Australian Intertidal Sponges from the Darwin Area

Patricia R. Bergquist and Catherine A. Tizard

Zoology Department, University of Auckland. New Zealand

Introduction

Up to the present time our knowledge of the sponge fauna of the North Coast of Australia derives from the work of Ridley (1884) who described shallow water and intertidal collections from Darwin eastward to Torres Strait, Hentschel (1912) who reported on collections from the Arafura Sea, and, to a lesser extent, Poléjoeff (1884) whose collections came, in part, from Torres Strait. Ridley is, however, the only author who has dealt specifically with the Darwin area.

From a zoogeographic standpoint the marine fauna of this area is potentially interesting. However, until recently, assumptions as to the affinities of this fauna have rested on very little data. A large portion of coastline of western and northern Australia remains biologically unexplored.

With the additions to the sponge fauna made in this paper the predominantly Indo Pacific nature of the fauna can be confirmed.

We are indebted to Miss E. Pope of the Australian Museum for the opportunity to study this collection and for the ecological notations attached to the specimens. The collection was made in October 1965 from four stations, three very near Darwin (12.5°S, 130.8°E) and one on the Coburg Peninsula to the north east of Darwin (11.5°S, 132°E). Of the Darwin stations, Fanny Bay was notable for rich sponge growth in muddy sand strewn with rocks, located about a quarter of a mile inland from low water mark. This habitat is depicted in Fig. 1, in which *Iotrochota baculifera* grows over almost every rock and the oscular projections of *Cacloearteria singaporense* protrude from the mud.

There are nineteen species belonging to seventeen genera in this collection. Making allowances for seasonal fluctuations, these probably represent most of the large, common intertidal sponges of this area. It must be noted, that apart from one sample which was epizooic upon a larger sponge, no encrusting sponges were collected. These certainly will occur in mud-free intertidal areas.

Ridley (1884) recorded twenty species from the Darwin intertidal and shallow offshore region. Of these, seventeen are recognizable today as either distinct species (9) or members of wide-ranging species (8). Only two species are common to both collections (*Iotrochota baculifera* and *Geodia globostellata*).

The dominant zoogeographic element in the fauna represented by both collections is a widespread Indo-Pacific element (46%), most of the species involved being shallow water forms throughout their range. These sponges are indicated by the notation IP in the systematic list which follows. A significant number of species have a North-Australian/Malayan (A/M) distribution (16%). There is a strong possibility that some of these species are even more widespread and that with more collecting the Indo-Pacific element can be expected to rise.

Species thus far known only from the coasts of Australia (A) represent 33% of the known sponges of the Darwin area. This figure can also be expected to decrease particularly with further collecting to the North and West of Australia. The remaining 5% of species are indeterminate in distribution since it is impossible at this stage to verify some of Ridley's identifications.

Species recorded for the first time for Northern Australia in this paper are *Ircinia spiculosa, Dysidea herbacea, Verongia ianthelliformis, Adocia turquoisia, Xestospongia exigua, Clathria reinwardti, Jaspis topsenti, Psammaplysilla purpurea* and *Isociella eccentrica*. In addition, three new species are described, *Sigmadocia symbiotica, Mycale digitata*, and *Pseudaxinyssa stipitata*.

The occurrence of a species of *Pseudaxinyssa* in the Darwin area is interesting. This genus has an essentially South-East African distribution. The species *Pseudaxinyssa pitys* recorded by de Laubenfels from the Palau Islands is certainly an erroneous identification. His sponge probably belongs in the Hymeniacidonidae not the Axinellidae. The present record extends the range of the genus certainly to Australia. The species *P. stipitata* is the only member of the Axinellida known from the Darwin area.

Few descriptive details are included in this work for those sponges which belong to common, widespread species. These for the great part are dealt with at some length by Bergquist (1965).

Methods

Color notations in the text are taken from Munsell (1940).

Means are quoted in brackets after the range of spicule dimensions, and unless otherwise stated are based upon ten measurements for each spicule type.

Systematic Discussion and List of Species

Order *Dictyoceratida* Minchin
- Family *Spongiidae* Gray
  - Genus *Ircinia* Nardo
    - *Ircinia irregularis* (Poléjaeff) — A
    - *Ircinia spiculosa* (Hentschel) — A/M
  - Genus *Verongia* Bowerbank
    - *Verongia ianthelliformis* (Lendenfeld) — A
  - Genus *Psammaplysilla* Keller
    - *Psammaplysilla purpurea* (Carter) — IP
- Family *Dysideidae* Gray
  - Genus *Dysidea* Johnston
    - *Dysidea herbacea* (Keller) — IP

Order *Haplosclerida* Topsent
- Family *Haliclonidae* de Laubenfels
  - Genus *Xestospongia* de Laubenfels
    - *Xestospongia exigua* (Kirkpatrick) — IP

Order *Poecilosclerida* Topsent
- Family *Adociidae* de Laubenfels

Genus *Adocia* Gray
Adocia turquoisia de Laubenfels IP
Adocia muricata (Ridley) A
Genus *Sigmadocia* de Laubenfels
Sigmadocia symbiotica nov. sp.
Family *Coelosphaeridae* Hentschel
Genus *Coelocarteria* Burton
Coelocarteria singaporense (Carter) IP
Family *Tedaniidae* Ridley and Dendy
Genus *Iotrochota* Ridley
Iotrochota baculifera Ridley IP
Family *Microcionidae* Hentschel
Genus *Clathria* Schmidt
Clathria reinwardti Vosmaer A/M
Genus *Isociella* Hallmann
Isociella eccentrica Burton A
Family *Ophlitaspongiidae* de Laubenfels
Genus *Mycale* Gray
Mycale digitata nov. sp.
Order *Axinellida* Bergquist
Family *Axinellidae* Ridley and Dendy
Genus *Pseudaxinyssa* Burton
Pseudaxinyssa stipitata nov. sp.
Order *Hadromerida* Topsent
Family *Spirastrellidae* Hentschel
Genus *Spirastrella* Schmidt
Spirastrella vagabunda Ridley IP
Order *Epipolasida* Sollas
Family *Jaspidae* de Laubenfels
Genus *Jaspis* Gray
Jaspis topsenti Thiele A/M
Order *Choristida* Sollas
Family *Geodiidae* Gray
Genus *Geodia* Lamarck
Geodia globostellifera Carter IP
Family *Tetillidae* Sollas
Genus *Cinachyra* Sollas
Cinachyra australiensis (Carter) IP

Order Dictyoceratida Minchin
Family Spongiidae Gray
Genus IRCINIA Nardo

Ircinia spiculosa Hentschel

Hircinia spiculosa Hentschel, 1912, p. 444.

Occurrence: Cape Don, Coburg Peninsula.
A.M. Reg. No. Z.3087.

Description: A massive, approximately spherical sponge, 7.0 cm thick,

8.0×9.0 cm in diameter.

Color: In life and in alcohol, the upper surface is black, the interior and lateral or shaded surface areas brick red. (rY-R 4/8)

Texture: Extremely tough but easily compressible.

Surface: The surface is flattened, covered over most of its area with small, evenly spaced conules 0.2-1.5 mm high. In several places shallow depressions occur, these are in two cases obviously the oscular areas, 3.0-6.0 mm across, but otherwise are points where foreign objects (shell etc.) have adhered to the surface. Conules are absent from the floor of such depressions.

Skeleton: The skeleton is composed of fasciculate columns of spongin B fibres cored with spicule fragments. Primary, ascending and secondary, connective fibres are distinguishable. Connective fibres are fasciculate only near the point where they join the primary fibres, usually by means of 5-8 diverging roots. Secondary fibres are also cored by spicule detritus.

Primary fibres range from 200-350 μ in total diameter, individual units being from 50-120 μ across. Secondary fibres range from 120-210 μ in diameter.

Filaments of two types are present, both forms terminated by spherical to ovate knobs 8.5-11.0 μ in diameter. The filaments are 3.0-6.5 μ in diameter.

The difference between the two filament types is in their chemical constitution. In some forms, granular, dark brown inclusions are evident and these show no staining reaction with either Mallory or Mallory Heidenhain procedures. Other filaments without inclusions show either the typical spongin A or B staining reaction.

The dermal region is packed with spicule fragments forming a recognizable spicule cortex to a depth of 300 μ.

Flagellated chambers are small, spherical, 25-35 μ in diameter.

Discussion: There are painfully few reliable and useful characters for specific distinction within *Ircinia*. However, this specimen with its marked spicule cortex and exclusively spicule detritus in the fibres can be identified confidently with Hentschel's species from the Arafura Sea.

De Laubenfels (1948) referred *Ircinia spiculosa* to *Ircinia clavata* Thiele from Chile. We have examined the holotype of the latter species, B.M. 08.9.24.214 and there is no doubt that they are distinct species. *Ircinia clavata* has very stout, clear filaments 8.0-10.0 μ in diameter, of a single type and rather sparse.

Previous distribution: Arafura Sea 12 m. Hentschel.

Ircinia irregularis (Poléjaeff)

Cacospongia irregularis Poléjaeff, 1884, p. 63, pl. vi, fig. 10.
Hircinia gigantea Lendenfeld, 1889, p. 588, pl. xxvii, fig. 7; pl. xxxviii, fig. 2; pl. xxxvi, figs. 1, 6, 10.
Hircinia irregularis, Burton, 1934, p. 578.

Occurrence: East Point, Extreme Low Water.
A.M. Reg. No. Z.3088.

Remarks: This specimen, black in life, conforms well with earlier descriptions, being cavernous, soft and compressible and inhabited by numerous decapod crustacea. The fibres in this specimen are cored with spicule detritus and sand grains. Only in this respect do they differ from the specimen described by

Lendenfeld where the fibres were to a great extent clear.

Previous Distribution: Australia, north and east coasts (Lendenfeld, Poléjaeff, Burton).

Genus VERONGIA Bowerbank

Verongia ianthelliformis (Lendenfeld)

(Plate 2, Fig. 2.)

Dendrilla ianthelliformis Lendenfeld, 1888, p. 29.
Dendrilla ianthelliformis, Lendenfeld, 1889, p. 719.
Aplysina praetensa Row, 1911, p. 3741, pl. 36, fig. 11.
Dendrilla ianthelliformis, de Laubenfels, 1948, p. 153.
Megalopastas ianthelliformis, Vacelet, 1958, p. 144.

Occurrence: East Point, at extreme low water.
A.M. Reg. No. Z.3089.

Description: An erect lamellate sponge with cactiform appearance, 7.0 cm high and 4.0–7.0 mm thick.

Color: In life dark violet to black (rY-R 2/2); in spirit very dark brown (rY-R 2/4).

Texture: Firm but elastic.

Surface: Smooth, except where the dermal membrane is raised into sharp conules. These are distributed irregularly over the whole surface but toward the base are frequently reduced to small lumps. Conules range from 0.2–3.0 mm high and are spaced 3.0–4.0 mm apart. Under low magnification a delicate tracery of dermal pores is visible.

Skeleton: The skeleton is a very open reticulation of spongin B fibres with anastomoses more frequent toward the periphery of the lamella and no clear distinction between primary or secondary members.

The fibres are typical of the genus, with stout, concentric, laminated spongin B investing a pith made up of a reticulum of fine threads. Fibres upto 800.0 μ in diameter are common. The spongin sheath veries from 60–90 μ in thickness regardless of total fibre diameter, thus the pith accounts for most of the bulk in the large fibres.

Histology: The dermal membrane is skin-like and is bonded closely to the subdermal tissues, the whole making up a superficial layer, 60–100 μ deep, which is rich in spongin A. This substance is particularly concentrated in a basal strip intervening between the dermal cellular concentration and the more diffuse endosomal region.

Tracts of spongin A run throughout the endosome but tend to be concentrated around canals. Pigment cells are particularly abundant in the dermal region but occur throughout the sponge.

Flagellated chambers are spherical, 16.0–30.0 μ (25 μ) in diameter and dispersed throughout the endosome.

Discussion: There have been several attempts to allocate Lendenfeld's species of *Dendrilla* and *Verongia* (*Aplysina*) to other genera. In no case has the re-allocation dealt with all the species involved, a tremendous task, and is no case has the author examined type material. Although long synonomies have been compounded (Burton 1934) little confidence can be placed in the findings. *Dendrilla*

ianthelliformis is one species which has been re-assigned several times without proper investigation. Certainly, Lendenfeld (1888 and 1889) gave a brief description, but the holotype (B.M. 86.7.8.10) has been available for examination, which, in this case, has revealed Lendenfeld's description to be accurate as far as it goes. Further details are given above.

Burton (1934) assigns *Verongia ianthelliformis* to *Dendrilla membranosa* (Pallas), a species with the huge, eurypylous, flagellated chambers which so well characterise the Dysideidae. There are no such structures in *V. ianthelliformis*.

Vacelet (1958) attempting to systematise the generic nomenclature applied to species of *Dendrilla*, *Megalopastas* and *Aplysilla* correctly points to the presence in *Megalopastas* Dendy of a reticulate skeleton as opposed to the dendritic skeleton of *Dendrilla* and uses this character to uphold *Megalopastas*. *Verongia ianthelliformis* has a reticulate skeleton and thus is referred by Vacelet to *Megalopastas*, again with no reference to the histology of the sponge.

Dendy (1905) stresses the large size and eurypylous nature of the flagellate chambers in *Megalopastas* and thus Vacelet's conclusion as regards *V. ianthelliformis* must on our observations be rejected.

De Laubenfels (1948) upholds *V. ianthelliformis* as a species of *Dendrilla*, not on the basis of Lendenfeld's description but because he identified *V. ianthelliformis* with *Megalopastas erecta* Row from the Red Sea. This synonomy can be rejected immediately by re-examining BM. 12.2.1.75 the holotype of *M. erecta*. This species is a typical *Megalopastas*, with reticulate skeleton and eurypylous chambers. In the same paragraph de Laubenfels refers *Aplysina praetensa* Row to *V. ianthelliformis* stating that it is "fragmentary" and "in poor condition". This specimen BM. 12.2.1.89 is certainly fragmentary but is not degenerate. It is clearly a *Verongia* with small spherical flagellate chambers, flexible texture conferred by rich impregnation of all regions by spongin A and massive concentric, pithed fibres. As far as can be determined from examination of the type specimen, *A. praetensa* Row is synonymous with *V. ianthelliformis*. There seems no impediment to including the species *ianthelliformis* in the genus *Verongia*. De Laubenfels (1948) has cast doubt on all of Lendenfeld's records of *Verongia* (*Aplysina*) from the Australian region, but it is now clear that this genus, in addition to its circumtropical but predominantly Northern Hemisphere distribution, extends southwards to Australia. It remains to evaluate all records individually, but Lendenfeld's *D. ianthelliformis* is a perfectly typical *Verongia* in its skeletal, morphological and histological attributes. The transfer is made here with complete confidence.

Previous Distribution: East Coast of Australia (Lendenfeld); Red Sea (Row).

Genus PSAMMAPLYSILLA Keller

Psammaplysilla purpurea (Carter)

Restricted Synonymy:
Aplysina purpurea Carter, 1880, p. 36.
Psammaplysilla arabica Keller, 1889, p. 358, pl. XXII, figs. 23-27.
Psammaplysilla purpurea, Bergquist, 1965, p. 135, fig. 6 a, b, c, d.
(See Bergquist, 1965 for full synonomy.)

Occurrence: Dudley Reef, encrusting over *Coelocarteria*.
A.M. Reg. No. Z.3090.

Remarks: This specimen is the first record of this common Indo-Pacific species from the north coast of Australia. For full description and discussion refer to Bergquist (1965).

Previous Distribution: Widespread Indo-Pacific.

Family Dysideidae Gray
Genus DYSIDEA Johnston
Dysidea herbacea (Keller)

Restricted Synonymy:
Spongelia herbacea Keller, 1889, p. 336, pl. 20, fig. 1.
Megalopastas arenofibrosa Dendy and Fredrick, 1924, p. 510, pl. 25, fig. 15.
Dysidea herbacea, Burton, 1934, p. 593.
Dysidea herbacea, Bergquist, 1965, p. 140, fig. 7 a, b, c.

Occurrence: Dudley Reef; Cape Don (Coburg Peninsula), 2 specimens, A.M. Reg. No. Z.3091; Z. 3092.

Remarks: The three specimens are typical of *Dysidea herbacea* as it occurs throughout the Indo-Pacific in shallow offshore or intertidal regions. For illustration of this species refer Bergquist (1965).

Previous Distribution: Red Sea (Keller, Row, Topsent); Indian Ocean (Dendy); Australia (Hentschel, Dendy and Fredrick, Burton); Marshall Islands (de Laubenfels); Palau Islands (Bergquist); Hawaii (Bergquist).

Order Haplosclerida Topsent
Family Haliclonidae de Laubenfels
Genus XESTOSPONGIA de Laubenfels
Xestospongia exigua (Kirkpatrick)
(Plate 2, Fig. 1)

Restricted Synonymy:
Petiosia exigua Kirkpatrick, 1900, p. 139, pl. XII, fig. 7; pl. XIII, fig. 4.
Xestospongia exigua, Bergquist, 1965, p. 149, fig. 14 i, ii, iii.

Occurrence: Dudley Reef, very common in intertidal zone. A.M. Reg. No. Z.3093.

Remarks: This is the first record of *Xestospongia exigua* from Australia. Elsewhere in the Indo-Pacific it is a common shallow water species. A full discussion of the range of form and structural variation in this species is given by Bergquist (1965).

The growth form of this sponge, in the Dudley Reef pools is exclusively as shown in the figure, a meandrine lamellate habit, covering large areas of the reef. The color, dark brown in life has not previously been noted.

The spicules are oxeas, 100-160×4.0–7.0 μ (149×6.2 μ).

Previous Distribution: Christmas Island (Kirkpatrick); Yap, Palau, Marshall Is. (de Laubenfels); Palau Islands (Bergquist).

Order Poecilosclerida Topsent
Family Adociidae de Laubenfels
Genus ADOCIA Gray

Adocia turquoisia de Laubenfels
(Plate 3, Fig. 1)

Adocia turquoisia, de Laubenfels, 1954, p. 106, fig. 67.
Adocia turquoisia, Bergquist, 1965, p. 154.

Occurrence: Fanny Bay, intertidal.
A.M. Reg. No. Z.3094.

Remarks: Little need be added to the descriptions listed above. The species has never been figured and thus a plate is appended.

Spicules are oxeas, 64–112×1.5–5 μ.

Previous Distribution: Palau Is., Marshall Is. (de Laubenfels); Palau Is. (Bergquist).

Adocia muricata (Ridley)
(Plate 3, Fig. 2)

Pellina muricata Ridley, 1884, p. 411, pl. 39, fig. J; pl. 41, fig. V.
Reniera aquaeductus, Ridley, 1884, p. 409.

Occurrence: Fanny Bay, midtidal.
A.M. Reg. No. Z. 3095.

Description: The sponge compared well with the description given by Ridley (1884) and a plate is appended. The actual dimensions are 7.0 cm high, 9.0 cm long, 8.0 cm across.

Color: In life, greenish-gray and in alcohol, pale brown to gray. (Y 7/2).

Texture: Spongy, easily compressible.

Surface: The surface is irregular, produced into thick oscular turrets and, on a smaller scale, into tiny conules 0.2–0.8 mm high. The gross appearance of the surface is punctate. The fine dermal skeleton is supported by a strong subdermal fibre reticulation and the gaps in this are visible through the surface.

Oscules are 4.0–6.0 mm in diameter, elevated, or rarely, flush with the surface.

This sponge inhabits the mud zone of the shore but is never mud coated. Plate 6, fig. 2.

Skeleton: The skeleton is an irregular reticulation of spicule fibres in which the primary fibres are well provided with spongin B, and run approximately at right angles to the surface, while the secondary, connecting fibres have little spongin, are irregular in disposition and grade imperceptibly into the mass of interfibrillar spicules. Near the surface the skeletal pattern becomes more regular and in the sub dermal position a strong tangential reticulum of secondary fibres is developed. This is overlain by a weak, unispicular, isodictyal dermal skeleton.

Fibre dimensions are; primary tracts 60–120 μ, secondary tracts from 12.0 (bispicular) to 80.0 μ.

Spicules: *Oxeas*—Slightly curved, or straight, sharply tapered spicules. Frequent stylote modifications occur. 128–256×9.0–11.0 μ (204×9.8 μ).

Discussion: This is the second record of this species from the Darwin area, the other being that of Ridley (1884). In one feature our specimen differs from the holotype; the number of spicule rows incorporated in primary and secondary tracts is considerably in excess of the 3–8 rows described by Ridley. In view of the similarity in surface features, overall habit and spicule morphology, we regard

this difference as variation within the species. No doubt intermediate forms occur, since this particular aspect of skeletal morphology is notoriously variable in other species of Adociidae.

This species, described by Ridley in *Pellina* is referred to *Adocia* since *Pellina* is understood (de Laubenfels 1936, 1950; Hechtel 1965) to be a genus with long membranous oscular tubes. On this basis *Adocia muricata* cannot remain in *Pellina*. We are not, at the present time, attempting to evaluate Burton's (1934) contention that *Pellina* is a complete synonym of *Adocia*.

Previous Distribution: Darwin (Ridley).

Genus SIGMADOCIA de Laubenfels

Sigmadocia symbiotica sp. nov.

(Text Fig. 1; Plate 4, Fig. 1)

Occurrence: Cape Don; Coburg Peninsula.

Holotype: Australian Museum. No. Z.3096.

Description: An erect, branched colony, 12.0 cm high, 7.0 cm wide distally, 2.0 cm wide at the base. Individual branches are cylindrical, 0.6-1.2 cm in diameter and frequently anastomosing. The sponge in this case is intimately investing a red alga (*Gracelaria*) and the great bulk of the combination is provided by the alga. The sponge so completely invests the exterior of the alga that presence of the latter is undetectable without sectioning. Sponge tissue extends through all the intervals between branches of the alga. The thickness of the sponge covering over the surface varies from 60-224 μ.

Fig. 1. *Sigmadocia symbiotica* nov. sp. Oxeas and sigma.

Color: In life, dark green; in alcohol, pale pink to yellow (Y-R-Y 8/4).

Texture: The sponge is hard, incompressible and in alcohol, extremely brittle.

Surface: The surface is smooth. Oscules lie flush with it, are 0.8-1.5 mm in diameter and dispersed irregularly.

Skeleton: An isodictyal reticulation of oxeas, arranged uniserially makes up the dermal skeleton. The regularity of this arrangement is often broken and the spicules are strewn without order. The internal skeleton has no organization beyond a few short 5-6 spicular tracts orientated at right angles to the surface. There is no visible spongin B. Sigmas are dispersed throughout the sponge tissue.

Spicules: *Megascleres*; *Oxeas*, curved, slightly angulate spicules which are rarely straight. 128-160×2.0-7.5 μ (142×4.0 μ).

Microscleres; *Sigmas*, of typical "C" form, 16.0-20.0 μ (17.8 μ).

Discussion: This sponge is described as a new species on the basis of its unique association with the *Gracelaria*. A similar sponge has been collected but

not yet described from the Palau Is.

Family Coelosphaeridae Hentschel
Genus COELOCARTERIA Burton
Coelocarteria singaporense (Carter)

Restricted Synonymy:
Phloeodictyon singaporense Carter, 1883, p. 326, pl. XIII, fig. 7.
Coelocarteria singaporense, Burton, 1934, p. 563.
Coelocarteria singaporense, Bergquist, 1965, p. 161.
(For full synonomy, ref. Bergquist, 1965)

Occurrence: Dudley Reef.
A.M. Reg. No. 3097.

Remarks: In habit, structure and spiculation, this species varies little throughout its range.

Previous Distribution: General Indo-Pacific.

Family Tedaniidae Ridley and Dendy
Genus IOTROCHOTA Ridley
Iotrochota baculifera Ridley
(Plate 1)

Restricted Synonymy:
Iotrochota baculifera Ridley, 1884, p. 435, pl. XXXIX, fig. M, pl. XLII, fig. F.
Iotrochota baculifera Bergquist, 1965, p. 163.

Occurrence: Fanny Bay, extremely common at low tide, often coated with mud. A.M. Reg. No. 3098.

Remarks: The deep purple dye which this sponge emits upon handling is a most accurate and useful identification characteristic.

Previous Distribution: Northern Darwin (Ridley); Celebes (Thiele); Philippines (Lévi); Marshall Is., Truk (de Laubenfels); Palau Is. (Bergquist).

Family Microcionidae Hentschel
Genus CLATHRIA Schmidt
Clathria reinwardti Vosmaer
(Plate 4, Fig. 2)

Clathria reinwardti Vosmaer, 1880, p. 152.
Clathria reinwardti var. *subcylindrica* Ridley, 1884, p. 446.

Occurrence: Dudley Reef, at extreme low water.
A.M. Reg. No. Z.3099.

Description: The sponge is ramose, with major, semi-prostrate branches, laterally compressed and up to 20.0 mm in diameter and secondary branches cylindrical, from 5.0-8.0 mm in diameter. The branches frequently anastomose and the whole sponge forms a tangled mass.

Color: In life, brick red (rY-R 5/10); in alcohol, pale brown (Y-R-Y 7/2).

Surface: The surface is both macroscopically and microscopically hispid, and

roughened and irregular. Short ridges cross the branches obliquely, sometimes becoming produced into short branches and providing a connection between adjacent rami. Between ridges the surface is lumpy; here the dermal membrane is visible stretched over the underlying tissues and a few oscules (0.2–0.5 mm in diameter) remain open.

Spicule Dimensions of *Clathria reinwardti*

Locality and Author	Styles	Accessory styles	Acanthostyles	Toxas	Isochelae
Ridley v. *subcylindrica* Torres Strait.	250–280 × 9.5–12.7 μ	220 × 10–12.7 μ	76 × 6.3 μ	absent	19.0 μ
Darwin	192–288 × 9–12 μ	230–267 × 3.0–7 μ	58–70.0 × 9.5 μ	110–190 × 1.0 μ	14.8–17.0 μ
Dudley Reef	(262 × 10.5 μ)	(250 × 6.0 μ)	(64 × 9.5 μ)	(148 × 1.0 μ)	(16.0 μ)

Skeleton: The skeleton is an irregular rectangular reticulation of spicule fibres, interrupted only occasionally by thicker ascending fibres. All fibres are composed of spongin B cored by smooth styles and echinated by acanthostyles. Great numbers of interstitial accessory styles occur throughout the sponge but the maximum concentration of these spicules is in the dermis where they form a distinct layer. The arrangement of the dermal styles ranges from tufted to tangential.

There is considerable variation in the diameter of the fibres but most fall within the range 40–120 μ.

The microscleres are the typical clathriid palmate isochelae and toxas. Isochelae are distributed throughout the sponge but the toxas seem to be confined to larval tissues where they occur in dragmata.

Spicules: *Megascleres*: (a) structural styles coring all fibres, these spicules are perfectly smooth and slightly curved in the anterior third.

(b) Accessory styles, smooth straight spicules.

(c) Acanthostyles which are short squat spicules spined over their entire length. The stylote form is exceptional; most spicules are distally rounded and thus, acanthostrongyles.

Microscleres: (a) Palmate isochelae of typical form.

(b) Toxas. Long, very fine spicules with a low central flexure and no recurvature of the tips.

Larvae: Larvae in all stages of development are present. Those about to be liberated are spherical, 420–480 μ in diameter with a dense layer of small cells enclosing a more diffuse body. The larval spiculation consists of isochelae around the periphery; fine styles internally, and toxa dragmata either internally or ranged around the larva just below the outer layer.

Discussion: This specimen is identified with *Clathria reinwardti* on the basis of habit and of its possessing the strongylote acanthose spicules mentioned by Ridley (1884) for his var. *subcylindrica*. The fact that no toxas are reported in this species by previous authors is not surprising in view of their extremely fine construction and the tendency apparent in our specimen for these spicules to be

confined to the larvae. There is no significant disparity between descriptions of *C. reinwardti* and our specimen in respect of spicule dimensions and skeletal construction.

There are two other species with which this sponge should be compared, *Clathria fasciculata* Wilson and *Clathria frondifera* Bowerbank. The former is well distinguished by the pronounced fascicular columns making up the main skeletal tracts. The latter is characterized by a tendency to adopt a pseudo-tubular or lamellate form. It is noted that Ridley (1884, p. 447) described a second variety of *C. reinwardti*, var. *palmata*, in which just such a tendency to lateral fusion and production of lamellate form of evident.

There are sufficient differences in spiculation to separate *C. frondifera* and *C. reinwardti*, (e.g. toxa size and form, acanthostyle morphology), but it seems probable that *C. reinwardti* var. *palmata* should be placed in *C. frondifera*.

Previous Distribution: Moluccas (Vosmaer); Torres St. 3-7 fms (Ridley).

Genus ISOCIELLA Hallmann

Isociella eccentrica (Burton)

(Plate 5, Fig. 1)

Ophlitaspongia eccentrica Burton, 1934, p. 560, pl. 1, 8, 9; Text fig. 12 a.
Axociella eccentrica, de Laubenfels, 1936, p. 113.

Occurrence: Fanny Bay; mud tide pools, common.
A.M. Reg. No. Z.3109.

Description: A repent, semi-encrusting sponge, very loosely attached to the substrate and giving rise to short vertical branches which rise from a compressed base.

Color: In spirit, yellow brown (Y 6/4).

Texture: Tough, but compressible.

Surface: The dominant feature of the surface is the irregular fibre reticulation which is continuous throughout the sponge. No special surface structures are differentiated and a clear surface membrane appears discontinuously. The overall external impression of the sponge is that of a haplosclerid. Oscules are disposed at the tips of short branches and measure 0.6–1.5 cm in diameter.

Skeleton: The skeleton is a slightly irregular, rectangular reticulum of spicule fibres with no axial concentration and no emphasis on primary or secondary tracts. There is very little fleshy tissue in the sponge. Both this feature, and the pattern of the skeleton are reminiscent of *Callyspongia*. The coring spicules are smooth, anteriorly curved styles present in the fibres in up to ten rows. There is rarely more than two spicule lengths between anastomoses in the skeletal reticulum and the number of spicule rows and the spongin fibre diameter alters at each anastomosis. Interstitial and dermal spicules are abundant; these are straight to slightly wavy styles. Two size categories of these spicules are recognizable but this is not reflected in the localization of accessory styles.

Toxas are dispersed throughout the sponge, usually aligned parallel to a segment of the skeleton. Palmate isochelae are also abundant and general in their distribution.

Spicules: No further descriptive details of the spicules are necessary since these have been figured by Burton (1934). A size comparison with the spicules

of the holotype is however useful.

Spicule Dimensions of *Isociella eccentrica*

Locality	Structural Styles	Accessory Styles	Toxas	Isochelae
Low Isles Burton HOLOTYPE*	360×17 μ	440×8 μ 240×5 μ	up to 320×4.0 μ	14–18 μ
Fanny Bay	288–440× 9.1–18.0 μ (345×12 μ)	300–470×5–8 μ (327×6.5 μ) 208–220×4.0 μ (214×4 μ)	76–270×2.5–6.5 μ (164×4 μ)	16.0–17.5 μ (16.75 μ)

* "toxiform"? oxeas, rare, 800×7 μ.

Discussion: Two points need elaboration in respect to the identification of this sponge with *O. eccentrica* Burton. First, the fact that Burton records huge oxeote spicules in the holotype is ignored. These spicules were, he says, rare. This, in conjunction with their size, makes it improbable that they belong to the specimen. Eecept on this point, the skeletal comparison between the two specimens is extremely close.

Second, the correct generic position of this sponge is difficult to determine. It is clearly not an *Ophlitaspongia*; the skeleton is not plumo-reticulate, there are no echinating styles and the structural spicules are totally invested in the spongin skeleton. De Laubenfels has placed the species in *Axociella* Hallmann, solely on grounds of microsclere spiculation but this cannot be sustained on grounds of skeletal morphology. *Axociella* species are ramose or lamellar, show some axial condensation and have an extra-axial radial skeleton. *Isociella* Hallmann has a sub-renieroid reticulate skeleton, lacks echinating spicules and has a spiculation equivalent to that of *Axociella*.

Isociella thus appears to be the correct genus for this sponge which differs from the two other species in the genus, *I. jacksoniana* Hallmann and *I. incrustans* Bergquist, in spicule dimensions and details of skeletal arrangement.

Previous Distribution: Low Isles, Great Barrier Reef (Burton).

Family Ophlitaspongiidae de Laubenfels
Genus MYCALE Gray
Mycale* (*Carmia*) *digitata nov. sp.
(Text Fig. 2; Plate 5, Fig. 2)

Occurrence: East Point

Holotype—Australian Museum Reg. No. Z.3100.

Description: A massive sponge with distinctive digitate, tapering oscular projections, 1.0–3.0 cm high and 0.4–1.8 cm in diameter.

Color: In life, dull yellow (Y 6/4); in alcohol, fawn (Y–R–Y 7/2).

Texture: Firm, just compressible.

Surface: The surface is smooth, but irregular with a thick (0.8 mm) dermis following the undulating contours of the endosome. For the most part the surface is clear of detritus and a pattern of small sub-dermal spaces is visible. This confers a punctate appearance on the sponge. No oscules are expanded on the holotype.

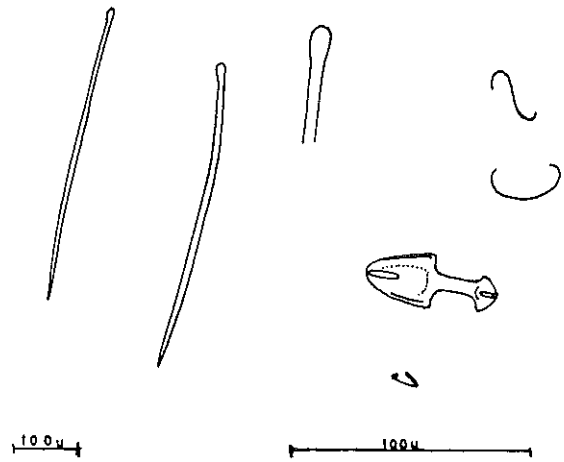

Fig. 2. *Mycale digitata* nov. sp. Subtylostyles, anisochelae, and sigmas.

Skeleton: The main skeleton is composed of subtylostyles in stout tracts of very variable diameter. In the deeper regions of the sponge these tracts branch and anastomose freely, but do not do so near the surface. From 400–600 μ below the surface the ascending spicule tracts begin to diverge and intersect the dermis as spicule brushes. These do not form a continuous palisade. An unusual, tangential spicule tract ramifies 200–250 μ below the surface and provides a strong reinforcement for the dermal region. This tract is equivalent in diameter to the main plumose columns.

Interstitial megascleres are abundant and there are no echinating megascleres. Spongin B is not obvious in the fibres. The microsclere complement is typical of the genus except in one respect; that raphides are absent or extremely rare. Sigmas and small anisochelae occur in the dermal membrane in addition to the interior; other larger anisochelae are restricted to the interior where the largest form rosettes 150–180 μ in diameter. Rosettes are concentrated in the sub-dermal region.

In the dermal membrane megascleres are strewn without order, sometimes 2–4 spicules are grouped into short tracts but no regular reticulation is developed.

The overall architecture of the endosome is cavernous as is typical of *Mycale*, but more compact than in most species. This is reflected in the firm texture of the sponge.

Histology: Flagellated chambers are ovoid to spherical, 25.0–40.0 μ in maximum diameter.

Spicules: *Megascleres*; *Subtylostyles*—slightly curved spicules, occasionally wavy or straight having a pronounced oval head and separated by a slight neck from the body of the spicule. 416–540×7.5–12.5 μ (502×10.3 μ)

Microscleres; (a) *Sigmas* of typical "C" or "S" form. Size categories are not distinguishable. 16.0–45.0 μ (29.0 μ)

(b) Palmate *anisochelae* of three size groups. These spicules have no distinctive morphological characteristics.

(i) 16.0-18.0 μ (16.4 μ) A group of very constant dimensions. These spicules occur throughout the sponge and are laterally compressed, the alae lying parallel to the shaft.
(ii) 24.0-29.0 μ (27.0 μ) These spicules are not abundant and do not form rosettes. They are identical in form and distribution with the largest anisochelae.
(iii) 53.0-65.0 μ (61.0 μ) Abundant in the interior, frequently in rosettes. The alae are set at an acute angle to the shaft.

(c) *Raphides*. These spicules are not certainly present. Rare individuals, 140.0-350.0 μ long occur but are not clearly distinct from developmental stages of megascleres.

Discussion: *Mycale digitata* is perhaps closest among described species of *Mycale* to *M. rhaphidotoxa* Hentschel from the Arafura Sea. There are, however, many differences, notably the absence of raphides, the morphology of the small anisochelae, the size of the sigmas and the habit of the sponge. *Mycale fistulifera* (Row) from the Red Sea, is similar in habit to *M. digitata* but quite distinct in construction and spiculation.

In describing our specimen as a new species, emphasis is given to the distinctive habit of the sponge, the unusually firm texture, the presence of a tangential, subdermal network of spicule tracts and to the details of spiculation.

Mycale digitata does not fall conclusively into any one of the three sub-genera set up by Topsent (1924). The absence of a spicule reticulation in the dermis removes the species from *Aegagrophila*, the subdermal spicule brushes do not form a continuous palisade and thus the species does not fall into *Mycale*. The lack of order in the tangential dermal megascleres allows us to utilize the sub genus *Carmia*. However, the spiculation of *M. digitata* is not typical of this group.

Order Axinellida Bergquist
Family Axinellidae Ridley and Dendy
Genus PSEUDAXINYSSA Burton

Pseudaxinyssa stipitata nov. sp.
(Text Fig. 3, 4; Plate 5, Fig. 3)

Occurrence: Dudley Reef, deeper pools at low water. Common.

Holotype—Australian Museum Reg. No. Z.3101.

Description: A vase-shaped, stalked sponge with a tendency to produce short branches from both internal and external surfaces. The texture of the body is firm and flexible, the stalk region is quite hard.

The specimen is 8 cm high, 9 cm across; the stalk, 1.8 cm thick; the lamella, 0.4-0.8 cm thick.

Color: The color in life is green (yG-Y 5/4); in spirit, pale brown, (gY 6/4).

Surface: The surface is thrown into short digitate projections or low, rounded elevations. Under low magnification, small evenly distributed conules are evident.

Skeleton: The skeleton is plumoreticulate, the central spicule tracts having adequate spongin investment which decreases toward both edges of the lamella. The axial fibres are anastomosing and occupy the central half of the lamella. Plumose spicule tracts arise from the axial fibres and curve toward the surface, which they intersect at right angles. Terminal spicule bundles of 8-20 spicules,

project 200-400 μ beyond the surface membrane.

This skeletal arrangement is typical of *Axinella*, with the axial region not sufficiently condensed to exclude interstitial spicules and cellular material from between the fibres and with the extra-axial tracts arising in plumose fashion and from the axis.

Spicules: *Megascleres*; *Oxeas* 170-330×3.5-17.0 μ (247×9.8 μ) Centrally flexed to straight spicules with no clear regional division between the two possible size categories. The smaller, thinner spicules are rare in the fibres but are not otherwise localized.

Discussion: The separation of *Pseudaxinyssa* from *Axinyssa* Lendenfeld is made on the basis that the latter should be reserved for species having microxeas at the surface in addition to the underlying skeleton of larger oxeas. The genus differs from *Axinella* in having oxeote spicules only. There has been some debate in the literature as to whether this is a valid distinction; Hallmann (1914, 1916), Wilson (1925) and Burton (1931, 1959) sustain this view but Dendy (1905, et seq.) is against it. Certainly there is ambiguity over species which have predominantly oxeote spicules but frequent inequiended variants. However, in clear cases such as the present, there is no real arguement against separating the genera.

Pseudaxinyssa stipitata is close to *P. tenuispicula* Burton from Natal, differing mainly in having slightly smaller spicules and a pronounced lamellate (cup-shaped) habit. *Axinella tricalyciformis* Bergquist (1967) should be referred to *Pseudaxinyssa*.

Fig. 3. *Pseudaxinyssa stipitata* nov. sp. Oxeas.

Fig. 4. Diagrammatic representation of skeleton of *Pseudaxinyssa stipitata* nov. sp. The axis with closely reticulated, spongin-rich fibres, from which extra-axial components curve outward to intersect the surface at right angles. Fibres terminate in spicule tufts.

Order Hadromerida Topsent
Family Spirastrellidae Hentschel
Genus SPIRASTRELLA Schmidt
Spirastrella vagabunda Ridley
(Plate 6, Fig. 1)

Restricted Synonymy:
Spirastrella vagabunda Ridley, 1884, p. 468.
Anthosigmella vagabunda, de Laubenfels, 1954, p. 201, fig. 136, pl. IX, fig. 6.
Spirastrella vagabunda, Bergquist, 1965, p. 184.

Occurrence: Fanny Bay; very common in mud zone, low tide. Three specimens. A.M. Reg. No. Z.3102, Z.3103; Z.3104.

Remarks: The largest specimen is figured since this is from an ecological standpoint a most important sponge in the Darwin area. In morphology and spiculation the three specimens exhibit much the same variation as described by Bergquist (1965) for the three Palau Island specimens. In one specimen (F.B. 1.) spirasters are rare and do not reach the maximum size that these spicules attain in the other two specimens.

Spicule dimensions for the three specimens are tabulated:

Specimens No.	Tylostyles	Spirasters
F.B. 1. Z.3102	230–544×7.5–16.5 μ (393×12.0 μ)	13.5–17.0 μ (15.0 μ)
F.B. 2. Z.3103	204–534×6.0–16.5 μ (367×10.8 μ)	14.0–20.0 μ (16.6 μ)
F.B. 3. Z.3104	205–590×7.0–16.0 μ (452×13.5 μ)	15.0–22.5 μ (17.5 μ)

Previous Distribution: Widespread Indo-Pacific (Bergquist, 1965).

Order Epipolasida Sollas
Family Jaspidae de Laubenfels
Genus JASPIS Gray
Jaspis topsenti Thiele

Jaspis topsenti Thiele, 1900, p. 58, fig. 13 a, b.

Occurrence: Fanny Bay.
A.M. Reg. No. Z. 3005.

Description: An encrusting amorphous sponge approximately 1.5–2.0 cm thick.

Color: In alcohol, flesh colored (yY-R 8/4) internally, with a thin white semi-opaque dermis.

Texture: Firm and incompressible.

Surface: The surface is hispid and prickly, encrusted to a great extent with shell and other debris. Where the surface is clean, small exhalent canals are discernible below the semi-transparent dermis. Oscules are small, 0.2–0.4 mm in diameter, and irregularly dispersed.

Skeleton: The thin dermal region is marked by a continuous crust of oxyasters and patches of small, thin oxeas disposed irregularly. The endosomal region contains densely packed large oxeas and is traversed by large exhalent canals. The spicule orientation is oblique to the surface and there is no discernable grouping of the megascleres into tracts. Microscleres of one type only are dispersed throughout the sponge, concentrated along the exhalent canals at the surface.

Spicules: *Megascleres*: Oxeas of two size groups:

(a) Large curved spicules occasionally with slightly stepped tips,
1398–2380 μ×48–73.5 μ (1930×63 μ)

(b) Small, thin oxeas,
170–304 μ×9.5–13 μ (185×10.8 μ)

Discussion: This specimen can be identified with *Jaspis topsenti* Thiele from Ternate on the basis of similar megasclere dimensions and the possession of only one category of microsclere, a tiny oxyaster. Differences in detail exist in the morphology of the asters. Thiele stressed that in his specimen the asters were oxyspherasters. Here the centrum is absent and we are dealing with oxyasters. However, we are considering a spicule of around 8.0 μ total diameter and the distinction does not warrant specific recognition. In the Darwin specimen cortical oxeas are present in small numbers, discontinuously distributed with no constant orientation. It is difficult to be certain that these spicules are proper. The

indications are that they are, however, as they could easily be overlooked, we cannot urge the separation of our specimen on this feature alone.

Thiele's description was unfortunately very brief and no details of skeletal arrangements or cortical development can be compared.

Previous Distribution: Ternate (Thiele).

Order Choristida Sollas
Family Geodiidae Gray
Genus GEODIA Lamarck
Geodia globostellifera Carter

Geodia globostellata Carter, 1880, p. 134, pl. 6, fig. 38.
Geodia globostellifera, Ridley, 1884, p. 480, pl. 43, fig. b.
Cydonium globostelliferum, Sollas, 1888, p. 261.

Occurrence: Fanny Bay.
A.M. Reg. No. Z.3006.

Description: A flattened oval sponge, 1.8 cm in length, 1.1 cm across, and 1.2 cm thick. The texture is firm but more resilient than is characteristic for a *Geodia*.

Color: The color in alcohol is uniformly cream.

Surface: Macroscopically, the surface appears smooth, interrupted only by a large pore area towards one side. Under low magnification, occasional spicule bundles are observed projecting through the dermis. The oscules are small, concentrated into one "pore sieve" area, (1 cm×8 cm).

Skeleton: The endosomal skeleton is made up of radially arranged bundles of oxeas and plagiotriaenes. The cladomes of the latter underly the dense layer of cortical sterrasters. Occasional protriaenes and anatriaenes lie both above and below the sterraster layer. Smaller oxeas form a palisade-like dermal skeleton reinforced by a superficial layer of small spherasters.

Microscleres of two types are abundant in the endosome, oxyasters restricted to this region and small spherasters of the same type as those at the surface. Sterrasters in all stages of development are found in the endosome but only fully developed stages occupy the cortical position.

Spicules: Little need be added to earlier reports since the spiculation differs from that described by previous authors only in the addition of occasional anatriaenes of typical form. Oxeas occur in two size ranges. Three categories of microscleres are present:

(a) *Oxyspherasters* with 5–7 rays, frequently stylote or strongylote.
(b) *Spherasters* in two size ranges
(c) *Sterrasters* of typical form and size.

Specimen	Endosomal oxeas	Plagiotraienes	(Rare) Protraienes	(Rare) Anatraienes	Cortical oxeas
Geodia globostellifera	1228–2600× 15–27.5 μ	*Rhabdome* 1304–1824× 22–48 μ	1536×8.5 μ	No intact specimens. Similar dimensions to protraienes	192–288× 1.5–5 μ
Fanny Bay		*Clads* 106–272× 13–38 μ			

Geodia globostellifera Lendenfeld 1930	2390–3000 × 21–38 μ.	*Shaft* 1710 × 21–70 μ *Cladome* 500–580 μ	*Shaft* —1000 μ	—	160 × 5 μ

Specimen	Sterrasters	Oxyasters	Larger spherasters	Small spherasters
Geodia globostellifera Fanny Bay	54.5–76.5 μ	22–41.5 μ	12.5–16.5 μ	4–5 μ
Geodia globostellifera Lendenfeld 1903	70–90 μ	Strongylasters of choanosome 34–38 μ	—	Small strongylasters 4.2–6.3 μ

Discussion: There is no doubt that this specimen is properly assigned to *Geodia globostellifera*. Such small differences in spiculation as we mentioned above are no doubt due to anatriaenes, rare at all times, having been overlooked by earlier workers.

Previous Distribution: Gulf of Manaar (Carter), Darwin, intertidal (Ridley).

Family Tetillidae Sollas

Genus CINACHYRA Sollas

Cinachyra australiensis (Carter)

(Plate 6, Fig. 2)

Tethya cranium var. *australiensis* Carter, 1886, p. 127.

Cinachyra australiensis, Burton, 1934, p. 523.

(For full synonymy, see Burton, 1934).

Occurrence: Fanny Bay, mud zone, very abundant.
A.M. Reg. No. Z.3007.

Discussion: The specimens are externally identical, globular with depressed porocalyces. Spiculation is likewise very similar in the two specimens; protriaenes and anatriaenes are present in both; microxeas are slightly roughened in both. In Z.3007 a few deformed plagiotriaenes are included among the megascleres.

An interesting color difference exists between these specimens when alive; Z.3007, from Fanny Bay is orange-yellow internally (rY 7/8). It is always mud covered and found in the upper half of the tidal range. The specimen from East Point, Z. 3008, is salmon pink in color (RY-R 6/4), and found much further down the shore, near extreme low water springs. The fact that this sponge is never mud covered probably reflects the lack of mud lower down the shore.

It has been noted earlier (Bergquist, 1965) that the extensive synonymy Burton (1934) gives for this species is open to question, but on the basis of literature observations no valid criterion for separating species out of this complex suggests itself.

In our collection we have recorded ecological differences between two specimens which on spicule and habit characteristics, clearly belong in the one

species. Further observations along these lines with additional investigations of substrate preference and reproductive cycles could prove useful in laying the foundation for re-interpreting the *C. australiensis* complex.

Previous Distribution: Australia (Carter, Burton); Malay Area (Lindgren, Kieschnick); Indian Ocean (Dendy); Palau Is. (Bergquist); Ponape, Truk, Bikini (de Laubenfels).

References

BERGQUIST, P. R. 1965. The sponges of Micronesia, Part 1, The Palau Archipelago. Pac. Sci. **19** (2): 123–204.

BURTON, M. 1931. A collection of marine sponges mostly from the Natal coast. Ann. Natal Mus. **6** (3): 337–358; pl. XXIII.

———. 1934. Sponges. Great Barrier Reef Expedition (1928–29) reports; Brit. Mus. (Nat. Hist.) **4** (14): 523–526.

———. 1959. Sponges. John Murray Expeditions 1933–34. Sci. Rep., Brit. Mus. (Nat. Hist.) **10** (5): 151–281.

CARTER, H. J. 1880. Report on specimens dredged from the Gulf of Manaar and presented to the Liverpool Free Museum by Capt. W. H. Cawne Warren. Ann. Mag. Nat. Hist. **5** (6): 129–156.

DENDY, A. 1905. Report on the sponges collected by Prof. Herdman at Ceylon in 1902. Herdman Rep. Pearl Oyster Fisheries Gulf of Manaar. Suppl. **18**: 57–246.

DENDY, A., and M. FREDERICK. 1924. On a collection of sponges from the Abrolhos Is., West Australia. J. Linn. Soc. Zool. **35**: 477–519.

HALLMANN, E. F. 1914. A revision of the monaxonid species described as new in Lendenfeld's "Catalogue of the sponges in the Australian Museum." Proc. Linn. Soc. N. S. W. **39** (1): 263–315; **39** (2): 327–376; **39** (3): 398–446.

———. 1916. A revision of the genera with microscleres included, or provisionally included in the family Axinellidae. Proc. Linn. Soc. N. S. W. **41** (1): 453–459; **41** (2): 495–552; **41** (3): 634–675.

———. 1920. New genera of monaxonid sponges related to the genus *Clathria*. Proc. Linn. Soc. N. S. W. **44** (4): 767–792; pl. XXVI–XL.

HENTSCHEL, E. 1912. Kiesel- und Hornschwamme der Arn- und Kei-Inseln. Abhandl. Senckenb. Naturf. Ges. **34**: 291–448.

LAUBENFELS, M.W. de. 1936. A discussion of the sponge fauna of the Dry Tortugas in particular and the West Indies in general, with material for a revision of the families and orders of the Porifera. Pub. Carnegie Inst. 467, Pap. Tortugas Lab. **30**: 1–225.

———. 1948. The Order Keratosa of the phylum Porifera; a monographic study. Allan Hancock Foundation Occ. Pap. **3**: 1–217.

———. 1954. The sponges of the West Central Pacific. Oregon State Monogr. Zool. **7**: 1–306.

LENDENFELD, R. von. 1888. Descriptive catalogue of the sponges in the Australian Museum, Sydney. London, pp. i–xvi; 1–260.

———. 1889. A monograph of the horny sponges. London, pp. 1–936, 50 pl.

LÉVI, C. 1961. Spongiaires des Îles Philippines, principalment recoltées au voisinage de Zamboanga. Phil. J. Sci. **88** (4): 509–533.

LINDGREN, N. G. 1898. Bietrag zur Kenntniss der Spongienfaurna des Malaylischen Archipels und der Chinesischen Meere. Zool. Jahrb. **11**: 1–96.

MUNSELL, A. 1942. Book of color. Pocket Edn. 2 vols. Munsell Color Co. Inc., Baltimore, Maryland.

POLÉJAEFF, N. 1884. Report on the Keratosa collected by H. M. S. "Challenger." Rep. Sci. Res. Voy. "Challenger," Zool., **11**: 1–88.

RIDLEY, S. A. O. 1884. Spongida. Report on the zoological collections made in the Indopacific Ocean during the voyage of H. M. S. "Alert" 1881–82. London. pp. 366–482; 582–630.

ROW, R. W. H. 1911. Reports on the marine biology of the Sudanese Red Sea. XIX. Sponges. Pt. II Non-Calcarea. Linn. J. Zool. **31** (208): 287–400; pl. 35–41.

SOLLAS, W. J. 1888. Report on the Tetractinellida collected by H. M. S. "Challenger" during the years 1873–76. Rep. Sci. Res. Voy. "Challenger," Zool., **25**: i–clxvi; 1–458.

THIELE, J. 1900. Kieselschwamme von Ternate: I. Abhandl. Senckenb. Naturf. Ges. **25**: 19–80.

———. 1905. Die Kiesel- und Hornschwamme der Sammlung Plate. Zool. Jahrb. Suppl., **6**: 407–496.

TOPSENT, E. 1924. Revision des *Mycale* de l'Europe Occidentale. Ann. Inst. Océanogr. Monaco **1** (3): 77–116.

VACELET, J. 1958. *Dendrilla acantha* nov. sp. Nouvelle éponge cornée Méditerranéenne. Remarques sûr les genres *Dendrilla* Lendenfeld et *Megalopastas* Dendy. Rec. Trav. Stat. Mar. d'Endoume **23** (14): 143–147; fig. 1, 2.

VOSMAER, G. C. J. 1932. The sponges of the Bay of Naples. Porifera Incalcaria. C. S. Vosmaer-Roell and M. Burton (ed.). The Hague, Martinus Nijhoff. pp. 1–828.

WILSON, H. V. 1925. Siliceous and horny sponges collected by the U.S. Fisheries steamer "Albatross" during the Philippine Expedition 1906–1910. Bull. U.S. Nat. Mus. 100, **2** (4): 273–532.

Explanation of Plates

Plate 1.

View of the muddy rock platform at Fanny Bay (foreground) and one of the pools intervening between successive platforms (right). Sponges are a dominant feature of this area, *Iotrochota baculifera* growing around and on top of moist rocks, *Cinachyra australiensis* also on and around rocks (left foreground) and *Coelocarteria singaporense* with long oscular projections rising from stolons submerged in the mud.

Plate 2.

Fig. 1. View of a low tidal pool (Dudley Reef), showing extensive meandering colonies of *Xestospongia exigua*.

Fig. 2. *Verongia ianthelliformis* (Lendenfeld).

Plate 3.

Fig. 1. *Adocia turquoisia* de Laubenfels.

Fig. 2. *Adocia muricata* (Ridley).

Plate 4.

Fig. 1. *Sigmadocia symbiotica* nov. sp. Holotype.

Fig. 2. *Clathria reinwardti* Vosmaer.

Plate 5.

Fig. 1. *Isociella eccentrica* (Burton).

Fig. 2. *Mycale digitata* nov. sp. Holotype.

Fig. 3. *Pseudaxinyssa stipitata* nov. sp. Holotype.

Plate 6.

Fig. 1. *Spirastrella vagabunda* Ridley.

Fig. 2. View *in situ* of *Cinachyra australiensis* in mud-zone of Fanny Bay. The sponges are so covered in mud that porocalyces are not visible. The sponge at lower right is *Adocia muricata* (Ridley).

Plate 1.

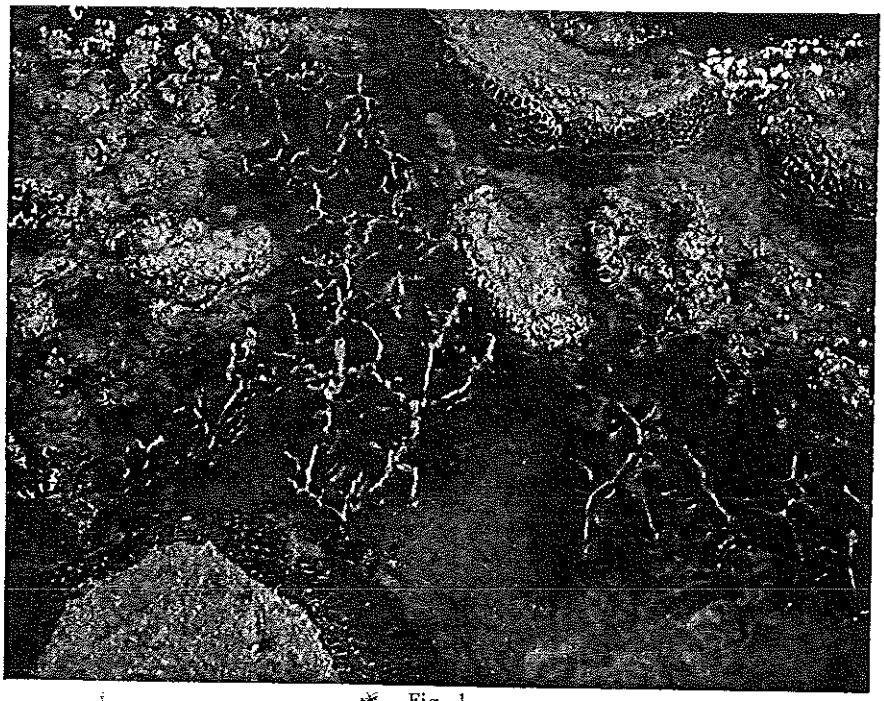

Fig. 1.

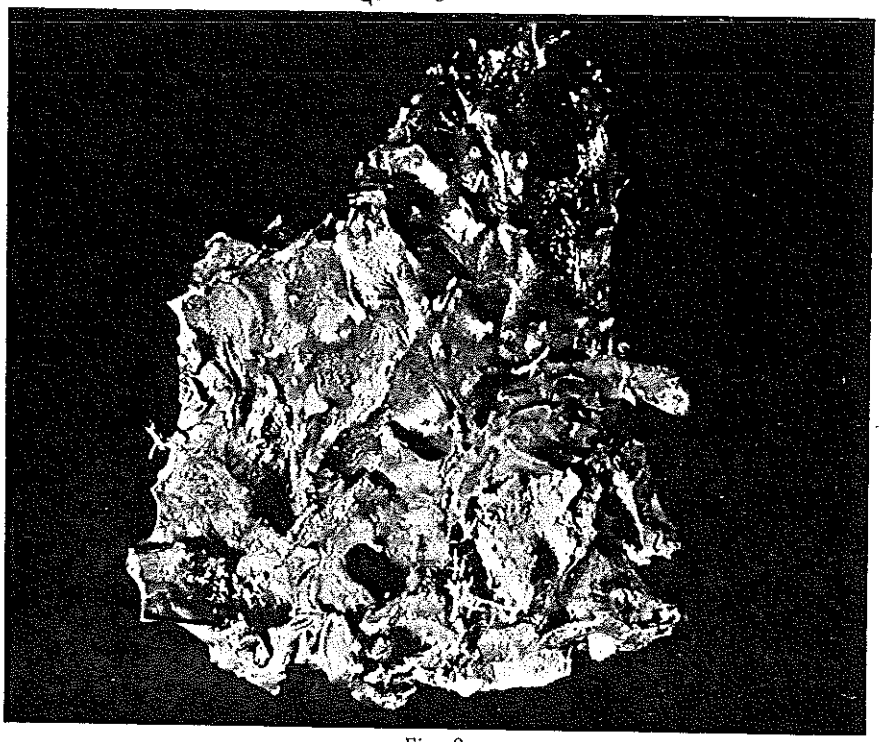

Fig. 2.
Plate 2.

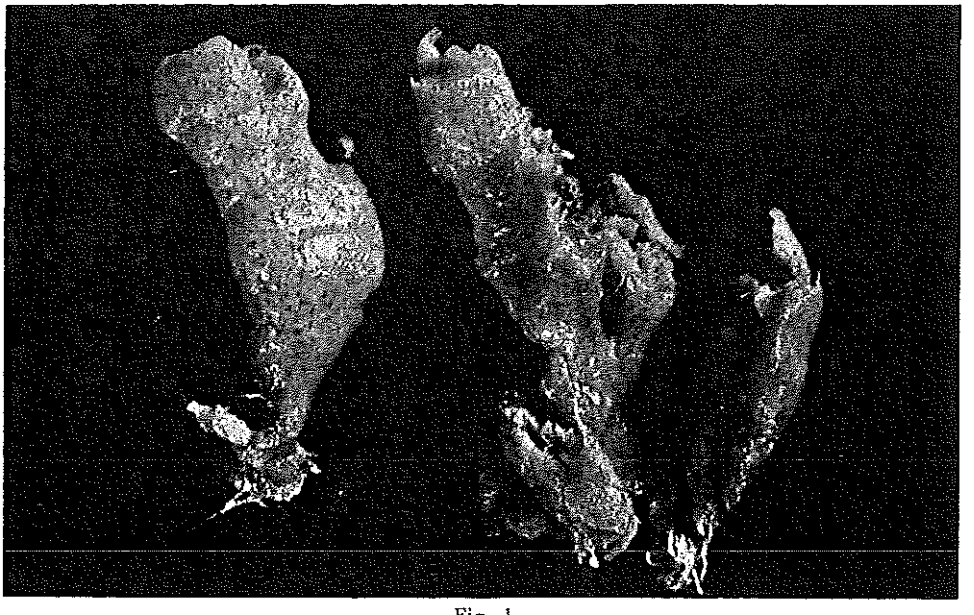

Fig. 1.

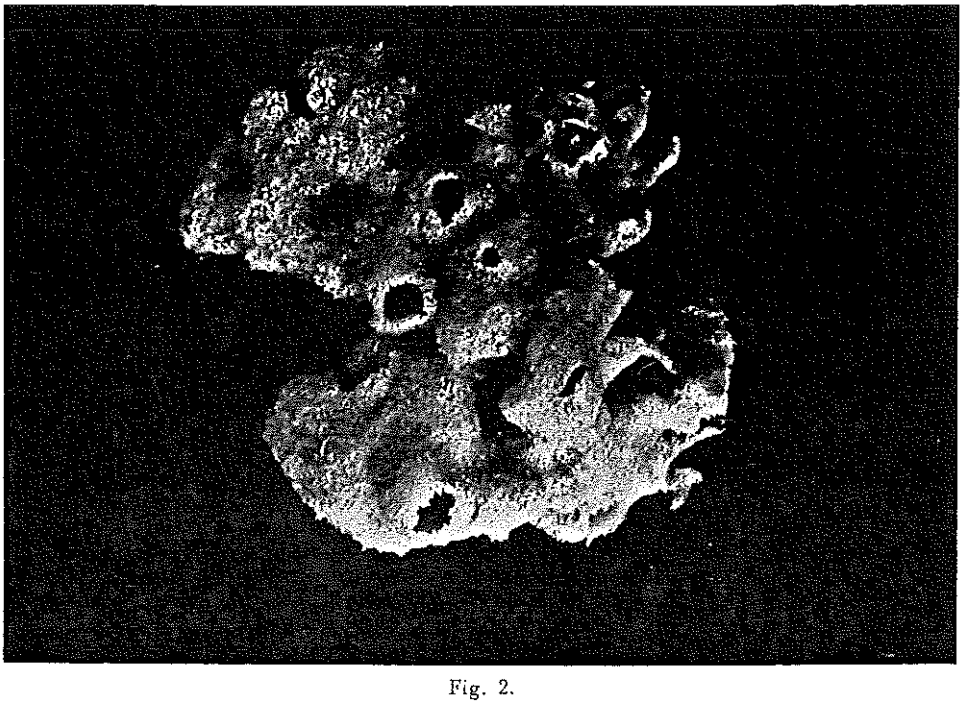

Fig. 2.

Plate 3.

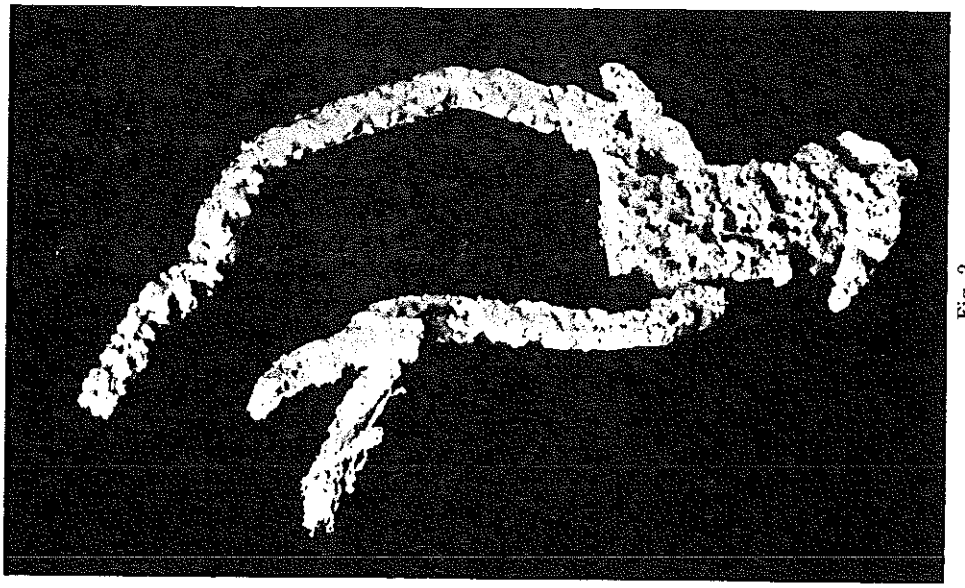

Fig. 2.

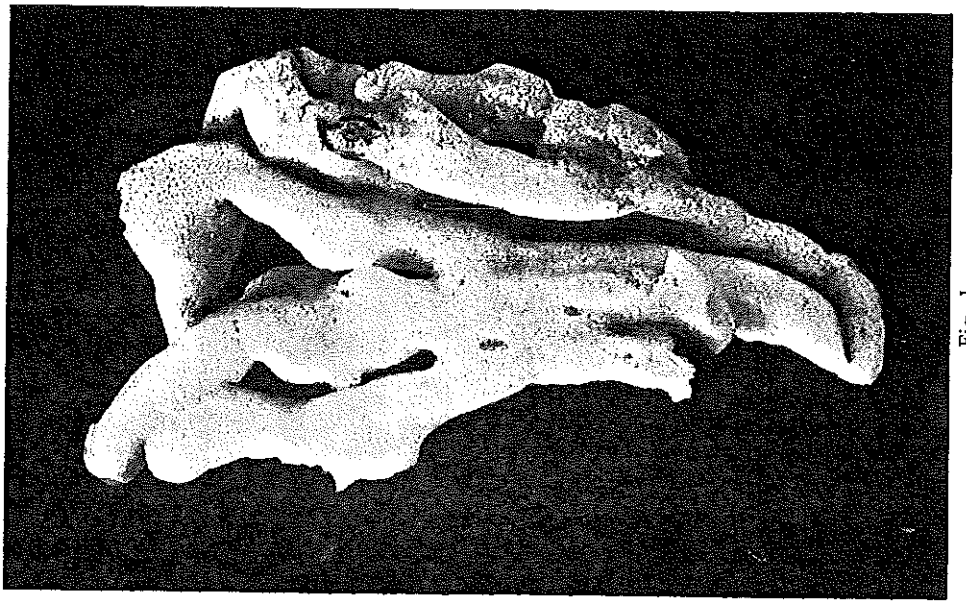

Fig. 1.

Plate 4.

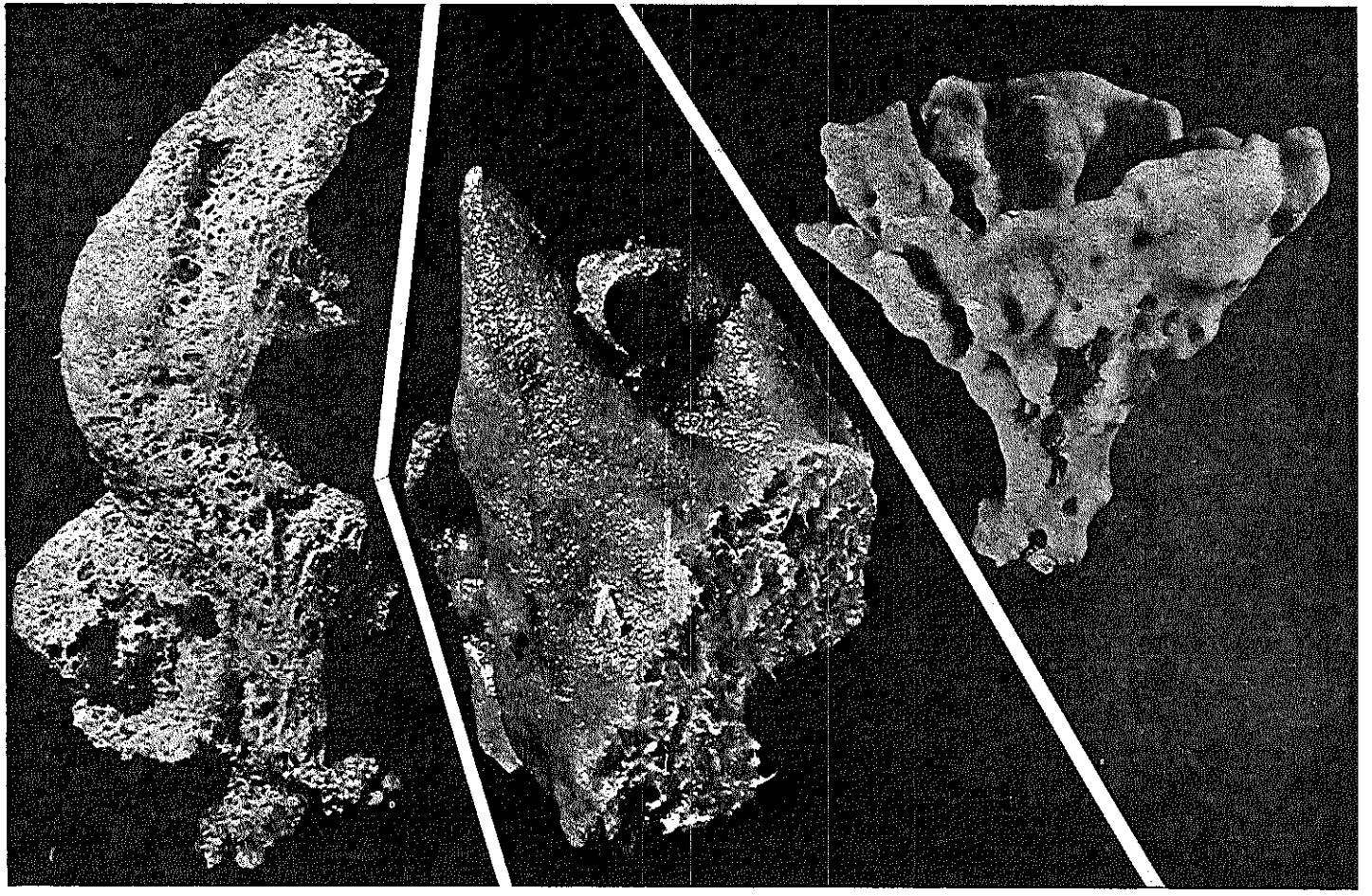

Fig. 1. Fig. 2 Fig. 3.

Plate 5.

Fig. 2.

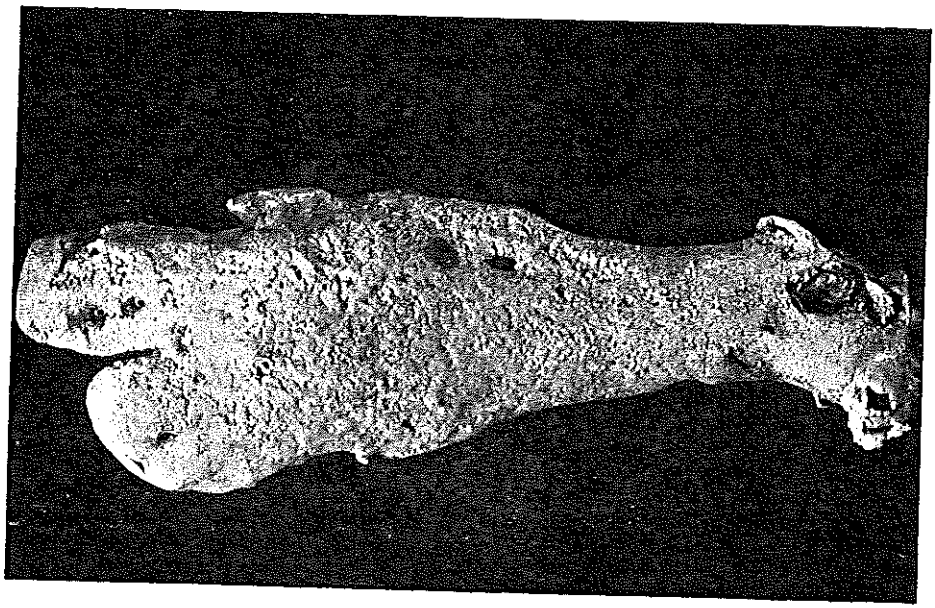

Fig. 1.

Plate 6.