Revision of Hexactinellids with Discoctasters, with Descriptions of Five New Species.

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The discoctasters are, as enunciated by F. E. SCHULZE,* strongly modified discohexasters in which the six principals have entirely or almost entirely atrophied while the terminals have undergone a new arrangement into eight secondary principals and terminal tufts at points of the central node corresponding to the eight corners of a cube. This peculiar kind of spicules have hitherto been known to occur in the following four species of *Rossellidæ*, viz. *Acanthascus cactus*, F. E. S., *Rhabdocalyptus mollis*, F. E. S., *Rh. Roeperi*, F. E. S. and *Rh. Dowlingi*, L. M. Lambe. To this list, I will add five more species, making in all nine discoctasterophorous species.

Before entering into diagnostic descriptions and systematic arrangement of these species, I hold it essential to make, once for all, some general notes on their structure.

They are all moderately thick-walled, barrel-like, cup-like, or vase-like forms with a deep gastral cavity. Frequently the body shows lateral compression after it has attained a certain size. The simple osculum is situated at the upper end. The thin ocular margin is at first turned inwards, but becomes later directed upwards or outwardly expanded. Attachment to the substratum takes place by an irregular space at the blind end, which region may be contracted in a stalk-like manner but is never solid. When the sponge grows on an inclined or vertical substratum, it commonly happens that the basal region is bent so as to direct the rest of the body upwards.

* Sitz-ber. d. kgl. Preuss. Akad. d. Wiss., XLVI, 1893.

The power of opening secondary osculæ or of budding out daughter persons seems to be widely spread, although neither of them are ever formed in any great number. A daughter person first arises as a cœcum-like outbulging of the wall, eventually to open an osculum at the summit.

The principal parenchymalia are exclusively long diactins of well-known nature and arrangement. The intermedia are always of three kinds: discoctasters, oxyhexasters, and microdiscohexasters.

With respect to discoctasters, it is to be noted that the central node contains a typical triaxial cross, which seems not to have been observed before in this kind of hexactinellidan spicule. It is made plainly visible when examined in glycerine or in any other medium of similar refractive power. The six points of the cross are turned towards the middle of the protuberant or otherwise somewhat concave space surrounded by every four secondary principals. The terminals are always, though often obsoletely, rough. The minute terminal discs are either simply shaped like pin-head or toothed at the margin. It frequently happens that deeply situated discoctasters are considerably larger than those in the periphery.

The oxyhexasters, which are the most abundant of all parenchymal intermedia, have very short and sometimes almost entirely atrophied principals. The terminals are smooth or more frequently rough. The roughness may develop at their basal parts into prickles with centrally turned points. Not unfrequently the oxyhexasters situated near the dermal surface differ from those more deeply situated in having longer principals and more slender and more numerous terminals, although they seem to be connected by transitional forms. The most usual number of terminals to a principal is two, and it very frequently happens in such a bifurcated ray that one of the terminals is but very little developed or entirely absent. Thus I have seen cases in which a small rudimentary and a normally developed terminal stood together on a principal. Then there are cases to be met with often enough, in which a single terminal is joined to a principal by its crooked basal end. The

crook just mentioned is, in other cases, modified into a gentle bend and in still others, completely straightened out so that now a principal and a terminal jut out from the central node in a single straight ray. But such a ray ought certainly not to be looked in the same light as the primary undivided ray of a hexactin. The latter is invariably traversed throughout its whole length by the axial canal, which, in the case of hexasters, is likewise found in the principals but never extends into the terminals. In conformity with the last mentioned fact, the apparently simple and unforked hexaster rays already referred to, contain the axial canal only at their bases, clearly demonstrating their constitution out of a principal and of a single terminal. As is well known, one or more rays in an oxyhexaster may be unforked or uniterminal; and when all are so and straight, as is of common occurrence, there arises a form which is in shape a hexatin though not a genuine one in nature. Such a spicule, when cleaned and examined in glycerine, will be found to contain the usual central axial cross, the arms of which extend but for a short distance into the bases of the six rays. The impropriety of simply calling it *oxyhexactin*, as has hitherto been the custom (SCHULZE, LAMBE, RAUF), is evident. It should be called hexactin-shaped oxyhexaster.

The microdiscohexasters are probably never absent, although in some species they occur quite sparingly. They are of usual shape and vary in diameter from 15μ to 26.6μ.

The autodermalia are rough, straight diactins, stauractins, or pentactins, one or the other of these predominating according to species. Monactins, orthodiactins, and triactins are only of occasional occurrence. As in all other Rossellids, a distally directed ray is never developed on the autodermalia. When stauractins or pentactins constitute the main elements, their cruciate rays are usually so arranged as to bring about an autodermal lattice-work with more or less regularly quadrate meshes; whereas, in species with diactin autodermals, the meshes formed are triangular, trapezoidal, or irregular in shape.

A hypodermal system of spicules is always present. For *Acanthascus cactus* it is characteristic that the hypodermalia consist exclusively

of diactins which are grouped in thin anastomosing strands. In the rest of octasterophorous species, they consist of moderately large oxypentactins, either solely or in union with subtangentially disposed diactins. The proximally directed shafts of these hypodermal pentactins are always smooth; the four paratangential rays are also smooth or minutely rough (*Staurocalyptus*), or else armed with biserially arranged, strong, hook-like prongs (*Rhabdocalyptus*). The paratangentials are often, though not always, paratropal, i.e. the four rays are, as it were, pushed aside so that they form with one another three more or less acute angles and one wide angle greater than 90° or even 180°. Similar hypodermal pentactins have long been known in *Rossella antarctica*. As in this species they are generally found in groups of several together. In every such group, proximally directed shafts, accompanied with slender comital diactins, form a more or less compact column or tuft that dips deeply into the parenchymal mass, while the heads composed of paratangential rays bring about a star-like figure, in which a number of streaks radiate in all directions from what I will call, for the sake of convenience, the hypodermal centre. It is easy to discover that the pentactin-heads in a hypodermal group lie one above the other and that the one in an upper situation is older and more fully developed than that following next below. The lowest is therefore the youngest, which developes itself clasping with one of its angles the column of shafts belonging to older pentactins. It is this preëxisting shaft-column that disturbs the regularly cruciate development of the head of young pentactins; hence the paratropal arrangement of paratangential rays.

The hypodermal pentactins remain in their *locus nascendi* only in certain species. More usually they are destined to be protruded outwards through the autodermal layer as prostalia pleuralia. These stand out isolated or in tufts from hypodermal centres; and, in case they are not shed off, their paratangential rays form a gossamer-like veil at a certain distance from the dermal surface, exactly as is known in the genus *Rossella*.

Diactin prostalia are also of common occurrence. These are to be

considered as specially developed parenchymalia. In many species of *Rhabdocalyptus* and *Staurocalyptus* I have found that in very young individuals the needle-like diactin-prostalia project from all parts of the body, but with growth of body, become restricted to the oscular margin, where they may form an ill-defined, often interrupted fringe.

The autogastralia are as a rule rough hexactins with some exceptions. They may be represented by pentactins or by both pentactins and stauractins. The autogastral pentactins has its unpaired ray always distally turned. In one noteworthy case (*Staurocalyptus pleorhaphides*), the autogastrals are to be considered either as being not at all developed or as being represented by short diactins that are not sharply differentiated from parenchymal elements. When autogastralia with cruciate paratangential rays are present in large numbers, they form a continuous lattice-work with small quadrate meshes, covering over the apertures of efferent canals. But when sparingly developed, there are left in the autogastral layer wide gaps, by means of which the efferent canals stand in direct communication with the gastral chamber.

Hypogastral strands are usually more or less distinctly present. They are nothing else than certain strands of parenchymal diactins, that have dissociated themselves in variable degrees from the parenchymal mass and have entered into the support of the autogastral layer.

Finally with respect to dictyobasalia—by which name I designate the thin reticular plate that invariably cover the surface of basal attachment,—I believe that it is formed mainly by direct as well as synapticular fusion of special spicules developed by the stimulus of foreign bodies in contact with the sponge. Where the plate is thin, the axial canal contained in the nodes of beams has the shape of a simple cross, showing that stauractins here lie as the structural basis. On the other hand, where the plate is of certain thickness, the axial canals contained are six-armed and even stout-rayed hexactins themselves are often discernible in the process of fusing with the dictyobasal beams.

The nine discoctasterophorous species, known to me at present, undoubtedly constitute a coherent group separated by a gap of not incon-

considerable extent from allied Rossellids in which the characteristic discoctaster is represented by typical discohexasters. Probably the group deserves to receive the rank of a sub-family, but I prefer to put off this question until I have studied all my Rosselid materials. As will be seen in the sequel I have distributed the species in question under three genera. One of these, *Acanthascus*, although represented by a single species, seems to me to be sufficiently distinct. With respect to the rest, I must say that it would largely depend upon the individual caprice of systematists whether to keep them on as two distinct genera, as I have done, or to make only a subgeneric distinction between them.

Genus ACANTHASCUS.

Discoctasterophorous Rossellids with exclusively diactin hypodermalia.

This genus as originally established by F. E. Schulze in the Challenger Report, included besides the species given below, two more forms that were called *A. grossularia* and *A. dubius*. These latter do not possess discoctasters, which seem to be represented here by discohexasters. On this account and from considerations of certain other points, it seems to me justifiable to remove them altogether from the genus. I think they might be included among *Rossella* more naturally than be left in union with a discoctasterophorous species. Prof. Schulze himself has declared, in his letter to me, to share in this idea now. So then, the genus *Acanthascus* remains with the following single species.

1. *Acanthascus cactus*, F. E. Sch.

Cup-like, vase-like, or funnel-shaped, often somewhat compressed, with simple oscular edge ; dermal surface with conical elevations, bearing on their apex a tuft of strong, needle-like, prostal oxydiactins. The body may attain a large size of more than 450 mm. in height. It frequently bears a limited number of secondary persons.

Parenchymal diactins small, probably never exceeding 15mm. in length.

Discoctasters with 3–6 straight or almost straight, minutely rough terminals on each principal. Length of entire rays (measured from centre) 53–130μ; those found in deep parts being often twice as large as those lying near the dermal layer. In larger discoctasters the principals are also rough-surfaced and the terminal discs 7–8 toothed.

Oxyhexasters 45–76μ in radius. Principals exceedingly short or almost entirely absent. Terminals rough, straight, stout; usually two to each principal, but very frequently reduced to one, so that there occur oxyhexasters with 11, 10, 9, 8, 7 or even 6 points. In the last case they may be typically hexactin-shaped though only in external appearance. The principal is rarely supplied with three terminals.

Microdiscohexasters of usual shape are of frequent occurrence especially in the dermal and gastral membranes.

Autodermalia are predominatingly rough stauractins forming a fine lattice-work with quadrate meshes. This layer is supported by rather thin strands of hypodermal diactins, forming a network of triangular, trapezoidal, or irregular meshes, whose sides rarely exceed 2 mm. in length.

Autogastralia are mainly rough pentactins. These do not form by themselves a continuous autogastral lattice-work but are found scattered on hypogastral strands together with discoctasters and oxyhexasters.

This species, known only from Sagami Sea, is one of the most abundant Hexactinellids of that locality in depths of over 200 fathoms.

Genus RHABDOCALYPTUS.

Discoctasterophorous Rossellids with pentactin hypodermalia, the paratangential rays of which are, when fully developed, armed with biserially arranged hook-like prongs.

When F. E. Schulze instituted this genus for the first time in the Challenger Report, two species were described by him, viz. *Rh. mollis* and *Rh. Roeperi*. Later L. M. Lambe* described a third species,

* Trans. Roy. Soc. Canada. Sect. IV, 1893. p. 37.

Rh. Dowlingi. Of these three species, only one, i. e. *mollis*, is retainable in the present genus as defined above, while I will now add to it two new species.

2. *Rhabdocalyptus mollis*, F. E. Sch.

Cup-like or vase-like, laterally compressed, contracted below, bearing one or more tube-like secondary persons. The body may attain a height of more than one foot.

Parenchymal diactins short, not exceeding 20 mm. in length. Disc-octasters especially abundant in the subdermal region; ray-length (measured from centre) 65–88μ; terminals 5–9 to a principal, rarely as few as 2, straight or only slightly bent outwards; terminal disc 7–8 toothed or simply pin-head like.

Oxyhexasters 51–80μ in radius. Two varieties are distinguishable. Those situated in deeper parts have usually two-forked rays, the principals being very short and often obsolete; terminals smooth or minutely rough, but always with more or less well developed basal barbs. Frequently there is only one terminal to a principal, and hexactin-shaped oxyhexasters are of common occurrence. Oxyhexasters found in the subdermal region have longer principals and bear 2–4 usually 3 rough terminals which are thinner and supplied with less prominent basal barbs. Oxyhexasters with spirally twisted rays are not of constant occurrence.

Microdiscohexasters of usual shape occur in variable numbers, especially in or near the dermal membrane.

Autodermalia are predominatingly rough diactins. Hypodermalia consist of pentactins, pronged in fully developed state, and of smooth diactins. The former have either paratropal or regularly cruciate heads, and in places protected from external influence, may stand out isolated as prostalia. Such a pentactin has paratangential rays not exceeding 5 mm. and a radial ray of not over 10 mm. in length.

Autogastralia are rough hexactins with bluntly conical ends, form-

ing a continuous lattice-work with quadrate meshes. The free proximal rays do not differ in character from the rest.

Locality: Sagami Sea. I have myself collected some specimens from depths of 274 fathoms and upward.

3. *Rhabdocalyptus capillatus*, n. sp.

Sac-like or vase-like, more or less strongly compressed. Ocular edge fringed with thin needle-like prostals, not outwardly expanded. Dermal surface thickly beset with pentactin prostalia which stand out in tufts from every hypodermal centre and form a thick tolerably firm gossamer-like layer all over the surface. The body may attain a height of 210 mm.

Parenchymalia may contain bow-like diactins of 24 mm. in length. Discoctasters are very small, measuring only 38–55μ in radius, and are of very characteristic shape. From a principal there arise 6–12 slender terminals, which are always bent in an S-like manner and form a bunch considerably expanded at the extremity. Terminal discs pin-head like. Discoctasters are most numerously found in the gastral layer.

Oxyhexasters and microdiscohexasters as in *Rh. mollis*, but the former have no or but little developed basal barbs. Hexactin-shaped oxyhexasters are rare.

Autodermalia likewise as in foregoing species. Hypodermalia consist solely of paratropal pentactins, which are grouped in closely concentrated centres. The older and pronged ones destined to be protruded as pleural prostalia, have paratangential rays that may reach 12 mm. in length and a still longer shaft.

Autogastralia, forming a continuous quadrate mesh-work, consist of rough hexactins with pointed ends, the free proximal ray being longer and supplied with better developed microspines than all the rest of their rays.

Notwithstanding the close similarity of spicules, this species is easily distinguishable from *Rh. mollis* by the smaller size and characteristic shape of discoctasters, by the larger size and the persistence of pentactin prostalia, etc.

Locality : Sagami Sea, from depths between 274 and 313 fathoms.

4. *Rhabdocalyptus victor*, n. sp.

Vase-like ; laterally compressed especially at basal part, which is usually bent ; sometimes with one or two secondary persons on the greater curvature of the basal region. Ocular edge simple or with an interrupted fringe of thin diactin prostals. The body may attain a large size, almost 3 feet high.

Parenchymalia may contain stout bow-shaped diactins, 28 mm. long and 0.4 mm. broad at middle. Discoctasters 90–120μ in radius ; terminals 4–8 in a tuft, straight or slightly bent outwards ; terminal discs pin-head like.

Oxyhexasters 90–140μ in radius. Principals exceedingly short or obsolete, usually two-forked. Terminals rough, which character changes towards base into small, inwardly directed prickles. Oxyhexasters with two terminals to every principal occur less frequently than those in which one or more principals bear only one terminal. Hexactin-shaped oxyhexasters are of frequent occurrence.

Microdiscohexasters of usual shape and size are of very isolated occurrence.

Autodermalia consist predominatingly of rough stauractins. Hypodermalia as in foregoing species, but somewhat smaller (parataugential rays 5–7mm. long). Unlike that species, the protruded hypodermal pentactins seem to be readily thrown off, leaving at every hypodermal centre a little bunch of the external ends of comital spicules, that accompanied the lost shafts, projected beyond the otherwise smooth surface. In this respect, the present species agrees with *Rh. mollis*.

Autogastralia as in *Rh. mollis*.

Locality : Sagami Sea, in depths of over 274 fathoms. Next to *Acanthascus cactus*, the present species is apparently the most abundant octasterophorous Hexactinellid in the locality just mentioned.

GENUS STAUROCALYPTUS, n. gen.

Discoctasterophorous Rossellids with pentactin hypodermalia, the paratangential rays of which never possess hook-like prongs, but are either smooth or minutely and uniformly rough.

To this new genus I should refer F. E. SCHULZE's *Rhabdocalyptus Roeperi* and L. M. LAMBE's *Rh. Dowlingi* besides 3 new species to be soon described.

5. *Staurocalyptus Dowlingi* (L. M. Lambe).

With some hesitation I consider certain specimens of *Staurocalyptus* from Sagami Sea as identical with this species first described by LAMBE (*loc. cit.*) from a specimen taken in the Strait of Georgia, Vancouver Island, at a depth of about 40 fathoms. From Sagami Sea, I have several, mostly fragmental specimens obtained at depths of over 235 fathoms. On these is based the following description.

Body subcylindrical or vase-like. It may grow to a considerable size about a foot in diameter. Oscular edge turned upwards or in fully developed state reflected outwards in flaps; simple and smooth or with more or less needle-like prostals. External surface of smaller specimens with a veil produced by the heads of prostal pentactins and also with a number of long diactin prostals standing out in isolated positions. After a certain stage of growth, both of these prostalia pleuralia seem to be lost, except pentactin prostals in positions protected from abrading influences. What constitutes one of the special characters of this species, is the spiny nature of the gastral surface caused by numerous needle-like (parenchymal) diactins that project their ends beyond the gastral surface. In the specimens examined by LAMBE, these gastral prostals seem to have been wanting.

Principal parenchymalia are bow-shaped and in large specimens may measure 35 mm. in length, but their dimension is, as in other species, variable according to the size of individuals.

Discoctasters with radius of 72–145μ or more, those deeply situated

being generally much larger than and often almost or fully twice as large as, those situated in the subdermal space. Terminals 2–8, usually 4–6, nearly straight, forming a slightly diverging tuft. Discs minute and pin-head like or with toothed margin.

Oxyhexasters vary in radius from 38μ to 80μ according to individuals. When changed into hexactin-shape, the radius may measure as much as 110μ. Principals exceedingly short or obsolete. Terminals 2–3, more usually 2, and often only one to a principal, hexactin-shaped oxyhexasters being of common or even abundant occurrence. Surface of terminals either smooth or rough, in which latter case the roughness may develop into small basal barbs. In some specimens only rough hexasters are found ; in others both rough and smooth ones occur, and then the latter are generally situated in deeper parts than the former.

Microdiscohexasters present in sparing numbers near the dermal or gastral surface.

Autodermalia consist almost exclusively of rough pentactins with rays 165μ long and 8μ broad in average.

Hypodermal pentactins comparatively small, usually not exceeding 4 mm. in length of paratangential rays (sometimes larger). The latter are either regularly cruciate or paratropal, according to their occurrence in isolated position or in groups. Their surface is smooth, but when fully developed, may become uniformly and thickly beset all over with exceedingly minute protuberances, exactly as I have observed in *Staurocalyptus pleorhaphides*, Ij. or in *Rossella longispina*, Ij. Judged from the series of specimens in my hand, it seems not improbable that the power of giving the above mentioned roughness to the heads of hypodermal pentactins is possessed by the present species only in young state, losing that power after a certain stage of growth. So that the oldest hypodermally situated pentactins as also all the prostal pentactins may be rough-headed in small, but smooth-headed in large, individuals, since in the latter all the rough-headed pentactins would have been shed off during growth.

In forming the hypodermal strands, the paratangential rays of the

above-mentioned pentactins are supplemented by short smooth diactins with or without annular swelling at centre.

Autogastralia are almost exclusively rough hexactins of approximately same dimensions as autodermalia. They are never present in sufficient numbers as to form a continuous lattice-work. The gastral layer therefore possesses gaps of small but variable size, bounded by beams consisting of hypogastral diactins, intermedial rosettes and autogastralia, similarly as in *Acanthascus cactus*.

6. *Staurocalyptus Roeperi* (F. E. Sch.)

This species is based on two specimens obtained by " Challenger " to the south of Puerta Bueno in Patagonia. It is not represented in Sagami Sea and is directly known to me only through two slide-preparations kindly sent to me by Prof. SCHULZE.

The body should be sac-like or cup-like with sharp, smooth oscular edge. The subdermal space, as seen through the even lattice-work of the dermal membrane, should form irregularly scattered, elongated, angular or spindle-shaped pits, whence arise rather narrow afferent canals. On the inner surface round sharply contoured depressions of various sizes occur, into the bottom of which the more or less wide efferent canals open.

Spiculation closely similar to that of foregoing species ; but differing in having much more slender rays to intermedial rosettes, dermalia and gastralia ; in the sparing quantity of prickles on dermalia and gastralia ; etc.

Discoctasters with radius of 65–83μ, without appreciable difference in size according to position. Principals slender, not exceeding 4μ in breadth ; with 2–5 nearly straight, slightly diverging terminals with minute, pin-head like discs.

Oxyhexasters very slender rayed ; 44–65μ in radius, those near the dermal surface being in general slightly smaller than those more deeply situated. Principals short, often exceedingly short, bearing 2–3 straight or wavy, obsoletely rough terminals. Cases of uniterminal principals

present; hexactin-shaped oxyhexasters probably not absent. It frequently happens that in a dilophous ray, a third terminal is represented by a spurious rudiment.

Microdiscohexasters of usual structure found in tolerable abundance in the subgastral region.

Autodermalia are predominatingly pentactins, but stauractins are by no means unfrequent. Occasionally triactins and diactins, rarely monactins. Rays sparingly rough, not always quite straight; 110–155μ long; usually less than 5μ in breadth at middle.

Hypodermal strands contain besides numerous slender diactins with tuberculated centre, medium-sized pentactins whose slender rays are smooth except at roughened ends. Head of pentactins not paratropal. It is not known whether these pentactins are ever extruded beyond the external surface.

Autogastralia are oxyhexactins with sparingly rough rays of about the same thickness as the autodermalia. Free proximal rays as long as 230μ; other rays somewhat shorter. According to SCHULZE, the autogastralia line the gastral surface as also the surface of the wide efferent canals.

7. *Staurocalyptus heteractinus*, n. sp.

This species is founded on a single bean-sized specimen from Sagami Sea. It represents a strongly compressed pouch with a small simple-edged osculum on one side of the upper end. Texture as in other species; without prostalia pleuralia of any sort.

Discoctasters especially common near the gastral surface. Radius 55–100μ. Terminals 2–7 to a principal; straight, diverging. Disc minute and pin-head like.

Oxyhexasters 53–57μ in radius. Most of those situated in deeper parts have two-forked rays with excessively short principals; terminals stout, straight, rough with minute prickles, which are more prominent and inwardly turned near base. Peripherally situated oxyhexasters have somwhat longer principals, each with 2–4, usually 3, rough-surfaced,

slender and straight terminals. Cases of a uniterminal principal have not been met with.

Microdiscohexasters of usual structure found scattered in the parenchyma.

Autodermalia consist mostly of faintly rough stauractins of variable size, with occasional pentactins and triactins, rarely with diactins. Some of these autodermalia are twice or even thrice as large as others. Radius 90–270μ; rays 9–13μ thick near centre. Ends of rays rounded or even clubbed. Autodermal meshes irregular, not rectangular.

Hypodermalia consist of irregularly distributed pentactins, with occasional stauractins and triactins. Paratangential rays under $^1/_2$ mm. in length; smooth, but often sparingly rough near the conically pointed end; not paratropal.

Autogastralia include faintly rough pentactins and stauractins, more rarely triactins and diactins. Ray-length 55–100μ; thickness near centre 6.5μ in average. They are not present in large numbers.

8. *Staurocalyptus glaber*, n. sp.

Goblet-like or vase-like; laterally compressed; thick-walled. Texture loose and light-looking. In young state with long diactin pleural prostalia; with age these become entirely lost or confined to oscular margin. Prostal pentactins not found. The body may attain a height of 250 mm. Several specimens from Sagami Sea.

Principal parenchymalia more or less bent in bow-like manner; not over 13 mm. in length.

Discoctasters especially abundant in subgastral region; very large, having radius of 250–330μ, although smaller ones are not wanting. Terminals 5–6 to each principal, nearly straight, slightly diverging; discs pin-head like.

Oxyhexasters 49–57μ in radius. Principals short but usually distinct; each with 2–4, usually 3, very slender terminals, which are faintly rough near base.

Microdiscohexasters occur not uncommonly in the dermal, less frequently in the gastral, membrane.

Autodermalia are almost exclusively stauractins with rough or prickly surface, the prickles on the external side being unusually well-developed.

Hypodermalia consist of filamentous diactins and of moderately sized pentactins with cruciate or paratropal heads. Paratangential rays of the latter smooth but with rough ends. These are, I think, never protruded beyond the dermal surface.

Autogastralia consist of comparatively large prickly hexactins, of whose rays the free proximal ray is the longest (450–560μ). They form a continuous lattice-work with quadrate meshes.

9. *Staurocalyptus pleorhaphides*, n. sp.

Thick-walled sac of about the shape and size of a small pear. Oscular edge sharp and simple. The surface shows a number of low hillock-like elevations from the apex of which long diactin prostalia stand out in loose bunches. The body is moreover covered by a veil of pentactin prostalia. Two specimens from Sagami Sea.

Principal parenchymalia, straight or bow-like; not over 8 mm. in length.

Discoctasters with rays 70–98μ long; each principal with 2–4, usually 3, diverging terminals, which are straight or slightly bent outwards. Discs minute, pin-head like.

Oxyhexasters with radius of 57μ in average. Principals extremely short; each with two, seldom more, rough-surfaced terminals. Frequently one or more principals in an oxyhexaster are uniterminal, although hexactin-shaped forms seem to occur but very rarely.

Microdiscohexasters present in sparing numbers.

Autodermalia are predominatingly rough diactins. Hypodermalia consist of a few diactins and of numerous pentactins, whose heads are either regularly cruciate or paratropal. Paratangential rays 5 mm. or

more in length ; smooth, but when fully developed, minutely and uniformly rough as in *St. Dowlingi.*

Gastralia are represented by diactins, some of which are similar to autodermalia, while others are larger and very sparingly rough and graduate over to parenchymal diactins.

More detailed descriptions with illustrations of all the above species will be embodied in my monograph on the Hexactinellids of Sagami Sea, which will be published in the Science College Journal.

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