Shallow Water Demospongiae from Heron Island

BY

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GREAT BARRIER REEF COMMITTEE
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SHALLOW WATER DEMOSPONGIAE FROM HERON ISLAND

The small collection of sponges reported on below was made in great part by Miss Isobel Bennett, University of Sydney, on two visits to Heron Island (Capricorn Group) in August and December 1962. While it is obviously not a complete collection it does include almost all the larger shallow water sponges and the most obvious of the encrusting forms and as such, is an adequate coverage of sponges for ecologists and students working in the Heron Island area.

Fifteen species of Demospongiae are represented in the collection and thirteen are identified to specific level. There are no new species recorded. The fauna is predominantly Indo-Pacific with eight species having broad Indo-Pacific distribution patterns. Two species are restricted to Australian coasts, two have a tropical Australian, New Guinea and Malayan distribution and one appears to be cosmopolitan.

This representation of various zoogeographic elements among the Demospongiae of the Great Barrier Reef area is comparable with the synopsis given by Burton (1934) for sponges in general with the expected difference that, apart from the disputed case of *Aaptos aaptos* (Schmidt), there are no Eastern Atlantic, Mediterranean and Caribbean species in the present collection.

More precise zoogeographic consideration of the sponge fauna of Australia must wait until Indo-Malayan, Eastern and Northern Australian faunas are better known.

LIST OF SPECIES

Order DICTYOCERATIDA
Spongia nardorus (Lendenfeld)
Phyllospongia foliascens (Pallas)

Order HAPLOSCLERIDA
Callyspongia confoederata (Ridley)
Callyspongia fibrosa (Ridley and Dendy)
Callyspongia doorae (Brøndsted)
Callyspongia clathrata (Dendy)
Adocia pumila (Lendenfeld)
Adocia sp.

Order HADROMERIDA
Aaptos aaptos (Schmidt)
Cliona sp.

Order EPIPOLASIDA
Tethya robusta Bowerbank
Tethya seychellensis (Wright)
Jaspis stellifera (Carter)
Asteropus simplex (Carter)

Order CHORISTIDA
Cinachyra australiensis (Carter)

Order DICTYOCERATIDA Minchin
Family SPONGIIDAE Gray
Genus SPONGIA Linné
SPONGIA NARDORUS (Lendenfeld)

Aphrodite nardorus Lendenfeld, 1886, p. 306.
Hippospongia aphroditella Lendenfeld, 1889, p. 312.
Ceratodendron haeckelii Marshall, 1892, p. 5.
Spongia nardorus Burton, 1934, p. 577.

Locality. Under boulders S.E. side of Heron Is., December 1962, one specimen.

Remarks. A conical sponge, 40 mm high, 20 mm in diameter with very prominent subdermal channels and apical oscules. The colour is mauve and the texture tough but compressible. This sponge is usually stalked, the stalk providing attachment in sandy substrate. The specimen in this collection is incomplete, thus it is impossible to know whether any stalk was present. In all other respects this specimen is typical of the species.

The skeleton is a network of spongin B fibres most of which are clear of detritus. Primary, cored fibres are most abundant at and just below the surface.

Distribution. Australia, north and east coasts.

Genus PHYLLOSPONGIA Ehlers
PHYLLOSPONGIA FOLIASCENS (Pallas)
(Pl. I)

Spongia foliascens Pallas, 1766, p. 395.
Phyllospongia foliascens, Lendenfeld, 1889, p. 196.
Phyllospongia foliascens, Bergquist, 1965, p. 131, Fig. 3*a*, *b*.

Locality. Heron Is. May 18, 1961 (Coll. P. R. Bergquist), one specimen; Green Is. (Coll. K. Gillett) one specimen. On the reef at low water in both localities.

Remarks. The specimens are typical of the species as described in the references cited above and figured in this paper.

Distribution. Indo-Pacific region.

Order HAPLOSCLERIDA Topsent
Family CALLYSPONGIIDAE de Laubenfels
Genus CALLYSPONGIA Duchassaing & Michelotti

CALLYSPONGIA CONFOEDERATA (Ridley)

Tuba confoederata Ridley, 1884, p. 400.
Siphonochalina confoederata, Lendenfeld, 1887, p. 803.
Spinosella confoederata, Topsent, 1897, p. 479.
Callyspongia confoederata, Burton, 1934, p. 541.

Locality. Outer reef, N.E. side of Heron Is., four metres. December 1962, one specimen.

Remarks. A horny, vase-shaped to tubular sponge with surface produced into spinous processes up to 8.0 mm high. The texture of the sponge is stiff, the colour pale yellow to brown. Tiny oscules are apparent on the inner smooth surface of the vase.

Spiculation is very simple, fine diacts, varying from oxeas to strongyles occur within spongin fibres. Dimensions 60–72 × 1.0μ.

Developing larvae are present in the specimen.

This species has been well figured by Lendenfeld 1887, Pl. XXV, Fig. 60, and, although Burton (1934) suggested that colour, shape and surface characteristics are variable in species of *Callyspongia*, there is nothing in the literature which indicates more than normal variability in *C. confoederata*. Forms in which multiple vase or tubular units arise from the basal region and in which the surface projections are reduced in number are to be expected.

Distribution. Australia, north, east and west coasts; Malaya.

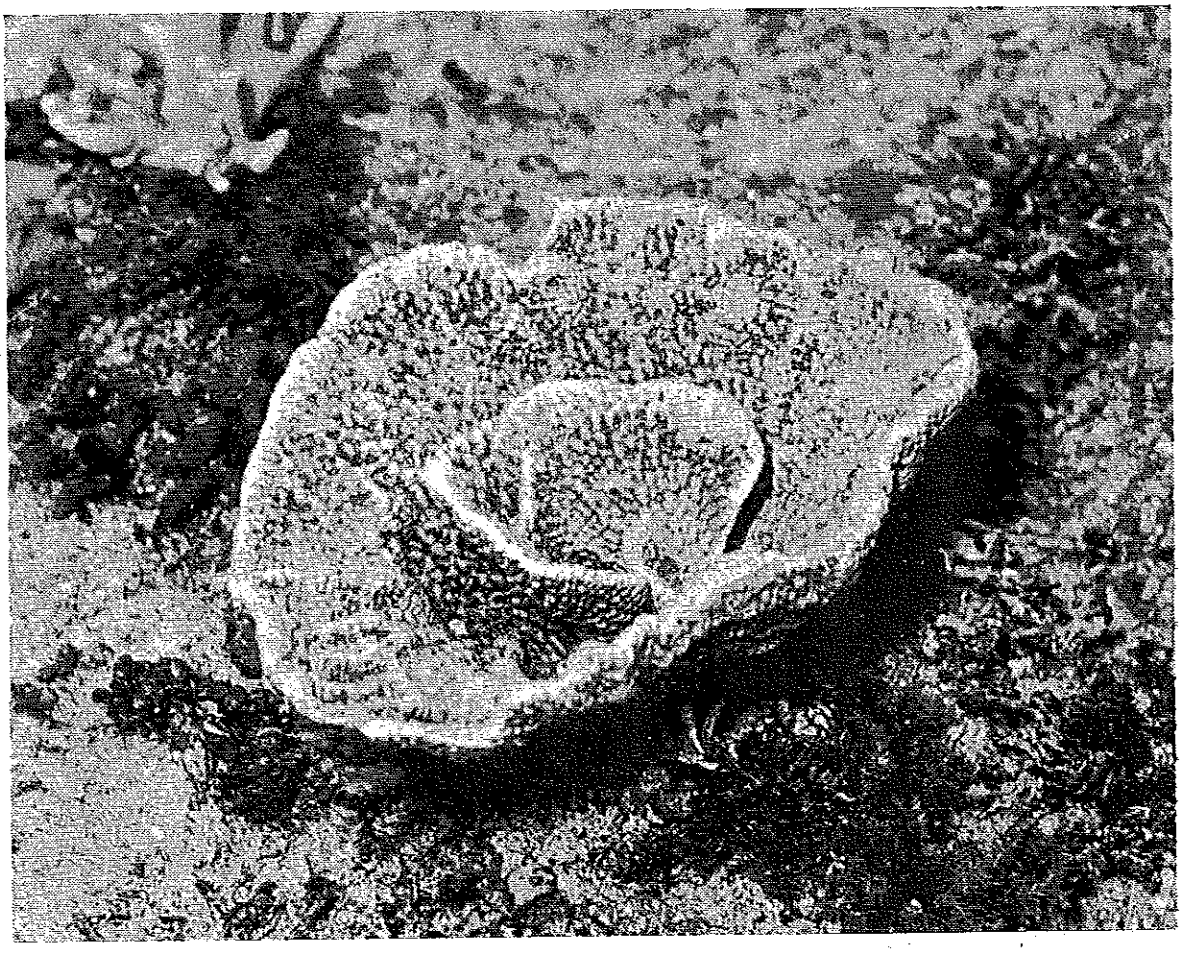

PLATE I.—*Phyllospongia foliascens* (Pallas) in situ on Green Island reef. The nodular and grooved surface pattern is characteristic of this species. Natural size, up to 20 cms high.

CALLYSPONGIA FIBROSA (Ridley and Dendy)

Dasychalina fibrosa Ridley and Dendy, 1886, p. 310.
Pachychalina fibrosa Ridley and Dendy, 1887, p. 21.
Pachychalina fibrosa, Lindgren, 1898, p. 11.
Callyspongia fibrosa, Burton, 1934, p. 540 (see this paper for full synonymy).

Locality. Outer reef, N.E. side of Heron Is., four metres. December 1962, one specimen.

Remarks. A branching, erect or repent sponge with spinous processes 2.0 to 5.0 mm high over the entire surface, individual branches 15 mm in diameter, colour dull purple. The sponge has soft compressible texture.

Spongin fibres make up the main and dermal skeleton and spicules are arranged multiserially within the fibres and occur sporadically throughout the flesh. Spicules are oxeas ranging to strongyles 90–105 × 2.0–3.0μ.

Distribution. Malay Area; Indian Ocean; Australia, Great Barrier Reef.

CALLYSPONGIA DOORAE (Brøndsted)

Cladochalina doorae Brøndsted, 1934, p. 14.

Locality. Under boulders, N. and S.E. sides of Heron Is. August 1962 and December 1962, two specimens.

Remarks. A pulvinate to encrusting white sponge up to 8.0 mm thick, the small portions included in the collection give no indication of the overall dimensions of the specimens. The texture is spongy and fibrous, the dermal and main skeletons being made up of spongin fibres containing very fine oxeas. The spicules are relatively inconspicuous components of the fibres, the secondary and dermal meshes are frequently unispicular. Spicules are oxeas, 68–90 × 0.5–1.8μ.

Distribution. New Guinea.

CALLYSPONGIA CLATHRATA (Dendy)

Chalina clathrata Dendy, 1905, p. 151.
Callyspongia clathrata, Burton, 1934, p. 543.

Locality. Under boulders, N.E. side of Heron Is. December 1962, one specimen.

Remarks. This sponge forms a thick encrustation up to 10.0 mm thick, with conical oscular projections 3.0–6.0 mm high arising from the surface. Oscules are 1.0–4.0 mm in diameter. The colour of the sponge is mauve, the texture elastic.

Spongin fibres, sparsely cored by spicules, make up the main skeleton, which is supplemented by interstitial spicules. The dermal network is made up of similar but finer fibres.

Spicules are oxeas, frequently strongylote, 90–160 × 2.0–3.5μ.

It is difficult to decide whether the dermal network in this specimen is subdivided by secondary meshes or is all one irregular primary reticulum. The generic identification depends upon interpreting the dermal fibres as both primary and secondary. Dendy (1905) did not describe a secondary reticulum specifically, Burton (1934) inferred that one was present by placing the species in *Callyspongia.* He did not elaborate on the transfer or describe his specimen.

C. clathrata appears to be a transitional species between *Haliclona* sp. with heavy fibrous skeletons and *Callyspongia.*

Distribution. Ceylon; Australia, Great Barrier Reef.

Family ADOCIIDAE de Laubenfels
Genus ADOCIA Gray

ADOCIA PUMILA (Lendenfeld)

Siphonochalina pumila Lendenfeld, 1887, p. 806.
Gelliodes spinosella Thiele, 1899, p. 22.
Adocia pumila, Burton, 1934, p. 537 (see this paper for full synonymy).

Locality. Under boulders, S.E. side of Heron Is. December 1962, two specimens.

Remarks. This species is well illustrated by Burton (1934). It is a gray to brown spreading sponge with prominent oscules raised on irregular lumps and with a delicate tangential dermal spicule skeleton. The main skeleton of the sponge is a combination of spicule fibre tracts of irregular pattern and an overlying unispicular isodictyal reticulation of oxeas. Spongin is reduced just below the surface and the dermal skeleton is supported by unispicular to trispicular fibres spaced 120–160μ apart.

Spicules are oxeas 98–130 $\times$ 2.0–3.5μ.

Distribution. Australia, north and east coasts; Malay area; Indian Ocean.

ADOCIA sp.

Locality. Under boulders S.E. side of Heron Is. December 1962, one specimen.

Remarks. The specimen is badly damaged and apart from the fawn colour and thin encrusting habit (2.0 mm thick) nothing can be said about its macroscopic characteristics. The skeleton is a unispicular to bispicular isodictyal reticulation of oxeas in conjunction with many spicules strewn without order. Two size categories of oxeas can be differentiated, the large 246–280 $\times$ 2.0–7.0μ make up the bulk of the skeleton, the smaller 120–180 $\times$ 1.0μ are not easily distinguished from slightly flexed toxas. A dermal skeleton is present but is damaged in this specimen.

Order HADROMERIDA Topsent
Family SUBERITIDAE Schmidt
Genus AAPTOS Gray

AAPTOS AAPTOS (Schmidt)

Ancorina aaptos Schmidt, 1864, p. 33.
Tuberella aaptos, Topsent, 1900, p. 285.
Tuberella aaptos, Hentschel, 1912, p. 319.
Aaptos aaptos, Dendy and Fredrick, 1924, p. 508 (see this paper for detailed synonymy).
Stylotella suberitoides Brøndsted, 1934, p. 24.
Aaptos aaptos v. *nigra* Levi, 1961, p. 131.

Locality. Under boulders, S.E. side of Heron Is. December 1962, one specimen.

Remarks. A massive, tuberous to subspherical sponge up to 50 mm in diameter, brown externally, yellow internally, turning completely red-brown in alcohol. The surface appears smooth but is slightly rough to the touch.

The spicules are strongyloxeas to styles and fall into two size categories: the smaller is common in spicule brushes just below the surface of the sponge, the larger makes up the weakly radial tracts of the endosomal skeleton.

Larger styles 550–1200 $\times$ 8.0–20.0μ.

Smaller styles 380–420 $\times$ 5–10μ.

No macroscopic cortical specialization is apparent.

Aaptos aaptos was originally described from the Adriatic and has been subsequently recorded from the Mediterranean, Caribbean, Indo-Pacific generally and from Australia and New Zealand. There are sound biological grounds for considering that the Mediterranean and Caribbean specimens are distinct from the Indo-Pacific ones, however, thus far no clear-cut evidence has been found on which to base the separation.

The best description of the Mediterranean forms is that given by Topsent (1900). Levi (1961) recorded a specimen of *Aaptos aaptos* from Viet Nam, this specimen had black external pigmentation but otherwise was comparable with European forms. Levi chose to recognize his sponge as variety *nigra*.

In view of the range of pigmentation shown by New Zealand forms of *Aaptos* it is unlikely that this distinction is valid. In northern New Zealand where *Aaptos* is very common in intertidal and shallow offshore waters the sponge is usually brown

externally, dull yellow internally. Forms with black surface pigmentation occur rarely, and forms with dull red to pink external pigmentation are common in depths over six metres. No differences in spiculation or morphology accompany the colour differences, which, apart from the black forms, are paralleled in European specimens.

Aaptos aaptos is characterized by spherical body form and a radiate skeleton. In New Zealand waters this form is always developed except when the sponge occurs under boulders or in crevices. It then tends to be massive to spreading with consequent weakening of the radial skeletal arrangement.

Unfortunately this aspect of morphology has not been dealt with in many records of *Aaptos aaptos*. A tuberous form seems common in the Mediterranean (Topsent 1900) and characterizes the specimens from the East Indies (Brøndsted 1934), Java (Hentschel 1912), and South Australia (Hentschel 1909). Radiate forms are recorded from Mediterranean (Topsent 1900), Porto Rico (Wilson 1902), Viet Nam (Levi 1961), and West Australia (Dendy 1924).

There is no indication in the literature whether the form of the above specimens is associated with any particular habitat. Only close comparison of living specimens of *Aaptos aaptos* from various localities can resolve the question of how to subdivide this species.

Distribution. Cosmopolitan in Temperate and Tropical Seas.

Family CLIONIDAE Gray
Genus CLIONA Gray

Cliona sp.

Locality. Heron Is., unspecified.

Two specimens are included in the collection, one boring in *Acropora*, the other in *Stylopora*. The colour of both was yellow. There is no point whatever in attempting to assign a specific name to this sponge without much more precise ecological information. Some species of *Cliona* have distinctive microscleres but the spiculation of the Heron Island specimens is merely tylostyles. Specific identification will thus depend upon better knowledge of colour, oscule and pore size and pattern, depth range and substrate preference.

Order EPIPOLASIDA Sollas
Family TETHYIDAE Gray
Genus TETHYA Lamarck

Tethya robusta Bowerbank

Tethya robusta Bowerbank, 1873, p. 10.
Donatia robusta, Dendy and Fredrick, 1924, p. 495.
Donatia robusta, Burton, 1924, p. 1037.
Tethya robusta, Burton, 1934, p. 568.

Locality. Under boulders, S.E. side of Heron Is. December 1962, three specimens. Northern side of Heron Is. August 1962, one specimen.

Remarks. The sponge is hemispherical, up to 30 mm in diameter, extremely firm and uncompressible, pink to white externally, yellow internally with a cortical zone clearly set off from the endosome. A characteristic surface tessellation of roughly hexagonal sections makes *Tethya robusta* easy to distinguish in the field. The cortical region is crowded with the larger microscleres, spherasters, leaving no substantial room for megasclere tracts or for cavities. This feature is constant for *T. robusta* throughout its range.

Distribution. Australia: Abrolhos Is., Great Barrier Reef; Indian Ocean; Red Sea.

Tethya seychellensis (Wright)

Alemo seychellensis Wright, 1881, p. 13.
Tethya seychellensis, Sollas, 1888, p. 427.

Donatia diploderma, Burton, 1924, p. 1039 (see this paper for full synonymy).
Tethya seychellensis, Hechtel, 1965, p. 65 (for discussion of synonymy).

Locality. Under boulders N.E. side of Heron Is. December 1962, one specimen.

Remarks. *Tethya seychellensis* is a spherical or hemispherical sponge, up to 25 mm in diameter, pale red-brown externally, white to pale yellow internally. It has the cortical specialization mentioned above for *T. robusta*, but this region is characterized by large subdermal lacunae between which are tracts of spherasters and megascleres. This structure makes the sponge softer and more compressible than *T. robusta*. The surface is marked by elevated papillae of variable shape and separated clearly by dermal grooves containing pores.

The specific nomenclature within the genus *Tethya* remains confused and a revision is required urgently. The Australian, New Zealand, and Indo-Pacific species are more numerous than the long synonymys in many papers would suggest. There is no doubt that ecological characteristics will be of importance in defining species in this genus. However, several Australian and Indo-Pacific species are characterized by the possession of oxyasters with irregularly branched rays among the microscleres. *Tethya seychellensis* is one of these species.

Distribution. Indo-Pacific.

Family JASPIDAE de Laubenfels
Genus JASPIS Gray

JASPIS STELLIFERA (Carter)
(Pl. II)

Amorphina stellifera Carter, 1879, p. 344.
Stellettinopsis carteri Ridley, 1884, p. 477.
Stellettinopsis tuberculata Carter, 1886a, p. 126.
Stellettinopsis lutea Carter, 1886b, p. 459.
Coppatias stellifera, Sollas, 1888, p. 208.
Coppatias tuberculatus, Sollas, 1888, p. 207.
Coppatias luteus, Sollas, 1888, p. 207.
Jaspis stellifera, Shaw, 1927, p. 422.
Jaspis stellifera, Burton, 1934, p. 522.

Locality. Sandy flats among dead coral boulders S.E. side of Heron Is. December 1962, two specimens No. 14, No. 20; August 1962, one specimen No. 1A.

Remarks. *Jaspis stellifera* is the commonest and most obvious sponge on the Heron Island reef. It is subspherical to spreading, dark brown externally, yellow internally with oscules often sunk into slight depressions of the surface. The spicules are oxeas, 600–850 × 5–18μ, spherasters 10.0–30.0μ, tylasters 24–36μ.

J. stellifera appears to be a common shallow water sponge around Australian coasts. Shaw (1927) included within *J. stellifera* four other species described by Carter as *Stellettinopsis purpurea, S. coriacea, S. tuberculatus* and *S. lutea*. However, there are two inconsistencies in the published data which make this synonymy difficult to accept without factual information which Shaw did not include.

First, *J. stellifera*, recorded by Shaw from Tasmania, has no asters; second, *Jaspis coriacea* and *J. purpurea** have two distinct categories of oxeas, a feature never noted in *J. stellifera*.

J. stellifera as described by Carter (1879) from South Australia has large oxeas and small microspined tylasters; as described by Ridley (1884) from Torres Strait it has slightly larger oxeas and identical microscleres. If *J. tuberculata* and *J. lutea* from Victoria are included within *J. stellifera*, then we have specimens with very similar internal and external morphology, oxeas of comparable size range but with microscleres which are much smaller and presumably of the spheraster to chiaster type.

* All four *Stellettinopsis* species cited belong in *Jaspis* and were transferred by Dendy (1916).

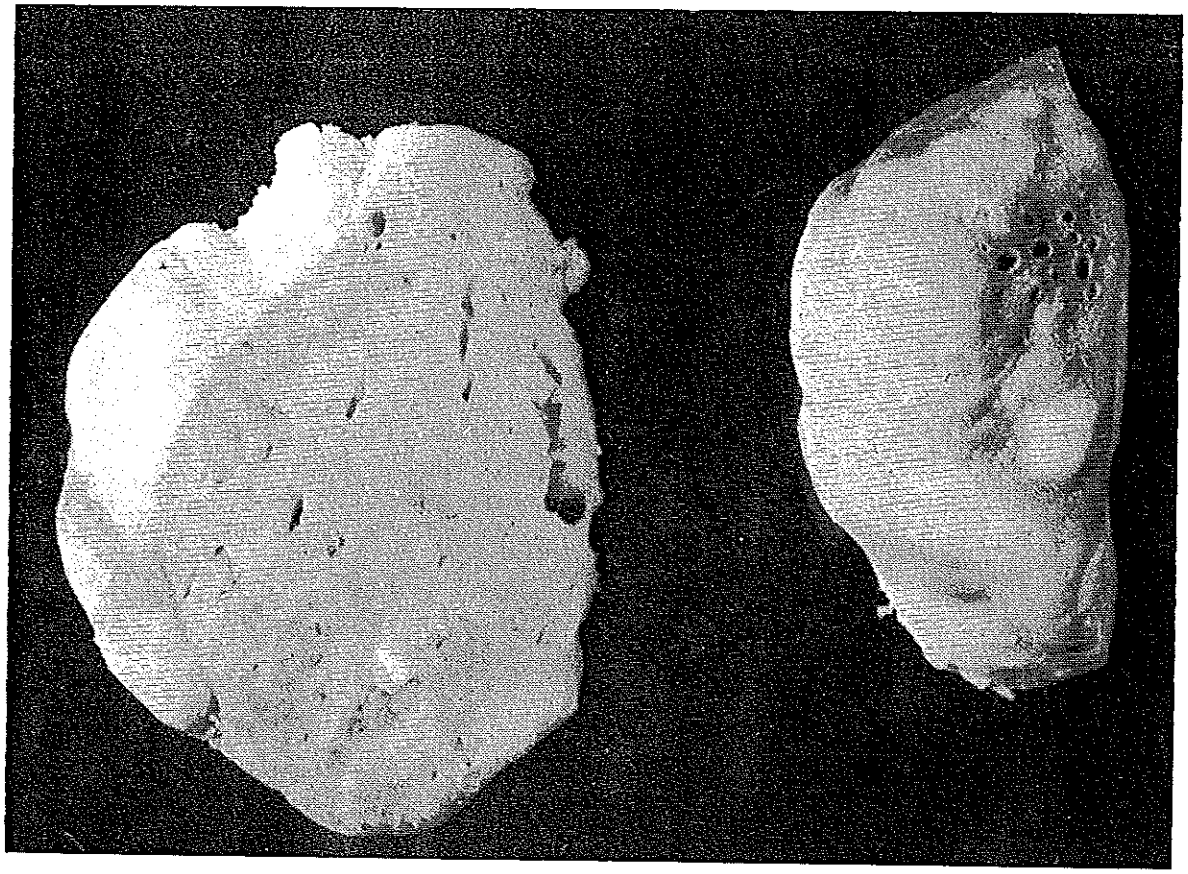

PLATE II.—*Jaspis stellifera* (Carter). Apical view showing the oscules and view of cut surface.

This assumption rests upon the observation that Carter, in his descriptions of asters, specified as "delicate", "stelliform", "without centrum" microscleres of the type found in the holotype of *J. stellifera*. Other, more typical eu- to spheraster forms he designated "stellate".

It is unfortunate that Shaw did not include any spicule dimensions or morphological description of the sponge she records as *J. stellifera*. It is more likely to be *J. coriacea* since microxeas are present.

In the Heron Island collection the three specimens are very similar in habit, colour, habitat, and internal morphology. One specimen, No. 14, has a tuberculate surface, the others are smooth. The megasclere spiculation is identical in all specimens, oxeas but no microxeas.

The microscleres, however, are variable in quantity and type from specimen to specimen. Specimen 20 has delicate tylasters with long roughened rays and almost no centrum. In addition and in greater abundance there are oxyspherasters with smooth conical rays. The oxyspherasters form a dense layer at the sponge surface as well as occurring throughout the endosome. In specimen 14 microscleres are not abundant except at the surface where oxyspherasters form a narrow crust. Tylasters are absent. In specimen 1A tylasters predominate: they are abundant throughout the sponge except at the surface. Oxyspherasters are present but only in patches are they concentrated at the surface.

The tylaster in the Heron Island specimens is identical with that described and figured for *J. stellifera* by Carter (1879) and Ridley (1884). The spheraster has never been figured but is perfectly typical.

There is little doubt that *J. stellifera* is a species which has two microsclere types, either of which can be absent, or fluctuate in relative abundance from specimen to

specimen in the same locality. In *J. stellifera* Carter and *J. carteri* (Ridley) the spherasters were rare or absent in *J. tuberculata* and *J. lutea* (Carter) the tylasters were rare or absent. Specimen 14 is identical with the type description of *J. tuberculata.*

Distribution. Australia; south east and north coasts, Tasmania.

Genus ASTEROPUS Sollas

ASTEROPUS SIMPLEX (Carter)

Stellettinopsis simplex Carter, 1879, p. 349.
Asteropus haeckeli Dendy, 1905, p. 109.
Asteropus simplex, Hentschel, 1909, p. 369.
Asteropus simplex, Dendy, 1924, p. 306.
Asteropus simplex, Bergquist, 1968, p. 32 (see this paper for detailed synonymy).

Locality. Under boulders S.E. side of Heron Is. December 1962, one specimen.

Remarks. This sponge can be distinguished by the white colour, firm rough texture, and presence of an outer cortical region, 1.0–1.5 mm deep, clearly distinguishable from the underlying endosome. The size, 10 mm thick and 15 mm across, is irrelevant and is known to vary greatly. The single specimen is typical of the species and the spicule dimensions are close to those quoted by Carter (1879) for the type specimen from Fremantle.

Spicules are Oxeas 800–1250 × 10–28μ
Oxyasters 20–38μ (three to twelve rays)
Sanidasters 10–22μ.

Distribution. Australia: south, west, and east coasts; New Zealand; Indian Ocean.

Order CHORISTIDA Sollas
Family TETILLIDAE Sollas
Genus CINACHYRA Sollas

CINACHYRA AUSTRALIENSIS (Carter)

Tethya cranium var *australiensis* Carter, 1886a, p. 127.
Cinachyra australiensis, Burton, 1934, p. 523 (see this paper for detailed synonymy).
Cinachyra australiensis, de Laubenfels, 1954, p. 241.
Cinachyra australiensis, Bergquist, 1965, p. 199.

Locality. Under boulders S.E. side of Heron Is. December 1962, two specimens.

Remarks. Spherical sponge 30 to 50 mm in diameter, with hispid surface and prominent porocalyces on the upper surface, gray externally, yellow internally.

Both specimens are quite typical of this common species, the only noteworthy point is that microxeas are extremely rare and roughened.

Distribution. Indo-Pacific.

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