

9. On Collections of the Cape Verde Islands Fauna made by Cyril Crossland, M.A. (Cantab.), B.Sc. (Lond.), F.Z.S., (late of the Gatty Marine Laboratory, St. Andrews University), from July to September 1904.—The Calcareous Sponges. By A. G. THACKER, A.R.C.S. (Lond.), Research Scholar in Zoology at the Royal College of Science \*.

[Received June 15, 1908.]

(Plate XL. † and Text-figures 155–166.)

It is somewhat remarkable that, although a considerable number of Calcareous Sponges has been described from the Azores and from the Canary Islands, only one species, *Grantia tuberosa*, dredged off St. Vincent by the 'Challenger,' has been hitherto recorded from the Cape Verde Islands. It was therefore to be expected that the dredging operations which were carried out by Mr. Crossland, with the aid of a grant from the Carnegie Trustees, in the summer of 1904, would yield some interesting results; and such has in fact been the case, for of the twelve species contained in the present collection, six are altogether new to science, and several of the remainder are of interest either from the zoögeographical or systematic point of view.

The twelve species are as follows:—

- Leucosolenia panis* (Haeckel).
- Leucosolenia atlantica*, sp. n.
- Leucosolenia canariensis* (Miklucho-Maclay).
- Sycon quadrangulatum* (Schmidt).
- Sycon caminatum*, sp. n.
- Grantia intermedia*, sp. n.
- Leucandra verdensis*, sp. n.
- Leucandra rudifera* (Poléjaeff).
- Leucandra sericata* (Ridley).
- Leucandra typica* (Poléjaeff).
- Leucandra crosslandi*, sp. n.
- Leucandra gemmipara*, sp. n.

Perhaps the most interesting of these species is the remarkable sponge, *Leucandra rudifera*, of which only a few fragments have been previously found and which is characterised by the possession of some curious and unique spicules in its gastral cortex.

Another fact, which is of some systematic interest and to which I would call attention, is the comprehensive sense in which I have been obliged to use the name *Leucosolenia canariensis*. From the great variability of certain characters in some of the Ascons in this collection, it seems probable that the characters by which certain sponges (notably *Leucosolenia nanseni* Breitfuss, and

\* Communicated by Professor ARTHUR DENDY, D.Sc., F.R.S., F.Z.S., Sec.L.S.

† For explanation of the Plate see p. 782.



*Leucosolenia tenuipilosa* Dendy) have been supposed to be specifically distinguished from Haeckel's original *Ascaltis canariensis* are really quite inconstant and not of specific value. As used by me, therefore, the name *Leucosolenia canariensis* includes sponges which have been hitherto considered to be specifically distinct from each other, and in my description of this species I have endeavoured to give a detailed justification of this procedure.

The calcisponge fauna of the Cape Verde Islands shows distinct affinity with that of the western side of the Atlantic. In a letter to Professor Minchin, Mr. Crossland suggested that the distribution of these species might prove interesting because the Islands receive currents from the Gulf Stream. This forecast has been to some extent corroborated, for *Leucosolenia panis* has been recorded from the coast of Florida (immediately in the course of the Gulf Stream, of course), and *Leucandra typica* and *Leucandra rudifera* were dredged by the 'Challenger' off Bermuda (also not far from the Gulf Stream) on the same day and from the same spot. I think, therefore, that it is not impossible that the Gulf Stream may be a factor in the distribution of all three species; but it should not be forgotten that the North Equatorial Current, which takes its origin near the Cape Verde Islands and meets the Gulf Stream as the latter issues from the Gulf of Mexico, might produce precisely the same results by distributing the sponges in the opposite direction, that is, by carrying them westwards instead of eastwards. The distribution of *Leucandra typica* may not be of much value in estimating these factors of dispersal, because having been recorded from Australia it is evidently a widely distributed if somewhat uncommon species, but in the case of *L. panis* and of *L. rudifera*, each of which has only been found once before, the facts here stated are of greater significance. *Leucandra sericata* is a sponge inhabiting the Atlantic coast of South America. Of the remaining two species which are not new, *L. canariensis* has a very wide range and *Sycon quadrangulatum* has been recorded from the Arctic, from the eastern Atlantic, and from the Mediterranean.

Where it has been necessary in the following pages to refer to individual specimens, I have done so by the use of the Registered Number (*R.N.*) which I have attached to each specimen in the collection\*. The numbers in square brackets—thus [1]—refer to the works given in the list of literature at the end. The list only includes such memoirs as I have had to refer to in the text.

Throughout this paper I have followed the classification of the Calcarea, set forth by Dendy in [9] and [11]. According to this system the genera *Leucosolenia* and *Leucandra* are very comprehensive, the former including all the Homocœla and the latter being extended to include species such as my *L. verdensis*, which

\* The collection has been placed in the University Museum of Zoology at Cambridge.



has no oxeote spicules. In the case of these two genera the classification is to be regarded, I think, as the expression of a suspension of judgment. There can be little doubt that both *Leucosolenia* and *Leucandra* will eventually have to be split up into several distinct genera; but until this can be done with some reasonable likelihood of finality, it would seem wisest not to attempt the task.

I take this opportunity of expressing my gratitude to Professor A. Dendy, F.R.S., who placed the collection at my disposal for examination, and who has throughout the research given me invaluable assistance and advice. I have also to thank my friend Mr. F. J. Bridgman, Marshall Scholar in the Royal College of Science, who has very kindly sketched the external form of several of the Heterocœla (Pl. XL. figs. 4, 5, 7, and 9). And finally I must acknowledge my indebtedness to the authorities of the British Museum (Natural History), who gave me access to the National Collection of Calcarea and have afforded me special facilities for consulting the literature on the subject, much of which is not easily obtainable elsewhere.

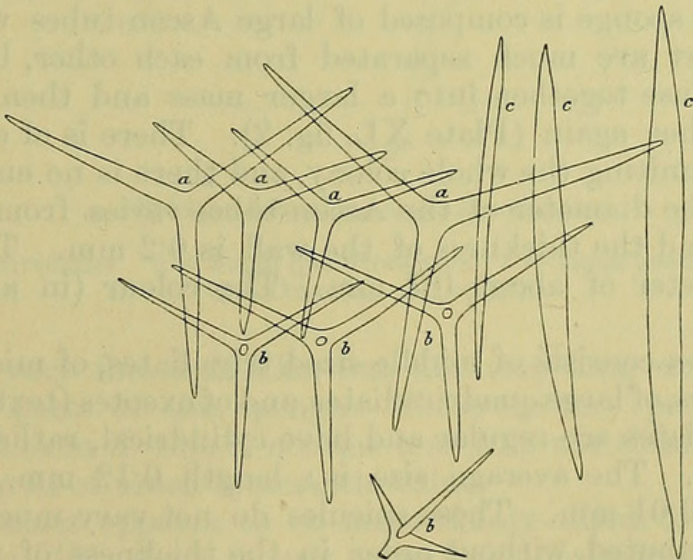
*LEUCOSOLENIA PANIS* (Haeckel). (Plate XL. fig. 1 & text-fig. 155.)

Synonymy:—

*Ascandra panis* Haeckel [14].

The collection contains three specimens of this beautiful little sponge, all dredged from a depth of 20 fathoms near North Point,

Text-fig. 155.



Spicules from *Leucosolenia panis*.

*a* = Triradiates. *b* = Quadriradiates. *c* = Oxeotes. All  $\times 120$ .

Boa Vista Island. The external form and general characters of these agree with the description of the species given by Haeckel,



but the largest of the three specimens is not more than one-sixth the size of that figured by him. The sponge is composed of a compact reticulum of Ascon-tubes, but there is no common investing skin or pseudoderm covering the whole colony and no endogastral network.

*Colour* (in alcohol) pale brown.

The *Skeleton*, which consists of all three kinds of spicules, shows only slight differences from Haeckel's description (text-fig. 155).

The triradiates are regular and fairly sharply pointed; they vary in length from 0.12 mm. to 0.18 mm. and in basal width from 0.011 mm. to 0.016 mm. The quadriradiates are less numerous than the triradiates and differ from them only by the presence of the fourth ray, which is the same length as the facial rays but only a little more than half as thick and is straight and sharply pointed. The oxeote spicules are somewhat smaller than those described by Haeckel; they vary in length from 0.35 mm. to 0.55 mm. and in maximum width from 0.025 mm. to 0.035 mm. They are either quite straight or very slightly curved and are sharply pointed, especially at one end. A few extremely fine hair-like oxea occur in my specimens; their presence is not to be regarded as of much systematic importance.

*Distribution.* Atlantic coast of North America; Florida (*Haeckel* [14]); Cape Verde Islands (*Crossland Collection*).

LEUCOSOLENIA ATLANTICA, sp. n. (Plate XL. fig. 2 & text-fig. 156.)

The collection contains two specimens of this species, both dredged from a depth of 20 fathoms off North Point, Boa Vista Island. The sponge is composed of large Ascon-tubes which for the most part are much separated from each other, but which occasionally fuse together into a larger mass and then separate from each other again (Plate XL. fig. 2). There is of course no pseudoderm uniting the whole colony, and there is no endogastral network. The diameter of the Ascon-tubes varies from 0.8 mm. to 1.2 mm. and the thickness of the wall is 0.2 mm. The oscula have a diameter of about 0.7 mm. The colour (in alcohol) is straw-yellow.

The *Skeleton* consists of middle-sized triradiates, of middle-sized quadriradiates, of large quadriradiates, and of oxeotes (text-fig. 156).

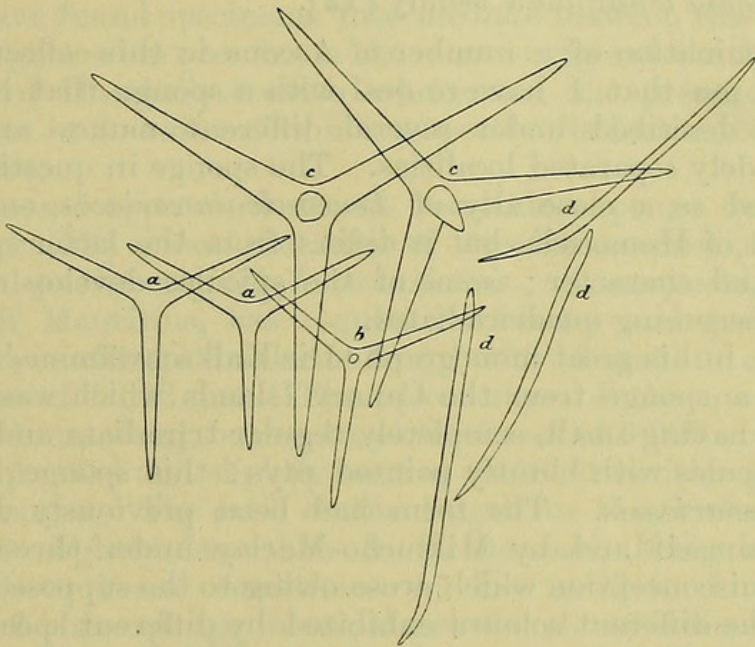
The triradiates are regular and have cylindrical, rather sharply pointed rays. The average size is: length 0.12 mm., width of rays at base 0.01 mm. These spicules do not vary much in size and are distributed without order in the thickness of the body-wall.

The middle-sized quadriradiates resemble the triradiates except for the presence of the fourth ray. The apical rays are feebly developed on these spicules, being thinner than the facial rays and not more than one quarter as long.



The large quadriradiates are also regular, have conical, fairly sharply pointed rays, and are distributed without order in the walls of the Ascon-tubes. The average length of their facial rays is 0.2 mm., and the thickness of the same at their bases is 0.035 mm. The apical rays are straight or slightly curved, are sharply pointed, are usually about half as long as the facial rays, and have a basal thickness of 0.025 mm. These spicules are quite numerous and do not vary much in size. The oxeote spicules are arranged transversely in the thickness of the sponge-wall, and their outer ends, which are slightly bent, project beyond the surface. They are fairly sharply pointed at both ends. Their average length is 0.3 mm. and their maximum thickness 0.009 mm. They are cylindrical, do not vary much in size, and are quite numerous.

Text-fig. 156.

Spicules from *Leucosolenia atlantica*.

*a* = Triradiates. *b* = Small quadriradiates. *c* = Large quadriradiates.  
*d* = Oxeotes. All  $\times 120$ .

A few very fine hair-like, but not very long oxea are to be found in parts of the sponge. These are very probably young forms, but even if this is not the case I do not think they are to be considered of much systematic value.

This species appears to be more closely allied to *Leucosolenia laxa* Kirk [15], than to any other previously described Ascon. It is distinguished, however, from the New Zealand form (1) by having the quadriradiates differentiated into spicules of two distinct sizes, (2) by having oxea considerably thinner than those of *L. laxa*, and (3) by its looser external form.

*Distribution.* Cape Verde Islands (*Crossland Collection*).



LEUCOSOLENIA CANARIENSIS (Miklucho-Maclay). (Plate XL. fig. 3 & text-figs. 157-160.)

Synonymy:—

*Nardoa canariensis* Miklucho-Maclay.

*Nardoa sulphurea* Miklucho-Maclay.

*Nardoa rubra* Miklucho-Maclay.

*Tarroma canariense* Haeckel (Prodromus).

*Tarroma sulphureum* Haeckel (Prodromus).

*Tarroma rubrum* Haeckel (Prodromus).

*Ascaltis canariensis* Haeckel [14].

*Ascaltis compacta* Schuffner [22].

*Ascaltis canariensis* Lakschewitsch [16].

*Ascetta coriacea*, n. var. *Ascaltis coriacea* Fristedt [13].

*Leucosolenia nanseni* Breitfuss [4].

*Ascetta coriacea* Arnesen [1].

*Leucosolenia tenuipilosa* Dendy [12].

The examination of a number of Ascons in this collection has convinced me that I have to deal with a sponge that has been previously described under several different names and from various widely separated localities. The sponge in question is to be regarded as a close ally of *Leucosolenia coriacea*, one of the commonest of Homocœla, but it differs from the latter species in one essential character; some of the spicules develop a fourth ray, thus becoming quadriradiates.

In 1872, in his great monograph 'Die Kalkschwämme,' Haeckel described a sponge from the Canary Islands which was characterised by having small, completely regular triradiate and quadriradiate spicules with bluntly pointed rays; this sponge he called *Ascaltis canariensis*. The form had been previously described both by himself and by Miklucho-Maclay under three specific names, a misconception which arose owing to the supposed specific value of the different colours exhibited by different specimens of the species. This Ascon was similar to *L. coriacea*, but differed from the latter by the presence of quadriradiates and by the smaller size of its spicules.

Some thirteen years later Lakschewitsch [16] recorded the same species under the same name from Minorca.

In 1898, in describing a collection of Calcarea from Spitzbergen (a preliminary account of which he had issued two years previously [3]), Breitfuss [4] described a sponge which he considered new to science and which he named *Leucosolenia nanseni*. Having regard to the results of the present investigation, I think this form cannot be regarded as specifically distinct from Haeckel's *Ascaltis canariensis*, and indeed Breitfuss himself noticed the great similarity between the two forms, for at the end of his description of *L. nanseni* he says:—"Das Skelet von *Leucosolenia nanseni* erinnert etwas an *Leucosolenia* (*Ascaltis*) *canariensis* (M.-Mcl.), unterscheidet sich aber von dieser durch die Grösse der Nadeln, welche bei letzterer Species beinahe dreimal



kleiner sind und nur eine Schenkellänge von 0.04–0.06 mm. bei einer Dicke von 0.003–0.005 mm. erreichen. Ausserdem ist die Innenseite der Röhren bei *L. nanseni* stets mit Papillen besetzt, dagegen bei *L. canariensis* nur bei der Varietät *papillata* H."

The measurements which he gives for the spicules of *L. nanseni* are: length of rays 0.113 to 0.145 mm., thickness at base 0.008 to 0.014 mm. This makes the spicules, as Breiffuss points out, nearly three times as large as in *L. canariensis*. I have found, however, a series of specimens which completely links up the two forms in this respect. There is one other slight difference between the two forms which Breiffuss does not mention in his comparison: in *L. canariensis*, Haeckel says that the apical rays of the quadriradiates are straight and are sometimes longer, sometimes shorter, than the facial rays; whereas in *L. nanseni* Breiffuss states that the apical rays are slightly curved and are usually only half the length of the other rays. In this character, too, I have found specimens intermediate between the two forms. Since papillæ were present on the inner surface of the Ascon-tubes in some of Haeckel's *Ascltis canariensis*, the presence of these structures in *L. nanseni* is not a specific distinction between the two forms.

*L. nanseni* appears to me to resemble a sponge described by Schuffner [22] under the name of *Ascltis compacta*, even more than it does the original *L. canariensis*. *A. compacta*, which was found off Mauritius, has regular triradiates and quadriradiates with rays reaching a maximum length of 0.12 mm. and a maximum thickness of 0.012 mm. The apical rays of the quadriradiates are 0.084 mm. long, have a basal thickness of 0.009 mm., and are sharply pointed and slightly bent at their extremities precisely as in *L. nanseni*. The ratio of the length to the thickness of the rays is slightly less than in *L. nanseni*, being usually less than 10 to 1 and sometimes as low as 7 to 1. Schuffner separated his sponge from Haeckel's *A. canariensis* because (1) it had no papillæ on the inner surfaces of the Ascon-tubes, and because (2) of the different shape of the apical rays of the quadriradiates. With regard to the latter point, I have, as stated above, found specimens intermediate between the two forms, and have also found much variation within the limits of the same specimen. And as for the papillæ, it is truly remarkable that whereas one of Schuffner's reasons for separating his sponge from *A. canariensis* was that it never had these structures, Breiffuss separated his sponges from *A. canariensis* partly on the ground that they always did have the papillæ. This affords a very good illustration of the kind of confusion which must necessarily arise if attempts are made to utilise structures, which are known to be indifferently present or absent within one species, as specific distinctions between that species and other members of the genus. It therefore appears that this *Ascltis compacta* is not distinct from either *L. nanseni* or *A. canariensis*, and I include it in the species *L. canariensis*.



Finally, a sponge described by Dendy [12] three years ago from Ceylon under the name *Leucosolenia tenuipilosa* is to be regarded as a variety of this species and as standing in the same relationship to typical specimens of *L. canariensis* as *L. coriacea ceylonensis*, Dendy, does to the typical *L. coriacea*. This variety, *L. canariensis tenuipilosa*, has regular triradiates and quadriradiates with rays 0.1 mm. long by 0.012 mm. thick, the apical rays of the quadriradiates being very variable but usually longer than the facial rays. The distinguishing feature of the variety is the presence of hair-like oxea. Similar hair-like oxea occur in several of the Cape Verde Islands specimens under discussion.

The collection contains a considerable number of specimens which I consider belong to this species. They were dredged by Mr. Crossland from various localities, Boa Vista Island, Porto Praya, and elsewhere. The sponge forms rather massive colonies of reticulating Ascon-tubes (Plate XL, fig. 3). The exhalent openings are true oscula and there is no pseudoderm or endogastral network, but in examples where the tubes anastomose very closely more or less indefinite inter-canals are formed. Each colony is attached by a somewhat constricted base, and in several cases there is a short stalk. None of the colonies in my specimens is very large; the larger sponges have a diameter of from 1 cm. to 2 cm. The diameter of the Ascon-tubes varies considerably in different specimens and in different parts of the same specimen; this variation ranges from 0.15 to 0.4 mm. The walls of the tubes are from 0.02 to 0.035 mm. thick. The colour (in alcohol) is brown.

The *Skeleton* consists of regular triradiates, and of quadriradiates which differ from the triradiates only in the presence of the fourth ray; some of the triradiates possess a knob evidently representing an incipient fourth ray. The rays are usually fairly bluntly pointed (though there is some variation in this respect) and are nearly cylindrical. The apical rays of the quadriradiates project at right angles to the facial rays. There is not much variation in the size of the spicules in the same individual, but much difference between the spicules of different specimens. The measurements of the spicules of the following series of five specimens show how completely this series links up *L. canariensis* on the one hand and *L. tenuipilosa* and *L. nanseni* on the other the sizes of the spicules of these sponges having been given above:—

*Specimen R.N. 6.*—Length of rays, 0.06–0.07 mm.

Thickness of rays, 0.006–0.007 mm.

Apical rays of quadriradiates straight and equal or nearly equal in length to facial rays.

*Specimen R.N. 8.*—Length of rays, 0.08–0.09 mm.

Thickness of rays, 0.007–0.008 mm.

Apical rays of quadriradiates straight and from one-half to two-thirds the length of the facial rays.



*Specimen R.N. 9.*—Length of rays, 0.1–0.11 mm.

Thickness of rays, 0.009–0.01 mm.

Apical rays of quadriradiates straight but variable in form; sometimes half as thick and nearly as long as the facial rays; sometimes equally thick but not much more than half as long as the facial rays.

*Specimen R.N. 14.*—Length of rays, 0.12–0.15 mm.

Thickness of rays, 0.013–0.016 mm.

Apical rays of quadriradiates either straight or bent at their extremities, and from two-thirds to equal length of the facial rays.

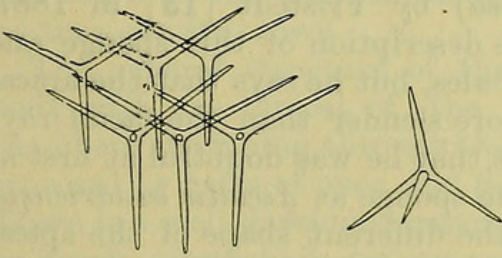
*Specimen R.N. 16.*—Length of rays, 0.15–0.19 mm.

Thickness of rays, 0.014–0.016 mm.

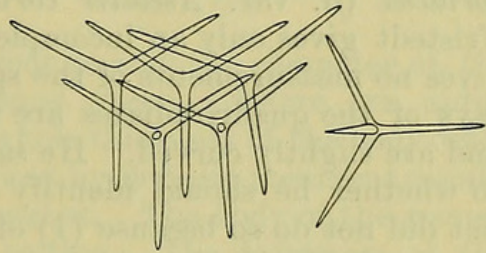
Apical rays of the quadriradiates very variable; either straight or bent at their extremities; either nearly as thick and half as long as the facial rays, or else much thinner but longer than the facial rays.

It will be noted that the rays in the first specimen are only very slightly larger than in Haeckel's *L. canariensis*, that in the second and third specimens the size is intermediate between

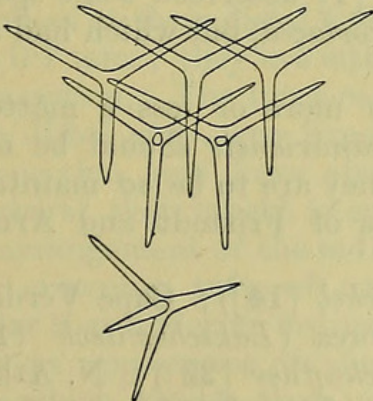
Text-fig. 157.



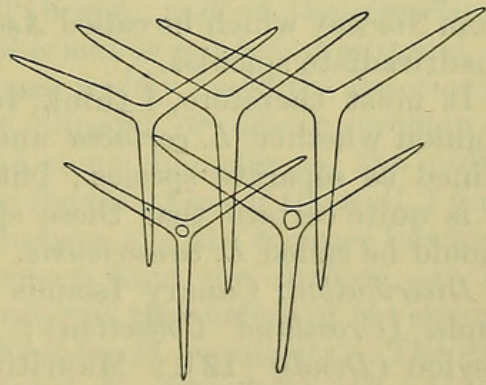
Text-fig. 158.



Text-fig. 159.



Text-fig. 160.



Spicules from four specimens of *Leucosolenia canariensis*, showing variation in the size of the spicules in different specimens. All  $\times 120$ .

*L. canariensis* and *L. nanseni*, that in the fourth specimen the size is almost the same as in *L. nanseni*, and finally that in the fifth specimen the spicules are larger than in Breitfuss's Ascons. All the specimens contain some triradiates with knobs repre-



senting incipient fourth rays. As has been already stated, several specimens contain some thin hair-like oxea, and in some examples these are quite numerous but in others very scarce; the latter specimens obviously form connecting links between the typical form of the species and the variety *L. canariensis tenuipilosa*. These spicules have a thickness of 0·0015 to 0·003 mm., and vary in length from 0·05 to 0·3 mm.; they are sharply pointed.

I found no papillæ on the inner surface of the Ascon-tubes; as these structures were present in some and absent in other specimens of Haeckel's *L. canariensis* (and absent in those described by Lakschewitsch), this character is manifestly not to be considered as of specific value.

It remains to discuss the relationship between *L. coriacea* and *L. canariensis*. As previously remarked, the only essential difference between them is that *L. canariensis* has quadriradiate spicules; but in the Cape Verde Islands examples there appears to be every gradation between specimens in which the quadriradiates are very numerous (quite 50 % of all the spicules) and other specimens in which they are very scarce, and it is obvious that the latter approach very nearly to *L. coriacea*. Nor is this all, for Ascons having a few quadriradiate spicules have been identified and described as *L. coriacea*. Breitfuss mentions [4] that his *L. nanseni* is very like a sponge described as *Ascetta coriacea* (n. var. *Ascaltis coriacea*) by Fristedt [13] in 1887. Fristedt gives only an incomplete description of this sponge and gives no measurements of the spicules, but he says that the apical rays of the quadriradiates are more slender than the facial rays and are slightly curved. He says that he was doubtful at first as to whether he should identify the sponge as *Ascaltis canariensis*, but did not do so because (1) of the different shape of the apical rays, and (2) of the wide separation of the localities where the respective specimens were found—his sponges being arctic.

Again, in the year 1900 Arnesen [1] described some sponges from Norway which he called *Ascetta coriacea*, but which had some quadriradiate spicules.

It must therefore, I think, remain more or less a matter of opinion whether *L. coriacea* and *L. canariensis* should be maintained as separate species; but if they are to be so maintained it is quite certain that these sponges of Fristedt and Arnesen should be called *L. canariensis*.

*Distribution.* Canary Islands (*Haeckel* [14]); Cape Verde Islands (*Crossland Collection*); Minorca (*Lakschewitsch* [16]); Ceylon (*Dendy* [12]); Mauritius (*Schuffner* [22]); N. Atlantic and Arctic Oceans, and the White Sea (*Fristedt* [13], *Arnesen* [1], *Breitfuss* [4] [5]).

SYCON QUADRANGULATUM (Schmidt).

Synonymy:—

*Syconella quadrangulata* O. Schmidt [21].

*Sycortis quadrangulata* Haeckel [14].



*Sycortis quadrangulata* Bowerbank (Norman) [2].

*Sycandra quadrangulata* Lendenfeld [17].

*Sycon quadrangulatum* Breitfuss [7].

The collection contains one small specimen of this well-known species. The length of the specimen is 3.5 mm. and its width 1 mm. It was dredged from a depth of 10 fathoms.

*Distribution.* Mediterranean, Straits of Gibraltar, coasts of Portugal and Brittany (*Schmidt* [21], *Haeckel* [14], and *Lendenfeld* [17]); Guernsey (*Bowerbank* [2]); the White Sea (*Breitfuss* [7]); the Cape Verde Islands (*Crossland Collection*).

SYCON CAMINATUM, sp. n. (Plate XL. fig. 4 & text-fig. 161.)

Mr. Crossland collected ten specimens of this new sponge, several of which are quite young individuals. The general form assumed by this *Sycon* is shown in Plate XL. fig. 4. It grows erect, either singly or in groups, and its greatest diameter is about one quarter its height. The largest specimen has a length (excluding the proboscis or peristome) of 14 mm. and its greatest width is 4 mm. The terminal osculum in this specimen has a diameter of 1.8 mm. A very characteristic and well-developed peristome or proboscis is present in all cases, and from this structure I have derived the specific name. The length of this peristome is variable; in one specimen it reaches as much as 4 mm., the length of the body of the sponge being only 8 mm. There is no true oscular crown.

The general structure of the sponge and the character of the body-wall are typical of the genus *Sycon*. There are radial chambers stretching through the whole thickness of the body-wall, crowned by tufts of oxea, and flanked by definite incurrent canals. There is a well-developed gastral cortex. The body of the sponge is nearly circular in transverse section. The thickness of the body-wall in the middle of the sponge, and therefore the length of the radial chambers, is 1 mm. The breadth of the radial chambers at their distal ends is 0.16 mm., and at their proximal ends 0.1 mm.; they are either spherical or somewhat ellipsoid in cross-section. The inter-canals open widely on to the exterior at their distal ends, are irregularly ellipsoid or nearly circular in cross-section, and have about the same diameter as the radial chambers; their length is equal to the thickness of the wall, 1 mm. The arrangement of the radial chambers, and the manner in which their crowning tufts of oxea project from the surface, are so regular that under an ordinary hand-lens the surface of the sponge gives an appearance of almost chess-board regularity. The distance which divides these crowning tufts from each other is, in the middle portion of the sponge, about 0.16 mm.

*Colour* (in alcohol) light brown.

The *Skeleton* consists of triradiates, quadriradiates, and oxea, and may be said to consist of four divisions: (1) that of the radial chambers, (2) that of the tufts of spicules at the ends of the radial chambers, (3) that of the gastral cortex, and (4) that of the peristome.



The tubar skeleton consists almost exclusively of triradiate spicules. The majority of these spicules are markedly sagittal but there is much variation in this respect, some spicules being almost equiangular and equiradiate, whilst others have an angle amounting nearly to  $180^\circ$  and the other two angles only a little more than  $90^\circ$  each. In typical spicules the sagittal form is due both to this difference of angles and to the greater length which is attained by the basal ray. All the rays are usually straight; but sometimes the paired rays are slightly curved throughout their lengths, in which case they always have their convex sides, never the concave, towards the basal ray; and sometimes the basal ray is curved at its extremity. In a few cases the basal ray is shorter than the paired rays. The size of an average triradiate of the tubar skeleton is as follows:—Length of paired rays, 0.09 mm.; width at base of rays, 0.012 mm. Length of basal ray, 0.11 mm.; width at base, 0.012 mm. The great majority of the spicules are of this size or very close to it, but the rays are occasionally considerably longer, although never much wider. A few quadriradiate spicules, with facial rays resembling the rays of the triradiates and with short apical rays, occur in the proximal portions of the radial canals; they are, however, very scarce and are probably of little systematic importance.

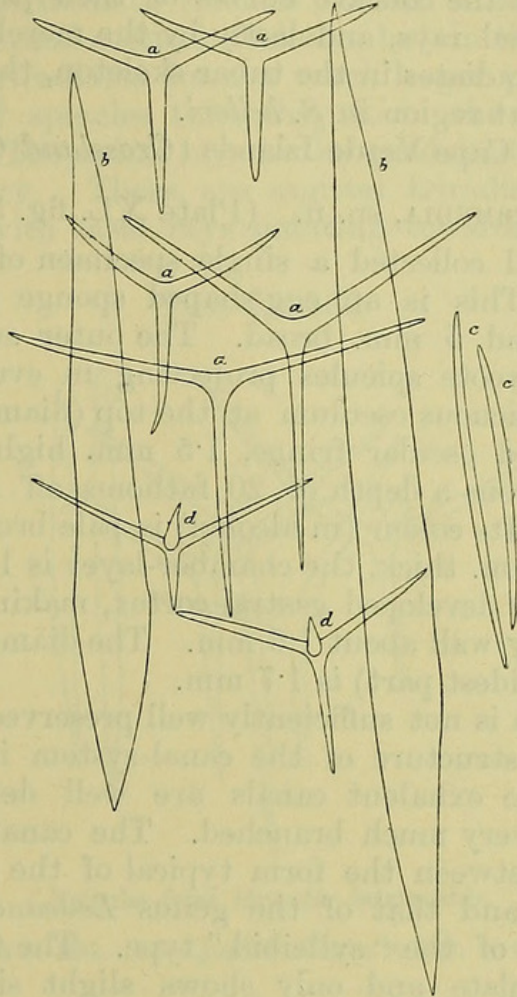
The crowning tufts at the ends of the radial chambers are composed of oxea of three sizes. The largest of these (text-fig. 161, *b*) reach a length of 0.8 mm. and a maximum thickness of 0.05 mm. They are usually sharply pointed at both ends, but they taper to the point more gradually at one (the projecting) end than at the other, the thickest part of the spicule not being in the middle of its length; this character is very marked in some spicules, but in others it is scarcely noticeable. These spicules are somewhat flattened, are straight or nearly straight, and have about one-third of their lengths projecting beyond the surface of the sponge. The tufts also consist in part of much smaller straight or somewhat curved, sharply pointed oxea (text-fig. 161, *c*), of a diameter only about equal to that of the rays of the triradiates; these reach a length of 0.25 mm. and have a maximum thickness of 0.01 mm. In addition to these there are a number of very fine hair-like oxea which may perhaps be young spicules.

The gastral cortex, which is well developed and is four or five layers of spicules thick, consists of triradiates and quadriradiates, the apical rays of the latter projecting freely into the gastral cavity. As in the tubar skeleton, there exists considerable variation in the spicules; the triradiates are typically somewhat longer and narrower than those of the radial canals, but otherwise there is little difference between the triradiates of the two regions. The average length of the rays is 0.12 mm., and their width at base 0.008 mm. One angle is frequently greater than the other two, thus making the spicules sagittal. The facial rays of the quadriradiates resemble the rays of the triradiates; the apical rays are short and stout and sharply pointed; they are either



straight or slightly curved at their extremities; their average length is 0.05 mm. and their width at base 0.011 mm. The majority of the quadriradiates, like the triradiates, are sagittal.

Text-fig. 161.

Spicules from *Sycon caminatum*.

*a* = Tubar triradiates. *b* = Large oxeotes. *c* = Small oxeotes. *d* = Gastral quadriradiates. All  $\times 120$ .

The peristome consists of an irregular and complicated network of spicules similar to those which occur in the other regions of the sponge. There are large and small oxea like those crowning the distal ends of the radial chambers, there are triradiates like those of the tubar skeleton, and also triradiates and quadriradiates resembling those of the gastral cortex. Some of the sagittal triradiates in this region have the concave curve of the paired rays towards the basal ray. The very minute hair-like oxea which project from the ends of the chambers do not occur in the peristomal region.

This *Sycon* is most nearly allied to *Sycandra* (*Sycon*) *helleri* Lendenfeld, a sponge found in the Adriatic Sea [17]. The species differ, however, in a number of points, perhaps the most important of which is the presence in my species of the remarkably well-



developed peristome. There is also never an oscular fringe of spicules in *S. caminatum*, a structure which is often present in *S. helleri*. *S. caminatum* is further distinguished by the presence of more than one kind of oxea at the distal ends of the radial chambers, by the absence from the radial chambers of sagittal triradiates with the concave curves of their paired rays turned towards the basal rays, and lastly by the merely sporadic occurrence of quadriradiates in the tubar skeleton, these spicules being numerous in that region in *S. helleri*.

*Distribution.* Cape Verde Islands (*Crossland Collection*).

GRANTIA INTERMEDIA, sp. n. (Plate XL. fig. 5 & text-fig. 162.)

Mr. Crossland collected a single specimen of this interesting new species. This is an egg-shaped sponge (Plate XL. fig. 5) 6 mm. high and 5 mm. broad. The outer surface is coarsely hispid, large oxeote spicules projecting in every direction, and there is a conspicuous osculum at the top (diameter 1 mm.) with a well-developed oscular fringe, 1.5 mm. high. The specimen was dredged from a depth of 20 fathoms off North Point, Boa Vista Island. Its colour (in alcohol) is pale brown. The dermal cortex is 0.16 mm. thick, the chamber-layer is 1.4 mm. thick, and there is a feebly developed gastral cortex, making the total thickness of the body-wall about 1.6 mm. The diameter of the gastral cavity (at its widest part) is 1.7 mm.

The specimen is not sufficiently well preserved to enable one to make out the structure of the canal-system in any very great detail; but the exhalent canals are well developed, and the chambers are very much branched. The canal-system is really intermediate between the form typical of the genus *Grantia* on the one hand and that of the genus *Leucandra* on the other; in short, it is of the "syllleibid" type. The tubar skeleton is, however, articulate and only shows slight signs of becoming scattered, and for this reason I place the species in *Grantia*, not in *Leucandra*.

The *Skeleton* consists of all three forms of spicules.

The tubar skeleton is composed of both triradiates and quadriradiates. The former are very variable in shape and are usually very irregular. Their rays are sometimes straight, sometimes curved, and all three angles are frequently unequal (text-fig. 162, a). The rays vary in length from 0.12 mm. to 0.24 mm. and in thickness from 0.011 mm. to 0.014 mm. Some of the triradiates in the tubar skeleton show a strong tendency to become sagittal, and it is the basal rays of these that attain the greatest length. There are a few, but only a very few, quadriradiates in the tubar skeleton; the apical rays of these are the same thickness as, but shorter than, the facial rays and are curved at their extremities. The facial rays resemble the rays of the triradiates. None of the rays of either triradiate or quadriradiate spicules is very sharply pointed.

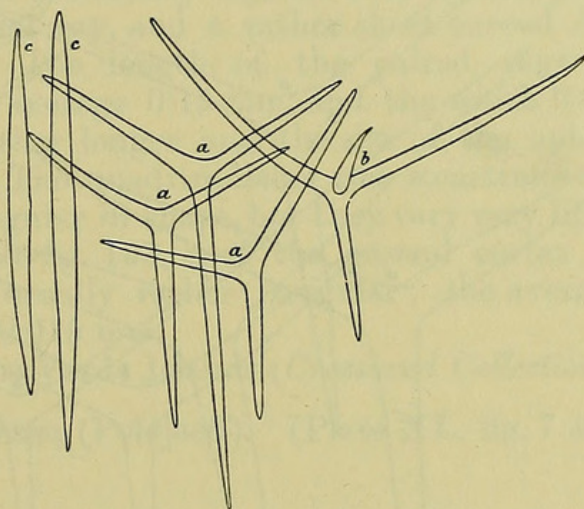
The dermal cortex consists of a compact mass of spicules resembling those of the tubar skeleton; the vast majority of the spicules



are triradiate, but there are a few quadriradiates as well. Both triradiates and quadriradiates are sometimes sagittal, and in this case they have their basal rays pointing towards the base of the sponge, as is usual in the genus.

The gastral cortex is 0.07 mm. thick, and is composed of triradiate and quadriradiate spicules similar to those occurring in the tubar and dermal cortical skeleton, but in this portion of the sponge the quadriradiates form a much larger percentage of the whole number of spicules than they do in the tubar skeleton or dermal cortex. The apical rays of the quadriradiates project into the gastral cavity. There are sagittal triradiates and sagittal quadriradiates with basal rays pointing towards the base of the sponge.

Text-fig. 162.



Spicules from *Grantia intermedia*.

*a* = Triradiates  $\times 120$ . *b* = Quadriradiates  $\times 120$ . *c* = Oxeteos  $\times 24$ .

There are also some "sub-gastral sagittal triradiates," viz., triradiates just buried within the gastral cortex and having a basal ray pointing horizontally outwards towards the dermal surface—in the same direction as the basal rays of the irregularly sagittal triradiates of the tubar skeleton point; the sagittal triradiates in this position closely resemble the sagittal triradiates in other situations.

There are some enormous oxeteo spicules projecting from the surface of the sponge. These are not arranged in groups, but emerge from the surface without definite order and either at right angles to the surface or more or less obliquely. Their proximal ends are buried more or less deeply in the tubar layer of the body-wall. The spicules are spindle-shaped, are rather bluntly pointed at both ends, reach a length of 2 mm., and have a maximum thickness of 0.06 mm. (text-fig. 162, *c*).

The oscular fringe is composed of very long and very fine oxeteo spicules. These reach a length of 3 mm. and have a maximum thickness of 0.008 mm.

*Distribution.* Cape Verde Islands (*Crossland Collection*).

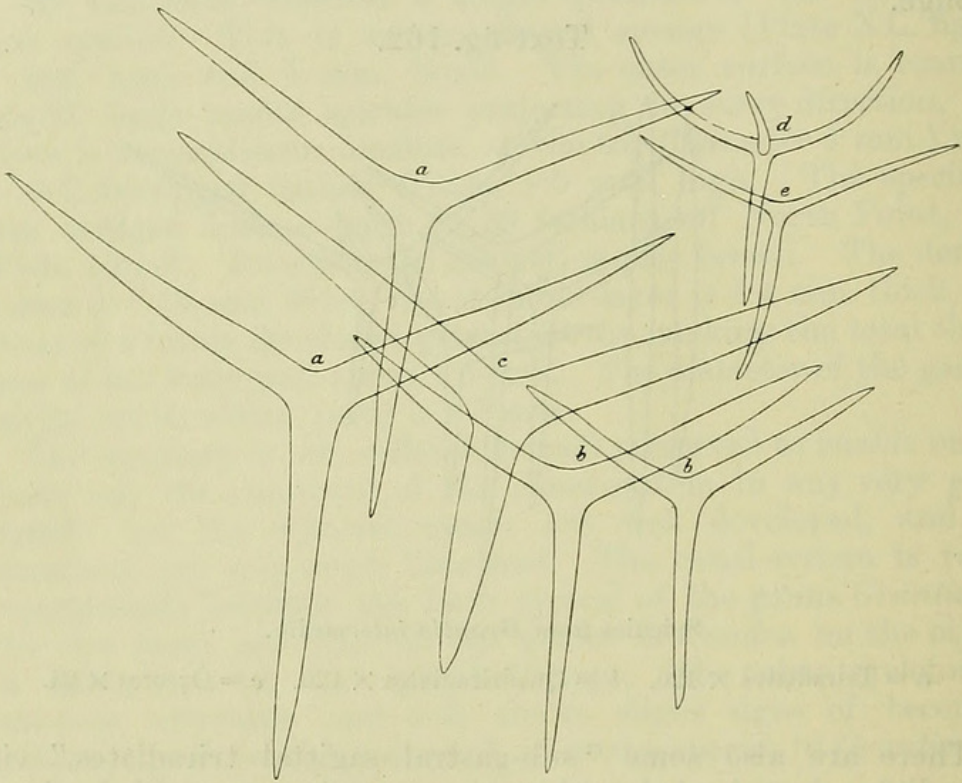


*LEUCANDRA VERDENSIS*, sp. n. (Plate XL. fig. 6 & text-fig. 163.)

The collection contains only a single specimen of this species. It was dredged from a depth of 10 fathoms and is a single Leucon person of sac-like form, nearly cylindrical in shape (Plate XL. fig. 6).

The length of the specimen is 6 mm. and its maximum width 3 mm. There is a terminal osculum which is naked and the surface of the body is smooth. The thickness of the body-wall is about 1 mm. and the diameter of the central gastral cavity is about the same. The colour of the sponge (in spirit) is brown.

Text-fig. 163.



Spicules from *Leucandra verdensis*.

*a* = Parenchymal triradiates. *b* = Regular triradiates of dermal cortex. *c* = Sagittal triradiate of dermal cortex. *d* = Gasteral quadriradiate. *e* = Gasteral triradiate. All  $\times 120$ .

The canal-system is typically leuconoid; the flagellate chambers, which are scattered about in the parenchyma between the dermal and gastral cortices, are spherical or sac-shaped and have a maximum diameter of about 0.06 mm.

The dermal cortex, which is pierced by passages leading into large inhalent canals, is only about 0.02 mm. thick; and the gastral cortex, which is similarly pierced by apertures leading from the exhalent canals, is of about the same thickness.

The *Skeleton* consists of triradiates and quadriradiates. There are no oxeote spicules.

The main mass of the skeleton, that of the chamber-layer, consists of numerous large, irregularly arranged, regular or sub-regular triradiate spicules (text-fig. 163, *a*). They do not vary



much in size; the average length of their rays is 0.3 mm. and the thickness at base is 0.04 mm.

The skeleton of the dermal cortex consists of three kinds of spicules:—(1) Regular or sub-regular triradiates similar to those of the chamber-layer but smaller; average size  $0.2 \times 0.025$  mm. (2) Sagittal triradiates: basal ray pointing towards the base of the sponge; these vary up to a maximum size of—paired rays  $0.3 \times 0.04$  mm., basal ray  $0.2 \times 0.04$  mm.; the basal ray is always shorter than the other two. (3) Sagittal quadriradiates, similar to the sagittal triradiates except for the presence of a straight apical ray, about one quarter the length of and three quarters the thickness of the paired rays; these spicules do not appear to reach such a large size as the sagittal triradiates.

The gastral cortex consists of small quadriradiates and triradiates; the former are mostly sagittal with curved paired rays, a long straight basal ray, and a rather short curved apical ray (text-fig. 163, *d*). The length of the paired rays in these spicules is on the average 0.15 mm. and the width 0.015 mm.; the basal ray is rather longer and the size of the apical ray is  $0.05 \times 0.009$  mm. The quadriradiates are sometimes irregular, sometimes nearly regular in shape, but they vary very little in size. The triradiates (text-fig. 163, *e*) of the gastral cortex also vary in shape, but are usually rather irregular; the average size of their rays is  $0.15 \times 0.015$  mm.

*Distribution.* Cape Verde Islands (*Crossland Collection*).

LEUCANDRA RUDIFERA (Poléjaeff). (Plate XL. fig. 7 & text-fig. 164.)

Synonymy:—

*Leuconia rudifera* Poléjaeff [19].

A few fragments of this species, which is characterised by the possession of very peculiar minute oxeote spicules in the gastral cortex, were collected off Bermuda by the 'Challenger' and were described by Poléjaeff. Mr. Crossland dredged three specimens, all of which are complete, so that I am fortunately able to add the description of the external form to that of the skeleton which was given by Poléjaeff.

The sponge (Plate XL. fig. 7) is composed of an irregularly massive bulbous *Leucon* individual, and in the largest specimen reaches a height of 2 cm. and a maximum width of 1.7 mm. The smallest specimen is egg-shaped; no doubt this is the young form and the irregularly massive appearance is acquired with growth. There is a large circular osculum at the top; there is a peristome, and two of the specimens possess oscular crowns. The thickness of the body-wall varies very much; in the largest specimen it is as thick as 8 mm. in one place and as thin as 2 mm. in another. The maximum diameter of the central gastral cavity is 6 mm. The external surface is only slightly hispid, for the large oxea either do not project at all or project only slightly. The internal surface is rough owing to the projection of the apical rays of the gastral quadriradiates.

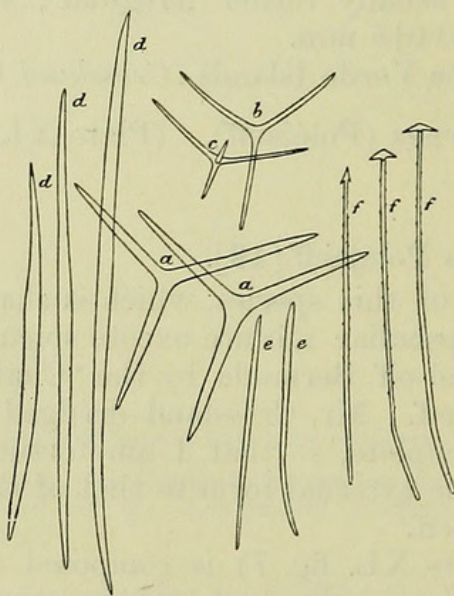


The canal-system is typically leuconoid ; the flagellated chambers are spherical and have a diameter of from 0·03 to 0·05 mm. Many of the incurrent and excurrent canals are very wide ; they attain a diameter of 1 mm. and in some cases of even more.

The *Skeleton* consists of the following elements :—(1) Large triradiates of the parenchyma. (2) Triradiates of the dermal cortex. (3) Sagittal quadriradiates and triradiates of the gastral cortex. (4) Large oxeotes, only slightly thicker than the large triradiates. (5) Minute oxea. (6) Minute spined grapnel-like oxea of the gastral cortex ; these latter form the main distinguishing character of the species. Finally, the two smaller specimens have oscular fringes consisting of long fine smooth oxea.

The large triradiates of the parenchyma (text-fig. 164, *a*), which make up the main mass of the skeleton, are more constant in shape than those in Poléjaeff's specimens. They are regular or very nearly regular and have sharp-pointed rays. The average size, from which there is not much variation, is—length 0·45 mm., basal width 0·045 mm. A small minority of the spicules depart from the regular form and are sagittal or irregular in shape, both rays and angles being unequal.

Text-fig. 164.



Spicules from *Leucandra rudifera*.

*a* = Parenchymal triradiates  $\times 24$ . *b* = Dermal triradiate  $\times 24$ . *c* = Gastral quadriradiate  $\times 24$ . *d* = Large oxeotes  $\times 24$ . *e* = Small oxeotes (of dermal cortex etc.)  $\times 120$ . *f* = Minute spined grapnel-like oxeotes of gastral cortex  $\times 500$ .

The triradiates of the dermal cortex are variable in shape, being either sagittal or irregular ; the thickness of their rays is about half that of those of the parenchymal triradiates, being on the average 0·022 mm. ; the rays are frequently slightly curved, are fairly sharply pointed, and reach a length of 0·35 mm. (text-fig. 164, *b*).

The gastral cortex consists almost entirely of quadriradiates



(text-fig. 164, c). These are sagittal and resemble those described by Poléjaeff. Lateral rays 0.35 mm. long, basal ray 0.2 mm. long; apical ray varies in length from 0.05 to 0.12 mm., usually slightly curved. All rays of the same basal diameter, 0.015 mm. There are a few triradiates in the gastral cortex; these only differ from the quadriradiates by the absence of the apical ray. As in the case of Poléjaeff's specimens, these quadriradiates also occur in small numbers in the walls of the exhalent canals.

Some large oxeote spicules are scattered about in the parenchyma; the greatest thickness of these is 0.055 mm. and they reach a maximum length of 2 mm., but usually do not exceed 1.5 mm. Many of these spicules do not project beyond the dermal cortex at all, and over the greater part of the surface of the sponge they never have more than one-third of their length projecting; near the osculum, however, they extend much further beyond the surface. The spicules are spindle-shaped and sharply pointed at both ends (text-fig. 164, d). They are not numerous.

There are also some very small oxea; these are either straight or slightly curved, and are fairly sharply pointed at both ends. They are shorter than those described by Poléjaeff; I found none longer than 0.25 mm. and they are usually only 0.15 mm. long. Their thickness is 0.003 mm. They occur either singly or in small bundles in or just beneath the dermal cortex, beyond which they often project. They are not numerous.

The minute and very peculiar spined grapnel-like oxea (text-fig. 164, f) of the gastral cortex form the main specific character of this *Leucon*. It is these spicules which Poléjaeff describes as "verticillate" oxea, but this term does not appear to be quite accurate, for the spines are not really arranged in verticils, but project on each side of the spicule alternately down the length of the shaft. These oxea reach a length of 0.06 mm. and their thickness varies from 0.0007 to 0.0011 mm. They are sometimes quite straight and sometimes curved throughout their length, but usually the spicule is straight in its distal and bent in its proximal part, which also seems to be slightly flattened and is slightly wider than the distal half, but I have not found any spicules so much expanded in this region as that figured by Poléjaeff in plate vii. fig. 3 a, III. [19]. In a few of the spicules the spiked head is much reduced, these spicules being evidently intermediate between those with large heads and ordinary spindle-shaped oxea.

Two of the specimens possess oscular fringes composed of spicules of the usual form—long, very fine oxea of maximum length 1.3 mm. and width 0.0025 mm. There is of course nothing remarkable in the presence of oscular fringes in two of the specimens and its absence in the third, for there are many *Calcarea* in which this structure is indifferently present or absent.

There is a peristome, and this structure is best developed on the specimen without an oscular fringe. It is composed of a complex network of spicules of all those types which occur in other regions of the body—large triradiates, small triradiates, small sagittal



quadriradiates, large and small oxea, and minute grapnel-like oxea.

*Colour* (in alcohol) white.

*Distribution*. Bermuda (*Poléjaeff*); Cape Verde Islands (*Crossland Collection*).

LEUCANDRA SERICATA (Ridley).

Synonymy:—

*Aphroceras sericatum* Ridley [20].

*Leuconia sericatum* Breitfuss [8] [6].

Mr. Crossland collected two specimens of this species. One of these is a solitary pear-shaped Leucon person 11 mm. high and with a maximum width of 5 mm.; the other specimen consists of three Leucon persons united at a common base, the central and largest of the three individuals being 2 cm. high and having a maximum width of 8 mm. The terminal oscula are protected by well-developed oscular fringes; the osculum of the largest individual is 2.5 mm. in diameter. The scattered flagellate chambers are usually somewhat elongated, occasionally being four times as long as broad; their width varies very little and is about 0.045 mm. The primary incurrent canals have a diameter of 0.2 mm. and the ultimate excurrent canals are about the same size.

The *Skeleton* agrees with the description given by Ridley. Many of the spicules of the gastral cortex lack apical rays, and are therefore of course triradiates.

*Colour* (in alcohol). One specimen is dirty white and the other brown.

*Distribution*. S.E. coast of Brazil (*Ridley*); Straits of Magellan (*Breitfuss*); Cape Verde Islands (*Crossland Collection*).

There is no doubt that this sponge is very closely allied to the much commoner species, *L. aspera*. It is to be distinguished from the latter however, (1) by the inferior ratio of the thickness of the large oxea to that of the parenchymal triradiates, and (2) by the size and shape of these triradiates themselves, which are larger than the corresponding spicules in *L. aspera* and are constantly sagittal. The presence in *L. sericata* of an oscular crown composed of special oxeotes, which is given by Ridley as a difference between the two forms, is a distinction which will not hold good, as this structure also occurs in many specimens of *L. aspera*.

LEUCANDRA TYPICA (Poléjaeff).

Synonymy:—

*Leuconia typica*, var. *massa* Poléjaeff [19].

„ „ var. *tuba* Poléjaeff [19].

*Leucandra typica*, var. *tuba* Lendenfeld [18].

*Leucandra typica* Dendy [10].

*Leuconia typica* Breitfuss [6].

Mr. Crossland dredged five specimens of this widely distributed species. One specimen consists of a mass of very wide, very short, united Leucon persons, and therefore is of the shape



typical of the var. *massa*; the total width of this specimen is 2.3 cm. and its height is much less. Another specimen, which consists of a single Leucon person, is elongated and has the form typical of the var. *tuba*; its height is 10 mm. and its maximum width 4 mm. The other three specimens are intermediate in size and shape between the foregoing specimens, and consequently are of a form intermediate between the two varieties of the species which were established by Poléjaeff.

The general anatomy and skeleton of my specimens agree with the descriptions given by Poléjaeff and v. Lendenfeld; the only peculiarity is in the oxeote spicules. The majority of these resemble the corresponding spicules of the specimens hitherto described, *i. e.*, they are small spindle-shaped or rather cylindrical, sharply pointed, straight or slightly curved, and very variable in size, reaching a maximum length of 0.3 mm. and a maximum diameter of 0.005 mm. A minority of the oxea are, however, peculiar in that they are shorter and wider in proportion to their length than are the ordinary spicules, and are also markedly flattened and more or less arrow-headed; the arrow-head is sometimes very conspicuous.

The characters by which Poléjaeff endeavoured to divide this species into two varieties, *tuba* and *massa*, do not appear to be constant. In external form I have, as stated above, three specimens which are intermediate between the varieties. The other two characters on which Poléjaeff established his varieties are as follows:—

- (a) Apical rays of gastric quadriradiates not longer than 0.06 mm. in *tuba*, but reaching 0.1 mm. in *massa*.
- (b) Oxeote spicules not longer than 0.15 mm. in *massa*, but reaching 0.3 mm. in *tuba*.

Now with regard to (a) I find that in my specimen, which is of the *tuba* external form, the apical rays in question reach a length of 0.1 mm., and this is not exceeded in any of the other specimens. Whilst with regard to (b) the oxea reach much the same maximum length in all the specimens—*viz.* about 0.3 mm.—and are if anything rather shorter in my specimen of *tuba* than in the others. For these reasons I do not think it desirable to retain the two varietal names.

*Distribution.* Bermuda (Poléjaeff); East coast of Australia (v. Lendenfeld); Cape Verde Islands (Crossland Collection).

LEUCANDRA CROSSLANDI, sp. n. (Plate XL. fig. 8 & text-fig. 165.)

A large number of fragments and several complete specimens of this species were dredged by Mr. Crossland from a depth of 15 to 20 fathoms near Boa Vista Island.

The sponge (Plate XL. fig. 8) is pear-shaped, is from twice to three times as long as it is broad, and usually several Leucon individuals grow together attached to one another at a common base. The individuals grow to a size of 1.5 cm. by 0.8 cm. Both external and internal surfaces of the body are rough. On large specimens the oscula have a diameter of 1.5 mm.; there is never

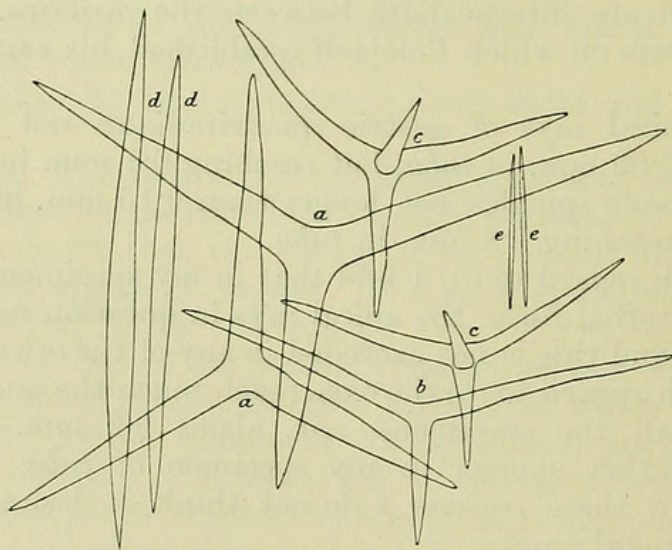


a true oscular crown, but an oscular rim or peristome is present; this varies very much in size, in some specimens being as short as 1 mm., or even less, whilst in others it reaches the enormous length of 7 mm. The thickness of the body-wall varies from 1 to 2.5 mm., and the maximum diameter of the central gastral cavity is 3 mm. The canal-system is of the form usual in the genus; the flagellate chambers are spherical or sac-shaped and are rather large, having a maximum diameter of 0.09 mm. The incurrent and excurrent canals have a maximum width of 0.25 mm. The width of the dermal cortex is 0.1 mm. and that of the gastral cortex 0.06 mm.

The *Skeleton* consists of the following elements:—(1) of middle-sized triradiates of the parenchyma, (2) of small triradiates of the dermal cortex, (3) of gastral quadriradiates, (4) of large oxea, three times as wide as the parenchymal triradiates, and (5) of minute oxea.

The main mass of the skeleton is made up by the middle-sized triradiates of the parenchyma (text-fig. 165, *a*). These vary somewhat in shape and size, but are usually sub-regular with rays 0.25 by 0.035 mm. Not infrequently they are slightly sagittal with the basal ray shorter than the lateral rays. The rays are sharply pointed.

Text-fig. 165.



Spicules from *Leucandra crosslandi*.

*a* = Parenchymal triradiates  $\times 120$ . *b* = Dermal triradiates  $\times 120$ . *c* = Gastral quadriradiates  $\times 120$ . *d* = Large oxeates  $\times 24$ . *e* = Minute oxeates  $\times 120$ .

The dermal cortex consists of a mass of slender-rayed sagittal triradiates; the lateral rays spread widely at an angle of from  $140^\circ$  to  $160^\circ$ , and are from twice to three times as long as the basal ray (text-fig. 165, *b*). A typical spicule of this kind gave the following measurements:—Length of lateral rays 0.18 mm.; length of basal ray 0.07 mm.; thickness of all rays at base 0.012 mm. The rays are sometimes considerably more slender than this.

The skeleton of the gastral cortex consists of sagittal quadri-



radiates (text-fig. 165, *c*). Similar spicules line the exhalant canals. The lateral rays are rather stout and are slightly curved; they are somewhat longer than the basal ray, which is straight. The apical ray is from one-third to one-half the length of the lateral rays. The average length of the lateral rays is 0.15 mm.; the average thickness of the facial rays at their bases is 0.02 mm. The apical rays are less thick at their bases and are sometimes curved at their extremities.

The large oxeote spicules are slightly spindle-shaped, are slightly curved, and are from twice to three times as thick as the parenchymal triradiates (text-fig. 165, *d*). They are completely buried in the parenchyma or project slightly beyond the dermal surface or project much beyond. They are sharply pointed at both ends. In length they vary from 1 mm. to 1.5 mm. and in width from 0.08 mm. to 0.1 mm.

Minute oxea (text-fig. 165, *e*) are to be found in all parts of the sponge, but are most numerous in the dermal cortex, from which they sometimes project beyond the surface of the sponge. They are pointed at both ends and are quite or nearly straight. Their average length is 0.15 mm., and their average maximum thickness 0.0035 mm. They vary considerably in length but very little in thickness.

The peristome consists as usual of a network of spicules of all the types which occur in other parts of the sponge.

*Colour* (in alcohol) white.

This *Leucon*, which I have much pleasure in naming after Mr. Crossland, appears to be more nearly allied to *Leucandra crambessa* Haeckel, than to any other previously described species. It differs from this species, however, by the presence of the minute oxea, by the larger size of the parenchymal triradiates—these being about twice the size of those in *L. crambessa*—and in sundry minor details of anatomy.

*Distribution.* Cape Verde Islands (*Crossland Collection*).

*LEUCANDRA GEMMIPARA*, sp. n. (Plate XL. fig. 9 & text-fig. 166.)

Mr. Crossland collected a considerable number of specimens of this species. The sponge (Plate XL. fig. 9) is elongated and somewhat flattened, and forms proliferous groups of incompletely separated *Leucon* individuals. The individuals grow to a height of 1–2 cm. and a width of 4 mm. Both external and internal surfaces of the body are fairly hispid. On the larger specimens the oscula have a diameter of 1.5 mm.; all the specimens have oscular fringes spicules, but on young individuals it is only feebly developed. The thickness of the body-wall varies very little; it is about 1 mm. or slightly less, whilst the maximum diameter of the central gastral cavity is 2 mm. The canal-system is typically leuconoid; the flagellated chambers are spherical or sac-shaped and are rather large, having a maximum diameter of 0.1 mm. The maximum diameter of the excurrent canals is only 0.15 mm., and of the incurrent canals even less. The thickness of the dermal cortex is 0.12 mm., and that of the gastral cortex 0.07 mm.

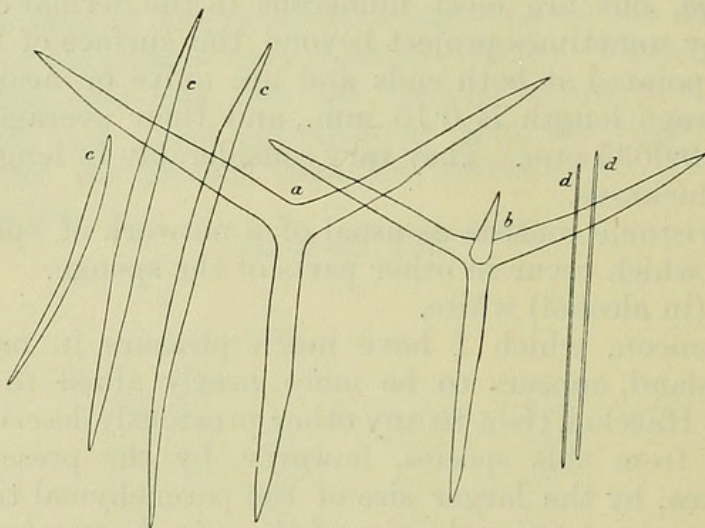


The *Skeleton* consists of the following elements:—(1) Rather small triradiates of the parenchyma; (2) small dermal triradiates; (3) gastral quadriradiates and triradiates; (4) large oxea, four times as thick as the parenchymal triradiates; (5) minute oxea; and (6) long slender oxea of the oscular fringe.

The main mass of the skeleton is composed of parenchymal triradiates (text-fig. 166, *a*). These are subregular in shape and their rays are almost always undulated; the length of the rays varies from 0.12 mm. to 0.22 mm., and the maximum thickness from 0.015 to 0.024 mm. They are sharply pointed. A few of these spicules sometimes develop apical rays of variable size and shape, thus becoming quadriradiates.

The dermal triradiates are similar to those of the parenchyma, but are smaller; they rarely exceed 0.1 mm. in length or 0.01 mm. in diameter.

Text-fig. 166.



Spicules from *Leucandra gemmipara*.

*a* = Parenchymal triradiate  $\times 120$ . *b* = Gastral quadriradiate  $\times 120$ .  
*c* = Large oxeotes  $\times 24$ . *d* = Small oxeotes  $\times 120$ .

The central gastral cavity and a great part of the canal-system are lined by sagittal quadriradiates and triradiates (text-fig. 166, *b*). The wide-spreading lateral rays are usually slightly shorter than the basal ray, and are either straight or slightly curved; all the rays are sharply pointed. The apical ray is curved at its extremity. A typical quadriradiate gave the following measurements:—Length of lateral rays 0.12 mm.; length of basal ray 0.15 mm.; length of apical ray 0.06 mm.; maximum thickness of facial rays 0.012 mm., and of the apical ray somewhat less. There are some triradiate spicules of similar form.

Numerous large oxea project from the outer surface of the sponge. They issue from the dermal cortex at a very acute angle with the surface and their projecting ends all point towards the osculum. They are spindle-shaped and are slightly curved, and gradually but sharply pointed at both ends (text-fig. 166, *c*). Fully half the length of the spicule is usually projecting beyond the



surface. These oxea reach a length of 2 mm., and their maximum thickness when full grown is from 0.07 mm. to 0.08 mm.

In the dermal cortex there are bundles of very small oxea, many of which project from the surface at various angles. These spicules (text-fig. 166, *d*) are more or less spindle-shaped and are nearly or quite straight; their diameter is 0.002 mm., and they reach a maximum length of 0.25 mm. They occur almost exclusively in the dermal cortex, but an occasional isolated spicule is to be found in the parenchyma.

The oscular fringe is composed of very long thin oxea. They reach a length of from 1 mm. to 2 mm., and their maximum diameter is 0.004 mm.

In addition to the fringe there is, as usual, a short peristome encircling each osculum.

*Colour* (in alcohol) yellowish-white.

This sponge bears a distinct resemblance to the well-known *Leucandra aspera* (Schmidt). It differs from this species, however, by the presence of minute oxea in the dermal cortex. *Leucandra gemmipara* is also not unlike the above described *L. crosslandi*, but it is to be distinguished from the latter (1) by the almost complete confinement of the small oxea to the dermal cortex, (2) by having much more slender parenchymal triradiates, and (3) by having smaller and different shaped dermal triradiates. In addition to these and certain other minor differences, I may mention that there is an oscular fringe present on all my specimens of *L. gemmipara*, but that this structure is not to be found on any of the specimens of *L. crosslandi*. I hesitate, however, to include this among the characters of specific value.

*Distribution.* Cape Verde Islands (*Crossland Collection*).

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## EXPLANATION OF PLATE XL.

Fig. 1. External form of *Leucosolenia panis*, × 3.

2.	”	”	<i>Leucosolenia atlantica</i> , × 2.
3.	”	”	<i>Leucosolenia canariensis</i> , × 4.
4.	”	”	<i>Sycon caminatum</i> , × 4.
5.	”	”	<i>Grantia intermedia</i> , × 4.
6.	”	”	<i>Leucandra verdensis</i> , × 4.
7.	”	”	<i>Leucandra rudifera</i> , × 2.
8.	”	”	<i>Leucandra crosslandi</i> , × 3.
9.	”	”	<i>Leucandra gemmipara</i> , × 4.





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