# MEDUSÆ OF THE HAWAIIAN ISLANDS COLLECTED BY THE STEAMER ALBATROSS IN 1902.

By ALFRED GOLDSBOROUGH MAYER,

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## INTRODUCTION.

The following pages contain a description of the Scyphomedusæ, Hydromedusæ, Siphonophoræ, and Ctenophoræ collected by the *Albatross* while in the Hawaiian Islands in 1902 upon a cruise of scientific exploration under the direction of Dr. David Starr Jordan and Dr. Barton Warren Evermann. The collection is a small one, contained in 39 bottles, all of the specimens preserved in formalin. The preservative has destroyed the otoliths of the Hydromedusæ; and the color of many of the specimens has faded, rendering specific identification difficult or impossible. Accordingly only those forms which are well preserved are described.

When this collection obtained in the Hawaiian Islands is compared with those of Agassiz and Mayer in the Paumotu, Society, Fiji islands, etc., of Bigelow and Browne in the Maldive Islands, and of Maas off the west coast of Central America, it appears that the majority of the Hawaiian forms are of wide distribution. For example, among the Scyphomedusæ, *Charybdea rastonii* is found off the coast of South Australia near Adelaide. *Atolla alexandri* is found off the Galapagos and Marquesas islands. *Periphylla dodecabostrycha* is found on the deep ocean floor of both Pacific and Atlantic oceans, while *Pelagia panopyra* is found in the middle and western regions of the tropical Pacific. Indeed only one Scyphomedusa, *Charybdea moseri*, nov. sp., appears to be peculiar to the Hawaiian Islands, and this is represented in the Philippine Islands by a closely allied species.

Among the Hydromedusæ *Solmaris insculpta*, nov. sp., appears to be peculiar to the Hawaiian Islands, although it is represented in Samoa by a closely allied species. *Rhopalonema typicum*, found by the *Albatross* in station 3806, at a depth of 25 fathoms, between Erben Bank and Kaiwi channel, has been described from the Galapagos, Marquesas, Paumotu, and Maldive islands. Another *Trachylina* form is doubtfully identified from broken fragments as *Solmaris punctatus*, and is crudely figured and described by Quoy and Gaimard (1824, Voy. d l'Uranie, Zool., p. 564. pl. 85, fig. 4) from the Hawaiian Islands. Two specimens of this medusa were taken by the *Albatross* at station 3878, from a depth of 75 fathoms, off Molokini Islet, on April 14.

A single *Bougainvillia*, believed to be identical with *B. fulva*, was obtained by the *Albatross* at station 3806, from a depth of 25 fathoms, between Erben Bank and

Kaiwi channel. This species has been taken by Agassiz and Mayer in the Ellice and Fiji islands.

Four large but badly broken specimens of *Eutima* were taken by the *Albatross* at station 4010, on the surface between Kauai and Oahu, on June 20. They appear to belong to a new species peculiar to Hawaii, but their state of preservation is such as to render accurate description impossible.

Among the Siphonophoræ obtained in the Hawaiian Islands by the *Albatross* are *Diphyopsis angustata*, *Abyla huxleyi*, *Physalia utriculus*, *Porpita pacifica*, *Velella pacifica*, and an *Agalma* too broken for specific determination. Among these all but the last named are certainly of wide distribution over the tropical Pacific.

The Ctenophoræ are represented by *Hormiphora fusiformis*, found also in the Marquesas and Paumotu islands, and a *Beroe* apparently identical with *B. australis* Agassiz and Mayer, from the Ellice and Fiji islands.

On the whole it appears that the medusa fauna of the Hawaiian Islands is mainly an insular one, recruited from forms capable of extensive distribution. The isolation of the islands and the relative smallness of their coastal areas have probably hindered the development of any considerable number of species peculiar to the locality.

It is remarkable that no Rhizostomæ were found in Hawaiian waters, although these Scyphomedusæ are very characteristic of Fiji, Australia, and the Malay Archipelago. Bigelow (1904, p. 248), however, calls attention to the fact that they are not commonly found among the Maldive Islands.

## DESCRIPTION OF SPECIES.

### SCYPHOMEDUSÆ.

#### Genus **CHARYBDEA** Péron et Lesueur, 1809.

*Charybdea*, Haeckel, Syst. der Medusen, p. 439, 1880.

Generic characters: Cubomedusæ with 4 simple interradial tentacles, with pedalia. The velarium is suspended by 4 radially situated bracket-like frenulæ from the walls of the subumbrella. Velar canals are found extending from the gastro-vascular space of the medusa into the entodermal lamella of the velarium. The stomach is wide and flat without wide mesenteries. There are 4 clusters of gastric cirri situated in the interradial angles of the stomach cavity.

#### **Charybdea rastonii** Haacke.

Pl. 1, figs. 1-1c.

*Charybdea rastonii* Haacke, W., Jena. Zeitschrift, 1887, p. 599, taf. 35, 15 fig.

Specific characters: The bell is nearly cubical, with flat top and almost plane sides. It is about 35 mm. high and 30 mm. wide. The 4 interradial pedalia are small, being only about 10 mm. long and 6 mm. wide. Each pedalium is hollow, and gives rise to a hollow tentacle, which is about 50 mm. long and closely ringed with nematocyst swellings. These tentacles taper gradually from base to tip, and are very flexible. There are four short club-like sense organs, alternate in position with the four tentacles, each sense organ found within a niche about 5 mm. above the level of the velarium, and knob-shaped with a short stalk. The sensory knob is provided with an entodermal otolith and 6 ectodermal eyes. Two of these eyes are large and median, and provided each with a doubly convex lense, while the other 4 eyes are small and lateral and are little more than ocelli. All of the eyes are directed inward, so as to view objects within the bell. (Figs. 1b, 1c, pl. 1.)

The velarium is wide, and is suspended by 4 radial mesenteries, or bracket-shaped frenulæ. Sixteen short, non-anastomosing velar canals extend inward into the substance of the velarium. (Fig. 1a, pl. 1.) There are 4 short interradial regions in the corners of the stomach, where one finds many

small gastric cirri. The manubrium is flat and wide, and 4 large, wide, flat, radial pouches extend outward from the stomach. These are partially separated one from another by 4 narrow, interradial partitions, extending from the corners of the stomach to the base of the pedalia. The radial pouches are in communication one with another only through the axial cavities of the pedalia. The 8 gonads are leaf-like, and are attached to the sides of the 4 interradial partitions, from which they project into the cavities of the radial pouches. They extend along the entire length of each interradial partition. Each gonad is widest near the region of the stomach, and tapers gradually to the region of the pedalium, so that each pair of gonads attached to the same interradial partition presents a pyriform outline. (Fig. 1, pl. 1.) The gelatinous substance of the bell is hyaline, the entodermal parts being milky. According to Haacke's description, the flexible shafts of the tentacles and the interradial gastric cirri are dull pink.

The gonads begin to develop when the medusa's bell is only 11 mm. high, and are large in medusæ in which the bell is 15 mm. high. The relatively wide, flat-topped bell is characteristic of this medusa in all stages, from those 11 mm. high to maturity, when the bell is fully 35 mm. in height.

This medusa was obtained by Haacke (1887) in the Gulf of St. Vincent, South Australia, in South latitude 35°. Forty-one specimens were obtained by the *Albatross*, 16 of these being caught at night by means of a net and an electric light, near the surface off the wharf at Honolulu.

*Record of Hawaiian specimens.*

| No. of specimens. | Date. | Station. | Geographical position. | Depth. | Remarks. |
|---|---|---|---|---|---|
| | 1902. | | | *Fathoms.* | |
| 3 | July 19..... | 4067..... | Puniawa Point, Maui Island. | 10–14 | All one-half to one-third grown. |
| 15 | .....do..... | 4068..... | .....do..... | 14–18 | All about 12 mm. high, with small gonads about 4 mm. wide. |
| 4 | .....do..... | 4069..... | .....do..... | 18–23 | All about 14 mm. high, with well-developed gonads. |
| 16 | Mar. 30, night. | Wharf at Honolulu... | Island of Oahu... | Surface. | Caught by aid of electric light, in dip net, at night. All well-grown medusæ with bells about 35 mm. high. One of these figured. |
| 3 | June 23..... | Hanalei ..... | Island of Kauai .. | ..... | All of medium size. |

**Charybdea moseri,** new species.

Pl. 1, figs. 2–2c.

? Semper, C., Zeit. für Wissen. Zool., bd. XIII, 1863, taf. 39., fig. 9.

This species is named in honor of Capt. Jefferson F. Moser, U. S. N., formerly commander of the *Albatross*.

The bell in large medusæ is about 80 mm. high and 47 mm. wide. The pedalia arise from the 4 interradial corners of the base of the bell as four short stalks, each of which gives rise to a wide flat spatula-like expansion, from which arises the long flexible portion of the tentacle. These tentacles are ringed at close intervals with clusters of nematocysts. They are hollow, and the canal, which connects their lumen with the gastro-vascular cavity of the bell, extends through the ring-like, flat, expanded portion of the pedalium. The basal stalks of the pedalia are only about 3 mm. long, the flat spatula-shaped, or wing-like, portion is 18 mm. long and 16 mm. wide, while the flexible parts of the tentacles are each about 80 mm. long.

There are 4 radially situated, club-shaped sense organs, each in a wide cleft-like niche, about 15 mm. above the margin of the velarium. The sensory part of each sense-club is pear-shaped and bears an entodermal, abaxial mass of otoliths, and four ectodermal ocelli. Two of these are large, and are provided with double convex lenses, while the other two are lateral and are mere pigment spots. The eyes are so arranged as to be directed toward the interior of the bell. (Figs. 2b, 2c).

The velarium is quite wide, and is supported at its 4 radial points by bracket-like frenulæ. Twenty-four simple non-branching diverticulæ, 6 in each quadrant, extend from the gastro-vascular space of the bell into the velarium. (Fig. 2a).

The manubrium is wide and shallow, with a four-cornered mouth, and simple lips. There are numerous short, simple, unbranched gastric cirri, in crescent-shaped areas, at the four interradial corners of the stomach.

The central stomach gives rise to 4 radial pouches, which extend out into the substance of the bell. These pouches are incompletely separated one from another by 4 narrow interradial septæ, which extend from the interradial corners of the stomach to near the basal stalks of the pedalia.

The gonads are leaf-like, are attached to the sides of the interradial septæ, and extend from the corners of the central stomach to within 8 mm. of the level of the velarium.

In medusæ preserved in formalin the flexible shafts of the tentacles are slightly pink, the eye spots are dark brown, and the gonads are milky yellow. The gelatinous substance of the bell is thin and hyaline, but of fairly rigid consistency.

This medusa resembles in some respects the form figured and briefly mentioned by Semper (1863) from the Philippine Islands. It is distinguished from Semper's medusa, however, by the very short basal stalks, and the different shape of the spatula-like "wings" of the pedalia. It can readily be distinguished from *C. rastonii* in all stages by its high, narrow bell, and wholly different pedalia. Also in *C. rastonii* the gonads are seen even in medusæ whose bells are but 12–13 mm. high, whereas in *C. moseri* the gonads do not begin to develop until the bell is fully 60 mm. high.

Twenty-three specimens of *C. moseri* were obtained by the *Albatross* among the Hawaiian Islands. With the exception of one specimen they were all obtained at the surface, the exceptional specimen being a small one from a depth of 25 fathoms. Type no. 21800 U. S. National Museum.

*Record of Hawaiian specimens.*

| No. of specimens. | Date. | Station. | Geographical position. | Depth. | Remarks. |
|---|---|---|---|---|---|
| | 1902. | | | *Fathoms.* | |
| 1 | Mar. 22..... | 3806 | 23° 25′ 36″ N.; 152° 24′ 30″ W. | 25..... | Small. No gonads. |
| 10 | Apr. 1–2.... | 3829 | Avalu Point, Lanai Island. | Surface. | Bells about 80 mm. high. Well developed gonads; one of them figured. |
| 2 | May 11..... | 3927 | 21° 31′ N.; 161° 55′ W.. | Surface. | Medium size. No gonads. |
| 1 | May 13..... | 3929 | 23° 19′ N.; 166° 54′ W.. | Surface. | Do. |
| 1 | May 15..... | 3930 | 25° 07′ N.; 170° 50′ W.. | Surface. | Do. |
| 6 | June 9..... | 3980 | 21° 23′ N.; 158° 19′ W.. | Surface. | Various sizes. One with bell 33 mm. high, with no gonads. One with bell 67 mm. high, with small gonads only 4 mm. wide. |
| 2 | June 17..... | 4009 | 21° 50′ 30″ N.; 159° 15′ W. | Surface. | One with bell 61 mm. high, with no gonads. Other small, with no gonads. |

### Genus PERIPHYLLA Steenstrup.

*Periphylla* Steenstrup, Acta Musei Hafniensis, 1837. Haeckel, Syst. der Medusen, p. 418, 1880. Maas, Résult. Camp. Sci. Albert Ier, Prince de Monaco, fasc. XXVIII, p. 44, 1904.

Generic characters: Periphyllidæ with 4 interradial marginal sense organs; with 16 (8 double) marginal lobes; with 12 solid tentacles, three between each successive pair of marginal sense organs.

### Periphylla dodecabostrycha Haeckel.

Pl. III, figs. 5, 6.

*Chrysaora* (*Dodecabostrycha*) *dubia*, Brandt, J. F., Mem. Acad. Imp. St.-Pétersbourg, Sci. Nat., VIe sér., par. 2, tom. 2, 4me liv., p. 387, 1838, taf. XXIX. Haeckel, E., Syst. der Medusen, p. 421, 1880. Vanhöffen, E., Acalephen der Plankton-Expedition, p. 10, taf. II, fig. 1, 1892; Die Acraspeden Medusen, Wissen. Ergeb. der Deutschen Tiefsee-Expedition, "Valdivia," bd. III, p. 23, 1902. Maas, O., Scyphomedusen der Siboga-Expedition, 11 monogr., 1903. p. 6, taf. II, fig. 15; taf. XII, fig. 107; Mem. Mus. Comp. Zool. at Harvard Coll., vol. XXIII, No. 1, 1897, p. 64, taf. XI, fig. 1. Résultats Campagnes Scientifiques Albert Ier, Prince de Monaco, etc., fasc. XXVIII, p. 47, pl. V, fig. 36–37, 1904.

There are five specimens of *Periphylla* in the *Albatross* collection which appear to be *Periphylla dodecabostrycha* in three different stages of growth. The bell of the smallest medusa is 55 mm. high and 50 mm. wide at the tentacular zone (fig. 5, pl. II); while that of the largest is 100 mm. wide and only 70 mm. high (fig. 6, pl. II). Another somewhat damaged specimen of intermediate size is 45 mm. wide and about 45 mm. high. As the color, shape of lappets, etc., remain the same in all of these

specimens, and they come from identical, or almost identical, localities, there is reason to suppose that they represent merely stages of growth of *Periphylla dodecabostrycha*.

Figures 5 and 6, plate II, show the shape of the bell in the smallest and largest medusa, respectively. It may be seen that when the medusa is small the bell is higher than it is wide, whereas in the large medusa the bell is wider than it is high in the proportion of about 10 to 7.

All of the specimens obtained by the *Albatross* are quite deeply pigmented with brownish-purple, the pigment extending into the entodermal pouches of the lappets, and being so dense in the zones of the circular and the radial muscle fibers that it is difficult to see the form and position of the gonads by looking through from the outside of the bell.

Attention should be called to the fact that it seems hazardous to attempt to separate the various species or races of *Periphylla*, on the ground of relative height and width of the bell, for the form of the bell appears to change with age, becoming flatter and relatively wider as the medusa grows larger.

Both Maas (1904) and Vanhöffen (1902) agree that in *P. hyacinthina* the bell is relatively high and the pigmentation so dense that the gonads can not be seen by looking through the walls of the bell; whereas in *P. dodecabostrycha* the bell is flatter, its apex is blunter, and the pigmentation is lighter, so that the gonads may be seen more or less clearly by looking through the bell walls from the outside. However, in 1892 (taf. I, fig. 1), Vanhöffen gives a figure of "*P. hyacinthina*" from life showing the gonads clearly visible through the hyaline walls of the pedal zone.

Similarly in *P. regina*, Maas (1897, taf. x) shows the bell only faintly pigmented, whereas Vanhöffen (1902), in his report upon the Scyphomedusæ of the *Valdivia* expedition, shows it quite densely pigmented. Vanhöffen (1902) concludes that the species described by Fewkes, Haeckel, etc., can be reduced to three, namely, *P. hyacinthina* Steenstrup (1837), *P. dodecabostrycha* Brandt (1838), and *P. regina* Haeckel (1880).

The species are separated mainly upon color differences, shape of bell, and size at the time of the development of the gonads. It should be borne in mind, however, that these are characters which are most apt to be individually a locally variable in medusæ. For example, the varieties and local races of *Cyanea* or *Obelia* along the Atlantic coast of the United States differ one from the other in just such characters; yet any attempt to separate them specifically leads to confusion, for there are intermediate forms that prevent such classification. The case may be somewhat similar with *Periphylla*, and it is possible that all of the so-called species may in the end prove to be local races of one and the same form. However this may be it has been demonstrated by the Plankton, *Valdivia*, and *Siboga* expeditions that the Periphyllidæ are truly deep-sea medusæ, living at or near the bottom, and only upon rare occasions coming to the surface.

It seems unnecessary to redescribe *Periphylla dodecabostrycha* after the excellent studies and figures of Vanhöffen and Maas, but for the sake of clearness we will enumerate some of the characteristic features of its anatomy.

Specific characters: Bell higher than wide in young, wider than high in well-grown medusæ. Four interradial marginal sense organs, 12 solid tentacles, and 16 spatula-like marginal lappets. Exumbrella with a deep annular furrow, and below this a zone of 16 thick gelatinous pedalia, one for each marginal sense organ and tentacle. The pedalia are separated one from another by deep longitudinal clefts which extend from the annular furrow downward through the mid region of each lappet. Thus the pedalia alternate in position with the lappets. Each sense organ contains a protruding sac of otoliths, and a mass of entodermal pigment. (See Maas, 1903, taf. II, fig. 15.)

There is a zone of well-developed circular muscles in the subumbrella above the bases of the tentacles. This zone is divided into 16 parts by 16 selvages. Each selvage extends down the middle of a lappet so that the reflected halves of each pair of adjacent lappets are connected by circular muscle fibers. There are 8 longitudinal areas of radial muscles in the subumbrella above the zone of circular muscles. Four of these are radial and 4 interradial. Eight V-shaped gonads alternate in position with the 8 strands of longitudinal muscles, the open ends of the V's being uppermost. The central stomach is wide, and is continued into the gastro-vascular space of the bell in 4 elongate radial clefts, the edges of which are lined with gastric cirri. A partial septum extends down the middle line of each lappet, and the gastro-vascular space forms a canal around this septum. The medusa is more or less deeply pigmented with purple-brown, which is especially well developed in the entoderm, but is sufficiently translucent to allow one to see the gonads showing faintly through the bell walls. The annular furrow and the clefts between the pedalia of the exumbrella exhibit brown ectodermal pigment. The tentacles are white, while the gelatinous substance of the bell is hyaline.

*Record of Hawaiian specimens.*

| No. of specimens. | Date. | Station. | Geographical position. | Depth. | Remarks. |
|---|---|---|---|---|---|
| | 1902. | | | *Fathoms.* | |
| 4 | June 17 | 4005 | Ukula Point, Kauai Island... | 577–480 | One small specimen 55 mm. high, 50 mm. wide. No gonads. Figured. Three large specimens about 100 mm. wide, 70 mm. high. With gonads. One figured. |
| 1 | June 24 | 4029 | .....do..... | 478–453 | Medium size, about 45 mm. wide, 45 mm. high. Damaged. |

*P. dodecabostrycha* is widely distributed over the floor of the deep oceans, especially in tropical regions of the Pacific. It has been found off the west coast of Mexico, off the coast of Chile, in the Indian Ocean, in the Malay Archipelago, even in the Guinea Stream, off the west coast of Africa, by the *Valdivia*, and in the Mediterranean, by the Prince of Monaco.

In small specimens a short, usually curved, diverticulum of the gastro-vascular space extends upward into the gelatinous substance of the apex of the bell. As was suggested by Vanhöffen, this may indicate that the medusa develops through an alternation of generations. This canal appears in our figure 5, plate II of the young medusa. Unfortunately we know nothing of the development of the Periphyllidæ.

### Genus ATOLLA Haeckel.

*Atolla*, Haeckel, Syst. der Medusen, p. 488, 1880. Fewkes, Report U. S. Commis. Fish and Fisheries for 1884 (1886). Vanhöffen, Ergeb der Deutschen Tiefsee-Expedition, bd. 3, 1902, p. 22 etc. Maas, Résult. Campagnes Sci., etc., Prince de Monaco, fasc. XXVIII, 1904, p. 48.

Generic characters: Collaspidæ with numerous (16 or more) tentacles which alternate with an equal number of marginal sense organs. The marginal lappets are twice as numerous as the tentacles, or marginal sense organs. The pedalia of the tentacles arise from a zone higher up upon the sides of the exumbrella than do the pedalia of the sense organs.

### Atolla alexandri Maas.

Pl. III, figs. 10, 11; Pl. II, fig. 7.

*Atolla alexandri* Maas, O., Mem. Mus. Comp. Zool., vol. XXIII, 1897, p. 81, taf. XI, fig. 2, taf. XIV, figs. 4, 5. Agassiz and Mayer, ibid., vol. XXVI, 1902, p. 156.

Four specimens of *Atolla*, all belonging to the species *alexandri*, were found by the *Albatross*, and we present life-size drawings of the largest specimen.

In *A. alexandri* we find, occupying the center of the exumbrella, a smooth-edged lenticular-shaped disk. This raised central portion of the exumbrella is about one-half as wide as the medusa itself. Thus in a medusa 64 mm. wide the central convexity is 33 mm. wide. The outer edge of this raised center is smooth, simple, and annular, and wholly lacks the radial folds and furrows seen in other species of *Atolla*. A deep annular groove encircles the outer edge of the central disk. Immediately beyond this groove lies the zone of tentacular pedalia. In a medusa 64 mm. in diameter these pedalia are each 5.5 mm. wide, and each one of them supports a short tapering tentacle about 13 mm. long. These pedalia are partially separated one from the other by deep radial clefts which extend radially inward midway between the tentacles for about one-half the distance from the outer edges of the pedalia to the annular furrow. In a medusa 64 mm. wide there were 32 pedalia and the same number of tentacles. Intermediate and alternating with the pedalia are the bases of the lappets. These lappet-stalks arise at a level lower than the pedalia of the tentacles, and each one bears a single marginal sense organ flanked by a pair of elongate marginal lappets. The sense organs, tentacles, and tentacular pedalia are thus equal in number each to each, while the marginal lappets are twice as numerous. Thus in the medusa 64 mm. in diameter there are 32 pedalia, 32 tentacles, 32 marginal sense organs, and 64 marginal lappets (see fig. 11).

Turning now to the subumbrella side of the medusa, we find at the center a more or less miter-shaped dark-colored manubrium, at the extremity of which we find the mouth surrounded by 4 long, narrow tapering lips. (See fig. 10, pl. III.)

There are 8 bean-shaped gonads in the subumbrella wall. They are adradial in position, and lie about half way between the center and the circular muscle. Each gonad, in a medusa 64 mm. in diameter, is 9 mm. long and 5 mm. wide.

The circular muscle band in the same medusa is a ring of powerful strands 2 mm. wide and 51 mm. in inside diameter. The whole subumbrella surface is strongly convex, the wing-muscle encircling its outer edge. The disk is 9 mm. thick in a medusa 64 mm. wide, its general form being that of a double convex lens.

The arrangement of the peripheral canals of the gastro-vascular space is shown in figure 7, plate II. Simple, straight canals extend radially outward to the sense organs, and to the bases of the tentacles, and these are joined by looping vessels that extend into the bases of the lappets. There are no fused plates in the radii of the tentacles, such as are described by Maas in *Atolla bairdii* (1904, Résultats Campagnes Scientifiques, etc., Prince de Monaco, fasc. XXVIII, p. 51, pl. IV, fig. 34).

The tentacles appear to increase with the growth of the medusa; thus, calling the diameter of the medusa the width across the ring muscle of the subumbrella, we find that a medusa 16 mm. in diameter had 23 tentacles, one of 16.5 mm. had 24, one of 43 mm. had 33, and one of 54.5 mm. had 32.

*Record of Hawaiian specimens.*

| Number of specimens. | Date | Station. | Geographical position. | Depth. | Remarks. |
|---|---|---|---|---|---|
| | 1902. | | | *Fathoms.* | |
| 1 | June 17 | 4005 | Ukula Point, Kauai Island... | 577–480 | Figured specimen; 32 tentacles. |
| 1 | ....do... | 4005 | .....do ..... | 577–480 | 8 gonads beginning to appear; 23 tentacles. |
| 1 | July 16 | 4154 | Alia Point Light, Hilo Bay... | 26–50 | No gonads apparent; 24 tentacles. |
| 1 | Aug. 12 | 4177 | Kawahioa Point..... | 451–319 | No gonads seen; damaged specimen; 33 tentacles. |

**Genus PELAGIA Péron et Lesueur.**

*Pelagia*, Péron et Lesueur, Tableau des Méduses, 1809. Haeckel, Syst. der Medusen, p. 504, 1880.

Generic characters: Pelagidæ with 8 adradial tentacles alternating with 8 marginal sense organs; 16 marginal lappets.

**Pelagia panopyra** Péron et Lesueur.

Pl. II, figs. 3, 4.

*Pelagia panopyra* Péron et Lesueur, Tableau des Méduses, p. 349, nr. 64, 1809. Brandt, J. F., Mem. Acad. Imp. des Sci. St. Petersbourg, VI^e^ ser., par. 2, Sci. Nat., tom 2, 4 ^ème^ liv., 1838, p. 382, pl. XIV, fig. 1, pl. XIVa, fig. 1–5. Haeckel, Syst. der Medusen, p. 509, 1880.

The disk is 45 mm. wide and about one-half as high as a hemisphere. The aboral, or exumbrella surface, is sparsely covered with blunt, wart-like, rounded protuberances. There are 8 hollow tentacles, each about three-fourths as long as the bell diameter. Eight marginal sense organs alternate with the 8 tentacles. There are 16 blunt marginal lappets. The mouth is at the center of the lower surface or subumbrella of the disk. It is surrounded by 4 curtain-like palps, which extend downward from the 4 radial corners of a throat tube. The throat tube is about 15 mm. long, and the curtain-like palps each about 35 mm. long. The central stomach is a flat disk-like cavity, which gives rise to 16 radiating pockets, or cavities, which extend outward the tentacles and sense organs. These pouches are completely separated one from another by septæ, which extend outward to the middle of the lappets. Sixteen powerful radial muscles extend outward through these septæ, near the subumbrella surface. The gonads are 4, complexly folded, outpocketing, in the 4 interradial edges of the stomach. There are 4 wide, shallow pits in the floor of the subumbrella. These are interradial and extend inward from the region of the gonads toward the center of the disk. The tentacles are pink, and the aboral surface of the disk is sprinkled with purple pigment. The gonads are deep purplish pink.

This species appears to be widely distributed over the middle and western parts of the tropical Pacific. Three specimens were found by the *Albatross* among the Hawaiian Islands.

*Record of Hawaiian specimens.*

| Number of specimens. | Date. | Station. | Geographical position. | Depth. | Remarks. |
|---|---|---|---|---|---|
| | 1902. | | | *Fathoms.* | |
| 1 | June 13 | Waimea .. | Kauai Island ..... | Surface... | Figured specimen 45 mm. in diameter. |
| 1 | May 13 | 3929 | 23° 19′ N.; 166° 54′ W ..... | .....do .... | 41 mm. in diameter. |
| 1 | June 17 | 4010 | Between Kauai and Oahu.. | .....do .... | 14 mm. in diameter. No gonads visible. |

## HYDROMEDUSÆ.

### Genus SOLMARIS Haeckel.

*Solmaris* Haeckel, Syst. der Medusen, p. 355, 1880.

Generic characters: Solmaridæ with a numerous and variable number of tentacles alternating with the equally numerous marginal lappets. Stomach a simple lenticular cavity, without pouches extending into the lappets. Gonads more numerous than the lappets and appearing as a ring of wart-like sacs in the subumbrella wall beyond the periphery of the stomach.

### **Solmaris insculpta,** new species.

Pl. III, figs. 8, 9.

Specific characters: The bell is about $\frac{2}{3}$ as high as a hemisphere and, in large specimens, is about 24 mm. in diameter. The rim of the bell consists of 14 lappets, the adjacent edges of which are joined by a velar web. The exumbrella of the bell is sculptured in high relief. A prominent ridge extends down the middle line of each lappet, and this median ridge is flanked by two others which extend down near the edges of the lappet. The valleys between the ridges are well marked, and the ridges themselves are rendered quite conspicuous by violet pigment which extends along their crests.

There are 14 relatively stiff tentacles which alternate with the lappets, arising from the sides of the bell at a zone about one-quarter of the distance from the rim of the bell to the apex. The entodermal cells of these tentacles are disk-like and their entodermal cores project inward to the edge of the stomach. The tentacles are all of the same size, and are a little longer than the bell radius.

Preservation in formalin had destroyed the otoliths, but it appears that there are three marginal sense organs to each lappet, or 52 in all.

The stomach is a flat lenticular cavity, and the mouth a simple round opening. There are 42 oval, pouch-like gonads arranged in a circle around the edge of the stomach. Of these gonads 14 occupy intertentacular radii, while the remaining 28 flank the sides of the tentacle bases. The gonads are regularly spaced in a circle at the periphery of the stomach; not grouped into more or less separate clusters as in *Solmaris godeffroyi* Haeckel, of Samoa. Moreover *S. godeffroyi* lacks the complex sculpturing of the exumbrella seen in *S. insculpta,* and there are but 24 gonads, arranged in 8 sets of 3 each (see Haeckel, 1879, Syst. der Medusen, p. 355, taf. XIX, fig. 2).

Specimens of *S. insculpta* preserved in formalin show gonads of a faint purplish brown color, while the sculptured ridges of the exumbrella are violet.

Forty specimens were obtained by the *Albatross* among the Hawaiian Islands, all being found on the surface. Small individuals have 12 or 13 tentacles, but the normal number in large specimens appears to be 14. Type no. 21799 U. S. National Museum.

*Record of Hawaiian specimens.*

| Number of specimens. | Date. | Station. | Geographical position. | Depth. | Remarks. |
|---|---|---|---|---|---|
| | 1902. | | | *Fathoms.* | |
| 2 | Mar. 17 | 3797 | 31° 55′ N.; 136° W. | Surface | One small, one of medium size. |
| 1 | May 6 | 3913 | Diamond Head, Oahu Island | do | Large. |
| 2 | May 11 | 3927 | 21° 31′ N.; 161° 55′ W | do | Do. |
| 2 | May 13 | 3929 | 23° 19′ N.; 166° 54′ W | do | Do. |
| 3 | May 15 | 3930 | 25° 07′ N.; 171° 50′ W | do | Small, medium size. |
| 6 | May 16 | 3932 | Laysan Island | do | Some small, some large. |
| 8 | June 17 | 4009 | Between Kauai and Oahu islands | do | One specimen was 28 mm. in diameter, and was the largest found by the Albatross. |
| 1 | | 4037 | West coast of Hawaii | do | Medium size. |
| 15 | (?) | (?) | (?) | (?) | Well preserved large specimens, no label. |

## CTENOPHORÆ.

### Genus HORMIPHORA L. Agassiz.

Generic characters: Cydippidæ with hook-shaped tentacle-sheaths placed close by the sides of the stomach. These sheaths open to the outside at the level of the funnel or between this and the apical sense organ. The tentacles have side branches, some of which are usually hand-shaped.

### Hormiphora fusiformis Moser.

Pl. III, fig. 12.

*Lampetia fusiformis* Agassiz and Mayer, Mem. Mus. Comp. Zool., vol. XXVI, 1902, no. 3, p. 171, pl. 13, figs. 59, 60.
*Hormiphora fusiformis* Moser, F., Die Ctenophoren, Siboga-Expeditie, monog. 12, 1903, p. 12, Leiden.

This ctenophore was first described by Agassiz and Mayer from the Marquesas and Paumotu Islands, where it was obtained by the *Albatross* in 1900.

Moser (1903) rightly calls attention to the fact that it approaches much more nearly to the genus *Hormiphora* than to *Lampetia*. However, it possesses the feathered tentacles seen in *Lampetia* and *Pleurobrachia*, and lacks the characteristic hand-shaped appendages of the tentacles seen in *Hormiphora*. The body is also far more elongate than in any previously described *Hormiphora*. It has, however, the peculiar hooked tentacle sheaths close to the sides of the stomach, such as are found in *Homiphora*. It seems probable that when the Ctenophoræ come to be revised it will be found convenient to place this form in a new genus. This, however, we hesitate to do at present.

Specific characters: The body is spindle-shaped, about 40 mm. long and 15 mm. wide in the tentacular diameter. It exhibits considerable lateral compression, the tentacular diameter being about half again as long as the thickness in the opposite direction. The apical sense organ contains a spherical mass of transparent otoliths. The eight meridional vessels extend not quite two-thirds the distance down the sides of the body from the apical sense organ. They are straight and end blindly below. There are about 40 combs of cilia upon each meridional vessel. These extend along almost the entire length of each canal. The two lateral tentacles arise from long, narrow clefts, close to the sides of the stomach. These tentacle sheaths, or clefts, open upon the sides of the body about midway between the apical sense organ and the base of the funnel, and they extend down close to the sides of the stomach about one-quarter the length of the animal above the mouth. The tentacles are highly contractile and are provided with simple lateral filaments, such as are seen in the genus *Pleurobrachia*, except that they are much less numerous. The mouth is a narrow slit, capable of no great expansion. The stomach is long, flat, and narrow, and it gives rise to two simple, straight-edged canals which extend down either side of the stomach to very near the level of the mouth opening. The funnel canal, and the radiating vessels that connect the stomach with the meridional vessels are broad and straight. The tentacles are milky in color, the stomach faint, steely blue, and all other parts of a glassy clearness.

*Record of Hawaiian specimens.*

| Number of specimens. | Date. | Station. | Geographical position. | Depth. |
|---|---|---|---|---|
| | 1902. | | | |
| 3 | Mar. 18 | 3799 | Between Enben Bank and Kaiwi Channel | Surface. |
| 2 | Apr. 15 | 3880 | Molokini Islet | Do. |
| 1 | June 17 | 4010 | Between Kaui and Oahu | Do. |

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## EXPLANATION OF PLATES.

### PLATE I.

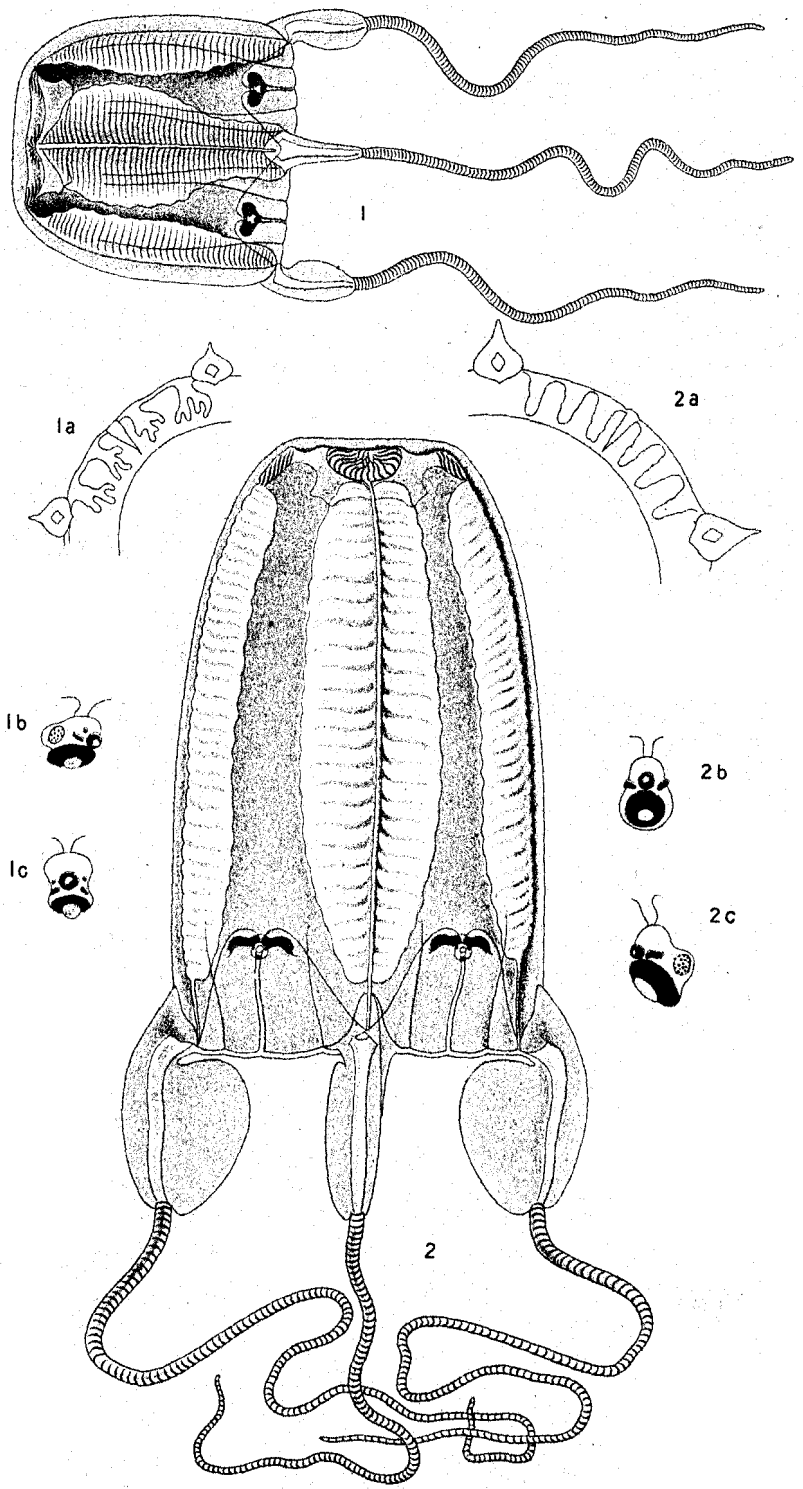
FIG. 1. *Charybdea rastonii* Haacke. Natural size, full grown.
1a. *Charybdea rastonii.* View of a quadrant of the velarium, showing the velar canals.
1b. *Charybdea rastonii.* Side view of sense-club.
1c. *Charybdea rastonii.* View of sense-club from the inner side. The eyes are arranged so as to perceive objects within the bell-cavity.
2. *Charybdea moseri.* New species; natural size, full grown.
2a. *Charybdea moseri.* A quadrant of the velarium showing the traight, unbranched, velar canals.
2b. *Charybdea moseri.* Sense-club seen from the inner side.
2c. *Charybdea moseri.* Side view of sense-club.

### PLATE II.

FIG. 3. *Pelagia panopyra* Péron et Lesueur. Oral view, natural size, of mature medusa.
4. *Pelagia panopyra.* Side view of mature medusa.
5. *Periphylla dodecabostrycha* Brandt-Haeckel. Side view of young medusa, showing the relatively high, sharp-pointed bell. Natural size.
6. *Periphylla dodecabostrycha.* Side view, natural size, of mature medusa, showing the flat, low-domed bell of the adult.
7. *Atolla alexandri.* View of the peripheral canals of the gastro-vascular system.

### PLATE III.

FIG. 8. *Solmaris insculpta*, new species. Oral view, twice the natural size.
9. *Solmaris insculpta.* Side view.
10. *Atolla alexandri* Maas. Oral view, natural size.
11. *Atolla alexandri.* Aboral view, showing sculpturing of the exumbrella.
12. *Hormiphora fusiformis* Moser = *Lampetia fusiformis* Agassiz and Mayer. Twice natural size.

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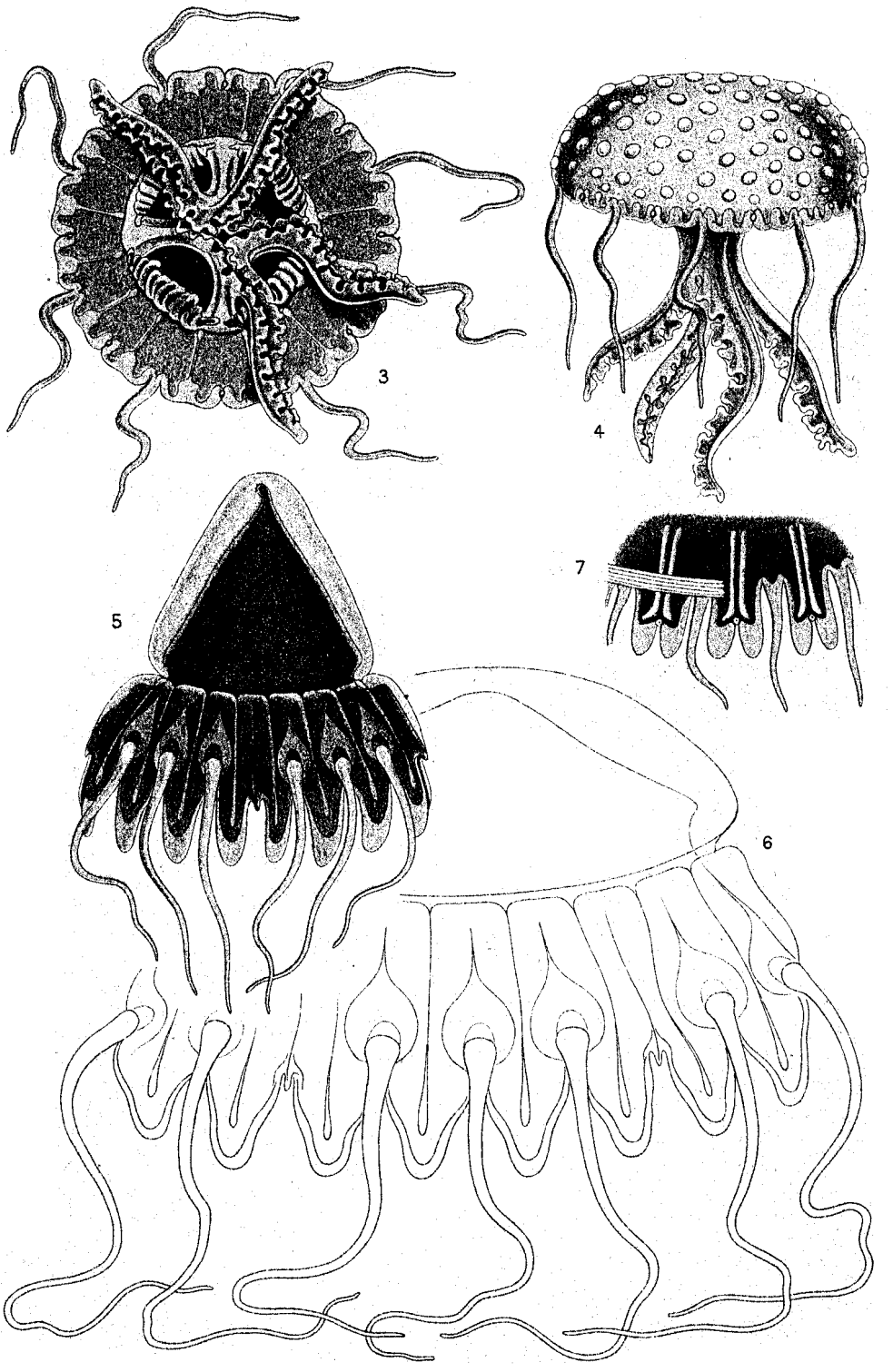


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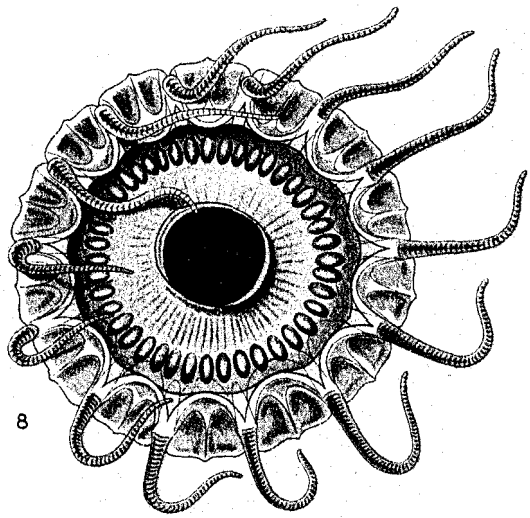

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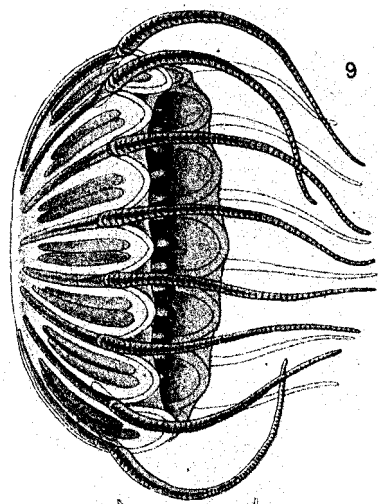

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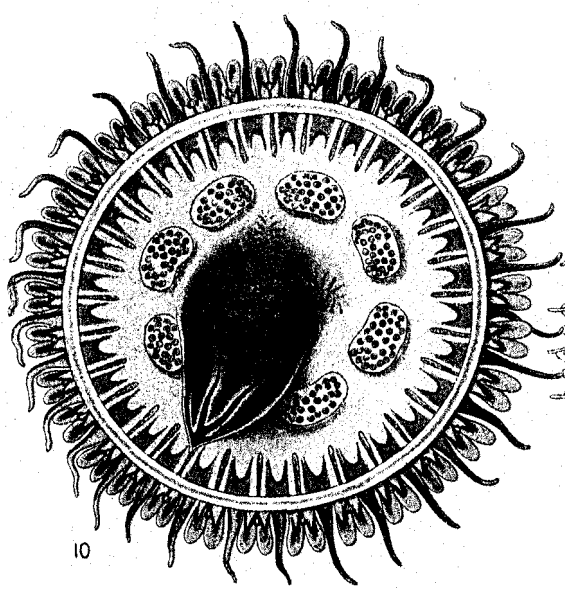

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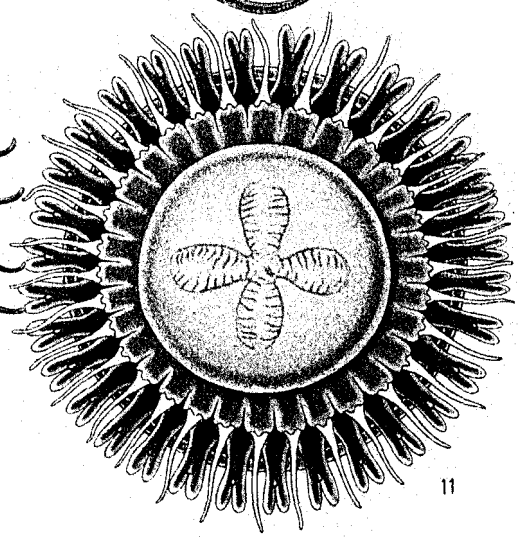

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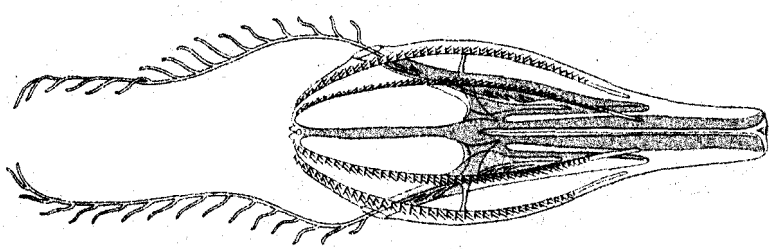

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