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REPORT
TO THE GOVERNMENT OF CEYLON
ON THE
PEARL OYSTER FISHERIES
OF THE
GULF OF MANAAR,
BY
W. A. HERDMAN, D.Sc., F.R.S., P.L.S.,
Professor of Natural History in the University of Liverpool.
WITH SUPPLEMENTARY REPORTS
UPON THE
MARINE BIOLOGY OF CEYLON,
BY OTHER NATURALISTS.

PART IV.

PUBLISHED AT THE REQUEST OF THE
COLONIAL GOVERNMENT
BY
THE ROYAL SOCIETY.

LONDON:
1905.

REPORT

ON THE

MEDUSÆ

(HYDROMEDUSÆ, SCYPHOMEDUSÆ AND CTENOPHORA)

COLLECTED BY

PROFESSOR HERDMAN, AT CEYLON, IN 1902.

BY

EDWARD T. BROWNE, B.A.,

ZOOLOGICAL RESEARCH LABORATORY, UNIVERSITY COLLEGE, LONDON.

[WITH FOUR PLATES.]

INTRODUCTION.

THE collection of Medusæ brought back by Professor HERDMAN from Ceylon and another forwarded by Mr. JAMES HORNELL were kindly sent to me by Professor HERDMAN for examination. So far as I know there are no previous records relating to the medusæ of Ceylon, except for the Siphonophora which have been specially studied on the spot by HAECKEL. Unfortunately none of his beautiful species occur in the collection.

The specimens come chiefly from two places—Galle, at the south of Ceylon, and the Pearl Banks in the Gulf of Manaar. It is distinctly a littoral collection from shallow water, and the littoral character is shown by the number of Anthomedusæ and Leptomedusæ. The collection has not brought to light any new genera, nor are the species in any way very remarkable, considering that they live within a tropical region, in a sea at about 80° F. From a geographical point of view the collection is a valuable one, as it has increased our knowledge of the distribution of genera.

Some of the specimens had been splendidly preserved and were a pleasure to work with, but many were in bad condition, more or less broken up, and these gave me endless trouble. I have endeavoured, as far as possible, to give such details as I hope

will lead to the recognition of the species again, but should any doubt arise when comparing a description or figure with living specimens, I would suggest that it would be better to amend my work rather than describe another species.

[After this report had been sent to the printer I received intimation from Professor OTTO MAAS, of Munich, that he was preparing for publication his account of the Hydromedusæ of the Dutch "Siboga" Expedition. As our respective reports were likely to be published about the same time we agreed to exchange proofs. I wish here to express my thanks to Professor MAAS for his kindness in allowing me to make use of his work, which must be regarded as a valuable contribution towards our knowledge of the Hydromedusæ.]

A few of the species in the Ceylon collection were also taken by the "Siboga" in the East Indies, namely :—*Irenopsis hexanemalis*, *Octocanna polynema*, *Mesonema pensile*, *Liriope tetraphylla*, and *Solmundella bitentaculata*.]

The following is a classified list of the species described in this report :—

HYDROMEDUSÆ.

ANTHOMEDUSÆ.

- | | |
|-----------------------|--|
| <i>Dipurena</i> sp. ? | <i>Cytæis herdmani</i> , n. sp. |
| | <i>Proboscidactyla minima</i> , n. sp. |

LEPTOMEDUSÆ.

- | | |
|--------------------------------------|--|
| <i>Laodice indica</i> , n. sp. | <i>Irene palkensis</i> , n. sp. |
| <i>Mitrocomium assimile</i> , n. sp. | <i>Irenopsis hexanemalis</i> , GOETTE. |
| <i>Eutima curva</i> , n. sp. | <i>Octocanna polynema</i> (HAECKEL). |
| <i>Octorchis orientalis</i> , n. sp. | <i>Æquorea conica</i> , n. sp. |
| <i>Irene ceylonensis</i> , n. sp. | „ <i>parva</i> , n. sp. |
| | <i>Mesonema pensile</i> (MODEER). |

TRACHOMEDUSÆ.

- | | |
|-------------------------------------|---|
| <i>Gonianemus hornelli</i> , n. sp. | <i>Olindias</i> sp. ? |
| | <i>Liriope tetraphylla</i> (CHAM. ET EYS.). |

NARCOMEDUSÆ.

- | | |
|---|--|
| <i>Solmundella bitentaculata</i> (QUOY ET GAIM.). | |
|---|--|

SIPHONOPHORA.

- | | |
|--------------------------------------|-----------------------------------|
| <i>Diphyes chamissonis</i> , HUXLEY. | <i>Agalmopsis</i> sp. ? |
| <i>Cupulita</i> sp. ? | <i>Physalia utriculus</i> , ESCH. |
| | <i>Porpita</i> sp. ? |

SCYPHOMEDUSÆ.

- | | |
|-----------------------------------|------------------------|
| <i>Charybdea</i> sp. ? | <i>Pelagia</i> sp. ? |
| <i>Nausithoe punctata</i> , KÖLL. | <i>Crambessa</i> sp. ? |

CTENOPHORA.

- | | |
|--|--------------------------------|
| <i>Pleurobrachia globosa</i> , MOSER, var. <i>ceylonensis</i> , n. | <i>Beroe flemingi</i> (ESCH.). |
|--|--------------------------------|

A COMPARISON BETWEEN THE MEDUSÆ OF CEYLON AND THOSE OF THE MALDIVES.

It is somewhat hazardous to draw a comparison between the medusoid fauna of Ceylon and that of the Maldives. About that of Ceylon I feel that we at present know but little, in fact, we have just made a beginning in our observations. We know, perhaps, a little more about the medusæ of the Maldives, which have recently been visited by two expeditions—the first under the leadership of Mr. STANLEY GARDINER, and the second, which soon followed the first, under the guidance of Professor ALEXANDER AGASSIZ.

Leaving out the oceanic medusæ, which have usually a wide geographical range, and limiting the comparison to the Anthomedusæ and Leptomedusæ, Mr. GARDINER's collection contained 5 genera and 5 species (3 of which were new species). Professor AGASSIZ's collection contained 10 genera (1 new genus) and 11 species (6 of which were new species and 3 were not named). With the possible exception of one of the *Æquoriidæ*, the genera and species were quite distinct in the two collections. Taking the two collections, without any limitations, there is a well-marked difference between them, which is quite as great as if they had come from localities a thousand miles apart. It is difficult to assign a correct reason for such a difference, but probably a different season of the year and the localities visited had much to do with it.

The two Maldivian collections contain altogether 14 genera and 15 species of Anthomedusæ and Leptomedusæ. The Ceylon collection contains 12 genera and 14 species (10 of which are regarded as new species). A comparison between the Maldivian and Ceylon collections shows that 6 genera (*Dipurena*?, *Proboscidactyla*, *Irene*, *Irenopsis*, *Mesonema* and *Æquorea*) are common to both, but only 2 species (*Irenopsis hexanemalis* and *Mesonema pensile*; the former also occurs at Zanzibar and the latter in the Red Sea). I think that these figures show clearly that the medusoid fauna of Ceylon is quite distinct from that of the Maldives.

HYDROMEDUSÆ.

ORDER: ANTHOMEDUSÆ.

FAMILY: SARSIIDÆ, FORBES, 1848.

Dipurena, McCRADY, 1858.

Dipurena, sp.?—Plate II., figs. 1 and 2.

Description.—Umbrella about as high as broad. Manubrium extending beyond the margin of the umbrella. Mouth circular. Gonads arranged in several large

isolated clusters upon the manubrium. Four tentacles with globular basal bulbs, and with numerous small clusters of nematocysts. Ocellus upon the outer side of each basal bulb.

Size :—Umbrella about 3 millims. in width and height.

Locality :—Galle Bay, one specimen on June 12 and two on August 25.

Notes.—The umbrella of the three specimens is so badly out of shape that a figure of it cannot be given. The manubrium (fig. 2) is a long thin tube, about two to three times the length of the cavity of the umbrella, with an apical knob in the jelly of the umbrella, and with a large terminal stomach which has a circular mouth. The gonads are situated on the manubrium in large roundish clusters, and their size makes them conspicuous. One specimen has four clusters of gonads, another has two clusters. The third specimen has lost its manubrium. The stomach itself also appears to be surrounded with generative cells. The tentacles (fig. 1) are long and flexible, and are closely studded with clusters of nematocysts, except for a short distance next to the basal bulb. The upper half of the basal bulb is globular and embedded in the jelly of the umbrella, the lower part is like a circular band round the tentacle, broader on the inner side than on the outer side. In this band, on the outer side, the ocellus is situated. The ocellus is circular, of a yellowish colour in formalin, and has a small lens.

I have placed this species in the genus *Dipurena* and follow at present HAECKEL's classification, though I think that this species and *Dipurena ophiogaster* will ultimately have to be removed to another genus. All the other species have the nematocysts on the tentacles confined to a large conspicuous terminal knob, and some in addition have a few large swellings containing nematocysts just above the terminal knob. *Dipurena ophiogaster* has the nematocysts on the tentacles arranged in quite a different manner. They form numerous semi-circular or three-quarter spiral loops round the tentacle when it is in a contracted or semi-contracted state. When the tentacle is fully expanded the nematocysts form minute globular clusters which give a moniliform appearance to the tentacle. The terminal cluster of nematocysts is very small and inconspicuous. The arrangement of the nematocysts of this species from Ceylon is similar to that of *Dipurena ophiogaster* and to that found in the genus *Sarsia*.

The specimens from Ceylon are very much like *Dipurena ophiogaster* which belongs to the British fauna, and it is not possible to point out a character in the structure of the tentacles or the manubrium with its gonads by which they can be specifically separated. As the specimens are in bad condition, I think it is best to leave the specific name in abeyance. They may differ from the *Dipurena ophiogaster* in the shape of the umbrella, in colour, and perhaps in other details.

BIGELOW (1904) found at the Maldives a *Dipurena* which he was not able to clearly distinguish from *Dipurena frigilis*, MAYER, belonging to the fauna of the Tortugas in the West Indies.

FAMILY: MARGELIIDÆ, HAECKEL, 1877.

Cytæis, ESCHSCHOLTZ, 1829.

Margeliidæ with four single perradial marginal tentacles, and with unbranched oral tentacles.

Cytæis herdmani, n. sp.—Plate I., fig. 1; Plate IV., fig. 12.

Description.—Umbrella somewhat bell-shaped, about as high as broad, with fairly thick walls. Velum narrow. Stomach large, about as long as wide, situated on a short peduncle, and extending a little over half-way down the cavity of the umbrella. Mouth circular (expanded) with about 50 to 60 oral tentacles, which are unbranched and evenly distributed. Four broad radial canals. Gonads forming four large perradial swellings, and extending the whole length of the stomach. Four thick tentacles, perradial, with very large basal bulbs, which are somewhat triangular in shape.

Size:—Umbrella about $3\frac{1}{2}$ millims. in width and height.

Locality:—One specimen from Chilaw Paar on March 20, and one from Cheval Paar on November 11.

Notes.—Of these two specimens, one is an adult and the other is an intermediate stage. The stomach is cross-shaped in transverse section, and the gonads occupy the sides of the cross. The oral tentacles have a small round terminal cluster of nematocysts. The four marginal tentacles are thick and have a dark central band of pigment (perhaps a brilliant colour in the sea). A transverse section (fig. 12) shows that the pigment granules are confined to the endoderm cells, which form a solid central band of cells along the tentacle. The pigment granules form a dense layer round the periphery of the endoderm, and are also scattered along the walls of the cells. There is a fairly thick layer of mesogloea and an extra thick ectoderm which contains an enormous number of nematocysts, closely packed together. The basal bulbs are very large and extend some way up the umbrella. There is a layer of dark pigment along the inner side of the bulb, and a thick whitish mass of cells on the outer side. Sections were not cut of the basal bulb, but the dark pigment granules would probably denote the endoderm and the external whitish cells the ectoderm. The specimen at the intermediate stage in development is about 2 millims. in width and height. It has four marginal tentacles, fewer oral tentacles, and smaller gonads than the adults.

This species is nearly related to *Cytæis nigritina* and *Cytæis macrogaster* of HAECKEL. It differs from them in having many more oral tentacles, in the shape of the basal bulbs, and in the structure of the tentacles.

FAMILY: WILLIIDÆ, FORBES, 1848.

Proboscidactyla, BRANDT, 1835, ex BROWNE, 1904.

Williidæ with four radial canals leaving the stomach.

***Proboscidactyla minima*, n. sp.—Plate II., fig. 3.**

Description.—Umbrella fairly thin and probably hemispherical in shape. Stomach divided into four longitudinal lobes. Mouth with a sinuous margin. Four radial canals with lateral branches. Gonads upon the lobes of the stomach. Tentacles short, about 16 to 20, with globular basal bulbs.

Size:—Umbrella about 1 millim. in diameter.

Locality:—Marichchukaddi, on the Gulf of Manaar, in February.

Notes.—There are 12 specimens, but their condition does not permit the production of a figure. I was unable to trace out the branching of the radial canal system, owing to the umbrella of all the specimens being more or less contracted, and to their fragile condition. The stomach is divided longitudinally into four lateral lobes and appears cross-shaped in transverse section. The gonads form lateral swellings upon the sides of the lobes, which do not extend along the top of the umbrella. The tentacles (fig. 3) are very short, about 0·25 millim. in length, and have a globular basal bulb situated in the jelly of the umbrella. On the ex-umbrella, not far from the margin, there are circular clusters of nematocysts, one between every two tentacles. The velum is very narrow. A few of the specimens are about 0·75 millim. in diameter and have 10 to 12 tentacles. Others, a little older, have 14 to 16 tentacles. One specimen has 18 tentacles. A full-grown adult has probably 20 tentacles. This species may be distinguished by the smallness of its size and the position of the gonads on the stomach.

ORDER: LEPTOMEDUSÆ.

FAMILY: THAUMANTIIDÆ, GEGENBAUR, 1856.

Laodice, LESSON, 1843.***Laodice indica*, n. sp.—Plate I., fig. 5; Plate IV., figs. 7 to 11.**

Description.—Umbrella slightly curved, about two to four times as broad as high, with moderately thick walls. Stomach cross-shaped, fairly large. Mouth with four short lips, having a slightly folded margin. Gonads extending from the stomach to about half-way or close to the margin of the umbrella, forming a large hollow sac upon each of the four radial canals. Tentacles about 60 to 80, with blackish basal bulbs, and without spurs. A large black ocellus upon the inner side of nearly all the basal bulbs. A single cordylus between every two tentacles. Cirri present.

Size:—Umbrella up to 6 millims. in diameter.

Locality:—Off Mutwal Island, West Coast of Ceylon, 12 specimens on March 19; and Galle, 3 specimens, on July 15.

Notes.—The collection contains 15 specimens which are about 5 millims. to 6 millims. in diameter and about the same age. The distance to which the gonads extend from the stomach along the radial canals varies in different specimens. Some have the

gonads on the proximal half of the canals, whilst in others the gonads reach nearly to the margin of the umbrella. The gonads first arise in the proximal part of the canals quite close to the stomach, and grow outwards towards the periphery of the umbrella. Owing to the great extension of the walls of the radial canals in the region occupied by the gonads, it is difficult in some specimens to mark the spot where the stomach ends and the canals begin. The gonads look as if they were situated upon lobes of the stomach. The length of the gonads is independent of the development of the generative cells, as a gonad extending over only half the radial canal has large ripe ova. Sections show (fig. 10) that the ova at an early stage in their development are among the endoderm cells, and that later on they move outwards to the ectoderm. The section figured shows an ovum leaving the ovary and breaking through the ectoderm.

The tentacles are closely packed together round the margin of the umbrella, and apparently form two alternating series, one projecting outwards and the other hanging down. Although similar in structure, only those belonging to the former have a conspicuous blackish basal bulb with a conspicuous black ocellus. The latter series have a smaller basal bulb, either colourless or slightly pigmented, and either without an ocellus or with a very small one. The basal bulb is on the inner side of the tentacle; it is a semi-circular thickening containing nematocysts and granules of pigment, which cover the exterior of the bulb and also extend in radiating lines into the interior. There is no spur-like projection at the base of the tentacles. The cirri (fig. 9) are capable of extending to a great length. There is probably one between every two tentacles, but very few were seen on the specimens. The free end terminates in an oval knob containing large nematocysts (fig. 11). The ocellus is situated on the margin of the basal bulb just below the velum. It is of an intense black colour, spherical in shape, with a circular pit penetrating nearly to the centre (fig. 8).

The cordylus is very small and club-shaped (fig. 9). The interior of club is composed of endoderm cells which are connected with endoderm cells of the circular canal (fig. 7). The structure of the cordylus resembles that of *Laodice calcarata* (see BROOKS, 1895).

The specimens from Ceylon come nearest to *Laodice calcarata* which inhabits the North Atlantic. They differ from it in having no spur at the base of the tentacles, in having larger ocelli, and perhaps in colour and in size.

FAMILY: EUkopidæ, GEGENBAUR, 1856.

Mitrocomium, HAECKEL, 1879.

Mitrocomium assimile, n. sp.—Plate I., fig. 3.

Description.—Umbrella fairly thick, a little broader than high. Velum narrow. Stomach short, with a quadrangular base. Four radial canals. Gonads upon the outer half of the radial canals, forming large oval sacs. Four perradial tentacles.

About 5 to 7 marginal bulbs in each quadrant; the central, interradial, bulb being much larger than the others. A cluster of cirri adjacent to and on each side of the tentacles. About five marginal sensory vesicles, each with two (occasionally three) otoliths, in each quadrant of the umbrella.

Size:—Umbrella 2 millims. in width and $1\frac{1}{2}$ millims. in height.

Locality:—Cheval Paar, in February.

Notes.—There is only one specimen of this little medusa in the collection. It is rather opaque with a yellowish stain, and its margin is badly curled inwards. The umbrella is somewhat contracted, so that it may not be quite so highly arched as figured. The stomach is contracted back. The mouth is wide open and quadrangular in outline, but has probably four lips when closed. The gonads (male) are very large for the size of the medusa. Each gonad is divided into two by a median longitudinal line. The tentacles have large basal bulbs and transverse bands of nematocysts. The cirri are more or less contracted, and have a small terminal cluster of nematocysts. The cirri are apparently confined to the proximity of the tentacles and none were seen scattered along the margin of the umbrella.

As there is only one specimen, I place the species provisionally in the genus *Mitrocomium*. It bears a resemblance to *Mitrocomium cirratum* in having cirri clustered at the base of each tentacle. According to HAECKEL's definition of the genus it should have 8 tentacles and 16 sense-organs.

Eutima, McCRADY, 1858.

Eutima curva, n. sp.—Plate III., figs. 1 to 3.

Description.—Umbrella probably hemispherical, nearly twice as broad as high, moderately thick. Peduncle of the stomach long, quadrangular in transverse section, and with a conical base. Stomach small, about twice as long as broad. Mouth with four small lips, and sinuous margin. Four radial canals. Gonads along nearly the whole length of the peduncle, one on each radial canal, beginning a little way below the conical base of the peduncle and terminating not far from the stomach. Four perradial tentacles, with long tapering cone-shaped basal bulbs, which are laterally compressed and curve over the margin of the umbrella. About 30 to 35 marginal bulbs in each quadrant of the umbrella, and alongside each bulb usually one, occasionally two cirri. Eight adradial marginal sensory vesicles, each with about 8 to 10 otoliths, which are arranged in a semicircle.

Size:—Umbrella 10 millims. in width and 6 millims. in height. Peduncle about 10 millims. in length.

Locality:—Off Mutwal Island, West Coast of Ceylon, on March 19.

Notes.—The single specimen, although in a good state of preservation, has the umbrella badly compressed and folded, so that it is impossible to figure the whole medusa. It is an adult, as the gonads contain large ova. The basal bulbs of the

tentacles are attached to a slight thickening of the umbrella and curl over the margin. The nematocysts along the tentacle are arranged in transverse bands which do not quite meet on the inner side of the tentacle, so that a shallow groove is formed along the inner side, running the whole length of the tentacle. The marginal bulbs have a patch of blackish pigment at their apex.

This species comes nearest to *Eutima mira* and *Eutima insignis*, but is distinguished from them by the shape of the basal bulbs.

Octorchis, HAECKEL, 1864.

Octorchis orientalis, n. sp.—Plate III., fig. 4.

Description.—Umbrella probably hemispherical, a little broader than high, and moderately thick. Peduncle of the stomach long, quadrangular in transverse section, and with a broad roundish base. The length of the peduncle is about twice the diameter of the umbrella. Stomach small, about as long as broad. Mouth with four short lips and a deeply folded margin. Gonads upon the peduncle of the stomach and also upon the sub-umbrella. The gonads occupy the greater length of the peduncle, extending along the radial canals, beginning a little way below the base of the peduncle and terminating close to the stomach. The gonads upon the sub-umbrella usually occupy the central third of the radial canals, or the outer half, but do not reach to the margin of the umbrella. Four long perradial tentacles, with long tapering cylindrical basal bulbs. About 18 to 20 marginal bulbs in each quadrant of the umbrella, each one with a lateral cirrus. Eight marginal sensory vesicles.

Size:—Umbrella about 5 millims. to 6 millims. in diameter.

Locality:—Galle Bay, one specimen on June 5, seven on June 12, and two on August 21.

Notes.—None of the specimens are in good condition, the umbrella being so flattened out and crumpled that it is not possible to draw a figure of it. Some of the largest specimens have the gonads upon the peduncle in a series of folds (fig. 4), but it is possible that the folding may be due to the contraction of the peduncle. The gonads upon the peduncle are much larger and longer than those upon the sub-umbrella, the latter forming merely a thin narrow band along the radial canals. The marginal bulbs are very small and inconspicuous. The cirri are very slender and have a small terminal cluster of nematocysts. The sense-organs are situated near the tentacles. They are very small and globular in shape, their otoliths not visible.

Notes on Intermediate Stages.

(a.) Umbrella about 2 millims. in diameter. Peduncle about 5 millims. in length, with gonads just appearing upon it. Four tentacles. Cirri present. About 9 marginal bulbs in each quadrant. Eight sense-organs.

(b.) Umbrella about 3 millims. in diameter. Peduncle about 6 millims. in length. Gonads just appearing upon the peduncle and sub-umbrella. About 12 marginal bulbs in each quadrant.

This species does not agree with HAECKEL's definition of the genus *Octorchis*, since it has only 4 instead of 8 tentacles, but in other respects it conforms to the generic character. *Octorchis gegenbauri* has been frequently taken by me in British seas. Early and intermediate stages (the latter often with gonads) have 4 tentacles, whereas the fully developed adult has 8 tentacles. I think it would be better to enlarge the generic character so as to include species with 4 and 8 tentacles, than to establish a new genus for species which have only 4 tentacles.

HAECKEL, in his monograph, mentions two species of *Octorchis*—*O. gegenbauri* and *O. campanulatus*, both occurring in the Mediterranean, but probably there is only one species. The specimens from Ceylon are distinguished from the Mediterranean species by the greater length of the gonads on the peduncle.

Irene, ESCHSCHOLTZ, 1829.

Irene ceylonensis, n. sp.—Plate III., figs. 9 to 11.

Description.—Umbrella probably watchglass-shaped, much broader than high, with thin walls. Velum narrow. Stomach short, situated upon a long cylindrical peduncle. Mouth with four lips, which have a folded margin. Four radial canals. Gonads linear, extending from the base of the peduncle to near the margin of the umbrella. Tentacles about 100. Cirri absent. Sensory vesicles, one between every two tentacles, each vesicle with a single otolith.

Size :—Umbrella up to about 25 millims. in diameter.

Locality :—Galle Bay, one specimen on July 15; Cheval Paar, five in November.

Notes.—The collection contains six specimens differing in age and size, the smallest being about 5 millims. in diameter. All the specimens are more or less damaged. They are in a fair state of preservation, but are stained dead black, probably owing to the use of osmic acid.

The umbrella is flat and thin, but is no doubt slightly curved when the medusa is alive. Only one specimen shows the peduncle fairly well, the others have either lost it or have it twisted up. The gonads form thin narrow bands, either straight or sinuous, extending along the radial canals over the sub-umbrella. In the largest specimens the ova are large and clearly visible. Some of the specimens have a marginal bulb between some of the tentacles, and these bulbs I believe to be the origin of new additional tentacles, and not warts or tubercles, which do not develop tentacles. I am doubtful about the presence of excretory pores at the back of the basal bulbs, as there were no indications of papillæ, but they may be contracted.

The sensory vesicles have one otolith, but occasionally a vesicle was seen with two otoliths, which may have been caused by twinning.

- (a) Umbrella about 5 millims. in diameter. About 28 tentacles.
- (b) " " 7 " " 36 "
- (c) " " 15 " " 72 "

Irene palkensis, n. sp.—Plate III., figs. 12 to 16.

Description.—Umbrella watchglass-shaped, about four times as broad as high. Velum narrow. Stomach short, situated upon a long cylindrical peduncle. Mouth with four short lips, which have a folded margin. Four radial canals. Gonads linear, extending from the base of the peduncle to near the margin of the umbrella. Tentacles about 50. Usually two or three marginal bulbs between every two tentacles. Excretory pores opposite the basal bulbs of the tentacles and all the marginal bulbs. Sensory vesicles about 2 to 4 between every two tentacles, each vesicle with two otoliths (variation 1 to 4).

Size:—Umbrella up to 20 millims. in diameter.

Locality:—Palk Bay, north of Ceylon, five specimens on March 16.

Notes.—The five specimens are all in a damaged condition, especially as to the gonads and the margin of the umbrella. The smallest is about 15 millims. in diameter and the largest about 20 millims. The gonads are upon the sub-umbrella along the radial canals. One specimen has the gonads extending from near the margin of the umbrella up to the peduncle, and for a short distance down the peduncle. The number of tentacles is only given from an estimation, as not one specimen has even a quadrant of the margin of the umbrella in a perfect condition. The basal bulb of the tentacle is somewhat globular when the tentacle is contracted, and more cone-shaped and tapering when the tentacle is expanded. On the inner side of the basal bulb just above the velum there projects an excretory pore. These pores are conspicuous and clearly visible when expanded, but almost invisible when contracted. Cirri were specially searched for, but none were seen. The marginal bulbs are small, and to judge from their appearance in one of the specimens, I think that some are capable of developing tentacles. Their number between every two tentacles is variable, usually two or three, sometimes only one. All these bulbs have excretory pores, similar to the pores opposite the basal bulbs of the tentacles. The sense-organs are closed vesicles with generally two otoliths (fig. 14), occasionally three to four otoliths, rarely one. The otoliths possess well-marked eccentric zones, which are conspicuous in specimens which have been apparently killed with a re-agent containing osmic acid.

At first sight *Irene palkensis* and *Irene ceylonensis* look very much alike, but after an examination of the organs on the margin of the umbrella I came to the conclusion that they were distinct species. *Irene ceylonensis* has about twice as many tentacles without a series of marginal bulbs in between them, and there is a difference in the shape of the basal bulbs of the tentacles, but I attach more importance to the sense-

organs as a better means of distinguishing between the two species. *Irene ceylonensis* has only one sense-organ between every two tentacles, each sense-organ with a single otolith. *Irene palkensis* has two to four sense-organs between every two tentacles, and each sense-organ usually has two otoliths, occasionally three to four, and rarely one. There is also a difference in the structure of the otoliths.

Irenopsis, GOETTE, 1886.

Eucopidae with numerous sensory vesicles, and with numerous tentacles. Six gonads in the course of six radial canals. Stomach upon a peduncle.

Irenopsis hexanemalis, GOETTE, 1886.—Plate I., fig. 4; Plate III., figs. 5 to 8.

Irenopsis hexanemalis, GOETTE, 1886, p. 832; CHUN, 1896, p. 5.

Phialidium tenue, BROWNE, 1904, p. 730, plate liv., fig. 4; plate lvii., fig. 16.

Description.—Umbrella like an inverted basin in shape, with a flattened top, about twice as broad as high. Velum narrow. Stomach short, with six lateral lobes, situated upon a short, broad, cone-shaped or semi-globular peduncle. Mouth with six lips, having a deeply-folded margin. Six radial canals. Gonads linear, on the distal part of the radial canals, close to the margin of the umbrella. Tentacles, about 30 to 40. Marginal bulbs about three or more between every two tentacles. Excretory pores opposite the basal and marginal bulbs. Sensory vesicles, usually one, sometimes two, between every two bulbs, each vesicle containing a single otolith (occasionally about two to four). Cirri absent.

Size:—Umbrella up to about 18 millims. in diameter.

Locality:—Palk Bay, 18 specimens on March 16; Cheval Paar, 9 specimens.

Notes.—The collection contains about two dozen specimens and nearly all are in bad condition. The smallest is an intermediate stage measuring 5 millims. in diameter. The stomach is situated upon a short peduncle which is about 2 millims. to 4 millims. in length. The peduncle is variable in shape. In some specimens it is conspicuous, but in others hardly noticeable. When semi-globular, or like a broad inverted cone, it is quite recognisable. In some of the specimens the peduncle is flattened out (whether this is natural or due to preservation I am unable to say), and in this condition the roof of the sub-umbrella appears convex, and the top of the umbrella is very thick. The stomach (fig. 8) is divided into six lobes, and its base seen aborally is like a six-rayed star. It is very short, about 1 millim. in length, and about twice as broad as long. The mouth has six conspicuous lips, which are continuous with the lobes of the stomach, and the margin of the lips is deeply and closely indented with a series of folds. In some specimens the stomach and its peduncle are within the cavity of the sub-umbrella, but those specimens which have an extra thick umbrella may have the stomach projecting a little way outside the cavity.

When a medusa has normally six radial canals, a variation in number may be expected. Medusæ with six radial canals have been derived from a form with four canals, and are much more liable to variation than those with four canals. There are altogether 27 specimens of *Irenopsis*, and six show a numerical variation in the radial canals, their numbers being as follows;—4, 7, 8, 8, 9, 11. The number of gonads also varies with the radial canals. The gonads vary very much in size, and are always situated upon the distal or outer half of the radial canals. Most of the specimens have very short linear or spindle-shaped gonads, about 1 millim. or little more in length, and situated near the margin of the umbrella. Three specimens have the gonads extending over nearly the whole of the distal half of the canals, but not quite reaching to the margin of the umbrella.

The tentacles vary in number according to the size and age of the specimens. The exact number in any one specimen could not be ascertained, as all the specimens have the margin of the umbrella more or less damaged. As a rule, in the largest specimens, there are about five or six tentacles (one specimen has six or seven) between every two radial canals. I estimated the number of tentacles in several large specimens to be about 36, and in one specimen at about 40. About the exact shape of the basal bulbs of the tentacles I am uncertain. In a contracted state they look somewhat globular, but are probably more conical when the tentacle is expanded. The marginal bulbs between the tentacles are very minute and their number is variable. Usually about three are present, but occasionally only one between every two tentacles. There are excretory pores opening above the velum, opposite every basal and marginal bulb. In nearly every specimen these pores are so contracted that their presence is not noticeable. In a few specimens they are well expanded (fig. 5) and form long papillæ. The marginal sense-organs (fig. 7) are closed vesicles, usually with a single otolith, but occasionally with two or three otoliths, rarely with four. There is generally only one between every two marginal bulbs, or about two to four between every two tentacles.

The genus *Irenopsis* was established by GOETTE for *Irenopsis hexanemalis*, found at Zanzibar. The original description is rather brief and there is no figure. CHUN, however, has given a fuller account of some specimens taken at Tumbatu, off Zanzibar. The genus clearly belongs to the sub-family Irenidæ, and is readily distinguished by the presence of six radial canals. As the specimens from Ceylon agree with the descriptions given by GOETTE and by CHUN, I have presumed that they are *Irenopsis hexanemalis*, though I should have liked to see a figure for comparison.

After seeing these specimens of *Irenopsis* I again examined *Phialidium tenue*, which was described by me as a new species in the Report on the Hydromedusæ of the Maldives Islands. The description of this species, based upon a single specimen, was given as follows:—"Umbrella watch glass-shaped and thin. Stomach small, quadrangular in shape, and situated on a semi-globular thickening of the umbrella.

Mouth with four lips and a sinuous margin. Four gonads extending over the outer half of each radial canal. Tentacles 25 in number. One or two minute marginal bulbs between every two tentacles. Sense-organs numerous, one or two, rarely three, between every two tentacles, with a single otolith. Umbrella 15 millims. in diameter." I clearly pointed out that I did not regard the thickening of the umbrella as a definite peduncle, and consequently placed the species in the genus *Phialidium* instead of in *Irene*. The result of the second examination, with specimens of *Irenopsis* for a comparison, leaves no doubt that the thickening of the umbrella must be regarded as a peduncle, so that the species does not belong to the genus *Phialidium*. It resembles *Irenopsis* in the shape of the peduncle, in the position of the gonads, in the number of tentacles, marginal bulbs and sense-organs. The basal bulbs of the tentacles are slightly larger. But it has only four radial canals, four gonads, and a mouth with four lips. If the specimen had been in this collection I should certainly have considered it to be an abnormal *Irenopsis*, having four instead of six radial canals. With four radial canals one would expect to see a mouth with four lips. I think that *Phialidium tenue* had better be regarded as an abnormal *Irenopsis*.

Octocanna, HAECKEL, 1879.

Octocanna polynema (HAECKEL)—Plate II., figs. 8, 9, 10.

Description.—Umbrella about twice to three times as broad as high, and thick. Stomach flat, octagonal base with eight lateral lobes, about 2 millims. in diameter. Mouth with eight small lips. Eight radial canals. Gonads linear, extending over the outer half of the radial canals and nearly reaching to the margin of the umbrella. Sixteen tentacles. About three to four marginal bulbs between every two tentacles, each having an excretory pore. One marginal sensory vesicle (seldom two) between every two bulbs, each vesicle with two otoliths (rarely with one or three).

Size:—Umbrella up to 12 millims. in diameter.

Locality:—Palk Bay, one on March 16; off Mutwal Island, one on March 19; Galle, one on August 25.

Notes.—The umbrella of two specimens is plano-convex in shape, fairly thick, and its margin is curled inwards. The third specimen has a very thick umbrella, which is more highly curved than those of the other two specimens, and the cavity of the umbrella is very shallow. The stomach has eight lobes, from which run the radial canals. The mouth is expanded in all the specimens and has eight small lips, corresponding in position to the radial canals. The gonads, in two of the specimens, are on the outer half of the radial canals, but in the third specimen they are more central, occupying the central third of the radial canals. They are linear in shape, increasing in thickness towards the distal end, and show fairly large ova. There are eight tentacles in the smallest specimen (8 millims. in diameter), one opposite each

radial canal, and eight large marginal bulbs, one midway between every two tentacles. A few of these bulbs are just beginning to develop tentacles. The tentacles are long and slender, and their basal bulbs are somewhat globular. The excretory papillæ are plainly visible, and project out just above the velum. All the basal bulbs and the small marginal bulbs have excretory pores. The small marginal bulbs are more or less conical in shape, and some look as if they were capable of developing tentacles.

I place this species provisionally in the genus *Octocanna*, as it does not possess all the characters according to HAECKEL's definition. There are two species of *Octocanna*, both of which were described, without figures, by HAECKEL, and have not since been recorded.

Octocanna octonema has 8 tentacles. Gonads reaching along the whole length of the radial canals. Sixteen sense-organs, each with a single otolith. Umbrella 10 millims. in diameter. Red Sea.

Octocanna polynema has 32 tentacles. Gonads not along the whole length of the radial canals. 60 to 80 sense-organs, each with two otoliths. Umbrella 15 millims. in diameter. Singapore.

Both the above species have four very long oral lips, which HAECKEL includes in the generic characters. The Ceylon specimens have eight small lips. They also possess marginal bulbs and excretory pores which are not mentioned by HAECKEL.

[In the report upon the Hydromedusæ of the "Siboga" Expedition, Professor MAAS describes under the name of *Octocanna polynema*, HAECKEL, some medusæ which appear to me to be identical with the specimens in the Ceylon collection. These specimens I had described in manuscript as a new species of *Octocanna*. As MAAS has emended HAECKEL's description and transfers the genus from the *Æquoriidæ* to the *Eucopidæ*, he has prevented me from introducing a superfluous new species. I quite agree with him as to the desirability of the removal of the genus to the *Eucopidæ* and have adopted the classification here.]

FAMILY: *ÆQUORIIDÆ*, ESCHSCHOLTZ, 1829.

Æquorea, PÉRON et LESUEUR, 1809; ex BROWNE, 1904.

Æquoriidæ with numerous simple unbranched radial canals. Stomach circular, with the lower wall fully developed. Mouth capable of closing up.

Æquorea conica, n. sp.—Plate I., fig. 2; Plate II., figs. 16, 17, 18.

Description.—Umbrella somewhat cone-shaped, with a rounded summit, a little higher than broad, and very thick. Velum narrow. Stomach flat and circular, about half the diameter of the umbrella. Oral lips about 16 in number, long and slender. About 16 radial canals. Gonads upon the proximal half of the radial canals, very much laterally compressed. Tentacles about 26 to 30, small and slender; their basal bulbs small and somewhat cone-shaped. Between every two tentacles a

very minute marginal bulb and two sensory vesicles (sometimes only one), each with two small otoliths.

Size:—Umbrella up to 7 millims. in width and 8 millims. in height.

Locality:—Pearl banks, Gulf of Manaar.

Notes.—The collection contains six specimens, which are mostly about the same size (5 millims. in width and 6 millims. in height) and age. Some are males and others are females having gonads with large ova. The oral lips have an external rib, with an internal groove which is probably ciliated. In this species the gonads are confined to the proximal half of the radial canals, and hang down as laterally compressed sacs. It is upon the position and shape of the gonads that I base the specific character. Excretory pores along the circular canal are not visible. Four of the specimens have 16 radial canals and 16 oral lips, one specimen has 15 canals and another 18 canals.

Æquorea parva, n. sp.—Plate II., figs. 5, 6, 7.

Description.—Umbrella plano-convex in shape, a little broader than high, very thick. Velum of moderate width. Stomach flat and circular, about one-third the diameter of the umbrella. Oral lips 13 to 16 in number, of moderate length and width. Radial canals 13 to 16. Gonads sac-like, in the central third of the radial canals. Four (perhaps eight) tentacles, with large basal bulbs. About 12 or more marginal bulbs between every two tentacles. About 10 or more marginal sensory vesicles between every two tentacles, or usually one between every two bulbs; each vesicle with two small otoliths.

Size:—Umbrella up to 6 millims. in width and 4 millims. in height.

Locality:—Galle Bay, one on June 5 and two on June 12.

Notes.—The three specimens are about the same size and age. One is a female and the other two are males. The stomach is about 2 millims. in diameter, and its lower wall about 1 millim. in width; the oral lips do not exceed 1 millim. in length. The gonads have lost their original shape, as they have been crushed down by the folding in of the margin of the umbrella. They occupy the central part of the radial canals, and are slightly nearer to the margin of the umbrella than to the stomach. The gonads hang down as sacs, somewhat laterally compressed. The female has large ova. One specimen has 13 radial canals, gonads and oral lips; the other two have 16 radial canals, gonads and lips. Two specimens have only four tentacles, but the third specimen has one interradial bulb which is just developing a tentacle. The interradial bulbs are much larger than the other bulbs and probably have tentacles in a fully developed specimen. The marginal bulbs, which are very variable in size, are somewhat cone-shaped and contain nematocysts. Some of the bulbs have an excretory pore opening on the sub-umbrella just above the velum. One specimen is badly infested with Cercaria.

This little *Aequorea* differs from the other species of the genus in the small numbers of its tentacles, and in the shape and position of the gonads upon the radial canals.

Mesonema, ESCHSCHOLTZ, 1829 ; ex BROWNE, 1904.

Æquoriidæ with numerous simple, unbranched radial canals. Stomach circular, with lower wall quite rudimentary. Mouth nearly as large as the diameter of the stomach and cannot be closed.

Mesonema pensile (MODEER), 1791—Plate II., figs. 11 to 15.

Medusa sp., FORSKÅL (1776, p. 9, tab. xxviii. b.).

Mesonema cœlem pensile, MODEER (1791, p. 32).

Mesonema pensile, HAECKEL (1879); BROWNE (1904, p. 733, pl. Iv., fig. 4; pl. lvii., figs. 2-9).

In my Report upon the Hydromedusæ of the Maldives Islands I gave a description of *Mesonema pensile* (MODEER). In this Ceylon collection there are fragments of a specimen which I believe belongs to this species. The specimen is from the Cheval Paar, Gulf of Manaar, and is broken up into about twenty-five pieces, which together represent only a portion of the whole medusa. Fortunately some of the fragments contain all the organs of the medusa, and it is possible, within certain limits, to give a description and to identify the species.

This medusa is so peculiarly constructed that all the organs lie close to the margin of the umbrella. The umbrella is rather like a plano-convex lens in shape and of great thickness. Around its periphery lie the mouth, stomach, radial canals, marginal tentacles, and sense-organs. These organs are all close together, the distance from the oral lips to the margin of the umbrella is only about 20 millims. To judge from the curvatures of the stomach and the margin of the umbrella on the three largest fragments (the largest fragment which contained all the organs measures 35 millims. in length), the diameter of the umbrella should be much larger than that of the largest Maldives specimen, which measured about 60 millims. in diameter. I think that this medusa when alive was probably about twice the size of the largest Maldives specimen.

The stomach (fig. 14) is rudimentary, and its lower wall is about 4 millims. in length. The margin of the mouth is furnished with a large number of long narrow lips, which are strengthened by an external rib. The length of the longest lips is about 4 millims. Among the lips there are many small ones in the course of development. In structure and shape the oral lips are exactly like those of the Maldives *Mesonema*, but they are a little longer. The lower wall of the stomach is also longer, twice the length.

The radial canals are very numerous, and very short ; the distance from margin of the stomach to the circular canal is about 9 millims. The radial canals usually run straight from the stomach to the circular canal, and in one fragment the canal system is quite normal, but some fragments show that the short portion of the canals,

between the termination of the gonads and the circular canal, has a strong tendency to curve and to send out lateral branches, which occasionally unite with lateral branches from an adjacent canal, or the union of two or three canals may occur, so that just near the margin of the umbrella the radial canal system appears to be very irregular.

The gonads are situated upon the radial canals and extend almost from the stomach to within a short distance of the circular canal, the distance from the termination of the gonad to the circular canal being about 2 millims. to 3 millims. The gonads are arranged in a lateral band along each side of the radial canals. At first a radial canal is merely a narrow, slender, inconspicuous tube (fig. 14, R.), then when the gonads begin to develop, the wall of the canal becomes thicker and increases in size. In this specimen the gonads are much larger than in the Maldivian specimens. They have the appearance of cylindrical sacs, about 6 millims. in length and 1 millim. in diameter, with the wall slightly crumpled. Between the canals bearing the fully-developed gonads there are, here and there, canals which are of much later growth showing gonads in various stages of development. Some of these canals are at about the same stage as those in the Maldivian specimens, showing that the Maldivian specimens had not reached their full development.

The tentacles (fig. 12) belong to the same type as those of the Maldivian specimens, but the basal bulbs have not such a long lateral extension along the margin of the umbrella. I have again examined the tentacles of the Maldivian specimens, and find the extension along the margin to be slightly variable. The tentacles are also much longer and larger than those in the Maldivian specimens, but they have the nematocysts arranged in the same manner. The nematocysts are in large clusters, which are laterally situated, on both sides, along the whole of the tentacle (fig. 13).

The marginal bulbs, like the basal bulb, at first sight, as shown by the figures in this Report and in the Maldivian Report, do not appear to be similar, but I believe that the difference in general appearance is due to a lateral contraction of the margin of the umbrella of the specimen in this collection. The bulbs are closely packed together, touching one another, and the sense-organs are squeezed out on to the inner margin of the umbrella (fig. 15). This lateral contraction would also explain the shortness of the basal bulbs of the tentacles upon the margin. In the genus *Aequorea*, excretory pores are present upon the inner side of the circular canals, one opposite each tentacle or bulb. In my description of this species in the Maldivian Report I did not mention the excretory pores, for the simple reason that I could not see any. But I have now cut a series of sections of a marginal bulb and found the pore in the usual place just above the velum. There is no trace of any external papilla or swelling, but simply a slender, narrow tube running from the circular canal to the exterior. It is just like a slit in the wall of the circular canal.

The sense-organs (fig. 15) are on the inner side of the margin of the umbrella, and are arranged in groups. These groups are placed midway between the marginal

bulbs. Between two tentacles I counted the number of bulbs and sense-organs, and found that there were 10 bulbs and 20 sense organs. The latter were arranged in numbers thus: 1.1.2.3.1.1.1.2.2.2.2.2. From the examination of other groups of sense-organs it may be said that there are either one or two, rarely three sense-organs between every two bulbs. A sense-organ contains two otoliths. The figure (11) shows the shape of the vesicle and the position of the otoliths, but the minute details of structure are somewhat diagrammatic.

It is impossible to estimate the number of tentacles, radial canals, &c., which the specimen should have, as the fragments are only a portion of the whole medusa. The tentacles are about 5 millims. to 8 millims. apart, and between them there are about 8 to 12 marginal bulbs, and about 4 to 8 radial canals.

Distribution:—Indian Ocean.

ORDER: TRACHOMEDUSÆ.

FAMILY: OLINDIIDÆ, HAECKEL, 1877; ex BROWNE, 1904.

Gonianemus, A. AGASSIZ, 1862.

Gonianemus hornelli, n. sp.—Plate I., fig. 6; Plate II., fig. 4.

Description.—Umbrella hemispherical, with moderately thick walls, about twice as broad as high. Velum fairly broad. Stomach cross-shaped, having four perradial lobes, situated upon a short, broad, cone-shaped peduncle. Mouth with four short lips. Four broad radial canals, upon which are situated the gonads. Gonads small in size, deeply folded and lobed, extending laterally from the canals and close to the velum. Tentacles about 70, arranged in 16 groups, and all have an adhesive disc about half-way down. Sixteen internal sense-organs, oval in shape, with a single otolith.

Size:—Umbrella 6 millims. in width and 3 millims. in height.

Locality:—Pearl Banks, Gulf of Manaar.

Notes.—The single specimen is in an excellent state of preservation and in perfect condition. The gonads are not papilliform, but are deeply folded and extend outwards on both sides of the radial canals. They are about twice as broad as high, and contain ova of a fair size. On one of the radial canals there is an additional gonad, smaller in size, and not far from the stomach. It may be regarded as an abnormal growth, as the other three canals show no signs of a gonad in that position.

The tentacles are arranged in 16 groups, but the grouping is not so well marked as in the genus *Gossea*. The tentacles forming a group are not of the same size, which is due to development. The perradial and interradial groups each contain five tentacles, the adrarial four tentacles. The central tentacle in each group is the largest, the tentacles on each side of the central one come next in size; the two outside tentacles vary very much in size, one is always very small. The attachment

of the basal part of the tentacle to the ex-umbrella varies in length according to the age of the tentacle. It proceeds furthest up the umbrella in the oldest tentacles and less far in the other tentacles, showing well the arrangement of the tentacles in groups. There is a semi-globular basal bulb on the inner side of each tentacle, and for a short distance the base of the tentacle is attached on its outer side to the margin of the ex-umbrella, being partly embedded in a groove. The tentacles are covered with nematocysts, which are arranged in transverse bands. The adhesive disc is on the outer side of the tentacle, forming a slightly raised elongated loop, and as it extends about half-way across the tentacle it is easily seen. All the tentacles of this specimen are contracted, and in this condition the adhesive disc is about half-way down the tentacle.

The sense-organs are inside the margin of the umbrella, adjacent to the circular canal, and their position is between the groups of tentacles.

Olindias, F. MÜLLER, 1861.

Olindias, sp. ?

There is only one specimen, which is in bad condition. The umbrella is about 6 millims. in diameter. The stomach is fairly large and cross-shaped. The mouth has four lips and its margin is slightly folded. Four perradial canals, and about three centripetal canals in each quadrant. The gonads extend over the outer half of the radial canals and are arranged in papilliform clusters. The margin of the umbrella is torn and damaged. There are two kinds of tentacles; the primary tentacles have a few spiral bands of nematocysts and a horseshoe-shaped terminal cluster, the secondary tentacles have numerous bands of nematocysts. Upon the margin of the umbrella there are a number of large bulbs which look like the basal bulbs of the secondary tentacles which have been broken off, and also a number of small bulbs. An internal sense-organ lies at the base of some of the primary tentacles, but this could only be seen here and there, owing to the opaqueness and damaged condition of the margin.

The specimen may be *Olindias singularis*, found at the Maldives, but it is not in a condition suitable for an accurate determination of the species. It was found amongst sea-weed at Galle, on February 17.

Note on the Olindiidæ.

In my Report on the Hydromedusæ of the Maldives Islands I revised the genera of the Olindiidæ, but did not know till too late that Professor SEITARO Goto had published a paper on "The Craspedote medusa *Olindias* and some of its Natural Allies" in the 'Mark Anniversary Volume.' It was not until several months after the publication of my paper that I was able to obtain a copy of the volume, and later on Professor Goto kindly sent me a reprint of his paper.

Goto has also revised the Olindiidæ, but excludes from the family the genera

Aglauropsis and *Gossea*, which have not an adhesive disc on the tentacles. About the genus *Olindias* we differ, and it is quite likely that I may be in the wrong. We both examined specimens sent out from the Zoological Station at Naples. I came to the conclusion that the primary (ex-umbrellar) tentacles had not a terminal adhesive disc, but Goto has expressed an opposite opinion. It is an important point in the classification and could, no doubt, be quickly settled by watching the habits of *Olindias* in the aquarium at Naples.

Goto has investigated the development of the sense-organs of *Olindioides formosa*, Goto, and has come to the conclusion that they are entirely derived from the ectoderm. On the ground that the sense-organ is ectodermal, Goto transfers the Olindiidæ from the Trachomedusæ to the Leptomedusæ and places them under the Eucopidæ. In this Report I have left the Olindiidæ in their old place for convenience sake, not that I dispute Goto's account of the development of the sense-organs, but rather that I am doubtful about their being true Leptomedusæ.

In 1901, when I was examining the medusæ brought back from the Falkland Islands by Mr. RUPERT VALLENTIN (I regret that the report on the collection is still unfinished, but hope to finish it next year), I cut some sections of the sense-organs of *Aglauropsis conantii*. The sense-organ lies in a corner, formed on one side by the ectoderm containing nematocysts on the margin of the umbrella, and on the other side by the endoderm of the circular canal. It is a globular vesicle containing an otolith upon a short stalk. The wall of the vesicle is composed of a single layer of cells which are in contact with the ectoderm, but isolated from the endoderm by what looks like a layer of mesoglœa. As this layer took a definite shape and stained a much deeper colour than the mesoglœa seen elsewhere, I, not knowing its origin, was doubtful about its really being mesoglœa. I was puzzled for a time over the sense-organ, not being sure whether the cells of the vesicle were ectoderm or endoderm, but finally came to the conclusion that the deeply-stained layer between the vesicle and the endoderm had some connection with the sense-organ and regarded the whole sense-organ as endodermal. As the sections showed that the preservation was not suitable for histological work (the specimens were preserved in formalin), I did not attempt to trace the development of the sense-organ.

After reading Goto's description of the development of the sense-organ of *Olindioides*, I again examined the sections of *Aglauropsis*. I am now inclined towards the view that the vesicle is ectodermal, and that it is cut off from the endoderm by mesoglœa, but before coming to a definite conclusion I should like to see earlier stages in development.

FAMILY: GERYONIIDÆ, Eschscholtz, 1829; ex Maas, 1893.

Trachomedusæ, with four or six radial canals, in the course of which are situated leaf-shaped gonads. Blind centripetal canals. Stomach on a long peduncle. Internal sensory vesicles.

Liriope, LESSON, 1843; ex MAAS, 1893.

Geryoniidæ, with four radial canals and with four or eight tentacles.

Liriope tetraphylla (CHAMISSO et EYSENHARDT), 1820.

Geryonia tetraphylla, CHAMISSO et EYSENHARDT (1820, p. 357, plate xxvii.).

Liriantha tetraphylla, HAECKEL (1879).

Liriope tetraphylla, VANHÖFFEN (1902, p. 82, taf. x.); BROWNE (1904, p. 738, pl. liv., fig. 3).

The collection contains 19 specimens; only a few are in fairly good condition. There are a few early and intermediate stages, but their condition is not satisfactory for a description. The largest specimens are similar to a figure given by VANHÖFFEN.

When I wrote the 'Report on the Hydromedusæ of the Maldives' I was not quite certain about the correctness of the identification of a *Liriope* which I called *L. tetraphylla* (1904, plate liv.). I have again examined this specimen (there was only one in that collection) and have come to the conclusion that it must be regarded as *Liriope tetraphylla*. I have failed to find a character by which it could be specifically separated from those in the collection from Ceylon.

Notes on the Largest Specimens.—The shape of the umbrella is similar to that in the figure given by VANHÖFFEN, and is not so thick or so rounded as in that figured by me in the Maldives Report. The peduncle of the stomach is long and tapering; its length in the largest specimen is about 13 millims. Along the peduncle run four interradial, longitudinal muscle bands, which bifurcate at the base of the peduncle and the two ends curve outwards. The stomach is large and sac-shaped. The gonads vary very slightly in shape. They resemble VANHÖFFEN's figure, and measure 7 millims. in width and 5 millims. in length. The space between the gonads (measured from the upper margins) is about 2 millims. The radial canals are fairly broad, and that part of the canal between the gonad and the circular canal is much broader than as figured by VANHÖFFEN and myself. Most of the specimens have three centripetal canals in each quadrant. They are broader and less tapering than those shown in the figures mentioned above. One of the specimens has only one or two centripetal canals in each quadrant. A few of the specimens have eight tentacles, but the majority have only the four perradial tentacles.

Size :—The largest specimen measures 15 millims. in width and 7 millims. in height.

Locality :—Cheval Paar, off Mutwal Island and Chilaw Paar, various dates in March and November; Galle Bay, in June and July.

Distribution :—Atlantic and Indian Oceans.

ORDER: NARCOMEDUSÆ.

FAMILY: ÆGINIDÆ, GEGENBAUR, 1856; ex MAAS, 1904.

Solmundella, HAECKEL, 1879; ex MAAS, 1904.

Æginidæ with two tentacles and with a stomach having eight pouches.

Solmundella bitentaculata (QUOY et GAIMARD), 1833—Plate IV., figs. 1 to 6.

Charybdea bitentaculata, QUOY et GAIMARD (1833, tome v., p. 295, plate xxv., figs. 4 and 5).

Æginella bitentaculata, HAECKEL (1879).

Solmundella bitentaculata, BROWNE (1904, p. 741, plate lvi., fig. 3).

Description of the Adult.—Umbrella cone-shaped, usually a little broader than high. Stomach circular and flat, nearly as wide as the umbrella, having eight lateral pouches which are rectangular in shape and about twice as broad as high. Mouth circular, with an everted rim. Gonads on the inner wall of the pouches and also extending over the outer half of the lower wall of the stomach, forming a continuous band. Two opposite tentacles, which are situated above the stomach, and are about two to three times longer than the diameter of the umbrella. Peronial bands and grooves present. Sense-organs 24, perhaps more, usually three in each octant.

Size:—Umbrella up to 9 millims. in height and width.

Locality:—Galle, in February and August; Modragam Paar and Cheval Paar, in November; and Trincomalee.

Distribution:—Australasian seas; Amboina Island (QUOY et GAIMARD). Singapore (BEDFORD; in Coll. E.T.B.). Indian Ocean; Maldives Islands (BIGELOW, 1904, p. 261, under the name of *Æginella dissonema*; and BROWNE).

Notes.—The collection contains 39 specimens; only a few are in good condition, and most of them are about 3 millims. to 5 millims. in diameter.

The umbrella is cone-shaped and nearly as high as broad. There is a slight variation in its shape, as the apex is more rounded in some specimens than in others. All the specimens have the apex of the umbrella more or less battered down so that it is impossible to note its exact shape, but it is not so pointed as that shown in the figure given by QUOY and GAIMARD. The peronial groove below each tentacle is very deep, and goes right back to the wall of the sub-umbrella. The stomach is circular and flat and has eight lateral pouches. The upper wall of the stomach is either flat or slightly convex. The lower wall is also flat, with a circular mouth in the centre. The mouth, when fully expanded, is almost as wide as the diameter of the stomach. Its natural size is apparently about one-third to one-quarter the diameter of the stomach, but when closed the opening is very small. The margin of the mouth has an everted rim, and it does not usually hang down so low as in the specimen figured by me in the Maldives Report.

HAECKEL, in his description of *Æginella dissonema*, and also MAYER (1900, p. 66, plate xiv.) state that there are four double perradial canals, each canal being divided into two by a longitudinal septum (called by HAECKEL the peronium). The appearance of a double radial canal was seen in the two Maldives specimens, and also very plainly in some of the specimens in this collection, especially when the umbrella had been lightly stained. Transverse sections, however, do not confirm the presence of radial canals, and, after cutting several complete series, I have come to the conclusion that they are a delusion.

Description of the Peronia.—It is in the perradii, without the tentacles, that the appearance of a double canal is best seen, and transverse section in this position shows the “septum” but no canals (fig. 1).

In the two perradii, which have the tentacles, there is a longitudinal groove, the peronial groove, running from the margin of the umbrella up to the tentacle. This groove is very deep, running back to the wall of the sub-umbrella, cutting the wall of the sub-umbrella nearly in two (fig. 2). At the bottom of this groove is the peronial band (figs. 2 and 6), which runs from the margin of the umbrella to the base of the tentacle. The peronial band is a solid cord of ectoderm cells, nearly circular in transverse section, and surrounded by mesoglœa, except on the side facing the peronial groove. In the lower wall of the stomach there are two little funnel-shaped pockets, one under the root of each tentacle. Sections show that the ectoderm of the lower wall of the stomach, at the apex of the pocket, unites with the peronial band, and is continuous with the ectoderm of the tentacle. In the ectoderm of the tentacles there are large round nematocysts. These nematocysts form a conspicuous band along the under or lower side of the tentacle near its base (fig. 6) and then, a little further along, spread all round the tentacle. I have found similar nematocysts in the ectoderm of the pockets in the lower wall of the stomach and scattered among the generative cells (fig. 2) adjacent to the pockets. They are also in the strand of ectoderm between the apex of the pocket and the tentacle, but not in the peronial band, which is between this point and the margin of the umbrella. It seems to me that the nematocysts develop in the lower wall of the stomach in the neighbourhood of the pockets, then migrate into the ectoderm of the pocket and pass along the strand to the ectoderm of the tentacle.

The “septum” in the perradii, without tentacles, has the same structure as the peronial bands connected with the tentacles, but there is no peronial groove and the band (“septum”) is completely surrounded with mesoglœa. It starts from the margin of the umbrella, runs up the side of the wall of the sub-umbrella, and at the level of the lower wall of the stomach it curves outwards and passes through the jelly to the ex-umbrella. In its passage through the jelly it tapers out almost to a point, and in some specimens stops a little way short of the ex-umbrella. Its presence marks the former existence of a tentacle, and shows that *Solmundella* is descended from a medusa which had four perradial tentacles.

The appearance of radial canals on each side of a “septum” is, in my opinion, due to the transparent mesoglœa in the short interval between the gastric pouches.

Sections across the margin of the umbrella do not show the existence of a definite circular canal.

Gonads.—Some of the specimens have the gonads confined to the inner wall of the gastric pouches, where they lie in the ectoderm (figs. 1 and 2). The gonads may extend over the lower half of each gastric pouch or over the whole pouch. Some of the large specimens have the gonads not only over the gastric pouches but

also over a part of the lower wall of the stomach, forming a continuous ring round the lower wall of the stomach just like the genital ring of a Solmaris. One specimen has the outer half of the lower wall of the stomach covered with ova, which are large and clearly visible; other specimens have only one quarter or one third of the wall of the stomach occupied with gonads. It appears from the specimens that the gonads first start developing at the bottom of the pouches, and then spread upwards and finally reach the lower wall of the stomach. The smallest specimens have the gonads confined to the pouches, but it is only in the largest specimens that the gonads are on the wall of the stomach.

Tentacles.—My figure of *Solmundella* in the Maldivian Report shows that the base or root of the tentacles is curved outwards towards the ex-umbrella. This I now find is not the normal position, but the position occasionally taken when a specimen is in a contracted condition. As a rule the root of the tentacle points towards the centre of the umbrella (fig. 6), and in specimens which do not show signs of contraction it is sometimes clear of the upper wall of the stomach and the curve is scarcely visible. The tentacles have numerous internal transverse septa (fig. 5) which are connected in the centre by an elongated endoderm cell, containing usually two nuclei. The lower part of the tentacle (fig. 4) is somewhat triangular in shape; along this portion there is a longitudinal muscle band.

Sense-organs.—The smaller specimens have two sense-organs and the largest ones three and perhaps more in each octant. In certain octants I have seen extra bulbs without sense-organs, and these may be the bases of sense-organs which have lost the otolithic part through injury.

A few of the specimens are infested with a Cercaria.

SIPHONOPHORA.

ORDER : CALYCOPHORÆ, LEUCKART.

FAMILY : DIPHYIDÆ, ESCHSCHOLTZ, 1829.

Diphyes, CUVIER, 1817.

Diphyes chamissonis, HUXLEY, 1859.

Diphyes chamissonis, HUXLEY (1859, p. 36, pl. i., fig. 3); BROWNE (1904, p. 742, pl. liv., fig. 6).

The collection contains eleven anterior nectophores, some of which are in very good condition. The specimens are similar to those which were described and figured by me in the 'Report on the Hydromedusæ of the Maldivian Islands.'

One specimen is from Galle, in July, but all the rest were from the Gulf of Manaar, mostly in February and March.

The nectophores measure about 8 millims. to 11 millims. in length. The somatocyst

shows considerable variation in length and thickness. Some of the specimens have the somatocyst similar in shape and size to that shown in my figure of the species, whereas in other specimens it is longer (the length varies from 2 millims. to $3\frac{1}{2}$ millims.) and much thinner. The length of the hydrœcium is also variable, about one-third to half the length of the umbrella.

ORDER : PHYSOPHORÆ, ESCHSCHOLTZ, 1829.

FAMILY : AGALMIDÆ, BRANDT, 1835.

Cupulita, QUOY et GAIMARD, 1824.

There is one small specimen of a *Cupulita*, from the Cheval Paar, which is very much broken up. I am unable to determine the species.

Agalmopsis, SARS, 1846.

There are two small specimens, from the Cheval Paar, both of which are badly contracted and broken. The nectophores have all disappeared with the exception of a few minute buds, and only one damaged bract remains. The tricornuate tentilla are large and in excellent condition.

FAMILY : PHYSALIIDÆ, BRANDT, 1835.

Physalia, LAMARCK, 1801.

Physalia utriculus, ESCHSCHOLTZ, 1829.

Physalia utriculus, HUXLEY (1859, p. 101, pl. x., pl. xii., fig. 12); BROWNE (1904, p. 744).

Two small specimens were caught off Watering Point, Galle. The float is about 15 millims. in length. There is one main tentacle and several very small secondary tentacles. The gonophores are beginning to develop.

FAMILY : PORPITIDÆ, BRANDT, 1835.

Porpita, LAMARCK, 1801.

Porpita is represented by the remains of a single float, obtained on the Pearl Banks, Gulf of Manaar, and measuring about 35 millims. in diameter. The upper surface of the float has numerous radial rows of stigmata on the back of prominent ridges. It resembles the float of *Porpita umbella*, which is figured by HAECKEL (1888, plate xlvi., fig. 5).

SCYPHOMEDUSÆ.

CHARYBDEIDA.

Charybdea, PÉRON et LESUEUR, 1809.

Charybdea, sp. ?

There is a single specimen in the collection from the pearl banks, and it is not in a first rate condition. The umbrella has become soft and limp, consequently it has collapsed and lost its natural shape. The umbrella measures about 75 millims. in length, and is probably cone-shaped. The stomach is very short and flat; the mouth has small lips. The gastric filaments appear to be perradial in position (the top of the umbrella is damaged and crushed in). Each of the four groups is composed of about six tufts of filaments packed so close together as to form a continuous row. The sense-organs are about 10 millims. away from the margin of the umbrella. There are four ocelli on the inner side of each tentaculocyst. The principal ocellus is very large and semi-globular in shape. Above it, a little nearer the base of the tentaculocyst, is a transverse ocellus, forming a narrow pigmented band. The other two ocelli are more lateral in position, and situated between the semi-globular and the transverse ocelli. The ocelli are of a reddish brown colour in formalin. The velarium contains seven unbranched canals between every two tentacles. The gonads form very narrow bands, and appear to be quite immature. The pedalia are about 20 millims. in length and 15 millims. in width. The shape of their wings and the tentacle resemble the figure of *Charybdea grandis* (AGASSIZ and MAYER, 1902, plate vi.).

This may be an immature specimen of *Charybdea grandis*, but I remain uncertain. A second specimen would have been an advantage for comparison.

CORONATA.

FAMILY: NAUSITHOIDÆ, HAECKEL, 1879; ex VANHÖFFEN, 1902.

Nausithoe, KÖLLIKER, 1853.

Nausithoe punctata, KÖLLIKER, 1853.

Nausithoe punctata, VANHÖFFEN, 1892, p. 13, Taf. iii., figs. 8 and 9; MAYER, 1900, p. 67, plate xxiii., figs. 67 and 68, plate xxvi., figs. 87 and 88; VANHÖFFEN, 1902, p. 29; BIGELOW, 1904, p. 263, plate vi., fig. 21.

Description.—The umbrella is somewhat hemispherical in shape. At the top of the umbrella there is a distinct hemispherical crown which is separated off from the

rest of the umbrella by a conspicuous circular furrow. Just below the circular furrow the radial furrows begin. There are 16 deep radial furrows on the ex-umbrella, one midway between every tentacle and sense organ, terminating at the base of the marginal lobes. The bottom of each furrow is attached to the wall of the sub-umbrella by a septum which divides the distal portion of the stomach into 16 pouches (8 ocular and 8 tentacular). The septum is continued for a little way down the middle of each marginal lobe, separating the prolongation of the stomach in each lobe into two parts. But as the septum does not proceed along the whole length of the gastric prolongation, two completely isolated pouches are not formed. The whole of the ex-umbrella, including the marginal lobes, is closely granulated.

The gastric filaments are arranged in four distinct groups, which are isolated from each other by the four basal angles of the cross-shaped mouth. There are about 10 to 12 filaments in each group arranged in a single row. Each group occupies the whole space between the angles of the mouth.

The mouth is large and cross-shaped, about 3 millims. in length and width.

The gonads vary in shape, and, looked at from the sub-umbrella, appear circular or oval. The largest are about 1 millim. in length and 0·75 millim. in width. Three specimens in one bottle have rose-red gonads, and two in another bottle are of an orange colour. All the specimens are in formalin. One is a male and four are females with large ova.

There are 16 marginal lobes, which are about as broad as long (2 millims.), and have a rounded edge. Between these lobes are the eight tentacles and eight sense-organs, which alternate with each other. The tentacles are of moderate length (about 5 millims.), stiff, and taper to a fine point. The sense-organs have an otolithic sac and a circular reddish pigmented ocellus.

The collection contains five specimens, three of which are in splendid condition. Two were from off Mutwal Island on March 19, and three from Muttuvavaratu Paar on March 29. The largest measures 9 millims. in width and 7 millims. in height. Two specimens are 9 millims. in width and 5 millims. in height. The others are slightly smaller.

I have compared these specimens with *Nausithoe punctata* obtained from the Zoological Laboratory at Naples, and feel certain that they belong to this species; in fact, they agree in every detail except in the shape of the ocellus. The Naples specimens have a circular pigmented ocellus on a semi-circular or convex bulb, whereas in the Ceylon specimens the ocellus forms a pigmented ring on a bulb with a flat surface.

The results obtained by the "Valdivia" and "Siboga" Expeditions show that *Nausithoe punctata* has a very wide geographical distribution. It occurs in all the oceans. It was taken by the "Valdivia" off the east coast of Ceylon, and by BIGELOW at the Maldives.

DISCOPHORA.

SEMÆOSTOMATA.

Pelagia.

Pelagia, sp. ?

There are nine very young stages, the smallest 4 millims. in diameter and the largest 8 millims. They have eight tentacles and eight sense-organs. These specimens are too immature for me to identify, as they have not long passed through the Ephyra stage. They are all from the Cheval Paar, Gulf of Manaar.

RHIZOSTOMATA.

FAMILY : LYCHNORHIZIDÆ, MAAS, 1903.

Crambessa.

Crambessa, sp. ?

The collection contains two specimens, both from Galle Bay, June and August ; one is in fairly good condition and the other is damaged.

Umbrella.—The umbrella is semi-globular, about twice as broad as high, and measures about 75 millims. in width and about 40 millims. in height. The ex-umbrella looks smooth, but a close examination with a lens shows that the surface is closely covered with very minute papillæ, which give it a granulated appearance. The ex-umbrella of one specimen has fine markings which look like a pattern produced by pressure against a tow-net. The pattern forms a network with a mesh of about half a millimetre.

Canal System.—There are eight ocular canals and eight adradial canals. The ocular canals run to the sense-organs, but the adradial canals stop at the circular canal and do not proceed to the margin. The circular canal, which is broad and conspicuous, is situated about 10 millims. from the margin of the umbrella. Between the circular canal and the margin of the umbrella the canal system forms a network of fine meshes. The ocular canals pass through this network and anastomose with it. On the inner side of the circular canal and between the radial canals there is a very coarse network of canals. This network is in communication with the circular canal, but not with the stomach. In one specimen there is a slight anastomosis of the inner network with some of the radial canals, but in the other specimen there is no union.

Margin of the Umbrella.—Some of the velar lobes are about as long as broad, somewhat quadrangular in shape, with rounded corners, and some are narrow and more pointed. There are about eight velar lobes between every two ocular lobes.

Sense-organs.—Eight sense-organs are present. The outer sensory pit is triangular in outline and its surface is folded. The principal folds radiate outwards from the bottom of the pit. The tentaculocyst is apparently without an ocellus, as there is no trace of any pigment. The ocular lobes are much smaller than the velar lobes, and are pointed.

Sub-umbrella Muscles.—In one specimen the sub-umbrella muscles have become detached and a clear view of the canal system is obtained. In the other specimen the muscles are present, and they form a circular band between the periphery of the oral disc and the margin of the umbrella. The circular muscle band is continuous and is not radially interrupted.

Sub-genital Cavity.—The four sub-genital ostia open into a common continuous cavity. The ostia are very large, forming long but narrow slits, about 20 millims. in width, and about as wide as the columns. The entrance is partly blocked in the centre by a large triangular gelatinous knob on the sub-umbrella, and just inside there is another median knob and also two small lateral ones.

Oral Arms.—In a normal specimen there should be eight oral arms of equal length, but in both of these specimens the oral arms are abnormal in number and in length. One specimen has ten oral arms, the four columns bearing respectively 2.2.3.3. arms. The arms show a great difference in size, the largest is about 80 millims., and the smallest about 25 millims. As one arm is much longer than the others, which are all of different lengths, it is probable that the medusa received an injury in the oral arms, and regeneration has followed. The upper arm is very short and is somewhat laterally compressed. In the arm, measuring 80 millims. in length, the upper arm is about 15 millims. and the lower arm about 65 millims. The lower arm has three thin wings bearing oral mouths along the outer edges down to the distal end, which does not bear a gelatinous knob. The oral mouths on the ventral wings are continued along the upper arms to the oral disc, where they meet and form a cross-shaped pattern. There are no special appendages of any kind upon the arms or the oral disc. In the second specimen the arms are broken off close to the arm disc and there are stumps of nine, possibly ten, arms.

Stomach.—The stomach is cross-shaped. The gastric filaments run round the margin of the stomach and also curve downwards and inwards, forming a loop in the base of the columns. It is at the end of the loop that the canal from the oral arm enters the stomach.

The gonads are immature.

The specimens are of a whitish colour in formalin.

So far as I can make out, these specimens belong to the genus *Crambessa*, but I am not able to determine the species. As they are immature they are probably at an intermediate stage in growth and may develop into a species which has already been described.

CTENOPHORA.

ORDER: CYDIPPIDEA, LESSON.

FAMILY: PLEUROBRACHIIDÆ, CHUN, 1880.

Pleurobrachia, FLEMING, 1822.

Pleurobrachia globosa, MOSER, var. *ceylonensis*, nov.*Pleurobrachia globosa*, MOSER (1903, p. 7, taf. i., figs. 1-4).

The collection contains about 900 specimens, varying in size from about 2 millims. up to 8 millims. in length. The largest specimen measures 8 millims. in length and 7 millims. in width.

A few are preserved in formalin and these have been used for examination, as they have retained their shape better than those in alcohol. The specimens in alcohol suffer more or less from contraction and shrinkage. When contraction or shrinkage is considerable, the position of the various organs changes so much that it would be quite possible to make two or more species out of a hundred specimens.

Locality:—A few were obtained on the Cheval Paar in March and Modragam Paar in November; the great majority were from Galle Bay in June, July and August.

Description.—The body is egg-shaped, sloping towards the oral pole, and almost circular in a transverse section. There are eight rows (costæ) of ciliated plates, of moderate length, extending over half, or a little more than half, of the meridional surface, beginning and terminating at about equal distances from the aboral and oral poles respectively. Each row contains about twenty narrow ciliated plates (combs). The meridional canals are just as long as the costæ. The two tentacles and their sheaths lie above the level of the stomach. The base of the sheath is in the first fork of the gastrovascular canals, on a level with the funnel. The sheath is like a long cone, tapering from the base, and lying at an angle of about 45 degrees from the perpendicular axis of the body and pointing towards the aboral end of the body. The opening of the sheath on the surface of the body is just under the aboral boundary line of the costæ. At the bottom of the sheath is the base of the tentacle, which is somewhat concave. The tentacles have lateral filaments, but no eolidiform appendages were seen. The transverse canals from the funnel to the meridional canals slope slightly in the aboral direction and join the meridional canals in the middle of their length, slightly above the level of the funnel. The base of the tentacle lies a little way from the funnel, but in a large number of specimens, owing to contraction or shrinkage, the base of the tentacle is adjacent to the funnel. It has contracted back on to the funnel and the top of the stomach.

On comparing the specimens with the figures of *Pleurobrachia globosa* (MOSER, 1903, taf. i., figs. 1-3), I find that they differ mainly in the length of the costæ, which

are about half as long again. There is a slight difference in the shape of the body, the specimens from Ceylon taper more towards the oral pole. The position of the tentacular sheath is identical and so also is its sheath opening. As the chief difference lies in the length of the costæ, I hesitate to add a new species to the genus, but prefer to mark the difference by establishing a new variety.

The "Siboga" specimens were obtained in the Malay Archipelago.

ORDER: BEROIDEA, LESSON.

FAMILY: BEROIDÆ, ESCHSCHOLTZ, 1829.

Beroe, P. BROWNE, 1756.

Beroe flemingi (ESCHSCHOLTZ), 1829.

Pandora flemingii, ESCHSCHOLTZ (1829, p. 39, taf. ii., fig. 7).

Beroe pandora, MOSER (1903, p. 23, taf. ii., figs. 8 and 9; taf. iii., figs. 9 and 10).

There are about a dozen specimens in the collection, four of which are in fair condition and the others in fragments.

Description.—The body is conical, compressed in the funnel (transverse) plane, a little longer than wide, and rounded at the aboral end. The mouth is wide and has a fairly thin margin. The costæ are of unequal length; the sub-transversal costæ are about twice or nearly twice as long as the sub-ventral costæ. The meridional canals do not unite with the stomodæal canals. The lateral canals of the meridional canals meander without uniting in the smaller specimens, while in the larger specimens they unite with those from the adjacent meridional canals, forming a coarse irregular network in the outer wall of the body. Short blind canals also proceed from the circular canal around the mouth. The meridional canals on their outer surface are sparsely sprinkled with minute reddish-brown spots of pigment. The gonads are along the walls of the meridional canals, male and female on opposite sides of the canals.

Size:—8 millims. long and 6 millims. wide, 10 millims. long and 10 millims. wide, 12 millims. long and 8 millims. wide. Larger specimens broken into fragments.

Locality:—Off Mutwal Island, March 19, twelve specimens; Galle Bay, July 15, one specimen.

Distribution:—N. Pacific, east of Japan. Malay Archipelago.

Miss MOSER, in her 'Report on the Ctenophora of the "Siboga" Expedition,' has revised the Pleurobrachiidæ and Beroidæ, and has given a useful key for the identification of the species. I have tried to identify these specimens with the aid of the key, but remain somewhat doubtful about the result. The difficulty of the identification is no doubt increased by my want of experience in the group and by the fact that the best specimens are early stages. Taking the unequal length of the costæ and the absence

of cilia round the mouth as a guide, the specimens come nearest to *Beroe flemingii*. They do not, however, quite agree in shape, and the lateral canals from the meridional canals do not communicate with the stomodæal canals. Miss MOSER states that the Siboga specimens are identical with *Pandora flemingii* of ESCHSCHOLTZ. This species ESCHSCHOLTZ named after the English zoologist JOHN FLEMING. Miss MOSER, however, has changed the specific name to *pandora*, wishing to retain the generic name *Pandora* as a specific name in honour of ESCHSCHOLTZ. The changing of the specific name of this species is certainly contrary to the International Rules on Nomenclature, and consequently the specific name *pandora* is invalid.

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DESCRIPTION OF PLATES.

All the figures were drawn from specimens in formalin or alcohol; all sense-organs and sections were drawn with a camera lucida.

REFERENCE LETTERS.

<i>A.</i>	Adhesive disc.	<i>Or.</i>	Oral lip.
<i>B.</i>	Basal bulb.	<i>P.</i>	Peronium.
<i>CC.</i>	Circular canal.	<i>PG.</i>	Peronial groove.
<i>Ec.</i>	Ectoderm	<i>R.</i>	Radial canal.
<i>En.</i>	Endoderm.	<i>S.</i>	Sense-organ.
<i>Ex.</i>	Ex-umbrella.	<i>Sm.</i>	Septum.
<i>G.</i>	Gonad.	<i>St.</i>	Stomach.
<i>M.</i>	Mesoglœa.	<i>Stp.</i>	Stomach (gastric) pouch.
<i>N.</i>	Nematocyst.	<i>Sub.</i>	Sub-umbrella.
<i>Oc.</i>	Ocellus.	<i>T.</i>	Tentacle.
<i>Ov.</i>	Ovum.	<i>V.</i>	Velum.

PLATE I.

- Fig. 1. *Cytæis herdmani*, n. sp. (p. 135). Lateral view. × 30.
 „ 2. *Æquorea conica*, n. sp. (p. 145). Lateral view. × 10.
 „ 3. *Mitrocomium assimile*, n. sp. (p. 137). Lateral view. × 20.
 „ 4. *Irenopsis hexanemalis*, GOETTE (p. 142). Lateral view. × 10.
 „ 5. *Laodice indica*, n. sp. (p. 136). Oral view. × 15.
 „ 6. *Gonianemus hornelli*, n. sp. (p. 149). Lateral view. × 10.

PLATE II.

- Fig. 1. Tentacle of *Dipurena* sp. ? (p. 133). Lateral view. $\times 35$.
 „ 2. Manubrium of *Dipurena*, showing the gonads and stomach. (Slightly contracted.) $\times 20$.
 „ 3. Tentacle of *Proboscidactyla minima*, n. sp. (p. 136). Inner view. $\times 60$.
 „ 4. Tentacle of *Gonionemus hornelli*, n. sp., showing the position of the adhesive disc (*A.*) Outer view. Enlarged.
 „ 5. *Æquorea parva*, n. sp. (p. 146). Oral view. $\times 10$.
 „ 6. Portion of the sub-umbrella of *Æquorea parva*, showing the oral lips (*Or.*), the lower wall of the stomach (*St.*), the gonad (*G.*), and a tentacle. $\times 20$.
 „ 7. Sense-organ of *Æquorea parva*. Optical section. $\times 400$.
 „ 8. *Octocanna polynema* (HAECKEL) (p. 144). Oral view. $\times 5$.
 „ 9. Tentacle of *Octocanna polynema*, and also marginal bulbs and sense-organs. Outer view. $\times 40$.
 „ 10. Sense-organ of *Octocanna polynema*. Optical section. $\times 400$.
- Figs. 11 to 15. *Mesonema pensile*, MODEER (p. 147).
- Fig. 11. Sense-organ. Optical section. $\times 400$.
 „ 12. Tentacle and marginal bulbs. Outer view. $\times 10$.
 „ 13. Clusters of nematocysts on the tentacle. $\times 80$.
 „ 14. Portion of the stomach and sub-umbrella, showing the oral lips (*Or.*), the lower wall of the stomach (*St.*), the radial canals (*R.*) and gonads (*G.*).
 R' and *R''* are radial canals at an early-stage development. $\times 5$.
 „ 15. Marginal bulbs and sense-organs. $\times 16$.
 „ 16. Portion of the sub-umbrella of *Æquorea conica*, showing the oral lips (*Or.*), the lower wall of the stomach (*St.*), the gonads (*G.*) and tentacles. $\times 10$.
 „ 17. Gonad (female) of *Æquorea conica*. Lateral view. $\times 15$.
 „ 18. Sense-organ of *Æquorea conica*. Optical section. $\times 400$.

PLATE III.

- Fig. 1. Manubrium of *Eutima curva*, n. sp. (p. 138), showing the peduncle with gonads and stomach. $\times 9$.
 „ 2. Portion of the margin of the umbrella of *Eutima curva*, showing the basal bulb of a tentacle, the marginal bulbs and cirri. Outer view. $\times 50$.
 „ 3. Sense-organ, marginal bulbs and cirri of *Eutima curva*. Oral view. $\times 100$.
 „ 4. Manubrium of *Octorchis orientalis*, n. sp. (p. 139); showing the peduncle with gonads and stomach. $\times 10$.
- Figs. 5 to 8. *Irenopsis hexanemalis*.
- Fig. 5. Tentacles and marginal bulbs, showing the excretory papillæ fully expanded. Outer view. $\times 30$.
 „ 6. Tentacles, marginal bulbs, and sense-organs (papillæ contracted). $\times 30$.
 „ 7. Sense-organ. Optical section. $\times 400$.
 „ 8. The stomach and its peduncle. Lateral view. $\times 10$.
 „ 9. *Irene ceylonensis*, n. sp. (p. 140). Oral view of the umbrella, showing the stomach and its peduncle, the position of the gonads, and the tentacles in one quadrant of the umbrella. $\times 3$.
 „ 10. Sense-organ of *Irene ceylonensis*. Optical section. $\times 400$.
 „ 11. Tentacles and sense-organs of *Irene ceylonensis*. Outer view. $\times 30$.
 „ 12. *Irene palkensis*, n. sp. (p. 141). Oral view of the umbrella, showing the stomach and its peduncle, the position of the gonads, and the tentacles in one quadrant of the umbrella. $\times 4$.
 „ 13. Tentacles, marginal bulbs, and sense-organs of *Irene palkensis*. $\times 40$.
- Figs. 14 to 16. Sense organs of *Irene palkensis*. $\times 400$.

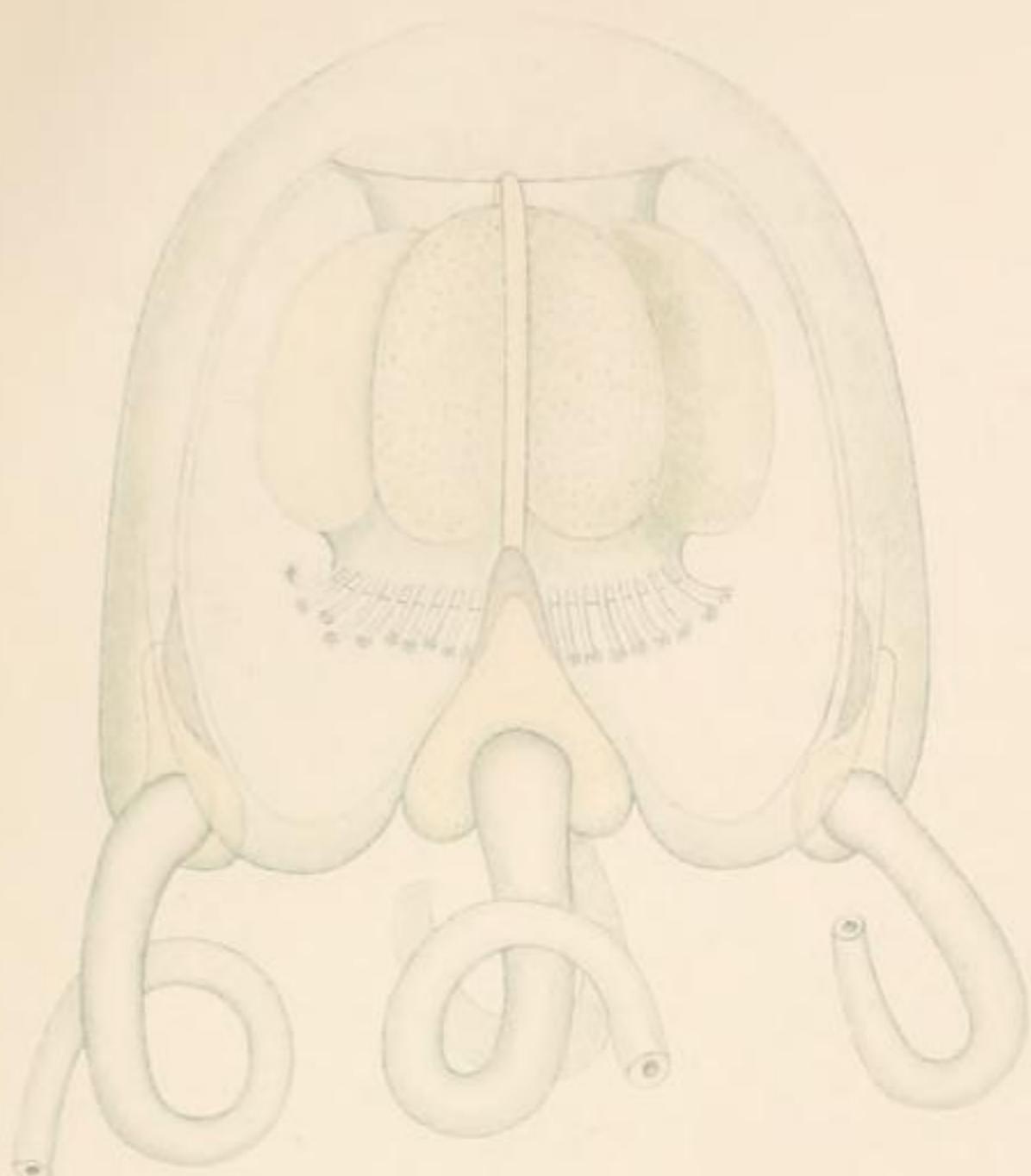
PLATE IV.

Figs. 1 to 6. *Solmundella bitentaculata*.

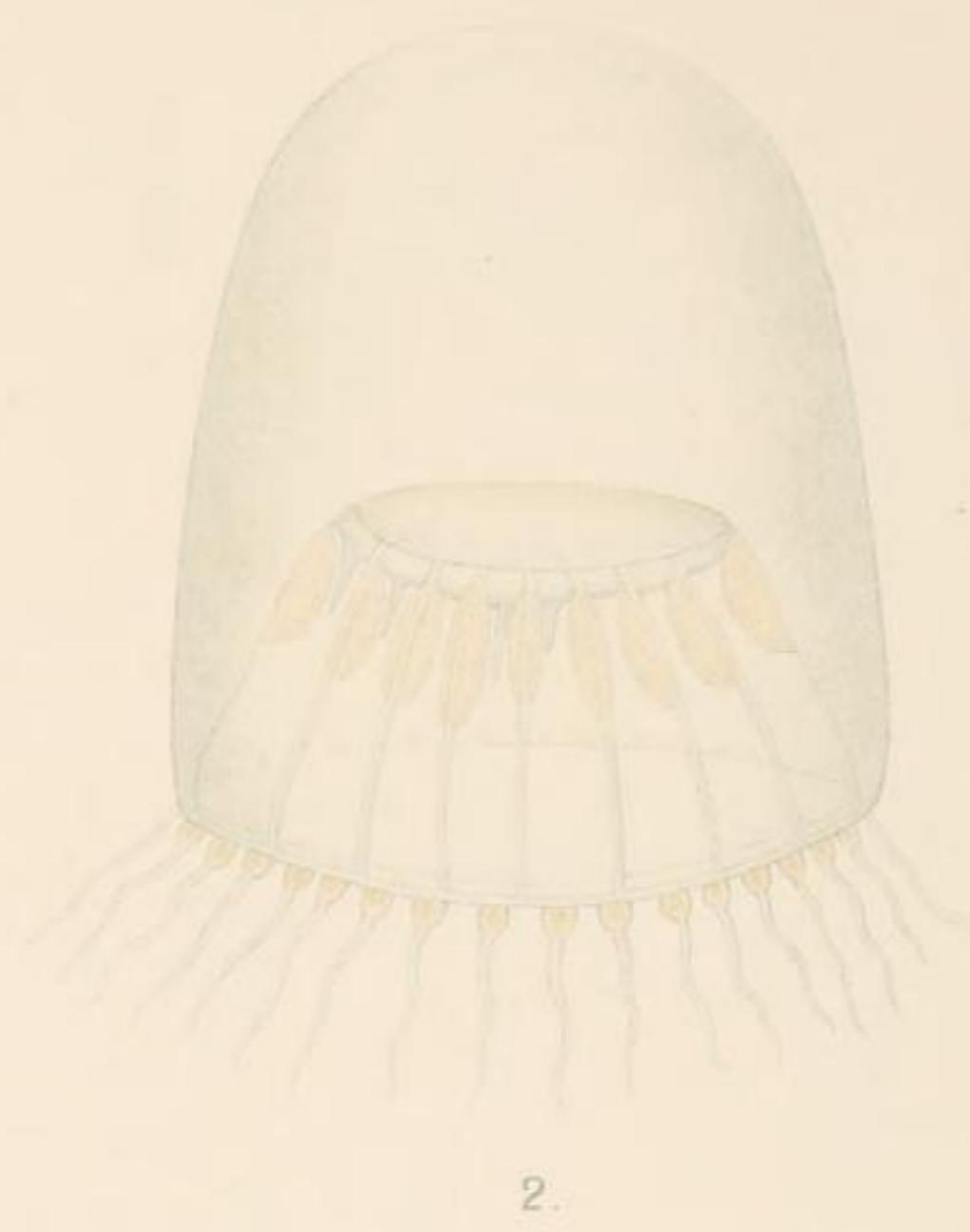
- Fig. 1. Transverse section of the peronium (*P.*) in the radius without tentacles, also showing the gastric pouches (*Stp.*) and the gonads (*G.*). $\times 260$.
 „ 2. Transverse section of the peronium (*P.*) in the radius with tentacles, showing the peronial groove (*P.G.*) $\times 270$.
 „ 3. Transverse section across the gastric pouches (*Stp.*), showing the position of the peronium (*P.*) in the radius without tentacles. $\times 20$.
 „ 4. Transverse section of a tentacle not far from the base. $\times 100$.
 „ 5. Longitudinal section of a portion of a tentacle not far from the distal end. $\times 270$.
 „ 6. Sketch showing the peronium (*P.*) running from the margin of the umbrella to the tentacle.
 * Plane of section, fig. 2. ** Plane of section, fig. 4.

Figs. 7 to 11. *Laodice indica*, n. sp.

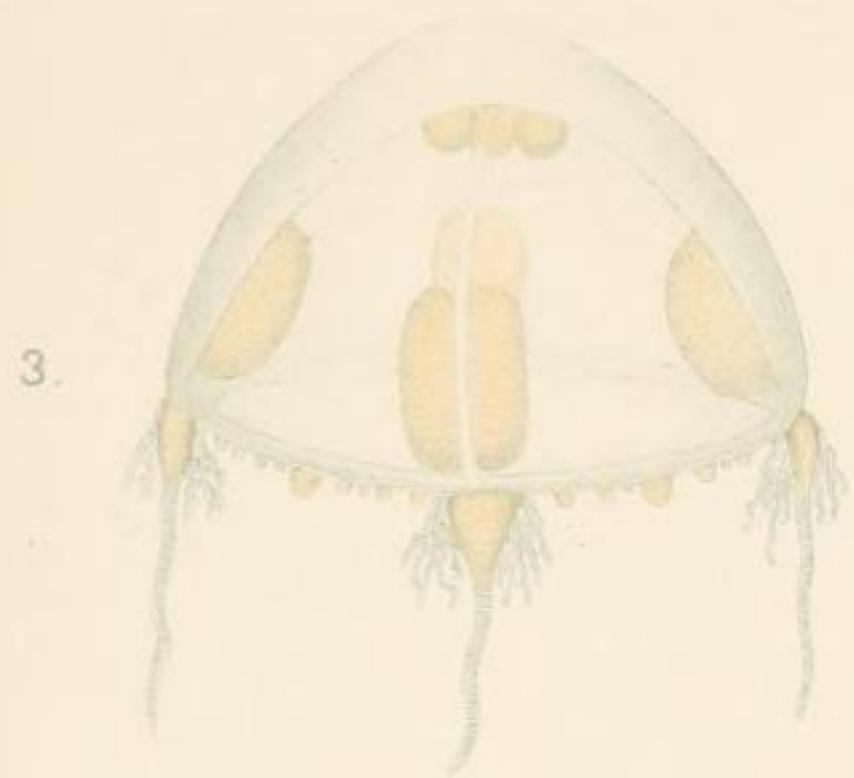
- Fig. 7. Longitudinal section of a cordylus. $\times 350$.
 „ 8. Longitudinal section through the basal bulb of a tentacle. $\times 150$.
 „ 9. Tentacle, cirrus, and cordylus. Inner view. $\times 85$.
 „ 10. Transverse section of an ovary, showing the escape of an ovum. $\times 80$.
 „ 11. Terminal cluster of nematocysts of a cirrus. $\times 380$.
 „ 12. *Cytaeis herdmani*, n. sp. Transverse section of a tentacle, showing the nematocysts in the ectoderm and the pigment granules in the endoderm. $\times 40$.



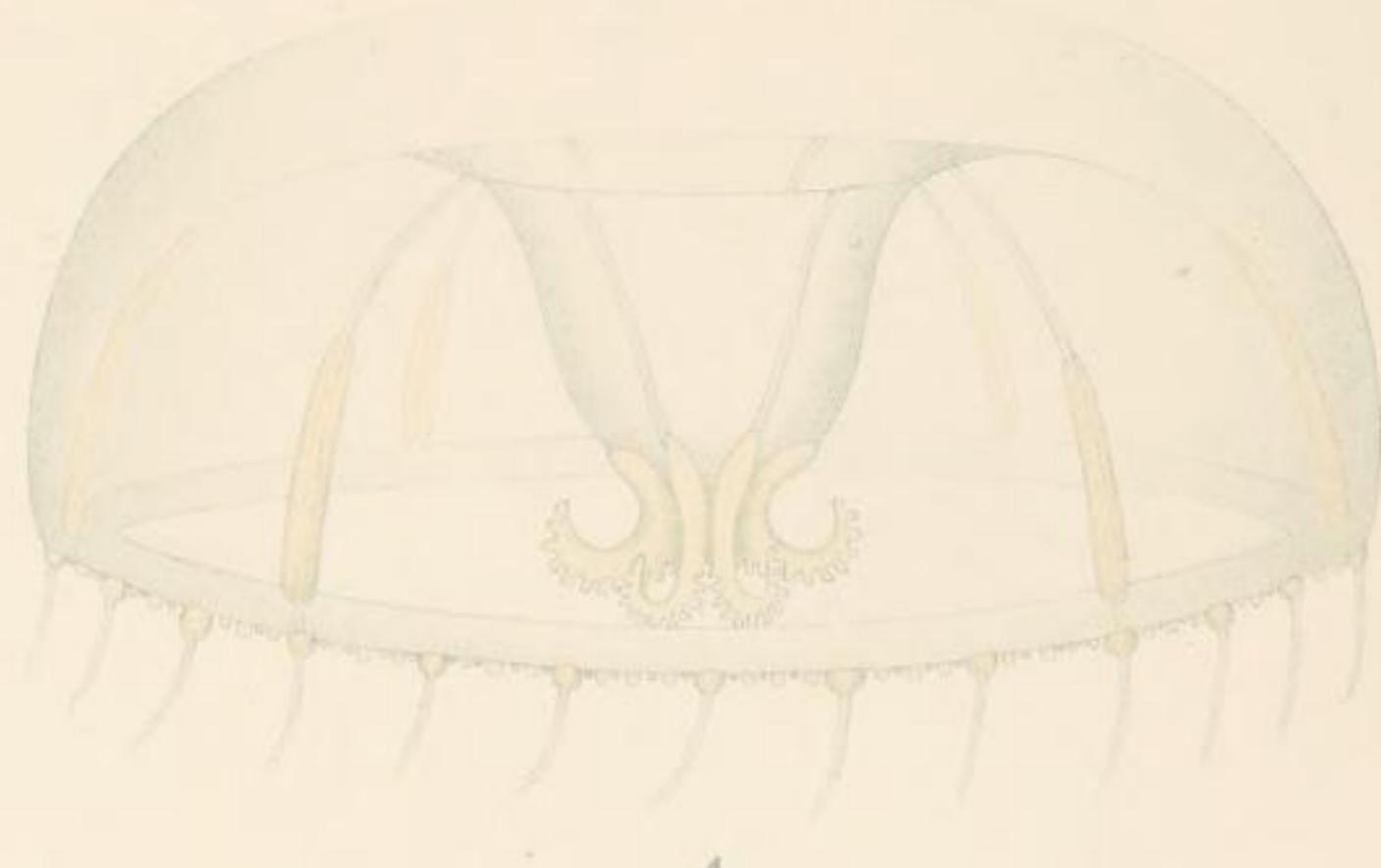
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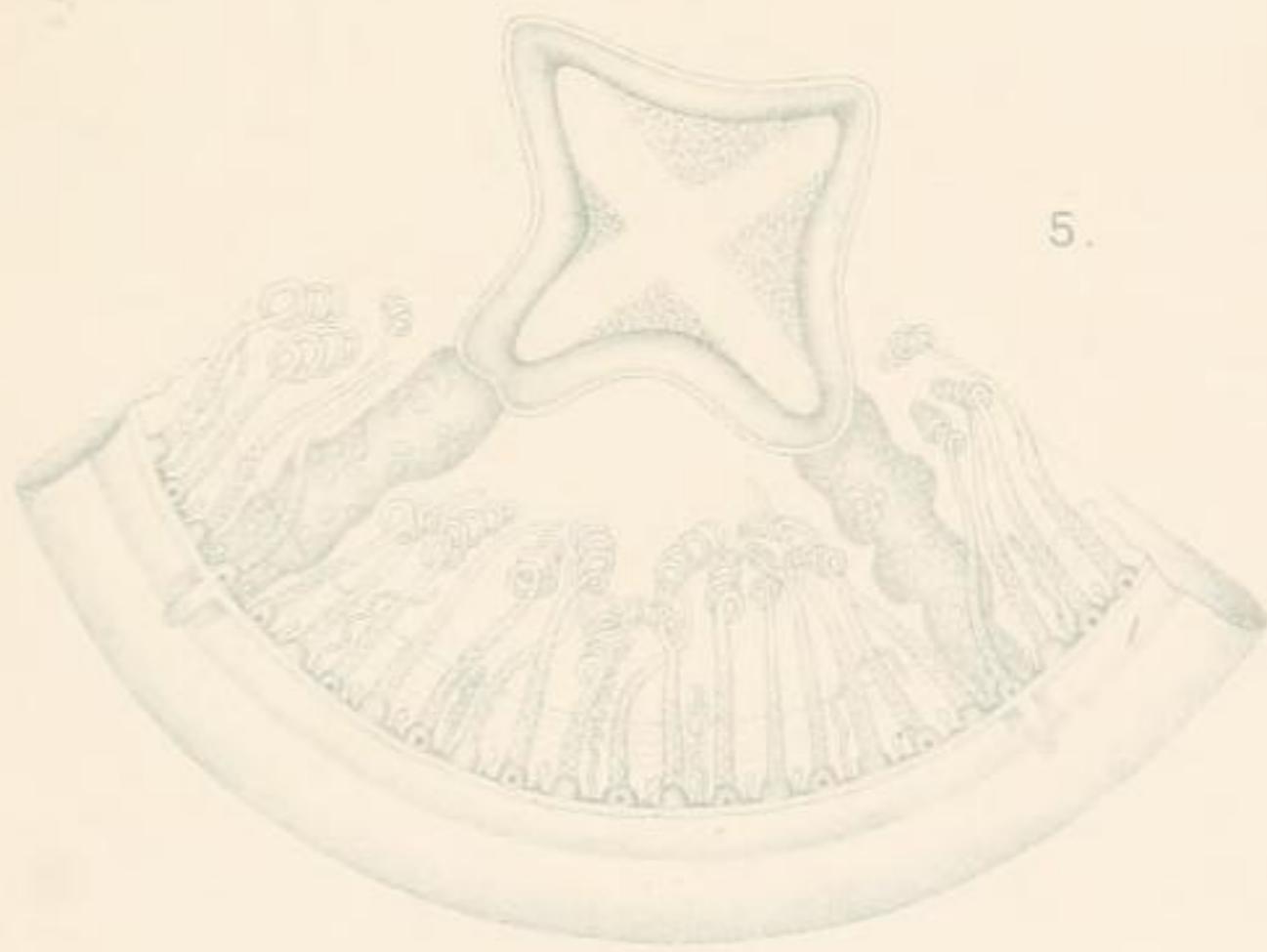
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