

	ft.	in.
Height at shoulder . . . . .	1	11
Length of fore leg . . . . .	1	4·5
Length from knee to fetlock (metacarpal joint) . . . . .	0	6·5
Length from fetlock to end of toe . . . . .	0	3·5
Length of hind leg . . . . .	1	11
Length from hock to fetlock (metatarsal joint) . . . . .	0	9·25
Length from fetlock to toe . . . . .	0	3·25
Length of horn from base to point, measured in a straight line . . . . .	0	7·25

This Gazelle is distinguished from *G. bennetti*, 1st, by colour. The face in the Indian Gazelle is nearly uniform rufescent fawn-colour, the parts which are black or blackish in *G. fuscifrons* being only a little darker than the rest in *G. bennetti*; the back also in the latter is more rufescent and less yellow, and the hairs are less dense. 2nd, by the greater length and more strongly marked annulation of the horns in the female, and by their well-marked curvation forwards towards the extremities. The horns in the female of *G. bennetti* are smaller than those of the male to a much more marked extent than in *G. dorcas*; the new species in this respect agrees probably with the African, and not with the Indian type.

From *G. dorcas*, *G. arabica*, and all allied forms the present species is also distinguished by the curvature of the horns and the coloration, especially of the face, none having such strong dark patches on the forehead and nose.

Of the habitat of this Gazelle nothing is known beyond what has been mentioned above. It has probably a wide extension throughout the deserts of Eastern Persia; and perhaps, as suggested above in referring to the notes by Dr. Jerdon on *Gazella christii*, it may extend into India. It probably, in Eastern Persia, inhabits the flat desert at a comparatively low elevation, whilst *G. subgutturosa* occurs along the bases of the hills and in the higher valleys.

## 2. Contributions to a General History of the *Spongiadæ*.

By J. S. BOWERBANK, LL.D., F.R.S., &c.—Part V.\*

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(Plates XXVIII.—XXXI.)

### ISODICTYA MIRABILIS, Bowerbank. (Plate XXVIII.)

Sponge virgultose. Surface smooth. Oscula simple, or very slightly elevated; margins thin, disposed laterally. Pores congregated in small pocilla, covered by a radial arrangement of ten conical sacculi, having their apices central and their bases marginal; pocilla and sacculi abundantly spiculous; porous areas arranged in shallow canaliculi, disposed in short irregular lines, more or less in accordance with the long axis of the sponge, bedded in a densely spiculous

\* For Part IV. see *antèa*, p. 3.



matrix lining the canaliculi; spicula same as those of the skeleton. Dermal membrane pellucid, furnished with a unispiculous rete. Skeleton stout and strong; primary and secondary lines both multi-spiculous; spicula acerate, short and stout. Interstitial membranes pellucid, rarely spiculous; spicula acerate, slender, few in number. Gemmules membranaceous, round or oval.

Colour in the dried state light ochreous yellow, or pink in parts.

*Hab.* East Indies (*S. P. Pratt, Esq.*).

Examined in the dried state.

I received this remarkable sponge, with several others, from my late friend *S. P. Pratt, Esq.*, to whom they were sent by his son from the East Indies. No part of the basal portion remains by which we might have judged of its natural size. In its present condition its colour is light ochreous yellow, with patches of rose-colour or pink on some parts of its distal end; and this tint penetrates considerably below the dermal surface. In its present state it is very firm and strong.

The inhalant system affords the most remarkable specific characters. It is elaborately constructed, and is unlike that of any other sponge with which I am acquainted. It consists of numerous pocilla, sunk beneath the dermal surface, each pocillum being covered by an elaborately constructed lid or shield, contained within a circular area or ring of closely packed spicula, from the inner margin of which are projected ten conical sacculi, their apices nearly meeting at the centre of the circular area. Many of these areas occur singly, slightly sunk beneath the dermal surface, while others are seen to be two, three, or more in linear arrangement, in short shallow canaliculi; and in some cases ten or twelve are disposed in a long and frequently curved or sinuous canal. The canaliculi do not form a connected system: each, whether short or long, is unconnected with the adjoining ones. The canaliculi are all lined with a thin continuous bed or matrix, composed of closely felted spicula, of the same size and form as those of the skeleton, in which the inhalant organs are imbedded, and which connects them with the others in that linear series. All the canals terminate with an inhalant area; and I have never seen an instance of either the lining matrix or the canal extending beyond the terminal inhalant areas.

The pocilla are nearly hemispherical; and the membranes of which they are constructed are abundantly strengthened by numerous spicula, of the same form and size as those of the skeleton, dispersed over the surface. The system of conical sacculi by which a pocillum is protected is also abundantly furnished with spicula, which are frequently projected from the apices of the cones into the open space between their terminations. The external surfaces of the conical sacculi are completely closed, and coated by closely packed spicula; but the basal portions of their inner surfaces are, for nearly half their length, open, as represented in fig. 8, as if a slice had been taken from each near the middle of its length, in a diagonal direction towards its base; so that it would appear that the conical organs are impervious to the external water, which enters the hemispherical basin



beneath, through the spaces between the apices of the conical organs. When the inner surface of this group of radiating organs is examined, the basal aperture of each is usually found to be completely open; but in some cases, as represented in one of them at *a*, fig. 8, there is what appears to be the remains of a closing membrane; it is, however, only in a very few cases that I have observed the remains of such an organ.

These singular radial organs are not present on the distal end of the sponge for about two inches of its length; and I examined this portion of it carefully in search of pores. I found the dermal membrane in a better state of preservation than on its proximal end, and its reticular structure well demonstrated. A few isolated pores in an open condition appeared at distant intervals; but many of these had more the aspect of orifices, by contraction of the membrane in drying, than of well-defined pores. I did not find any pores open in the pocilla beneath the radial coverings; but this is not surprising, as in dead sponges the general rule is to find them closed, and the exception is to find them open.

The gemmules are not numerous. I found one only in the section at right angles to the surface of the pocillum represented by figure 7; but in other cups taken from close to the proximal end of the sponge there were considerable numbers of them disposed on the inner surface of the membrane, and on the outer surfaces of the sacculi of the disk there were a few attached to those surfaces; but none were found within any of the conical sacculi, although their open mouths within the pocilla might have led us to expect to see some of them there. The gemmules are membranous, round or oval, semitransparent, and of a dark amber-colour, just such as we find in numerous other species of *Isodictya*. I searched in vain for them in the surrounding skeleton-tissues; but I found solitary ones only at distant intervals attached to the reticulations of more distant parts of the skeleton.

Since the above description was written, on looking over a collection of sponges I purchased of the late Mr. James de Carl Sowerby many years since, I found another specimen of the species. It is similar in form to the figured one, is an inch shorter, and has neither its natural base nor its apex, but is rather larger in its diameter. Its inhalant and exhalant organs are exceedingly like those of the type specimen; but the latter are rather large. In their anatomical characters, the two specimens are in perfect accordance.

**DICTYOCYLINDRUS DENTATUS, Bowerbank. (Plate XXIX.)**

Sponge ramose, pedicelled, pedicel short and stout; branches very numerous, ascending, culminating towards the apex of the sponge, occasionally dividing or inosculating, furnished abundantly with stout tooth-shaped processes. Surface smooth. Oscula simple, minute. Pores inconspicuous. Dermal membrane coriaceous, profusely furnished with dentato-cylindro-hexradiate retentive and defensive spicula; radii very short and stout; apices bi- or tridentate. Skeleton—spicula acuminate, long and rather stout, and rarely cylin-



drical. Interstitial membranes—spicula the same as those of the dermis, comparatively few in number.

Colour, dried, light ochreous yellow.

*Hab.* Nichol Bay, Australia (*Mr. George Clifton*).

Examined in the dried state.

This remarkable specimen of *Dictyocyindrus* is  $17\frac{1}{2}$  inches in height, and its greatest breadth 7 inches; the branches appear all to have maintained their natural position, and several of them near the distal termination of the sponge are united by inosculation. The natural base has been preserved. The pedicel is stout and short, and it does not rise from the base quite 3 inches before it is resolved into numerous ascending branches, which divide dichotomously or trichotomously. Each of the branches is furnished with numerous stout compressed tooth-shaped processes, consisting of converging compressed masses of skeleton-spicula pullulating from the axial skeleton of the branch, and entirely enveloped by the coriaceous dermis. The most decisive specific character of this sponge is undoubtedly the singular forms of spicula that abound in the dermal membrane, the dentato-cylindro-hexradiate defensive and retentive spicula. The membrane is crowded with them in all parts. From the shortness of their radii allowing them to assume any imaginable position, when mounted for examination their normal form is not always to be readily recognized; but a careful observation soon establishes the true nature of their structure. In nearly all of them the number of the dental terminations of the radii vary; but the tridentate terminations appear mostly to predominate. Abnormal variations in the forms of these spicula are by no means infrequent.

The axial skeleton of the branches fills the whole of their diameter, and has all the characters of a true *Dictyocyindrus*. It is rather compactly constructed; and a few slender spicula, of the same form as those of the skeleton, are interwoven at various angles with those of the great ascending column. The true structure of this sponge can be exhibited only in a longitudinal section.

#### ECIONEMIA ACERVUS, Bowerbank. (Plate XXX.)

Sponge massive, pedicelled (?); surface even, minutely hispid. Oscula simple, dispersed, few in number. Pores inconspicuous. Dermal membrane furnished abundantly with subtuberculated fusiformi-cylindrical spicula, very minute and short. Connecting-spicula attenuato-expando-ternate, large, stout, and abundant, and with a considerable number of attenuato-recurvo-ternate spicula; shafts long, slender, and attenuated. Skeleton—spicula of axis fusiformi-acerate, very large and stout. Interstitial membranes—tension-spicula acerate, minute, and slender, numerous, and tuberculated fusiformi-cylindrical, short and stout, very minute, numerous. Retentive spicula subsphero-attenuato-stellate; radii few and very slender, and cylindro-sphero-stellate radii short and numerous; both forms very minute.

Colour in the dried state dark brown.



*Hab.* Fiji Islands (*Sir E. Home*). In the collection of the Royal College of Surgeons (see 'Catalogue of Porifera,' part i. 1860, p. 127, B. 170).

Examined in the dried state.

The form of this sponge is somewhat like that of a pear, the basal end being the smaller one. It is  $2\frac{1}{4}$  inches in height, and  $1\frac{1}{2}$  inch at its greatest diameter. The natural base of the sponge is not present. The fractured termination is nearly circular, and is  $\frac{3}{4}$  of an inch in diameter; and there is every appearance of its having been supported, when perfect, on a short stout pedicel. The surface is armed with numerous minute acerate or fusiformi-acerate spicula, which project from it about one third or half their length at right angles to its plane. The surface of the sponge in its present state has a large number of orifices, produced by the contraction of the tissues; the true oscula visible are very small, of an oval form, not exceeding above a line in length and half a line in width, and are closed by the proper membrane of the organ. Immediately beneath the dermal membrane there is a thick stratum of membranous tissue and sarcode, in which the triradiate heads of the connecting-spicula are immersed. I could not detect in this stratum the slightest indication of the presence of gemmules. The dermal membrane is crowded with the subtuberculated fusiformi-cylindrical spicula; and very few indeed of the pores were in an open condition. Some of these appeared to have intermarginal cavities beneath them somewhat resembling those apparent in the dermal crust of *Geodia* and *Pachymatisma*; but I could not satisfactorily determine the fact of their existence, the tissues in which they are situated having been greatly disarranged by the contraction incurred by drying; under more favourable circumstances it is very probable that such intermarginal cavities will be found to exist.

This sponge exhibits in its structure very nearly the extremes in magnitude of the spicula. While those of the skeleton and connecting system are more than usually large and stout, the defensive ones and those of the membranous and sarcodous systems are unusually minute, and the stellate ones especially so, requiring a linear power of not less than 800 or 1000 to demonstrate their forms in a satisfactory manner: many of them do not exceed  $\frac{1}{4000}$  inch in extreme diameter; and the fusiformi-cylindrical spicula average  $\frac{1}{3000}$  in length by  $\frac{1}{10000}$  inch greatest diameter.

The interstitial membranes are abundantly covered with sarcode, in which there are a vast number of spherical nucleated cells, varying in diameter from  $\frac{1}{5000}$  inch to  $\frac{1}{10000}$  inch.

*ECIONEMIA Densa*, Bowerbank. (Plate XXX.)

Sponge massive or subcylathiform, sessile; surface sinuous and uneven, asperated. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane thin, pellucid, abundantly spiculous; spicula tuberculated, subcylindrical, occasionally fusiform, short and minute. Skeleton-fasciculi numerous and large; spicula fusiformi-cylindrical, long and stout, variable in form and proportion. Connecting-spicula



attenuato-expando-ternate, rarely patento-ternate; radii short and stout, occasionally cylindrical. Interstitial membranes—tension-spicula acerate, small and slender, few in number, and tuberculated, subcylindrical, the same as those of the dermal membrane. Retentive spicula: attenuato-stellate, radii spinous; cylindro-sphero-stellate, radii spinous; and cylindro-sphero-stellate, radii short and spineless.

Colour, in the dried state, ochreous yellow.

*Hab.* Fiji Islands (*Sir Everard Home*). Museum Royal College of Surgeons. Catalogue of Porifera, part i. 1860, p. 127, B. 171.

Examined in the dried state.

This sponge,  $2\frac{1}{4}$  inches in height and 2 inches greatest diameter, is massive but inclined to be cyathiform, and it has apparently been attached by its base to a small oval pebble. In the dried condition, the ternate heads of the connecting-spicula project beyond the surface of the dermal membrane, imparting an asperated sensation to the touch; this character, it is probable, would not exist in the living sponge.

In consequence of the destruction of the greater part of the dermal membrane, the oscula are not very readily to be distinguished; but the few that are apparent are small and simple in their structure.

The dermal membrane, when mounted in Canada balsam and examined with a power of 160 linear, appears almost opaque from the profusion of the tuberculated subcylindrical spicula with which it is furnished; they are irregularly but very closely packed in a single stratum on its internal surface; an average-sized one measured, length  $\frac{1}{2143}$  inch, diameter  $\frac{1}{7500}$  inch. When exceeding the ordinary size, they are frequently somewhat fusiform.

The skeleton-spicula are irregular in their size and proportions, and frequently have a sudden decrease of diameter at the distal termination two or three times their own diameter from the apex; and sometimes this contraction may be observed at both terminations of a spiculum.

The retentive spicula of the interstitial membranes afford excellent specific characters. The attenuato-stellate ones have their radii always more or less spinous: sometimes their apices only are thus armed; but in their fully developed state the spination extends over every part of them. There are two distinct forms of cylindro-sphero-stellate spicula:—one in which the central sphere is comparatively small, and which has the cylindrical radii spinous; the other in which the central sphere is largely produced, and the cylindrical radii are perfectly smooth. These varieties of sphero-stellate spicula are perfectly distinct and permanent, and never appear to graduate into each other. These stellate forms are very abundant, but they are not readily to be detected *in situ* without the section being immersed in Canada balsam, in consequence of the great density of the sarcodous tissues. They are mixed together and are irregularly dispersed on the interstitial tissues; and along with them



there are a few of the tuberculated subcylindrical spicula that are so abundant on the dermal membrane.

*Dictyocylindrus setosus*, Bowerbank. (Plate XXX.)

Sponge fan-shaped, branching dichotomously, pedicel short; surface setose; setæ long and very numerous, usually simple, sometimes branching dichotomously, projected ascendingly, composed of numerous stout acerate spicula disposed in parallel lines. Oscula and pores inconspicuous. Dermal membrane pellucid, spiculous; spicula acerate, like those of the setæ, few, dispersed. Skeleton—spicula of the axis cylindrical, long, somewhat slender, and more or less flexuous. Interstitial membranes abundantly spiculous; spicula acerate, the same as those of the setæ, occasionally reticulating.

Colour, in the dried state, ochreous yellow.

*Hab.* Bere Regis, Devonshire (*Mr. John Quekett*). Museum Royal College of Surgeons. Catalogue of Porifera, part i. 1860, p. 118, B. 117.

Examined in the dried state.

The sponge is  $5\frac{1}{2}$  inches high and 6 inches broad. It is of a thick and somewhat irregular fan-shape, and the whole of the sponge, excepting the short pedicel, is thickly covered with setæ, which are frequently as long as the diameter of the branch, and nearly equal in diameter throughout their whole length; they terminate rather obtusely, occasionally dividing dichotomously near the distal termination. The spicula of which they are composed are about half the length and twice the diameter of those of the skeleton-axis.

Where the spaces between the branching setæ are somewhat wide, the interstitial structures frequently assume very much the aspect of a Halichondroid reticulation; but towards the terminations of the setæ their spicula are dispersed on the interstitial membranes in the same manner as those of the dermal membrane.

I am strongly of opinion that the habitat assigned to *D. setosus* in the 'Catalogue of Porifera,' part i. 1860, p. 118, B. 117, is erroneous, and that the sponge there described is not a British species; and I believe that the habitat "Bere Regis" should have been applied to a specimen of *Dictyocylindrus hispidus* which Mr. Quekett informed me he had found on the coast of Devonshire. I saw specimens of that species in his possession, and I have one in my collection which he then presented to me. In accordance with these facts, I have, in my description of *D. hispidus*, vol. ii. p. 108, Monograph of British Spongiadæ, given his authority for the coast of Devonshire as a habitat of the species. It is most probable that the habitat "Bere Regis" should have been applied to the sponge B. 118, p. 119, of the Catalogue, which seems from the description to be a specimen of *D. hispidus*, Bow., or *Halichondria hispidus*, Johnston.

When I described and named the sponge *D. setosus* at the Museum of the Royal College of Surgeons, Mr. Quekett told me that the locality was unknown, and I entered it so in my MS. description; and he took notes regarding it from my description of it



at the time, from which it appears to me that the description of the sponge *D. setosus* in the museum was taken.

I have a perfect remembrance that at the time that I was working at the sponges in the museum there was no British species in the collection with which I was not previously well acquainted. I may also add that, although I have since examined numerous species of sponges from the coasts of Dorset, Devon, and Cornwall, I have never seen another specimen of *D. setosus* from those or any other locality.

*PACHYMATISMA INCONSPICUA*, Bowerbank. (Plate XXXI.)

Sponge massive, sessile; surface even, furnished sparingly with small acerate defensive spicula. Oscula unknown. Pores congregated. Dermal membrane spiculous; tension-spicula acerate, small; retentive spicula attenuato-stellate, small, and very abundant, and cylindro-stellate, minute, and few in number. Skeleton—radial immediately beneath the dermal crust for the length of the connecting-spicula, irregular beneath; spicula subfusiformi-acerate, stout and long. Connecting-spicula attenuato-super-expando-ternate, large and long, with very rarely slender porrecto-ternate or recurvo-ternate spicula. Interstitial membranes abundantly spiculous; retentive spicula acerate, flexuous, very long and slender; retentive spicula the same as those of the dermal membrane, very numerous. Ovaria spherical, depressed.

Colour, in the dried state, light fawn.

*Hab.* South Seas (*Sir Everard Home*).

Examined in the dried state.

This sponge is in the collection of the Royal College of Surgeons, London. It was brought, I believe, from the South Sea by Sir E. Home. It is nearly 3 inches in length. A section from the basal end at right angles to its long axis presented a figure approaching to an oblong of the dimensions of  $1\frac{1}{4}$  inch by  $\frac{3}{4}$  of an inch. The natural attachment of the sponge is not preserved; but there is every appearance of its having been a sessile species.

To the unassisted eye the surface appears smooth; but by the aid of an inch lens it is seen to be covered with minute puncta, indicating the intermarginal cavities beneath, and a few small acerate defensive spicula are projected for a short distance beyond the surface. When a thin section from the surface is immersed in Canada balsam, and viewed by transmitted light with a power of about 100 linear, the pores are seen to be congregated over the intermarginal cavities, and the pellucid membrane of the areas in which they are situated is furnished with a few small acerate tension-spicula, and it is crowded with the attenuato-stellate retentive spicula; but without the aid of Canada balsam the latter forms of spicula are invisible amidst the sarcode that lines the inner surface of the membrane.

The skeleton-structure immediately beneath the dermal crust of the sponge is quite as regularly radiate as that of a *Geodia*; and this



regularity does not extend beyond the length of the shafts of the connecting-spicula; all beneath that point to the centre of the sponge is entirely devoid of regularity. The intermarginal spaces and the interstitial membranes within them are crowded with the stellate retentive spicula; but below the terminations of the retentive spicula they were comparatively few in number, and in the inner and central parts of the sponge they are rarely, if ever, to be found. The retentive stellate spicula are of two descriptions. The attenuato-stellate ones are small and nearly uniform in size, a few large ones occasionally appearing among them. The cylindro-stellate ones are very minute, not exceeding one third or one fourth the diameter of the average-sized attenuato-stellate ones.

I did not succeed in finding the slender porrecto-ternate or recurvo-ternate spicula *in situ*; but a few fragments of each were found among the spicula obtained by the aid of nitric acid. By the same means also I detected the presence in the sponge of a few deltoid spicula.

**PACHYMATISMA CONTORTA, Bowerbank. (Plate XXXI.)**

Sponge branching; branches irregular, short, stout, anastomosing; surface undulating. Oscula simple, dispersed, small. Pores inconspicuous. Skeleton-spicula acerate, large and long, and occasionally acuate, large and long. Connecting-spicula attenuato-patento-ternate, rare and very variable in size. Interstitial membranes—tension-spicula acerate, short and stout; retentive spicula attenuato-stellate, comparatively large, and attenuato-sphero-stellate, minute; radii more or less acutely conical. Ovaria obtusely oval, slightly depressed, component cuneiform spicula small and slender.

Colour, in the dried state, light brown.

*Hab.* Fiji Islands (*Sir Everard Home*). See Catalogue of Porifera in the Museum of the Royal College of Surgeons, part i. 1860, p. 126, B. 166.

The short branches of this sponge vary in diameter from 3 to 9 lines, and in the greater part of the sponge are so much anastomosed as to almost form an irregular mass. The surface is somewhat uneven and undulating; and in some of the most protected parts there are a few spicula that project from between the ovaria; but the specimen has so many fragments of parasitical sponges attached to it as to render the slight proofs of its hispid character doubtful. The oscula are few in number, and the largest was scarcely a line in diameter. I could not determine the characters of the pores, in consequence of the destruction of the dermal membrane by weathering or washing. The dermal crust of the sponge is hard and very compact, and in some parts attains a thickness of nearly a line. The radiating structure immediately beneath the dermal crust, so striking and characteristic in the greater number of the species of this genus, is in this species almost obsolete; and the irregular central portion of the interstitial tissues extends in many places quite to the inner surface of the dermal crust; while in other parts the



radial structure prevails in patches only, and the connecting-spicula are comparatively rare, and frequently in an imperfectly developed condition.

The skeleton is abundantly spiculous; the two forms, the acerate and acuate, are indiscriminately mixed in its structure; but the former prevail to a much greater extent than the latter ones.

The short stout tension-spicula of the interstitial structures are unusually large and strong; they are very numerous, and are irregularly dispersed on all parts of the membranes. The two forms of stellate retentive spicula are very abundant, and are irregularly dispersed over all parts of the membranes. The larger of the two, the attenuato-stellate ones, are very numerous; they vary to some extent in size and in the number of their radii; the one represented by fig. 11, Plate XXXI., is a very fully developed specimen. The minute sphero-stellate spicula also vary somewhat in their size and form, the radii in some being much more conical than in others; and they are very much more numerous than those of the larger form.

The sponge is evidently an adult specimen, as nearly all the ovaries are in the solid or exhausted condition, and very few immature ones were observed on the more deeply seated parts of the interstitial membranes.

*GEODIA PARASITICA*, Bowerbank. (Plate XXXI.)

Sponge sessile, coating; surface even or slightly nodose, smooth. Dermal membrane translucent, furnished abundantly with minute sphero-stellate spicula. Connecting-spicula attenuato-subpatentoternate, few in number. Oscula simple, dispersed (?), few in number. Pores congregated, porous areas abundantly furnished with small sphero-stellate retentive and defensive spicula; radii numerous, short, acutely conical. Skeleton-spicula fusiformi-acerate, large and stout, numerous. Interstitial membranes—tension-spicula fusiformi-acerate, small and slender; retentive spicula small, sphero-stellate, the same as those of dermal membrane, rather numerous. Ovaria globose, rather depressed.

Colour, in the dried state, light cream-yellow.

*Hab.* Unknown (*Mr. Thos. Ingall*).

Examined in the dried state.

I am indebted to my late friend Mr. Ingall for my knowledge of this species. It was originally, I believe, parasitical on the base of a coral. In its present condition it consists of fourteen fragments, the largest of which slightly exceeds half an inch in diameter; when entire it probably covered about  $1\frac{1}{2}$  square inch; and the thickness does not appear to have exceeded  $\frac{1}{4}$  of an inch in any part. The surface has evidently been uneven, with one or more nodular elevations. The surface is smooth, and there does not appear to have been any large or small spicula projected beyond it. A few oscula were apparent on the fragments, two of which were nearly one tenth of an inch in diameter; and on one fragment there was apparently the remains of a portion of a sunken area, which may



have had a small collection of oscula at the bottom of it originally ; but the dilapidated condition of the specimen allows of nothing more definite than a conjecture on the subject. The porous areas were not evenly dispersed over the surface ; and two or three small groups of them only were apparent, marked by the usual pitted appearance that indicated the presence beneath of the intermarginal cavities. On this portion of the specimen the dermal membrane was in a tolerably perfect condition, and contained an abundance of minute sphero-stellate spicula, like those of the interstitial membranes, in which they were also rather abundant. These minute organs are very characteristic of this species. The spherical centre of a fully developed one measured  $\frac{1}{2400}$  inch diameter, and the spiculum between the extreme apices  $\frac{1}{1500}$  inch. They are very similar in form to the sphero-stellate spicula of *Tethea lyncurium*, but are very much more minute, and the number of the radii is much greater ; but they resemble those of *T. lyncurium* very much in their conical form. I have not before found this form of spiculum in the sarcodæ of a *Geodia*. The diameter of a fully developed ovarium was  $\frac{1}{333}$  inch. The cuneiform spicula of which they are composed are large in proportion to the size of the ovarium, and the distal extremities are much angulated.

**GEODIA PAUPERA, Bowerbank. (Plate XXXI.)**

Sponge massive, coating ; surface even, smooth. Oscula simple ; congregated in depressed areas. Pores congregated. Dermal membrane thin, pellucid. Connecting-spicula attenuato-expando-ternate, variable in size and proportions, rather few in number. Skeleton abundantly spiculous ; spicula fusiformi-acerate, comparatively small and short. Interstitial membranes—tension-spicula subfusiformi-acerate, small and slender ; retentive spicula cylindro-stellate, variable in size and structure, and very minute cylindro-stellate ; radii short and stout. Ovaria globose ; cuneiform spicula of adult specimens comparatively large, distal ends prominently angulated.

Colour, in the dried state, cream-white.

*Hab.* Unknown.

Examined in the dried state.

I am indebted to Mr. Jeremiah Slade for my knowledge of this species. It was purchased at a public sale of specimens of natural history from various localities. It is based on an irregular mass of coral, an *Astræa*, about 4 inches in diameter, on which has grown a specimen of *Gorgonia flabellum* and a compound tunicated mollusk ; the latter has very nearly covered the *Geodia*, which is about 2 inches in length, and rather exceeding an inch in breadth. The specimen has suffered much by maceration, and nearly the whole of the dermal membrane has been destroyed ; the little that remained was thin and translucent, but in such a condition as to afford no other specific characters. In sections made at right angles to the dermal surface, large intermarginal cavities were apparent, passing through the dermal crust from its outer to its inner surface, which is covered



by a thick layer of indurated sarcode. The distal ends of these organs are protected by an irregular fringe of small fusiformi-sub-acuate or acerate external defensive spicula. These conditions of the dermal crust and the intermarginal cavities unmistakably indicate the congregation of the pores on the dermal membrane.

The oscula are few in number; they are congregated in a slightly depressed area; the largest does not exceed the tenth of an inch in diameter. The connecting-spicula are comparatively small and few in number; they do not penetrate the dermal crust, but their ternate terminations are closely applied to the proximal surface of the stratum of indurated sarcode immediately beneath the dermal crust. The greater portion of them are subexpando-ternate; but some of them are nearly patento-ternate. They vary in length from about  $\frac{1}{30}$  to  $\frac{1}{26}$  inch. The fusiformi-acerate spicula of the skeleton are very numerous; they average  $\frac{1}{26}$  inch in length, while the fusiformi-acerate tension ones, which are abundantly intermixed with them, seldom exceed  $\frac{1}{100}$  inch in length.

The two forms of cylindro-stellate retentive spicula differ considerably in size. Two of them, imbedded closely adjoining each other in the interstitial membranes, measured from the distal extremities of their opposite radii as follows:—the largest one  $\frac{1}{1734}$  inch extreme diameter, the minute cylindro-stellate form  $\frac{1}{3896}$  inch extreme diameter, while the radii in each were nearly of the same diameter. They do not appear to pass into each other by variations in the proportional length of the radii, but each variety seems to adhere to nearly the same dimensions; neither do they appear to occupy particular positions on the tissues, but are irregularly dispersed over the interstitial membranes.

The adult ovaries are perfectly globular, or very slightly depressed at the foramen; they measure  $\frac{1}{62}$  inch in diameter; the cuneiform spicula of which they are composed are comparatively large, and the distal extremities are strongly developed and are very angular. Ovaria in all stages of development were present in abundance in all parts of the interior of the sponge. The structural peculiarities of the ovaries in this species are more than usually beautiful when viewed with a power of about 700 linear. The distal termination of each spiculum in the adult specimens presents an acutely angulated stellate appearance, closely resembling a five- or six-rayed star, the radii of which are acutely conical, cemented together by translucent siliceous matter, so that each ovarium resembles a beautiful crystal sphere, regularly ornamented with innumerable minute stellæ.

Many years have passed since I first examined this sponge, but I have never been fortunate enough to meet with another specimen.

#### TETHEA HISPIDA, Bowerbank. (Plate XXXI.)

Sponge sessile(?); surface strongly and thickly hispid. Oscula and pores inconspicuous? Dermis abundantly spiculous; spicula disposed at right angles to the surface, uniformly crowded together; superfusiformi-subovo-spinulate, very minute, forming a secondary series of defensive spicula. Primary series of defensive spicula super-



fusiformi-acuate or subovo-spinulate, very large and long. Skeleton. spicula superfusiformi-acuate and subovo-spinulate, large and long. Tension-spicula superfusiformi-subovo-spinulate, small, irregularly dispersed, numerous.

Colour, dried, light grey.

*Hab.* Portland, Maine, N. America (*Dr. Dawson*, M'Gill's College, Montreal).

Examined in the dried state.

I received a small slice of this sponge from Prot. Dawson. From the curve of the surface, this specimen appears to have been about an inch and a half in diameter. In its present state the hispidation of the surface is very strongly produced, and probably much exaggerated by drying; the spicula are comparatively very large and long—more so than those of the skeleton-fasciculi. The secondary series of defensive spicula are of the same form as those of the interstitial membranes, but not more than half their average size. The whole of the spicula are exceedingly fusiform, the middle of the shaft being frequently twice the diameter of the base of the spiculum. The ovo-spinulate character prevails more or less in all the spicula, but is more distinctly produced in those of the interstitial membranes and the secondary dermal defensive ones. In the deeply seated portions of the skeleton-fasciculi the ovo-spinulate character is very nearly or quite obsolete in some of the skeleton-spicula, and in others every gradation of its development may be traced up to its perfect production. No traces of reproductive organs could be detected on any part of the interstitial membranes.

The peculiarities of the organization of this sponge distinctly separate it from any other species with which I am acquainted.

#### DESCRIPTION OF THE PLATES.

##### PLATE XXVIII.

*Isodictya mirabilis*, Bowerbank.

Fig. 1 represents the type specimen, natural size.

2. A small portion of a section at right angles to the dermal surface, magnified 80 linear.
- 3, 4. Two of the short, stout acuate skeleton-spicula, magnified 123 linear.
5. One of the slender tension-spicula from the interstitial membranes, magnified 123 linear.
6. One of the inhalant pocilla, partially closed by the radial arrangement of conical sacculi, magnified 61 linear.
7. A section at right angles to the dermal surface of one of the inhalant pocilla, magnified 61 linear.
8. One of the conical sacculi of the inhalant areas, exhibiting the remains of a membrane, which probably occasionally closed the mouth of that organ, magnified 80 linear.

##### PLATE XXIX.

*Dictyocylindrus dentatus*, Bowerbank.

Fig. 1 represents the type specimen, half the natural size.

2. One of the branches, natural size.
3. A side view of one of the dentato-cylindro-hexradiate retentive and defensive spicula from the dermal membrane, magnified 530 linear.



- Fig. 4. An end view of one of the dentato-cylindro-hexradiate spicula, magnified 530 linear.
5. A malformed specimen of the dentato-cylindro-hexradiate form of spiculum, magnified 530 linear. Malformations of this spiculum are not uncommon.
6. An average-sized acuate skeleton-spiculum, magnified 80 linear.
7. One of the spicula from the interstitial membranes, magnified 80 linear.

## PLATE XXX.

*Ecionemia acervus*, Bowerbank.

- Fig. 1 represents a fully developed fusiformi-acerate skeleton-spiculum, magnified 80 linear. These spicula vary to a very considerable extent in size.
2. A full-sized attenuato-expando-ternate connecting-spiculum, magnified 80 linear.
3. A fully developed attenuato-recurvo-ternate connecting-spiculum, magnified 80 linear.
4. Two of the subtuberculated fusiformi-cylindrical tension-spicula from the dermal membrane, magnified 530 linear.
5. One of the subsphero-attenuato-stellate retentive spicula, magnified 530 linear.
6. A minute cylindro-sphero-stellate retentive spiculum from the interstitial membranes, magnified 530 linear.

By an accidental omission, one of the minute and slender acerate tension and external defensive spicula was not figured as intended. Those spicula are identical in form with the one represented by fig. 10 in the present Plate, from *Ecionemia densa*, the only difference being that those of *E. acervus* are much less in both length and diameter.

*Ecionemia densa*, Bowerbank.

- Fig. 7 represents one of the fusiformi-cylindrical skeleton-spicula, magnified 80 linear.
8. One of the attenuato-expando-ternate connecting-spicula, magnified 80 linear.
9. A portion of a larger specimen of an attenuato-expando-ternate connecting-spiculum, the radii of which are cylindrical, magnified 80 linear.
10. One of the small and slender acerate tension-spicula, from the interstitial membranes, magnified 80 linear.
11. Two of the tuberculated subcylindrical tension-spicula from the interstitial membranes, magnified 530 linear.
12. An attenuato-stellate entirely spined retentive spiculum, magnified 530 linear.
13. One of the cylindro-sphero-stellate entirely spined retentive spicula, magnified 530 linear.
14. A cylindro-sphero-stellate retentive spiculum, radii spineless, magnified 530 linear.

*Dictyocylindrus setosus*, Bowerbank.

- Fig. 15 represents a portion of a terminal group of setæ, from the distal end of the sponge, with a small piece of the dermal membrane and its characteristic spicula, magnified 80 linear.
16. One of the flexuous cylindrical skeleton-spicula from the axis of the sponge, magnified 150 linear.
17. An acerate spiculum from one of the setæ, magnified 150 linear.

## PLATE XXXI.

*Pachymatisma inconspicua*, Bowerbank.

- Fig. 1. One of the subfusiformi-acerate skeleton-spicula, magnified 80 linear.
2. An average-sized superexpando-ternate attenuated connecting-spiculum, magnified 80 linear. These spicula vary greatly in their size and



amount of development of their radii, and also in the degree of their expansion.

- Fig. 3. One of the small acerate defensive spicula of the dermal surface, magnified 80 linear. This figure also represents the small acerate tension-spicula of the dermal membrane.
4. One of the long, slender, and flexuous acerate tension-spicula of the interstitial membranes, magnified 80 linear.
5. An attenuato-stellate retentive spiculum, from the interstitial membranes, magnified 530 linear.
6. One of the minute cylindro-stellate retentive spicula from the interstitial membranes, magnified 530 linear.

*Pachymatisma contorta*, Bowerbank.

- Fig. 7 represents a full-sized acerate skeleton-spiculum, magnified 80 linear.
8. An average-sized acerate skeleton-spiculum, magnified 80 linear.
9. One of the short, stout, acerate tension-spicula from the interstitial membranes, magnified 80 linear.
10. A fully developed attenuato-stellate retentive spiculum from the interstitial membranes, magnified 530 linear.
11. A very fully developed attenuato-sphero-stellate retentive spiculum from the interstitial membranes, magnified 530 linear.

*Geodia parasitica*, Bowerbank.

- Fig. 12 represents one of the large fusiformi-acerate skeleton-spicula, magnified 80 linear.
13. An average-sized attenuato-subpatento-ternate connecting-spiculum, magnified 80 linear.
14. One of the small and slender fusiformi-acerate tension-spicula from the interstitial membranes, magnified 80 linear.
15. One of the minute sphero-stellate retentive and defensive spicula from the dermal membrane, magnified 530 linear.

*Geodia paupera*, Bowerbank.

- Fig. 16 represents an average-sized skeleton-spiculum, magnified 80 linear.
17. A full-sized attenuato-expando-ternate connecting-spiculum, magnified 80 linear.
18. A small-sized attenuato-expando-ternate connecting-spiculum, magnified 80 linear. This-sized spiculum is not uncommon intermixed with the larger specimens of the same form.
19. One of the small subfusiformi-acerate tension-spicula from the interstitial membranes, magnified 80 linear. This form also represents the external defensive spicula of the porous areas.
20. One of the largest size of cylindro-stellate retentive spicula from the interstitial membranes, magnified 530 linear.
21. One of the minute cylindro-stellate retentive spicula from the interstitial membranes, magnified 530 linear.

*Tethea hispida*, Bowerbank.

- Fig. 22 represents a fully-developed skeleton-spiculum, magnified 80 linear. This figure also represents a small-sized primary defensive spiculum.
23. A young skeleton-spiculum, before it has developed its spinulate basal bulbous appendage, magnified 80 linear.
24. One of the minute superfusiformi-ovo-spinulate spicula of the secondary external defensive system, magnified 80 linear.
25. One of the same description of secondary external defensive spicula, magnified 250 linear. These figures 24 and 25 also represent the tension-spicula of the interstitial membranes.
26. A slender form of ovo-spinulate spiculum, occasionally intermixed with the other tension-spicula of the interstitial membranes, magnified 80 linear.





Bowerbank, J. O. 1873. "Contributions to a general history of the Spongiadae. Part V." *Proceedings of the Zoological Society of London* 1873, 319–333.

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