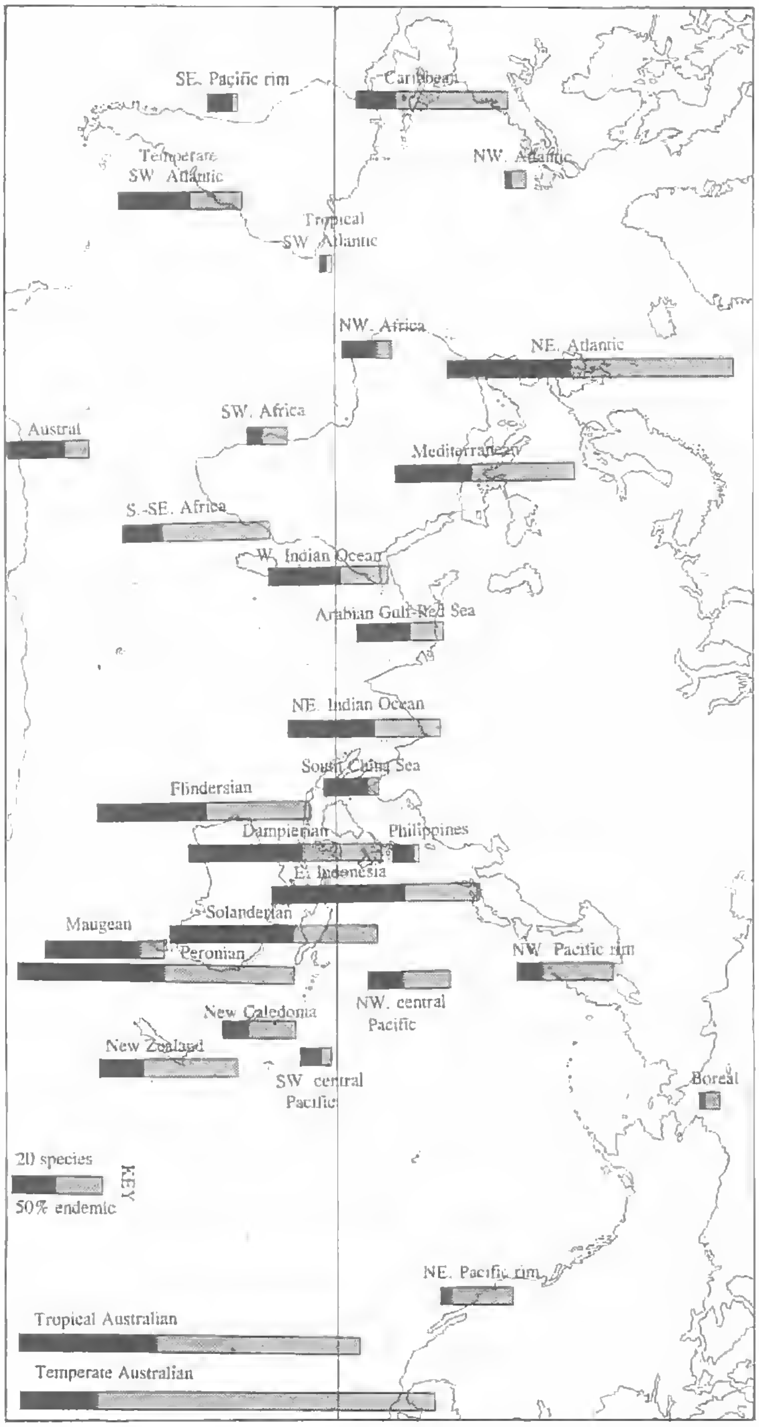


FIG. 316. Distribution of microcionid species and levels of endemism in biogeographic provinces. Division of provincial faunas based on traditional biogeographic regions (Wiedenmayer, 1989). Bar length = total number of provincial species; grey hatch = % of species endemic to each province.

Biogeography. Many early attempts to analyse biogeographic patterns of marine sponges were unsuccessful because authors attempted too broad a taxonomic coverage without detailed taxonomic revisions and the belated recognition that many so-called 'widely distributed' species actually consist of allopatric, cryptic sibling species, thus masking potentially informative patterns on distribution and biasing proportions of regional endemism. By comparison, several contemporary biogeographic

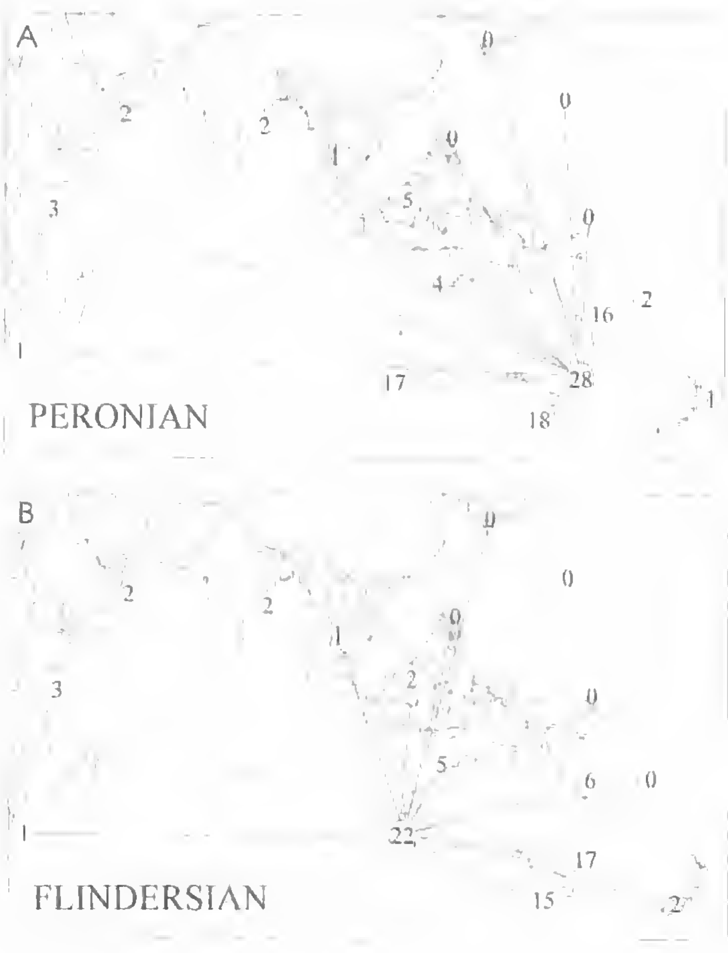


FIG. 317. A,B, Biogeographic relationships between Australian microcionid species within Indo-west Pacific marine provinces, showing numbers of shared species between provinces (provincial endemic species circled).

analyses have had greater success based on relatively well-revised, restricted taxa (genera, families), (e.g., Van Soest et al., 1991; Hooper, 1991; Van Soest & Hooper, 1993; Hooper & Lévi, 1994; Bergquist & Kelly-Borges, 1995). Yet these studies too have not reached any consensus concerning general area statements for shallow water marine sponges, and they fail to distinguish between vicariant events or subsequent dispersals to explain species' distributions (Hooper & Lévi, 1994).

Only one (Hooper & Lévi, 1994) included species of Microcionidae, providing a preliminary analysis of biogeographic patterns amongst Indo-west Pacific species, comparing levels of species endemism throughout world marine provinces, comparing regional faunas within the Indo-west Pacific region (targeting the New Caledonian fauna in particular), and contrasting these broad distribution patterns for Microcionidae with those of the families Raspailiidae and Axinellidae. These analyses are taken further in this study, focussing in particular on the Australian fauna, and incorporating additional data derived from the present revision. Hooper & Lévi (1994) also provided an areacladistic analysis of one species group (*Clathria 'procera'* group), comparing sibling species' distributions and postulating historical biogeographic patterns and relationships throughout the world's seas. Although it is clear from this study and others that historical biogeography can provide many more facets to the questions posed by biogeographers, who attempt to understand relationships between both provincial species and the provinces themselves, it is also clear that analysis of many species groups are required to gain a meaningful interpretation of data and to resolve a general area statement for the marine biome (Van Soest et al., 1991). It is inappropriate to undertake such a detailed areacladistic analyses in this present work restricted to the Australian fauna, whereas it will be much more useful to include a revised Indonesian and Micronesian microcionid fauna into analyses (in prep.). The present analysis follows the format used for Raspailiidae (Hooper, 1991).

From present data and the earlier analysis (Hooper & Lévi, 1994) there is little evidence for cosmopolitan microcionids. A possible exception is *Clathria atrasanguinea* which has contiguous

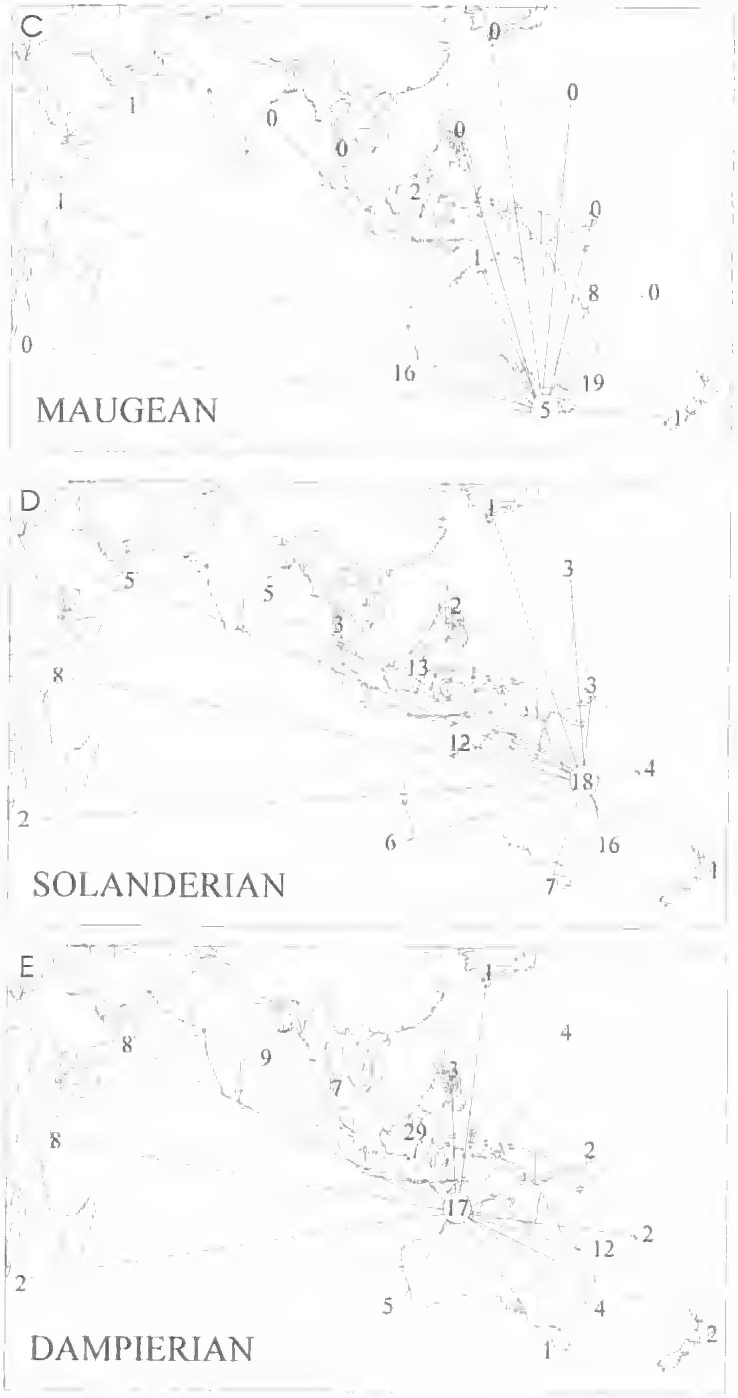


FIG. 317. C-E. Biogeographic relationships between Australian microcionid species within Indo-west Pacific marine provinces, showing numbers of shared species between provinces (provincial endemic species circled).

populations (i.e. substantiated by comparison of voucher specimens) within the W and E Indian Ocean system, Mediterranean-E Atlantic system, and W Atlantic system (though not yet recorded from the Pacific). All other reported cases of cosmopolitan species consist of 2 or more sibling species. In contrast, 9 species of microcionids are widely distributed, usually with disjunct distributions (possibly explained by local extinctions within intermediate provinces; e.g., *C. cactiformis*). It is possible that some of these species also comprise more than one allopatric sibling species but it was not possible to detect any consistent differences between populations based solely on skeletal characters. Similarly, most species of Microcionidae are restricted to single ocean systems, and only about 5% of species range widely within any particular system (whereas most other species are much more restricted in their ranges). Worldwide 72% of species are restricted to a single biogeographic province although levels of regional endemism range from 30-80% of species (Fig. 316).

Microcionids are relatively diverse and prevalent, with most species found predominantly in shallow-waters but some ranging down to 2500m depth. They comprise between 7-16% of all species of demosponges within the various marine biogeographic regions of the world (8% average), with two major peaks of diversity indicated: Indo-Australia region and NE Atlantic (Hooper & Lévi 1994: fig.3). Within the Indo-west Pacific, extending from the Andaman Sea to islands of the W Pacific rim, there are 196 species of which 115 (or about 60%) are endemic to the region. This level of endemism is closely comparable to that in NE Atlantic species. The Indo-west Pacific species represent about 7% of the region's demosponge fauna.

Australian continental marine provinces contain 148 species of microcionids, comprising about 11% of the entire demosponge fauna for the region, with 111 (or 75%) being endemic.

Although it is not possible to postulate detailed faunistic relationships using these crude analyses microcionid distribution data do support the concept of a differentiated southern Gondwanan fauna and northern Tethys fauna within coastal Australia (Hooper & Lévi, 1994) based on a different data set. Temperate Australian marine provinces contain a higher diversity of microcionids (90 species) and greater endemism (81%) than tropical provinces (the latter with 74 species, 59% endemic) (Fig. 316). These levels of endemism are very similar to those observed for Raspailiidae (Hooper, 1991), although the temperate raspailiid fauna was less diverse but had greater endemism than did the tropical fauna.

This observation is further supported considering the Australian fauna in more detail (Fig. 317).

Peronian (Fig. 317A). Of all Australian continental provinces the SE Australian temperate (Peronian) province contains the greatest diversity of species (60) and also the highest proportion of regional endemism (28 species or 48%). Not surprisingly greatest similarities in species composition (i.e., numbers of shared species) are with the adjacent temperate provinces (Flindersian, Maugean) and adjacent tropical Solanderian province, with only few 'widespread' species common to all Indo-west Pacific provinces.

Flindersian (Fig. 317B). The southern and SW Australian temperate (Flindersian) province contains 46 species of which 22 (47%) are endemic, showing greatest similarities to the other two southern Australian temperate provinces (Peronian, Maugean), whereas few species are shared with the adjacent NW tropical (Dampierian) province (no doubt reflecting the relative importance of the Leeuwin current to the marine biogeography of the west coast (Pearce & Walker, 1991; Hooper, 1994)).

Maugean (Fig. 317C). The cool temperate Bass Strait-Tasmanian (Maugean) province contains 26 species of microcionids with only 5 (or 19%) endemic, showing greatest similarities to the other southern temperate provinces.

Solanderian (Fig. 317D). The NE Australian tropical (Solanderian) province contains 45 species (18 or 40% endemic), with similarities to the adjacent temperate Peronian, tropical Dampierian and SE Indonesian faunas.

Dampierian (Fig. 317E). A similar relationship is indicated for the tropical northwest Australian (Dampierian) province containing 42 species (17 species or 40% endemic).

From these comparisons between adjacent provincial faunas it is clear that the two tropical provinces (Dampierian and Solanderian) share the highest number of sympatric species and also share a large number of species with both Indonesia and the western Pacific rim islands. Nevertheless, nearly half the number of species in each of these provinces are unique. Similarly, the three southern Australian (continental, temperate) provinces share a large proportion of their species, especially Peronian and Maugean faunas, whereas there is very little mixing (less than 15% of species) between temperate and tropical Australian microcionid species. Only two species of microcionids have confirmed trans-Tasman Sea distributions (Bergquist & Fromont, 1988), and only four are found in both the Solanderian and New Caledonian provinces (Hooper & Lévi, 1993a), with similar observations reported for Raspailiidae (Hooper, 1991) in which both New Zealand and New Caledonian faunas have exceptionally high numbers of endemic microcionid species (nearly 70% and 67% endemism, respectively).

The Antarctic and austral islands faunas have a low diversity of microcionids (18) and few endemic species (28%), sharing many species with adjacent provinces such as New Zealand, SW Atlantic, Subantarctic islands and SE Pacific. There are no austral temperate species found in the Australian continental faunas, as also observed for the Raspailiidae (Hooper, 1991).

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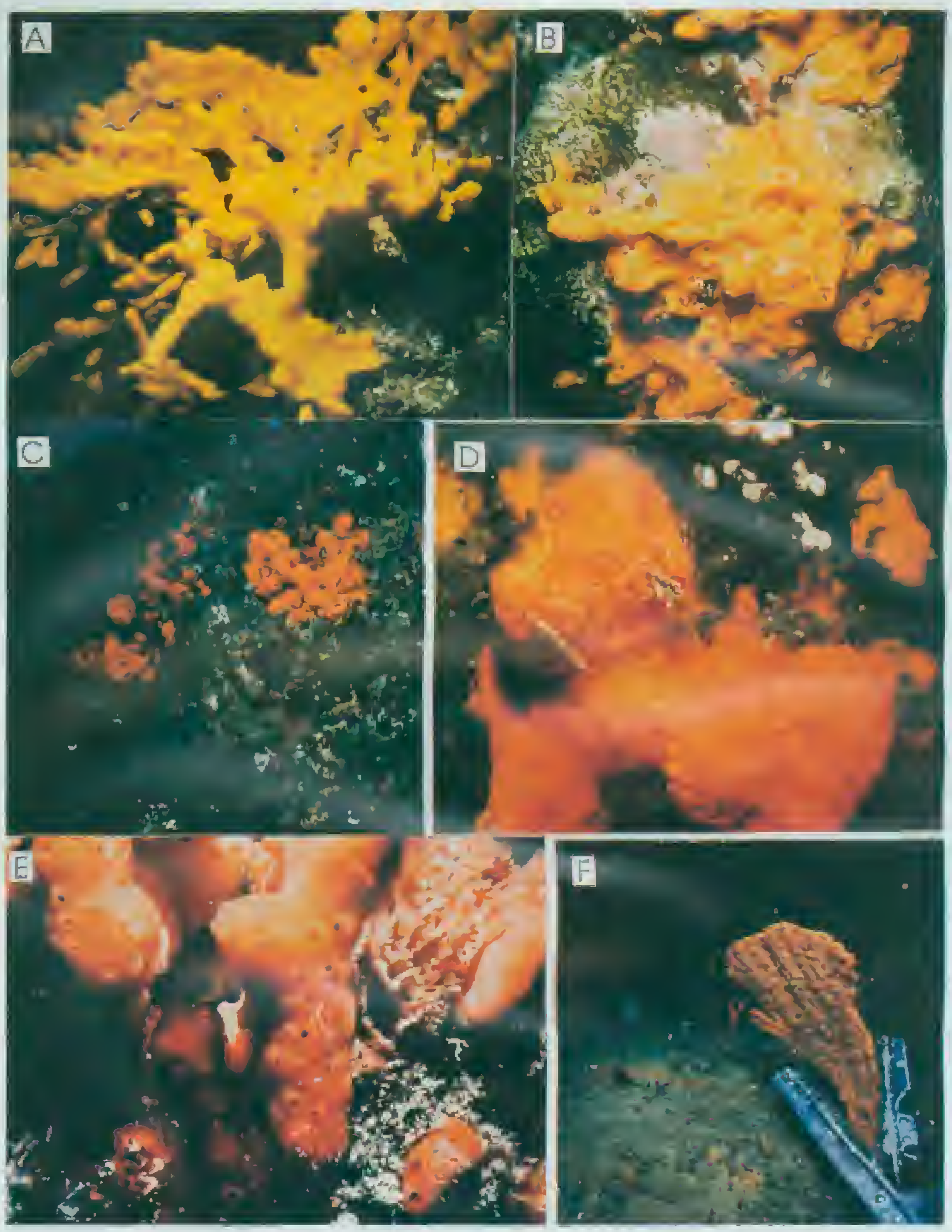

PLATE 1. A, *Clathria* (*C.*) *angulifera* (QMG303230, N. Stradbroke I., Qld., 30m, photo author). B, *Clathria* (*C.*) *conectens* (QMG305135, Direction Is, GBR, 15m, photo author). C, *Clathria* (*C.*) *kylista* (QMG300035, Mooloolabah, Qld., 10m, photo author). D, *Clathria* (*C.*) *murphyi* (QMG300656, Houtman Abrolhos, WA, 9m, photo NCI). E, *Clathria* (*C.*) *noarlungae* (NTMZ3566, Kingston S.E., SA, 5m, photo NCI). F, *Clathria* (*C.*) *striata* (QMG303755, North Head, NSW, 50m, photo D. Roberts).

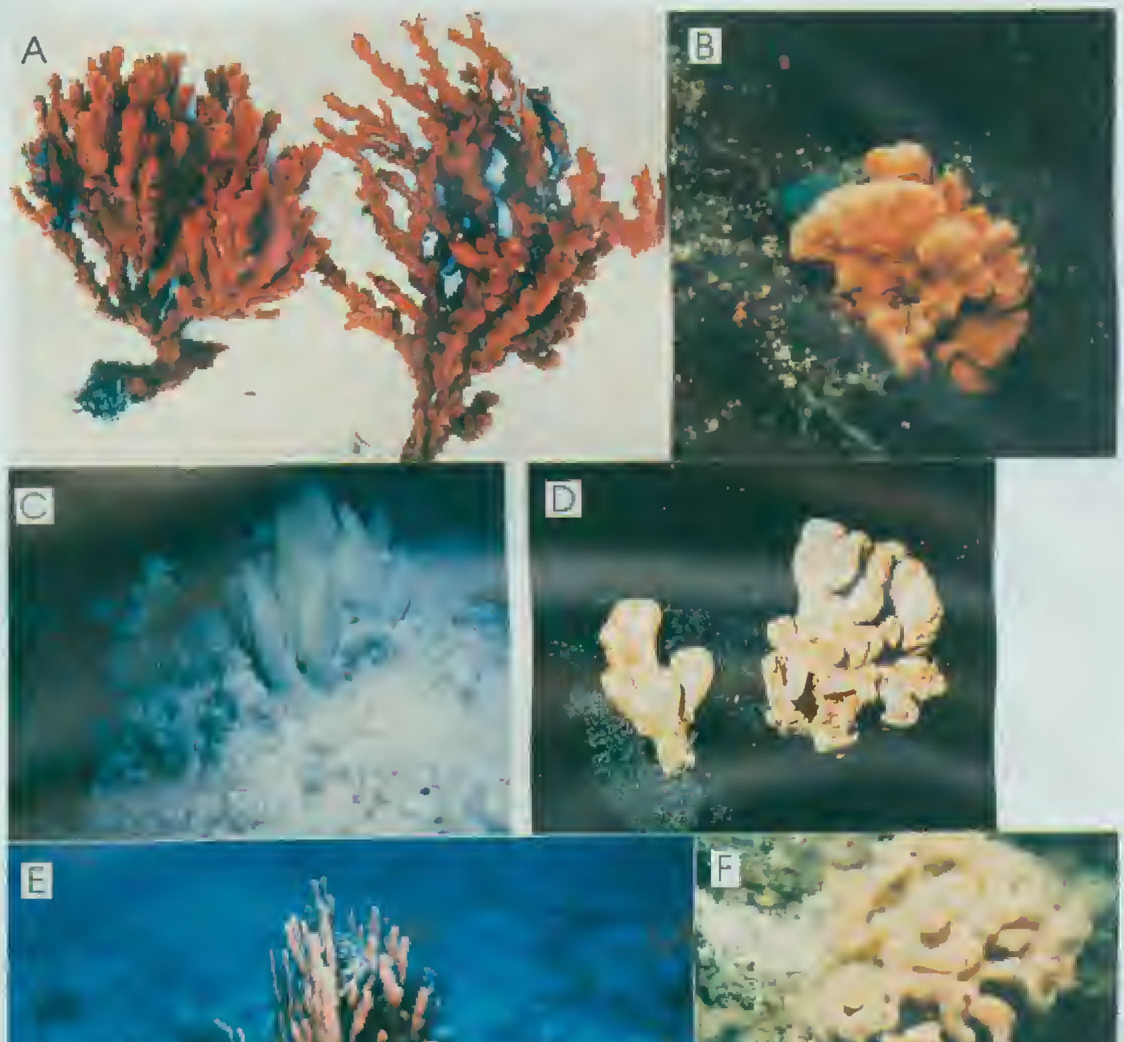

PLATE 2. A, *Clathria* (*C.*) *transiens* (QMG300268, Furneaux Is, Tas, 18m, photo NCI). B, *Clathria* (*W.*) *australiensis* (QMG301458, Cook I, NSW, 15m, photo author). C, *Clathria* (*W.*) *abrolhosensis* (NTMZ3218, Houtman Abrolhos, WA, 22m, photo author). D, *Clathria* (*W.*) *claviformis* (QMG300576, Parry Shoals, NT, 30m, photo NCI). E, *Clathria* (*W.*) *ensiae* (NTMZ3561, Marion Reef, SA, 6m, photo NCI). F, *Clathria* (*W.*) *tuberosa* (QMG303428, Mandorah, NT, 1m, photo author).

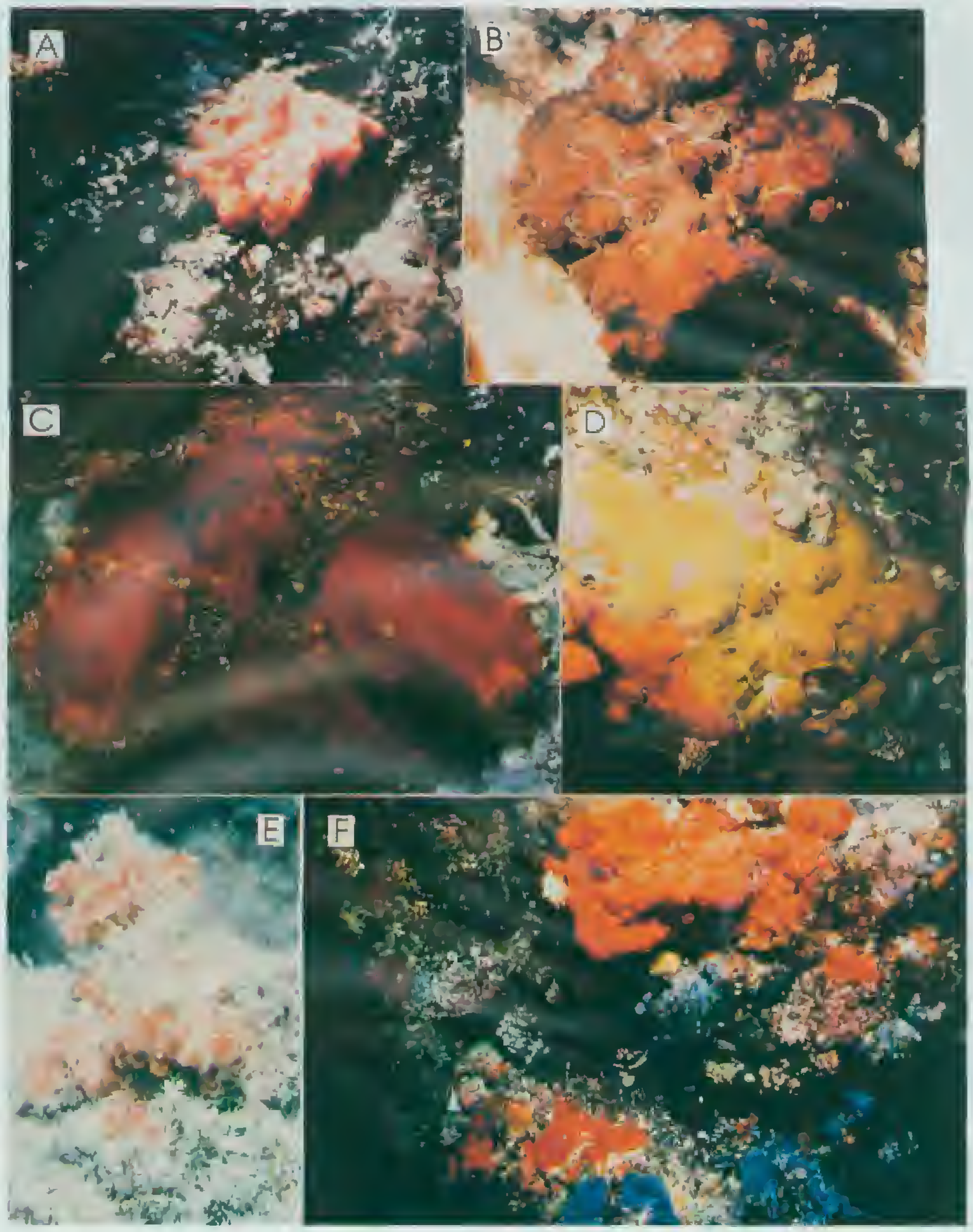

PLATE 3. A, *Clathria* (*D.*) *myxilloides* (QMG300613, Kangaroo I, SA, 18m, photo NCI). B, *Clathria* (*D.*) *pyramida* (QMG300238, Kangaroo I., SA, 6m, photo NCI). C, *Clathria* (*M.*) *aceratoobtusa* with *Rostanga arbutus* feeding (QMG300543, Long Reef, NSW, 0m, photo W. Rudman). D, *Clathria* (*M.*) *illawarrae* (QMG304572, Shell Harbour, NSW, 2m, photo L. Miller). E, *Clathria* (*M.*) *lizardensis* (QMG304121, Lizard I., GBR, 9m, photo author). F, *Clathria* (*I.*) *selachia* (NTMZ2946, Shark Bay, WA, 7m, photo author).

PLATE 4. A, *Clathria* (*I.*) *eccentrica* (NTMZ288, Darwin Harbour, NT, 1m, photo author). B, *Clathria* (*A.*) *thetidis* (QMG303752, North Head, NSW, 50m, photo D. Roberts). C, *Clathria* (*T.*) *abietina* (NTMZ2163, Darwin Harbour, NT, 10m, photo author). D, *Clathria* (*T.*) *abietina* (NTMZ2611, Darwin Harbour, NT, 12m, photo author). E, *Clathria* (*T.*) *cactiformis* (NTMZ3831, St. Patrick's Head, Tas., 6m, photo NCI). F, *Clathria* (*T.*) *cactiformis* (QMG300736, Houtman Abrolhos, WA, 8m, photo NCI).

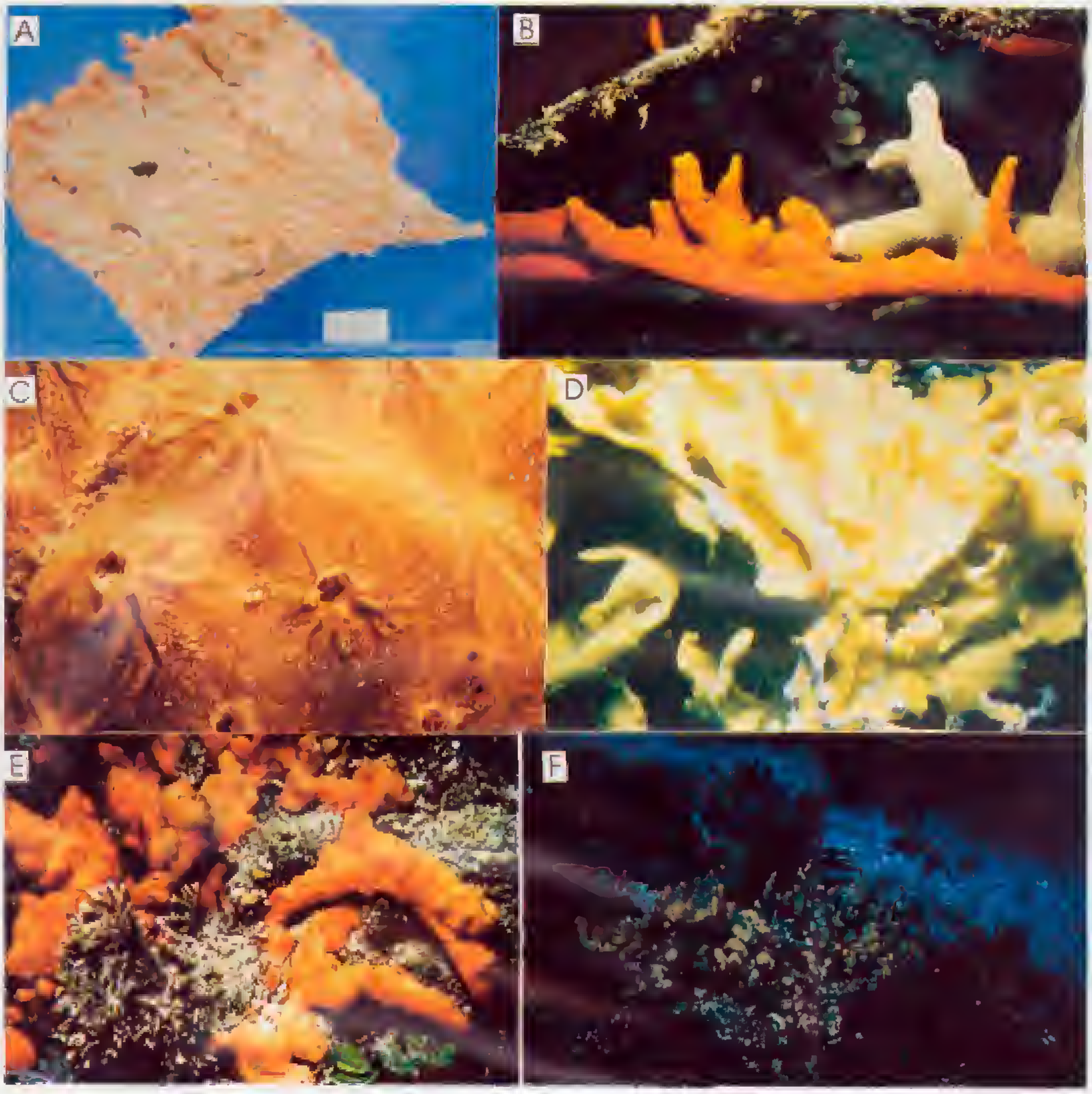

PLATE 5. A, *Clathria* (*T.*) *cancellaria* (QMG300536, Houtman Abrolhos, WA, 8m, photo NCI). B, *Clathria* (*T.*) *cervicornis* (QMG300707, Howick Is, GBR, 20m, photo author). C, *Clathria* (*T.*) *coralliophila* (QMG300377, Motupore I., PNG, 8m, photo NCI). D, *Clathria* (*T.*) *aphylla* (QMG300477, Houtman Abrolhos, WA, 20m, photo NCI). E, *Clathria* (*T.*) *craspedia* (QMG301452, Cook I., NSW, 15m, photo author). F, *Clathria* (*T.*) *craspedia* (QMG301452, Cook I, NSW, 15m, photo author).

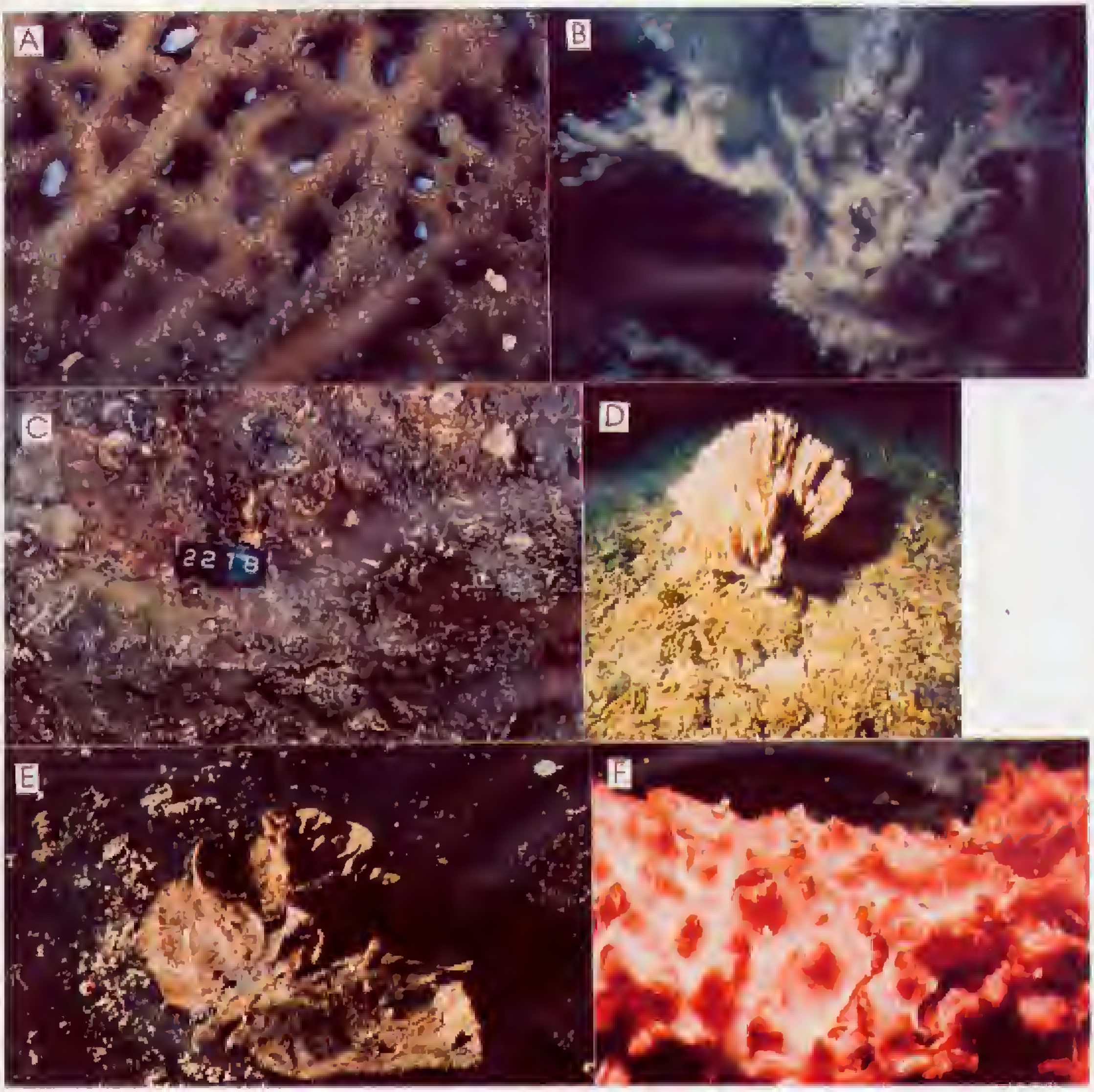

PLATE 6. A, *Clathria* (*T.*) *coppingeri* (NTMZ1152, Northwest Shelf, WA, 55m depth, photo author). B, *Clathria* (*T.*) *darwinensis* (QMG303375, Darwin Harbour, NT, 17m, photo author). C, *Clathria* (*T.*) *hallmanni* (NTMZ2218, Darwin Harbour, NT, 0m, photo author). D, *Clathria* (*T.*) *hesperia* (NTMZ3327, Exmouth Gulf, WA, 16m, photo NCI). E, *Clathria* (*T.*) *hesperia* (QMG300213, Amphinome Shoals, NW Shelf, WA, 50m, photo author). F, *Clathria* (*T.*) *hirsuta* (QMG300603, Whitsunday Is, GBR, 20m, photo NCI).

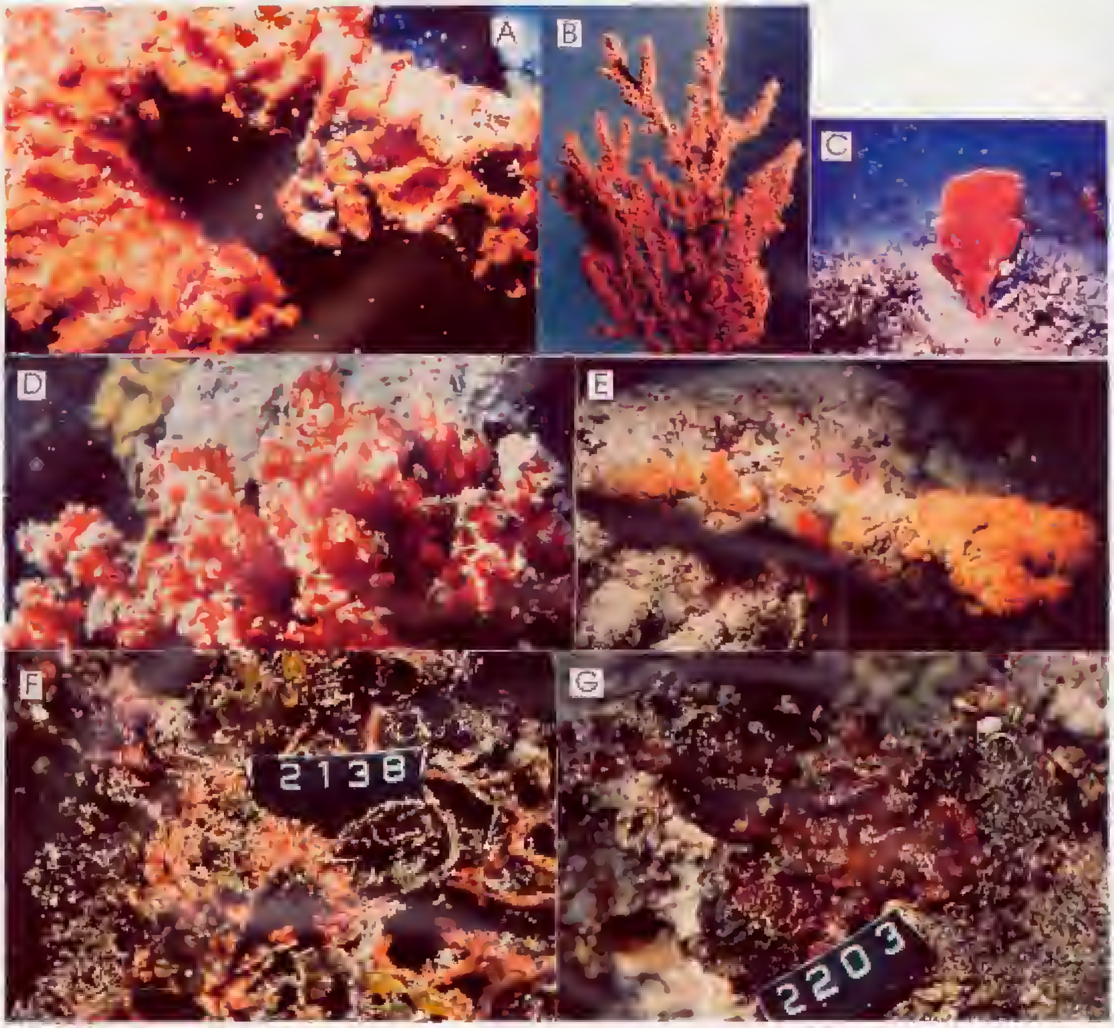

PLATE 7. A, *Clathria* (*T.*) *hirsuta* (QMG300771, Solitary Is, NSW, 7m, photo NCI). B, *Clathria* (*T.*) *lendenfeldi* (unregistered, Darwin Harbour, NT, 12m, photo N.Smit). C, *Clathria* (*T.*) *lendenfeldi* (NTMZ3489, Monte Bello Is, WA, 4m, photo NCI). D, *Clathria* (*T.*) *lendenfeldi* (NTMZ64, Port Essington, NT, 6m, photo author). E, *Clathria* (*T.*) *lendenfeldi* (QMG305138, Direction Is, GBR, 20m, photo author). F, *Clathria* (*T.*) *phorbasiformis* (NTMZ2138, Darwin Harbour, NT, 0m, photo author). G, *Clathria* (*T.*) *phorbasiformis* (NTMZ2203, Darwin Harbour, NT, 0m, photo author).

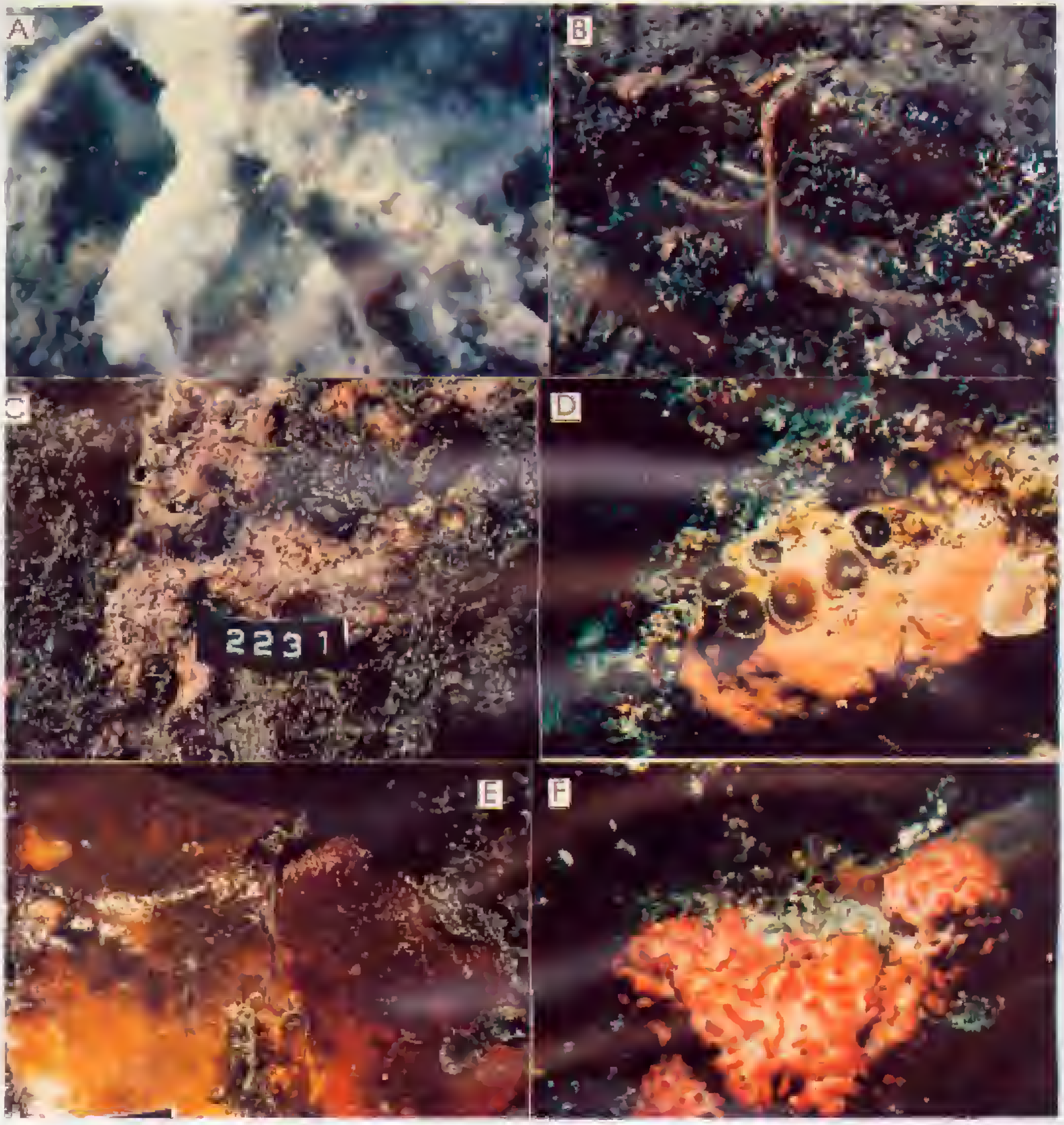

PLATE 8. A, *Clathria (T.) reinwardti* (NTMZ77, Port Essington, NT, 15m, photo author). B, *Clathria (T.) reinwardti* (NTMZ2206, Darwin Harbour, NT, 0m, photo author). C, *Clathria (T.) tingens* (NTMZ2231, Darwin Harbour, NT, 0m, photo author). D, *Clathria (T.) tingens* (QMG303826, Hook Reef, GBR, 31m, photo author). E, *Clathria (T.) toxifera* (NTMZ2222, Darwin Harbour, NT, 0m, photo author). F, *Clathria (T.) vulpina* (QMG301376, Byron Bay, NSW, 18m, photo author).

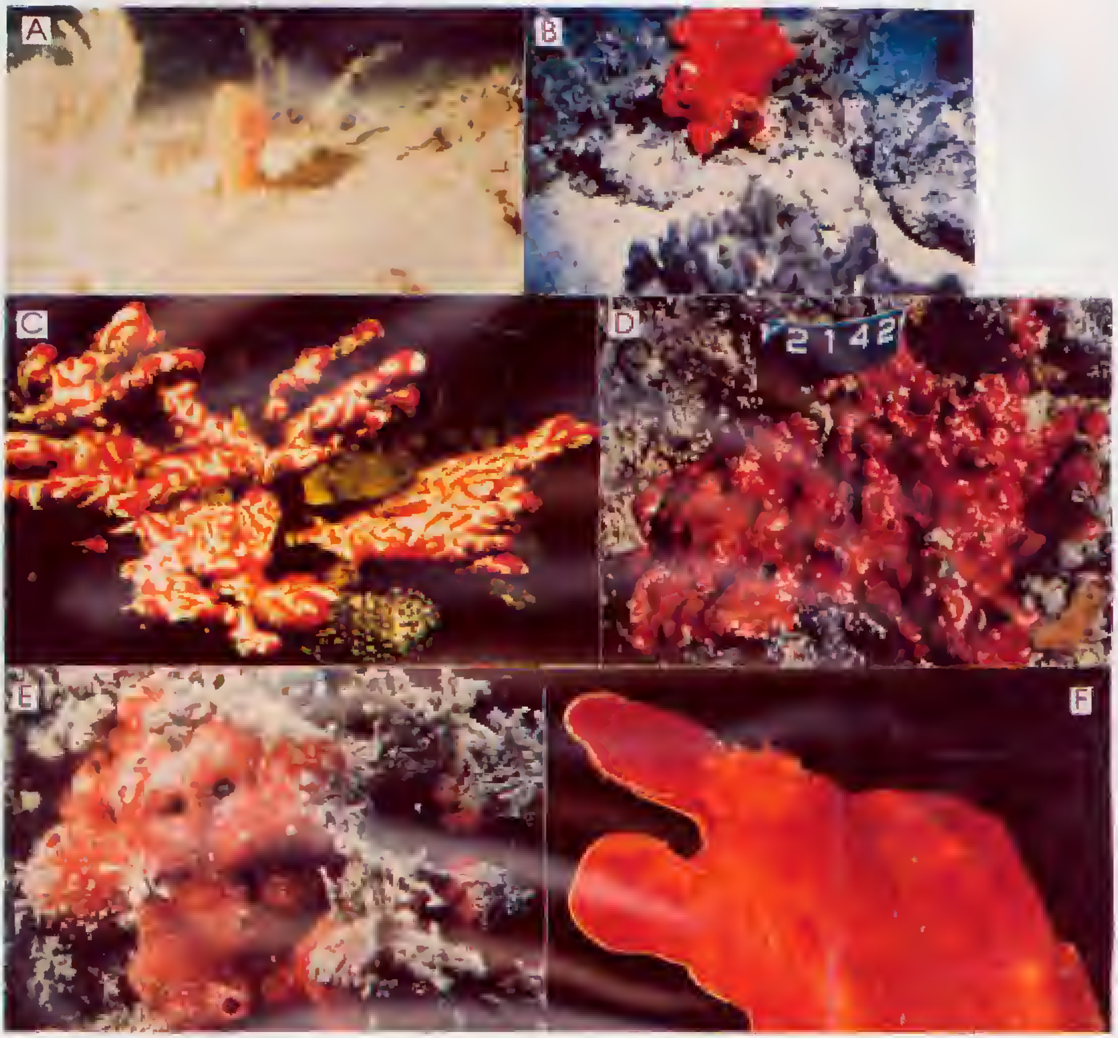

PLATE 9. A, *Clathria* (*T.*) *wesselensis* (QMG300361, Wessel Is, NT, 13m depth, photo author). B, *Antho* (*A.*) *tuberosa* (QMG300203, Shark Bay, WA, 8m, photo author). C, *Antho* (*A.*) *tuberosa* (QMG300678, Houtman Abrolhos, WA, 20m, photo NCI). D, *Antho* (*P.*) *ridleyi* (NTMZ2142, Darwin Harbour, NT, 0m, photo author). E, *Antho* (*P.*) *ridleyi* (NTMZ299, Darwin Harbour, 3m, photo author). F, *Antho* (*I.*) *chartacea* with *Rostanga* feeding (NTMZ2831, Botany Bay, NSW, 2m, photo W, Rudman).

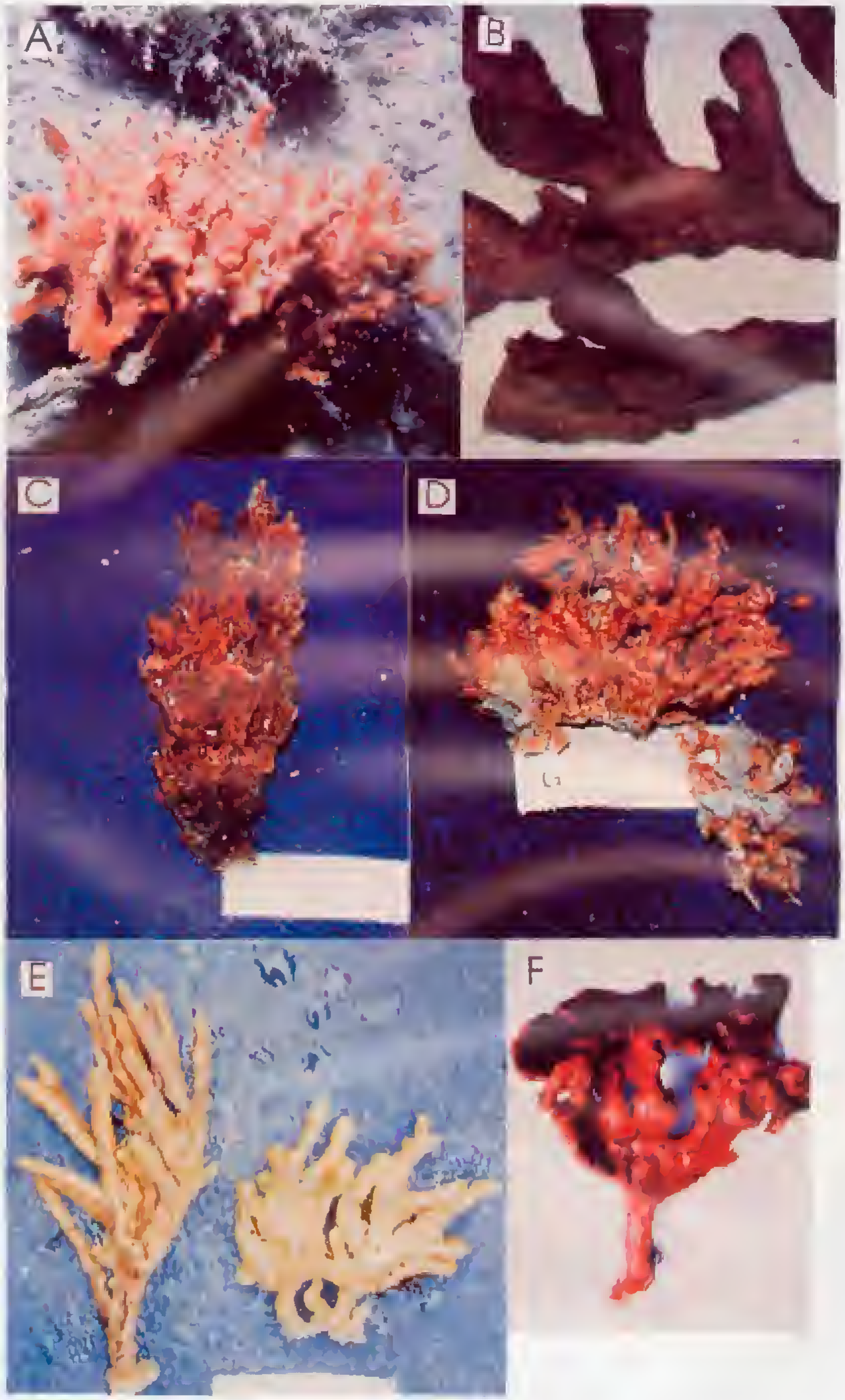

PLATE 10. A, *Antho* (*I.*) *punicea* (QMG304399, Lizard I., GBR, 18m, photo author). B, *Echinoclathria axinelloides* (QMG300269, Furneaux Is, Tas, 20m, photo NCI). C, *Echinoclathria bergquistae* (QMG303827, Hook Reef, GBR, 24m, photo author). D, *Echinoclathria digitata* (QMG304763, Howick Is, GBR, 21m, photo J. Kennedy). E, *Echinoclathria egena* (QMG300669, St. Patrick's Head, Tas., 6m, photo NCI). F, *Echinoclathria levii* (QMG300675, Bicheno, Tas., 30m, photo NCI).

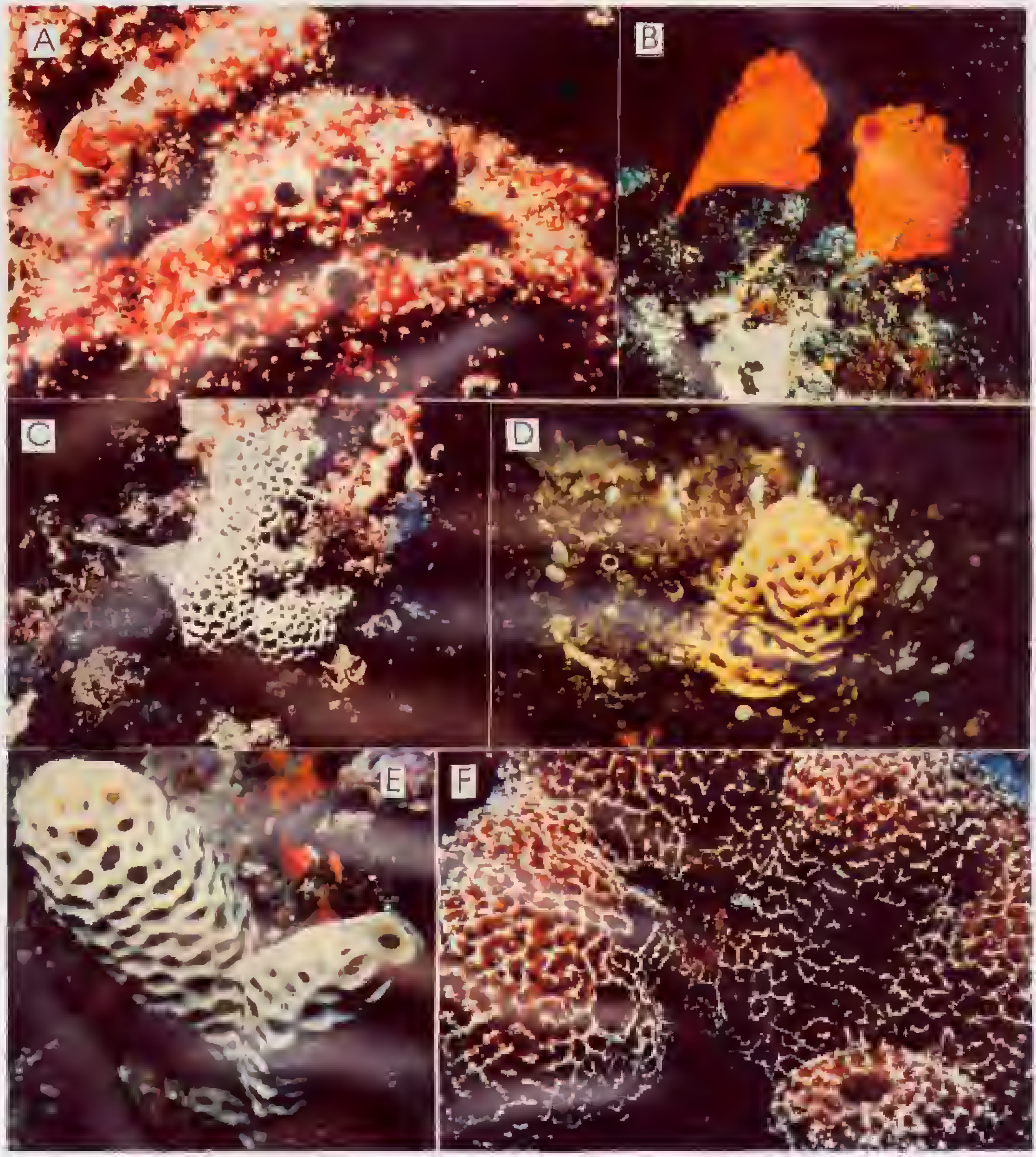

PLATE 11. A, *Echinoclathria notialis* (QMG300614, Kangaroo I., SA, 6m, photo NCI). B, *Echinoclathria riddlei* (QMG300271, Bicheno, Tas., 30m, photo NCI). C, *Holopsamma arborea* (QMG300239, Kangaroo I., SA, 17m, photo NCI). D, *Holopsamma crassa* (QMG303235, Moreton Bay, Qld., 30m, photo author). E, *Holopsamma laminaefavosa* (QMG301399, Byron Bay, NSW, 20m, photo author). F, *Holopsamma* sp. indeterminate (QMG300620, Edithburgh, SA, 6m, photo NCI).

PLATE 12. A, *Echinochalina* (*E.*) *barba* (NTMZ3853, Kent Is, Tas, 20m, photo NCI). B, *Echinochalina* (*E.*) *intermedia* (QMG300025, Mooloolabah, Qld., 30m, photo author). C, *Echinochalina* (*E.*) *tubulosa* (QMG300265, Kent Is, Tas, 20m, photo NCI). D, *Echinochalina* (*P.*) *collata* (QMG304120, Lizard I., GBR, 9m, photo author). E, *Echinochalina* (*P.*) *isaaci* (QMG305464, Swain Reefs, GBR, 22m, photo author). F, *Echinochalina* (*P.*) *tuberosa* (QMG300039, Mooloolabah, Qld., 15m, photo author).

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