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THE MEDUSÆ OF THE SCOTTISH NATIONAL
ANTARCTIC EXPEDITION

BY

MR EDWARD T BROWNE

[WITH TWO PLATES.]

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X.—The Medusæ of the Scottish National Antarctic Expedition. By Edward T. Browne, Zoological Research Laboratory, University College, London. Communicated by Dr W. S. BRUCE. (With Two Plates.)

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This is a report upon the Medusæ collected by the Scottish National Antarctic Expedition during the voyage of the *Scotia* in the years 1902, 1903, and 1904, under the leadership of Dr W. S. BRUCE, to whom I am indebted for the opportunity of examining the specimens.

The collection is a small one containing twelve species, but five more species would have probably been added if only the specimens had been in a recognisable condition. Some of the specimens are in excellent condition, and these were mostly taken at the surface, but others are very much damaged. Unfortunately, the damaged specimens are just the ones wanted in good condition, as they mostly come from the Antarctic region and from the stations where the nets were sent down to a great depth. The damage is done in the nets, and other collections which have passed through my hands tell the same tale. It is the rubbing together of the sides of the net that tears the medusæ to pieces. All deep-sea nets should be so constructed that the sides of the nets cannot come together, and also provided with a large can at the end.

The following is a classified list of the species taken on this expedition :—

HYDROMEDUSÆ.

ANTHOMEDUSÆ.

- Hippocrene macloviana* (Lesson). Falkland Islands.
Willia mutabilis, Browne. Falkland Islands.

LEPTOMEDUSÆ.

- Staurophora falklandica*, n. sp. **Falkland Islands.**
Phialidium simplex, Browne. Falkland Islands.

TRACHOMEDUSÆ.

- Haliereas papillosum*, Vanhöffen, var. *antarcticum*, nov. Antarctic Ocean.
Botrynema brucei, n. g. et n. sp. **Antarctic Ocean.**

SCYPHOMEDUSÆ.

CORONATA.

- Atolla chuni*, Vanhöffen. South Atlantic.
Atolla wyvillei, Haeckel. Antarctic Ocean.

DISCOPHORA.

- Pelagia perla* (Slabber). North Atlantic.
Desmonema chierchiana, Vanhöffen. Falkland Islands.
Phacellophora ornata (Verrill). South Atlantic.
Aurelia solida, Browne. North Atlantic.

The principal interest in this collection should be in the specimens taken in the Antarctic Ocean. There is, however, a difference of opinion about the position of the northern boundary line of the Antarctic Ocean, and I consider the Falkland Islands to be outside the boundary line.

It will be seen from the above list that only three species have been taken indisputably within the Antarctic region. *Halicreas papillosum*, var. *antarcticum*, may turn out to be a new species when better specimens have been examined. The new genus *Botrynema* has a well-marked character in the arrangement of the margin of the umbrella into lobes, and the tentacles into groups. *Atolla wyvillei* had already been recorded for the Antarctic. These three species probably live at a considerable depth, and belong to the deep-sea medusæ. Amongst the unrecognisable specimens taken within the Antarctic region are a *Berœ*, and a *Pleurobrachia*, or an allied genus.

During the stay of the *Scotia* in Stanley Harbour, Falkland Islands, a new species of *Staurophora* was secured, very much like the North Atlantic species, and also a fine specimen of *Desmonema chierchiana*, which I have but little doubt has been described under several other names, and is a common Cyaneid of the Magellan Straits and the Falklands. In the large bottle containing the *Desmonema* were some macerated specimens of *Hippocrene macloviana*, *Willia mutabilis*, and *Phialidium simplex*, all of which are common medusæ in Stanley Harbour.

The occurrence of *Phacellophora ornata* in the South Atlantic is of geographical interest, as it has only been previously recorded from Eastport (Maine, U.S.A.), on the North Atlantic coast of America. The finding of *Aurelia solida* at a mid-North Atlantic station is also of interest, because quite recently it was described as a new species from the Indian Ocean.

HYDROMEDUSÆ.

ANTHOMEDUSÆ.

Family MARGELIDÆ.

Hippocrene macloviana (Lesson), 1829.

Hippocrene macloviana, Hæckel, 1879, p. 103, Taf. v. fig. 1-2; Browne, 1902, p. 278.

Station.—Stanley Harbour, Falkland Islands, 7th January 1903.

Two adult specimens in a macerated condition were found in the bottle containing *Desmonema chierchiana*.

H. macloviana is a very common medusa in Stanley Harbour, and has not been recorded from any other locality.

Family WILLIDÆ.

Willia mutabilis, Browne, 1902.

Willia mutabilis, Browne, 1902, p. 280.

Station.—Stanley Harbour, Falkland Islands, 7th January 1903.

A single specimen in bad condition was found in the bottle containing *Desmonema*. This was one of the new species collected by Mr R. VALLENTIN in Stanley Harbour during 1898–1899.

LEPTOMEDUSÆ.

Family LAODICEIDÆ, L. Agassiz, 1862.

Character of the Family.—Leptomedusæ with cordyli, commonly called sensory clubs, on the margin of the umbrella. (BROWNE, 1907.)

Staurophora, Brandt, 1835.

Generic Character.—Laodiceidæ with four radial canals; with a narrow cross-shaped stomach, and mouth extending across the sub-umbrella; with ocelli on the basal bulbs of the tentacles. (BROWNE, 1907.)

Staurophora falklandica, nova species. (Plate I. figs. 1–8.)

Station.—Stanley Harbour, Falkland Islands, 7th January 1903.

The collection contains a single specimen, which is in fairly good condition, but rather damaged in places on the margin of the umbrella.

Description.—The umbrella is very thin, and measures 90 mm. in diameter when completely flattened out. Its natural shape would probably be something like a shallow watch-glass. The velum is extremely narrow for the size of the umbrella, about 1 mm. in width, and is in an almost rudimentary condition.

The stomach forms a large perradial cross, which extends nearly to the margin of the umbrella, and consequently the true radial canals are very short, about 6 mm. in length. The mouth is of the same length as the stomach, and has its margin arranged in a complicated series of folds. The gonads (male) extend along the whole length of the stomach, forming a close series of deep folds (fig. 5). This folding of the lateral walls of the stomach frequently gives rise to small pockets, which are probably receptacles for the digestion of food.

The principal tentacles (fig. 4) are very numerous (several hundred), closely packed together round the margin of the umbrella. Between every two tentacles there is usually a very small tentacle, somewhat similar to the large tentacles in shape, but not so fine and slender as a typical cirrus.

Between every large and small tentacle, there is generally a long cordylus, commonly called a sensory club (figs. 2 and 3). On the inner side of the basal bulbs of the large tentacles, and very close to the velum, there is usually one black ocellus, but it is frequently broken up into two or three smaller pigment spots.

LINKO has found in *Staurophora arctica* minute ectodermal sensory vesicles, which are situated above the velum at its juncture with the umbrella. I have searched for sensory vesicles in this specimen, and have failed to find the slightest trace of one. Transverse sections of the umbrellar margin show a small cavity in the ectoderm in the same position as LINKO's sensory vesicles. This cavity, however, runs through a series of over three hundred thick sections, so that it is not likely to be a sense-organ with otoliths, but it looks more like a breakage in the ectodermal layer.

Staurophora falklandica bears a strong resemblance to *S. laciniata*, L. Agassiz, which is found in the North Atlantic, on the coasts of North America and North Europe. The latter species has alternating series of long and short tentacles, but the difference in size is very slight, and both series have ocelli. In the Falkland specimen there is a considerable difference in the size between the two kinds of tentacles (fig. 4). The very small ones are all about the same size and are without ocelli. They have the appearance of rudimentary tentacles. It is rather a risky point, I admit, on which to base the character of a new species, as there is the probability of the small tentacles developing into full-sized tentacles with ocelli.

Family EUCOPIDÆ.

Phialidium simplex, Browne, 1902.

Phialidium simplex, Browne, 1902, p. 282.

Station.—Stanley Harbour, Falkland Islands, 7th January 1903.

A single adult specimen in bad condition of this species was found in the bottle containing *Desmonema chierchiana*.

It was one of the new species in MR VALLENTIN'S collection from Stanley Harbour.

TRACHOMEDUSÆ.

Family HALICREIDÆ, Fewkes, 1882.

Vanhöffen, 1902; Maas, 1906.

Character of Family (MAAS, 1906).—Trachomedusæ with numerous tentacles differing in size, arranged in a single row; with eight very broad radial canals; with a thick umbrella often provided with outgrowths (with a wide, thin-walled tubular stomach).

Genus *Halicreas*, Fewkes, 1882.

Generic Character (MAAS, 1905).—Trachomedusæ with very numerous tentacles (more than fifteen in an octant), which by their unequal sizes show different times of appearing; with a long tubular mouth; with eight perradial outgrowths of jelly near the margin of the umbrella.

Halicreas papillosum, Vanhöffen, var. *antarcticum*, nov.

Halicreas papillosum, Vanhöffen, 1902, p. 68, Taf. ix. fig. 7-8, Taf. xi. fig. 30;
Maas, 1905, p. 57, Taf. x. fig. 70, Taf. xi. fig. 71.

Station 413, lat. 72° 02' S., long. 23° 40' W. Vertical net, 0-1000 fathoms. 15th March 1904.

Two specimens belonging to the genus *Halicreas* were taken at this station, and both are unfortunately in very bad condition.

Specimen No. 1.—The umbrella is about 30 mm. in diameter, and is quite flattened out. On the ex-umbrella, at a short distance above the margin, there are eight clusters of papillate processes in the radii of the radial canals. In shape and size these clusters resemble the papillate processes of *Halicreas papillosum* (Vanhöffen, 1902, Taf. ix. fig. 7-8). There are, however, one or two isolated processes in most of the radii, just above the principal cluster.

The stomach has been completely torn out, and not even a trace of it remains. The radial canals have nearly all shared the fate of the stomach, but two have been fairly well preserved from destruction, and are very broad. There are indications of six more canals.

Only the lower parts of the gonads remain on four of the radial canals. The gonads lie in groove-like depressions of the sub-umbrella, and do not extend to the margin of the umbrella. The radial canals and gonads are whitish in formalin. On the surface of the sub-umbrella, somewhere about the periphery of the stomach, there are eight semi-globular projecting lumps of jelly, one between every two radial canals.

The margin of the umbrella is in bad condition, and only the basal stumps of the tentacles, partly embedded in the margin of the umbrella, now remain. The stumps show that the tentacles are very numerous.

Specimen No. 2.—This specimen is much smaller than the one described above, and looks like a contorted mass of jelly. It shows the eight clusters of papillate processes near the margin of the umbrella, and the eight semi-globular projections on the sub-umbrella. It is, however, an important specimen, because it shows that the top of the umbrella is capped by a small, low, somewhat spherical lump of jelly, which is studded with about nine small, somewhat conical processes, or tubercles. They closely resemble the marginal processes in shape and size, but are more isolated, being spread over a larger area. In the largest specimen a rather oval cap with about three or more

processes is delineated on the top of the umbrella, which has been squeezed flat by pressure in the net.

The first specimens of this genus were described by FEWKES, 1882, under the name of *Halicreas minimum*. These were taken in the North Atlantic off the coast of the United States, between lat. 38°–39° N. and long. 68°–71° W., and at a considerable depth. As all the specimens were in very bad condition, FEWKES's description and figures are consequently of little scientific value. He succeeded, however, in establishing the genus, but not the species.

It was left to VANHÖFFEN to give the first adequate description of a *Halicreas* (*H. papillosum*), which he illustrated by beautiful figures. His specimens were taken on the voyage of the *Valdivia*, at many stations off the western coast of Africa between the Canary Islands and Cape Town, and the species was again found widely distributed over the warm regions of the Indian Ocean. Its chief habitat is apparently the tropical regions of the Atlantic and Indian Oceans, and although once taken at 300 fathoms, it evidently prefers to live below 500 fathoms. In the Atlantic *H. papillosum* was not found north of lat. 25° N., and its southernmost range in both oceans was not beyond lat. 35° S.

The geographical range of this species is important, and the southern boundary appears to have been fairly well fixed by the *Valdivia*. This ship, after leaving Cape Town, went to Bouvet Island, and then as far south as lat. 64°, off Enderby Land, returning across the Indian Ocean, *via* Kerguelen and New Amsterdam, to Sumatra. Although nets were used at many stations and at great depths, yet this species was not once found south of lat. 35° S.

The *Scotia* specimen was taken in lat. 72°, not far off the Antarctic continent, which is very far outside the geographical range of *H. papillosum*. It is mainly for the sake of geographical distribution that I have decided to establish a new variety, which may attain the rank of a species when better specimens have been obtained. At present the *Scotia* specimens can only be distinguished from those of VANHÖFFEN by the presence of a group of tubercles on the summit of the umbrella.

MAAS has also described and figured *Halicreas papillosum* from specimens obtained by the *Siboga* expedition to the East Indian Archipelago. Some of his specimens have a cone-shaped process on the summit of the umbrella, in which they agree with VANHÖFFEN's *H. papillosum*; but some have an ordinary plain rounded umbrella, without any ornamentation on the summit. These latter agree with FEWKES' description of *H. minimum*, but FEWKES' specimens were in worse condition than those of the *Scotia*.

VANHÖFFEN has placed in the genus *Halicreas* two other species (*H. glabrum* and *H. rotundatum*) which have not got the marginal groups of tubercles. MAAS' definition of the genus would exclude these two species, as he restricts the genus to species with marginal tubercles. I certainly agree with MAAS in regarding the marginal tubercles as a generic character. It is most probable that more than one

species of *Halicreas* will be ultimately found to possess this character. I cannot call to mind any other kind of medusa possessing tubercles in a similar position, and they are certainly a most useful aid in the identification of specimens in bad condition.

Botrynema, novum genus.

Generic Character.—Trachomedusæ with sixteen groups of tentacles (two groups containing many tentacles in a single row in each octant) and eight solitary perradial tentacles (without perradial tubercles or outgrowths of jelly near the margin of the ex-umbrella).

The characteristic feature of this new genus is the arrangement of the tentacles into distinct groups or clusters; hence the generic name. I think less confusion will be produced by introducing a new genus based upon the above character, than by trying to emend an old genus and regarding this character as a specific one. The placing of the new genus *Botrynema* in the family Halicreidæ, as emended by MAAS, is provisional. Until better specimens showing the shape of the tentacles and the structure of the sense-organs can be obtained, the position of this genus among the Trachomedusæ must remain doubtful.

Botrynema brucei, nova species. (Plate I. figs. 8–9; Plate II. fig. 1.)

Station 301, lat. 64° 48' S., long. 44° 26' W. Trawl, 0–2485 fathoms. 13th March 1903.

The collection contains only one specimen which is in fairly good condition, except for the margin of the umbrella.

Description.—The umbrella is very thick, about as broad as high, 25 mm., with a conspicuous conical projection on its summit. **The velum is very broad.** The stomach is circular, about 9 mm. in diameter, and its centre is partly filled with a semi-globular projecting mass of jelly. The mouth is large and circular, owing to the thin wall of stomach being contracted back. There are eight broad radial canals, and a very broad circular canal. The gonads are shield-shaped and occupy the central part of all the radial canals. They are in rather a macerated and torn condition, and have the appearance of immature male gonads.

The tentacles (fig. 1) have all been broken off close to the margin of the umbrella, but their basal ends remain partly embedded in the ex-umbrella. There are eight percanal (perradial) solitary tentacles and sixteen groups of tentacles. The eight solitary percanal tentacles are in a deep groove or furrow, which extends about 2 mm. over the margin of the umbrella. These tentacles are probably directed upwards, and those in the groups directed downwards. *Halicreas papillosum* has eight percanal tentacles which are very much larger (though similar in structure) than the tentacles which line the margin of the umbrella between the radial canals.

The margin of the umbrella of *Botrynema* is divided into sixteen small lobes which are separated by furrows. There are eight percanal furrows, in which are situated the solitary tentacles, and eight inter-canal furrows, smaller in size and without tentacles. Upon each of the sixteen lobes are attached the basal ends of a group of tentacles, about twelve in number, arranged in a single row and in a definite order of growth. The basal ends of the tentacles vary in length and in size, indicating that the tentacles are of different lengths, which is no doubt due to differences in age. In fig. 1 the longest basal ends are nearest to the percanal tentacle, but in some of the other groups the shortest basal end occupies this position. It was in only one of the intervals between the groups of tentacles that very minute basal ends of tentacles were seen. They are indicated in the figure, and are evidently of much later growth than the tentacles on the lobes. *Gossea corynetes* (Petasidæ) has eight distinct groups of tentacles, and in the fully grown adult a few minute tentacles make their appearance, long after the other tentacles, in the vacant space between the groups.

The margin of the umbrella was carefully searched over for sense-organs, and none were seen; but the margin is by no means in good condition, so that the absence of sense-organs is not surprising. The specimen is in formalin, and the colour of the principal organs is whitish. There is no trace of any red or reddish-brown pigment.

I have much pleasure in naming this species after Dr WILLIAM S. BRUCE, the leader of the Scottish National Antarctic Expedition.

SCYPHOMEDUSÆ.

CORONATA.

Family ATOLLIDÆ.

Atolla chuni, Vanhöffen, 1902.

Atolla chuni, Vanhöffen, 1902, p. 12, Taf. i. fig. 1-2, Taf. v. fig. 26.

Station 450, lat. 48° S., long. 9° 50' W. Trawl, 1332 fathoms. 12th April 1904.

The collection contains one specimen, which evidently got damaged in the trawl. The mouth, stomach, and gonads are partly torn away, but the margin of the umbrella is in fairly good condition.

This species was first found by the *Valdivia* expedition, and has been beautifully figured by VANHÖFFEN. Two specimens were taken by the *Valdivia* between the Cape of Good Hope and Bouvet Island (lat. 42° S., long. 14° E.) in a vertical net at 1500 metres (821 fathoms), in the Antarctic current with a temperature of 0°·8 C.

Atolla chuni is distinguished from the other species of the genus by the presence

of warts (*Gallertperlen*) on the marginal lobes. In the *Scotia* specimen the warts are quite conspicuous upon the lobes. Some of the lobes have nine warts (four on each side and one in the middle), agreeing in number, position, and size with VANHÖFFEN'S description. Many lobes, however, have only seven warts (three on each side and one in the middle), and as the two smaller uppermost warts are the missing ones, these lobes are probably at an earlier stage in development. The central wart was missing in two lobes—perhaps an instance of variation.

There are twenty-four tentacles and twenty-four sense-organs. The gonads are completely torn away in places, and only two perfect and two imperfect sacs remain. There is sufficient evidence to show that the genital sacs form very nearly a complete ring. Two of the sacs are close enough to touch each other, and others show only a very slight separation.

Measurements.—(The specimen is rather flattened out.) Diameter of the central disc, 23 mm. Diameter of the muscle-band, 35 mm. Diameter of the stomach, 16 mm. Length and width of pedalia, 3·5 mm.

Atolla wyvillei, Haeckel, 1880.

Atolla wyvillei, Haeckel, 1880, p. 488; Haeckel, 1881, p. 113, pl. xxix.; Vanhöffen, 1902, p. 13, Taf. v. fig. 22.

Station 413, lat. 72° 02' S., long. 23° 40' W. Vertical net, 0–1000 fathoms. 15th March 1904.

At this station was taken an *Atolla* which is in very bad condition. Its stomach and gonads are completely gone, and the umbrella is flattened out.

The periphery of the central disc is distinctly divided into large lobes, and the radial furrows separating the lobes are rather broad. The furrows resemble those in VANHÖFFEN'S figure of *Atolla wyvillei* much more than those in the one he gives of *A. verrilli*. It is upon the shape of the furrows that I have decided to call the specimen *A. wyvillei* rather than *A. verrilli*. There are twenty-two tentacles, and the marginal lobes are without warts. The pedalia have a slight longitudinal furrow. As the diameter of the muscle-band is only 25 mm., the specimen is about half-grown.

Atolla wyvillei was first found by the *Challenger* expedition at the depth of about 2000 fathoms. Three specimens were taken about midway between the Kerguelen Islands and Melbourne (lat. 53° S., long. 108° E.), and two specimens in the South Atlantic Ocean off the coast of Patagonia (lat. 42° S., long. 56° W.). The *Valdivia* expedition secured a specimen south-east of Bouvet Island (lat. 56° S., long. 14° E.) in a vertical net down to 1500 metres (821 fathoms), and another specimen off Kemp Land (lat. 63° S., long. 57° E.) in a dredge down to 4600 metres (2517 fathoms).

DISCOPHORA.

Family PELAGIIDÆ.

Pelagia perla (Slabber), 1775.

Station 542, lat. 37° 56' N., long. 29° 11' W. 4th July 1904.

Station 543, Fayal Harbour, Azores. Surface. 5th July 1904.

Station 544, lat. 39° 15' N., long. 26° 55' W. (north of the Azores). Surface. 7th July 1904.

Fourteen specimens were taken in Fayal Harbour. The smallest is about 50 mm. in diameter, and the largest about 75 mm. The umbrella is about twice as broad as high, and externally covered with large elliptical warts. The marginal lobes are quadrilateral, with rounded corners, a little broader than long. The oral arms are about twice the length of the radius of the umbrella, and the œsophagus about two-thirds the length of the radius.

Eighteen specimens were collected at the station north of the Azores. They are all young stages, about 20–30 mm. in diameter, and have roundish warts on the ex-umbrella. At *Station* 542 a single specimen in very bad condition was taken.

There is probably only one species of *Pelagia* in the North Atlantic, though six have been described.

Family CYANEIDÆ.

Desmonema, L. Agassiz, 1862.

This genus was established by L. AGASSIZ for the reception of *Chrysaora gaudi-chaudi*, Lesson, which was first discovered during the voyage of the *Coquille* in Soledad Bay, Falkland Islands, and also near Cape Horn. At the same time AGASSIZ made another new genus called *Couthouyia*, of which only a very brief account was given. HÆCKEL emended the definition of the genus *Desmonema* so as to include *Couthouyia*, and added three species, namely, *Couthouyia pendula*, L. Agassiz; *Cyanea imporcata*, Norman; and a new species called *Desmonema annasethe*. According to HÆCKEL's definition, *Desmonema* differs from *Cyanea* in having the tentacles arranged in a single row instead of in several rows.

VANHÖFFEN a little later also emended the genus, and rejected HÆCKEL's distinction as to the arrangement of the tentacles, on the ground that *Cyanea* passes through a stage with the tentacles arranged in a single row. VANHÖFFEN's definition of the genus *Desmonema* is based upon AGASSIZ's brief description of *Couthouyia pendula*, and the genus therefore should have been called *Couthouyia*. According to VANHÖFFEN, *Desmonema* differs from *Cyanea* in possessing twenty-four marginal lobes. In *Desmonema* the tentacular lobes are not divided as in *Cyanea*. The gonads are shorter and do not hang down so far as those of *Cyanea*, and the oral arms taper from a broad

base. VANHÖFFEN places three species in the genus, the two old ones, *D. pendula* from Tierra del Fuego, *D. gaudichaudi* from the Falklands and from near Cape Horn, and a new species called *D. chierchiana* found at Punta Arenas in the Straits of Magellan. This last species has been fully described and well figured, but I am able to add a further account after the examination of five specimens in different stages of development found in Stanley Harbour, Falkland Islands. It will be noticed that the above three species are inhabiting the same region, and I have but little doubt that they all belong to one species, which, in accordance with the law of priority, should be called *Desmonema gaudichaudi* (Lesson).

The description of *Chrysaora gaudichaudi* by LESSON is incomplete, and is based upon an abnormal specimen with twelve groups of tentacles instead of the normal eight. Consequently the shape and size of the marginal lobes would differ from those of the normal type. AGASSIZ'S description of *Couthouyia pendula* is practically a generic one, but he does state that the oral arms are of an extraordinary length.

VANHÖFFEN points out that *Desmonema chierchiana* is distinguished from *D. gaudichaudi* by shorter oral arms. The largest specimen in the *Scotia* collection shows that *D. chierchiana* has much longer arms than those mentioned by VANHÖFFEN. The length and size of the oral arms are of little use for a specific character, on account of their great power of expansion and contraction. VANHÖFFEN also points out that the shape and size of the marginal lobes of *D. chierchiana* differ from those of *D. gaudichaudi*. It must be remembered that LESSON'S specimen was an abnormal one. The marginal lobes of the *Scotia* specimens are not quite like those of VANHÖFFEN'S Punta Arenas specimens, the difference being probably due to variation and not to a different geographical race.

VANHÖFFEN lays a certain amount of stress on the gonads of *Desmonema* being smaller than those of *Cyanea*, and not hanging down so far. The largest specimen in the *Scotia* collection has much larger gonads than VANHÖFFEN'S specimen, and they are just like the gonads of *Cyanea capillata*.

I rather think that the specific character of *D. chierchiana* lies in the arrangement of the tentacles in practically a straight row, adjacent to the distal edge of the circular muscles. Concomitant with the straight row of tentacles are the undivided tentacular lobes, and the absence of radial muscles in the marginal lobes. The tapering of the oral arms may also come in as a useful aid for the determination of the species. The ultimate fate of *Desmonema* as an independent genus depends upon the revision of the genera and species of the Cyaneidæ. MAAS (1904) has also commented upon the relationship of *Desmonema* and *Cyanea*, and the necessity for a revision of the species.

Desmonema chierchiana, Vanhöffen, 1888. (Plate II. fig. 2.)

Desmonema chierchiana, Vanhöffen, 1888, p. 17, Taf. i. fig. 4.

? *Chrysaora gaudichaudi*, Lesson, 1830, p. 114, pl. xiii. fig. 1.

? *Desmonema gaudichaudi*, L. Agassiz, 1862, vol. iv. p. 166.

? *Desmonema gaudichaudi*, Haeckel, 1880, p. 527.

? *Couthouyia pendula*, L. Agassiz, 1862, vol. iv. p. 118, p. 163.

? *Desmonema pendula*, Haeckel, 1880, p. 528.

Station.—Stanley Harbour, Falkland Islands, 7th January 1903.

The *Scotia* brought home three specimens, the largest of which is in splendid condition, but the other two are not quite perfect. The large collection of medusæ made by Mr RUPERT VALLENTIN in Stanley Harbour during the summer of 1898–1899 is still in my possession, and it contains two early stages of this species in excellent condition. At the time when I examined Mr VALLENTIN'S collection I was unable to identify these young stages, as they were just too young to show clearly the generic characters. By the aid of the *Scotia* specimens I have now been able to identify them, and the five specimens form a nice series showing different stages in development.

Specimen A (VALLENTIN Coll.).—This specimen is the youngest of the series, and its development has not proceeded very far beyond the *Ephyra* stage.

The umbrella is very thin and flat, measuring about 14 mm. in diameter. The ex-umbrella has scattered over its surface numerous small clusters of nematocysts, which are most prominent and conspicuous on the marginal lobes. The stomach is circular, about 9 mm. in diameter, and has sixteen radiating pouches which are separated from each other by radial septa. Eight of the pouches are opposite sense-organs, and eight opposite the groups of tentacles. Within the stomach are four interradial bundles of gastric filaments. From the mouth hang down four oral arms, which are a little longer than the radius of the umbrella. They have the appearance of four large lips folded along the centre. Their external surface is closely covered with small warts containing nematocysts.

There are eight adradial groups of tentacles, each group containing one long tentacle and four to six minute tentacles or tentacular buds. The presence of one long tentacle in each group indicates that in an earlier stage only eight tentacles are present. The tentacles are within the margin of the umbrella, adjacent to the distal edge of the gastral pouches. There are eight tentaculocysts (rhopalia), four perradial and four interradial.

The margin of the umbrella is divided into sixteen lobes or lappets by eight deep clefts leading to the sense-organs, and by eight clefts, not quite so deep, which occur in the middle of the tentacular lobes (the lobes opposite the groups of tentacles). At this stage, however, each marginal lobe is composed of one ocular and half a tentacular lobe. Later on this cleft in the middle of the tentacular lobes becomes obliterated. The marginal lobes have a definite series of canals connected with the pouches of the stomach. **The canal system will be described in the next stage.**

Specimen B (Valentin Coll.).—The umbrella is fairly thin and flat, measuring about 25 mm. in diameter, and is very pellucid in formalin.

The stomach is about 15 mm. in diameter, with sixteen radial pouches. The tentacular pouches are a little broader than the ocular ones. The oral arms are about twice as long as the radius of the umbrella.

The tentacles show an increase in number and in size. In each group the central tentacle is very conspicuous by its great length (fig. 2). It is at least six times as long as the other tentacles. Each group contains about three to six tentacles and about six tentacular buds.

The cleft in the middle of the tentacular lobe has nearly disappeared (fig. 2), and the ocular lobes are just marked off by a slight incurving of the margin. Each ocular lobe has a broad canal which gives off a number of short lateral branches, which in this stage are just beginning to develop. The tentacular lobes have a number of canals, one between every two tentacles. These canals in the later stages have each a series of bifurcations.

Specimen C (Scotia Coll.).—The umbrella is moderately curved and is fairly thick, measuring 50 mm. in width and 20 mm. in height.

The stomach is circular, about 25 mm. in diameter, with sixteen radiating pouches. The width of the tentacular pouches at their distal end is about 10 mm., and the ocular pouches about 7 mm. The oral arms are in a damaged condition. The width between the pillars of the arms, measured across the oval where the gonads are just beginning to show, is 11 mm., and the width of the pillar is 3 mm. at its narrowest point.

There are eight groups of tentacles arranged in a straight single row. Each group consists of twelve to fifteen tentacles, with the largest in the middle. The large tentacles are all in a broken condition.

The cleft in the middle of the tentacular lobes has practically disappeared. The ocular lobes are slightly more prominent, projecting further out than the tentacular lobes. The canal system is of the same pattern as in specimen B, but the branches have more bifurcations.

Specimen D.—The umbrella is fairly thick, about 80 mm. in width and 40 mm. in height. Clusters of nematocysts are closely scattered over the ex-umbrella and the marginal lobes, but the warts are absent, so that the surface looks quite smooth.

The stomach measures about 35 mm. in diameter. The width of the tentacular pouches at the distal end is about 18 mm., and the ocular about 12 mm. This specimen is in a damaged condition, having lost its oral arms, gonads, and tentacles. The distance between the pillars of the oral arms is about 15 mm. There are indications of twelve to fourteen tentacles in each of the eight groups.

The ocular and tentacular lobes are united into one large lobe with an even margin. The marginal distinction between the lobes has become obliterated, and the medusa has the appearance of possessing eight broad marginal lobes which are separated from each other by the deep ocular clefts. But owing to the incurving of the margin of the

umbrella its margin appears to be deeply lobated. Upon the periphery of the ex-umbrella there are sixteen deep radial furrows, in line with the sixteen radial septa which divide the pouches of the stomach. It is along these furrows that the folding takes place, dividing the margin into sixteen broad folds, each of which is again subdivided by the eight ocular clefts, and by an indentation in the middle of the tentacular lobes. On straightening out the margin of the umbrella all these folds disappear, and one then sees the true lobation of the margin.

Specimen E.—This specimen is the largest in the *Scotia* collection, and as it is in excellent condition full details are given.

The umbrella is rather flat, and has probably flattened out in the jar owing to the pliability of the jelly. It measures about 160 mm. in diameter with the marginal lobes folded inwards. For the size of the umbrella the jelly is not very thick.

The stomach is circular in outline, about 75 mm. in diameter, with sixteen radial pouches. The tentacular pouches are 35–40 mm. in width at their distal margin, and the ocular about 25–30 mm. The circular muscle-bands of the sub-umbrella are upon the lower wall of the pouches, and are separated radially by sixteen furrows which correspond in position to the septa of the gastral pouches. I have not been able to find any radial muscle-bands on the sub-umbrella or the marginal lobes.

The four oral arms are about 350 mm. in length, and are probably capable of extending to a much greater length. Along the whole length of each arm runs a double frill. These frills are very broad near the mouth and gradually decrease in width towards the distal end of the arms, and give to the arms a long, slender appearance. The width of the pillars of the arms is 7–8 mm. across the narrowest part.

The four gonads are similar in position and shape to those of *Cyanea capillata*. They hang down in clusters from between the bases of the oral arms, and are much larger than the gonads of the specimen figured by VANHÖFFEN. As the medusa lies flat in the dish the gonads extend about half way across the circular muscles. The ova are quite small and immature, so that in a fully ripe condition the gonads should be much larger in size. The genital openings between the oral arms are oval in shape and measure nearly 40 mm. in length.

There are eight groups of tentacles arranged in a straight single row, adjacent to the outer edge of the circular muscles. The largest tentacles are in the middle of the group and the smallest on either side. They are like long threads with a dark reddish endoderm, and externally covered closely with roundish warts containing nematocysts. The number of tentacles in each group is as follows: 20, 21, 19, 17, 18, 20, 21, 19.

The eight sense-organs are quite simple in their construction. The tentaculocyst in the early stages lies in a rather broad U-shaped groove, which is partly covered on the sub-umbrella side by the margins of the two ocular lobes. In the adult stage, owing to the increase in the size of the ocular lobes, the groove is longer and is completely covered by the ocular lobes. A canal from the pouch of the stomach runs in the roof of the groove, and at its distal end is situated a small tentaculocyst, about twice

as long as broad, containing concretions. On the wall of this canal near the tentaculo-cyst a small roundish swelling is present in the earlier stages, and a long ridge-like swelling in the adult. **It is probably a sensory pad.**

The medusa as it lies on its back in a basin, with the margin of the umbrella folded inwards, shows very clearly the sixteen radial furrows on the periphery of the ex-umbrella. These furrows are lines of weakness, for they reduce the thickness of the marginal jelly. In two places the ocular lobe is completely isolated from the tentacular lobe, the tearing asunder taking place along the furrow. The folding of the incurved margin is similar to that described for specimen D.

The tentacular lobes measure 55 mm. in breadth, and are about two and a half times as broad as the ocular lobes. **Their length is about 30 mm.** In this specimen the length of the tentacular and ocular lobes is about the same. In VANHÖFFEN'S specimen the ocular lobes are a little shorter than the tentacular. In most of the octants there is no indentation between the tentacular and ocular lobes; an even margin extends from one ocular cleft to another. But in two places there are natural indentations between the ocular and tentacular lobes, very much like the indentations drawn by VANHÖFFEN. Evidently there is a fair range of variation in the shape and size of the marginal lobes, and taken by themselves they are not a specific character. The marginal lobes and the surface of the ex-umbrella are quite smooth. Apparently the warts conspicuous on the lobes in the early stages disappear before the medusa reaches the adult state.

The arrangement of the canals in the marginal lobes is similar to that in the earlier stages, but there are more bifurcations. The canal system has been well illustrated in VANHÖFFEN'S figure.

In Mr VALLENTIN'S manuscript notes I have found several references to *Desmonema* in Stanley Harbour, from November 1898 to February 1899. During November large and small specimens were very abundant, the largest being about 1 foot (300 mm.) in diameter. At the end of December specimens up to 2 feet (600 mm.) in diameter were abundant. Records show that large specimens were present in considerable numbers during January and February. On 6th February thousands were stranded on the shore after a strong wind.

Family ULMARIDÆ.

Phacellophora ornata (Verrill, 1869). (Plate II. figs. 3-4).

Callinema ornata, Verrill, 1869, p. 116.

Callinema ornata, Fewkes, 1888, p. 234, pl. vi.

Phacellophora ornata, Haeckel, 1880, p. 643.

Phacellophora ornata, Vanhöffen, 1906, p. 59, figs. 25-26.

Station 98, lat. 34° 2' S., long. 49° 7' W. **Surface.** 28th December 1902.

A single specimen was taken at this station, which is about five degrees east of Montevideo. It is unfortunately damaged, having completely lost the oral arms.

In the *Voyage of the Scotia*, a book which gives an interesting and popular account of the work done by the Scottish National Antarctic Expedition, there is an allusion to this medusa: "On the 28th, in $33^{\circ} 51' S.$, $48^{\circ} 48' W.$, we crossed a great yellow band of gelatinous scum stretching from horizon to horizon. It proved to consist of microscopic algæ (Desmidæ) closely allied to the diatoms, and in the scum were numbers of Portuguese men-of-war (*Physalia*), Jelly-fish (*Aurelia*), Ctenophores, and other organisms." The specimen was labelled *Aurelia* sp.

Description.—The umbrella has flattened out, and as it lies in the dish it is about five times as broad as high. The diameter, measured across to the circular canal, is about 120 mm. The central portion of the ex-umbrella is slightly raised and is covered with small warts, which are quite visible to the naked eye. The periphery of the umbrella is quite smooth. The base of the stomach is small for the size of the umbrella, measuring only 30 mm. in diameter. The oral arms have disappeared, and only broken stumps remain.

From the stomach to the circular canal run forty-two broad radial canals. The canals in the radii of the sense-organs are branched; the branching is rather irregular, and there is a tendency to anastomosis (fig. 3). The canals in the radii of the tentacles are unbranched, with somewhat irregular outlines.

The margin of the umbrella is not quite perfect, but nine sense-organs are present, and the number of branched radial canals indicates that two sense-organs are missing. The tentacles are arranged in a single row along the outer edge of the circular canal. The row is broken by the sense-organs so that groups are formed.

The character of the genus *Phacellophora* is the presence of sixteen sense-organs, by which it is distinguished from *Sthenonia* with eight sense-organs. The *Scotia* specimen has eleven sense-organs and eleven groups of tentacles, and it is evident from the irregular distribution of the sense-organs that the specimen is an abnormal one. In two places on the margin the sense-organs are very close together, with just a few tentacles between them.

There are twenty tentacles in the largest group, and a very small tentacular bud lies between every two tentacles. The tentacles are all about the same size and have a well-marked character. They have the appearance of long, tapering threads of clear jelly, with a thin whitish line along the outer side. On applying higher magnification one sees that the tentacle has a canal running along its whole length. This canal in the basal portion of the tentacle is very large, forming a large hollow cavity; but it quickly decreases in size until it becomes a very tiny tube, which is perhaps solid towards the distal end, running not in the centre of the tentacle, but close against the outer side (fig. 4). It is only the basal portion of the tentacle that is really hollow, and the canal is a rudiment of an axial endodermal cavity. Along the outer side of the tentacle runs a double row of warts, which are loaded with nematocysts. There are no muscle-fibres visible in the tentacles.

The ocular lobes (fig. 3) on the margin of the umbrella are thick, being flat on the

inner side and rounded on the ex-umbrellar side. They are about 12 mm. in length and 6 mm. in width, having the outer edge with rounded corners, and are separated from the tentacular lobe by a slight marginal cleft. Along the centre of each ocular lobe runs an unbranched canal.

The tentacular lobes are about as long as the ocular lobes, and have an undulating margin. These lobes correspond in number and width with the groups of tentacles. Each lobe has a few isolated canals which are in connection with the circular canal. Some of these canals are slightly bifurcated at the distal end.

This specimen agrees very well with FEWKES' description and figures of *Callinema ornata* so far as the canal system, sense-organs, tentacles, and marginal lobes are concerned. *Phacellophora ornata* up till now has only been taken in one locality, namely, at Eastport, on the coast of Maine, U.S., in the North Atlantic. VERRILL obtained three specimens, and many years later FEWKES secured another.

Aurelia solida, Browne.

Aurelia solida, Browne, 1905, p. 960, pl. xciv.

Station 539, lat. 33° 53' N., long. 32° 27' W. Surface. 1st July 1904.

Four specimens were taken at this station, which is about 15 degrees west of Madeira. Two are in very good condition, and two have a dilapidated umbrellar margin. My original description of *Aurelia solida* was based upon a single specimen obtained by Mr STANLEY GARDINER during his expedition to the Maldive and Laccadive Archipelagoes. I was certainly surprised to find this species from a mid-North Atlantic station in the *Scotia* collection. The occurrence of this *Aurelia* in the Indian Ocean and the North Atlantic shows a very wide geographical range, and it is most probable that the species has been taken long ago and recorded under another name. But none of the descriptions and figures of the numerous species of *Aurelia* show the characters of this medusa. It is certainly not *Aurelia aurita*, neither can it be regarded as a variety of that species.

Description.—The umbrella is hemispherical, about twice as broad as high, and thick. The four specimens are about the same size, 55–60 mm. in width, and smaller than the Maldive specimen, which measured 80 mm. in width. The ex-umbrella is covered with small circular clusters of nematocysts.

The mouth is cross-shaped and formed by four thick, somewhat triangular segments, which are about 20 mm. in length. The four segments are interradial and separated from one another. The mouth has the appearance of a cone-shaped lump of jelly cut longitudinally into four equal segments, and the four pieces placed together again. Along the outer edge of each segment runs a short frill, which at the base grows out to form the oral arm, which extends a little way beyond the margin of the umbrella.

The radial canals show a certain amount of variation, especially in the interradial series, and a slight amount of anastomosis takes place near the margin of the umbrella.

The sense-organs are exactly like those described in the Maldive specimen. The tentaculocysts are at right angles to the margin of the umbrella, pointing towards the ex-umbrella, and stand in a kind of alcove which is at the end of a deep groove open on the dorsal or ex-umbrellar side. It is by the position and structure of the sense-organ that this species can at once be distinguished from *Aurelia aurita*.

The subgenital cavities are nearly circular, and have a fairly thick covering, with a small circular aperture about 2 mm. in diameter. They are similar in shape to those of the Maldive specimen, but are not so prominent and have not such a thick external wall. The gonads form oval or horse-shoe-shaped bands. They have not reached maturity.

Jelly-fishes in an unrecognisable condition were taken at the following stations:—

Station 325, Scotia Bay, South Orkneys, 25th March 1903. "Fragments of a *Beröe*."

Station 414, lat. 71° 50' S., long. 23° 30' W.; 0-1000 fathoms. Vertical net. One Trachomedusa. Fragments of the umbrella of a Scyphomedusa. One specimen of a large *Pleurobrachia*?

Station 415, lat. 71° 28' S., long. 22° 32' W.; 0-2338 fathoms. A lump of jelly found in a sounding-tube.

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EXPLANATION OF PLATES.

PLATE I.

Staurophora falklandica, n. sp.

- Fig. 1. Oral view. Natural size.
 Fig. 2. Cordylus partly contracted. × 140.
 Fig. 3. Cordylus expanded. × 140.
 Fig. 4. Margin of the umbrella, showing the tentacles and cordyli. Inner side. × 25. *cc.*, circular canal; *oc.*, ocellus; *sc.*, cordylus; *T*², rudimentary tentacle; *v.*, velum.
 Fig. 5. Inner side of the wall of the stomach with gonads. × 10. *g.*, gonads; *m.*, margin of the mouth.
 Fig. 6. Lateral view of the base of a tentacle. × 25.
 Fig. 7. Basal bulb of a tentacle. Outer side. × 25. *t.r.*, the spur or root of the tentacle.
 Fig. 8. *Botrynema brucei*, n. g., n. sp. Lateral view. The margin of the umbrella is curled inwards. × 2.
 Fig. 9. *Botrynema brucei*. Diagram showing the position of the gonads.
cc., circular canal; *g.*, gonads; *m.*, margin of mouth; *r.*, radial canal; *st.*, stomach.

PLATE II.

- Fig. 1. *Botrynema brucei*. A sketch showing the arrangement of the tentacles on the margin of the umbrella. The velum is omitted; its position is below the tentacles. Aboral view. × 9. *per.*, percanal (perradial) radius; *inter.*, intercanal radius; *p.t.*, percanal tentacle.
 Fig. 2. *Desmonema chierchiana*, Vanhöffen. A portion of the sub-umbrella showing the arrangement of the circular muscles, tentacles, sense-organs, and marginal lobes in a young stage. × 3. *c.m.*, circular muscles; *oc.c.*, canal of the ocular lobe; *oc.l.*, ocular lobe; *r.*, tentaculocyst (rhopalium); *spt.*, septum dividing the pouches of the stomach; *t.c.*, canal of the tentacular lobe; *t.l.*, tentacular lobe.
 Fig. 3. *Phacellophora ornata* (Verrill). A portion of the sub-umbrella showing the arrangement of the radial canals, sense-organs, and tentacles. Natural size. *cc.*, circular canal; *oc.c.*, canal of the ocular lobe; *oc.l.*, ocular lobe; *r.*, tentaculocyst; *r.c.*, radial canals; *s.*, stomach; *t.*, tentacles (cut off at base); *t.c.*, canal of the tentacular lobe; *t.l.*, tentacular lobe.
 Fig. 4. *Phacellophora ornata*. Portion of a tentacle, showing the arrangement of the nematocysts. *e.*, endodermal canal; *n.*, nematocysts.

Addendum.

On the sub-umbrella and on the gonads of the large *Desmonema chierchiana* many amphipods were found. Mrs E. W. SEXTON of Plymouth kindly undertook their identification, and informs me that they are *Hyperia gaudichaudi* (H. Milne-Edwards). Most of the specimens were immature, but adult males and females were present. *Hyperia gaudichaudi* has been taken off the coast of Chile, and was present in the Antarctic collections made by the *Southern Cross* and by the *Discovery*.

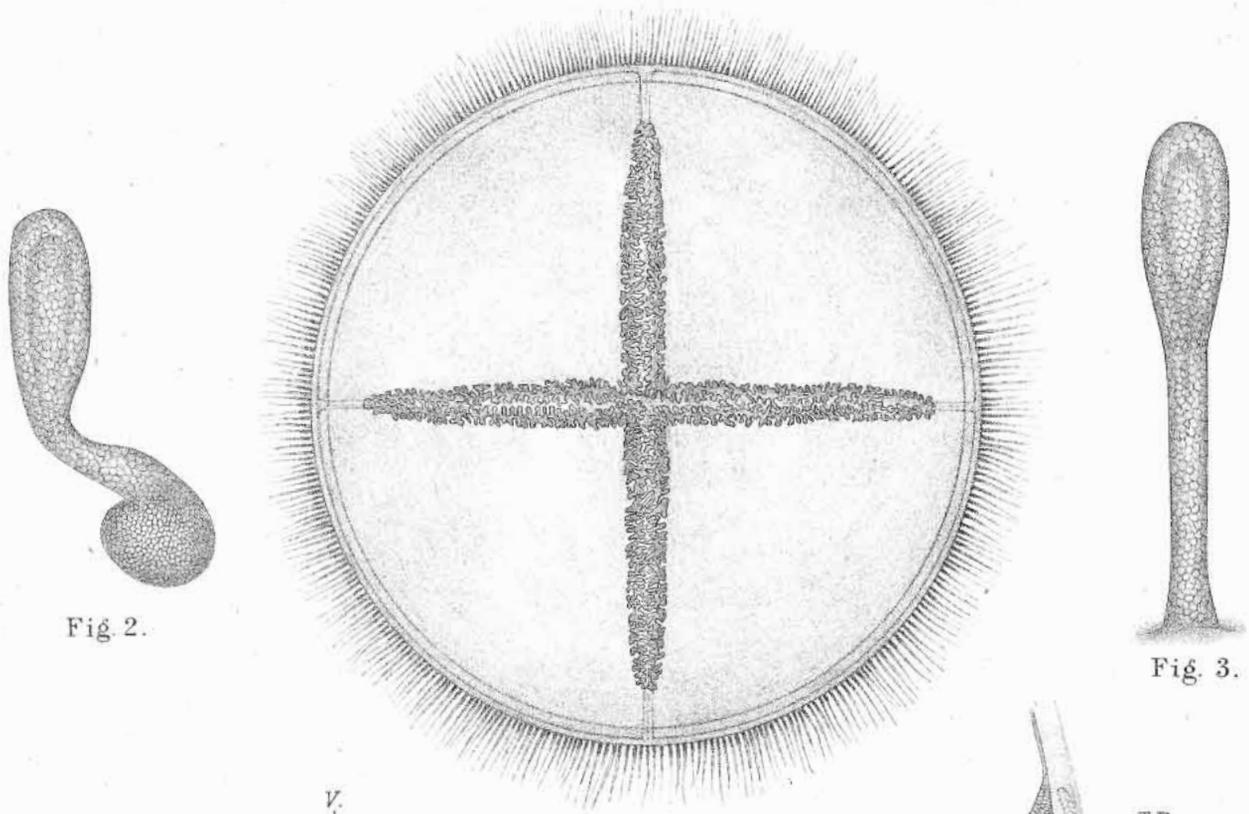


Fig. 1.

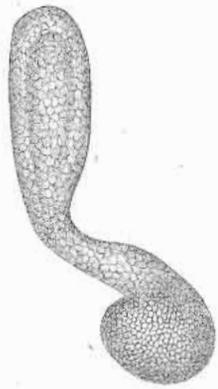


Fig. 2.



Fig. 3.

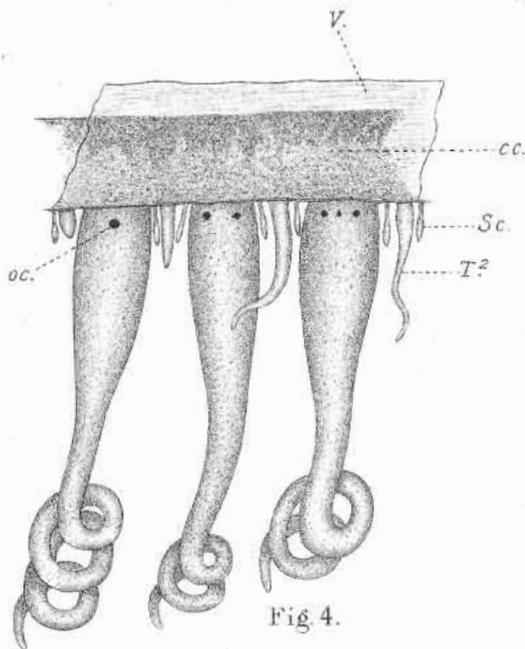


Fig. 4.

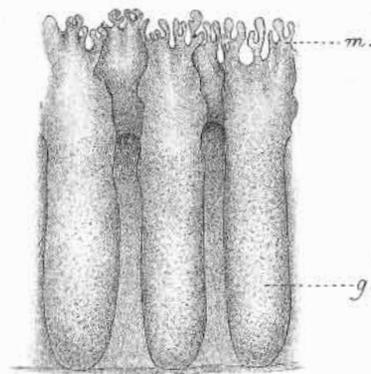


Fig. 5.

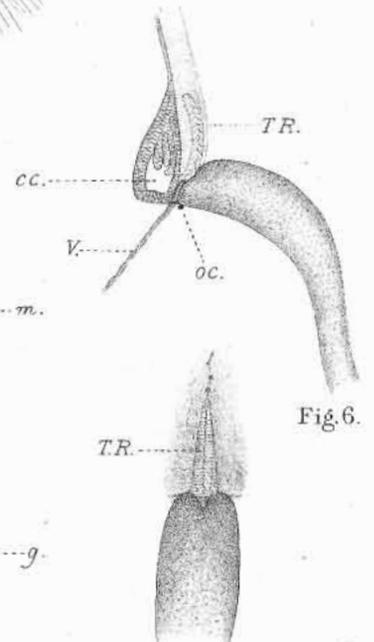


Fig. 6.

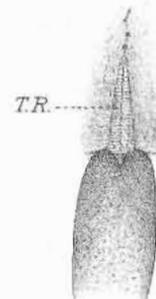


Fig. 7.

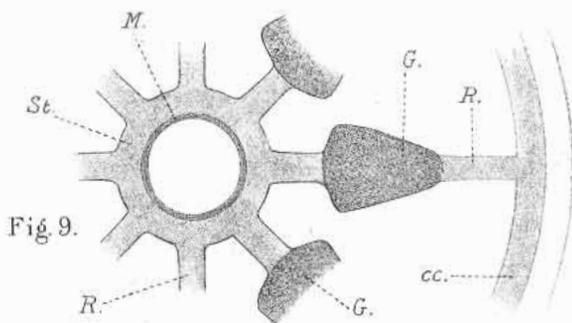


Fig. 9.

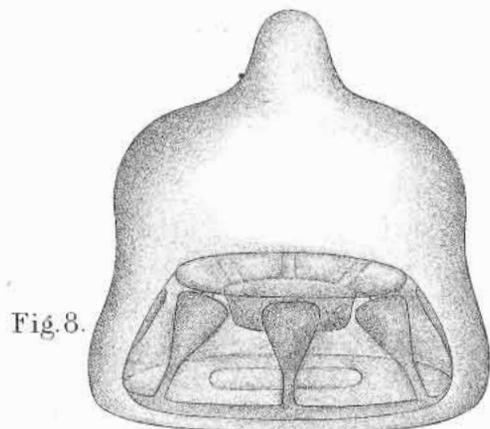
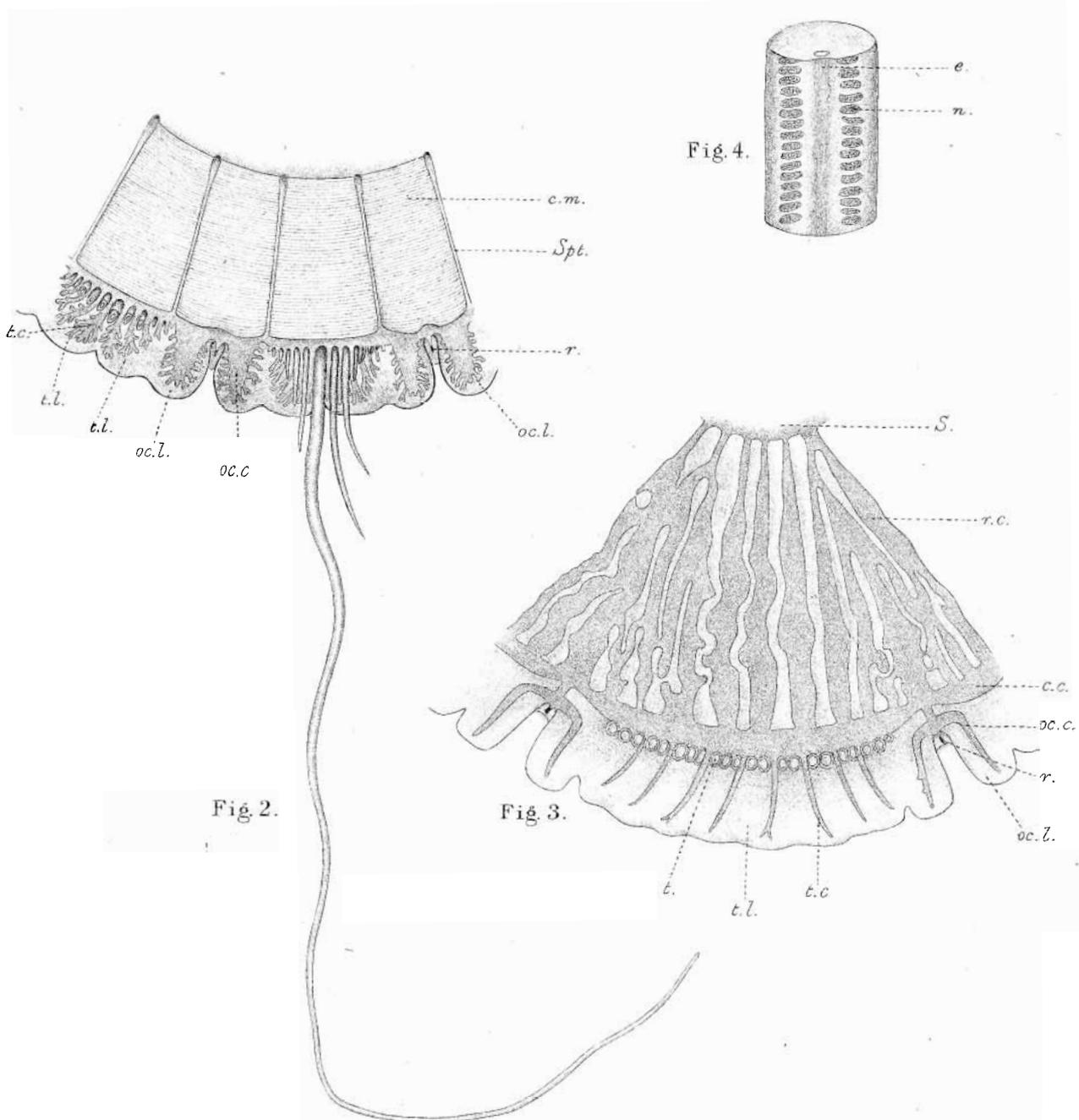
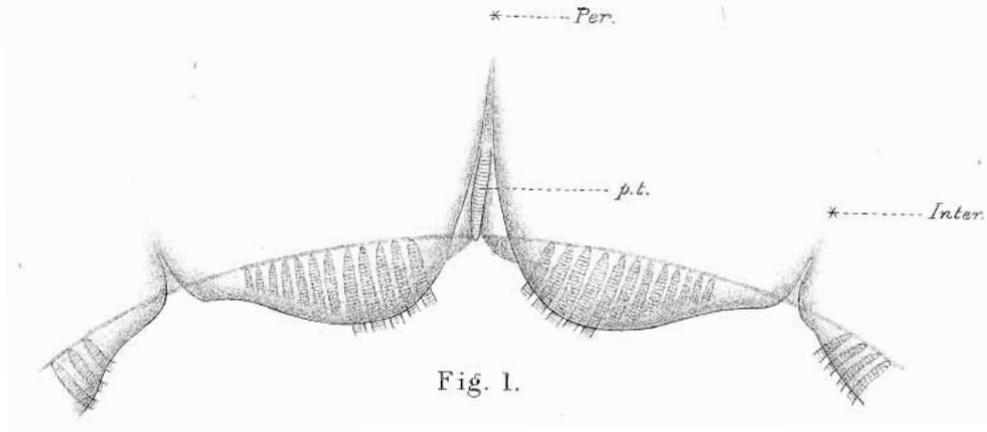


Fig. 8.



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„ Part 3.	1 10 0	1 3 0			
„ Part 4.	0 7 6	0 5 8			

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