yond the level of the hinder edge of the choanæ. Head moderate; snout broad, rounded, with distinct canthus rostralis; loreal region deeply concave; nostril equally distant from the eye and the border of the mouth; interorbital space as broad as the upper eyelid; tympanum three fifths the diameter of the eye, separated from the orbit by an interspace equal to its diameter. Fingers and toes with swollen tips and very strong subarticular tubercles; first finger extending beyond second; toes almost entirely webbed, the swollen tips alone being free; a single oval, blunt, metatarsal tubercle. The hind limb being carried forwards along the body, the tibio-tarsal articulation reaches the tip of the mouth. Upper surfaces covered with small pustules; a strong fold from the eye to the shoulder; a glandular lateral fold. Upper surfaces olive, with rather indistinct blackish spots; flanks blackish-and-whitish marbled; hinder side of thighs blackish, marbled with grey; lower surfaces whitish, the throat and breast soiled with grey. From snout to vent 106 millim.

One female specimen from Ventanas.

Hypopachus oxyrrhinus, sp. n.

Snout pointed, very prominent, about once and a half the diameter of the eye. Fore limb much longer than its distance from the tip of the snout; third finger much elongate; toes short, with a rudiment of web; tips of fingers and toes blunt; subarticular tubercles distinct; two very prominent, oval, compressed, shovel-shaped metatarsal tubercles, the inner very large. The hind limb being carried forwards along the body, the tibio-tarsal articulation reaches between the shoulder and the eye. Skin nearly smooth; a fold across the head, behind the eyes. Vinaceous above, blackish on the sides, the limits between the two colours well defined; a black oblique band across the thigh, and another across the leg; hinder side of thighs marbled with blackish; lower surfaces dirty white, more or less marbled with brownish. Male with a subgular vocal sac. From snout to vent 28 millim.

Two male specimens from Presidio.

XLVI.—*Contributions to our Knowledge of the* Spongida.—Pachytragida. By H. J. Carter, F.R.S. &c.

[Plates XIV., XV.]

The Pachytragida or third family of my Holorhaphidota, designated as sponges "more or less corticate, with a can-

cellous, more or less radiated structure internally well differentiated" ('Annals,' 1875, vol. xvi. p. 133), now only consists of three groups, viz. Geodina, Stellettina, and Tethyina; but as it seems to me desirable that a fourth should be inserted between the two latter, this will appear hereafter under the proposed name of "Theneanina," for reasons which will then become evident.

1. Geodina.

The spiculation of this group, whose characters are detailed at length in my Classification (*op. et loc. cit.* p. 183), consists of a "body-" (Pl. XIV. fig. 1, *a*), a "zone-" (fig. 1, *b*), and "anchoring-spicules" (fig. 1, *c*), together with a great number of minute globular siliceous bodies, and still smaller stellates &c. or "flesh-spicules," which are chiefly congregated into a hard crust around the exterior; but as some of these elements may be variously formed, it becomes necessary, for memory's sake, to subdivide the group accordingly; and for this purpose we, of course, select that element which offers the most striking diversity, viz the "zone-spicule." In this we find the following differences:—

Section 1.

Arms simple and straight (or Orthactinida).

a. Radiating more or less forwards. (*Proradiata.*)
b. Radiating horizontally. (*Planiradiata.*)
c. Curved outwards or backwards respectively. (*Recurviradiata.*)

Section 2.

Arms simple, straight, and bifurcated (Dichelactinida).

a. Radiating more or less forwards. (*Proradiata.*)
b. Radiating horizontally. (*Planiradiata.*)
c. Curved outwards or backwards respectively. (*Recurviradiata.*)

Although *Pachymatisma*, Bk. (for illustrations in detail see 'Annals,' 1869, vol. iv. p. 9, pl. ii. figs. 16 *a*, *b*), would thus belong to Section 1, *b*, the body-spicule *here* presents the greatest difference, being more or less cylindrical and obtuse or inflated at both ends (*ib. ib.* fig. 17) instead of fusiform and sharp-pointed, which is the usual form; while the zone-spicule is so abnormally developed in general that it is the exception rather than the rule to find a perfect one. In Schmidt's genus *Caminus* (Spong. Adriat. Meeres, p. 48,

Taf. iii. fig. 27, and Taf. iv. fig. 6) the spiculation appears to be much the same, as evidenced not only by his illustrations, but by the type specimen in the British Museum; hence it appears to be closely allied to *Pachymatisma*.

But *all* the specimens of Geodina which have been described and illustrated will, even after having been placed in the above divisions, be found to be so much alike that the whole group requires to be carefully examined individually as well as collectively, before the little differences which they present specifically can be rightly appreciated for final arrangement. What these "differences" amount to I am unable to suggest, further than that the stellates and other forms of minute flesh-spicules, which often accompany the globular siliceous bodies, may afford some assistance in this way.

There are only two British species enumerated among the sponges in Dr. Bowerbank's Monograph, viz. *Geodia zetlandica* and *Pachymatisma Johnstonia*, of which excellent representations are given in vol. iii. (pls. vii. and viii. figs. 1–9 and 1–7 respectively). But in the *deeper* sea around the British Isles there are many more ("Sponges from the Atlantic Ocean," 'Annals,' 1876, vol. xviii. p. 397 &c. pl. xvi.); and the group is plentifully distributed throughout the warmer regions of the world, from which a great many so-called species have been recorded. But before all have been brought together and properly divided, as just proposed, they must continue as they now are, in hopeless confusion.

Being unable to do more now than propose the divisions of the Geodina above mentioned, I must refer the reader for the little else that I have published on the subject to the "General Observations" in my paper on the West-Indian Sponges ('Annals,' 1882, vol. ix. p. 363).

Geodia canaliculata, Sdt. (Pl. XIV. fig. 1, *a–m*.)

Geodia canaliculata, Spong. Küste v. Algier, 1868, p. 21, Taf. iv. fig. 7.

It is strange that of this species, which Schmidt calls "new," he should have *only* given the *abnormal* spiculation; so, having found one in Dr. Bowerbank's general collection from Adelaide, on the south coast of Australia, now in the British Museum, I have sought out the *normal* spiculation, which belongs to my Section 2, *b*. Thus the arms of the zone-spicule radiate on the same plane (that is, perpendicular to the shaft), and are each bifurcated (Pl. XIV. fig. 1, *b*), while the normal and fully developed globular or globo-elliptical siliceous body or ball (fig. 1, *d* and *h*) presents that pattern on its surface (fig. 1, *i–k*) which will be more particularly described in the

next group, viz. Stellettina, and is more than twice the size of the abnormal one (fig. 1, *e* and *l*) that accompanies it (see Schmidt's illustration, *l. c.*), which, on the other hand, will be afterwards found to be the *normal* form in the new species that I am about to describe under the name of *Stelletta reticulata*. The entire specimen of *Geodia canaliculata*, according to my "Notes," is subglobular, light fawn-colour throughout, and 3 inches in diameter, with the vents grouped here and there, and a thick cortex, chiefly composed of the normal and abnormal siliceous bodies mentioned.

2. Stellettina.

With reference to the group Stellettina, the name of which is derived from Schmidt's genus "*Stelletta*," established in 1862 (Spong. Adriat. Meeres, p. 46), equivalent to Bowerbank's genus "*Ecionemia*" of 1866 (Mon. Brit. Spong. vol. ii. p. 4, "type *Ecionemia acervus*, Bk., MS."), both of whose diagnoses are *now* remarkably inadequate, the distinction between this and the group Geodina is trenchantly defined if we restrict the siliceous body or ball of the crust to a globular or globo-elliptical form, in which the surface, when fully and normally developed, presents (in all instances that have come under my notice) the tessellated pattern delineated in fig. 1, *i–k* (Pl. XIV.), which is made up of minute, flat, polygonal facets, rendered more or less stelliform by a still smaller spine or ray at each angle, all supported on conical processes, which are the circumferential terminations of the delicate linear crystalline segmental radii of which the whole body is composed, and so closely approximated that, but for a shallow groove or interval not more than one third of the diameter of the facet which separates them (fig. *k*), the whole would be continuous. Thus it becomes very easy, where there is a crust of such globular bodies, to divide *Geodia* from those species of *Stelletta* in which there is none or nothing but a few minute stellates. Hence Schmidt's and Bowerbank's diagnoses of *Stelletta* are so far sufficient. But there are certain other sponges that have been called "*Stelletta*" by Schmidt, as well as some new species which I myself am about to describe, which, although presenting, on the one hand, a thin crust composed of *discoid* bodies otherwise identical in structure with the globular ones of *Geodia* (ex. gr. *Stelletta euastrum*, *S. discophora*, and *S. mamillaris*, Sdt.), and, on the other, bacilliform and globostelliform bodies respectively (ex. gr. *Stelletta bacillifera* and *S. globostellata*, Crtr., n. sp.), cannot be included under the part of Schmidt's diagnosis

which relates to the surface, viz. "*Cortex tenuior, stellas minores* 3- *ad* 7-*radiatas continens*," which is the only characteristic of that form of *Stelletta* to which I have alluded as being thus trenchantly distinguished from the chief cortical element of a genuine *Geodia* in this respect. Hence it becomes desirable either to transfer these to the Geodina, in which case additional sections must be made for them, and the distinguishing character of the Geodina above mentioned is thus rendered useless; or to extend the diagnosis of the Stellettina so as to include them in the latter. Formerly I thought that the discophorous *Stellettæ* should form a part of the Geodina, and so proposed that they should be added to *Pachymatisma* and *Caminus* ('Annals,' 1880, vol. vi. pp. 136, 137), for reasons then mentioned; but now that I have had to consider the relationship of these two groups more closely, it seems to me that they had better remain where Schmidt placed them, viz. under the genus *Stelletta*—that is, with the Stellettina. Thus the diagnosis of the latter would still remain as stated in my classification (*op. et loc. cit.*) unless it should be considered desirable to add to the end of it the following words—"viz. discoid, bacilliform, or globostellate bodies," so as to include the species above mentioned.

The subdivision which I have proposed for the Geodina equally applying to the Stellettina, we have thus to add to it for the latter that which follows, viz.:—

Subsection 1.

Thin-skinned Stellettæ. (Psilodermata.)

a. Cortex thin or next to nothing, charged more or less with minute stellates only. (*Stellifera.*)

b. Cortex the same, but charged with bacilliform bodies chiefly. (*Bacillifera.*)

Subsection 2.

Thick-skinned Stellettæ. (Pycnodermata.)

a. Cortex thick, charged with discoid bodies. (*Discifera.*)

b. Cortex thick, charged with globostellates. (*Globostellata.*)

As regards "Subsection 1, *a*," and generally throughout the Stellettina, the stellates are thin and delicate, so that the fragment under microscopic examination, even in liquor potassæ, requires to be kept there some time before they will make their appearance, and thus are only satisfactorily seen when it is mounted in Canada balsam. This is particularly the case with those of the interior, where the rays are still

more slender and the stellate often without appreciable body or central nucleus (Pl. XIV. fig. 2, *f*, &c.).

In "Subsection 1, *b*," the cortex becomes more defined by the addition of the bacilliform spicule, which then is the dominant element. Its typical form is an obtuse-ended acerate more or less inflated in the centre and microspined throughout (Pl. XIV. fig. 3, *g*), but may vary from elliptical up to that condition in which it is cylindrical or absolutely straight (that is, without curvature or central inflation, and thus essentially a microspined bacillum), while, abnormally, it may pass from a uniaxial into a polyaxial form like that of a stellate, viz. when the primary cell takes to elongating itself in more directions than one (Pl. XIV. fig. 3, *iii*). In *Ecionemia acervus*, Bk., it is stated to be "fusiform-cylindrical," averaging 1-3000th inch in length by 1-10,000th in its greatest transverse diameter; and in *Ecionemia densa*, Bk., it is represented of an elliptical form, covered with minute tubercles instead of spines (Proc. Zool. Soc. 1873, pl. xxx. figs. 1–6 and 7–14 respectively). Both these species are in the Museum of the Royal College of Surgeons, and are stated to have come from the "Fiji Islands;" while Schmidt, who examined the former in 1866 (Spong. Adriat. Meeres, 2nd Suppl. p. 12), found it to be a species of the genus "*Stelletta*," which he established in 1862 (*ib.* p. 46), and therefore called it "*Stelletta*." Again, the bacilliform spicule is present in *Ecionemia ponderosa*, Bk., from Guernsey, which is identical with the species on the sea-shore rocks here (Burleigh Salterton, S. Devon), that I subsequently described, of course in ignorance of this identity, as *Stelletta aspera* ('Annals,' 1871, vol. vii. p. 8, pl. iv. fig. 12)—but in such a modified form, on account of the length of the spines, that it looks very much like a "spinispirula," and is actually described as "elongo-stellate" by Dr. Bowerbank, who, in his "Terminology" (Mon. B. S. vol. i. fig. 35), uses this name for the spinispirula of *Tethea muricata*. But although the shaft is evidently spiral in the latter, I have never, from its minuteness, been able to satisfy myself that it is so in the former, although I incline to this view. Be it as it may, however, it matters very little; for although this would bring it nearer to *Ecionemia compressa*, as we shall see by-and-by, the conventional line of separation must be drawn somewhere; and the more important part of the spiculation in *Ecionemia ponderosa* allies it most nearly to *Stelletta*, as Schmidt has stated. It is present in *Stelletta Hellerii*, Sdt., from the Adriatic, also in an undescribed species in the general collection of the British Museum (no. 302, registered 40. 1. 1. 1), said to have come from W. Africa; also

among a collection of sponges made by Dr. J. Anderson, F.R.S. &c., around King's Island, on the coast of Burmah; but largest of all in a specimen from the south coast of Australia, in the Bowerbank general collection at the British Museum, in which it is fusiform, straight, microspined, and 11 by 2½-6000ths of an inch in its greatest dimensions (fig. 3, *d* and *f*).

As a typical form of "Subsection 2, *a*," I might instance *Stelletta euastrum*, Sdt., of which the description, illustrated in detail, was published in 1880 ('Annals,' vol. vi. pp. 135–7, pl. vii. fig. 41, *a–l*, and 42, *a*, *c*). *S. discophora*, besides living in the Adriatic, was dredged by Saville Kent on the N.W. coast of Spain and Portugal (no. 21, reg. no. 72. 5. 4, Kent collection, British Museum); and type specimens of this and *S. mamillaris*, Sdt.), also from the Adriatic, may be found among Schmidt's slides of the Adriatic sponges in the British Museum, under nos. 15 and 16 respectively.

Lastly, in the division "*b*" of the same "Subsection" come the two species to be described hereafter under the names of *Stelletta reticulata* and *S. globostellata* respectively, in which the crust from its thickness, resembles that of *Geodia*, and its spicule that of the large globostellate in *Donatia lyncurium*.

The shallow-water British species of *Stelletta* are *Ecionemia ponderosa*, Bk., = *Stelletta aspera*, Crtr., *Stelletta lactea*, Crtr., and *S. Grubii*, Sdt., all of which I have found on the rocks of the seashore about this place (Budleigh-Salterton).

*New Species**.

Stelletta australiensis, Crtr. (Pl. XIV. fig. 2, *a–h*.)

This is a gigantic specimen, stated in my "Notes" to be 12 inches high, 7½ inches broad, and 3 inches thick at the base, from which it diminishes in size upwards so as to become linguiform. The surface is even, but much worn away in

* In the measurements of the spicules the average of the largest is taken; but it should always be remembered that spicules, in this matter like every thing else, grow from small to large, and therefore that, in the sponge, which is a congeries of individuals formed by successive additions of new structure, there may be many small as well as large spicules; also that the length is not always in proportion to the thickness, so that among the average largest spicules some may be longer and thinner while others are shorter and thicker; lastly, not only the size but the form also of the spicules in specimens of the *same* species may slightly differ. Hence a wide margin should be allowed for all this; while our chief object should be to find out and delineate that spiculation which is *normally* representative of the species.

parts, so that the vents were not seen. Skeletal spicules of three forms, viz.:—1, body-spicule, acerate, sharp-pointed, fusiform, smooth, curved, 157 by 4-1800ths inch in its greatest dimensions (fig. 2, *a*); 2, zone-spicule, almost equally long, shaft curved, 160 by 4-1800ths inch, pointed at one end, trifid at the other, arms simple, pointed, carried very much in front and rather curved inwards corolla-like, 14-1800ths inch long (fig. 2, *b*); 3, anchors and forks as usual, with long thin shafts (fig. 2, *c* and *d*). Flesh-spicules of two forms, viz. bacillar and stellate, both very small; the former 2-6000ths inch long (fig. 2, *e*), and the latter the same in diameter (fig. 2, *f*). Incrustation very thin (fig. 2, *g*, *h*).

Hab. Marine.

Loc. Freemantle, west coast of Australia.

Obs. This specimen is in the Bowerbank general collection at the British Museum, and was labelled "Freemantle, W. Australia. Clifton." The smoothness and thinness of the cutis is probably owing to the minuteness of the flesh-spicules with which the dermal sarcode is charged.

Stelletta bacillifera, var. *robusta*, Crtr.
(Pl. XIV. fig. 3, *a–f*.)

Conical compressed; head expanded, flat, elliptical, and corrugated from the specimen being dry, sides smooth and furrowed to a point. Vents few and *very* large, each contracted by a wide sarcodic diaphragm, situated in the flat part. Spicules of two kinds, viz. skeletal and flesh-spicules:—1, body-spicule, acerate, sharp-pointed, fusiform, smooth, curved, 93 by $1\frac{3}{4}$-1800ths inch in greatest dimensions (fig. 3, *a*); 2, zone-spicule, about the same length, shaft straight, about 110 by 2-1800ths inch, pointed at one end, trifid at the other, arms simple, horizontal, recurved, each 3-1800ths long (fig. 3, *b*); 3, anchors alone, no forks seen, anchor-head flattish and expanded, shaft short (fig. 3, *c*). Flesh-spicules of three forms, viz.:—1, bacillar, fusiform, microspined, 11 by $2\frac{1}{2}$-6000ths inch in its greatest dimensions (fig. 3, *d* and *g*); 2, minute, stellate, about 2-6000ths inch in diameter (fig. 3, *e* and *h*); 3, minute, acerate, curved, sometimes undulated, varying in size under 30-6000ths inch (fig. 3, *f*). Incrustation very thin. Size of entire specimen 4 inches high and 6 by 3 inches in diameter across the head or base of the cone-shaped mass.

Hab. Marine.

Loc. Ports Elliot and Adelaide, S. Australia.

Obs. Of this species there are two dozen specimens in the

Bowerbank general collection at the British Museum. The flesh-spicules of the surface in the now dry and corrugated part are mixed with grains of sand, which of course thickens the incrustation, which is very thin in the smooth part or sides, where there is little or no sand. This increased thickness, which in some instances amounts fully to 1-16th inch, must not be set down to an accumulation of the dermal flesh-spicules, but rather to the "habit" of the sponge, which, from its frequent occurrence, appears to be very common with *Stelletta* on the south coast of Australia. In the specimen above described there is a great variety in the form of the bacillar flesh-spicules, which, always very large comparatively, may sometimes be so scantily spined as to be almost smooth; at others the spines themselves may be unusually large, and in some cases the spicule is absolutely cylindrical from end to end, where consequently it is obtuse; while the primary cell, which is normally uniaxial, from its extension in opposite directions, becomes often more or less polyaxial, so as to cause the spicule to present a radiated or stellate form (fig. 3, *i*, *i*, *i*). Small acerates are not uncommonly mixed with the dermal spicules both in *Geodia* and *Stelletta*, where they seem to be connected with the opening and closing of the pore, being situated in an erect circular or flat radiated position around the latter, as the case may be ('Annals,' 1880, vol. vi. pl. vi. fig. 37). I have designated this form as "var. *robusta*," because I have already specifically named one from the coast of Burmah "*bacillifera*," but wherein the bacillar spicule is very small. (MS. Report of a large collection of Sponges from the north-western side of King's Island or Padaw, one of the Mergui archipelago, collected by Dr. J. Anderson, F.R.S., Superintendent, Indian Museum, Calcutta, whence they have been forwarded for my examination.)

Stelletta reticulata, Crtr. (Pl. XIV. fig. 4, *a–f*.)

Irregularly globular, lobate, enclosing two mussel-shells. Surface uniformly reticulated. Vents on the prominent parts of the lobes. Spicules of two kinds, viz. skeleton- and flesh-spicules:—1, body-spicule acerate, sharp-pointed, fusiform, smooth, curved, 65 by 1¾-1800ths inch in its greatest dimensions (fig. 4, *a*); 2, zone-spicule less in length, shaft straight, 40 by 2-1800ths, arms simple, horizontal, 5-1800ths inch long (fig. 4, *b*). Neither anchors nor forks seen. Flesh-spicules of two forms, viz.:—1, globostellate, with the rays, which are thick, conical and prominent, spined over the extremities, which may be truncated or round, 8-6000ths inch in

diameter (fig. 4, *c* and *e*); 2, minute stellate, about 2-6000ths inch in diameter (fig. 4, *d* and *f*). Incrustation, which is strikingly reticulated, comparatively thick, *i. e.* about 1-96th inch in vertical diameter (fig. 4, *g*, *h*). Size of entire specimen 3 inches high and 2 inches in horizontal diameter.

Hab. Marine.

Loc. ——?

Obs. As the large globostellate when fully developed appears to stop at the form and diameter above mentioned, but may be found of all sizes below this, so the former appears to be its *normal* condition, which is almost identical, as before noticed, with the abnormal one of the siliceous body or ball in *Geodia canaliculata*. The characteristic reticulation of the surface from which the designation is taken arises from the dermal sarcode originally presenting this fibro-reticulated structure in a soft state becoming densely charged with the flesh-spicules. Although the specimen bore no label, it was found among Dr. Bowerbank's specimens from the south coast of Australia; and therefore this may have been its "locality."

Stelletta globostellata, Crtr. (Pl. XIV. fig. 5, *a–h.*)

Compressed and corrugated on the surface, probably from desiccation; smooth above, rough below, where it was torn off from the object on which it grew. Surface hard, even, dimpled by a vermiculated reticulation in low relief, the interstice of which presents a pore-opening. Vents congregated in one part of the surface. Spicules of two kinds, viz. skeletal and flesh-spicules:—1, body-spicule, acerate, sharp-pointed, fusiform, smooth, curved, 63 by $1\frac{1}{4}$-1800ths inch in its greatest dimensions (fig. 5, *a*), 2, zone-spicule not so long, shaft straight, 45 by $1\frac{1}{4}$-1800ths inch, pointed at one end, trifid at the other, arms thin, long, and horizontal, 13-1800ths in length (fig. 5, *b*). Neither anchors nor forks seen. Flesh-spicules of two forms, viz.:—1, a beautifully clear crystalline globostellate, whose rays are conical, long, smooth, and sharp-pointed, being about one third of the diameter of the whole body, which is 12-6000ths inch (fig. 5, *c* and *e*); 2, small stellate, about 3-6000ths inch in diameter (fig. 5 *d* and *f*). Incrustation white, hard, and comparatively thick, viz. 1-96th inch in vertical diameter (fig. 5, *g*, *h*), contrasting strongly in its white colour with the internal substance, which now, in its dried state, is dirty yellow. Size of entire specimen about 3 inches in horizontal diameter by $1\frac{1}{2}$ thick.

Hab. Marine. On coral-reef.

Loc. Galle, Ceylon.

Obs. This specimen, which is stated to have been taken in the living state from the coral-reef, where it grew, by Dr. Ondaatji, of Ceylon, is now, I understand from Mr. B. W. Priest, who sent it to me, in the British Museum. It is a remarkable species, on account of the form and size of the globostellate of which the crust is chiefly composed, thus presenting at the same time a flesh-spicule like the large globostellate of *Donatia lyncurium* and an incrustation like that of *Geodia*. As in the last species, viz. *S. reticulata*, the fully developed form may be traced up from great minuteness.

3. Theneanina (new group).

When the late Dr. J. E. Gray was arranging the Spongida for the purpose of classification (Proc. Zool. Soc., May 1867, p. 492), he found it necessary, among other things, to extricate from confusion Dr. Bowerbank's "*Tethea muricata*," and, substituting the term "*Thenea*," while he confined that of "*Tethya*=*Tethea*" to those sponges whose type is *Tethya cranium*, Lam., placed both in his fifth family, viz. the "Tethyadæ." If we do not take this view of the case, the genus is worth nothing; for, misled by Dr. Bowerbank's statement respecting *Tethea muricata* (Mon. B. S. vol. i. p. 25), Dr. Gray gives as the first diagnosis, that the "simple spicules," *i. e.* the body-spicules or acerates, are "not protruded beyond the surface," which is erroneous, inasmuch as their protrusion is common to all the Pachytragida, bearing the same relation as a cat's claw to its sheath, in so far as they can be covered or uncovered as occasion may require. How this should have occurred when Prof. Sollas states that Dr. Gray had a "real knowledge" of this sponge I cannot understand (Sollas, "Report on the Sponge-fauna of Norway," 'Annals,' 1882, vol. ix. p. 429). Subsequently H.M.S. 'Lightning' returned to Oban, on the 21st Sept. 1868, bringing dredgings from the Atlantic Ocean between the north of Scotland and the Faroe Islands, made under the auspices of Dr. Carpenter and Sir (then Dr.) Wyville Thomson; and on the 15th of April of the following year, 1869, Dr. Perceval Wright exhibited at the Dublin Microscopical Society the spiculation of a little sponge which Dr. Wallich had dredged up from the North-Atlantic sea-bed on board H.M.S. 'Bulldog' in 1860, stating that "he (Dr. Wright) would not further for the present allude to it" (Quart. Journ. Microscop. Science, Oct. 1869, p. 422). Sir

Wyville Thomson was also present, and observed "that he had taken this species, or at least one very closely allied to it, on the same ground on which he had taken *Holtenia Carpenteri*" (*ib.* Jan. 1870, p. 81). On the 17th June following, Sir Wyville Thomson communicated his paper on *Holtenia Carpenteri* to the Royal Society, in which, with reference to his proposed classification of the Spongida, he observes:—"The typical vitreous sponges appear to approach the Radiantia through such forms as *Tisiphonia* and *Stelletta*" (Phil. Trans. for 1869, vol. clix. p. 714); therefore at that period he was acquainted with the characters of "*Tisiphonia*." In January 1870 appeared Dr. Wright's representation and description of the sponge which he had brought before the Dublin Microscopical Society on the 15th April, 1869, now named by him "*Wyvillethomsonia Wallichii*" (Quart. Journ. Microscop. Sci. *l. c.*); and on the 3rd of the same month the late Dr. J. E. Gray wrote to me, enclosing a woodcut of a sponge called "*Tisiphonia agariciformis*" (which Sir Wyville Thomson, then at Dublin, appears to have used at a lecture, whether published or not I know not), adding that "Bowerbank's figures of the spicules in *Tethea muricata* are probably those of *Tisiphonia*, *Wyvillethomsonia*, and *Dorvillia* respectively." This note I still have, although the woodcut was returned after I had made a careful tracing of it in my "Journal," where it now is. Subsequently Saville Kent's representation and description of this sponge under the name of *Dorvillia agariciformis* was published in the number of the 'Monthly Microscopical Journal' for December 1, 1870; and Sir Wyville Thomson's "woodcut," which is the best representation that I have seen of this sponge, was used for illustrating his description of it in 'The Depths of the Sea,' published in 1873.

As Dr. Gray had handed over to me two sets of quarto plates of *Hyalonema lusitanica* and *Tisiphonia agariciformis* respectively, which he had received from Sir Wyville Thomson—evidently drawn for the purpose of accompanying them with letterpress after the manner of his *Holtenia Carpenteri*, had he not been ordered away in H.M.S. 'Challenger'—when he transferred to me all the rest of H.M.S. 'Lightning' and 'Porcupine' sponge-dredgings for my examination and publication, I thought it only right that these two sponges should be left for him to publish himself on some future occasion, as was stated in my account of the 'Porcupine' sponges ('Annals,' 1876, vol. xviii. p. 471, footnote); and this is why I have not until the present time given any attention to *Tisiphonia agariciformis* and its allies beyond their mere mention.

I will now, however, go as fully into the subject as my means will allow, summing up at the end the result of my investigations.

These means consist of an examination of the type specimens of Bowerbank's *Tethea muricata*, *Ecionemia compressa*, *Hymeniacidon placentula*, and *Normania crassa*, an investigation of many of the specimens of *Tisiphonia agariciformis*, together with two of *Normania crassa* that were handed over to me by Sir Wyville Thomson and of one of the latter which I found on a specimen of *Azorica Pfeifferæ* in the British Museum; and a careful perusal of Prof. Sollas's paper on "*Thenea Wallichii*," dredged by the Rev. A. M. Norman in the "Kors Fiord" of Norway in 1878 ('Annals,' 1882, vol. ix. p. 427).

Taking *Tethea muricata* first, of which a type specimen is now before me labelled by Dr. Bowerbank himself, and almost identical in general form with that described by him (Proc. Zool. Soc., Feb. 1872, p. 115), and now in the British Museum, its spiculation consists of the body-spicule, the zone-spicule, and the three-armed, recurved, or anchoring-spicule held together with sarcode which is charged with flesh-spicules, all arranged as in *Stelletta*, that is:—that the body-spicule is chiefly confined to the centre, but together with the zone-spicule also forms bundles arranged more or less perpendicularly to the centre in a zonular manner around the circumference; the anchors or anchoring-spicules, together with the free ends of some of the body-spicules, extend beyond the circumference; and the flesh-spicules are chiefly congregated in the dermal sarcode. When, however, this spiculation is particularized, it is further found to possess features so different from that of *Stelletta* and all other sponges that it is typically distinct. Thus there are two forms of zone-spicules, viz. a trifurcated and a simply trifid one?, often only bifid ("attenuato-expando-ternate bifurcating" and "simple-expando-ternate" connecting-spicules of Bowerbank), of which the arms of the former are so unusually extended that when spread out in the dermal sarcode the latter look like the outer or larger structure of a spider's web. The anchors, again, whose heads or free ends are barbed (and when protruded, I may as well state once for all here, are very seldom preserved in any of the sponges where they occur), appear to be confined to the root-like appendages similar to the cord of *Hyalonema Sieboldii* ("radical processes" of Bowerbank, *l. c.*), the proximal ends of which are imbedded in the centre of the sponge around the lower part of the cylindrical cloaca, which, after having received all the branches of the excretory canal-system, opens at the summit by a single wide osculum also like that of

Hyalonema Sieboldii. The free ends of these spicules appear to me to be *always* terminated by *three* recurved arms, although they often look like two, which illusion can be corrected by alteration of the focus. Moreover I have never been able to detect any "forks" or trifid *extended* arms among them, which seems to indicate that there are none, as in the cord of *Hyalonema*, since, when the two forms are together, which is commonly the case in *Geodia*, *Stelletta*, and *Tethya*, the recurved arms are so much more liable to be torn off by catching in opposing objects than the extended ones, that some of the latter are almost sure to be retained when the former have all disappeared. As the cords or root-like appendages which vary in number (? under four) have been broken off close to the body in my specimen, I presume that this was the case in Dr. Bowerbank's, as they do not appear in his illustration; nevertheless he states that they are "about ¾ inch in length" (*l. c.*). The flesh-spicules, on the other hand, are spinispirular in form (Spiralsternchen, Sdt.), with long microspined rays, varying much in size, so that the largest appear to be of a different kind; but by careful examination the smallest can be traced by gradation into the largest, as Prof. Sollas has described (pp. 443, 444, *l. c.*), when their microspination of course becomes more evident. Here I would observe that, among the spicules which Dr. Bowerbank in his description (*l. c.* p. 118) has considered "extraneous" in Saville Kent's illustrations of *Dorvillia agariciformis* (*op. et l. c.*) are "figs. 16, 17, 18," which are so much like the larger forms of flesh-spicule in *Thenea muricata*, to say nothing of *Dorvillia*, in which they occur abundantly, that when Dr. Bowerbank adds that he observed "several in a piece of epidermis" of *Tethea muricata* that he had mounted "in 1855," among which was the quadriradiate form represented by Mr. Kent in his fig. 18, it does not seem unreasonable to infer that they were not "extraneous." Indeed there are four or more such in the microscopic fragment of the type specimen that I have in my cabinet of slides.

The next form that claims our attention is *Wyvillethomsonia Wallichii* = *Tisiphonia agariciformis* = *Dorvillia agariciformis*, because its spiculation is so like that of *Tethea muricata*; and of this species I may safely say that scores have passed through my hands, out of which the most perfect type, although small, that I could select, is now before me; hence I can speak more authoritatively about it than any other. *Wyvillethomsonia Wallichii* chiefly differs from *Tethea muricata* in possessing the agaric form, which is well represented in both Saville Kent's and Sir Wyville Thomson's

illustrations, but does not appear in Dr. Wright's figure, because this approaches more to the embryonic form, which is spherical, as evidenced by a specimen, not more than the 225th of an inch in diameter, which I accidentally found (and have mounted) on a fragment of a linear sponge-spicule dredged up from the Atlantic Ocean, where this species seems as it were to swarm. Besides this the larger forms of flesh-spicules which Prof. Sollas has termed "quadriradiate stellates" and described in his paper (*l. c.* pp. 433, 434) are incomparably more abundant than in *Tethea muricata*; at the same time, from what he has stated and what I myself have observed, this often appears to be the effect of age; hence Prof. Sollas observes (p. 433) that "it is worth noticing that the quadriradiate stellates are the last spicules to appear in the development of *Thenea Wallichii* [*Wyvillethomsonia Wallichii*]; so that very young examples of this species are not distinguishable from *T. muricata.*"

In the most perfect form of *Wyvillethomsonia Wallichii* that I could find, which, as just stated, is that now before me, the summit is covered with fine anchor-spicules amongst the projecting points of the body-spicules, while the radical cords extended from the other end are of course composed of much stouter ones, so that, as in all the Pachytragida, they may be considered part of the normal spiculation, although, from what has been stated, they may not be always present; that is to say an absence of the *anchor-heads* is of no specific value. As regards the dimensions of this little specimen, it is 1¼ inch long, including the radical cords (four in number), of which the body forms one half. The pileus or hat is 1-12th of an inch in vertical diameter, and the cribriform lace-like dermal structure between it and the rest of the body about the same; while the widest part of the body is the pileus, being now, in the compressed state of the specimen, 5-12ths inch, on either side of which, *i. e.* above and below, it diminishes to the ends respectively, the upper part terminating in the broad osculum at the summit, and the lower part extended somewhat over the radical appendages. Interiorly the upper part of the central line is occupied by a long cup-like cloaca, which opens at the summit through a wide osculum, and the lower part chiefly by the ends of the spicules which go to form the radical cords; while the rest of the body is traversed by a cavernous excretory canal-system like that of *Hyalonema*, which opens into the cloaca. Thus the adult form and the abundance of large flesh-spicules chiefly causes *Wyvillethomsonia Wallichii* to differ from *Tethea muricata.*

Of *Tisiphonia fenestrata*, Sdt., from Bequia, near St. Vincent in the West Indies (Spong. des Meerbusen v. Mexico, 1880, 2. Heft, S. 71, Taf. x. fig. 2), I can state nothing, further than what may be learnt from the description and illustrations, viz. that in form it is nearly allied to *Wyvillethomsonia Wallichii*, and that its spiculation presents no essential difference.

We come now, however, to a very different form in this group, viz. one that is sessile, and not pedunculate like the foregoing; I allude to "*Normania crassa*," of which I now only possess the slides of those dredged on board H.M.S. 'Porcupine,' a specimen of that on *Azorica Pfeifferæ*, and my "Notes" of these and the other two so-called species, viz. *Ecionemia compressa* and *Hymeniacidon placentula*, Bk., to which I have above alluded.

In all these the spiculation is so much alike when the type specimens themselves are examined (but not Dr. Bowerbank's illustrations, Mon. B. S. vol. iii., in two of which, viz. *Normania crassa* and *Hymeniacidon placentula*, the spined and centrally inflated spicules, and in the latter the smaller size of the flesh-spicule also, *are omitted*, although alluded to in the descriptions respectively) that they appear to me to be one and the same species. The body-spicule is, of course, present as a large long acerate; but the zone-spicule is hardly more than rudimentary—that is, reduced to a simple trifid ("attenuato-patento-ternate connecting spiculum," Bk.), in which, as in *Tethya merguiensis* (a new species of Tethyina to be described hereafter), the shaft is hardly to be distinguished in point of form and length from the arms, while the "unusually long bifurcated trifid" is altogether absent. There are of course no anchoring-spicules; but the flesh-spicules, both large and small, are the same; added to which there is a more or less centrally inflated spined acerate, which, in conjunction with the rest of their differences, distinctly distinguishes this species from the type of *Tethea muricata* and from *Wyvillethomsonia Wallichii*. Prof. Sollas therefore is quite right when he states that they are "generically different, although nearly allied" to *Normania crassa* (p. 433, *l. c.*).

I certainly did use the expression "similar variety of *Tethea muricata*," with reference to *Hymeniacidon placentula* and *Normania crassa*, in my attempt to show that Bowerbank's work could claim the earliest mention of these sponges ('Annals,' 1878, vol. ii. p. 176), of which Schmidt says, "Ich schliesse mich dieser Ansicht durchaus an." But it was only done cursorily; for at that time I was engaged in going through the whole of Dr. Bowerbank's type specimens of his British

sponges in the British Museum for the purpose of writing a "Commentary" on them, and had only time to note the relationship; while until now I have not had occasion to return to the subject seriously, and thus now find it necessary to state the result of my investigations more precisely. But when Prof. Sollas observes that I attempted to "impose" the name "*Tisiphonia*" upon *Normania crassa*, because I called the Manaar specimen "*Tisiphonia nana*," it should be remembered that Sir Wyville Thomson, as before stated, had used the term "*Tisiphonia*" six months before "*Wyville-thomsonia Wallichii*" appeared, and that he was then cognizant of the nature of "*Tisiphonia*," or he would not have coupled it with "*Stelletta*;" further, that I was not then prepared to accept Dr. Gray's change of "*Tethea*" to "*Thenea muricata*," and hence had no option but to call the Manaar specimen "*Tisiphonia*."

Lastly, with reference to the Rev. A. M. Norman's statement (Bowerbank's Mon. Brit. Spong. vol. iv. 1882, p. 31, posthumously edited by Mr. Norman), viz. that I speak "very confidently respecting the type specimen of *Normania crassa*, a sponge which is in my cabinet, and which he has never seen," I must reply that I have probably seen more specimens of it than Mr. Norman himself, if, in addition to what I have stated, the specimen in Dr. Bowerbank's collection of British sponges now in the British Museum (that I had long since sketched and examined microscopically with great care), together with the representation and description of Mr. Norman's "cabinet" specimen in Dr. Bowerbank's third volume (plate lxxxi. &c.), be taken into account. Moreover, if the spiculation had been "wholly different" from that of *Tethea muricata*, as Mr. Norman has stated, contrary to the observations of Prof. Sollas and myself, I should in all probability have not "cursorily" stated that *Normania crassa* was only a sessile form of *Tethea muricata*, nor would Schmidt have indorsed my opinion as before stated.

Thus the results of my investigations are as follows, viz. that the term "*Thenea*" for "*Tethea muricata*," as proposed by Dr. Gray, should be accepted and a group headed "Theneanina" formed under the simple diagnosis of "spinispirular flesh-spicules," which should be inserted between Stellettina and Tethyina, in which there should be two genera having the characters of *Tethea muricata* and *Normania crassa* respectively, as above described, but with their names altered also respectively to "*Thenea*," Gray, and "*Ecionemia*," Bk. My reasons for using the term "*Ecionemia*" for the second genus are the following, viz.:—the almost complete identity that exists be-

tween the spiculation of *Ecionemia compressa* and *Normania crassa* (see Dr. Bowerbank's illustrations, vol. iii. pls. ix. and lxxxi. respectively) ; and the description of the former having been published in 1866 (Mon. B. S. vol. ii. p. 55), while that of *Normania crassa* was not published until 1874 (*ib. ib.* vol. iii. pl. lxxxi. &c.).

It may now be asked, If *Normania crassa*, Bk., and *Hymeniacidon placentula*, Bk., of 1874, are but repetitions of *Ecionemia compressa*, Bk., of 1866, and are to be placed in the group "Theneanina," what is to become of *Ecionemia ponderosa*, Bk., of 1866? The genus, founded by Dr. Bowerbank on a foreign sponge in the museum of the Royal College of Surgeons, had, according to his statement, then *no* "British species" (Mon. B. S. vol. i. p. 174), but Schmidt, who examined it in 1866 (Spong. Adriat. Meeres, 2nd Suppl. S. 12), identified it with his genus "*Stelletta*," whose diagnosis he had published in 1862 (*ib.* p. 46). Bowerbank must have subsequently received the two species which are described in the first vol. of his Monograph (pp. 55 and 56), viz. *Ecionemia compressa* from Shetland and *E. ponderosa* from Guernsey, the former of which I have identified with *Normania crassa*, also from Shetland, and the latter with my *Stelletta aspera* from the shore-rocks of this place, which is on the coast of the English Channel, nearly opposite Guernsey. Hence, then, in matter of priority we must give Schmidt's name to Bowerbank's *Ecionemia ponderosa* and call it "*Stelletta ponderosa*." Dr. Bowerbank subsequently published an illustrated description of the sponge in the museum of the Royal College of Surgeons under his originally MS. name of *Ecionemia acervus* (Proc. Zool. Soc. 1873, p. 322). So much for dates and nomenclature!

We now come to the *structure* of Bowerbank's *Ecionemia ponderosa*, whereon it may be asked how he came to ally it on the one hand to his *Ecionemia compressa* and on the other to *Ecionemia acervus*.

Probably on account of the flesh-spicule being like the spinispirula of the former, and the rest of the spiculation like that of *S. acervus*; for it is a fact that the *small* flesh-spicule of *Ecionemia ponderosa* is very much like that of *Ecionemia compressa*; wherefore, in my description of *Ecionemia ponderosa* ('Annals,' 1871, vol. viii. p. 8), I have pointed out the difference between it and the spinispirula of *Tethea muricata*; but from its being so small and delicate, having been coarsely represented by myself (*l. c.*), and worse by Dr. Bowerbank (Mon. vol. iii. pl. viii. fig. 14), I cannot satisfy myself *now*, even with a high power, whether the shaft of the flesh-spicule

is straight, like the bacillar flesh-spicule of *Stelletta*, or spiral, like that of *Tethea muricata*, so have placed it in the group Stellettina as the first approach to the bacillar body afterwards so strongly developed in "Subsection 1, *b*," ex. gr. *Stelletta bacillifera*, var. *robusta*. But although it is viewed as a species of *Stelletta*, it cannot be ignored that it is a bordering species which brings the Stellettina close to the Theneanina.

Finally the classification would stand thus:—

THENEANINA, Crtr. (new group).

Char. Microspined spinispirular flesh-spicules *.

Gen. 1. THENEA, Gray.

Char. Pedicellate or rooted. See *anteà*, under *Tethea muricata* and *Wyvillethomsonia Wallichii*, for spiculation.

No. 1. *Thenea muricata*, Bk.

Globoconical in form, with a few large flesh-spicules.

No. 2. *Thenea Wallichii*, Wright.

Agariciform, with a great abundance of large flesh-spicules.

No. 3. *Thenea fenestrata*, Sdt. (*op. et loc. cit.*).

Gen. 2. ECIONEMIA, Bk.

Char. Sessile. See *anteà*, under "*Normania crassa*."

No. 1. *Ecionemia compressa*, Bk.

Without trifurcates or anchoring-spicules, but with the addition of a centrally inflated spiniferous acerate.

No. 2. *Ecionemia nana*, Crtr.

With tricurvates and aborted shaft. For spiculation see 'Annals,' 1880 (vol. vi. p. 138, pl. vii. fig. 43, &c.). The other two species that I have there mentioned are "provisional."

* In *Geodia* the flesh-spicule is essentially the siliceous ball, as above defined, in *Stelletta* a stellate, in Theneanina a spinispirula, and in Tethyina a bihamate.

4. Tethyina.

Lastly, the group Tethyina, whose type is *Tethya cranium*, Lam. (Johnston, Hist. Brit. Spong. 1842, p. 83, pl. i. fig. 1), is closely allied to all the foregoing both in general structure and in spiculation, although generally the species do not present the "zone-spicule," as will appear hereafter, while the flesh-spicule in all instances yet known, with the exception of one in which it has not been seen, is a minute bihamate (*fibula*).

The term "*Tethya*," originally derived from Τηθύς, mythol., hence τῆθος, an oyster, τήθυα, Arist., and *Tethea*, Pliny, was used by Donati, and thus finally became *Tethea* and *Tethya*, Lamarck (Ann. s. Vertebr. 1816, vol. ii. pp. 384, 385), who adopted the generic name of "*Tethya*," originally used in 1750 by Donati for *Tethya sphærica* (= *Tethya lyncurium*, Lam.), for a sponge which O. F. Müller had described under the name of *Alcyonium cranium*, but (*ap.* Johnston) had not figured (Zool. Danicæ Prod. 255, Zool. Dan. tab. lxxv., 1777–1806).

After this Nardo, perhaps seeing that Lamarck had placed two totally different sponges in the same genus, viz. *Tethya* (*op. et loc. cit.*), substituted the generic term "*Donatia*" for Donati's "*Tethya*;" and thus *Tethya cranium*, Lam., remained the same ('Isis,' 1833). Schmidt, however, reversed the thing, and, returning to Donati's original generic name, viz. "*Tethya*," invented that of "*Tetilla*" for Lamarck's "*Tethya*" *cranium* in 1870 (Spongf. Atlant. Geb. p. 66), but very rightly separated the two by placing "*Tethya*" in his Suberitidinæ and "*Tetilla*" in his Anchorinidæ. Still, why Schmidt should have interfered with the distinction which Nardo had made and Dr. Gray in his proposed classification had accepted, that is, by using the name "*Tetilla*" for "*Tethya*" *cranium* as a generic name, which he *first* instituted for a sponge sent to him by Fritz Müller from Desterro, in South America, in 1868 (Spong. Küste v. Algier, p. 40), I am ignorant, seeing that the term "*Tethya*," which Schmidt had reserved for "*Tethya lyncurium*," is here said to be in direct relation with the sponge from Desterro which he called "*Tetilla euplocamus*" ("an eine directe Verwandschaft"). Had he stopped here and only called the sponge from Desterro "*Tetilla*" (although, as will be seen hereafter, it is merely a rooted form of *Tethya cranium* that is widely spread under similar conditions in or probably throughout the tropics), one could have only said that "the distinction generically was not called for;" but when this generic name is carried on in 1870 (*l. c.*) to Lamarck's *Tethya cranium* so typically established in name and illustration by Johnston in 1842 (Hist. Brit. Spong.

p. 83, pl. i. figs. 1–8), and thus so generally accepted, as before stated, one cannot help considering it, to say the least, unnecessary; hence I shall continue to use Lamarck's appellation, viz. *Tethya cranium*, for the typical illustration of my Tethyina.

The skeletal spiculation of this group, the characters of which are detailed at length in my classification (*op. et loc. cit.* p. 184), only differs from that of the foregoing in the absence of the body-spicule, which, however, appears in a rudimentary state in a species that will be described hereafter under the name of *Tethya merguiensis*. I have already, however, alluded to the presence of this spicule in Tethyina (*l. c.*), but have never until now had an opportunity of examining and describing an entire specimen in which it is a general character. My first observation of it was in *Tethya arabica*, where it was partial; and is thus recorded in the description of that sponge:—"In one small portion of the surface which I examined there happened to be several stoutish triradiate spicules with their rays expanded in the circular part, like those of *Geodia*, showing by this occasional occurrence how such characters may be present in species otherwise distinctly different" ('Annals,' 1869, vol. iv. p. 4). I have always regretted that I did not, for preservation and future reference, mount this sponge in Canada balsam; and therefore, on the next occasion that I met with it, which was in a little mutilated specimen about 7-12ths inch in diameter, fixed to a little piece of cardboard in the British Museum (no. 452, reg. no. 40. 10. 23. 8), I did mount a microscopic fragment that is now before me, in which, however, the form of the zone-spicule and the length of its shaft (Pl. XV. fig. 9) shows that it was a different species from *Tethya merguiensis* (fig. 7, *b b*), although the presence of *Carpenteria utricularis* and *Polytrema* with it also pointed to a tropical origin.

With reference to the flesh-spicule, it has been stated above that, in all instances yet known with the exception of one species, viz. *Tethya antarctica*, Crtr. ('Annals,' 1872, vol. ix. p. 414), this is a minute bihamate; yet in some cases the form of this bihamate is so different that the differences alone here are sufficient to constitute a specific distinction, ex. gr. *Tethya atropurpurea*, wherein it is not only unusually large, but furnished scantily with large spines, especially at the ends ('Annals,' 1870, vol. vi. p. 176, pl. xiii. fig. 10). The simple bihamate, too, is very frequently microspined all over, although this is not always so evident as in *Tethya cranium*, var. *abyssorum* ('Annals,' 1876, vol. xviii. p. 405, pl. xvi. fig. 49); while in *Craniella tethyoides*, Sdt. (does not the ana-

grammatized *Tethya cranium* here point to the embarrassment caused by the introduction of "*Tetilla*" for *Tethya*?), it is represented as wrinkled by transverse elevations, "Querhöckern und Runzeln" (Spong. Atlantisch. Geb. p. 66, Taf. vi. fig. 9). Here I would observe that a sharp turn in the direction of a spicule often presents itself under the illusory form of a globular inflation; hence one termination of the bihamate has been represented in this way in Dr. Bowerbank's illustration of *Tethya cranium* (Mon. B. S. vol. iii. pl. xiv. fig. 5).

Besides the sessile species of Tethyina, *ex. gr.* the type species *Tethya cranium*, there are pedicellate or rooted ones. *Tetilla euplocamus*, Sdt., to which I have already alluded, is one of these, in which the anchoring-spicules are twisted into a cord for about half an inch, like those of *Tethya dactyloidea*, Crtr. ('Annals,' 1869, vol. iii. p. 17, fig. 1, *b*), before they become separated into a lash for fixing-purposes in the sand or mud of a soft sea-bottom, as with the cord of *Hyalonema*. In *Tetilla polyura*, Sdt., which came from Iceland, they are not twisted into a single cord, but proceed at once to their destination in little tufts which issue from papillary eminences, into which the lower part of the body is divided, recalling to mind the radical cords of *Thenea Wallichii* &c. Long before either of these were described I had found *Tethya dactyloidea* on the south-east coast of Arabia (viz. in Dec. 1844), but did not publish my description and illustration of it until 1869; and then I had mislaid part of it, which was not found until 1872; hence the first part appears in the former year ('Annals,' vol. iii. p. 15) and the other in the latter ('Annals,' vol. ix. p. 82). I afterwards found it in the Maham estuary at Bombay, which is also sandy; and just now have received several specimens from the sea about King's Island, off the coast of Burmah, which has a mud-bottom. Thus the radiciferous form of *Tethya* appears to be very general. Besides *Tethya dactyloidea* and *T. merguiensis* there is a robust form of *Tethya cranium*, which grows on the rocks about King's Island, and in my MS. report of the sponges there, to which I have already alluded, has been designated "var. *robusta*," in which the excretory canal-system in its cavernous character resembles that of *Thenea Wallichii* and *Hyalonema Sieboldii*, but, instead of opening into a central cloaca, ends in a series of very large vents situated round the lower third of the sessile globular sponge. However, in the radiciferous form there *is* a short cloaca with single wide osculum at the summit as in *Thenea Wallichii*.

From the above observations, then, it follows that a subdivision of the Tethyina might stand thus:—

Section 1.

Without zone-spicule or ungirled. (Azosta.)

a. Sessile forms. (*Sessilia.*)
b. Rooted forms. (*Radicifera.*)

Section 2.

With zone-spicule. (Zosterophora.)

a. Sessile forms. (*Sessilia.*)
b. Rooted forms. (*Radicifera.*)

The Geodina, Stellettina, and Tethyina are often globular in general form; but this appears to arise from their base of attachment having been destroyed, probably at a very early period of their development, when they adapt themselves to their environment, and thus, having no fixed point, become round.

New Species.

Tethya merguiensis, Crtr.
(Pl. XV. fig. 6, *a–f*, fig. 7, *a–k*, and fig. 8, *a–h*.)

Circular, convex, sessile, depressed, rather constricted at the base (fig. 6, *a–f*). Consistence loose, soft. Colour black-brown. Surface uniformly hispid from the protrusion of spicules, interrupted only by several large vents of different sizes, chiefly situated towards the circumference (fig. 6, *b*). Pores in the interstices of a fibro-dermal reticulation whose sarcode, charged with dark brown pigmental cells and flesh-spicules, is thus rendered strikingly cribriform (fig. 8, *a–h*). Internal structure radiating in large bundles from the centre, which is midway between the base and the summit (fig. 6, *c*, *d*), separating as they advance towards the surface and leaving wide intervals between them, which form a cavernous kind of excretory canal-system that opens at the vents mentioned. Spiculation comprising six forms, viz.:—1, body-spicule (which is by far the largest), acerate, attenuatingly sharp-pointed, fusiform, smooth, nearly straight, about 1-6th by 1-600th inch in its greatest dimensions (fig. 6, *a* and *e*); 2, zone-spicule, smooth, trifid, arms radiating laterally and a little forwards at equal angles from each other and from the shaft, which is so like them in size and shape that, when *in situ*, it is not only almost impossible to say which is which, but whether the spicule is or is not a gigantic 4-rayed stellate of this kind;

arms about 1-56th inch long, occasionally and abnormally bifid at the extremity (fig. 7, *b b*); 3 and 4, anchors and forks setaceous from the great length of their whip-like delicate shafts, heads as usual (fig. 7, *c*, *d*); 5 and 6, flesh-spicules, viz. the usual bihamate, $2\frac{1}{2}$-6000ths inch long (fig. 7, *f* and *h*), and a thin acerate about 1-100th inch long (fig. 7, *g*). Nos. 1, 3, and 4 project in great abundance beyond the surface, where, from their extreme length, they not only give the hispid character, but, from their inclined position, very nearly conceal the vents. No. 2, in its usual position, with the shaft or one ray inwards, is confined to the circumference, where, in plurality, it forms a zonular line. Nos. 5 and 6 are chiefly confined to the dermal sarcode. Pigmental cells, which are abundantly scattered through the sarcode generally, about $1\frac{1}{2}$-6000ths inch in diameter, charged with dark brown spherical granules, which, in combination, give the black-brown colour to the sponge generally (fig. 6, *i* and *k*). Size of specimen about 10-12ths inch in its greatest horizontal diameter, which is between the base and the summit, 6-12ths inch high.

Hab. Marine, growing on hard objects.

Loc. King's Island, Mergui archipelago, coast of Burmah.

Obs. The black colour, together with the presence of a circumferential line of zone-spicules, distinguishes this species from *Tethya cranium*. As far back as 1869 I noticed the presence *partially* of zone-spicules in *Tethea arabica*, and afterwards in an undescribed species generally, as before noticed; but they differed from those above described in the possession of a long shaft and shorter arms, thus more resembling the zone-spicule of *Geodia* &c. (Pl. XV. fig. 9). The reticulated fibro-dermal structure covered by a layer of sarcode, rendered dark and cribriform by the pores, the pigmental cells, and the flesh-spicules, recalls to mind a similar structure in *Thenea Wallichii*, just below the margin of the pileus, being equally striking and beautiful (fig. 8, *c c c*).

I have only met with one specimen of *Tethya merguiensis*; and that is among the collection of sponges made by Dr. Anderson, to which I have alluded. It is accompanied by two sessile specimens, so nearly allied to *Tethya cranium* that I have designated them as "var. *robusta*" in my MS. report, which it is the intention of Dr. Anderson to publish with those of the other Invertebrata collected by him at the same time. Besides these there are the several specimens of *Tethya dactyloidea*, to which I have above alluded; so that the Tethyina are richly represented in this locality.

EXPLANATION OF THE PLATES.

N.B.—All the figures, except the "more magnified" flesh-spicules, are drawn to the scale of 1-24th to 1-1800th inch, in order that their relative sizes may at once be recognized. The "more magnified" views are chiefly on the scale of 1-24th to 1-6000th inch.

In Plate XV. the spiculation of *Tethya merguiensis* is drawn to the scale of 1-48th to 1-1800th inch, as the limits of the Plate would not permit of their being delineated upon that of the preceding Plate, viz. 1-24th to 1-1800th inch.

Plate XIV.

Fig. 1. *Geodia canaliculata*, Sdt., spiculation of. Skeleton-spicules: *a*, body-spicule; *b*, zone-spicule; *c*, anchor, with part of shaft. (Where anchors and forks are not given together, it must not be inferred that the missing one or both were not present, but rather that they were *not seen*.) Flesh-spicules: *d*, siliceous body or ball; *e*, abnormal form of the same; *f*, stellate; *g*, dermal acerate. Scale 1-24th to 1-1800th inch. More magnified views: *h*, siliceous body or ball; *i*, surface-pattern of the same, still more magnified, upper view; *k*, the same, lateral view; *l*, abnormal forms of siliceous ball; *m*, stellate. *h*. *l*, and *m* are to the scale of 1-24th to 1-6000th inch, and *i* and *k* to a still larger scale.

Fig. 2. *Stelletta australiensis*, n. sp., spiculation of. Skeleton-spicules: *a*, body-spicule; *b*, zone-spicule; *c*, anchor; *d*, fork. Flesh-spicules: *e*, bacillar body; *f*, stellate. *g*, fragment magnified 2 diameters, to show thinness of *h*, the crust or cutis.

Fig. 3. *Stelletta bacillifera*, var. *robusta*, n. var., spiculation of. Skeletal spicules: *a*, body-spicule; *b*, zone-spicule; *c*, anchor. Flesh-spicules: *d*, bacilliform body; *e*, stellate; *f*, dermal acerate. More magnified views: *g*, bacilliform body; *h*, stellate; *i i i*, abnormal forms of *g*.

Fig. 4. *Stelletta reticulata*, n. sp., spiculation of. Skeletal spicules: *a*, body-spicule; *b*, zone-spicule (no anchors or forks seen). Flesh-spicules: *c*, globostellate, with rays truncated and spined; *d*, stellate. More magnified views: *e*, globostellate; *f*, stellate.

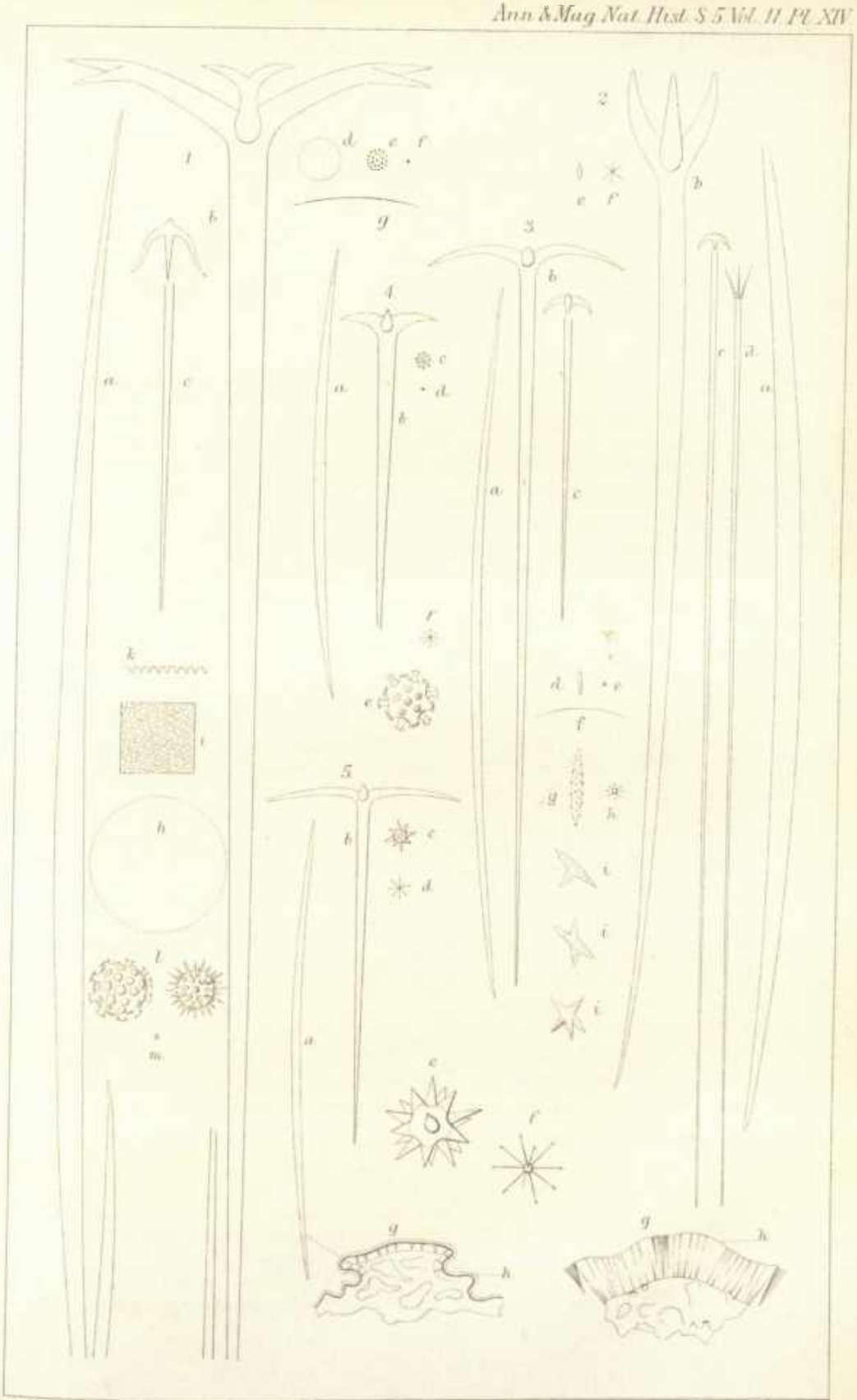
Fig. 5. *Stelletta globostellata*, n. sp., spiculation of. Skeletal spicules: *a*, body-spicule; *b*, zone-spicule (anchors and forks not seen); *c*, globostellate with rays pointed and smooth; *d*, internal stellate. More magnified views: *e*, globostellate; *f*, internal stellate. *g*, fragment magnified 2 diameters, to show thickness of *h*, the crust or cutis.

Plate XV.

Fig. 6. *Tethya merguiensis*, n. sp., natural size. *a*, upper view; *b*, vents; *c*, lower view; *d*, base of attachment; *e*, lateral view; *f*, base of attachment.

Fig. 7. The same, spiculation of. Skeleton-spicules: *a*, body-spicule; *b b*, zone-spicules; *c*, anchor; *d*, fork. Flesh-spicules: *f*, bihamate; *g*, dermal acerate. *e*, real length of body-spicule. More magnified views: *h*, bihamate or fibula; *i*, pigmental cells; *k*, pigmental cell still more magnified, to show the pigment-granules.

Fig. 8. The same. Interstice of dermal fibro-reticulation, much but *relatively* magnified, to show the elements of the dermis. *a a a a a a*,



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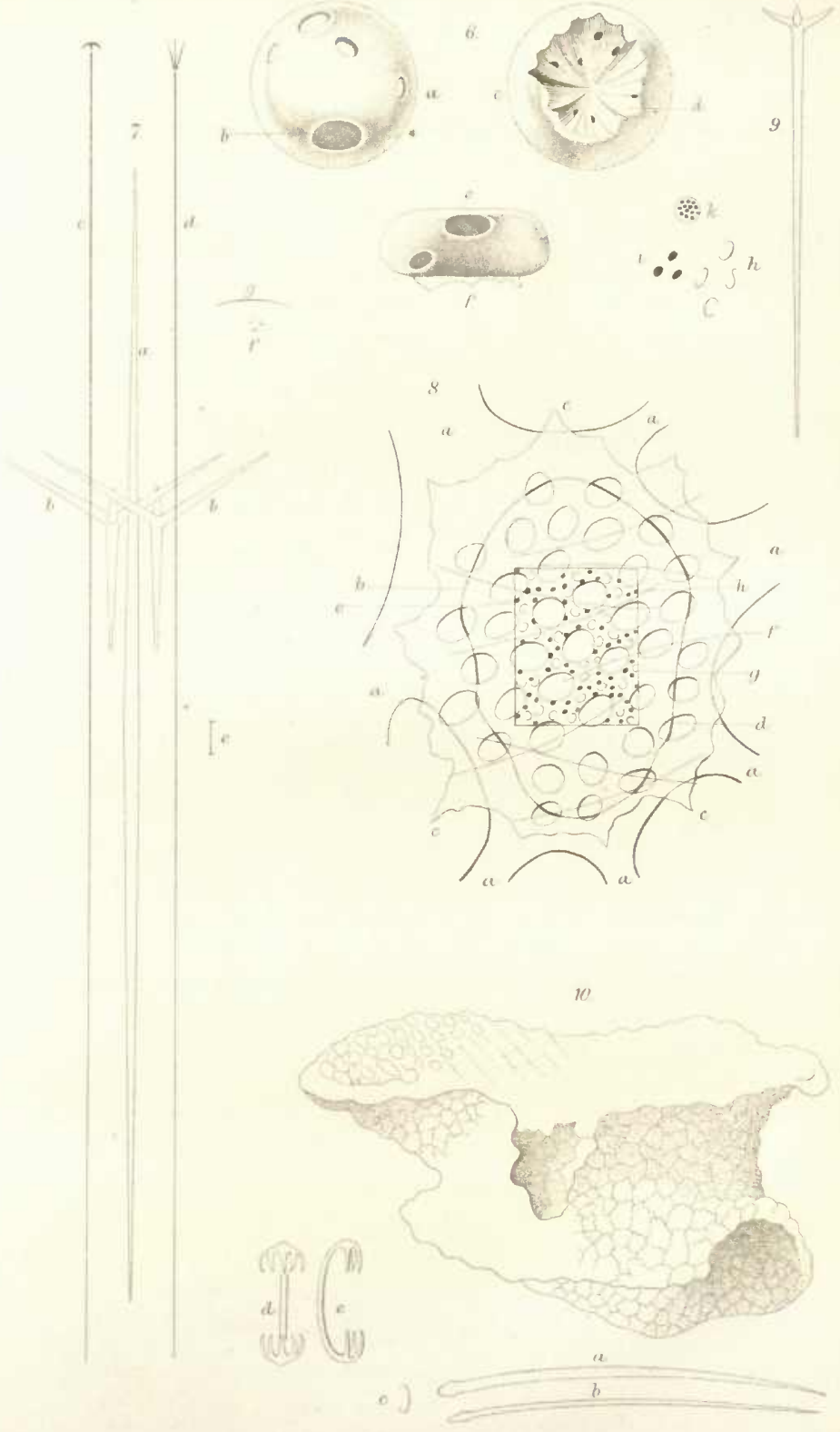
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