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VIII.—Report on specimens dredged up from the Gulf of Manaar and presented to the Liverpool Free Museum by Capt. W. H. Cawne Warren

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nule-like, round, smooth scales, not imbricate;" while *C. marmoreus* is again placed in the genus *Tonicia* of Gray, which is described as having the "mantle simple, horny, naked, smooth, or glabrous." *C. mediterraneus*, Gray (probably meant for *C. siculus*, Gray, = *C. olivaceus*, Spengler), is placed in both the genera *Lepidopleurus* of Risso and *Leptochiton*. *C. Hanleyi*, Bean, = *C. mendicarius*, Mighels, has the same kind of sculpture as *C. scabridus*, and belongs to the genus *Chatopleura* of Shuttleworth.

I may mention that *C. cancellatus* was sent me by the late Professor Sars as his *C. alveolus*; but the latter, as since described and figured by his no less eminent son, is a different species.

VIII.—*Report on Specimens dredged up from the Gulf of Manaar and presented to the Liverpool Free Museum by Capt. W. H. Cawne Warren.* By H. J. CARTER, F.R.S. &c.

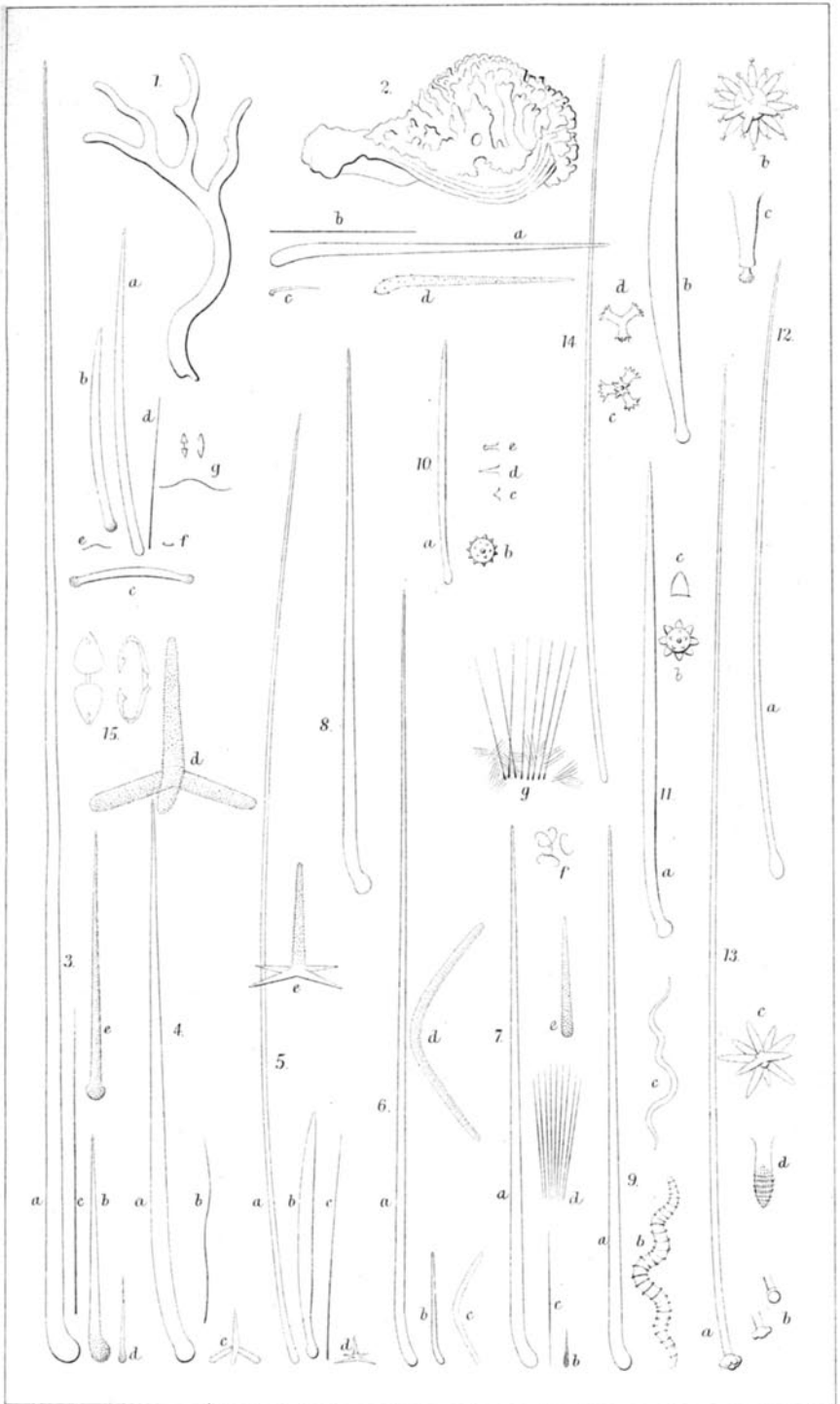
[Continued from vol. v. p. 457.]

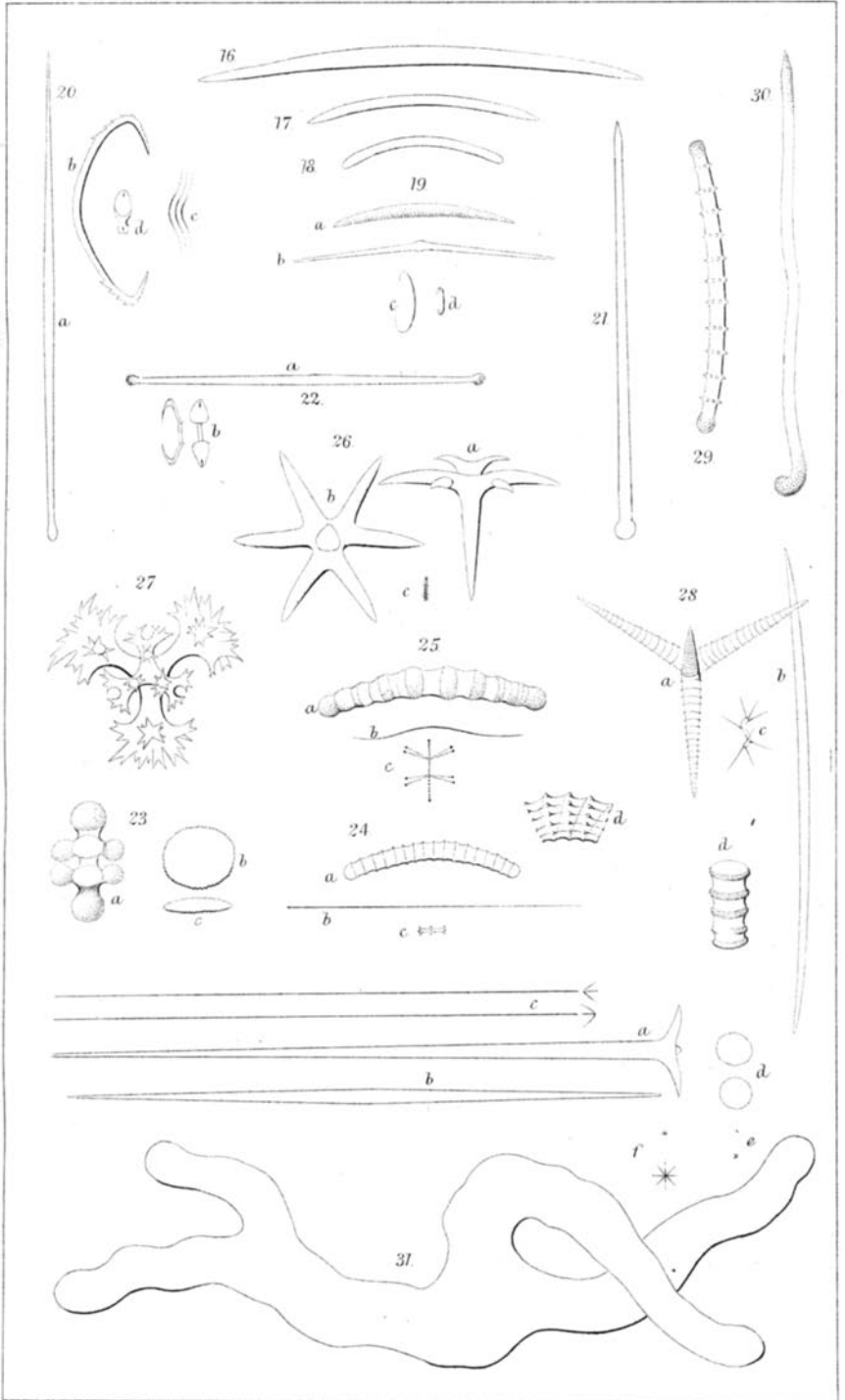
[Plates IV.-VI.]

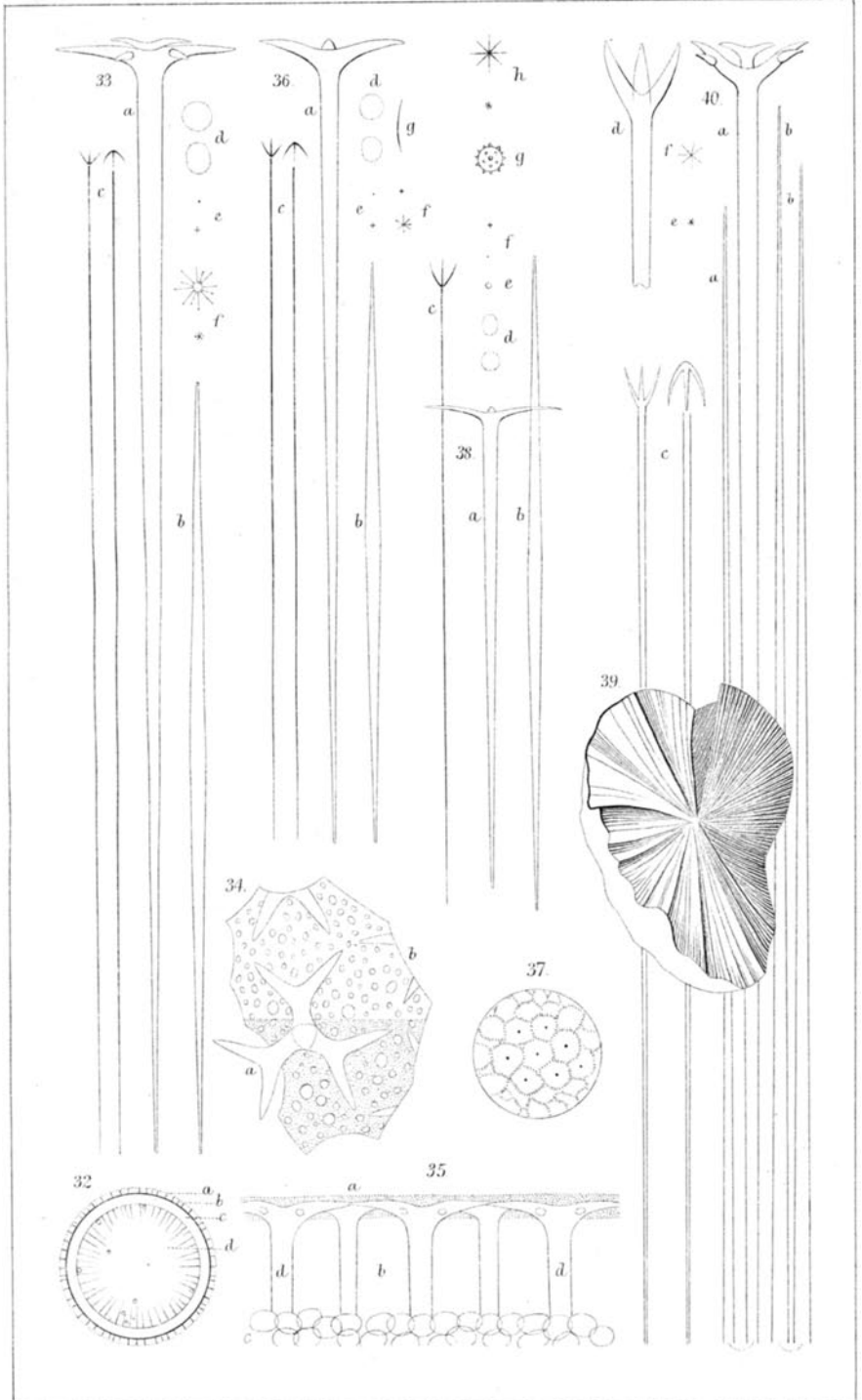
SPONGIDA.

The descriptions of the Spongida found in and about the Melobesian nodules from the Gulf of Manaar will, so far as they go, be arranged after the classification proposed in my "Notes," &c. ('Annals,' 1875, vol. xvi. p. 128 *et seq.*); so to this I must refer the reader for the characters of the orders &c. respectively.

In the measurement of the spicules it should be remembered that their form is of much more consequence than their dimensions, as the latter may vary:—1st, in different specimens; 2nd, in the same specimens (as they present themselves under all degrees of development); and 3rd, in the same species, where the average largest vary in proportion to their stoutness, the stoutest being the shortest, and *vice versâ*. My measurements are taken from the average largest of the specimens, as *these* may be assumed to represent the ultimate size, and will be given in parts of an inch, for the purpose of conveying an idea of the *relative* rather than the *real* size of the spicules; while, to avoid repetition, it may be stated here, once for all, that, unless otherwise mentioned, they will refer to the *greatest diameters* of the object. It should not be forgotten that all the specimens are *dry*.







CERATINA.

Aplysina purpurea, n. sp.

Form irregular, membranous, hollow, cactiform on the surface. Colour black-purple. Fibre weakly developed, so that, when elementarily examined, nothing can be distinguished beyond a laminated condensation of the membranous structure densely charged with purple pigment-cells like that of *Ianthella flabelliformis*, Gray (Proc. Zool. Soc. Jan. 1869, p. 50), extending among the Melobesian nodules and detritus of the sea-bottom, so as to form an agglomeration in which the contrast of the dark pigment-cells and the purple stain that accompanies them with the whiteness of the fragments over which the sponge may be spreading is very striking, even to the naked eye. In this respect it is very like *A. nævus* ('Annals,' 1876, vol. xviii. p. 229, pl. xii. fig. 2).

I also possess a large specimen of a similar sponge from Trincomalee, on the N.E. coast of the island of Ceylon, in which the purple colour is not so dark, but the fibrous structure is almost entirely absent, although the surface is cactiform and drawn up into puckered monticules; so the latter is not always dependent on the presence of fibre. It is pyramidal in shape, compressed, and 5 inches high, with a base also 5 inches long and 2 inches thick.

Aplysina fusca, n. sp.

Massive, digitate, hollow, cactiform on the surface. Colour dark brown. Growing like the last. Fibre well developed, of a light brownish colour, opaque, hollow in its dry state, with the axial cavity largely developed in proportion to its horny investment.

PSAMMONEMATA.

Hircinia arundinacea, n. sp. (provisional).

This imperfect specimen, which is in long stalks about 1-6th inch in diameter and of a light yellow colour, has had its sarcodic parts replaced by the parasite which usually attacks the *Hirciniæ* in all parts of the world, viz. *Spongiophaga communis*.

Hircinia fusca, n. sp. (provisional).

Massive, digitate, branched lobate, cactiform on the surface. Colour dark brown. Growing like the species of *Aplysina* above described, but solid and charged with fibre covered with foreign material.

RHAPHIDONEMATA.

The Chalinida are only represented by a mere amorphous fragment not more than an inch in diameter, in which the fibre is resilient as usual, and charged with small acerate spicules only.

Desmacidon Jeffreysii, Bk.

This species, described by Dr. Bowerbank, under the name above given, in his *Mon. Brit. Spong.* (vol. ii. p. 347, and figured in vol. iii. pl. lxii.), also by the Rev. A. M. Norman under the generic name of *Oceanapia* (*Brit. Assoc. Report*, 1868, p. 334), is, with a slightly varied form, found in the Gulf of Manaar, where the body portions (for there are two specimens) are not more than an inch in diameter respectively, although the tubular extensions are much branched and upwards of 6 inches in length, covered with an overgrowth of other organisms, together with sea-bottom detritus which nearly obscures the surface both of body and tubes. Internally, however, it is essentially the same as *Desmacidon Jeffreysii*, but with the exception that it contains no flesh-spicules—that is, minute bihamates (*fibule*),—thus resembling that from the south coast of Australia, where it also occurs, but more under the British form, viz. turnip-like; while the British form *does* contain the bihamates, as mentioned by Mr. Norman (*l. c.*), and found by myself in the identical specimen figured by Dr. Bowerbank (*l. c.*), although the latter has neither figured nor mentioned them in his description or illustrations (*B. S.* vol. iii.).

In classification, I feel inclined to place this sponge among the CavoChalinida, on account of its fibrous structure charged with simple acerate spicules, and its hollow tubular extensions; but it should, I think, be considered the type of a distinct group.

ECHINONEMATA.

Dictyocylindrus manaarensis, n. sp.

(Pl. IV. fig. 1, a-g.)

Stalk-like, erect, cylindrical, branched dichotomously; branches round, obtusely pointed (Pl. IV. fig. 1). Consistence firm. Colour now dark brown. Surface slightly hispid. Structurally consisting of spicules in juxtaposition, arranged in tufts perpendicularly round a condensed axis of a like nature. Spicules of six forms, viz.:—1, long, smooth, curved, acuate, 45 by $1\frac{1}{2}$ -1800th (fig. 1, a); 2, shorter, smooth, curved, acuate, proportionately stouter, with inflated

microspined round head, 27 by $1\frac{1}{2}$ -1800th (fig. 1, *b*); 3, hair-like, smooth, acuminate, about 17-1800ths long (fig. 1, *d*); 4, thick, fusiform, slightly curved, shaft with inflated round and microspined extremities, 17-1800ths long (fig. 1, *e*); 5, flesh-spicule, smooth, tricurvate, 12-6000ths long (fig. 1, *e, g*); 6, flesh-spicule, equianchorate, naviculiform, 4-6000ths long (fig. 1, *f, g*). Nos. 1-4 form, in plurality, the tuft, of which 3 is the most numerous, and all have their long axis respectively outwards; 5 and 6 are plentifully distributed about the base of the tuft. Size of specimen (which is imperfect) about $1\frac{3}{4}$ inch long, stem 1-10th inch in diameter.

Hab. Marine. Growing on hard objects.

Loc. Gulf of Manaar.

Obs. This well accords with the genus *Dictyocylindrus* as established by Dr. Bowerbank. The thick short spicule with inflated and microspined extremities (no. 4) may be considered the echinating form.

Dictyocylindrus sessilis, n. sp. (Pl. IV. fig. 2, *a-d*.)

Massive, convex, sessile, spreading, becoming subhemispherical (Pl. IV. fig. 2). Consistence hard, rigid. Colour light brown. Surface uniformly uneven. Structurally composed of tongue-shaped columns radiating and branching from the base to the circumference, where they are more or less divided, and thus altogether, when dry, present the appearance of a cauliflower, consisting of tufts of spicules densely packed together, and rendered almost inseparable without fracture by their tough sarcodic union. Spicules of three forms, viz. :—1, large, stout, smooth, acuminate, curved chiefly towards the blunt end, which is slightly larger than the shaft, 45 by 2-1800ths (fig. 2, *a*); 2, thin, hair-like, smooth, acuminate, about 20-1800ths long (fig. 2, *b*); 3, flesh- or echinating spicule, shaped like no. 1, but spined throughout, sparsely towards the large end, 35 by 2-6000ths (fig. 2, *c, d*). The large acuates are surrounded by bundles of the hair-like ones, having the echinating spicule at their base, to form, all together, the "tuft." Size of specimen about 6-12ths inch high in the centre by $1\frac{1}{4}$ inch in horizontal diameter.

Hab. Marine. Growing on hard objects.

Loc. Gulf of Manaar.

Obs. In this, as in many other species of the Echinonemata, the tufts, when dissected out, will be found to be almost identical in form with those of *Microciona atosanguinea*, Bk., showing not only an alliance between the two genera, but that *Dictyocylindrus* is only a more complicated structure of *Microciona*.

Microcionina.

I intended this family to include Dr. Bowerbank's genera *Microcionia* and *Hymerhaphia* (Brit. Spong. vol. i. pp. 188, 189), chiefly because they are all thin, flat, incrusting and laminiform species, containing respectively a *setaceous* form of spicule, and another more or less allied to the echinating one of the Echinonemata.

The distinguishing character between these two genera, according to Dr. Bowerbank, is that the spicules of *Microcionia* are arranged in tufts or "columns" (ex. gr. *M. atrosanguinea* = *Scopalina*, Sdt.), and those of *Hymerhaphia* are not. But the spiculation is more persistent than the "columns" in many instances, whereby the diagnosis would break down, as the *Microcionia* thus becomes a *Hymerhaphia*. Taking an opposite view of the case, *Hymerhaphia vermiculata*, Bk., of course contains no "columns;" but *H. vermiculata*, var. *erecta* ('Annals,' 1876, vol. xviii. p. 307, pl. xii. fig. 4 &c.), does (that is, "fasciculi"), with identical spiculation; so here the diagnosis of *Hymerhaphia* breaks down. Again, Dr. Bowerbank's *Microcionia carnosa* of 1866 is made identical with *Halichondria plumosa*, Johnston, 1870 (B. S. vol. iii. p. 61), and renamed *Microcionia plumosa*. Now, considering that *Halichondria plumosa* grows up into an erect massive form, it must, according to Dr. Bowerbank's diagnosis, be a *Microcionia* at one time, viz. when flat and incrusting, and at another not—that is, when it is erect and massive; hence I have proposed a group "Plumohalichondrina" for this and similar species, the most remarkable of which that I have seen comes from Port Elizabeth, South Africa, where it appears to be very abundant; it is large, branched, and compressed, like an elk's horn; and they all possess the *angulated* (Bk.) equianchorate, not the naviculiform spicule of *Microcionia*.

Nor is it uncommon to find an Echinonematous sponge beginning in the flat form of a *Microcionia* and then becoming erect, as appears to be the case with *Halichondria plumosa* just mentioned. But while this shows that the "columns" in *Microcionia* are not of much generic value, it also points out that genera formed upon the characters of indigenous species are very likely to break down when applied to world-wide collections; yet the same may be said of the latter until *all* the species of a class are known.

There is still another of Dr. Bowerbank's genera which, both in spiculation and growth, is very nearly allied to these thin, flat, incrusting laminiform sponges, viz. *Hymedesmia*; but here, again, his chief distinguishing character, viz. the

“recumbent” or horizontal position of the linear spicules, seems to me to be by no means constant and often dependent on circumstances. Even in his description of *Hymedesmia stellata* (B. S. vol. ii. p. 150) he uses the term “hispid;” and in the species *Hymedesmia spinatostellifera*, to be hereafter described, I was obliged to seek for an illustration of the entire skeleton-spicule among *erect* or projecting ones in the more protected parts.

Dr. Bowerbank admits that all these three genera, which are given one after another in his ‘British Spongiadæ,’ are very nearly allied; and I now feel much inclined to place them *all* in my group Microcionina, although the Hymedesmina in my classification stand as the ninth group of my Holorhaphidota; but then the species which illustrate it (p. 197), viz. *Hymedesmia Johnsoni*, Bk., and *Desmacidon titubans*, have not the long, setaceous, acute, or spinulate spicule which characterizes Dr. Bowerbank’s original species (viz. *H. radiata* and *H. stellata*, described in 1866, B. S. vol. ii. pp. 149 and 150, and illustrated in 1870, vol. iii. pl. xxviii.), and which, together with its accompaniments, is characteristic of the kind of *Hymedesmia* that I should place in my group Microcionina. *Hymedesmia Johnsoni* and *Desmacidon titubans* would be much better placed alongside with *Esperina*, where they now are in my classification.

There are, however, species which have not this kind of spiculation, viz. the setaceous acute, &c., ex. gr. *Rhaphidhystia spectabilis* (‘Annals,’ 1879, vol. iii. p. 300, pl. xxvi. figs. 13, 14a); and there are specimens which may be so circumstanced as never to get beyond a thin lamina, although under other conditions they might grow up into erect forms: such is perhaps *Hymedesmia zetlandica*, Bk., judging from its spiculation *in the type specimen* now in the British Museum, which I should be inclined to regard as allied to *Halichondria plumosa*, in which case it would come under my Plumohalichondrina.

Having premised these remarks it will be understood that although hereafter I shall describe the species of *Hymedesmia* found on the Melobesian nodules among the Holorhaphidota, yet I am of opinion that *they* ought to be under the Echinonemata, in the group Microcionina, together with the following ones of *Microcionia* and *Hymerhaphia*.

Microcionia atrosanguinea, Bk., and *M. armata*, Bk.

Both these species occur on the Melobesian nodules, now of a red-cinnamon colour, but were probably “blood-red,” like the British specimens of the same sponges when alive. Both

are characterized by the large, setaceous acute, accompanied by a thin one, together with a small clavate-spined spicule (the echinating form), a smooth tricurvate and a naviculiform, small, equianchorate (flesh-spicules), all arranged in tufts with the flesh-spicules about their base; but the tufts or "columns" are much more developed in the former than in any other species of the kind, whence it was called "*Scopalina*" by Schmidt in 1862. In *M. armata* the tufts are not so strongly developed, but the tricurvate spicule is unusually so, and in some instances so spread out as to resemble a long, thin, straight acerate with a short abrupt curvature in the centre.

Microciona affinis, n. sp. (Pl. IV. fig. 15.)

This species is very like the type species, *Microciona atosanguinea*, in spiculation, but is extremely thin, has no tufts ("columns"), and the colour now is whitish yellow. Its chief specific difference, however, lies in the form of the equianchorate, which being extremely abundant and thicker (but not longer), from a greater projection of the central tongue-shaped arm, presents the appearance of being barbed on the inner side of the point, so that when viewed laterally this has much the appearance of a fish-hook (Pl. IV. fig. 15).

Hab. Marine. On hard objects.

Loc. Gulf of Manaar.

Obs. This is one of the species to which I have above alluded, in which the spiculation is essentially like that of the type specimen of Dr. Bowerbank's genus *Microciona*, viz. *M. atosanguinea*, although it possesses no "columns." The "fish-hook"-like appearance at the end of the central arm of the equianchorate, when viewed laterally, may be owing to a deficiency or hole in the upper part of the falcate septum which ordinarily unites this arm to the shaft, and a corresponding thickening of the septum at this part, which in some instances appears to extend to the shaft itself; but the object is too small for me to state, with any certainty, more than that it presents the "fish-hook appearance" mentioned.

Microciona bulboretorta, n. sp. (Pl. IV. fig. 3, a-e.)

Laminiform, extremely thin, hirsute, spreading. Colour, when dry, whitish yellow. Spicules of four forms, viz.:—1, long, setaceous, smooth, acute, with inflated blunt end turned to one side, 175 by 2-1800ths (Pl. IV. fig. 3, a); 2, the same, but short, and spined halfway up from the blunt end, 30 by 1½-1800th (fig. 3, b); 3, the same, about half the length of the last (fig. 3, d, e); 4, thin, smooth, acute, 40-1800ths long (fig. 3, c). All the spiculation is erect, and no. 4 in tufts

around no. 1. Size variable; that of specimen about $\frac{1}{4}$ inch in horizontal diameter.

Hab. Marine. On hard objects.

Loc. Gulf of Manaar.

Obs. The large inflation of the fixed end, which is turned to one side, occurs in all the spicules except no. 4. There are no anchorates and no tricurvates; so that the spiculation is something like that of *Hymerhaphia clavata*, Bk.; but, as above stated, all the spicules are erect like those of a *Microcionia*, whereas in Dr. Bowerbank's illustration of that species (B. S. vol. iii. pl. xxvi. fig. 4) part, at least, are reclined confusedly; but then, as I have also said before, this may have been occasioned by circumstances, viz. protection or exposure respectively during growth.

Microcionia quadriradiata, n. sp.
(Pl. IV. fig. 4, a-d.)

Laminiform, extremely thin, hirsute, spreading. Colour, when dry, dark brown. Spicules of three forms, viz.:—1, large, setaceous, smooth, acuminate, curved chiefly towards the blunt end, which is globular and rather less in diameter than the shaft, from which it is separated by a slight constriction, 75 by 3-1800ths (Pl. IV. fig. 4, a); 2, thin, smooth, acuminate, frequently more or less crooked, 25-1800ths long (fig. 4, b); 3, quadriradiate, consisting of three arms radiating at equal angles from a common central point, which, raised and tripod-like, supports the fourth arm in an erect position; all densely and uniformly microspined, $5\frac{1}{2}$ by 6-1800ths (fig. 4, c, d). No. 1, together with tufts of no. 2, projects vertically out of the lamina, which is densely charged with no. 3, whose erect arm thus becomes the *echinating* spicule. Size variable; that of specimen about $\frac{1}{4}$ inch in diameter.

Hab. Marine. On hard objects.

Loc. Gulf of Manaar.

Obs. The quadriradiate spicule of this species is almost identical in form with that of *Dictyocylindrus Vickersii* ('Annals,' 1879, vol. iii. p. 292, pl. xxvii. figs. 5-8), where the vertical arm in like manner becomes the *echinating* element or spicule; and the crooked form of the thin acerate is also similar; but the skeleton- or setaceous spicule is different. In the species, however, to which Mr. Thomas Higgin has called attention, and which also grew on a *Melobesia* ("Nullipore"), both the quadriradiate and setaceous spicule are essentially identical; therefore this is a specimen of *Microcionia quadriradiata* from the West Indies ('Annals,' 1877, vol. xix. p. 296, pl. xiv. fig. 9).

Microciona quinqueradiata, n. sp.
(Pl. IV. fig. 5, *a-e*.)

Laminiform, extremely thin, hirsute, spreading. Cream-colour. Spicules of four forms, viz.:—1, long, setaceous, curved, simple, acuate, 125 by 1-1800th (Pl. IV. fig. 5, *a*); 2, short, thick, acuate, curved generally, with blunt end round and a little less in diameter than the shaft, from which it is differentiated by a slight constriction, 33 by 2-1800ths (fig. 5, *b*); 3, thin, slender, simple, acuate, 30-1800ths long (fig. 5, *c*); 4, quadriradiate, consisting of four *smooth* pointed arms radiating opposite each other from a common centre that is raised so as to form a four-legged base to the fifth arm, which is erect, longer than the rest, gradually pointed, thickly spined throughout and the spines recurved, 6 by 5-1800ths (fig. 5, *d, e*). Nos. 1-3 are erect, and the latter in greater plurality than the others, while the long, spined arm of the quadriradiate, which is very numerous, forms the echinating part. Size variable; that of the specimen about $\frac{1}{4}$ inch in horizontal diameter.

Hab. Marine. On hard objects.

Loc. Gulf of Manaar.

Obs. This species is in growth, colour, and spiculation very like the foregoing one; but while the quadriradiate or echinating spicule in *M. quadriradiata* is most like that of *Dictyocylindrus Vickersii* (*l. c.*), it is the setaceous and thick, short, acuate spicules respectively here which most resemble the spiculation of that sponge.

Microciona curvispiculifera, n. sp.
(Pl. IV. fig. 6, *a-d*.)

Laminiform, extremely thin, hirsute, spreading. Cream-colour. Spicules of three forms, viz.:—1, long, setaceous, smooth, acuate, curved chiefly towards the blunt end, which is smooth and not differentiated from the shaft, 100 by 1-1800th (fig. 6, *a*); 2, the same, but much shorter, although proportionately stouter, 15 by 1-1800th (fig. 6, *b*); 3, cylindrical, bent in the centre, round at the extremities, smooth at first, becoming when fully formed spiniferous throughout, 15 by $\frac{2}{3}$ -1800th (fig. 6, *c, d*). Nos. 1 and 2 are erect and fixed in a layer of the bent spiniferous spicules, which project outwards so that half of their length, lying parallel with the other spicules, becomes the echinating part. Size variable; that of the specimen about $\frac{1}{4}$ inch in horizontal diameter.

Hab. Marine. On hard objects.

Loc. Gulf of Manaar.

Obs. This species is well-characterized by the bent spicules, many of which present different degrees of smoothness in proportion to the amount of development, which ends in their becoming thickly spinous throughout.

Microciona fascispiculifera, n. sp.
(Pl. IV. fig. 7, a-g.)

Laminiform, extremely thin, hirsute, spreading, covered with little bundles of spicules of different lengths respectively (Pl. IV. fig. 7, g). Cream-colour. Spicules of four forms, viz.:—1, long, setaceous, smooth, acuminate, curved chiefly towards the blunt end, which is not differentiated from the shaft, 70 by $1\frac{3}{4}$ -1800ths (fig. 7, a); 2, acerate, hair-like, in bundles, of different lengths below 20-1800ths (fig. 7, c, d); 3, spined acuminate, 5-1800ths long (fig. 7, b and e); 4, minute, simple, bihamate, 2-6000ths (fig. 7, f). Nos. 1 and 3 project from a layer formed of nos. 2 and 4, the former in sheaf-shaped bundles of various dimensions lying on the surface. Size variable; that of the specimen about $\frac{1}{4}$ inch in horizontal diameter.

Hab. Marine. On hard objects.

Loc. Gulf of Manaar.

Obs. This species is also well characterized, viz. by the fasciculi of hair-like spicules, which respectively vary from 1-3000th to 1-90th inch in length, and by reflected light under the microscope look very much like minute white sawdust, for which, at first, I mistook them, partly on account of the specimens having been packed in this material that had more or less adhered to them. It is not the first time that I have found a hair-like spiculation of this kind in *Microciona*, as may be seen by a reference to the illustration of *M. minutula* ('Annals,' 1876, vol. xviii. p. 239, *mendose script.* "*pusilla*," pl. xvi. fig. 51, &c.).—N.B. Never pack sponges in cotton wool or sawdust, but place them at once in spirit and water in a jar or keg, with a *vellum* label on them written in *black-lead pencil*.

The presence of sheaf-shaped fasciculi of hair-like spicules looking, as just stated, like minute sawdust by reflected light (Pl. IV. fig. 7, g) is a very common feature in different species of *Esperia*, where they often appear to replace the tricurvates. I delineated them first in 1871 ('Annals,' vol. vii. pl. iv. fig. 22), in *Stelletta lactea*, and again in *Esperia socialis* (ib. ib. pl. xvii. fig. 7, d, p. 277). Finally in 1874 ('Annals,' vol. xiv. p. 104) I conjectured not only that they were produced in cells like tricurvates similarly developed (ib. ib. pl. x. figs. 3-8), but

that, in some instances, they were identical with the latter; and now they have presented themselves in *Microciona fascispiculifera*, which seems to be a very common species in the Gulf of Manaar, as there are many specimens of it on the Melobesian nodules. This, however, is not the only instance in which the flesh-spicules may be developed together in groups, as we see by the rosettes of inequianchorates, also another common feature of *Esperia*; and I have little doubt that bihamates may be produced in the same way, particularly after considering the illustration of *Hymedesmia zetlandica*, Bk. (Brit. Sponges, vol. iii. pl. xxix.), in which the bihamates are not single, as is usually the case, but in groups like the tricurvates &c. It should, however, be remembered that these spicules are often developed *singly* as well as in groups in their cells ('Annals,' l. c. pl. x. figs. 11 and 12). We must view the sheaf-shaped bundles, then, I think, as "flesh-spicules" closely allied to, if not identical with, tricurvates; and therefore they may occur in any kind of spiculiferous sponge; hence it is not strange that we should find them in a *Microciona*, where the tricurvate is such a common flesh-spicule.

Mr. Sollas has proposed for them the name of "trichites" ('Annals,' 1880, vol. v. p. 133), which it would be as well henceforth to adopt, as they are evidently not peculiar to one kind of sponge, and may occur in a great number; so that they should, for convenience of description, have a fixed designation, although, as I have above stated, they seem to me to be but another form of the tricurvate.

Hymerhaphia unispiculum, n. sp.
(Pl. IV. fig. 8.)

Laminiform, extremely thin, hirsute, spreading. Cream-colour. Spicules of one form only viz. large, setaceous, smooth, acute, curved chiefly towards the blunt end, which is hemispherical and a little more in diameter than the shaft, from which it is differentiated by a slight constriction, 70 by 1 $\frac{3}{4}$ -1800th (Pl. IV. fig. 8). Size variable; that of the specimen about $\frac{1}{4}$ inch in horizontal diameter.

Hab. Marine. On hard objects.

Loc. Gulf of Manaar.

Obs. *Hymerhaphia unispiculum* is not so remarkable for the form of its spicule, which is common to many species, as for there being no other, in which respect it resembles *Hymedesmia simplicissima*, Bk. (Brit. Sponges, vol. iii. pl. lxxx. fig. 1). It seems to me questionable, however, if this is not

accidental, and that the other spicules, which often accompany a similar form, are, from some cause or another, absent here; the record, therefore, is only made *provisionally*.

Hymerhaphia vermiculata, var. *erecta*.

This, which is but an erect form of *Hymerhaphia vermiculata*, Bk., I found plentifully among the dredgings of the 'Porcupine' from the bed of the Atlantic Ocean between the north of Scotland and the Faroe Islands ('Annals,' 1876, vol. xviii. p. 307, pl. xii. fig. 4, &c.); and it seems to be equally plentiful in the Gulf of Manaar, with this difference only, that the acute spicules are not so large or so setaceous as those in the specimens from the Atlantic sea-bed.

Hymerhaphia clavata, Bk.

Laminiform, extremely thin, hirsute, spreading. Cream-colour. Spicules of four forms, viz.:—1, large, smooth, acute like that of *H. unispiculum*, 100 by 3-1800ths; 2, clavate, nearly straight, with the blunt end differentiated from the shaft by being one third more in diameter, spined throughout, 14 by $2\frac{1}{2}$ -1800ths; 3, the same, but not more than half the size; 4, thin, smooth, acute, 30-1800ths long. All these spicules are erect; and no. 1, which is rather sparse and very large and long, is surrounded by a great number of the fine acuates no. 4. Size variable; that of the specimen about $\frac{1}{4}$ inch in horizontal diameter.

Hab. Marine. On hard objects.

Loc. Gulf of Manaar.

Obs. This is so nearly allied in spiculation to *Hymerhaphia clavata*, Bk., that I think it must be a specimen of the same species; but lest it should not be, I have given the description, merely adding that if it differs from *Microciona* in the absence of the "columns," it certainly comes so near it in the elements and arrangement of its spiculation that it is almost questionable whether it should not be called a *Microciona*.

Hymerhaphia eruca, n. sp. (Pl. IV. fig. 9, a-c.)

Laminiform, extremely thin, hirsute, spreading. Colour light brown. Spicules of three forms, viz.:—1, large, smooth, setaceous, acute, chiefly curved towards the blunt end, which is slightly inflated hemispherically, and slightly differentiated from the shaft by constriction, 70 by $1\frac{3}{4}$ -1800th (Pl. IV. fig. 9, a); 2, vermiculate, acerate, annulated at more or less equal distances by projecting ridges, which here and there are broken or imperfect, 25 by $1\frac{1}{2}$ -1800th (fig. 9, b); 3,

the same, but smaller and smooth, in an earlier stage of development (fig. 9, c). No. 1 projects from a bed of no. 2. Size variable; that of the specimens about $\frac{1}{4}$ inch in horizontal diameter.

Hab. Marine. On hard objects.

Loc. Gulf of Manaar.

Obs. This sponge, in spiculation and arrangement of the spicules, is very like *Hymenophoria vermiculata*, Bk.; indeed the early form of the caterpillar-like spicule (that is, before the annulations are developed) is precisely like the contort spicule of *H. vermiculata* (fig. 9, c).

Baculifera.

This group was established for receiving a great number of different forms of a sponge both suberitic in its consistence and in the form of its spicules, but Echinonematous in their arrangement, wherefore it was placed in the order Echinonemata. So far as I have had an opportunity of examining these forms they have all had only one and the same form of spicule, which is pin-like, with the head elongated at right angles to the shaft, like that of a crutch, but so peculiar that there is no mistaking it anywhere when once known. The specimens which I have seen chiefly come from the southwest coast of Australia; and the first described were named *Caulospongia verticillaris* and *C. plicata*, by Mr. Saville Kent (Proc. Zool. Soc. 1871), of which the former is in the Liverpool Free Museum, and the latter in the British Museum. I found a small fragment of this group of a light brown, which is the usual colour, in two places on the Melobesian nodules.

HOLORHAPHIDOTA.

Renierida.

Much information is yet needed to make the species in the groups of this family clear; for the acerate form of spicule is so common among them that, unless accompanied by a flesh-spicule, which is seldom the case, the descriptions only of a great number of fully developed specimens can establish the species. Thus in the British Museum there are two species on a large, branched, stony coral from Madeira, both massive and amorphous, one yellow, the other white or colourless; both belong to my group "*Crassa*," from the large size of their spicules. The yellow one has a cylindrical spicule with obtuse ends (sausage-shaped); the white one, a still larger spicule, which is long, thick, fusiform, acerate, more like

that of *Halichondria panicea*—that is, gradually pointed. Now just the same kind of sponges appear on the Melobesian nodules; but although the spicule of the colourless or white species is almost identical with that on the Madeira coral, that of the yellow one, instead of being cylindrical and sausage-shaped, is acerate and sharp-pointed; while there is a third species about the Melobesian nodules, which is dark brown, that has a cylindrical obtusely-ended spicule. Under these circumstances all that I can do is briefly to describe them respectively by the terms *yellow*, *white*, and *dark brown*, provisionally—that is, until the species to which they respectively belong shall have been satisfactorily defined.

Reniera, yellow. (Pl. V. fig. 17.)

Massive, lobate. Consistence firm. Colour ochre-yellow. Surface even. Spicule of one form only, viz. smooth, acerate, fusiform, curved, abruptly sharp-pointed, 17 by $1\frac{1}{2}$ -1800th (Pl. V. fig. 17). Colour variable—some specimens being greyish yellow, and others almost white. Size of largest specimen about $2\frac{1}{2}$ inches in its longest diameter.

Reniera, white. (Pl. V. fig. 16.)

Massive, lobate, rising into short tubular processes. Consistence firm. Colour white. Surface even. Spicule of one form only, viz. smooth, acerate, fusiform, curved, gradually pointed, 60 by $2\frac{1}{2}$ -1800ths (Pl. V. fig. 16). Size of largest specimen about 3 inches in diameter.

Reniera, dark brown. (Pl. V. fig. 18.)

Amorphous, growing in small portions here and there in the depressions of the Melobesian nodules. Consistence firm. Colour dark brown. Spicule of one form only, viz. smooth, cylindrical, curved, rounded at the extremities, 23 by 1-1800th (Pl. V. fig. 18). Size of largest specimen about an inch in horizontal diameter.

Reniera fibulifera, Sdt.

This sponge, which seems to be world-wide in its distribution, was represented by a small growth, about 1-16th inch in horizontal diameter, which was identified at the time, but overlooked afterwards, so that there is no slide or mounted specimen of it.

Halichondria albescens, Johnston.

Here and there on the nodules.

Halichondrina.

Halichondria aceratospiculum, n. sp.
(Pl. V. fig. 19, a-d.)

There was only a minute trace of this, but sufficient for mounting and for the following description of its spicules, which consist of four forms, viz.:—1, acerate, fusiform, curved, sharp-pointed, thickly spined throughout, 25 by $1\frac{1}{2}$ -6000th (Pl. V. fig. 19, a); 2, smooth, acerate, fusiform, curved, slightly inflated in the centre, and gradually pointed, 35 by 1-6000th (fig. 19, b); 3, bihamate, simple, 8-6000ths long (fig. 19, c); 4, equianchorate, shaft slightly curved, arms linear in appearance, and distinct when viewed laterally, $3\frac{1}{2}$ -6000ths long (fig. 19, d).

Obs. This is evidently the spiculation of a variety of *Halichondria incrustans*, in which the flesh-spicules, viz. nos. 3 and 4, are in form identical, while the acerate forms of the larger spicules respectively lead to the designation.

Esperina.

Esperia tunicata, Sdt.

This consists of a thin fragment, about $\frac{1}{2}$ an inch in horizontal diameter, abounding with the usual Esperian rosettes, composed of the inequianchorate of the species, accompanied by a great number of nondescript forms, which appear to be half-developed inequianchorates that have respectively been generated in separate cells.

Esperia serratohamata, n. sp. (Pl. V. fig. 20, a-d.)

Of this sponge, which I have long wished to find, viz. since I published a representation of the peculiar form of the bihamate found among the spicules in one of the chambers of a specimen of *Carpenteria balaniformis* ('Annals,' 1876, vol. xvii. pl. xiii. fig. 10), a minute portion has grown on one of the Melobesian nodules, which has yielded sufficient for mounting and retaining in the dried state respectively. It possesses four forms of spicules, viz.:—1, the usual Esperian skeleton-spicule, smooth, fusiform, sub-pinlike, with oval inflation at the blunt end, 43 by $1\frac{1}{4}$ -6000th (Pl. V. fig. 20, a); 2, large, bihamate, serrated on the outside towards each extremity, with the teeth directed backwards, 24 by $1\frac{1}{4}$ -6000th (fig. 20, b); 3, tricurvate, simple, hair-like, dispersed and in groups, 12-6000ths long (fig. 20, c); 4, inequianchorate, small, with the head nearly two thirds of the entire length, 4 by $2\frac{1}{2}$ -6000ths (fig. 20, d), dispersed

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singly and combined in the form of rosettes respectively. Size of specimen about 1-6th inch in horizontal diameter.

Hab. Marine. On hard objects.

Loc. Gulf of Manaar.

Obs. The remarkable form of the bihamate, together with the short thick inequianchorate, is distinctly characteristic of this *Esperia*, which is not the case with many other species, in which the spiculation is so much alike that much confusion still exists respecting them.

Hymedesmina.

Hymedesmia stellivarians, n. sp.

(Pl. IV. fig. 10, *a-e*.)

Laminiform, extremely thin, spreading, smooth or hirsute. Colour yellow. Spicules of two forms, viz.:—1, pin-like, smooth, fusiform, with oval head, 32 by 1-1800th (Pl. IV. fig. 10, *a*); 2, globostellate, rays short and conical, or short and capitate, or long and pointed, respectively; hence the designation (fig. 10, *b* and *c*, *d*, *e*). Pin-like spicule incorporated with the bed of stellates where the parts are exposed, more or less erect where protected. Size variable; that of specimen about an inch in horizontal diameter.

Hab. Marine. On *Hircinia fusca*.

Loc. Gulf of Manaar.

Obs. I am inclined to think that the real colour of this species is white, and that its yellow tint has been derived from the brown colouring-matter of the *Hircinia* on which it has grown. It is chiefly distinguished from the following sponge, whose stellate is very similar, by the form and smallness of the linear pin-like spicule.

Hymedesmia Moorei, n. sp. (Pl. IV. fig. 11, *a-c*.)

Laminiform, extremely thin, spreading, smooth or hirsute. Colour glistening white. Spicules of two forms, viz.:—1, pin-like, smooth, fusiform, chiefly curved towards the blunt end, which is spherical, varying to simple uninflated acute, 62 by 2-1800ths (Pl. IV. fig. 11, *a*); 2, globostellate, rays at first long and pointed, with body proportionally small, then short, thick, and conical, with proportionally enlarged body, finally mitre-shaped and microspined, 5-6000ths (fig. 11, *b* and *c*). Where exposed the linear spicule is incorporated with the layer of stellates horizontally, but where protected it is erect. Size variable; that of specimen about an inch in horizontal diameter.

Hab. Marine. On hard objects.

Loc. Gulf of Manaar.

Obs. Like the last species but for the form of the skeleton-spicule no. 1. Named after Mr. T. J. Moore, the assiduous Conservator of the Liverpool Free Museum.

Hymedesmia spinatostellifera, n. sp.

(Pl. IV. fig. 13, *a-d*.)

Laminiform, extremely thin, spreading, smooth or hirsute. Salmon-colour. Spicules of two forms, viz.:—1, pin-like, very long and slender, smooth, curved, head at first round and smooth, then elongated transversely by a convex addition to both sides, and, finally, by similar growths all over so as to become tuberoso, shaft 130 by 1-1800th, head much larger than the shaft (Pl. IV. fig. 13, *a* and *b*); 2, stellate, multiradiate, rays conocylindrical, spined in annular rows towards the extremity, fixed on a body which is about one third of the diameter of the whole stellate, 10-6000ths in diameter (fig. 13, *c* and *d*). Linear spicules, where exposed, imbedded among the stellates, but erect and projecting where protected. Size variable; that of specimen extending over the whole of a Melobesian nodule upwards of an inch in diameter.

Hab. Marine. On hard objects.

Loc. Gulf of Manaar.

Obs. This species is characterized by its pink or salmon-colour, the peculiar tuberoso form of the head of the linear spicule when fully developed, the large size of the stellate, and the peculiar form and microspination of its rays.

Hymedesmia capitatostellifera, n. sp.

(Pl. IV. fig. 12, *a-c*.)

Laminiform, extremely thin, spreading, sparsely hirsute. Colour snow-white. Spicules of two forms, viz.:—1, pin-like, curved, smooth, long, setaceous, head oval and wider in diameter than the shaft, which is 80 by 1-1800th (Pl. IV. fig. 12, *a*); 2, stellate, with large globular body, multiradiate, rays terminating in a globular, inflated, and spined head with constricted neck, 12-6000ths in diameter (fig. 12, *b* and *c*). Pin-like spicule fixed by its head in the sarcodic layer of the sponge, which is densely charged with the stellates. Size variable, that of specimen about $\frac{1}{4}$ inch in horizontal diameter.

Hab. Marine. On hard objects.

Loc. Gulf of Manaar.

Obs. This species is characterized by its brilliant snow-white colour, the large size of its stellates, and the peculiar capitation of their rays.

Hymedesmia trigonostellata, n. sp.
(Pl. IV. fig. 14, a-d).

Laminiform, extremely thin, spreading, smooth or hirsute. Colour snow-white, glistening. Spicules of three forms, viz.:—1, acute, long, thin, smooth, 50 by $\frac{1}{2}$ -1800th (Pl. IV. fig. 14, a); 2, pin-like, ensiform, smooth, with inflated fusiform shaft, long neck, and small round head not more than one third of the diameter of the shaft, 25 by 1-1800th (fig. 14, b); 3, stellate, quadriradiate, in which three of the rays form a kind of tripod to the fourth, that is erect, thus presenting a triangular appearance; each ray expanded at the extremity by a multifid spinous division, 3-6000ths in diameter (fig. 14, c, d). No. 1, sparsely scattered, projects beyond no. 2, which is parquetted in among no. 3 in great abundance, so as to present a smooth glistening surface. Size variable; that of specimen about $\frac{1}{4}$ inch in horizontal diameter.

Hab. Marine. On hard objects.

Loc. Gulf of Manaar.

Obs. The peculiar sword-like form of the pin-like spicule no. 2, together with that of the stellate, characterizes this species unmistakably; while the latter, which always resembles that of *Axos Cliftoni* in the multifid spine-like division of the extremities of its rays, is often rendered still more like it by being sexradiate.

Suberitida.

Suberites vestigium, n. sp. (Pl. V. fig. 21.)

Laminiform, extremely thin, spreading. Colour glistening white, asbestos-like. Spicule of one form only, viz. pin-like, shaft slightly curved and slightly fusiform, head spherical, a little less than the shaft in diameter, 27 by 1-1800th (Pl. V. fig. 21). Spicules confusedly arranged, among which many project irregularly. Size variable, that of the specimen about $\frac{1}{4}$ inch in horizontal diameter.

Hab. Marine, on hard objects.

Loc. Gulf of Manaar.

Obs. This species, although very like a *Hymedesmia* in growth and appearance, is also very different in spiculation. As may have been observed, there is no long setaceous spicule here markedly projecting from a layer of smaller ones of a

different form, but the whole composed of one only, viz. pin-like, and that, too, not characterized by any one in particular being longer than the rest. It often presents a bluish-green tint (now dry) like that of a similar species on the rocks here (Budleigh-Salterton); but the head of the latter is different in form, viz. globoconical followed by an inflated ring like that of *Suberites* (*Halichondria*, Johnston) *carnosa*. It may be remembered that the colour of the British species (which, when fresh, is cobalt-blue) is owing to the presence of a minute parasitic *Oscillatoria*, for which I have proposed the name of "*Hypheothrix cœrulea*" ('Annals,' 1878, vol. ii. p. 164). How far this, as well as the British species, may be that which, under other circumstances, grows into a larger and distinct form of *Suberite*, I am not able to state; all that I can say is that both are frequently found under the conditions above mentioned.

Suberites fistulatus, n. sp. (Pl. V. fig. 22, *a*, *b*.)

Irregularly globular, elongate, sessile, appendiculate, the appendages consisting of long tubular extensions of different sizes, irregularly scattered over the surface, which is otherwise even. Colour now pinkish brown. Internally cavernous, densely charged with two forms of spicules, viz.:—1, linear, fusiform, slightly curved, and inflated at both ends, which are microspined, 23 by $\frac{1}{2}$ -1800th (Pl. V. fig. 22, *a*); 2, equianchorate (flesh-spicule), naviculiform, 8-6000ths long, comparatively large and numerous (fig. 22, *b*). The tubular appendages are prolonged from large vents, which are in connexion with the cavernous structure of the body. Size of specimen 3 inches long, 3 broad, and $2\frac{1}{2}$ high.

Hab. Marine. On hard objects.

Loc. Gulf of Manaar, and Freemantle, S.W. Australia.

Obs. Having found a minute portion of this sponge on one of the Melobesian nodules of the Gulf of Manaar, I at once recognized in it the spiculation of the sponge above described, which is in the general collection of Dr. Bowerbank's sponges purchased by the British Museum. The cavernous and cork-like consistence claims for it a place among the *Suberitida*.

Placospongia melobesioides, Gray (Proc. Zool. Soc. Jan. 1867, p. 127, woodcut, fig. 1).

General character largely and irregularly placophorous, hard, petrous, *Geodia*-like, dichotomously branched; branches angulated irregularly and therefore variable in diameter.

Colour white or brown. Surface even, divided into irregular, polygonal, placoid spaces varying in size, under half an inch in diameter, slightly concave towards the centre, raised at the margin, where they meet each other, but do not join. No pores and no vents visible over the placoid spaces themselves, but a line of separation between them where in apposition, through which communication with the interior is obtained. Plates or placoid portions crust-like, composed of siliceous globules, like those of *Geodia*, united together by exceedingly tough fibrous sarcode; subjacent to which is another layer composed of areolar sarcode charged with pin-like spicules, whose points project slightly beyond and between the marginal appositions of the plates respectively; within which, again, is a solid thick axis, *entirely* composed of the same kind of siliceous globules as the plates. Spicules of four forms, viz. :—1, large, pin-like, straight, smooth, shaft subconical and abruptly pointed, head globular, as wide as the thickest part of the shaft, 65 by 1-1800th; 2, siliceous globule, more or less elliptical, compressed slightly in the direction of a hilous depression, which is on one side; surface uniformly consisting of minute stelliform points, more or less multifid and in juxtaposition, being the ends of the radiated crystalline structure of which the interior is composed, 17 by 13-6000ths; 3, a much smaller siliceous globule, which is spherical and covered with minute conical points in juxtaposition, that give it a multiangular appearance, 3-6000ths; 4, smooth, microscopic, siliceous globules, which appear to be originally developed in cells, about 3-6000ths in diameter. No. 2 (siliceous globule), with which no. 3 is sparsely mixed, forms the staple spicule of the hard axis and mail-like plates respectively; while no. 1, the pin-like spicule, is confined to the areolar sarcodic layer between the two, where it is arranged in glistening tufts, whose points, as before stated, project through the line of separation between the plates. The microscopic globules appear to be chiefly situated in the dermal layer. Size of largest specimen (for there are two) about $1\frac{1}{2}$ inch long, 8-12ths inch broad, and 4-12ths thick.

Hab. Marine. Attached to hard objects.

Loc. Gulf of Manaar.

Obs. I have partly described this species from the specimens in the British Museum, one of which was well figured by Dr. Gray (*l. c.*); but the description not being detailed with that minuteness which this remarkable sponge deserves, has led to my making the above additional statements. It will have been observed that the siliceous globule is identical with

that of a *Geodia*, but the rest of the structure so totally different that, wherever located among the Holorhaphidota, it must form a distinct group. The sponge not only grows independently, as above stated, but also parasitically (that is, lamini-form over hard objects), yet always presenting the placophorous or mail-plated surface, which is already evident in the smallest of the Manaar specimens, although it is extremely thin and only 1-12th inch in horizontal diameter, with a correspondingly diminutive form of the spiculation, indicating not only that it is a very young specimen, but that the *separation* of the plates from the commencement favours its subsequent enlargement, and thus explains the mode of growth.

Besides this there is a species, or, rather, variety, in which a spinispirular flesh-spicule is added to the foregoing spiculation, consisting of a slightly sigmoid microspined shaft like the flesh-spicule of *Cliona corallinoides*, whose spines afterwards may become elongated, and sometimes multifid at the extremity, so as to present the appearance shown by Dr. Bowerbank (Proc. Zool. Soc. 1874, pl. xlvi. fig. 4). The British-Museum specimen, of which I made a mounting in Canada balsam some years ago, came from "Puntas Arenas" in "Central America," and has been in the collection (as learnt from the registration) since 1850. In my "Notes" I see that it came "off a *Gorgonia*," while that described and called by Dr. Bowerbank "*Geodia carinata*" (*l. c.* fig. 1), now also in the British Museum, is on the same kind of black horny *Gorgonia*-stem from the "South Sea;" hence it is not impossible that both may have come from the tropics; but, be that as it may, these are the only two specimens that I have seen in which the spinispirula is present. It seems, however, to afford corroborative evidence of this sponge being allied to the Suberitida rather than to the Geodina; for when the pin-like spicules and the spinispirulas are seen together, in addition to the structure generally, there is only one link left which causes *Placospongia* to resemble the Geodina; and that is the siliceous ball; so that the characters are far more in favour of the Suberitida than the Geodina. Hence, as before stated, the group of which *Placospongia* may be considered typical should be placed among the Suberitida. I might here mention that in the hilous depression of the siliceous globules of my mounted preparations there is a plug of sarcode, showing the way in which the former are connected with the latter.

Eccælonida.

(Excavating Sponges.)

In the 'Journal of the Royal Microscopical Society' (1879, vol. ii. p. 496) I proposed the name of "Eccælonida" for this family, enumerating thereunder three genera, viz. *Cliona*, *Thoosa*, and *Alectona*, and stating that the skeleton-spicule of *Thoosa* had not been determined. Previously ('Annals,' 1879, vol. iii. p. 352) I had indicated that, judging from the figures which he has given, Hancock had probably based this genus on spicules of some kind of *Samus*. I further added, in the 'Microscopical Journal' (*l. c.* p. 497), that it was not impossible that *Samus anonymus* would ultimately have to come in as a fourth genus of the Eccælonida. All this is now ascertained by the undoubted excavating habit of *Samus anonymus* in some of the Manaar nodules, and the existence of *Thoosa* in others, where no spicule of *Samus*, or any thing like Hancock's figures, is present. New species of *Samus* have also been determined, as well as more Eccælonida, including a new genus—which will now be successively described.

Thoosa socialis, n. sp. (Pl. V. fig. 23, a-c.)

General form (when dry and contracted) a minute sarcodic mass densely charged with the spicules of the species, in which no particular figure or structure can be distinguished. Colour yellowish. Spicules of two forms, viz.:—1, short, thick, nodose, consisting of a central shaft upon which are developed ten globular microspined projections that finally obscure it from their enlargement and approximation, so arranged that one occupies each extremity and the eight others two circular rows respectively in the centre of the shaft, all touching each other when the spicule is fully developed, 8 by 5-6000ths (Pl. V. fig. 23, a); 2, circular, compressed, rough or irregularly microspined and wrinkled, 5 by 4-6000ths (fig. 23, b, c); the latter sparsely mixed among the former. Size of largest specimen about 1-16th inch in diameter.

Hab. Marine. In excavated cavities of the Melobesian nodules, alone or in company with other sponges which have made or have occupied them after they have been made.

Loc. Gulf of Manaar.

Obs. Whether this is the sponge to which Hancock alludes (*l. c.*) or not, he has omitted to mention its accompanying spicule, viz. the cake-like one no. 2; while the presence of the species not only by itself, but together with different other sponges now occupying some of the previously ex-

cavated cavities of the Melobesian nodules, has led me to designate it "*socialis*." The specimen of *Samus anonymus*, to which I have alluded I first found, together with a *Cliona*, in an excavated cavity; and knowing of no other sponge but a *Cliona* that made such cavities, I viewed the *Samus* as an intruder; but now that, in the Melobesian nodules, I have found *Samus anonymus* filling the excavations alone, I am constrained to admit it as a new genus of the Eccælonida. If such shall be found to be the case with *Thoosa*, then also there will be no doubt of its excavating power; but the specimens of it that I have seen have been so minute and so mixed up with other sponges, that at present I consider this only a provisional determination. Had I obtained it as I did the following species, which is equally minute, viz. by solution of the piece of *Melobesia* containing it in nitric acid, I might have seen the sarcode holding the spicules; but in the dried state in which I found it I could only infer its existence from the contracted appearance of the little mass. On account of its presence in specimens of many other sponges from the excavations of the Melobesian nodules that I have mounted in Canada balsam, it seems to me to be very plentiful, but in very minute portions. The larger spicule, no. 1, also exists in the neighbourhood of the Seychelle Islands, as represented in the 'Annals' of last year (vol. iii. pl. xxix. fig. 21).

Dotona pulchella, n. gen. et sp.
(Pl. V. fig. 24, a-d.)

General form (when dry and contracted) a minute sarcodic mass densely charged with the spicules of the species. Colour white. Spicules of three forms, viz.:—1, a cylindrical curved shaft, round at the ends, which are microspined, interrupted throughout by apparently annular lines at equal distances from each other, but which, by alteration of the focus, are found to be parts of a spiral ridge formed of microscopic points, united longitudinally and respectively by striæ, which thus extend throughout the spicule, 12 by $1\frac{1}{2}$ -6000th (Pl. V. fig. 24, a, d); 2, acute, simple, smooth, hair-like, very fine, 20-6000ths long (fig. 24, b); 3, flesh-spicule, minute, consisting of a straight shaft spined over both ends divergingly, and in a ring round the centre, 2 by $\frac{1}{2}$ -6000th (fig. 24, c). Spicules mixed together generally; very variable in size and in various stages of development; the flesh-spicules very minute and sparse. Size of specimen about 1-8th inch in diameter.

Hab. Marine. In excavated cavities of the Melobesian

nodules, sometimes in company with other sponges, and sometimes alone.

Loc. Gulf of Manaar.

Obs. The extreme beauty of the large spicule of this species so attracted my attention while it made its appearance in more or less plurality among the fragments of other sponges which I had mounted, that I determined to look for it *in situ*, feeling almost convinced that it was one of the *Eccoelonida*, but which, like *Thoosa socialis*, could, from its minuteness, be only sought successfully with the microscope. This was accomplished at last, but not until I had often relinquished the search as hopeless; and then the fragment was observed to consist of several dilated globular portions of transparent sarcodic membrane united together isthmically, and densely charged with the spicules of the species on their inner surface, so that when contracted in the dried state they gave the little massive appearance above mentioned. It was also in company with a minute fragment of *Thoosa socialis*; but from its form and approach towards the surface-apertures of the excavation in which it existed by little digital processes densely charged with the spicules of the species at their extremities, like those of *Alectona Millari*, there can be no doubt that this is a truly excavating sponge, for whose genus I have proposed the name of "*Dotona*," after another of the sea-nymphs, and "*pulchella*," from its great beauty. The annulation, when examined by alteration of the focus, so that both sides of the spicule may be examined, is found to be formed, as above stated, of a *spiral* ridge whose coils are so close together that at first they resemble annulations (fig. 24, *d*).

Alectona Higginii, n. sp.
(Pl. V. fig. 25, *a-c*.)

Lining excavated cavities in a Melobesian nodule, in the form of a sarcodic membrane charged on the inner side with the spicules of the species. Colour now that of dried sarcode—that is, yellowish. Spicules of three forms, viz. :—1, subcylindrical, slightly curved, round at the ends, sausage-like, divided irregularly throughout the body into a number of annular depressions and inflations, the latter of which are microspined, and very variable in form and length, the shortest being the thickest, 5 to 20 by $1\frac{1}{2}$ to $2\frac{1}{2}$ -6000ths (Pl. V. fig. 25, *a*); 2, fine, hair-like, acerate, tending to the form of a tricurvate, 12-6000ths long (fig. 25, *b*); 3, flesh-spicule, consisting of a straight shaft interrupted towards the centre by eight or more faintly capitate rays radiating circularly from separate points a little nearer to each other than to the extremities of

the shaft; rays equal in length to the distance between the points of radiation and the end of the shaft on each side; all parts of the spicule about the same thinness, which is almost immeasurable; all microspined and all respectively terminated by a globular inflation, 5 by 4-6000ths long (fig. 25, c). Size of largest specimen that of the Melobesian nodule which it infests, viz. $1\frac{1}{4}$ inch in diameter.

Hab. Marine. Excavating nodules formed of the layers of *Melobesia*.

Loc. Gulf of Manaar.

Obs. Like *Alectona Millari*, this is essentially an excavating sponge; for the whole nodule is honeycombed by it; and the largest cavity exposed is one sixth of an inch in diameter, fenestrated towards the surface and in the direction of the other cavities which surround it, so that there can be no doubt of its nature any more than of that of the foregoing species. Then the spiculation being something like that of *Alectona Millari*, and especially the flesh-spicule, I have named it after my friend Mr. Thomas H. Higgin, F.L.S., of Liverpool, who has made such important additions to our knowledge of the Spongida.

Samus anonymus, Gray.

This species, which is common in excavations of the Melobesian nodules, I described and figured in the 'Annals' (1879, vol. iii. p. 350, pl. xxix. figs. 1-4), afterwards stating (Journ. Roy. Microscop. Soc. *l. c.*) that it would probably have to be placed as a new genus among the excavating sponges. The form and frequency with which it occurs in the Melobesian nodules of the Gulf of Manaar has now (as before stated) placed this beyond doubt; therefore I will at once give its generic characters under the name "*Samus*," which was established by Dr. Gray (Proc. Zool. Soc. 1867, p. 526) upon the spicule of an unknown sponge, first figured by Dr. Bowerbank (B. S. vol. i. pl. ii. figs. 41, 42).

SAMUS, nov. gen.

Gen. char.—Sarcode charged with large, coarse, multifid spicules, whose prongs are more or less subdivided according to the species; filling excavated cavities in calcareous structures when fresh, and when dry contracted into masses, through which the prongs of the spicules project in a thorn-like manner; connected with filamentous processes of the same, which occupied the channels of extension; generally accompanied by a flesh-spicule.

Samus simplex, n. sp. (Pl. V. fig. 26, a-c.)

Occurring as just mentioned. Colour that of dried sarcode. Spicules of two forms, viz. :—1, a short shaft with trifid head once divided (trifurcate), the whole expanded at right angles to the shaft, 15 by 3-1800ths (Pl. V. fig. 26, a, b); 2, minute or flesh-spicule, consisting of a straight shaft spined throughout irregularly, spines most prominent towards the ends, 3-6000ths long (fig. 26, c). Size of specimen variable, concurrent with that of the excavated cavity, which may be 1-6th inch in diameter.

Hab. Marine. In excavations of the Melobesian nodules, towards the surface.

Loc. Gulf of Manaar.

Obs. This is the simplest form of *Samus*-spicule that I have met with; hence the designation of the sponge to which it belongs.

Samus (Pachastrella) parasiticus.

(‘Annals,’ 1876, vol. xviii. p. 410, pl. xvi. fig. 50 &c.)

This species, which I formerly called “*Pachastrella parasitica*” (*l. c.*), occurs abundantly in excavations of the Melobesian nodules, accompanied by both forms of its flesh-spicules, viz. the spined bacillar form, fig. 50, *d* (*l. c.*), and the spinispirula, fig. 50, *f* (*l. c.*). Originally I did not know the habitat of *Samus parasiticus*; but seeing that it so much resembled *Dercitus niger*, Gray, in spiculation, and finding the latter in company with a *Cliona* (to which I have before alluded) in excavations of marine calcareous structure (old coral) from the island of Cuba, I at once thought that *Samus parasiticus* must be closely allied to it, and hence gave it the generic name of “*Pachastrella*,” which now should be abandoned for “*Samus*.” At the same time I would here observe that the presence of the spicules of *Dercitus niger* (*Hymeniacidon Bucklandi*, latterly *Battersbya Bucklandi*, Bk., 1870) with *Cliona* either shows that *Dercitus niger* is an intruder of this kind occasionally, or that this is part of the habitat of this great, massive, liver-like black sponge so common on our shore-rocks. Be this as it may, there is so much relationship between the *Pachastrellæ* (Schmidt’s name for the deep-sea species of *Dercitus*, viz. *P. abyssi*) and *Samus*, that hereafter I expect it will be thought desirable to at least make them one group. Hence it also becomes questionable whether my *Pachastrella intacta* (‘Annals,’ *l. c.* p. 409, pl. xv. fig. 41 &c.) does not belong to the same category.

Samus complicatus, n. sp.

(Pl. V. fig. 27.)

I would propose this name for the spicule of a sponge of another species of *Samus*, of which there are several specimens in my mountings of the dust from the root-bunch of *Euplectella cucumer* found in the deep sea about the Seychelle Islands, on account of its extremely complicated form, presenting under the microscope one of the most beautiful objects of the kind that I have ever seen. It consists of four arms, three of which form a kind of tripod to the fourth, which is erect, and all thrice divided again to their extremities (there is no shaft); so that it defies all attempts at delineation, from the complicated state of the branches and the impossibility, from the dimensions of the object, of getting the whole into focus at the same time; hence the illustration (Pl. V. fig. 27) must be regarded as a diagram. There is no doubt of its belonging to a *Samus*, of which there are probably many more species yet to be discovered; indeed the representations given by Dr. Bowerbank, which appear to be similarly quadriradiate (B. S. vol. i. pl. x. figs. 235, 236), also seem to be those of spicules belonging to species of the same genus.

Here I would add that, however much *Samus* and *Pachastrella* may be allied to each other in spiculation, their habitats may be totally different; and when we come to add *Cliona* to the Eccelonida, we get a heterogeneous mixture of sponges in kind, whatever may be their alliances otherwise; for *Cliona celata* itself, which infests the oyster-shell, may become, when it has destroyed the latter, the free massive Suberite to which Dr. Bowerbank has given the name of *Rhaphyrus Griffithsii*.

[To be continued.]

IX.—*Descriptions of new Species of Asiatic Lepidoptera Heterocera.* By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

Tribe BOMBYCITES.

Saturniida.

1. *Antheræa læpoides*, sp. n.

Primaries above with the basal third dull lake-red, traversed by two irregular saffron-yellow stripes, and with very irregular external edge; central area occupied by a very irregular gamboge-yellow band enclosing the ocellus, which is dull