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XLIII.—*Description of Sponges from Funafuti.*

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[Plates XIII.–XV.]

THE sponges described in this paper were obtained by the second Boring Expedition to Funafuti, and were entrusted to me by Prof. Judd for description. The specimens, which are mostly very small, incrust or are attached to fragments of corals and corallines dredged up from depths of from 30 to 145 fathoms. The fragments were obtained only with great difficulty, since they had to be detached from the bottom by means of chisels. The collection includes the representatives of twenty-one species, of which eleven are new.

In 1897 Mr. Whitelegge described (30, p. 323) from the same locality a small collection obtained from the surface of the reefs. Of the sixteen species recorded by him only one occurs in the present collection.

Altogether thirty-six species have been recorded from this locality. The special features of interest are the occurrence (1) of *Astrosclera Willeyana*, Lister, which represents a new family, or, possibly, order of calcareous sponges, (2) of a recent species of the Lithonine genus *Plectroninia*, hitherto found only in the Eocene, and (3) of a new genus of Clionidæ.

The following is a list of the species :—

Subclass *CALCAREA*.

1. *Astrosclera Willeyana*, Lister.
2. *Plectroninia Hindei*, sp. n.
3. *Clathrina depressa* (Dendy).

Subclass *DEMOSPONGIDA*.

Order CARNOSA.

Suborder Oligosilicina.

4. *Chondrilla mixta*, Schulze.

Suborder Microsclerophora.

5. *Corticium candelabrum*, O. Schmidt.
6. *Placinolopha spinosa*, sp. n.
7. *Placinastrella clathrata*, sp. n.

Order TETRACTINELLIDA.

8. *Erylus monticularis*, sp. n.

Order MONAXONIDA.

Suborder Hadromerina.

Section Clavulida.

Fam. **Clionidæ**.

9. *Cliona mucronata*, Sollas.
10. —— *Schmidti* (Ridley).
11. *Dyscliona Davidi*, gen. et sp. n.

Fam. **Spirastrellidæ**.

12. *Latrunculia clavigera*, sp. n.

Suborder Halichondrina.

Fam. **Pœciloscleridæ**.

13. *Agelas gracilis*, Whitelegge.
14. *Tedania levis*, sp. n.

Fam. **Haploscleridæ**.

15. *Chondropsis ceratosus*, sp. n.
16. *Pachychalina fibrosa*, Ridley & Dendy.

Order MONOCERATINA.

17. *Luffariella variabilis* (Polejaeff).
18. —— *geometrica*, sp. n.
19. *Psammopemma purpureum* (Carter).
20. *Stelospongus cavernosus* (Pallas), var. *pyriformis*, Lendenfeld.
21. *Polyfibrospongia Sweeti*, sp. n.

Astrosclera Willeyana, Lister.

1900. *Astrosclera Willeyana*, Lister (16, p. 459, fig. A, 1-5).

The single large specimen of this species from Funafuti was sent to Mr. J. J. Lister, of Cambridge, who was at the time engaged in working out the structure of four small specimens of the same species from Lifu. Mr. Lister's description of the external features of the Funafuti specimen is as follows :—

"The specimen from Funafuti (fig. A, 1–5) has grown attached by a short stalk about 6 millim. wide at the base, which expands into a broad nearly circular disc, convex above, and resembling the pileus of a mushroom in shape. The diameter of the disc is about 20 millim., and the distance

from the broken end of the stalk to the centre of the upper surface of the disc is 16 mm.

"A smooth imperforate cortical layer covers the outer surface of the stalk and under surface of the disc. . . . The upper surface of the disc is in part perforated by pores.

"There appears to have been an interruption of the growth of the specimen after the formation of the disc, and the later expansion has taken place not uniformly, but only from parts of its upper surface. At these parts rounded bosses of different sizes have been formed, and they, like the original disc, are perforated by pores on their convex upper surfaces and covered on the sides by an imperforate cortical layer. . . . the greater mass of the new growth appears to have been formed by the fusion of three originally distinct bosses.

"The upper surface, whether of the original disc or of the later formed bosses, is perforated by closely-set pores. These are sometimes isolated, but often they open into curving and branching grooves, recalling those of the coral *Mæandrina*.

"At seven places on the surface of the later growth, and at one on the original growth, the lines of pores are seen to be disposed in a radiating manner about so many centres. The pores along these lines are large, being at least twice the diameter of those distributed elsewhere.

"The fully formed skeleton is built up of a solid mass of polyhedral elements (40 to 150 μ in diameter), whose surfaces are united closely together to the complete exclusion of the soft parts."

For a full account of the structure of the skeleton and soft parts of this sponge reference must be made to Mr. Lister's memoir (16). The skeletal structure of *Astrosclera* differs so entirely from that of other sponges that it will probably have to be placed in a third order of Calcarea, the other two being Lithonina and Dialytina; but Mr. Lister would defer the establishment of such a division until more material becomes available for investigation.

Plectroninia, Hinde (12, p. 51).

Plectroninia Hindei, sp. n. (Pl. XIII. fig. 1, *a–r*.)

The specimen, which forms a minute oval crust on a coralline, is 4 × 3 millim. in area and 1 millim. in thickness at the centre, but thinning away to the edges. The surface appears vitreous, with a faint yellow tinge, the interior being crystalline vitreous. The crust, which was easily flaked off from the coralline, showed a granular crystalline basal layer; on

vertical section a second granular "basal" layer, parallel with the first, occurs in the middle of the section.

Under magnification, the polygonal openings (105 μ in diameter) of the excurrent canals are seen occupying the whole upper surface.

The thin edges of the specimen allow of no room for a dermal layer, but in one small recess there was a little nest of loose oxeas and styles, possibly the constituents of such a layer.

The *skeleton* is mainly built up of stout quadriradiates, usually smooth, with fused facial rays and with the sharp apical ray more or less free and pointing almost vertically to the surface; occasionally the surface of the rays is slightly spined or tuberculated.

The *basal* layers are composed of densely packed but separate small quadriradiates, varying considerably in shape and size, with rays frequently spined and terminating in flat expansions.

Spicules.—Skeletal network: length of beams formed by facial rays 70–100 μ, and 40 μ in thickness; apical rays 85–200 μ in length by 15–45 μ in thickness.

The rays of the smaller basal quadriradiates vary from 18 to 35 μ in length.

Triradiates: (1) Sagittal, rays sharp-pointed, basal ray 120×7 μ, laterals 60×7 μ.

(2) Irregular, with slender pointed unequal rays, resting on the apices (tripod type).

(3) Tuning-forks: (*a*) with prongs curved away from the plane of the handle, with equal prongs each ending in trifid points.

(*b*) Prongs and handle in one plane, prongs of unequal length and spined; there are several variations in the shape of form (*b*).

Lance-shaped subtylotes and styles, finely spined with disk- or crook-shaped head, $200–500 \times 6$ μ, head 5 μ, neck 3 μ.

Finely spined oxeotes, $200–400 \times 7$ μ.

Plectroninia Hindei constitutes the second recent Lithonine sponge that has been discovered, the first being *Petrostroma Schulzei*, Löderlein, from Japan (10, p. 15, pls. ii.–vi.).

The new species is near to *Plectroninia Halli*, Hinde, from Eocene beds at Geelong and Flinders. So far as can be made out from crushed fragments and a broken surface of the minute specimen, the skeletal framework is fairly regularly reticulate, without presenting any radiating main beams, and the facial rays of the quadriradiates are always expanded, and not tapering. The chief specific differences from

P. Halli lie in the smaller size of the beams and meshes of the network and in the characters of the loose spicules. The type of the genus is turbinate in form, but it cannot be said what would be the ultimate shape of the probably young specimen of *P. Hindei*.

Locality. Beacon Island, Funafuti, 50 fath.

Clathrina depressa (Dendy).

1891. *Leucosolenia depressa*, Dendy (8, p. 65, pl. iii. figs. 4, 4 *a*, pl. viii. fig. 8, pl. xi. fig. 4).

The specimen forms a small whitish patch about 6 millim. in area on the surface of *Luffariella variabilis*. The dermal triradiates are slightly larger than in specimens from Port Phillip, being 240×25 μ, as against 200×28 μ from the latter locality; the quadriradiates are few in number and with the apical ray almost aborted.

Locality. Funamara, Falefatu, 25–45 fath.

Distribution. Port Phillip, Victoria; Funafuti Atoll.

Chondrilla mixta, F. E. Schulze.

1877. *Chondrilla mixta*, F. E. Schulze (23, p. 116).

The one specimen forms a small bluish-black incrustation on an *Agaricia*. The surface of the sponge is finely granular to the naked eye. The spherasters are 25–30 μ in diameter, with about 20 pyramidal prickles, and the oxyasters 24–28 μ in diameter, with a centrum 7 μ in diameter.

The spherasters just below the surface are united into little heaps, which give rise to the granular appearance of the surface; the oxyasters are only very rarely present in the ectosome.

Locality. Funafuti Islet.

Distribution. Java; Amirante Is.; Red Sea; Funafuti Atoll.

Corticum candelabrum, O. Schmidt.

1862. *Corticium candelabrum*, O. Schmidt (21, p. 42, pl. iii. fig. 25).
1881. *Corticium candelabrum*, F. E. Schulze (25, p. 410).

The specimen forms a small greenish-black disk, 3 millim. in area by 1 millim. in thickness, attached to a piece of coralline.

Locality. Fuafatu, 50–70 fath.

Distribution. Adriatic; Zebu; Funafuti Atoll.

Placinolopha spinosa, sp. n. (Pl. XIII. fig. 2, *a–m*.)

The specimen forms a whitish-brown crust about 10 millim. in area and 1–2 millim. thick, creeping over a nodule of coralline. Several oval oscules, ·5 × ·25 millim. in diameter, with membranous edges level with the surface, are present. The choanosome forms more or less vertical folds beneath the ectosome. The skeleton is composed of micro-calthrops of various sizes densely scattered in the ectosome and walls of the choanosomal folds, and of lophodiactines arranged tangentially in the ectosome and in the walls of the folds.

Spicules.—Microcalthrops in graduated sizes, from very slender forms with rays 24 × 2 μ, smooth or slightly spined, with simple or bifid ends, up to stout forms with rays 42 × 9 μ, much spined and di- or trichotomously branched at the ends. Lophodiactines 240 × 12 μ, with simple or branched spines and once or twice branched at the ends.

The lophodiactines of *P. spinosa* resemble in form a spicule figured by Sollas (26, pl. xxxv. fig. 24), who found it associated with spicules of the Lithistid *Corallistes Thomasi* from the Ki Islands. Sollas, who was doubtful whether to regard the spicule as Tetractinellid or Monaxonid, assigned it to a new genus and species—*Orthorhachis problematica*. It seems very probable that Sollas's species comes under *Placinolopha*. The spicule figured by him is 450 × 40 μ, nearly twice the size of the largest lophodiactine of *P. spinosa*.

Including that of Sollas, there are three species belonging to this genus:—

P. Bedoti, Topsent.—Philippines (28, p. 429).

P. spinosa, sp. n.—Funafuti.

P. problematica, Sollas.—Ki Islands.

Locality. E. end of Fuafatu, Funafuti Atoll, 50–70 fath.

Placinastrella clathrata, sp. n. (Pl. XIII. fig. 3, *a–o*.)

The specimen, which forms a small, rounded, soft nodule 8 × 5 × 5 millim. in size and of dirty white colour in spirit, appears to have been cut off from a coral.

The surface is smooth, but when highly magnified shows an extremely fine pile formed by the points of a palisade of cortical diactines. An oscule in the form of an irregular fissure about 1 millim. in length, and level with the surface, occurs on the summit of the specimen. The pores occupy irregular cribriform areas with well-defined margins; the sieve-meshes are 70 μ in diameter and the pores about 30 μ (about two or three to a mesh). The pores lead by short

canaliculi into a system of subdermal spaces, which open into incurrent channels and spaces in the interstices of a close network of tubes, the lumen of the tubes constituting the excurrent canal system ; this arrangement recalls that found in the Ascon genus *Clathrina*.

Skeleton.—The ectosome is supported by a palisade of slender diactines, but in the meshes of the pore-areas the diactines are tangential. The walls of the choanosomal tubes are supported by tangentially arranged diactines, triods, and microcalthrops of various sizes.

Spicules.—Diactines attaining $140 \times 5\ \mu$, straight or slightly curved, with a slight kink or irregular thickening in the centre, and often abruptly bent near each end. Ectosomal diactines $36 \times 1{\cdot}5\ \mu$, with a slight kink in the centre.

Triods regular or irregular, with two rays (together $120 \times 4\ \mu$) in a line and a shorter third ray ($36\ \mu$) forming an angle.

Calthrops, larger forms with rays $36 \times 5\ \mu$, smaller with rays $18 \times 3\ \mu$.

The only other species of this genus *Placinastrella copiosa*, Schulze (24, p. 433, pl. xxi. figs. 17–21), is found at Naples. A cortical palisade of diactines is present in both ; but the large definitely orientated calthrops occurring in *P. copiosa* are wanting in *P. clathrata*.

The tubular reticulum appears to be merely an elaboration of the system of simple folds found in *Placina simplex*, and the proper position for *Placinastrella* is probably in the family Placinidæ, where Schulze placed it (24, p. 449), rather than in the Pachastrellidæ, to which the genus was assigned by Sollas (26, p. 103).

Locality. Funafuti Islet.

Erylus monticularis, sp. n. (Pl. XIV. fig. 3, *a–h*.)

The sponge forms an extremely thin pale brown lamella incrusting an *Agaricia*. Several minute conical oscules, ·07 millim. in height and ·175 millim. broad at the base, are scattered over the flat surface, the walls of the cones being supported by a sloping palisade of small oxea $80 \times 3\ \mu$.

Skeleton.—Beneath the surface-layer of disciform sterrasters is a layer of scattered orthotriænes, with reduced rhabdomes directed vertically downwards.

Spicules.—Megascleres : oxea (few) slightly curved, $210 \times 10\ \mu$.

Orthotriænes : rays of cladome each $186 \times 3\ \mu$, slender, straight, sharp-pointed, rhabdome $6\ \mu$.

Microscleres : sterrasters oval, with diameters $150 \times 114\ \mu$,

both surfaces granulose, with radiating striæ, edges finely serrated.

Microxea (medium) $80 \times 3\ \mu$, slightly curved. Very slender microxea $40 \times 1\ \mu$.

Small chiasters 10 μ in diameter, with small centrum and about 12 slightly tylote rays.

Oxyasters 18–30 μ in diameter, with about 6 rays.

The new species is near *E. placenta*, Thiele (27, p. 5, pl. i. fig. 1, pl. vi. figs. 1, *a–h*), but differs from it chiefly in the proportions of the oxea and orthotriænes. In Thiele's species the oxea attain a size of 800 μ, and the microxea are centrotylote. Further, in the new species there are no orthotriænes with long rhabdomes 500 μ in length, but only aborted forms.

Locality. Funafuti Islet.

Cliona Schmidti (Ridley).

1870. *Vioa Johnstoni*, var., O. Schmidt (22, p. 5, pl. vi. fig. 18).
1881. *Vioa Schmidti*, Ridley (18, p. 130).
1884. *Vioa Schmidti*, Ridley (19, p. 622).
1898. *Vioa Schmidtii*, Lendenfeld (14, p. 72, pl. iii. fig. 31, pl. vi. fig. 53, pl. vii. fig. 74, pl. x. figs. 135–139).

The specimens of this species ramify in fragments of *Echinopora* along with *Dyscliona Davidi*, and in a lamina of *Agaricia* along with *Cliona mucronata*, Sollas. Colour purple.

One of the two kinds of spinispirulas is $54 \times 1{\cdot}5\ \mu$, slender, with eight or more curves and with separate short blunt spines, the other kind being much stouter, $48 \times 6\ \mu$, with about six bends and with sharp pyramidal spines.

The tylostyles are $360 \times 4\ \mu$, straight or slightly curved, with oval or spherical heads about 7 μ in diameter, but showing a certain amount of variation in shape and size.

Locality. Funamara, 25–45 fath., and Funafuti Islet.

Distribution. Amirante Is.; Funafuti Atoll; Adriatic.

Dyscliona, gen. nov.

Clionidæ with diactinal (usually strongylote) megascleres and spined diactinal microscleres.

Dyscliona Davidi, sp. n. (Pl. XIV. fig. 1, *a–g*.)

Boring sponges of orange-yellow colour. Oscular papillæ (and poral papillæ ?) projecting slightly above the surface, cylindrical, patent, and about 1 millim. in diameter. Membranous poral areas (?) irregular in form and level with the

general surface. Lobes (mainly following the shape of the meshes of the madrepore in the present specimens) usually elongated and quadrangular, attaining a size of $3\,5 \times 1{\cdot}5$ millim., but varying in shape and size; lobes connected with each other by short tubular channels varying in diameter; the interior of the lobes occupied by a labyrinth of thin-walled channels and spaces. Flagellated chambers oval, eurypylous, $30 \times 24\ \mu$.

Skeleton formed of scattered strongyles occasionally forming an irregular reticulum, and mostly lying tangentially in the walls of the lobes.

Spicules.—Megascleres: strongyles varying from 126 to 246 μ in length and from 3 to $5{\cdot}5\ \mu$ in thickness, curved at the centre, smooth, rarely slightly roughened at the ends.

Microscleres: microstrongyles (rather rare) $90 \times 3\ \mu$, slightly curved, with truncate ends, and with spines arranged in a regular closely-whorled spiral.

Surface of the "galleries," and especially of the connecting channels, finely shagreened, but frequently smooth.

The specimens consist of three fragments of the coral *Echinopora* excavated by the sponge. Two of the pieces are dried, the sponge being of a dark brown colour; the third piece is in formol, the sponge here being orange-yellow when the coral is freshly fractured, but gradually becoming brown on exposure to light. The fragments are also excavated by the purple boring-sponge *Cliona Schmidti*, Ridley. The new species is nearly related to the *Cliona purpurea* of Hancock (11, p. 343, pl. xii. fig. 6), the latter species now coming under the new genus.

Topsent (28, pp. 576–7) was of opinion that Hancock's species was not a genuine boring-sponge, but possibly a Desmacidine which had grown into excavations made by some other organism. In answer to my request for information about Hancock's collection, Mr. R. Howse, Curator of the Newcastle Museum, very kindly forwarded to me the type specimen of *Cliona purpurea*. In view of the close affinity of this species to *D. Davidi*, a brief description of the former is given here for comparison.

The type specimen consists of several small fragments of *Tridacna gigas*, with holes for the oscular and poral papillæ on the inner and outer surfaces. The broken edges show a labyrinth of small oval cavities with finely shagreened surface connected by tubes or foramina, and lined with a dull red fluffy membrane. The megascleres are amphi-subtylote and measure $246 \times 5{\cdot}25\ \mu$, the ends being $6\ \mu$ in breadth, slightly spined, and sometimes with a terminal tuft of spines. The

microscleres are strongylote or substylote, slightly curved, finely and irregularly spined, and 90–144 μ in length by 3–5 μ in breadth.

After a careful examination of Hancock's specimen I consider *Dyscliona purpurea* to be a genuine boring-sponge.

To return to the Funafuti species: the *Echinopora* has been bored by *Cliona Schmidti* and by the filamentous alga *Achlya*, and precautions were necessary to ensure that the *Dyscliona* was obtained free from admixture with the *Cliona*. Fragments of the coral with the cavities lined solely with the yellow tissues of *Dyscliona* were separated, none of the tylote and spinispirular spicules of *C. Schmidti* being found. Hence I consider that these excavations were formed by the *Dyscliona*. Further, the existence of *two* closely allied species, *D. purpurea* and *D. Davidi*, ramifying deep down in the substance of shell and coral, tends to confirm the hypothesis that we have here genuine boring-sponges.

If this supposition be correct, the true position of these species would seem to be in the Clavulid family Clionidæ, despite the fact that only diactinal megascleres are present in them and that true spinispirulas do not occur. The undoubted Clionid sponges, *Cliona nodosa* and *C. labyrinthica*, have only diactinal megascleres; and, further, the spirally-spined microscleres of *Dyscliona Davidi* may be regarded as modified spinispirulas, the modification having proceeded still further in *D. purpurea*.

If *D. Davidi* and *D. purpurea* are not Clionids we have to assume that the faculty of boring belongs to Halichondrine as well as to certain Clavulid and Tetractinellid sponges.

To have placed these two species in the genus *Cliona* would have been to unduly disturb what Topsent has termed the "incomparable homogénéité" of that genus; accordingly they have been put into a new genus, *Dyscliona*. The new species is named after Prof. Edgeworth David, the leader of the Australian Boring Expedition.

Locality. Funamara and Funafuti Islet, 25–45 fath.

Latrunculia clavigera, sp. n. (Pl. XIV. fig. 2, *a–e*.)

Sponge forming a very thin greyish-white crust (on the stem of a *Gorgonia*).

Skeleton formed of a surface-layer of discasters, and, beneath this, of scattered tylotes arranged horizontally; scattered small nail-shaped tylotes with points upwards and heads on basal surface.

Spicules.—Megascleres: tylotes, average size 850 × 9 μ,

slightly curved; head faintly trilobed, 12 μ in breadth (one large tylote 1295 × 15 μ was present on the microscopic slide).

Microscleres : discasters, 54 μ in length, straight or slightly curved, shaft spinose, tylote; disks concave above, convex below, with thick spinose rims; upper disk 19 μ, lower 26 μ in diameter.

Small nail-shaped tylotes, 120 × 6 μ, straight, ending in a very sharp point, with double head 11 μ in breadth.

Carter gives a figure of a discaster (2, p. 358, pl. xxix. fig. 20) obtained by him from the debris of the root-tuft of *Euplectella cucumer* from the Comoro Islands, which closely resembles the discaster of the new species.

Locality. W. of Tutanga, Funafuti, 86 fath.

Tedania levis, sp. n. (Pl. XIV. fig. 4, *a–e.*)

Sponge forming a pale slate-coloured crust about 10 millim. in area and ·5 millim. in thickness, on a nodule of coralline.

Surface smooth ; no oscules or pores visible; consistence firm.

Skeleton.—Dermal : a felt-like network of tangentially arranged, contorted, spined strongyles. Choanosomal : a rather dense mass of contorted spined strongyles, occasionally with a tendency to unite into bundles ; also scattered smooth styli (rather rare) and scattered smooth strongyles (rather rare). Trichodragmata and rhaphides abundant, the former being cylindrical and frayed at the ends.

Spicules.—Spined strongyles 250 to 300 μ in length and 3 to 12 μ in breadth, the dermal spicules being the more slender. Styles smooth, straight, or slightly curved, 245 to 1380 μ in length and 4 to 12 μ in breadth. Smooth strongyles straight, averaging about 1085 by 12 μ.

Rhaphides 150 to 200 μ in length and about 1 μ in thickness ; trichodragmata 150 to 200 μ in length and about 6 to 12 μ in thickness.

The new species, which is only placed in *Tedania* provisionally, should probably come under a new genus near *Tedania*, but differing from it in having spined diactinal megascleres in the choanosome. The contorted megascleres call to mind those of certain Axinellid sponges.

Locality. Fuafatu, 50–70 fms.

Chondropsis, Carter (6, p. 122).

Chondropsis ceratosus, sp. n. (Pl. XV. fig. 3, *a–c.*)

Two specimens. Sponge incrusting. Colour reddish brown ; texture soft and elastic.

Oscules 3 millim. in diameter, level with surface, with thin margins. Dermal membrane smooth, supported by a reticulum of primary and secondary fibres.

Skeleton formed of a square-meshed reticulum of horny fibres, which latter may be clear or filled with sand-grains. Width of meshes about 245 μ; width of fibres from 24 to 48 μ.

Spicules.—Megascleres: oxea (rare and possibly foreign) slender, straight, sharp-pointed, 120×2 μ.

Microscleres: sigmata abundant, 30 to 50 μ in length.

Locality. W. of Tutanga, 30 fath.

The specimens, which are of irregular shape, are growing on fragments of *Seriatopora*, on branches of which they form a thin semitransparent coating, but attaining some thickness between the branches.

The new species differs considerably from other species of *Chondropsis* in its comparative freedom from sand and other foreign bodies; but I can find no other position for it than in the genus *Chondropsis*, Carter, as emended by Dendy (9, p. 250).

Pachychalina fibrosa, Ridley and Dendy.

1887. *Pachychalina fibrosa*, Ridley and Dendy (20, p. 21, pl. iv. figs. 3, 4).
1888. *Pachychalina fibrosa*, Lindgren (15, p. 293, pl. xix figs. 6 *a–e*).

The specimen is in the form of a small dried fragment 40 millim. in height, finger-shaped and expanded at the upper end. The colour is pale yellow and the spinules 2 to 3 millim. in height.

The spicules are strongyles $114 \times 3{\cdot}5$ μ, slightly curved.

Had it not been for Lindgren's description of transition forms in the spicules, which, in his specimens, include oxea, tornota, and strongyla, I would have hesitated before placing the specimen in the above species. Doubtless *Pachychalina spinosissima*, Dendy, and *Chalina spinifera*, Carter, are very nearly allied to the present species, but it is doubtful whether they are identical.

Locality. Funafuti Atoll.

Distribution. Off Bahia; Philippines; Funafuti Atoll; Cochin China; Java; Christmas I. (?); Mergui (?).

Luffariella variabilis (Poléjaeff).

1884. *Luffaria variabilis*, Poléjaeff (17, p. 69, pl. ix. figs. 1–6).
1889. *Luffaria variabilis*, Lendenfeld (13, p. 387, pl. xxxiv. fig. 5).
1899. *Luffariella variabilis*, Thiele (27, p. 25).

Several small, massive, and digitate specimens of this sponge occur from depths of 25–86 fathoms, either as dried washed-out skeletons or preserved in formalin ; the branches of one of the digitate varieties anastomose. The dermal membrane is dark slate or black and the interior rich yellow.

Localities. Funamara, 25–45 fath.; Falefatu, 80 fath.; and Funafuti Islet.

Distribution. Api, New Hebrides, 60-70 fath.; Tahiti, reefs; Funafuti Atoll.

Luffariella geometrica, sp. n.
(Pl. XV. fig. 1, *a–c*.)

Sponge forming two subspherical masses attached to a branch of *Seriatopora*, the larger being 20 millim. in diameter. Colour reddish brown ; consistence soft and elastic.

The dermal membrane sandy in parts, but in other parts transparent, the whole sponge being more or less transparent and allowing one or more concentric spheres (indicating periods of growth) to be visible in the interior. Oscules level with the surface and 6 millim. in diameter.

Surface conuli 210 μ, formed by projecting main fibres.

Skeleton forming a regular rectangular network composed of radiating primary main fibres, joined by secondary horizontal fibres in such a manner as to form triangular shafts ; tertiary fibres also present, more or less irregularly distributed.

Dermal skeleton a regular reticulum in which usually six secondary fibres radiate out from each nodal vertical primary fibre, the joined bases of the resulting triangles forming more or less regular hexagons; the primary meshes filled in with a network of more slender fibres.

Fibres.—Primary main fibres 175–210 μ, secondary 110 μ, tertiary 16 μ.

Width of meshes about 700–1500 μ in width and 400–650 μ in height.

Flagellated chambers subspherical, 32 μ in diameter.

The present form constitutes the fifth described species of the genus. *L. geometrica* is more nearly allied to *L. calyx*, Lendenfeld, from the Indian Ocean, than to the other species, but differs from it in being devoid of gyriform protuberances on the surface.

The pith of the fibres occupies about one third of their diameter and is clearly differentiated by staining with borax carmine.

Locality. W. of Tutanga, 30 fath.

Psammopemma purpureum (Carter).

1880. *Aplysina purpurea*, Carter (3, p. 36).
1881. *Aplysina purpurea*, Carter (4, p. 103, pl. ix. figs. 1, 2).
1885. *Pseudoceratina durissima*, Carter (5, p. 204).
1885. *Holopsamma fuliginosa*, Carter (5, p. 213).
1889. *Aplysina purpurea*, Dendy (7, p. 97).
1889. *Psammopemma fuliginosum*, Lendenfeld (13, p. 636).

The sponge, which forms a dark purple incrustation on *Halimeda*, has a few cactiform protuberances on its surface and fragments of the coralline imbedded in its substance. The ground-substance contains fine fibrillæ 2 μ in thickness.

After examining the type specimens of *Pseudoceratina durissima*, Carter, and *H. fuliginosa*, I agree with Lendenfeld in considering these species as synonyms of *A. purpurea*; but I can see no reason for rejecting the oldest species name *purpureum*.

Locality. Tutanga, 50 fath.

Distribution. Port Phillip, Victoria; Funafuti Atoll; Gulf of Manaar.

Stelospongus cavernosus (Pallas), var. *pyriformis*, Lendenfeld.

1889. *Stelospongus cavernosus*, var. *pyriformis*, Lendenfeld (13, p. 509).

A small specimen, 70×40 millim. in area by 20 millim. in thickness, consisting only of the hard brown skeleton of flattened-pyriform shape.

The type specimen of the variety is in the British Museum (registered, year 1838. 4. 16. 10), the specimen having been purchased from a dealer, and it is important to note that the locality is unknown, and probably not "West Indies," as recorded by Lendenfeld. In fact, the type specimen may have come from the Pacific, since various specimens presented by Sir E. Home, who brought home collections from the Pacific, are registered on the same page. It is not unlikely that the dealer obtained his specimen from some fellow-voyager of Sir E. Home.

On the under surface of both specimens an oval patch of pale brown dermal membrane incrusted with foreign bodies still persists, and probably coincides with the area of attachment of the sponge.

Locality. Funafuti Atoll.

Polyfibrospongia, Bowerbank (1, p. 459).

1889. *Hircinia*, subgenus *Polyfibrospongia*, Lendenfeld (13, p. 587).
1884. *Stelospongus*, Ridley (19, p. 383).

Stelosponginæ with a loose skeleton-net, the trabeculæ of which are formed of fascicles of parallel slender fibres frequently anastomosing.

Polyfibrospongia Sweeti, sp. n. (Pl. XV. fig. 2, *a–c*.)

Sponge forming an irregular incrusting mass, 4 centim. in length, 2·5 centim. in width, and 1 centim. in thickness, nearly encircling the stem of a *Gorgonia*; with long membranous yellow oscular tubes about 2 centim. in height, occasionally branched. Dermal membrane smooth, pergamentaceous, yellowish white.

Skeleton.—Ectosomal: composed of stout primary fibres 30 to 60 μ in thickness, partly cored with foreign bodies, the meshes being filled in by thinner clear fibres and crowded with foreign bodies; the oscular tubes consisting of a continuation of the dermal layer, but with the cored fibres forming a regular network with square meshes.

Choanosomal skeleton composed of an oval-meshed network of loose bundles of slightly branched anastomosing fibrils, the diameter of the bundles being 210 μ and of the fibrils 9 μ; also of sparsely scattered slightly branched fibres 50 μ thick, and passing from the base to the surface, composed of foreign bodies cemented by spongin.

Filaments absent.

This remarkable species is nearly related to *Polyfibrospongia flabellifera*, Bowerbank, a thin flabellate species from New Guinea, but differs in shape and in having the oscular tubes. The type specimen of Bowerbank's species is in the Dresden Museum, but the Bowerbank collection contains two slides prepared from the type, and quite sufficient to show the close similarity in the skeletal structure of the two species.

Lendenfeld puts Bowerbank's species in a subgenus *Polyfibrospongia* under the genus *Hircinia*. After a careful search I have been unable to find filaments in either of the above two species, though these mysterious objects are abundant in a specimen from Port Jackson named by Lendenfeld *Hircinia* (*Polyfibrospongia*) *gigantea*.

To include *H. gigantea* in the same genus with *Polyfibrospongia Sweeti* and *flabellifera* would be tantamount to regarding the filaments as unessential elements from the systematic point of view. I have not at present a definite opinion on this difficult controversial question of the systematic value of the filaments, a question on which equally eminent spongologists take diametrically opposite views.

For the present I shall retain Bowerbank's genus with the two species *Sweeti* and *flabellifera*, placing it next to *Stelospongus*, and shall leave *H. gigantea* and *fasciculata* under *Hircinia*. The new species is named after Mr. G. Sweet, whose munificent donations rendered possible the success of the Australian Boring Expedition.

Locality. W. of Tutanga, 86 fath., Funafuti Atoll.

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EXPLANATION OF THE PLATES.

Plate XIII.

Fig. 1. *Plectroninia Hindei*, sp. n.
a. Specimen, natural size.
b, *c*. Large fused quadriradiates, forming skeleton mesh, × 200.
d, *e*. Smaller quadriradiates of basal layer, × 200.
f, *g*, *h*. Triradiates, × 200.
i–*l*. Tuning-fork spicules, × 400.
m–*o*. Tylotes and subtylotes, × 400.
p–*r*. Style and oxea, × 400.

Fig. 2. *Placinolopha spinosa*, sp. n.
a. Natural size.
b–*i*. Microcalthrops in graduated sizes, × 200.
k–*m*. Lophodiactines, × 200.

Fig. 3. *Placinastrella clathrata*, sp. n.
a. Surface, showing a pore area, × 6.
b. Section, × 10.
c. Small calthrops, × 200.
d. Larger calthrops, × 200.
e–*g*. Triods, × 200.
h. Dermal diactine, × 200.
i–*o*. Larger (choanosomal) diactines, × 200.

Plate XIV.

Fig. 1, *a*. Fragment of *Echinopora* bored by *Dyscliona Davidi*, sp. n.
b. Portion of the sponge separated by decalcification, showing the lobes, × 10.
c. Strongyle, × 200.
d. Spirally spined microstrongyle, × 200.
e. The same, × 600.
f, *g*. Spicules of *D. purpurea*, Hancock, copied from Hancock's figures.

Fig. 2. *Latrunculia clavigera*.
a. Specimen incrusting *Gorgonia*, natural size.
b. Tylote, × 125.
c, *d*. Discasters, × 400.
e. Small tylote, × 400.

Fig. 3. *Erylus monticularis*, sp. n.
a. Surface, × 50.
b. Sterraster, × 400.
c. Large oxeum, × 200.
d. Medium-sized oxeum, × 250.
e. Smallest microxea, × 250.
f. Orthotriæne, × 100.
g. Chiaster, × 400.
h. Oxyasters, × 400.

Fig. 4. *Tedania levis*, sp. n.
a. Spined strongyle, × 200.
b. Tylote, × 200.
c. Smooth strongyle, × 200.
d. Trichodragma, × 200.
e. The same with rhaphides compact, × 200.

PLATE XV.

Fig. 1. *Luffariella geometrica*, sp. n.
a. Natural size.
b. Section, × 10.
c. Dermal skeleton, × 25.
Fig. 2. *Polyfibrospongia Sweeti*, sp. n.
a. Natural size.
b. Section, × 25.
c. Wall of oscular tube, × 15.
d. Bundle of fibres teased out, × 250.
Fig. 3. *Chondropsis ceratosus*, sp. n.
a. Skeletal network, × 25.
b. Sigmata, × 125.
c. Oxeum, × 125.

XLIV.—*The Scorpions of the Genus* Heterometrus.

By R. I. POCOCK.

PROF. KRAEPELIN (Das Tierr., Scorp. p. 124, 1899) recognizes, under the name *Scorpio* *, two species of the genus *Heterometrus*, namely *maurus* and *Boehmi*, a form referred on the authority of Birula to *testaceus* of C. Koch, from Syria, being regarded as doubtfully distinct. To the synonymy of *maurus* is added *palmatus* of Ehrenberg and *propinquus* of Simon, the latter being qualified with a mark of interrogation.

An examination of the material at my disposal has led me to conclusions by no means in accord with those contained in 'Tierreich.' *H. Boehmi* and *H. propinquus* are unknown to me; but including the latter I recognize the following four species as occurring in the area inhabited, according to Prof. Kraepelin, by the one form *maurus*:—

(1) *Heterometrus maurus* (Linn.).

Scorpio maurus, Linn. Syst. Nat. ed. 10, p. 624 (1758).
Buthus testaceus, C. Koch, Die Arachn. v. p. 3, fig. 259 (1839).
Scorpio maurus, Kraepelin, Das Tierr., Scorp. etc. p. 124 (1899) (in part.).

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* The system, if any, of determining the type species of genera, which is adopted by Prof. Kraepelin, and presumably sanctioned by the Tierreich-Committee, is most puzzling. By elimination *maurus* is not the type species of *Scorpio*, since it was removed from that genus under the name *palmatus* by Hemprich and Ehrenberg and fixed on to *Heterometrus* by Thorell (Ann. & Mag. Nat. Hist. (4) xvii. p. 2, 1876). If it be regarded as the type of *Scorpio* on the strength of standing first under that heading in the 10th edition of the 'Systema,' it must for the same reason be regarded as the type of *Heterometrus*. In that case *Heterometrus* must be a synonym of *Scorpio*. Prof. Kraepelin, however, retains by elimination the name *Heterometrus* for the second species it originally contained, namely *spinifer*.

Loc. Marocco and Algeria. The British Museum has many examples from Tangier (*B. B. Woodward, &c.*), Cape Spartel (*T. Annandale*), Tunis, and Algiers.

(2) *Heterometrus palmatus*, Hempr. & Ehrenb.

Heterometrus palmatus, Hempr. & Ehrenb. Symb. Phys., Scorpiones, no. 1 (1829).
Heterometrus palmatus flavus and ? *rufus*, iid. ibid.
Scorpio maurus, Kraepelin, *op. cit.* (in part.).

Loc. Egypt: Cairo (*Dr. Anderson*).

Hemprich and Ehrenberg recognized two varieties of the Egyptian species—one from Alexandria, which was named *flavus*; the other from Sinai, named *rufus*. I have seen no examples from Sinai, but a single male specimen from Cairo (*Dr. Anderson*), which is doubtless referable to *H. palmatus flavus*, belongs to quite a distinct species from the Algerian *H. maurus*.

(3) *Heterometrus fuscus*, Hempr. & Ehrenb.

Heterometrus palmatus fuscus, Hempr. & Ehrenb. Symb. Phys., Scorp. no. 1 (1829); Simon, Ann. Soc. Ent. Fr. (5) ii. p. 258 (1872).
Heterometrus palmatus, var. *minor*, Simon, ibid.
Heterometrus testaceus, Birula, Horæ Soc. Ent. Ross. xxxiii. p. 138 (1898); Kraepelin, *op. cit.* (nec *testaceus*, C. Koch).

Loc. Syria: Jerusalem (*Herr Rolle*), Tiberias (*A. Smith Woodward*), &c.

Birula seems to have recognized the distinctness of the Syrian species, but erroneously used the name *testaceus* for it: *testaceus* was applied by C. Koch to a specimen from Algeria co-specific with *maurus* of Linn.

(4) *Heterometrus propinquus*, Simon.

Heterometrus propinquus, Simon, Ann. Soc. Ent. Fr. (5) ii. p. 259 (1872).

Loc. Syria: Damascus and Nablous.

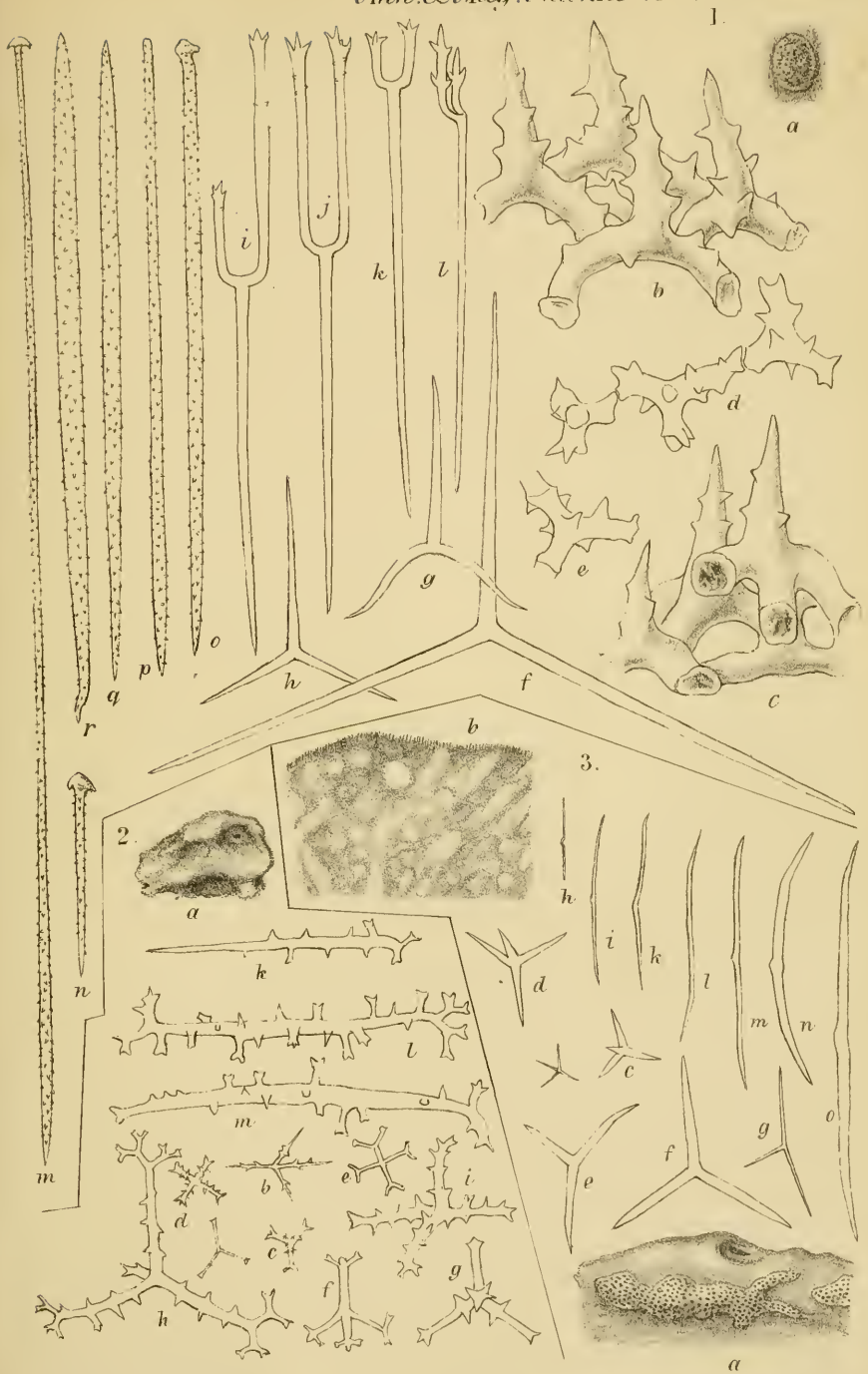
This species is said to differ from the preceding (*H. fuscus*) in having the median eyes larger, the vesicle more globular, and 14 pectinal teeth.

Simon, unfortunately, did not determine the sex of his specimens; but since the type of *H. propinquus* is said to be smoother than specimens of *H. fuscus*, it is safe to assume that the former species is based upon the female sex.

To the above-mentioned I have to add the following new forms:—

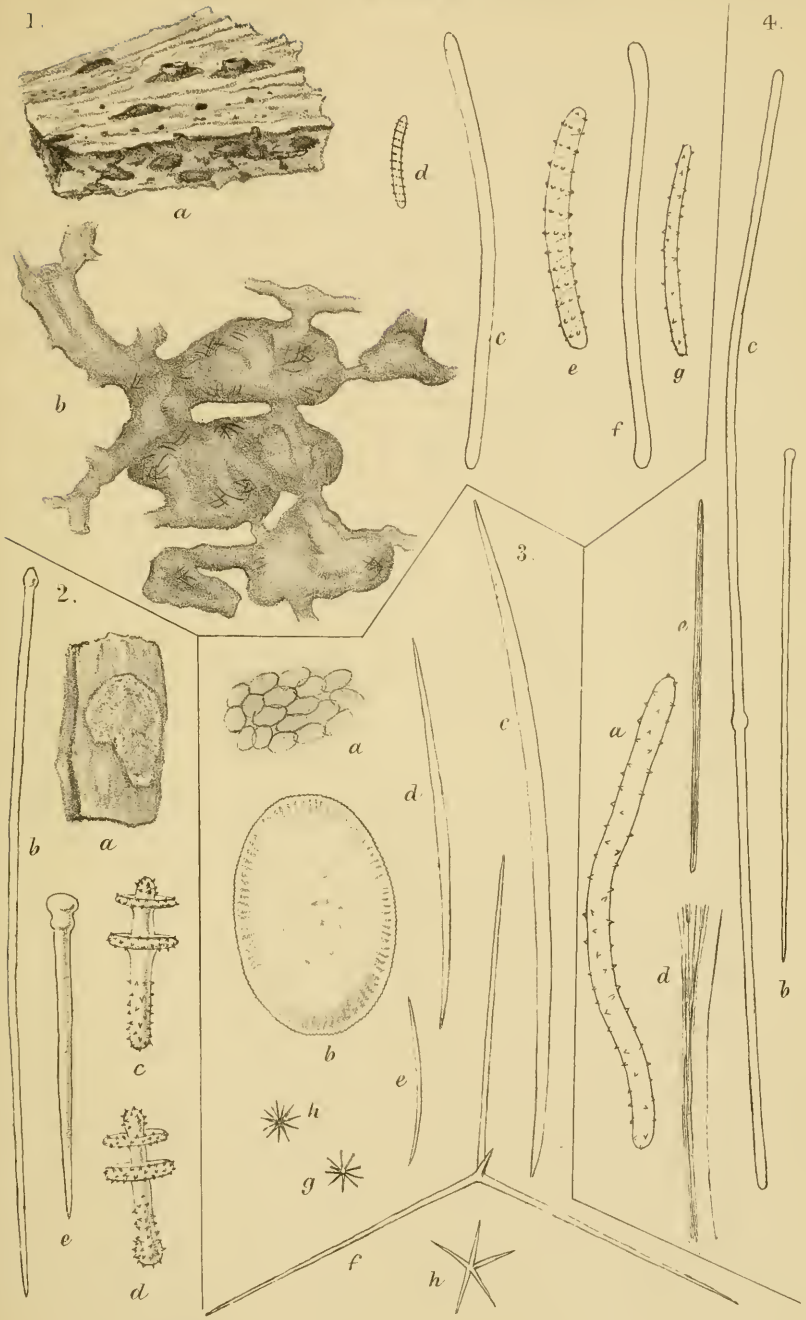
(5) *Heterometrus arabicus*, sp. n.

Colour a nearly uniform yellowish brown, the legs and tail



P. Highley del. et lith.

Mintern Bros imp.



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1a.


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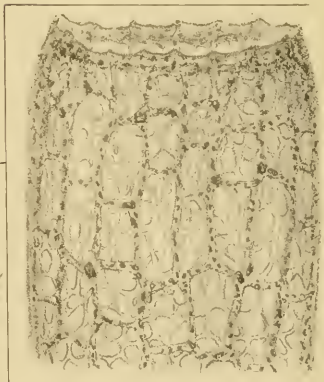
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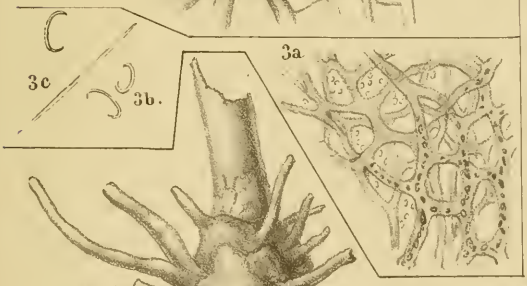
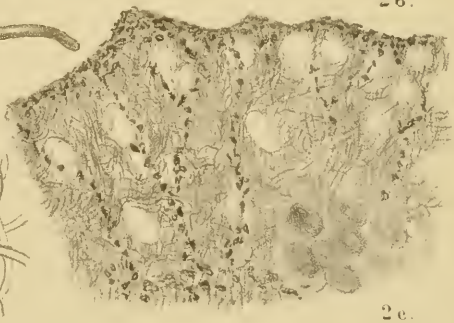

3a.
3b.
3c.

2a.

2d.


2e.

P. Highley del. et lith.

Minter Bros. imp.