

REPORT
ON THE
CALCAREOUS SPONGES
COLLECTED BY
MR. JAMES HORNELL
AT
OKHAMANDAL IN KATTIAWAR IN 1905-6.
BY
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[With Two Plates.]

THE collection of sponges from Okhamandal placed in my hands by Mr. James Hornell contains six species of Calcarea, unfortunately not in a very good state of preservation. I have found it necessary to describe as new one species of Sycon (*S. grantioides*) and one of Leucandra (*L. dwarkaensis*), together with a variety of *Leucandra donnani* (var. *tenuiradiata*). More interesting than these new forms, however, are the specimens of *Grantessa hastifera* (Row) and *Heteropia glomerosa* (Bowerbank), which enable me to add a good deal to our knowledge of these little known species.

The classification adopted is that of Dendy and Row's [1913] "Classification and Phylogeny of the Calcareous Sponges, with a Reference List of all the described Species, systematically arranged." I have followed my usual practice of quoting the Register Number (R.N.) of each specimen in order to facilitate accurate reference.

1. **Sycon grantioides**, n. sp.—(Plate I, Fig. 1.)

The single specimen, unfortunately in a bad state of preservation, has the form of a slightly compressed cylinder, rather wider above than below, but contracting

suddenly to a moderately wide vent (Fig. 1). There is now no peristome, but it is impossible to be certain that there were no hair-like oxea surrounding the vent in life. The dermal surface is minutely reticulate, without conspicuously projecting oxea in its present condition, but this is because the outer ends of the numerous large oxea have all been broken off short. Size of specimen about 16 mm. high by 7 mm. in greatest width. Texture soft and flabby. Colour in spirit white.

The gastral cavity is wide, and the total thickness of the sponge wall only about 1.0 mm. The gastral surface is smooth and pierced by the numerous small apertures of the exhalant canals. The dermal surface is formed by the fusion of the conical outer ends of the radial chambers to form a reticulate pattern. The gastral cortex is moderately thick and pierced by the short exhalant canals. The radial chambers taper towards their distal extremities, while proximally they open, usually in groups, into the short exhalant canals that pierce the gastral cortex. They are provided with well developed diaphragms at the apopyles. They exhibit the "linked" arrangement described by Jenkin [1908B] in his genus *Tenthrenodes*. The inhalant canals open on the dermal surface by wide apertures between the distal conuli.

The skeleton is typically syconoid in its arrangement, except that the usual tufts of oxea which crown the distal ends of the chambers in typical species of the genus are replaced by large oxea which cannot really be said to be arranged in tufts at all, but extend sometimes through the entire thickness of the sponge-wall, between the chambers, with their distal ends projecting from the surface more or less at right angles. The articulate tubar skeleton consists of many joints, but there are no specially differentiated subgastral sagittal radiates. The spicules are so much broken and eroded that I have not found it practicable to get perfect specimens suitable for figuring. The following descriptions, however, may be taken as substantially correct.

(1) Sagittal triradiates of the many-jointed articulate tubar skeleton; with very long and slender rays; the oral angle wider than the paired angles; the oral rays curved around the chamber as usual and sometimes slightly and irregularly bent. Dimensions of a specimen whose oral rays lie in about the middle of the chamber wall:—Basal ray about 0.2 by 0.005 mm.¹; oral rays about 0.12 by 0.005 mm.

(2) Radiates of the gastral skeleton; usually triradiate but sometimes with a feebly developed apical ray. With wide oral angle and very long and slender facial rays. These spicules are not definitely oriented but form a confused felt-work in the gastral cortex, in which it is very difficult to follow the individual rays for their entire length. I have measured the basal ray up to 0.4 mm. in length, with an oral ray of about 0.2 mm., each having a diameter at the base of about 0.01 mm., but they are usually rather more slender.

¹ The first measurement is the length and the second the greatest thickness in all cases except where otherwise stated.

(3) Oxea ; straight or nearly so, and of nearly uniform diameter, but gradually sharp-pointed at their inner ends ; slender in proportion to their great length. The outer ends are all broken off so that I cannot say what they are like. I have measured the remaining portion of the spicule up to about 1.7 by 0.025 mm.

This species is not a typical Sycon. In the arrangement of its oxea it much more closely approaches the genus *Grantia*, from which, however, it must be excluded on account of the absence of a dermal cortex. In the "linked" arrangement of the radial chambers it resembles those species included by Jenkin [1908B] in his genus *Tenthrenodes*, but that genus cannot be maintained [Dendy and Row 1913].

Register Number and Locality. III. 4. Off Dwarka.

2. *Grantessa hastifera* (Row).—(Plate I, Figs. 2, 2a ; Plate II, Figs. 7a-7f".)

Grantilla hastifera Row [1909].

Grantessa hastifera Dendy [1913].

It is a curious coincidence that this species, first described by my colleague Mr. Row in 1909, and re-described by myself in 1913, in both cases from very inadequate material, should again occur in the present collection. Mr. Hornell's material, however, enables me to add some valuable particulars, especially with regard to the extremely variable external form and the structure of the very remarkable hastate oxea.

The sponge (Figs. 2, 2a) may be described as consisting of thin lamellæ, folded into irregularly tubular or cup-shaped forms ; sometimes forming irregularly proliferating masses of larger and smaller tubes (Fig. 2a). The lamella or sponge-wall is about 1.5 mm. in thickness, but the diameter of the tubes or cups varies from about 2 mm. to at least 22 mm. Unfortunately the sponge is very fragile and the material has been much broken up, so that it is difficult to say anything about the oscula, but these appear to be naked and terminal. The larger fragments (Fig. 2) look like thin, concave, irregular shells, but they probably formed parts of cups in life. All the pieces are possibly parts of the same colony, and it is certain that the wide cups give off narrow cylindrical tubes.

The outer surface is for the most part smooth and subglabrous, but here and there with a few conspicuously projecting spicules. The inner surface (Fig. 2) is pitted by the numerous openings of the short exhalant canals, arranged in groups. The colour in spirit is dirty white.

The canal system is syconoid, but the material is so badly preserved that it is impossible to make out any details.

The gastral and dermal cortex are each about 0.14 mm. in thickness. The gastral cortical skeleton is made up of the slender rays of tangential gastral triradiates (Fig. 7b) and to a slight extent of the much stouter oral rays of subgastral sagittal triradiates

(Fig. 7c). The dermal cortical skeleton is made up of the dermal triradiates (Fig. 7a) arranged tangentially, and of the outer rays of subdermal pseudosagittal triradiates (Fig. 7e). The tubar skeleton approaches but does not completely realise the inarticulate type, the stout subgastral sagittal triradiates being succeeded centrifugally by two or three other sagittal triradiates very similar to themselves (Fig. 7d). The subdermal pseudosagittal triradiates (Fig. 7e) are much slenderer than the subgastral spicules (Fig. 7c), and their centripetally directed rays are commonly grouped in bundles which meet and overlap the opposing basal rays of subgastral or tubar sagittals. Around the oscular margin there is a narrow band of strongly alate triradiates which occasionally develop a short apical ray. There appears to be no oscular fringe of oxea, but a few stout oxea (Figs. 7f, 7f', 7f'') are to be found penetrating the sponge wall more or less at right angles, and often projecting from the dermal surface.

The spicules may be grouped under the following heads:—

1. Dermal triradiates (Fig. 7a). Nearly equiangular but commonly inequiradiate, with indications of a sagittal character. There is no definite orientation, but what appear to be the oral rays are sometimes more or less crooked while the basal ray is straight. All rays gradually and sharply pointed. Size very variable. In a typical example the basal ray measured about 0.42 by 0.025 mm., and the orals 0.36 by 0.025 mm. and 0.3 by 0.025 mm. respectively.

2. Gastral triradiates (Fig. 7b). Very similar to the dermal triradiates but considerably smaller. In a typical example the apparently basal ray, which was straight, measured about 0.16 by 0.02 mm., and the orals, which were very slightly crooked, each about 0.24 by 0.015 mm. Towards the osculum these spicules become very strongly sagittal and exhibit a definite orientation, the oral rays being extended in line with one another and parallel to the oscular margin, while a short apical ray is occasionally developed.

3. Subgastral sagittal triradiates (Fig. 7c). Stout, with oral rays slightly recurved towards the basal, which latter is straight. Oral rays bent towards one another in a plane parallel to the gastral surface, so as to give rise to a deceptive appearance of inequality according to the point of view.¹ All rays gradually sharp-pointed. In a typical example the basal ray measured 0.51 by 0.04 mm., the orals *apparently* 0.37 by 0.035 and 0.25 by 0.035 mm. respectively.

4. Tubar triradiates (Fig. 7d). These are not really distinguishable from the subgastral sagittal triradiates except by their more distal position. The most distally situated show less curvature of the oral rays, and are of smaller size, but they are connected by intermediate forms with the typical subgastral sagittals.

5. Subdermal pseudosagittal² triradiates (Fig. 7e). Conspicuously smaller and

¹ Actual inequality may, however, occur to a considerable extent.

² For a discussion as to the nature of these spicules *vide infra*, p. 86.

especially more slender than the subgastral sagittals, with the centripetal ray straight and the outer rays more or less bent and asymmetrical. All rays gradually sharp-pointed. In a typical example the centripetal ray measured 0.36 by 0.025 mm., and the outer rays *apparently* 0.24 by 0.025 and 0.17 by 0.025 mm. respectively.

6. Large oxea (Figs. 7*f*, 7*f'*, 7*f''*). These spicules, though not very numerous, are highly characteristic. Their outer ends usually project more or less at right angles from the surface, and often for a great proportion of the length of the spicule, but except over protected areas of the surface they are almost invariably broken off. The form of these spicules affords by far the most characteristic feature of the species, and after a careful study of isolated specimens I am able to add certain particulars under this heading. The entire spicule is slightly curved (Fig. 7*f'*). The inner end is simply sharp-pointed. The outer end is sharp-pointed and flattened like a spear-head, with a sharp knife-edge on either side. On one side (the concave side of the spicule) this knife-edge is simply rounded, on the other it is produced backwards, where it meets the cylindrical shaft of the spicule, into two short, conical teeth. The presence of two teeth can only be clearly seen when the spicule is examined edge on (Figs. 7*f*, 7*f''*), and hence only a single tooth, as seen in side view (Fig. 7*f'*), has hitherto been described. These spicules measure about 0.83 mm. in total length by 0.035 mm. in diameter in the middle, while the spear-head measures about 0.1 mm. in length.

7. Trichoxea; long and very slender, typically arranged more or less at right angles to the dermal surface, but so scarce that they can hardly be regarded as an essential constituent of the spiculation.

Previously known Distribution. Red Sea (Row); Providence I., Indian Ocean (Dendy).

Register Number and Locality. III. 2. Off Dwarka.

3. *Heteropia glomerosa* (Bowerbank).—(Plate I., Figs. 3, 3*a*, 3*b*; Plate II., Figs. 8*a*–8*g*)

Leuconia glomerosa Bowerbank [1873].

This well-characterised and very beautiful species was first described by Bowerbank in 1873, from dry material collected at Port Elizabeth, South Africa. The type specimen, which is now in the Natural History Department of the British Museum, is a good deal worn, and possibly beach-rolled, and Bowerbank's figure cannot be taken to represent its natural appearance very accurately. The species has not been recorded since its original publication, but it occurs in considerable quantity in Mr. Hornell's collection. Although the locality is so widely separated from that where it was originally found, there can be no doubt as to the identification, which is based upon a careful re-examination of Bowerbank's material. His description and figures are quite in-

sufficient, and in several respects misleading. Thus he says that "the terminal orifices are rarely ciliated; but when they are so furnished the ciliary fringe is composed of a prolongation of the layer of large acerate spicula." This really applies only to the openings accidentally produced by breaking across of branches, the true oscula are provided with a special fringe of slender, hair-like oxea. Again, he says that there are no "defensive spicula projected from the oscular surface," by which he evidently means no gastral quadriradiates; such spicules, however, occur in his specimen. The statement that the apices of the subdermal and subgastral triradiates are cemented together where they meet by "keratode" hardly deserves contradiction, the "keratode" being, of course, simply the dried remains of the soft tissues.

Under the circumstances it seems desirable to give a completely new description, based upon Mr. Hornell's spirit-preserved material. I may say, however, that I cannot find any character in which his specimens differ from the type.

The sponge colony (Figs. 3, 3a, 3b) consists of very numerous, rather slender, cylindrical branches, for the most part ascending vertically and lying close together. The branching is very irregular and takes place by the formation of lateral buds at varying levels. Each branch terminates, when fully developed, in a distinct osculum, but the younger buds are blind. The oscula appear to be naked, but are in reality provided with an inconspicuous fringe of slender, hair-like oxea. The projecting portions of these spicules appear always to be broken off. Just within the osculum is a transverse membranous sphincter. All the colonies have evidently been attached below in life, and in one case a portion of the substratum is still present in the form of a barnacle shell.

The largest colony, or piece of a colony, in the collection measures about 32 mm. in height by 38 mm. in greatest breadth, and is composed of about 50 branches measuring up to about 19 mm. in length and 2.5 mm. in diameter. There is considerable variation, both as regards the length of the branches and the compactness of the colony, in different specimens. The surface of the branches is longitudinally striated (Ute-like) owing to the presence of the large dermal oxea, but otherwise smooth. The colour in life was white, in spirit it is dirty white.

The canal system is typically syconoid, the thimble-shaped radial chambers extending at right angles through the wall of the sponge from gastral to dermal cortex.

The preservation of the material is not good enough to enable me to make any detailed histological observations, but the nuclei of the collared cells are apical.

The gastral cortex is fairly thick, and its skeleton is made up of the facial rays of gastral sagittal triradiates and quadriradiates, and the oral rays of subgastral sagittal triradiates. The dermal cortical skeleton is very strongly developed and made up of dermal triradiates, the outer rays of subdermal pseudosagittal

triradiates, and huge longitudinally placed oxea, the latter lying for the most part on the inner side of the layer of triradiates. The tubar skeleton is of the inarticulate type (Figs. 8*d*, 8*e*), composed of the centrifugal rays of the subgastral triradiates and the centripetal rays of the subdermal triradiates (Fig. 8*e*, *o*¹). The former usually extend outwards right through the chamber layer, while the latter may extend inwards as far as the gastral cortex or may fall considerably short of this. Just within the osculum the stout oral rays of the sagittal gastral triradiates, here distinctly alate, are extended parallel with the oscular margin and packed close together in a dense feltwork. Immediately on the *inner* side of this feltwork lie the hair-like oxea of the oscular fringe. The oscular fringe thus arises from the gastral cortex and the colossal dermal oxea take no part in its formation.

The spicules may be grouped under the following heads:—

1. Dermal triradiates (Fig. 8*a*). These are nearly equiangular but sagittal owing to the greater length of the basal ray. The rays are usually straight and rather slender, tapering gradually to sharp points, the basal ray being a good deal longer and rather more slender than the orals. In a typical example the oral rays measured about 0.11 by 0.01 mm. and the basal about 0.24 by 0.008 mm. There is a good deal of irregularity in the arrangement of these spicules, but typically the basal ray points away from the osculum as usual.

2. Gastral triradiates (Fig. 8*b*). These are a good deal larger than the dermal triradiates and more markedly sagittal, the basal ray being usually very long and slender, while the oral rays are often more or less curved backwards. The oral rays are sometimes very unequally developed, one being much longer than the other. The rays are slender and more or less gradually sharp-pointed. In a typical example the oral rays measured 0.2 by 0.012 mm. and 0.17 by 0.012 mm. respectively, and the basal ray 0.44 by 0.012 mm. The basal ray is typically directed away from the osculum as usual. Near the osculum the oral rays are curved backwards so much as to lie almost in a line with one another, and are much more strongly developed than the basal.

3. Gastral quadriradiates (Fig. 8*c*). These resemble the gastral triradiates, but they are decidedly stouter. The apical ray may be very strongly developed (Fig. 8*c*, *a.r.*), straight and sharply pointed, and directed obliquely upwards in the gastral cavity. These spicules are not very numerous.

4. Subgastral sagittal triradiates (Fig. 8*d*). These are typical alate spicules, with slender, gradually sharp-pointed rays. The recurved oral rays are extended almost in line with one another in the deeper part of the gastral cortex; the straight basal ray extends through the chamber layer to the dermal cortex. In a typical example the oral rays measured about 0.145 by 0.01 mm.; the basal about 0.245 by 0.01 mm.

5. Subdermal pseudosagittal triradiates (Figs. 8e, 8f). The form and arrangement of these spicules strongly support the view¹ that they are really distal tubar triradiates which have undergone rotation so that the original basal ray (*b*) has come to lie in or below the dermal cortex, while one of the original oral rays (*o*¹) has come to be directed inwards and has become more or less elongated. I had previously looked upon this inwardly pointing ray as the basal ray of a sagittal spicule, and upon the true basal ray as one of the orals. It will be well in future to speak of the former (Figs. 8e, 8f, *o*¹) simply as the centripetal ray, and the others as the outer or dermal rays. In the present case the dermal rays are asymmetrical and it is quite easy to see which is the original basal ray (*b*), for it is straight, while the other (*o*²) is often more or less curved or crooked, and really forms a pair with the centripetal ray, which is also frequently bent. The centripetal rays usually lie in close juxtaposition with the centrifugal rays of the subgastral sagittal triradiates. In a typical example the centripetal ray measured about 0.13 by 0.01 mm., and the dermal rays about 0.11 by 0.01 mm., but the centripetal ray may be more elongated. All the rays are more or less gradually sharp-pointed.

6. Colossal oxea of the dermal cortex (Fig. 8g). These spicules are fusiform but commonly thicker at one end than at the other. They vary much in size, up to about 2.85 by 0.075 mm.

7. Hair-like oxea of the oscular fringe. Straight and very slender, only about 0.004 mm. in maximum diameter. Their length is probably about 0.6 mm., but they are almost invariably broken short in preparations.

Previously known Distribution. Port Elizabeth, South Africa (Bowerbank).

Register Numbers and Localities. I., a number of good colonies from Okhamandal Point (off Buoy ; 5. 1. 06) ; IV. 6, two small fragments from the S.W. Coast of Beyt Island.

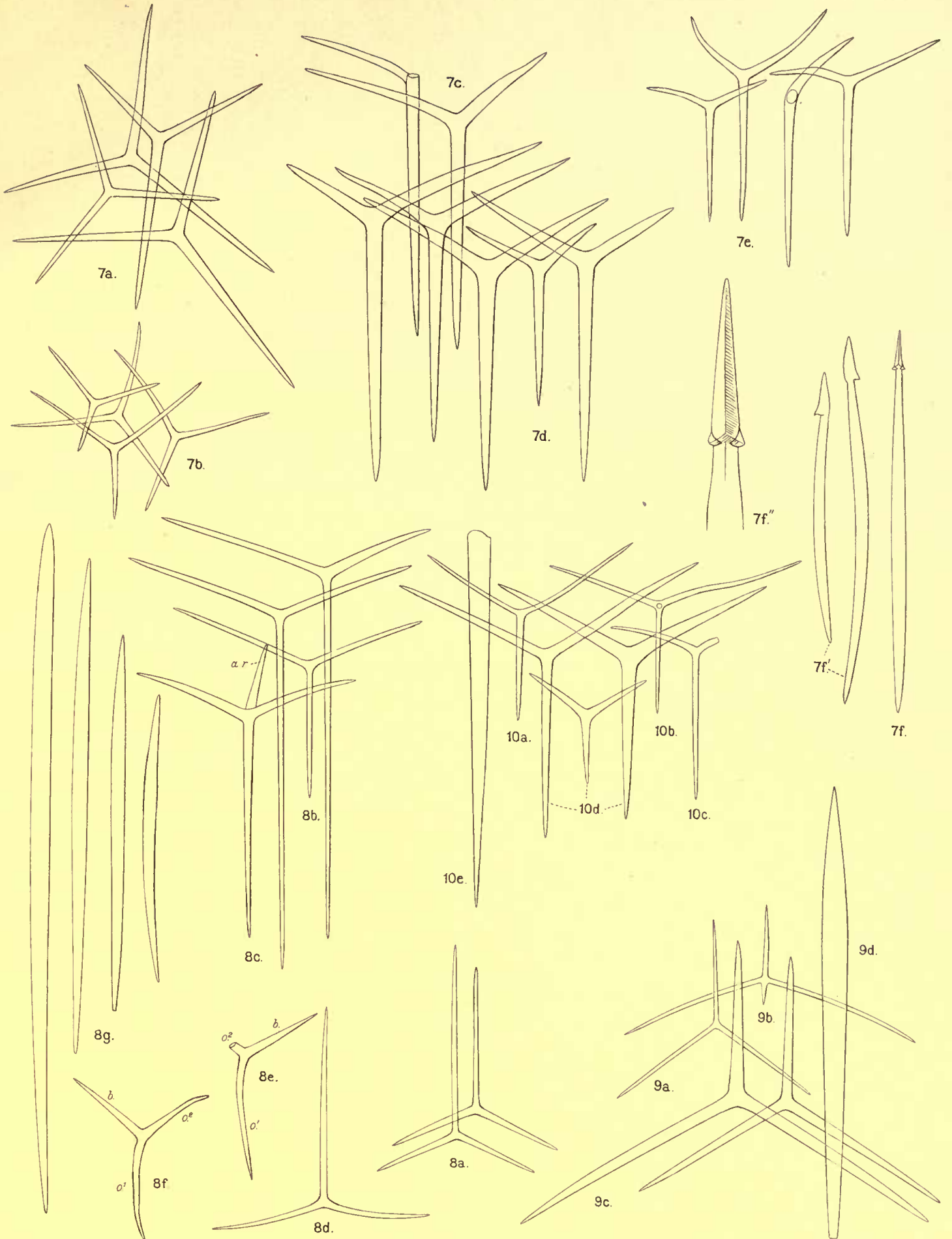
4. *Leucandra donnani* Dendy, var. *tenuiradiata* nov. (Plate I., Figs. 4, 4a, 4b ; Plate II., Figs. 9a-9d).

Leucandra donnani Dendy [1905].

There are five specimens in the collection which I think must certainly be referred to this species, although the curious differences in the proportions of the spicules make it desirable to give them a special varietal name.

The external form in the best example (R.N. IV. 8, Fig. 4) agrees closely with that of the type of the species from Ceylon, even in the curiously curved character of the whole sponge. The colour, however, is white, owing to the absence of the pigment granules found in the type. The brittle texture is pronounced and has resulted in the breaking of the specimen in two.

¹ Cf. Dendy and Row [1913], p. 750.



The skeleton is composed, as in the type, of a thin layer of slender dermal triradiates (Fig. 9a), a thin layer of slender gastral quadriradiates (Fig. 9b), with some triradiates, and a thick layer of much larger triradiates (Fig. 9c) in the chamber layer between the two. The latter are quite irregularly arranged. The dermal and chamber-layer triradiates are perhaps less strongly sagittal than in the type. There are a few large oxea (Fig. 9d) arranged more or less at right angles to the surface, but with their outer ends broken off short.

The dermal triradiates (Fig. 9a) are considerably smaller and more slender than in the type. The gastral quadriradiates (Fig. 9b) have more slender rays than those of the type, but they may be longer. The chamber-layer triradiates (Fig. 9c) are altogether smaller and of more slender build. The oxea (Fig. 9d), however, are considerably larger than in the type.

This specimen (R.N. IV. 8) may be taken as the type of the variety.

Another specimen (R.N. IV. 17a, Fig. 4a) is of very irregular, sac-like form, and has a delicate oscular fringe of hair-like oxea. There was no such fringe in the type of the species, nor have I been able to find one in R.N. IV. 8, but I cannot say whether or not its absence is due to abrasion. It may possibly be a characteristic feature of the variety. R.N. IV. 17b is a damaged specimen closely resembling R.N. IV. 17a. I have been unable to determine whether or not it has an oscular fringe. There are indications in R.N. IV. 17a that the outer ends of the large oxea may be lance-headed.

R.N. III. 5 (Fig. 4b) is a small specimen, also of curiously curved form, attached to a stony Polyzoan colony (Retepora?) whereby its surface has been protected from abrasion. The large oxea in this case project far beyond the dermal surface, and many, if not all, of them are distinctly lance-headed. There is also a feebly developed oscular fringe of trichoxea.

The chief distinguishing features of the variety appear to be the comparatively large size of the oxea and the comparatively small size of the triradiates of the chamber layer. The lance-headed form of the oxea is perhaps a specific character, which I have reason to believe occurs in the type of the species (in which it is shown by the broken off outer end of one spicule very clearly).

Register Numbers and Locality. III. 5, off Dwarka; IV. 8, IV. 9c, IV. 17a and b, off S.W. Coast of Beyt Island.

5. *Leucandra wasinensis* (Jenkin). (Plate I. Fig. 5.)

Leucilla wasinensis Jenkin [1908].

Leucandra wasinensis Dendy [1913].

I refer to this species a single small specimen (Fig. 5), about 4 mm. in height (exclusive of the oscular fringe of slender oxea, which is very prominent). The

sponge is a typical leucon person of ovoid form. The canal system is typical. The spiculation consists of the following elements:—

(1) Rather large dermal radiates, mostly with a well-developed centripetal apical ray.

(2) Large, irregularly scattered radiates of the chamber layer, mostly, at any rate, without apical rays.

(3) Slender subgastral sagittal radiates, mostly, if not all, with short apical rays; of typical form and arrangement. These are not mentioned by Jenkin in the case of the type, but probably occur there. I also overlooked them in the specimen recorded by me [1913] from Saya de Malha, but I find on re-examination that they undoubtedly occur therein.

(4) Gastral quadriradiates; a good deal smaller than the dermal radiates and with well developed, sharp-pointed, curved apical rays projecting into the gastral cavity.

(5) Quadriradiates of the larger exhalant canals; perhaps merely radiates of the chamber layer with short, thorn-like apical rays.

(6) Stout fusiform oxea projecting radially from the dermal surface; their outer ends too much broken and corroded for description.

(7) Slender hair-like oxea (trichoxea) of the peristomial fringe.

(8) ? A few rather large microxea at the surface in contact with foreign objects.

A direct comparison with the type has convinced me, as in the case of the Saya de Malha specimen, that there is not sufficient difference to justify a specific separation, especially as there are only single specimens known from the three localities.

Previously known Distribution. Wasin, East Africa (Jenkin); Saya de Malha, Indian Ocean (Dendy).

Register Number and Locality. XXXV. 9. Off Dwarka.

6. *Leucandra dwarkaensis*, n.sp. (Plate I. Fig. 6; Plate II. Figs. 10a–10e).

The single specimen (Fig. 6) is massive and irregular below, compressed above, and terminating in a wide, slit-like vent. The entire body is sac-shaped, with a very wide gastral cavity. Height about 28 mm.; width in the middle 17 mm. The outer surface is now nearly smooth, but this is doubtless due to the more or less complete erosion of the outer ends of the large oxea. The oscular margin is very thin and shows the remains of a fringe of close-packed, hair-like oxea. A good deal of foreign material is collected on both dermal and gastral surfaces, including numerous small siliceous oxeote spicules. Colour in spirit dirty white.

The canal system is typical. There is a rather thick gelatinous ectosome

containing irregular subdermal cavities which lead into the wide inhalant lacunæ. The flagellate chambers are spherical, about 0.087 mm. in diameter and thickly scattered throughout the choanosome. The gastral cortex is thin; its inner surface nearly smooth and pierced by numerous exhalant openings.

The arrangement of the skeleton offers no peculiarities. The dermal skeleton is composed of slender sagittal triradiates, tangentially arranged, with a few scattered microxea. The gastral skeleton consists of slender sagittal quadriradiates and triradiates. The skeleton of the chamber layer consists of much larger and stouter triradiates, irregularly scattered, and of the inner portions of large oxea whose outer ends are broken off. There are a few slender subgastral sagittal triradiates and quadriradiates in the younger parts of the sponge towards the vent. There is an oscular fringe of trichoxea.

1. Dermal triradiates (Fig. 10*a*). Sagittal, with long, slender, gradually sharp-pointed rays. The oral rays usually curved, with wide oral angle. Size varying a good deal, rays commonly somewhat unequal in length, averaging say about 0.28 by 0.017 mm. The arrangement of these spicules, except for the fact that they all lie tangentially, is quite irregular.

2. Gastral quadriradiates (Fig. 10*b*). Sagittal, facial rays straighter and rather more slender than those of the dermal triradiates, but of about the same length and gradually sharp-pointed. Apical ray moderately long, slender, finely pointed, nearly straight. As usual these spicules become more regularly arranged and strongly alate towards the oscular margin, where also the paired rays become much stouter than the basal ray.

3. Gastral triradiates. Similar to the gastral quadriradiates but without the apical ray.

4. Subgastral sagittal radiates (Fig. 10*c*). Rays long and slender, gradually sharp-pointed. Basal ray much longer than orals, say about 0.32 by 0.015 mm., while the orals are only about 0.19 mm. long. Occasionally with a short apical ray. Arranged as usual with the basal ray directly centrifugally.

5. Triradiates of the chamber larger (Fig. 10*d*). Approximately regular, with moderately stout, nearly straight, gradually sharp-pointed rays, varying a good deal in actual size and in proportions; measuring say about 0.35 by 0.03 mm.

6. Large oxea (Fig. 10*e*). With their inner ends deeply implanted in the chamber layer, or perhaps even projecting into the gastral cavity, and their outer ends projecting obliquely upwards and outwards from the dermal surface. The inner ends, where perfect, are gradually and finely pointed; the outer ends are all broken off short close to the dermal surface. The perfect spicule must be nearly straight and very long. The portions remaining in the sponge may measure nearly 2 mm. in length, with a thickness of about 0.05 mm. These spicules are very numerous.

7. Hair-like oxea (trichoxea) of the peristome. These are well developed but all broken off short, their remaining portions being densely crowded together.

8. Microxea. These seem to have been fairly numerous in the dermal layer, but, owing perhaps to the fact that the specimen was first preserved in formalin, they have been extensively eroded and perhaps some of them entirely dissolved away. They seem to have been hastately pointed at one end.

The most characteristic feature of this species appears to be the external form, and especially the wide, slit-like vent, but, in the presence of only a single specimen, it is impossible to say how far this may be constant.

The arrangement of the skeleton and the form and size of the principal spicules agree closely with the corresponding features in *Leucandra donnani* var. *tenuiradiata*, but in the latter I have found no microxea and no subgastral sagittal radiates.

Register Number and Locality. XXIII. 6. Off Dwarka, 15–17 fathoms.

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DESCRIPTIONS OF PLATES.

PLATE I.

- Fig. 1. *Sycon grantioides* n.sp. (R.N. III. 4). × 4.
 Figs. 2, 2a. *Grantessa hastifera* (Row) (Parts of R.N. III. 2). × 2.
 „ 3, 3a, 3b. *Heteropia glomerosa* (Bowerbank) (Parts of R.N. I.). × 2.
 Fig. 4. *Leucandra donnani* Dendy, var. *tenuiradiata* nov. (R.N. IV. 8). × 3½.
 „ 4a. *Leucandra donnani* Dendy, var. *tenuiradiata* nov. (R.N. IV. 17a). *a*, vent; × 3⅔.
 „ 4b. *Leucandra donnani* Dendy, var. *tenuiradiata* nov. (R.N. III. 5). × 4.
 „ 5. *Leucandra wasinensis* (Jenkin) (R.N. XXXV. 9). × 5½.
 „ 6. *Leucandra dwarkaensis* n. sp. (R.N. XXIII. 6). × 1¾.

PLATE II.

Figs. 7a-7f''. *Grantessa hastifera* (Row) (R.N. III. 2).

- Fig. 7a. Dermal triradiates. × 90.
 „ 7b. Gastral triradiates. × 90.
 „ 7c. Subgastral sagittal triradiates. × 90.
 „ 7d. Tubar triradiates. × 90.
 „ 7e. Subdermal pseudosagittal triradiates. × 90.
 „ 7f. Large oxeote, front view. × 90.
 „ 7f'. do. do. side view. × 90.
 „ 7f''. do. do. outer end, front view. × 360.

Figs. 8a-8g. *Heteropia glomerosa* (Bowerbank) (R.N. I.).

- Fig. 8a. Dermal triradiates. × 166.
 „ 8b. Gastral triradiates. × 166.
 „ 8c. Gastral quadriradiate, *a. r.*, apical ray. × 166.
 „ 8d. Subgastral sagittal, and 8e, subdermal pseudosagittal triradiate *in situ*; the outer paired (oral) ray of the latter being broken off. *b*, basal ray; *o*¹, centripetal paired ray; *o*², outer paired ray. × 166.
 „ 8f. Complete subdermal pseudosagittal triradiate; lettering as before. × 166.
 „ 8g. Dermal oxea. × 50.

Figs. 9a-9d. *Leucandra donnani* (Dendy) var. *tenuiradiata* nov. (R. N. IV. 8).

- Fig. 9a. Dermal triradiate. × 90.
 „ 9b. Gastral quadriradiate. × 90.
 „ 9c. Triradiates of the chamber layer. × 90.
 „ 9d. Oxeote. × 90.

Figs. 10a-10e. *Leucandra dwarkaensis*, n. sp. (R.N. XXIII. 6).

- „ 10a. Dermal triradiate. × 100.
 „ 10b. Gastral quadriradiate. × 100.
 „ 10c. Subgastral sagittal triradiate (broken). × 100.
 „ 10d. Triradiates of the chamber layer. × 100.
 „ 10e. Inner end of large oxeote. × 100.

