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MARINE PORIFERA.

BY JANE STEPHENS, B.Sc.

PLATE I.

Read JUNE 10. Published JULY 17, 1912.

THE sponges named in the following report were collected off Clare Island and along the coast of the adjacent mainland from Blacksod Bay to Ballynakill Harbour.

During the Survey of 1909–1911, special attention was given to the sponges of Clare Island and Clew Bay: but within the last few years extensive collections of sponges have been made by Mr. G. P. Farran at Bofin and Ballynakill, and by Mr. Farran and Mr. R. Southern in Blacksod Bay, during the scientific cruises of the s.s. "Helga," of the Fisheries Branch of the Irish Department of Agriculture. It seemed advisable, therefore, to deal with the larger area in this report, in the hope of obtaining, by the inclusion of a longer and more varied coast-line, a more complete study of the sponges typical of the west of Ireland than would have been possible if a very limited district had alone been considered.

The sponges of Clare Island seem to have been left untouched until the present work was undertaken. The earliest collection of sponges off the coast of the adjacent mainland was made in the year 1840 by William Thompson who records seven species for Clew Bay and Killary Harbour (**16**, **17**). It should, perhaps, be mentioned that about this time, or possibly a little earlier, William McCalla collected many sponges off the west coast of Ireland, which are recorded in Johnston's "History of British Sponges" (**9**). The locality for some of these is given vaguely as Connemara. It is thus impossible to know with certainty if they were taken within our area. As McCalla lived at Roundstone, it is probable that most of his collecting was done outside the southern limit of the district under consideration. With the exception of one species taken in Clew Bay in 1872 (**1**, vol. iii, p. 326), no further work was done until Canon A. M. Norman visited the west of Ireland in 1874, and collected a very large number of sponges off the coasts of Galway and Mayo. These specimens he handed over to Dr. Bowerbank, whose description of them

takes up a large part of the fourth volume of the Monograph of British Sponges (1). In this collection no fewer than forty-nine species (including ten new species) are recorded for Westport Bay. Three of the new species, *Hymeniacidon tenebrosus, Halichondria flabellifera* and *Isodictya implicita*, have to be rejected, as well as some of the other species which have since been proved to be identical with previously named species or which have been wrongly determined. The list is thus already shortened. Many species, however, of Halichondria, Reniera, and Hymeniacidon remain, which will, no doubt, be reduced in number when the type specimens are re-examined and re-described.

In the years 1890–1891 a survey of the fishing-grounds off the west coast of Ireland was carried out by the Royal Dublin Society. Unfortunately no account of the sponges then collected was published, beyond the mention of two or three common species in the general report of the survey (8). The specimens have since remained unnamed in the Irish National Museum, and the opportunity is now taken of adding to the present list some species from this collection which have not been obtained in the course of the Clare Island Survey. Another collection of sponges was made during the cruise of the "Argo" off the west coast of Ireland in 1890 (6). Only one species, however, is recorded for the district under consideration.

No further additions were made to the sponges of the district until the work of the Clare Island Survey began.

As already stated, special attention was given to the sponges of Clare Island and Clew Bay during the Clare Island Survey of 1909–1911.

Owing to the high cliffs on the western side of Clare Island, and the great exposure of that coast, collecting between tide-marks was carried on along the eastern and southern shores, chiefly between Portlea and the quay below the abbey. Even there the exposure is considerable; and only in a few places did the sponges grow at all luxuriantly. Many sponges were collected in the deep rock-pools, but, for the most part, the rarer species were found in the broad, shallow pools which were crowded with great masses of calcareous sea-weed (*Lithophyllum incrustans*). The sponges were completely hidden from view until the Lithophyllum was broken up, when they were found coating all the cracks and crevices of the calcareous mass. The following are among the rarer species found in this way:—*Sycon raphanus, Leucandra clarensis*, n. sp., *Pilochrota lactea, Stryphnus ponderosus, Dercitus Bucklandi, Terpios fugax, Mycale littoralis, Reniera fistulosa* and *Aplysilla rosea*.

Advantage was taken of exceptionally calm weather during one visit to Clare Island to examine the pools near Kinnadevdilla at the extreme south-west of the island. In these pools the Lithophyllum did not occur in such

masses, and the sponges were consequently scarcer than in the pools along the more sheltered parts of the coast.

The greatest contrast on Clare Island to these exposed conditions was afforded by the "Seal Cave" to the north of the Light-house Cove on the north-eastern side of the island. In this cave the sponges grew in far greater luxuriance than at any other part of the island. The upper end of the cave was free from sea-weed, and there its walls were lined by a broad band of sponges, extending to about six feet beneath low-water mark. This band consisted chiefly of yellow *Halichondria panicea* with very large patches of pure white *Clathrina coriacea*. In one place masses of *Esperiopsis fucorum*, of a rich orange-red colour, covered many square feet of rock. The pools at the upper end of the cave, which could only be reached at low water on a calm day, were crowded with sponges, sea-anemones, and hydroids, the bright colours of which contrasted with the pale purple background of incrusting calcareous sea-weed which covered the surface of the rocks. In these pools *Clathrina coriacea*, pure white and sulphur-yellow in colour, occurr edin numerous patches, with many small specimens of *Sycon raphanus* and *Leucandra Johnstoni*, and a number of very fine specimens of *Leucandra Gossei*. With them grew large specimens of *Myxilla incrustans*, pale yellow in colour, *Esperiopsis fucorum* of a bright orange-red, and *Stylostichon plumosum* varying in colour from a livid red to pale orange-red. *Hymeniacidon carunculo, Ophlitaspongia seriata, Spongelia fragilis*, and other common species also occurred in these pools, while large specimens of *Pachymatisma johnstonia* grew under an overhanging ledge of rock.

At Mr. Praeger's suggestion, and with his help, several deep, small rock-pools were chosen as near low-water mark as possible. The water was bailed out of these pools, and sponges were thus obtained which were never exposed even at the lowest tides. *Clathrina contorta, Leucandra Gossei, Dercitus Bucklandi*, and *Pachychalina limbata* were collected in this way, together with large specimens of other species not common between tide-marks on Clare Island.

Shore-collecting was also carried on at several places along the northern coasts of Achill Island, and at Old Head and Cleahy Rocks on the south shore of Clew Bay. These places were less exposed than Clare Island, but the conditions under which the sponges grew were very similar.

Further work was done among the islands at the head of Clew Bay, particularly those islands lying at the entrance of and within Westport Bay, the muddy boulder-strewn shores of which offer such a contrast to the clean, exposed rocky coasts of Clare Island. The difference in size and abundance of the sponges off these islands, and the same

species growing under the shelter of the calcareous sea-weed on Clare Island was very striking.

Blacksod Bay, where the collecting was carried on chiefly by Mr. Farran and Mr. Southern, is, on the whole, intermediate in character between Clare Island and the islands at the head of Clew Bay. Its shores, like those of the Clew Bay islands, are chiefly boulder-strewn, but they are not so sheltered. On the other hand, the exposure is much less in Blacksod Bay than on Clare Island.

The sponges obtained in deeper water are due to the work done on board the "Helga" during her scientific cruises off the Galway and Mayo coasts, as well as during her special cruises off Clare Island in the course of the present Survey. Only the sponges dredged in less than 45 fathoms are included in this list. In addition to the sponges thus obtained, further specimens were collected by Mr. Colgan and Mr. Praeger, who carried on dredging at intervals during the Survey in shallower water off Clare Island and among the inner islands of Clew Bay.

As a result of the work done during the Survey sixty-four species have been obtained. Of these, two are described as new, while the following twenty species are recorded for the first time for the Irish coast:—

Clathrina contorta.	Mycale placoides.
Leucosolenia complicata.	M. rotalis.
*Sycon raphanus.	*M. littoralis.
*S. setosum.	*Myxilla rosacea.
*S. ampulla.	*Timea Hallezi, *var.* crassa.
*Grantia capillosa.	Hymedesmia paupertas.
Leucandra Gossei.	Vibulinus rigidus.
Oscarella lobularis.	Tragosia infundibuliformis.
Pilochrota lactea.	Aplysilla rosea.
Stryphnus ponderosus.	A. sulphurea.

The species marked with an asterisk have not been recorded previously from the British Isles.

In the region covered by the Survey, there are, as already indicated, two districts where the conditions under which the sponges live are widely different—Clare Island, with its rocky coasts exposed to the force of the Atlantic, and the islands at the head of Clew Bay, with their sheltered boulder-strewn shores. When the shore sponges of these two areas are compared in greater detail, considerable differences, as might be anticipated, are apparent.

The most marked differences are:—

(1) The luxuriant growth and great abundance of the sponges on the shores of the islands at the head of Clew Bay as compared with those on Clare Island. (2) The absence or rarity between tide-marks on Clare Island of several species of non-calcareous sponges which occur off the islands at the head of Clew Bay. (3) The small number of species of calcareous sponges found between tide-marks off the islands at the head of Clew Bay as compared with the number found between tide-marks on Clare Island.

(1.) This difference, which has already been touched upon, is well marked. Only in two or three places along the shores of Clare Island, notably in the "Seal Cave," under the great boulders to the north of Portlea beach and on the rocks near the harbour, were the sponges at all conspicuous by their size and numbers. On looking into the shallow Lithophyllum pools, no signs of sponges could be seen, with the exception, occasionally, of a few projecting oscula of *Hymeniacidon caruncula*. As already mentioned, it was only by breaking up masses of the calcareous sea-weed that any sponges could be found. In this way, in addition to the rarer species already referred to, small specimens of common species were found, such as *Leucosolenia variabilis*, *Sycon compressum*, *Oscarella lobularis*, *Stylostichon plumosum*, and others. These species grew to a larger size in the deep rock-pools, but there they were hidden from view by a dense growth of coralline and other sea-weeds.

The sheltered shores of the inner islands of Clew Bay offer a striking contrast to these conditions. There, where there are no rock-pools, the sponges are to be seen at low tide growing on and under stones and on Fucus. Off the N.W. shore of Annagh Island, in particular, they may be seen at extreme low water growing in great luxuriance. The most characteristic is *Hymeniacidon caruncula*, which there attains a very large size. It spreads in thick sheets over the stones, or grows in great cushion-like masses which are conspicuous at a considerable distance owing to their size and to their colour, which varies from salmon-pink to deep orange-red. Large green and yellow specimens of *Halichondria panicea* abound, and fine masses of *Esperiopsis fucorum* of a rich orange-red, and *Spongelia fragilis*, less noticeable on account of its dark greyish colour. Very large specimens of dark purple *Reniera Peachi* and rusty-brown *Reniera simulans* grow chiefly on the more sheltered sides of boulders; and, on the under side of large stones, numerous patches of *Terpios fugax* of a wonderful deep blue contrast with the bright colours of *Aplysilla rosea* and *Aplysilla sulphurea*. Numerous very large specimens of *Leucosolenia variabilis*, *Sycon compressum*, and *Sycon ciliatum* grew on Fucus.

(2.) With reference to the second difference, the following species were found at low water off the inner islands of Clew Bay, but were not obtained

between tide-marks on Clare Island:—*Suberites carnosus*, *Ficulina ficus*, *Cliona celata*, *Polymastia mammillaris*, and *Aplysilla sulphurea*. Small specimens of *Spongelia fragilis* were found on Clare Island, but only in the most sheltered places, although the species grows in such masses on the shores of the islands in the Bay. *Aplysilla rosea* and *Terpios fugax* were common off the inner islands, while only two or three small specimens were obtained on Clare Island. One small specimen of *Pachychalina limbata*, another species common on the inner islands, was found between tide-marks on Clare Island. It was collected from a deep rock-pool out of which the water had been bailed.

(3.) As regards the third difference, only the commonest species of Calcarea were found between tide-marks on the inner islands of Clew Bay, while twelve species occurred off Clare Island. *Leucosolenia variabilis*, *Sycon compressum*, and *Sycon ciliatum* were in abundance off the inner islands, and *Clathrina coriacea* and *Leucandra nivea* were fairly common. But, in addition to these, only one or two specimens of *Leucosolenia complicata* and *Leucandra Johnstoni* were found. On the other hand, the following species were obtained between tide-marks on Clare Island:—

Clathrina coriacea.	Sycon raphanus.
C. contorta.	S. compressum.
Leucosolenia variabilis.	Leucandra Johnstoni.
L. botryoides.	L. nivea.
L. complicata.	L. Gossei.
Sycon ciliatum.	L. cliarensis *n. sp.*

Blacksod Bay was equally rich as regards the number of species of Calcarea found there, and Achill Island and Old Head were also good localities. The head of Clew Bay, where so few species of Calcarea were obtained, is the only limestone area within our district; and in connexion with this fact it is interesting to quote a remark of Professor Topsent. Comparing the sponge-fauna of Luc and Roscoff, he says (20, p. 524) "Alors que la côte calcaire étonne par sa pauvreté en Calcarea, la côte siliceuse s'en montre d'une richesse extrême: les *Leucosolenia coriacea*, *Grantia compressa*, *Leuconia nivea*, *L. Johnstoni*, &c., abondantes sous les pierres, y tapissent littéralement les parois des grottes."

Professor Minchin (13) states that he found his largest specimens of *Leucosolenia complicata* at Roscoff, where there are clean granite rocks and pure water, very different from the estuarine conditions of Plymouth Sound, where he also collected the species. With reference to this remark it may be noticed that the largest and finest specimens of *Clathrina coriacea*, *Leucandra nivea* and *L. Johnstoni* were found off Clare Island, where the rocks are non-calcareous and the water very pure. But, on the other hand, the specimens of *Leucosolenia variabilis*, *Sycon compressum*, and *S. ciliatum* taken off the muddy limestone shore of Annagh Island, near the head of Westport Bay, were by far the largest found between tide-marks within the district. The Clare Island specimens of these species were particularly small, even at the most sheltered parts of its shores.

As regards the geographical distribution of the species collected during the Clare Island Survey, only a few general statements will be made, as, owing to the unsatisfactory state of our knowledge of many of the shallow-water sponges, particularly of the Calcarea (see 13, p. 355), a detailed analysis of their distribution would be impossible.

More than half the sponges under consideration apparently occur along the whole of the western shores of Europe, from north to south, some of them extending into the Mediterranean. Of these, about twelve have a more or less world-wide distribution. With the exception of *Sycon ampulla*, *Myxilla placoides*, and two or three species hitherto recorded for only one locality, the remaining species occur off the southern and western shores of Europe, but have not been found, up to the present, further north than the coasts of England and Ireland.

Myxilla placoides, as already mentioned, is an exception to the distribution thus outlined. It is, however, probably only a deep-water species (p. 34). Lundbeck (11) states that it occurs off Iceland, the Faeröes, and the Shetland Islands, and off the coast of Newfoundland. The occurrence of *M. placoides* off the west of Ireland extends the southern limit of the species on the European side of the Atlantic. *Sycon ampulla* has up to this been recorded for the Atlantic coast of South America, East Africa, and the Azores.

The classification of the sponges in this report is taken from Professor Dendy's recent work on Ceylon sponges (4), with the exception of the subdivisions of the family Desmacidonidae, which are those proposed by Professor Lundbeck (11) and adopted by Mr. Kirkpatrick in his "Tetraxonida of the National Antarctic Expedition," 1908. The classification of the Calcarea Homocoela is that of Professor Minchin.

It has not been thought necessary to burden a report of this kind with complete lists of the names proposed from time to time for some of the older species, especially those of Bowerbank. As a rule, therefore, only the modern names are given. These are taken from Hanitsch's and Topsent's papers on the revision of Bowerbank's genera and species (7 and 22), with additions and corrections proposed by the latter writer and by other workers during recent years. Bowerbank's species have already been considerably reduced

in number, but there is no doubt that they will be still further reduced when the type specimens are re-examined and re-described. Until this is done the task of identifying many of the littoral species of the British Isles will be difficult, and the results to some extent at all events, unsatisfactory.

I am greatly indebted to Mr. R. Kirkpatrick, of the British Museum, for his courtesy in allowing me to examine slides and specimens in the Bowerbank and Norman Collections under his charge, and also for his kindness in giving me his valuable help and advice on many occasions. I have also to thank Professor E. A. Minchin for the gift of specimens, and the loan of many slides of Clathrina and Leucosolenia, and Professor R. von Lendenfeld for his kindness in giving advice as regards the new species of Leucandra.

Mr. E. W. L. Holt has kindly allowed me to make use of a large collection of slides given him by Canon Norman, which includes many preparations of type and other specimens of Bowerbank, Carter, Schmidt, Vosmaer, and Levinsen.

Class CALCAREA.

Grade HOMOCOELA.

Family **CLATHRINIDAE.**

Clathrina coriacea (Montagu).

Common between tide-marks throughout the district, both on Clare Island and along the coast of the mainland. Growing in patches of considerable extent in sheltered places. The largest specimens seen were those in the "Seal Cave," on Clare Island; their colour was pure white and sulphur-yellow.

Most of the specimens collected at different parts of the district were white in colour, but those obtained off the islands at the head of Clew Bay were yellowish-green. The specimens growing in rock-pools on Clare Island, in crevices of *Lithophyllum incrustans*, were of a beautiful vermilion.

Previous Irish Records.—N.E. and E. coasts.

Clathrina contorta (Bowerbank).

This species is now recorded for the first time for the Irish coast. The spiculation of the Irish specimens agrees in every particular with the description of the species recently given by Professor Minchin (**14**). The monaxons are rare in all the specimens, and usually only two or three were found after a long search. For the most part they vary in length between 0·375 and 0·45 mm., and have a thickness of 0·02–0·03 mm., but in the larger specimens they reach a length of about 1·3 mm. by 0·05–0·07 mm.

All the specimens that were seen alive, both on Clare Island and in Blacksod Bay, were of a beautiful lilac colour, with the exception of one specimen found on the south shore of Clare Island, which was greyish-white.

Localities.—In deep rock-pools at Portlea (three specimens), and at Gubanoomeen (one specimen), Clare Island. Growing on the under side of large stones between tide-marks in Blacksod Bay (five specimens); off Blacksod light-house, 8–9 fms. (one specimen).

Geographical Distribution.—"Extending from the Adriatic round the coasts of France into the English Channel, and probably also on to the coasts of Great Britain" (Minchin). The form *spinosa* has recently been taken off Zanzibar (Jenkin).

Clathrina lacunosa (Bean).

One specimen, 5 mm. in height, was dredged by the "Helga" to the south of Mulranny pier, Clew Bay, in 5½–11 fms.

The species has been hitherto recorded for Ireland only for two or three localities off the N.E. coast.

Family **LEUCOSOLENIIDAE.**

Leucosolenia botryoides (Ellis and Solander).

This species appears to be rare in the district except in one locality in Blacksod Bay where it was fairly common. Elsewhere only a few specimens were found, although special search was made for the species among large quantities of Leucosolenia collected during the Survey. All the specimens obtained were found between tide marks.

L. botryoides is usually stated to be common off the Irish coast. As the earlier workers on Irish sponges did not distinguish between the different species of Leucosolenia, their records must be regarded as valueless, except those which have been confirmed by Professor Minchin, who has re-examined specimens from Bangor and Portrush and found them to be the true *L. botryoides* (**13**, pp. 393, 394).

Localities.—Gubanoomeen, Clare Island (one specimen); Leckanvy, Clew Bay (one specimen, collected by A. R. Nichols); Carrigeenmore, Blacksod Bay, fairly common; Ballynakill Harbour, 1 specimen.

Leucosolenia variabilis (Haeckel).

With the exception of the doubtful *Spongia confervicola* Templeton (Mag. Nat. History, ix, 1836, p. 470), described from an Irish specimen, which Professor Minchin states (**13**, p. 351) is probably *L. variabilis*, the species has

only been recorded for two Irish localities. Yet it is by far the commonest species of Leucosolenia found round our coasts. It was, no doubt, often confused with the preceding species. It is abundant off Clare Island and along the coast of the adjacent mainland, both between tide-marks, where it often grows in very exposed situations, and in a few fathoms of water. Especially large specimens were found growing on Fucus off Annagh Island, Westport Bay.

Previous Irish Records.—Strangford Lough and Bantry Bay (5).

Leucosolenia complicata (Montagu).

This species proved to be fairly common. It was usually obtained by dredging, but was also found several times between tide-marks. As Professor Minchin states (13), it cannot stand as much exposure as *L. variabilis*, and is rarely found in situations where it will be left dry at ordinary tides.

Localities.—At the S.W. point of Clare Island, under Lithophyllum; off Clare Island harbour, 5 fms. (N. Colgan); at several stations off Clare Island light-house at depths varying from 5 to 21 fms.; Leckanvy, between tide-marks (collected by A. R. Nichols) and Inishinnel, Clew Bay, 5 fms; Scotch Bonnet, Westport Bay, between tide-marks; Blacksod Bay, between tide-marks, not common; Bofin Harbour; Ballynakill Harbour, 5–7 fms.

Grade HETEROCOELA.

Family **SYCETTIDAE.**

Sycon ciliatum (Fabricius).

Widely distributed throughout the district both between tide-marks and in a few fathoms of water. Much less common off Clare Island than off the islands at the head of Clew Bay and in Blacksod Bay. The largest specimens that were obtained between tide-marks were found off Annagh Island, Westport Bay, where the species grew in the greatest abundance.

Sycon coronatum (Ellis and Solander).

A few specimens were obtained possessing thicker monaxons and gastral quadriradiates with longer apical rays than are typical of *S. ciliatum*—characters which are stated to separate the two species.

Localities.—Barranagh and Elly Bay, Blacksod Bay.

Sycon raphanus Schmidt.

This species is not uncommon off Clare Island and in Blacksod Bay. On the island it was usually obtained between tide-marks by breaking up masses

of *Lithophyllum incrustans*, in the crevices of which many small specimens grew. It was found at extreme low water in Blacksod Bay, growing on the under side of large stones.

In some of the larger specimens of this species the radial chambers are slightly branched at the outer end, as described by Schultze and von Lendenfeld.

Localities.—Eastern and southern shores of Clare Island, growing in the rock-pools under the shelter of *Lithophyllum incrustans*, and in the "Seal Cave"; off the S.W. point of Clare Island, 25½ fms.; off Clare Island light-house, 7 fms.; off The Bills, 27½ fms.; Blacksod Bay, from Barranagh to Carrigeenmore, between tide-marks, and in 1 fm. (low water) off Ardelly Point; Bofin.

Sycon setosum Schmidt.

Several small specimens were obtained which seem to agree with this species as re-described by Haeckel (5) and von Lendenfeld (10). The species is characterized by the great length of the dermal monaxons and of the apical rays of the gastral quadriradiates. The latter reach a length of 0·5 mm. in the Irish specimens, and sometimes extend more than half-way across the gastral cavity, which is thus completely filled with these intercrossing rays.

Dendy (2) suggests that *S. setosum* is probably merely a variety of *S. raphanus*. The species has been recorded for the Mediterranean, (?) Azores, and off Australia.

Localities.—Doooga, Achill Island, between tide-marks; Carrigeenmore, Blacksod Bay, between tide-marks.

Sycon ampulla (Haeckel).

Two small, stalked Sycons were dredged by the "Helga" in 27½ fms. off The Bills, which are isolated rocks lying eight miles to the N.W. of Clare Island.

These specimens agree closely with Haeckel's description of *S. ampulla* (5), a species hitherto found only off the Atlantic coast of South America, off the Azores in 130 metres (21), and off East Africa (Jenkin).

The larger of the two Irish specimens measures 9 mm. in its entire length, the stalk being 4·5 mm. long. The diameter of the upper part of the sponge is 2 mm., that of the stalk 0·5 mm. The smaller specimen is 5 mm. long, the stalk again being half the entire length of the sponge.

The short, slender monaxons radiate from the distal ends of the flagellated chambers in such a way as to give a very characteristic appearance to the surface of the sponge when it is seen under a low power of the microscope.

The spicules agree well with the measurements given by Haeckel.

The monaxons of the distal cones are 0·2–0·3 mm. by 0·005 mm. The triradiates of the radial chambers have a basal ray 0·1–0·15 mm. and lateral rays 0·075–0·1 mm. in length by 0·005 mm., while the basal ray of the characteristic stalk triradiates reaches a length of 0·2 mm. by 0·008 mm. and the short lateral rays are only 0·04 mm. long. The apical ray of the gastral quadriradiates is 0·075–0·1 mm. by 0·005 mm.

Sycon compressum (Fabricius).

Common between tide-marks throughout the district, and often growing in exposed situations. Also dredged in a few fathoms of water. In great abundance between tide-marks on Annagh Island, Westport Bay, where some of the specimens measured 9 cm. in length.

Family **GRANTIIDAE.**

Grantia capillosa (Schmidt).

This species was dredged by the "Helga" at several stations in Clew Bay: namely, off Clare Island light-house, ten specimens growing on the branches of *Vibulinus suposus* in 16 fms., and one specimen in 25 fms.; 3·8 miles N.E. ½ N. of Carrowmore summit, 18 fms., one specimen; off Mulranny pier, 5½–11 fms., one specimen.

Leucandra nivea (Grant).

This species is not common off Clare Island, but occurs in abundance between tide-marks in Blacksod Bay.

Localities.—South shore of Clare Island, between tide-marks; off Clare Island light-house, 19-25½ fms.; off Mulranny pier, 5½–11 fms.; Scotch Bonnet and Annagh Island in Westport Bay, and Blacksod Bay, from Barranagh to Carrigeenmore, between tide-marks.

Previous Irish Records.—Westport Bay, 6–7 fms. (**1**, vol. iv, p. 164) and off the N.E., E., and W. coasts.

Leucandra Johnstoni (Carter).

This species was found only between tide-marks, and was, on the whole, less common than the preceding species, although it occurred locally in abundance. It grow in great profusion on the under side of the huge boulders to the north of Portlea, Clare Island. On the other hand, it was rare in Blacksod Bay, where *L. nivea* was so common.

Localities.—Eastern and southern shores of Clare Island, not common; Inishimmel, Clew Bay; Old Head; Doocga, Achill Island; Blacksod Bay, not common.

Previous Irish Records.—"Irish coast" as *Grantia nivea* var. (**9**); Strangford Lough (**5**).

Leucandra fistulosa (Johnston).

Only two specimens were obtained during the Survey. They were dredged by the "Helga" near the entrance of Clew Bay, 3·8 miles N.E. ½ N. of Carrowmore summit in 18 fms.

Previously recorded for Ireland for the N.E. coast.

Leucandra Gossei (Bowerbank). Plate I, fig. 9.

Very fine specimens of this species were found growing in the shallow pools at the end of the "Seal Cave," Clare Island. The specimens agreed closely with the descriptions of the species given by Bowerbank and Haeckel, but in addition to the kinds of spicules enumerated by these authors, there was in the Irish specimens another kind, namely minute bayonet-headed, dermal monaxons (Plate I, fig. 9). As these monaxons occurred only near the base of the sponge, and as they varied very much in abundance in different specimens and were sometimes so scarce as only to be found after considerable search, it seemed probable that they had been overlooked in the type specimens. An examination of the slides of *L. Gossei* in the British Museum proved that this was the case. Small bayonet-headed monaxons were found, though not in great numbers, on these slides. They occurred in all the preparations of spicules of *L. Gossei* in both the Bowerbank and Norman Collections. They were not seen, however, in position in the sections, none of which, perhaps, were taken near the base of the sponge.

In the Irish specimens these minute monaxons are placed perpendicularly to the surface of the sponge, where they form a very dense dermal layer. Sometimes this layer is well developed at the base of the sponge, but occasionally only a few of the minute monaxons are to be found after a long search at the extreme base of the specimen. In other specimens this dermal layer extends a little way up the sides of the sponge, and in some cases may reach to about one-third the height of the whole specimen. When the surface is wrinkled, especially dense masses of the dermal monaxons may be seen in the hollows between the ridges. In no case was any trace of this dermal layer found near the summit of the sponge. I have failed to find mention of the occurrence of these dermal, bayonet-headed spicules in any references to this species in more recent papers. In the Irish specimens

these spicules vary between 0·075–0·1 mm. in length by about 0·0025 mm. at the thickest part.

The finest Irish specimen was found in the "Seal Cave." It reaches a height of 16 mm. and is 15 mm. in breadth. There are five oscules which are raised on osecular tubes about 2 mm. above the surface of the sponge. The dermal layer of small monaxons was first noticed in the specimen found by Mr. Praeger at the bottom of a deep rock-pool out of which the water had been bailed. It is better developed in this specimen than in any of the others. The small monaxons are in very great abundance, so much so that at first it seemed that the specimen would prove to belong to a new species. It was only on finding that the sponges from the "Seal Cave," which were undoubtedly *L. Gossei*, possessed a similar dermal layer, developed to a varying extent in different specimens, that it became evident that the first-found specimen really belonged to this species.

Localities.—Clare Island, in the "Seal Cave" to the north of Portlea (seven specimens): growing on stem of Laminaria found washed up on the shore to the east of the harbour (one specimen); and at Portnuckagh, on washed-up Laminaria root (one specimen): Gubanoomeen, in a deep bailed-out rock-pool (one specimen, collected by R. Ll. Praeger).

Leucandra cliarensis[1] n. sp. Plate I, figs. 1–8.

This species is easily distinguished at sight from all other species of Leucandra hitherto found off the shores of the British Isles by the presence of large dermal monaxon spicules, which lie for the most part parallel to the long axis of the sponge. These spicules can be seen with the naked eye; they give a characteristic silvery-white appearance to the sponge. At first sight the sponge seems quite smooth, but usually the tips of a few large monaxons may be seen projecting very slightly, here and there, from the surface. The colour is usually white, but some specimens are greyish.

The sponge is very hard and firm to the touch, and varies considerably in shape. It is usually more or less cylindrical, but tapers towards each end (Plate I, fig. 7). At the summit, there is a single, naked osculum. This form may reach a height of 20 mm. with a diameter of 4 mm.; it closely resembles *Ute glabra* Schmidt in external appearance. Other specimens are oval, with a single osculum, and others again are more irregularly shaped, with two or three oscula (Plate I, fig. 8). The largest specimen found has a height of 20 mm., with a breadth of 15 mm. and a thickness of 6 mm.

The flagellated chambers are round or ovoid; they average 0·08–0·15 mm. in diameter. Wide excurrent canals open into the gastral cavity.

The skeleton consists of monaxons, triradiates, and quadriradiates.

[1] After *Cliara*, the old name of Clare Island.

The large dermal monaxons lie for the most part parallel to the surface of the sponge, but some lie more or less obliquely to it, and the extreme tips of a few of the obliquely lying spicules project slightly beyond the surface of the sponge. In a few specimens the monaxons project beyond the edge of the osculum.

Minute bayonet-headed monaxons also project from the surface of the sponge. They vary considerably in abundance in different specimens, but are found in greater or smaller numbers all over the surface of the sponge from the summit to the base. They do not form a dense layer as do similar spicules at the base of *Leucandra Gossei*.

The greater part of the body-skeleton is made up of triradiates. Among them, however, are found a few quadriradiates with a short apical ray. These vary in abundance in different specimens. The triradiates and quadriradiates beneath the gastral layer have rather long basal rays. These subgastral spicules are more clearly marked in some specimens than in others.

The gastral quadriradiates are characterized by long sabre-shaped apical rays which recall the similarly shaped apical rays of the gastral quadriradiates of *Ute glabra* Schmidt, and *Vosmaeria corticata* Lendenfeld. Among the gastral quadriradiates are gastral triradiates similar to them in character, except for the absence of the apical ray.

The spicules measure as follows:—

Large dermal monaxons, often thicker at one end than at the other (fig. 1) up to 1·3 mm. in length by 0·05–0·07 mm.

Small bayonet-headed monaxons of the dermal surface (fig. 6) 0·1–0·18 mm. by 0·0025 mm.

Alate triradiates of the main skeleton, with rays tapering uniformly to a sharp point (fig. 5). Basal ray, 0·12–0·16 mm. by 0·01–0·013 mm. Paired rays, 0·1–0·135 mm. by 0·01–0·013 mm.

Alate quadriradiates of the main skeleton (fig. 4). Basal ray, 0·1–0·15 mm. by 0·01 mm. Paired rays, 0·08–0·1 mm. by 0·01 mm. Apical ray, 0·03 mm. in length.

The basal ray of the subgastral triradiates and quadriradiates may reach a length of 0·225 mm.

Alate quadriradiates of the gastral layer (fig. 2). Basal ray, straight, tapering rather abruptly into a slender shaft, 0·13–0·25 mm. in length by 0·008 mm. at the proximal, and 0·0025 mm. near the distal end of the ray. Paired rays, 0·1–0·14 mm. by 0·01–0·012 mm. Apical ray long, sabre-shaped, usually between 0·2–0·37 mm. in length by 0·013–0·02 mm. at its greatest breadth.

The alate triradiates of the gastral layer (fig. 3) are similar to the facial rays of the gastral quadriradiates.

This species was only obtained between tide-marks, at extreme low water. With the exception of two or three specimens which were found in sheltered pools, the Clare Island specimens of this species grew completely hidden from view, under the shelter of *Lithophyllum incrustans* in shallow pools. These specimens were all long and slender or oval in shape, and had a single osculum. In Blacksod Bay the species was found growing underneath large stones, and the specimens thus obtained were often more or less irregularly shaped.

Localities.—Eastern and southern shores of Clare Island; Old Head; Cleahy Rocks; Doogga, Achill Island; Blacksod Bay, from Barranagh to Carrigeenmore.

Class NON-CALCAREA.

Order MYXOSPONGIDA.

Halisarca Dujardini Johnston.

Common between tide-marks, and widely distributed throughout the district.

Localities.—Eastern and southern shores of Clare Island; off Clare Island light-house, 17–19 fms., growing on Laminaria root; Dorinish, Clew Bay; Old Head and Cleahy Rocks; Scotch Bonnet and Annagh Island, Westport Bay; Dugort, Achill Island; Blacksod Bay, from Barranagh to Carrigeenmore, between tide-marks, and also dredged in 2 fms.; Ballynakill Harbour, between tide-marks.

Previous Irish Records.—Strangford Lough and the Dublin coast.

Geographical Distribution.—Greenland; northern and western coasts of Europe; Mediterranean; Straits of Magellan.

Oscarella lobularis (Schmidt).

Common between tide-marks, and often growing in exposed situations. The colour of specimens well sheltered from the light was ochre-yellow. Other specimens in less sheltered positions were ochre-yellow, more or less strongly tinged with livid red; others, again, exposed to a stronger light were altogether red.

This species, although not previously recorded for Ireland, is quite common round the coast.

Localities.—Eastern and southern shores of Clare Island, where it is especially abundant under the large boulders between Kinnacorra and the harbour; also common in the rock-pools in the crevices of *Lithophyllum incrustans*; Inishimmel and Dorinish, Clew Bay; Old Head; Annagh Island and Scotch Bonnet, Westport Bay; Dugort, Achill Island; Blacksod Bay, from Barranagh to Carrigeenmore, common.

Geographical Distribution.—S. coast of England, France, Mediterranean.

Order TETRAXONIDA.

Grade TETRACTINELLIDA.

Sub-order ASTROPHORA.

Family PACHASTRELLIDAE.

Dercitus Bucklandi (Bowerbank).

Locality.—South shore of Clare Island at Gubanoomeen. One large specimen was obtained at the bottom of a deep rock-pool out of which the water had been bailed. A small incrusting specimen growing under Lithophyllum was found near the same place.

Previous Irish Record.—"Between tide-marks, Westport Bay" (1).

Geographical Distribution.—South coast of England, Wales, Guernsey, France. Between tide-marks.

Family STELLETTIDAE.

Stelletta Grubei Schmidt.

"On the under side of large stones at extreme low water, spring tides, at entrance of Westport Bay," as *Tethya Collingsi*, Bowerbank (1).

This species was not taken during the present Survey.

Geographical Distribution.—South coast of England, Channel Islands, France, Mediterranean.

Pilochrota lactea (Carter).

This species proved to be fairly common in several places along the eastern and southern shores of Clare Island, where it lives in the rock-pools under the shelter of *Lithophyllum incrustans*. Nothing can be seen of the sponge until masses of the Lithophyllum are broken up, when it is found growing in rather thin, white patches in the numerous crevices of the calcareous sea-weed.

Localities.—Alnahaskilla, near the harbour, Gubanoomeen and Kinnatevdilla, Clare Island.

Geographical Distribution.—South coast of England, France, off the Azores. Between tide-marks to 396 fms.

Stryphnus ponderosus (Bowerbank).

This species grows under exactly the same conditions as *Pilochrota lactea*; but it is evidently much rarer, as only two specimens were found, although numerous pieces of Lithophyllum were especially examined for it. The sponge formed a thin greyish-white incrustation in crevices of the calcareous sea-weed.

Localities.—Gubanoomeen and Kinnateydilla, Clare Island.

Geographical Distribution.—South coast of England, Wales, Guernsey, France, and off the north coast of Spain, between tide-marks to 70 fms.

Family **GEODIIDAE.**

Pachymatisma johnstonia (Bowerbank).

Localities.—Clare Island. Three large specimens were found at extreme low water, growing under ledges of rock on the walls of the "Seal Caves"; Gubanoomeen, one specimen in deep rock-pool; near Kinnateydilla, one very small, incrusting specimen in a crevice of Lithophyllum. Old Head, one specimen in rock-pool.

Previous Irish Records.—South coast and Connemara.

Geographical Distribution.—Norway, Orkneys, England, Channel Islands, France.

Grade MONAXONELLIDA.

Sub-order ASTROMONAXONELLIDA.

Family **TETHYIDAE.**

Tethya lyncurium (Linn.).

Localities.—Off Inishimmel, Clew Bay, between tide-marks, and in 5 fms.; off Scotch Bonnet, Westport Bay, between tide-marks; Ballynakill Harbour, between tide-marks.

Previous Irish Records.—Westport Bay (1), Strangford Lough, and Connemara.

Geographical Distribution.—Arctic Ocean, North Atlantic, Mediterranean, Azores, Porto Rico, off Senegal, Red Sea, Indian Ocean.

Family **SPIRASTRELLIDAE.**

Timea Hallezi (Topsent), var. **crassa** Topsent.

(*Hymedesmia Hallezi*, var. *crassa* Topsent.)

Only one specimen was found during the Survey. It measures 10 mm. by 8 mm., and forms a thin incrustation on a piece of calcareous sea-weed.

The spicules agree exactly with Topsent's description (**25**); and as nearly all the sphaerasters are large, and have thickened, truncated actines, the Irish specimen agrees with his variety *crassa*, rather than with the typical form. Topsent mentions that the variety is commoner in the English Channel than the typical form. He has obtained it off Luc and Roscoff at a depth of 25–65 metres. These are the only localities at which this sponge has hitherto been found. The typical form has been taken in the English Channel, off the coast of Belgium (**25**), and off the Malay Peninsula.[1]

Thiele has recently shown (**15**) that the species ascribed by Topsent to the genus Hymedesmia (**25**) must be referred to Timea, Gray.

Locality.—2 miles S.E. of Inishturk tower, 13 fms. ("Helga").

Family **ASTRAXINELLIDAE** Dendy (**4**).

Vibulinus stuposus (Montagu).

Localities.—6 miles E. by S. of Clare Island light-house, 16 fms., one specimen; Ballynakill Harbour, 6–8 fms., one specimen.

The only Irish records for this species are for the Dublin and Galway coasts.

Geographical Distribution.—Off the coasts of Great Britain, France, Spain, and in the Mediterranean.

Vibulinus rigidus (Montagu).

A small unbranched sponge growing on a stone was obtained, which, as regards spicules, agrees exactly with Topsent's re-description of *V. rigidus* (**18**). It differs from the preceding species, as he points out, in possessing larger asters and evenly pointed oxea. The Irish specimen measures only 10 mm. in height and 2 mm. in diameter.

Locality.—Off Mulranny pier, Clew Bay, 5½–11 fms., dredged by the "Helga."

Geographical Distribution.—Off the coasts of England and France.

Family **CLIONIDAE.**

Cliona celata Grant.

This sponge was not found between tide-marks on Clare Island, but was common at extreme low water off the islands in Clew Bay and Westport Bay, where it bores into the blocks of limestone strewn on the shore. It was also found at low water in Blacksod Bay. Oyster-shells perforated by this sponge were frequently dredged in Westport Bay and Blacksod Bay. A very large, massive specimen was dredged off Clare Island.

[1] I. Solias, Proc. Zool. Soc., 1902.

Terpios fugax Duchassaing and Michelotti.

Only three small specimens were found on Clare Island. They grew in crevices of *Lithophyllum incrustans*. The species was widely distributed in Clew Bay and Blacksod Bay, where it was found at extreme low water growing on the under side of large stones, in patches of a beautiful deep blue colour. This was the only colour-variety found.

Localities.—Ahahaskilla and Portruckagh, Clare Island; Annagh Island and Scotch Bonnet, Westport Bay; Dorinish and Inishimmel, Clew Bay; Blacksod Bay, from Barranagh to Carrigeennore.

Previous Irish Record.—Roundstone Bay, as *Hymedesmia tenuicula* (1).

Geographical Distribution.—Coasts of England and France; Mediterranean, Azores, Antilles, Amboina, off Malay Peninsula.

Sub-order SIGMATOMONAXONELLIDA.

Family **HAPLOSCLERIDAE.**

Sub-family **Gelliinae.**

Gellius jugosus (Bowerbank).

A sponge dredged near the entrance of Westport Bay was labelled by Bowerbank "*Isodictya jugosa?*" (1).

Gellius ravus n.sp.[1] Plate I. figs 10–12.

The sponge is in the form of a flat incrustation, about 12 mm. in thickness. The surface is apparently smooth, but under the lens it is seen to be slightly hispid. The consistence is soft and fragile. Oscules few, 3–4 mm. in diameter, and usually with a rim rising about 3 mm. above the surface of the sponge. Colour when alive pale greyish-yellow. The dermal membrane is thin, and is perforated by numerous pores. Sigmata are abundant in this membrane, and a few toxa are also present.

[1] Among some sponges collected several years ago off Lambay, Co. Dublin, were a few minute fragments of a species of Gellius, bearing a resemblance to *Gellius angulatus* (Bowerbank). Mr. Kirkpatrick kindly compared the spicules with those of the type specimen of *G. angulatus* in the British Museum, and decided that, for the present, the Lambay specimen might be recorded as a variety of that species. But he suggested, at the same time, the possibility of its having to be regarded as a new species (Irish Naturalist, xvi. 1907, p. 87). The fragments were too small to admit of any examination of the structure of the skeleton.

Recently, specimens have been collected off Clare Island and off the north and east coasts of Ireland, which agree with the Lambay sponge, while still another specimen has been found among the old unnamed collection of the Royal Dublin Society from the west of Ireland.

Mr. Kirkpatrick again gave his valuable advice and assistance as regards these specimens; and with the larger amount of material available, it seems well to describe the Irish specimens as belonging to a new species.

At the surface of the sponge the oxea form a polyspicular network; but here and there the sides of the meshes are partly formed of single oxea. The fibres of the main skeleton project through the dermis, so that the surface of the sponge is slightly hispid.

The main skeleton is formed of well-marked fibres running vertically through the sponge. These are united by single oxea. Sigmata and toxa occur all through the sponge.

Spicules.—The oxea are slightly curved and sharply pointed. They measure 0·15–0·185 mm. by 0·0065 mm.

Sigmata numerous and very fine, 0·008 mm. in length.

Toxa, with the middle of the spicule gently curved, 0·06–0·07 mm. in length, and about 0·001 mm. in thickness.

The above description is taken from the Clare Island specimen which is in the best state of preservation. The other Irish specimens agree with it as regards arrangement of the skeleton and character of the spicules, but the oxea vary slightly in average length in the different specimens. In those from Portstewart and Howth, the oxea are, on the whole, slightly longer. They reach a length of 0·2–0·22 mm. by 0·008 mm., while in the Blacksod Bay specimen, they are shorter and more slender, measuring only about 0·125–0·15 mm. by 0·003–0·005 mm.

Gellius ravus differs from *G. angulatus* (Bowerbank) in the length of the oxea, the shape of the toxa and the structure of the dermis.

The oxea are longer in *G. angulatus*; they reach a length of 0·298 mm.

The toxa in the Irish species are slightly curved in the middle, not sharply bent or "angulated" as is characteristic of the toxa in Bowerbank's species. A very few of the toxa on the slide in the British Museum, prepared from the type of *G. angulatus*, show a rather more rounded bend, thus approaching the toxa of the Irish species in character. A preparation of the dermis taken from the type of *G. angulatus* shows a unispicular network, much as is figured by Bowerbank (1, vol. iii, pl. xli, fig. 5) which only very rarely exhibits a tendency to become polyspicular, two or three spicules being occasionally united to form the sides of the meshes. The dermis appears to be quite smooth.

Again, *Gellius ravus* is evidently nearly allied to the sponge described by Lundbeck (11) under the name *G. angulatus* Bow.? The Irish specimens agree with this sponge as regards the structure of the dermis and the main skeleton, while the toxa resemble in shape those of the Icelandic sponge rather than those of the type of *G. angulatus*. The chief difference apparently between the two lies in the measurements of the spicules, those of the Icelandic sponge being much greater than those of the Irish species.

Localities.—Gubanoomeen, Clare Island, between tide-marks, and ? Blacksod Bay (Royal Dublin Society's Survey).

And also between tide-marks at Portstewart, Co. Londonderry (collected by R. Southern); Lambay (collected by A. R. Nichols); and near the Needles, Howth, Co. Dublin.

Sub-family **Renicrinae.**

Reniera simulans (Johnston).

This species was common between tide-marks throughout the district. It grew to a very large size off the islands in Westport Bay, where it spread in thick incrustations, or occurred as branching masses, which formed a network over the rocks. The colour varied from rusty-brown to grey and greyish-brown.

The species has been recorded several times from both east and west coasts of Ireland.

Localities.—Eastern and southern shores of Clare Island; Cleahy Rocks, Old Head and Inishimmel, Clew Bay, and dredged in 5–11 fms. in the bay; Annagh Island and Scotch Bonnet, Westport Bay; Blacksod Bay, from Barranagh to Carrigeennore, and off Ardelly Point, 3½–8 fms.

Reniera Peachi (Bowerbank).

This species was only once found between tide-marks on Clare Island, but was fairly common along the coast of the adjacent mainland. It grew in abundance off Annagh Island, where it formed large cushion-like or branching masses, dark purple in colour.

Localities.—Gubanoomeen, Clare Island; Inishimmel, Clew Bay; Westport Bay in 3 fms., and between tide-marks on Annagh Island and Scotch Bonnet; Old Head; Blacksod Bay, between tide-marks and in 4–8 fms.

Previous Irish Records.—Westport Bay and Bantry Bay (1).

Reniera cinerea (Grant).

Localities.—Scotch Bonnet, Westport Bay, between tide-marks; off Mulranny pier, Clew Bay, 5½ – 11 fms.; Blacksod Bay, between tide-marks and in 4¾ fms.; Ballynakill.

Previous Irish Records.—Clew Bay (17), and Westport Bay (1) Connemara and Dublin coasts.

Reniera fistulosa (Bowerbank).

The oxea in the three small specimens that were found are shorter than those of the type-specimen; they scarcely reach a length 0·125 mm. The species was once previously recorded for the Irish coast.

Localities.—Gubanoomeen, Clare Island, under *Lithophyllum incrustans*; Blacksod Bay, between tide-marks.

Reniera indistincta (Bowerbank).

Several specimens of Reniera were obtained which agree well with Bowerbank's description of this species (1), and with preparations of the sponge from Westport Bay, so named by him.

When alive the sponge is dark grey in colour.

It is very soft to the touch, and all the specimens collected were penetrated in every direction by worm-tubes.

Localities.—Inishimmel and Inishlyre, Clew Bay, between tide-marks and in 5 fms.; Annagh Island, Westport Bay; Elly Bay and Barranagh, Blacksod Bay, all between tide-marks; Ballynakill.

Previous Irish Records.—Westport Bay, 5 fms. (1).

In addition to the foregoing species of Reniera, the following species from Westport Bay (1, vol. iv) have been referred to that genus:—*Isodictya remanenda, I. MacAndrewi, I. perplexa, I. crassa, I. Bowerbanki,* and *I. pallida.*

A number of pieces of Reniera collected during the Survey remain undetermined, as it was found impossible to name them with any degree of certainty in the present unsatisfactory state of our knowledge of many of the species of Reniera that have been recorded from the coasts of the British Isles.

Halichondria panicea (Pallas).

Common everywhere, and growing nearer high-water mark than any of the other species.

H. panicea spread over many square feet of rock in the "Seal Cave" on Clare Island, forming, as already mentioned, a deep band round the walls of the cave. It also grew in great masses off the islands in Westport Bay. On the other hand, it was completely hidden from view in the Lithophyllum pools on Clare Island, growing as it did in thin patches in the crevices of the calcareous sea-weed. The species has been previously recorded for many parts of the Irish coast.

Geographical Distribution.—Arctic, North Atlantic, Antarctic, and Indian Oceans, off Australia and Japan.

Sub-family **Chalininae.**

Chalina oculata (Pallas).

One small unbranched specimen (40 mm. in height) with a well-marked stalk was dredged by the "Helga" off Clare Island light house, in 21 fms. Although fairly common on the east coast of Ireland, this species appears to be rare on the west coast, where it has only once been previously recorded.

Geographical Distribution.—European and American shores of the North Atlantic, Bay of Bengal, off New Zealand. From shallow water to 80 fms.

Pachychalina limbata (Montagu).

Only one specimen was found between tide-marks on Clare Island. It was taken in a deep rock-pool from which the water had been bailed. The species was widely distributed, but not abundant, between tide-marks in Blacksod Bay.

P. limbata has been recorded from several localities along the east coast of Ireland and from Roundstone Bay on the west coast.

Localities.—Portlea, Clare Island, in rock-pool; off Clare Island harbour, 5 fms. (N. Colgan); Old Head; Annagh Island, Westport Bay, between tide-marks; Blacksod Bay, from Barranagh to Carrigeennore, between tide-marks, and dredged in 2–5 fms.

Pachychalina Montagui (Fleming).

Recorded for Westport Bay, as *Isodictya elegans* (1).

Sub-family **Desmacellinae.**

Biemna corrugata (Bowerbank)

Westport Bay, as *Halichondria corrugata* (1).

Family **DESMACIDONIDAE.**

Sub-family **Ectyoninae.**

Stylostichon plumosum (Montagu).

Common between tide-marks throughout the district, but only rarely obtained by dredging. Especially large specimens were found under the great flat boulders to the north of Portlea, and in the pools in the "Seal Cave," Clare Island; and off the islands in Westport Bay.

Colour ochre-yellow, or ochre-yellow tinged with orange-red or livid red. Easily recognized by its texture and colour, and by its strong, peculiar odour when collected.

Localities.—Eastern and southern shores of Clare Island, in deep pools, under boulders, and in crevices of Lithophyllum; Achill Island; Clew Bay, 5 fms., and along the south shore of the bay; Westport Bay; Blacksod Bay, common.

Previous Irish Records.—Westport Bay, as *Microciona plumosa*, and N.E. Ireland as *M. Keati* (1).

Geographical Distribution.—Western coast of Europe from Norway to France; Gulf of Manaar (Carter).

Microciona armata Bowerbank.

One specimen only was obtained; it was growing in the form of a thin incrustation on an oyster-shell. Colour when alive dark brick-red. This is the second Irish record for the species which was described by Bowerbank from a specimen taken in Belfast Lough (1).

Locality—N.E. of Scotch Bonnet, Westport Bay, 3 fms.

Geographical Distribution.—Off the Shetlands, south coast of England, France, Adriatic, Gulf of Manaar (Carter).

"**Microciona fictitia** Bowerbank."

Several sponges from Westport Bay were recorded by Bowerbank under the above name, but among the specimens so named I have only been able to find two quite distinct species, *Stylostichon plumosum* and *Myxilla rosacea*. Among some sponges given by Canon Norman to the Dublin Museum were fragments growing on Lithothamnion, and labelled "*Microciona fictitia*, Westport Bay, named by Bowerbank." Some of these were fragments of *S. plumosum*, others of *M. rosacea*. Two of Canon Norman's slides in Mr. Holt's possession, with similar labels, proved to be taken from specimens of the same two species; while, through Mr. Kirkpatrick's kindness, I was able to ascertain that the large specimen mentioned by Bowerbank (1, vol. iv, p. 49) was *M. rosacea*, and that a second sponge growing on Pecten, also from Westport Bay and named *M. fictitia*, was a specimen of *S. plumosum*.

Pocillon Hyndmani (Bowerbank).

(*Isodictya implicita* Bowerbank.)

On comparing slides prepared from the type specimens of *P. Hyndmani* and *P. implicitum* the spicules were found to agree so exactly in size and character that it seemed necessary to conclude that the latter name must be regarded as a synonym of the former. This view was strengthened by finding in the Norman Collection of sponges in the British Museum one of the

The slender isochelae arcuatae are scattered through the sponge. They are about 0·016 mm. in length.

The species has been recorded from Birturbuy Bay and Roundstone Bay, Co. Galway (1) and Roscoff (Topsent).

Raspailia pumila (Bowerbank).

Off Coastguard Bay, Ballynakill Harbour, 4–8 fms., two specimens.
Westport Bay, at extreme low water (1).

Raspailia ? Howsei (Bowerbank).

A species of Raspailia was found between tide-marks, Blacksod Bay, which seems to agree fairly well with the description of *R. Howsei*. The largest specimen found is 40 mm. in height; it is much branched, the branches coalescing to a great extent. The skeleton is formed of styles and subtylostyles in plumose columns. Some of these spicules project from the surface, and render it very hispid. Slender oxea are found in the plumose skeleton columns, and also form radiating bundles projecting from the dermis. The acanthostyles are exceedingly scarce, and apparently occur only near the base of the sponge. The spicules agree fairly well with those of R. *Howsei*. The styles and subtylostyles, however, are more slender than those in the type specimen. The spicules measure as follows:—Styles (or subtylostyles), up to nearly 2 mm. in length by 0·013–0·016 mm. at the head; oxea, 0·4–0·55 mm. by 0·005 mm.; acanthostyles, 0·07–0·1 mm. by 0·008 mm. at the head.

Echinodictyum truncus (Bowerbank).

Westport Bay, 5 fms., as *Isodictya truncus* (1).

Sub-family **Mycalinæ**.

Myxilla incrustans (Johnston).

Widely distributed throughout the district, but not common. The colour in all the specimens seen alive was a beautiful, clear, pale yellow, without any tinge of orange or red.

The surface of the sponge is usually more deeply grooved, and the consistence less firm than in the following species, from which it is easily distinguished, when alive, by its colour and texture.

Mucus is exuded in great quantities by the sponge.

Localities.—"Seal Cave," Alnahaskilla, and Gubanoomeen, Clare Island, extreme low water; off S.W. of Clare Island, 25½ fms.: between tide-marks in the following localities:—Old Head and Inishimmel, Clew Bay; Scotch Bonnet, Westport Bay; Blacksod Bay; Ballynakill.

Previous Irish Records.—N.E., E. and W. coasts.

Geographical Distribution.—Jan Mayen and Greenland (Lundbeck); along the west coast of Europe from Norway to France, Bay of Biscay ("Caudan"); Gulf of St. Lawrence: off South Africa (Kirkpatrick). Between tide-marks to about 200 fms.

Myxilla rosacea (Lieberkühn).

This species, which has frequently been confused with the preceding one, and which has recently been re-described by Lundbeck (11), was taken at a number of localities, both between tide-marks and in a few fathoms of water. It has not previously been recognized as a member of the British or Irish fauna, but an examination of some of Bowerbank's specimens and slides shows that the species passed through his hands, but was described by him under several different names.

One of the Bowerbank slides in Mr. Holt's possession is labelled "*Halichondria incrustans*, Westport Bay." It proves to be *M. rosacea*.

Specimens of this species were named by Bowerbank *Microciona fictilia* (see p. 27) and *Halichondria fibrillifera* (see p. 32).

Again, out of four dried specimens in the Dublin Museum collected by W. M'Calla in Connemara and labelled *Dendoryx incrustans*, two proved to be *M. rosacea*. I have recently collected the species off Co. Dublin, and it will, no doubt, be found to occur all round our coasts. It is apparently commoner than the preceding species.

The colour of this sponge is quite different from that of *M. incrustans*. It is usually buff-yellow, and is often tinged with red on the more exposed parts of the sponge. The specimens growing on worm-tubes off Annagh Island were of a more or less uniform deep orange-red.

Abundant mucus is given out as in the preceding species.

Localities.—Gubanoomeen, Clare Island, between tide-marks, and dredged at different stations off the Clare Island light-house at depths varying from 10 to 25½ fms.; Inishimmel, between tide-marks, and off the Cloghcormick Buoy, Clew Bay, 5–10 fms.; off Annagh Island, growing on tubes of *Sabella pavonina* on the Zostera beds; Scotch Bonnet, between tide-marks; Carrigeenmore, Blacksod Bay, at extreme low water.

Geographical Distribution.—Off the Faeroës (Lundbeck), France, Spain, and Portugal; Mediterranean, Azores. Between tide-marks to 100 fms.

"**Halichondria flabellifera** Bowerbank."

In his fourth volume on British sponges, Bowerbank created a new species, *Halichondria flabellifera*, for a sponge dredged in Westport Bay. He stated that this sponge had a reticulate skeleton, with smooth "acuate" skeleton spicules and spinous "defensive" spicules. From this description the species was, later on, placed in Topsent's genus Lissodendoryx.

Among the slides given by Canon Norman to Mr. Holt was one labelled "*Halichondria flabellifera*, Westport Bay. Type." As the section on this slide proved to be taken from a specimen of *Myxilla rosacea*, I was glad of the opportunity given me by Mr. Kirkpatrick of examining the type-slides of *H. flabellifera* in the Bowerbank Collection in the British Museum.

The sections on one of these slides also belong to *M. rosacea*, but the other slides, with spicule-preparations, provided an explanation of Bowerbank's description, as they showed an admixture of spicules from two quite different sponges, namely, *Myxilla rosacea* and a species of Mycale. It is evident that Bowerbank included the spicules of these two species in the description of his new species, *H. flabellifera*. The "subfusiform-cylindrical," the "defensive," the "bidentate equianchorate," and the small "bihamate" spicules of Bowerbank's description are respectively the tornotes, acanthostyles, isochelae anchorae, and sigmata of *Myxilla rosacea*, while the "fusiform-acuate" skeleton-spicules, the "palmato-inaequianchorates," and the large "bihamates" are respectively the subtylostyles, anisochelae, and sigmata belonging to the Mycale species. It is not clear how the Mycale spicules became mixed with those of *Myxilla rosacea*, as the type-specimen of *H. flabellifera* seems to consist only of *M. rosacea*; but possibly a closer examination would result in the discovery of some fragment of Mycale. At all events, it is evident that the species *H. flabellifera* must be abandoned.

Mycale aegagropila (Johnston).

Widely distributed, but much commoner along the coast of the mainland than on Clare Island. The finest specimen was taken at Ballynakill. It is nearly spherical, and measures 11 cm. in diameter. The colour of the specimens seen alive was ochre-yellow, often tinged with dark grey.

Desmacidon constrictus, Bowerbank, has long been recognized as a synonym of *Mycale lingua* (Bowerbank); but the Westport specimen, so named by Bowerbank, does not agree with his original description of *D. constrictus*. A Bowerbank slide, in Mr. Holt's possession, labelled "*Desmacidon constrictus*, Westport Bay," proves to be taken from a specimen of *M. aegagropila*. That Bowerbank observed the toxa, which are present, is shown by the fact that

he speaks of the "tricurvate acerates" in his account of the Westport specimen (1, vol. iv, p. 175).

Localities.—Portlea and Gubanoomeen, Clare Island, in deep rock-pools; Inishimmel, Clew Bay; Annagh Island and Scotch Bonnet, Westport Bay, very common; Blacksod Bay; Bofin Harbour, and Ballynakill Harbour. All between tide-marks.

Previous Irish Records.—Off N.E. and W. coasts.

Mycale macilenta (Bowerbank).

It has been suggested by Vosmaer and Pekelharing (26) that this species should be united with the preceding one. It seems advisable, however, to keep them apart for the present, until a full description of *M. macilenta* is available. From an examination of slides in Mr. Holt's possession, prepared from the types of *M. macilenta* and *M. similaris* (which have long been united under the same species), it is seen that the palmate anisochelae fall into two groups, in which the proportions of the various parts of the chelae to each other are different. These two groups of chelae are characteristic of several species of Mycale, as Lundbeck recently pointed out (11). In *M. macilenta* the larger anisochelae, which usually occur in rosettes, have comparatively short and broad alae at the larger end of the spicule, while the alae in the smaller anisochelae, which do not form rosettes, are longer in proportion to the length of the spicule, and narrow. In *M. aegagropila* the anisochelae are all of the latter type, and lie singly in the tissues. In addition to this difference, the toxa in *M. macilenta* sometimes reach a length of 0·2 mm., or more; in *M. aegagropila* they are usually about 0·06 mm. in length.

Specimens possessing anisochelae falling into two groups, and long toxa, were found several times during the Survey. All were taken between tide-marks, and, with the exception of the Clare Island specimen, which spreads over a Laminaria root, all grew in a thin film on living shells of *Pecten varius*. The colour of the specimens seen alive was ochre-yellow.

Localities.—Ahahaskilla, Clare Island; Scotch Bonnet, Westport Bay; Elly Bay and Barranagh, Blacksod Bay; Ballynakill Harbour.

Previous Irish Records.—Westport Bay, as *Desmacidon similaris* and *Raphiodesma floreum* (1); and Aran Islands, as *Esperella sordida* (6).

Mycale lingua (Bowerbank).

Westport Bay, 4 fms. (1, vol. iv, p. 182).

This identification has not been verified. Canon Norman apparently had reason to doubt its accuracy, as he queries the occurrence of the species off

the west coast of Ireland in his table of the geographical distribution of British sponges (1, vol. iv, p. 23). The species must, at least, be rare off the Irish coast, as it has not been found among any of the large collections of sponges made at different times off our coasts.

Mycale placoides (Carter).

Specimens of this species were found among the sponges collected on the Royal Dublin Society cruises off the west coast of Ireland. Several fragments are labelled Blacksod Bay. No depth is given, and the date on the label does not correspond to that of any of the stations. It is probable, therefore, that the locality is wrong, as this species has never yet been taken in less than 100 fms.—a much greater depth than is to be found in Blacksod Bay. Although not yet recorded in Ireland, *M. placoides* will probably prove to be fairly common in the deeper water off the coast, as specimens, hitherto unnamed, have been found among sponges dredged by the earlier expeditions off the west coast of Ireland.

Mycale rotalis (Bowerbank).

The largest specimen obtained was growing on a dead oyster-shell. It covered the greater part of both the inner and outer side of the valve, and measured 9·5 cm. in length. Its greatest thickness is 2·5 cm.

Colour when alive deep scarlet.

The dermal skeleton consists of a network of very regular triangular meshes, as shown in Bowerbank's figure (1, vol. iii, plate xc, fig. 9). This type of dermal skeleton is found in other species of Mycale, but it is remarkable in this case for its beautiful regularity. The main skeleton is formed of fibres. A little below the surface of the sponge these fibres divide into finer strands, which spread out in a penicillate manner, and pierce the nodes of the dermal skeleton, so that the spicules project very slightly beyond the surface of the sponge.

The spicules agree well in character and size with those of the type. In the Irish specimens they measure as follows:—subtylostyles. 0·25–0·3 mm. × 0·008 mm.; palmate anisochelae of one kind, 0·015–0·024 mm; sigmata, 0·06–0·07 mm. in length. The anisochelae occur scattered through the sponge, and are not found in rosettes; the alae at the larger end are long and narrow.

Mycale rotalis has hitherto been taken on two occasions off the south coast of England (1).

Localities.—Off Scotch Bonnet, Westport Bay, 3 fms., two specimens growing on dead oyster-shells; Dorinish, Clew Bay, between tide-marks, in crevices of limestone boulders; Blacksod Bay, three specimens found at extreme low water.

Mycale littoralis (Topsent).

This species is characterized by the presence of bundles of long raphides. The anisochelae are of the usual Mycale-type, and fall into two groups. In the rosette anisochelae the larger alae are nearly as broad as they are long; in the smaller anisochelae they are longer in proportion to the length of the spicule, and narrow. The measurements of the spicules agree well with those given for the original specimens (20). The large anisochelae are very constant in size, and reach a length of 0·033 mm.; the smaller ones vary considerably in size, their length being 0·013–0·02 mm. The subtylostyles measure 0·225–0·26 mm. by 0·007 mm. The raphides reach a length of 0·375–0·4 mm.

The Clare Island specimen forms a thin incrustation on the under side of a piece of *Lithophyllum incrustans*. It was yellow-ochre in colour when alive and very soft to the touch. It was crowded with embryos of a deep yellow colour (July).

The Bofin specimen is a smooth, thin, soft sponge growing over a mass of sea-weed, Polyzoa and Ascidia. The subtylostyles are much thinner than in the Clare Island specimen, only reaching a thickness of 0·003 mm., and the anisochelae are not so abundant.

A third specimen is a large, flat sponge, soft in texture. It is penetrated in every direction by worm-tubes, which give the sponge a very different appearance from that of the preceding specimens.

The species has previously been taken only off the French coast, at Roscoff and Luc.

Localities.—South shore of Clare Island at Gubanoomeen; Ballynakill Harbour (two specimens); Bofin Harbour.

Mycale fallaciosum (Bowerbank).

Bowerbank (1, vol. iv) does not mention the occurrence of toxa in his description of this species, but in Mr. Holt's collection there is a preparation from the type specimen in which toxa are present. Should they really belong to the sponge, *M. fallaciosum* may prove to be a synonym of *M. mucilenta*, as the spicules in both seem to agree in size and character.

Mycale sp.

Bowerbank records a sponge from Westport Bay (1, vol. iv) under the name *Raphiodesma simplicissimum*. A slide so labelled is in Mr. Holt's collection; but on it, in addition to the megascleres, are anisochelae of the usual Mycale type, and sigmata, which have evidently been overlooked by Bowerbank, as these spicules do not occur in the sponge originally described by him under the name *R. simplicissimum*.

Esperiopsis fucorum (Johnston).

This species, which was very abundant at extreme low water off the sheltered shores of the islands in Westport Bay, was rare between tide-marks on Clare Island. It grew on the walls of the "Seal Cave" in masses several square feet in extent, but, in addition to these specimens, only one other was found growing between tide-marks on the island, while another specimen on a Laminaria root was found washed up on the shore. *E. fucorum* reached a very large size off Annagh Island, where it was extremely abundant, growing in great masses on stones, Zostera, and Fucus. It was also common in a few fathoms of water in Clew Bay. The species was much rarer in Blacksod Bay, where only a few specimens were found.

The colour of all the specimens seen alive was a very bright orange-red.

Bowerbank's *Isodictya Clarkei* has been placed as a synonym of *E. fucorum* (22). This cannot be correct, as *I. Clarkei* possesses anisochelae, and is probably identical, as Lundbeck suggests (11), with *Mycale ornata* (Schmidt). On the other hand, the specimen from Westport Bay which Bowerbank named *I. Clarkei* possesses isochelae characteristic of Esperiopsis, and will probably be found to be *E. fucorum*.

Bowerbank's species *Isodictya dubia* recorded for Clew Bay and Westport Bay (1) will probably prove to be identical with *E. fucorum*.

Localities.—"Seal Cave," Ahahaskilla and Porttarriv, Clare Island; at several stations off the islands at the head of Clew Bay in 4–10 fms., and between tide-marks on Annagh Island, Westport Bay; Dugort, Achill Island; Blacksod Bay between tide-marks and in 6–8 fms.; Bofin Harbour; Ballynakill Harbour, between tide-marks.

Previous Irish Records.—Killary Bay (17) and off the N.E., E., and W. coasts.

Esperiopsis (?) involuta (Bowerbank).

"Dredged in Westport Bay," as *Isodictya involuta* (1).

Family **AXINELLIDAE.**

Hymeniacidon caruncula Bowerbank.

This common sponge is found everywhere along the coast. With the exception of *Halichondria panicea*, it grows nearer high-water mark than any other of our sponges. It flourishes to a remarkable degree in parts of Westport Bay. The colour usually varies from salmon-colour to deep orange-red. Less frequently it is bright red, or green externally and orange internally ("*H. viridans*"). Throughout the district orange-red specimens were by far the commonest. A few small bright red specimens were found under the Lithophyllum on Clare Island; and a large green specimen with orange centre was obtained near Clare Island harbour. The specimens near the Whaling Station, Blacksod Bay, were deep ochre-yellow. As Topsent suggests, probably several other of Bowerbank's species will be found, on examination, to be identical with this common species (22, p. 21), and the name *H. caruncula* itself may have to give place to that of *H. sanguinea* Grant (25, p. 261).

Recorded for Westport Bay, as *H. caruncula* and *H. consimilis* (1).

Hymeniacidon sanguinea (Grant).

This sponge is separated by Bowerbank from the preceding species on account of its blood-red colour and longer spicules. Topsent (25, p. 261) points out the insufficiency of these characters for the separation of the species, and believes the sponge described by Bowerbank under the name *H. sanguinea* to be identical with *H. caruncula* Bowerbank, and the *Spongia sanguinea* of Grant to be, for the time, an enigmatic species. On the other hand, remembering the extreme abundance of *H. caruncula*, and the exposed situations in which it grows, Topsent remarks on the improbability of its having escaped the notice of the older zoologists. He therefore suggests that *H. caruncula* will be found to be synonymous with some previously described species, and perhaps with *H. sanguinea* (Grant).

Among Mr. Holt's collection of Bowerbank slides are two, labelled respectively "*H. sanguinea*, Bofin Island," and "*H. caruncula*, Guliot Caves,

Sark." The spicules on the former slide are not longer than those on the latter. On both slides they vary in length between 0·24–0·27 mm., so that this evidence, so far as it goes, is in favour of Topsent's suggestion as to the identity of these two species as described by Bowerbank.

Recorded for Westport Bay (1).

The following species of Hymeniacidon are recorded by Bowerbank (1, vol iv) for Westport Bay:—*H. mammeatus*, *H. medius* and *H. collosus*.

Isodictya invalida (= *Desmacidon pumosus*, *fide* Topsent, 22) and *I. pertenuis* may also be referred to this genus; they were at one time placed under Stylotella, a genus which Dendy (4) considers to be synonymous with Hymeniacidon.

Tragosia infundibuliformis (Johnston).

Localities.—Dredged by the "Helga" ten miles W. by S. of the Clare Island light-house, 41–42 fms. (two small specimens), and off The Bills, 27½ fms. (one specimen).

This species has not been previously recorded for Ireland, but several specimens hitherto unnamed have been found in the Irish National Museum among sponges dredged by the earlier expeditions off the Irish coast.

Geographical Distribution.—Off the Shetlands, Hebrides, Norway, south of England, France. From 25 to 345 fms.

Order EUCERATOSA.

Family **APLYSILLIDAE.**

Aplysilla rosea Schultze.

Only one small specimen of this species was found off Clare Island. It was growing under *Lithophyllum incrustans*. The species was widely distributed and fairly common at extreme low water off the islands at the head of Clew Bay and in Blacksod Bay, where it grew on the under surface of large stones.

Localities.—South shore of Clare Island, at Gubanoomeen; Dorinish and Inishimmel, Clew Bay; Scotch Bonnet and Annagh Island, Westport Bay; Blacksod Bay, from Barranagh to Carrigeenmore; Ballynakill Harbour.

Geographical Distribution.—Shetlands, France, Mediterranean, Australia.

Aplysilla sulphurea Schultze.

Much less common than the preceding, but fairly abundant in one or two localities in Blacksod Bay. Found growing on the under side of large stones at extreme low water.

Localities.—Scotch Bonnet, Westport Bay; Blacksod Bay, from Barranagh to Carrigeenmore.

Geographical Distribution.—Shetlands, France, Mediterranean, Azores, Australia, Straits of Magellan.

Family **SPONGELIIDAE.**

Spongelia fragilis (Montagu).

This species was found only in the most sheltered places between tide-marks on Clare Island, such as the "Seal Cave" and the pools near the harbour. On the other hand, it was extremely common along the coast of the mainland in Blacksod Bay and Westport Bay. It grew in great abundance off Annagh Island, where very large specimens were found. *S. fragilis* was also dredged in a few fathoms of water off Clare Island, and in Westport Bay, where it was very common.

Previous Irish Records.—Westport Bay, as *Dysidea coriacea* (1), and off the N.E., E., and W. coasts.

Geographical Distribution.—European and American coasts of the North Atlantic; Mediterranean; off South America; Indian Ocean and Australia. Between tide-marks up to 345 fms.

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