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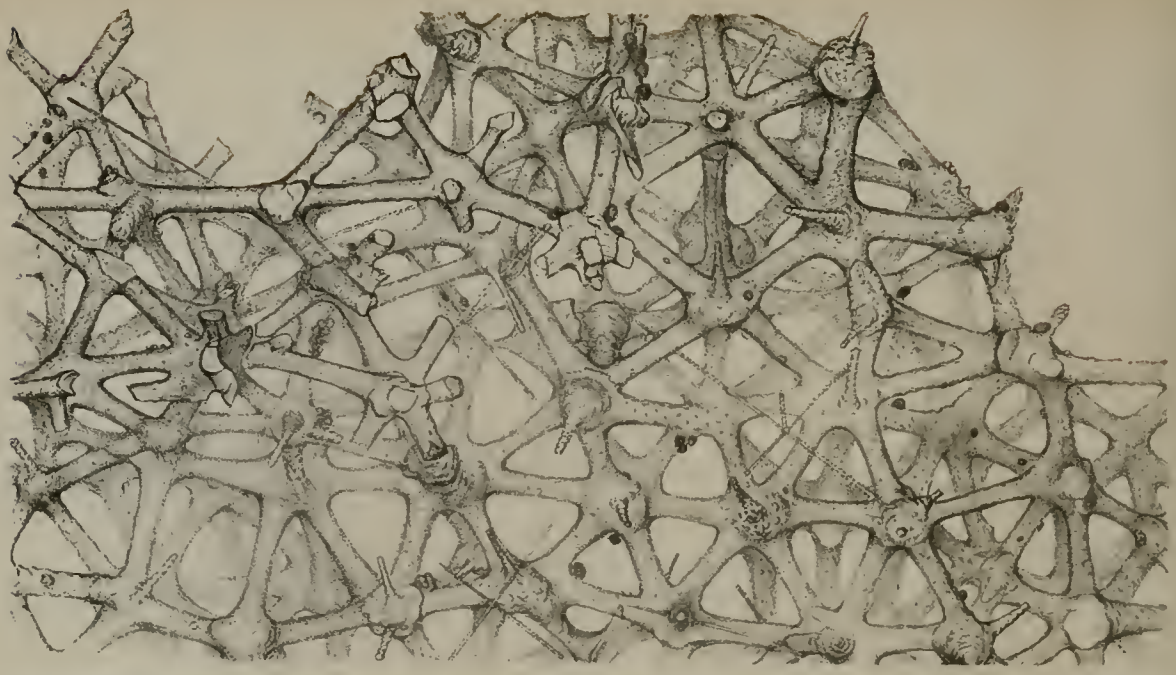

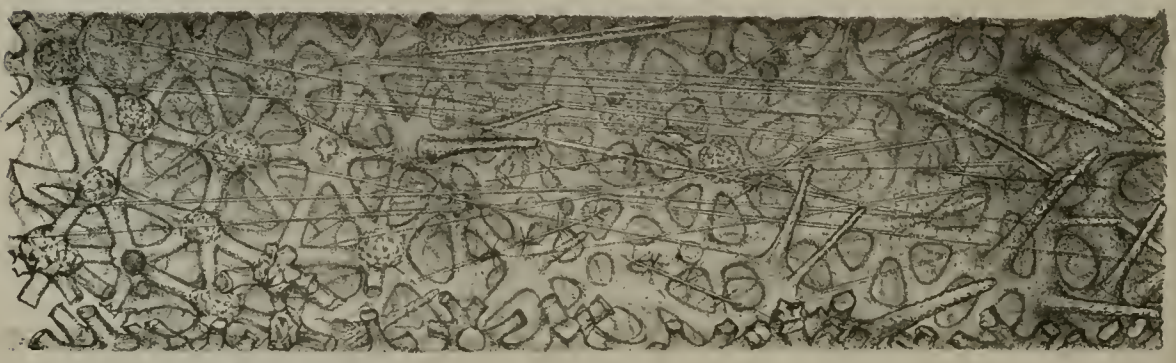

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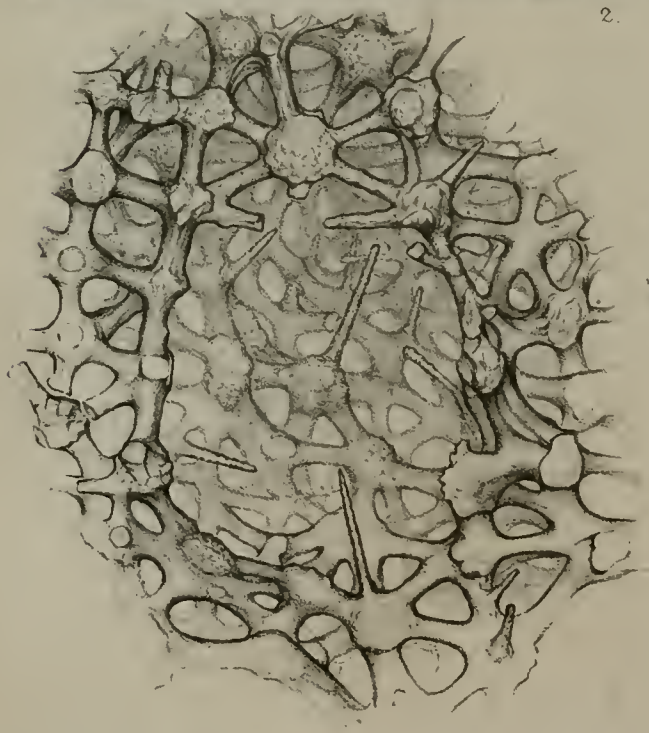

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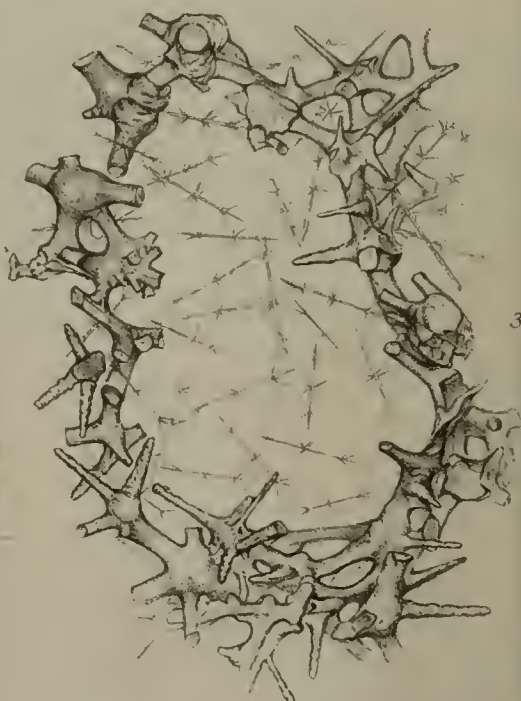
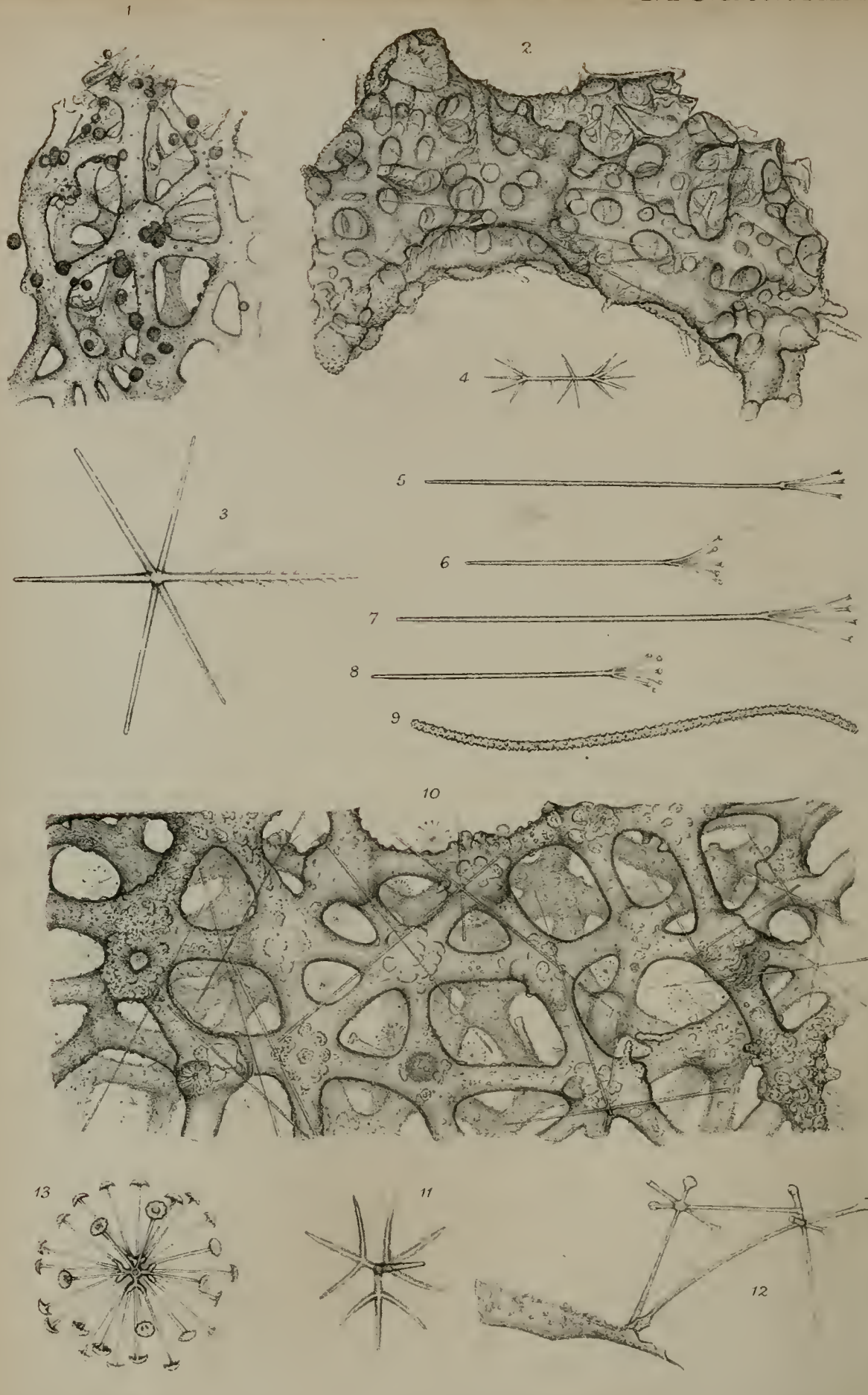


3

Lens Aldous del. et lith

W. West imp

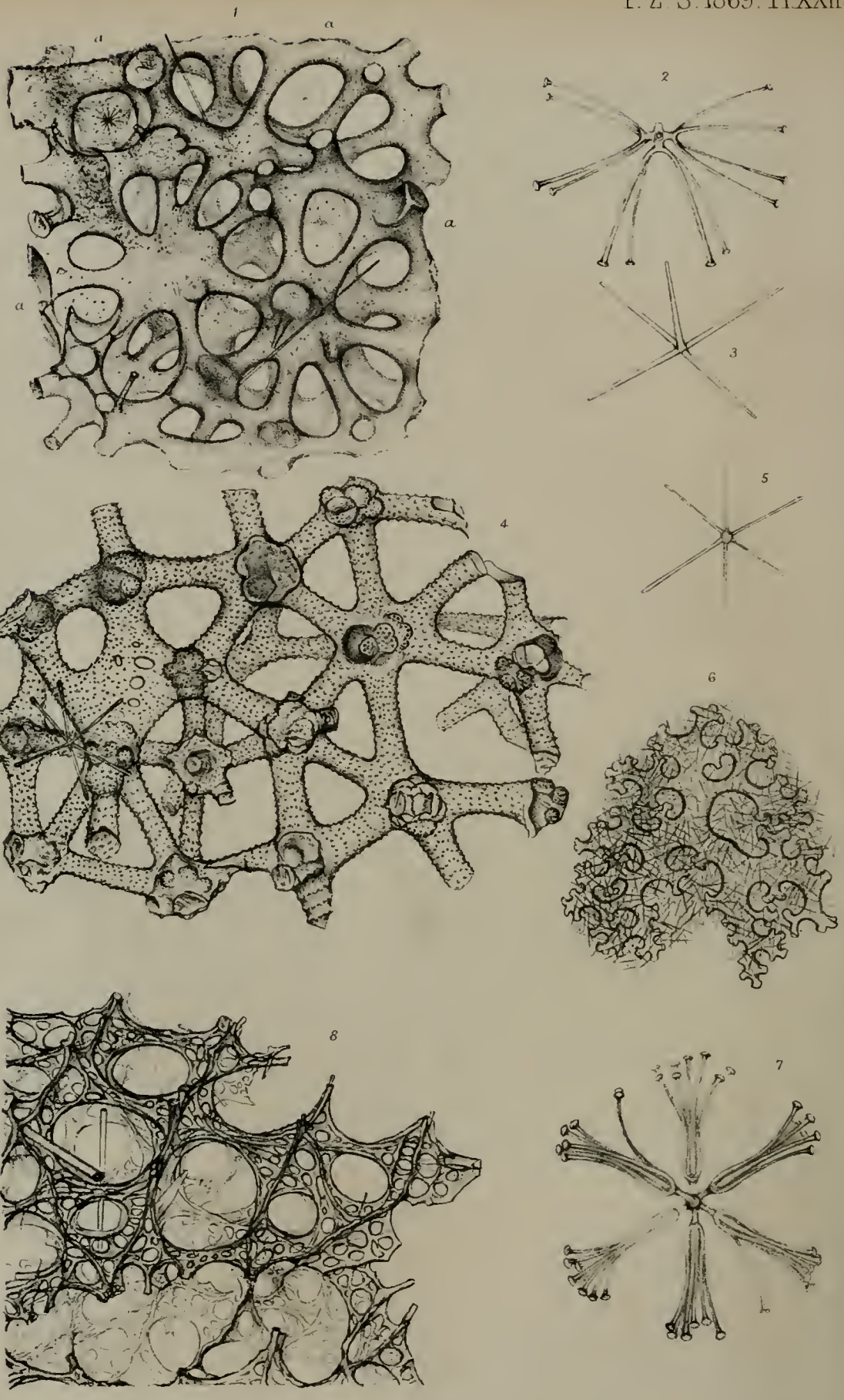
Siliceo-fibrous Sponges



Lens Aldous del et lith

W. West imp.

Silicco-fibrous Sponges.



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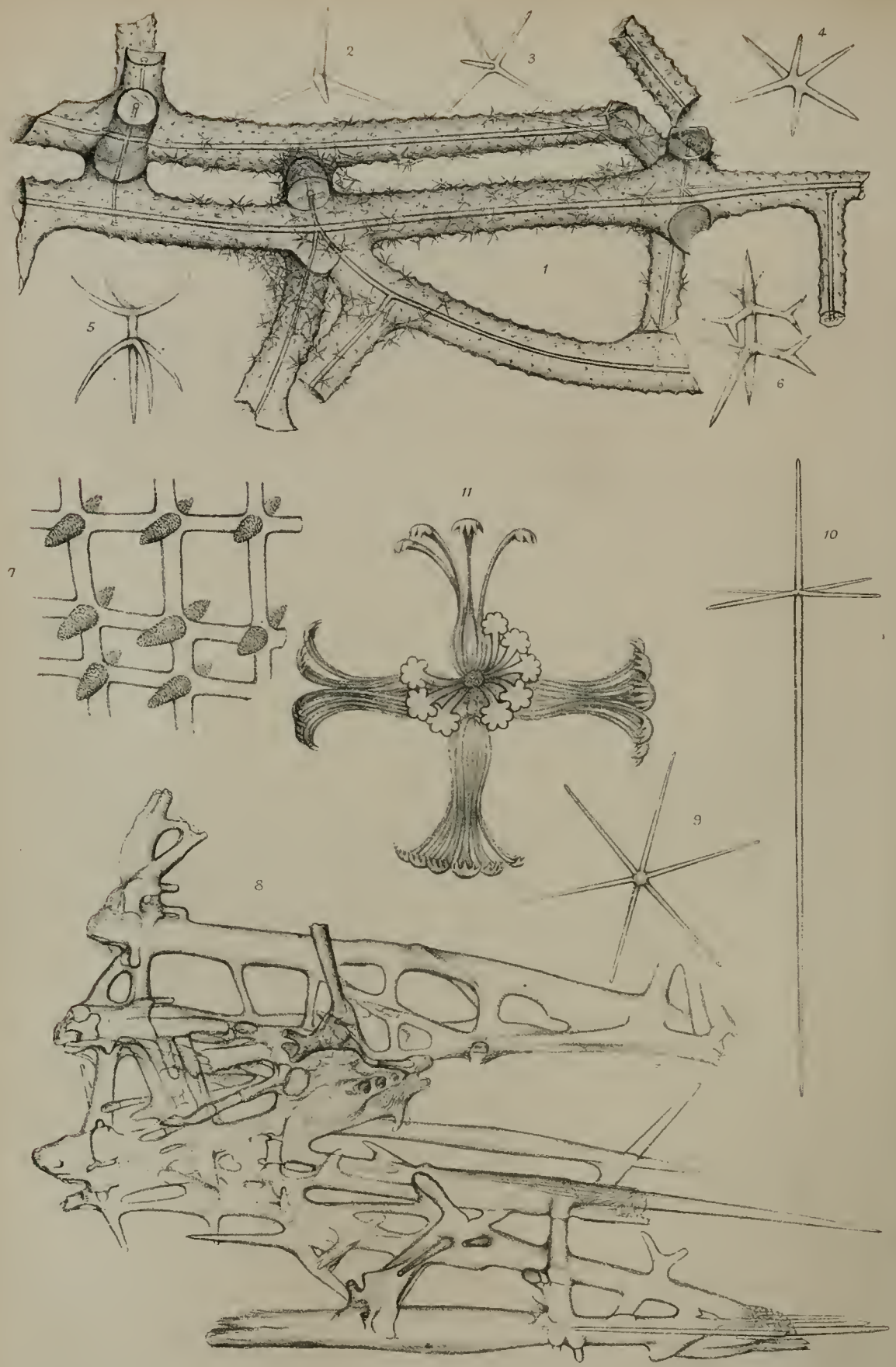
W West imp

Siliceo-fibrous Sponges.



Lens Aldous del. et lith.

Siliceo-fibrous Sponges.

W. West imp.

Lens Aldous del. et lith.

W. West imp.

Silicео-fibrous Sponges.

6. A Monograph of the Siliceo-fibrous Sponges. By J. S. Bowerbank, LL.D., F.R.S., F.Z.S., &c.—Part II.*

(Plates XXI.–XXV.)

Iphiteon, Valenciennes.

Iphiteon panicea, of the Museum, Jardin des Plantes, is distinctly a symmetrical structure. The skeleton is reticulated in a very remarkable manner. The whole consists of a series of regular areas, with pentagonal or hexagonal margins, from each angle of which a fibre passes in a direct line to the centre of the area, where they unite, forming a central, slightly protuberant mass. From each of these centres one or two fibres are given off at about right angles to the plane of the area, in opposite directions to each other, by which the adjoining areas above and below are connected. These connecting fibres always terminate at junctional angles of the nearest adjoining area, and the fibres thus projected never seem to unite with any other portions of the reticulating skeleton.

The appearance resulting from this mode of structure is very remarkable when we view a microscopical plane of this beautiful tissue. The effect is that all the areas present a singularly confluent appearance, each perfect in itself, and each forming, as it were, a part of a neighbouring area. Occasionally square spaces may be found; but these are only intervals of the reticulations.

In treating of the gemmules in my paper "On the Anatomy and Physiology of the Spongiadæ," I have figured a small portion of the skeleton of the specimen in the French Museum, said to be from Porto Rico (plate 34. fig. 17, Phil. Trans. for 1862), and I have there designated it as identical with Stutchbury's genus *Dactylocalyx*; but a more critical examination, with a view to the determination of its specific characters, has convinced me that I was in error in doing so. Neither *Dactylocalyx* nor *Iphiteon* appear in Lamarck's 'Animaux sans Vertèbres,' second edition, published in 1836, nor in Agassiz's 'Nomenclator Zoologicus,' published in 1848. Nor is there any notice of the subject in the list of the works of Prof. Valenciennes published in the 'Bibliographia Zoologiæ et Geologiæ,' by the Ray Society, 1854; we may therefore reasonably conclude that although named by Prof. Valenciennes in the Museum of the Jardin des Plantes, he never published any descriptive characters of the genus. The symmetrical arrangement of the skeleton-structures distinctly separates *Iphiteon* from *Dactylocalyx*, with which it has hitherto been confounded by other English naturalists as well as by me. I therefore propose the following characters for the genus

Iphiteon, Valenciennes.

Skeleton siliceo-fibrous. Fibre solid, cylindrical. Reticulations symmetrical. Areas rotulate, confluent.

Type *Iphiteon panicea* from Porto Rico, Museum of the Jardin des Plantes, Paris.

* For Part I. see *antè*, pp. 66–100.

IPHITEON PANICEA, Valenciennes.

Sponge cyathiform, slightly pedicelled. Surface of rigid skeleton even? Oscula, pores, and dermal membrane unknown. Skeleton symmetrically radial; radii short and stout; areas of the rete mostly six-sided, spaces within triangular; fibre cylindrical, incipiently spinous. Tension-spicula simple, hexradiate, slender, abundantly spinous; radii terminally more or less clavate. Retentive spicula spinulo-pentafurcated? hexradiate stellate, few in number. Gemmules simple, membranous, subspherical, irregularly dispersed, very numerous.

Colour in the living state unknown.

Hab. Porto Rico, 1799 (*Prof. Valenciennes*).

Examined in the state of skeleton.

The specimen designated *Iphiteon panicea* in the Museum of the Jardin des Plantes, Paris, is said to have been brought from Porto Rico in the year 1799. It is an irregularly cup-shaped sponge, the diameter of its distal margin being about equal to its height, which, to the best of my recollection, was from 7 to 8 inches. From the colour and general appearance of the specimen, I believe it to be the one from which Prof. Valenciennes gave a small fragment to Prof. Melville some years since, which he kindly transferred to me, and which fragment contains the gemmules *in situ*. I have so fully described the general structure of the skeleton in my description of the genus, as to render it unnecessary to dilate further on that portion of its history.

No fragments of the expansile dermal system could be detected; and we are therefore deprived of the most important specific characters.

I could not detect auxiliary skeleton-spicula, simulating hexradiate spicula, springing from the primary skeleton-fibres and anastomosing freely with each other, as in *Dactylocalyx*; but in lieu of them true simple hexradiate tension-spicula were frequently to be seen in groups in the interstitial spaces, but they never appeared to inosculate with each other or to deviate from their normal forms. These spicula are of comparatively large size; the radii are slightly and progressively attenuated, and entirely and acutely spinous, but they do not terminate in a point, but either in a group of acute spines or they are more or less subclavate.

The retentive spicula appear to be exceedingly few in number in the interstitial tissues; in several small masses of the skeleton abounding in sarcode and gemmules I found but two of them. The secondary radii were apparently five in number, but they were so much obscured by the surrounding sarcode as to render the determination of this character very uncertain.

The simple membranous subspherical gemmules are very like those of a halichondroid sponge; they are very numerous, somewhat variable in size and form, and are nearly all of them attached to the skeleton-fibres.

A portion of the skeleton with the gemmules is figured in the

illustrations to my paper "On the Anatomy and Physiology of the Spongiadæ" (Phil. Trans. for 1862, plate 34. figs. 17 & 18), and also in vol. i. of 'Monograph of British Spongiadæ' (plate 35. figs. 340 & 341). The latter figure in each of these quotations represents one of the gemmules filled with granular matter, ×666 linear. A small portion of the skeleton from the Porto Rico specimen is also figured in Plate XXII. fig. 1, of the present work, ×108 linear, to exhibit the abundance of these organs *in situ*. In this portion of the skeleton (fig. 1, Plate XXI., representing the general contour of the skeleton) the gemmules are very few in number, the original of the figure being from a different portion of the sponge.

IPHITEON BEATRIX, Bowerbank.

Aphrocallistes beatrix, Gray, Proc. Zool. Soc. 1858, p. 115, pl. xi.

Sponge fistulous, branching irregularly. Surface of the rigid skeleton undulating or tuberous. Oscula congregated, terminal. Pores and dermal system unknown. Skeleton symmetrically radial; radii short and stout; areas of the rete mostly six-sided, spaces within triangular; fibre cylindrical; central umbo of the areas spinous. Inhalant spaces of the skeleton-surface armed with stout elongo-conical, acutely terminated, and abundantly spinous defensive fibres. External defensive spicula of the skeleton acerate, distal portions incipiently recurvato-spinous, long and slender, very numerous; and also stout subfusiformi-cylindrical, entirely spinous spicula, few in number. Interstitial spicula attenuated rectangulated hexradiate, large and small; axial ray of the latter occasionally spinous at one or both of its terminations; spines very long and slender, curving towards the extremities. Spicula of the membranes:—Tension-spicula acerate, very slender. Retentive spicula acerate, verticillately spinous; verticilli few in number; spines large and acute, and also porrecto-spinulo-multiradiate spicula with slightly attenuated shafts; radii from three to six or more, slender and minute, few in number. Gemmules spherical, membranous, irregularly dispersed.

Colour in the living state unknown.

Hab. Malacca (*Admiral Sir Edward Belcher*).

Examined in the skeleton state.

Dr. Gray's description of this beautiful sponge in the 'Proceedings' of this Society for 1858 is inaccurate in several important points. In the first place he describes it as calcareous, whereas it is purely siliceo-fibrous. He also states the outer surface to be "formed of intertangled transparent spines which inosculate and unite with each other at the intersection," while the whole of the skeleton is formed of a symmetrical network of siliceous fibre. He further states that "the end of the main tube is closed with an open network formed of spicula," when in reality it is an intricate reticulation of siliceous fibre of a very remarkable structure. Subsequently the author writes, "in this genus the mass of the sponge is formed of small spicula, which inosculate and are united together, forming a hard mass pierced with numerous closed, small, uniform

hexangular pores, lined with a thin layer formed of elongate fusiform spicula, placed parallel in bungle in a more or less longitudinal direction round the inner mouth of the pores." The whole of this latter description of the structure of the sponge is remarkable for its inaccuracy. He repeats the fallacy that "the sponge is formed of small spicula," and describes their inosculation, when no such inosculation ever takes place among true spicula. He describes the pores in the total absence of the dermal membrane, evidently mistaking the incurrent orifices of the skeleton for those organs, and then he lines the cavities "with spicula placed parallel in bungle." What may be the mode of disposition of spicula in bungle I must leave my readers to imagine, as I really cannot conceive their arrangement under such circumstances, and especially as I have been totally unable to detect any such lining of spicula within the orifices described by Dr. Gray.

The sponge, of the natural size, and slightly magnified, has been beautifully represented in plate 11 of the 'Proceedings of the Zoological Society' for 1858.

The natural surface, and the whole of the dermal system of this sponge, have been entirely destroyed, and the pores are therefore unknown to us; but from the regularity of the size and mode of disposition of the incurrent orifices of the skeleton, it is very probable that they were congregated immediately above them. Within the sponge, on the surface of the great cloacal cavity, there are a series of large areas for the discharge of the excurrent streams into the cloaca; they are very like in size and form to those of the inhalant surface, but they are destitute of the elaborate defences that characterize the inhalant organs. Fig. 4, Plate XXI. represents one of these areas $\times$ 108 linear.

The form and mode of disposition of the oscular area readily indicates the congregation of the oscula after the same manner as that indicated in *Alcyoncellum speciosum*, and as exhibited in various species of *Geodia*. The reticulation-fibre closing this area in the sponge under consideration is remarkably complex and beautiful; each fibre of the oscular area is a compound structure. When a portion of it is immersed in Canada balsam, and viewed by a microscopic power of about 150 linear, it is seen to be a complete cylinder formed of a dense network of siliceo-fibrous structure, produced on the same radial principle as that which prevails in the skeleton of the sponge, but in consequence of the small elongate cylindrical space in which it is developed, its structure is necessarily very confused; yet the indication of radial fibres within it are sufficiently apparent to assure us of this fact. On the surface, and within the reticulations, there were a few very slender, smooth, acerate spicula which, from the mode of their disposition, are evidently the tension-spicula of the membranous tissues of the sponge. From the external surface of the compound fibre there were a few basal portions of, apparently, hexradiate auxiliary fibres projected; but none of them were developed to the extent of the production of the rectangulated lateral fibres. The external fibres of this beautiful com-

pound structure were incipiently spinous, but the internal ones were smooth. The portion of the compound fibre examined measured $\frac{1}{71}$ inch in diameter, and is represented by fig. 2, Plate XXII., $\times 108$ linear.

The structure of the skeleton of *Aphrocallistes beatrix*, Gray, is precisely in accordance with that of *Iphiteon panicea*; and if agreement in organic structure be an evidence of close alliance, the two must belong to the same genus, however different their external forms may be. The same description of symmetrical confluent areas of siliceo-fibrous structure forms the skeleton, the only difference being that the areas are rather less in their average diameter than those of *I. panicea*. In the latter species they average $\frac{1}{63}$ inch, while in the former they are $\frac{1}{71}$ inch; but in their general structural aspect they so closely resemble each other that, if it were not for the spinous umbonate centres of the areas in *I. beatrix*, they could not be distinguished when examined beneath the microscope. Fig. 2, Plate XXI. represents a section at right angles to the surface of the sponge. The view of the surface of the sponge does not exhibit distinctly the peculiar rotulate structure of the areas; and it is only when we obtain a section at right angles to the surface that this strikingly characteristic structure is to be seen in all its symmetry and beauty. But the surface view exhibits many of the specific characters in an extremely striking and beautiful manner. Here we observe large inhalant spaces, abounding in rectangulated hexradiate spicula, for the support and multiplication of the nutrient membranes of the sponge; and that the delicate tissues may be preserved from the ravages of minute annelids and other insidious enemies, the mouths of the apertures are abundantly defended by the projection into them of large elongate cones of fibre, profusely furnished with minute spines; and deeply imbedded amidst the skeleton-fibre we find an abundant supply of acerate tension-spicula, and of the short, acerate, verticillately spined retentive ones, and occasionally groups of two or three of the porrecto-spinulo-quaternate spicula with attenuating shafts (fig. 3, Plate XXI., $\times 108$ linear). The surface of the skeleton is furnished with a profusion of attenuated acerate external defensive spicula, the distal portions of which are abundantly spinous, the spines appearing as if notched upward out of the shaft of the spiculum, their acute points being all directed downward. The greater portion of these defensive organs are deeply immersed in the skeleton-mass beneath, their distal ends projecting not more than about one-fifth or one-sixth of their length beyond the general surface of the sponge. A section at right angles to the mass of the skeleton is necessary to exhibit distinctly their structure and position in the sponge. The auxiliary rectangulated hexradiate fibres of the skeleton are produced very sparingly in this species; they do not attain the full development of the shaft and lateral radiations as in *Dactylocalyx*, the lower half of the shaft only being produced; and this portion of it is abundantly spinous, and terminates hemispherically. In one portion of the skeleton, mounted in Canada balsam, their purpose in the economy of the animal is dis-

played in a very beautiful manner. Five of them are projected at different angles in about the same plane; and as it fortunately happens that the interstitial membrane is in a beautiful state of preservation, it is seen suspended on the points of the fibres, the margin curving gently from one to the other of them, in precisely the same manner as wet linen cloth would if it were supported on a series of short props for the purpose of being dried; and the resemblance is rendered the more complete by the doubling and folding of the membrane at the points of contact with the rough terminations of the supporting fibre; and in the space of membrane between two of these supporting props, we have one of the rectangulated hexradiate interstitial spicula, with its almost brush-like spinous axial spiculum, imbedded in the surface of the membrane, to contribute its share of support to that portion of the structure.

The attenuated hexradiate rectangulated interstitial spicula are comparatively small and delicate in their structure; the proximal and distal portions of the axial spiculum are very nearly equal. They have usually one or both of these parts furnished with very long and slender spines, which curve in the directions of the terminations of the shaft (fig. 3, Plate XXII.). But when this form of spiculum occurs in some of the larger interstitial cavities, they are increased in size in proportion to the necessities of the situation, and two or three of them are grouped so as mutually to support each other, as well as to perform the common office of supporting the membranous structures. In this case their radii appear to be entirely destitute of spines.

The slender acerate tension-spicula are few in number, and appear to abound more towards the surface of the sponge than in its deeper recesses.

The acerate verticillately spinous retentive spicula are exceedingly abundant in those parts where there are any remains of the membranous and sarcodous structures. The spinous verticilli are few in number; when in a fully developed condition there are frequently as many as four of them; but three is the more usual quantity, with perhaps a single intermediate spine to represent the fourth whorl. Sometimes they exhibit only two irregular terminal groups of spines and a smooth shaft intervening. The spines are long and acutely conical (fig. 4, Plate XXII., $\times 308$ linear).

The porrecto-multispinulate spicula are comparatively few in number. They do not appear to be irregularly dispersed, but occur in groups of two or three together. They agree very nearly in size, but the degree of expansion of their terminal radii differs considerably; nor do all the rays on the same spiculum agree in that respect. The number of the radii at their apices appears to vary considerably; those I have observed and figured in Plate XXII. figs. 5, 6, 7, 8, range from 3 to 6 spinulate radii. The shaft is long, slender, and attenuating to its base. Prof. Wyville Thomson, in describing this form of spiculum in his paper on Sponges in the 'Annals and Magazine of Natural History' for February 1868, p. 124, says, "no doubt these are the separate branches of a complex hexradiate spi-

cule, closely resembling those figured by Bowerbank ('British Sponges,' vol. i. figs. 190, 192)." I cannot agree with the learned Professor in this opinion. All the numerous specimens that I have seen, both separated from the sponge and *in situ*, have their natural basal terminations; and no indication whatever exists of any central hexradiate spiculum from which they may have been separated.

A few gemmules were observed adhering to the skeleton-fibres of the inner surface of the interstitial cavities of the sponge; they are similar in character to those of *I. panicea*, but in the specimen under consideration they are not nearly so numerous as in the Porto-Rico specimen of that species.

IPHITEON SUBGLOBOSA, Bowerbank.

Dactylocalyx subglobosa, Gray, P. Z. S. 1867, p. 506, plate xxvii. fig. 1.

Sponge massive, somewhat cyathiform, sessile. Surface uneven. Oscula and pores unknown. Dermal membrane—retentive spicula spiculated biternate, minute, very numerous? Skeleton symmetrically radial; areas confluent, somewhat irregular, mostly six-sided, spaces within triangular; skeleton-fibre at the external surface coarsely and irregularly tuberculated; fibre within the sponge minutely tuberculated; disposition of the tubercles sublinear. Auxiliary fibres rectangulated hexradiate, abundantly spinous; radii spinulate. External defensive spicula fusiformi-acerate, very large and long, distal terminations occasionally incipiently spinous. Interstitial spicula rectangulated hexradiate, very slender, radii subclavate, basal ray very long. Spicula of the membranes—retentive spicula spinulo-quadrifurcate and pentafurcate hexradiate stellate, numerous; margins of the spinulate terminations crenulate.

Colour in the living state unknown.
Hab. Malacca? (*Dr. J. E. Gray*).
Examined in the state of skeleton.

This sponge is in the collection at the British Museum. It is figured of the natural size in the 'Proceedings' of this Society for 1867, plate 27. fig. 1; and at p. 506 of the same volume, Dr. J. E. Gray gives the following brief description of it:—"Sponge subglobose, with a deep central concavity above; the outer surface with irregular anastomosing oscules.

"*Hab.* Malacca?"

The sponge is based on a fragment of coral, and has very much the form of a young and undeveloped specimen of one of the best description of Turkey sponges, in which the form of the cup is rather indicated than produced; and it is very probable that in its fully developed state it will be found to be a truly cyathiform species.

The expansile dermal system of the sponge has been entirely destroyed; the oscula and pores are therefore unknown to us; but on one fragment of the outer portion of the skeleton submitted to examination there was a very small piece of the dermal membrane adhering to the surface of the skeleton, and this was densely crowded

with minute spiculated biternate retentive spicula, and a few single ones were entangled in the adjoining interstices of the skeleton. As the colour of this small portion of the membrane was the same as that of minute portions of sarcode dispersed amidst the reticulations of the skeleton, there can be no reasonable doubt of its really belonging to the sponge.

These spicula are so minute that they require a microscopic power of about 700 linear to define them in a satisfactory manner, and in the present case they were only visible after having been immersed in Canada balsam. A detached specimen of one of these spicula is represented by fig. 11, Plate XXII.

The structure of the skeleton is stronger, larger, and more irregular than that of *I. panicea* or *I. beatrix*; but there is no doubt of its being truly an *Iphiteon*. The average diameter of the skeleton-fibre is $\frac{1}{500}$ inch. The surface-fibres are very closely tuberculated, the tubercles looking very like small extraneous patches of silex adherent to the surface; and clusters of these coarse tubercles are frequently accumulated on the umbones of the confluent areas of the skeleton-structures, as represented in fig. 10, Plate XXII., which represents a portion of the surface of the rigid skeleton. The tubercles of the interior fibres are much more regular in their form, and are frequently disposed in lines, consisting of five or six of them at nearly right angles to the axis of the fibre; and a very considerable number of the fibres have no tubercles upon them.

The rectangulated hexradiate auxiliary fibres were very abundant in some of the large interstitial spaces of the skeleton: when fully developed they are abundantly spinous, and the radii have spinulate terminations; in an early stage of growth they are frequently spineless, or only incipiently spinous, and in this condition, intermixed with the stouter and more developed ones, they may be readily mistaken for spicula; but their habit of anastomosing with each other, and their basal connexion with the parent skeleton-fibre, readily distinguish them. Fig. 12, Plate XXII., represents two of the auxiliary fibres in a less complicated form than they are usually met with in the interstitial spaces of the skeleton, and exhibiting distinctly their basement on the skeleton-fibre, and their subsequent inosculation.

The rectangulated hexradiate interstitial spicula are comparatively few in number; they are very slender, smooth, and their radii are clavate. The auxiliary fibres seem to have superseded them in their peculiar office of affording support to the interstitial membranes, and of multiplying the sarcodous surfaces of the interstitial spaces.

The external defensive spicula of the skeleton are remarkably large and long. I have not seen an entire one; but in a perfect condition they cannot be less than $\frac{1}{4}$ inch in length, and the diameter of the middle of one *in situ* was $\frac{1}{200}$ inch, more than twice the size of an average-sized skeleton-fibre. Their basal portions are deeply immersed in the external portion of the skeleton. The basal termination in a few cases appeared to be incipiently spinous; but this seemed to be rather the exception than the rule.

The retentive spinulo-quadrifurcate and pentafurcate spicula are very numerous, and the numbers of the two appear to be about equal. When a power of 700 or 800 linear is applied to them, their margins are seen to be regularly and closely crenulated. I do not remember to have seen this remarkable character in the corresponding spicula of any other species of siliceo-fibrous sponges.

IPHITEON INGALLI, Bowerbank.

Dactylocalyx pumicea, Gray, P. Z. S. 1867, p. 506, plate xxvii. fig. 2.

Sponge cup-shaped. Rigid skeleton—upper or exhalant surface with large intermarginal excurrent canals radiating irregularly from the centre towards the circumference. Under or inhalant surface with short radiating intermarginal canals. Surface even. Oscula, pores, and expansile dermal system unknown. Skeleton—fibre stout, more or less furnished with scattered warty tubercles. Auxiliary fibres abundantly tuberculated, terminating spinulately. Interstitial spicula rectangulated hexradiate, large; radii nearly equal, attenuated and acutely terminated. Retentive spicula spinulo-quadrifurcate hexradiate stellate; terminal radii long.

Colour in the natural state unknown.

Hab. St. Vincent's, West Indies (*Thos. Ingall, Esq.*).

Examined in the skeleton-state.

This sponge is figured by Dr. Gray, on the scale of one-eighth of its natural size, in plate xxvii. of the 'Proceedings' of this Society for 1867, and is erroneously designated *Dactylocalyx pumicea* in p. 506 of the same volume, but without any reference either to its internal or external characters, although the latter in *I. Ingalli* are strikingly different from those of the rigid skeleton of the former, as I have stated at length in my description of the surface-characters of *Dactylocalyx pumiceus, anteà* p. 77.

Beside the difference in the surfaces of the rigid skeletons, there are such conclusive structural characters in their configurations that, had Dr. Gray taken the trouble to compare sections of the two sponges, he must have at once seen that they were not only different species, but distinct genera as well.

In the absence of the expansile dermal systems in both sponges, they agree in their external forms exceedingly well; but this character is common to so many and such discordant genera and species as to be of little or no value in their specific discrimination, even had they belonged to the same genus.

I have been unable to detect any characteristic fragments of the expansile dermal system of the type specimen of *I. Ingalli*.

The outer or inhalant surface of the sponge is covered in numerous places with a thin brown membrane adhering closely to the surface of the rigid skeleton, and dipping into and lining the incurrent orifices of the sponge. The membrane is completely covered by minute spherical vesicles; but I could not detect any imbedded spicula. From its close adherence to the surface of the rigid skeleton,

its delicate structure, and the total absence of dermal spicula, it is evident that it has formed no part of the expansile dermal system, and that it is truly the enveloping membrane of the rigid skeleton of the sponge thickly covered by sarcode.

Whether these minute molecules are the basal vesicles of the ciliary system is a question of considerable interest, to be hereafter determined by naturalists who have the opportunity of examining these interesting sponges fresh from their native element. Their situation and general character are very similar to the homologous organs in *Grantia compressa*, and their position in *I. Ingalli* is just that in which we should expect to find the ciliary system. We cannot hope to find any cilia remaining under such circumstances; those of *Grantia compressa* and other nearly allied species are rarely visible, except during the life of the animal and while in a state of activity.

In a small piece of the membranous structure of this sponge which I received from my friend Mr. Ingall, in March 1860, the appearances presented are widely different from those of the membrane I have described above. The colour and the sarcode are very similar; but there is a total absence of the minute spherical bodies. The field of view presents a very confused appearance. Numerous long, slender, and flexible attenuato-acerate spicula are confusedly matted together, and amongst them there are a considerable number of large rectangulated hexradiate spicula with radii of equal length, gradually attenuated from their proximal to their distal terminations; and amidst this complicated mass there are innumerable spinulo-quadrifurcate hexradiate stellate retentive spicula.

From what part of the sponge these portions of its structure have been derived it is difficult to conjecture; but it is evident that there are other forms of spicula than those we have observed *in situ* that belong to it, and that, although the spinulo-quadrifurcate retentive spicula are rather abundant in the interstices of the rigid skeleton, there are other parts of the sponge in which they are crowded to such a degree as to be innumerable.

The general appearance of the spinulo-quadrifurcate hexradiate spicula is very like that represented by fig. 2, Pl. XXIII.; and I have chosen a mutilated specimen which has only three of its primary rays remaining as best calculated to display its quadrifurcate structure. The configuration of the rigid skeleton is decidedly that of an *Iphiteon* of a somewhat delicate structure. The skeleton-fibres near the surface are rather strongly tuberculated; but those of the interior are very much less so, and in some parts they are almost smooth. The mouths of the incurrent canals on the surface of the rigid skeleton are numerous and frequently closely adjoining each other, the separation often not exceeding half of their own diameter. The auxiliary fibres at some distance within these canals are frequently abundant and much complicated in structure. They are stout, very rugged, with irregularly disposed tubercles, and their free terminations are spinulate. The rectangulated hexradiate interstitial spicula *in situ* are few in number, and their radii are gradually

attenuated to a sharp point. In size, compared with those I have previously described in a fragment of the membranous tissue, they are small and slender.

The genera of the two sponges *I. Ingalli* and *Dactylocalyx pumiceus* being distinctly different, it is unnecessary to enter into a long description of their differential characters to prove that Dr. Gray is in error in assigning the type specimen of the former to the latter genus; but it may be as well to state that none of the singular and beautiful forms of spicula which I have obtained from the type specimen of *D. pumiceus*, and have figured in Plate III., part 1, are to be found in the tissues of the type specimen of *I. Ingalli*.

IPHITEON CALLOCYATHES, Bowerbank.

Myliusia callocyathes, Gray, P. Z. S. 1859, p. 439, *Radiata*, pl. XVI.

Sponge sessile or slightly pedicelled, cyathiform. Upper surface of rigid skeleton even; under surface sinuously plicated and tubulated. Oscula and pores unknown. Expansile dermal system—dermal membrane pellucid, furnished abundantly with minute short, stout, acerate tension-spicula; connecting spicula furcated foliato-expando-ternate. Skeleton—fibre variable in diameter, verticillately spinous, spines small, acutely conical; interstitial spicula rectangulated hexradiate, axial and rectangulating radii nearly equal in length, slender, terminations subclavate; retentive spicula spinulo-multifurcate hexradiate stellate, terminations of each heptaradiate or octoradiate; of two sorts, one with terminal radii expanded, the other with terminal radii contracted into separate groups.

Colour in the natural state unknown.
Hab. West Indies (*Dr. M'Gee*).
Examined in the skeleton-state.

In the description of the external characters of this sponge it must be remembered that it is that of the rigid skeleton only, and that it is probable that both surfaces would be more or less smooth and even when covered by the expansile dermal system.

The arrangement of the skeleton is decidedly that of an *Iphiteon*; but the structural character of the fibres of which it is composed is strikingly distinct from any other species of the genus. They are variable in size to a considerable extent; but whatever may be their diameters, they are always furnished with numerous small sharply conical spines, which exhibit a strong tendency to a verticillate arrangement; and around the central umbones of the confluent areas of the skeleton they are frequently congregated on slightly elevated detached patches, each containing from seven to ten minute spinules.

These structural characters would have sufficed, in the present state of our knowledge of the species of this genus, to distinguish it from any other member of the group; but, by a careful examination of the type specimen, I fortunately obtained from near the base of the sponge on the inner surface a small piece of the expansile dermal system in connexion with a portion of the surface of

the rigid skeleton; but as these tissues on the exhalant surface are not nearly so distinct and regular in their structure as those of the inhalant surface, I could not find a piece that would have afforded a satisfactory figure, although when viewed beneath the microscope the nature and characters of the tissues were beyond a doubt. The furcated foliato-expando-ternate connecting spicula, when thus seen *in situ*, are so closely packed, and the terminations of their radii are so locked together, that they cannot be separated by the eye; and the small acerate tension-spicula so profusely scattered on the dermal membrane covering their apices tends greatly to confuse the aspect of the tissues beneath: it is only when we have one of them separated, as represented by fig. 6, Pl. XXIII., that we are enabled to comprehend their structure. But although ineligible for figuring, this fragment of the expansile dermal system clearly demonstrated the agreement in general structure of this species with those in which it is more amply and clearly exhibited.

The furcated foliato-expando-ternate connecting spicula are singular in their form, and are very characteristic of the species. Both the primary and secondary ramifications of their apices are very much depressed; they are very thin, and small short branches are projected from their edges so as greatly to increase their plane of support to the dermal membrane, which appears to have closely adhered to them in the living state, as I have not seen any separate spiculum of this form without a portion of the dermal membrane and its numerous tension-spicula closely adhering to its external surface.

The rectangulated hexradiate interstitial spicula appear to be few in number in the present condition of the sponge. They are small and slender, and the apices of the radii are slightly inclined to be clavate; the axial and rectangulating radii are usually of very nearly the same length,—a few of them only having the basal portions of the axial radii elongated to about twice that of a rectangulated ray.

There are two sorts of spinulo-multifurcate hexradiate retentive spicula, with seven or eight spinulate radii to each termination:—one in which the primary radii are short, and the secondary ones projected expansively, so as to form one great compound stellate spiculum, in which it is very difficult to separate with the eye the six sets of terminal spinulate radii; the other form in which the primary radii are longer and the terminal groups of spinulate spicula, usually six, rarely seven or eight in number, are projected contractedly so as to form six separate and very distinct groups of terminal spinulate spicula, as represented by fig. 7, Pl. XXIII. The first-mentioned form is very like that from *Dactylocalyx pumiceus*, represented by fig. 4, Pl. III., part 1, with the imaginary addition of as many more radii as are there represented.

Myliusia, Gray, Proc. Zool. Soc. 1859, p. 439.

Skeleton siliceo-fibrous. Fibres solid, cylindrical. Rete symmetrical, disposed in a series of crypt-like layers parallel with the external surface, with intervening planes of perforated siliceous tissue.

The stratified character of the reticulating skeleton of the type sponge of this genus, when viewed in a section at right angles to its natural surface, with a microscopical power of 100 linear, at once separates it from the unsymmetrical structure of *Dactylocalyx*; and although participating with *Iphiteon* in the character of symmetrical arrangement of its skeleton, it is equally well distinguished from that genus by the total absence of the confluent areas that are so characteristic in those sponges.

In a paper read before this Society, November 22, 1859, by Dr. J. E. Gray, entitled "Description of *MacAndrewia* and *Myliusia*, two new forms of Sponges," and published in the 'Proceedings' of the Society for that year, page 437, the author has described his genus *Myliusia*, page 439, and has figured in plate xvi. *Radiata*, of the same volume, his species *Myliusia callocyathes* as the type of his genus; subsequently, in the 'Proceedings' of this Society for 1867, p. 506, in his "Notes on the Arrangement of Sponges," he has given the following characters as those of the genus:—"The sponge conical, cup-shaped, pierced with numerous short truncated tubes, forming raised folded anastomosing laminæ on the lower surface." This description applies only to the external characters of the skeleton, entirely omitting all the other anatomical peculiarities of the sponge. On microscopically examining the structures of the type specimen I found them to be identical with those of the genus *Iphiteon*, and I have therefore arranged Dr. Gray's *Myliusia callocyathes* as *Iphiteon callocyathes* in the present paper.

In Dr. Gray's "Notes on the Arrangement of Sponges," p. 506, he states that, "There are two small specimens in the British Museum which probably belong to the same species. The smaller one was collected by the Rev. L. Guilding at St. Vincent's in 1840; and the other was received from the West Indies by Mr. Scrivener in 1842." On examining microscopically the structures of the specimen collected by the Rev. L. Guilding at St. Vincent's, I found it to differ widely in the construction of its skeleton from either *Iphiteon* or *Dactylocalyx*, and I therefore propose to apply Dr. Gray's genus *Myliusia* to this species in place of the one to which he has erroneously attached it.

The specimen from "Mr. Scrivener in 1842" is identical in structure with Dr. Gray's type specimen of his genus *Myliusia*, both as regards generic and specific characters, and should therefore be arranged with that sponge as *Iphiteon callocyathes*.

MYLIUSIA GRAYII.

Myliusia callocyathes, Gray, P. Z. S. 1859, p. 439, et 1867, p. 506.

Sponge sessile, massive. Dermal surface unknown. Surface of rigid skeleton uneven and excavated. Oscula, pores, and expansile dermal system unknown. Skeleton stratified, forming a series of expanded crypt-like spaces. Fibre cylindrical, incipiently or minutely spinous. Interstitial spicula numerous, acerate, large and long, variable in size; disposed in lines at right angles to the strati-

fication in loose fasciculi of two to four or five together. Retentive spicula spinulo-multifurcate hexradiate stellate.

Colour of skeleton translucent white.
Hab. St. Vincent's, West Indies (*Rev. Lansdown Guilding*).
Examined in the skeleton-state.

The specimen proposed as the type of the genus *Myliusia* has on the front of the board on which it is fixed *Myliusia*, St. Vincent's, Rev. L. Guilding, 40. 10. 23. 11." On the back of the board "Scrivener."

The sponge is sessile, the base being as wide as the specimen, which has a diameter of about three-fourths of an inch, and is about half an inch in height. The form of the mass is slightly oval; it is composed of a series of thin sinuous plates of skeleton-structure not more than one-third of a line in thickness. The sinuations of the plates form deep orifices in the substance of the sponge, which sometimes extend nearly to the base. By the aid of a lens of an inch focus, the stratified texture of the sinuous plates is distinctly visible. No sarcodous matter could be detected.

There are no visible remains of the expansile dermal system of the sponge. When viewed by the microscope the surface of the rigid skeleton has a very remarkable aspect. It is formed of a series of square or irregularly angular areas, the angles of which are filled in with thin perforated angle-plates with their inner margins curved, so that when combined they leave a large circular or oval orifice in the middle of each space; and the upper surface of each layer of vaulted structure presents as nearly as possible the same aspect as the external layer of the rigid skeleton. There is no uniformity, either of size or arrangement, in the perforations of these horizontal angle-plates; but combined they present to the eye the idea of the greatest amount of lightness, strength, and beauty that can well be conceived to exist in such a structure (fig. 8, Pl. XXIII.).

When we obtain a favourable section of the rigid skeleton at right angles to the surface of the sponge, we find that it is formed of a series of crypt-like layers of skeleton-fibre, each layer forming as it were a distinct and extensive crypt-like space with short, stout, cylindrical pillars with gradually expanded bases and capitals, the intervening portions of the shafts of the columns being irregularly studded with acutely conical incipient spines. Occasionally the regularity of the columnar arrangement is broken by the occurrence of large irregular interstitial spaces, into which short, stout, very spinous cylindrical or attenuating portions of fibre are projected, very like the basal portions of the auxiliary fibres that occur in several species of *Iphiteon*, but never appearing to throw off rectangulating lateral branches. These organs are evidently rather for defensive purposes than as auxiliary supporters of the sarcodous membranes, as beside them these spaces frequently have several long and slender acerate interstitial spicula traversing them in various directions; while in the crypt-like spaces a few only of such spicula are seen passing through them in diagonal directions (fig. 1, Pl. XXV.).

These interstitial spicula are very long and are frequently flexuous, and are sometimes extremely numerous and closely matted together. In this state they have probably belonged to the expansile dermal system; but in the present well-washed condition of the specimen the true position of these matted groups could not be determined. The probability, however, of their having belonged to the external surface is increased by the presence among them of fragments of a thin brown membrane and numerous grains of sand.

The skeleton-fibres are more or less spinous. The spines are acutely conical, and are irregularly dispersed over the surface; some parts of the skeleton have the fibres nearly spineless, while others are abundantly furnished with those minute organs.

The spinulo-hexradiate stellate spicula are found dispersed in all parts of the skeleton-tissues; but there are some little patches of intermingled remains of membranes and spicula in which eight or ten were in close conjunction, indicating the probability that in the natural condition of the sponge they were very numerously dispersed in the membranous tissues. I counted thirty rays in some of them; and we may therefore designate them as spinulo-multifurcate hexradiate stellate spicula.

The basal structure of the sponge is a remarkably beautiful tissue. It has on its surface an indistinct indication of irregular areas, similar to those of the skeleton-structure, when viewed at right angles to its surface; but the spaces of the open central areas are filled up by plates of siliceous structure perforated by numerous round or oval holes. The skeleton-structure immediately above it is an irregular modification of the ordinary skeleton-tissues, with dense patches of stout acerate spicula intermixed with it. A few patches of the basal membranous tissue remain *in situ*; in its present state it is of a brown amber-colour; no spicula could be detected imbedded in them.

Kaliapsis, Bowerbank.

Skeleton siliceo-fibrous. Basal fibres cylindrical and canaliculated; distal fibres non-canaliculated, compressed. Basal reticulations symmetrical and reversedly arcuate; distal reticulations unsymmetrical and continuously ramifying.

The structures of the sponge which is the type of this genus are remarkably anomalous, it combining in its skeleton both solid and canaliculated fibre, each having a separate and distinct mode of disposition in the animal. The terminations of the central canals of the basal cylindrical fibres are abrupt, and they are distinctly visible at the parts where the ramified skeleton commences. No evidence of central canals could be detected in any part of the upper ramifying portion of the skeleton-structure, which divides continuously as it approaches the surface, where the terminations spread horizontally in every direction, their extremities interlocking and forming a complicated and very beautiful lace-like surface to the rigid skeleton, a small portion of which is represented in Plate XXV. fig. 3.

These structures, and their modes of disposition, are so remarkable

as to cause this genus to be readily distinguished from any others with which we are acquainted among the siliceo-fibrous sponges.

KALIAPSIS CIDARIS, Bowerbank.

Sponge coating, parasitical, very thin. Oscula and pores unknown. Expansile dermal system furnished with foliato-peltate connecting spicula, peltate heads more or less mammillated, very various in form; shafts short and conical. Dermal membrane furnished abundantly with minute incipiently spinous fusiformi-cylindrical spicula, short and stout, dispersed. Skeleton—basal portion composed of stout canaliculated cylindrical fibre arranged symmetrically in a series of reversed semicircular confluent arches, from the crowns of which emanate short stout cidarate prehensile fibres with acutely conical terminations. Basal limbs of the arches attenuating and ramifying irregularly upwards, and terminating at the surface of the rigid skeleton in a plane of very complicated non-canaliculated retiform layer of depressed fibres.

Colour in the dried state white.

Hab. Parasitic on the base of *Oculina rosea*, from the South Seas (*J. S. Bowerbank*).

Examined in the dried state.

I found this singular and beautiful little sponge on the base of a specimen of *Oculina rosea* from the South Seas in 1855, and figured a portion of it in illustration of my paper on the "Anatomy and Physiology of the Spongiadæ" published in the 'Philosophical Transactions of the Royal Society' for 1862, plate 28. fig. 12, p. 759, as a specimen of prehensile sponge-fibre; and also in vol. i. of 'A Monograph of the British Spongiadæ,' plate 15. fig. 278, p. 80, for the same purpose.

I also figured seven specimens of the dermal connecting spicula in the 'Philosophical Transactions of the Royal Society' for 1858, plate 24. figs. 32–38 inclusive, in illustration of the foliato-peltate forms of connecting spicula, and described in detail the mode of their development from the simple discoid form to their mature and most complicated ramified condition. They are also figured in 'Monograph of British Spongiadæ,' plate 4. figs. 102, 103, and plate 5. figs. 104–108 inclusive, in illustration of the terminology.

The whole sponge, when attached to the base of the coral, did not exceed about 3 lines in diameter; and the largest portion obtained for examination is nearly square, 2 lines in length, and about $1\frac{1}{2}$ line in breadth, and not exceeding $\frac{1}{40}$ inch in thickness. Its peculiar structure is singularly illustrative of its parasitic habit. I have carefully examined many other specimens of *Oculina rosea*, but have never been fortunate enough to find another specimen.

On several portions of the largest piece of rigid skeleton I found one or two of the foliato-peltate spicula adherent and *in situ*; and in the material scraped from the coral matrix immediately surrounding the sponge, they were found in abundance in every stage of development, and along with them numerous very minute fusiformi-

cylindrical spicula, which had every appearance of belonging to the dermal membrane. With this indication, I mounted all the remaining fragments of the sponge in my possession, and I was fortunate enough to find a small piece of dermal membrane crowded with these minute spicula, and having several of the foliato-peltate spicula attached to its under surface, thus leaving no doubt remaining regarding the presence and nature of the expansile dermal membrane of this singular and beautiful species of siliceo-fibrous sponge (Pl. XXV. fig. 4).

The specific characters of the sponge, although few in number, combined with the peculiar and very striking ones derivable from the skeleton, which I have described in detail in treating of the genus, enable us readily to distinguish the species from any other siliceo-fibrous sponge. The cidarate prehensile fibres at the base of the sponge are remarkably curious organs; they proceed at right angles from the crowns of the reversed basal arches, and terminate in stout and acute cones; and intermediate between their origins and terminations each has a ring of stout round bosses admirably fitting them first to penetrate the fleshy external coat of the coral, and, when once inserted, to securely maintain their position. There is no mistaking the office of these curious and beautiful organs and the admirable adaptation to the nature of the basis on which they were destined to be parasitic (Pl. XXV. fig. 2).

The forms of the foliato-peltate heads of the connecting spicula are exceedingly various, passing through every gradation from simple circular plates to the most elaborate foliations. On some of the heads of the detached spicula groups of three or four of the minute fusiform-cylindrical retentive and defensive spicula were attached; but on some parts of the small fragment of the dermal membrane they were so numerous and so crowded together as to render their individual forms perfectly undistinguishable. The membrane is of a dark brown colour, and can scarcely be said to be transparent, in consequence of the number of the spicula and the density of the sarcode in which they are imbedded. I measured some of the largest and smallest of them, and found their average length not to exceed $\frac{1}{909}$ inch. The greatest diameter of a large one was $\frac{1}{6000}$ inch (Pl. XXV. fig. 5).

In these minute spicula the central canal was visible with a linear power of 666 throughout the whole of their lengths, and it occupied about one-sixth of the greatest diameter, so that its own diameter could not exceed about $\frac{1}{36000}$ inch.

Farrea occa, Bowerbank.

Sponge massive, pedicelled? Surface even? minutely hispid? Oscula and pores unknown. Dermis furnished with a quadrilateral smooth siliceo-fibrous network, armed at the angles oppositely, externally and internally, with short imbricated conical spicular defences. Skeleton—rete irregularly quadrilateral; fibre cylindrical, more or less minutely tuberculated or spined. Tension-spicula biternate, spiculated biternate, and furcated spiculated biternate,

and rarely attenuato-rectangulated triradiate spicula. Retentive spicula attenuato-stellate, very irregular in structure, minute, very numerous.

Colour in the living state unknown.
Hab. Seychelle Islands (*Capt. Etheridge, R.N.*).
Examined in the state of skeleton.

The remarkable sponge, the subject of the present description, is beautifully figured in the 'Transactions of the Linnean Society of London,' vol. xxii. plate 21, as the basal mass "of a coarse irregular siliceous sponge," upon which the subject of the paper, *Euplectella cucumer*, Owen, is based. The author very briefly notices the structure of this basal portion of his figure; and three small portions of its structure are represented by figures 8, 9, and 9*a*, with scarcely a sufficient amount of microscopic power to give an adequate idea of their structures.

The sponge is an irregular mass, 4 inches in length by about $2\frac{1}{4}$ inches in width, of siliceo-fibrous structure: about 2 inches of the basal portion of its length consists of a dense irregularly cylindrical stem about $\frac{1}{2}$ inch in diameter; from its surface-structure, as seen by the aid of a 2-inch lens, there appears to be no doubt of its being truly a portion of the sponge whence it is projected. The dense structure and mode of projection of this indurated portion of the sponge renders it probable that in the living state the animal was more or less elevated on a pedestal.

The greater portion of the body of the sponge is in a disrupted state, apparently from compression; but the whole of its structures are loosely bound together by the numerous long prehensile basal spicula of the *Euplectella*, which penetrate its substance and envelop it on every side. Fragments of the beautiful harrow-like tissue of the dermis are dispersed on various portions of the specimen; and in one place, partly hidden by what appears to be the small valve of a *Terebratula*, there is a portion of the harrow-like tissue about equal to half or three-fourths of a superficial square inch. The general distribution of the fibres of the skeleton is not readily to be determined, as the intermixture of the prehensile basal spicula of the *Euplectella* with its tissues is so abundant as to very much confuse its general aspect to the eye of an observer. The dermal structure of this sponge is very remarkable. It consists of a regular quadrilateral network of smooth siliceous fibre, from the angles of which a double set of short conical spiculum-shafts are projected, each about $\frac{1}{120}$ inch in length, and entirely covered with spines. Each set are at right angles to the plane of the network, one series pointing inward and serving the purpose of attaching the dermis to the body of the sponge beneath, while the other set are directed outward, serving as defensive weapons; so that a small piece of this tissue beneath the microscope closely resembles an agricultural harrow, with the difference that it has two sets of teeth in opposite directions instead of one. The dermal membrane has been nearly all destroyed; but entangled with the fibres of the skeleton there are some of the attenuato-stel-

late spicula, with which it is probable that the membrane was amply furnished as secondary defences against minute enemies.

This singular tissue is figured in the 'Philosophical Transactions of the Royal Society' for 1862, plate 32. fig. 7, and also in my 'Monograph of the British Spongiadæ,' vol. i. plate 21. fig. 311. I believe the portions presented to the eye in the pieces figured to be the external surface, as the fragments of the dermal membrane which remained all seemed to cover that side of the fibres of the network, and the presence of the external series of the spicular organs is strongly indicative of the minute hispidation of the surface of the sponge in its natural condition.

In the present condition of the sponge it is impossible to determine whether this singular harrow-like dermal structure was continuous over the whole of its surface when in the living condition; but the probability is, judging from the general structure of the expansile dermal system of every other known species of siliceo-fibrous sponge, that it was composed of detached sections, so as to allow of the usual amount of expansion and contraction that we observe to exist in every other such sponge.

The reticulation of the skeleton is always angular, but the areas vary from square into all imaginable varieties of the oblong figure. The fibre is stout and strong, with a well-defined central canal in its fully developed condition; a portion of it is represented in Plate XXIV. fig. 1, with numerous attenuato-stellate retentive spicula adhering to the fibres.

Occasionally in some portions of the skeleton-fibre we find two canals, neither of which are central: this abnormal form probably arises from two immature fibres, closely approximated in an early stage of their development, uniting longitudinally; and in one case I observed as many as three irregular portions of canals in one fragment of the fibre; but this irregularity of structure is the exception and not the rule. The spination of the skeleton-fibres is very slightly produced in the form of acute cones, and in some of the larger fibres it may be almost designated as incipient, while occasionally in some of the immature ones the spinules assume the forms of tubercles, which are sometimes more or less bifurcated.

The interstitial tension-spicula of this sponge are very remarkable organs. They are simple biternate, spiculated biternate, and furcated spiculated biternate. Sometimes one termination only is spiculated, sometimes both are thus furnished. One or two of the terminal radii are frequently furcated; but it is of rare occurrence that the whole of them are produced to that extent. They occur in groups entangled together; in several of these groups they were numerous and closely packed, much in the same manner in which we find the spinulo-trifurcated hexradiate spicula of the interstitial membranes of *Dactylocalyx pumicea* when seen *in situ*. They are stout and comparatively of large size (Pl. XXIV. figs. 5 & 6).

The attenuato-stellate retentive spicula are minute and very irregular in their structure and in the number of their radii. They have evidently been very numerous, as they are frequently found adhering

in considerable numbers around portions of the skeleton-fibres; and it is probable that the dermal and interstitial membranes were abundantly furnished with them (Pl. XXIV. figs. 2, 3, 4).

This remarkable sponge is in its skeleton-structures exactly like those of a *Verongia*, its siliceous nature constituting the only essential difference. The specimen is undoubtedly by far the most valuable of the two represented in the plate in the 'Transactions of the Linnean Society.' In conclusion, I must return my best thanks to my friend Dr. A. Farre for the repeated opportunities I have had of closely examining its structure.

Purisiphonia, Bowerbank.

Skeleton siliceo-fibrous, reticulate, unsymmetrical; fibres composed of concentric layers of solid silex, with a continuous central canal.

This genus is intermediate in its structure between *Dactylocalyx*, Stutchbury, and *Farrea*, Bowerbank. Like the latter, its fibres are continuously canaliculated; but it has not anything approaching the angulated symmetrical arrangement of its skeleton-fibres; on the contrary, it very closely simulates the mode of the distribution of the fibres that prevail in *Dactylocalyx*. The central canals in the fibres of the species of *Purisiphonia* on which the genus is founded occupy from about one-fifth to one-third of the entire diameter of the fibre; they are straight and uniform in their own diameter, and have little or no enlargements at their junctions with each other. The reticulations of the skeleton are frequently extremely close, so that the areas do not exceed, or sometimes even equal, the diameters of the fibres bounding them.

Purisiphonia Clarkei, Bowerbank.

Sponge fistulous, branching; surface of rigid skeleton even. Oscula simple, dispersed over the inner surface of the fistulæ. Dermal structures unknown. Skeleton stout, closely reticulated. Interstitial cavities furnished with rectangulated hexradiate spicula.

Hab. Wollumbilla, Queensland, Australia (*Dr. Clarke*). Fossil.

There is much greater difficulty in the specific description of a fossil sponge than of a recent one, as a considerable portion of the most decisive specific characters are usually absent, in consequence of the decomposition of the softer parts of the organization previously to fossilization; and this is doubtless the case with the specimen under consideration; but although thus deprived of the use of many valuable descriptive characters, there are sufficient remaining to enable us to securely determine its specific identity.

It is difficult to say what has been the correct form of the specimen in its unmutilated state; but, judging by its present condition, it has originally been a large fistulous sponge, giving off fistular branches at irregular intervals. The large fistular body of the sponge has been split longitudinally, and a portion 4 inches in length, and of about half of the tube of the sponge, remains, and from the

surface of this the entire basal portions of two secondary fistular branches proceed. There are also the remains of another such branch at the margin of the primary fistula at the right-hand side. The outer surface of the sponge has an irregular reticulation of stout siliceous fibres, very similar to those of *Dactylocalyx* immediately beneath the dermis.

In all the recent species of this tribe of siliceo-fibrous sponges with which I am acquainted, there is an expansile dermal system attached to the stiff non-expansile skeleton beneath by connecting spicula cemented at their basal points more or less to the mass of the skeleton beneath by keratode only, and which would naturally be separated from the body of the sponge by maceration and by decomposition of the membranous and keratose matter a short period after its death; and none of the expansile dermal system, it is probable, would appear with the fossil unless it were to be enveloped and fixed in the matrix after its death—a result scarcely to be expected. This organized envelope usually affords the most distinct and determinative specific characters of the sponge, and it was very important to discover its remains if possible; but in this attempt I have been unsuccessful.

In its living condition this sponge would probably exhibit a smooth membranous surface; but in its present state we have large open areas exhibited *in lieu* of the smooth dermal membrane. These areas are, in fact, the distal ends of the intermarginal cavities, and are usually much larger than the interstitial spaces immediately beneath them. In the specimen under consideration, as in similarly organized recent sponges, the proximal terminations of the intermarginal cavities communicate immediately with the distal ends of the interstitial spaces, and these uniting increase in their size as they progress towards the inner parietes of the great cloacal cavity of the sponge, into which they finally discharge their streams through the oscula. In this organization they closely resemble the structures in the recent genera *Grantia*, *Verongia*, and many of the fistular keratose sponges of the West-Indian seas.

I have not detected any connecting spicula, and I have assigned the rectangulated hexradiate ones to the interstitial cavities on the faith of some very dilapidated remains of them, deeply immersed in the tissues, and rendered visible only by the penetrating power of the Lieberkühn—and by two other fragments, one detached, represented in Plate XXV. fig. 7, and the other *in situ*, in the portion of the skeleton figured at *a*, fig. 6, Plate XXV.

The nearest relations to this tribe of sponges among the fossil ones are decidedly the siliceo-fibrous sponges of the Flamborough Chalk; below that formation I am not aware of any such sponges having ever been found. The matrix of the Australian fossil also possesses much of the character of chalk; it dissolves completely in dilute hydrochloric acid, leaving only a small quantity of sandy residuum.

I may also observe that the similarity of form and structure between the Australian and the English Chalk fossil sponges in this

case is by no means a new fact, as there are abundant instances of similar close alliances existing among the recent Australian sponges and those of the chalk formation of England; and amongst the most prominent are the existing representatives of *Choanites* and *Ventriculites*.

Alcyoncellum speciosum, Quoy et Gaimard.

Euplectella aspergillum, Owen, Trans. Zool. Soc. iii. p. 203.
Euplectella cucumer, Owen, Trans. Linn. Soc. xxii. p. 117, pl. 21.

Sponge sessile, cylindrical, more or less curved, enlarging progressively from the basal to the distal extremity; upper portion furnished with numerous sharp ridges of interlacing fibres disposed diagonally and somewhat symmetrically; apex truncate, closed by a coarse, ventricose, fibrous network, and encircled by a strongly produced fibrous ridge or frill. Base furnished with numerous fasciculi of large and long prehensile spicula projected downward; spicula attenuato-quaternate, barbed alternately for about one-third of their length from the distal extremity. Oscula congregated, terminal. Pores congregated; inhalant apertures symmetrically equidistant, disposed in lines radiating from the base to the apex of the sponge. Dermal membrane abundantly spiculous; spicula acerate, long and slender, fasciculated; fasciculi compact, disposed in radiating or parallel groups. Skeleton symmetrical: primary lines radiating from the base to the apex, equidistant; secondary lines at right angles to the primary ones; interstitial structures interlacing diagonally. Spicula of the membranes—interstitial spicula rectangulated attenuated hexradiate, short and stout, rarely completely developed; also attenuated rectangulated triradiate apically spined. Spicula of the sarcode trifurcated attenuato-hexradiate stellate, and floricomo-hexradiate, very minute.

Colour amber-yellow?

Hab. Philippine Islands; Island of Bohol, 10 fathoms (*Mr. Hugh Cuming*); Island of Zebu, about 24 fathoms (*Mr. R. Geale*).

Examined in the skeleton-state.

There are several indications of a close alliance between *Alcyoncellum* and *Dactylocalyx*, *Iphiteon*, and the other genera of well developed siliceo-fibrous sponges.

The structure of the skeleton-fibres and their habit of anastomosing whenever they touch each other are precisely the same as they are in the genera I have named. The floricomo-hexradiate stellate retentive spicula of *Alcyoncellum*, Plate XXIV. fig. 11, and the beautiful spinulo-multifurcate hexradiate spicula of *Iphiteon callocyathes*, Plate XXIII. fig. 7, are so peculiar in their forms, and so similar in the mode of their construction and relative positions in the two sponges, as to at once lead us to the conclusion that the two species are in very close alliance with each other. A similar close alliance is indicated by the comparison of the slender attenuated rectangulated-hexradiate interstitial spicula of *Alcyoncellum* (Pl. XXIV. fig. 9) and those of *Iphiteon callocyathes* represented Plate XXIII.

fig. 5. These strongly marked points of resemblance in form and identity in relative situation and office between the auxiliary spicula, in addition to those of the skeleton, irresistibly lead us to the conclusion that these sponges, however different in their forms, are structurally members of the same family. Strongly marked differences in form are apt to lead our judgments astray when superficial observations only are made of the specimens before us; but when we see such extraordinary variations of form occurring in the same species under different circumstances and amounts of development as those we observe in sponges with the habits of which we are perfectly familiar, as, for instance, in our protean species *Halichondria panicea*, we should be prepared to admit, as in truth we ultimately must do, the same latitude of variation among the nearly allied species and individuals of the same species of the siliceo-fibrous sponges.

In all the numerous specimens of *Alcyoncellum* with which I am acquainted, the skeleton is composed of rigid inosculating siliceous fibre, as I have stated in my paper on *Alcyoncellum speciosum*, Proc. Zool. Soc. 1867, p. 351, in my description of the generic character in p. 353, in the following terms:—"Skeleton siliceo-fibrous; primary lines radiating from the base in parallel, straight, or slightly spiral lines; secondary lines at right angles to the primary ones." I will not reiterate here the full details of the structure of these beautiful sponges that I have given in my paper as quoted above; and such a repetition is the more unnecessary as they have been imported so abundantly of late as to place specimens for microscopical examination within the reach of almost every one interested in the subject. The sponges have also been figured in Trans. Zool. Soc. vol. iii., and in Trans. Linn. Soc. London, xxii. pl. 21, and also in the Ann. & Mag. Nat. Hist. for Feb. 1868, pl. iv.; but in none of these plates is there any delineation of the skeleton-structure with a high mieroscopical power, and it is this want that I purpose at the present time to supply, that we may be enabled to arrive at a sound conclusion as regards its true skeleton-structure, and also as to such of its specific characters as have not hitherto been figured or described.

Dr. Gray, in his "Notes on the Arrangement of Sponges," Proc. Zool. Soc. 1867, p. 492, has, at p. 504, described the *Euplectelladæ* (*Alcyoncellum*, Quoy et Gaimard) as having a "skeleton composed of longitudinal, transverse, and oblique bundles of spicules intersecting each other and forming a network;" and Prof. Wyville Thomson, in his paper on the "Vitreous" Sponges, Ann. & Mag. Nat. Hist. for Feb. 1868, p. 114, at p. 126, in his description of his proposed new genus "*Habrodictyon*," has adopted the error into which Dr. Gray has fallen by describing the skeleton as consisting "of a perfectly irregular network of siliceous needles loosely and irregularly arranged in sheaves crossing one another at low angles, and connected by a small quantity of soft mucilaginous sarcode." These descriptions of the skeleton are, in both cases, completely erroneous, as can be readily demonstrated by boiling portions of the

skeleton in nitric acid, when it will be immediately apparent that no disintegration of the reticulated structure results from this operation, which would inevitably be the case if it were formed of fasciculi of spicula held together by sarcode only. On the contrary, the whole of the skeleton is formed of an irregular network of solid siliceous fibres approaching each other and anastomosing with more than the usual frequency in such sponges.

Very few, if any, of the secondary fibres in either the transverse or diagonal portions of the skeleton are simple in their structure. They seem always to be composed of two or more simple fibres running parallel to each other and anastomosing at short distances. Sometimes the anastomosing points of two parallel fibres are so close to each other that the two thus combined have the appearance of a narrow tape or ribbon with thickened margins and a line of nearly uniform pinhole perforations running down the middle of it.

Amidst these complicated anastomosing lines of the skeleton numerous stout rectangulated hexradiate and triradiate spicula are irregularly mixed; they appear as if they were simply entangled amidst the tissues supporting and supported by the interstitial membranes of the sponge. None of them under these circumstances have any permanent connexion with the skeleton; neither do the spicula of the numerous bundles of long prehensile organs so abundant towards the base of the sponge ever anastomose with the skeleton-fibres or with each other. No marks of such an attachment can be detected upon any part of them; and, in truth, their recurved spinous appendages and their long and flexible shafts imbedded in the tough membranous integuments of the dermal tissues renders such anastomsis of the organs with the rigid skeleton quite unnecessary; and if we measure the probability of the possession of such dermal integuments by *Alcyoncellum* in a living state with what we know of the dermal structures of *Dactylocalyx Masoni*, *Prattii*, &c., little doubt can remain in our minds that its dermal integuments are much of the same nature as those of the rest of the rigid siliceo-fibrous sponges. The structure of the stout network of the oscular area is very similar to that of the corresponding organ in *Iphiteon beatrix*. Each fibre of the net is compounded of a condensed mass of simple skeleton-fibres anastomosing in every direction as in that of *I. beatrix*. In truth, the more searchingly we examine the skeleton-structures of the beautiful subject under description the more closely we find its alliances to be to the great family of the siliceo-fibrous sponges.

It is much to be regretted that, amidst the large number of specimens that have recently been imported, there does not appear to have been any one of them preserved in the living state as when taken from the sea; nor have we any well authenticated report by a competent naturalist of their condition when thus obtained. But if we may reason from the analogies presented by other siliceo-fibrous sponges preserved in the state in which they were taken from the sea, we should expect to find *Alcyoncellum* with a stout and somewhat coriaceous enveloping dermal membrane; and I have in my possession a fragment of such a membrane about 2 lines in length,

and ½ in breadth, which was shaken off a specimen of *A. speciosum* that I purchased of Mr. Geale in January 1867.

This fragment of membranous tissue is, comparatively speaking, of considerable thickness, and abounds in amber-coloured sarcode, and there appear to be two well-defined layers of tissue. In the external one there are numerous fasciculi of long slender acerate spicula, the number in each being much too numerous to be counted, and they are very compactly disposed. In one part of the surface the fasciculi radiate from a common basal point, while in two other parts they are nearly parallel to each other. On reversing the specimen the internal layer presented a rudely cellulated appearance, abounding in sarcode, in which two of the most characteristic auxiliary spicula of *Alcyoncellum* were deeply imbedded—one of them, an incompletely developed stout rectangulated hexradiate interstitial spiculum, exactly represented by fig. 181, plate 7, Mon. Brit. Spongiadæ, vol. i., and the other a rectangulated hexradiate one, represented by fig. 198, plate 9, of the same work; and there is also a slender rectangulated hexradiate spiculum, like the one represented by fig. 10, Plate XXIV., illustrating the present paper. With these indications, I think there is little doubt that the structure I have described is a portion of the dermal system of *Alcyoncellum*, and that, when we obtain a specimen in the condition in which it is taken from the sea in the living state, we shall find the beautiful skeleton entirely enveloped by such a dermal membrane as I have described from the fragment in my possession.

Should these ideas prove correct, a slight addition would become necessary in my description of the specific characters of *Alcyoncellum speciosum* in the Proc. Zool. Soc. for March 28, 1867, p. 354, line 12 of the specific character, where the dermal membrane is described as "unknown," in place of which should be added, "Dermal membrane abundantly spiculous; spicula acerate, long and slender, fasciculated; fasciculi compact, disposed in radiating or parallel groups."

In this description of the dermal structure of the sponge, it will be observed that there are no connecting spicula present; and we may therefore infer that the genus *Alcyoncellum* is not furnished with an expansile dermal system as in the massive rigid skeletons of *Dactylocalyx* and other similar siliceo-fibrous sponges. The fistular construction of the skeleton in *Alcyoncellum* renders such a provision as an expansile dermal system quite as unnecessary as it would be in the genus *Grantia* and numerous other fistulous sponges.

I obtained also two fragments of the skeleton in which there was a considerable quantity of sarcode; and immersed in this substance numerous rectangulated triradiate and rectangulated hexradiate spicula of the slender descriptions were intermixed without any apparent arrangement. Every one of the interstices of the fibrous skeleton, large or small, was abundantly supplied with them. The well-washed specimens of the sponge now so numerous afford no adequate idea of the profusion of these descriptions of spicula that exist in the sponge in its natural condition.

There were also numerous indications of the presence of floricomo-

hexradiate stellate spicula amidst the sarcode; but the density of that substance rendered them almost invisible.

In some of the specimens that I have recently examined, I have observed a remarkable habit of some of the rectangulated hexradiate spicula—that is, that one of the axial radii is more or less sheathed or enveloped by branches of skeleton-fibre, so as to give the spiculum a firm and permanent position; and this appears to be more frequently the case with those which are projected into the inhalant areas. This attachment of the spiculum by the fibre is not a fusing of one into the other, as when two fibres touch each other, but it is simply a partial envelopment of a portion of one of the radii, so as to give it a secure basal point of attachment to enable it to perform its appointed office of sustaining the interstitial membranes of the sponge under peculiar circumstances, or to protect the orifice over which it is projected. The portion of the ray thus enveloped may frequently be traced within the enveloping fibre. It is a very remarkable fact that none of the other auxiliary spicula, although large and strong, are ever seen to be thus agglutinated by the fibres. This singular habit of the rectangulated triradiate spicula assimilates them in their office in some measure to the auxiliary fibres in the skeletons of *Dactylocalyx* and *Iphiteon*. Although thus agglutinated by the fibre, they really form no essential part of the true rigid skeleton of the sponge, but are in reality neither more nor less than auxiliary supports to the interstitial membranes under certain conditions.

APPENDIX (May 25, 1869).

Since the preceding portion of this paper was written, I have seen several specimens of *Alcyoncellum speciosum* that were sent home in spirit in the condition they were in when taken from the sea. There were five specimens, all as nearly as possible in the same condition. They were of a dark dirty colour, and looked very much as if they had been dipped into thin mud and then dried. On mounting slices from the surface, and fragments of the entire structure of the skeleton, this dirty-looking substance, when immersed in Canada balsam, proved to be the remains of the membranous and sarcodous tissues; but I could not find any traces of a dermal membrane, such as might naturally be expected to be present if the sponges were in a living condition when taken from the sea. The largest specimen in spirit had a considerable portion of one side of it entirely deficient of the sarcodous and membranous structures that were abundant in the other parts of the specimen. This circumstance, the deficiency of dermal membrane, and the condition of the sarcode and interstitial membranes in the whole of the specimens, appears to lead to the conclusion that these specimens were dead sponges in a state of partial decomposition, and that we have yet to acquire specimens which were in the living state when brought up from the bottom of the sea.

Although not in so satisfactory a condition as may have been desired, they were still in such a state of preservation as to afford some interesting points of information regarding the structural pecu-

liarities of the animal. Thus the true natural positions and mode of arrangement of the stout attenuated rectangulated hexradiate spicula, the full series of the varieties of which are figured in the 'Philosophical Transactions,' 1858, plate 25. figs. 24–33, and in Mon. Brit. Sponges, vol. i. plate 7. figs. 174–183, are well exhibited *in situ*, which I have never yet seen in any of the well-washed specimens with which we are now so familiar. In the large lateral orifices of such specimens they are sometimes entirely wanting, or a few only of them are found in the neighbourhood of the large circular area. In the specimens in which they are held in their natural positions by the sarcodous and membranous tissues, they are regularly disposed around the circular area, forming a compact marginal ring, their stout radii projecting in every direction among the surrounding portions of the skeleton, but not within the circular area; so that where one of the radii would, by the natural laws of development, have been found, its production is arrested, and it is represented by only a slight tumefaction on the axis of the spiculum; hence it is that we find such numerous varieties of form among these remarkable spicula. All the other radii immersed in the surrounding structures are completely developed, crossing each other in every direction; so that although unconnected by siliceous cementation with the fibrous skeleton, they form a strong but somewhat expansile marginal band to the circular area. We are thus enabled to perceive the reason of the numerous cases of the suppression of frequently several of the radii of these marginal spicula, and to read the important fact from their positions and modifications that their production is as much regulated and modified by the structural necessities of the organs in which they form important parts, as are the bones and other organic structures of the most highly constituted animals.

The true positions of the slender rectangulated hexradiate spicula with elongated basal axial rays are also well determined in these specimens; they are seen in considerable numbers in the interstitial cavities of the sponge, supporting the interstitial membranes, and vastly increasing the amount of surface in those vital organs.

The trifurcated attenuato-hexradiate and floricomo-hexradiate spicula are not very numerous; they are irregularly dispersed on the sarcodous membranes of the sponge, and are completely immersed in the sarcode, and without the aid of Canada balsam are usually invisible.

DESCRIPTION OF THE PLATES.

PLATE XXI.

Fig. 1. A portion of the rigid skeleton of *Iphiteon panicea* from the specimen from Porto-Rico, in the Museum of the Jardin des Plantes, Paris, exhibiting the confluent structure of the rotulate areas of the skeleton, rectangulate hexradiate spicula, and a few gemmules *in situ*, ×108 linear.

Fig. 2. A section at right angles to the surface of *Iphiteon beatrix*, exhibiting the confluent rotulate structure of the rigid skeleton, the fasciculi of acerate spicula, and the verticillately spinous retentive spicula *in situ*, ×108 linear.

Fig. 3. One of the inhalant areas on the external surface of the rigid skeleton of *I. beatrix*, exhibiting the elongo-conical defensive fibres and numerous verticillately spined retentive spicula *in situ*, ×108 linear.

Fig. 4. One of the large excurrent orifices on the side of the great cloacal cavity within the sponge of *I. beatrix*, ×108 linear.

Plate XXII.

Fig. 1. A small portion of the rigid skeleton of *Iphiteon panicea* from Porto Rico, exhibiting the abundance of the gemmules in some parts of the sponge, ×108 linear.

Fig. 2. A portion of one of the fibres forming the oscular area of *Iphiteon beatrix*, exhibiting the compound reticulate nature of its structure and a few of the slender acerate spicula *in situ*, ×108 linear.

Fig. 3. One of the attenuated rectangulated hexradiate interstitial spicula with one of the shaft-radii spinous, from *I. beatrix*, ×308 linear.

Fig. 4. A retentive verticillately spined spiculum from *I. beatrix*, ×308 linear.

Figs. 5, 6, 7, 8. Four of the porrecto-multiradiate retentive spicula from *I. beatrix*, ×308 linear.

Fig. 9. One of the subfusiformi-cylindrical entirely spinous spicula from *I. beatrix*, ×108 linear.

Fig. 10. A portion of the surface of the rigid skeleton of *Iphiteon subglobosa*, exhibiting the umbonal clusters of coarse tubercles, rectangulated hexradiate interstitial spicula *in situ*, and numerous spinulo-quadrifurcate and pentafurcate hexradiate stellate retentive spicula dispersed amidst the interstices of the skeleton, ×108 linear.

Fig. 11. One of the minute spiculated biternate retentive spicula of the dermal membrane of *I. subglobosa*, ×666 linear.

Fig. 12. Two of the rectangulated hexradiate auxiliary fibres from *I. subglobosa*, based on a portion of a fibre of the rigid skeleton, anastomosing by their radii, ×175 linear.

Fig. 13. One of the pentafurcate hexradiate stellate retentive spicula of *I. subglobosa*, ×666 linear.

Plate XXIII.

Fig. 1. A small portion of the surface of the rigid skeleton of *Iphiteon Ingalli*, exhibiting its confluent rotulate structure with quadrifurcate hexradiate stellate spicula amidst the fibres opposite *a*, *a*, *a*, *a*, ×108 linear.

Fig. 2. One of the quadrifurcate hexradiate stellate retentive spicula of *I. Ingalli*; three of the primary radii having been broken off, the quadrifurcate structure of the remaining radii is very distinctly displayed: ×530 linear.

Fig. 3. One of the rectangulated hexradiate interstitial spicula of *I. Ingalli*, ×108 linear.

Fig. 4. A small portion of the surface of the rigid skeleton of *I. callocyathes*, exhibiting the more or less verticillate disposition of the minute spines of the skeleton-fibre, ×108 linear.

Fig. 5. One of the rectangulated hexradiate interstitial spicula of *I. callocyathes*, ×175 linear.

Fig. 6. A furcated foliato-expando ternate connecting spiculum of *I. callocyathes*, covered by the minute, short, stout acerate tension-spicula of the dermal membrane, ×183 linear.

Fig. 7. A very perfect and beautiful example of a spinulo-multifurcate hexradiate stellate retentive spiculum of *I. callocyathes*, ×666 linear.

Fig. 8. A view of portions of two of the intervening planes of perforated siliceous tissue parallel with the external surface of the rigid skeleton, and which divide the layers of crypt-like tissue of the skeleton of *Myliusia Grayii* from each other, with their numerous circular orifices of intercommunication between the upper and lower strata of the skeleton, ×108 linear.

PLATE XXIV.

Fig. 1. A small portion of the rigid skeleton of *Farrea occa*, exhibiting its angulated structure and central canals in the fibres, on which are dispersed numerous small attenuate-stellate retentive spicula, ×108 linear.
Figs. 2, 3, & 4. Three of the small attenuato-stellate retentive spicula from *F. occa*, showing some of their numerous variations in form, size, and the number of their radii, figs. 2 & 3 ×400, & fig. 4 ×666 linear.
Fig. 5. A spiculated biternate interstitial spiculum from *F. occa*, ×45 linear.
Fig. 6. A furcated spiculated biternate interstitial spiculum from *F. occa*, ×65 linear.
Fig. 7. A portion of the harrow-shaped quadrilateral siliceo-fibrous dermal structure of *F. occa* oppositely armed at its angles, ×50 linear.
Fig. 8. A fragment of the siliceo-fibrous skeleton of *Alcyoncellum speciosum*.
Fig. 9. A slender attenuated rectangulated hexradiate interstitial spiculum with nearly equal radii from *A. speciosum*, ×175 linear.
Fig. 10. A slender attenuated rectangulated hexradiated interstitial spiculum with elongated basal shaft from *A. speciosum*, ×108 linear.
Fig. 11. A very fine specimen of floricomo-hexradiate stellate retentive spiculum from *A. speciosum*, ×666 linear.

PLATE XXV.

Fig. 1. A portion of a section of the rigid skeleton of *Myliusia Grayii*, at right angles to the surface, exhibiting the crypt-like arrangement of the skeleton, ×108 linear.
Fig. 2. A section at right angles to the surface of the skeleton of *Kaliapsis cidaris*, from the surface to the basal prehensile organs, exhibiting the change of the structure from the basal canaliculated fibres to the imperforate and ramifying ones of the superior mass of the skeleton, ×183 linear.
Fig. 3. A portion of the minute ramifications of the fibrous structure of the surface of the rigid skeleton of *K. cidaris*, ×308 linear.
Fig. 4. Three of the foliato-peltate connecting spicula of the expansile dermal system of *K. cidaris*, one of them (*a*) having upon it a group of minute incipiently spinous fusiformi-cylindrical spicula, ×175 linear.
Fig. 5. Two of the minute incipiently spinous fusiformi-cylindrical spicula of the dermal membrane of *K. cidaris*, ×666 linear.
Fig. 6. A portion of the rigid skeleton of *Purisiphonia Clarkei*, exhibiting the irregular mode of disposition of the canaliculated siliceo-fibrous structure, and one of the rectangulated hexradiate interstitial spicula *in situ*, opposite (*a*), ×108 linear.
Fig. 7. An imperfect rectangulated hexradiate interstitial spiculum from *P. Clarkei*, ×175 linear.

7. On the Genus *Alcyone*.

By R. B. SHARPE.

I propose to give short synopses of some of the more obscure genera of the family *Alcedinidæ*, in order that the various species, before appearing in my 'Monograph,' may be brought under the notice of ornithologists, and thus my arrangements and synonymy may be fairly exposed to criticism. It is my wish to make the Monograph of the Kingfishers as complete as possible; and I therefore invite the criticisms of all my friends, in order that I may be able to take advantage of them in my larger work.