THIRD REPORT

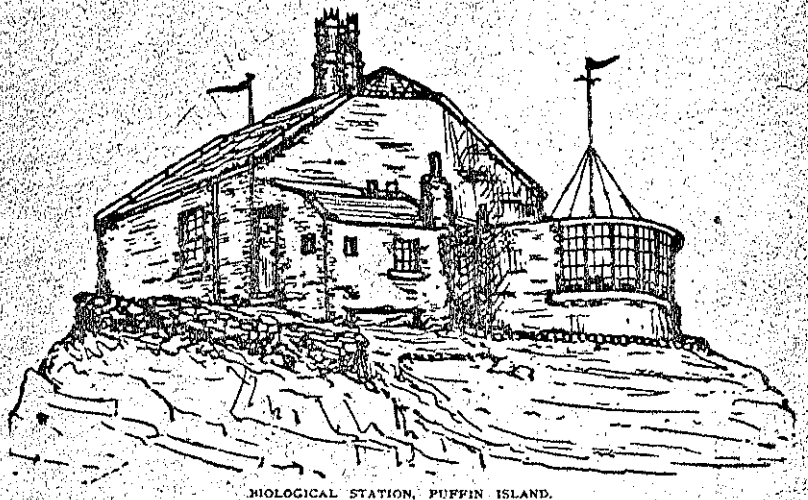
ON THE

PORIFERA

OF THE

L.M.B.C. DISTRICT.

WITH SIX PLATES.



BIOLOGICAL STATION, PUFFIN ISLAND.

BY

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LIVERPOOL:

T. DOBB & CO., PRINTERS, 229, BROWNLOW HILL.

1900.

[Trans. Biol. Soc., L'pool. Vol. IV.]

THIRD REPORT on the PORIFERA of the L.M.B.C. DISTRICT.

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With Plates X.—XV.

[Read 9th May, 1890.]

In the two previous reports* on the Porifera of the district forty-four species were recorded, one of which was new to British seas and three new to science. Several cruises in Liverpool Bay during the summer of 1889 and the present spring, and also shore-working at the Biological Station, Puffin Island, in April, 1889, and at Port Erin, Isle of Man, last April, enable me to add twelve species to the record, three of which are new to science, making in all fifty-six species.

In my former report I fell into a serious error in regard to the structure and systematic position of *Seiriola compacta*, n. sp., and I desire to acknowledge my indebtedness to Professor Sollas, D. Sc., for the great kindness with which he has pointed out the mistake to me and has answered many questions having a bearing on that species. I give now a re-description of *Seiriola compacta* (see below).

The following table gives all sponges found up to the present date in the district, and shows the distribution of the species in the four parts in which they have been most

* "Report on the Porifera of the L.M.B.C. District." by Thomas Higgin, F.L.S., in "Fauna of Liverpool Bay," Vol. I., 1886. And "Second Report on the Porifera of the L.M.B.C. District," by R. Hanitsch, in Proc. Biol. Soc., Liverpool," Vol. III., 1889, and "Fauna," Vol. II.

carefully collected. There is nothing very striking in the distribution. The estuaries of the Mersey and the Dee are by far the poorest in Porifera, as might have been expected. But it is rather surprising that up to now only one tetractinellid sponge (*Pachymatisma johnstonia*, B.) has been recorded from the Isle of Man. Most probably there are numbers of Tetractinellida living on the rocky shores of that island, and simply requiring to be sought for. The north-east corner of our district has, as far as I know, not yet been specially searched for sponges, so that only two species are recorded from Morecambe Bay. These are: *Chalina oculata*, J. and *Suberites domuncula*, N. I have not thought it necessary to give in the table a special column to that locality. Puffin Island is only separated from the North Wales column in order that there may be a record of the species found in the immediate neighbourhood of our Biological Station. In all twenty-six species have now been found on the shores of the island.

The lists in the former reports included the species *Halichondria coccinea*, B., which had been collected in Belfast Lough. I shall leave it out in the present report, as that species has not yet been found inside the boundaries of our district. Also *Papillina suberea*, S., has now been left out as it is merely a synonym for *Cliona celata*, Gr. I shall adhere to the classification employed in the previous report, but the nomenclature of the species differs in a few instances. I now use:—

Spongelia fragilis, M.,	instead of	*Dysidea fragilis.*
Chalina pallida. B., ...	,,	*Chalinula pallida.*
Chalina densa, B., ...	,,	*Chalinula densa.*
Amphilectus incrustans, J.,	,,	*Desmacidon incrustans.*
Esperella ægagropila, C.,	,,	*Esperia ægagropila.*
Suberites domuncula, N.,	,,	*Suberites suberea*, M.
Dercitus bucklandi, B.,	,,	*Dercitus niger*, C.

LIST of PORIFERA recorded from the L.M.B.C. DISTRICT.

Order I. **MYXOSPONGIÆ.**	Estuaries of Mersey & Dee.	Isle of Man.	North Wales.	Puffin Island.
Family.				
HALISARCIDÆ—*Halisarca dujardini*, J.	×	×	×	×
Halisarca rubra, n. sp.	...	...	×	...
Order II. **CERATOSA.**				
SPONGELIDÆ—*Spongelia fragilis*, M.	...	...	×	×
Order III. **MONAXONIDA.**				
Subord. HALICHONDRINA.				
HOMORRHAPHIDÆ—*Halichondria panicea*, J.	×	×	×	×
Halichondria albescens, J.	...	...	×	...
Halichondria caruncula, B.	...	×	×	...
Reniera varians, B.	×	...	×	×
Reniera elegans, B.	...	×	...	...
Reniera simulans, J.	...	×	...	...
Reniera fistulosa, B.	...	×	×	...
Reniera clava, B.	...	×	...	...
Reniera semitubulosa, S.	...	...	×	×
Reniera ingalli, B.	...	×	...	...
Chalina oculata, J.	...	...	×	...
Chalina limbata, M.	...	×	×	×
Chalina montagui, T.	...	×	...	...
Chalina pallida, B.	...	×	...	...
Chalina densa, B.	...	×	×	...
Chalina gracilenta, B.	...	...	×	×
HETERORRHAPHIDÆ—None.				
DESMACIDONIDÆ—*Desmacidon fucorum*, J.	...	×	×	×
Esperella ægagropila, J.	...	...	×	...
Esperella floreum, B.	...	×	...	...
Amphilectus incrustans, J.	...	×	×	×
Clathria seriata, J.	...	×	×	×
Plumohalichondria plumosa, C.	...	...	×	...
Plumohalichondria atras anguinea, B.	×	...	×	×
AXINELLIDÆ—*Hymeniacidon sanguinea*, J.	...	×	×	...
Axinella mammillata, n. sp.	...	...	×	×
Raspailia ventilabrum, B.	...	...	×	...
Raspailia rigida, M.	...	×	×	×

Subord. CLAVULINA.	Estuaries of Mersey & Dee.	Isle of Man.	North Wales.	Puffin Island.
SUBERITIDÆ—*Suberites carnosa*, J.	×	...	...	...
Suberites domuncula, N.	×	×	×	×
Suberites ficus, E.	...	...	×	...
Cliona celata, Gr.	...	×	×	×
Polymastia mammillaris, J.	...	...	×	×
Polymastia robusta, B.	...	...	×	...
SPIRASTRELLIDÆ—None.				
Order IV. **TETRACTINELLIDA.**				
Subord. CHORISTIDA.				
TETILLIDÆ—*Tethya lyncurium*, J.	...	...	×	...
PACHASTRELLIDÆ—*Dercitus bucklandi*, B.	...	...	×	×
STELLETTIDÆ—*Seiriola compacta*, Hn.	...	...	×	×
Stelletta grubei, S.	...	...	×	...
Stelletta collingsi, B.	...	...	×	×
Ecionemia ponderosa, B.	...	...	×	...
GEODIIDÆ—*Pachymatisma johnstonia*, B.	...	×	×	×
Subord. LITHISTIDA.				
None.				
Order V. **HEXACTINELLIDA.**				
None.				
Order VI. **CALCAREA.**				
ASCONIDÆ—*Ascetta coriacea*, F.	...	×	×	×
Ascaltis botryoides, F.	...	×	×	...
Ascaltis contorta, B.	×	...	×	...
Ascortis lacunosa, J.	...	...	×	×
LEUCONIDÆ—*Leucandra fistulosa*, J.	...	×	...	...
Leucandra gossei, B.	...	×	×	...
Leucandra nivea, F.	×	×	×	×
Leucandra johnstoni, C.	...	×	×	...
Leucaltis impressa, n. sp.	...	...	×	×
SYCONIDÆ—*Sycortis aspera*, G.	...	×	...	...
Sycandra ciliata, F.	×	×	×	×
Sycandra compressa, F.	...	×	×	×
Aphroceras ramosa, C.	...	...	×	...

Order I. MYXOSPONGIÆ.

Halisarca rubra, n. sp. (Pl. X., figs. 1 and 2.)

New species of *Halisarca* have been described so frequently, which have afterwards been shown not to belong to that genus or even not to exist at all, that it is with some reluctance that I establish the new species *Halisarca rubra*. The specimen was dredged on the "Spindrift" Expedition in July, 1889, off Holyhead, from a depth of about fifty fathoms. It encrusted both valves of a living *Mytilus edulis* with thin brick-red patches, the entire thickness of the sponge being 0·45 mm. Its surface showed a somewhat wavy outline, which condition was apparently solely caused by the hairs of the *Mytilus* projecting through it, and the sponge growing for a short distance upwards along those hairs. Oscula and pores were not visible to the unaided eye.

Vertical sections showed that the outer portion of the sponge had suffered, so that its structure could not be made out satisfactorily. The figure (see Pl. X., fig. 1) of it therefore is somewhat diagrammatic. The inner and greater portion of the sponge was well preserved (Pl. X., fig. 2). There is a "dermal membrane" between the outer world and subdermal cavities, about 0·014 mm. in thickness. The subdermal cavities are flat, and seem to be distinct from the wide irregular cavities of the canal system. Oscula and pores could not be detected. The flagellated chambers are round or oval, with a diameter of 0·08 to 0·14 mm. The size of the collar-cells, of which however the collars and flagellæ were never seen distinctly, is about 0·006 mm. The mesoderm consists of fibrous tissue. Imbedded in it are large red pigment-cells, 0·02 to 0·026 mm. in size, more or less oval and pretty numerous. Their nuclei are small, and sometimes only indistinctly seen.

In sections prepared without staining the pigment-cells have preserved almost their natural colours.

The only acknowledged species of *Halisarca* is the well-known cosmopolitan *Halisarca dujardini*. It has been redescribed and figured (after Schulze) by Lendenfeld,* but there seems to be a good deal of difference between it and *H. rubra*. In *H. dujardini* the cavities of the canal system are not distinct from the subdermal cavities, and the flagellated chambers are irregularly tubular and branched. It may be that my new species belongs to the genus *Bajulus*, Lendenfeld (loc. cit. p. 724), in which there are distinct subdermal cavities and regularly oval flagellated chambers.

Although none of Carter's species of *Halisarca* have been acknowledged by Lendenfeld, still it ought to be remembered that Carter described two red species of *Halisarca*. The one is *Halisarca rubitingens*, C,† from the Gulf of Manaar. Carter describes it as "amorphous, indefinitely spreading and agglomerating together everything in its course, at the same time that the whole is tinged externally by its red colour, appearing in the form of a thin membrane when stretched across cavities, composed of polygonal divisions (cells) in juxtaposition, filled with granular contents in which the pigment is situated." The other red species is *Halisarca cruenta*, C.,‡ from the Gulf of Suez. Carter says about its colour: "crimson colour of the surface, which is seated in an extremely thin cuticula, fading off into grey internally." Evidently in both of Carter's species the pigment is placed in the ectoderm, and

* R. v. Lendenfeld, "A Monograph of the Horny Sponges," p. 728, Pl. 50, fig. 2.

† Carter, "Annals and Magazine of Natural History," 5th ser., vol. vii., p. 366.

‡ Carter, loc. cit., vol. viii., p. 247.

therefore they cannot be identical with *Halisarca rubra*.

It is well known that the colour in Sponges is sometimes caused by ova.* Still that could scarcely be the explanation of the red cells in *Halisarca rubra*, as the nuclei of the cells in question are much too small to be the germinal vesicles, and in general appearance the cells did not resemble ova.

Order II. CERATOSA.

Spongelia fragilis, Montagu.

To the two localties where this species had been found previously, Church Bay, near Holyhead, and Puffin Island, I am able to add now Penrhos Bay, Anglesey, where we dredged it on the "Hyæna" Expedition of May 25th, 1890.

This form is probably identical with Lendenfeld's † *Spongelia fragilis* var. *irregularis*. Still there is some difference in the colour. Lendenfeld says in regard to his variety, "the colour of the living sponge is dull violet-red on the surface and yellowish in the interior." My specimens are of a yellowish sand-grey throughout.

Order III. MONAXONIDA.

Reniera varians, Bowerbank.

This species, which has been recorded from the Mersey and Hilbre Island, has now been discovered also at Puffin Island. I found one specimen hanging from a ledge of rock at the north end, below the Biological Station, in April, 1889. The under surface of this particular rock was literally covered with other species of sponges: *Clathria seriata*, *Plumohalichondria atrasanguinea*, *Amphilectus incrustans*, *Raspailia rigida*, *Leucandra nivea*, *Sycandra ciliata*, and *Sycandra compressa*.

* Carter, "Notes Introductory to the Study and Classification of the Spongida, A.M.N.H.," 4th ser., vol. xvi., p. 37.

† R. v. Lendenfeld, "A Monograph of the Horny Sponges," p. 662.

A great number of very fine specimens were collected again at Hilbre Island on March 21st, 1890, although this species had not been seen there for several years.

Reniera ingalli, Bowerbank.

Isodictya ingalli, Bowerb., Brit. Spong., vol. iii., p. 241, pl. lxxviii.

Bowerbank gave his description from three dried specimens which had been sent to him from Southport. The one specimen, which I found in a tidal pool at Port Erin, April, 1890, has quite the appearance of that figured by Bowerbank, although it is only about one-half the length. Its colour, when alive, and also after having been kept in spirit, is a brownish-yellow. It is hard and stony to the touch. The spicules are slightly curved, and rather bluntly pointed oxea, measuring 0·15 by 0·009 mm. They are held together by a rather large amount of ceratose, and form somewhat irregular meshes, which may be unispicular or bispicular. The width of the oscula varies from 1 to 2 mm.

Chalina gracilenta, Bowerbank.

This species is new to our district and was first described by Bowerbank,* who collected it at Torbay, Scarborough, coast of Northumberland, and Hastings. Oscar Schmidt † seemed to have some doubts about its systematic position or even its existence, but I am able to confirm Bowerbank's statements in regard to both points.

I found one specimen of *Chalina gracilenta* at the north-east end of Puffin Island, April, 1889, in one of the tidal pools, where it was attached to *Corallina officinalis*. It formed an encrusting mass of oval shape, 11 mm. by 5 mm., of yellowish-grey colour.

* Bowerbank, "British Spongiadæ," vol. ii., p. 372, and vol. iii. p. 171.

† Oscar Schmidt, "Spongienfauna des Atlantischen Gebietes," p. 77.

This species is a very interesting one, as from a superficial examination with a low power one might think it a ceratose sponge. Even with a high power the spicules are difficult to recognize in the thick ceratose fibres, whilst in other species of *Chalina* they are seen well with a low power. The thickness of the ceratose fibres is 0·02 to 0·075 mm. The spicules are extremely thin oxea, 0·07 by 0·002 mm. The width of the ceratose meshes varies from 0·15 to 0·30 mm.

If Lendenfeld* is right in his theory, as he most probably is, that "the skeleton of the Spongidæ was developed from that of the Homorrhaphidæ by the entire replacement of the spicules by spongin," then we must certainly think of forms like *Chalina gracilenta*, which lost the small traces of spicules they still possessed, whilst simultaneously essential changes in the canal system took place, and thus became changed into Ceratosa. In regard to the changes of the canal system, especially the change of the small flagellated chambers of the Monaxonida into the large sac-shaped ones of the Ceratosa, we may perhaps accept the mechanical explanation which Keller† gives in a recent paper. As a ceratose skeleton has certainly less rigidity than a siliceous one, the flagellated chambers of the Ceratosa are more liable to become compressed, and to be seriously affected in their function, than those of the siliceous sponges. An increase in size of the flagellated chambers would therefore be of advantage, as even under pressure some parts of them would remain expanded and functional. Keller's theory accounts well enough for the large flagellated chambers of the Ceratosa and Myxospongiæ, but scarcely for those of the Hexactinellida, which seem to

* R. v. Lendenfeld, "A Monograph of the Horny Sponges," p. 770.

† Conrad Keller, "Die Spongienfauna d. rothen Meeres." 1. Hälfte. Zeitschr. f. wissensch. Zoologie, 48, Band, 3. und 4. Heft.

have acquired both large flagellated chambers and a rigid siliceous skeleton.

Chalina montagui, Johnston. (Pl. XI., fig. 1.)

Halichondria montagui, Johnst., Brit. Sponges, p. 99, pl. vi.

Chalina montagui, Bowerb., B. S., vol. ii., p. 366; vol. iii., pl. lxviii.

This species is an addition to the Fauna of our district. I found it in a large and rocky tidal pool at Port Erin, April, 1890. Johnston records it as "not uncommon in the estuary of Kingsbridge at very low water, adhering to stones, and is occasionally taken by the trawl in the open sea on the coast of Devon, Conamara, and Dublin Bay." Bowerbank adds to those localities Brighton and Hastings.

The figure of the sponge, which I give in natural size on Pl. XI., was drawn by me from a photograph which Dr. Kohn (Chemical Laboratories, University College, Liverpool) had kindly taken from the specimen after it had been in spirit for some time. The specimen is larger than the one figured by Johnston, and differs from it in having shorter and less whip-like tubular portions. Bowerbank's figure had been taken from a rather poor specimen.

The colour of the living specimen was straw-yellow. The oscula are always placed on the extremity of conical elevations, and measure 3 mm. in diameter.

The spicules are mostly oxea, but a number of styli are also present. Both kinds of spicules are slightly curved, and measure on an average 0·096 by 0·008 mm. They are imbedded either in ceratose or in the so-called ascending fibres. Inside the ceratose the spicules are arranged in unispicular rows. The thickness of the ceratose fibre is 0·007 to 0·036 mm. The diameter of the ceratose meshes varies from 0·05 to 0·1 mm. The ascending fibres extend throughout the whole mass of the sponge, and give off branches in all directions. Their diameter is 0·05 to 0·08 mm. Inside those ascending fibres the spicules are

arranged in about five longitudinal parallel rows. These fibres seem to consist only of connective tissue and spicules. Ceratose does not appear to be present in them.

Esperella floreum, Bowerbank.

Hymeniacidon floreum, Bowerbank (vol. ii., p. 190).

Rhaphiodesma floreum, Bowerbank (vol. iii., p. 94).

This species is an addition to our fauna, and was dredged off the Calf of Man, on the "Hyæna" cruise of Easter, 1889. Another species of the same genus, *Esperella ægagropila*, J., had previously been collected at Holyhead.* Our species was first described by Bowerbank, under the name *Hymeniacidon floreum*, which was afterwards changed by the same author into *Rhaphiodesma floreum*. Oscar Schmidt† was the first who pointed out that this species, together with *Hymeniacidon lingua* and *Hymeniacidon subclavata* belonged to Nardo's older genus *Esperia*. In the course of time the genus *Esperia* had to be changed into *Esperella*,‡ so that we now arrive at the name *Esperella floreum*, B.

Our specimen was found encrusting a living *Pecten operularis*, with a thin and rugged layer of greyish colour. The thickness of this layer is about 1 mm. The skeleton consists of megascleres and microscleres. The former are styli (0·24 mm. by 0·008 mm.), which lie in irregularly arranged and loose bundles. The microscleres consist firstly of anisochelæ, which are arranged in beautiful rosettes. Similar structures are found in *Esperella lingua*, B.,§ in *Jophon abnormalis*, Ridley and Dendy,‖ and in

* Thos. Higgin, "Report on the Porifera of the L.M.B.C. District." In "Fauna of Liverpool Bay," vol. i., p. 85.

† Oscar Schmidt, "Spongienfauna des Atlantischen Gebietes," 1870, p. 76.

‡ Vosmaer, "Bronn's Klassen u. Ordn. d. Thierreichs, Porifera," p. 353.

§ Bowerbank, "British Spongiadæ," vol. i., pl. xviii., fig. 297.

‖ Ridley and Dendy, "Report on the Monaxonida, collected by H. M. S Challenger," pl. xvii., fig. 7.

Desmacidon titubans, Schmidt.* The length of the isolated anisochelæ in *Esperella floreum* is 0·036 mm. Besides those microscleres we find also simple sigmata, 0·06 mm. in length. Lastly there appeared to be present also a most minute kind of microscleres, but, on account of their smallness, I could not make out whether they were sigmata or chelæ. They measure 0·008—0·016 mm. in length. Possibly they are simply younger stages of the large anisochelæ and sigmata.

In no other species of sponge did I ever see such great masses of ova and developing embryos (morulæ) as in *Esperella floreum*. The ova are placed quite close to each other so that one might almost speak of ovaries, and they lie near to the limiting membrane, "in the position of greatest security." The morulæ are nearer to the surface. It was interesting to me to find that the greatest part of Ridley's and Dendy's "Embryological Notes" † is taken from the examination of some species of *Esperella*. These authors found that in large and massive sponges, like *Esperella lapidiformis*, where the position of the ova and embryos is a matter of no very great importance, so long as they do not lie near to the surface, those elements are scattered through the whole of the choanosome; whilst in a small and delicate species, like *Esperella biserialis*, the embryos take refuge in the centre of the spicular axis. Further they state, that in *Esperella mammiformis* the embryos are found grouped close to the stone to which the sponge is attached, near the centre of the base.

Our species has been recorded by Bowerbank from East Loch, Tarbet, Harris, and Strangford Lough.

* Carter, "Ann. and Mag. Nat. Hist., ser. 5, vol. ix., pl. xii., fig. 24.

† Ridley and Dendy, loc. cit., p. 4.

Amphilectus incrustans, Johnston.

Halichondria incrustans, Johnston.
Halichondria saburrata, Johnston.
Halichondria panicea, Grant.
Desmacidon incrustans, Schmidt.

This species seems to be of world-wide distribution. Higgin* states that it has been found in the West Indies and Falklands Islands; Bowerbank† records it from Frith of Forth, Hebrides, Orkneys and Shetland Islands, Welsh and Irish Coasts, Channel Islands, and Hastings. Further, it has been previously collected in two parts of our district, at Port Erin and Holyhead, and now I am able to add also Puffin Island to the list.

This sponge has been described or mentioned by Grant, Johnston, Bowerbank, Carter, and Higgin under the genus *Halichondria*. But Oscar Schmidt recognized that it, together with eighteen other of Bowerbank's species of *Halichondria*, belongs to the Desmacidonidæ, and accordingly, in my "Second Report," &c., I called this sponge *Desmacidon incrustans*. However, as I intend to follow Ridley and Dendy's principles of classification as far as possible and to accept their definitions of genera, I find it now necessary to remove our species to the genus *Amphilectus*, Vosmaer,‡ also one of the Desmacidonidæ. In doing so I think it advisable to repeat what Ridley and Dendy say in regard to this genus:—"We make use of this genus in the manner indicated by its founder, namely, as a provisional receptacle for a number of doubtful Desmacidonidæ."§

* Higgin, "Report on the Porifera," in "Fauna of Liverpool Bay," p. 84.

† Bowerbank, 'British Spongiadæ," vol. ii., p. 249.

‡ For definition of the genus *Amphilectus* see Vosmaer, "Notes from the Leyden Museum" vol. ii., p. 109.

§ Ridley and Dendy, "Report on the Monaxonida collected by H.M.S. Challenger,'" p. 123.

Amphilectus incrustans is fairly plentiful at Puffin Island, where it is found encrusting the rocks at about low-water mark (April, 1889). The colour is straw-yellow, and a kind of meandering marking on its surface is very characteristic. These markings seem to be caused by the alternate presence and absence of spicules. There are two kinds of megasclera: firstly tornotæ, measuring 0·19 mm. by 0·005 mm., which are found chiefly in the ectosome, and project with about half of their length beyond the ectoderm. And further: spined styli, measuring 0·195 mm. by 0·008 mm., which are found scattered irregularly through certain districts of the choanosome. The microcleres consist of palmate isochelæ (0·034 mm.) and simple sigmata (0.02 mm). I found also a few anisochelæ, but I am not quite sure whether they belong to the sponge. Ceratose is present in a small amount and is best seen in very thin sections. The arrangement of the spicules is rather remarkable, as they are found only in certain tracts which stand at right angles to the surface. Alternating with those spiculated portions we find tracts of tissue which are quite devoid of spicules, and these latter tracts seem to be wider than the spiculated ones. The alternate arrangement of these tracts causes, I think, the meandering marking on the surface of the sponge. The diameter of the oscula is about 1 to 2 mm.

A red coloured and elastic sponge which I collected at Port Erin, April, 1890, apparently belongs to the same species.

Clathria seriata, Johnston.

Halichondria seriata, Johnston.
Spongia seriata, Grant.
Chalina seriata, Bowerbank (vol. ii., p. 376).
Ophlitaspongia seriata, Bowerbank (vol. iii., p. 167).

In my previous report, in giving the list of the Porifera recorded from the L.M.B.C. district, I placed the sponge

referred to by Mr. Higgin under the name *Ophlitaspongia seriata*, under the genus *Clathria*, Schmidt. Having found this form in profusion at Puffin Island, April, 1889, and at Port Erin, Easter, 1889 and 1890 (at both places for the first time), I am able to give now a further account of its systematic position.

I may use the same words in regard to this species which were used by Ridley and Dendy* about *Clathria inanchorata*: "Although it possesses no chelæ, yet this species agrees so closely with the genus *Clathria* in other respects that we have deemed it advisable to include it in that species, it is perhaps a form that once possessed isochelate microsclera and has now lost them." And this *Clathria inanchorata* is the only Desmacidonid sponge which forms an exception to Ridley and Dendy's definition of the family Desmacidonidæ. Their definition runs as follows (page 62):—"Desmacidonidæ: Megasclera of various forms, usually monactinal. Microsclera always present and always including chelæ." Then they add in a footnote: "We have included one or two species without chelæ on the supposition that they have had them and subsequently lost them." I would prefer the exception to be included in the definition proper of the family, especially as we do not know whether their "supposition" corresponds to phylogenetic facts. For that reason I am inclined to accept rather Lendenfeld's† definition of the Desmacidonidæ: "Cornacuspongiæ, with a supporting skeleton composed of spiculiferous, often echinated fibres. Generally with chelæ in the ground substance. If chelæ are absent, the fibres are echinated by projecting spicules."

* Ridley and Dendy, "Report on the Monaxonida collected by H.M.S. 'Challenger,'" p. 150.

† R. v. Lendenfeld, "Descriptive Catalogue of the Sponges in the Australian Museum, Sydney," p. 210.

Our *Clathria seriata* fits in very well in Lendenfeld's definition of the Desmacidonidæ, and agrees also with the generic characters of *Clathria* as given by the same author, page 22: "Genus *Clathria*—Desmacidonidæ with a skeleton composed of bundles of spicules invested by spongin, from which spined styli protrude." One of Lendenfeld's species of *Clathria* has chelæ (*C. pyramida*) and two have no chelæ, (*C. macropora* and *C. australis*). Therefore up to now there are four species of *Clathria* without chelæ, viz., *C. australis*, *C. inanchorata*, *C. macropora*, and *C. seriata*.

The living sponge is of a dark blood-red colour, and encrusts the rocks with a layer of about 3 mm. in thickness. The skeleton consists of a network of horny fibres 0·016—0·028 mm. thick. The meshes are square, and 0·09—0·225 mm. wide. In the axis of the horny fibres, as well as echinating from the fibres, smooth styli are found, 0·1 mm. by 0·008 mm. The echinating styli generally stand together in bundles, and spring from the points where the fibres meet. According to Bowerbank toxa are very abundant in this species, but I found comparatively few of them. They measure 0·05 mm. by 0·001 mm.

The oscula are numerous, and 1 to 1·5 mm. in diameter.

As I mention on page 208, this species is frequently found along with *Plumohalichondria atrasanguinea*, B. As these two species agree completely in colour, and as *Pl. atrasanguinea* is decidedly the form which is best defended by the spicules, it might be regarded as a case of mimicry. The bright colouring of *Pl. atrasanguinea* would then be warning, and that of *Clathria seriata* protective. The similarity in colour may, however, be quite accidental.

Plumohalichondria atrasanguinea, Bowerbank.

Microciona atrasanguinea, Bowerbank.

This form is new to our district, another species of the

same genus, *Plumohalichondria plumosa*, Carter, having previously been obtained at Holyhead.* I found it at Puffin Island, April, 1889, and at Hilbre Island, May 1889, a short way above low-water mark.

Bowerbank† records it from St. Katherine's Cave, Tenby; rocks off Hastings; Guliot Caves, Sark; Lennen Cove, Land's End, Cornwall, and he describes the external appearance of this sponge in the following words:—"Its appearance is that of a small patch from one to two inches in diameter, of dark clot of blood adhering closely to the surface of the rock, and it can be obtained only by cutting away the piece of stone to which it adheres. It rarely exceeds about half a line in thickness. Its extreme thinness readily distinguishes it from the deep red coloured sponge, *Chalina seriata*,§ which occurs abundantly along with it in that cave (at St. Katherine's Island, Tenby), and which is so thick as to be easily removed from the rock with a knife." Bowerbank's description applies very well to the condition in which I found this form, together with *Clathria seriata*, at Puffin Island. In order to get sections of *Plumohalichondria atrasanguinea* one has to remove a portion of the rock (carbonate of lime) together with the sponge, and dissolve the former with acids. Specimens from Hilbre Island are of less use for histological purposes because the rocks there consist of sandstone.

The ceratose skeleton of our species consists of a limiting membrane which is closely applied to the rock, and of ascending fibres, arising about at right angles from the limiting membrane. Those fibres are furnished abundantly with echinating megascleres of two kinds; there are styli

* Thomas Higgin, "Report on the Porifera," in "Fauna of Liverpool Bay," p. 78.

† Bowerbank, "British Spongiadæ," vol. ii,, p. 139.

§ *Chalina seriata* is identical with *Clathria seriata*, see p. 205.

(0·3—0·53 mm. by 0·012 mm.) and spined styli (0·148 mm. by 0·008 mm). The former generally spring from the inner portions of the fibres, and at less acute angles (about 25°), whilst the spined styli have their bases more in the outer portions of the fibres and spring at greater angles (about 50°) from the fibres. There are also two kinds of microscleres—toxa (0·124 mm. by 0·002 mm.) and extremely minute chelæ (0·012 to 0·016 mm). The microscleres are irregularly scattered through the tissue between the ascending fibres.

A very brief description of this species has also been given by Carter.*

Axinella mammillata, n. sp. (Pl. X., figs 3—5).

I was doubtful for some time in which genus of the family Axinellidæ, the new sponge described below, should be included. At first I was rather inclined to make of it a new species of *Raspailia*, Nardo, but as Ridley and Dendy† propose to reserve the genus *Raspailia* exclusively for the whip-like forms, I decided to place the new sponge under the genus *Axinella*, Schmidt.‡ Still in doing so I do not feel great satisfaction, as the genus *Axinella* seems at present to be a receptacle for all Axinellidæ which do not belong to the more clearly defined genera: *Hymeniacidon*, *Phakellia*, *Ciocalypta*, *Acanthella*, *Raspailia*, *Dendropsis*, and *Thrinacophora*. Ridley and Dendy say, in regard to the genus *Axinella*, "Sponge typically ramose, but may be massive. Skeleton fibre plumose. Megasclera stylote and sometimes oxeote. No microsclera. This is a very critical genus, and it is impossible to give a satisfactory

* Carter, "Annals and Mag. Nat. Hist.," fourth ser., vol. xvi., p. 195, and fifth ser., vol. vi., p. 40.

† Ridley and Dendy, "Report on the Monaxonida, collected by H.M.S. 'Challenger,'" p. 178 and p. 188.

‡ Oscar Schmidt, "Spongien des Adriatischen Meeres." 1862, p. 60.

plate are called "portion of a band of elongated mesodermal cells found accompanying a skeleton fibre."

I have mentioned already the great similarity which exists in the external appearance of *Axinella mammillata* and *Polymastia mammillaris*. As it might be misleading to distinguish the species by the spicules alone, as those of *Axinella mammillata* sometimes approach the tylostylote character, and those of *Polymastia mammillaris* the tylote character, it appeared quite necessary to sectionize one of the papillæ for the sake of identification. The difference then is quite striking. In *Polymastia mammillaris* the papilla has the form of a tube with a large central cavity, with large subdermal spaces and well developed pore-membranes.* None of these characters are present in *Axinella mammillata*. Inside of the papillæ we have here and there larger or smaller quite irregular cavities, no distinct subdermal spaces, and of oscula, pores and pore-membranes nothing definite could be seen.

I found one specimen of this new species in one of the tidal pools on the north end of Puffin Island, at lowest tide, April, 1889.

Raspailia ventilabrum, Bowerbank.

Dictyocylindrus ventilabrum, Bowerbank.

In my previous report I regarded this species as identical with *Raspailia viminalis*, Schmidt, and described it under that name. But, as pointed out recently by Topsent,† there exists a difference between *R. viminalis*, S., and *R. ventilabrum*, B. The styli are slightly tylostylote in *R. viminalis*, whilst in *R. ventilabrum* they are of the normal character.

* See my former Report in Proc. Liverpool Biol. Society, vol. iii., pl. vi., figs. 2 and 3.

† Emile Topsent, "Etudes de Spongiaires." Revue Biologique du Nord de la France, tome ii., no. 8, Mai, 1890.

A single specimen had previously been recorded from Church Bay, near Holyhead. On the "Hyæna" expedition of May 25th, 1890, we dredged three specimens in Penrhos Bay (10 fathoms) and off Rhoscolyn Beacon (12 fathoms), on the west coast of Anglesea. The best of the specimens showed a narrow base with four branches, three of which were again divided dichotomously. The colour was a dull purple. The height of the specimens ranges between 4 and 6 cm. Their branches are perfectly cylindrical, whilst Bowerbank's* figure shows rugged ridges along the branches. Probably Bowerbank's figure is not quite reliable, as it had been taken from a dried specimen.

Raspailia rigida, Montagu.

Spongia rigida, Montagu, Mem. Wern. Soc., vol. ii., pt. i.

Non *Raspailia (?) rigida*, Ridley and Dendy, Chall. Rep., p. 191.

The species, which in my former report I regarded as *Raspailia stelligera*, Schmidt, seems in reality to be *Raspailia rigida*, Montagu. Topsent's† recent paper has drawn my attention to this fact. There are two species of the genus *Raspailia*, Nardo, which possess stellate spicules, both first described by Montagu under the names *Spongia stuposa* and *Spongia rigida*, the latter differing from the former by having much shorter branches and larger stellate spicules. Bowerbank considered the *Sp. rigida* merely as a dwarfed variety of *Sp. stuposa*, and included both in the name *Dictyocylindrus stuposus*. But Topsent shows that they are really distinct species. Consequently as my specimens have very short branches indeed and comparatively large stellate spicules, I consider them to be *Raspailia rigida*, M. As stated by Topsent, the *Ras-*

* Bowerbank, loc. cit., vol. iii., pl. xvi.

† Emile Topsent, loc. cit.

pailia stelligera, Schmidt, is only a superfluous synonym for *Raspailia stuposa*, Montagu.

There are, as mentioned above, two species of *Raspailia* with stellate microscleres, *R. stuposa*, M., and *R. rigida*, M. In my former report I drew attention to Ridley and Dendy's statement that the only stellate forms of microscleres "which are certainly known to occur in the Monaxonida" are spirulæ, discastra and amphiastra," and I proposed that spherasters should be mentioned as a fourth form of stellate microscleres in the Monaxonida, and that the limits of the genus *Raspailia*, as given by Ridley and Dendy, should be enlarged by leaving out the negative character "no microsclera," so as to reconstitute the older and wider genus defined by Nardo and Schmidt. I see now that Lendenfeld's definitions of the group in question also want alterations. In his "Descriptive Catalogue"* the definition of the order "Cornacuspongiæ," which comprises also the Axinellidæ, is too narrow, as it gives the negative character "Microsclera, never stellate." This character should be left out. Similarly in the "Monograph†" Lendenfeld defines his sub-family "Axinellinæ," which includes *Raspailia*, as "Axinellidæ without microsclera." This definition also wants correction.

This species which has now been found on the shores of Puffin Island several times, has also been dredged on the "Hyæna" expedition of May 25th, 1890, in Penrhos Bay, west coast of Anglesey, from a depth of about 10 fathoms.

Suberites domuncula, Nardo.

Halichondria suberea, Montagu.

Johnston‡ describes this sponge under the name *Hali-*

* R. v. Lendenfeld, "Descriptive Catalogue of the Sponges in the Australian Museum, Sydney," p. 74.

† R. v. Lendenfeld, "A Monograph of the Horny Sponges," p. 903.

‡ Johnston, "British Sponges," p. 140.

chondria suburea, and says, in regard to its habitat, "It has the singular property of being attached only (so far as I have been able to ascertain) to old univalve shells, which it entirely invests." He mentions then that most of those shells were inhabited by hermit-crabs. Schmidt's* definition is similar, "Suberites globosus, incrustans et involvens conchas, quas Paguri domos sibi elegerunt." Mr. Higgin has already recorded specimens of this peculiar habit from Holyhead and Morecambe Bay, and I am able to add Calf of Man, where it was dredged on the "Hyæna" expedition of April, 1889. But still this species does not seem to restrict itself exclusively to univalve shells inhabited by hermit-crabs, although those cases are the conspicuous and interesting ones. A sponge, apparently of the same species, was dredged on the above mentioned "Hyæna" expedition of April, 1889, and also off Calf of Man. It encrusted a living *Pecten operularis*, forming a thin layer (about 2 mm. in thickness) of greyish colour. I have found it also encrusting tetractinellid sponges, on *Seiriola compacta*, mihi, and on *Stelletta collingsi*, B. As I shall state more fully on page 221, I erroneously described in my former report such an encrusting layer of *Suberites domuncula* as the ectosome of *Seiriola*. The upper portion of fig. 1, Pl. VII., Vol. III., Proc. Liverpool Biol. Soc. may therefore be taken as a fairly correct representation of a vertical section through a *Suberites domuncula*. The thickness of that specimen was unusually small, only about 0·24 mm. The spicules of it are tylostyli 0·1 to 0·38 mm. by 0·003 to 0·006 mm. They are arranged in bundles, and project for about one-half of their length through the ectoderm. The heads of the longer tylostyli are supported by the basal membrane. The figure also

* Oscar Schmidt, "Spongien des Adriatischen Meeres," Theil i., p. 67.

shows pore-membranes, pores and sub-dermal cavities.

Suberites ficus, Esper.

Alcyonium ficus, Esper.
Halichondria ficus, Johnston.
Hymeniacidon ficus, Bowerb., B. S., vol. ii., p. 206; vol. iii., pl. xxxvi.
Halichondria ficus, Carter, A.M.N.H., 5, ix., p. 353.
Suberites ficus, Schmidt, Spongienfauna des Atlant. Gebietes, p. 76.

Two specimens of this species were found by Mr. Herbert C. Chadwick opposite the ferry-slip, at Bangor, in August, 1887, attached to the rock. I was unable to record it in my former Report, as I heard only quite recently about this find. The one specimen is about 3 cm. in height, the other one 1·3 cm. This species has been recorded by Bowerbank from the coast of Scotland; coast of Northumberland; Island of Harris; Hebrides; and from Gilter Sound, near Tenby. I may mention that about fifteen fine specimens of *Suberites ficus* were dredged by Professor Herdman in the Sound of Mull, in 1881, and are now in the Zoological Museum of University College, Liverpool.

Cliona celata, Grant. (Pl. XI., fig. 2, and Pl. XII).

Vioa celata, Nardo.
Spongia terebrans, Duvernoy.
Halichondria celata, Johnston.
Hymeniacidon celata, Bowerbank.
Raphyrus Griffithsii, Bowerbank.
Vioa celata, O. Schmidt.
Papillina suburea, O. Schmidt.
Spongia sulphurea, Desor.
Cliona sulphurea, Verill.

Mr. Higgin, in his "Report on the Porifera of the L.M.B.C. District," page 85, has already mentioned that in our district both forms of *Cliona celata* are found, the "massive" and the "sinuous" one, but I am not aware that massive specimens of such a size were ever found before in our neighbourhood as those which were dredged on the "Hyæna" expedition of May 25th, 1890, on the west coast

of Anglesey. The first specimen was got in Penrhos Bay, from a depth of about ten fathoms. More material was taken off Towyn (twelve fathoms), and lastly off Rhoscolyn Beacon (twelve fathoms) the dredge brought up a specimen larger than any sponge ever found in our district, and probably not exceeded in size by any sponge ever collected on the British coast. It measures horizontally 31 cm. by 20 cm., and vertically 12 cm. The figure on Pl. XII. represents the specimen in not quite one-half natural size. I drew it from a photograph which Mr. Benjamin Davies (Physical Laboratories, University College, Liverpool) had kindly taken from the specimen after it had been in spirit for some time. Those members of our expedition who attempted to photograph it on board of the "Hyæna" were less successful.

The colour of the largest and of most of the smaller specimens, when alive, was ochreous-yellow. But the first specimen which we got from Penrhos Bay, was distinctly sulphur-yellow. The oscula are large and well marked. They have the shape of slits, and measure from 2 by 1 mm. to 8 by 3 mm. Two of them are seen in the figure upon one of the smaller lobes. A row of oscula on the upper edge of the largest lobe could not be represented in the figure. The pore-areas form extremely numerous and well-marked circular patches (2 mm. in diameter) on the extremity of very short papillæ, just projecting beyond the level of the sponge. In the "sinuous" form of *Cliona celata* those little papillæ with their pore-areas are generally the only things which are visible inside of or projecting from the small circular holes of the inhabited and perforated shell.

The spicules are tylostyli. They measure 0·315 mm. by 0·008 mm. A few of them were smaller, down to 0·225 by 0·003 mm. A vertical section through the sponge shows

at the first glance two very different tissues. The one is strong, fibrous and full of spicules, the other one is highly porous and reticulated, with a smaller number of spicules. The latter chiefly forms the choanosome, the former the ectosome, but broad strands of the ectosome are given off, which project down and branch throughout the choanosome, thus giving a strong support to the soft tissue of the choanosome (Pl. XI., fig. 2). The incurrent and excurrent canals are large and numerous. The size of the flagellated chambers is about 0·04 by 0·028 mm.

If one sees only the two extremes in the mode of growth of *Cliona celata*, the small boring form, which scarcely projects out of the holes of a perforated oyster shell, and the large massive form described above, then it is really difficult to convince oneself of the identity of the two forms. Intermediate stages, however, soon show the identity. The Zoological Museum of University College, Liverpool, possesses a specimen, dredged by Professor Herdman in Cailliach Bay, Mull, September, 1882, which represents an exceedingly good example of such an intermediate stage. The pore-areas of the future massive form are all fully developed, but they are easily recognized as being the upper surfaces of small papillæ which project from the holes of the perforated foreign body. Further, there is a layer of sponge-mass (varying from 1 to 3 mm. in thickness) outside and above the non-perforated surface of the foreign body (an igneous rock), which layer extends laterally to and fuses with the papillæ.

After the boring form of *Cliona celata* had been described by Grant and Nardo, Johnston discovered the massive stage and recognized it as a variety of the boring one. Other authors again considered both forms as different species, so also Bowerbank, who established a new genus for the massive form and called it *Raphyrus Griffithsii*.*

For an exhausting account of this comedy of errors I refer to Leidy's recent paper "The Boring-Sponge, *Cliona* †"

Leidy, in his paper, also discusses the question whether the *Cliona sulphurea*, Desor, of the American coast, which is found both boring and massive, might be identical with *Cliona celata*, Grant, of Europe. He finds that the two forms agree in all respects except two. Hancock‡ had stated that in *Cliona celata*, Grant, hexagonal siliceous granules are found on the surface of the sponge, by which the latter is able to work out the cavities it inhabits. Leidy says he has not been able to detect those granules in the American sponge. The second difficulty is: "Grant, Hancock, Bowerbank, and Lieberkühn give as the size of the spicules of *Cliona celata* about $\frac{1}{50}$ of an inch, while in all our ('i.e. American') forms of *Cliona*, in the oyster and clam, and in the largest massive varieties, the size of the spicules is only about $\frac{1}{80}$ of an inch."

The first difficulty about the hexagonal granules has been solved by Topsent.§ He considers them as broken pieces of the prismatic layer of the perforated shell, perhaps intermixed with grains of quartz. In regard to the second difficulty, Topsent remarks that the difference in size of spicules cannot be of much value, as he himself has observed spicules from 0·18 mm. to 0·35 mm. in length. On page 217 I gave as the length of the spicules 0·315 mm. As $\frac{1}{50}$ inch is equal to 0·508 mm., and $\frac{1}{80}$ inch is equal to 0·317 mm., we see that Topsent's and my own observations agree with Leidy's measurements as exactly as one could expect.

* Bowerbank, "British Spongiadæ," vol. ii., p. 354; vol. iii., pl. lxiv.

† In. "Pro. Acad. Nat. Sciences, Philadelphia," part i., January—April, 1889, p. 70.

‡ Albany Hancock, "On the excavating power of certain Sponges belonging to the genus Cliona," 1849.

§ Emile Topsent, "*Cliona celata* ou *Cliona sulphurea*?" Bulletin de la Société Zoologique de France," 1889, p. 351.

whilst we all three differ from the older and perhaps incorrect observations. There can be no doubt whatever that *Cliona sulphurea*, Desor, *is* identical with *Cliona celata*, Grant. I will add that I have measured also the spicules of a boring form of *Cliona celata* from Puffin Island, and get the following results: most spicules about 0·36 by 0·008 mm., a few smaller down to 0·27 by 0·003 mm.

Polymastia mammillaris, Johnston.

Several specimens of this were dredged on the "Hyæna" expedition of May 25th, 1890, in Penrhos Bay (10 fathoms), off Rhoscolyn Beacon (12 fathoms), and off Porth Dafarth, Anglesey. The largest of the specimens forms a globular mass with a diameter of 4 cm. More than one hundred papillæ rise from its upper surface. The other specimens were slightly smaller and flatter. They all were of a bright orange-yellow. One small specimen was also collected at the east end of Puffin Island, June 18th, 1890. This species had previously been dredged in Church Bay, near Holyhead. For description and figures see my former report.

Polymastia robusta, Bowerbank.

In my former report I recorded this species from Church Bay, Holyhead. We have dredged since two specimens of it on the "Hyæna" expedition of May 25th, 1890, in Penrhos Bay (10 fathoms), and off Rhoscolyn Beacon (12 fathoms), on the west coast of Anglesey. The specimens are hemispherical masses, of a diameter of about 4·5 cm. in horizontal direction and 2 cm. in height. The colour of the one specimen was a dirty greyish-yellow; of the other one a pure orange tint.

Order IV. TETRACTINELLIDA.

Tethya lyncurium, Johnston.

Five specimens of almost perfect globular form were dredged on the "Hyæna" expedition of May 25th, 1890, in Penrhos Bay (10 fathoms), and off Rhoscolyn Beacon (12 fathoms), on the west coast of Anglesey. The cortex of the living sponge was cadmium-yellow, its inner portion brown. The diameter of the specimens is 1·5 to 2 cm. One of them was covered with about thirty buds.*

One specimen of this species had previously been dredged in Church Bay, Holyhead.

Dercitus bucklandi, Bowerbank.

This sponge, which had already been recorded by Mr. Higgin under the name *Dercitus niger*, C., from Holyhead, has now also been discovered at Puffin Island. I found a few specimens of it at the entrance of the large cave on the north end of the island, at low spring tide, April, 1889. The largest of the specimens measures 3 cm. by 2 cm. in horizontal direction and 0·6 cm. in height. Colour, dark black.

For an extensive list of the literature, and a revised description of this species, see Sollas.†

Seiriola compacta, Hanitsch (Pl. XIII., figs. 1—4).

In my former report on the Porifera of the L.M.B.C. District‡ I described and figured a new species of a tetractinellid sponge under the above name, which I took to be the representative of a new family. But in doing so I fell into a serious error, and I have to thank Professor Sollas, D.Sc., for pointing out the mistake to me. The two layers which I described as ectosome and choanosome of *one* sponge are really two quite separate sponges, an encrusting Suberite and an encrusted Stellettid. "Each is," as Prof. Sollas writes me, after having seen my preparations, "a separate individual, the Suberite is defined from the

* Compare Bowerbank, "British Spongiadæ," vol. ii. p. 94.

† Sollas, "Report on the Tetractinellida collected by H.M.S. 'Challenger,'" p. 108.

‡ Proc. Liverpool Biological Society, vol. iii., p. 169—172, pl. vii.

Stellettid by its own basal membrane, and the Stellettid from the Suberite by its outer epithelium, distinguished in favourable parts of the sections by the somewhat dense layer of sanidasters which usually are more crowded there than elsewhere. The basal membrane of the Suberite supports the heads of the longer tylostyles as so commonly happens in these sponges." Curiously enough Döderlein * fell into a quite similar error in regard to *Discodermia calyx*, D., and Bowerbank † in regard to *Stelletta collingsi*, B., and *Stelletta schmidtei*, B. As, notwithstanding the above stated error, the encrusted tetractinellid sponge is new to science, and is the only representative of a new genus, *Seiriola*,‡ I propose to give now a corrected description of it. No new figure of the spicules will be necessary, as I can refer to Vol. III., Pl. VII., where, however, no notice should be taken of the upper thinner layer which does not belong to *Seiriola compacta*. This foreign layer is characterized by tylostylote spicules and is separated from the lower portion, the *Seiriola compacta*, by a definite line of demarcation. It belongs to a monaxonid sponge, *Suberites domuncula*, Nardo.

The first specimen of *Seiriola compacta* was found at Puffin Island, in June, 1888, in one of the caves on the north-east side of the island, which are exposed only at low spring tides, and then accessible only by boat. It formed a knob-like mass, like that of so many tetractinellid sponges, and measured horizontally 4 cm. by 1·5 cm., and vertically 1·3 cm. It came into my hands after it had been in rather weak spirit for several weeks, and was then

* Sollas, "Report on the Tetractinellida," collected by H.M.S. "Challenger," p. 295.

† Sollas, loc. cit., p. 186.

‡ From Seiriol, an early Welsh saint, who is said to have had his cell on Puffin Island.

of dark grey colour. In April, 1889, I collected in the same cave several specimens of *Seiriola* which were white with a slight greyish tint, and have kept their colour perfectly well in strong spirit. The specimens have about the same dimensions as the original one, but they are flatter. Although the shape and colour of this sponge agree completely with those of *Stelletta collingsi*, B., which I collected at the same time and in the same locality, still one may distinguish the two forms in the following way: *Stelletta* has a hispid surface; *Seiriola* is smooth to the touch; *Stelletta* shows a cortex even in a rough vertical section made with the pocket-knife; *Seiriola* does not. Curiously also a specimen of the new material was encrusted by *Suberites domuncula*, and in the same way also one or two specimens of *Stelletta collingsi*. The rest were not encrusted. Oscula and pores were not visible in the living specimens.

The skeleton of *Seiriola compacta* consists of megascleres and microscleres. The former show the following forms: dichotriæna, orthotriæna, oxea, styli, strongyla, tylota. The dichotriæna are very numerous, and are arranged immediately beneath the surface, with their cladomes directed towards the surface. The rhabdome measures from 0·36 to 0·42 mm., the protocladus from 0·06 to 0·09 mm., and the deuterocladus from 0·037 to 0·45 mm. The orthotriæna are far less numerous and slightly smaller than the dichotriæna. They are also placed close to the surface. The oxea are the most numerous spicules, and are arranged in bundles, which take their origin in or immediately beneath the region of the triæna, and stretch vertically down through the whole depth of the sponge. The oxea measure 0·34 to 1·5 mm. by 0·009 to 0·026 mm. Amongst them we find a few stylote, strongylote, and tylote spicules.

The microscleres are oxyasters, 0·025 mm. in diameter,

and sanidasters (not spirasters, as I called them in my previous report) 0·012 to 0·016 mm. in length, and are both very typical forms. The oxyasters are found only in the choanosome, the sanidasters chiefly in the ectosome, and a few also in the choanosome.

Besides those megascleres and microscleres, I found fragments of a third kind of spicule (see fig. 2 c., Pl. VII., Vol. III.), the appearance of which, in my former report, I compared with broken blades of fret saws. The largest of these pieces measured 0·08 by 0·0014 mm. They were found just beneath the surface of the sponge. But now I think it quite possible that they do not belong to *Seiriola* at all, but rather to *Stelletta collingsi*, in which latter sponge I now describe them for the first time (see Pl. XIV., figs. 1 and 2). As my specimens of *Seiriola* and *Stelletta* had been taken from the same rock, and had been kept together for some time in the same jar of spirits, it is possible that fragments of those spicules found their way accidentally into the *Seiriola*.

Oscula and pores could not be distinctly seen, neither in the living specimens nor in sections. The incurrent and excurrent canals seem to branch in a very irregular manner through the sponge. The chamber-system appears to belong to the eurypylous type,* in so far as the flagellated chambers lie closely round the excurrent canals, and as the apopyles are not continued into special tubes and are extremely short. At the same time the term "eurypylous" does not apply correctly to *Seiriola*, as the apopyles are extremely narrow. The flagellated chambers and collar cells are very small. The former are oval, and measure 0·012 by 0·008 mm. The collar cells measure 0·0013 mm.

The mesoderm of *Seiriola* consists of sarcenchym, the

* Sollas, loc. cit., p. xv.

greatest part of which however has been replaced by cystenchymatous tissue, also called vesicular connective tissue or bladder-cells ("blasiges Bindegewebe" of German authors). These bladder-cells are generally spherical, with an average diameter of 0·04 mm. In the original, less well preserved material of *Seiriola*, these cells contained very little protoplasm which, together with the small nucleus, adhered to one side of the cell-wall only, leaving the greatest part of the cell quite empty (compare Pl. VII., fig. 1, Proc. L'pool Biol. Soc., Vol. III). Also in the second and well preserved material the bladder cells showed eccentrically situated nuclei; the protoplasm, however, was found not only round the nuclei and along the neighbouring parts of the cell-wall, but threads of it radiated throughout the remainder of the cell (Pl. XIII., figs. 1 and 2). Bladder-cells have been already observed by various authors in other sponges, as by Vosmaer* in *Polymastia hemisphærica*, by Sollas† in *Pachymatisma*, *Stryphnus*, &c., and also in some of the Lithistida. A similar tissue is known to occur in many Molluscs and in Tunicata.‡

Of great interest too were strands of spindle-shaped cells which occur in great frequency (Pl. XIII., figs. 1—3). The cells are arranged longitudinally and in parallel rows, and are apparently imbedded in a clear gelatinous matrix. Their size varies greatly, the largest cells measure about 0·048 by 0·014 mm. Both ends of the cells are prolonged into delicate fibres. They are all highly granular, and intensely stained after treatment with picro-carmine. The

* Vosmaer, "Sponges of the 'Willem Barents Expedition, 1880 and 1881,'" in "Bijdragen tot de Dierkunde."

† Sollas, "Report on the Tetractinellida," collected by H.M.S. "Challenger," p. xxxix.

‡ W. A. Herdman, "Report on the Tunicata," collected by H.M.S. "Challenger," Vol. I., pp. 28—29.

nuclei are small and not very conspicuous, apparently on account of the opaque protoplasm of the cells. The nature of these cells seems to be distinctly different from that of the much smaller spindle-shaped cells described in *Axinella mammillata*, n. sp. (page 211). In the latter species the granules of the cells are distinctly spherical, clear, and highly light-refracting. In *Seiriola* the granules are opaque, and apparently of no definite outline. Further, in *Axinella* the spindle-cells run in strands along the chief masses of spicules, and suggest at once that they might be "sclero-blasts." But in *Seiriola* such a relation between the spindle-cells and the spicules does not seem to exist. On the contrary, quite independently of the presence or absence of spicules, the strands of those cells permeate the choanosome in an irregular fashion, giving off numerous branches (Pl. XIII., fig. 3). Further, I have not been able to find any connection between those strands and the incurrent and excurrent canals, or with any other structure. Transverse sections through the strands are frequently met with in preparations, and they show a round outline. Sollas's "myocytes" seem to be similar structures, but they differ from those cells in *Seiriola* by chiefly occurring "concentrically arranged about the openings of the water-canals." Still I shall not be surprised if future investigations prove those cells to be neuro-muscular elements.

In regard to the systematic position of *Seiriola compacta* Professor Sollas wrote me as follows:—"The choanosomal spicule is a characteristic oxyaster, the ectosomal microsclere is a typical sanidaster; this latter places the sponge in the Sanidasterina. Of the genera of this group it approaches most nearly *Stryphnus*, but differs from all the species of this genus which I have seen. The sanidaster is a better sanidaster, i.e., more typical and regular

than in most species of *Stryphnus*, and the oxeas are not colossals, while they do seem to be arranged in bundles." Prof. Sollas further suggested placing *Seiriola compacta* as a new species of the genus *Stryphnus*, Sollas.*

In consequence of Prof. Sollas's advice I have now decided to drop the new family "Seiriolidæ" which I established in my former report, and I place the new sponge amongst the Sanidasterina, a sub-family of the family Stellettidæ. But I still intend to retain the new genus "*Seiriola*." The differences between it and the genus *Stryphnus* justify, I think, my doing so. These differences are:—

(1.) *Stryphnus*—The choanosomal megascleres are colossal oxeas, closely strewn through the sponge, not aggregated to form fibres and not radiately arranged. *Seiriola*—The choanosomal megascleres are oxeas of ordinary size, and besides those also styli, strongyla and tylota. The spicules seem to be aggregated in bundles, and somewhat radiately arranged.

(2.) *Stryphnus*—The microscleres are some form of euaster, and an irregular amphiaster or sanidaster. *Seiriola*—The microscleres are typical forms of oxyaster and sanidaster.

(3.) *Stryphnus*—The flagellated chambers are either aphodal or slightly diplodal. *Seiriola*—The flagellated chambers are eurypylous.

Stelletta collingsi, Bowerbank (Pl. XIV., figs. 1—3).

Tethea collingsii, Bowerbank.
Tethea schmidtei, Bowerbank.
Collingsia sarniensis, Gray.
Collingsia schmidtei, Gray.
Stelletta collingsii, Sollas.

The sponge, which in my former report was mentioned

* Sollas, loc. cit., p. 171.

under the name *Ecionemia ponderosa*, B., has, by further examination, turned out to be a *Stelletta collingsi*, B., or at least a variety of it.

I have found in it all the different kinds of spicules which have been mentioned by Bowerbank, and more recently by Sollas,* and some other spicules in addition to those. The megascleres are—oxea 1·8 by 0·032 mm.; orthotriæna, the rhabdome of which measures 1·42 by 0·032 mm., and the cladi 0·105 by 0·028 mm.; a few dichotriæna, the protocladi of which measure in length 0·056 to 0·084 mm., and the deuterocladi 0·028 to 0·046 mm.; and a very few protriæna, rhabdome 0·40 mm., cladi 0·036 mm. Both dichotriæna and protriæna had not been mentioned by previous authors. The microscleres are—chiaster, 0·012 mm. in diameter, found only in the ectosome, just beneath the surface; and oxyasters with a varying number of actines, found chiefly in the choanosome. It seems to be the rule that the larger the oxyasters are, the smaller is the number of their actines. I found that—

4 radiated oxyasters measured 0·056 mm. in diameter
6 ,, ,, 0·040 ,, ,,
8 ,, ,, 0·032 ,, ,,

Besides those above-mentioned kinds of megascleres and microscleres I found an additional kind of spicule which I will call "prionorrhabds" † (Pl. XIV., figs. 1 and 2). They are long and slender spicules, 0·40 by 0·002 mm., one end of which is profusely spined, the other and larger portion is smooth. The two extreme ends of the spicules are sharply pointed. I have found these prionorrhabds only in the ectosome, with their spined ends imbedded in it and the smooth ends projecting through the ectoderm and penetrating into a calcareous sponge *Sycandra ciliata*, which was attached to the surface of the *Stelletta*. The prionorrhabds are arranged radiately, the ideal centre of the circle lying inside the *Sycandra*. But only this one small portion of the *Stelletta*, opposite to which the *Sycandra* is situated, shows those spicules.

* Sollas, loc. cit., p. 185.

† From πρίων a saw.

As this special kind of spicule has never before been described in *Stelletta collingsi*, nor in any other sponge, the question arises whether my specimen is identical at all with *St. collingsi* or whether the spicules are present in all specimens of *St. collingsi* and have been overlooked by former investigators, or lastly, whether they are a special acquirement which may become developed in the sponge under certain conditions. I am inclined to accept the last of the three views. I have mentioned already that the prionorrhabds were found only in a certain portion of *Stelletta*, and I believe that they have been acquired by the sponge under the special abnormal conditions to protect itself against the encroaching foreign body, a calcareous sponge. As in my specimen they are very localized, it is quite possible that they have been overlooked by other workers.

I collected several specimens of *Stelletta collingsi* at Puffin Island, in one of the caves on the north end of the island, in April, 1889. One specimen had been found there already, in June, 1888. The colour of the living specimen is greyish-white.

Pachymatisma johnstonia, Bowerbank.

The colour of this species is known to be subject to great variation. Bowerbank* states—"Littoral specimens, light to dark slate-grey. Deep sea specimens, pink or red." And Sollas† says—"Slate-grey on the portion exposed to the light, almost white beneath; specimens from

* Bowerbank, "British Spongiadæ," vol. ii., p. 51.

† Sollas, "Report on the Tetractinellida," collected by H.M.S. "Challenger," p. 243.

considerable depths, pink or red (Bowerbank)." I had excellent opportunity of convincing myself of this variation in colour in one of the large caves at Puffin Island, in April, 1889. The cave, situated on the north end of the island, is accessible only at lowest spring tides, and even then only with boat. Right at the entrance to the cave I noticed that the specimens of *Pachymatisma* were of a dark slate-grey colour. Rowing further into the interior I found specimens of a light grey, and in the farthest recess of the cave I discovered some splendid specimens of a perfect cream-white tint. I found quite similar conditions in April, 1890, near Brada Head, Port Erin, in a cave which also is accessible only with boat and at lowest tide. The specimens of *Pachymatisma*, larger even than those at Puffin Island, were lighter in colour the further back in the cave they were found.

The explanation of these facts is, in my opinion, found only in the direct action of the light of the sun. The more exposed the specimens were to the light, the darker they were; the more protected, the lighter. I know very well that such an explanation is not at all in accordance with the generally accepted views, and Wallace's* statement, "that light and heat of the sun are not the direct causes of the colour of animals," is not only his own view, but is shared by the majority of modern biologists. Still my own view finds support in what Lendenfeld† has recently said in regard to the Ceratosa—"No differences are observed in the colour of different parts of the surface except that the lower side is generally lighter-coloured than the upper side. This is less of a protective acquisition than a direct effect of the light. The parts of the surface exposed to it are darker coloured by its photographic action than the lower side which is always in shade." I therefore merely apply what Lendenfeld said in regard to different parts of the same specimen to different specimens of the same species.

* Wallace, "Darwinism," p. 195.

† R. v. Lendenfeld, "A Monograph of the Horny Sponges," p. 742.

I will not omit to state that in neither of the two cases could one think of accounting for the colouring by protective resemblance to the environment. The lighter specimens especially were as different in colour from the rocks (carbonate of lime at Puffin Island and slate of Ordovician age at Brada Head, Port Erin) as they possibly could be. Altogether it has not been proved yet that sponges ever imitate their surroundings in colour. Out of the numerous species of our district which I have had occasion to examine in the living condition, not a single instance seemed to give a sure proof of such an imitation. If here or there a species of sponges, organisms which in their shades and tints show almost as innumerable transitions as the spectrum itself, happens to resemble its surroundings, whilst the vast majority of the other species do not, then it is surely out of place to take that one example as a proof of imitation of the environment. I may quote what Lendenfeld* says in regard to the Ceratosa—"The horny sponges never *imitate* their surroundings in colour, although some of them, particularly those which have an arenaceous cortex, are very similar in colour to the sea bottom on which they grow. Most of the horny sponges are, like many of the other shallow water Silicea, very intensely coloured, and it would appear that these vivid colours have been adopted by the sponges for the purpose of frightening their enemies." This seems really to be the only explanation for most of the colours in sponges. Animals which, like the great majority of sponges, are so extraordinarily well defended by their skeleton, are scarcely in need of a pro-

* R. v. Lendenfeld, "A Monograph of the Horny Sponges," p. 742.

tective colouring to enable them to escape from their enemies; what they really want are warning colours.

The dimensions of the largest specimen of *Pachymatisma* from Puffin Island is 10 cm. by 7 cm. in horizontal direction; 1·5 cm. in height. The largest specimen from Port Erin measures 12 cm. by 6 cm. horizontally and 6 cm. vertically. I give also the measurements of the spicules, as my results differ somewhat from Bowerbank's and Sollas's * :—

I.—Megasclera: strongyla, 0·57 to 0·75 mm. by 0·012 to 0·024 mm. Orthotriæna: rhabdome, 0·405 by 0·016 mm; cladus, 0·255 by 0·016 mm. Also a few styli are present, which are not mentioned by Bowerbank and Sollas. They measure 0·635 by 0·009 mm.

II.—Microsclera: sterraster, either spherical, 0·045 to 0·075 mm. in diameter; or elliptical, from 0·06 by 0·045 mm. to 0·09 by 0·068 mm. Oxyaster, 0·048 to 0·056 mm. in diameter; microstrongyla, 0·018 by 0·003 mm.

This species seems to be the only tetractinellid sponge which up to now has been found at the Isle of Man, and it is now for the first time recorded in our L.M.B.C. reports from that locality. I hear that Mr. Geo. Swainson, of Bolton, collected some specimens of it at Parwick Bay, Isle of Man, during last autumn.

Order VI. CALCAREA.

Ascetta coriacea, Fleming.

I found a single small specimen of this species at Puffin Island, April, 1889, at lowest spring tide, in the large cave on the north side of the island. It encrusted a living oyster, which latter was firmly attached to the wall of the cave.

* Sollas, loc. cit., p. 242.

Ascetta coriacea had previously been recorded from Port Erin and Holyhead, and I collected again great quantities of it at Fleshwick Bay, near Port Erin, Easter, 1890.

Ascaltis botryoides, Fleming.

A number of specimens of this form were obtained in Fleshwick Bay, near Port Erin, on the "Hyæna" expedition of Easter, 1889. I found them in a shallow pool just beyond the entrance of a long and narrow cave, where I collected some again at Easter, 1890. The level of the pool was near high-water mark (!).

Mr. Higgin records this species from Holyhead.

Ascaltis contorta, Bowerbank.

Leucosolenia contorta, B., Brit. Spong., vol. ii., p. 29; vol. iii., pl. iii.
Leucosolenia contorta, Carter, Midland Naturalist, vol. iii., p. 195.

A few small specimens have been found for the first time in our district by Mr. Herbert C. Chadwick, near Beaumaris, August, 1889, and subsequently I found it myself at Hilbre Island, March, 1890. Bowerbank records it from Guernsey, Scarborough (?), and from the Guliot Caves, Sark.

Ascortis lacunosa, Johnston.

Grantia lacunosa, Johnston.
Leucosolenia lacunosa, Bowerbank.

I refer to this species a few specimens which were dredged on the "Hyæna" expedition of May 25th, 1890, in Penrhos Bay, off Rhoscolyn Beacon, and off Porth Dafarth, where they were found sticking to Zoophytes.

The presence of oxeote spicules in the stalk-like portion of these specimens shows that they belong to this species and not to *Ascetta primordialis*, Hkl., some varieties (especially *Nardorus primordialis*)* of which they resemble very closely. For figures and descriptions see Bowerbank†

* Hæckel, "Die Kalkschwæmme," vol. iii., pl. ii., fig. 5.
† Bowerbank, loc. cit. vol. ii., p. 22; vol. iii., pl. iv.

and Hæckel.* Two specimens, which in my former report I recorded as *Ascetta primordialis*, are also referable to this species.

Leucaltis impressa, n. sp. (Pl. XV., figs. 1—3).

I found three specimens of this new species at Puffin Island, April, 1889, in one of the large tidal pools on the north-east end of the island. The sponge consists of a solitary persona, which has an elongate and somewhat flattened shape. In two of the specimens the surface is longitudinally corrugated, but is even in the third specimen; it is, however, smooth in all three cases, and hard to the touch. The average height is 12 mm., the diameters in the two horizontal directions 6 mm. and 4 mm. The osculum is terminal, it bears no frill, and measures 0·5 mm. in diameter. The colour is white.

A transverse section shows a thick body-wall and a gastral cavity of about the same width as the body-wall. The diameter of the gastral cavity is therefore only about one-third of the diameter of the whole specimen. The flagellated chambers are spherical or ovoid and exceedingly numerous. They measure from 0·09 mm. to 0·18 mm. in diameter. The inhalent canals branch and anastomose between the flagellated chambers, and open finally into the gastral cavity. These openings are 0·05 to 0·1 mm. in diameter.

The skeleton of the body-wall and of the outer surface consists of triacts and tetracts. The former are by far the more numerous, and each of their rays measures about 0·1 mm. by 0·008 mm. There are also a few triacts with rays of 0·16 mm. in length. In all these triacts one of the rays is straight, the two others slightly curved. The tetracts which are found in the outer surface and in the body-wall generally have about the same dimensions as the triacts,

* Hæckel, loc. cit., vol. ii., p. 70; vol. iii., pl. xi, fig. 2.

but their fourth ray, which stands vertically upon the three others, is short and hook-like. It measures 0·03 mm. In addition to these spicules we find large gastral tetract spicules. They consist of three short rays (0·14 mm.) which lie in one plane, and of a fourth long ray (0·43 mm.), which stands at right angles to the former. The short rays are slightly curved, they lie in the inner surface of the body-wall and parallel to its circumference. The fourth ray projects freely into the gastral cavity. These tetract spicules are very numerous, so that their short rays form a kind of dense basket-work on the inner surface of the body-wall.

The spherical flagellated chambers of this species and its ramifying canals place it amongst the Leuconidæ, and its triact and tetract spicules bring it under the genus *Leucaltis*, Hæckel. Following now Hæckel's "Ubersicht der 6 Species des Genus *Leucaltis*,"* and taking no notice of the tetracts with the one hook-like ray, we arrive at *Leucaltis pumila*, Bowerbank. The respective steps in that "Ubersicht" are: 1. "Skelet nicht scharf getrennt in ein völlig verschiedenes Rinden-und Mark-Skelet." 2. "Hauptmasse des Skelets aus Dreistrahlern gebildet.' 3. "Vierstrahler entweder bloss in der dermalen oder bloss in der gastralen Fläche. Alle oder ein Theil der Dreistrahler und Vierstrahler nicht regulär." 4. "Vierstrahler bloss in der stacheligen gastralen und canalen Fläche." 5. "Basal Strahl der Vierstrahler länger als die lateralen.—*Leucaltis pumila*." Yet when we compare the specific characters of *Leucaltis pumila*, as given in the detailed descriptions of Hæckel and Bowerbank,† with our species, we find so many and such great differences between these two forms that I feel obliged to establish a new

* Hæckel, "Die Kalkschwämme," Bd. ii. p. 143.

† Bowerbank, "British Spongiadæ," vol. ii., p. 41.

species. These differences are: 1. In *Leucaltis pumila* there are no tetracts with hook-like rays, such as are found in *Leucaltis impressa*. 2. The proportion in size of the gastral tetracts is different in the two species, the stalk being much longer in the new form. 3. The inner surface of the body-wall in *Leucaltis impressa* appears not to be provided with triacts in addition to tetracts as in *Leucaltis pumila*. 4. Bowerbank mentions the "very large size of the surface spicula" in *Leucaltis pumila*, of which there is no trace in our species.

I may mention that *Leucaltis pumila* has, according to Hæckel, a very wide geographical distribution. It has been found at Guernsey by Norman; at Magador (coast of Morocco) by Hæckel; at the Cape by Wilhelm Bleek; and in the Indian Ocean (Bass Strait) by Wendt.

Leucandra gossei, Bowerbank.

This form had previously been recorded from Port Erin and Holyhead. A few specimens of it have been collected again at Port Erin (April, 1889, and April, 1890), and also at Fleshwick Bay (April, 1890). It is one of the rarest calcareous sponges in our district.

Leucandra johnstoni, Carter.

A number of fine specimens of it were collected by me at Fleshwick Bay, Isle of Man, and a few also at Port Erin, in April, 1890. It had previously been found at Port Erin and Holyhead.

Leucandra nivea, Fleming.

In Mr. Higgin's report this species was recorded from the Isle of Man only. I have found it since, and in profusion, at Puffin Island, April, 1889; and a few specimens also at Hilbre Island, June, 1889. An unusually large and highly corrugated specimen of it, recalling *Leucandra johnstonia*, C., was collected by Mr. Charles Walker at Fleshwick Bay, April, 1890.

It generally forms small white patches on the rocks, and is easily recognizable.

Sycandra ciliata, Fleming.

Owing to an oversight *Sycandra ciliata* was not recorded in the two previous reports as having been found at Hilbre Island. It had been collected there in the summer of 1885 by the members of the Liverpool Marine Biological Committee,* and I have found a few small specimens of it in the same locality in March, 1890. Common in other parts of the district.

Explanation of the Plates.

ch. choanosome.
cy. cystenchymatous tissue.
d.m. dermal membrane.
e. ectosome.
e.c. exhalent canals.
f.c. flagellated chambers.
i.c. inhalent canals.
m. gastric cavity.
p.a. pore area.
p.c. "problematic cells."
pg. pigment cells.
pr. prionorrhabds.
s.c. subdermal cavities.
s.l. layer of scleroblasts (?).

Plate X.

Fig. 1. Vertical section through outer portion of *Halisarca rubra*, n. sp., semi-diagrammatic (× 250).

Fig. 2. Vertical section through inner portion of *Halisarca rubra*, n. sp. (× 250). It is doubtful whether the parts in figs. 1 and 2, named "i. c.," are inhalent or exhalent canals.

Fig. 3. *Axinella mammillata*, n. sp., natural size.

Fig. 4. Scleroblasts (?) of *Axinella mammillata* (× 800).

Fig. 5. Portion of a longitudinal section through one of the papillæ of *Axinella mammillata* (× 150).

Plate XI.

Fig. 1. *Chalina montagui*, Johnston, natural size.

*W. A. Herdman, in "Introduction" to "Fauna of Liverpool Bay," Vol. I. p. 8.

Fig. 2. Vertical section through the massive form of *Cliona celata*, Grant (× 3).

PLATE XII.

Fig. 1. *Cliona celata*, Grant, not quite one-half natural size.

PLATE XIII.

Fig. 1. A portion of the choanosome of *Seiriola compacta*, Hanitsch, showing chamber-system, strand of "problematic cells" (in longitudinal section), and cystenchymatous tissue (× 250).

Fig. 2. Transverse section through a strand of "problematic cells" of *Seiriola compacta*, with cystenchymatous tissue around it (× 250).

Fig. 3. Section through the choanosome of *Seiriola compacta*, showing the branching of the strands of "problematic cells" (× 50).

Fig. 4. Portion of fibrous layer of *Seiriola compacta*, situated between ectosome and choanosome (× 250).

PLATE XIV.

Fig. 1. Vertical section through the upper portion of the ectosome of *Stelletta collingsi*, Bowerbank. The encroaching *Sycandra ciliata* (in the upper left corner of the plate), shown diagrammatically, (× 200).

Fig. 2. Spined portion of a prionorrhabd (× 800).

Fig. 3. *a*, chiaster (× 800); *b*, *c*, and *d*, forms of oxyaster (× 400).

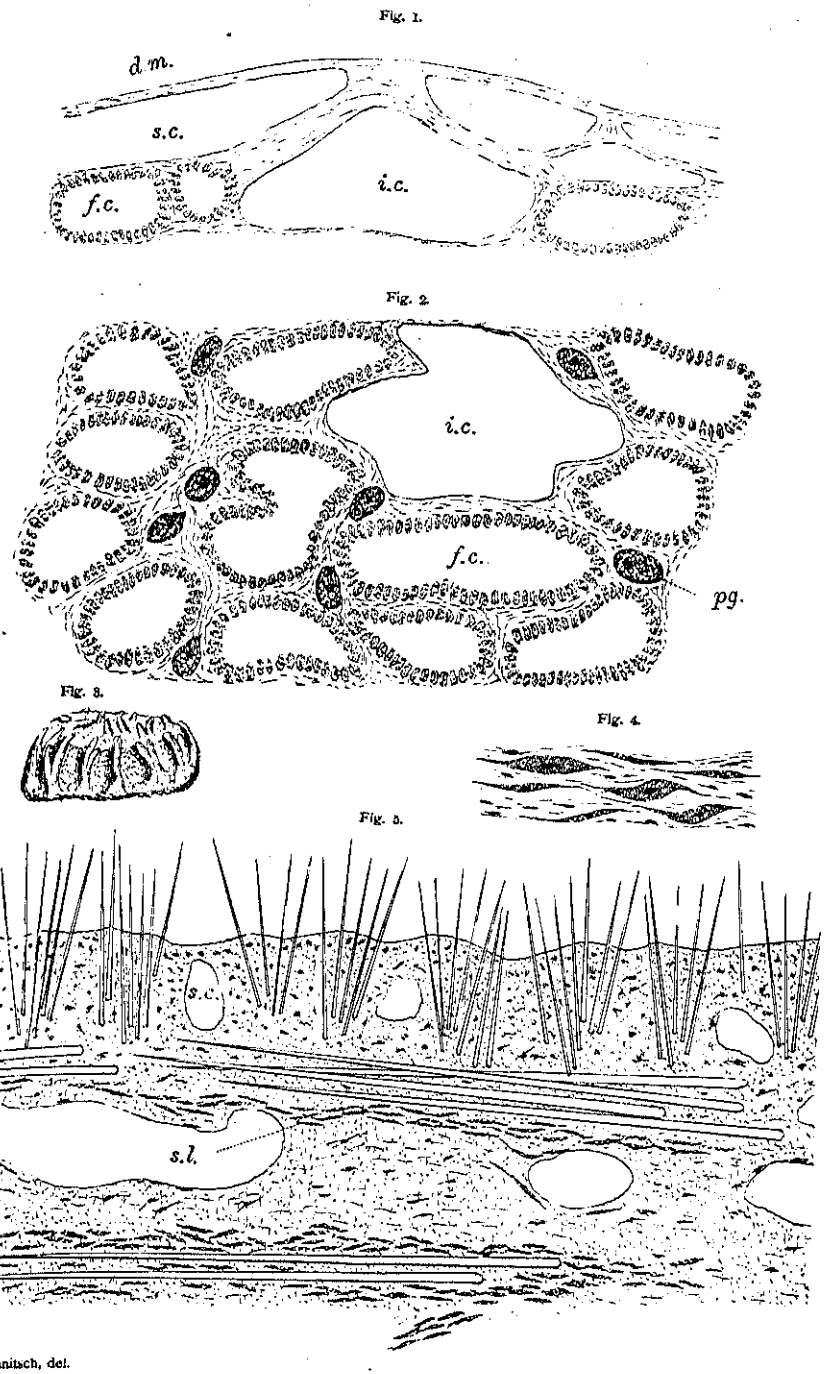
Fig. 4. *a*, protriæna; *b*, dichotriæna (× 60).

PLATE XV.

Fig. 1. Portion of transverse section through *Leucaltis impressa*, n. sp. (× 80).

Fig. 2. Two specimens of *Leucaltis impressa*, natural size.

Fig. 3. *a*, *b*, *c*, and *d*, triacts and tetracts of the body-wall (× 150); *f*, gastral tetract (× 150).



HALISARCA RUBRA, N. SP.
AXINELLA MAMMILLATA, N. SP.

Fig. 1.

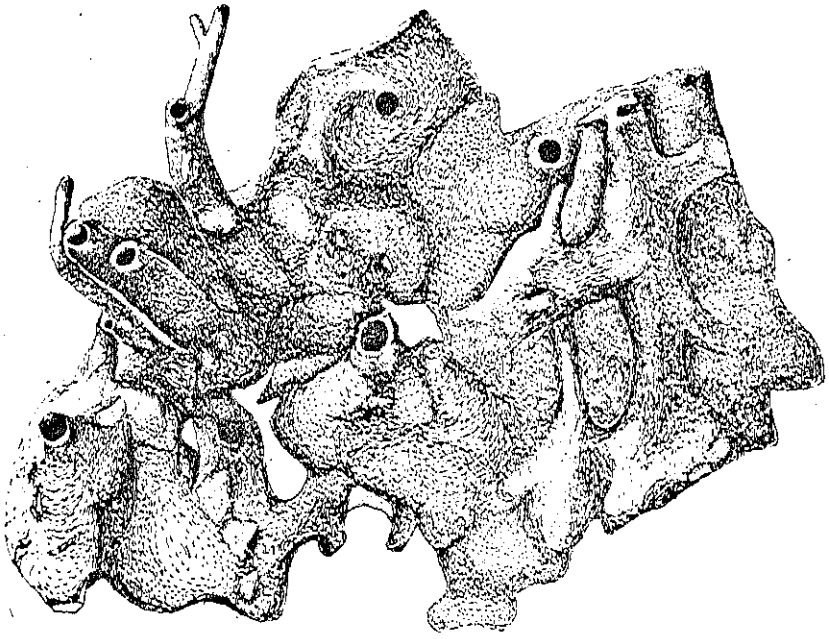
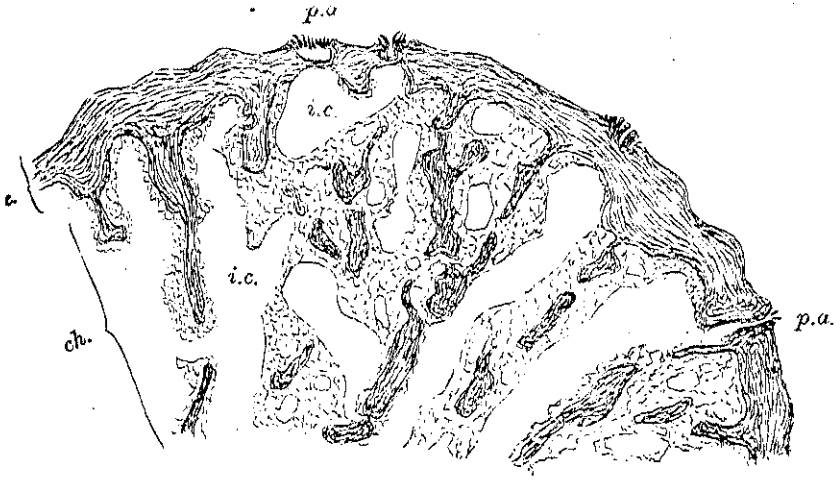
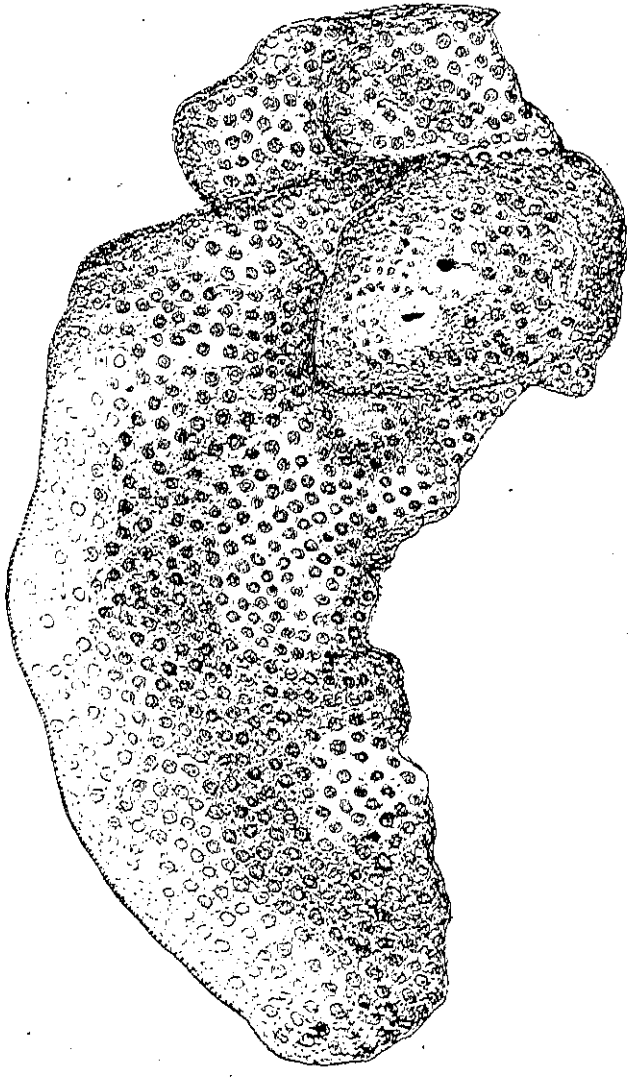


Fig. 2.



K. Hamitsch, del.

CHALINA MONTAGUI. JOHNSTON.



R. Haaltsch, del.

CLIONA CELATA. GRANT.

Fig. 1.

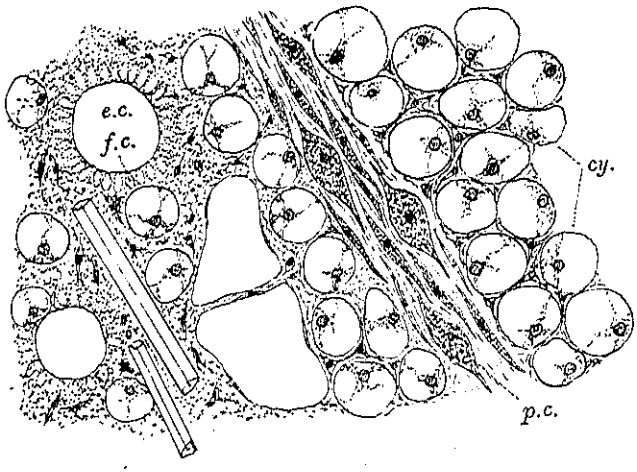


Fig. 2.

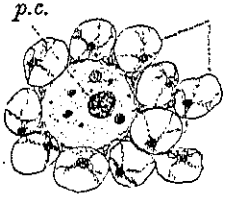
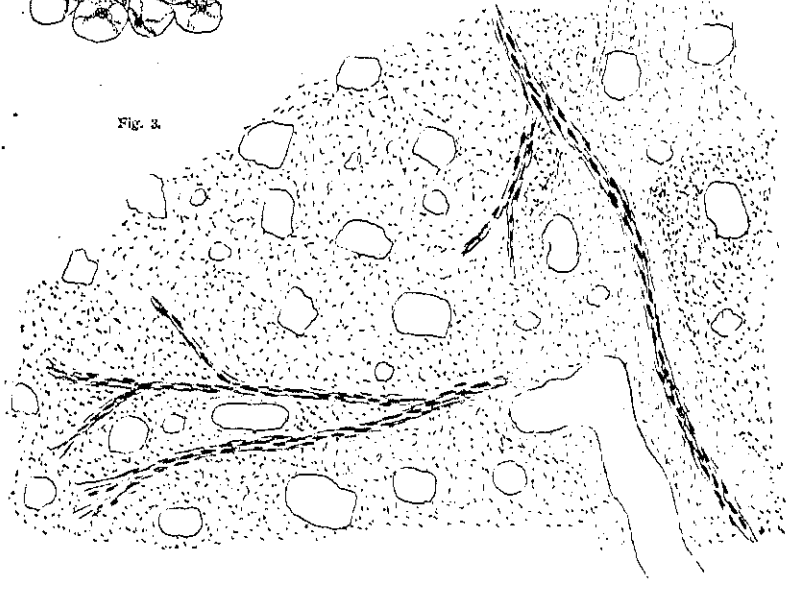


Fig. 4.

Fig. 3.



R. Hanitsch, del.

SEIRIOLA COMPACTA, HANITSCH.

Fig. 1.

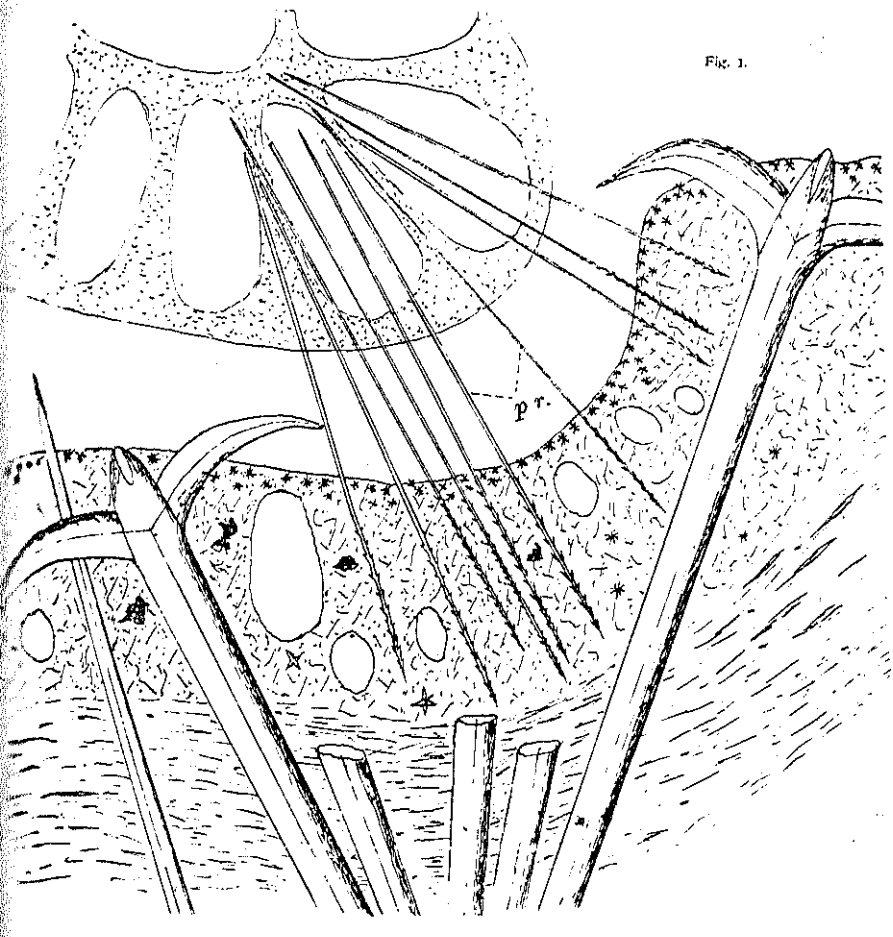


Fig. 2

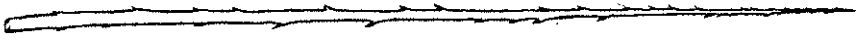


Fig. 3.

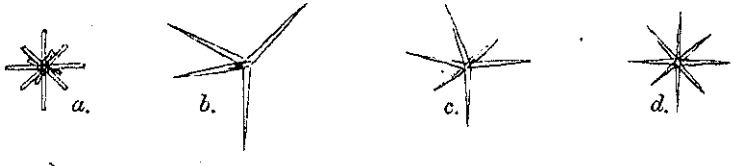
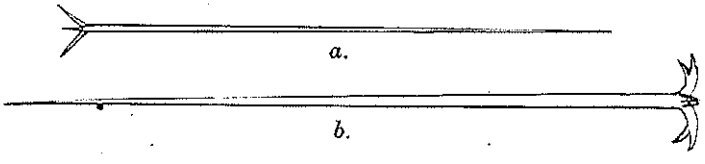


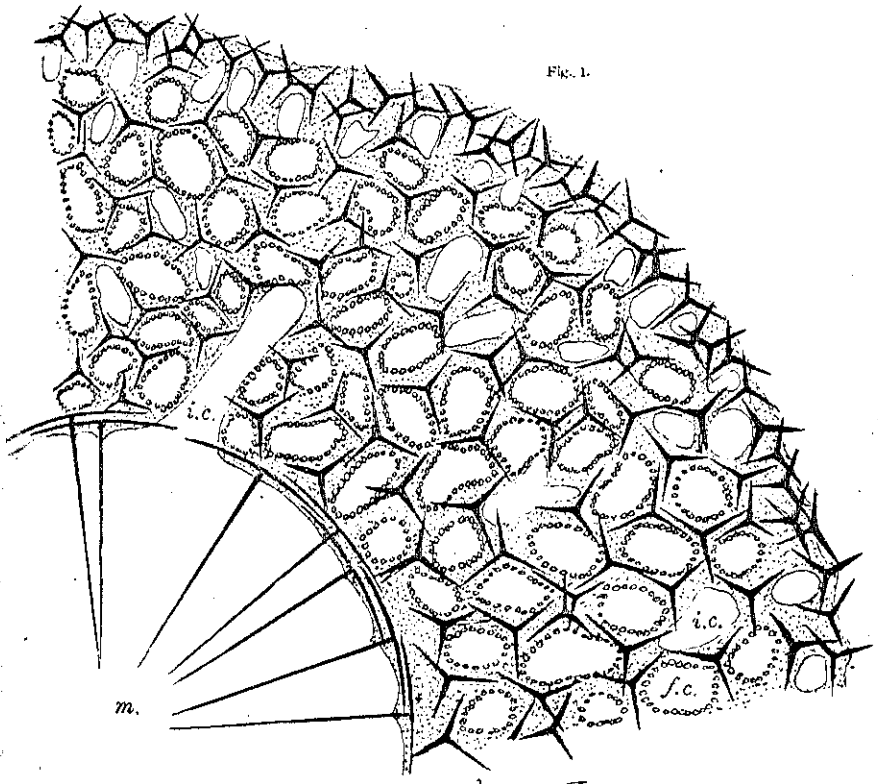
Fig. 4.



R. Hantzsch, del.

STELLETTA COLLINGSI. BOWERBANK.

Fig. 1.



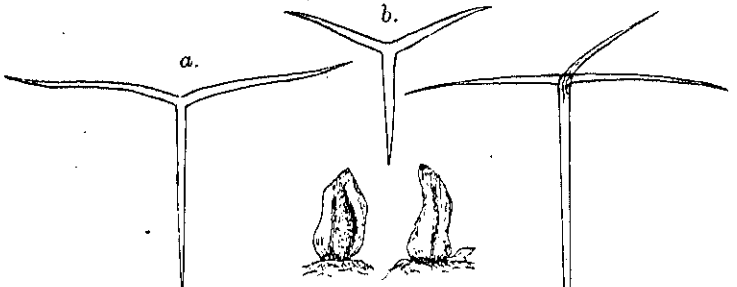


Fig. 2.

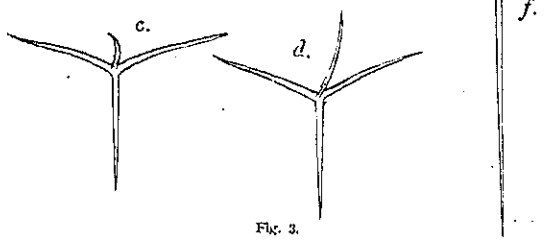


Fig. 3.

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LEUCALTIS IMPRESSA. N. SP.