the dermal rete with its central canals, and the smooth elongate-conical defensive organs, × 36 linear.

Fig. 7. A small portion of the siliceo-fibrous skeleton of *Farrea parasitica*, × 80 linear.

2. Contributions to a General History of the *Spongiadæ*. By J. S. Bowerbank, LL.D., F.R.S., &c.—Part VII.

[Received March 12, 1875.]

When my friend Commodore Parish went out to China to take the command at Hong Kong, he kindly promised to render me any assistance in his power in the collection of Sponges and other specimens of natural history; and I am pleased to say he has performed his promise in a most effective and liberal manner. By far the greater number of specimens of Sponges sent home to England are so carefully and effectually washed instead of being dried immediately in the condition in which they come from the sea, that the greater portion of their most valuable specific characters are completely destroyed. This destructive process has been carefully avoided in the preservation of the specimens which form the subjects of the present communication; and the descriptions of these specimens are the more valuable to science as they lead us to the conclusion that the species at that distant portion of the earth are in reality very closely allied in their generic and other anatomical characters to those of our Northern European seas.

Microciona tuberosa, Bowerbank.

Sponge massive, sessile, tuberous; tuberous projections corrugated, minutely spinous, more or less fistulous. Oscula simple, small, dispersed. Pores inconspicuous. Dermal membrane pellucid, spiculous; tension-spicula acuate, slender, dispersed, rather few in number. Skeleton-columns rather stout, anastomosing, forming a coarse, open, and somewhat complicated rete; skeleton-spicula acuate, rather long and slender; internal defensive spicula attenuato-acuate, small, entirely spinous. Interstitial membranes spiculous; tension-spicula slender, acuate, few in number.

Colour, in the dried state, dull pale green.

Hab. Straits of Malacca (*Commodore Parish, R.N.*).

Examined in the dried state.

This very remarkable sponge was sent to me by my friend Commodore Parish with several other interesting and valuable specimens collected in the Straits of Malacca. It is based on the surface of another species of sponge, a unispiculous *Halichondria*, which it almost entirely covers, and with which it is so intimately incorporated, and so closely resembles it in colour, as to render it very difficult to discriminate the two without a microscopical examination of their structures. Its external form is singular and very characteristic. It is $2\frac{1}{2}$ inches long, $1\frac{1}{2}$ broad, $1\frac{1}{4}$ inch in height; and its external

surface is entirely composed of tuberous projections, the surfaces of which are minutely corrugated. They vary from a $\frac{1}{4}$ to $\frac{1}{2}$ an inch in height, and in diameter from 2 to 4 or 5 lines. Their distal terminations are slightly convex or nearly flat, with a simple orifice frequently on the summit, and when in this condition they are more or less fistulous. The oscula are simple perforations, seldom exceeding the size of one of the skeleton-areas. The dermal membrane is pellucid. It is rather sparingly furnished with slender acuate tension-spicula, which are of the same form as those of the skeleton columns, but rather shorter and more slender; and intermixed with the tension-spicula there are numerous minute grains of sand and other extraneous matters adherent to the outer surface of the membrane.

The skeleton in this species is more complicated in its structure than it is in the greater number of the known species of the genus, the skeleton-columns anastomosing more frequently and more regularly than is usual; so that the skeleton assumes the form of a rudely constructed reticulation. The skeleton-columns are stout and strong, abounding in keratode, in which their long, slender, acuate spicula are somewhat loosely distributed; and along with them there are frequently minute grains of extraneous matter imbedded. The columns are abundantly supplied with internal defensive, attenuato-acuate, entirely spined spicula; they are projected at nearly equal distances and at right angles to the surface into the interstitial spaces, so as to present an exceedingly formidable series of weapons of defence against the attacks of any intrusive annelids or other enemies. These defensive spicula require a linear power of about 300 to render their forms and spination distinctly to the eye.

The interstitial membranes are furnished with a few tension-spicula and extraneous grains of sand in a manner very similar to that of the dermal membrane. The spicula of this species have their nearest alliance in form to those of our British species *M. fallax*; but the structural characters of the sponge in other respects are very strikingly different.

In the spicula prepared by boiling in nitric acid and mounting in Canada balsam there were numerous adventitious forms of spicula, which the peculiarities of the structure of this sponge is especially liable to collect and retain; but of these very few, comparatively, could be detected on the insterstitial membranes of the sponge.

HYMERAPHIA SPINULARIA, Bowerbank.

Sponge coating, very thin. Surface even, strongly hispid. Oscula simple, minute, dispersed. Pores inconspicuous. Dermal membrane pellucid, sparingly spiculous; spicula same as those of the skeleton. Skeleton and external defensive spicula subfusiformi-spinulate, long and rather slender, very numerous. Internal defensive spicula subfusiformi-spinulate, comparatively short and stout, numerous.

Colour, in the dried state, light ochreous yellow.
Hab. Coast of Corea (*Commodore Parish, R.N.*).
Examined in the dried state.

This sponge is parasitical on the shell of a large specimen of *Spondylus spathuliferus* (?), which measures from the hinge to the front of the shell nearly 3 inches. It completely covers every part of the shell and all its spines, many of which exceed 1 inch in length; and in no part does it appear to exceed in thickness a stout sheet of paper. The surface is abundantly but minutely hispid by the projection of the skeleton-spicula through the dermal membrane for about half their entire length, thus performing the offices of external defensive spicula as well as those of the skeleton. The oscula are simple orifices, so minute as not to be readily detected even with the aid of a lens of 2 inches focus. In the specimen under description there are appearances very liable to deceive an observer in search of these organs, as they assume a form very likely to deceive the eye, that of little conical elevations terminating in small circular orifices.

These fallacious appearances are thus produced. Before the shell was covered by the sponge a considerable number of small *Balani* had built upon its upper valve and also upon some of the spines; and these shell-parasites have become so completely covered by the sponge as to leave only the terminal orifice of each visible, simulating in a remarkable manner what might readily be mistaken for the oscula of the sponge. The dermal membrane is pellucid; it is situated about midway between the bases of the skeleton-spicula and their apices; and a few spicula of the same size and form as those of the skeleton are distributed on its surface. The skeleton-spicula all spring from the basal membrane of the sponge, and are projected through the dermal one for about half their lengths: they vary to some extent in length; a fully developed one measured $\frac{1}{48}$ inch in length; and as they pass for about half their length through the substance of the sponge, its entire thickness will be about $\frac{1}{100}$ inch. The skeleton-spicula are all more or less fusiform, and in many of them the spinulate base is very slightly produced; their greatest diameter is $\frac{1}{2308}$ inch.

The internal defensive spicula all spring from the basal membrane: their average length is $\frac{1}{214}$ inch; and their diameter is rather less than that of the skeleton-spicula; some of the largest of them reach very nearly to the inner surface of the dermal membrane.

This species is closely allied to the British *Hymeraphia simplex*; but it differs from it in having the skeleton-spicula much more slender and delicate, and in their fusiform shape, and also by the total absence of attenuato-spinulate incipiently spinous defensive spicula.

RAPHIODESMA PARISHII, Bowerbank.

Sponge sessile, coating thinly, even, minutely hispid; spicula acuate, same as those of the skeleton, visibly reticulated. Oscula simple, dispersed, small, rather few in number. Pores inconspicuous. Dermal membrane abundantly spiculous, reticulated; rete multispiculous, strongly developed; areas rather irregular in form, but nearly equal in size; spicula of rete acuate, same size and form as those of the skeleton; tension-spicula biclavate cylindrical, very slender, dispersed or loosely fasciculated, and tricurvate acerate, small and

very slender. Retentive spicula inequidentato-palmate anchorate, congregated in circular groups or dispersed, large and strong; and very minute palmato-inequianchorate, dispersed; also very minute, bidentate, equianchorate, dispersed; and also bidentate, equianchorate, rather large and stout, few in number; also bihamate simple and contort large and strong, and the same form very minute and slender. Skeleton-fasciculi more or less multispiculous; bases and apices of the component spicula coincident, irregularly disposed; spicula acuate, stout, moderately long; basal membrane stout, somewhat coriaceous, abundantly armed with attenuato-acuate entirely spined internal defensive spicula; interstitial membranes spiculous; spicula same as those of the dermal membrane, rather sparingly dispersed.

Colour dull cream-white in the dried state.
Hab. Straits of Malacca (*Commodore Parish, R.N.*).
Examined in the dried state.

I received six specimens of this very interesting sponge from my friend Commodore Parish, who obtained them from the Straits of Malacca. The largest measured $3\frac{1}{4}$ inches in length by $1\frac{3}{4}$ broad, and its greatest thickness does not exceed about $\frac{1}{8}$ of an inch. It entirely covers a mass of *Cellepora* about a $\frac{1}{4}$ of an inch in thickness. The surface appears smooth to the eye, but it is really minutely hispid. The hispidation is produced by the projection of about half the length of the spicula of skeleton-fasciculi; the distal ends of each of them separate divergingly, forming an infinite number of minute external defensive groups; as the amount of their projection does not exceed $\frac{1}{160}$ inch, this character is only to be observed in sections at right angles to the surface mounted in Canada balsam. This radiating expansion of the skeleton-fasciculi at the surface of the sponge, so as to form an efficient system of external defence, is on the same principle as the expansion of the distal terminations of the primary fibres of the skeleton of many species of the genus *Isodictya*, thus exhibiting in a very different mode of the construction of the skeleton the same economic design in the production of a series of organs of external defence. In other genera where this beautiful mode of adaptation is inapplicable, especial systems of spicula are provided to achieve the necessary defences of the dermal surface.

The dermal membrane and the interstitial tissues are remarkably rich in defensive and retentive spicula; and I have never found in any other sponge so great a number of forms and so much variety of size as in this species. The dermal rete is very strongly and compactly constructed; but the spicula composing it have not their terminations coincident as in the skeleton-fasciculi. Both forms of tension-spicula are small and slender. The biclavate cylindrical ones are $\frac{1}{150}$ inch in length and $\frac{1}{10000}$ inch in diameter; the greater number of them are collected into fasciculi containing from five to eight or nine spicula; and others are singly disposed among the rest of the spicula. The fasciculi have no especial mode of distribution.

The tricurvate acerate tension-spicula are also very small and slender; one of the largest of them measured $\frac{1}{300}$ inch in length: the curves of these spicula are not very strongly produced, and some of them exhibit but faint traces of curvature; they are not very numerous. The retentive spicula are especially remarkable for the great variety of their size and form. The largest of the retentive spicula, the inequidentato-palmate anchorate ones, are congregated in rosette-shaped groups, a few only appearing singly located. The groups of these spicula so characteristic of the genus *Raphiodesma* are not very numerous, nor do they contain so many spicula as those we observe in some other species of the genus; the usual number is about eight or ten in each. They are situated on the basal membrane as well as on the inner surface of the dermal one, just as similar groups of such spicula are dispersed on the inner surface of our British species *R. lingua*, in which they are frequently crowded together in considerable numbers. The spicula in the species in course of description are strongly produced; an average-sized one measured $\frac{1}{161}$ inch in length, and the breadth of the broad spatulate distal end was $\frac{1}{1000}$ inch. These dimensions contrast strongly with those of the numerous small inequipalmate anchorate ones dispersed on the surface of the membranes, the average length of which is $\frac{1}{1428}$ inch; and the contrast is still greater with the very minute palmato-equianchorate ones, two of which measured respectively $\frac{1}{2500}$ and $\frac{1}{5000}$ inch in length; so that a considerable number of the latter ones might be shovelled up as in a scoop by one of the large form of these spicula which compose the large rosette-like groups. One of the stout bidentate equianchorate spicula measured $\frac{1}{666}$ inch in length. A similar difference in size occurs between the two sorts of bihamate spicula. The larger of the two measured $\frac{1}{500}$ inch in length, with greatest diameter of the shaft $\frac{1}{3614}$ inch, while the length of one of the smaller description of this form was $\frac{1}{1500}$ inch.

The fasciculation of the skeleton is very variable; some of the bundles contain numerous spicula, while others consist of two or three only; and the mode of disposition of the fasciculi is also very irregular. The spicula in all the bundles appear to have their bases and apices coincident. The length of an average-sized skeleton-spiculum is $\frac{1}{50}$ inch, and the diameter $\frac{1}{2307}$ inch.

The basal membrane is abundantly armed with numerous attenuato-acuate entirely spined internal defensive spicula projected at right angles to its inner surface. In the basal portion of the sponge a thin stem of a *Tubularia* was imbedded; and this was closely surrounded by basal membrane, from all parts of which numerous internal defensive spicula were projected. This curious habit of the sponge to surround included extraneous matters with membrane, and then to project defensive spicula from their surfaces, I have several times observed in some of our British sponges.

On the surface of another sponge from the same locality I found a very young specimen of the sponge under description not exceeding a $\frac{1}{4}$ of an inch in diameter and as thin as a piece of paper. The dermal membrane was in a fully developed condition; the basal

membrane was present as a very thin film; and the skeleton was indicated by a few straggling spicula only; so that in this state the specimen might have been readily mistaken for a *Hymedesmia*.

I have named this remarkably interesting species after my good friend Commodore Parish, to whom I am indebted for it and many other interesting sponges, and also for numerous other interesting and valuable specimens of natural history.

HALICHONDRIA ELEGANTIA, Bowerbank.

Sponge massive, sessile. Surface variable but smooth, or but slightly rugose. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane pellucid, in parts slightly coriaceous, furnished with a rather irregular unispiculous network of short acerate spicula, of the same form and size as those of the skeleton, and also with numerous simple and contort bihamate retentive spicula. Skeleton-rete rarely more than unispiculous, somewhat irregular; spicula acerate, rather short and stout. Interstitial membranes furnished rather abundantly with very minute simple and contort retentive spicula.

Colour, in the dried state, pallid green.
Hab. Straits of Malacca (*Commodore Parish, R.N.*).
Examined in the dried state.

I received this interesting and elegantly constructed species of *Halichondria* from my friend Commodore Parish, who obtained it from the Straits of Malacca. The sponge is, in a great measure, covered by the specimen of *Microciona tuberosa* described in this paper. Its length is about $2\frac{1}{2}$ inches, and its breadth about $1\frac{1}{4}$ inch. The dermal membrane is smooth and pellucid, and it is furnished with a beautiful unispiculous rete, the areas of which are somewhat unsymmetrical. The reticulated structure of the skeleton accords very closely with that of the dermis: it is mostly unispiculous, but occasionally it is bi- or trispiculous, and is characterized by the same irregularities in the reticulation that exist in the dermal structure, so that the whole structure is light and elegant. The form and size of the spicula are the same in all parts of the sponge; they are rather short and stout. The retentive spicula of the dermal and interstitial membranes are especially characteristic of the species; they are rather abundantly distributed on some parts of those tissues and but sparingly so on others, and they are so minute as to require a power of about 400 linear to render them distinctly to the eye.

The nearest allied species to this sponge is our British *Halichondria couchii*. In size and external form they are very different from each other; but structurally, as regards the dermal and skeleton-tissues, they so closely resemble each other as to render it very difficult to separate them. Fortunately the abundance of bihamate retentive spicula in *H. elegantia* and their complete absence in *H. couchii* renders the discrimination of the two species easy and certain.

HALICHONDRIA ASPERA, Bowerbank.

Sponge massive, sessile; surface uneven and very rugged. Oscula simple, large and numerous, dispersed. Dermal membrane pellucid, abundantly spiculous; tension-spicula biclavate cylindrical, loosely fasciculated; and long and slender acerate, dispersed; retentive spicula bidentate equianchorate, stout and comparatively large, few in number; and the same form very minute and rather numerous; also bihamate, comparatively large and strong, few in number; and the same form very minute and slender and much more numerous. Skeleton-rete more or less multispiculous, rather regular; spicula short and stout, acuate, occasionally subflecto-acuate. Interstitial membranes sparingly furnished with the same tension- and retentive spicula as the dermal membrane.

Colour, in the dried state, pallid green.
Hab. Straits of Malacca (*Commodore Parish*).
Examined in the dried state.

I received this sponge among others from my friend Commodore Parish, who obtained it from the Straits of Malacca. It is $2\frac{1}{2}$ inches long by 2 in breadth; and the thickness is rather more than an inch. Its form is very irregular, and its surface exceedingly rugged and uneven, abounding in minute ridges and asperities, so much so that it is difficult at the first sight to distinguish the oscula. The dermal membrane is abundantly furnished with spicula. There are two distinct forms of the tension ones; the most abundant of the two are the biclavated cylindrical ones, which are usually gathered together in loosely formed fasciculi of from two or three to six or eight; and a few of them are dispersed singly among the others. The fasciculi are disposed without any approximation to order. The second form of tension-spiculum is very slender acerate or fusiformi-acerate; they are longer than the biclavated cylindrical ones, but less in their greatest diameter, and they are distributed singly in considerable number among the others. The occurrence of two distinct forms of tension-spicula and two different modes of their distribution is very rarely seen in the dermal membrane of the same sponge, and thus it is very characteristic of the species. The retentive spicula are also very remarkable in this species. There are two distinct sorts of bidentate equianchorate ones, and also of bihamate spicula. The largest sort of bidentate equianchorate ones are more than twice the size of the smaller anchorate ones; comparatively they are stout and strong; but they are very few in number, while the smaller ones are comparatively numerous. A full-sized large one measured $\frac{1}{1000}$ inch in length, while the average length of smaller ones was $\frac{1}{2300}$ inch in length. The same difference in size exists between the two sorts of bihamate spicula. The largest sort measured $\frac{1}{750}$ inch in length, while two of the smaller ones measured respectively $\frac{1}{1500}$ and $\frac{1}{1875}$ inch in length. They are also comparatively very numerous, while the larger ones are of very rare occurrence. No gradational sizes exist between the large and small forms of either the anchorate or bihamate spicula. The small

description of both of these organs require the application of a power of at least 400 linear to render them distinctly to the eye. Their minuteness is such that they do not exceed in length the diameter of a skeleton-spiculum, $\frac{1}{1500}$ inch.

The skeleton-rete is strongly developed, and the spicula are comparatively short and very stout.

The nearest alliance to this sponge among our British species is *Halichondria forcipis*. Its general habit, the forms and modes of disposition of the spicula of the dermis, and the form and proportions of the skeleton-spicula exhibit close resemblances; but in other important characters the two species are essentially different.

HALICHONDRIA FRONDIFERA, Bowerbank.

Sponge branching from the base numerously; branches rather compressed, frequently dividing, distal terminations spinoid. Surface minutely rugose. Oscula simple, minute, dispersed. Pores inconspicuous. Dermal membrane abundantly spiculous; tension-spicula acuate, rather long and slender, dispersed; retentive spicula bidentate equianchorate, very minute and few in number. Skeleton-rete multispiculous, compact, rather close and strong, areas small; spicula acuate, rather stout and short. Internal defensive spicula attenuato-acuate, entirely spined, short and stout, uniform in size, rather numerous.

Colour, in the dried state, dull grey.

Hab. Straits of Malacca and Gaspar Straits (*Commodore Parish, R.N.*).

Examined in the dried state.

I am indebted to my friend Commodore Parish for this remarkable sponge; he obtained it with many others from the Straits of Malacca. It is attached to the shell of a small *Spondylus*, nearly the whole of the valve of which is covered by the thin basal portion of the sponge, from which numerous slender compressed branches are given off, some of them nearly two inches in length; each of these branches resembles in form a stag's horn, but with many more divisions than would be possessed by the horn. The oscula are simple and minute, a few only near the distal terminations of the branches being visible with the aid of a lens of two inches focus. The tension-spicula of the dermal membrane are exceedingly numerous, so much so as almost to present a felted appearance; they are quite as long as those of the skeleton, but not more than half their diameter. The bidentate equianchorate retentive spicula are very minute and slender, and very few in number: I could not detect them *in situ*; but amidst the spicula prepared by the action of nitric acid I found them on some of the fragments of the dermal membrane and a very few among the other spicula; one of the largest of them measured $\frac{1}{2000}$ inch in length. They require a power of about 400 linear to render them distinctly to the eye. The attenuato-acuate, entirely spined, internal defensive spicula are uniform in size and rather numerous; they are based on the skeleton-rete, and

are projected at right angles to the fibre into the areas, frequently in considerable numbers; a power of about 300 linear is required to exhibit them *in situ* in a satisfactory manner; their length rarely exceeds $\frac{1}{300}$ inch.

The acuate skeleton-spicula are distinctly different in their proportions from those of the dermis; their diameter is twice that of the dermal ones. A full-sized one measured $\frac{1}{2000}$ inch in diameter.

Since the above description was written I have examined another specimen of this species, sent to me from the Straits of Gaspar by Commodore Parish. It is, in its external and anatomical characters, very like the type one, but rather larger and more strongly developed. A remarkable circumstance attending this specimen is that it has two very interesting radiate animals seated upon it, the small or basal arms of which are so interwoven amidst the branches of the sponge as to render it impossible to disentangle them without the destruction of the radiate animals, while the larger and longer arms for entangling their prey are thrown out above in every direction. Their mode of anchoring themselves on the sponge is an interesting fact in their natural history.

HALICHONDRIA RIGIDA, Bowerbank.

Sponge massive, sessile. Surface very rugged and uneven, full of ridges and depressions. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane pellucid, spiculous; tension-spicula acuate, the same diameter and nearly the same length as those of the skeleton; retentive spicula bihamate, simple, and contort, rather numerous; and bidentate equianchorate, small, but rather stout, not numerous. Skeleton-rete multispiculous, very wide and open, irregular; areas very variable in size; spicula purely acuate, rather short and stout. Interstitial membranes sparingly spiculous; spicula same as those of the dermis.

Colour, in the dried state, dull green.

Hab. Straits of Malacca (*Commodore Parish, R.N.*).

Examined in the dried state.

I obtained this sponge from my friend Commodore Parish. It is from the Straits of Malacca. It is 2½ inches long, 1 inch wide, and rather exceeds half an inch in average thickness.

The dermal membrane is rather sparingly furnished with tension-spicula. There is very little difference between these spicula and those of the skeleton; the latter are rather the longer of the two; their diameter is about the same. In consequence of the open structure of the skeleton-rete there are a considerable number of surreptitious spicula of various forms amidst the tissues of this sponge; and fragments of some of these are occasionally incorporated in the skeleton-fibre, as in a *Dysidea*. The spicula in the fibre are numerous and closely compacted, and the areas very wide, but by no means equal or regular in either form or size. The bihamate retentive spicula are not very abundant; they are rather slender; and the simple and contort forms are about equal in number, and

they are about as numerous on the interstitial membranes as on the dermal one. The bidentate equianchorate ones are rather rare; they are not readily found *in situ* amidst the numerous minute grains of sand adherent to the membranes; but they are readily found among the spicula prepared by the aid of nitric acid, but they require the application of a power of about 400 linear to render them distinctly to the eye; they are stout and short in their proportions.

The interstitial membranes are usually rather sparingly spiculous; but occasionally the spicula are clustered together in considerable quantities.

HALICHONDRIA CRASSA, Bowerbank.

Sponge massive, sessile. Surface uneven and very rugged, with numerous irregular thin ridges and elevations, coarsely reticulated. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane spiculous; tension-spicula acuate, same size and form as those of the skeleton, not very numerous; retentive spicula, two descriptions of bihamate, simple and contort, large and small, and bidentate equianchorate minute, and few in number. Skeleton-rete multispiculous, coarse, and strong; areas large and irregular; spicula acuate, rather short and stout. Interstitial membranes spiculous; spicula same as those of the dermis.

Colour, in the dried state, dull pale green.
Hab. Straits of Malacca (*Commodore Parish*).
Examined in the dried state.

I received a single specimen of this sponge from my friend Commodore Parish, who obtained it from the Straits of Malacca. It is a rough-looking mass, very irregular in form, about 1½ inch in diameter, and half an inch in thickness, and it has several specimens of *Balanus* imbedded in its substance. Its surface is full of sharp, thin, elevated ridges and deep depressions; and all parts of its surface are coarsely reticulated, the reticulation being more or less visible to the unassisted eye, and very apparent by the aid of a lens of 2 inches focus. This coarse reticulation arises in the dried specimen from the very coarse and open character of the skeleton-structures immediately beneath the dermis.

The oscula are rather numerous; and some of them exceed a line in diameter. The dermal membrane is in some parts rather sparingly, and in others profusely, furnished with its respective spicula; the tension ones, like those of the skeleton, are purely acuate. Of the bihamate retentive spicula there are two distinct sizes—one comparatively large (that is to say, measuring on an average $\frac{1}{682}$ inch in length), while the minuter set of these forms measured only $\frac{1}{2727}$ inch in length. These minute forms could not be detected *in situ*; but in the remains of the membranes rendered transparent by the action of nitric acid and mounting in Canada balsam, and with a power of about 700 linear, they were distinctly visible. The bidentate equianchorate retentive spicula were also minute; they varied in length from $\frac{1}{1054}$ inch to $\frac{1}{375}$ inch, and required a power of about 400

linear to define their forms distinctly; proportionately they were rather stoutly and strongly formed.

The structural peculiarities of the skeleton form a very striking specific character in this species. The rete is strongly and compactly formed, and the number of spicula in any part of it is far greater than can be counted. The areas are unsymmetrical and rather variable; and the interstitial membranes filling them are frequently abundantly supplied with the same description of spicula as those of the dermal one.

HALICHONDRIA COMPRESSA, Bowerbank.

Sponge branching irregularly and abruptly; branches compressed. Surface more or less rugose or spinous. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane spiculous; tension-spicula subclavate acuate, variable in form, dispersed or more or less fasciculated; retentive spicula bidentate, rarely tridentate equianchorate, comparatively large and very stout, rather few in number; and the same form minute and slender, numerous. Skeleton-rete multispiculous, very irregular; areas large and variable in form; spicula acuate, rather short and stout. Interstitial membranes sparingly spiculous; spicula same as those of the dermis.

Colour, in the dried state, dark green.
Hab. Straits of Malacca (*Commodore Parish, R.N.*).
Examined in the dried state.

I received this remarkable sponge with others from my friend Commodore Parish, who obtained it from the Straits of Malacca. It is rather less than 2 inches in height, and less than an inch wide at its greatest expansion. The external form is remarkably singular. It rises from a very small base, and immediately branches abruptly in every direction and at every possible angle. The branches are nearly all of the same size, and are all more or less compressed, and their surfaces rough and irregular.

The dermal membrane is comparatively stout, and in most parts it is abundantly spiculous. The tension-spicula are occasionally subfasciculated, or so numerous as almost to appear felted together; while in others they are dispersed singly, and rather sparingly distributed, crossing each other at various angles. These spicula are subject to considerable variation in form: all of them are more or less subclavate at the base, but their shafts exhibit the greatest amount of variation; some are quite attenuato-acuate, while others terminate so obtusely as to closely approach the cylindrical form; and gradational forms between the two extremes are of frequent occurrence. The bidentate equianchorate retentive spicula also exhibit very remarkable characters. There are two very distinct sorts of them—one comparatively large and of very robust structure, the other very minutely slender and delicate; both have their shafts semicircular. The larger ones average $\frac{1}{600}$ inch in length, with a diameter of shaft of $\frac{1}{3000}$ inch; the smaller series never appear to exceed $\frac{1}{12000}$ inch in length, and the shaft of one of the

largest of them measured $\frac{1}{12000}$ inch in diameter. In these smaller ones there also exists another peculiarity; and that is that the terminal teeth are given off at nearly right angles to the axis of the shaft. These peculiarities of the tension and retentive spicula of the dermal membrane, combined with the eccentric and singular form of the sponge, afford excellent specific characters to discriminate this from any other nearly allied species.

HALICHONDRIA VARIA, Bowerbank.

Sponge massive, sessile, variable in form. Surface smooth or rough and rugged. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane spiculous, reticulated; rete unispiculous; spicula acerate, stout, same size and form as those of the skeleton; retentive spicula bihamate, simple and contort, minute and slender, very numerous. Skeleton-rete compact, uni- or bispiculous; areas unsymmetrical; spicula acerate, short and stout. Interstitial membranes—retentive spicula bihamate, simple and contort, slender and minute, numerous.

Colour, in the dried state, dull ochreous yellow.
Hab. Straits of Malacca (*Commodore Parish*).
Examined in the dried state.

The external characters of this sponge are exceedingly variable. Sometimes it appears as a rough and irregular mass, full of small ridges and prominences; at other times it assumes the form of short cylindrical branches, with a surface comparatively smooth, and with the oscula well developed and evenly distributed. Notwithstanding these striking variations in form, the structural characters are exactly the same in every specimen. The most striking specific characters are exhibited in the dermal membrane, the unispiculous rete of which is a very beautiful object when mounted in Canada balsam. The rete is seldom more than one spiculum in width; and the areas vary to a very considerable extent in form; and the membranes filling the areas are in many cases crowded with the minute slender bihamate retentive spicula. These spicula are very small and slender, and require a power of about 300 linear to define them in a satisfactory manner. Their length does not exceed twice the diameter of a skeleton-spiculum.

The skeleton-rete is compact and strongly constructed, with but slight approaches to symmetry. The areas are very variable in form, and each side rarely ever exceeds one spiculum in length. The short stout acerate spicula of which it is formed are the same in length and form as those of the dermal rete. Within the mass of the sponge there are frequently to be seen interstitial cavities of comparatively considerable size; and in the lining membranes of these the minute bihamate retentive spicula abound to quite as great an extent as in the dermal membrane. I received several small specimens of this sponge from my friend Commodore Parish, who obtained them from the Straits of Malacca.

HALICHONDRIA PURPUREA, Bowerbank.

Sponge massive, sessile. Surface very rough and rugged. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane spiculous; tension-spicula fusiformi-acuate, rather slender, longer than those of the skeleton, very numerous; retentive spicula bidentate equianchorate, very minute, equable in size, numerous. Skeleton-rete very coarse and open; fibre multispiculous, very stout and compact; spicula fusiform acuate, short and stout. Interstitial membranes spiculous; spicula same as those of the dermis, dispersed, numerous. Sarcode dark purple.

Colour, in the dried state, dark purple.
Hab. Straits of Malacca (*Commodore Parish*).
Examined in the dried state.

Among the sponges from the Straits of Malacca which I received from my friend Commodore Parish, there was a specimen of a *Sertularia*, on which there were four species of parasitical sponges located, and among them the one in course of description. It is a small mass about half an inch wide at the base, gradually decreasing in size, and terminating acutely at the height of $1\frac{1}{4}$ inch, of a deep-purple colour. The surface is remarkably rugged, full of deep pits and sharp elevations. The dermal membrane is very characteristic of the species; it abounds in spicula; the tension ones are frequently nearly twice the length of the skeleton ones, while they are very little more than half their diameter. They are very numerous, in some parts forming flat wide fasciculi, and in others they are scattered indiscriminately over the surface of the membrane. The retentive bidentate equianchorate ones are also very characteristic; they are slender and delicate in form, very equable in size, and very minute; they do not exceed $\frac{1}{1363}$ inch in length, or twice the diameter of a fully developed skeleton-spiculum, which measured $\frac{1}{2545}$ inch in diameter. Nearly the whole of these spicula, seen *in situ*, were firmly attached to the surface of the membrane by the middle of the convex back of the shaft. They were very numerous on some parts of both the dermal and interstitial membranes. Occasionally a few also of the short stout skeleton-spicula were mingled with the tension-spicula of both the dermal and interstitial membranes.

The skeleton-structure is remarkably coarse and strong, the fibre containing a far greater number of spicula than is usual in skeletons of the genus *Halichondria*, and the areas are wide and irregular in their form. These peculiarities of structure seem to indicate that this species attains a much greater size than the specimen under description. The whole of the internal sarcode, as well as the external portions of the sponge, are of a dark purple colour.

ISODICTYA RUDIS, Bowerbank.

Sponge massive, sessile. Surface rugged and very uneven. Oscula simple, dispersed, numerous. Pores inconspicuous. Dermal membrane abundantly spiculous; tension-spicula acerate, long and slender, numerous, dispersed. Skeleton—texture coarse and irregular; pri-

mary lines multispiculous; secondary lines very irregular, mostly unispiculous, occasionally bi- or trispiculous; spicula acuate, stout, and rather short. Interstitial membranes sparingly spiculous; spicula same as those of the dermis.

Colour, in the dried state, pale ochreous yellow.
Hab. Straits of Malacca (*Commodore Parish*).
Examined in the dried state.

The external characters of this species are by no means prepossessing. It is a rough and very uneven mass, 2 inches in length and about 1 inch in greatest diameter, full of ridges and depressions. Sections cut at right angles to the surface do not readily illustrate the characteristic structure of *Isodictya*, in consequence of the coarse and irregular nature of the skeleton; but on a more careful examination the presence of the stout continuous primary lines of the skeleton unmistakably lead us to a correct determination of the genus. The dermal membrane is very characteristic of the species. It is abundantly supplied with long, slender, acerate tension-spicula, irregularly distributed and crossing each other in every direction. These spicula are quite as long, and frequently longer, than those of the skeleton, while their diameter varies from half to one third of those of the last-named organs.

The skeleton-structure is very open and irregular, and the spicula in the primary fibres are very numerous; they are acuate and comparatively stout and short. The secondary lines are very irregularly distributed and rather numerous; so that when a section of the sponge is hastily examined, it is very liable to be mistaken for that of a *Halichondria*.

I received this species from my friend Commodore Parish, who obtained it from the Straits of Malacca.

Isodictya virgata, Bowerbank.

Sponge virgultose, more or less fistulous. Surface smooth. Oscula simple, dispersed, rather large. Pores inconspicuous. Dermal membrane spiculous; spicula acerate, same size and form as those of the skeleton, reticulated; rete rarely more than unispiculous or bispiculous, areas irregular in form; retentive spicula bihamate, simple, and contort, rather numerous, minute. Skeleton diffuse and irregular; primary lines multispiculous, spaces between them varying from one to two spicula in width, rarely wider; secondary lines bi- or trispiculous, irregular. Interstitial membranes furnished abundantly with minute simple and contort bihamate retentive spicula, same as those of the dermis.

Colour, in the dried state, pale ochreous yellow.
Hab. Straits of Malacca (*Commodore Parish*).
Examined in the dried state.

This sponge consists of two short branches based on a small fragment of stone or coral; the tallest of the two does not exceed 2 inches in height, and about 2 lines in diameter; for a portion of its length there is a central fistulous cavity, but it does not appear at the

distal extremities of the branches. The skeleton-structure of this species appears to be very irregular; but the well-produced primary lines of the skeleton unmistakably stamps it as an *Isodictya*. The rete of the dermal membrane is more or less irregular, and is, with its retentive spicula, very characteristic of the species. Its areas frequently exceed in width the length of a spiculum, and they vary to a considerable extent in form. The retentive spicula within them are in some of them rather numerous, while in others they are very sparingly distributed; they are very minute and slender, requiring a power of about 500 linear to render them distinctly to the eye. In the interstitial membranes the retentive spicula are very much more numerous than they are in the dermal one; and they are especially so in the linings of the fistulous cavities.

It is very probable that hereafter this species will be found to attain a much greater altitude than the specimen in course of description. I am indebted to my friend Commodore Parish for my knowledge of it. He obtained it from the Straits of Malacca.

Desmacidon foliodes, Bowerbank.

Sponge ramous, branches inosculating. Surface smooth, but more or less spiniferous. Oscula simple, dispersed. Pores inconspicuous. Dermal membrane pellucid, spiculous, furnished with a leaf-like reticulation of minute acerate spicula. Skeleton—reticulating fibres compact and strong; areas wide and irregular. Spicula acerate, rather small and short. Interstitial membranes spiculous; tension-spicula dispersed, same form and size as those of the dermis.

Colour, in the dried state, dull ochreous yellow.
Hab. Straits of Malacca (*Commodore Parish*).
Examined in the dried state.

This sponge and a small specimen of *Geodia carinata* are based together on a little sandy mass; they are so closely incorporated, and so nearly resemble each other in size, colour, and form, as to be readily mistaken by a hasty observer for one species only. The sponge-stem has an irregular expansion of 4½ inches length, and has an average diameter of about 4 lines; one portion of the branches is comparatively smooth, while another portion abounds in spinous projections.

The most strikingly distinctive character in this sponge exists in the dermal membrane. When a portion of it is mounted in Canada balsam and viewed with a linear power of about 100, it exhibits an appearance exceedingly like that of a portion of the skeleton of a macerated leaf of *Populus nigra*. There are a series of veins or long fasciculi composed of numerous minute acerate spicula meandering for considerable lengths on the inner surface of the membrane; and the spaces between each of these are occupied by a very delicate uniserial network of minute spicula, simulating in a remarkable manner the leafy skeleton. The skeleton-rete is very open and irregular, and the fibre of which it is composed is very closely compacted; the acerate spicula of the skeleton are very much larger

than those of the dermal membrane; but the whole of the spicula are rather small, requiring a power of about 300 linear to render their forms and proportions distinctly.

The interstitial membranes are abundantly supplied with acerate spicula irregularly dispersed, and of the same size as those of the dermis. I am indebted to my friend Commodore Parish for this interesting species. He obtained it from the Straits of Malacca.

DESMACIDON VENUSTA, Bowerbank.

Sponge sessile, fistulous; fistulæ comparatively large and open. Surface smooth and even. Oscula simple, within the fistulæ. Pores inconspicuous. Dermal membrane pellucid, abundantly spiculous, reticulated; rete unispiculous, very regular and beautiful; areas mostly triangular, rarely quadrangular; spicula acerate, short and stout, same size as those of the skeleton. Skeleton-rete very diffuse and irregular; fibres slender and compact; spicula small, short, and stout. Interstitial spaces filled with beautiful masses of unispiculous reticulated structure; spicula same as those of the fibrous skeleton; areas same size and form as those of the dermal membrane.

Colour pale ochreous yellow in the dried state.
Hab. Straits of Malacca (*Commodore Parish*).
Examined in the dried state.

This sponge consists of four short stout fistulæ, not quite an inch in height, the whole mass averaging about $1\frac{1}{2}$ inch in breadth, and the parietes of the fistulæ are about $\frac{1}{8}$ of an inch in thickness. The structural peculiarities of the dermal membrane, when a small portion of it is mounted in Canada balsam and viewed with a power of about 100 linear, are remarkably regular and beautiful, and especially characteristic of the species. The rete consists of an elegantly symmetrical network of single spicula, with nearly the whole of the areas of a triangular form, a quadrangular one being of rather rare occurrence; and as the component spicula are very equal in their lengths and diameters, the result is a remarkable degree of symmetry and beauty. The whole of the interstitial spaces within the fibrous skeleton are filled with masses of a similarly regular and beautiful unispiculous reticular structure, closely simulating that of the dermal structure; and amidst this beautiful tissue the long, slender, fibrous skeleton meanders in various directions. Although the structural characters of this species are few and simple, the regularity and beauty of the modes of their disposition afford excellent specific characters for its identification. The only species of *Desmacidon* with which it might possibly be confounded is *D. folioides*, from the same locality; but, independent of the differences of external form, the last-named species differs in the dermal membrane being furnished with the peculiar leaf-like arrangement of its rete, and in the interstitial spaces; the spicula are only sparingly dispersed on the membranes. In both species the spicula are of about the same length; but those of the species in course of description are twice the diameter of those of *D. folioides*.