

JOURNAL OF THE COLLEGE OF SCIENCE, IMPERIAL UNIVERSITY,
TŌKYŌ, JAPAN.

VOL. XXVII, ARTICLE 9.

Some Medusæ of Japanese Waters.

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With 5 plates.

Since the publication of my last paper* on Japanese medusæ in this Journal, I have obtained several interesting forms of medusæ from different parts of the empire, especially from the northern parts, where the author and his friends have collected at times. They are mostly new to science and will be reported upon in this paper. In addition to Scyphomedusæ I have taken up for description some Hydromedusæ also.

* Kishinouye—Some Scyphomedusæ of Japan. Jour. Coll. Sc. Tokyo. Vol. XVII, 7. 1902.

SCYPHOMEDUSÆ.**Stauromedusæ.****Stenoscyphidæ.***Thaumatoscyphus*, n. g.

Stenoscyphidæ with eight principal tentacles transformed into small and slender bodies, not adhesive.

Thaumatoscyphus distinctus, n. sp.

(Pl. I, Figs. 1, 2.)

The entire body is goblet-shaped. The calyx is nearly so broad as high. The umbrella-margin is divided into eight short arms. They are nearly equidistant from one another, and so short that they can scarcely be seen from the outer side. The peduncle is nearly equal in length to the calyx, four times as long as broad. The adhesive surface at the aboral end is wide and more or less quadrate. The cavity in the peduncle is divided into four chambers by fusion of the well-developed interradial tæniolæ.

The exumbrella is smooth though beset with small, isolated, rather sparsely scattered nematocysts. There exist some grooves close to and running parallel with the umbrella-margin of the exumbrella. In the subumbrella, there are four, deep, interradial infundibula. The outer surface of mesogonia is beset with many spherical groups of nematocysts of different sizes. Those near the umbrella-margin and the middle parts of mesogonia are especially large, being about 1 mm. in diameter.

The muscular system is well developed. The coronal muscle is a broad undivided band, of which the greater part is found in the exumbrella, outside the bunches of secondary tentacles. This is very remarkable, since we know of no parallel case in any other species of Scyphomedusæ. A bundle of longitudinal muscle is found at each corner of the central stomach cavity. The muscle originates from the pyloric portion, and is found in the wall of the stomach cavity. These perradial muscles are broad, but weakly developed. The interradial muscles, however, are well developed. They run from the aboral end of the peduncle to the umbrella-margin. Each of these interradial muscles is divided at the distal end into two short limbs for the adradial bunches of tentacles.

The connective tissue is well developed in the gelatinous layer of the umbrella. There are found in it many long elastic fibres running in different directions.

The eight primary tentacles are transformed into small, cylindrical bodies. They are erect, hollow inside, and not adhesive. They are black at base and along the axial median line. They serve probably as a sensory organ standing in relation to light. The secondary tentacles are short, capped; each with a small depression at the end of the distal cap. These tentacles are grouped into eight adradial bunches, each of which consists of about forty tentacles, growing in a lanceolate tract on the abaxial side of oral arms. The tract is revolved, axially turned, and resembles the similar tract of *Schizodiscus nagatensis*.* The tentacles in the proximal part of the tentacular tract have very large swollen stalks and degenerated urticating caps. The swelling

* Kishinouye—Some Scyphomedusæ of Japan. Jour. Coll. Sc. Tokyo. Vol. XVII, 7. 1902.

is found on the abaxial side of the stalk; it is adapted for adhesion.

The œsophagus is very short and somewhat quadrangular in shape, with the wall abaxially reflexed; it is rich in longitudinal folds. The central stomach cavity is long and prismatic. The gastric filaments are simple, long, and numerous, growing thickly in eight adradial rows.

The genital glands are eight in number. Each of them is of a lanceolate shape, and consists of seven or eight oblong follicles. The abaxial side of the gland is black and can be seen through the umbrella.

Two fine specimens were collected by Dr. K. Yendo in August 1903, in Shimushiri or Shumushu, the most north-eastern island of Chishima (Kurile Islands). The larger specimen measures 15 mm. and the smaller 12 mm. in umbrella-diameter.

Lucernaridæ.

Halicystus tenuis, n. sp.

(Pl. I, Fig. 3.)

The calyx or umbrella is narrow, gradually expanding towards the umbrella-margin, nearly twice or a little more than twice as high as the breadth. The peduncle is long, quadrate, and four-chambered. In the subumbrella, there are numerous groups of nematocysts. The perradial mesogonian folds have each three or four large groups of same. Many smaller groups of nematocysts are found on the umbrella-margin.

The oral arms are more or less united in pairs. The perradial sinuses are deeper and wider than the interradial. Each oral arm has 35-45 capped tentacles with short stalk. The eight transformed, principal tentacles or the marginal bodies are large and globular. Their diameter is nearly as long as that of the peduncle.

The manubrium is rather short, nearly quadrangular, and rich in longitudinal folds; it is not much expanded at the margin of the opening. The gastric filaments are long and numerous, arranged in rows on both sides of interradial deltoid muscles.

The genital glands number eight and are long and narrow in form. They extend from the tip of oral arms to the junction of the peduncle with umbrella. Each gland consists of nearly forty round sacs, arranged in two longitudinal rows. The glands run close by the sides of interradial muscles.

The ground color of the body is pale yellow, while the anchors and the secondary tentacles are deep yellow, and the genitalia black on the abaxial side.

The total length of body is about 16 mm., of which about 5 mm. is the length of the peduncle. The breadth of umbrella is about 6 mm.

This species was collected by Mr. Oguma at Oshoro, Hokkaido, in August 1908, and was sent to me by his teacher, Dr. K. Yendo. Afterwards I have received from Dr. A. Oka a few specimens of this species which were collected by one of his pupils at Dedarubira, quite near Oshoro, in September 1905. An immature specimen, probably belonging to this species, was obtained by Mr. J. Hara at Shirisawabe, near Hakodate in July 1900.

Cubomedusæ.

Charybdeidæ.

Charybdea mora, n. sp.

(Pl. I, Figs. 4-9.)

The umbrella is bell-shaped, nearly cubical, flattened above, and slightly higher than broad. The gelatinous substance of the umbrella is nearly uniformly thick. The exumbrella is granulated, divided into several areas by grooves as in some other species of this genus, such as *Ch. murrayana* Hæckel.* The aboral circular groove is deep and separates the apical area from the hanging coronal area. The four interradial grooves are deep and run down from the circular groove along the interradial corner of umbrella nearly to the origin of pedalia. The eight adradial grooves run down also from the circular groove, becoming gradually wide and indistinct in the lower half of umbrella.

The stomach cavity is flat and somewhat octagonal. The interradial sides of the octagon are shorter than the perradial. The cavity is a little broader than the umbrella-radius. The manubrium is short with four large lips. The four interradial groups of gastric filaments or the phacelli are well developed, occupying the interradial sides of the octagonal stomach cavity. Each phacellus consists of from eight to twelve brush-like filaments.

The distance of the sensory niche from the umbrella-margin is very short, it being only about $\frac{1}{6}$ the distance between pedalia.

* Hæckel—Deep Sea Medusæ. Challenger Report.

The velarium is rather broad. In each quadrant of it are found four dendritic canals.

The genital glands are eight in number, broad, leaf-like and fastened in pairs along interradial septa. The pair occupy each radial pouch nearly entirely, touching each other in the middle.

The sensory niches or cryptæ rhopalares are heart-shaped cavities, directed towards the oral end. The external opening of each cavity is furnished with a somewhat triangular lid that hangs down from the aboral margin, so that the opening is horn-shaped. The sensory club has two well-developed ocelli, two pairs of smaller eye-spots, and a distal otolithic concretion of lenticular shape and refractive nature.

The pedalia are oblong, leaf-shaped, with a median ridge. They are about $\frac{2}{5}$ as long as the height of umbrella, and are granulated in the abaxial parts.

The tentacles are about $1\frac{1}{2}$ times as long as the height of umbrella. They are of a slightly pinkish color, but all other parts are colorless and nearly transparent.

The height of umbrella is about 40 mm.

This species is abundant in summer, near the sandy shore of Tateyama Harbour at the mouth of Tokyo Bay, and is a source of much annoyance to sea-bathers. It is locally known under the name of "mōra."

Tamoya virulenta, n. sp.

(Pl. I, Fig. 10.)

The umbrella is quadrangularly prismatic with a nearly flat top, about twice as high as broad. The exumbrella is granulated. The granules are more numerous on the top and near the

margin of umbrella than in other parts. The pedalia are long, well-developed, nearly $3\frac{1}{2}$ times as long as high, and about half as long as the height of umbrella. The proximal portion of the pedalia is triangularly prismatic, while the distal portion is laterally compressed. The pedalia are keeled along the lateral median line.

The tentacles are very thick and long, about eight times as long as the height of umbrella. They are easily severed, and their sting is so fiery, that the medusa is much dreaded by fishermen.

The cryptæ rhopalaes open externally with a crescent-shaped aperture, convex towards the oral side. The rhopalia or the sensory club is pear-shaped. On its axial side we find two well-developed ocelli and a pair of pigment-rings or degenerated ocelli.

The gastrovascular system is well developed. The oral tube is quadrangularly prismatic, about $\frac{1}{3}$ so long as the height of umbrella. The wall of the oral tube is rather thick and tough; but the oral opening is more or less contractile. It is surrounded by four triangular lobes. The stomach cavity is almost spherical, occupying a little less than half the height of umbrella. Between the wall of the stomach cavity and the subumbrella, there are four perradial vertical lamellæ, called the upper frenula, suspensoria or mesogonia. The radial pouches are broad and rectangular, separated from each other by narrow cathamma.

A broad canal is found in each tentacle. The canal sends off a vertical blind branch at the insertion of pedalia with umbrella.

The velarium is broad, with from six to eight complexly dendritic canals in each quadrant. These canals occupy nearly the whole expanse of the velarium.

The sexual gland is represented by eight leaf-shaped outgrowths from the interradial cathamma into the radial pouches. The gland extends from the root of the pedalia to the upper corner of umbrella.

In specimens newly preserved in formalin, the umbrella is tinged with a light greenish color, and the margin of the granules on exumbrella near the umbrella-margin are brownish. The tentacles are beautifully greenish at the proximal end, and pinkish in the remaining distal parts. However, in half-grown examples the tentacles are entirely pinkish.

The largest specimen examined measures 100 mm. high and 60 mm. broad. This species was collected by Dr. I. Ikeda and Mr. Y. Sakai in the Inland Sea, off Kogoshima and off Innoshima.

This species is known among fishermen as "hikurage," which means fire medusa or inflaming medusa, so named from the fiery sting. Found in autumn and winter.

Discomedusæ.

Semostomæ.

Generally the oral arms are more or less convoluted, thus constricting the oral aperture to a great degree.

Pelagidæ.

Pelagia panopyra, Péron et Lesueur.

The umbrella is about half as high as broad. Its gelatinous substance is thick in the centre. The exumbrella is covered with many rounded protuberances or nematocysts which become generally elongated and much crowded in the marginal parts. The sixteen marginal lobes are similar in size and form, broader than

high, more or less quadrate, much attenuated in the median parts, and often subdivided into two narrow lobes. The eight adradial tentacles are long, round in cross-section, covered with minute nematocysts on all sides, and about four times as long as the diameter of umbrella.

The oral tube is about as long as the radius of umbrella and ridged at perradial corners. The oral arms are generally a little longer than the diameter of umbrella. Their lateral lobes are wide and much ruffled along margin. The ridges of oral tube and the mid-ribs of oral arms are covered with nematocysts which are generally small, elongate, and rather crowded.

The four genital glands are well developed in length, and bulge out as many-lobed sacs.

Genital glands, margin of oral arms, tentacles, and nematocysts on oral tube as well as oral arms are generally violet-colored, while the inner wall of oral tube is yellowish, especially at the perradial corners.

Young specimens have flatter umbrella, more weakly developed oral arms, and a less number of nematocysts especially in the marginal parts of exumbrella than adults.

The species occurs in abundance in the Kuroshiwo in warm seasons. It grows to a size of about 60 mm. in diameter of umbrella. Often a soft-shelled barnacle (*Anelasma* sp.) is found attached to the medusâ. Once an immature fish, belonging to the genus *Psenes*, was caught together with the medusa, as the two were in association. The fish is about 30 mm. long and has many dark spots on sides.

As was already remarked by some authorities, the medusæ belonging to the genus *Pelagia* are very difficult to identify. The principal characters used for specific identification are the shape

of umbrella, the shape and size of nematocysts as well as their distribution on umbrella, the shape of marginal lobes, the length of the oral tube and of oral arms, the coloration, etc. However, these characters are subject to considerable variation according to the age of individuals, and even among those in same stage of growth and simultaneously collected in the same locality.

Chrysaora convoluta, n. sp.

(Pl. II, Figs. 11-14.)

The umbrella is somewhat vaulted, its height being contained about three times in the breadth. The umbrella-margin is divided into thirty-two lobes, which have rounded margin. The ocular lobes are broader than other marginal lobes, while the tentacular lobes are slightly longer than the ocular lobes, which are subdivided into two unequal lobes by a slight incision at the point of origin of radial cathamma. The adradial incision between tentacular lobes is deeper than the incision between tentacular and ocular lobes. The coronal portion of umbrella hangs down nearly vertically, and makes an angle with the remaining portion. The gelatinous substance of umbrella is thick and tough.

The exumbrella is smooth, and presents a brown, sixteen rayed, star-shaped figure, the rays having straight boundaries. The broad centre of the figure is colorless. The rays disappear in the hanging coronal parts. There are many brown spots of irregular size, shape and distribution between the rays.

In the subumbrella are found sixteen, narrow, dark brown, radiating rays on the lower side of the radial cathamma or the septa between radial pouches. The oral pillars are remarkably well developed, leave a narrow slit between every two of them, and consist

each of two adradial outgrowths, ovoid in form and covered with numerous, brown, elongated nematocysts of a minute size.

The oral tube is short, cruciate in cross-section and has raised perradial edges, thick wall and a narrow convoluted slit. The lower end of oral tube is divided into four well developed oral arms, which are sent out in a nearly horizontal plane or a little reflected toward the aboral side.

The oral arms are not straight, but are convoluted anticlockwise, when seen from the oral side. The proximal part of oral arms is pretty thick and broad, and is provided on the margin with a thin, broad and much ruffled hanging part besides some finger-shaped processes among the oral frills. One lateral moiety of the proximal parts of oral arms is horizontally folded over the other half, so that the oral opening is not wide but is a narrow, oblique and cruciate slit. While the oral arms are very wide in the proximal parts, they are narrow in the remaining greater parts and twist themselves spirally four or five times. When straightened out they are about thrice as long as the umbrella-radius. The twisting of arms occurs generally in species of the genera *Chrysaora*, *Dactylometra*, etc., a fact which has hitherto been overlooked, except in one extreme case observed by me in a medusa (*Chrysaora gilberti**) from the Californian coast.

The subgenital ostia open merely by radiating slits. The genital glands do not bulge out from these ostia.

The specimen examined measures about 300 mm. in umbrella-diameter. It was collected by Mr. Hiroshi Katō, while on board of a cod-fishing schooner in the Okhotsk Sea in 1907. Immature cod is often found under the umbrella of the species. This species

* Kishinouye.—A New Medusa from the Californian Coast. Zool. Anzeiger, Bd. XXII. 1899.

is nearly allied to, and possibly identical with, *Ch. melanaster* Brandt. The description and illustration in Brandt's work are incomplete, and the type specimen is not found now. The species here described as new differs from Brandt's in color markings and in the shape of marginal lobes, oral arms, subgenital ostia, etc.

Chrysaora sp.

In Aniwa Bay, off Korsakoff in Saghalin, I had collected on Aug. 17, 1905, a beautiful medusa belonging to genus *Chrysaora*; but as at that time I had no means to preserve it, I made of it only a rough sketch and a short note. From these I find that the medusa is closely allied to *Ch. helvola* Brandt, but the marginal lobe is rounded in outline and not dentate as in the latter species. The medusa measured 400 mm. in diameter, the stomach cavity measuring across nearly half as much. The ex-umbrella had numerous nematocysts. On it a star-shaped figure was not found, but in the subumbrella there were observed sixteen (eight ocular and eight adradial) rays of a dark orange-yellow color. The adradial rays were divided into two at their axial extremity. The tentacles, broad at the insertion, were dark red in color. The oral arms were long and of a light reddish violet color. The subgenital ostium was wide.

Neopelagia, n. g.

Pelagidæ with four perradial and four interradial tentacles in the place of eight principal sensory clubs.

Neopelagia eximia, n. sp.

(Pl. III, Fig. 15.)

The umbrella is flat, disc-shaped, more or less depressed at centre. The exumbrella is granulated. The gelatinous substance of the umbrella is rather tough.

The presence of eight principal tentacles is extraordinary and very remarkable. The tentacles are laterally compressed and are granulated with nematocysts on the abaxial side only.

The central stomach cavity is large, its diameter being longer than the radius of umbrella. The radial pouches are quite similar to those of the genera *Pelagia* and *Sanderia*. The pouches send two horn-shaped processes into each marginal lobe. The septa between the radial pouches are nearly straight, but generally bent towards the sensory club near the distal end.

The four oral pillars are narrow. The oral tube with four prominent perradial ridges is columnar and nearly as long as the umbrella-diameter. On its sides but especially on perradial ridges and also on oral pillars, there are numerous, minute, conical nematocysts. The lower end of oral tube gradually expands and is divided into four well developed oral arms.

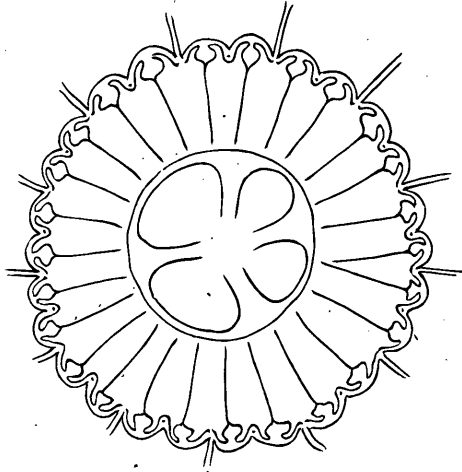
The four oral arms are spirally convoluted, clockwise when seen from the oral side. They seem to be more or less contractile, especially in the distal parts. Their lateral lobes are wide and much ruffled. Their midrib is provided with nematocysts.

The four genital glands are well developed and consist each of many laterally compressed, lamelliform outgrowths. The glands are bent towards the centre and the oral side at both extremities and thus closely touch one another. There is no distinct subgenital

cavity, but there are four subgenital depressions continuous with the interradial grooves on the sides of oral tube.

The genital glands are light red, the margin of oral arms violet colored; nematocysts on oral tube and tentacles also violet colored. The interradial inner wall of oral tube is yellowish. All other parts are colorless and transparent.

Fig. 1.



Neopelagia eximia.
 $\frac{1}{2}$ natural size.

This remarkable form was collected at Misaki in November 1908. It measures about 90 mm. in the diameter of umbrella. The form lacks radial symmetry. In each of two quadrants, we count eight marginal lobes, four sensory clubs and four tentacles. These numbers seem to be normal. In the third quadrant, we find only four marginal lobes, two sensory clubs and two tentacles. These numbers should be those of the immature stage. In the fourth quadrant there are six marginal lobes, two sensory clubs and three tentacles. It seems that in this quadrant two marginal lobes and one tentacle were added by intercalation.

At first I was inclined to refer this form to the genus *Sanderia*; but from the extraordinary position of tentacles, I have come to think it proper to institute a new genus for the reception of this remarkable medusa.

The medusa was accompanied by an immature fish, belonging to the genus *Psenes*, the same species as that caught together

with *Pelagia panopyra*. This circumstance and also the color of the medusa tend to show that the species is pelagic in habit.

Cyaneidæ.

Cyanea citrea, n. sp.

(Pl. IV, Figs. 16, 17.)

The umbrella is flat, discoidal, thick in the central parts, about one fifth as thick as the umbrella-radius. This radius is about $2\frac{1}{2}$ times as long as that of the central stomach. The umbrella-margin is divided into thirty-two lobes, as each ephyra-lobe is divided into two lobes by a shallow notch. All the lobes are rounded in the free margin.

The gastrovascular system is well developed. The peripheral branches of radial pouches are mostly dendritic but seldom anastomose with one another. The radial pouches and their branches occupy nearly the whole surface of subumbrella. The ocular pouch is nearly rectangular, while the tentacular pouch is narrow on the axial side but gradually broadens towards umbrella-margin and is about twice as broad as the ocular pouch at the level of sensory clubs.

The sharp grooves in the roof of the gastrovascular system are rather simple, and divide the roof into a central region and sixteen peripheral regions by one circular, eight ocular and eight adradial grooves.

The oral arms or curtains are very fine and complicated. They diverge from the oral tube nearly horizontally, their abaxial tips being bent clockwise, when seen from the oral side. They are shorter than umbrella-radius and are divided into great many lobes, which are very narrow at the abaxial tip but gradually increase in breadth and length towards the middle

part of oral arms, whence again they become gradually short and narrow as they approach the axis of the body. The thin hanging parts on both sides of the mid-rib of oral arms are much ruffled and very broad, broader than the length of the oral arm; those of one and the same arm are developed exactly alike, touch each other, and are often united here and there along the margins.

The muscular system is well developed. Outside the stomach cavity, there are fine, parallel, concentric ridges about fifteen in number; besides, there exist about five concentric ridges in the proximal parts of the oral tube. In the tentacular region, there are sixteen bundles of radial ridges, which number about fourteen in each bundle. The minute canals in the concentric ridges are nearly uniformly developed; each of them sends forth from five to eight, short and crowded branches.

The tentacles are long and numerous. They are grouped in eight U-shaped tracts. About three or four rows of tentacles are found at the proximal base of the tract.

The reproductive elements are developed in the four inter-radial sexual glands as well as on the inner side of oral arms in small patches of irregular shape but chiefly near the margin along which the curtain-like parts of both sides are united.

The umbrella is deep orange in color, the oral arms light orange-brown, the male genital gland light orange-yellow, the female genital gland dark yellow-brown, and the tentacles reddish in distal parts.

The umbrella measures about 300 mm. in diameter.

I have found this species rather abundant on the eastern coast of Poromushiri in October 1904. An incomplete specimen, belonging most probably to this species, was collected by Prof. Ijima's party near Korsakoff, in September 1906.

This species is very closely allied to *C. ferruginea* Eschscholz and *C. postelsii* Brandt, but differs from either of these in the form of ephyra-lobe, ocular pouch, color, etc.

Many Amphipods and immature stages of codfish and other fishes belonging to the Cottidæ are often found among the oral curtains or under the umbrella.

Cyanea purpurea, n. sp.

(Pl. IV, Figs. 18, 19.)

The umbrella is discoidal. Its radius is about three times as long as the radius of the stomach cavity. The umbrella margin is divided into sixteen ephyra-lobes which are broad and rather truncate at end.

The peripheral branches of the radial pouches are branched several times and anastomose with one another, forming a complicated meshwork. The breadth of the ocular pouch at the level of the sensory club is about half that of the tentacular pouch. The lateral margin of these radial pouches is uneven with numerous processes.

The muscular system of subumbrella is well developed. Outside the stomach cavity, there are about thirteen concentric ridges; besides, there are about five concentric ridges in the proximal part of the oral tube. In the tentacular region, there are sixteen bundles of radial ridges, there being about twelve of these in each bundle.

The tentacles are numerous and are grouped in eight horse-shoe-shaped tracts. There are about five rows of tentacles at the proximal base of the tract.

The umbrella is violet colored, while the oral arms are reddish.

The species grows to a size of about 360 mm. in diameter. Found on the coasts of Saghalin from May to August.

Ulmaridæ.

Parumbrosa, n. g.

Ulmaridæ with eight sensory clubs, twenty-four tentacles, and sixty-four marginal lobes, every two of which alternate with a sensory club or a tentacle.

Parumbrosa polylobata, n. sp.

(Pl. IV, Figs. 20-23.)

The umbrella is flat, disc-shaped, about four times as broad as high. Its gelatinous substance is very rich in water and consequently of a very delicate consistence. The exumbrella is finely and uniformly granulated. The umbrella margin is divided into sixty-four lobes: six lanceolate velar lobes between every two narrow, divergent, ocular lobes.

The tentacles number twenty-four. They are laterally compressed, and are rich in muscular fibres on the axial side. Nematocysts are mostly found on the abaxial side of the tentacle in transverse bands. The adradial tentacles are better developed than the others.

The subumbrella is nearly smooth, the development of the muscular system being very weak.

The central stomach cavity is nearly round and flat, with four interradial pits on its floor. These pits bulge out as conical processes into the subgenital cavities. They may be compared to

the genital pouches in the floor of stomach cavity of some forms belonging to the genus *Aurelia*.

The vascular system is rather simple. The canals are broad, but not uniform in calibre. There are sixteen radial canals, of which the eight ocular canals are branched, and their branches anastomose with one another. There are three rows of meshes, and in each octant of the umbrella we find a pair of large triangular meshes in the axialmost row and six smaller meshes of irregular shape in each of the remaining two rows. The adradial canals are simple, run to the umbrella margin and thence into tentacles. The circular canal sends off a small canal into each velar lobe and each tentacle. So far as I know, the presence of a canal in each velar lobe is quite peculiar to this species, which differs in this respect from all other known species of the Ulmaridæ, (*Phacellophora* excluded), in which the radial canals, except the ocular and tentacular canals, generally terminate in the circular canal.

The gastric filaments are long and numerous. They grow on the sides of the triangular area formed by the genital gland and the oral pillars.

The oral tube is quadrangularly prismatic, and the oral arms are lanceolate and nearly so long as the umbrella radius. They diverge from the oral tube and are in the distal parts aborally directed. They are thick and keeled along the mid-rib, finely frilled, and are furnished with minute brachial filaments on the margin.

The four sexual glands are long, narrow bands, consisting of numerous transverse folds. The adjoining glands almost touch each other near the extremities. They form the boundary of the central stomach cavity.

The subgenital cavities as well as the subgenital ostia are not well marked. The cavities gradually widen from the ostia inwards.

The thickened border of the ostia becomes confluent with the perradial ridges of oral tube on the axial side. Therefore, the contour of the ostia is not definite on that side.

I have found this species in a large number in June 1907, in a haul of a shrimp-trawl in the Bay of Toyama from a depth of about 130 metres. I was told by fishermen that they never find this species on the surface of sea.

A good sized specimen measures 160 mm. in diameter.

The entire animal is colorless and nearly transparent.

Phacellophora ambigua, (Brandt)?

The umbrella is flat, disc-shaped. The exumbrella is granulated. The umbrella-margin is provided with sixteen sensory clubs, and is divided into forty-eight lobes. The ocular lobes are narrow, pointed, and diverge from the sensory club. The sixteen velar lobes are broad and nearly triangular in shape. On the oral side of each velar lobe, there are about nine tentacles in one row, running a little removed from the umbrella-margin.

Each ocular canal gives off from two to four lateral branches on each side, and there are three to five simple canals between every two ocular canals.

This species is sometimes found in winter near Misaki and even in the Bay of Suruga. I have collected it on the eastern coast of Poromushiri in November 1904.



Phacellophora ambigua?
Natural size.

Aurelia limbata, Brandt.

The umbrella is shallow, cap-shaped, and somewhat contracted at the margin. The sixteen marginal lobes or ephyra-lobes are very short and broad and are separated by shallow notches, of which the adradially situated are especially shallow. The ex-umbrella is very finely granulated. The gelatinous substance of the umbrella is thick in the centre and gradually becomes thin towards the margin. The central knob, hanging down from the upper wall of the stomach cavity, is low and triangular, as seen in the longitudinal section.

The subgenital pore is comparatively large, being of about one-third the diameter of the subgenital cavity.

The meshwork of the vascular system is complicated and very fine near the umbrella-margin. In each genital bay, there are from three to nine canals, *i. e.* one branching interradial, two simple adradial, and between these from two to six branching canals.

The oral arms are nearly as long as the umbrella-radius. Their proximal part is broad, thick and twisted. There is a narrow horizontal ridge between the oral tube and the oral arms.

The largest specimen before me measures 150 mm. in diameter and about 60 mm. in height.

Young specimens are pale yellow or pinkish in color, while old specimens are brownish and their tentacles nearly black.

I have collected several young specimens on the east coast of Poromushiri in November 1904. Prof. Ijima's party collected this species at Chippesani, Saghalin, in August 1906. Further Mr. H. Kato obtained a large specimen off the south-eastern coast of Poromushiri in September 1908.

Rhizostomæ.**Crambessidæ.***Thysanostoma thysanura*, Hæckel.

The umbrella is shallow, disc-shaped, four times as broad as high. It is thick in the centre, but becomes suddenly thin at the hanging marginal parts. The latter is curved axially, and are divided into about 120 lobes. About 13 velar lobes are found between every two narrow ocular lobes. The exumbrella is finely granulated, the granules being about 1 mm. in diameter.

The oral pillars are very short and narrow, having very wide subgenital ostia between them. They are about $\frac{2}{7}$ as wide as the diameter of ostia. The oral disc is quadrate with much vaulted aboral surface, on which I could not find the quadrate depression figured and described by Hæckel.

The oral arms are about twice as long as the umbrella-diameter. They are nearly of the same breadth from root to tip.

I have obtained a fine specimen of this species measuring 160 mm. in diameter, from the harbour of Tateyama. The Zoological Institute of the Science College is in possession of two smaller specimens collected by Mr. K. Aoki, off Atami in Prov. Izu. They are 55 mm. and 60 mm. in diameter respectively.

This species is quite different from the medusa which I had described under the name of *Th. denscrispum*, though Maas thinks this to be a young form of Hæckel's *Th. thysanura*.

HYDROMEDUSÆ.

Anthomedusæ.

Codonidæ.

Sarsia rosaria, (A. Agassiz).

The umbrella is long, ovoid, twice or a little over twice higher than broad, and somewhat broader in aboral than in oral parts. The manubrium is long and cylindrical, protruding a little out of the umbrella-margin. It is nearly uniformly thick throughout, the surface being covered with the genital gland. The tentacles, four in number, are nearly twice as long as the height of umbrella. The ocular bulbs are small.

The manubrium is light red, while all other parts are colorless.

Breadth 8 mm., height 17-19 mm., thickness at top 3-4 mm.

This species was collected by Mr. Hiroshi Kato on the north-eastern coast of Chishima (Kuriles) in September 1907. He told me that medusæ of this species are phosphorescent at night.

Tiaridæ.

Catablema multicirrata, n. sp.

The umbrella is bell-shaped, about as high as broad. The stomach cavity is large and cruciate. The manubrium is wide, cruciate in cross-section, widened and a little reflexed at the mouth, the margin of which is rich in minute folds. The four radial canals are broad and give off minute lateral branches.

The circular canal is narrow, simple, and divided into minute branches. The sexual glands are four interradial bags with longitudinal folds, hanging down around the manubrium. No mesenterium. The tentacles number many hundreds, closely arranged in two alternating rows; they are slender but swollen near base.

I have collected this species on the east coast of Poromushiri in November 1904.

Margelidæ.

Lizzia shimiko, n. sp.

(Pl. V, Fig. 24.)

The umbrella is bell-shaped, slightly higher than broad. The manubrium, quadrangularly pyramidal in shape, is nearly half as long as the height of umbrella. It is on a short gastric peduncle. The oral lobes are prominent, each terminating with two oral styles. There are eight (four perradial and four interradial) red spots on the umbrella-margin, each bearing a group of three or four short tentacles. The perradial spots are larger than the interradial, and the tentacles of perradial groups are longer than those of interradial groups. Two medusiform buds are found at each perradial corner at the base of manubrium. The aboral buds are older.

This species is small, measuring only about 2 mm. in diameter. The manubrium and the medusiform buds are pinkish, the remaining parts almost colorless and transparent.

Found at Misaki, in Hamana Inlet, and in the Bay of Ōmura. Quite numerous in winter. Its vulgar name is "shimiko."

Favonia nipponica, n. sp.

(Pl. V, Fig. 25.)

The umbrella is bell-shaped, a little higher than broad. The stomach cavity is cubical with quadrate base. The genital glands are four vertically folded sacs growing out from the stomach-wall, and run along the radial canals for more than half the length of these canals. The sacs are broadest near the stomach and gradually diminish in breadth towards the abaxial end. The four oral styles are twice longer than the oesophagus, and are dichotomously branched about ten times. The four tentacular bulbs are crescent-shaped and abaxially reflexed. In each tentacular bulb, there are about fifty tentacles arranged in two rows. In the middle part of each tentacular bulb, there are two short, stiff, club-shaped, aborally directed tentacles.

The umbrella is 17 mm. high and 15 mm. broad. The genital glands are bluish in the male, pale yellowish in the female. The tentacular bulbs are orange-colored, ocelli brown, and distal end of tentacles light orange.

Found in the Bays of Tokyo and of Mikawa. Very abundant in spring.

Favonia sulcata, n. sp.

(Pl. V, Fig. 26.)

The umbrella is bell-shaped, a little higher than broad, and more or less quadrate in cross-section. There are four, very narrow, interradial, longitudinal grooves in the lower half of the exumbrella. The oral styles are well developed, longer than

the œsophagus, and dichotomously branched. Two or three of them are found at each perradial corner of œsophagus. The genital glands are four, well developed, vertically compressed pouches. They run together with radial canals for more than two-thirds the length of these. The four tentacular bulbs are arched toward aboral side; on each of them there are about forty long tentacles in one row, and two short and stiff tentacles, directed more or less upwards in the middle parts. The radial canals have ragged outlines. The velum is broad and strong.

The medusa measures 13.5 mm. in breadth, and 16 mm. in height.

Collected by Prof. Ijima's party at Korsakoff in 1906.

Cladonemidæ.

Urashimea,* n. g.

Cladonemidæ with four radial canals, four amentiform tentacles, and meridional bands of nematocysts on exumbrella. There are four, interradial, hollow spaces, between exumbrella and subumbrella, which spaces I propose to call the interumbrellar spaces. They are something quite different from the "Scheitelhöhle" or the "Nesselschläuche."

Urashimea globosa, n. sp.

(Pl. V, Figs. 27-29.)

The umbrella is globose, slightly higher than broad, very thick and armed with numerous meridional bands of nematocysts.

* *Urashima*, name of legendary fisherman, who is said to have lived with the Sea-Goddess "Otohime" in her submarine palace.

These bands are grouped more or less definitely into four perradial groups. The interumbrellar spaces have many pointed processes on the aboral side. The oral opening is protected by four triangular oral lobes. The genital glands consist of four pouches hanging down from the horizontal parts of radial canals. The glands are broadest at the axial extremity ; each gland with two longitudinal folds. The radial canals have many minute processes on the abaxial side. The tentacles are longer than the height of umbrella, and are covered with numerous, short, capped filaments on all sides. Each tentacle has an eye-spot at its proximal end on the abaxial side.

The medusa measures 15 mm. in breadth, and 17 mm. in height.

Collected by Prof. Ijima's party in Saghalin, and by Mr. K. Tago at Monbetsu in Kitami, Hokkaido.

Urashimea macrotentaculata, n. sp.

(Pl. V, Fig. 30.)

The umbrella is a little higher than broad, and is armed with a few meridional bands of nematocysts. The interumbrellar spaces have no pointed processes. The oral opening is protected by four, short, indistinct oral lobes. The genital glands are four triangular pouches, each with two longitudinal folds. The radial canals have minute processes on the abaxial side. The tentacles are longer than the height of umbrella, and are covered with numerous, short, capped filaments on all sides.

The medusa measures 8 mm. in breadth, and 10 mm. in height.

Collected off Kunō in the Bay of Suruga, May 1900.

Leptomedusæ.

Thaumantidæ.

Staurophora discoidea, n. sp.

The umbrella is thin, disc-shaped, and fragile in consistence. The velum is narrow. The stomach is cruciate with very long limbs, each of which takes up about three-fourths of the umbrella-radius. The oral opening is as long as the stomach, and is well marked near the ends of the gastric cross by the much frilled margin. The genital glands are minutely and longitudinally folded. The number of these folds is about thirty on each side of a limb of the gastric cross. The radial canals are short, simple and slender. They are numerous, equal-sized, and grow much crowded together. Many of them have one or two eye-spots on the axial side of their somewhat thickened root.

The medusa measures about 120 mm. in diameter, and 34-40 mm. in height.

Found near Poromushiri in November 1904, and also at Chippesani in Saghalin.

This species is very closely allied to *St. mertensii* Brandt, but differs from it by the more numerous lateral folds of the genital gland. In *St. mertensii* their number is stated by Brandt to be seventeen.

Canotidæ.*Polyorchis karafutoensis*, n. sp.

(Pl. V, Fig. 31.)

The umbrella is bell-shaped, somewhat quadrangular. The umbrella-margin is nearly straight, not lobed. The manubrium is quadrangularly prismatic, hangs down from the gastric peduncle, and ends with an expanded mouth, the oral lobes of which are well developed. From the proximal part of each perradial canal, there hang down about ten dichotomously branched gonads. These are a little longer than the manubrium and almost reach the level of the velum. Each perradial canal has from fourteen to sixteen long, lateral branches on each side. These branch-canals are again divided into numerous small subbranches near the distal end. Besides, there are many, short, centripetal canals; these are simple with the exception of a few in interradial corners which are branched. Numerous tentacles are arranged in about two or three rows; they number about thirty in each quadrant. Peculiar is the fact that many tentacles are divided.

A very fine specimen was obtained at Korsakoff by Prof. Ijima's party on September 19, 1906. It is very well preserved in formalin, and measures 50 mm. in breadth and 60 mm. in height.

Trachomedusæ.**Olindiidæ.***Scolionema*, n. g.

Olindiidæ with two kinds of tentacles: Those of one kind are provided with a sucker at some distance from the distal end

and project more or less horizontally, while those of the other kind are weakly developed and without sucker, and curve downwards and inwards. Medusa-buds are produced from the middle part of the four perradial canals. Closely allied to the genus *Gonionema*.

Scolionema gemmifera, n. sp.

(Pl. V, Figs. 32, 33.)

The umbrella is more or less globular, its height and breadth being nearly equal. Sixteen (four perradial, four interradial, and eight adradial) larger tentacles with sucker alternate with sixteen smaller tentacles without sucker. Tentacles of both kinds have in their distal parts, ring-like swellings caused by the presence of nematocysts. The endoderm cells at the base of tentacles are greenish, while those in the distal parts are reddish. The larger tentacles are nearly equal in length to the umbrella-diameter; The portion of the tentacle proximal from the sucker is nearly straight, while the distal portion is bent in a crook-like manner. There are eight otocysts. The manubrium has quadrate base, and is light red in color, except at the narrow mouth which is of a brownish color. The velum is well developed. In the middle part of radial canals, we find medusiform buds of a light red color. The circular canal and the four radial canals are simple and narrow. The diameter of the umbrella is 4 mm.

In an immature specimen, about 0.7 mm. in diameter, the exumbrella is found to be covered with nematocysts and to be in possession of only one sort of tentacles. These are adhesive

and number eight (four perradial and four interradial). There are only four otocysts. The manubrium is nearly tubular.

This species is found at Misaki in winter.

Narcomedusæ.

Æginidæ.

Ægina pentanema, n. sp.

(Pl. V, Fig. 34.)

The umbrella is disc-shaped with flat top and nearly vertical sides. It is nearly twice as broad as high. The jelly of the umbrella is tough and very thick at the centre. The mouth is simple and round, opening at the end of the conical œsophagus. The ten genital sacs are nearly quadrate. The five tentacles are nearly twice as long as the radius of umbrella.

The medusa measures about 20 mm. in breadth, and 10 mm. in height.

Collected at Misaki and in the Bay of Suruga in spring and winter.

Tôkyo, June 3, 1909.



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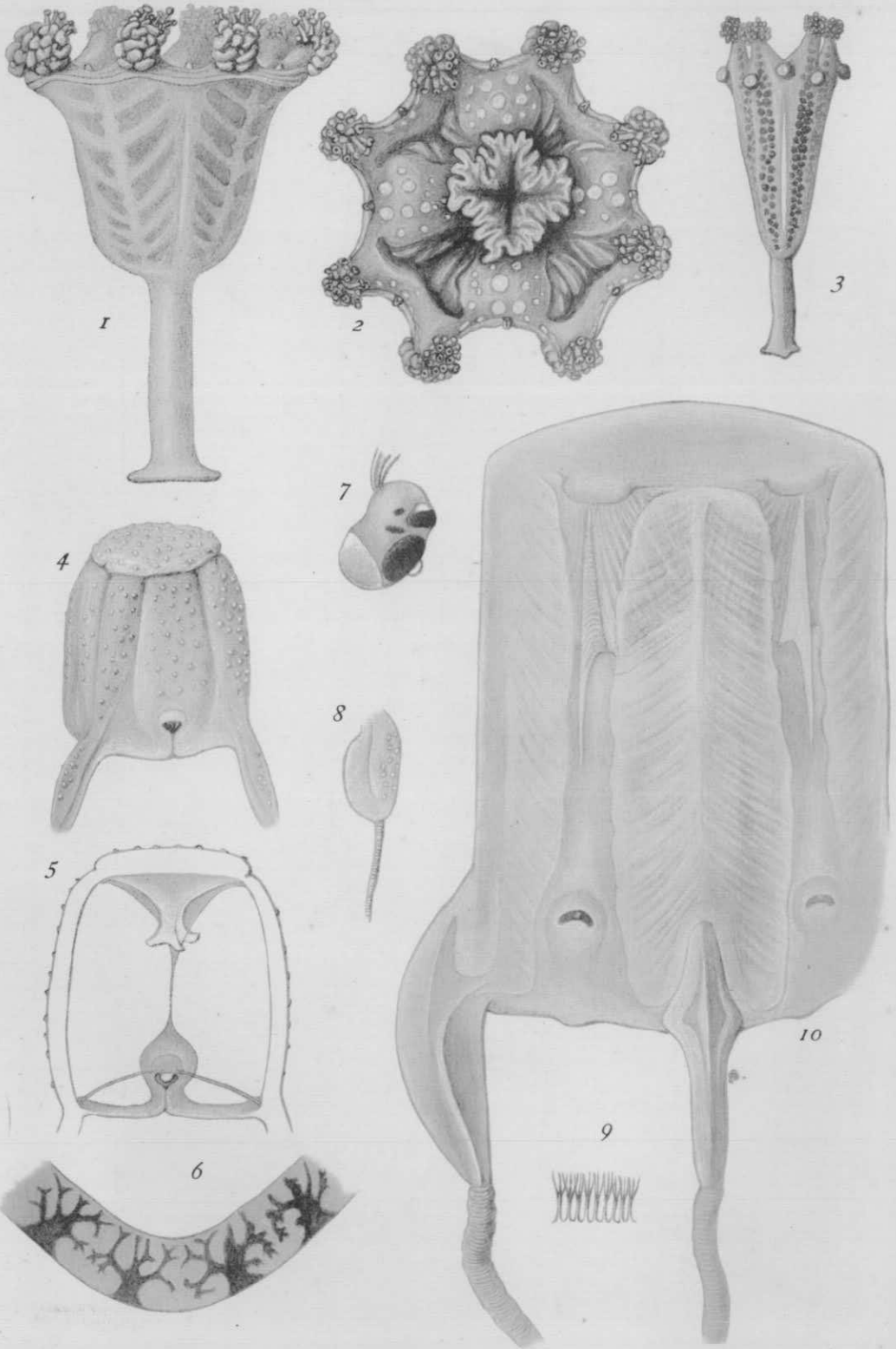
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K. KISHINOUE.
SOME MEDUSÆ OF JAPANESE WATERS.

PLATE I.

Plate I.

- Fig. 1.—*Thaumatocyphus distinctus*. 3 × natural size. Side view.
- Fig. 2.—*Thaumatocyphus distinctus*. 3 × natural size. Oral view.
- Fig. 3.—*Halicystus tenuis*. 3 × natural size.
- Fig. 4.—*Charybdea mora*. Natural size. Showing nematocysts, grooves, and a sensory niche in the exumbrella.
- Fig. 5.—*Charybdea mora*. Natural size. Showing manubrium, genital glands, nerve ring, thickness of the exumbrella, etc.
- Fig. 6.—A quadrant of the velarium of *Charybdea mora*, showing the dendritic canals. Magnified.
- Fig. 7.—Sensory club of *Charybdea mora*. Magnified. Side view.
- Fig. 8.—Pedalium of *Charybdea mora*. Natural size.
- Fig. 9.—Phacellus of *Charybdea mora*. 2 × natural size.
- Fig. 10.—*Tamoya virulenta*. Natural size. The shape of the sensory niche is not correctly represented.



Auctor del.

1-2, *Thaumatoscyphus distinctus*.

3, *Halicrystus tenuis*.

4-9, *Charybdea mora*.

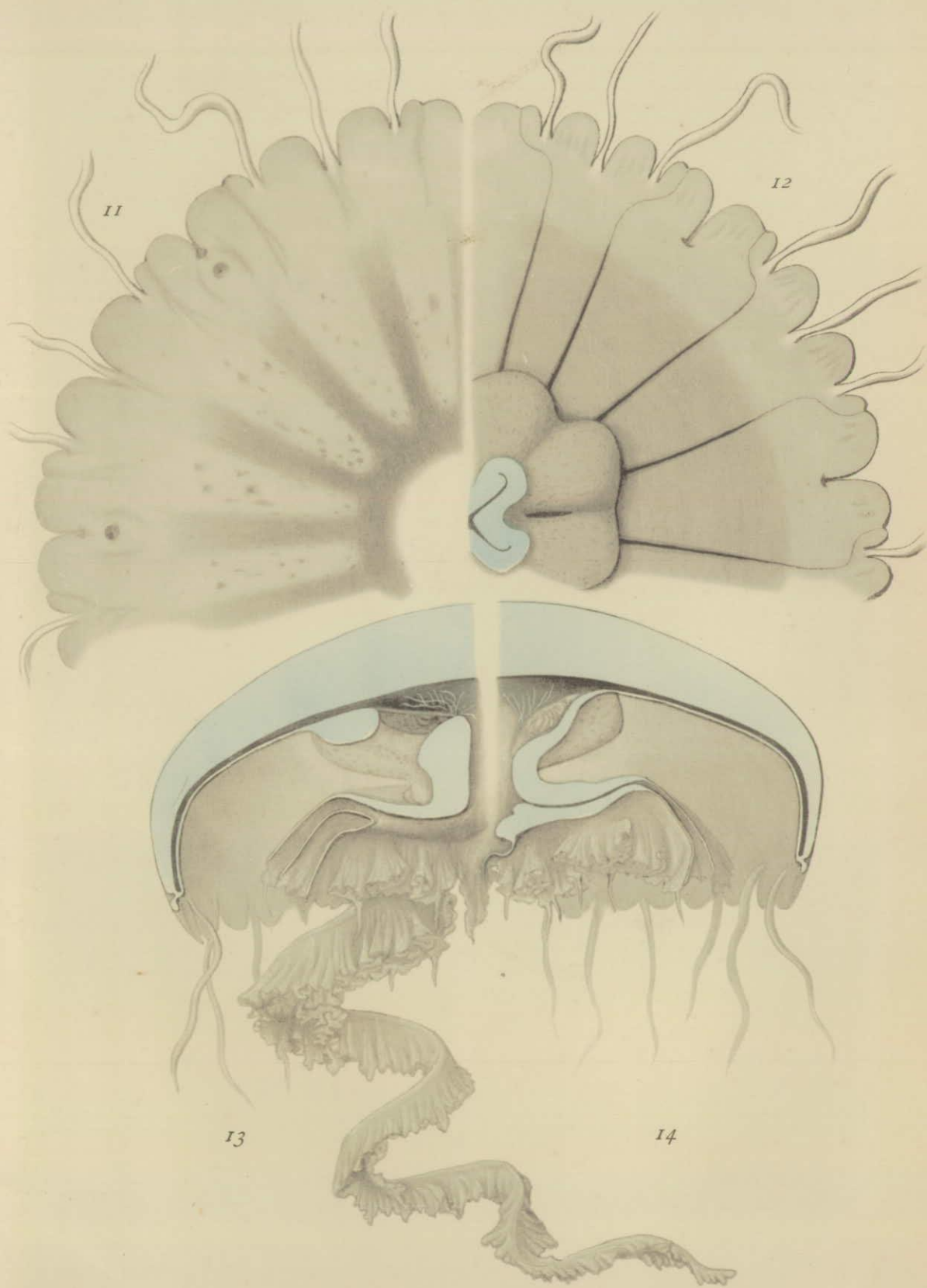
10, *Tamoya virulenta*.

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PLATE II.

Plate II.

- Fig. 11.—A quadrant of the umbrella of *Chrysaora convoluta*. Aboral view.
 $\frac{1}{2}$ natural size.
- Fig. 12.—A quadrant of the umbrella of *Chrysaora convoluta*. Oral view.
Showing the oral tube in cross-section, a very narrow subgenital ostia, and very wide and curiously formed oral pillars. $\frac{1}{2}$ natural size.
- Fig. 13.—Longitudinal section of *Chrysaora convoluta*, through an inter-radial plane. $\frac{1}{2}$ natural size.
- Fig. 14.—Longitudinal section of *Chrysaora convoluta*, through a perradial plane. $\frac{1}{2}$ natural size.



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PLATE III.

Plate III.

Fig. 15.—*Neopelagia eximia*. Natural size.

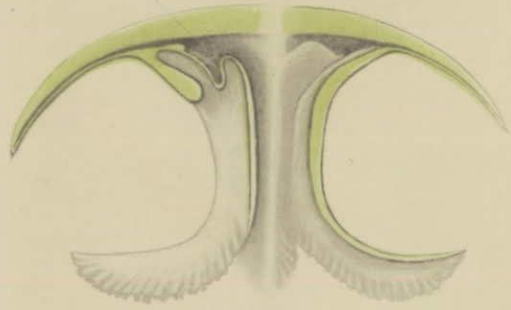
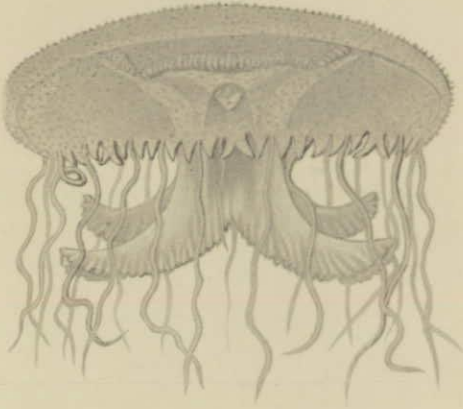


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PLATE IV.

Plate IV.

- Fig. 16.—Portion of an ephyra-lobe of *Cyanea citrea*. Natural size.
- Fig. 17.—Canals in a concentric muscular ridge of *Cyanea citrea*. Magnified.
- Fig. 18.—Portion of an ephyra-lobe of *Cyanea purpurea*. $\frac{1}{4}$ natural size.
- Fig. 19.—Canals in a concentric muscular ridge of *Cyanea purpurea*. Magnified.
- Fig. 20.—*Parumbrosa polylobata*. $\frac{1}{2}$ natural size.
- Fig. 21.—Longitudinal section of *Parumbrosa polylobata* through an inter-radial plane. $\frac{1}{2}$ natural size.
- Fig. 22.—Longitudinal section of *Parumbrosa polylobata* through a per-radial plane. $\frac{1}{2}$ natural size.
- Fig. 23.—*Parumbrosa polylobata*, seen from oral side, showing oral tube, genital glands, vascular system, etc. Natural size.



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Auctor del.

16, 17, *Cyanea citrea*. 18, 19, *Cyanea purpurea*.

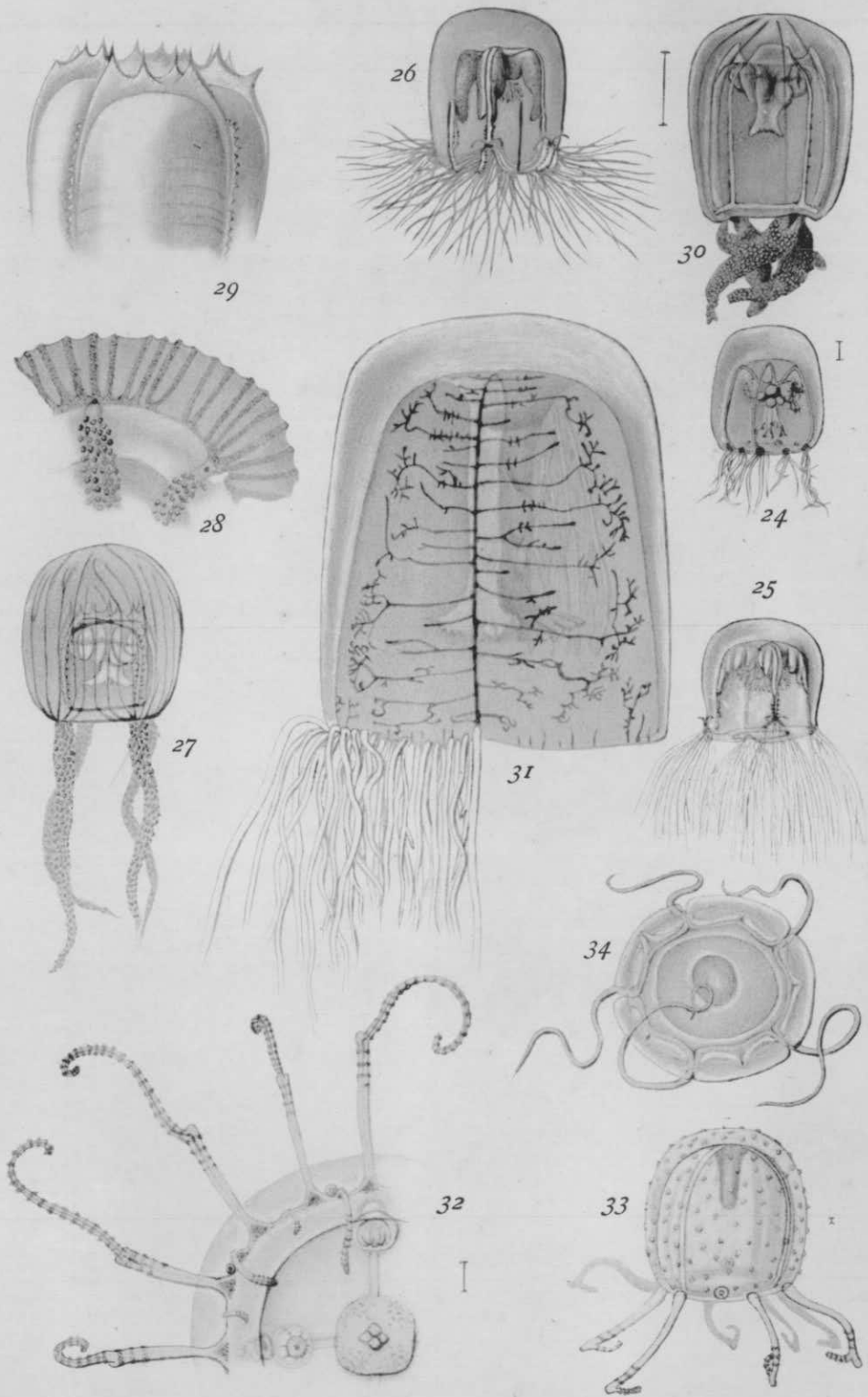
20-23, *Parumbrosa polylobata*.

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PLATE V.

Plate V.

- Fig. 24.—*Lizzia shimiko*. Magnified.
Fig. 25.—*Favonia nipponica*. Natural size.
Fig. 26.—*Favonia sulcata*. $\frac{3}{2}$ natural size.
Fig. 27.—*Urashimea globosa*. $\frac{3}{2}$ natural size.
Fig. 28.—Portion of the umbrella-margin of *Urashimea globosa*. Magnified.
Fig. 29.—Interumbrellar spaces and radial canals of *Urashimea globosa*.
Magnified.
Fig. 30.—*Urashimea macrotentaculata*. 3 × natural size.
Fig. 31.—*Polyorchis karafutoensis*. Natural size.
Fig. 32.—*Scolionema gemmifera*. Adult form. Magnified.
Fig. 33.—*Scolionema gemmifera*. Immature form. Magnified.
Fig. 34.—*Aegina pentanema*. $\frac{3}{2}$ natural size.



Auctor del.

Fig. 24, *Lizzia shimiko*.
 Fig. 25, *Favonia nipponica*.
 Fig. 26, *Favonia suleata*.
 Fig. 27-29, *Urashimea globosa*.

Fig. 30, *Urashimea macrotentaculata*.
 Fig. 31, *Polyorchis karafutoensis*.
 Fig. 32, 33, *Scolionema gemmifera*.
 Fig. 34, *Aegina pentanema*.