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Studies on the Hexactinellida.

CONTRIBUTION II.

(The genera *Corbitella* and *Heterotella*).

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With one plate.

While in Paris in the early part of this year, I was enabled, through the courtesy of Professor EDMOND PERRIER and the friendly assistance of Dr. CH. GRAVIER, to examine, amongst other things, the old types of *Corbitella speciosa* (QUOY GAIMARD) and of *Heterotella corbicula* (BOWERBANK). For the perplexing history of our knowledge of these little known forms, the reader is referred to a paper by F. E. SCHULZE ('00).

Another Euplectellid, *Eudictyum elegans* MARSHALL, has also long stood in need of re-examination as being closely allied to, if not identical with, one or the other of the above mentioned forms. On the occasion of a visit last year to Amsterdam, an opportunity was given me of examining the type of MARSHALL; and subsequently, Professor MAX WEBER has kindly supplied me with a sample of its tissues to make studies on.

I now propose to give an account of my observations on the above mentioned Euplectellids. The following may be mentioned at once as consequences to be derived from the results I obtained on the systematic: GRAY'S genera *Corbitella* and *Heterotella* should be kept up as distinct; the former to comprise not only QUOY and GAIMARD'S *speciosa* but also MARSHALL'S *Eudictyum elegans* as well as F. E. SCHULZE'S *Tægeria pulchra*, and the latter to stand represented by the single original species *corbicula* of BOWERBANK.

Corbitella speciosa (QUOY et GAIMARD).

(Plate, figs. 1–12.)

Alcyoncellum speciosum. QUOY and GAIMARD, '33, p. 302; Pl. XXVI, fig. 3.—MILNE EDWARDS, '36, p. 586.—FILHOL, '85, p. 284; Pl. VI, fig. 1. (*Not* BOWERBANK, '67, pp. 353–358.—*Nor* BOWERBANK, '69, p. 344; Pl. XXIV, figs. 8–11).

Alcyonellum speciosum. OWEN, '49, p. 205, (*not Alcyonellum gelatinosum*).

Euplectella speciosa in part. GRAY, '66, p. 487.

Alcyoncellum sp. BOWERBANK, '67. pp. 358–359 (*not* pp. 353–358).

Corbitella speciosa. GRAY, '67, p. 530; Pl. XXVIII, fig. 1.—GRAY, '72, p. 457.—SCHULZE, '00, p. 156.

Habrodictyon speciosum. W. THOMSON, '68, p. 131; Pl. IV. fig. 2 (*not* fig. 2 *a*).—CARTER, '73; pp. 361, 367.

Habrodictyon speciosum in part. MARSHALL, '76, p. 129.

Habrodictyum speciosum in part. SCHULZE, '86, p. 42.—SCHULZE, '87, p. 99.

The type, preserved in the Muséum d'Histoire Naturelle, Jardin des Plantes, is to be considered as the only specimen known of this species. It is known that the specimen was given to Quoy and Gaimard by M. Merkus, the governor of the Moluccas, and in accord therewith the label attached to it bears the record: "des Moluques: Mm. Quoy et Gaimard. Exp^{on} D'Urville. 1829." W. Thomson's ('68, p. 132) statement that the specimen is labelled to quite another effect is clearly an error. The labelling quoted by him belongs, as was suggested by Gray ('68, p. 173), to a different sponge (specimen A of *Heterotella corbicula*, which shall be treated further on).

The figures of the specimen, prepared after a photograph and given by both Gray ('67) and W. Thomson ('68), are excellent and well fitted to give a correct idea of its general appearance. Quoy and Gaimard's figure of the same, as well as that to be seen in Filhol's ('85) work, are not entirely satisfactory.

Besides the original describers, Bowerbank ('67, pp. 358–359) and W. Thomson (*l. c.*) have both given us accounts of the specimen from independent observations. Singularly enough, Bowerbank at the time was somehow not cognizant of the fact that he had to deal with Quoy and Gaimard's type of "*Alcyoncellum speciosum*"; for, while calling by that old name the Philippine *Euplectella aspergillum* Owen, the very type of Quoy and Gaimard was laid down by him as representing a different species of the same genus.

Although I have but little to add to the existing descriptions of the general appearance of the specimen, I may be allowed to give here my own notes in full.

The specimen may be said to consist of little besides the skeletal framework, in which all the component parenchymalia are rigidly fused together by synapticular formations from the base to the sieve-plate inclusive. The loose parts have been almost entirely lost. In this denuded state the specimen is tubular and phallus-like, gradually expanding from the base to the somewhat flatly rounded upper end. Total length 210 mm. Cross-section of the body, which is irregularly circular, measures in diameter : 64–62½ mm. near the upper end, 45–42 mm. at the middle and 36–33 mm. near the lower end.

The closed basal end is obliquely truncated. Compact basidictyonal incrustation is to be seen at this end, and also in an isolated irregular patch close to, but on one side of, this end. One point in the description given by QUOY and GAIMARD is in disagreement with the facts. According to them the body should be *open* at the extremity opposite to that which is dilated and rounded, although they have made mention of certain indications that the sponge must have been fixed by one of its ends. In their figure also the basal end presents the appearance of being open, which is certainly a misrepresentation, probably of the engraver. Probably the authors were to a degree misled by this appearance of their figure.

The upper end of the body is closed by an arching over, as it were, of the lateral wall. This passes over gradually and without essential change in texture into the terminal part which should represent the sieve-plate. The absence of a demarcation of any sort between the sieve-plate and the lateral wall has been repeatedly emphasized by writers; but, in my opinion, it is by no means to be excluded that in the original unmacerated state of the specimen there was present a marginal ridge consisting of a loose tissue such as might easily have been lost.

The entire latticework-like wall is thin except at the region of basal incrustations. The meshes which should have each contained an osculum (both parietal and cribellar, *cfr.* IJIMA, '01, p. 39) are rather wide. The beams, filigree-like in structure, are never more than $\frac{3}{4}$ mm. thick. They combine to form a latticework of an irregular kind (*vide* fig. in either GRAY '67, or THOMSON '68). Many of the stronger beams are seen to pursue a flexuous course, on the whole longitudinally directed; some others run, at least for a short distance, in a direction more inclined to the transverse or the oblique. However, irregular deviations in the course as well as in the branching and anastomosing are of such frequent occurrence that it is scarcely possible to distinguish separate systems of beams such as are seen in *Euplectella.* So far as the skeletal tube goes, there exists no indication of parietal ledges. Although I have no observation on the megascleric elements of the beams, it seems to me more than probable that both the comitalia and principalia parenchymalia are, at least mainly, diactins.

Of the interstitial loose tissue, I have fortunately found some vestiges still left, scantily attached here and there to the skeletal framework. They had to be searched for by means of a lens. By careful manipulation with pins or a pair of pincers, I succeeded in securing the tissue in a quantity sufficient to make of it a number of microscopical preparations, an examination of which revealed some points of great systematic importance to the genus and the species.

W. THOMSON ('68, p. 131) communicated some information respecting the loose spicules of this species, but it was so little that not much use could be made of it for the systematic. And moreover, soon after I had gone into the study of the Euplectellids in the Paris museum, I had to conclude that one of the spicules mentioned and the single one figured by him (*l. c.*, fig. 2 *a*)—a spicule which chiefly weighed with him in regarding this species as a distinct one—does not belong to the species at all! I recognize in that spicule the small spiny hexactin (*vide* Pl., figs. 20–23) which is characteristic to, and not uncommonly found in, *Heterotella corbicula* and which is easily distinguishable from a similar spicule of *Corbitella speciosa*. The said spicule was held by W. THOMSON as probably identical with BOWERBANK'S "bifurcate rectangulated hexradiate spicule" (BOWERB. '58, Pl. XXV, fig. 38; also '64, Pl. VIII, fig. 188). I think W. THOMSON was quite correct in this identification; for, BOWERBANK'S above named spicule was taken, not from *C. speciosa*, but from "*Alcyoncellum corbicula*" obtained in 80 fathoms off the Island of Bourbon (*vide* BOWERB., '67, p. 358). As before mentioned, W. THOMSON by an unfortunate confounding of labels ascribed to the only specimen of *C. speciosa* the labelling "*Alcyoncellum corbicula* VAL. Tiré par 80 brasses de profondeur dans la rade de St. Denis de Bourbon" etc. Probably this labelling and the spicule in question belonged together, but neither of them to the *C. speciosa*. This tends also to explain that W. THOMSON has entirely overlooked the spiny microxyhexactin and the discohexasters soon to be described from *C. speciosa*.

To return to my own observations on the loose tissue spiculation, the parenchymalia (accessoria) consist mainly of the well-known, long, slender diactins, with which are associated a not inconsiderable quantity of hexactins. The diactins may be as thick as 20 μ, but the majority are much thinner and of a filamentous appearance (down to 7 μ in thickness near the center).

The spicular center is ordinarily simply annulated, occasionally supplied with cruciately disposed knobs; ends of rays being rough-surfaced as usual. Occasionally slender tauactins came under observation. The hexactins are of various sizes. The larger ones may be said to be of a medium size and strength. Often one axis is considerably longer than the two others, the elongated axis not seldom forming bundles in association with diactin elements.

Of common occurrence are similarly rayed pentactins, in which the unpaired ray exceeds all the others in length (about 100 μ long; thickness near the center 7 μ or less). Many, if not all, of these are probably to be looked upon as the gastralia (Pl., fig. 4).

At places dagger-like hexactins of varying sizes are met with in the preparations. Hilt-ray 50–200 μ long, 4–10 μ thick near the center; guard-rays about as long as, or somewhat longer than, the hilt-ray in the same spicule; length of blade-ray usually several times that of the hilt-ray. A large spicule of this category may reach 1 mm. in total length. Some at least of such hexactins are undoubtedly the dermalia. So, for instance, the rather small hexactins (Pl., fig. 2) in which the short hilt-ray of about 50 μ length is quite or nearly smooth with rounded termination; and also the tolerably large ones (Pl., fig. 1) in which the hilt-ray (about 200 μ long, 10 μ thick near the central node and gradually tapering outwards to a point) bears in close apposition graphiocomal rhaphides, besides being distinguished from the other rays on account of the more extensive roughness of its surface. The roughness of the dermal hilt-ray is however never very pronounced.

The larger hexactins of the parenchyme seem to diminish gradually in size down to such small and slender-rayed oxyhexactins as measure only 160 μ or under in axial length and about 3 μ in breadth of ray near the center. These may be called microxyhexactins. They occur in scattered distribution, though at places several may be found side by side. There are to be distinguished two kinds of the microxyhexactin, *viz.*, the smooth (Pl., fig. 3) and the spiny (Pl., fig. 9).

Of these the spiny microxyhexactin is more numerous and certainly more highly characterized. The rays are not infrequently of unequal length in the same spicule; they are either nearly straight or slightly bent. Except in the basal part, each of them is supplied with a varying number of rather slender spines (up to 7 μ in length). These are irregularly distributed, and indefinite as to their direction, being sometimes recurved, sometimes obliquely outwardly directed and at other times projecting nearly vertically. Their number on a ray may be quite small, sometimes even only two or three. In certain cases the few spines present were quite obsolete, a fact which seemed to indicate a gradational transition between the spiny and the smooth microxyhexactins. Axial length of the spiny microxyhexactins generally 120–130 μ, exceptionally 280 μ. Similarly spinose microxyhexactins occur also in *C. elegans*, *C. pulchra*, *Regadrella okinoseana* and *Dictyaulus elegans*, and further in a peculiarly modified form in *Heterotella corbicula*.

Of a somewhat doubtful nature are the small, thick-rayed spicules of stunted appearance, which are met with in some numbers in certain parts of my preparations (Pl., figs. 5–8). They are usually pentactins but occasionally a hexactin, a tauactin or a compass-needle-like diactin. The stout-looking rays are smooth, nearly uniformly broad throughout, and with rounded terminations. They may be so short as to measure only 40 μ in length with a breadth of 10 μ; but the size and the proportions are subject to much variation, some of the spicules wellnigh approaching the ordinary pentactin gastralia or the hexactin parenchymalia in these respects. The general appearance of the spicules strongly reminded me of the oscularia of certain *Euplectella*. Apparently the same kind of spicules was made known by MARSHALL ('75, p. 212, Pl. XVI, figs. 66 *e–h*) from *Corbitella elegans* and was held by him to be the oscularia. I doubt the correctness of this interpretation. So far as is known to me, the occurrence of well differentiated oscularia is confined to the genus *Euplectella*; and moreover, I have found in *Regadrella okinoseana* spicules similar to the kind in question scattered among the parenchymalia (IJ., '01; Pl. VIII, figs. 27, 28, 34).

The hexasters consist of the floricome, the discohexaster and the graphiocome.

The floricome was found in some numbers in more or less fragmentary states. It measures 72–83 μ in diameter. The principals are slender and bear each a perianth of 7 or 8 terminals of the usual character. The claws, of which there are three or four to each terminal plate, are very small. In many cases of the rosette, only the basal parts of the terminal perianth remained, the missing parts having been broken off.

Comparatively large and strong-rayed discohexasters (Pl., figs. 10 and 11) occur in great abundance. Diameter 100–130 μ, occasionally reaching up to 145 μ (on an average 120 μ). Each exceedingly short or almost obsolete principal bears 2 or 3 diverging terminals, which, thickening somewhat towards the outer end, finally terminate in a convex, marginally pronged, conspicuous disc, about 16 μ in diameter as measured from tip to tip of two oppositely standing prongs. The prongs are strong, recurved ; in number 5–8, usually 6, to each disc. Now and then the rosette under consideration takes the form of a discohemihexaster (fig. 11), in which one or more of the principals have only one terminal in a straight line while the remaining principals have two in the usual disposition. In a few cases I have observed a uniterminal ray crooked near the base in much the same way as is known to sometimes occur in oxyhemihexasters of certain Rossellids. Purely hexactinose form of the discohexaster in question (=F. E. SCHULZE's Derivat-Hexactin or Discohexactin, which terms I think had better be avoided as liable to lead to a misconception) is also met with, though only very rarely. Such a hexactinose discohexaster exactly corresponds in shape with the same of *Corbitella elegans* (Pl., fig. 13) but is smaller by nearly one-half.

Possibly a second form of discohexaster, differing considerably from the one above described, is to be ascribed to the species. I say this on the strength of the single case I have discovered of the very small, incompletely preserved discohexaster, which I have shown in Pl., fig. 12. It measured only 40 μ in diameter. From each short principal there arise divergingly slender, rough-surfaced terminals, 3 or 4 in number. The terminal disc is composed of about 6 minute claws forming an irregular umbel ; at any rate the claws are not uniformly recurved and seem to spring at variable angles from the end-point of the terminal.

The graphiocome has never been observed intact. Nevertheless, its presence in the species is not to be doubted from the occurrence of fine rhaphides (about 150 μ long), either isolated or grouped into bundles, and which, as I have shown in the last Contribution, take their origin as the terminals of graphiocomes.

Corbitella elegans (MARSHALL).

(Plate, figs. 13–15.)

Eudictyon elegans. MARSHALL, '75, p. 211; Pl. XVI, figs. 66 *a–l*.—MARSHALL, '76, p. 129.

Eudictyum elegans. SCHULZE, '86, p. 43.—SCHULZE, '87, pp. 103–104.—SCHULZE, '00, pp. 164–165.

The possibility of the little known *Eudictyum elegans* MARSHALL being generically and even specifically identical with *Corbitella speciosa* has been assumed by both MARSHALL and F. E. SCHULZE. The result of my examination of MARSHALL's type, preserved in the Museum of the Zoölogical Garden in Amsterdam, tends to show that while the species should decidedly be ranged under the same genus as *C. speciosa,* the extension of the identity to the point of species is scarcely justifiable. At least so long as the differences which I shall point out in the sequel remain not bridged over by intermediate transitions, I consider it expedient to keep up MARSHALL's species under the name of *Corbitella elegans.*

The locality of the single specimen on which the species is based has never before been made known. On the label attached to it, it stands thus: "Coll. van der Hucht. Molukken." The specimen thus comes from the same islands as *C. speciosa,* a fact which made me at first presume its identity with the species just mentioned, as had been suggested by MARSHALL and SCHULZE. As known through the original describer the two specimens here alluded to closely resemble each other in general appearance and, I may add, in spiculation too, except in certain points to which attention will soon be called.

The type of *C. elegans* is a complete specimen ; only it is strongly macerated on the external surface, so that the cuff and parietal ledges, if these were originally at all present, must have entirely fallen away. A considerable quantity of the loose tissue however still exists in connection with the skeletal lattice-work, while the internal surface of the wall seems to be tolerably well preserved. Nothing unusual in the quantity of the loose tissue on this surface attracted my attention ; it is of much the same character and appearance as I know it to be in *Regadrella* or in *Euplectella*. The statement of MARSHALL ('75) that the "flake-tissue" lies on the inner side of the skeletal lattice-work applies to the actual condition only in a relative sense that that tissue has been lost from the outside by abrasion.

The clavate tubular body measures 232 mm. in height. Inferiorly it gradually narrows towards the solid basal knob, close to which extremity the width is 34 mm. The irregularly rounded upper extremity is 101 mm. wide, as measured in one way. The wall at this end shows a considerable—evidently an abnormal—outbulging towards one side, so much so that the body appears as if bent at the top. For the measurements given above I am indebted to the kindness of Professor MAX WEBER.

Of the main parenchymal bundles or the skeletal beams, not a few pursue a more or less distinctly longitudinal course ; the rest run more or less obliquely, freely intersecting and anastomosing with one another. Thus the skeletal lattice-work is of an irregular character. A rather extensive area at the upper end is to be considered as representing the sieve-plate. The beams and the meshes at that part look much like those in the sieve-plate of either *Regadrella okinoseana* or *Euplectella marshalli*. However, as was mentioned by MARSHALL, they pass over gradually and without any abrupt change in character into those of the lateral parietes.

According to MARSHALL the sponge consists of unfused spicules, which statement, as he himself gave it to be understood, is based on but a hasty observation with the naked eye. To me it at once seemed apparent that all the main skeletal beams—those of the sieve-plate included—consisted of spicules soldered together in the usual manner. The truth of this observation was later confirmed by microscopic examination of a beam fragment as well as by a note received from Professor MAX WEBER, who, at my request, kindly determined the fused state of elements in the sieve-plate beams. Spicular fusion existing in this structure, there can be no question as to the same condition obtaining in the skeletal lattice-work of the lateral wall; for, it is a recognized fact that the soldering together of spicules begins at the base and proceeds continuously towards the apex of the sponge-body.

Of the loose tissue half a dozen preparations stand at my disposal for study. So far as are represented in these, the supporting parenchymalia are mainly diactins (length 4 mm. and under; breadth near the center 6–45 μ) and much less frequently hexactins with slender rays and of variable dimensions under a medium size. There also occur at intervals the same slender microxyhexactins, in both the smooth and the peculiarly spiny variety, that were found in *Corbitella speciosa*. Axial length of microxyhexactins 330–150 μ; breadth of ray near the center 3 or 4 μ. Scattered here and there are the small, plump-looking, 2–6 rayed spicules which had been described and figured by MARSHALL ('75, figs. 66 *e–h*) and to which I have already alluded under *Corbitella speciosa* (p. 8). Axial length 57 μ and over; thickness of ray 6–16 μ. Occasionally I have found this peculiar spicule adhering to the shaft of the dermalia.

In details of character all the spicules thus far noticed agree with the corresponding elements in *Corbitella speciosa*; so that, what I have said concerning them may be considered to hold good here also.

Sword-shaped hexactins of variable size, which by the manner of their arrangement distinctly prove themselves to be the dermalia, are plentifully represented in my preparations (Pl., figs. 14 and 15). They have mostly strong rays, measuring 20 μ or more—up to 27 μ—in breadth near the central node, while in other and weakly developed cases the breadth may not exceed 8 μ. The total length of the spicule may reach nearly 1 mm. The hilt-ray, up to 200 μ in length, narrows but slightly towards the rounded outer end; it is nearly or quite smooth throughout. In certain cases I have seen that ray reduced to a knob; and in some others it was the blade-ray that was so unusually shortened as to differ not much in length from the paratangential rays. Whether the much thicker rays of average dermalia can be looked upon as one of the distinguishing characters of the species in contrast with *Corbitella speciosa*, will require testing with more specimens.

The gastralia are not represented in my preparations.

As regards the hexasters, the occurrence of graphiocomes is certain, since the rhaphides (145 μ long) are not uncommonly met with, either scattered or grouped into bundles.

The floricome measures 98–114 μ in diameter. It is therefore considerably larger than in *Corbitella speciosa* (72–83 μ). Each slender principal bears a perianth of 6–8 terminals. Terminal plate with 5 or 6, moderately large claws.

A difference much more remarkable than that in the size of the floricomes exists between this and the foregoing species in the nature of the discohexaster. Whereas in *C. speciosa* this kind of rosette occurs predominantly in the ordinary hexaster form and only exceptionally in the modified hexactinose form, the relative proportion of these two forms as they occur in *C. elegans* is just the reverse. A further point of important difference lies in the fact that the hexactinose discohexaster of the latter species is usually nearly twice or more than twice as large as any discohexaster in the former (Pl., fig. 13).

The hexactinose discohexaster of *C. elegans* was figured and remarked upon by MARSHALL. In all my preparatious it occurs in very great abundance and in most places in crowded disposition. Axial length 220–264 μ. The six rays arranged as in a regular hexactin are usually straight or nearly so. Near the central node about 7½ μ thick, they narrow somewhat outwardly but to thicken again near their junction with the convex terminal disc. Breadth at the middle about 6 μ. The terminal disc measures up to 19 μ in diameter. Its recurved marginal prongs are strong; in number 5–8, usually 6, to each disc. Altogether the disc is shaped exactly like that of the discohexaster of *C. speciosa.*

In the figure of this characteristic spicule given by MARSHALL ('75, fig. 66 *b*) one important point requires a correction; *viz.*, the axial filament is represented by him as reaching right up to the terminal disc. This is by no means the fact. Examination of the spicule in glycerine reveals that the axial cross is confined to the central node, in a manner known to me to be the case in all hexactinose rosettes derived from hexasters (IJ., '97, pp. 44–45). I do not know how to account for another figure of MARSHALL's (*l. c.*, fig. 66 *d*), in which a spicular ray with axial filament is shown as being forked into two disc-bearing branches, unless it be a faulty representation of a discohexaster principal bearing two terminals.

As already alluded to, the same discohexaster in the ordinary form, in which each principal is supplied with 2 or 3 terminals, is however not wanting; but such forms occur every rarely indeed. In fact I have met with only two such cases, measuring respectively 122 μ and 165 μ in diameter. They were thus much smaller than the hexactinose variety, and this fact seemed to bring the relationship between *C. elegans* and *speciosa* very close indeed.

Finally, the peculiar spicule mentioned and figured by MARSHALL (*l. c.*, figs. 66 *i* and *k*), which shows some resemblance to the central portion of a graphiocome but is much too large for it, has not been discovered by me. Probably he was right in regarding that spicule as of extrinsic origin.

Corbitella pulchra (F. E. SCH.).

Tægeria pulchra. Narr. Chall. Cruise, '85, fig. 158.—F. E. SCHULZE, '86, p. 41.—F. E. SCHULZE, '87, p. 94; Pl. VII, Pl. VIII and Pl. XI, figs. 1–3.—F. E. SCHULZE, '95, pp. 35, 49.

The genus *Tægeria* was instituted by F. E. SCHLUZE for the single species, *T. pulchra*, known in a unique specimen that was obtained by the "Challenger" near the Fiji Island from a depth of 1115 meters. From the detailed descriptions given by that investigator, it clearly follows that that species can not be held generically separate from either *C. speciosa* or *C. elegans.* The name *Tægeria* should be put down as a synonym of GRAY'S older name *Corbitella.*

Especially close seems to be the resemblance in spiculation between *C. pulchra* and *C. speciosa.* Under general agreement in shape and structure, the two species have in common not only the smooth and the spiny microxyhexactins, the graphiocome and the floricome, but also similarly characterized discohexasters in both the ordinary and the hexactinose form (=F. E. Schulze's Discohexactin).

So far as our knowledge goes, the following points in the structure and spiculation of *C. pulchra* seem to be noteworthy as offering probably useful data for its differential diagnosis:

1. The body, whose length (200 mm.) does not fall much short of that of the known specimens of *C. speciosa* and *elegans*, is in shape ventricose, not clavate.

2. The upper end of the body, instead of being covered by a sieve-plate, is overarched by a wreath of projecting rays belonging to the principalia marginalia. This condition has been assumed by F. E. Schulze ('95, p. 35) as possibly due to a partial loss of a sieve-plate, such as is found in *Dictyaulus elegans* F. E. Sch. Now while that possibility can not be wholly set aside, it seems to me equally possible that we have here to do with the same perfectly natural phenomenon as the coronal wreath of *Regadrella komeyamai* Ij. ('01, p. 253).

3. Assuming there was originally a sieve-plate, this could not have passed over (to judge from Schulze's figure) so insensibly into the lattice-work of the lateral wall as in either *C. speciosa* or *elegans.* Moreover there exists a marginal ridge which seems to be tolerably persistent.

4. The parenchymal bundles, while irregularly crossing one another in the greater part of the body, are arranged in regular longitudinal and transverse systems near the upper end.

5. The synapticular fusion of spicules does not extend to the upper end of the body.

6. The strongest parenchymal principalia are predominantly stauractins; more seldom triactins and diactins.

7. The dermalia, which vary much in size, should have all the rays running out to a fine point.

8. The floricome, according to my computation from the figure in the Challenger Report, should measure about 100 μ in diameter, which size is about the same as in *C. elegans* but considerably larger than in *C. speciosa.*

9. Of the two forms of the discohexaster the ordinary seems to be by far the commoner as in *C. speciosa.* Both forms should be of about the same size. For the hexactinose form, F. E. SCHULZE has given 170 μ for axial length. This indicates the size of the discohexaster to be larger than in *C. speciosa*, and considerably smaller than in *C. elegans* so far as the hexactinose form is concerned.

Heterotella corbicula (BOWERBANK)

(Plate, figs. 16–23.)

Euplectella sp. BOWERBANK, '58, Pl. XXV, figs. 37 and 38 (*probably also* figs. 35 and 36 and Pl. XXVI, fig. 5).

Alcyoncellum corbicula. VALENCIENNES *in literis*, Mus. d'hist. nat. Paris.—BOWERBANK, '62, pp. 1103, 1104.—BOWERBANK, '64, p. 176.—BOWERBANK, '67, p. 358.

Alcyoncellum sp. BOWERBANK, '64, Pl. VII, fig. 187 (*probably also* figs. 185 and 186) and Pl. VIII, fig. 188 (? *also* fig. 195).

Heterotella corbicula. GRAY, '67, p. 531; Pl. XXVIII, fig. 2. —GRAY, '72, p. 457.

Habrodictyon corbicula. W. THOMSON, '68, p. 129; Pl. IV, fig. 1.—CARTER, '73, pp. 361, 367.

Habrodictyon speciosum in part. MARSHALL, '76, p. 129.

Habrodictyum speciosum in part. SCHULZE, '86, p. 42.—SCHULZE, '87, p. 99.

Corbitella corbicula. SCHULZE, '00, p. 156.

In the zoological museum of the Jardin des Plantes there exist three specimens bearing the name "*Alcyoncellum corbicula.*" All come from the Island of Bourbon. In my opinion they represent a distinct species for which a distinct genus should be allotted.

Two of the specimens are evidently those that were remarked upon by BOWERBANK ('67, pp. 358, 359); all the three seem to have been examined by W. THOMSON ('68, pp. 129–131). For the sake of reference I will call them Specimens A, B and C.

SPECIMEN A. This is the specimen which is labelled "*Alcyoncellum corbicula* VAL. Tiré par 80 brasses de profondeur dans la rade St. Denis de Bourbon par Mr. LESCHENAULT, 1819." Of all the three specimens it is the one that earliest became known, in that BOWERBANK, as early as 1858, had figured some spicules from it and in 1867 had given a short account of it, claiming its distinctness as a species from all other "*Alcyoncellum*" known to him.

The specimen is the torn upper end of a tubular Euplectellid sponge, consisting of a partly damaged, roundish and flatly convex sieve-plate, 50–58 mm. in diameter, and of the adjoining part of the lateral wall to an extent of about 55 mm. or less in length. A short distance from the top, the diameter of the body must have measured nearly 70 mm. The lateral wall slightly closes in towards the sieve-plate margin, somewhat as in *Regadrella phœnix* (IJ., '01, p. 267). The entire length of the original individual can of course not be ascertained. That the base was firmly fixed to a hard substratum may be concluded from the state of that part in Specimen B.

The sieve-plate closely resembles that of *Euplectella* or of *Regadrella*. The meshes are oval, ovoid, triangular or quadrangular with rounded corners, some of the largest measuring 3½ mm. across. The beams are laterally compressed and measure up to 1 mm. or thereabout in breadth as seen from above. Many of them are perceptible as more or less radially directed, especially in the peripheral part of the sieve-plate.

The ring-like edge of the sieve-plate is well marked. Here all around was probably originally present a low continuous ridge, which is at places still preserved with fine palisade-like marginalia projecting out to a length of nearly 2 mm.

The lateral wall, much lacerated on the outside, is rather thin. Its general appearance is very much like that of the same part in *Euplectella imperialis* or in *E. marshalli*, in a similarly macerated state of preservation. Externally are seen a number of parechymal bundles running for the greater part obliquely. Beneath these is the more strongly developed system of longitudinal bundles. As has been correctly noted by BOWERBANK ('67, p. 358), these bundles for the mcst part terminate when they reach the marginal ring; the rest cross it and pass continuously into the sieve-plate beams. Internal to all is the system of wavy transverse bundles, which together with the longitudinal forms a tolerably regularly checkered lattice-work. The meshes of the lattice-work contain each a parietal osculum. This is circular, measures up to 2 mm. in diameter and is separated from nearest neighbors by a space of 2–3 mm. Nowhere in the specimen is the ankylosis of spicules observable.

The spiculation of this specimen will be described in detail, after we have dealt with the two other specimens.

SPECIMEN B. This bears the labelling "*Alcyoncellum corbicula*. Bourbon. M. SACHET. 1857."* It is the complete specimen of which an account was first given by BOWERBANK in '67, p. 359, who held it as specifically different from all other specimens bearing the same name in the Paris museum. A very good figure of the same specimen, prepared after a photograph, was shortly afterwards given by GRAY ('67, fig. 2) and also by W. THOMSON ('68, fig. 1) together with a description based on original observation. As this specimen, besides being entire, differs somewhat in general appearance from Specimen A, a special description will not be out of place.

The sponge is tubular, shaped somewhat like a glass-tumbler, abrupty truncated above and somewhat tapering downwards. In the upper part it is roundish in cross-section; inferiorly it becomes four-cornered, finally to become compressed at the base. At this end the wall is broken through but is furnished in parts with a few knob-like points of attachment to a hard substratum. Total length of body 105 mm. Greatest breadth, close to the upper end, 92–96 mm.

* The wording on the label as given by W. THOMSON ('68, p. 131) should run somewhat differently. Either the labelling has since been changed or W. THOMSON did not quote correctly, perhaps by a slip of memory.

The nearly horizontal sieve-plate at the upper end is irregularly circular, measuring 50–60 mm. in diameter. In the middle it is broken; against the lateral wall it is bounded by a low, compact-looking marginal ridge. Meshes of the plate shaped as in Specimen A, but on the whole somewhat larger, measuring up to 4 or 5 mm. across. Beams laterally compressed, up to ¾ mm. in width as seen from above. The nodes may however be 1½ mm. broad. The stronger beams show a somewhat radial arrangement.

The lateral wall is thick, measuring at places 5 mm. or over in thickness. Pit-like or shallower depressions give quite an uneven appearance to the external surface. The bottom of each such depression is occupied by a round parietal osculum, which may measure 2 mm. in diameter. The oscula are arranged irregularly, not in regular rows. The spaces between the oscula are made up of loosely connected fine fibers or ill-defined bundles of fibers, which pursue an indefinitely directed and irregularly flexuous course, intersecting at low angles and anastomosing in all directions. Only in the uppermost portion of the wall one perceives that many of the bundles show a tendency to a more or less longitudinal direction. On the whole the wall, as seen from the exterior, appears irregularly latticed and woolly.

On the internal surface is seen a distinct system of rather widely separated, compact-looking, wavy and intersecting bundles which are in general transversely directed.

The entire sponge is quite soft. The external surface has been subjected to much laceration, but there still remains in the parenchyme a large quantity of dried-up soft parts and of microscleræ. Evidently ankylosis between the spicules nowhere exists except in parts of the basal knobs in direct contact with the substratum.

The sponge differs from Specimen A in its much thicker wall and in the more irregular disposition of its skeletal bundles. Striking as is the difference at first sight, I consider it as due to individual circumstances. Not improbably we have here to do with a specimen fully developed in all parts but stunted in general growth. I am inclined to think that the checker-like arrangement of the main parenchymal bundles in Specimen A, as also in the corresponding portion of *Corbitella pulchra*, is related to the relatively young state of the part concerned. After that part has reached a certain stage of development, an irregularity in the arrangement of the bundles may set in, as is factually seen in the lower and therefore the older portion of *Corbitella pulchra*. This is all the more conceivable in *Heterotella corbicula*, since here the parenchymalia are totally wanting in large stauractins, whose paratangentially disposed rays might permanently determine the vertical intersection of the bundles. Moreover, if in Specimen A the external oblique bundles should undergo a further quantitative development, a great approach in its appearance towards that of Specimen B would be the result.

As regards spiculation the two specimens are practically identical even to details, so far as my observations go. For this reason I consider it superfluous to enter specially into its description.

Specimen C. The labelling of this runs: "*Alcyoncellum corbicula* Val. de Bourbon. Donné par M. Sachet 1857." It is the torn upper end of the body, much mutilated and preserved pressed between two plates of glass. In the middle is the irregularly oval sieve-plate, 54 mm. and 68 mm. in diameters. Around this is attached a small adjoining portion of the lateral wall, much rent and flattened out. As the specimen is sealed up between the glasses I have not undertaken a microscopic investigation of its spicules; but in general structure it so closely resembles Specimen A that I have little doubt of the two being specifically identical.

Spiculation. The following description of the spiculation is principally based on my observations on Specimen A. It may however be considered to hold good also for Specimen B, unless otherwise mentioned. Of each specimen I have four microscopic preparations to make studies on.

The regularly checker-like arrangement of the main skeletal bundles in Specimen A made me at first assume the presence of large stauractions among their elements. But in this I was mistaken. For the principalia of the said bundles as well as of the parenchyme in general, I have found only diactins. These are long and bow-like or bent in the middle in an elbow-like manner. The center is even-surfaced. The larger principalia in the main bundles may be 15 mm. long and 150 μ thick at the center.

The accessoria parenchymalia, occuring partly as comitalia and partly in loose arrangement, are predominantly long and filamentous diactins of the usual character. Length up to 5 mm. or more. Breadth near the middle down to about 4 μ. Center four-knobbed, less frequently simply annulated. Occasionally the four knobs are prolonged into regular rays, thus converting the spicule into a hexactin in which one of the axes is more or less elongated in excess over the others. Quite or nearly regular hexactins of a medium or smaller size and with slender pointed rays, are also not wanting among the accessoria parenchymalia.

Such hexactins, 200–300 μ in axial length and 3–6 μ in breadth of rays near the center, were at places not uncommon. When very small (under 100 μ in axial length), as they were sometimes found to be, they may deserve to be called smooth microxyhexactins. But these are quite rare.

The dermalia are mostly sword-shaped hexactins (Pl., figs. 17 and 18) of variable size and strength. While a small one may measure only half a millimeter or thereabout in length, a large one may be over one millimeter long. In thickness of rays the variation ranges from 9 μ up to 30 μ, as measured close to the center. The comparatively short guard-rays and the prolonged blade-ray havé rough ends, ultimately terminating in conical points. The short hilt-ray, generally under 100 μ in length, tapers somewhat outwards and ends rounded; it is either smooth all over or sparingly beset with low microtubercles. Not uncommonly the hilt-ray is reduced to a mere knob (Pl., fig. 19) or has even entirely disappeared; the spicule is then a pentactin with the unpaired ray much prolonged. It can nevertheless be recognized as a dermalia on account of its arrangement in association with other unmistakeable hexactin-dermalia. Moreover, different stages in the reduction of the hilt-ray are plentifully represented in the varied length of that ray in different dermalia.

Certain pentactins with much more slender rays, which I have occasionally met with in isolated positions, gave me the impression that I had before me elements of the gastral skeleton.

The marginalia (Pl., fig. 16) are hexactins in which the distally directed ray is specially developed and the longest. They again are quite variable in size and strength; they are, I believe, connected with the dermalia by all sorts of intermediate sizes and forms. Tolerably well developed marginalia have the distal ray considerably over one millimeter in length and 40 μ thick near the base but slightly thicker farther outwards. The outer end of the ray is tapering, but the extreme tip is found invariably broken off. Except at the basal portion and also to a certain extent at the outer end, the ray is furnished with low, conical and irregularly distributed tubercles, which are however never very numerous. The apices of the tubercles, not always pointed but often rounded, are directed either laterally or obliquely outwards.—A spicule exactly like the marginalia here described was also discovered in the preparations of Specimen B, which, by macroscopic observation, showed no trace of a marginal palisade.

The sieve-plate beams are composed mainly of the parenchymal diactins, which are here somewhat shorter than in the lateral wall. Certain hexactins situated in the midst of these diactins are certainly to be considered as likewise parenchymal; but other hexactins and pentactins of regular shape and occuring superficially in some numbers undoubtedly represent the dermalia —and perhaps also the gastralia—in this region of the body. The said hexactins and pentactins have an axial length of 260 μ on an average; the tapering rays vary in thickness at the base from 4 μ to 15 μ. Among these spicules I have sometimes observed, more frequently in Specimen B than in Specimen A, abnormalities in the form of distorted rays, of tubercular formations or of amalgamated parts of other spicules. The irregular looking spicule given by W. Thomson ('68) in his fig. 1 *a* undoubtedly comes under this head.

From both Specimens A and B I have a parietal osculum cut out and made into preparations. In these I do not find any specially differentiated oscularia.

I now come to consider the peculiar spiny microhexactin

(Pl., figs. 20–23), which constitutes the most characteristic kind of spicules in this genus and species. In my opinion it is directly derived and not far removed from the spiny microxyhexactin that we have seen in *Corbitella speciosa*, *C. elegans*, etc., and at the same time it may represent to a degree a stage in the transformation of a spiny oxyhexactin into an oxyhexaster. The spicule is the one that has been figured by BOWERBANK ('58, Pl. XXV, fig. 38; '64, Pl. VIII, fig. 188) under the name of "bifurcated rectangulated hexradiate spicule." Apparently the identical spicule has also been figured by W. THOMSON (*l. c.*, fig. 2 *a*) and alleged by him to belong to *Corbitella speciosa*.

The spicule in question occurs in the parenchyma of both Specimens A and B, not very abundantly but at intervals in rather scattered distribution. Its size is somewhat variable: axial length 64–100 μ in Specimen A; 76–136 μ in Specimen B. In the center is a small spherical node, whence arise the fine, gradually tapering rays, not more than 2 μ thick at base. Some of the six rays may be perfectly simple, running out to a fine point, as in a smooth microxyhexactin (see Pl., figs. 22 and 23). But more generally the rays are armed with tolerably long, slender and branch-like spines, which are however never numerous. The usual number is 1–3, at most 4, to a ray. The spines arise at quite indefinite points in the space from about the middle to the outer end of the ray, and are generally directed obliquely outwards, though cases of a retroverted or of a vertically outstanding spine were sometimes met with. After taking origin they are either nearly straight or curved one way or the other, always running out to an exceedingly fine point.

When a spine or spines spring out laterally from a ray that keeps up a tolerably straight course to the end, as is occasionally the case, the entire ray is in all essential points comparable to that of a spiny microxyhexactin (Pl., fig. 9), such as we have seen in *Corbitella speciosa* or *C. elegans*. Sometimes a ray is seen to end rather abruptly, apparently without being broken off at the point, and to send out a spine close to that end at varying angles. This leads over to cases in which a ray appears simply bent at a certain distance from the outer end, and also to those in which a ray, though nearly straight throughout, shows a sudden diminishing in caliber at a similar position. I have therefore been led to the belief that in certain cases—but not in all—the terminal portion of a ray, much as it may took like a direct elongation of the ray itself, is to be considered as a spine of secondary nature and not as a part of the ray proper. This would be much the same as the relation between a terminal and a principal in a hexactinose hexaster.

Further it very frequently happens that towards their outer end the rays appear more as if split into two or three, symmetrically or asymmetrically divergent branches, rather than as bearing one or two spines at the spot (see figs.). Nevertheless, a close observation may sometimes reveal the fact that one of the branches, owing to a slight difference in caliber or in the manner of origin, may not improperly be interpreted as a part of the ray proper and the rest as secondary appendages or spines. But at other times all the fine branches are so exactly similar in appearance that it is impossible to attempt the distinction. I am greatly inclined to believe that in many, if not all, such cases what appear as branches are really all spines borne at the extreme end of a ray, similarly to the terminals in an oxyhexaster are. A demonstration of the extent of the axial filament in the rays should make the matter clear. However, by examining the spicules in glycerine and under a high power of the microscope, I could indeed trace the filament for some distance from the central node into the rays, though nowhere with as much distinctness as in a larger spicule, and soon it always became quite indistinguishable, probably on account of the fineness of the rays themselves. So that, no use could be made of the observation in clearing up the question.

The hexaster present in the species is only of two kinds: *viz.*, the floricome and the graphiocome. Notwithstanding a thorough search made in my preparations, I have failed to discover a third hexaster form. Whether this negative character is due to a loss by the species or is to be regarded as primary, is of course difficult to say. Possibly the absence is to a certain degree compensated by the presence of the interesting spiny microhexactin above described.

The floricome in Specimen A was mostly represented by fragments; only in two cases was it found nearly intact, measuring in diameter 94 μ and 100 μ respectively. In Specimen B several could be measured, ranging 82–92 μ in diameter. The floricome is of a delicate appearance; principals slender; terminal claws of moderate strength.

The graphiocome as such was never found; but the occurrence here and there of unmistakeable rhaphides sufficiently attests its presence in the species.

In conclusion, a few words about the Euplectellid subfamily to which the forms treated of in this Contribution belong, to be followed by summarized statements of the characters of these.

The subfamily in question is the Tægerinæ of F. E. SCHULZE. Granting that this is to be kept up as separate from the Euplectellinæ, there seems to be a necessity for renaming it, since *Tægeria* has sunk to the rank of a synonym of *Corbitella*. I therefore propose to call the subfamily by the name of Corbitellinæ.

The definition of the subfamily ***Corbitellinæ*** would be somewhat as follows:

Euplectellidæ of saccular or tubular body, always firmly attached by the base to solid substratum. Superior end of body mostly with a sieve-plate. Lateral wall with parietal oscula which are devoid of specially differentiated oscularia. Skeletal lattice-work usually irregular; fused or unfused. Principalia parenchymalia as a rule diactins, sometimes stauractins. Accessoria parenchymalia slender-rayed diactins, hexactins, etc. Spiny microhexactins present in many. Hexasters generally include floricome and graphiocome, in addition to which there usually occur one or more other hexaster varieties.

The genera and species sufficiently known to be referable to this subfamily are:

1. *Corbitella speciosa* (Q. and G.). Moluccas.
2. *C. elegans* (MARSH.). Moluccas.
3. *C. pulchra* (F. E. SCH.). Fiji Is.
4. *Heterotella corbicula* (BOWERB.). Bourbon Is.
5. *Regadrella phœnix* O. SCHM. Atlantic, E. Pacific.
6. *R. okinoseana* IJ. Sagami Sea, Indian Ocean.
7. *R. komeyamai* IJ. Sagami Sea.

8. *Walteria flemmingi* F. E. Sch. N. of Kermadec.
9. *W. leuckarti* Ij. Sagami Sea.
10. *Dictyaulus elegans* F. E. Sch. Indian Ocean.
11. *Dictyocalyx gracilis* F. E. Sch. S. Pacific.

Diagnoses of the Corbitellinæ described in this Contribution.

Genus **Corbitella** Gray.

Corbitellinæ with sieve-plate; saccular, thin-walled, phallus-like. Lateral wall with numerous, round and irregularly arranged parietal oscula. Spiny microxyhexactin present. Besides the floricome and the graphiocome, there occurs a tolerably strongly developed form of discohexaster in which each terminal ends with a convex disc with strong, recurved, marginal prongs.

Corbitella speciosa (Q. and G.).—*Corbitella* with body broadest at the arched upper end. Skeletal beams, including those of the sieve-plate, fused together. Principalia parenchymalia probably diactins; accessoria diactins and hexactins. Discohexaster in the ordinary hexaster form or in the hemihexaster form; rarely hexactinose; diameter 100–130 μ, occasionally up to 145 μ. Diameter of floricome 72–83 μ.

Corbitella elegans (Marsh.).—Quite like *C. speciosa* except in the following points: Discohexaster predominantly in the hexactinose form; diameter 220–264 μ. Diameter of floricome 98–114 μ.

Corbitella pulchra (F. E. Sch.).—*Corbitella* with ventricose body; skeletal beams in the uppermost part of the wall arranged longitudinally and transversely (always?). Sieve-plate present (?). Skeletal beams unfused in the upper part of the body. The strongest principalia parenchymalia are mostly stauractins. Discohexaster predominantly in the ordinary hexaster form; sometimes hexactinose; diameter about 170 μ. Floricome about 100 μ in diameter.

Genus **Heterotella** Gray.

With a single species.

Heterotella corbicula (Bowerb.).—Corbitellinæ of saccular shape, the lateral wall slightly closing in towards the margin of a flatly convex sieve-plate. With numerous, round, irregularly arranged parietal oscula. Skeletal beams unfused. Principalia parenchymalia diactins; accessoria diactins and hexactins. Microhexactins present, in which the rays are sparingly supplied with long, slender spines; such a ray sometimes appearing like a long oxyhexaster-principal with 1–3 terminals. Floricome and graphiocome only present; no discohexaster.

List of works referred to.

'33. Quoy, J. R. C., et Gaimard, P. Voyage de découvertes de "l'Astrolabe."

'36. Milne Edwards, H. *Lamarck's* Histoire des animaux sans vertèbrés. 2me Edit, t. II.

'49. Owen, R. Description of a new genus and species of Sponge (Euplectella Aspergillum, O.).—Trans. Zool. Soc. Lond., III, 2.

'58. Bowerbank, J. S. On the anatomy and physiology of the Spongiadæ. Pt. I.—Phil. Trans., CXLVIII, 2.

'62. ———. Ditto. Pt. III.—Phil. Trans., CLII, 2.

'64. ———. A monograph of the British Spongiadæ. Vol. I.

'66. Gray, J. E. Venus's Flower-basket (Euplectella speciosa).—Ann. and Mag. Nat. Hist,; ser. 3, XVIII.

'67. Bowerbank, J. S. On Alcyoncellum speciosum.—Proc. Zool. Soc. Lond.; 1867.

'67. Gray, J. E. Notes on the arrangement of sponges, with the description of some new genera.—Proc. Zool. Soc. Lond.; 1867.

'68. Thomson, W. On the "vitreous" sponges.—Ann. and Mag. Nat. Hist.; ser. 4, I.

'68. Gray, J. E. Observations on sponges and on their arrangement and nomenclature.—Ann. and Mag. Nat. Hist.; ser. 4, I.

'69. Bowerbank, J. S. A monograph of the siliceo-fibrous sponges. Pt. II. —Proc. Zool. Soc. Lond.; 1869.

'72. Gray, J. E. Notes on the classification of the sponges.—Ann. and Mag. Nat. Hist,; ser. 4, IX.

'73. Carter, H. J. On the Hexactinellidæ and Lithistidæ generally, etc. —Ann. and Mag. Nat. Hist.; ser. 4, XII.

'75. Marshall, W. Untersuchungen über Hexactinelliden.—Zeitschr. f. wiss. Zool.; XXV, Suppl.

'76. ———. Ideen über die Verwandtschaftsverhältnisse der Hexactinelliden. —Zeitschr. f. wiss. Zool.; XXVII.

'85. Filhol, H. La vie au fond des mers.

'85. Narrative of the cruise of H. M. S. "Challenger." Vol. I.

'86. Schulze, F. E. Ueber den Bau und das System der Hexactinelliden. —Abh. preuss. Akad. Wiss. Berlin, 1886.

'87. ———. Hexactinellida.—Challenger Report, Vol. XXI.

'95. ———. Hexactinelliden des Indischen Oceanes. II Theil. Die Hexasterophora.—Abh. preuss. Akad. Wiss. Berlin, 1895.

'97. Ijima, I. Revision of Hexactinellids with discoctasters, with descriptions of five new species.—Annot. Zool. Jap. Vol. i.

'00. Schulze, F. E. [Ueber Corbitella speciosa Q. and G. und Corbitella corbicula Bwbk.].—Sitzgs.-ber. Gesellsch. naturforsch. Freunde, Berlin, 1900.

'01. Ijima, I. Studies on the Hexactinellida. Contrib. I. Euplectellidæ. —Jour. Sci. Coll. Tokyo, Vol. xv.

PLATE.

Illustrating: I. Ijima, Studies on the Hexactinellida. Contribution II.

The Genera *Corbitella* and *Heterotella.*

Explanation of Plate

Figs. 1–12, *Corbitella speciosa* (Q. and G.).

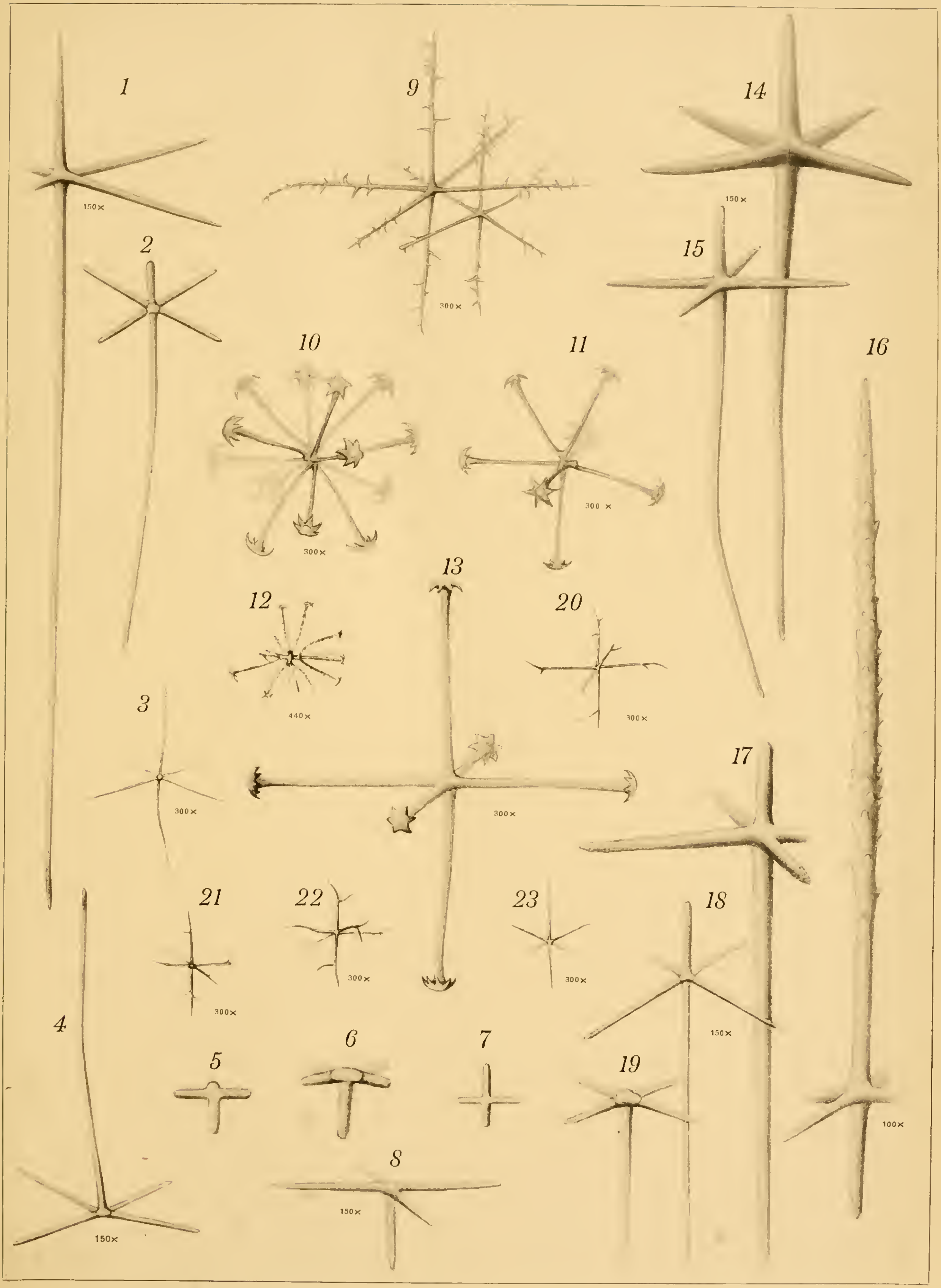
Figs. 1–2. A large and a small dermalia. 150×.
Fig. 3. A smooth microxyhexactin from the parenchyma. 300×.
Fig. 4. A gastralia. 150×.
Figs. 5–8. Small, plump-looking spicules of various shapes and dimensions; from the parenchyma. 150×.
Fig. 9. Two spiny microxyhexactins from the parenchyma. 300×.
Fig. 10. A discohexaster with 2 or 3 terminals to each principal. 300×.
Fig. 11. A discohemihexaster. 300×.
Fig. 12. A small discohexaster found only once. 440×.

Figs. 13–15, *Corbitella elegans* (Marsh.).

Fig. 13. A hexactinose discohexaster. 300×.
Figs. 14, 15. Dermalia. 150×.

Figs. 16–23, *Heterotella corbicula* (Bowerb.).
All from Specimen A.

Fig. 16. A marginalia. 100×.
Figs. 17–19. Dermalia. 150×.
Figs. 20–23. Spiny microhexactins. 300×.



1–12, CORBITELLA SPECIOSA. 13–15, CORBITELLA ELEGANS. 16–23, HETEROTELLA CORBICULA.