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## Annals and Magazine of Natural History: Series 4

Publication details, including instructions  
for authors and subscription information:

<http://www.tandfonline.com/loi/tnah10>

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sea sponges and their  
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Published online: 13 Oct 2009.

To cite this article: H.J. Carter F.R.S. (1874) XXXI.—Descriptions and figures of deep-sea sponges and their spicules from the Atlantic Ocean, dredged up on board H.M.S. 'Porcupine', chiefly in 1869; with figures and descriptions of some remarkable spicules from the Agulhas Shoal and Colon, Panama, *Annals and Magazine of Natural History: Series 4*, 14:82, 245-257, DOI: [10.1080/00222937408680964](https://doi.org/10.1080/00222937408680964)

To link to this article: <http://dx.doi.org/10.1080/00222937408680964>

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XXXI.—*Descriptions and Figures of Deep-sea Sponges and their Spicules from the Atlantic Ocean, dredged up on board H.M.S. 'Porcupine,' chiefly in 1869; with Figures and Descriptions of some remarkable Spicules from the Agulhas Shoal and Colon, Panama.* By H. J. CARTER, F.R.S. &c.

[Concluded from p. 221.]

*Halichondria abyssi*, n. sp. Pl. XIV. figs. 26–28, and Pl. XV. fig. 40, *a, b, c*.

General form unknown. Sessile, spreading horizontally. Colour grey or brown. Internal structure massive, consisting of an areolar skeleton formed of polygonally arranged bundles of spicules covered with sarcode (Pl. XIV. fig. 26). Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicules of three forms, viz.:—the longest, smooth, curved, fusiform acerate, fine-pointed, average largest size 45 by  $\frac{2}{3}$ -1800th inch in its greatest diameters (Pl. XV. fig. 40, *a*); shorter spicule, stout, smooth, acuate, curved, rather abruptly pointed, averaging in its largest size 35 by 1-1800th inch in its greatest diameters (fig. 40, *b*); smallest form smooth, curved, fusiform, inflated equally at each extremity, average largest size 22 by  $\frac{1}{2}$ -1800th inch in its greatest diameters (fig. 40, *c*). Flesh-spicules of two forms, viz. equianchorate and tricurvate. Equianchorate (Pl. XIV. fig. 27, *a, b*): shaft round, much curved, almost bent, expanded but not alate at the ends, where the expansion extends into a claw- or clam-shaped umbrella-like head, composed of six linear recurved arms webbed together nearly to the extremities; average largest size 16 by 3-6000ths inch in its greatest diameters, viz. length of shaft and width of head respectively. Tricurvate (fig. 28) stout, 18 by 1-6000th inch in its greatest diameters. Size of entire fragments each about  $\frac{1}{2}$  inch in diameter and 1-12th inch thick.

*Hab.* Deep sea, on deciduous shells.

*Loc.* Atlantic Ocean. Between the north coast of Scotland and the Faroe Islands.

*Obs.* The jars containing these two fragments respectively bear the No. "65," which station gives a depth of 345 fathoms. That in the smaller jar is of the least consequence, being a mere unconnected formless fragment of a brown colour; while the other (which is figured) has grown over the concavity of a small ostraceous bivalve shell (fig. 26, *b*), and is of a lighter colour, but at once reveals the structure and habitat of the sponge, although, from being only a fragment

with none of the surface left, it fails to afford its general form. The unconnected brown fragment is in company with specimens of *Tisiphonia agariciformis* only; while that on the shell has with it *Tisiphonia*, *Hymedesmia Johnstoni*, Bk., *Hymedesmia verticillata*, Bk., and *Desmacella pumilio*, Sdt., also a branched Suberite with pin-like spicule only, *Tethya cranium*, and *Halichondria ventilabrum*.

In the brown fragment there is *no tricurvate* (fig. 28); but it is abundant in the fragment growing over the shell. I also observe that, in the figure of *Hymedesmia Johnstoni* given by Dr. Bowerbank (B. S. vol. i. pl. 18. fig. 293) from a Madeira specimen, there is *no tricurvate*, while the tricurvate is a prominent object in a specimen of the same sponge from Madeira in the British Museum. Still as it was the habit of *Halichondria abyssii* to take in grains of sand and foreign spicules into its structure, I am still doubtful, as the tricurvate is not in both specimens, whether it also may not have belonged to a different sponge.

Thus we have here another or third sponge whose anchorates have the clam-shaped or umbrella-like ends similar to those of *Cladorhiza* and *Chondrocladia*, while there are three forms of skeleton-spicules instead of one, hence resembling, but for the absence of spines, some of the varieties of *Halichondria incrustans*; so that, unless these clam-shaped ends are to be considered the chief grouping characters, the presence of the three forms of skeleton-spicule, together with the massive areolar structure, the sessile incrusting habit, and the "crumb-of-bread"-like structural appearance of this sponge, must ally it more to *H. incrustans* than to *Cladorhiza* or *Chondrocladia*, where the general form is branched stem-like, and there is only one form of spicule, like that of *Esperia*.

Lastly, I would observe that there is in both specimens a minute equianchorate spicule (fig. 27, c), about 4-6000ths inch long, in great abundance, which, although with straight shaft and anchor-like head, seems to me to be no more than the embryonic form of the great equianchorate flesh-spicule with bent shaft and deeply dentate clam-shaped heads.

*Halichondria forcipis*, Bk. Pl. XIV. figs. 29-32, and  
Pl. XV. fig. 41, a, b.

General form massive, lobed, sessile, stiff, areolar, like "crumb of bread." Sessile. Colour light grey (Pl. XIV. fig. 29). Surface irregularly areolar, owing to the form of the subjacent skeleton-structure; covered with a dermal sarcode, which, adhering to the projecting points of the former, pre-

sents a cribriform structure over the rounded cavities beneath (fig. 29, *a*). Pores making up the cribriform area just mentioned (fig. 29, *a*). Vents scattered. Internal structure becoming cavernous towards the base (fig. 30), charged with the spicules of the species, and permeated by the excretory canals, of which the dilated cavernous structure is chiefly composed. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicules of two forms, viz.:—1st, the largest, smooth, stout, slightly curved, acuminate, rather abruptly pointed, average largest size 40 by  $1\frac{1}{3}$ -1800th inch in its greatest diameters (Pl. XV. fig. 41, *b*); 2nd, smooth, nearly straight, slightly fusiform, constricted and slightly inflated at the extremities, average largest size 20 by  $\frac{1}{3}$ -1800th in its greatest dimensions (fig. 41, *a*). Flesh-spicules of two forms, viz. tricurvate and equianchorate. Tricurvate long, bent upon itself so as to assume the form of a pair of forceps (Pl. XIV. fig. 32, *a*) (whence its designation): arms separate at the point of bending (which is round), but in contact a little further on, and then spreading out again for a short distance towards their terminations, which are *unequal*, one arm being a little longer than the other; arms incipiently spined throughout, spines recurved or inclined *towards* the bend on each arm, becoming almost obsolete at the bend itself; extremities much attenuated and finely pointed; average largest size 30 by  $\frac{1}{2}$ -1800th of an inch in its greatest diameters. Equianchorate (fig. 31, *a, b*) stout, consisting of a curved shaft and three linear arms at each end; the tubercle evident, and the falces respectively extending to about half the length of the arm; average largest size 13 by 4-6000ths of an inch in its greatest diameters, viz. the length of the shaft and width of the head respectively. Size of entire specimen  $1\frac{3}{4}$  long,  $1\frac{1}{2}$  wide, and  $\frac{1}{2}$  inch high or thick, vertically.

*Hab.* Deep sea.

*Loc.* Atlantic Ocean. Between the north of Scotland and the Faroe Islands.

*Obs.* This specimen is alone in a jar with the No. "54" on it, which gives a depth of 363 fathoms. It has already been described among the British sponges by Dr. Bowerbank under the name above given (vol. ii. p. 244), but *not* illustrated. The "bidentate spicules" mentioned by Dr. Bowerbank appear to me to be merely early forms of the equianchorate, and the "minute bihamates" embryonic forms of the tricurvate or large forcipiform spicules, which, in the deep-sea specimen are not more than 2-1800ths inch long, very faintly displayed, very abundant, and with arms in *all* of *unequal* length, the short one being not more than one third of the

length of the other (Pl. XIV. fig. 32, *b*) ; so that this, being a constant occurrence and making its appearance in the embryonic form, must be considered a normal condition of the spicule. Dr. Bowerbank's specimen was dredged up "at Shetland."

In *Esperia cupressiformis* there is a very minute form of the same kind of tricurvate (Pl. XIV. fig. 18), but with a bulbous inflation at the extremity of each arm and other differences which will be learnt by reference to its description. I have also just found a minute sponge on the "rocks" here (Buddleigh-Salterton), not more than 2 lines long, containing a similar spicule, but without bulbous ends, hairpin-like. It is *very* minute, not being more than 2-6000ths inch long, but in company with the same kind of equianchorate and double form of skeleton-spicule as those in *Halichondria forcipis*, though not the same species.

All, however, are eclipsed by the beautiful form which I have figured of a much stouter forcipiform spicule that came from an arenaceous deposit in the neighbourhood of Colon or Aspinwall, Panama, five specimens of which, having been mounted, were sent to me by Mr. F. Kitton of Norwich. Here the arms in all are *equal* in length and the extremities abruptly pointed, indeed, may be termed conical ; this, together with the great development of the spines, points out a different species from that of *Halichondria forcipis*, for which I propose the name of *Forcepia colonensis* (Pl. XV. fig. 47). Size of specimens 19 by  $\frac{3}{4}$ -1800th inch in its greatest diameters ; width of bend 2-1800ths inch, distance of ends 3-1800ths inch. In Schmidt's *Suberites arciger*, from the coast of Greenland (Atlantisch. Spongienfaun. p. 47, Taf. v. fig. 6), we appear to have another example of this form of spicule, in which the body is smooth and the ends, which are strongly though scantily spined, so far separated from each other that the spicule forms two sides of an almost equilateral triangle, the distance between the free ends being about 53-6000ths inch. This, too, Schmidt calls a tricurvate (*Bogen*).

The forceps-form of the tricurvate spicule in *Halichondria forcipis* is therefore not confined to this sponge, or kind of sponge, since it appears, as before stated, in *Esperia cupressiformis*, in the Buddleigh-Salterton specimen, in *Suberites arciger* (if I am right in identifying the tricurvate in Schmidt's sponge with it), as well as free in this arenaceous deposit about Colon. At the same time it should be remembered that this spicule is subject to great variety in form, since I have lately found it here (in a new species of *Esperia*) straight (that is,

without any bend), and even longer than the skeleton-spicule of the species; while throughout it was enclosed by a delicate nucleated mother-cell, shaped like a bolster.

The mounted specimen of *Suberites arciger* which Schmidt sent to the British Museum, besides the tricurvate, presents the true pin-like skeleton-spicule of a Suberite.

In *Halichondria forcipis* both the skeleton-spicules and equianchorates are very much allied, in general form, to those of *Halichondria incrustans*; but in place of the bihamate of the latter we have the forcipiform tricurvate in the former, while the "crumb-of-bread"-like appearance of the structure, in the general form, is very much like that of *Halichondria incrustans*, which used to be designated "*H. panicea*."

*Cliona abyssorum*, n. sp. Pl. XIV. fig. 33, and  
Pl. XV. fig. 45, *a*, *b*, *c*.

Sponge retiform, permeating the branches of *Lophohelia prolifera*, and appearing here and there in small heads through corresponding holes in this coral. Pores and vents respectively in these heads. Internal structure areolar, charged with the spicules of the species, and permeated by the excretory system, which is more areolar than tubular. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicules of two forms, viz. :—1st, the largest, smooth, pin-like, fusiform, curved, fine-pointed, chiefly confined to the "heads," average largest size 57 by  $\frac{2}{3}$ -1800th inch in its greatest diameters, head oval and as wide as the shaft (Pl. XV. fig. 45, *a*); 2nd, the small skeleton-spicule, smooth, curved, fusiform, acerate, fine-pointed, chiefly confined to the body, average largest size 25 by  $\frac{2}{3}$ -1800th inch in its greatest diameters (fig. 45, *b*). Flesh-spicule of one form only (fig. 45, *c*), smooth, spiral, sinuous, straight, abruptly terminated at each end, and presenting four bends on each side in its course, densely charging the sarcode throughout; average largest size 20 by 1-6000th inch in its greatest diameters. Size of entire specimen undefinable from its fungus-like permeating growth.

*Hab.* Deep sea, permeating the branches of *Lophohelia prolifera*.

*Loc.* Atlantic Ocean, "chops" of English Channel.

*Obs.* The specimen of *Lophohelia prolifera* in which this sponge was found is partly enveloped in *Corticium abyssi*, which having already been figured and described in the 'Annals' of 1873 (vol. xii. p. 17, pl. i. figs. 1 & 2), I must refer the reader to that for all particulars concerning this part of its history, merely observing that it was dredged up from a

depth of 500 fathoms at the entrance of the English Channel.

The sponge itself, being very minute, while its concealment, according to the habit of the so-called "boring sponges," being, with the exception of the small apertures through which the heads respectively are protruded, completely within the branches of the coral, it is impossible without breaking up the *Lophohelia* to ascertain its exact form, though this may be anticipated from our acquaintance with that of *Cliona coral-linoides*, so common on the British coasts ('Annals,' vol. viii. 1871, p. 14, pl. ii. figs. 33-37), since all these "boring sponges" have the same kind of half-reticulated, half-lobulated form in the interior of the bodies which they inhabit.

This species, however, is especially beautiful on account of the dense mass of large, spiral, sinuous spicules (fig. 33) with which the sarcode is charged, presenting, when torn to pieces under the microscope, the appearance of tresses of curled hair. It is figured by Dr. Bowerbank in his B. S. (vol. i. p. 239, pl. iii. fig. 71) as it "occurs in the interstitial membranes of *Geodia carinata*, Bk. MS."!

*Cliona abyssorum* being, according to my arrangement, a Suberite, will come under my fifth group of sponges, viz. RAYNERIÆ.

*Desmacella pumilio*, Schmidt (Atlantisch. Spongienfaun. p. 53, Taf. 5. fig. 14, and mounted specimen in British Museum). Pl. XV. fig. 42, *a, b, c*.

Amorphous fragments of this sponge occur about the specimen of *Corticium abyssi* which envelops the *Lophohelia* just mentioned (Annals, l. c.). Its skeleton-spicule is pin-like (fig. 42, *a*); and flesh-spicules a bihamate (fig. 42, *c*) and a very much flattened tricurvate (fig. 42, *b*), which latter, however, does not appear in Schmidt's illustrations of this sponge. But as yet I do not know what value to attach to these flesh-spicules in many instances as special characteristics. At the Cape of Good Hope (Natal) the same kind of small equi-anchorate navicular form is present in several sponges, many of which are even more than generically different.

In my arrangement *Desmacella pumilio* would come among the Suberites in my 5th division, viz. RAYNERIÆ.

*Reniera fibulata*, Schmidt (Spong. adriatisch. Meeres, p. 73, Taf. vii. fig. 9). Pl. XV. fig. 44, *a, b*.

Fragments of this sponge occur about this specimen (in



the same amorphous condition as the preceding one), possessing a smooth, curved, pointed, fusiform, acerate skeleton-spicule (fig. 44, *a*), and a bihamate flesh-spicule (fig. 44, *b*). But I do not see any difference, in this respect, between Schmidt's *Reniera fibulata* (*l. c.*) and his *R. bullata* from the coast of Portugal (British Museum, mounted specimen; and Atlantisch. Spongienf. p. 40). In the mounted specimen at the British Museum, too, of *R. accommodata* from Cette in the south of France (Spong. Küste Algier. p. 30) there are with the same form of skeleton-spicule tricurvates as well as bihamates. But this is a world-wide sponge, presenting several slight varieties in its spicular complement, yet, I think, only one general form, to which I hope to return for more lengthy consideration on a future occasion, as the subject is thus well worthy of a separate treatise.

*Reniera fibulata* and its like will come into a Group as yet unnamed in my fifth division of sponges, viz. RAYNERIÆ.

*Dictyocylin drus anchorata*, n. sp. Plate XV.  
fig. 43, *a, b, c.*

This is another sponge which, in small amorphous masses, occurs about the *Corticium* just mentioned, and presents three kinds of spicules, viz. a skeleton, an echinating, and a flesh-spicule. Skeleton-spicule stout, smooth, curved, gradually pointed; but the curve sudden and *between the centre and the large end*, which is very characteristic of the sponges bearing this form of spicule; average largest size 60 by 2-1800ths inch in its greatest diameters (fig. 43, *a*). Echinating spicule nearly straight, acuate, or club-shaped and short-spined throughout; average largest size  $3\frac{1}{2}$  by  $\frac{1}{2}$ -1800th of an inch in its greatest diameters (fig. 43, *b*). By the term "echinating" is meant a spicule that has its head fixed in the fibre which sustains the skeleton-spicules, while the rest of its body is free. Flesh-spicule a minute anchorate, of the navicular or weaver's-shuttle-like form, much bent upon itself; average largest size  $1\frac{1}{2}$ -1800th of an inch long (fig. 43, *c*).

This sponge would of course come among my fourth division of sponges, viz. ARMATÆ.

Hence about the specimen of *Corticium abyssi* which envelops the *Lophohelia* (see fig. of spec. Annals, *l. c.*) there are seven kinds of sponges, viz. :—*Farrea occa* and *Aphrocallistes Bocagei*, which grew on the branches of the dead coral; *Cliona abyssorum*, the boring sponge, which inhabited their interior; *Corticium abyssi*, which enveloped the whole; and *Desmacella pumilio*, *Reniera fibulata*, and *Dictyocylin drus*

*anchorata*, which, in amorphous fragments, exist inside the tubes of the *Farrea* and on the surface of the *Corticium* respectively.

Lastly, we come to two beautiful forms of sponge-spicules which were found *free* in an arenaceous deposit of the Agulhas Shoal at the Cape of Good Hope, and in the neighbourhood of Colon, Panama, respectively:—the former dredged up by Dr. G. C. Wallich himself in 1857; and the latter from Colon, together with the forcipiform spicule above mentioned, just mounted and forwarded to me by Mr. F. Kitton, of Norwich.

For the sponge bearing the spicule from the Agulhas Shoal I propose the name of "*Gummina Wallichii*," and for that from Colon "*Corticium Kittonii*."

To some it may seem strange to give a name to a sponge from a single form of spicule; but when it is considered that there is no kind of sponges but the Gummineæ of Schmidt in which such-like spicules are to be found, and that the spicules themselves respectively are sufficiently remarkable to characterize any sponge, the difficulty will probably disappear. Let us now proceed to their description, beginning with

*Gummina Wallichii*, n. sp. Pl. XV. fig. 46, *a, b, c*.

Spicule acerate, curved, fusiform, covered with twelve(?) rows of prominent tubercles, alternately placed in longitudinal lines extending from one end of the spicule to the other (fig. 46, *b*). Tubercle (fig. 46, *c*) consisting of a short cylindrical process somewhat expanded at the base, constricted in the centre, and again slightly expanded at the summit, which is round (fig. 46, *c*). Central canal (fig. 46, *a*) bent angularly in the centre, from which it proceeds towards each extremity in a slightly undulating form, straightening towards the end. Size of specimen 58 by  $4\frac{1}{2}$ -1800ths inch in its greatest diameters.

*Obs.* Of the arenaceous deposit in which this exquisitely beautiful spicule was found, Dr. G. C. Wallich, who kindly sent it to me in February 1871, states, "I have a considerable quantity of a green sand-like deposit which I dredged up in 80 to 100 fathoms water on the Agulhas Shoal so long ago as 1857."

It is interesting to find that the arenaceous deposit from which Mr. Kitton obtained his spicules was of a like nature, inasmuch as, after boiling a portion of it in nitric acid, he states that the casts of the internal cavities of Foraminifera, minute corals, and boring sponges, which were also present, came out of a "dark green colour like the greensand fossils."

It is further interesting to find a figure of this spicule in Dr. Bowerbank's 'British Spongiadæ' (vol. i. p. 270, pl. xi. fig. 244), which is stated to have been "repeatedly found in the matter obtained by washing the roots of *Oculina rosea* and other corals from the South Sea by my friends Messrs. Mathew Marshall, Legg and Ingall; but the sponge from whence it is most probably derived has never yet been determined," &c. With this Dr. Bowerbank gives two other figures of similar kinds of spicules, and considers that they "indicate the existence of a peculiar tribe of sponges with which we are at present entirely unacquainted." That "tribe," as I have above stated, is probably Schmidt's Gummineæ.

*Corticium Kittonii*, n. sp. Pl. XV. fig. 48, *a, b, c*.

Spicule stout, consisting of a short shaft from one end of which 2, 3, or 4 arms spread upwards and outwards *en fleur-de-lis* (fig. 48, *a, b, c*). Arms about twice the length of the shaft, and all parts, with the exception of that about the junction of the arms with the shaft, thickly covered by stout vertical short spines. Size of specimens—total length 19-1800ths inch; shaft 11 by 2-1800ths inch in its greatest diameters.

*Obs.* The arenaceous deposit from which these beautiful spicules were obtained came from the neighbourhood of Colon, Panama, and was sent to Mr. Kitton, of Norwich, chiefly for its richness in Diatomaceæ. They are so exquisitely mounted, and so perfect, that nothing further in this respect could be desired; while they are so characteristically like those of *Corticium abyssi* which I have described and figured in the 'Annals' (vol. xii. July 1873, p. 19, pl. i. figs. 3-5), that I do not think I can be wrong in giving the name above mentioned to the sponge from which these were originally derived.

To the likeness in nature of the arenaceous deposit from which these spicules were obtained to that of the Agulhas Shoal dredged up by Dr. Wallich, and of both to the "greensand" of the Chalk Formation, I have above alluded.

Nor should I omit to add here, respecting the probable existence of the Gummineæ themselves in the "greensand deposit," that the fossil spicules termed "*Monilites*" (Annals, vol. vii. 1871, p. 132, pl. ix. figs. 44-47, now that I am better acquainted with the existing species) seem to me to have belonged to sponges of this kind; while I have lately found acerate and short-shafted, three-armed, *beaded* forms of this spicule in some powder from the interior of a flint from

Warborough, Berkshire, forwarded to me by the Rev. R. St. Patrick, in company with a full spicular complement of the fossil *Geodia* termed (*l. c.*) *Geodites haldonensis*, in great abundance, which appears to have been the specimen in particular enclosed in this flint.

Thus the *Gummina* would seem to have grown about the *Geodia* before the latter became imbedded for fossilization; while it is curious that among the deposits of heterogeneous sponge-spicules in the Upper Greensand of Haldon Hill, I should have happened to select the very spicules for the representative of *Geodites haldonensis* that are, with the exception of those of the supposed *Gummina*, exclusively present in the powder of the Warborough flint.

Thus it would *à priori* appear that, by going to the interior of flints, we may be able to find out the exact spicular complement of each species whose spicules are heterogeneously mixed up in the spiculiferous deposits of the Greensand.

But, on the other hand, the presence of seven existing species together, as found in the deep-sea specimen to which I have above alluded, shows how we may be defeated in this inquiry.

## EXPLANATION OF THE PLATES.

### PLATE XIII.

All the spicules in Plates XIII. and XIV. are flesh-spicules, and, to show their sizes relatively, all, with the exception of fig. 32, *a*, Plate XIV., have been drawn on the scale of 1-12th to 1-6000th inch. Fig. 32, *a* is drawn on the scale of 1-12th to 1-1800th inch.

**Fig. 1.** *Halichondria incrustans*, Bk, equianchorate, three views: *a*, lateral, *b*, anterior, and *c*, posterior views, respectively; *ddd*, shaft; *eee*, anterior arm; *ffff*, lateral arms; *gg*, falx of anterior arm; *hhh*, falces of lateral arms; *ii*, tubercle, here linear.

In this instance the shaft is alate on each side, above and below, as seen in *b* and *c*.

N.B. The anchorate of *Halichondria incrustans* is figured and described in detail especially to enable the reader to comprehend the following forms of this spicule, which are so modified, that they would be almost unintelligible without a key of this kind.

**Fig. 2.** *Guitarra fimbriata*, n. gen. et sp., natural size.

**Fig. 3.** The same, magnified two diameters: *a*, apical vent, surrounded by a fringe of long spicules; *b*, root; *c*, smaller vents on the surface; *d*, portion of surface *en profil*, more magnified to show the structure of its villous surface.

**Fig. 4.** The same, three views of the anchorate: *a*, lateral view, *b*, anterior, and *c*, posterior view (all fringed on their inner aspect); *d*, fringe; *e*, tubercle; *f*, falx.

**Fig. 5.** The same, embryonic form of this anchorate.

- Fig. 6.* *Melonanchora elliptica*, n. gen. et sp., natural size, lateral view: *a a*, tubercular pore-areæ; *b*, small stone in the base.
- Fig. 7.* The same, basal view, natural size: *a*, tubercular pore-areæ; *b*, stone in the base.
- Fig. 8.* The same, tubercular pore-area, much magnified to show its cribriform sarcode, crossed by bundles of the dermal spicules, *a*.
- Fig. 9.* The same, anchorate, nearly fully developed, lateral view. When fully developed the notch in the centre of the inner margin of the arms (*a*) is entirely obliterated, and the arms thus rendered uninterruptedly continuous. All the arms present fine parallel striæ (*b*) perpendicular to the margin.
- Fig. 10.* The same, end view, showing the four melonoid divisions crossing each other at right angles.
- Fig. 11.* The same, earlier stage of development of anchorate when the arms are approaching each other but not united. The dotted lines indicate the direction in which they extend to meet each other so as, with the shaft, to form a melonoid form like figs. 9 & 10.
- Fig. 12.* The same, embryonic form: *a*, lateral; *b*, anterior view.
- Fig. 13.* *Esperia villosa*, n. sp.: *a*, naked fibre spreading below into a root-like form of attachment; *b*, magnified view of dermal sarcode, to show how the projecting tufts of spicules form the villous surface, with the pores intervening; *c*, the same, with the spicules broken off and their ends only showing.
- Fig. 14.* The same, fully developed anchorate, navicular, or weaver's-shuttle-like form: *a*, anterior view; *b*, lateral view; *c*, half-developed form, to show the difference in width of the arms &c.; *d*, embryonic form; *e*, apparent constriction in shaft formed from approximation of lateral arms in fully developed form.
- Fig. 15.* The same, bihamate spicule: *a*, central canal.

## PLATE XIV.

- Fig. 16.* *Esperia cupressiformis*, n. sp., magnified two diameters: *a*, root; *b*, stem; *c*, branches; *d*, upper extremity; *e*, branch, more magnified; *f*, end of same, still more magnified, to show termination of skeleton-spicules covered by sarcode densely charged with the flesh-spicules figs. 17 and 18, the ends of the former of which project; *g*, *Esperia cupressiformis* (variety of), the end magnified, to show *h*, branches of the same, webbed together by dermal sarcode.
- Fig. 17.* The same, flesh-spicule of inequianchorate: *a*, lateral view; *b*, anterior view.
- Fig. 18.* The same, forcipiform flesh-spicule: *a*, enlarged view of bulbous extremity.
- Fig. 19.* *Esperia cupressiformis*, variety of, natural size: *a*, lateral view of head, showing its compressed form and lip-like semi-division, in a line parallel to the compression, also its surface half-covered with projecting bundles of skeleton-spicules; *b*, the same, front view of flat side; *c*, stem and root.
- Fig. 20.* *Chondrocladia virgata*, Wy. Thomson: *a*, lateral view of equianchorate; *b*, anterior view of same; *c*, posterior view of one extremity as seen from behind, to show the form of teeth and head, with the union of the latter through the falx to the alate end of the shaft; *d*, head; *eeee*, alate appendages of the

shaft; *f*, falx or eighth arm of head joining the latter to the shaft.

*Fig. 21.* The same, bihamate flesh-spicule.

*Fig. 22.* *Cladorhiza abyssicola*, Sars, inequianchorate of, to compare with the foregoing: *a*, lateral view; *b*, dorsal view; *c c*, aborted ends; *d*, alate appendages of shaft; *e*, falx.

The other flesh-spicule, viz. the bihamate, being of enormous size, is too large to be here introduced.

*Fig. 23.* *Histoderma appendiculatum*, n. sp., natural size: *a*, body; *b*, tubular appendages; *c*, conical projection at the end.

*Fig. 24.* The same, equianchorate: *a*, lateral view; *b*, anterior view.

*Fig. 25.* The same, bihamate flesh-spicule.

*Fig. 26.* *Halichondria abyssi*, n. sp., natural size, on a deciduous ostraccean shell: *a*, sponge; *b*, shell.

*Fig. 27.* The same, equianchorate: *a*, anterior view; *b*, lateral view; *c*, embryonic form.

N.B. Here there are no alate appendages, but the end of the shaft widens into the umbrella-like head.

*Fig. 28.* The same, tricurvate flesh-spicule, seen in one of the two specimens only.

*Fig. 29.* *Halichondria forcipis*, Bk., upper surface, natural size: *a*, fragment of dermal surface, to show pore-areæ = cribriform sarcode in the interstices of the skeleton-structure.

*Fig. 30.* The same, lower surface, natural size: showing large cancellous structure, and detritus imbedded in the sarcode: *a*, deciduous ostraccean bivalve shell.

*Fig. 31.* The same, equianchorate: *a*, lateral view; *b*, anterior view.

*Fig. 32.* The same, forcipiform spicule incipiently spined: *a*, full-grown form; *b*, embryonic form.

*Fig. 33.* *Cliona abyssorum*, n. sp., spiro-sinuous flesh-spicule.

#### PLATE XV.

All the spicules in this Plate are drawn on the scale of 1-12th to 1-1800th of an inch, with the exception of figs. 42, *a*, 43, *a*, *b*, 44, *a*, and 45, *a*, *b*, *c*, which are all on the scale of 1-24th to 1-1800th inch, and fig. 47, on the scale of 1-12th to 1-6000th inch, to show their relative sizes.

*Fig. 34.* *Guitarra fimbriata*, skeleton-spicule of one form only.

*Fig. 35.* *Melonanchora elliptica*, skeleton-spicules of two forms: *a*, small; *b*, larger form.

*Fig. 36.* *Esperia villosa*, skeleton-spicule of one form only.

*Fig. 37.* *Esperia cupressiformis*, skeleton-spicule of one form only.

*Fig. 38.* *Chondrocladia virgata*, Wy. Thomson, skeleton-spicule of one form only.

*Fig. 39.* *Histoderma appendiculatum*, skeleton-spicules of two forms: *a*, large; *b*, smaller form.

*Fig. 40.* *Halichondria abyssi*, skeleton-spicules of three forms: *a*, long acerate; *b*, shorter and stout acuate; *c*, smallest, with inflated ends.

*Fig. 41.* *Halichondria forcipis*, Bk., skeleton-spicule of two forms: *a*, small; *b*, large.

*Fig. 42.* *Desmacella pumilio*, Schmidt: *a*, skeleton-spicule of one form only; *b* and *c*, flesh-spicules, tricurvate and bihamate respectively.

*Fig. 43.* *Dictyocylindrus anchorata*, n. sp.: *a*, skeleton-spicule of one kind

only; *b*, echinating spicule, spinous; *c*, equianchorate flesh-spicule, navicular, much bent upon itself.

*Fig. 44. Reniera fibulata*, Schmidt: *a*, skeleton-spicule of one kind only; *b*, flesh-spicule, bihamate.

*Fig. 45. Chiona abyssorum*, skeleton-spicules of two forms: *a*, large, pin-like; *b*, smaller, acerate; *c*, flesh-spicule, spiro-sinuous. See more magnified view of the latter in fig. 33, Pl. XIV.

*Fig. 46. Gummina Wallichii*: *a*, central canal; *b*, rows of tubercles; *c*, more magnified view of tubercle.

N.B. In the upper half, for convenience, the tubercles are omitted.

*Fig. 47. Forcepia colonensis*. Scale 1-12th to 1-6000th inch.

N.B. On one side the spines are partly omitted for convenience. This figure is intended for comparison with fig. 32, *a*, Pl. XIV.; but it should be remembered that it is drawn to a much larger scale, not being half so long as fig. 32 in reality, although stouter and more markedly spined.

*Fig. 48. Corticium Kittonii*: *a*, three-branched form; *b*, four-branched (here the spines are again omitted for convenience); *c*, two-branched form.

XXXII.—*Description of a new Species of Lizard of the Genus Celestus*. By A. W. E. O'SHAUGHNESSY, Assistant in the Natural-History Departments of the British Museum.

*Celestus bilobatus*, sp. n.

Body slender, elongate, rounded; limbs short, the anterior not reaching to the eye, the posterior not quite to the middle of the side. Ear very small, almost closed. Head obtuse; muzzle rounded, shorter than the interorbital width of the head. Supranasals two pairs; internasal large, broad; frontal broad, oblong; small interparietal, smaller fronto-parietals, large parietals, and small occipital. A small scale or two scales wedged in between parietals and supraorbitals. Five supra-orbitals, the fifth triangular, entirely on the flattened upper surface of the head and abutting on the internasal. Two narrow plates, one elongate, coming forward from the line of the supraoculars, are wedged in between the fifth supraorbital and internasal and the several postnasal or lateral plates, of which there are two postnasals proper, one over the other, and two consecutive loreals. Rostral very short and very wide. Supralabials eight. Teeth conspicuously bilobate. Scales in forty-one longitudinal series, twelve-to-fourteen-keeled, without prominent central keel; eighty-six scales in the median ventral series; the preanal scales much larger, in three rows, about twelve. All the scales rounded. Tail much longer than body and head.