

Nevertheless I am struck with this circumstance, that the rugose Corals, with a tetrameral type, are hardly ever found, except in the transition-rocks; they therefore preceded the secondary Corals of the hexameral type, just as in the embryos of our living Actiniae we see appear 4 and then 6 tentacles. The history of the organisms on the surface of the earth consequently resembles the development of an existing animal.

Some species of the Actiniae seem to be reproduced with the greatest facility by means of little fragments abandoned by the foot. I have ascertained this process of multiplication in all the individuals of *Sagartia pellucida** that I kept in captivity in 1872 and 1874. Diequemare discovered the strange fact in *Metridium dianthus*.

Spontaneous scissiparity is, on the contrary, the most common mode of propagation in *Sagartia ignea*. I have observed it also in *Anemonia sulcata*†. It never takes place in *Sagartia effiata*, and in many other species which I have examined. The tendency to scissiparity and to reproduction by means of the fragments of the foot would have nearly the value of a specific character.—*Comptes Rendus*, November 23, 1874, p. 1207.

Action of Light on the Development of the Young of Frogs.

M. Thury took the eggs of *Rana temporaria* and placed them all under precisely the same favourable circumstances, except that while part received light through colourless glass, another part received it through green glass. The former developed rapidly, and by the end of May had a length of four centimetres, and well developed hind legs in most of them; while the latter were slowly developed, blackish in colour, hardly had a length of two centimetres by the end of May, and were without a trace of the hind legs. By the 10th of June the former had their fore legs and some were changed to frogs; the latter, still black, had no trace of legs, and breathed almost exclusively by means of their gills. By the 15th of July all the former had become frogs; but those of the latter still had no legs, and by the 2nd of August they were all dead without a trace of legs having appeared. Some of the young of the latter lot, transferred to the vessel of the former on the 15th of July, finished their metamorphosis. At the same time some of the former transferred to the vessel containing the latter continued to develop, showing the influence of the first impulse in their development.—*L'Institut*, Dec. 23, 1874.

* On the 23rd of August, 1872, a *Sagartia pellucida* abandoned about ten fragments of the foot; on the 25th of August they became rounded; on the 5th of September one of them bore 8 tentacles; on the 7th of September the same fragment presented 15 or 16 tentacles.

† On the 18th of September, 1874, an *Anemonia sulcata* divided spontaneously, brought together its divided integuments; on the 21st of September the new-formed disk spread out, and the rudiments of the new tentacles were seen; on the 28th of September there were 20 tentacles.

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XLVII.—*On two Hexactinellid Sponges from the Philippine Islands in the Liverpool Free Museum.* By THOMAS HIGGIN, of Huyton. With Remarks by H. J. CARTER, F.R.S. &c.

[Plates XXI. & XXII.]

THE sponges a brief description of which is now given were lately purchased, together with some examples of *Meyerina claviformis* and *Rossella philippinensis*, by Mr. S. T. Martin, of Altringham, from the friends of an English resident at Cebu, and by his kindness and liberality have now been added to the collection in the Liverpool Free Museum. They are said to have been obtained by diving, and therefore, if this was the case, were probably procured at a depth not exceeding 10 fathoms. One of them is a new species of the genus *Hyalonema*, which it is proposed to name after the island from the neighbourhood of which it was obtained. The other is a fine specimen of *Labaria hemisphaerica*, Gray, in very good condition, and, having the anchoring-spicules *in situ* and the base perfect, affords an opportunity of settling the doubts which have hung around the first example brought to this country (by Dr. Meyer). Both were sent to England in a dry state.

Hyalonema cebuense, n. sp., mihi. Pl. XXI. fig. 1.

In general form the sponge resembles a sculptor's mallet which has become indented on its sides by repeated blows
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on the head of the chisel, the handle being represented by a twisted rope-like anchoring appendage. The colour is light sponge-yellow. The dermal surface, now entire only on the lower half of the sponge, consists of a latticework, generally of a light grey colour, following the gentle undulations of the exterior of the mass, and is entirely "pore-area." There are no "vent-ridges" as in *Meyerina claviformis*; but at the top of the sponge is an irregular funnel-shaped cloacal orifice communicating with cavities in the centre of the mass. The glass-rope-like anchoring appendage has been imbedded for half its length in the sandy bottom of the sea, has a strong spiral twist, issues from the sponge as a cord, and, cord-like, passes up through fully two thirds of the head. The latticework of the surface is covered by a sarcode investing membrane, pierced with pores over the interstices, which pores are bordered by the arms of a little dermal spicule (to be more particularly described hereafter) whose points touch each other, thus forming a lesser latticework within the interstices of the larger one. The pores thus situated lead at once into the general canal-system, which consists of very large and small passages, usually with rather thin walls, and having an areolar appearance. Some of the large canals take a vertical course towards the depression at the top of the sponge; others run directly across it into the central cavities; but all communicate directly or indirectly with these cavities—which are more or less ovate in form, and extend up and down the sponge round the cord or fixed end of the anchoring rope.

The spicules composing the glass rope are of one kind only, 12 to 14 inches long, and fusiform. The fixed end of this spicule or that part within the sponge, is smooth; and the surface of the free portion is also smooth for half or two thirds of its upper part; but after this it begins gradually to present what appears to be a broken spiral line, which by degrees becomes wider. Soon the line becomes a ledge, the perpendicular margin of which looks towards the sponge; and on the ledges are found thin pointed flat spines or teeth standing up side by side in a row or line. By degrees the ledges carrying many teeth subside into brackets carrying a single spine only, when the spicule has an undulating or sinuous appearance for a short distance and finally a short, smooth, straight portion, when, having reached its greatest amount of attenuation (viz. about 1-400th of an inch in diameter), it again gradually swells out to 1-300th of an inch, and then ends in a small, thick, conical or mitre-shaped head, with four short round arms, recurved and opposite or at right angles to each other, the

head (including the arms) being about as broad as long, viz. 1-150th of an inch (fig. 9)—that is, about three or four times less in diameter than the thickest part of the shaft, which is much nearer the free than the fixed end.

The spicules of the latticework (fig. 2) are of three kinds:—1, a strong five-rayed or nail-like form, consisting of a vertical shaft pointed at one end, and carrying at the other four rather long, robust, horizontal arms at right angles to the shaft and to each other; the shafts of these spicules are fixed in the general sponge-mass vertically; and the arms of each extend towards, meet, and overlap those of others horizontally, thus forming the square-shaped meshes of the larger latticework; 2, long, slender, fusiform, acerate spicules, which lie upon the arms of the large nail-like forms longitudinally, and help to strengthen the lines of the latticework; 3, small crucially headed spicules of the nail-like form, the shaft of which is much longer than the arms of the head, and furnished all round throughout the greater part of its length with long spines, which are bent obliquely outwards and extend to the pointed end, giving the whole a plumose appearance; the arms, which are nearly smooth, are pointed, opposite, and at right angles to the shaft and to each other (fig. 8). These spicules are generally found in pairs, with the shafts close together and the arms obliquely crossing each other as they rest upon those of the large nail-like spicules; also throughout the areas of the large meshes, where their nail-like heads are fixed in the dermal membrane, with the common shaft standing outwards, and the points of the arms touching those of their neighbours, so as to divide the large meshes of the latticework into a number of smaller ones, each of which is converted into a round hole or pore by the dermal sarcode.

But amongst the spicules of the surface must be mentioned a very large, stout, acerate spicule, closely resembling that found by Mr. H. J. Carter in the stem of *Crateromorpha Meyeri*, measuring in its average largest size about 4-12ths of an inch in length by 1-66th at its broadest part. It is occasionally found under the arms of the large nail-like spicules, but generally together with long slender acerates (both smooth and spined), composing strong fibrous lines, which contribute to support the latticework and to connect it with the general sponge-mass (Pl. XXII. fig. 1).

The spicules of the general structure are:—1, large and small nail-like forms, with smooth shafts and arms; 2, long, slender, smooth, fusiform acerates; 3, the same, with four large tubercles on the middle of the spicule, or abortive rays; 4, long, thin, fusiform-acerate, thickly spined throughout, the

spines bent, and all pointing towards one and the same end of the spicule; 5, fusiform-acerate, sparsely spined throughout, but the spines on each half pointing respectively towards the middle of the spicule (Pl. XXI. fig. 3); 6, the large stout, smooth acerate (whose measurements have just been stated), conspicuous from its great size amongst the other forms with which it is associated (Pl. XXII. fig. 1); 7, slender, smooth, crucial or four-armed spicules, the arms horizontal and at right angles to each other; 8, similar-shaped spicules, larger than the last named, but barbed harpoon-like towards the ends of the arms (Pl. XXI. fig. 4); 9, small sexradiate forms furnished with rather long spines, which commence about half-way along the rays, shooting out in the direction of their points and bent upon themselves outwards (fig. 5); 10, a nail-like form with short straight arms and long plumose shaft, spines rather short; 11, large eight-armed birotulates, about 1-90th of an inch in length, with dome-shaped heads and four or eight tubercles, chiefly confined to a ring round the middle of the shaft; 12, a small eight-armed birotulate of slender form, about 1-225th of an inch in length (fig. 6), the shaft of which is studded throughout with short obtusely pointed spines, the heads not dome-shaped but pointed; 13, a very minute birotulate, averaging 1-1250th of an inch in length, having the appearance of bearing only two arms at each end (fig. 7), but, when carefully focused endwise, is seen to be multihamate, the normal number of its arms being probably eight, though in some instances six only can be counted, whilst in others ten may be seen, the shaft spined more or less throughout, and the heads dome-shaped; this minute spicule is found in great numbers in the dermal sarcode, as well as generally throughout the sponge.

The long fusiform-acerate spicules form the fibrous lines of the general structure, on which are seen the large birotulates and the long-shafted plumose forms; whilst the crucial spicules are found in the sarcode of the walls of the canals. Most of the acerate forms are of the sexradiate type, as is evident from the cross in the central canal in the middle of the spicule; but the main shaft only is produced, the arms either not being produced at all or appearing only as tubercles.

The spicules of the sponge immediately embracing or surrounding the glass rope where it issues from the mass are several varieties or modifications of the sexradiate type. There is no Polype on the rope, nor any membranous covering of any kind. The sponge-head is grooved inwards circularly round the rope, as a pear often is round the stalk; and the plumose spicules of the dermal latticework can be traced close up to the

rope, which is there surrounded by an irregular line of closely packed, small, sexradiate spicules interspersed with plain and tubercled acerates. The form most noticeable here is a crucial-shaped spicule (Pl. XXII. fig. 2), the arms of which measure about 1-100th of an inch in length, straight or more or less bent towards the extremities, and closely studded near the points with short, obtusely pointed, vertical spines, which appear to represent the "cylindro-cruciform" spicules of *Hyalonema Sieboldii* figured by Dr. Bowerbank (B. S. vol. i. p. 252, pl. vi. figs. 153-156), the "spinicruces" (?) of Brandt. Another prominent spicule is the smooth-armed nail-like form, and the same furnished near the ends of the arms with short obtusely pointed spines. There are also many extremely slender long-armed crucial and six-rayed spicules, with the arms of varying lengths, sometimes smooth and sometimes furnished sparingly with long spines bent in some instances towards the points, in other cases towards the base of the arms. There is also a development of the four-armed plumose spicule into the sexradiate form, another shaft opposite the plumose one being projected, rather longer than the other, and thickly studded, like the crucial arms (which are nearly as long as the plumose shaft), with short obtusely pointed spines: sometimes also this form occurs with only two of the crucial arms produced. The minute birotulate, too, is very numerous here.

The height of the sponge, measuring from the part from which the anchoring rope issues, is about $5\frac{1}{2}$ inches, its breadth is about $4\frac{1}{4}$ inches; and the length of glass rope visible is nearly 10 inches, with a diameter of $\frac{1}{2}$ an inch close to the sponge.

Hab. Marine.

Loc. Cebu, Philippine Islands.

Obs. The fact of the sponge having lost the latticework covering on its upper half, and the canal-system being in consequence either exposed or covered with a matted mass of spicules, led at first to the inference that it had become detached from the sea-bottom, and had either been cast up on the shore or had been rolling about for some time on its sides, and had so accumulated the matted mass from without. But when it was found that the mass contained only the spicules of the species, it appeared unlikely that it had been so gathered up; for if the sponge had been rolling about on the sea-bottom, the matted part would probably have contained a number of spicules belonging to many other sponges. On consulting Mr. H. J. Carter, F.R.S., who has been most kind in expressing his opinion on this sponge, in pointing out different points of special interest, and in reviewing and discussing the

observations made with the view of establishing them, and so very materially helping in the description, he suggested what appears to be the true solution of the difficulty. He accounts for the existence of the matted mass by finding that the sponge has been attacked by a *Mucor*-like fungus, which has been gradually destroying the sarcode and eating into the sponge-substance; and as the sarcode has disappeared, the spicules losing their natural support have fallen together into the matted mass, which in this state now covers over much of the upper portion of the sponge. Although the specimen is thus rendered imperfect so far as the entirety of the latticework goes, it is nevertheless highly interesting as showing the ravages of the parasitic fungoid growth, whose mycelium is found in great quantity not only on the surface, but gradually extending into the mass, and spreading everywhere its bright little sporules in extreme abundance.

The sponge itself, again, is interesting on account of the glass rope being without its usual parasite, viz. the incrusting Polype (*Polythoa*), which is still held by a few persons to be a part of the sponge (its "oscula"!), and by some to belong to the glass rope, on which they say the sponge is parasitic—in opposition to the more generally received impression, now confirmed by this specimen, that the glass rope is the stem or anchoring appendage of the sponge, upon which the Polype is parasitic.

The twisted stem or glass rope is almost identical with that of *Hyalonema Sieboldii*: the surface of the spicules composing it hardly differs except towards the lower part, where the difference is only sufficient to indicate a variety; while the anchoring head or termination is of the same character—namely, mitre-shaped with four opposite arms. The free ends, however, of these spicules in the Japanese specimens are generally broken off; but an example exists in the Liverpool Free Museum (no. 10. 9. 68. 1) in which many of the terminations remain; and Mr. Laurence Hardman, of Rock Ferry, also has a specimen, received last year through his son from the island of Inosima, in which the free ends are in a tolerably perfect condition. In the latter example these spicules terminate, as in *H. cebuense*, in four short, bluntly pointed, rounded arms, recurved and opposite, or at right angles to each other, the head and arms being about as broad as long, and measuring 1-170th of an inch. In the Liverpool-Free-Museum specimen, however, the terminations, although of the same character, present modifications of the four opposite arms: that is to say, sometimes four rather shorter arms appear between the four principal arms, making eight arms in all; sometimes just above the four arms on the smooth shaft are

prominences or swellings, which again (as in fig. 10) are so developed as to form a double set of four arms, one set capping the other. The Liverpool-Museum specimen bears the usual Polype; the Inosima example, in which the glass rope is short, has no Polype on it.

The existence of the large stout acerate spicules in the surface-structure of *Hyalonema cebuense* is a noticeable feature; similar spicules quite as large are found in the Japanese *Hyalonemas*—not on the surface, however, but, together with other acerate spicules, forming the fibrous lines of the general internal structure, being probably most numerous round the fixed part of the stem.

It is interesting to notice the relationships which seem to exist between the various kinds of Hexactinellid sponges, as shown in the peculiar forms of spicules differently developed in some, appearing in greater or less quantities in other species, and occupying different positions in the general structure of the different sponges, but which would perhaps occupy too much space to describe in detail here. All such observations, however, lead to the conclusion that the peculiar features of the various anchoring appendages, adopted by Mr. H. J. Carter as the means of distinguishing genera, are the most remarkable and most easily noticeable for this purpose.

Remarks by MR. CARTER.

In bringing to notice *Hyalonema cebuense*, Mr. Higgin has described and illustrated a sponge which, if not sufficiently different from *Hyalonema Sieboldii*, Gray, to constitute a new species, is at least deserving of the separate designation which has been given to it.

Here we have, in the first place, a full-grown *Hyalonema* with an entire absence of the parasitic Polype which usually corticates the upper part of the cord!

We have also obtained through it the free termination of the anchoring-spicule of which the cord is composed in the *Hyalonemata*, which was previously unknown; and moreover Mr. Higgin has shown that in both *Hyalonema Sieboldii* and *H. cebuense* the principle of formation is the same, viz. a mitre-shaped inflation with four spines or arms recurved and opposite: also in Mr. Hardman's specimen, to which Mr. Higgin has alluded, it is stated to be four-armed opposite, the same "as in *H. cebuense*;" while the Polype, too, is absent from the cord of this specimen. But it so happens that the specimen which Mr. Higgin kindly sent me of an anchoring-spicule from this cord had eight arms or spines each opposite each

other on the mitre-shaped inflation of the head, and not four above and four below, as delineated by Mr. Higgin (Pl. XXI. fig. 10) from the specimen of *Hyalonema Sieboldii* in the Liverpool Free Museum. This shows that, besides four arms recurved and opposite on a mitre-shaped inflation being the principle on which the head of the anchoring-spicule is formed generally in the *Hyalonemata*, it is subject to the modifications mentioned in all these specimens.

As regards the bearing of this "principle of formation" on the termination of the anchoring-spicules of the genus *Rossella*, in which there are also four opposite arms, it will be seen by comparing the two that there is no "inflation" in *Rossella*, but the arms come off from the end of the spicule directly; also that the diameter of the head, taken in its entirety, is far greater than that of any part of the shaft—which is the opposite in *Hyalonema*, in which the so-called "arms" are little more than spines, while in *Rossella*, from their size and length, they are really "arms;" lastly, that the shafts of the anchoring-spicules in the genus *Rossella* are not spined, but smooth.

The large "birotulate, no. 11," p. 380, appears to be the full-grown size of the minute or embryonal one "no. 13," as evidenced by gradationary development in a fragment of *Hyalonema Sieboldii* mounted in Canada balsam; while the differences in form do not amount to more than modifications of the normal type—consisting of a shaft, and eight arms opposite and recurved, all round each end; which arms being knife-shaped with their thin edges respectively extended into a falcate form towards the shaft, with which they are thus united, constitutes this flesh-spicule the representative among the Hexactinellid sponges of the common equianchorate.

The "spincruces" of Brandt, so well figured by Dr. Bowerbank (Brit. Spong. vol. i. pl. vi. figs. 153–157, p. 252), have their representatives, as stated by Mr. Higgin (p. 381), in the crucial spicules with spined extremities, so abundant just where the sponge-head joins the cord in *Hyalonema cebuense* (Pl. XXII. fig. 2).

They are similarly situated in *H. Sieboldii* and in *H. lusitanicum*; but we do not find that they extend upwards further than this.

In some very small specimens of *H. lusitanicum* dredged up off the Butt of the Lewis on board H.M.S. 'Porcupine' both with and without the Polype, these spicules are equally abundant at the point mentioned; while the cord in *H. lusitanicum*, not stopping halfway up the sponge-head as in *H. Sieboldii*, but passing entirely through the head so as to

end at the summit in a little conical point, affords ample opportunity in *H. lusitanicum* to search for the "spincruces" throughout its whole length within the sponge-head; for it is covered, even to the end of the "conical point," with the sponge-structure, especially the little dermal plumose spicule, though I cannot detect the "spincruces" in any part of the cord or sponge-head above the place indicated.

Moreover, where the Polype is present, it is the sarcode layer immediately in contact with the cord which is so densely charged with those beautiful little spined sexradiates, and which, in some instances, evidently extends downwards beyond the integument of the Polype; so that altogether the Polype must be considered to have no part in their production, while the "spincruces" must therefore be viewed as the hexactinellid form of spicule (with its variations) peculiar to the sarcode investment of the cord.

Labaria hemisphaerica, Gray. Pl. XXII. fig. 3.

This species has already been described by Mr. H. J. Carter ('Annals,' 1873, ser. 4, vol. xi. p. 275), from the sponge named by the late Dr. J. E. Gray in his communication published in the same volume at page 235. Mr. Carter, however, soon became aware that the specimen placed in his hands for description was not in its natural state; and the discovery that the brush-like appendage apparently growing out from the centre of the base had been artificially placed there, and was made up of spicules belonging to quite another species, led him to think that the whisker-like spicules standing out from the sides of this specimen of *Labaria* were probably also a native's fancy. It is fortunate therefore that a good specimen has now been brought to this country, with the anchoring-spicules *in situ*, and without the "fraudulent tuft" which the British-Museum sponge possesses. In Mr. Carter's description, the "locality" whence Dr. Meyer's sponge was obtained is thus stated, viz. "Unknown, from Singapore;" but it was subsequently observed by Dr. Meyer ('Annals,' 1874, ser. 4, vol. xiii. p. 66) that it was procured "from the reefs in the sea near the village of Talisay, on the island of Cebu, Philippine Islands;" and in explanation of the artificial condition of the sponge, in a letter to Dr. Gray (*ibid.* p. 188), he explains that his "Malay boy was charged with the business," and that "he or the fishermen may have done the mischief." Dr. Meyer does not seem to have been present when the specimen was got up; but he adds that it was obtained from the same ground as "*Meyerina clavæformis*, *Crateromorpha Meyeri*, and *Rossella philippinensis*."

As regards the present example, the only information given is that it was obtained by diving, off the island of Cebu; but it is in a natural state, and has not been tampered with like the British-Museum specimen.

In form it is like a small bird's nest the bottom of which is flat, with a well-defined edge; the sides are rounded; and the sponge attains its greatest diameter about one third of the way down from the edge of the hollow of the nest, towards the base. The entire surface, inside and outside (speaking as of a nest), is a network of spicules: that of the sides of the nest, being a close reticulation, is no doubt "pore-area;" whilst that of the hollow of the nest is a very much more open network, and must be considered "vent-area," as has been stated by Mr. H. J. Carter in the paper to which I have already alluded. The structure covered by the surface-reticulation, as seen through this network, is a strongly woven-together mass of spicules, pierced with large and small passages leading directly from the outside to the inside. These passages or canals are largest towards the base of the sponge, where they are ovate in form, and measure in diameter half an inch by a quarter; they gradually diminish in calibre and lose their oval shape, becoming circular towards the upper edge of the nest. The surface-reticulation is closest round the edge of the hollow; and from this edge stands up a thin broken line of erect spicules of irregular height, varying from $\frac{1}{4}$ to $\frac{3}{8}$ of an inch. The rounded sides of the sponge, chiefly where it assumes its greatest diameter, are furnished with whisker-like bundles of long spicules, which issue from circular holes the edges of which are slightly raised, each bundle consisting of a dozen or more spicules, many of which are broken short off and very few are entire. Around the circumference of the base are arranged loose fascicles of anchoring-spicules from 3 to 4 inches in length and having a diameter of about $\frac{1}{2}$ an inch measuring along the edge of the base, by $\frac{1}{4}$ to $\frac{3}{8}$ of an inch across it. A few scattered short spicules project here and there from the base generally; but there are no bundles other than those around its edge; and therefore the sponge is without any thing like the "fraudulent tuft" stuck into the British-Museum specimen, or occupying its position. The bundles of anchoring-spicules, whilst the sponge was in a living state, no doubt grew straight down from its base into the bottom of the sea; but they are now twisted under it, in consequence of the sponge having been placed to dry in the position in which it appears in the Plate.

The anchoring-spicules are of one kind only, viz. smooth, fusiform, terminating at the free end in two opposite hooks;

there are no spined forms, from which it must be inferred that the spined anchoring-spicules noticed by Mr. Carter in his description of the British-Museum sponge belonged to a "*Meyerina claviformis*," as well as the bunch of spicules forming the "fraudulent tuft," and had been caught up accidentally, if not purposely stuck on to the specimen. The smooth anchoring-spicule which is the one proper to the species is a fine hair-like spicule, 3 to 4 inches in length; it tapers from its middle to a fine point at its fixed end, and also gradually diminishes to within a short distance of its free end, measuring there only 1-1000th of an inch, after which it quickly becomes flat, with a breadth of 1-300th of an inch, and ends in two opposite hooks, recurved like the flukes of an anchor, as figured by Mr. Carter ('Annals,' 1873, ser. 4, vol. xii. pl. xiv. fig. 2), the entire spread of the anchor measuring 1-45th of an inch (Pl. XXII. fig. 3 A).

The spicules of the whisker-like tufts are plain, fusiform, in length about $3\frac{1}{2}$ inches, with a diameter of 8-500ths of an inch at the middle or thickest part.

The spicules of the erect fringe round the labrum, all more or less broken at the free end, are also fusiform, and, as they exist at present, are smooth throughout; but there is an appearance of spines on some towards the free end, and therefore in their perfect state they may perhaps be furnished with short conical spines towards the points. The largest are about one inch long, with a diameter in the middle of 1-750th of an inch.

The spicules of the surface-reticulation are of four kinds:—
1, large nail-like spicules (that is, smooth pointed shafts) with four equally smooth arms projecting opposite or at right angles to each other from the heads of the shafts, the arms inclined slightly downwards or inwards; these spicules are of various sizes, from the large form, plainly visible to the unassisted sight, down to others of microscopic minuteness; the shafts of the larger spicules are $\frac{1}{2}$ an inch in length; the arms may be the same, but most frequently they are of different lengths; and sometimes one of them is blunt, not at all pointed, and not more than 1-12th of an inch long; the shafts and arms measure at the cross about 1-48th of an inch in diameter;
2, long, slender, acerate spicules, thickly covered with short sharp spines, all pointing towards one and the same end of the shaft;
3, smooth acerates, with the cross on the central canal;
4, plumose spicules of shapes intermediate between one with a very thick shaft, short and bushy-looking, with long, strong, bluntly ended arms (Pl. XXII. fig. 5), and another with small, short, fine arms and a long feather-like

shaft (fig. 7); the crucial arms of which, thickly studded with short obtusely pointed spines, are bent downwards, as if to embrace or fit to the arms of the large spicules on which they rest.

The strongly woven-together basketwork of the interior, as seen through the investing network, is composed of:—smooth spicules of the sexradiate type (that is, acerate with simply a central cross indicating their hexactinellid character); acerate, with four tubercles at the middle of the shaft; sparsely spined acerates, the spines bent towards the middle of the spicule; four-rayed, five-rayed, and six-rayed spicules, the long arms of which are bent together in all varieties of ways; amongst these are large and small eight-armed "birotulates" with dome-shaped heads, and some very minute ones; small sexradiate spicules, the arms of which are furnished towards the free end with three, four, or five long spines projecting in the direction of the free end of the arm, but soon becoming bent outwards (fig. 14); also a small acerate spicule in great abundance peculiar to the species, furnished with fine spines not very close together, all of which are bent towards one end of the spicule, increasing in length along one third of the spicule (viz. from the end from which they look), and then gradually diminishing again from this point to the other end of the shaft (fig. 11); and plumose spicules in great variety.

Size:—extreme transverse diameter $4\frac{1}{2}$ by 4 inches; depth $3\frac{1}{4}$ inches; diameter of hollow at the labrum $3\frac{1}{2}$ by 3 inches; depth of hollow $1\frac{1}{2}$ inch; diameter of base 3 by $2\frac{3}{4}$ inches; length of bundles of anchoring-spicules 3 to $3\frac{1}{2}$ inches.

Hab. Marine.

Loc. Cebu, Philippine Islands.

Obs. The position of the large smooth nail-like spicules is readily seen in the figure, which is drawn from a photograph of the sponge; and the elevations and depressions on the surface, caused by their arms being slightly bent inwards towards the shaft, are also easily observed. The large areas enclosed by the arms of these large spicules crossing each other are subdivided again and again by smaller spicules of the same form; and the fine network so caused has no doubt supported the dermal sarcode, stretched membrane-like upon it and pierced with pores. But this sarcode does not now exist in this membranous form, having apparently contracted round the lines of spicules forming this dermal reticulation, and thus left holes bordered by spicules, which were filled up by pores respectively circumscribed by sarcode. The plumose spicules are all seen about the lines of the network; and if they have ever rested

on the membranous sarcode, as in the British-Museum specimen (in the way described by Mr. Carter), they have been drawn in to the arms of the other spicules by the contraction of the sarcode.

Remarks by MR. CARTER.

The specimen of *Labaria hemisphaerica* above described and figured by Mr. Higgin is fortunately so well preserved that there can be no doubt of its being in a natural state, viz. unaffected by destructive influences or tampering of any kind, as that which I described belonging to the British Museum ('Annals,' 1873, ser. 4, vol. xi. p. 275); hence it serves well to correct that description.

That "cat's-whisker-like" groups of spicules do project from the sides of *Labaria hemisphaerica* as normal appendages there can be no doubt; and that the anchoring-spicules with spined shafts are abnormal may be inferred from their entire absence in Mr. Higgin's specimen. We must therefore conclude that the latter belonged to the "fraudulent tuft" of anchoring-spicules from *Meyerina claviformis*, which had been thrust into the base of the British-Museum specimen. And for this I am well prepared, seeing that in my figures of the supposed anchoring-spicules with spined shaft from *Labaria hemisphaerica*, and the real one from *Meyerina claviformis* respectively that I have figured ('Annals,' 1873, vol. xii. pp. 467, 468, pl. xiv. figs. 1 & 3), it is stated and shown that the differences between these two spicules are "too slight for specific distinction."

Further, it now appears to me that, while the shafts of the anchoring-spicules of *Labaria hemisphaerica* and of the genus *Rossella* are all smooth, those of *Hyalonema* &c. are all spined; and that the latter only appear to be sometimes smooth from the spines being continued upwards from the free end for a less distance in some than in others, whereby when the spined ends are broken off (which is often the case) there is an appearance of two forms, viz. one spined and the other smooth. Hence the mistake.

EXPLANATION OF THE PLATES.

PLATE XXI.

Fig. 1. *Hyalonema cebuense*, Higgin, after a photograph by Robinson and Thompson, rather less than half the actual size: *a*, the investing latticework; *b*, portion denuded of the latticework, which has been destroyed by a parasitic fungus attacking the sarcode which supported and connected the spicules.

- Fig. 2. Portion of dermal latticework, showing the relative position of the spicules of which it is composed: *aaa*, arms of large nail-like spicule; *sss*, shafts of the same; *d*, sarcode stretched across the mesh; *p*, pores; *c*, feathered spicules (no. 8) *in situ*. Diagrammatic.
- Fig. 3. Sparsely spined acerate spicule, the spines pointing towards the middle of the spicule.
- Fig. 4. Crucial spicule, with points of arms barbed like a harpoon.
- Fig. 5. Small sexradiate spicule, the arms spined towards their extremities; the spines bent upon themselves, pointing towards the ends of the arms.
- Fig. 6. Slender birotulate with eight arms at each end, the shaft studded with short blunt spinos throughout its entire length.
- Fig. 7. Minute birotulate generally with eight arms at each end, in great quantities throughout the sponge.
- Fig. 8. Crucially headed plumose spicule of the latticework.
- Fig. 9. Free end of one of the spicules of the glass rope.
- Fig. 10. Free end of one of the spicules of the glass rope of a Japanese *Hyalonema*, in the possession of the Liverpool Free Museum (no. 10. 9. 68. 1).

PLATE XXII.

- Fig. 1. Large acerate spicule from surface of *Hyalonema cebuense*, similar to that found in the stem of *Crateromorpha Meyeri*; it is also found in *Hyalonema Sieboldii*, not, however, on the surface, but in the interior structure round the cord. It measures about 4-12ths of an inch in length by 1-66th in its broadest part.
- Fig. 2. "Spinicrucial" spicule from base of sponge-head of *Hyalonema cebuense*, in great quantity about the cord; length of each arm 4-500ths to 5-500ths of an inch.
- Fig. 3. *Labaria hemisphaerica*, Gray, after a photograph by Robinson and Thompson.
- Fig. 3A. Anchoring-spicule of *Labaria hemisphaerica*, drawn to the scale of 1-500th to 1-8th of an inch.
- Fig. 4. Large nail-like spicule from the surface-reticulation of the same. Shaft $\frac{1}{2}$ an inch in length, with a diameter of 1-48th of an inch at the head; length of arms $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$ inch respectively.
- Figs. 5-7. Plumose spicules, extreme forms, there being many varieties of intermediate shape; measuring from 2-500ths to 10-500ths of an inch in height or length of plumose shaft.
- Figs. 8-14. Some of the spicules of the general structure: 8, 9, 10 measure on an average 1-10th of an inch in length; 11 is peculiar to the species, and measures generally 8-500ths of an inch in length; 12 and 13 are drawn to the scale, viz. 1-500th to 1-8th of an inch (13 supposed to be an immature form of 12); 14 measures 3-500ths of an inch from the point of one arm to the point of the arm opposite.

XLVIII.—Descriptions of some new Asiatic Species of Rhynchites. By FRANCIS P. PASCOE, F.L.S. &c.

It is chiefly from the collection made by Mr. Wallace that I have selected the following well-marked species of *Rhynchites*. The genus was separated from *Attelabus*, Linn., by Herbst in 1797, and comprises about 100 species, including those here described; it is almost cosmopolitan, but has not yet been found in Australia. M. Roelofs has lately described several new species from Japan; and I have here added another (allied to *R. betuleti*) which is also found there (Yokohama), although it does not seem to have been met with by Mr. Lewis's collectors.

Rhynchites elysius.

R. lacte caeruleus, sparso albido-pilosus; rostro (♀) corporis dimidia longitudine, modice arcuato, vage punctulato, dimidio basali tricarinato; (♂) brevior et manifeste crassior, infra angulis exterioribus utrinque fortiter quinque-dentatis; antennis haud elongatis, articulis 3°, 4° aequalibus; clava magna, grisea, art. duobus basalibus triangularibus, singulis latitudine haud longioribus, ultimo ovato, acuminato; prothoracae latitudine haud longior, sat vage punctulato; elytris amplis, striato-punctatis, punctis approximatis, interstitiis sat confertim punctulatis; tibiis costulatis. Long. 4 lin.

Hab. Sumatra.

Allied to two species known as *R. philippensis*, Chev., and *R. caelestinus**, Gyll., but at once distinguished from both by the sparse punctuation on the prothorax. *R. azureus*, Ol.†, is a very distinct species, hitherto overlooked, except that it is doubtfully cited as a synonym by Gyllenhal for his *caelestinus*.

Rhynchites alcyoneus.

R. caeruleus, elytris violaceis, albido-pilosus; rostro tenui, corporis longitudine vix dimidia, modice arcuato, haud carinato, basi inter oculos compresso; antennis haud elongatis, articulo tertio quam quarto paulo longiore, clava concolori, art. duobus basalibus elongato-triangularibus, ultimo anguste ovato, acuminato; prothoracae

* There is some confusion in the synonymy here. Taking Lacordaire's note (Gen. vi. p. 555) as correct, the following would be the chronology:—

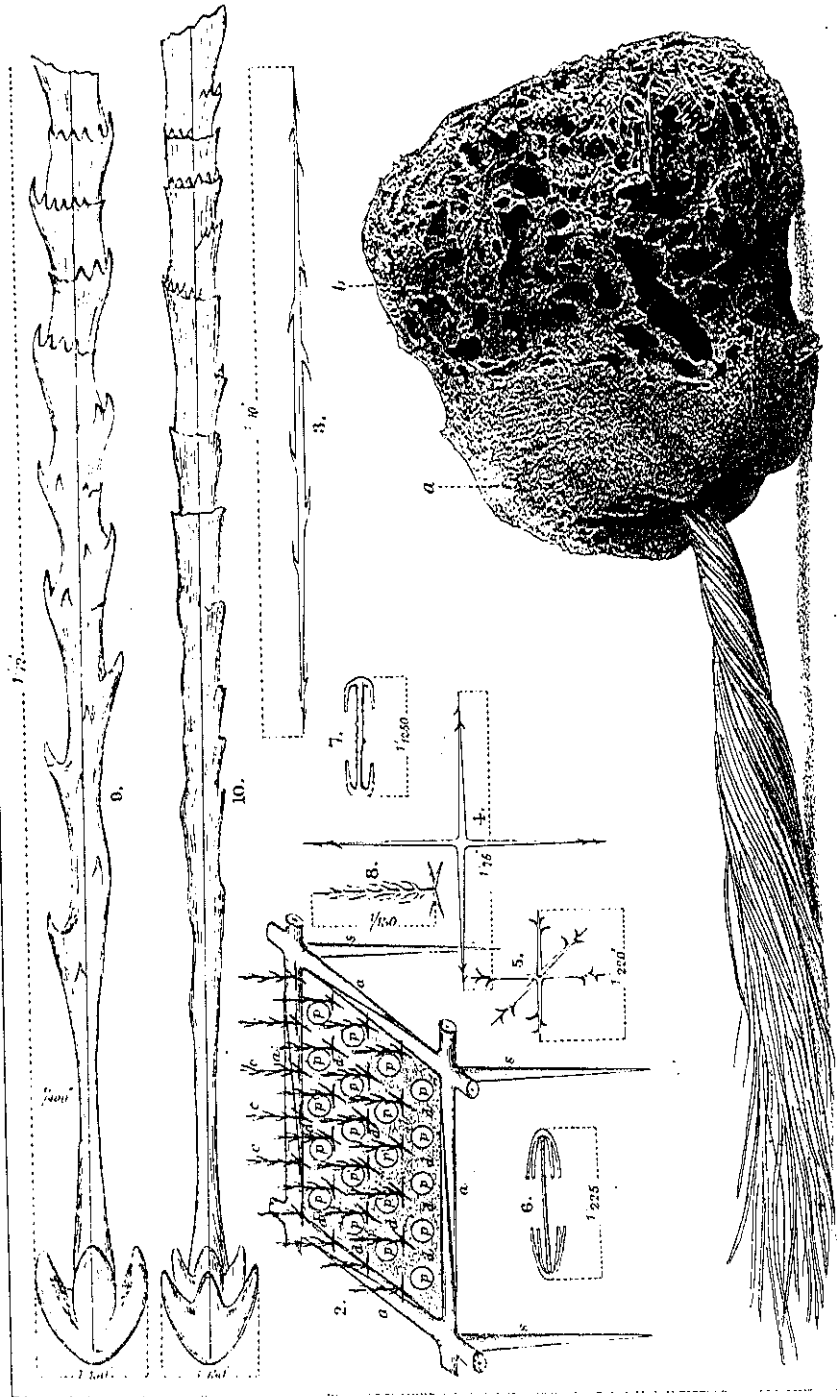
Rhynchites caelestinus, Gyll., 1833.

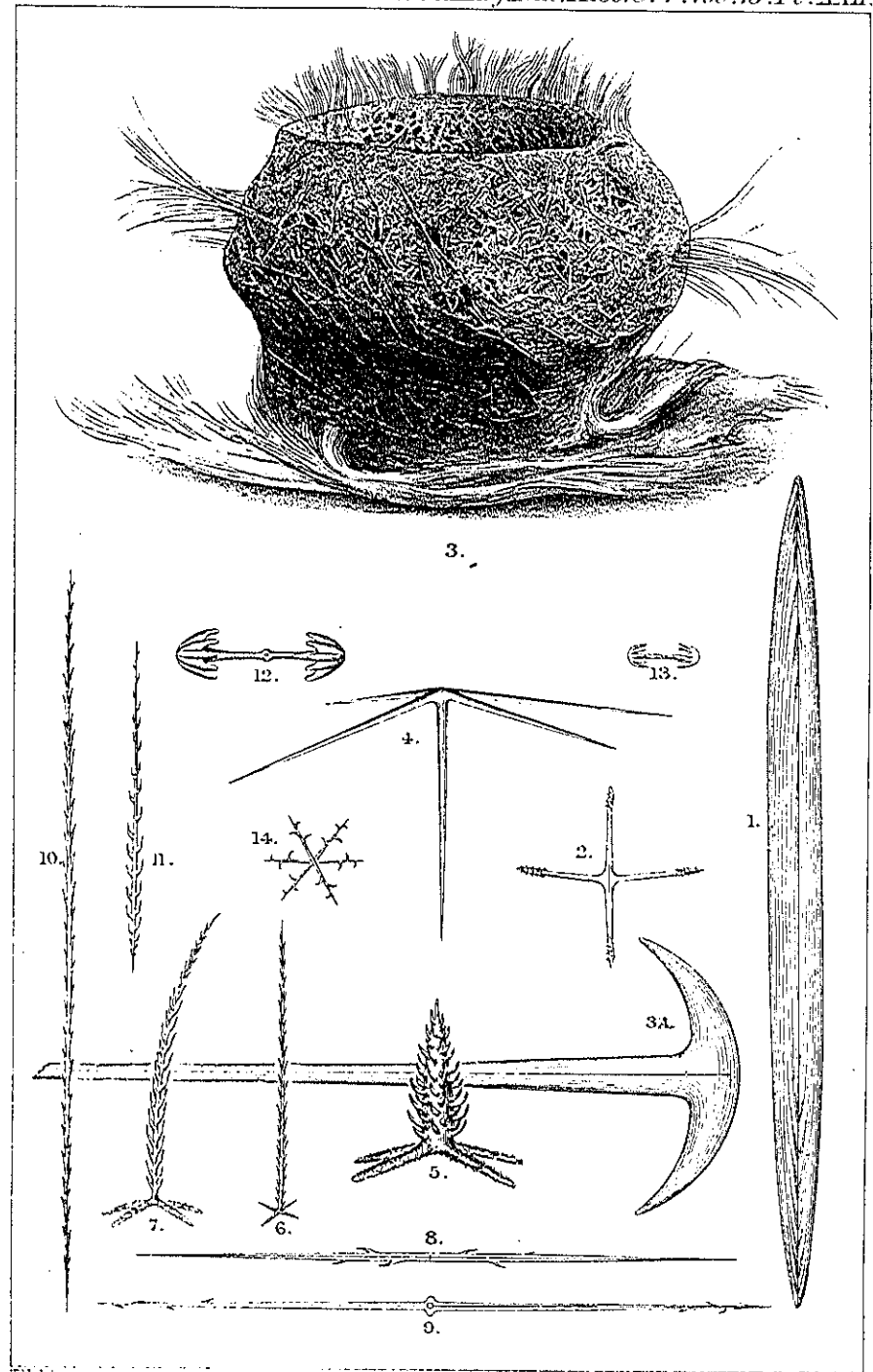
— *grandis*, Imhoff, 1838.

— *philippensis*, Chev., 1841.

Yet Lacordaire, adopting the two latter names, gives the first as a synonym for both.

† Ins. v. no. 81, p. 23, pl. ii. fig. 32. My specimens are from Singapore and Sumatra.





H. del.

Mutern Bress lith.