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Preliminary notice on Hexactinellida of the Gauss-Expedition.

By F. E. Schulze and R. Kirkpatrick.

There are seven new species and four new subspecies of Hexactinellida in this collection. The following is a list:

1) *Hyalonema drygalskii* n. sp.
2) *Caulophacus antarcticus* n. sp.
3) *Rossella antarctica gaussi* nov. subsp.
4) - *racovitxae minuta* nov. subsp.
5) - *gaussi* n. sp.
6) - *lychnophora* n. sp.
7) - *fibulata* n. sp.
8) - *mixta* n. sp.
9) *Aulorossella vanhoeffeni* n. sp.
10) - - *armata* n. subsp.
11) *Chonelasma lamella choanoides* nov. subsp.

Hyalonema drygalskii n. sp.

Description. The unique specimen is oval in shape, 18 mm long and 11 mm broad; the circular oscule, 2 mm in diameter, is surrounded by a fine fringe of marginalia projecting 1 mm; a stiff root tuft extends downwards about 11 mm.

The surface is very finely pilose and shows a regular square-meshed

pattern. The shallow gastral cavity is 3 mm deep, and has several large exhalant openings in its floor.

The skeleton. — The skeleton of the dermatosom is mainly constructed of square meshes formed by the tangential rays of hypodermal pentactins, of pinules and amphidisks; that of the gastrosom, of diactins with a central swelling, and arranged in longitudinal and transverse strands forming an obscurely square meshed reticulum; no autogastral pinules occur; the choanosom is supported by a cubical-meshed framework.

The spicules. — Parenchymal regular hexactins with smooth sharp pointed rays, straight or slightly curved, $300 \times 15\ \mu$ in length and basal thickness respectively.

Parenchymal diactins (rare) $450 \times 8\ \mu$, with central swelling.

Marginalia 938 μ long, 11 μ thick in centre, with four central knobs; with proximal end smooth, distal end with spines similar to those of the pinuli, but larger.

Basalia, monactinal or with denticulate spiral ridge; with pronged anchor at the lower end.

Auto-dermal pentactin pinuli with slender, rather finely spined, distal ray 480 μ long, with fine hair-like end. Pentactin hypodermalia, with smooth, sharp-pointed rays, the tangentials being $550 \times 24\ \mu$. Stauractin acanthophores with rays 100 μ long, smooth in central part, spined at distal ends.

Autogastral diactins, $1070 \times 10\ \mu$, curved, and with central swelling.

Macramphidisks, unusually small, varying from 95—111 μ in length; with hemispherical — not bell-shaped — umbrellas 18,5 μ in diameter, and with 8 shovel shaped rays 30 μ long, 10 μ broad, with lancet-shaped pointed ends.

Mesamphidisks of two kinds. (a) 60 μ long; with hemispherical umbrellas 18,5 μ long, 21,4 μ broad, with 12 teeth like those of the macramphidisks, but relatively narrower; (b) 57 μ long; with bell-shaped umbrellas 25,7 μ long, 21,4 μ broad, with 12 sharp-pointed ligulate rays.

Micramphidisks from 8,5—23 μ in length. Micro-oxyhexactins with smooth rays 52 μ long, and with a deep curve at junction of middle and outer third.

Thanks to the diagnostic tables of species of *Hyalonema* drawn up by F. E. Schulze, (Valdivia, Hexactinellida 1904. p. 161, 163) it is possible to distinguish with ease the new form from the 45 already known species. *Hyalonema drygalskii* belongs to the group of five species in which the umbrellas of the macramphidisks have shovel-shaped lancet-pointed ends, and the micro-oxyhexactins have strongly curved rays. In *H. apertum* F. E. Sch. the rays of the oxyhexactins are rough. *H. elegans* F. E. Sch. and *H. gracile* F. E. Sch. are distinguished by the possession of macramphidisks with half-egg-shaped umbrellas and long teeth. *H. masoni* has autodermal pinuli with poplar-tree-like pinular rays; and finally, *H. lamella* F. E. Sch. has its macramphidisks scattered in the parenchyma, whereas those of *H. drygalskii* are vertically orientated at the surface. Special features of the new species are: — the small size of the macramphidisks, and the total absence of auto-gastral pinuli.

Locality. Station 24. XI. 1903. 2725 m.

2. *Caulophacus antarcticus* n. sp.

The stems of 18 examples of an undescribed species of *Caulophacus* were obtained from 2725— 3397 m. Nothing of the sponge body remains; but in several of the hollow stems some dried mud was found containing spicules commonly occurring in species of *Caulophacus*. The stems ranged in length from 4 mm to 21 cm. Most of them had a sharp curve above the basal disk, and several had one or two supplementary disks of attachment along the stem, giving the impression of a repent habit of growth.

The spicules of the stem are long diactines, which have become joined by innumerable bands of synapticula. The outer fibres of the stem are longitudinal, the inner oblique and transverse. Most of the diactines are swollen and rough at both ends, some only at one end.

The following spicules were found in the mud inside the stems: — Pentactins. Pinuli, probably autogastral, with pinular ray 214 μ long and 7,5 μ broad at base, and 26 μ broad (including spines) near the apex; smooth above base, then with scattered short spines for more than half the length, and finally with thick incurved spines up to, or nearly as far as, the summit. Tangential rays, $81 \times 7{,}5\ \mu$, slightly bent away from the outer radial ray, with rough surface, especially at the ends, which may be pointed, or more or less rounded. With a smooth rounded knob in place of an inner radial ray. These spicules are probably auto-gastral and not auto-dermal, because in the seven known species of *Caulophacus* and in the doubtful *C. oviformis* F. E. Sch. the auto-dermal pinuli are hexactins. Pentactin auto-gastralia with a proximal knob are found in *C. agassizii* F. E. Sch. and *C. valdiviae* F. E. Sch., and similar spicules without the knob, in *C. latus* F. E. Sch., but the pinuli of the new species are at once distinguished from those of the three mentioned, by having a club-shaped outer radial ray in place of a slender tapering one. One example of a pinul was found with a radial ray 412 μ long, and finely spined at the end.

Pentactins (hypodermal or hypogastral) with smooth tangential rays $149 \times 6{,}25\ \mu$, rough only at ends.

Heterodiscohexactins (F. E. Sch.)[1], seu Monodiscohexasters (Kirkp.) regular, the rays 75 × 6 μ with scattered prickles curved centrad, disks 11 μ in diameter with 5 sharp denticles; the axial canal extends 8,5 μ from centre. Lophodiscohexasters, 8,5 μ in diameter with short smooth rather thick main rays 7 μ long, 2,85 μ thick. The end rays 34 μ long, five or six in number form a circle round a central ray; the disks, very extremely small, with four or five clawlike teeth. These spicules have some resemblance to the lophodiscohexasters of *Caulophacus? oviformis* F. E. Sch., but the latter are much larger (114 μ) and with more slender main rays (7 × 1,5 μ). *C. oviformis* has hexactin autodermalia and autogastralia. A hemidiscohexaster was found, 130 μ in diameter, with three single rays, and 2 main rays ending in two disk-tipped end rays; one ray was broken off at the base.

Heterohexactins[1] with tangential rays 35 μ long and radial rays 50 μ long, with finely granular surface.

Oxyhexasters are rare among *Caulophacus* species where discohexasters are greatly developed; hemioxyhexasters are found, however, in *C. latus* F. E. Sch.

Localities. From stations to north west of Gauss station 2450—3397 m.

2. *Rossella antarctica gaussi* nov. subsp.

There are ninety specimens of this subspecies, which is easily and quickly recognised. The new form differs from the typical one, in having calycocomes with longer, more slender and more tuberculated main rays than those of the type. The main rays of calycocomes of the typical form are generally smooth, rather thick, and about 13—16 μ long, and 3,5 μ thick. Those of the variety are (in specimen No. 35) 22 μ long, 3 μ thick, and with many tubercles. In other respects, the new subspecies resembles the typical form. In specimen 4 both kinds of calycocomes occur.

The Discovery-specimen named *Rossella antarctica* (specimen A) belongs to this subspecies.

Locality. Gauss Station. 350—385 m.

Rossella racovitzae minuta, n. subsp.

There are 15 examples of this species. Seven specimens vary only slightly from the typical form described by Topsent in the Report on the Belgica Sponges p. 33; they have very large calycocomes over 300 μ in diameter; the microdiscohexasters however do not attain the very large size (70 μ) of some of those found in the Belgica specimens.

[1] Heterodiscohexactins (as heteroxyhexactins, heterostauractins, heterodiactins etc.) F. E. Schulze names such hexactins of which the distal endrays do not show the continuation of the axial canal, evident in the proximal ray-part.

Five specimens, which are placed in a new subspecies *minuta* have not only smaller microdiscohexasters, but smaller calycocomes, varying from 160—250 μ in diameter. Three specimens of this species have no calycocomes, and are placed provisionally under the new subspecies.

A velum is present in all the specimens; i. e. a certain number of hypodermal pentactins project at different levels beyond the surface.

The species *Rossella hexactinophila* Kirkp. (Discovery Report, Hexactinellida p. 12) is found to be a subspecies of *R. racovitzae* Topsent, viz subsp. *hexactinophila*. It was supposed to differ from *R. racovitzae racovitzae* on account of the presence of a velum in the former, but this structure is now found to exist in *R. racovitzae*.

Localities. Specimens were obtained from Gauss Station, from depths of 380—385 m.

Rossella gaussi n. sp.

There are four specimens of this species. The largest example is globose, being 3,9 cm high, and 3,6 cm broad. The surface is covered with rounded wart-like hummocks. There is a usually well developed velum of hypodermal pentactins with mostly cruciate tangentials with densely granular surface.

The prostalia pleuralia are strong, thick sharp-pointed diactins.

The parenchymal diactins have rounded ends. The autodermal pentactins have a granular surface. The character that at once becomes obvious on examining sections is the great abundance of discohexasters and the almost total absence of oxyhexasters.

These are the features which distinguish the new species from the nearly related *R. racovitzae*. The diactine principalia, the auto-dermalia and auto-gastralia are nearly similar in both species.

The calycocomes, which in the type specimen are more abundant in the dermatosom than in the gastrosom, vary in size, the largest being 312 μ in diameter. In the type specimen heterodiscohexactins (F. E. Sch.) seu monodiscohexaters (Kirkp.) are very common, but hemidiscohexasters are more frequently found in the other three specimens. In the type, the heterodiscohexactins (F. E. Sch.) seu monodiscohexasters (Kirkp.) seem to replace to a great extent both calycocomes and microdiscohexasters in the gastrosom. The specimen named *R. racovitzae* in the Discovery Report Hexactinellida p. 14, belongs to this species. At the same time, it has no velum, and the tufts of pleuralia emerge from pointed conules; but the discohexasters are abundant, and the oxyhexasters almost absent.

Locality. Gauss Station 350—380 metres.

Rossella lychnophora n. sp.

The single specimen of this species is an oval sack 16 mm long and 11 mm broad. Rather thick diactine prostalia pleuralia project mostly in an upward and downward direction. A fairly continuous velum projects about 3 mm beyond the surface.

The parenchymal diactins have rounded ends.

The autodermalia (pentactin and stauractin) have a granular surface. The chief distinguishing character of the species is in the calycocomes. These spicules are very slender at the point of junction of the six main rays, so much so that the field in bestrewn with broken-off rays, the main rays and capitula having the shape of long beaked opercula of moss capsules. The central point of meeting of the axial canals is not a point but a spherical space, when the rays emanate (hence the specific name *lychnophora*).

The calycocomes, 247 μ in diameter, have slender main rays tapering to the centre, 9,75 μ long, 1,5 μ thick at the central end, and 3,75 μ thick at the distal end where they join the capitula. The long slender capitulum in 16 μ long and 5 μ broad; the end-rays are 88 μ long, and diameter of the distal end of the tuft of end-rays only 19,5 μ. The rays vary in number from 2—7 but then are commonly 6. Sometimes the capitula are broader and the end-rays more divergent. This species is one of the „*racovitzae*" group.

Locality. The unique specimen came from Gauss Station. 27. IX. 1902. 385 m.

Rossella fibulata n. sp.

The new species is represented only by three small fragments. The characteristic feature consists in the presence of heterostauractins, heterotriactins and heterodiactins (F. E. Sch.) seu monostauraster, monotriasters and monodiasters (Kirkp.). The last kind are present in abundance and enable the species to be immediately recognised.

The typical form of heterodiactins seu monodiasters is a slender sharp pointed rod with four central tubercles; the smaller kind are about 160 – 200 μ in length and 7 - 8 μ in thickness, the larger kind attain a size of 600 μ in length and 26 μ in thickness. The largest forms closely resemble the hypodermal and hypogastral diactine accessoria, but the important point about the heterodiactins (F. E. Sch.) seu monodiasters (Kirkp.) is the abrupt termination of the axial canals a little beyond the centre of the spicule. The large heterodiactins (F. E. Sch.) seu monodiasters (Kirkp.) and the small hypodermal diactins though alike externally have had a very different history; the former are derived from hexasters and the latter from hexactins. This constitutes are interesting cases of convergence.

The autodermalia, calycocomes, hypodermal pentactins &c., show the species to be a *Rossella* and to be one of the „*racovitzae*" group.

Locality. Gauss Station 2. XII. 1902. 385 m.

Rossella mixta n. sp.

The unique specimen is oval and small being 7 mm long, 6 mm broad and deep, and with a wall thickness of 1,7 mm. Diactine pleuralia extend 9 mm, and pentactins forming an obscurely marked velum about 3 mm beyond the surface.

Spicules. The diactine principalia are 2,5 mm. long, 11,5 μ thick, with sharp-pointed roughened ends.

The autodermal pentactins and stauractins have rays 130 μ long, 10 μ thick at the base and 3,25 μ thick near the ends, and have the surface beset with small spines (and not granular).

The hypodermal pentactins, mostly orthotropal, have rays 1330 $\times$ 38 μ, smooth or with granular surface. The auto-gastral hexactins have slender rather sharp-pointed rays 146 μ long, 6 μ thick at the central end and 2,5 μ thick at the distal end; with finely and sparsely spined surface. The calycocomes 172 μ in diameter, have main rays 13 μ long, 3 μ thick at the central end and 3,25 μ thick distally; without capitulum, with perianth-like tuft of end rays with a diameter of 36 μ.

Mesodiscohexasters 87 μ in diameter, with short main rays and 2 or 3 end rays to each main ray.

Microdiscohexasters varying from 23—48 μ usually with two lengths of end rays, though some of the smaller kind have only one length.

Oxyhexasters 98 μ in diameter with main rays bifurcating into two slender end rays are common; rarely stouter forms with 3 end rays to each main ray are found.

Rossella mixta belongs to a group of species (Oxydiactina group) with slender sharp pointed diactine principalia. The calycocomes are primitive, i. e. the end rays are attached separately to the main ray and not fused into a capitulum. The auto-dermalia have spinous rather than granular surface; the auto-gastralia are slender, (thereby differing from *R. podagrosa* where they are thick).

R. mixta seems to be the starting point of a group which branches on the one hand to *R. podagrosa* Kirkp. and *R. nuda* Topsent, and on the other to *Aulorossella vanhoeffeni armata* n. subsp. and *A. vanhoeffeni* n. sp.

Locality. The specimen came from station 8. XI. 1902, 350 m.

Aulorossella Kirkp.

1908. *Aulorossella* Kirkpatrick Discovery Hexactinellida p. 14.

The genus was established to include 3 species of Antarctic Rossellinae, and was characterised by having 3 kinds of discohexasters, and oxypentactine hypodermalia with short prong-like rays making an acute angle with the shaft. Accordingly the dermal surface is not supported by the tangential rays of pentactine hypodermalia and there is no velum; a root-tuft is usually present, but never marginalia. The Gauss collection includes several examples of a new species and subspecies of *Aulorossella*. In the typical form the hypodermal pentactins and the tufts of diactine pleuralia have disappeared entirely; in the variety both kinds of spicules still persist. Accordingly the generic definition must be slightly emended as follows: "Rossellinae . . .« with or without hypodermal pentactins, these spicules when present having short smooth pronglike tangential rays making an acute angle with the radial ray.

Aulorossella vanhoeffeni n. sp.

Description. The single specimen is in the form of an oval barrel-shaped thick walled sack with a well developed root-tuft. The body is 11 cm long, and 5,6 cm in diameter about the middle, and with a circular oscule 2,2 cm in diameter; the wall attains a thickness of 12 mm; the basalia all end in four-pronged anchors. The colour is grayish buff in alcohol. The greater part of the surface is uniformly smooth, and entirely devoid of pleuralia, but at the lower end are conical tubercles whence tufts of basalia emerge. Beneath the dermal surface is a network of bundles of hypodermal diactins, the meshes of which network are spanned over by the tangential rays of the autodermal pentactins. The gastral surface has a rough porous aspect.

A marked feature is the size of the hypogastral spaces supported by vertical bundles of diactine accessoria.

Spicules. The diactine principalia are slender flexible sharp-pointed diactins; very large isolated diactins occur also. The auto-dermalia have a thickly spined surface — a characteristic feature in *Aulorossella* generally.

The auto-gastralia are hexactins with thickly-spined blunt-ended rays. The calycocomes show a considerable range of variation, some having simple perianth-like end rays without capitulum, others having a central boss surrounded by end rays, and others again having a well-marked capitulum. The total diameter varies from 140—190 μ. The mesodiscohexasters, 106 μ in diameter have short primary rays 6 μ long, and 2, 3, or 4 end rays. Microdiscohexasters 47 μ in diameter,

have two lengths of end rays. Oxyhexasters 140 μ in diameter have short main rays ending in 2, 3, or 4 end rays; hemioxyhexasters and heteroxyhexactins seu monoxyhexasters rare.

Aulorossella vanhoeffeni armata nov. subsp.

There are several small specimens, the largest being in the form of an oval sack 3,1 cm long and 1,8 cm broad. The surface is beset with small conical tubercles whence arise diactine pleuralia. The hypodermal pentactins still persist, but the tangential rays are reduced to mere prongs bent down at an acute angle with the shaft.

In one example several transitional forms of hypodermal pentactins are present, i. e. one or two rays may be rather long and nearly at right angles, and the other rays short and bent at an angle. The rough spinous auto-dermalia and calycocomes are the same or nearly the same as those in the typical form.

Localities. All specimens come from 380—385 metres from near "Gauss" Station.

Diagnosis table of species of *Aulorossella*.

A. With shallow gastral cavity.
   1) *A. longstaffi* Kirkp.
B. With deep gastral cavity.
   a. With abundant oxyhexasters with long main rays and 4 thorn-like end rays, among the auto-gastralia. *A. pilosa* Kirkp.
   b. Without oxyhexasters among the auto-gastralia.
   1) With mostly pentactin autogastralia *A. levis* Kirkp.
   2) With only hexactin autogastralia *A. vanhoeffeni* n. sp.

Anoxycalyx ijimai Kirkp.

The "Gauss" collection includes a large number of specimens of this species. Kirkpatrick (Discovery Hexactinellida p. 23.) put this form among the Lanuginellinae, on account of its having strobilocomes; but the genuine strobilocomes are very minute hexasters with verticils of rays without disks, whereas the so-called strobilocomes of *A. ijimai* are macro discohexasters from 165—255 μ in diameter. It is now proposed to call these spicules with strobiloid capitulum and several verticils of disk-tipped end rays — macrostrobilocomes.

Further, the so-called graphiocomes of *A. ijimai* require a new designation; and the term "pappocome" is proposed for these spicules with their very divergent tufts of slender rays.

The large microdiscohexasters are 120 μ in diameter, and not 60 μ as stated in the "Discovery". Report, the error being due to an omission to double the measurement of the half diameter. Lastly a few rare oxy-

hexasters were found in one of the numerous specimens, hence the definition of Anoxycalyx requires to be altered from "Oxyhexasters absent" to "oxyhexasters absent or extremely rare".

The genus is now included among the Rossellinae.

Chonelasma lamella choanoides nov. subsp.

One specimen and several fragments of the new form were found, but all were in a macerated condition. One nearly complete specimen is funnel-shaped, and expanded out on one side. Spicules occur among the debris, and in one instance several autogastral pentactins which are fused into the dictyonal network, are of the same character as those of the typical form of *C. lamella*. The autogastral and autodermal pentactins have tangential rays with smooth under surface and strongly developed spines on the distal surface as in the type. All other species of Chonelasma have hexactin autodermalia and autogastralia. Accordingly there can be no doubt of the close relationship of the "Gauss" specimens with *C. lamella*.

Localities. From stations to North west of Gauss-station, from depths of 2450—3397 metres.