XX.—*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 (*concluded*). By H. J. Carter, F.R.S. &c.

[Plates XII.–XVI.]

In July 1871 Prof. (now Sir) C. Wyville Thomson asked me if I would undertake to describe the sponges dredged up on board H.M.S. 'Porcupine' in 1869, to which I consented, when I had finished arranging the collections of sponges in the British Museum about which I was then engaged. In June 1872 Prof. Thomson sent me 108 jars containing these sponges in spirit, besides some small boxes containing dried specimens. Most of the former had labels on them; but the latter were without any. Prof. Thomson was then busily engaged in preparing for the expedition of H.M.S. 'Challenger;' and all that he had time to state was that the jars were labelled in accordance with the numbers of the stations and depths on the Charts which accompanied the "Preliminary Report of the Scientific Expedition of the Deep Sea in H.M.S. 'Porcupine' during the summer of 1869" (Proceed. Royal Soc. no. 121), and that I might use them as I liked for the purpose mentioned, only leaving them in "some kind of order" when their descriptions had been completed.

On their arrival, I first numbered all the jars and dried specimens with a running number of my own, which they still bear. Then every specimen, both fragmentary and entire, was sketched and examined microscopically, and the sketch and microscopic detail placed under these numbers respectively. After this, whatever figures the labels on the jars bore were added to their respective numbers. Thus, having secured a memorandum of all that I possessed in this way in case of accident, the whole was laid aside for deliberate examination when the opportunity offered—that is, when I had finished my examination and arrangement of the collections of sponges in the British Museum.

Soon it became evident to me from the latter that I must make a "classification" for myself; for nothing that had been produced would suffice for this purpose; and hence I was obliged to postpone describing the greater part of the sponges dredged up on board H.M.S. 'Porcupine' until this was completed and printed ('Annals,' 1875, vol. xvi. p. 1 &c.).

Meanwhile, in 1873, I published a paper on two *Gummineæ*, one of which came from the 'Porcupine' ('Annals,' vol. xii. p. 17); then a paper on the Hexactinellidæ and Lithistidæ, in 1873, wherein the specimens of *Aphrocallistes Bocagei*, *Farrea occa*, &c., from the same source, were described (*op. cit.* vol. xii. p. 445). After this several of these sponges were described and illustrated in 1874 (*op. cit.* vol. xiv. p. 207 &c.); and now I have to offer the remainder,—dredged up on board the 'Porcupine' in 1869 and 1870.

As regards the form and measurements of sponges, whether entire or fragmentary, and as regards that of their spicules, nothing can be more variable. They all grow from small to large, and all may *vary* more or less in every respect during the course of their development; so that what I have stated in this paper must be understood to be what the sponges dredged up on board the 'Porcupine' *only*, present.

Thus, then, as the spicules in particular grow from small to large, and are successively developed, they will be found to be of all sizes in the sponge to which they may belong. Hence their average largest size respectively has been taken for description, measurement, and illustration.

The measurements are all in parts of an inch; and for the convenience of the student they are given in accordance with the divisions of my micrometer eye-piece, viz. in 1800ths or 6000ths of an inch, under a magnifying-power approximately of 85 and 266 diameters; while for the detail other powers (of 120 and 375 approximately) have been employed.

As the numbers *alone* are given in the descriptions, they must be understood to refer to the *greatest diameters* of the *average largest* size of the spicule, without this being expressed. Thus the description of an acerate or linear form may have appended to it, "100-1800ths by 2-1800ths inch," which means 100-1800ths inch long and 2-1800ths inch broad in its *greatest diameters*. By this the student will at once be able to draw the spicule to any scale; or if he chooses to reduce the fractions to their ultimate value,—he would get in this instance 1-18th by 1-900th inch.

Again, a spicule may be attenuatingly or abruptly pointed—that is, drawn out gradually to a sharp point or abruptly terminating in one which, if altogether omitted, would give a round end. This is the meaning of these expressions.

Lastly, as regards colour. It should be remembered that all the specimens have come to me in spirit or dry respectively, and therefore that, as the colours of sponges are in some instances permanent and in others evanescent, I can only give that colour which these sponges *now* present to me. *Aplysina nævus* still retains its dark red-purple tint; but most of the rest present different shades of what may be termed "sponge-colour," viz. tawny, light yellow, grey, or whitish; at the same time, these are the colours which sponges usually have.

An "Addendum" will be appended, in which a list of *all* the sponges dredged up by the 'Porcupine' during her cruises in 1869 and 1870, with their respective localities generally, will be given; then a list of all the *dried* specimens without numbers which have been handed over to me; finally, a few "Memoranda" on some minute organisms which accompanied the sponges—to wit, *Polytrema*, *Xanthidium*, and Coccoliths, together with a note on the "black grains" often seen in great abundance in the Globigeriniferous sand.

Halisarca cruenta, n. sp.

General form film-like, spreading, with irregularly undulating margin. Colour madder-brown, crimson, becoming crimson-black on the surface when dry. Surface smooth, corresponding with the irregularities of the object on which it may be growing; consisting of a delicate sarco-fibrous layer. Pores and vents not recognized. Internal structure madder-pink, composed of areolar sarcode in which are imbedded the ampullaceous sacs and, when present, also ova, which are known by their spherical form and deeper colour; traversed by the branched excretory canal-system. Ampullaceous sacs about 10-6000ths inch in diameter; spongozoa about $\frac{2}{3}$-6000th, and ova about 4-6000ths inch in diameter. Size of specimens varying, under 2 inches in horizontal diameter.

Hab. Marine, on the surface of *Corallistes Bowerbankii*, Johnston; *Stelletta pachastrelloides*, n. sp.; and *Pachastrella abyssi*, Sdt., extending into and tinging with its red colour for a certain distance the structure on which it may be growing.

Loc. Station 25=374 fathoms—that is (as the "station" and "depth" are inserted together on the "Chart"), a few miles north of Cape St. Vincent.

Obs. This sponge has very much the appearance of spots of venous blood, especially when dry; and the colour is deepest where the specimen is charged with ova, from the dark crimson colour of the latter. It looks very much like *Hildenbrandtia rubra* at first sight, on account of its thinness and dark blood-red colour; but the absence of the algal cell and the presence of ova distinguish it from the cellular structure charged with conceptacles bearing tetraspores and paraphyses in the latter. As the specimens are not favourable for description, the above observations must to a certain extent be taken provisionally. It is at all times difficult to make out the minute structure of *Halisarca*, which can only be most advantageously examined

while living, less so after having been placed in spirit and water *when living*, and least of all when allowed to dry or pass into dissolution, which it does almost immediately after death. My specimens, therefore, being for the most part dry, and the two in spirit broken down in structure, are, as just stated, not in a favourable state for description. Were a figure to be given of this sponge, it would be hardly more than a blot of red or crimson ink upon a piece of paper.

Corticium parasiticum, n. sp. (Pl. XVI. fig. 52.)

General form incrusting, minute, soft, fibreless. Colour grey. Surface even, pierced by the ends of the spicules of the species. Pores and vents not seen. Internal structure composed of areolar sarcode charged with small spicules. Spicules of one kind only, viz. pin-like, nearly straight, or more or less curved irregularly and suddenly, especially towards the large end; head smooth, globular, a little wider in diameter than the thickest part of the shaft; shaft conical, not fusiform, round, sharp-pointed, microspined throughout; 30–40- by $\frac{1}{2}$-6000ths inch, densely charging the sarcode confusedly—that is, apparently without definite arrangement.

Hab. Marine, incrusting dead stems of *Esperia cupressus* n. sp., var. *bihamatifera*.

Loc. Station 42=862 fathoms, "chops" of English Channel.

Obs. This species covers the stems of two specimens of the *Esperia* mentioned, dredged up very near the station from which *Corticium abyssi* was obtained ('Annals,' 1873, vol. xii. p. 18, pl. i. fig. 1 &c.). It appears to me to be the sponge which has given the characteristic surface-spicule to Schmidt's *Cometella gracilior*, whatever the original form of *Cometella* on which it grew might have been (Atlantisch. Spongienf. p. 49, Taf. iv. fig. 9). There is no doubt of its being a parasite here; for not only the stem, but a part of the pinnatifid branches of the *Esperia* are present under it, together with all their characteristic spicules. I have often seen a parasitic sponge charged with pin-like spicules, although not of the same form as that above mentioned; and it has also often struck me that the spiculous suborder of Carnosa, viz. Gumminida, may by-and-by be found to pass into the suborder Suberitida of my Holorhaphidota, where there appears to be no fibre and no definite arrangement of the spicules, with which the sarcode is densely charged.

Aplysina nævus, n. sp. (Pl. XII. figs. 2 & 1, *c*.)

General form spiniferous, flat, thin, spreading, sessile. Colour

madder-red. Surface rising into thorn-like processes, from each of which projects a single hair-like horny filament about $\frac{1}{8}$ inch in length, of a dark amber-colour, that often sends off a minor branch at its exit, and thus becomes bifurcated. Covered with an incrustation of minute foreign bodies, disposed in a reticulate form with depressed interstices. Foreign bodies consisting of a heterogeneous mixture of sand-grains, fragments of sponge-spicules, minute Foraminifera, and the like, which, on becoming dry, presents an opaque pinkish grey colour that conceals the dark red fleshy portion of the interior. Pores in the interstices of the incrustation (fig. 2, *b*). Vents not observed. Internal structure soft, fleshy, consisting of a thin layer of compact areolar sarcode traversed perpendicularly by thick, horny, hair-like filaments of a dark amber-colour (fig. 2, *a*), which, rising singly and separately from an expanded circular disk respectively on the basal layer of the sponge (fig. 2, *c*), that attaches the latter to the hard object on which it may be growing, pursue a perpendicular course towards the surface, where they respectively issue from the ends of the thorn-like processes, as before stated. Horny filament hollow, conical, ending in an attenuated form externally, where it is frequently bifurcated or divided into two portions of unequal length, as above mentioned. Sarcode charged with minute bodies (? spongozoa or pigment-cells) of a red colour, which thus give the characteristic colour to the sponge generally in the fresh or undried state. Size of specimens about $\frac{3}{4}$ inch in their longest horizontal diameter.

Hab. Marine, growing over hard objects.

Loc. Between the north of Scotland and the Faroe Islands, and a little north-west of the Shetlands, in 345 and 312 fathoms respectively.

Obs. For an account of the Aplysinida see 'Annals,' 1872, vol. x. p. 101. Specimens of this sponge exist in two jars numbered (Stations) 65 and 82 respectively, which give the localities and depths above mentioned. The former has spread itself over part of the upper valve of a Terebratule (fig. 1, *c*), and the latter round a fragment of a branch of stony coral (fig. 2). It has been designated "*nævus*" specifically, from the surface being like a raised red "mother's-mark," hairy and papillated; while the interior is characterized by single, separated horny filaments, which traverse the interior of the sponge perpendicularly, and do not give off any branches until arriving at their point of issue from the summits respectively of the thorn-like processes of the surface, when they frequently, but not always, become divided into two branches of unequal length. The reticulated appearance of the incrustation, which is only observed in the dry specimens, indicates that, as usual, the accumulation of the foreign objects is confined to the lines of the subjacent, in this instance subcorneous, dermal reticulated structure.

On the 29th March last the Rev. A. M. Norman sent me another species of this genus, for which he proposes the specific name of "*incrustans*." It only differs from that above described in the papillæ of the surface not being so prominent and thorny, and in its structure being areolar and sandy *throughout* like that of *Dysidea fragilis*, and of a light yellow instead of a pink cream-colour when dry. *Loc.* "Shetland, 170 fathoms," on hard objects.

Spongia officinalis. (Pl. XII. fig. 1, *d*.)

General form unequally lobate, spreading, sessile. Colour light brown. Surface irregularly lobed and minutely divided into polygonal spaces by the dermal horny reticulation, which supports and thus shows itself through the transparent dermal sarcode, projecting from the latter at the knots or points of union of the lines respectively in attenuated, minute, horny filaments, which give the surface a hairy appearance. Pores in the interstices of the dermal reticulation. Vents large and irregular both in size and situation. Internally consisting of a densely reticulate, anastomosing, horny, transparent, tough, brownish fibre, which gives the brown colour to the sponge; supporting transparent areolar sarcode, which is traversed by the excretory canal-system, often running in a branched form for some distance just below the dermal sarcode before opening at the vents mentioned. Size $1\frac{1}{4}$ inch in its largest diameter.

Hab. Marine, on hard objects.

Loc. Same as that of *Aplysina nævus*, viz. station 65.

Obs. This, which is a genuine specimen, although small, of *Spongia officinalis*, is only found in the jar numbered 65, where it has partly overgrown the upper valve of the same Terebratule as that on which *Aplysina nævus* has spread itself (fig. 1, *d*), presenting between them a small portion of *Dysidea fragilis* (fig. 1, *e*).

While the Terebratule bears the three sponges just mentioned, it is itself fixed to a pebble (fig. 1, *a*) which bears in addition two small specimens of *Phakellia infundibuliformis*, Johnst. (fig. 1, *fff*), also the basal fragment of a cylindrical calcareous worm-tube over which *Latrunculia cratera*, Bocage, has grown (fig. 1, *gg*), and at the foot of this on the pebble a little patch of *Microciona longispiculum*, n. sp. (fig. 1, *h*); so that the pebble and the Terebratule together bear six species

of sponges. In the same jar also are specimens of *Dictyocylindrus abyssorum*, n. sp.; *Phakellia infundibuliformis*; *Halichondria Hyndmani*, Bk.; *Wyville-Thomsonia Wallichii*, Wright, = *Tisiphonia agariciformis*, Wy. T.; and *Pachastrella abyssi*, Sdt.

HIRCINIA (*Polytherses*, Duchas. de Fonb. et Mich.).

A small cubical fragment, about two inches in diameter, of coarse structure and brown colour, in which the sarcode has been entirely replaced by the alga *Spongiophaga communis*.

Loc. Station 25, in 374 fathoms, near Cape St. Vincent.

Spongelia pallescens, Sdt. (Adriat. Spongienf. p. 30, Taf. iii. fig. 8).

In jar 84, depth 155 fathoms, there is a finger-shaped fragment or lobe of this sponge about 2 inches long and $\frac{1}{2}$ inch in diameter, now of a light whitish grey colour. It appears to have been torn off from a larger specimen. The surface presents a uniformly reticulated structure, in which the knots consist of sharp monticular eminences, and the interstices are depressed as is usual in all the Psammonemata, with here and there a large circular vent. It is sandy throughout, but differs from the following (viz. *Dysidea fragilis*) in possessing a more definite form, which arises, perhaps, from the horny element being more developed, both around the sandy cores and as simple fibre throughout the structure generally. There is an arenaceous sponge in the British Museum of a greyish brown colour, massive and lobed, with large vents, which seems to be an intermediate species. It comes from Port Jackson in Australia; and the variety of spicules amongst its sand-grains is very remarkable, as indicating the number of different sponges that must be in that locality. Of course, the nature of the foreign contents depends entirely upon the kind of material at hand for the sponge to build with.

Dysidea fragilis, Johnst.

Small amorphous fragments of this sponge were dredged up at stations 65 and 82, in 345 and 312 fathoms respectively.

Dictyocylindrus abyssorum, n. sp. (Pl. XII. fig. 3, and Pl. XV. fig. 25, *a*, *b*.)

General form dendritic, branched dichotomously three or four times on the same plane. Hard. Branches round, somewhat

compressed and expanded at the distal extremities, the terminal ones short, fork-like, but round at the ends; stem below the branches short, thick, expanded at the base. Colour yellowish white or dark brown. Surface even, hirsute (fig. 3, *a*). Pores and vents indistinct. Internal structure compact, increasing in density towards the axis, composed of spicules held together by cellular sarcode, which again is traversed by the excretory canals. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicules of two forms, viz.:—1, large, acuate, attenuatingly pointed, bent or suddenly curved towards the large end, 92- by $1\frac{1}{2}$-1800ths inch (Pl. XV. fig. 25, *a*); 2, subskeleton, sub-pinlike, smooth, attenuatingly pointed, nearly straight, sparsely microspined at the extremity of the inflated end, 45- by $\frac{1}{2}$-1800ths inch (fig. 25, *b*). Flesh-spicules of three forms, viz.:—1, acuate, club-shaped, attenuatingly pointed, bent towards the large end, sparsely spined throughout, spines vertical, 19- by 1-1800ths inch (Pl. XII. fig. 3, *b*); 2, equianchorate, shuttle-like, with nearly straight shaft—6-6000ths inch long by $1\frac{1}{2}$-6000ths inch broad at the arms (fig. 3, *c* & *f*); 3, tricurvate or bow-shaped, smooth, with pointed and spined extremities, 26-1800ths inch long (fig. 3, *d*, *e*). The large acuates form the chief part of the stem, where they are arranged vertically, while others are projected through the dermal sarcode at right angles to them, and thus give the hirsute character to the surface; the sub-pinlike spicule projects at the base of the latter, and the spined acuate flesh-spicules at their base again, appearing just beyond the dermal sarcode; while the equianchorate and bow-shaped flesh-spicules are dispersed generally throughout the structure. Size of largest entire specimen (of which there are two) $3\frac{1}{2}$ inches long by $2\frac{1}{2}$ inches broad; stem at the bottom $\frac{1}{2}$ inch long and $\frac{1}{4}$ inch thick.

Hab. Marine, attached by an expanded base to hard objects.

Loc. Between the north of Scotland and the Faroe Islands, in 440 and 345 fathoms.

Obs. There are two specimens of this sponge, obtained respectively from stations 51 and 65, as indicated by the numbers on their respective jars. These numbers give the depths and locality above mentioned. The smaller specimen is alone, in the jar numbered "51;" while the other not only has a portion of *Halichondria Hyndmani* on one of its branches, but in the jar are also *Pachastrella abyssi*, *Wyville-Thomsonia Wallichii*, and all the specimens on the Terebratule and pebble mentioned under *Spongia officinalis*.

In several of the order Echinonemata, and especially of the branched forms of which *Dictyocylindrus abyssorum* is one,

the whole of the stem is very hard and the structure of the axis becomes extremely dense from the closely impacted state of the spicules of which it is composed; while the excretory systems, being numerous and short-branched, are consequently diminutive in form, so that neither the vents nor the pores are very conspicuous in sponges of this kind; again the acuate spicule is here, as generally in this order, more or less suddenly curved excentrically—that is, towards the large end, which thus, together with the inflation of this extremity, frequently resembles the hilt of a pistol.

Dictyocylindrus simplex, n. sp.

I have applied this name to small amorphous fragments of a sponge occurring here and there by itself and on other sponges dredged up between the north of Scotland and the Faroe Islands, which only differs from *D. anchorata* in the absence of anchorates. This is all the information that the specimens afford.

Dictyocylindrus virgultosus, Bk. (Mon. Brit. Spong. vol. ii. p. 113, and vol. iii. pl. xix. figs. 14–18). (Pl. XII. fig. 5, and Pl. XV. fig. 27.)

General form pyramidal or conical, elongated, sharp-pointed, expanded at the base; pyramids grouped. Colour yellowish white. Surface hirsute, even, covered with small eminences consisting of tufts of spicules radiating from points respectively, where their ends are gathered together and fixed in the dermal sarcode around the base of a large spicule. Pores and vents not evident, from the smallness of the specimens. Internal structure compact throughout, becoming most so towards the centre, composed of bundles of spicules in close approximation, arranged longitudinally and diminishing in number towards the apex of the cone; imbedded in cancellated sarcode, which is, no doubt, traversed by the excretory canals. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicule of two forms, viz.:—1, large, acuate, smooth, sharp-pointed, curved suddenly or bent towards the large extremity, 132- by 1½-1800ths inch (Pl. XV. fig. 27); 2, subskeleton-spicule small, acerate, curved, sharp-pointed, 32- by ½-1800ths inch (Pl. XII. fig. 5, *d*). Flesh-spicules of one form only, viz. acuate or club-shaped, sharp-pointed, bent and inflated at the large extremity, uniformly spined throughout, spines short and vertical, 11- to 14-1800ths inch long (fig. 5, *c*). The large acuates are chiefly found in the body of the sponge, where they are arranged longitudinally or in vertical bundles; but the largest traverse the dermal sarcode obliquely and form

respectively the centre of each group of the small, subskeleton, acerate spicules (fig. 5, *d*), which thus give the surface its hirsute, tufted character. The flesh-spicules do not traverse the dermal sarcode, but are arranged, feather-like, and sparsely, around the acuates of the interior, varying much in size. Entire specimen consisting of a group of three cones, each of which is about 8-12ths inch long, and 3-12ths inch in diameter at the base.

Hab. Marine, on hard objects.

Loc. The North-Sea side of Shetland in 64 to 75 fathoms.

Obs. This sponge has been named, described, and illustrated by Dr. Bowerbank, as above indicated, from "Shetland, in the cabinet of the Rev. A. M. Norman;" but as the specimens were dry and mine is wet, it has seemed to me desirable to describe and figure it again from the latter. The figures on the jar are "67 and 68," which give the locality and depths above mentioned. On one of the cones has grown a specimen of *Grantia ciliata*, ? var. (fig. 6), and a small one of *Tethya cranium* (fig. 5, *a*). This is all that is in the jar. The *Grantia* will be described hereafter.

In the British Museum, among the specimens dredged up on board the 'Norna' on the coast of Portugal, is a sponge of a similar conical form, also grouped, but with a tuberculated surface, each tubercle of which is supported on a bundle of spicules that radiate from a solid, conical, central axis. Here, however, there is only one kind of spicule, viz. acuate, smooth, and sharp-pointed; so that it does not belong to the Ectyonida, but, belonging to the Axinellida, might be called "*Ciocalypta* (Bk.) *tuberculata*," seeing that, like other species of this group about to be mentioned, it will probably have to come under the order Echinonemata.

Another similar (*i. e.* conical) form has been described and named by Dr. Bowerbank *Ciocalypta penicillus* (Mon. Brit. Spong. vol. ii. p. 81, and vol. iii. pl. xiii. figs. 2–4); but this is a massive one, in which the characteristic conical heads, at first grouped, soon pass into a common body from which the characteristic ends alone project. There is a specimen of this kind in the British Museum, 6 inches in diameter, which, from its white surface and yellowish interior, might be taken for *Halichondria panicea*, Johnst. It also has only one form of spicule, viz. acuate, smooth, sharp-pointed.

A third species has been named "*C. Leei*" by Dr. Bowerbank (*op. cit.* vol. iii. pl. lxxxvi. figs. 1–3); it, again, has only one form of spicule, viz. acuate.

And a fourth the same author has named "*C. Tyleri*" (Proc. Zool. Soc. 1873, p. 21, pl. iv. figs. 9–12, from "Port

Elizabeth, Australia" [? Cape]). There is also a specimen of this in the British Museum from Port Elizabeth in S. Africa; but in this species the spicule is acerate, curved, and sharp-pointed (not acuate); still all present the same conical pyramidal forms, growing in groups like a pine-forest; and all but the first present the snow-white colour on the surface, with the light tawny-yellow colour interiorly, by which they so much resemble *Halichondria panicea*, that at first sight they might be taken for varieties of this sponge, as before stated.

Plumohalichondria microcionides, n. sp. (Pl. XII. fig. 11, and Pl. XV. fig. 30, *a*, *b*.)

General form, now, globular, sessile at one point. Colour yellowish white. Surface smooth, irregularly mamillated on the free side. Pores and vents? Internal structure, radiating in plumose branches closely approximated from the point of attachment upwards. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicule of two forms, viz.:—1, large, acuate, attenuatingly pointed, globularly inflated and suddenly curved at the large end, which is thickly spined, smooth in the rest of its extent, 68- by 1½-1800ths inch (Pl. XV. fig. 30, *a*); 2, acerate, smooth, fusiform, attenuatingly pointed at each end, nearly straight, 38-1800ths inch long (Pl. XV. fig. 30, *b*). Flesh-spicules of two forms, viz.:—1, acuate, globularly inflated at the large end, attenuatingly pointed at the other, thickly spined throughout, 17-1800ths inch long (Pl. XII. fig. 11, *a*); 2, equianchorate, navicular in form; shaft long and slightly curved; arms long and slightly expanded, falcated, with half their extent thus webbed to the shaft, 28-6000ths inch long (Pl. XII. fig. 11, *b*). The acerate skeleton-spicules are confined to the fibre of the sponge, which is echinated with the large skeleton- and small spined acuates, while the equianchorates are dispersed generally. Size of specimen ½ an inch in diameter.

Hab. Marine.

Loc. Between the north of Scotland and the Faroe Islands, in 440 fathoms.

Obs. This little specimen is in a jar by itself, labelled 51, which gives the locality and depth above mentioned. It appears to me to be a rolled fragment of a larger sponge, while its thickness, combined with the presence of the acerate spicule, seems to ally it more to *Halichondria plumosa* than to *Microciona*, which is laminiform; still the character of the large acuate is peculiarly like that of *Microciona*; and hence the appearance of this spicule resembles that of a gradational form between these two sponges.

Microciona jecusculum, Bk. (*op. cit.* vol. iii. pl. lxxxiii. figs. 1–6).

This sponge was originally described by Dr. Bowerbank as a "*Hymeniacidon*" (*op. cit.* vol. ii. p. 198). The spicules are:—a partially spined, large, skeleton acuate; a smooth, acuate; pointed, subskeleton acerate; a small, entirely spined acuate, and an angulate or bow-shaped equianchorate.

Loc. Island of Harris, Hebrides.

Two specimens of this thin laminiform sponge were dredged up on board the 'Porcupine,' viz. at station 25, in 374 fathoms, near Cape St. Vincent, and at station 61, in 114 fathoms, near the Faroe Islands, respectively—the former, of a reddish colour, spreading over the flat surfaces of a piece of *Corallistes Bowerbankii*, and the latter, almost colourless, over a Terebratule. Both are characterized by possessing a smooth, acerate, subskeleton-spicule, and a much greater development of the spines round the bases of the two forms of acuates respectively, than in any other part; while the spicule-illustrations given by Dr. Bowerbank agree better with the colourless specimen on the Terebratule than with the red one on the piece of *Corallistes*. The spicules in the latter are not so large, the acuate skeleton-spicule less curved towards the base, and the equianchorate larger in the arms and more pointed at the ends, so as, laterally, to resemble a bow, of which the anterior arm of each end, being by recurvation closely approximated at their points, would form the cord or string. In both the tricurvate is absent; and the subskeleton-spicule, being acerate, smooth, and nearly straight, corresponds more with that of *Halichondria plumosa* than with that of the Microcionina generally, in which it is acuate. It may be questioned hereafter whether the differences noticed between the above-mentioned forms of *M. jecusculum* are sufficient to constitute two species. Colour alone in sponges is seldom of much specific value.

Microciona longispiculum, n. sp. (Pl. XII. fig. 1, *h*, and Pl. XV. fig. 31, *a*, *b*, *c*.)

General form thin, laminar, hirsute. Colour tawny. Surface hairy. Pores and vents not seen. Spicules of two kinds, viz. skeleton- and flesh-spicules. Large skeleton-spicule long, smooth, curved, thin, globularly inflated or bulbous at the fixed extremity, smooth throughout, 160-1800ths inch long by 2-1800ths inch in diameter at the bulb (Pl. XV. fig. 31, *a*). Subskeleton-spicule smooth, acuate, curved,

40-1800ths inch long (fig. 31, *b*). Flesh-spicule short, acuate, straight or slightly curved, inflated at the fixed extremity, spined throughout (fig. 31, *c*). As usual in *Microciona*, the whole of the spicules are arranged *vertically*, side by side, in the thin lamina of which the sponge is composed. Size of specimen about ½ an inch in horizontal diameter, and probably not more than 1-96th inch thick.

Hab. Marine, spreading over hard objects.

Loc. At station 65, in 345 fathoms.

Obs. This specimen is on the pebble bearing the Terebratule over which *Aplysina nævus* has grown (Pl. XII. fig. 1, *h*), at the base of the calcareous worm-tube covered with *Latrunculia cratera*, Boc., which is also thin, spreading, and laminiform, as will be hereafter noted.

Microciona plana, n. sp.

General form thin, laminar. Colour tawny. Surface hirsute. Pores and vents not seen. Spicules of two kinds, viz. skeleton- and flesh-spicules. Large skeleton-spicule simple, acuate, curved most towards the fixed end, smooth throughout, 65-1800ths by 1½-1800th inch. Subskeleton-spicule the same, but not more than half this size. Flesh-spicules of two forms, viz.:—1, acuate, bulbous at the large end, spined throughout, 15-1800ths inch long; 2, equianchorate, navicular, shuttle-like, 7-6000ths inch long. The skeleton-spicules are arranged vertically side by side, the spined acuates feather-like around the bases of the long spicules respectively, and the anchorates scattered irregularly throughout the lamina of which the sponge is composed. Size of specimen about 1 inch in horizontal diameter.

Hab. Marine, spreading over hard objects, laminiform.

Loc. At station 25, in 374 fathoms, near Cape St. Vincent.

Obs. This specimen is on the upper surface of a rough, flat, slate-like stone, which also bore the living specimen of *Macandrewia azorica* that will hereafter be mentioned. The thin lamelliform state of the Microcionina effectively precludes an evident appearance of both pores and vents, which, although, of course, present as part of the structure of a sponge, can only be followed here with the microscope.

Microciona intexta, n. sp. (Pl. XV. fig. 43, *a*, *b*, *c*.)

As *Pachastrella intexta* (which will be described hereafter) grows in among the spicules of dead *Corallistes Bowerbankii*, extending from the surface downwards, so this *Microciona* grows, causing a brown discoloration of the *Corallistes*, which

discoloration, when placed under the microscope, is found to arise from the presence of sarcode charged with two kinds of spicules, viz. one skeleton- and one flesh-spicule. Skeleton-spicule acuate, straight, but with the large end suddenly bent to one side (like the head of a walking-stick), and terminating attenuatingly in a point at the other end, sparsely covered with short vertical spines throughout, 80- by 3-6000ths inch (Pl. XV. fig. 43, *a*). Flesh-spicule a simple bihamate, much curved, and more or less tortuous (fig. 43, *b*). The skeleton-spicules are sparsely imbedded among the flesh-spicules, which are exceedingly numerous and thrown together confusedly, so as to form the greater part of the mass (fig. 43, *c*). Pores and vents not seen. Size of portion of discoloration in the *Corallistes* about ¼ inch in diameter.

Hab. Marine, on *Corallistes Bowerbankii*.

Loc. Station 25, in 374 fathoms, near Cape St. Vincent.

Obs. This sponge is chiefly remarkable for the form of its skeleton-spicule and the mass of bihamates in which it is imbedded. Being parasitic among the spicules of *Corallistes*, I, of course, can give no description of its form: I am not quite certain that it should be called a *Microciona*, and therefore only give this generic name provisionally.

Microciona pusilla, n. sp. (Pl. XVI. fig. 51, *a*, *b*, *c*, *d*.)

I have met with another *Microciona* of the same kind, growing on *Polytrema utriculare*, not dredged up on board the 'Porcupine' (Ann. 1876, vol. xvii. p. 210), but probably from the tropics. (Dr. Bowerbank has figured a similar spicule from *Oculina rosea*, *op. cit.* vol. i. pl. xi. fig. 243.) In my instance, however, the skeleton-spicules are smooth, and the bent portion of the large end has a tendency to a spiral twist (*a*, *b*); while they grow erect on the surface of the *Polytrema*, with fine acuates between them (*c*), and minute bihamates (?) scattered throughout the structure, which are almost too small to be satisfactorily described under a ¼-inch object-glass (*d*). The thick skeleton-spicule with bent large end is hardly more than a quarter the size of that of *Microciona intexta*, although somewhat similar in form, being about 36- by 1-6000ths inch in its greatest diameters.

Phakellia ventilabrum, Bk., = *Halichondria v.*, Johnston.

Fragments of this sponge appear in jars 61–63, 64, 65, and 84, which, being the numbers of the stations where they were dredged up, indicate a depth varying between 155 and 640 fathoms, and a locality extending north of the Butt of Lewis to

Thorshaven in the Faroe Islands, and the Haaf banks on the east of Shetland; also in jar No. 25=374 of 1870, near Cape St. Vincent. The finest and most perfect specimens that I have ever seen are those from the Haaf banks, presented to the British Museum by Dr. Bowerbank.

Phakellia (Bk.) *infundibuliformis*, C., = *Halichondria inf.*, Johnston.

Entire specimens and fragments of this sponge appear in jars 65, 78, and 83, which, being the numbers of the stations where they were respectively dredged up, indicate a depth varying from 290 to 345 fathoms, with a locality between the Orkney, the Shetland, and the Faroe Islands.

This sponge in general form is very like, although much inferior in size to, *Phakellia ventilabrum*—indeed just as Johnston has described it; and I can see no reason for altering any thing but Johnston's generic name to "*Phakellia*," and not to "*Isodictya*" as Dr. Bowerbank has done. The spicules are essentially those of *Phakellia ventilabrum*, viz. an acuate and an acerate; but they are shorter, stouter, and straighter than those of the latter, the acerate being simply curved, and not undulating as in *P. ventilabrum*. Outlines of two specimens of *P. infundibuliformis* in its fan-shaped form may be seen *in situ* on the pebble on which they have grown (Pl. XII. fig. 1, *fff*).

[To be continued.]

XXI.—*On a Collection of Lepidoptera from Port Moresby, New Guinea.* By Arthur G. Butler, F.L.S. &c.

The following species were recently received from Mr. W. Y. Turner of the London Medical Mission at New Guinea, and form a very interesting little collection. Most of the named species were previously known from Aru, only one or two of the commoner and more widely ranging species being identical with those of Australia.

Rhopalocera.

Family **Nymphalidæ**.

Subfamily *Danainæ*, Bates.

Genus Danais, Latreille.

1. *Danais ferruginea*, n. sp.

Allied to *D. mytilene*, but the transverse, oblique, subapical white band composed of large semiconnected spots as in *D. philene*; the ground-colour of the wings much darker on both surfaces. Expanse of wings 3 inches 1–5 lines.

Two males.

2. *Danais leucoptera*.

Danais leucoptera, Butler, Ent. Mo. Mag. xi. p. 163 (1874).

One female.

Genus Euplœa, Fabricius.

3. *Euplœa resarta*, n. sp.

Ground-colour of *E. Lapeyrousei*, blackish piceous, purplish in certain lights; the borders and the abdominal and anal areas of secondaries lighter, cupreous, greyish towards outer margin; primaries with a transverse series of eleven discal whitish spots, five of them strigiform, subcostal, the sixth and seventh hastate, subapical, the remainder rounded, well separated, bifid; secondaries with an increasing series of twelve, oval, whitish, discal spots, and a less-defined submarginal series of whitish dots: wings below paler than above, especially round the borders; primaries with four lilacine dots, one in the cell and three beyond it; discal spots as above, but white; several submarginal dots in pairs; secondaries with a spot in the cell and five dots in an angular series beyond it lilacine; discal and submarginal spots as above, but the latter edged with brown: body black, spotted with white. Expanse of wings 3 inches 7 lines.

One female.

A very distinct species, allied to *E. Lapeyrousei*, but with the aspect of *E. vermiculata*.

4. *Euplœa Lapeyrousei*.

Euplœa Lapeyrousei, Boisduval, Voy. Astr. Lép. p. 97 (1832).
Euplœa Batesii, Felder, Reise der Nov. Lep. ii. p. 331 (1867).

Two females.

E. Lapeyrousei was not previously in the Museum; the small species hitherto representing it in the collection proves to be quite distinct; it is of the form and size of *E. sepulchralis*, with the coloration of the *E. melina* group. It may take the name proposed for it by Dr. Boisduval, *E. Paykullei*.

5. *Euplœa mœsta*.

Euplœa mœsta, Butler, P. Z. S. p. 284, fig. 3 (1866).

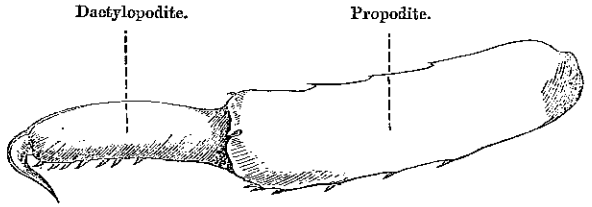
Three males.

The bluish submarginal spots in primaries are more frequently absent than present.

XXVI.—*On the Mode in which the Young of the New-Zealand* Astacidæ *attach themselves to the Mother*. By J. Wood-Mason.

A few days ago I received from Dr. Julius von Haast, Director of the Canterbury Museum, a small collection of crustaceans, amongst which is a specimen of remarkable interest. It is a female of *Astacoides zealandicus**, laden with young. On attempting to remove one of these from beneath the tail of the mother, I was surprised to find that it was firmly attached thereto, so firmly, indeed, that I had to exert considerable force in order to detach it, and even then it came away leaving its two hindmost pairs of walking-legs behind. The dactylopodite of each of these legs, on examination under a low power, was found to be provided at its extremity with a strongly hooked, exceedingly acute, movable claw, and on the lower edge at the end with six or seven sharp spines, against which the claw folds, and thus forms a very efficient prehensile arrangement. With these four legs, which are at this stage the longest, strongest, and most highly indurated of all the appendages, stretched straight backwards so as to be parallel with the postabdomen, the young crayfish hangs suspended head downwards from the postabdominal appendages of the mother. The young found thus attached measure, with the postabdomen extended, $7\frac{1}{2}$ millims., exclusive of the antennæ.

The accompanying figure represents the two terminal joints of one of the legs drawn by the aid of the camera lucida. I am not aware whether the young of *Astacus fluviatilis* attach themselves in this manner; certainly Rathke does not state that they do so in his admirable account of the development of the species.



The ova in the New-Zealand representatives of the genus

* = *Paranephrops setosus*, Hutton, Ann. & Mag. Nat. Hist. 1873, xii. p. 402.

Astacoides * are large and few in number; and the young undergo no metamorphosis after quitting the egg. A large female of *Astacoides zealandicus* has but 380 eggs, measuring $2\frac{3}{4} \times 2\frac{1}{3}$ millims., under the tail; and these are attached to the appendages in the manner described by Lereboullet (in Ann. des Sc. Nat. sér. 4, vol. xiv. 1860) for *Astacus fluviatilis*.

XXVII.—*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 (*concluded*). By H. J. Carter, F.R.S. &c.

[Continued from p. 240.]

Hymeraphia vermiculata, Bk., var. *erecta*, n. sp. (Pl. XII. fig. 4, and Pl. XV. fig. 26, *a*, *b*.)

General form short, cylindrical, angular, club-shaped, becoming massive, lobed and lobulated, or compressed and expanding flabellately. Colour now yellowish white. Surface hirsute, even, reticulo-pitted, more or less furrowed; dermal structure reticulate. Pores in the sarcode tympanizing the interstices of the dermal reticulation. Vents scattered here and there on the surface. Internal structure consisting of fasciculi branching and subdividing obliquely from a central axis amidst the sarcode, which again is traversed by the branches of the excretory canal-system, that terminate for the most part in the furrows of the surface, which in their natural state are converted into canals by the dermal sarcode. Colour internally the same as that of the surface, or perhaps a little deeper. Spicules of one kind only, viz. skeleton-; no flesh-spicules. Skeleton-spicules of two forms, viz.:—1, very large, long and acuate, smooth, sharp-pointed, slightly curved towards the fixed end, which is the widest part of the spicule, but not inflated, 100- by $3\frac{1}{2}$-1800ths inch (Pl. XV. fig. 26, *a*); 2, subskeleton-, a much smaller spicule, vermiculate, acerate, acuate, or cylindrical and obtuse at the ends, 45- by 1-1800th inch (fig. 26, *b*). The large acuates at their fixed ends are imbedded in a mass of interwoven vermiculates, which thus form fasciculi round them (Pl. XII. fig. 4, *a*, *b*), while their

* *Astacoides*, Guérin, Revue Zool. 1839, p. 109; *Paranephrops*, White, in Gray's Zool. Misc. 1842, p. 78, and Dieffenbach's 'New Zealand,' 1843, ii. p. 267.

pointed ends, projecting externally, give the hirsute appearance to the dermal sarcode, where the points are so arranged in linear network as to present the reticulo-pitted aspect above mentioned. Size of sponge extending from a thin lamina up to 3 inches in height, varying in thickness with the form taken by the sponge.

Hab. Marine, attached individually to little pebbles.

Loc. Atlantic Ocean, between the north of Scotland, the Shetland and the Färöe Islands, in depths varying from 114 to 640 fathoms.

Obs. In form this species only differs from *H. vermiculata*, Bk. (which is thin, laminiform, and incrusting, fig. 4, *c*), in being erect or vertical, but in nothing else, further than that the spicules appear to be a little larger and the vermiculates a little less vermicular in *H. erecta*. In structure, both consist of large acuate spicules, whose pointed ends for the most part project externally, and are tied together internally by a mass of the vermiculates; while the less degree of vermiculation of the latter in *H. erecta*, as well as the tendency to a flabellate form, seems to point out a transition of the latter to *Phakellia ventilabrum*, where the interlacing spicules still retain a little vermiculation, until it is lost altogether in *P. infundibuliformis*, where the shape of the acuate remains, but that of the undulating or vermicular spicule has passed into a simply curved acerate, which curve, it should be also remembered, approaches in form to that of a 'bend' in the centre, ending with *Axinella*. Thus we have a group of sponges extending from the lowest form, viz. *Hymeraphia vermiculata*, to *Axinella*, which may hereafter be found serviceable in dividing the group Multiformia of my suborder Axinellida in the order Echinonemata. *Hymeraphia vermiculata* bears a similar relation to *Phakellia ventilabrum* that *Microciona atrosanguinea* does to *Halichondria plumosa*.

H. erecta is present in several jars, especially in No. 65, whose depth is 345 fathoms, about 40 miles N.W. of the Shetland Islands; and *H. vermiculata* is almost always found in company with it. Fragments of *Phakellia ventilabrum* and *P. infundibuliformis* also come from the same localities. At station 51 portions of *Geodia*, *Stelletta*, and *Reniera fibulata*, Sdt., were dredged up with it; and at 65, *Geodia*, *Tisiphonia*, *Donatia lyncurium*, *Trichostemma hemisphæricum*, Sars, *Polymastia brevis*, Bk., and *Phakellia ventilabrum*.

Both *Axinella mastophora*, Sdt., and *Auletta sycinularia*, Sdt. (Atlantisch. Spongienf. pp. 45 and 61, and Taf. iv. figs. 5 and 14 respectively), appear, from the form of their spicules and hirsute surfaces, to be allied to *H. erecta*.

Cornulum textile, n. sp. (Pl. XII. fig. 9, and Pl. XV. fig. 28, *a*, *b*.)

General form an obconic sheath, horn-shaped, more or less twisted or bent upon itself, fixed by the narrow end, open at the large one, which is filled up by a protruding portion of the internal structure. Colour yellowish white. Surface of the sheath or dermis smooth, presenting a number of circular ridges marking the degrees of growth; composed of a horny sarcodic membrane densely charged with spicules, so as to resemble a textile fabric (Pl. XII. fig. 9, *a*). Pores and vents probably in the protruding mutilated head, in which, as usual in the histodermal forms, the structure is so delicate that all the soft parts are broken down into a confused pulp. Internal structure (fig. 9, *b*) consisting of a conical fibrous mass corresponding in form with that of the sheath, consisting of bundles of spicules dividing and subdividing from the conical to the expanded end, where they terminate in thin plumose lacinulations; supporting throughout the internal sarcode and excretory system, before the sarcode becomes broken down. Colour yellowish white. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicules of two forms, viz.:—1, large, subfusiform, smooth, sometimes slightly inflated at the ends, which are round and microspined, 27- by 1-1800th inch (Pl. XV. fig. 28, *a*); 2, subskeleton-spicule, extremely thin, acuate, smooth and pointed, subundulous, 32–55-6000ths by 1-18,000th inch (fig. 28, *b*). Flesh-spicules of two forms, viz.:—1, very small, equianchorate, navicular, 3-6000ths inch long (Pl. XII. fig. 9, *e*); 2, tricurvate or bow-shaped, smooth and pointed, 30-6000ths inch long (fig. 9, *d*). The large skeleton-spicules, which are the only ones that appear under an inch object-glass, are chiefly confined to the sheath and the fibrous bundles forming the skeleton of the internal structure, while the rest are distributed generally throughout the broken-down sarcode. Size of specimens about one inch long by a quarter to half an inch in diameter at the widest end.

Hab. Marine, attached to hard objects.

Loc. About 40 miles N.W. of the Shetland Islands, in 345 fathoms.

Obs. These specimens, of which there are three, are contained in jars bearing the same number, viz. "65," which gives the locality and depth above mentioned. One is accompanied by a fragment of *Halichondria panicea*. The spicules generally and their arrangement in the skeleton point to the second division of the Echinonemata, viz. the Axinellida, especially as many of the large ones have a tendency to an acuate

form, while the loose structure of the internal parts, unattended by any dense axial arrangement, is more like the Halichondrina. Pending the examination of a perfect specimen, which, I expect, from the delicate structure of the internal contents in all the "histodermal" sponges, is not likely to be soon obtained, I think this sponge had better be placed provisionally in the second division of the Echinonemata. In all the specimens the protruding head being fringed out, probably by friction and decomposition, thus fails to present the original form.

Halichondria foliata, Bk. (*op. cit.* vol. iii. pl. 73. fig. 1). (Pl. XII. fig. 10, and Pl. XV. fig. 29, *a*, *b*.)

Of this sponge there is only a fragment by itself in a jar numbered 65, which station is a little N.W. of the Shetland Islands. It is about $\frac{3}{4}$ inch square and $\frac{1}{6}$ inch thick, and belonged to a compressed, erect or vertical sponge entirely composed of a reticulated, anastomosing structure, whose interstices are open from side to side—that is, directly through the sponge fenestrally. The reticulated fibre, which is ragged and hirsute from the projection of spicules, is now of a pale whitish-yellow colour. Pores and vents not evident. Spicules of two kinds, viz. skeleton- and flesh-spicules. Large skeleton-spicule acuate, smooth, sharp-pointed towards the large end, 94- by 4-6000ths inch (Pl. XV. fig. 29, *a*); small or subskeleton-spicule also acuate, smooth, sharp-pointed, inflated at the large end, scantily spined over the extremity, 78- by 1-6000th inch (fig. 29, *b*). Flesh-spicules of two forms, viz.:—1, equianchorate, navicular or shuttle-shaped, 4-6000ths inch long (Pl. XII. fig. 10, *a*); and, 2, a tricurvate, whose arms are very thin and spread out horizontally to a great extent, with a sudden bend in the centre, often converted into a loop, 140-6000ths inch long (fig. 10, *b*). It is by the projection of the large skeleton-spicules chiefly that the hirsute surface is produced. The remarkable form and size of the tricurvate are not confined to this sponge; for they are to be found in *Microciona armata*, Bk.; but here the ends are spiniferous. I learn this more particularly from a mounted specimen of this sponge which I have found here (Budleigh-Salterton).

Isodictya spinispiculum, n. sp. (Pl. XV. fig. 42.)

On the rough flat stone bearing a specimen of *Macandrewia azorica* before mentioned, with one of *Geodia nodastrella*, n. sp., to be hereafter described, is a portion of *Isodictya spinispiculum*.

The jar in which this is contained bears on its label "25, 75–374 fathoms, a few miles north of Cape St. Vincent." Here 75–374 may mean "from 75 to 374" fathoms. Besides the sponges mentioned, the jar contains *Corallistes Bowerbankii*, *Azorica Pfeiffere*, *Pachastrella abyssi*, *Stelletta pachastrelloides*, n. sp., *Phakellia ventilabrum*, &c. The portion of *Isodictya* is laminiform, about half an inch in diameter, and 1-24th inch thick. Its surface is even and covered with holes (? pores and vents respectively), while the interior consists of an areolar structure easily crushable, and composed of sarcode charged with one kind of spicule only, which is arranged in bundles end to end, and crossing each other in accordance with the kind and form of the areolar structure common to the Isodictyosa. The spicule is straight, cylindrical, bent abruptly close to each end and rounded terminally; but while one end is turned in one direction, the other is not turned in the opposite, but laterally, so that when the bend of one end is seen the other is obscured by being in a line with the shaft; besides this, the shaft is sparsely covered throughout with short erect spines, except at the ends which are smooth, about 50- by 2-6000ths inch (Pl. XV. fig. 42). Size of entire specimen half an inch in horizontal diameter.

Hab. Marine, on hard objects.

Loc. Above mentioned.

Obs. The most remarkable point about this little specimen is the peculiar character of its spiculum.

THALYSIAS, Duchass. de Fonb. et Michelotti.

There are three small specimens of *Thalysias*, two of which are on large fragments of *Corallistes Bowerbankii* from station 25=374 fathoms near Cape St. Vincent, and the other separate in a jar numbered 6=345 fathoms N.W. of the Shetland Islands. All present the chalky-white appearance characteristic of the sponge to which Duchassaing de Fonbressin et G. Michelotti have given the name "*Thalysias*" ('Spongiaires de la Mer Caraïbe,' pl. xvii. fig. 1), and consist of two or three papillæ, open respectively at the summit; but when examined microscopically two are found to present only one kind of spicule, which is nearly cylindrical, curved, smooth, and round at the ends, 28- by $1\frac{1}{2}$-6000th inch; and the other two kinds of spicules, viz. a skeleton- and a flesh-spicule; of which the skeleton-spicule also is nearly cylindrical, curved and smooth, but abruptly pointed at the ends, 45- by $2\frac{1}{2}$-6000ths inch, and the flesh-spicule a fine tricurvate, 9-6000ths inch long.

This is the first time that I have found the skeleton-spicule of

a *Thalysias* to be accompanied by any flesh-spicule; and hence I propose for it the name of *T. tricurvatifera*; it is one of those on *Corallistes Bowerbankii* from Cape St. Vincent. The value, however, of the presence or absence of a flesh-spicule for specific designation will, I think, as I have before stated, be found very doubtful in many instances.

Reniera crassa, n. sp.

General form irregular, massive, lobate. Colour pale ochre-yellow. Surface even, undulating with the form of the mass, provided with a beautiful dermal reticulation (composed of sarcode charged with the spicules of the species) whose free side is smooth and the other rough where it intermingles with the subjacent structure. Pores in the sarcode tympanizing the interstices of the dermal reticulation. Vents congregated in large deep depressions or holes here and there, where they open through a large cribriform dermal layer at the bottom. Internal structure massive, areolar, composed of sarcode densely charged with the spicules of the species and traversed by the branches of the excretory canal-system, which finally open at the cribriform vents mentioned. Spicule of one kind only, viz. acerate, curved, smooth, abruptly pointed, 85- by 4½-6000ths inch, accompanied by others of all sizes, some of which are not more than 6-6000ths inch long, although of the same thickness (that is, nearly as thick as long), with rounded ends, sausage-like. Size of specimen about 6 inches long by 3 inches thick.

Hab. Marine.

Loc. A little south of the Färöe Islands, in 167 fathoms.

Obs. The number on the jar containing this specimen is "60," which station gives the locality and depth above mentioned. It is one of the coarse, large Renierida which I intend to place under the group "Crassa." They much exceed in size the Thalyosa, which they otherwise resemble in consistence and spicule, being of a chalky friable nature when dry, and, for the most part, of an ochreous yellow colour. There is one in the British Museum, which is crateriform in the centre, measuring 18 inches in diameter by 12 inches high. The coarseness in structure, arising chiefly from the greater size of the spicule, is the chief character that distinguishes the Crassa from the Thalyosa.

Halichondria forcipis, Bk., var. *bulbosa*, n. sp. (Pl. XIII. fig. 19, and Pl. XV. fig. 37, *a*, *b*.)

General form, surface, pores, vents, and excretory canal-system ——? (being a mere fragment). Internal structure cancellous, crumb-of-bread-like. Colour yellowish white. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicules of two forms, viz. :—1, large, acuate, smooth, curved, abruptly pointed, 40- by 1-1800th inch (Pl. XV. fig. 37, *a*); 2, subskeleton-spicule, small, acerate, subfusiform, smooth, curved, with slightly inflated oval ends, 22- by ½-1800th inch (fig. 37, *b*). Flesh-spicules of three forms, viz.:—1, a small equianchorate, shaft slightly curved, arms slightly expanded, 9-6000ths inch long (Pl. XIII. fig. 19, *c*); 2, bihamate (*fibula*), C- or S-shaped, simple, smooth, sharp-pointed, 16-6000ths inch long (fig. 19, *d*); 3, a tricurvate or bow, compasses-like, a little open, microspined, bulbous at the extremities, 9-6000ths inch long, distance between the ends 6-6000ths inch (fig. 19, *e*, *f*). The large acuates and small acerates with inflated ends make up the cancellated skeleton-structure, while the flesh-spicules are dispersed throughout the sarcode occupying its interstices. Size of specimen, that of the concavity of the piece of the bivalve shell which it occupies, viz. about 1 by ½ inch square; wholly incomplete in general form—in short, as before stated, a "mere fragment."

Hab. Marine, on hard objects.

Loc. In a jar numbered "24 and 25—1870;" that is, in 292–374 fathoms on the north side of Cape St. Vincent.

Obs. This small imperfect specimen, designated "*bulbosa*," from the bulbous ends of the tricurvate, was obtained from the locality and depth above mentioned, during the cruise of the 'Porcupine' to the Mediterranean Sea (see Report, Roy. Soc. Proc. No. 125, vol. xix.). It is accompanied by a small fragment of *Reniera fibulata*, Sdt., a rolled one of *Corallistes Bowerbankii* (?), about ¾ inch in diameter, and two rolled portions of *Askonema*-spicules matted together with sand and mud. The pincers or compasses-like form of the tricurvate is not uncommon (see 'Annals,' 1874, vol. xiv. p. 248, under *Halichondria forcipis*). Schmidt also represents one in *Desmacidon* (*Esperia*) *anceps*; but here only one arm has the bulbous extremity (Exped. German. 1871, "Kieselspongien," Taf. i. fig. 4, described at p. 432); this specimen, which came from the coast of West Greenland, is figured with an *inequi*-anchorate flesh-spicule (fig. 7).

Cribrella hospitalis, Sdt. (Pl. XIII. fig. 18, and Pl. XV. fig. 36, *a*, *b*.)

As this sponge has already been named and described by Schmidt (Atlant. Spongienf. p. 56), and I have identified our specimens with his slide in the British Museum, there can be

little doubt that the figure and spicules respectively of ours are those of *Cribrella hospitalis*. But as Schmidt has only given one of the circular or oval cribriform areæ (fig. 19, *b*) as an illustration of this sponge, I have thought it desirable to add that of the best specimen of the *entire* sponge as dredged up on board the 'Porcupine,' together with its spicules.

There are three specimens in a jar by themselves, numbered "57," which gives a depth of 632 fathoms, and a locality midway between the north of Scotland and the Färöe Islands. They have all grown on hard objects, such as small pebbles, coral, &c.; and the largest, which is irregularly pear-shaped and has been figured (Pl. XIII. fig. 18), is $1\frac{1}{2}$ inch high, $\frac{7}{8}$ inch diameter in the head, and $\frac{1}{4}$ inch diameter in the short, stem-like base.

It belongs to my group "Halichondrina," as the two skeleton-spicules, viz. one a spined acuate (Pl. XV. fig. 36, *a*), and the other a smooth acerate with rounded ends (fig. 36, *b*), together with the equianchorate spicule (which is very stout and broad, Pl. XIII. fig. 18, *d*), and general structure indicate.

Halichondria phlyctenodes, n. sp. (Pl. XIII. fig. 17, and Pl. XV. fig. 35.)

General form blister-like, convex, depressed, sessile, irregularly elliptical, fixed by its marginal circumference throughout to the object on which it has grown; presenting a funnel-shaped extension of the surface here and there, which terminates respectively in a short cylindrical tubular prolongation, slightly enlarged outwards and truncated at the extremity; tubular prolongations seven in number. Colour yellowish white now. Surface even, smooth; dermal structure textile-like, formed by spicules horizontally imbedded in the dermal sarcode so as thus to form a firm membranous covering. Pores in the sarcode tympanizing the intersticcs between the dermal spicules. Vents respectively at the extremities of the tubular prolongations of the dermal membrane, constricted as usual, at the free end, by a sphinctral diaphragm of sarcode. Internal structure originally delicate, now pulpy, composed of spicules held together by sarcode, in which the branches of the excretory canal-system, now broken down, originally ramified. Sarcode cream-yellow. Skeleton-spicule of one form only, viz. acerate, smooth, slightly curved and obtusely pointed, 42- by 1-1800th inch (Pl. XV. fig. 35). Flesh-spicules of two forms, viz.:—1, equianchorate, short and stout, shaft much curved, bow-like, arms falcate or webbed nearly to their

ends respectively, much expanded, 8- by $3\frac{1}{2}$-6000ths inch (Pl. XIII. fig. 17, *f*); 2, bihamate or fibula, simple, C- or S-shaped, subspiral, 20-6000ths inch long (fig. 17, *g*). The skeleton-spicules make up the chief part of the dermal and internal structures, both of which are plentifully charged with each kind of flesh-spicule. Size of specimen $1\frac{4}{12}$ inch long, $\frac{8}{12}$ inch broad, and $\frac{3}{12}$ inch high; tubular prolongations $\frac{1}{5}$ inch long by $\frac{1}{12}$ inch broad at the free extremity, which is rather larger than the fixed end.

Hab. Marine, on hard objects.

Loc. Atlantic Ocean, in 374 fathoms, a few miles north of Cape St. Vincent; on a fragment of *Corallistes Bowerbankii*, Carter.

Obs. There is only one specimen of this sponge; and it is fixed to the flat surface of one of the fragments of *Corallistes Bowerbankii* in the large jar bearing the figures 374 fathoms, =station 25 of the 1870 cruise.

The spicular complement approaches nearest to that of the group Halichondrina; but I have never been able to find the spined acuate spicule common to the sponges of this group, except in one mounted instance, where it appears to be accidental, as I have sought for it in vain in many other fragments both of the dermal and internal structures. This again is another of the "histodermal" sponges dredged up on board the 'Porcupine.'

Halichondria abyssi ('Annals,' 1874, vol. xiv. p. 245, pl. xiv. figs. 26–28). (Pl. XIV. fig. 24, *a*, *b*.)

Since describing and illustrating the fragment of this sponge (*l. c.*), Mr. T. Higgin of Huyton, near Liverpool, has brought to my notice that the embryonic form (*l. c.* fig. 27, *c*) is birotulate—that is, that each end terminates in a dome-shaped or umbrella-like head composed of twelve spines webbed together (Pl. XIV. fig. 24, *b*) like the birotulate of *Hyalonema* &c. That this spicule is still what I have termed it, viz. "embryonic," is proved by my having found that the fully developed spicule (*l. c.* fig, 27, *b*) presents the same kind of head when a favourable view can be obtained of it (which is rather difficult, as the matured form generally lies on its side). The shaft, too, is often evidently bent, even in the embryonic state. Lately Mr. Higgin has found a West-Indian sponge of a purple-brown colour charged with this embryonic form only, which is identical with a fragment of the same kind of sponge in the British Museum stated to have come from Blackwood Bay in Australia. As the spicules of this species somewhat differ from *Halichondria abyssi*, Mr. Higgin, who has now

several good specimens from the locality mentioned, is about to describe it under the name *H. birotulata*. The locality of *Halichondria abyssi*, as before stated, is station 65, =345 fathoms, north-west of the Shetland Islands.

Esperia placoides, n. sp. (Pl. XIII. fig. 12, and Pl. XV. fig. 32.)

General form fir-cone-like, scaly, oblong, almost cylindrical, round at the summit, rising from a stipitate base composed of a hard perspiculiferous stem, which branches upwards into the interior. Colour now yellowish grey. Surface uniformly divided into plates of various sizes and shapes (Pl. XIII. fig. 12, *a a a*), separated from each other by deep grooves (fig. 12, *b b*), except at the summit, which is formed of one continuous large scale pierced with many vents; margin of the scale scarped all round and circumscribing a somewhat convex villous area (fig. 12, *a*, *a*); grooves between the scales concave, smooth (fig. 12, *i*); structure of the scale spiculous, consisting of a dense layer of small spicules, which project externally, giving the villous surface (fig. 12, *f*), and interlap internally with larger ones, which, in bundles, project into the sponge (fig. 12, *g*), while the two are knit together, textile-like, by a thin transverse layer at their point of contact, thus forming a plate or scale which easily comes off entire; structure of the groove (fig. 12, *k*) sarcodic, consisting of obliquely reticulated rugæ whose interstices are pierced by the "pores" so as to form a sieve-like area, like that in *Tisiphonia agaricoides*. Pores about 1-1000th inch in diameter, situated in the sarcode tympanizing the interstices of the rugæ in the grooves (fig. 12, *k*, *l*, & *l'*). Vents chiefly on the summit, where they consist of short conical elevations, terminated respectively by an aperture about 3-48ths inch in diameter, sometimes singly, in one or more of the larger scales (fig. 12, *c c* & *m*). Internal structure consisting of the spiculiferous stem (fig. 12, *d*), which, branching out in all directions, supports the sarcode charged with the spicules of the species and traversed by the excretory canal-system, which ends in the vents mentioned. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicule of one form, viz. sub-pinlike, almost acuate, fusiform, smooth, sharp-pointed and slightly curved, with the obtuse end less in diameter than the centre of the shaft, 60- by $1\frac{1}{4}$-1800th inch (Pl. XV. fig. 32). Flesh-spicules of three forms, viz.:—1, inequianchorate of the common *Esperia* form, separate and in rosette-like groups, 18-6000ths inch long, head 7-6000ths inch long (Pl. XIII. fig. 12, *n*); 2, bihamate or fibula, C-shaped, simple, $4\frac{1}{2}$-6000ths inch long (fig. 12, *o*); 3, fine acerates in bundles, which represent the tricurvates, 17-6000ths inch long (fig. 12, *p*, *q*). The skeleton-spicules make up the general structure, and almost entirely that of the stem and its branches, while the flesh-spiculess are scattered throughout the sponge generally. Size of the most perfect specimen $2\frac{1}{2}$ inches high by $1\frac{1}{2}$ inch in transverse diameter; largest part of the stem at the base $\frac{3}{8}$ inch in diameter.

Hab. Marine.

Loc. Atlantic Ocean in 345 fathoms, at station 65, about 40 miles N.N.W. of the Shetland Islands.

Obs. There are three specimens of this sponge, viz. two in one jar and one in the other, unaccompanied by any other sponge. Both jars are labelled "65," which gives the locality and depth above mentioned. In its spicules it does not differ much from the forms most common to the group Esperina; but the presence of the plates and the cribriform grooves between them, as above described, gives it a distinctive scale-like character; hence the designation "*placoides*." The scales are not imbricated, but separate and arranged like slabs of stone in a pavement with a groove between them, although probably susceptible of being drawn together by general contraction when the closure of the pores becomes necessary. From the expanded and flattened state of the end of the stem it would appear that the sponge had been attached to some hard submarine object, growing erect perhaps, as the dredge could not have reached it if it had been suspended from the roof of a submarine rock-cavern. The specimens are charged with spherical ova, whose largest size measures 25-1800ths inch in diameter, and in many instances are sufficiently developed to present the rudimentary forms of the spicules of the sponge to which they belong.

Esperia borassus, n. sp. (Pl. XIII. fig. 13, and Pl. XV. fig. 33.)

So called from the groups of spicules of which it is composed resembling so many minute palmyra trees in a row. The head of each, windmill-like and supported on a stem formed of a bundle of spicules, consists of the usual forms common to *Esperia*, viz. a sub-pinlike fusiform skeleton-spicule (Pl. XV. fig. 33), and three forms of flesh-spicules, viz. the usual *in*equianchorate, separate and in rosettes (Pl. XIII. fig. 13, *c*), the bihamate or fibula (fig. 13, *d*), and the tricurvate or bow, which is here represented as usual in *Esperia*, viz. in navicular or sheaf-shaped bundles of minute

acerates, that, when separate, often present the tricurvate undulation. The entire specimen, which is not more than 5-24ths inch long by 2-24ths inch high, is situated in a small surface-depression of a large *dried* fragment of *Pachastrella abyssi*, about 3 inches square and 2 inches thick; hence it now presents no appreciable amount of sarcode; but from its striking appearance I have thought it worth illustrating, although, after all, it may be a surface portion of an *Esperia* which grows much larger and ultimately assumes a totally different aspect. No label being on the specimen of *Pachastrella*, I conclude that it came from station 25, near Cape St. Vincent, since other like specimens of the same kind of *Pachastrella* in a *wet* state are in the jar bearing on its label "374" fathoms.

Esperia cupressiformis, var. *bihamatifera*, n. sp.
(Pl. XIII. fig. 14, and Pl. XV. fig. 34, *a*, *b*.)

Of this sponge there is only a fragment, viz. about $\frac{2}{12}$ inch of the head or free end, with no label on the jar, where it is in company with several specimens of *Esperia cupressiformis* ('Annals,' 1874, vol. xiv. p. 215, pl. xiv. fig. 16, &c.), and also a portion of the stem of another specimen covered with *Corticium parasiticum*, together with several specimens of *Polymastia ornata*, Bk. No difference can be seen between it and *E. cupressiformis* until examined microscopically, when the presence of a large *in*equianchorate of a peculiar shape (Pl. XIII. fig. 14, *a*), and an abundance of small bihamates or fibulæ (fig. 14, *c*), together with the absence of the forceps-tricurvate, points out that it must be made a variety of *E. cupressiformis*; and thus it has been designated "*bihamatifera*." Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicule of one form only, viz. acuate or subcapitate, smooth, fusiform, abruptly pointed, larger and less capitate in the stem than in the branchlets, 195-6000ths inch in the stem (Pl. XV. fig. 34, *a*), 133-6000ths inch long in the branchlet. Flesh-spicules of three forms, viz. two inequianchorates, small and large, and one bihamate. Small inequianchorate the same as that of *E. cupressiformis* (Pl. XIII. fig. 14, *b*); large inequianchorate of the common form, but rounded at the small end, 11-6000ths inch long (fig. 14, *a*); bihamate simple, 4-6000ths inch long (fig. 14, *c*). It is not improbable, from the presence of *Corticium parasiticum* on the portion of the stem of this species, that the whole of the contents of this jar came from the "chops" of the English Channel (see *Corticium parasiticum*, antcà).

Cladorhiza abyssicola, Sars, var. *corticocancellata*, n. sp.
(Pl. XIII. fig. 16.)

General form short-branched shrubby stems, covered with a thick cancellated cortex, echinated with short, erect, spine-like processes; ends of the branches tumid, round. Colour cream-yellow in spirit. Surface irregular, cancellate, with the holes bordered by short spine-like processes, which consist of pointed bundles of spicules. Pores in the dermal sarcode covering the cancellated structure. Vents indistinct. Internal structure consisting of the axis or stem, which is hard, compact, and colourless, being composed of spicules of the species closely approximated and arranged together longitudinally and parallel to each other, tending to the formation of a spiral cord, at right angles to which bundles of spicules issue, supporting (as they branch outwards and terminate on the spine-like processes of the surface) the cancellated sarcodic substance of the cortex, traversed by the branches of the excretory canal-system, whose openings at the vents have been stated to be indistinct. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicule of one form only, viz. acuate, fusiform, attenuatingly pointed, smooth and nearly straight, head less in diameter than the body, 100- by 1-1800th inch. Flesh-spicules of two forms, viz.:—1, inequianchorate, exactly like that of *C. abyssicola* ('Annals,' 1874, vol. xiv. pl. 14. fig. 22); 2, bihamate or fibula, simple, smooth, with nearly a straight back or shaft and a prolonged, whip-like, everted end to each extremity, 39- by 1-6000th inch (Pl. XIII. fig. 16, *a*). The skeleton-spicules are chiefly confined to the stems and branches supporting the sarcode, while the largest are in the former, and the flesh-spicules scattered profusely (especially the inequianchorate) throughout the sarcode generally. Size of entire sponge unknown, as the specimens are all in fragments.

Hab. Marine.

Loc. Between the north of Scotland and the Shetland and the Färöe Islands, in 345 and 632 fathoms.

Obs. There are four jars containing specimens of *Cladorhiza abyssicola*, Sars, and *C. corticocancellata*, all more or less fragmentary and mixed together, and all bearing the same number, viz. "57," which gives the locality and depth above mentioned: add to these another jar, No. 65, which gives a locality about 40 miles N.N.W. of the Shetland Islands in 345 fathoms, containing a single specimen of *C. abyssicola* so different in form to all the rest, that it requires the short and separate description which will be given presently.

Cladorhiza abyssicola and *C. corticocancellata* differ in the following particulars, viz. :—The former (Pl. XIII. fig. 15) is more or less slender and pinnatifid in its branching, the branches long and attenuatingly pointed, and the cortex consisting of long drooping filaments issuing from a thin stratum of sarcode at their base; while the bihamate or fibula flesh-spicule is simply C-shaped (fig. 15, *a*). The latter, on the other hand, is irregularly branched, the branches thick, short and tumid towards the free end, and the cortex thick, cancellous, and covered with short, erect, spine-like processes around the holes of the surface (fig. 16), while the bihamate or fibula flesh-spicule is an elongated C-shape, whose extremities respectively are everted and prolonged into a whip-like form (fig. 16, *a*).

Lastly the peculiar form in jar 65, to which I have alluded, is like that of a pinnatifid *Gorgonia*, in which the round stem is bordered on each side by long undivided branches, coming off somewhat irregularly on each side, but all opposite or on the same plane. The cortex is uniformly granulated and hirsute, but without filamentous prolongations, and the branches and stem round and of the same size throughout, the former obtusely rounded at the free extremity. In other respects (that is, in colour and the form of its spicules respectively, together with the structure of the cortex and stem) it is exactly like *C. abyssicola*. The specimen is imperfect, inasmuch as, both the distal and proximal ends having been broken off, it gives no idea of what the entire form of the sponge was. There are four inches of the stem left, which is $\frac{1}{8}$ inch in diameter, and the longest of the branches, which are irregular in this respect, $2\frac{1}{2}$ inches in length, with a little less transverse diameter than that of the stem. Of its being identical with *C. abyssicola* in all but form, there can be no doubt; and the form, although it may constitute a variety, cannot make a distinct species. I have thought it worth while to give a short description of this specimen, because it has evidently been placed in the jar by itself under the idea that it was a distinct species, and that hereafter it might not be taken for such.

Schmidt's *C. pennatula* (Nordsee-Exped. 1872, Spongien, p. 119, Taf. i. figs. 14, 15, and 16) seems to me to be so like *C. abyssicola*, Sars, that as Schmidt states that Sars's work, wherein the latter is described and illustrated, is not accessible to him, I cannot help thinking that with more opportunities Schmidt would have pronounced his specimen to be identical with that of Sars. Indeed Schmidt himself, a little further on, questions whether the specimens of *C. abyssicola*, Sars, alluded to by Wy. Thomson ('Depths of the Sea,' p. 113), may not be the same as his *C. pennatula*; but I cannot see among these specimens (all of which are now before me) any that are not mere modifications *in form only* of Sars's *C. abyssicola*, viz. a main stem with pinnate branches corticated with the drooping filaments or branchlets.

The "peculiar form in jar 65" above described is in no way like Sars's *C. abyssicola*, while *C. corticocancellata* is the "fourth" species of this kind of sponge to which I have alluded, but have omitted to mention further ('Ann.' 1874, vol. xiv. p. 218), wherein the anchorate possesses such a peculiar shape in the arrangement and number of the divisions of its head-like extremities. These, however, in *Halichondria abyssi*, which I thought were *lateral*, have now been found, as I have before stated, by Mr. Higgin to be circular, so that the minute spicules of which they are part are therefore as birotulate as the birotulate spicules of *Hyalonema* &c., but divided also, as before stated, into twelve arms in the way already mentioned under *Halichondria abyssi*.

Hymeraphia verticillata, Bk. (Pl. XIV. fig. 21 &c., and Pl. XV. fig. 39, *a*, *b*.)

General form thin, laminiform, incrusting, covered irregularly with aculeations of different heights, here and there presenting a short tubular prolongation. Colour cream-yellow or dark grey. Surface uniformly aculeated, each aculeation prolonged by the projection of a large spicule from its summit, surrounded by a number of smaller spicules, while the aculeation itself or sponge portion is chiefly composed of the dermal layer, which is densely charged with its spiniferous spicules; dermis thick, membranous, textile-like. Pores in minute depressions between the aculeations. Vents respectively at the ends of the tubular prolongations? Internal structure soft, composed of spicules held together by sarcode, traversed by the excretory canal-system, which terminates at the vents mentioned. Sarcode much yellower in the interior than on the surface. Skeleton-spicules of three forms, viz. :—1, very large, long, and acuate, sub-pinlike, smooth, curved, sharp-pointed, often bulbous, and sometimes doubly inflated at the fixed end, 200- by $6\frac{2}{3}$-1800ths inch (Pl. XV. fig. 39, *a*); 2, sub-skeleton-spicule or acerate, of a remarkable shape, viz. fusiform, nearly straight, inflated in the centre, once (sometimes twice) obtuse at the extremities, which are respectively fissurate (that is, divided into three pointed arms approximated at the points so as to form an apiculated termination); central

canal, although *not* inflated in the *centre*, is so at the *extremities*, which leads to an optical delusion, in which one arm appears to be twisted backwards (see Dr. Bowerbank's illustration, *op. cit.* vol. i. pl. x. fig. 240), 65- by 1-1800th inch (fig. 39, *b*, and Pl. XIV. fig. 21, *e–h*); 3, acerate, fusiform, curved more or less, evidently inflated in the centre, especially in the smaller forms, verticillately spined throughout at regular intervals, the spines becoming general towards the ends (Pl. XIV. fig. 21, *i*)—or moniliform, with smooth, elliptical inflations only, decreasing in size from the centre towards either end (fig. 21, *k*), 20-1800ths inch long. The large spicules, viz. no. 1, project singly, for the most part, from the summits of the aculeations respectively (fig. 21, *m–p*), while no. 2, the centrally inflated subskeleton-spicule, is chiefly congregated round them at their exit from the aculeation (fig. 21, *o o*); and the verticillately spined and moniliform spicules, viz. no. 3 (fig. 21, *i*, *k*), make up, in their smaller sizes, the greater part of the dermal layer (fig. 21, *n*), while the larger ones are confined to the inner sarcode. Size of specimen about $\frac{5}{12}$ inch in horizontal diameter and about $\frac{1}{12}$ inch thick in the centre, including the aculeations, which amount to half this.

Hab. Marine, on small pebbles.

Loc. Atlantic Ocean, in 345 fathoms, about 40 miles N.N.W. of the Shetland Islands.

Obs. There are three specimens of this sponge, all about the size mentioned; two are light cream-coloured and the other dark grey. The two light ones are in a jar labelled "65," whose locality and depth is that above mentioned, and the dark specimen in a jar labelled "78,"=290 fathoms, about 65 miles N.N.W. of the Orkneys. Associated with the latter is *Hymeraphia pyrula*, n. sp., and with the former *Phakellia ventilabrum*, *Tisiphonia*, *Tethya cranium*, *Desmacella pumilio*, and *Hymedesmia Johnsoni*.

This sponge has already been named, described, and illustrated by Dr. Bowerbank (*op. cit.* vol. ii. p. 145, vol. i. pl. x. figs. 238, 239, and 240, and vol. iii. pl. xxvii. figs. 1–3); but as the additional inflation towards the end of the large spicule (fig. 2) in the latter illustration and the recurvature of the third spine in fig. 240 (vol. i.) appear to me to be rather exceptional than ordinary forms, while the observation in vol. i. p. 146, that the "moniliform" is the "young state" of the verticillate spicule, is not borne out by the fact that both moniliform and verticillately spined spicules are present of all sizes, from the smallest to the largest, which are of equal length, however much the absence of the spines in the moniliform ones may be considered as "incomplete development." (If there is one thing more to be *deprecated* than another in the description of sponges, it is the figuring of exceptional forms of spicules as characteristic of the species.)

There is, however, a great diversity of form in all three kinds of spicules, since the terminal inflation of the large spicule is not only occasionally double, and that of the centrally inflated spicule also, but the extremities of the latter, although always more or less fissurate or spined, are equally varied.

Then, again, the verticillately spined and moniliform spicules vary in size from 2- to 20-1800ths inch in length, while the absence of any particular form of flesh-spicule may be supplied by the smallest verticillate ones, in which the central inflation then causes them very much to resemble the centrally inflated flesh-spicule of *Halichondria suberea* and *H. ficus*, Johnst., *Suberites domuncula*, Sdt. (Dr. Bowerbank, *op. cit.* vol. ii. p. 202, is wrong in restricting the presence of these centrally inflated flesh-spicules to *H. ficus*, inasmuch as they are equally present in both the type specimens of *H. suberea* and *H. ficus* respectively, of the Johnstonian collection in the British Museum.)

The only approach in form to the centrally inflated subskeleton-spicule with fissurate ends of *Hymeraphia verticillata*, that I know of, is in *Halicnema patera*, Bk. (vol. iii. pl. xv. figs. 31 and 32); but here the ends are sharp-pointed, although the centre of the shaft is once and sometimes twice inflated; still these spicules are congregated round the great sub-pinlike acuates of the fringe at the circumference of *H. patera*, where they thus bear the same relation to each other that the centrally inflated spicules do to the great sub-pinlike spicule in *Hymeraphia verticillata*. The double *terminal* inflation of the latter, too, is common in *Halicnema patera*, while the staple spicule of the body generally, which is smaller, consists of a curved acerate, inflated in the centre, and thickly (although not verticillately as in *Hymeraphia verticillata*) spined throughout. So that the spicule-complement of *Halicnema patera* comes nearest of all known sponges to that of *Hymeraphia verticillata*; and the former I have thought best for the present to place among the Subcritida. Perhaps *Halicnema patera* and its like may have to come there also.

It has been above stated, conjecturally, that the great sub-pinlike-spicule which projects from the summit of the aculeation is about 200-1800ths inch long (that is, $\frac{1}{9}$ inch); but as this spicule from its extreme length is generally broken off just outside the summit of each aculeation, while its inner

extremity rests on the pebble, the entire length has been computed by allowing two thirds for the inner and one third for the outer portion, reckoning the total thickness of the sponge from the pebble to the summit of the aculeation as above stated. The position of the vents must also be taken as provisional; for I have never seen one with an unmistakably defined margin and only the "tubular prolongations" above mentioned, which, having been broken off at the extremities, may after all *not* have been tubularly prolonged vents.

In several sponges there is a subskeleton-spicule, which presents two or three spines at one or both ends (*ex. gr.* Pl. XV. figs. 25, *b*, 29, *b*, and 28, *a*), which so far are like the fissurate ends of the spicule in *Hymeraphia verticillata*; and this often passes into ends which are inflated and spined all over in other species. The remarkable spiculation of *Hymeraphia verticillata* has necessitated this long description.

[To be continued.]

XXVIII.—*On a new Genus and Species of Collembola from Kerguelen Island.* By Sir John Lubbock, Bart., M.P.

Among the Thysanura submitted to me by Mr. Eaton was a form of the *Lipuridæ*, which I propose to dedicate to M. Tullberg, who has so largely contributed to our knowledge of this group.

Genus Tullbergia, n. g.

Corpus elongatum. Antennæ non clavatæ, quadriarticulatæ. Organa postantennalia transversa. Unguiculi inferiores nulli. Spinæ anales magnæ.

Tullbergia antarctica, n. sp.

White (colourless in spirit). Skin granular, and with scattered hairs. Ocelli absent (I could see none). Postantennal organ situated directly behind the antenna; it has numerous oval tubercles. Feet with only one claw, and without tenent hairs. Anal spines large and strong; their apex oblique and outwardly prolonged into a somewhat slender triangular point, not acuminate.

Length $\frac{1}{8}$ inch.

Hab. Common in wet moss on hill-sides and low ground in the neighbourhood of Observatory Bay, Royal Sound.

XXIX.—*The Mammals of Turkestan.* By Dr. N. Severtzoff.

[Continued from p. 225.]

Ovis Heinsii, nob.

I have thus named this species, the first specimen having been sent to me by General Heins from Tockmack.

All the three surfaces of the horns are equally concave; the edges, although slightly rounded, are sharp. In the section at the base of the horn the nuchal surface is a little narrower than the orbital surface, and the frontal surface is about once and a half as broad as either of the two former.

The spiral of the horn fits on an inserted cone pointing to the outside; the axis of this cone points backwards with a slight inclination downwards.

The basal chord and the axis of the skull form an angle of 40°, the basal chord and the median form an angle of 31°; whilst the latter and the terminal chord meet in a right angle, which, however, I believe, is less in very old specimens.

The occipital ridge of the skull is rather elevated. The nasal and orbital processes of the *frontals* are at first united in one broad bone, which reaches down to the anterior rim of the orbit, where the processes separate, the orbital, which is not much smaller than the nasal process, extending over the anterior parts of the orbit.

The nasals are not widened superiorly; their lateral edges are not straight, but rather wavy; the sharpened points extend over half the bone, so that the nostrils are very large, almost two thirds of the whole distance from the anterior rim of the orbit to the free extremities of the præmaxillæ. The profile is convex.

The lachrymals form only the anterior corner of the orbit; of the Wormerian bones the upper one fits into the space between the nasal and orbital processes of the frontal; the middle border is the shortest and the only one bent towards the interior of the orbit, forming a very sharp angle at its point.

In the form of the lachrymal *O. Heinsii* is nearer to *O. Karelini* than any other species of this genus.

The malar forms almost the entire lower and anterior edge of the orbit; its facial portion extends further towards the muzzle than the lachrymal, from which latter it is partly separated by a process of the maxillary; the end of the facial portion forms three rounded processes, of which the middle one is the largest, the others being rather short. The maxillaries

[In the copy of the 'Fauna of Turkestan' translated by me, I find the following short list of addenda, by Dr. N. A. Severtzoff.—F. C. C.]

MAMMALIA.

1. *Felis* (*Catolynx*) *chaus* (vel *Chaus catolynx*, Pall.).

Occurs about Semiretchje, Issik-kul, about Hodgent, and in the whole Zarevshan valley, Lower-Oxus marshes. It has considerably larger feet than *F. servalina*.

2. *Canis aureus*.

On the Oxus.

3. *Vesperugo noctula*.

At Cheenaz on the Syr it was caught in March 1875; not observed before.

4. *Spermophilus xanthoprymnus*, Benn.

Erroneously noticed by me formerly as *Sp. fulvus*, Licht., which also exists in Turkestan, but only near the lower Syr. *Sp. xanthoprymnus* was found by me near Tashkent and Cheenaz, and near Samarkand by Russoff.

5. *Spermophilus Eversmanni*, Brdt.

Found, in the summer of 1874, near the mountain-lake Lairam-kul, north of Kulja.

XXXVII.—*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 (*concluded*). By H. J. CARTER, F.R.S. &c.

[Continued from p. 324.]

Cometella pyrula, n. sp. (Pl. XIV. fig. 20, and Pl. XV. fig. 38.)

General form pear-like, twisted upon itself or towards the stem, which is attached to a small stone; head pyriform, apiculated by the projection of a conical point (Pl. XIV. fig. 20, *f*). Colour cream-yellow. Surface smooth, hard, firm, punctate, each punctum being the apex of a low conical projection formed of spicules arranged in a whorl-like manner (fig. 20, *h*). Pores not seen, probably the puncta respectively

(fig. 20, *g*). Vent single, apical, surrounded by a cone of long linear spicules (fig. 20, *e*). Internal structure densely spiculous, compact, suberose, hard and firmly continuous with the dermal layer; composed of spicules radiating in bundles from the centre (which is light-coloured, on account of the comparative absence of sarcode) to the circumference; followed by a zone of softer substance, in which the ova appear to be specially developed, limited by a layer of compressed cavities, forming part of the excretory canal-system, into which the ova fall probably, when matured, and thus gain their exit. This, again, is followed by a subdermal zone, in which the bundles of spicules appear to be finally divided into lashes, each lash going to a punctum or pore on the surface; last of all comes the dermal zone itself, which is composed of a layer of spicules corresponding in the lightness of its colour with that of the centre, probably also from the comparative absence of sarcode; the whole traversed by the excretory canal-system, which opens at the single vent mentioned (fig. 20, *d*). Stem similarly composed. Sarcode of the internal substance yellower than that of the dermis. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicules of two forms, viz.:—1, large, acerate, fusiform, smooth, finely pointed at each end and nearly straight, about 37- by $\frac{1}{2}$-1800th inch (Pl. XIV. fig. 20, *i*, and Pl. XV. fig. 38); 2, small or subskeleton, short, subacuate or subacerate, fusiform, slightly curved, thickly and irregularly spined, spines short, sharp, conical, vertical, 11- by 1-1800th inch (fig. 20, *k*). Flesh-spicule of one form only, viz. equianchorate, with slightly curved bow-shaped shaft and falcate spreading arms, webbed up nearly to the points (fig. 20, *l*, *m*). The skeleton-, mixed with a few of the spinous spicules, chiefly make up the structure of the sponge generally, while the cone at the apex of the head (fig. 20, *f*) is formed by a projection of the smooth long acerates alone; each "lash" of spicules also, after traversing the subdermal zone, ends by slightly protruding beyond the apex of its respective punctum, while the dermal layer of the short spiniferous acuates is arranged in whorls round the puncta, whose apices are thus traversed by the lash of skeleton-spicules respectively; and here *alone* the flesh-spicules (anchorates) appear to be congregated. Size of specimen about 11-24ths inch long by 4-24ths in the broadest part, *i. e.* of the head.

Hab. Marine, attached to small pebbles.

Loc. Atlantic Ocean, in 290 fathoms, about 65 miles N.N.W. of the Orkneys.

Obs. There is but one *entire* specimen of this little sponge,

accompanied by the stem of another, from which the head has been broken off. The label on the jar is "78," which gives the locality and depth above mentioned. It appears to belong to Schmidt's genus "*Cometella*" ('Atlantisch. Spongienf.' 1870, p. 49), and under other circumstances might grow erect and have a longer stem, as the headless one (fig. 20, *c*) seems to point out. The spicules indicate an alliance with those of the group Halichondrina, while the compactness of the tissue is like that of the Subcrite *Halichondria suberea*, &c. In the jar with it are specimens of *Halichondria carnosa*, *Polymastia*, *Hymeraphia verticillata*, *Phakellia ventilabrum*, and *Tethya cranium* = *Donatia*, Gray.

Hymeraphia microcionides, n. sp. (Not illustrated.)

General aspect laminiform, extremely thin, following horizontally the form of the surface on which it may be growing. Colour now light yellow. Surface hirsute from the projection of long smooth spicules. Pores and vents indistinct. Internal structure consisting of a layer of spined spicules confusedly arranged, out of which spring vertically others which give the hirsute character just mentioned. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicule of three forms, viz.:—1, large, long, acuate, smooth, nearly straight, attenuatingly pointed, increasing in size gradually from the large or fixed to the small or free end, 100- by 1½-1800th inch; 2, subskeleton, much smaller than the foregoing, acuate, short-spined, attenuatingly pointed, slightly curved towards the fixed end, which is a little smaller than that of the shaft that follows it, 16- by 1-1800th inch; 3, subskeleton, cylindrical, circularly curved (that is rainbow-like), spined throughout, especially at the ends, which are obtuse and round, 10- by ½-1800th inch. Flesh-spicule of one form only, viz. equianchorate, small, navicular in form, rather bent in the shaft, 6-6000ths inch long. The curved, cylindrical, spined spicule forms a dense layer in which the two acuates are fixed vertically by their large ends, the spined acuate only just appearing above the surface, while the large smooth one is 1-12th inch long, and the flesh-spicule, or anchorate, scattered irregularly throughout the lamina. Size of specimen about ¾ inch in diameter, and 1-96th inch thick, exclusive of the long spicules.

Hab. Marine, on hard objects.

Loc. Station 25, in 374 fathoms, near Cape St. Vincent, growing over a piece of *Pachastrella abyssi*.

Obs. There is nothing peculiar in this sponge beyond its resemblance to *Microciona* in its growth, form, and spicules.

In *Microciona*, however, the arrangement of the latter is for the most part scopiform, or in vertical bundles (hence Schmidt's name "*Scopalina*"); while here there is a distinct layer formed by the curved spinous spicules, out of which the acuates project separately and directly upwards like hairs on the surface of the body. The equianchorate is like that of *Microciona*; and most probably both it and *Hymeraphia* will hereafter be shown to be intimately allied.

Since this was written, Mr. T. Higgin has sent me a specimen of a like sponge, which he found on a piece of old stony coral from Grenada, in the West Indies. It is laminiform, extremely thin, and consists of a layer of spiniferous spicules, out of which project a number of smooth long acuates hirsutely. But the bedding spined spicules are *quadriradiate*, somewhat like in form to those of *Dercitus niger*; and I could detect no kind of flesh-spicule.

Suberites massa, Sdt. (Spong. Adriat. Meeres, p. 67, Taf. vii. fig. 2).

Two fragments of this sponge were dredged up at station 65 in 345 fathoms. They consist of small round branches about 2 inches long, which are again branched irregularly and more or less coalescent. Indeed they look as if they had been torn off from some larger coalescent mass of vertical branches of the same nature. The colour is light yellow, the surface villous, the structure compact, and the spicule of one kind only, viz. pin-like, with smooth, fusiform, pointed shaft and more or less oval head.

The tendency of this sponge is evidently to coalesce, so that, in its lower or older part, it becomes massive, as seen in the specimen illustrated by Schmidt, where the tops of the branches only remain free. A similar specimen exists in the British Museum, where it is even more consolidated—and another where the branches have remained more separate and terminate in flattened digitate or serrate margins respectively, like toes on the human foot. These came from the coast of Portugal. I have also a specimen of the kind from the Mauritius, sent to me by Dr. Dickie, of a pinkish yellow colour.

Another in the British-Museum collection was dredged up by Sir J. Ross in 74½° south latitude, depth 206 fathoms; but it is of a leaden grey colour, and possessing a pin-like spicule, in which the head is for the most part spherical and much larger than any other part of the spicule, I have proposed for this (in MS.) the name of "*Suberites antarctica*." In its sur-

face are nestled parasitically many small crustaceans, which have been named, described, and figured by the Rev. Thomas R. R. Stebbing, M.A. ('Annals,' 1875, vol. xv. p. 184, pl. xv. fig. 1, &c.).

Polymastina.

(μαστός, nipple.)

I would propose this name for a group of sponges which provisionally might be placed before *Donatina*, in the suborder Suberitida, under the order Holorhaphidota in my classification ('Ann.' 1875, vol. xvi. p. 190), characterizing it by a smooth appendiculate (mastophorous) surface, for the most part sessile, sometimes stalked; composed internally of a radiating structure consisting of bundles of large, smooth pointed, fusiform spicules, for the most part round or inflated pin-like at the inner or larger end, sometimes acerate or sharp at both ends; faced with a smaller spicule of the like form, which, together with the larger ones, project more or less beyond the surface, so as to give it the villous character above mentioned. More or less hollow or soft internally, or intensely compact and hard throughout.

Of these, *Polymastia brevis*, *bulbosa*, *mamillaris*, *ornata*, and *robusta*, Bk. (*op. cit.* vol. iii. 1874), also *Thecophora semisuberites*, Sdt., *T. ibla*, Wy. Thomson, *Rinalda uberrima*, Sdt., with the, to me, stalked forms, viz. *Polymastia stipitata*, n. sp., *Cometella simplex*, n. sp., and *Podospongia Lovenii*, Bocage, together with the laminiform *Latrunculia cratera*, Bocage, have all, with the exception of *Cometella simplex*, which seems to have come from the "chops" of the English Channel, been dredged up at various stations respectively between the north of Scotland and the Färöe Islands, especially at station 65, in 345 fathoms.

Other species of *Polymastia* have been described and illustrated by Dr. Bowerbank (*op. cit.*), viz. *P. conifera*, *radiosa*, and *spinularia*, also by Schmidt (Atlantisch. Spongienf. 1870), viz. *Radiella spinularia*, Sol., *Eumatia sitiens* and the stalked sponge *Cometella stellata* perhaps; while Balsamo-Crivelli in 1863 (Atti della Soc. Ital. di Scienze, vol. v. tav. vi. figs. 10–17) *first of all* figured the species *Suberites appendiculatus*. It is possible that several of these species are but different forms of the same; hence further observations may considerably reduce their number.

The second kind of sponges included under Polymastina is the hard, solid, compact one, but still presenting the same kind of spicules and villous surface. One of these I described and illustrated in 1870 under the name of *Trachya pernucleata*

('Ann.' 1870, vol. vi. p. 178, pl. xiii. figs. 11, &c.), also establishing the genus at the same time.

Others of a like nature exist in the British Museum from Port Elizabeth in S. Africa; and lately Mr. W. J. Sollas has given me half of one, in form like a little bolster (viz. cylindrical and slightly constricted in the middle), said to have come from Australia. It is 5 inches long and 2 inches thick. Those which I have hitherto seen vary under this size, are more or less globular, and each attached to a little stone. They are *intensely* hard and tough, grey outside and light yellow within, presenting a uniformly round form and stiff villous surface, with no appearance of vents, or at least, if any of the latter, very small, numerous, and indistinct. Internally the structure is fibrous, radio-reticulate, traversed through the interstices by the excretory canal-system, which is evident enough here. As the branched reticulation radiates from the centre, which is *not* nucleated, the fibre of which it is composed becomes smaller and the interstices closer until a little before it arrives at the circumference, where it is lost in a dense mass of spicules that terminate in the villous surface of the dermis. The spicules of which the reticulated structure and the body generally are composed are smooth, slightly curved, and fusiform, rounded or inflated pin-like at one end and more or less pointed at the other, faced by a smaller but like form at the circumference, where there is *no cortex* beyond the more densely packed state of the general structure. My observations under *Trachya pernucleata* (*l. c.*) are equally applicable here; and these sponges, of which there may be several species, will probably have to be considered a solid *Geodia*-like form of *Polymastia*, very nearly allied to the *Donatina*, and all belonging to the suborder Suberitida. I am very much inclined to think that although in some of the species the spicule appears to be acerate (that is, finely pointed at *both* ends), a microscopical power of about 400 would show that one end is slightly obtuse—that is, leading to the acuate and pin-like forms with fusiform shafts of most of the species. When one end of a linear spicule is rendered thus obtuse, it is always at the expense *in length* of this half of the spicule, so that the maximum inflation of the shaft is thus thrown out of the middle and nearest to the obtuse end.

Polymastia stipitata, n. sp.

General form consisting of a head and long stem. Head round at first, then obovoid with a papillary eminence on one side of the large end; afterwards cylindrical, expanded upwards,

truncate obliquely above and horizontally below, the truncated areas being circumscribed by a prominent ridge, which above, when fully developed, rises into a circular wall that terminates the head. Stem long, slender, expanded at first where in connexion with the head, then narrow, and afterwards gradually increasing towards the lower end, where it suddenly thickens into an irregularly bulbous form, to terminate in a bunch of numerous root-like fibres more or less matted together with the sand in which the sponge has been fixed. Colour grey. Surface hirsute throughout, hirsuteness especially evident over the head and ridges formed by the pointed ends of projecting spicules, which, taking a spiral direction round the body, end in a whorl for the most part situated in the centre of the summit; stem rugose or corrugated circularly on the surface, where the rugæ are most prominent at the lower part. Pores not seen. Vents on the summit and upper part of the head respectively, consisting of a large one in the centre of the whorl, and one to five smaller ones along the projecting line formed by the upper ridge, each vent prolonged by a little conical tuft of spicules. Internal structure radiate, consisting of bundles of large spicules imbedded in sarcode and issuing in gyrate lines from a central point towards the circumference, where their points intermingle with those of a dermal layer of small spicules, which thus together produce the hirsute surface; traversed by the branches of the excretory canal-systems which terminate at the vents mentioned. Stem internally consisting of a gently spiral cord formed of large long spicules applied longitudinally to each other successively, where they are all held together by sarcode, and covered by a dense dermal layer or sheath, through which the dermal spicules project perpendicularly in the form of a minute crust. Spicules of one form only and two sizes, viz. a body- and a dermal-spicule. Body-spicule large, long, acerate, fusiform, attenuatingly pointed at both ends, one of which is *slightly* obtuse, nearly straight, 250- by 4-1800ths inch. Dermal spicule of the same form, but only a 40th part of the length, being 6–8- by $\frac{1}{3}$-1800th inch. The body-spicule chiefly belongs to the stem and bundles of the head, each of which is faced by the layer of dermal spicules, while an intermediate size filling up the interstices of the head causes the hirsute character there to be more evident than on the stem, where the dermal spicule alone exists.

Size. This, like the form, depends upon age and the degree of development. The largest I have is about $3\frac{1}{2}$ inches long, $\frac{1}{2}$ an inch of which is head and the rest stem; the head is about $\frac{5}{12}$ inch in diameter at its upper part.

Hab. Marine, growing erect in a sandy bottom, in which the root-like fibres are spread out for fixation.

Loc. Chiefly between the north of Scotland and the Färöe Islands.

Obs. The above description shows that the structure of the head is essentially like that of the sessile *Polymastiæ*, Bk.; hence its designation; while the lower end of the stem, being suddenly enlarged and terminating in a bunch of numerous rootlets, contrasts strongly with the following species, which is the reverse, although the structure of the head here too will be seen to resemble that of *Polymastia*. At first I thought *Polymastia stipitata* was Sars's *Hyalonema longissimum*, since some of the specimens of the former (which came from near Cape St. Vincent) are exactly like his figures: but there is no central inflation of the spicule in any of them; and if there were, there would be no sexradiate cross of the central canal, which is peculiarly, as Schmidt has noticed, the character of the Hexactinellida: therefore I wonder that the name of "*Hyalonema*" should have been applied to these sponges; a glass stem alone does not make a hexactinellid sponge. The same might be said of Lovén's *H. boreale* (figs. 9–11, 'Ann.' 1868, vol. ii. p. 81, pl. vi.); while Prof. Wy. Thomson ('Depths of the Sea,' p. 114) only gives a figure of the entire sponge without alluding to the form of the spicules. Still the forms represented by Lovén's, Sars's, and Thomson's figures respectively of the entire sponge are all present among those dredged up on board the 'Porcupine,' none of which have any central inflation on the spicule: or if so, it must be the exception; for after repeated examinations I have not found one.

Cometella simplex, n. sp. (Pl. XVI. fig. 53.)

General form consisting of a head and stem. Head obovate globular, passing below into a fine stalk, which, narrowing towards the lower end, divides dichotomously into a few delicate, dendriform, root-like fibres. Colour light yellow. Surface of head and stem hirsute throughout, hirsuteness especially prominent over the former, arising from the projection of the pointed ends of the spicules. Pores and vents not evident. Internal structure radiate, consisting of bundles of large spicules extending from a central point to the circumference, where they are met by a much smaller set, which together produce the hirsute appearance; head in a longitudinal section presenting a thin transparent dermal layer, then an opaque much thicker subdermal zone, followed by a layer of compressed cavities, which belong to the excretory canal-system, finally

resting on the radiating structure of the centre (see section of *Cometella pyrula*, Pl. XIV. fig. 20, *d*). Stem internally consisting of large spicules applied longitudinally to each other successively as they are held together by sarcode, and finally covered by a denser dermal sheath, pierced perpendicularly by smaller spicules. Spicules of three forms, viz. acuate, subpinlike, and pinlike or dermal, all smooth, nearly straight, fusiform, and attenuatingly pointed. The largest or acuate has the large end rounded and a little less in diameter than the shaft, 150- by $\frac{3}{4}$-1800th inch; the smallest or dermal is pinlike, with globular terminal inflation, also a little less in diameter than the shaft, 20- by $\frac{1}{2}$-1800th inch; and the subpinlike of intermediate size between the two, with the terminal inflation equally variable, as the globular head appears to pass gradually into the simple, round, acuate or *un*inflated end of the large skeleton-spicule. The largest spicules are confined to the stem and the bundles in the head, both of which are faced by a layer of the pinlike dermal spicule, mixed with the intermediate sub-pinlike ones, not only in the head but throughout the stem. Size of specimen (for there is only one) $\frac{5}{12}$ inch long in totality, of which $\frac{2}{12}$ belong to the head.

Hab. Marine, growing erect, fixed in a sandy bottom by the root-like fibres above mentioned.

Loc. Probably the "chops" of the English Channel in about 500 fathoms.

Obs. Although there is no number on the jar containing this specimen, its concomitants seem to indicate the locality just mentioned. By a comparison with the foregoing species, viz. *Polymastia stipitata*, the points of difference will be obvious, although the structure of the head together with the forms and disposition of the spicules respectively closely allies it to the Polymastina. The specimen is very small; and therefore its fully developed form may be somewhat different, as in the last species. Being like Schmidt's genus *Cometella* in figure and constitution, I have given it his generic name, with the specific designation of "*simplex*," as it contains no flesh-spicule like that of *C. stellata*, Sdt.

Podospongia Lovenii and *Latrunculia cratera*, Boc.

Specimens of these two sponges, so well described and illustrated by Bocage (Journ. d. Sc. Math. Phys. et Naturelles, no. iv. Lisbonne, 1869), were dredged up between the north of Scotland and the Färöe Islands, and the former also at two or three other stations between this and the coast of Portugal. Between Scotland and the Färöe Islands, the former came

from station 82=312 fathoms, and the latter from 65=345 fathoms.

Although *Podospongia Lovenii* is furnished with a long stem like *Cometella*, and *Latrunculia cratera* is laminiform, incrusting, there is so little difference between the shape and disposition of their spicules, that I cannot help thinking that both ought to have been put under the same generic name.

Again, while Schmidt places his genus *Cometella* among his Suberitidinæ, he places *Latrunculia cratera* under his Desmacidinæ. But if *Podospongia* and *Latrunculia* be but species of the same genus, as I have above assumed, and the structure of *Cometella*, especially *C. stellata*, Sdt., be closely allied to that of *Podospongia Lovenii* (which is the case), then it appears to me that all these should come under the Suberites, where Schmidt has placed his *Cometella*, if not Schmidt's laminiform *Sceptrella regalis* also, whose body- or linear spicule, according to the type specimen in the British Museum, is like that of the rest, viz. acuate, smooth, fusiform, while the sceptre-like flesh-spicule only differs from that of *Latrunculia* in the presence of spines over its rays and of three forms of the anchorate, which "forms," as Schmidt has observed (Atlant. Spongienf. p. 58), are certainly very remarkable; but still they are but flesh-spicules, the value of which in specific distinction is, as I have before stated, not always of much consequence.

Geodia nodastrella, n. sp. (Pl. XVI. fig. 45.)

General form irregularly tuberous (like a potato) when large, spheroidal when small; free or fixed, presenting one or more points of attachment according to the circumstances and situation under which it has grown, with here and there large, deep depressions of the surface. Colour yellowish opaque white. Surface even, presenting here and there the deep depressions mentioned, bottomed by a cribriform structure. Dermis consisting of a reticulated layer of sarcode charged with minute nodastrelloids (Pl. XVI. fig. 45, *g*, *k*); stelliferous in appearance, on account of the interstices being most developed in patches linked together by the general reticulation; supported on bundles of small, dermal, acerate spicules that project from the subjacent petrous crust (fig. 45, *h*), which consists of an agglomeration of siliceous balls, held together by sarcode charged with nodastrelloids, and pierced by numerous holes (which respectively are overlaid with the stelliform patches of the dermal reticulation just mentioned) opening internally into the great marginal cavities of the pore-system. Pores consisting of the interstices of the dermal reticulation, opening

into the lobes respectively of the petrous crust. Vents in the cribriform structure at the bottom of the deep depressions of the surface. Internal structure consisting of a circumferential zone of spicules arranged parallel to each other and perpendicular to the body-substance on which their pointed ends rest, while their heads support the petrous crust of siliceous balls; composed of the "zone-spicule" *par excellence* (fig. 45, *a*), the "body-spicule" (fig. 45, *c*), and the two forms of "anchoring-spicule" (fig. 45, *d*). Body-substance composed of the "body-spicules" alone, held together by areolar sarcode charged more or less with flesh-spicules, and traversed by the branches of the excretory canal-system. Excretory canal-system most developed towards the circumference, least towards the centre of the body-substance, where the spicules are most densely aggregated and the structure most compact, whence the subnucleated appearance. Skeleton-spicules of three forms, viz.:—1, the zone-spicule, composed of a long, stout, straight shaft, smooth, round, sharp-pointed, and directed internally, supporting a head consisting of three arms, furcated, expanded horizontally, and a little recurved, supporting the petrous crust externally, shaft 170- by 8-1800ths inch, total expansion of the arms 54-1800ths inch in diameter (fig. 45, *a*); 2, body- or staple spicule, acerate, stout, more or less curved, smooth, round, attenuatingly pointed, mixed with the zone-spicules, where it often pierces the crust, and forming, with the exception of the siliceous balls in all stages of development and the body-stellates exclusively, the skeleton-spicule of the body-substance, 190- by 5-1800ths inch (fig. 45, *c*); 3, anchoring-spicule, composed of a long, delicate, straight shaft, smooth, round, sharp-pointed, and directed internally, supporting a small head with usually three delicate arms recurved like the flukes of an anchor, or extended like the prong of a fork (fig. 45, *d*), associated with the zone-spicules, but often piercing the petrous crust so as to form anchoring-spicules externally, which are for the most part broken off, shaft very long and thin, variable in length, arms about 9-1800ths inch long. Flesh-spicules of four forms, viz.:—1, the nodastrellum, globular, the rays being represented by minute round tubercles about 2-6000ths inch in diameter, hence its name, most abundant in the dermal reticulation (fig. 45, *g*, *k*): 2, dermal, acerate, slightly curved, smooth, round, attenuatingly pointed, supporting the dermal reticulation over the petrous crust, about 22- by $\frac{1}{2}$-1800th inch (fig. 45, *h*): 3, siliceous ball, spheroidal or elliptical (fig. 45, *f*), slightly compressed, presenting, when fully developed, a tessellated stelliferous surface, and a hilum-like depression on the

flattened sides respectively, composed of radiating, columnar structure internally, each pillar ending on the surface in a little stelliform head, which, in juxtaposition, produces the tessellated appearance mentioned; the siliceous balls at maturity form the crust, and are scattered throughout the sarcode of the outer part of the body-substance and zone, as before stated, in all stages of growth, where their gradationary development may be easily observed; largest or adult size about 7-1800ths inch in diameter: 4, body-stellate, consisting of a starlike spicule with conical pointed rays, united together in the centre *without* a nucleus or body (fig. 45, *e*, *i*), sparsely scattered through the body-substance, about 3-6000ths inch in diameter. Size of largest specimens, which are tuberous, 4 inches in diameter; size of smallest specimens, which are spheroidal, 4-12ths inch in diameter.

Hab. Marine, free or attached to solid bodies.

Loc. In the deep water between the north of Scotland, the north-west of Shetland, and the Färöe Islands, at stations 51, 57, 61–63, and 65 respectively; also near Cape St. Vincent.

Obs. It is difficult to find a satisfactory distinguishing character among most of the Geodina, as they are so much alike in all parts of the world. In the above instance this is chiefly to be found in the nodose form of the surface-spicule or stellate, and hence the designation "*nodastrella*;" while the furcate division of the arms of the zone-spicule appears to offer (for the specimens dredged up on board the 'Porcupine' at least) a convenient character for separation, if not also for recognizing the *embryonic form of the ovum*, as will presently be seen.

It was at the base of a specimen of one of these *Geodiæ*, about 2 inches in diameter, that I found two projecting spicules bearing respectively a globular embryonic form, which, from its size, appears to be the first stage after the elimination of the ovum of this species. These I mounted in balsam together, on the spicules bearing them respectively as I found them. One, the largest, is 14-, and the other 9-1800ths inch in diameter. They are both composed of furcate zone-spicules, which have the furcated arms of their heads incurvated over the convexity of the embryo, while their shafts are directed towards the centre; in both, too, the sarcode is sparsely charged with minute stellates, from some of which the siliceous balls might subsequently have become developed, as the latter originate in this way, while when fully developed the siliceous ball is nearly as large as the whole embryo itself. Besides these spicules, the smaller specimen possesses the acerate body-spicule, which projects a little beyond the surface; and one or

two of these linear projecting shafts having been broken off leads me to infer that these might have been anchoring-spicules which had lost their heads, as the latter are not to be seen on either embryo. The whole of the embryo and its spicules are, of course, of microscopic minuteness, as they can only be seen with $\frac{1}{4}$-inch compound power, equal to nearly 400 diameters, although quite as clearly as if the spicules had been of the largest size.

I have been thus particular in describing these embryos taken from the base of a *Geodia* and corresponding in the form of their spicules with those of that *Geodia*, because the name of "ovarium" has been applied to the "siliceous balls" of the petrous crust by Dr. Bowerbank, and that of "ovisacs" by the late Dr. Gray in his "Notes on the Arrangement of Sponges" (P. Z. S. 9th May, 1867), while many others have adopted a similar terminology; so that, had not Dr. Johnston (Brit. Spong. 1842, p. 202), Schmidt, and those who have particularly examined these bodies from their earliest appearance to their full development, which every specimen of *Geodia* presents in abundance, been perfectly satisfied that they could not be considered reproductive elements of the *Geodia* under any form, these two embryos would prove that the "siliceous balls" are nothing more than sponge-spicules of this particular form; besides, they have just the appearance and general character of the embryos of *Tethya cranium*, which I described and illustrated in 1872 (Ann. & Mag. Nat. Hist. vol. ix. p. 426, pl. xxii.).

The description of *Geodia nodastrella* above given may appear prolix; but it is the first time that I have had the opportunity of giving a *typical* one; and the species are so much alike that this in its general characters may serve for all the rest.

Geodia megastrella, n. sp. (Pl. XVI. figs. 46 and 46′.)

General form hemispheroidal, elongate, flattened at the base, where it is adherent to the surface of the large fragment of *Corallistes Bowerbankii* on which it has grown, presenting a large circular aperture on the summit. Colour now grey. Surface, where not rubbed off, the same as in the foregoing species; but the stellate of the dermis (fig. 46′, *h*, *m*) furnished with minutely spined capitate rays instead of simple nodes, and the siliceous ball very large, being 13-1800ths inch in diameter (fig. 46′, *g*). Pores as in the last species (fig. 46, *c*). Vent single, on the summit, consisting of a large circular hole partly closed by a diaphragm of sarcode (fig. 46, *d*). Internal

structure the same as in the foregoing species; but the zone-spicule and the stellate with which the internal sarcode is charged are different. Thus the zone-spicule consists of a long, smooth, round, straight shaft, pointed internally and terminated externally by three simple, or unfurcated arms, which are applied to the inner side of the petrous crust of siliceous balls (fig. 46′, *a*). Arms smooth, round, sharp-pointed, expanded laterally and anteriorly, and slightly recurved; shaft about 200- by 5-1800ths inch, arm about 47- by 5-1800ths inch. Body-spicule about 210- by 3-1800ths inch (fig. 46′, *c*). Anchoring-spicules much the same as in the last species (fig. 46′, *d*). Sometimes, too, the arms of the zone-spicule are furcated (fig. 46′, *b*). Flesh-spicules of the sarcode internally stelliform, of two sizes, viz.:—1, the largest (megastrellum), very large and plentiful, consisting of 3–7 arms radiating irregularly from the centre, which has *no body* or nucleus; arm round, straight, sharp-pointed and microspined throughout; total diameter of the megastrellum 6-1800ths inch, arm 3-1800ths inch long (fig. 46′, *e*, *k*): 2, small body-stellate, the same as the foregoing, but only 3-6000ths inch in diameter (fig. 46′, *f*, *l*). The seven-armed form appears to be most common in both the megastrellum and the body-stellate. Size of specimen (fig. 46) 1 by $1\frac{1}{4}$ inch long at the base and $\frac{3}{4}$ inch high; longer than broad.

Hab. Marine, on hard bodies.

Loc. Probably from station 25=374 fathoms, near Cape St. Vincent, where the fragments of *Corallistes Bowerbankii* in the jar bearing these numbers were dredged up; for the specimen is dry and has no label.

Obs. There is only one specimen of this *Geodia*; and, as just stated, it is dry and has grown on the flat surface of a large fragment of *Corallistes Bowerbankii*.

Geodia megastrella, var. *lævispina*.
(Pl. XVI. fig. 47 &c.)

Of this form there is only a fragment of the crust or capping about an inch square, to which a little of the internal structure is still adherent. It was dredged in 292 fathoms, at station 24, which would be a few miles north of Cape St. Vincent, in the 1870 cruise, and agrees with the last species in the form of the zone- and body-spicules and the presence of the large stellate (megastrellum), but not in the surface stellate, the rays of which are simply truncated (fig. 47, *f*, *k*), and the siliceous ball about 11-1800ths inch in diameter (fig. 47, *e*). The zone-spicule (fig. 47, *a*), too, is much smaller; for the shaft

is only 87- by 3-1800ths inch long, and the arms 29-1800ths inch long respectively. Here also there is a tendency to bifurcation in the latter; while the large stellate (megastrellum) of the interior, although of the same size as that of the foregoing species, has for the most part only six arms, and these are *smooth, not microspined* (fig. 47, *d, h*), as in the foregoing species.

Hab. Marine.

Loc. Above mentioned.

Obs. With only a fragment of the capping or petrous crust of this form, this is all that can be stated descriptively about its spicules; and the general form of the entire sponge of course is absent altogether.

The specimen, however, is very interesting in a developmental point of view; for its spicules being in many instances abnormal in form, especially the siliceous ball, shows how intimately the latter is connected with a stellate, and how, in all probability in its minutest form, it always originates in one. Thus the siliceous ball, even when of full size, often presents itself here in the form of a thick coarse stellate, with from five to seven arms, each of which may present more or less of the little stellate terminations which, in juxtaposition, make up the tessellated surface of the matured and normally developed ball, showing plainly that the latter belongs to the stellate group of spicules.

We see a similar development of the siliceous ball in Dr. Bowerbank's illustrations of *Geodia tuberosa* (Proc. Zool. Soc. 1872, pl. 46. fig. 11) and especially in the abnormal developments given by Schmidt (Spong. Küste Algier, 1868, Taf. iv. fig. 6) on the left side of the illustrations of *Stelletta intermedia*, where, as *Stelletta* has no siliceous balls, it is evidently the abnormal development of the stellate itself, which closely approaches that of the abnormally developed siliceous ball in *Geodia megastrella*, var. *lævispina*.

The fact, too, that the siliceous ball belongs to and probably originates in a stellate form, bears upon the nature of the stellates present in the embryos of *Geodia megastrella*, which altogether are respectively hardly larger than the full-sized siliceous balls of this species, and therefore can only present these balls in a rudimentary state—that is, in the stellate form.

In the three species of *Geodia* above described, the fluked anchoring-spicule somewhat differs in the form of its head, as may be seen in the illustrations; but this has not been insisted on in the descriptions, because the form often differs so much even in the same species.

Stelletta pachastrelloides, n. sp. (Pl. XV. fig. 40, &c.)

General form large, flat, thick, irregularly undulated, amorphous, composed of a confused mass of spicules; margin thick, round, and also irregularly undulous, except where it appears to have been broken off from the submarine object to which the sponge had been attached. Colour cream-yellow. Upper and under surfaces so much alike as to be almost undistinguishable, the former undulating, even, asperous from projection of the ends of the large spicules, which are more or less confusedly and horizontally imbedded in the dermal sarcode; the latter similar, but more granular, and sometimes indicated by the impressions of small pebbles on which the sponge may have rested while growing; the whole more or less enveloping small objects such as minute Foraminifera (*Globigerina*), small shells, &c., also overgrown by a variety of other sponges. Pores chiefly in the dermal sarcode, tympanizing the interstices between the projecting spicules. Vents single or in groups, more or less irregularly scattered over both surfaces, especially the lower one. Internal structure more compact, consisting also of a confused mass of spicules held together by cancellated sarcode, traversed by the branched canals of the excretory system, which chiefly run towards the lower surface, where they end in the vents mentioned. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicules of three forms, viz.:—1, zone-spicule, comparatively small, consisting of a three-armed shaft, arms equal, equidistant, simple, smooth, sharp-pointed, expanded almost horizontally and slightly recurved; shaft about twice the length of the arm, straight, smooth, sharp-pointed, 60- by 5-1800ths inch, arm 35- by 4-1800ths inch (Pl. XV. fig. 40, *b*); 2, body-spicule, *very large* simple acerate, slightly curved, and sharp-pointed, 260- by 7-1800ths inch (fig. 40, *a*); 3, anchoring-spicule, a three-armed shaft, arms equal, equidistant, simple, smooth, sharp-pointed, at first expanded for a short distance, and then suddenly bent backward; shaft thin and very long, smooth, straight, sharp-pointed, 260- by $1\frac{1}{2}$-1800th inch long, arms 12- by $1\frac{1}{2}$-1800th long (fig. 40, *c, h*). The forked form not observed. Flesh-spicules of four forms, viz.:—1, long, simple, acerate, slightly curved and thickly microspined, 58- by $1\frac{1}{2}$-6000th inch, but very variable in size (fig. 40, *d, i*); 2, short, simple, acerate, curved or bent in the centre, with or without central inflation, pointed or obtuse at the extremities, thickly microspined, 11- by 2-6000ths inch (fig. 40, *e*); 3, globular stellate, of 6 or 7 rays, rays unequal, microspined at the extremities,

4-6000ths inch in total diameter (fig. 40, *f*); 4, elongated stellate, axis bacilliform, twisted and spined, spines or rays linear, 3-6000ths inch long (fig. 40, *g*). Zone-spicules chiefly confined to the surface, where they are disposed together confusedly, with their arms for the most part expanded over the surface and their shafts directed inwards. Body-spicule, which is the staple form and dominant size, confusedly spread throughout the mass, and where near the surface projecting through it so as to give a horribly asperous character. Anchoring-spicule much less numerous, imbedded in the general structure, or projecting with its head outwards and the shaft in the sponge. Flesh-spicule disposed in a mass among the foregoing, so as to fill up the interstices, where No. 2 is chiefly confined to the surface, the stellates being for the most part scanty. Size of specimens averages 5 inches broad by 1 inch thick.

Hab. Marine, frequently free, not fixed.

Loc. Atlantic Ocean, in 374 fathoms, at station 25, near Cape St. Vincent.

Obs. The fragments of this sponge, in their flat, amorphous forms, respectively resemble the broken ones of a thick, coarse, uneven earthenware dish with the edges rounded. Four are dry and without number; while the fifth is in a large jar accompanied by fragments of *Corallistes Bowerbankii*, *Macandrewia azorica*, and *Azorica Pfeifferæ*, *Geodia nodastrella*, *Phakellia ventilabrum*, *Hymeraphia verticillata*, *Histoderma phlyctenodes*, *Polytherses*, D. et M. (*Hircinia* permeated by the alga *Spongiophaga communis*), and small specimens of *Thalysias*, *Microciona*, and *Isodictya* respectively.

There is a great resemblance in general form between the fragments of this sponge and those of *Corallistes Bowerbankii* and *Pachastrella abyssi*, as if they all originally came from flat expanded masses, unless they grew out *Polyporus*-like by marginal attachment to some submarine rock, or were currented about in a free state. Their confused structure of densely packed spicules, too, agrees with that of the Pachastrellina and Lithistina, together with the perpendicular direction to the flat surfaces of the short excretory canals, opening chiefly on one side; while the proportions of the zone-spicule approaching, in the length of its arms and shortness of the shaft, to that of the Pachastrellina causes this *Stelletta* very much to resemble the sponges of that group. On the other hand the large size of the body-spicule or acerate and the presence of the anchoring-spicule ally it to the Stellettina; hence the designation "*pachastrelloides*."

The anchoring-spicule when projecting externally has its head for the most part broken off, and therefore is only found perfect in depressions where it has been protected from contact with external objects.

From the variety and number of foreign objects imbedded in the dermal sarcode, it would appear as if the fragments of this sponge had been currented about over the deep-sea bottom while they were still growing, thus adding to their structure—or, in a fixed position, had grown in the midst of deep-sea detritus, thus with their horrible roughness closely resembling the fragments of *Pachastrella abyssi* with which they are associated: they are very disagreeable to handle, and very dangerous, from the coarseness of their spicules, to the object-glasses of a microscope.

Tethya cranium, var. *abyssorum*. (Pl. XVI. fig. 49.)

With reference to this variety, which abounds among the dredgings of the 'Porcupine,' chiefly from the deep sea separating the north of Scotland from the Färöe Islands, I can see so little difference between it and that of *T. cranium* of more shallow water, viz. from the Haaf banks off Shetland, that the special designation of this variety merely rests on the larger size of the flesh-spicules (bihamates), which, under $\frac{1}{4}$-inch compound power (=about 400 diameters), are seen to be covered with minute vertical spines, while those of *T. cranium* in the British Museum are only half the size and the spines on the surface hardly visible. In the variety, the flesh-spicules are 4-6000ths inch long (Pl. XVI. fig. 49).

This seems to be equally prolific with the specimen of *T. cranium* figured in the 'Annals' (1872, vol. ix. pl. 22. fig. 13) to show its pregnancy with ova and embryos in various stages of development; for there is hardly a specimen among the sponges dredged up by the 'Porcupine' which has not one or more in various degrees of development adhering to it. (The same might be said, almost, of *Tisiphonia agariciformis*.) In their natural state, all the specimens of *T. cranium* are covered with the heads of the projecting anchoring-spicules; but while the forked forms frequently remain, the recurved or anchor-headed ones have their arms for the most part broken off. The bihamates, too, although scattered throughout the sarcode, are, as Dr. Bowerbank has observed, most plentifully congregated in the dermal layer.

Tethya cranium, var. *infrequens*. (Pl. XVI. fig. 48.)

Another variety of *T. cranium* was dredged up at station 57 in 632 fathoms; but as there is only one specimen of it, I am unable to state if it be a normal or a pathological develop-

ment. It differs from *T. cranium* in the following particulars, viz.:—the anchoring-spicule of both forms (fluke and fork) are much larger and stouter; in the fluked form (fig. 48, *c*) the arms are much more expanded and not so recurved as in *T. cranium*, while those of the forked form (fig. 48, *a*) are truncated towards their extremities, which respectively terminate in a cup-shaped excavation bordered by a serrated margin, while the central canal at the bottom of the cup-shaped cavity divides into a lash of branches, each of which goes to one of the tooth-like processes on the margin of the cup (fig. 48, *b*). Neither does the specimen, although in other respects exactly like *T. cranium*, contain any flesh-spicules (bihamates).

I have given the specimen a special designation; but I am very desirous not to introduce any thing into the description of a sponge which even borders upon an abnormal or pathological development of any part of it, as its natural varieties are quite sufficient to occupy our attention at one time. If their pathological ones are to be described, this should be done separately, and in an article exclusively devoted to the subject, as mixing the two must lead to inextricable confusion.

Pachastrella amygdaloides, n. sp. (Pl. XIV. fig. 22.)

General form almond-shaped, truncated at the apex, sessile. Colour yellowish white. Surface even, rough; structure of dermal sarcode confusedly spiculous in direct continuation with the interior, not corticate, charged with small, linear flesh-spicules filling up the interstices of the larger radiate or skeleton ones. Pores in the interstices among the small linear spicules, which are confusedly heaped together around them. Vents congregated in a circular depression at the truncated end (fig. 22, *c*). Internal structure composed of spicules equally confusedly held together by the internal sarcode, traversed by the excretory canal-system, which opens at the vents mentioned. Sarcode cancellous, of the same colour as the surface. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicule of two forms, viz.:—1, large, triradiate, in which the fourth arm or shaft is only represented by a short extension of the central canal *inside* the spicule, or subquadrate, in which this is only extended into a short round elevation or knob (fig. 22, *g g*), arms round, smooth, sharp-pointed, and somewhat curved, 50- by 4-1800ths inch; 2, long, acerate, fusiform, smooth, sharp-pointed, 117- by 1-1800th inch (fig. 22, *h*). Flesh-spicules of three forms, viz.:—1, accrate, fusiform, sharp-pointed, slightly curved, microspined, varying in size from 6- to 30-6000ths inch long (fig. 22, *i*); 2, the same but smaller, and for the most part centrally inflated (fig. 22, *k*), probably passing, when more developed, into the former; 3, stelliform, irregularly rayed, or with elongated axis and rays chiefly developed at the ends bistellate-like, rays linear (fig. 22, *l l*). The large triradiate and subquadriradiates, together with the acerate skeleton-spicules which are very long, are confusedly arranged together throughout the sponge, lying perhaps most horizontally on the surface, while the flesh-spicules, imbedded in the sarcode, make up the rest of the mass, the larger microspined flesh-spicules being chiefly confined to the interior, and the smaller ones to the surface, while the stellates are dispersed generally and very subordinate in number. Size of specimen about 1 inch long, 7-12ths inch broad, and 5-12ths inch in its vertical diameter.

Hab. Marine, on hard bodies.

Loc. Atlantic Ocean, at station 24=292 fathoms, near Cape St. Vincent.

Obs. There is only one specimen of this sponge, which is contained in a jar labelled "24, 292 fathoms," which station will be found on the chart accompanying the report of the cruise of the 'Porcupine' in 1870 (Roy. Soc. Proc. no. 125). It is accompanied by small specimens of several other sponges, viz. *Histoderma appendiculatum*, *Hymedesmia Johnstoni*, *Geodia*, *Tisiphonia*, *Tethya cranium*, *Pachastrella abyssi*, and a histodermal form of *Halichondria panicea*, together with several rolled pieces of agglomerated spicules of various sponges.

There is a great resemblance between the spicules of this sponge and those of Schmidt's *Sphinctrella horrida*, Atlant. Spongienf. p. 65, Taf. vi. figs. 6 & 7 (that is, rather, to the spicules in the slide of this sponge belonging to the British Museum), but it differs much from Schmidt's illustration fig. 7, in which there are distinct sphinctral areæ of the dermal sarcode charged with stellates, while the larger linear skeleton-spicules are obtusely pointed—which is quite opposite to the above description of *Pachastrella amygdaloides*, taken, too, from a specimen unusually perfect.

Pachastrella geodioides, n. sp. (Pl. XIV. fig. 23 &c.)

General form globular, a little wider at the base than at the summit, sessile. Colour dark grey. Surface even, uniform, slightly roughened by projecting spicules; dermal sarcode charged confusedly with the spicules of the species mixed with minute foreign organisms of various kinds, directly continuous with the internal structure that is *not* corticate. Pores in the dermal structure, more or less indistinct. Vents small, scat-

tered singly here and there. Internal structure compact, consisting of cancellated sarcode confusedly charged with the spicules of the species, together with minute foreign objects like those of the dermal layer, traversed by the excretory canal-system, which opens at the vents mentioned. Colour of sarcode dark grey. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicules of three forms, like those of *P. amygdaloides*, viz.:—1, large triradiate, in which the fourth arm or shaft is only represented by a short extension of the central canal inside the spicule, or subquadriradiate, in which this is extended into a short round prominence more or less prolonged, arms of equal length, smooth, round, sharp-pointed, somewhat curved, 50- by 6-1800ths inch (fig. 23, *i*, *b*); 2, similar to the foregoing, but much smaller, with the fourth ray or shaft produced or not, and the three arms bifurcated or not at the extremities (fig. 23, *k k k*); 3, linear, acerate, fusiform, smooth, sharp-pointed, and slightly curved, much smaller and more subordinate in this respect than the linear spicule of *P. amygdaloides*, 53- by $\frac{3}{4}$-1800th inch (fig. 23, *l*). Flesh-spicule of one form only, viz. globostellate, with the rays reduced to short round tubercles, mulberry- or blackberry-like (fig. 23, *m*, *o*, *p*), often presenting a distinct stellate in the centre, whose rays respectively end in the short round tubercles of the surface (fig. 23, *m*, *n*), 6-6000ths inch in diameter. Although the average largest size of the spicules respectively is easily obtained, there is a great variety in this as well as in the forms of all, and they are all confusedly massed together, mixed up with the flesh-spicules in great abundance as well as with the minute foreign objects, especially consisting in this instance of the siliceous balls of *Geodia*: perhaps the arms of the large radiates lie flatter on the surface than anywhere else, where they are partially hidden by the flesh-spicules among which they are imbedded, and thus present a tessellated surface; but there is no *cortex*, as before stated, and the dermal surface is but the limit externally of the internal or general structure and composition of the sponge. Size of specimen about 1 inch high by 1 inch in diameter at the bottom.

Hab. Marine, attached to hard objects.

Loc. Atlantic Ocean, in company with *P. amygdaloides*, near Cape St. Vincent.

Obs. There is but one specimen of this sponge; and it is contained in the jar with *P. amygdaloides*, under which the number of the station &c. is mentioned. Although much like *P. amygdaloides* as regards the presence of the large triradiate and subquadriradiate skeleton-spicules, there is abundant evidence in other respects for separation, as may be seen by the descriptions of these two species of *Pachastrella* respectively.

While the globular form and compact structure generally, if not the great abundance of the little globostellate flesh-spicules, liken this sponge to *Geodia*, the great abundance also of triradiate and subquadriradiate spicules mixed together confusedly (that is, without apparent order) also recalls to mind the structure and spicules of the Calcarea, while the absence of cortex and its massive nature ally it most to the group Lithistina among the Pachastrellida.

Of course, where there is only one specimen of a sponge to describe from, as in this instance, a wide margin must be given to differences of general form which may be found to occur after a large number have been examined; but this does not affect the composition.

The form of the acerate skeleton-spicule being the same in *P. amygdaloides* and *P. geodioides*, only one illustration (Pl. XIV. figs. 22 & 23, *h*, *l*, respectively) is given for both; but it should be remembered that this spicule is three times as large in the former as in the latter, where it also varies greatly in size.

Pachastrella intexta, n. sp. (Pl. XV. fig. 41.)

Indicated by the presence of a circumscribed light discoloration in an old brown, dead, thick, flat fragment of *Corallistes Bowerbankii*, dredged up in 374 fathoms at station 25, a few miles north of Cape St. Vincent.

Although the specimen of this sponge is insignificant in extent, having been discovered almost by accident while examining microscopically different-coloured patches on the fragment of *Corallistes* mentioned, its spicules furnish a new species of *Pachastrella*, consisting, like all the rest, of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicules of two forms, viz.:—1, linear and branched; linear spicule long, acerate, curved, smooth and sharp-pointed, which having only been observed in a fragmentary state from the portion of *Corallistes* among whose spicules the sponge has grown, having to be dug out with the point of a penknife for examination, its measurements have not been ascertained: 2, ramular or radiate skeleton-spicule, consisting of a straight smooth shaft, pointed at both ends, from the centre of which, or thereabouts, branch off three arms at equal distances from each other, which become bifurcated and often trifurcated (Pl. XV. fig. 41); arms 44-6000ths inch in *total* diameter, slightly inclined forwards; viewing the fifth ray as an anterior prolongation of the shaft, which is altogether subsidiary in size to the rest, the arms and their branches are the most striking part. Flesh-spicules of two forms, viz.:—1, bacillary, slightly undulate, presenting

throughout its course a number of short blunt spines of different lengths, chiefly radiating from the ends, and more or less congregated at two points on the body of the shaft (fig. 41 *a*), 5-6000ths inch long; 2, minute, also bacillary in the shaft, which is more or less twisted, and presents a number of fine, thin, long, linear spines, chiefly congregated about the ends, so as to assume a bistellate appearance, 2½-6000ths inch long (fig. 41, *b*).

Pachastrella parasitica, n. sp. (Pl. XVI. fig. 50 &c.)

Like the foregoing, but not belonging to the sponges dredged up on board the 'Porcupine,' is a *Pachastrella* which I have lately found on a specimen of *Polytrema utriculare* ('Annals,' 1876, vol. xvii. p. 211, pl. xiii. fig. 17, *a*, *b*), and have therefore designated "*parasitica*." Locality unknown. The linear, acerate (Pl. XVI. fig. 50, *c*), and ramular skeleton- (fig. 50, *a*), with the bacillary spinous (fig. 50, *d*) and minute stellate (fig. 50, *f*) flesh-spicules are, *mutatis mutandis*, the same. Here, however, the branches of the ramular skeleton-spicule are *thrice* divided, not "twice" only, as erroneously figured and stated in the 'Annals' (*l. c.*), where also the shaft should have been prolonged anteriorly. The large bacillary spined flesh-spicule, too, is thin, slightly undulating and thickly beset with minute spines like that of *Pachastrella abyssi*; but we have not the distinguishing character of the latter here, viz. the thick, solid, *skittle*-shaped flesh-spicule.

Had not my attention, at the time I alluded to this species in the 'Annals,' been chiefly taken up in examining the organism on which it is parasitic, I should not have made the mistakes in delineation &c. to which I have above referred; while now that it is specially called to the sponges, I have the opportunity of correcting them.

All the species of *Pachastrella*, beginning with *Dercitus niger* of our coasts, are amorphous, and are in the habit of penetrating any crevices over which they may be growing; so that they are often found in the midst of the branches of old corals and deciduous shells, in company with a boring *Cliona*, which they follow but *do not precede*. Again, they do not reject hard objects with which they may come into contact during growth, especially *P. abyssi*, which appears to incorporate every thing of the kind it meets with, in which these sponges very much resemble fungi.

With the shaft being often prolonged beyond the giving-off of the branches in *P. parasitica*, together with the twisted and divided form of the distal bifurcations, we have a ramular form which seems to lead into the still more complicate one of the Lithistina.

[To be continued].

XXXVIII.—*Descriptions of supposed new Birds from the Khási-Nágá Hill-ranges south of the Brahmaputra River, Assam.* By Major H. H. Godwin-Austen, F.Z.S. &c.

Garrulax nuchalis, n. sp.

Above, top of head to nape dark slaty grey, succeeded by a broad rich ferruginous collar an inch in breadth, which fades into the olive-green of the back. Wings and tail of a rather darker tint of olive, the latter tipped black; the first four primaries are edged hoary grey; the shoulder of wing has a rusty tinge. A narrow frontal band; the lores, with a narrow line over and below the eye, black; this is continued in a streak of dark rusty brown over the ear-coverts; a few white feathers border the black frontal band above. Chin black, extending a short way down the middle of throat; breast pale ashy, with a slight vinous tinge. Cheeks and ear-coverts pure white. Flanks and under tail-coverts dull olive-green. Bill black. Irides purple lake. Legs fleshy grey.

Length 10 inches, wing 4·25, tail 4·6, tarsus 1·7, bill at front 0·9.

This beautiful species was among a batch of birds lately received from and collected by Mr. M. T. Ogle of the Topographical Survey, in the Lhota-Nágá hills. It is the representative there of *G. chinensis*, but differs in possessing the broad ferruginous nape, and the neutral grey of the head is of a darker hue. In other respects it is identical, save in some minor points, such as:—the black of the throat does not extend so far down on to the upper breast; the lower breast is paler than in *chinensis*, and has a vinous tinge; the under tail-coverts are pure olivaceous with no ochraceous tint; and, lastly, the white of the cheek and ear-coverts extends in this new form further down the side of the neck.

On a careful comparison, made by myself and Lord Walden, of *Suya atrogularis* of the Darjeeling hills with specimens I had hitherto supposed to be exactly the same found on the Khási hills, the differences are so well marked that they are sufficient to separate them as a distinct race, to which I give the title *Suya khasiana*.

These differences are as follows:—

Suya atrogularis, Moore (of which eight specimens were examined),

a. Is a greyer bird, with a decided tinge of olivaceous;

b. None show pure white beneath;

c. Thigh-coverts pale brown.

XLVII.—*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 (*concluded*). By H. J. Carter, F.R.S. &c.

[Concluded from p. 410.]

Ophiraphidites tortuosus, n. sp.

Groups of large, tortuous acerates, more or less uniform in size, congregated in deep depressions on the surface of *Discodermia polydiscus* and *Stelletta pachastrelloides*, without definite arrangement, naked, void of sarcodic structure, and unaccompanied by any other spicules but a few large trifids from *Pachastrella abyssi*; adherent by one end to the surface on which they may be situated, and retained in position chiefly by their intertwining with each other. Form of spicules chiefly acerate, sometimes nearly straight or only slightly curved, bow-like; sometimes acuate, and occasionally obtusely pointed or round at the ends, also occasionally with one extremity bifid, 200- by 5-1800ths inch long when nearly straight.

Hab. Marine, growing in the depressions above mentioned.

Loc. Probably near Cape St. Vincent, as the dried specimens on which they are situated appear to be identical with those in the jar numbered "25, 75, 374 fathoms."

Obs. As the spicules of these groups are very remarkable from their snake-like shape, together with the circumstances above mentioned, it is necessary to describe them as far as possible, from their occurring in the dredgings of the 'Porcupine.' I cannot state with certainty whether they represent a distinct sponge or are the transformed spicules of another sponge; but incline to the latter opinion, and to think that they belong to *Pachastrella abyssi*:—first, because the only other spicules that I have found among them are the large trifids of this sponge; secondly, because the arms of this large trifid, as it *occurs on the surface*, are also occasionally tortuous; and, thirdly, because the arms of these large trifids are frequently bifid at the extremities. On the other hand, the spicules of *Ophiraphidites* chiefly consist of large acerates which, when without the tortuous curving, are precisely like those of *Stelletta pachastrelloides* (Pl. XV. fig. 40, *a*), where the large acerates in size as far surpass any other of the spicules as the large bifids in *Pachastrella abyssi* surpass in size its acerates; so that, if we adopt the transformation of the latter, it must be from a trifid into a tortuous acerate—if of the former, of a large, normally curved acerate into a tortuous one. Hence the uncertainty in my mind as to which they belong to if they do not represent a distinct sponge. I might also add that in no sponge have I ever seen these tortuous acerates grouped together as above described below the surface, except in *Hymeraphia vermiculata*, Bk., and its variety *erecta* (Pl. XV. fig. 26, *b*), where their great inferiority in size and their forming part of a distinct structure, from the midst of which projects large acuates, shows at once that they are not *Ophiraphidites tortuosus*. At the same time, as the laminiform species, viz. *Hymeraphia vermiculata*, Bk., grows on the surface of hard objects, such as pebbles, and other sponges, indiscriminately, and there are tortuous acuates mixed up with the tortuous acerates in *Ophiraphidites*, it may still be a question whether this may not be after all a transformation of the spicules of *H. vermiculata* with which a few of the trifids of *Pachastrella abyssi* have become accidentally mixed.

Be this, however, as it may, after having described *Ophiraphidites tortuosus* as part of the dredgings of the 'Porcupine,' the great point of interest that attaches to them is that such spicules are found fossilized in the Upper Greensand of Haldon Hill, near Exeter, in the Mid-Miocene or Bruxellien "étage" about Brussels, and in the Cretaceous strata of Westphalia, in Germany, respectively. In my illustrations of the fossil sponge-spicules of the Upper Greensand of Haldon Hill, near Exeter, I have figured one ('Annals,' 1871, vol. vii. p. 131, pl. x. fig. 79) under the name of "*Esperites giganteus*," conceiving it then to be, from its sigmoid shape, a gigantic S-shaped bihamate (fibula) of an *Esperia*, whereas now I see that it is a spicule like those of *Ophiraphidites tortuosus*; hence the term "*Esperites giganteus*" should be erased, and that of *Ophiraphidites tortuosus* substituted for it. The specific name "*giganteus*" cannot be retained, because its size corresponds with that of the spicules of the existing *Ophiraphidites*. I next observed it in M. A. Rutot's illustrations of fossil sponge-spicules "de l'étage Bruxellien" about Brussels (Ann. de la Soc. Malacologique de Belgique, t. ix. 1874, pl. 3. figs. 5 & 29), confirmed by its presence in some of the spiculiferous sand itself (kindly sent to me by M. E. Vanden Broeck), wherein it is plentifully present; lastly, in Prof. K. A. Zittel's illustrations of sponge-spicules found about a specimen of *Cœloptychium agaricoides* from the Quadersandstein of Westphalia (Abhandlungen der k. bayer. Akad. der W. ii. Cl. xii. Bd. iii. Abth. Taf. 4. figs. 25 & 26, 1876). Schmidt has also figured them (Grundz. Spongienf. d. atlant. Gebietes, 1870, p. 24, Taf. iii. fig. 3, *c*), in connexion with *Corallistes Bowerbankii* (*C. typus*, Sdt.), as they certainly are no part of this sponge. To M. Rutot and Prof. Zittel I am greatly indebted for a copy of

their memoirs respectively, which no one engaged in the study of sponges, either recent or fossil, should be without.

Lithistina, Carter.

There were four species of Lithistina dredged up on board the 'Porcupine' during the cruise of 1870, probably all from the neighbourhood of Cape St. Vincent, viz. *Corallistes Bowerbankii*, *Discodermia polydiscus*, *Macandrewia azorica*, and *Azorica Pfeifferæ*—the two former in dead fragments, and the two latter in a living state. I am unable to say with certainty that *Discodermia polydiscus* came from the same locality as the rest, because the specimens, which are dry, are without number; but presumptive evidence is in favour of it.

Corallistes Bowerbankii, Carter, 1876, = *Dactylocalyx Bowerbankii*, Johnson, 1863, = *Corallistes typus*, Schmidt, 1870.

The type specimen of this sponge is in the British Museum, and in general form might be likened to a large, shallow, patulous cup with undulating sides and round edges, supported on a thick short stem. It is 12 inches in diameter, and $\frac{1}{2}$ an inch thick in the wall; and its structure internally, which consists of the filigreed form of spicule common to the Lithistina, is faced by a dermal layer of three-armed shafts, the arms of which are furcated, intercross with each other and in all parts, are round, smooth, and pointed, *not* filigreed; these, again, are imbedded in the dermal sarcode, which is charged with a single form of flesh-spicule, consisting of a short, thick, subspiral shaft, tuberculo-spined throughout, and not two forms, as erroneously stated in my paper on the Hexactinellidæ and Lithistidæ ('Annals,' 1873, vol. xii. pp. 437 & 441), which mistake was occasioned by my having described from a slide into which the acerate flesh-spicules of *Macandrewia azorica* had got by accident. Colour cream-yellow in the dried state.

I have changed the name of "*Dactylocalyx Bowerbankii*" to that of *Corallistes Bowerbankii* for two reasons, viz.:—first, because *Dactylocalyx* was given by Stutchbury to a Hexactinellid sponge, viz. *D. pumiceus*, so far back as 1841 (half of which is in the British Museum), and therefore is typically connected with this order of sponges; and secondly, because Schmidt has given the name of "*Corallistes*" to many of his Lithistid sponges, which belong to a totally different order—thus avoiding the confusion which must arise by mixing up in name the Hexactinellid with the Lithistid sponges. So far, too, all the Lithistina are sessile or thick, short, stipitate sponges,

and grow on rocks or attached to stones, while this is only partially the case with the Hexactinellida.

The four species of Lithistina above mentioned come respectively from the neighbouring seas of the West Indies, Madeira, the Azores, and the coast of Portugal. The type specimen of *Discodermia polydiscus* in the British Museum came from the island of St. Vincent, in the West Indies, that of *Corallistes Bowerbankii* from Madeira, that of *Macandrewia azorica* from the Azores, and that of *Azorica Pfeifferæ* from Madeira; while, as above stated, all four species have been dredged up on board the 'Porcupine' near Cape St. Vincent. Bocage's specimen of *Discodermia polydiscus* came from the coast of Portugal; and Schmidt's *Corallistes clavatella* = *Macandrewia azorica*, and his *C. typus* = *Corallistes Bowerbankii*, respectively from the Gulf of Florida.

Several dead fragments of *Corallistes Bowerbankii* were dredged up in 374 fathoms near Cape St. Vincent, during the cruise of 1870 (Roy. Soc. Proceed. no. 125). On the jar are the numbers "25, 75, 374 fathoms." I assume that "75" means from 75 to 374 fathoms; otherwise I do not know what it means; the number of the station is of course "25." They are about 4 inches in diameter; and the thickest piece is $\frac{3}{4}$ of an inch between the two surfaces. Although much worn, they are still angular and undulating in shape, as if they had once formed the walls of a shallow goblet like that of the type specimen in the British Museum; but some fragments being much thicker than any part of this specimen, they probably belonged to a "goblet" of much larger dimensions. Having been dead for a long time, they are of course sarcodeless, and now more or less filled with deep-sea organisms (*Globigerina*, &c.), besides being overgrown in many parts with a variety of other sponges gathered during the time they have been drifting about the bottom of the sea. There is little or no difference in form between their flat surfaces; and this is the case with the type specimen mentioned, which was taken alive and therefore still possesses its dermal sarcode intact, so that there is not much for identification left; but in some parts of the fragments where the mud has been washed out or had never entered, the large and characteristic dermal spicule, with its furcate arms, is still present in considerable abundance, although not exactly *in situ*; for it appears among the other spicular structure of the mass just below the surface; the minute or flesh-spicule, however, is altogether gone, having floated off or out, probably when the sarcode passed into dissolution. Still, the large dermal spicule is sufficient, from its peculiar form and the *horizontality* of its arms, together with its long shaft, to preclude

the possibility of its being confounded with any other of the kind either in the Geodina, Stellettina, or Pachastrellina. Thus the existence of *Corallistes Bowerbankii* near Cape St. Vincent is established.

From the position of the large furcate spicules being *in* rather than on the surface of the specimens, it might be inferred that these, in particular, were on their way to that transformation which the surface layer of all growing sponges must undergo if it passes into and becomes incorporated with the tissue of the interior, while the characteristic layer of these dermal spicules imbedded in the sarcode charged with the flesh-spicule in the living sponge would then altogether disappear. Thus a little further in than the surface no trace of the furcate spicule would be seen; for by this time they would all have become transformed into the staple form of the interior structure—unless the old dermal layer is absorbed, the internal structure pushed forward, and a new dermal layer formed, or the old dermal layer is expanded and its deficiences made up by the addition of new dermal layer—neither of which appears to be so likely as the first assumption. Be this as it may, the characteristic dermal spicule of *Corallistes Bowerbankii* is present here.

On crushing some portions of these specimens taken from parts which had been washed clean of mud &c., the fragments of the larger filigreed spicules, under the microscope, forcibly recalled to mind those which I had found in the Upper Greensand of Haldon Hill near Exeter ('Annals,' 1871, "On Fossil Sponge-spicules, &c." vol. vii. pl. viii.).

For good illustrations of the dermal and flesh-spicules of this species, see Dr. Bowerbank's figures (Proc. Zool. Soc. 1869, pl. vi. figs. 5–8, "Monograph on the Silicco-Fibrous Sponges").

Discodermia polydiscus, Bocage, 1869, = *Dactylocalyx polydiscus*, Bowerbank, 1869.

The type specimen of this species is in the British Museum; and its general form is shallow, cup-like, with comparatively thick walls and an equally short, stout, stipitate base. It is an inch in diameter, and ¾ of an inch high; and its structure internally consists of the filigreed spicule common to the Lithistina (but of a peculiar form, which will be mentioned directly), faced by a dermal layer of thin, smooth, subcircular disks with more or less curvilinear or toothed margin, furnished respectively with a short, round, pointed shaft, which projects internally, and imbedded in a dermal sarcode densely charged with a minute, curved, acerate, microspined flesh-spicule.

The peculiarity of the staple spicule of the interior is that it presents four smooth, round arms, which, radiating irregularly from a central point, soon divide into two branches respectively that terminate botryoidally or in the form of a bunch of grapes, which unites or interlocks with that of the neighbouring branch; and thus the internal structure is formed, except at the surface, where the branches immediately under the dermal layer of disks &c. terminate respectively in flat filigreed or dendriform expansions which do *not* intermingle with those of opposite branches. In the dermal disks there is a circular space opposite the end of the shaft with a *trifid* line, which represents the trifid central canal; and this in the body of the spicule of the interior is often seen in its *quadruple form*, from the addition of the shaft, which makes the fourth arm. Colour yellowish grey or white. Here, again, I prefer the term "*Discodermia*" of Bocage to that of "*Dactylocalyx*," Bowerbank, for the reasons above mentioned.

Several fragments of this sponge were dredged up on board the 'Porcupine,' probably near Cape St. Vincent; but they are all dry and without number. Unlike the foregoing, they are all more or less rounded and elliptical, varying in size, under 1 inch long by ¾ of an inch in their short diameter. One fragment is a little longer and somewhat lobed; but they give no idea whatever of what the general form of the entire sponge might have been. Like the fragments of the foregoing species, too, they are sarcodeless, and partly filled with deep-sea mud and its accompanying minute organisms, but not overgrown with other sponges, perhaps from their having been less stationary and more exposed to friction than the fragments of *Corallistes Bowerbankii*, except in one instance, where the rolled fragment presents a depression in which there is a good specimen of *Ophiraphidites tortuosus*.

The peculiar form of their internal structure, and the presence of the peculiar dermal disks amongst it in considerable numbers, although no trace of the flesh-spicule remains, are quite sufficient to establish the species.

For good illustrations of the dermal and flesh-spicules, together with that of the staple spicule of the interior, see Dr. Bowerbank's figures (Proc. Zool. Soc. 1869, pl. vi. figs. 9–14) and Bocage's "Éponges siliceuses nouvelles de Portugal et de l'île St. Iago, Archipel de Cap-Vert" (Journal des Sci. Mathémat., Phys. et Naturelles, no. iv. Lisbonne, 1869).

It may seem strange that only dead fragments of this and the foregoing *Corallistes* were dredged up on board the 'Porcupine;' but when it is remembered that these sponges grow

on hard objects such as rocks &c., it can easily be understood how living specimens, as in the following instances, are only obtained by mere accident. (*Euplectella cucumer* was accidentally brought up by a hook and line at the Seychelles by a fisherman there.)

Schmidt's *Corallistes polydiscus* (Atlant. Spongienf. p. 24, Taf. iii. figs. 8 & 9) appears to me, from the form of its surface-spicule, to be a different species, according in this respect with a large vase-like specimen from the Philippine Islands that I have lately been examining, in which, however, there is, in addition to the acerate flesh-spicule, a small solid one of an elliptical form like that characterizing *Pachastrella abyssi*, while the acerate flesh-spicule in all is almost identical with that of *Macandrewia azorica*.

Macandrewia azorica, Gray, 1859, = *Dactylocalyx McAndrewii*, Bowerbank, 1869, = *Corallistes clavatella*, Schmidt, 1870.

The type specimen of this sponge is in the British Museum, and in general form might be likened to a deep vase with contracted stipitate base and thick wall, becoming deeply undulated as it expands upwards, and terminating in an equally thick round margin, which not only follows the undulating form of the wall itself, but is more or less indented irregularly and curvilinearly throughout. It is 5 inches high by 4 inches in diameter in the widest part of the brim. The inner surface presents a number of circular vents regularly arranged, which, while the dermal sarcode remains on, are single and form the centres respectively of so many sets of superficial, radiating, branched canals converted into gutters by the dermal sarcode, which, when rubbed off or raised, appear in the form of groups of 5–7 or more small holes, that are very characteristic of the species; while the outer side is covered with minute puncta that represent the pores. The internal structure is composed of the filigreed spicule common to the Lithistina, faced by a dermal layer of three-armed shafts, each arm of which is flattened, spread out horizontally, more or less divided and bordered by a curvilinear toothed edge on each side, while the shaft which projects into the interior is smooth, rather short, round, and pointed. These spicules are imbedded in dermal sarcode charged with a minute acerate, smooth (not microspined as in *Discodermia*), curved, fusiform, flesh-spicule in great abundance, which, where the curvilinear edges of opposite arms of the great dermal spicule form between them a circular area, are arranged in the sarcode in a radiating manner, extending from the centre to the circumference, so as to leave in the centre a pore, which can be

expanded by the retraction of the sarcode and elevation of the radiated flesh-spicules into a conical form. This is well represented in Schmidt's figure 7, *b*, Taf. iii. (Atlantisch. Spongienf. 1870).

My reason for retaining Dr. Gray's generic name of "*Macandrewia*," and rejecting Dr. Bowerbank's subsequent one of "*Dactylocalyx*," can, from what has been above stated, be easily understood. Besides, what student of the Invertebrata would not wish to remember the name of the late Mr. MacAndrew?

A single specimen of this sponge was dredged up on board the 'Porcupine,' and, although factured and much more irregular in its growth than the type specimen in the British Museum, was, generally (as the fragments are present and can be put together), of the same form, being about $4\frac{1}{2}$ inches in diameter across the brim by 3 inches deep, and about $\frac{3}{16}$ of an inch thick in the walls. It is in the same jar with the dead fragments of *Corallistes Bowerbankii*, on which, as before stated, are the numbers "25, 75, 374 fathoms." Having been taken while *living*, its structure is in all respects like that of the type specimen above mentioned.

There are also two or three other small fragments of this sponge dry and without number, which, having been taken dead and much worn by attrition, only show the characteristic *groups of vents*, which become exposed, as before stated, when the dermal layer has been worn off. Were I to assign any peculiarity to the form of the filigreed spicule of *Macandrewia azorica*, I should say that the tubercles of the branches had a tendency to assume the form of conical, slightly curved prongs, something like those on the antlers of a stag.

Good figures of the spicules of this species may be seen in Dr. Bowerbank's illustrations of it (Proc. Zool. Soc. 1869, pl. iv. fig. 5, pl. v. figs. 1–5), together with fig. 6 in pl. xxiii., which, by accident, has been figured as belonging to the hexactinellid sponge "*Iphiteon callocyathes*, Bk. 1869," = *Myliusia callocyathes*, Gray, 1859. No doubt the spicule of *Macandrewia azorica*, thickly covered by its peculiar flesh-spicule, got by accident into the mounted preparation of *Iphiteon callocyathes*, and thus was drawn as a part of the latter, just as a portion of *Macandrewia azorica* got by accident into my mounted specimen of *Corallistes Bowerbankii* as before stated, and led me into a similar error, viz. that of adding to the latter the flesh-spicule of *Macandrewia azorica*, an error which I have now corrected. This shows how particular we should be in our mountings, or, at all events, in identifying the spicules which they may contain with those only belonging to the sponge we wish to illustrate.

Azorica Pfeifferæ, Carter, 1873, ?=*Leiodermatium Lynceus*, Schmidt, 1870.

The type specimen of this sponge is in the British Museum; and its general form is that of an expanded vase whose walls, rising from a thick short stem, soon spread out in an undulating manner into a head 14 inches in diameter, which has the appearance of a large "double flower," on account of the sinuous infoliations of the wall, which are so abundant as to fill up the whole of the vasal cavity, with the sides and bottom of which they are of course continuous. It is 11 inches in vertical diameter, and the wall seldom more than $\frac{1}{6}$ of an inch thick, slightly thinning towards the margin, which is round and irregularly fissured or curvilinear. The surface is even, especially on the *outer* side of the wall, where the *pores* are situated in the form of puncta closely approximated, and only interrupted on the *inner* side of the wall, where the *vents* are situated, by the latter, which in the form of single circular holes, each with an elevated margin, are irregularly scattered over this surface at some distance from each other.

The structure internally consists of that filigreed kind of spicule common, as before stated, to the Lithistina generally, faced by a dermal layer of siliceous network in which the branching, although larger in some respects than in others, is so irregular that it is impossible to divide it into distinct heads indicative of its being composed of so many distinct dermal spicules like those of the other Lithistina; neither are the supports or shafts of these supposed heads a bit more distinguishable on the inner side of the dermal layer, on account of their irregularly branching there also; so that this layer cannot be designated an irregular network. But on the branches of both outer and inner aspects there are short, thick, oval tubercles of a peculiar form, inasmuch as the summit of each respectively presents a short thick branch, which soon divides once or twice into crooked attenuated extremities, while the ends of many of the branches terminate in the same manner; but *the branched oval tubercle appears to me the characteristic feature of the structure*, as I do not observe it to be so marked in any other species, although that of *Farrea densa* ('Annals,' 1873, vol. xii. pl. 17. fig. 6) is something like it. Besides this, the sarcode is charged with an abundance of long, delicate, fusiform acerate spicules, the largest of which are about 1-14th inch in length by 1-3000th in thickness; but these are *only* found towards the *margin* of the frond-like wall, where, coming from opposite sides, they meet, and drying in their sarcode together, there form a more

or less sharp, fringed edge. These spicules rapidly diminish in size with their distance from the margin of the wall; so that very soon they altogether disappear; whether by incorporation with the older and general structure or by absorption I am not able to state. Where they are not present, the margin of the wall presents a *rounded* form. Occasionally the larger ones on the edge are inflated or spined at one or both extremities; but this appears to be an abnormal state, their staple form being acerate. Colour whitish yellow. The "oval" appearance of the summit of the tubercle when seen from above is an optical delusion which is corrected by the lateral view.

There are a few fragments of this sponge in the same jar as the foregoing species (viz. that bearing the numbers "25, 75, 374 fathoms"); and they average 2 inches in diameter by $\frac{1}{6}$ of an inch in thickness. These, which consist chiefly of *living* portions or portions which were taken *alive* and afterwards preserved in spirit and water, bear all the characters above mentioned, including the presence of the acerate spicules, which are very abundant where the living border of a new layer can be traced growing over the surface of a previously dead or denuded surface of the frond. The fragments appear to have been broken off by the dredge from the head of a living specimen, as the fractured parts are not worn by attrition.

I have given a short account of a very large specimen of this species, viz. *Azorica Pfeifferæ* ('Annals,' 1873, vol. xii. p. 442), which, together with a slightly smaller one of the same kind, was presented to the British Museum by Madame Ida Pfeiffer.

It appears from Schmidt's figures (Atlant. Spongienf. pl. iii. fig. 2 &c.) to be very like his *Leiodermatium Lynceus*; but here the oscules were on the *outer* side, which is the reverse of what they are in *Azorica Pfeifferæ*, and the reverse of what generally obtains in sponges, where the concave or tubular portion receives the vents. Schmidt's diagnosis of *Leiodermatium* (smooth-skin), too, is:—"In der Oberflächenschicht liegen keine isolirten Kieselkörper" (*op. cit.* p. 21). So the presence of the isolated acerate spicules above mentioned, although confined to the sarcode towards the growing margin of *Azorica Pfeifferæ*, is also opposed to this. Hence it becomes doubtful whether Schmidt's *Leiodermatium Lynceus* is *Azorica Pfeifferæ*; but there is no doubt that the latter does not agree with his diagnosis, although the "isolated acerates" are only partially present—that is, about the growing portion. Then, in the Lithistina, where there *are* "isolirte Kieselkörper" on the surface, they all disappear from it as the latter becomes incorporated with the internal or older structure, and thus trans-

formed into this structure *pari passu* with the growth or increase in bulk of the sponge.

The reason for my designating this sponge "*Pfeifferæ*" is evident from what I have above stated; and we may now extend its distribution from Madeira to the coast of Portugal.

Calcarea.

Grantia ciliata, Fleming, ? var. *spinispiculum*. (Pl. XII. figs. 6, 7, & 8.)

The specimen of this calcareous sponge dredged up on board the 'Porcupine' on the North-Sea side of Shetland in 64–75 fathoms has grown on one of the cones of *Dictyocylindrus virgultosus*, Bk., together with a young specimen of *Tethya cranium* (Pl. XII. fig. 6). It is $\frac{1}{1\frac{1}{2}}$ inch long by $\frac{3}{1\frac{1}{2}}$ inch broad. The body is fusiform; and the beard, which is $\frac{1}{1\frac{1}{2}}$ inch wide, is composed of an erect row of large, acerate, linear spicules arranged parallel to each other, intermixed with small triradiates, and ending in a defined free edge, which is neither patulous nor fringed, but even; while the body itself is composed of the usual mass of triradiates, among which are plentifully scattered long, fusiform, stout acerates, which are grouped together in projecting tufts all over the surface, thus presenting a granulated aspect, in which tufts, especially towards the lower part of the sponge, are fine acerate spicules recurvedly barbed or spined in a serrated manner, chiefly on *one* side of the outer third of the free end (fig. 7). This form of spicule, which averages, in its largest size, 124- by 1-6000th inch long, and of which about a third is barbed, is a peculiarity that has necessitated my giving a short description of the whole sponge, not only because such a form of spicule is present *here*, but because I have met with a similar form before, in connexion with a specimen of *Grantia ciliata* obtained from a piece of sea-weed thrown up on the beach of this place (Budleigh-Salterton, south coast of Devon).

In July 1870, while looking at some spicules of *Grantia ciliata* which had been mounted about two years previously, I observed that there were two or three linear ones with one end inflated and spined on one side, something like the end of the spined anchoring-spicules of *Euplectella aspergillum*, together with other recurved spines like barbs, extended more or less in the same line for a certain distance up the shaft; while, knowing that calcareous spicules mounted in balsam sooner or later pass into dissolution, leaving behind them only a few aqueous-looking globules, I immediately measured and

sketched these spicules, so that the record of them is not lost and is herewith given (Pl. XII. fig. 8). Now, I am in the habit of mounting a portion of a calcareous sponge in a *dry cell*, where it may be considered to be almost imperishable without accident. These spicules were respectively about 50- and 90-6000ths inch long and 1-6000th inch broad, while the barbs numbered about sixteen, and the terminal inflation in one presented *no* spines. To what variety of *Grantia ciliata*, if to any in particular, they appertained I cannot state, as I can only say that up to the time they were mounted I knew of no other kinds of calcareous sponges on this beach, and therefore they could be only the kinds mentioned; but I have in vain sought for such spicules since, although I have examined many specimens of *Grantia ciliata*, taken from the same kind of seaweed, similarly thrown up on the beach here, as the specimen came from to which these spined spicules must have belonged.

The next instance (for they are not common) that I have observed of this kind of anchoring-spicule occurring in a calcareous sponge is that figured by Häckel in 'Die Kalkschwämme,' 1872 (Atlas, pl. 50. fig. 1), under the name of *Syculmis synapta* (previously named by Schmidt in MS. *Sycurus synapta*). This sponge, which is about $\frac{1}{2}$ inch long in the body and about $\frac{1}{1\frac{1}{2}}$ inch thick (*op. cit.* vol. ii. p. 289), is provided with anchoring-spicules of a peculiar kind, inasmuch as the free extremity is furnished with three spines or claws, more or less directed to one side, and without terminal inflation, while there are no barbs or spines on the other part of the spicule, which is long and linear. The specimen came from the Museum at Copenhagen, and originally from the coast of Brazil (*op. cit.* vol. ii. p. 288).

Thus we may infer that some at least of the tubular calcareous sponges, in addition to having a structure very much like that of *Euplectella* in miniature, are also provided with similar anchoring-spicules. I have sought for them in many species since discovering them in the slide above mentioned, without having found any thing of the kind, until coming to the one above mentioned, which was dredged up on board the 'Porcupine.' I need hardly add that they should be sought for in the posterior part of the sponge, or that attached to the object on which it may have grown.

There was but one other specimen of a calcareous sponge dredged up on board the 'Porcupine;' and this is in a jar numbered 51,=440 fathoms, between the north of Scotland and the Färöe Islands. It is in company with *Polymastia brevis*, Bk., but so mutilated that nothing more can be made out of

it than that it was about the size of that above mentioned, but had *no beard*, and an *un*tufted even surface without any trace of barbed spicules, but with the usual triradiates and the large acerates above mentioned, which, when entire, must have given it somewhat of the character of *Ute capillosa*, Sdt. (Spongienf. Adriat. 1862, Taf. 1. fig. 6).

Since the above was written and illustrated, I have seen Franz Eilhard Schulze's paper on the structure and development of *Sycandra raphanus*, Häckel (Zeitschrift f. wissensch. Zoologie, xxv. Bd., 3. Supp., Dec. 1875), in which four figures are given like the spined spicules above mentioned in the Budleigh-Salterton specimens commonly called "*Grantia ciliata*" (Taf. xix. fig. 1, *a–d*), also said to be "rare" and occurring in the tufts at "the distal ends of the radiating tubes."

Addendum.

Having made a Table of all the sponges dredged up on board H.M.S. 'Porcupine' in 1869–70 that were handed over to me, with the stations and depths respectively from which they had been obtained, I have been able to draw up the following summary so far as the information accompanying them permits, viz.*:—

1st. *In the Deep Sea between the North of Scotland, the Orkneys, the Shetland and the Färöe Islands.*

Aplysina nævus, n. sp.
Spongia officinalis *auctt.*
Dysidea fragilis, *Johnst.*
Spongelia pallescens, *Sdt.*
Dictyocylindrus virgultosus, *Bk.*
—— abyssorum, n. sp.
Plumohalichondria microcionides, n. sp.
Microciona jecusculum, *Bk.*
—— longispiculum, n. sp.
Phakellia ventilabrum, *Bk.*
—— infundibuliformis, *C.*,= Halichondria infundibuliformis, *Johnst.*
Hymeraphia vermiculata, *Bk.*
—— erecta, n. sp. (? variety).
Cornulum textile, n. gen.
Dictyocylindrus simplex, n. sp.
—— anchoratus, n. sp. (Ann. & Mag. Nat. Hist. 1874, vol. xiv. p. 251, pl. xv. fig. 43, *a*, *b*, *c*.)
Halichondria foliata, *Bk.*
—— panicea, *Johnst.*
—— cancellata, var. nov.
Isodictya varians, *Bk.*
Thalysias, *Duchas. de Fonb. et Michelotti.*
Reniera crassa, n. sp.
—— fibulata, *Sdt.*
Halichondria incrustans, *Johnst.* (var.).
—— forcipis, *Bk.* (*Op. et loc. cit.* p. 246, pl. xiv. figs. 29–32 &c.)
Halichondria abyssi, n. sp. (*L. c.* p. 245, pl. xiv. figs. 26–28 &c.)
Melonanchora elliptica, n. gen. (*L. c.* p. 212, pl. xiii. figs. 6–12, &c.)*
Cribrella hospitalis, *Sdt.*
Esperia cupressiformis, n. gen. (*L. c.* p. 215, pl. xiv. figs. 16–19, &c.)†
Chondrocladia virgata, *Wy. Th.* (*L. c.* p. 217, pl. xiv. figs. 20 & 21 &c.)
Cladorhiza abyssicola, *Sars.* (*L. c.* p. 219, pl. xiv. fig. 22.)
—— ——, var. corticocancellata, nov.
Esperia placoides, n. sp.
—— villosa, n. sp. (*L. c.* p. 213, pl. xiii. figs. 13–15 &c.)
Halichondria Hyndmani, *Bk.*
—— carnosa, *Johnst.*
Hymedesmia Johnsoni, *Bk.*
Hymeraphia verticillata, *Bk.*
Suberites massa, *Sdt.*
Cometella pyrula, n. sp.
Podospongia Lovenii, *Boc.*
Latrunculia cratera, *Boc.*
Desmacella pumilio, *Sdt.* (*L. c.* p. 250, pl. xv. fig. 42, *a*, *b*, *c*.)
Donatia lyncurium, *Gray*,= Tethya lyncurium, *Lam.*
Trichostemma hemisphæricum, *Sars.*
Thecophora semisuberites, *Sdt.*
—— ibla, *Wy. Th.*
Rinalda uberrima, *Sdt.*
Polymastia ornata, *Bk.*
—— brevis, *Bk.*
—— robusta, *Bk.*
—— mamillaris, *Bk.*
—— stipitata, n. gen.
Geodia nodastrella, n. sp.
Wyville-Thomsonia Wallichii, *Wright*, = Tisiphonia agariciformis, *Wy. Th.*
Stelletta pachastrelloides, n. sp.
Tethya cranium, *Lam.*
—— zetlandica, *Cart.*, ? var.
—— abyssorum, ? var.
—— infrequens, ? var.
Pachastrella abyssi, *Sdt.*
—— geodioides, n. gen.
Rossella velata, *Wy. Th.* (Annals, 1875, vol. xv. p. 120.)
Holtenia Carpenteri, *Wy. Th.* ‡
Grantia ciliata, ? var.

2nd. *Deep Sea in the "Chops" of the English Channel.*

Corticium abyssi, n. sp. (Annals, 1873, vol. xii. p. 18, pl. i. figs. 1–9 & 15.)
—— parasiticum, n. sp.
Isodictya varians, *Bk.*
Reniera fibulata, *Sdt.* (*Op. cit.* 1874, vol. xiv. p. 250, pl. xv. fig. 44, *a*, *b*.)
Esperia cupressiformis, n. g. (*L. c.*)
—— ——, var. hamatifera, nov.
Hymedesmia Johnsoni, *Bk.*
Cliona abyssorum, n. gen. (*L. c.* p. 249, pl. xiv. fig. 33 &c.)
Desmacella pumilio, *Sdt.* (*L. c.*)
Tisiphonia agariciformis, *Wy. Th.*
Aphrocallistes Bocagei, *Wright.* (*Op. cit.* 1873, vol. xii. p. 446.)
Farrea occa, *Bk.* (*L. c.* p. 445.)
Holtenia Carpenteri, *Wy. Th.*
Corallistes, spicules of a.

* As these sponges are arranged consecutively in accordance with my classification, as far as is at present possible, no notice is to be taken of the same name being repeated here and there, as this refers to the author' appellation, and not to the location of the sponge in my Classification.

* Stray, fully developed anchorates of this sponge (that is, with the three arms united like a four-ribbed ellipse) are very common in the Atlantic sea-bed. Dr. Wallich sent me a drawing of one dredged up on board the 'Bulldog' in 1860.

† For "No. 27, &c.," p. 216 ('Annals,' 1874, vol. xiv.), sixth line from bottom, read "42=862 fathoms, Chops of English Channel."

‡ *Holtenia Carpenteri* has been described and illustrated by Sir Wy. Thomson in the 'Philosophical Transactions' for 1869 (vol. 159, pt. ii. p. 701 &c.), who before leaving in the 'Challenger' had had similar illustrations lithographed of *Hyalonema lusitanicum* and *Tisiphonia agariciformis*; so no description of either of these sponges will be found in my report.

3rd. *A "few miles north of Cape St. Vincent,"* 1870.

Halisarca cruenta, n. sp.
Hircinia (Polytherses, *Duch. de Fonb. et Michelotti*).
Microciona jecusculum, *Bk.*
—— planum, n. sp.
Phakellia ventilabrum, *Bk.*
—— infundibuliformis, = Hal. infundibuliformis, *Johnst.*
Halichondria panicea, *Johnst.*
Isodictya spinispiculum, n. sp.
Thalysias tricurvatifera, n. sp.
Thalysias (*Duch. de Fonb. et Michelotti*).
Reniera fibulata, *Sdt.* (*L. c.*)
Histoderma appendiculatum, n. gen. ?=Cœlosphæra tubifex, *Wy. Th.* (*Op. cit.* 1874, vol. xiv. p. 220, pl. xv. fig. 39, *a*, *b*.)*
Halichondria forcipis, *Bk.*, var. bulbosa, nov.
—— phlyctenoides, n. sp.
—— carnosa, *Johnst.*
Polymastia stipitata, n. gen.
Geodia megastrella, n. sp.
—— ——, var. lævispina.
Tisiphonia agariciformis, *Wy. Th.*
Tethya cranium, *Lam.*
—— ——, var. zetlandica, *Cart.*
Pachastrella abyssi, *Sdt.*
—— amygdaloides, n. sp.
—— geodioides, n. gen.
—— intexta, n. sp.
Corallistes Bowerbankii, = Dactylocalyx Bowerbankii, *Johnson.*
Discodermia polydiscus, *Boc.* = Dactylocalyx polydiscus, *Bk.*
Macandrewia azorica, *Gray.*
Azorica Pfeifferæ, *Cart.*
Askonema setubalense, *Kent.*
Rossella velata, *Wy. Th.* ('Depths of the Sea,' p. 419).
Polytrema miniaceum, *De Blainville.*

Jars with no Number.

Corticium parasiticum, n. sp.
Halichondria panicea, *Johnst.*
—— incrustans, *Johnst.*, var. nov.
Esperia cupressiformis, n. sp. (*Op.* et *loc. cit.*)
—— ——, var. hamatifera, nov.
Chondrocladia virgata, *Wy. Th.* (*Op.* et *loc. cit.*)
Guitarra fimbriata, n. gen. (*Op. cit.* 1874, vol. xiv. p. 210, pl. xiii. figs. 2–5 &c.)†
Podospongia Lovenii, *Boc.*
Desmacella pumilio, *Sdt.* (*L. c.*)
Donatia lyncurium, *Gray.*
Cometella simplex, n. sp.
Polymastia ornata, *Bk.*
Geodia nodastrella, n. sp.
Tisiphonia agariciformis, *Wy. Th.*
Aphrocallistes Bocagei, *Wright.* (*L. c.*)
Farrea occa, *Bk.* (*L. c.*)
Askonema setubalense, *Kent.*
Holtenia Carpenteri, *Wy. Th.*
Hyalonema lusitanicum, *Boc.* Probably from station 46, about 55 miles N.W. of the Butt of Lewis.

Dried Specimens of Sponges.

Among the dried specimens without number are *Hyalonema lusitanicum*, *Holtenia Carpenteri*, and *Rossella velata*, with a fragment of the base of *Euplectella aspergillum directly* attached to a piece of old coral detritus, and fragments of *Aphrocallistes Bocagei*; also large fragments of *Corallistes Bowerbankii*, *Discodermia polydiscus*, and *Macandrewia azorica*; *Pachastrella abyssi*, *Stelletta pachastrelloides*, and *Geodia megastrella*, the latter entire.

* For "2 and 24, &c.," p. 221 ('Annals,' 1874, vol. xiv.), eleventh line from top, read "24 & 24=292 fathoms, near Cape St. Vincent;" and for "2," in thirteenth line from top, read "24 and 2 in pencil."

† In a sponge from the neighbourhood of the Falkland Islands, sent me by Mr. T. Higgin, of Huyton, Liverpool, the anchorate of *Guitarra* is present in plurality as a foreign object.

Memoranda of other Organisms found among the Sponges.

Polytrema miniaceum.

On an old fragment of a branch of dead coral about an inch long and $\frac{3}{12}$ inch thick, partly covered with Polyzoa, and pierced with holes of a *Cliona*, which was living in its interior, are five specimens of *Polytrema miniaceum* with their heads, as usual, broken off, leaving nothing but their lower halves. This fragment was dredged up at station 24, =292 fathoms, a few miles north of Cape St. Vincent. With the exception of these specimens, I have not met with even a trace of *Polytrema* among the sponges dredged up on board the 'Porcupine' north of this locality.

Xanthidium abyssorum, n. sp.

General form a spherical cell, covered with erect, conical, transparent, hollow cirri, ending in two or three short filaments, straight and expanded, or recurved and curled. Cell more or less filled with yellowish, granular, soft material. Composition chitinous. Size of cell about 4-1800ths inch in diameter; length of cirrus above 1-1800th inch.

Hab. Marine.

Loc. Chops of English Channel, in 862 fathoms.

Obs. This form of *Xanthidium* is found attached to *Corticium parasiticum* where the latter covers the old stems of *Esperia cupressus*, var. *hamatifera*. Nitric acid applied on the slide causes the ends of the cirri to contract, but does not dissolve the cell, which on drying and mounting loses its sphericity, but not its diameter. The cirri, however, become so transparent in the balsam that it is difficult to see them. I possess a fossil specimen in flint, of precisely the same form, only hardly half the diameter in the cell, which is angulo-spherical by contraction, and the cirri a little longer. Precisely the same kind of cirri, too, are present in some winter-eggs or statoblasts of the Bombay *Lophopus* which I have mounted; and the reasons may be seen ('Annals,' 1859, vol. iii. p. 342), in my comparison of the winter-eggs of the freshwater Bryozoa with the seed-like body of *Spongilla*, why I therein stated that the results of my observations were "more in

favour of the *Xanthidia* being the petrified orbicular statoblasts of the Polyzoa than the petrified sporangia of Desmidieæ."

Xanthidium bicirratum, n. sp. (Pl. XV. fig. 44.)

General form a spheroidal or slightly elliptical cell, provided with two opposite erect cirri, each of which, after a short distance, divides into two longer filaments that, recurving in opposite directions apparently in the same plane, finally cross those of the opposite side. Cell empty or filled with a few yellowish fragments of soft material. Composition chitinous. Size of cell about 2-6000ths inch in diameter; length of cirrus before dividing about 1-6000th inch, length of filaments after dividing 5-6000ths inch.

Hab. Marine.

Loc. Common between the north of Scotland and the Färöe Islands.

Obs. Although, in this instance, the cell is not more than a fifth of the size of that of *X. abyssorum*, its general appearance, together with its contents, inclines me to view it as a *Xanthidium*—that is, the shell, at least, of the egg of a Polyzoon. Nitric acid applied on the slide does not cause any appreciable alteration in the shape, nor does drying or mounting in balsam, probably on account of the chitinous wall being thicker than in *X. abyssorum*.

Coccoliths and Rhabdoliths.

The oval and cyclical *Coccoliths* with their respective *Coccospheres* have also been generally present in great abundance; also *Rhabdoliths*, but no *Rhabdospheres*. The oval *Coccolith* appears to abound between the north of Scotland and the Färöe Islands; the cyclical one southwards, and the *Rhabdoliths* from the "chops of the English Channel" to Cape St. Vincent, where all three forms are found together—at least, judging from what I have observed about the sponges from these three different localities.

I might here add that, in the sand about the sponges in the British Museum, dredged up by Sir J. Ross in 300 fathoms, 74½°, and in 206 fathoms, 77½° south latitude, respectively, I found no *Coccoliths* and very few *Globigerinæ*, but many Radiolaria.

BLACK GRAINS.

Among the *Globigeriniferous* sand may often be observed "black grains," frequently shapeless and more or less angular,

but often representing casts, with their peculiar markings, of the chambers of *Globigerina* and other minute Foraminifera. If a little of this sand be carefully washed, dried, and placed under the microscope, it will be easily seen that they have all the same origin; for, beginning of a yellowish colour, passing into brown, and finally black, they may respectively be observed within the chambers of *Globigerina*, half in and half out, as they approach that state in which, being altogether without even a fragment of the white calcareous test, and in the form of casts, they either retain this recognizable form or lose it altogether and become more or less angular.

EXPLANATION OF THE PLATES.

PLATE XII.

Fig. 1. Pebble on which there is a Terebratule and six kinds of sponges. *a a*, pebble; *b*, Terebratule,—the Terebratule bearing *c*, *Aplysina nævus*, *d*, *Spongia officinalis*, *e*, *Dysidia fragilis*; the pebble bearing:—*f f f*, fronds of two specimens of *Phakellia ventilabrum*, Bk.; *g g*, *Spongia Lovenii*, Boc.; *h*, *Microciona longispiculum*. All natural size.

Fig. 2. *Aplysina nævus*, grown over a branch of coral, natural size. *a*, fragment, magnified, to show:—*b*, dermal incrustation covered with pore-depressions or puncta; and *c*, basal end of filaments expanded into layer of attachment.

Fig. 3. *Dictyocylindrus abyssorum*, natural size. *a*, portion of branch, magnified, to show hirsute character; *b*, small acuate, spined; *c*, anchorate; *d*, tricurvate (bow): *b*, *c*, *d* on scale of 1-24th to 1-1800th of an inch. *e*, end of tricurvate, more magnified, to show that it is spined; *f*, anchorate, more magnified. For skeleton-spicules see Pl. XV. fig. 25, *a*, *b*.

Fig. 4. *Hymeraphia vermiculata*, Bk., var. *erecta*, natural size. *a*, fixed end of large skeleton-spicule; and *b*, tortuous subskeleton-spicules with which it is surrounded: scale 1-24th to 1-1800th inch. *c*, *H. vermiculata*, Bk., covering a small pebble: natural size. For skeleton- and subskeleton-spicules, see Pl. XV. fig. 26, *a*, *b*.

Fig. 5. *Dictyocylindrus virgultosus*, Bk., bearing a young *Tethya cranium* and a variety of *Grantia ciliata*. *a*, *Tethya*; *b*, *Grantia ciliata*; *c*, small acuate spined spicule of *D. virgultosus*; *d*, acerate subskeleton-spicule, smooth: scale of *c*, *d*, 1-24th to 1-1800th inch.

Fig. 6. *Grantia ciliata*, Flem., var. *spinispiculum*, C., on *Dictyocylindrus virgultosus*, natural size.

Fig. 7. The same, barbed spicule among the acerates towards the base: *a*, fixed end; *b*, free or barbed end. Scale 1-24th to 1-6000th inch.

Fig. 8. *Grantia ciliata*, Flem., variety (from Budleigh-Salterton, south coast of Devonshire). Two barbed spicules with inflated extremities, respectively; one spined like the anchoring-spicule of *Euplectella aspergillum*. Scale 1-12th to 1-6000th inch.

Fig. 9. *Cornudum textile*, natural size. *a*, textile sheath; *b*, fibrous struc-

ture of the interior, projecting and frayed out; *c*, anchorate; *d*, tricurvate: *c*, *d*, on the scale of 1-24th to 1-6000th inch. *e*, anchorate, more magnified. For the skeleton-spicule see Pl. XV. fig. 28.

Fig. 10. *Halichondria foliata*, Bk., fragment, natural size. *a*, anchorate; *b*, tricurvate: scale 1-24th to 1-6000th inch. For the skeleton-spicules see Pl. XV. fig. 29, *a*, *b*.

Fig. 11. *Plumohalichondria microcionides* (rolled fragment), natural size. *a*, clavate acuate, spined, 1-48th to 1-6000th inch; *b*, anchorate, more magnified: scale 1-24th to 1-6000th inch. For skeleton-spicules see Pl. XV. fig. 30, *a*, *b*.

Plate XIII.

Fig. 12. *Esperia placoides*, natural size. *a a a*, scales; *b b*, grooves between the scales; *c c*, vents; *d*, stem; *e*, diagram of two scales, viewed laterally, to show their structure and the groove between them; *f*, free surface, hirsute; *g*, base, rooted to the interior by bundles of skeleton-spicules; *h*, vertical portion; *i*, groove: scale 1-24th to 1-48th inch. *k*, diagram of a portion of the surface of a "groove," magnified, to show *l*, the pore-areæ occupying the interstices of the reticulated smooth rugæ, *l' l' l'*; *m*, vent, magnified, to show form; *n*, anchorate; *o*, bihamate or fibula; *p*, bundle of tricurvates; *q*, single tricurvate: *m–q* on same scale, viz. 1-24th to 1-6000th inch. For the skeleton-spicule see Pl. XV. fig. 32.

Fig. 13. *Esperia borassus*, on a fragment of *Pachastrella abyssi*, Sdt., natural size. *a a a*, pachastrella and spicules; *b*, *E. borassus*; *c*, anchorate; *d*, bihamate: on the same scale, viz. 1-24th to 1-6000 inch. For the skeleton-spicule see Pl. XV. fig. 33.

Fig. 14. *Esperia cupressiformis*, var. *hamatifera*, free extremity, natural size. *a*, large anchorate; *b*, small anchorate; *c*, bihamate: on the same scale, viz. 1-24th to 1-6000th inch. For the skeleton-spicule see Pl. XV. fig. 34.

Fig. 15. *Cladorhiza abyssicola*, Sars, branch of, natural size. *a*, characteristic bihamate.

Fig. 16. *Cladorhiza abyssicola*, var. *corticocancellata*, end of branch of, natural size. *a*, characteristic bihamate.

Fig. 17. *Halichondria phlyctenodes*, on a fragment of *Corallistes Bowerbankii*, natural size. *a a a*, *Corallistes*; *b*, *H. phlyctenodes*; *c c*, appendiculate tubular vents; *d*, end of one that has been cut off; *e*, tubular vent, magnified two diameters; *f*, anchorate; *g*, bihamate: on the same scale, viz. 1-24th to 1-6000th inch. For the skeleton-spicule see Pl. XV. fig. 35.

Fig. 18. *Cribrella hospitalis*, Sdt., natural size. *a*, sponge; *b*, pore-areæ, circular and cribriform; *c*, stem; *d*, anchorate: on the scale of 1-24th to 1-6000th inch. For the skeleton-spicules see Pl. XV. fig. 36, *a*, *b*.

Fig. 19. *Halichondria forcipis*, Bk., var. *bulbosa*, a fragment in a fragment of a bivalve shell, natural size. *a*, shell; *b*, sponge; *c*, anchorate; *d*, bihamate; *e*, tricurvate, in the form of a pair of open compasses: on the same scale, viz. 1-24th 1-6000th inch. *f*, one arm of the tricurvate, more magnified to show the bulb at the extremity. For the skeleton-spicules see Pl. XV. fig. 37, *a*, *b*.

Plate XIV.

Fig. 20. *Cometella pyrula*, n. sp., on a pebble. *a a*, two pebbles linked together by the stem of another specimen, from which the head has been broken off; *b*, *C. pyrula*; *c*, stem without head: natural size. *d*, section of the same, magnified two diameters, to show internal structure, composed of nucleus with radiating bundles of spicules, ovarian zone, layer of compressed excretory cavities, subdermal zone, and dermal layer, diagrammatic. *e*, summit, still more magnified, to show that the terminal vent, *f*, thereon is surrounded by a bundle of long acerate spicules like *i*, and the surface *g*, covered with polygonal spaces, whose lineation culminates in pointed elevations; *h*, elevation, greatly magnified, to show that it is a pore situated in the centre of a whirl of the spicules, "*k*," about which the anchorate spicules, "*l*," are congregated and alone to be found; *i*, skeleton-spicule; *k*, spined acuate or subskeleton-spicule; *l*, anchorate; *m*, the same, more magnified: *k*, *l*, *i* are drawn to the same scale, viz. 1-48th to 1-6000th inch. For the skeleton-spicule see also Pl. XV. fig. 38.

Fig. 21. *Hymeraphia verticillata*, Bk., on a pebble, magnified two diameters. *a*, pebble; *b*, *H. verticillata*; *c*, monticules, from which respectively a large skeleton-spicule projects as at "*m*;" *d*, fixed end of large skeleton-spicule, often bulbous; *e*, acerate centro-inflated spicule, fissurate at the ends; *f*, central inflation; *g g*, fissurate ends; *h*, the same, magnified, to show the three arms; *i*, staple spicule of the body and dermis verticillately spined; *k*, the same, moniliform; *l*, the same at an early stage of development, to show that the bead-like form is persistent; *m*, diagram of monticule, to show its elementary composition and the arrangement of the spicules composing it; *n*, dermal layer charged with verticillate and moniliform spicules; *o o*, group of centrally inflated spicules surrounding the great acuate spicule *p*. For the skeleton-spicules see Pl. XV. fig. 39, *a*, *b*. *d*, *e*, *i*, and *k* are on the same scale, viz. 1-48th to 1-6000th inch.

Fig. 22. *Pachastrella amygdaloides*, on a piece of rock, natural size. *a*, rock; *b*, sponge; *c*, vent-area; *d*, the same specimen, lateral view, natural size. *e*, rock; *f*, sponge; *g g*, forms of large radiate skeleton-spicule; *h*, form of acerate spicule; *i*, subskeleton-spicule, microspined; *k*, flesh-spicule, microspined; *l l*, stellate with linear arms or rays: with the exception of *h* and *i*, all are on the same scale, viz. 1-24th to 1-6000th inch.

Fig. 23. *Pachastrella geodioides*, natural size: *a*, diagram on the scale of 1-48th to 1-1800th inch, to show heterogeneous composition of body and surface; *b b b*, large radiate skeleton-spicules; *c c c*, subskeleton radiate spicules; *d d*, acerate spicules; *e e*, siliceous balls of a *Geodia*; *f*, test of a *Globigerina*; *g g*, grains of quartz; *h*, dots representing globo-tuberculated stellates, more magnified in *m*. Spicules separate:—*i*, large radiate skeleton-spicule, with three arms, on same scale; *k k k*, subskeleton radiate spicules of various forms; *l*, acerate spicule, scale 1-24th to 1-6000th inch; *m*, globostellate or flesh-spicule under its two forms, viz. *n*, with stelliform interior, *o*, with solid interior, scale 1-12th to 1-6000th inch; *p*, more magnified view of tubercle.

N.B. As the skeleton acerate spicule is of the same form in

both the last species, only one figure has been given; but it should be remembered that while it varies in length in both species, especially in the latter, it is generally three times the length in *P. amygdaloides* that it is in *P. geodioides*.

Fig. 24. *Halichondria abyssi* ('Annals,' 1874, vol. xiv. p. 245, pl. xiv. fig. 2, *c*), "embryonic form" of flesh-spicule (anchorate), magnified, to show that it is birotulate: *a*, lateral view; *b*, end view.

Plate XV.

Fig. 25. *Dictyocylindrus abyssorum*, skeleton-spicules: *a*, large; *b*, small. Scale 1-24th to 1-1800th inch.

Fig. 26. *Hymeraphia erecta*, skeleton-spicules: *a*, large; *b*, small. Scale 1-24th to 1-1800th inch.

Fig. 27. *Dictyocylindrus virgultosus*, Bk., skeleton-spicule. Scale 1-24th to 1-1800th inch.

Fig. 28. *Cornulum textile*, skeleton-spicules: *a*, large; *b*, small. Scale 1-24th to 1-6000th inch.

Fig. 29. *Halichondria foliata*, Bk., skeleton-spicules: *a*, large; *b*, small. Scale 1-24th to 1-6000th inch.

Fig. 30. *Plumohalichondria microcionides*, skeleton-spicules: *a*, large; *b*, small. Scale 1-48th to 1-6000th inch.

Fig. 31. *Microciona longispiculum*, skeleton- and flesh-spicules: *a*, large; *b*, small; *c*, flesh or echinating spicule. Scale 1-24th to 1-1800th inch.

Fig. 32. *Esperia placoides*, skeleton-spicule. Scale 1-48th to 1-6000th inch.

Fig. 33. *Esperia borassus*, skeleton-spicule. Scale 1-48th to 1-6000th inch.

Fig. 34. *Esperia cupressiformis*, var. *bihamatifera*, skeleton-spicule: *a*, body form; *b*, surface form. Scale 1-12th to 1-1800th inch.

Fig. 35. *Halichondria phlyctenodes*, skeleton-spicule. Scale 1-48th to 1-6000th inch.

Fig. 36. *Cribrella hospitalis*, Sdt., skeleton-spicules: *a*, large; *b*, small. Scale 1-24th to 1-6000th inch.

Fig. 37. *Halichondria forcipis*, Bk., var. *bulbosa*, skeleton-spicules: *a*, large; *b*, small. Scale 1-24th to 1-6000th inch.

Fig. 38. *Cometella pyrula*, skeleton-spicule. Scale 1-48th to 1-6000th inch.

Fig. 39. *Hymeraphia verticillata*, Bk., var. *erecta*, skeleton-spicules: *a*, large; *b*, small or centrally inflated. Scale 1-24th to 1-1800th inch.

Fig. 40. *Stelletta pachastrelloides*. *a*, large acerate skeleton- or "body-spicule;" *b*, three-armed "zone-spicule;" *c*, anchoring-spicule;" *d*, microspined subskeleton-spicule: all on the same scale, viz. 1-48th to 1-1800th inch. *e*, microspined flesh-spicule, more magnified; *f*, large stellate spicule with conical rays spiniferous; *g*, minute bistellate spicule with linear rays: scale of *f* & *g*, 1-12th to 1-6000th inch. *h*, head of anchoring-spicule, more magnified; *i*, microspined subskeleton acerate spicule, more magnified.

Fig. 41. *Pachastrella intexta*, quinqueradiate skeleton-spicule, scale 1-24th to 1-6000th inch. *a*, bacilliform blunt-spined flesh-spicule; *b*, bistellate minute flesh-spicule with linear rays: scale 1-12th to 1-6000th inch.

Fig. 42. *Isodictya spinispiculum*, spicule of. Scale 1-24th to 1-6000th inch.

Fig. 43. *Microciona intexta*: *a*, skeleton-spicule; *b*, bihamate; *c*, bihamates in the mass. Scale 1-24th to 1-6000th inch.

Fig. 44. *Xanthidium bicirratum*. Scale 1-12th to 1-6000th inch.

Plate XVI.

Fig. 45. *Geodia nodastrella*. *a*, "zone-spicule," viewed laterally; *b*, end view of head; *c*, "body" or large skeleton acerate spicule; *d*, "anchoring-spicule" fluked and forked; *e*, body-stellate; *f*, siliceous balls of crust, globular and elliptical forms; *g*, nodostellate of dermis and crust; *h*, dermal acerate: all on the same scale, viz. 1-48th to 1-1800th inch. *i*, body-stellate, more magnified; *k*, nodostellate of dermis and crust, more magnified.

Fig. 46. *Geodia megastrella* on a fragment of *Corallistes*: *a*, sponge; *b*, aperture or common vent; *c*, pore-areæ; *d*, fragment of *Corallistes Bowerbankii*.

Fig. 46'. The same, spicules of. *a*, zone-spicule; *b*, less frequent form of head of zone-spicule; *c*, "body" or large skeleton acerate spicule; *d*, anchoring-spicules, fluked and forked; *e*, megastrella, arms microspined; *f*, body-stellate; *g*, siliceous balls of crust, globular and elliptical forms; *h*, dermal stellate; *i*, dermal acerate: all on the same scale, viz. 1-48th to 1-1800th inch. *k*, megastrella, more magnified; *l*, body-stellate, more magnified; *m*, dermal stellate, more magnified.

Fig. 47. *Geodia megastrella*, var. *lævispina*. *a*, zone-spicule; *b*, body or large skeleton acerate spicule; *c*, anchoring-spicules, fluked and forked respectively; *d*, megastrella; *e*, siliceous balls of crust; *f*, stellate of dermis and crust; *g*, dermal acerate: all on the same scale, viz. 1-48th to 1-1800th inch. *h*, megastrella, more magnified; *i*, spines broken off; *k*, dermal stellate, more magnified.

Fig. 48. *Tethya cranium*, var. *infrequens*. *a*, projecting forked anchoring-spicule, with arms truncated and terminating in little cup-shaped excavations with serrated margins respectively; *c*, projecting fluked or anchor-like anchoring-spicule: scale 1-48th to 1-6000th inch. *b*, extremity of arm of forked form (*a*), more magnified.

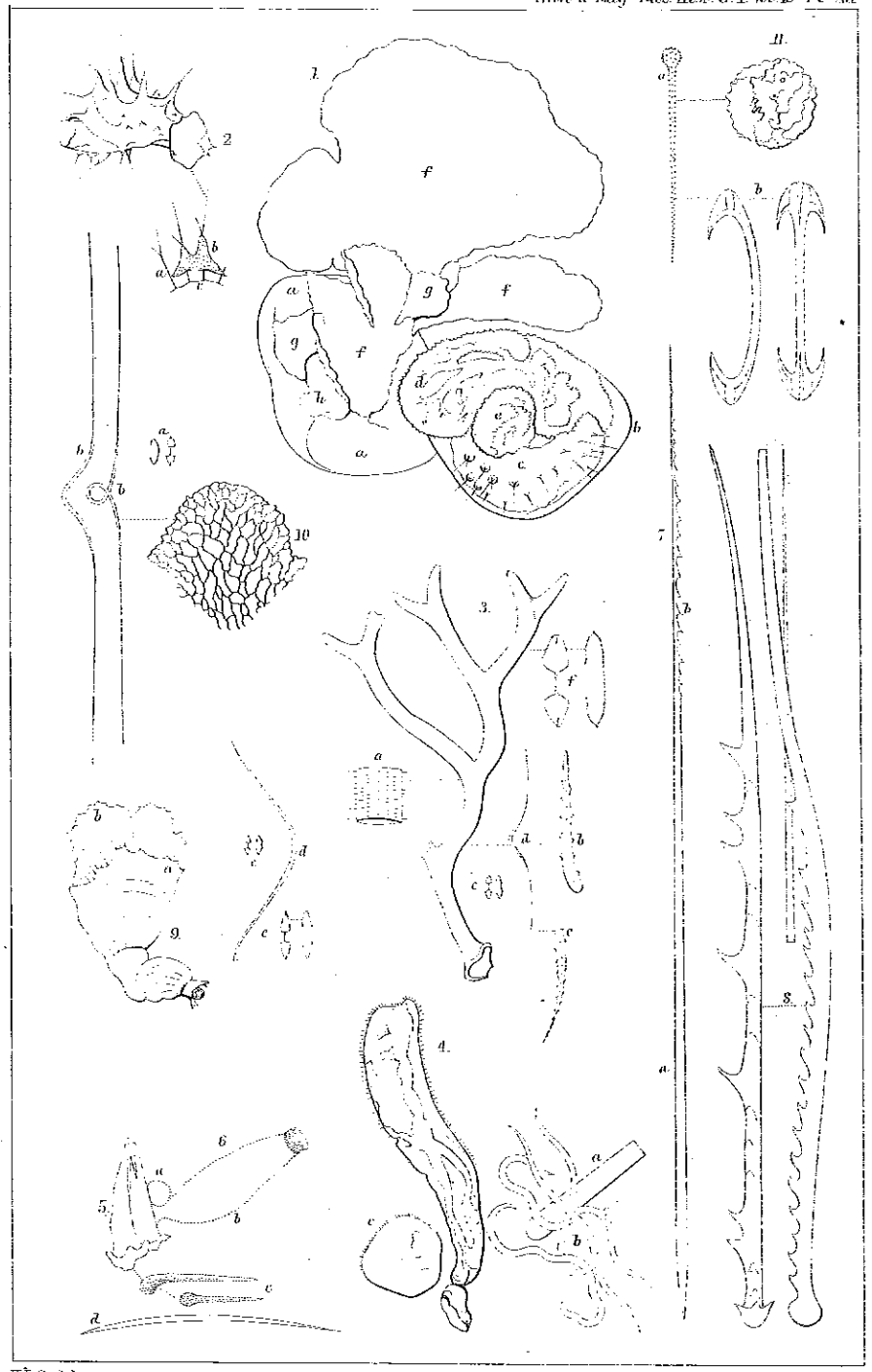
Fig. 49. *Tethya cranium*, var. *abyssorum*: *a*, two bihamates, magnified to show that they are spinous. Scale 1-6th to 1-6000th inch.

Fig. 50. *Pachastrella parasitica*. *a*, radiate skeleton-spicule, showing that its arms are thrice forked; *b*, shaft, prolonged above as well as below; *c*, acerate skeleton-spicule; *d*, spinous bacillary flesh-spicule; *f*, minute stellate: all on the same scale, viz. 1-24th to 1-6000th inch. *e*, spinous bacillary flesh-spicule, more magnified.

Fig. 51. *Microciona minutula*: *a*, large skeleton-spicule; *b*, different forms of its head; *c*, slender acuate; *d*, bihamates. Scale 1-24th to 1-6000th inch.

Fig. 52. *Corticium parasiticum*, spicules of. Scale 1-24th to 1-6000th inch.

Fig. 53. *Cometella simplex*, natural size.



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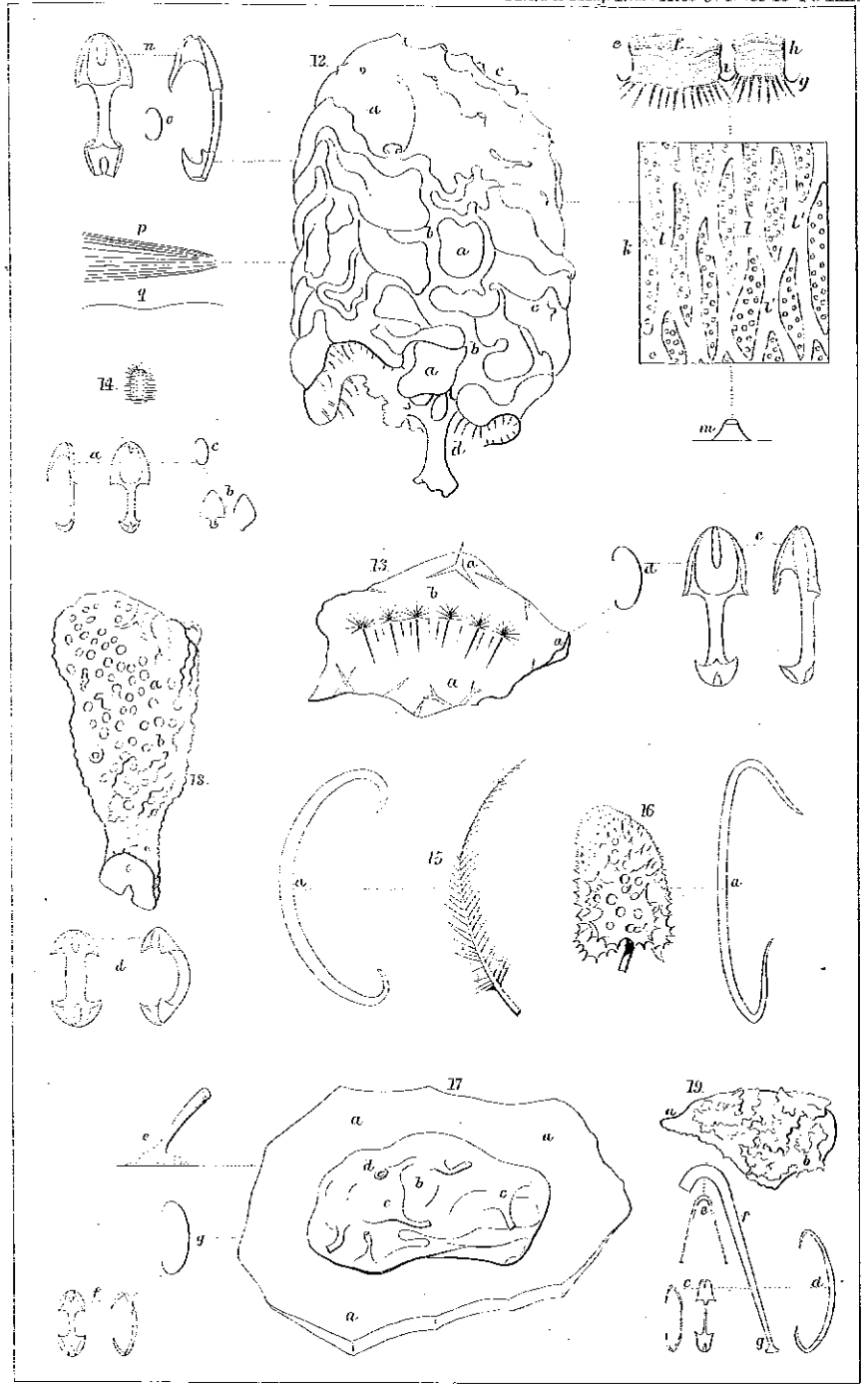
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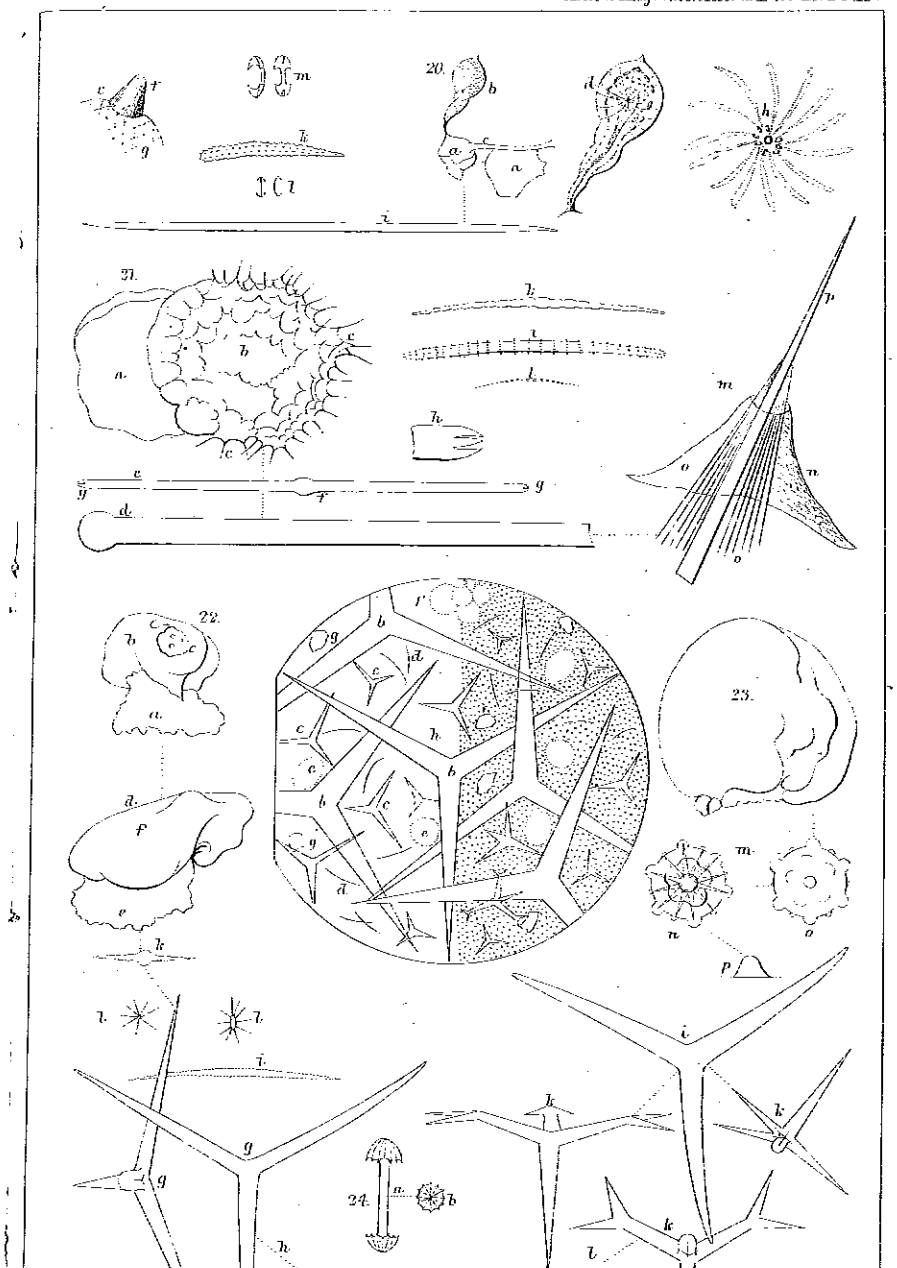

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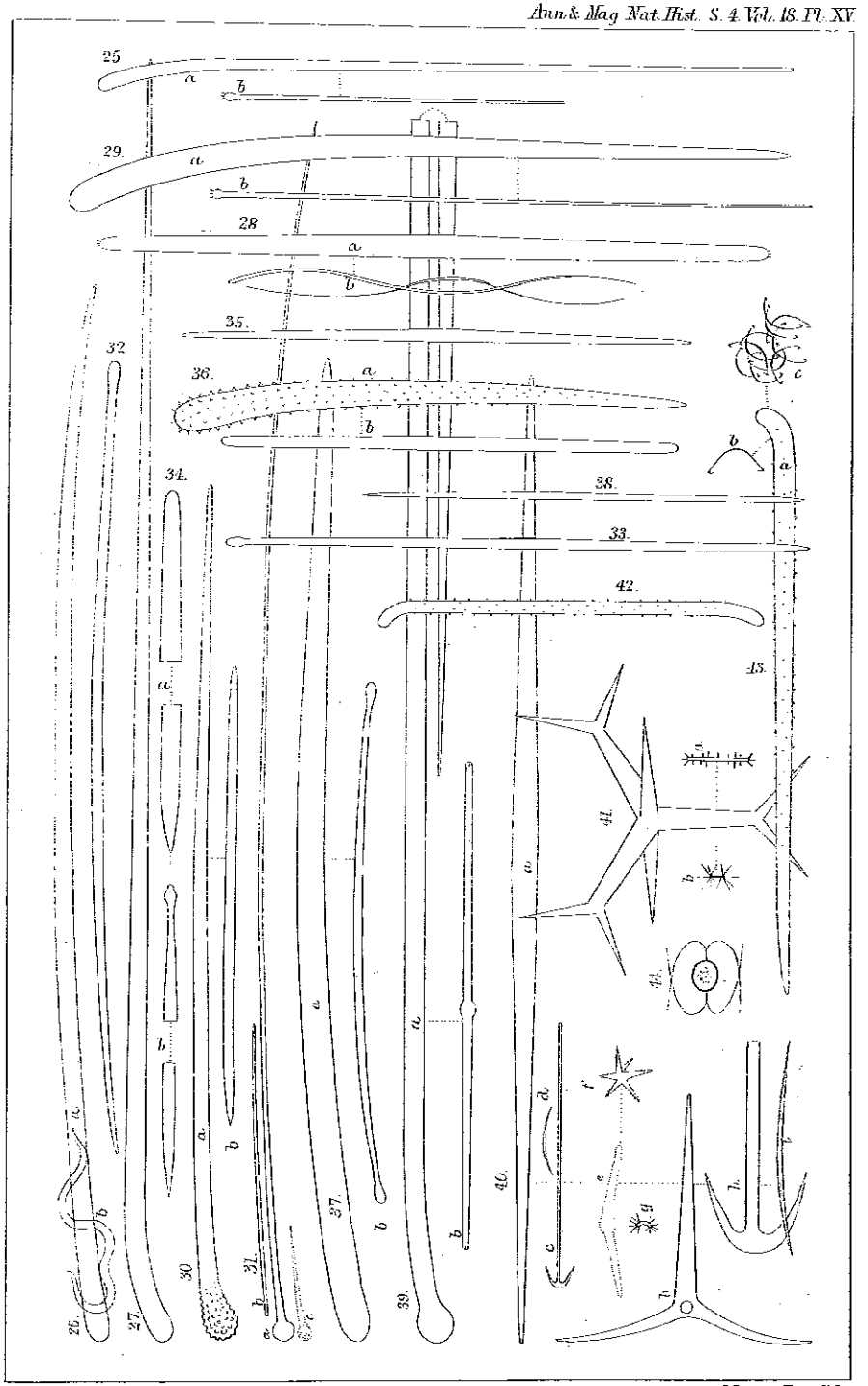

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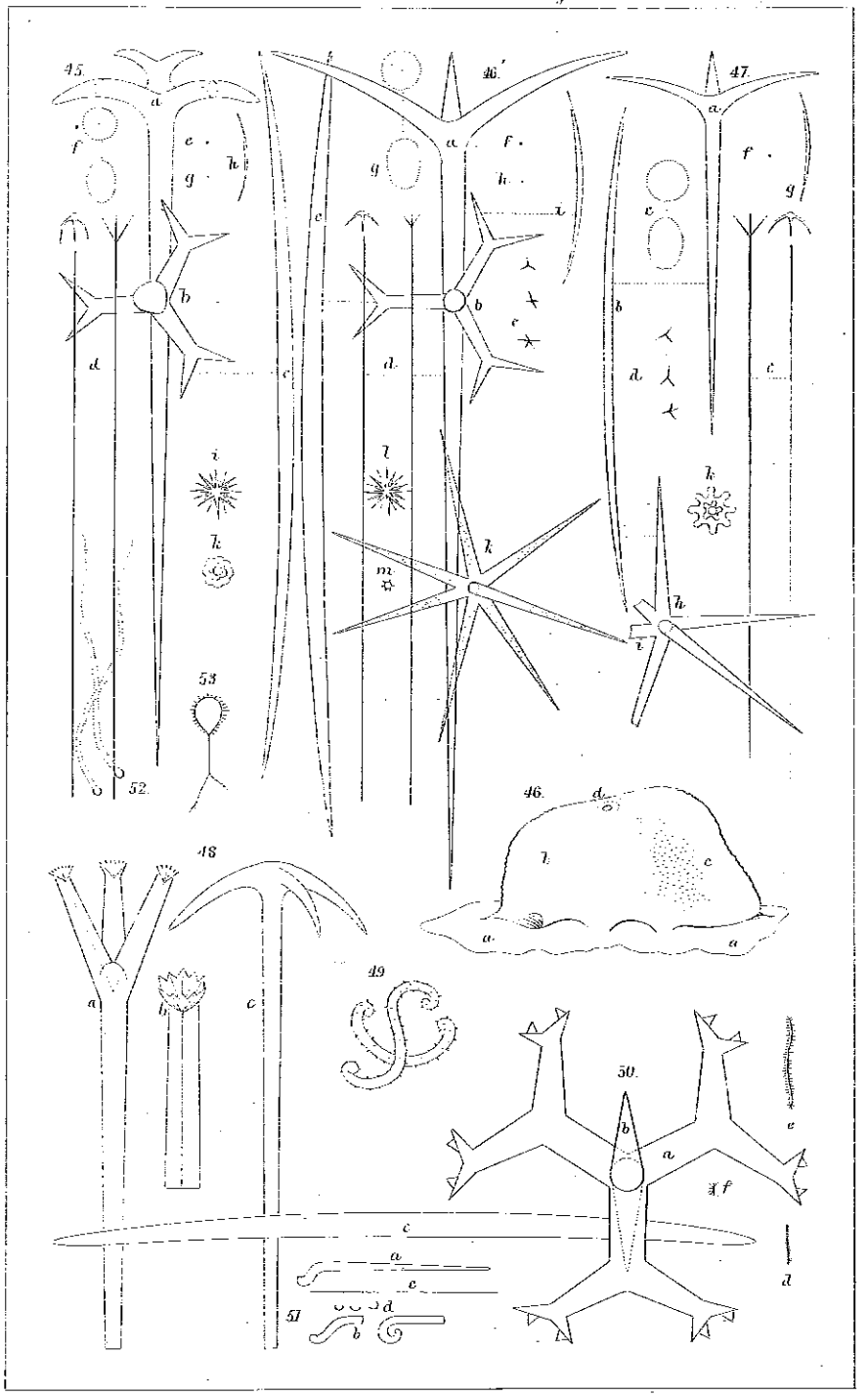
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