

red, nearly the same as in *Rupicola crocea*; but I may remark that *C. victor* gets this splendid garb immediately after its first green dress, without going into an intermediate yellow dress, such as that of *C. luteovirens*. One of the specimens of *C. victor* which I have had the pleasure of examining showed the change of plumage very clearly, having on the sides of the belly and flanks still some grass-green feathers, the remnants of the first plumage. Another point of importance is also the range of both species. *C. luteovirens* has been found only on the islands of Viti-Levu and Ovalau, whereas *C. victor*, so far as our knowledge extends, is confined to the small islands of Taviuni and Lanthala, on the east coast of the large island Vanua-Levu. I believe the above-given remarks and comparisons between *C. luteovirens* and *C. victor* are sufficient to prove that they form excellent species, which ought not to be confounded in any way; at least Mr. Layard must give us far more exact and minute explanation in order to prove that his conclusions are right.

10. A Monograph of the Siliceo-fibrous Sponges. By J. S. BOWERBANK, LL.D., F.R.S., F.Z.S., &c.—Part V.

[Received September 17, 1875.]

(Plates LXI. & LXII.)

*FARREA SPINIFERA*. (Plate LXI. fig. 1.)

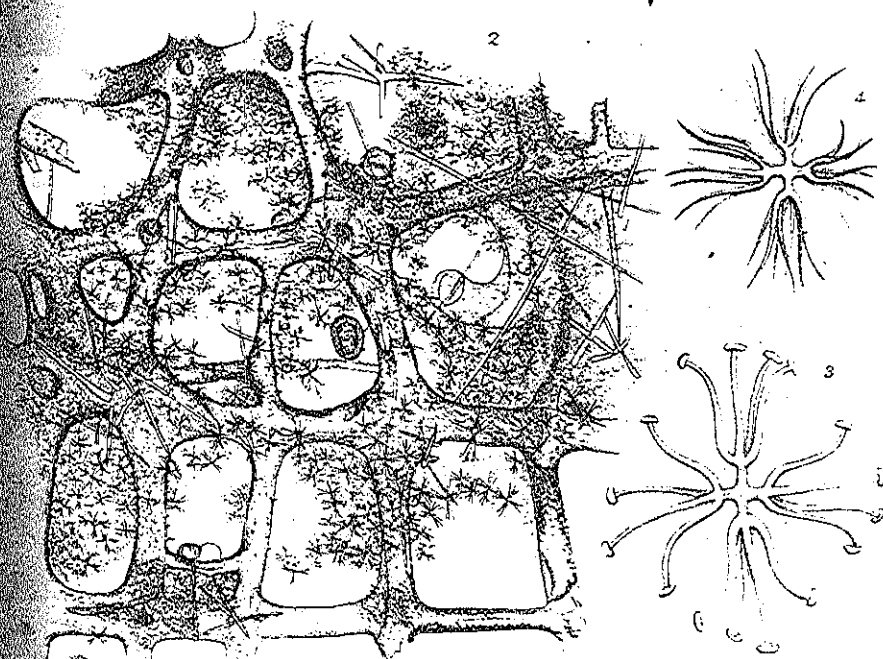
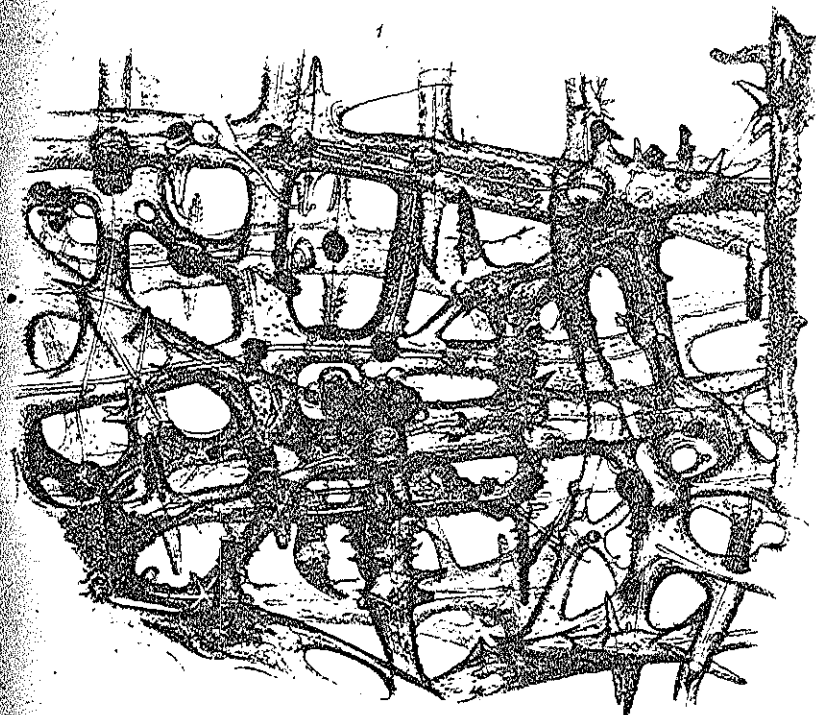
Sponge-form unknown. Dermal membrane unknown. External skeleton-surface (?) irregular; primary fibres branching and anastomosing, large and strong, armed irregularly with very large and strong, acutely conical spines; fibres and large spines mostly smooth, occasionally incipiently and minutely spinous; secondary fibres minutely spinous. Internal surface similar in character to the external one, but less strongly developed. Interstitial stratum—rete irregular, fibres more slender than those of the external surfaces, profusely minutely spinous, spines symmetrically disposed in about equidistant linear series in accordance with the long axis of the fibre. Sarcodæ dark amber brown.

Colour, in the dried state, dark amber.

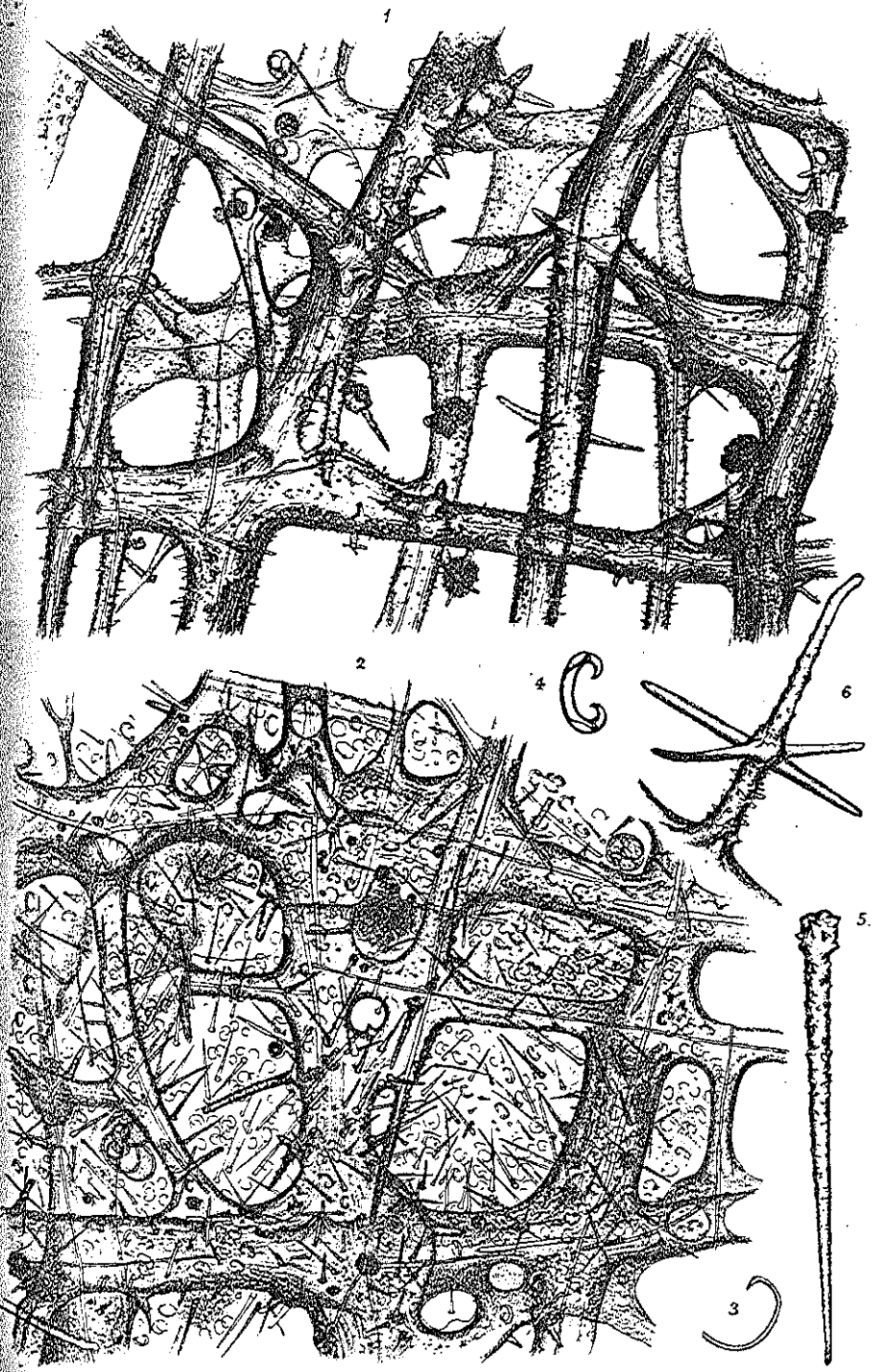
*Hab.* West Indies, Captain Hunter, R.N.?

Examined in the dried state.

The specimen from which this species is characterized is a fragment seven lines in length, by four in greatest breadth; and it has every appearance of having been part of the side of a small cup-shaped Sponge. I have presumed that the surface having the stoutest fibres and the greatest amount of defensive armature is the external one. There are no indications of a symmetrical dermal rete, such as we find in some other species of *Farrea*; but the skeleton-fibres are quite in accordance with the structural peculiarities of those of many species of that genus, and I have therefore referred



*Farrea spinifera* 1. *F. spinulenta* 2-3.



*Farrea aculeata* 1. *F. robusta* 2-6.

it to *Farrea* until further information on the subject enables us to assign it more correctly to its proper place among the siliceo-fibrous sponges.

The primary skeleton-fibres are large and cylindrical, but of unequal diameter, and mostly have the appearance of transparent longitudinal striation from their strongly marked lines of growth, and they are more or less minutely spinous; their course is irregular, not running in straight lines, but in meandering ones, branching at intervals and again anastomosing with each other. Their large conical defensive organs are not all systematically projected outwards at about right angles to the dermal surface; some are so disposed, while others have a lateral direction, or are projected at various intermediate angles.

The central system of canals in the primary fibres is subject to considerable irregularity. Sometimes they are regularly confluent; at others they are produced in opposite directions, and their distal ends pass each other, and each has a caecoid termination. It is not an unusual circumstance to see a short sexradiate arrangement of canals within one of the large fibres, as if the process of the production of new branches was first, the development of the canals within the parent fibre, and then the projection of the young offshoots in accordance with the nascent canals. In some cases there is not the slightest indication on the surface of the large fibre of the coming offshoot, while in others there is a very slight elevation on its surface immediately above the nascent canal; or the young shoot, in the form of an acutely conical projection, is unmistakably present with the continuation of the canal in its centre to its apex, where it usually appears to be open in the early stage of its development, with extremely delicate margins; but in a more advanced stage of its growth the apex becomes solid. These projections of young branches are readily to be distinguished from the conical external defences by their canals, while the defensive organs appear to be perfectly solid.

The inner external surface has the same characters as the outer one, but the dermal skeleton-fibres seem to be rather more slender. The intervening skeleton is more regular in its construction than the external layers. The reticulation is more regularly quadrate and the areas smaller. The fibres are also smaller and more profusely spinous; and the central canals are more continuous and confluent than those of the fibres of the external surface, and in some parts they are densely coated with dark-coloured opaque sarcodæ. I could not detect the slightest traces of any detached spicula amidst the structures.

This interesting specimen is in the cabinet of my friend Mr. H. Deane, who, I believe, received it with other specimens from Captain Hunter, R.N.

Since the above description was written, I have received another specimen of this species from my friend Mr. Deane. It is about four lines square, and is closely attached by one of its broad surfaces to the side of a small fragment of a *Vermetus*, and does not exhibit

traces of any pedicel. In every anatomical character it is in close accordance with the type specimen. A portion of this specimen is quite obscured by a crowd of Foraminifera and Polycistina entangled in the areas of the skeleton-rete.

The decease of my friend Mr. Deane does not allow of my determining the locality of this species with certainty; but I am strongly of opinion that it was collected by Captain Hunter in the West Indies, along with *Farrea Gassioti* and other similar specimens.

*FARREA SPINULENTA.* (Plate LXI. figs. 2 & 3.)

Sponge-mass unknown. Dermis furnished with a quadrilateral siliceo-fibrous network, armed at the angles oppositely externally and internally with imbricated elongate-conical spicular defences. Fibre solid, without canals, minutely spinous; spines acutely conical, rather numerous, symmetrically disposed. Dermal membrane thin, translucent, abundantly furnished with spinulo-quadrifurcate sexradiate stellate retentive spicula dispersed. Interstitial spicula large, simple, rectangulate, sexradiate; radii acerate, more or less spinous. Sarcode light brown.

Colour, in the dried state, light brown.

*Hab.* Tripoli (*Captain C. Tyler*).

Examined in the dried state.

The portion of the sponge representing this very interesting species is not quite the eighth of an inch in diameter. It was presented to my friend Captain Charles Tyler by Mr. Deane. It was found off the coast of Tripoli. The specimen is but a minute portion of the dermis of a sponge the mass of which is unknown to us; but the nature of the structures displayed by its microscopical examination unmistakably indicates that it belongs to the genus *Farrea*. The quadrilateral siliceo-fibrous network of the dermal rete accords in form very closely with that of *Farrea occa*. The fibres in each species are solid; and, as in *F. occa*, the angles of the tissue, both externally and internally, are armed with imbricated conical spicular defences; but these organs are longer and more slender in their proportions than in those of *F. occa*.

Thus far they agree very closely in their structures. They differ from each other in other important characters. The fibres in *F. occa* are quite smooth, while those in the species under consideration are regularly and systematically spinous, forming a very important specific character. These spines are not irregularly dispersed; they are disposed in equidistant parallel lines, in accordance with the long axis of the fibre, the spines in each line being also at about equal distances from each other and opposite the middle of the intervening spaces of those in the lines on each side of them, so that their mode of disposition on the fibre is remarkably symmetrical and very characteristic. Other essential differences occur in the dermal membranes of the two species. In the quadrilateral, smooth, siliceo-fibrous network of the dermis of *F. occa*, described in the Proceedings of the Zoological Society of London for March 13, 1869,

p. 339, plate xxiv. fig. 7, there are some very small portions of the dermal membrane on parts not represented in the figure *in situ* on some of the angles of the rete, in which there were fragments of extraneous spicula of various forms embedded in the sarcode; but I could not detect any form among them that could be assigned with any degree of probability as belonging to that dermal membrane, while in that of that of the species under description the dermal membrane abounded with them. The form of these spinulo-quadrifurcate sexradiate stellate spicula is slender and very beautiful; and they are so numerous in some parts of the tissue, and so closely packed together, that their forms are completely obscured; but in other parts, where a few only occur, they may be frequently seen in a very perfect condition. They are very minute: one of the largest that was measured did not exceed in its extreme diameter  $\frac{1}{100}$  inch; and the quadrifurcate terminal spicula measured  $\frac{1}{200}$  inch in diameter.

The large, simple rectangulate sexradiate interstitial spicula with spinous radii, a few of which are entangled in the inner surface of the dermal rete, also form efficient specific characters, none such having hitherto been found in *Farrea occa*.

*FARREA ACULEATA.* (Plate LXII. fig. 1.)

Sponge—form, dermal membrane, oscula, and pores unknown. Skeleton—primary fibres cylindrical, stout, branching, and anastomosing, furnished profusely with acutely conical spines irregularly dispersed, and with numerous long, slender defensive prickles projected in various directions, covered with minute spines, and also with numerous rectangulate sexradiate defensive organs, radii slender, entirely spinous; canals very slender, confluent, frequently obsolete. Secondary fibres the same as the primary ones, short and less in diameter.

Colour, in the dried state, dark amber?

*Hab.* West Indies (*Captain Hunter, R.N.?*).

Examined in the skeleton state.

The specimen, a portion of which is represented by fig. 1, Plate LXII., is 10 lines long, by 6 wide. It has apparently formed part of a rather large-sized cup sponge. From the flatness of the specimen and the uniformity of the two surfaces, it cannot be determined with certainty which of the two was the outer or inhalant one; but I am inclined to believe that the figure represents a part of the outer surface; nor can its locality be accurately determined. The specimen was presented to me by my late friend Mr. Henry Deane, with several other siliceo-fibrous ones, including those from the West Indies collected by Captain Hunter, R.N.; and I am strongly inclined to believe the locality to be the same as that of *Farrea Gassioti*, lat. 14° 8' N., long. 77° 33' W., West Indies, 800 to 1000 fathoms.

The reticular skeleton of this species is very regular, by far the greatest number of the areas being square, and the fibres in both directions being of about the same diameter. There appears gene-

rally to be two layers of skeleton-structure; and occasionally a portion of a third layer may be seen between them; and this intermediate one appears to be very much less regular in its structure than either of the other two. The acutely conical spines on the fibres are not equally dispersed; on some parts they are very numerous, while on others they are much less in number. The aculei are very characteristic organs. They are of unequal length, and irregular in their mode of disposition. On some fibres a single one is projected; on others there are two on opposite sides of the fibre; and sometimes there are three or four developed in directions opposite to each other. They are rather slender, and attenuate gradually from the base to the distal extremity, which is frequently very slender and acute. The rectangulate sexradiate defensive organs are numerous; they are of nearly equal size, and are disposed irregularly among the fibres; but they are mostly projected into the square areas of the skeleton-rete. The canals in the skeleton-fibres are very slender, and in many of the large ones they are partially or entirely obsolete.

I know of no other species for which *F. aculeata* might be readily mistaken except *F. spinifera*. The former species differs from the latter in the smallness and very much less-developed state of the canalication of its fibres, and in the far greater development of the minute spination of its skeleton—also in the abundance in the former species of the rectangulate sexradiate internal defences, while in the latter they appear to be totally absent.

*FARRA ROBUSTA.* (Plate LXII. figs. 2-6.)

Sponge—form cup-shaped? surface minutely hispid. Oscula and pores unknown. Dermal membrane thin and pellucid, abundantly spiculous; tension-spicula long and very slender, subclavate, cylindrical, very few in number; retentive spicula simple and contort, bihamate, small and slender, dispersed, rather numerous, and bidentate equianchorate small and few in number; furnished also with numerous internal defensive spicula of subspinulate, attenuato-acuate forms, entirely incipiently spinous, projected at various angles from the inner surface of the membrane.

Skeleton—fibres very large and strong, cylindrical, sparingly spinous or aculeated; aculei short and slender, dispersed; armed abundantly with rectangulate sexradiate defensive organs, radii slender, attenuated, incipiently spinous. Rete more or less quadrangular, areas frequently very little more in breadth than the diameters of the skeleton-fibres. Central canals small.

Colour, in the dried state, dark amber.

*Hab.* West Indies (*Captain Hunter, R.N.?*).

Examined in the skeleton state.

I have seen only a single specimen of this remarkable sponge. It was given, with other specimens, by the late Mr. Henry Deane to my friend Captain Charles Tyler, who kindly presented it to me for description and publication. It consists of a thin plate of siliceo-fibrous

structure of an irregular form, of an average diameter of half an inch. It is constructed of two, and in some parts of three, layers of rete, the intermediate layer, when present, having its fibres more slender and more irregularly disposed than the two external ones. The fibres of the outer structures are remarkably large and strong; an average-sized one measured  $\frac{1}{125}$  in. in diameter; and the rete is more than usually close and compact; in many cases the areas do not exceed in breadth the diameter of the surrounding fibres. The form of the rete is mostly either square or oblong; and its strength is greatly increased by the interior angles being replaced by curves, so that the areas are to a great extent either circular or oval. The external layer of tissue is sparingly spinous, and is also furnished with short and slender aculei, and abundantly with rectangulate sexradiate defensive organs, based most frequently on the sides of the fibres and projected thence into the areas of the network; and the aculei are apparently the nascent state of these organs.

There are strong appearances of the specimen having been part of a cup-shaped sponge; at one portion of it the skeleton-rete is closely and irregularly as it were crushed together; from this part the primary skeleton-fibres radiate in a fan-shaped mode, the secondary ones assume the state of a series of concentric curves, and the reticulation increases in regularity of structure as it approaches what has evidently been the distal portion of the cup-shaped structure; and here it is that we find the dermal membrane and its characteristic spicula in the finest state of preservation.

The dermal membrane is extremely pellucid, and would scarcely be visible if it were not for the numerous retentive spicula adherent to its surface.

The bihamate retentive spicula are numerous; uniform in size, and very slender; their curves are about three fourths of a circle; and they are equally dispersed over the surface of the membrane. They do not exceed  $\frac{1}{37}$  inch in length. The minute bidentate anchorate ones are very few in number; one of the largest of them measured  $\frac{1}{100}$  inch in length: they vary in their mode of development to some extent; and occasionally there is a third, small tooth, more or less produced, between the two large lateral ones. The attenuato-subspinulate internal defensive spicula are also very numerous; they vary somewhat in size, and are entirely incipiently spinous; one of the largest measured  $\frac{1}{30}$  inch in length; they are based on the inner surface of the dermal membrane, and are projected inwards at various angles, while others are seated on the sides of the dermal skeleton-rete, and are projected into the areas at various angles. The whole three forms abound, not only on those parts of the membrane covering the areas of the reticulations of the fibres, but they also occur on the parts attached to the skeleton-fibres, so that no part of the dermal membrane is left unprotected.

The central canals of the skeleton-fibres are small; they vary to a slight extent in some parts of the rete, and in some of the largest of the fibres they are entirely obsolete.

The rectangulate sexradiate organs are not very numerous near

the external surface of the sponge, but they occur in considerable numbers on the more deeply situated portions of the skeleton-fibres, whence they are projected into the areas of the skeleton-rete. They vary considerably in the amount of their development: some are comparatively short, and have their lateral radii widely spread; and these are abundantly spinous; while others are taller and have slender and nearly smooth radii. The dimensions of one of the stouter forms was  $\frac{1}{20}$  inch high, with a lateral spread of  $\frac{1}{10}$  inch.

There is no species among those which are most nearly allied to the one in course of description with which it is likely to be confounded. The robust form of its skeleton, and the peculiarities of its membranes and its other organs strikingly distinguish the species.

The abundance and variety of the forms of defensive spicula in this sponge present a striking evidence of the futility of attempting to arrange the Spongiadæ by the forms of their auxiliary spicula, as it has been suggested by some imaginative naturalists. Systems founded on such bases look very learned and imposing upon paper, but when applied to the accurate discrimination of species they prove quite inadequate to their proposed purpose.

In such sponges as the one under consideration, which have exceedingly thin parietes, and but comparatively small portions of soft tissues, it becomes necessary that those vital parts should be taken especial care of; and hence the profusion and variety of these minute defensive spicula to protect the vital parts, otherwise so much exposed to the numerous minute predatory creatures that exist so abundantly around them; and hence it is that nature has in each case provided the defences most suitable to the various species, without reference to any particular type of sponges, and those only most appropriate to the purpose of the preservation of the membranous and sarcodous organs so essential to the individual's existence. In the species in course of description, we have not only the usual rectangulate sexradiate organs of defence common to so many siliceo-fibrous sponges, but we also have, in addition to them, those which are so frequently appropriated to *Halichondria* and many other genera differing widely in their structures from each other, to render the preservation of the delicate membranous organs of this species completely certain. In other species of siliceo-fibrous sponges of similarly delicate structure we have the floriform-sexradiate stellate forms, as in *Farrea spinulenta*, which are so plentiful in several species of *Geodia*, a genus differing widely in its structural peculiarities from *Farrea* and other kindred genera.

A slight doubt exists as to the true locality of this sponge, which the decease of my late friend Mr. Henry Deane does not allow us to clear up. When Captain Tyler received the specimen from Mr. Deane, he received others of a similar description from the coast of Tripoli; but he is strongly of opinion that this species was among those that were brought up on the cable by Captain Hunter in lat. 14° 8' N., long. 77° 38' W. from 800 to 1000 fathoms depth.

## EXPLANATION OF THE PLATES.

## PLATE LXI.

- Fig. 1 represents a view of a portion of the external surface of the late Mr. Henry Deane's specimen of *Farrea spinifera*,  $\times 61$  linear.  
 Fig. 2 represents a portion of the dermal surface of *Farrea spinulenta*, with its numerous quadrifurcate spinulo-sexradiate stellate retentive spicula,  $\times 80$  linear.  
 Fig. 3. One of the quadrifurcate spinulo-sexradiate stellate spicula,  $\times 666$  linear.  
 Fig. 4. A sexradiate stellate spiculum with attenuated radii, from *Alcyoncellum speciosum*, to compare with those of *Farrea spinulenta*,  $\times 666$  linear.

## PLATE LXII.

- Fig. 1. A portion of the skeleton-rete of *Farrea aculeata*, exhibiting the general structure of the sponge and the characteristic mode of disposition of the aculei,  $\times 61$  linear.  
 Fig. 2 represents a portion of the outer or inhalant surface of *Farrea robusta*, with the dermal membrane in a fine state of preservation, with its numerous retentive and defensive spicula *in situ*,  $\times 80$  linear.  
 Fig. 3. One of the contort bihamate retentive spicula,  $\times 666$  linear.  
 Fig. 4. One of the minute bidentate equianchorate retentive spicula,  $\times 666$  linear.  
 Fig. 5. A fully developed subspinulate attenuato-acuate internal defensive spiculum, entirely but incipiently spinous,  $\times 666$  linear.  
 Fig. 6. One of the rectangulate sexradiate internal defensive organs, entirely but incipiently spinous, based on a portion of the skeleton-fibre, and projected into one of the areas of the skeleton-rete,  $\times 666$ .

November 16, 1875.

Dr. Günther, F.R.S., V.P., in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of October 1875.

The total number of registered additions to the Society's Menagerie during the month of October was 73, of which 39 were by presentation, 16 by purchase, 2 by exchange, 5 by birth, and 11 were received on deposit. The total number of departures during the same period, by death and removals, was 130.

The most noticeable additions during the month of October were as follows:—

1. A Scolopaceous Courlan (*Aramus scolopaceus*) from South America, purchased 6th October, 1875. This bird was in a very weak condition when received, and did not live long, but is of interest as being the first example of this aberrant form yet received alive.

2. A Binturong, from Malacca, presented by Capt. A. R. Ord, October 19th. We have likewise now in the Gardens a Grey Binturong (*Arctictis albifrons*, F. Cuv.) from Borneo, presented by Sir Harry Ord in 1873; so that we may hope eventually to solve the question whether this and the Black Binturong (*A. binturong*) are really different species, as considered by F. Cuvier, or mere varieties.