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On the Pelagic Annelids of Japan.

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With one plate.

Introduction.

Of pelagic Annelids, the Alciopidæ and the Tomopteridæ, not a single species has hitherto been reported from the Japanese waters, while my own researches thus far have brought to light nine species belonging to the above families. Of these species three were found to be new to science.

The material upon which my studies were based, have been collected by me mostly in Misaki during my repeated visits to the Marine Laboratory of the Science College, Tokyo Imperial University. Collecting was also made at Heda in Prov. Izu and at Miho in Prov. Suruga.

Here I beg to offer my thanks to Prof. I. Ijima who rendered me much aid in the course of my investigations.

Family **ALCIOPIDAE**

With two large red, highly organized eyes situated on sides of prostomium, which is further provided with 5 tentacles. On each side of body-segment, near base of parapodium, lies a wreath-like

protuberance or side-gland. Parapodium uniramous and conical in shape, with a dorsal and a ventral cirrus; with an aciculum and a bundle of either simple or compound setæ. Body transparent; pelagic in habit.

Key to the genera found in Japan.

a'. Prostomium not prolonged anteriorly beyond eyes.
  b'. Parapodium without cirriform appendage.
    c'. Setæ simple... ... ...*Alciopa* Aud. et M-Edw.
    c''. Setæ compound ... ... *Asterope* Clap.
  b''. Parapodium with a cirriform appendage; setæ compound... ... ... *Vanadis* Clap.
a''. Prostomium prolonged anteriorly beyond eyes.
  b'. Parapodium with a cirriform appendage, setæ compound ... ... *Callizona* Greeff.
  b''. Parapodium without cirriform appendage; setæ compound ... ... *Rhynchonerella* Costa.

Genus **Alciopa** Aud. et M-Edw.

Prostomium not prolonged anteriorly beyond eyes. Proboscis destitute of teeth. Parapodium without cirriform appendage setæ simple.

Alciopa Cantrainii (delle Chiaje).

Pl. I, fig. 9.

1845. *Najades Cantrainii*, delle Chiaje, Anim. invertebr. della Sicilia, Tom. III, p. 99.
1850. *Alciope Edwardsii*, Grube, Die Familien d. Annel., p. 305.
1868. *Alciopa Cantrainii*, Claparède, Annél. chétop. du golfe de Naples—Suppl., p. 105.
1868. *Alciopa Edwardii*, Ehlers, Die Borsten-wurmer, p. 176.
1876. *Alciopa Cantrainii*, Greeff, Untersuchungen über die Alciopiden, p. 57.
1886. *Alciope microcephala*, Viguier, Etudes sur les animaux inferieures de la baie d'Alger. Arch. d. Zool. Expér. 2 Serie, tom. 4, p. 104.
1892. *Alciopa Edwardsii*, Hering, Zur Kenntniss der Alciopiden von Messina, p. 721.
1900. *Alciopa Cantrainii*, Apstein, Die Alciopiden u. Tomopteriden d. Plankton-Expedition, p. 7.

Body transparent, entirely colourless except the red eyes and the deep-brownish side-glands. It consists of 62 segments, measuring 98 mm. in total length, 5.5 mm. in breadth. Segment 3–3½ times as broad as long.

Prostomium with 2 pairs of short tentacles and with a still shorter median tentacle on dorsal surface of prostomium. Eyes two, each provided with a large lens, attached to antero-lateral sides of prostomium and directed antero-ventrally.

Tentacular cirri present in 3 pairs; those of first pair simple, all the others bifurcated.

Parapodium elongated, conical in shape; provided with an aciculum, which extends a little beyond tip of parapodium, and with a tuft of long simple setæ. Dorsal cirrus broad, arising from base of parapodium. Ventral cirrus leaf-like, arising from the proximal half of the ventral border of parapodium. Near base of parapodium there lies a large deep-brownish side-gland (or segmental gland).

Proboscis (Pl I, fig. 9) short and broad, with a pair of short lateral papillæ at the anterior end in the protruded state; teeth absent.

Habitat:—Misaki; Heda in Prov. Izu; Miho in Prov. Suruga.

Genus **Asterope** Claparède.

Prostomium not prolonged anteriorly beyond eyes. Proboscis provided with teeth. Parapodium without cirriform appendage; setæ compound.

Asterope candida (delle Chiaje).

Pl. I, fig. 10.

1845. *Alciopa candida*, delle Chiaje, Anim. invertebr. della Sicilia, Tom. III, p. 98.
1850. *Alciope candida*, Grube, Die Familien d. Annel., p. 305.
1868. *Asterope candida*, Claparède, Annél. chétop. du golfe de Naples.—Suppl., p. 108. (p. 472).

1868. *Liocapa vertebralis*, Ehlers, Die Borstenwurmer, p. 181.
1876. *Asterope candida*, Greeff, Untersuchungen über die Alciopiden, p. 62.
1886. *Liocapa candida*, Levinsen, Spolia Atlantica, p. 333.
1892. *Alciopa vittata*, Hering, Zur Kenntniss der Alciopiden von Messina, p. 747.
1900. *Asterope candida*, Apstein, Die Alciopiden u. Tomopteriden der Plankton-Expedition, p. 7.

Boby very long, slender, transparent, consisting of about 270 segments, measuring 185 mm. in total length, 2 mm. broad at about the 30th segment, in which parts segments are about half as long as broad.

Prostomium small. Eyes two in number, very large, each provided with a large lens; they are almost lateral in position and are laterally and slightly dorsally directed; distance between the eyes in dorsal aspect of prostomium shorter than their diameter. Tentacles in two pairs, extending only a little beyond anterior border of eyes; the median tentacle conical in shape, with broad base, much shorter than paired tentacles.

Tentacular cirri in 3 pairs, those of the anteriormost pair about twice as long as any of the other pairs.

Dorsal cirri of two anteriormost parapodium pairs bladder-shaped in female, normally shaped in male.

Typical parapodium elongate conical, provided with an aciculum extending a little beyond tip of parapodium and with a tuft of compound setæ (Pl. I, fig. 10); dorsal cirrus broad and leaf-like extending beyond tip of parapodium; ventral cirrus also leaf-like but smaller than the dorsal, nearly reaching to parapodium tip.

Side-glands very well developed, being present from the first parapodiated segment posteriorly almost to anal segment, at the same time gradually diminishing in size. They are of a deep-reddish brown colour in the living state, but the colour fades away nearly entirely when preserved in alcohol.

In the anteriormost 10 or 15 segments, the deep-reddish brown of the side-glands extends mesiad on the dorsal surface and meets in the median line, thus forming a transverse pigmented band in each segment.

Anal segment with a pair of long anal cirri.

Proboscis long and cylindrical, being about equal in length to the anteriormost 12 segments taken together; it is provided with a pair of long subulate, so-called clasping organs, and shows many small papillæ on the anterior border in the protruded state.

Habitat:—Misaki (specimens obtained in this locality during March were found with the body-cavity filled with reproductive elements); Miho in Prov. Suruga.

Genus **Vanadis** Claparède.

Prostomium not prolonged anteriorly beyond eyes. Proboscis without teeth. Parapodium with a cirriform appendage; setæ compound.

Vanadis grandis, n. sp.

Pl. I, figs. 1–7.

Body slender and exceedingly long, consisting of 688 segments; 408 mm. in total length, 1.3 mm. in breadth in the anterior region of body, which tapers very gradually towards posterior end, the breadth decreasing to 0.8 mm. in about 500th segment.

Prostomium (Pl. I, fig. 1.) together with eyes measures 2.2 mm. in breadth, and is provided with two pairs of short conical tentacles, of which the dorsal pair is slightly longer than the ventral and is directed antero-laterally, while the latter is almost ventrally directed. The fifth or median tentacle arises from a little distance behind the line of the anterior border of eyes and is directed anteriorly, reaching to the anterior end of prostomium. The bright red eyes are of an enormously large size, and touch each other on the dorsal median line of prostomium; each having a clear, almost ventrally directed lens (Pl. I, fig. 2).

The anteriormost 6 segments bear each a pair of tentacular cirri; the first and the second pair of these are simple and long,

the former being slightly shorter than the latter; the third pair is bifurcated, its dorsal branch being shorter than the second pair, while the ventral branch is again shorter than the dorsal; the remaining three pairs of tentacular cirri, borne on the 4th, 5th and 6th segment respectively, are also bifurcated into a lanceolate longer dorsal and a shorter ventral branch.

The 7th segment is the anteriormost of those which bear parapodia provided with setæ.

Typical parapodium, the 18th (Pl. I, fig. 5.), is lanceolate, with a cirriform appendage at tip; dorsal cirrus, somewhat oval and short-necked, arising near dorsal base of parapodium and extending for more than $\frac{1}{3}$ the length of the latter; ventral cirrus, narrower and longer than the dorsal, reaching to nearly $\frac{3}{4}$ the length of parapodium; aciculum single; setæ compound, with a long terminal piece (Pl. I, fig. 7.).

In the posterior region of body, the parapodium (Pl. I, fig. 6.) is more slender than that of anteriorly placed segments and the dorsal cirrus is much elongate, reaching nearly to tip of parapodium, while the ventral cirrus becomes enlarged and somewhat elliptical in outline.

The first pair of side-glands is found on the 7th segment (or the first parapodiated segment), and the 2nd and the 3rd pair occur on the 8th and the 9th segment respectively. Then, after an interval of two glandless segments, the glands reappear on segments 12th, 13th, 14th and 15th to be followed again by three glandless segments. In more posterior parts of body, glandiferrous and glandless segments make alternate succession, either occuring 3–5 (but sometimes only 1, at other times 6 and rarely 7) together at a time in consecutive series.

The side-glands in anterior and middle regions of body are small, appearing only as deep brownish areas on sides of segments in both dorsal and ventral aspects (figs. 1, 3). In posterior region of body the glands are much larger (fig. 4) in the ventral aspect, in some cases those of the two sides nearly meeting in the median line, though in the dorsal aspect the increase in their size is not so marked as in the ventral.

The body is generally colourless, but those segments which bear the side-glands are of a bright green colour.

No white papillæ are observed on the ventral surface of body, differing in this respect from *Vanadis longissima** (Levinsen) (=*Vanadis fasciata* Apstein), to which species the present form seems to come nearest.

Habitat:—Misaki.

Genus **Callizona** Greeff.

Prostomium extending anteriorly to a considerable distance beyond eyes. Proboscis without teeth. Parapodium with a cirriform appendage; setæ compound.

Callizona japonica, n. sp.

Pl. I, fig. 8.

Body slender 38 mm. long and 0.5 mm. broad, consisting of about 190 segments followed by a certain number of indistinctly marked ones.

Prostomium (Pl. I, fig. 8) greatly prolonged anteriorly beyond the line of eyes. Paired tentacles short and stout, the dorsal pair shorter than the ventral; median tentacle arising from between the eyes, elongate conical, about equal in length to ventral paired tentacles. Eyes reddish-brown, with ventro-laterally directed clear lens.

Tentacular cirri 3 pairs, of gradually increasing lengths from the first to the third.

Parapodium elongate, with a long cirriform appendage at tip; dorsal cirrus relatively large and elongate-cordate in shape; ventral

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* Apstein:—Die Alciopiden u. Tomopteriden d. Plankton-Expedition, 1900, p. 11.
Apstein:—*Vanadis fasciata*, eine neue Alciopide (Separatabd. aus d. Zool. Jahrbüchern, abt. f. syst. Band V.).

cirrus smaller and narrower than the dorsal, its tip about reaching to base of the cirriform appendage.

Anteriorly placed parapodium with 2 stout acicula in addition to a tuft of long compound setæ; but from middle parts of body posteriorly each parapodium with only one aciculum.

Side-glands reddish-brown, distinctly observable from first parapodiated segment posteriorly.

Anal cirri absent.

Proboscis (Pl. I, fig. 8) short and thick, the anterior border papillated in the protruded condition.

Habitat:—Misaki.

Genus **Rhynchonerella** A. Costa.

Prostomium prolonged anteriorly beyond eyes. Proboscis without teeth. Parapodium without cirriform appendage; setæ compound.

Rhynchonerella fulgens Greeff.

Pl. I, figs, 11–12.

1885. *Rhynchonerella fulgens*, Greeff, Ueber die pelagische Fauna an den Küsten der Guinea-Inseln. Zeit. f. Wiss. Zool., Bd. 42, p. 450; Taf. XIII, Fig. 27.

1886. *Rhynchonerella capitata*, Viguier, Études sur les animaux inférieurs de la baie d'Alger. Arch. Zool. Exper. 2 série, tom. 4, p. 408, Pl. XXV, figs. 1, 2.

1900. *Rhynochonerella fulgens*, Apstein, Die Alciopiden u. Tomopteriden der Plankton-Expedition, p. 15.

The slender body, consisting of 85–90 segments, measures about 20 mm. in length and 0.5 mm. in breadth. It is colourless except the light brownish prostomium and the brownish spots and streaks on body-segments.

Prostomium with two large eyes (Pl. I, fig. 11), twice as broad as the next following segment. The eyes brownish-red, provided with antero-laterally directed lens. The two pairs of

tentacles at anterior end of prostomium are rather short, as shown in fig. 11. Median tantacle shorter than $\frac{1}{3}$ the length of paired tentacles, placed just behind the line of the anterior border of eyes.

Of the 4 pairs of tentacular cirri, the anteriormost is the shortest. The length gradually increases posteriorly to the 3rd pair. The 4th pair is especially long, being about twice as long as the first, each showing a distinct basal joint.

Parapodium (Pl. I, fig. 12) conical, with dorsal and ventral cirri; cirriform appendage absent.

First pair of parapodia bears, in addition to an aciculum, two simple and stout bristles and one or two very fine and long compound setæ; dorsal cirrus large and leaf-like, in the dorsal aspect entirely covering over the parapodium proper; ventral cirrus much smaller.

Second pair of parapodia is essentially like the first except in being provided with a bundle of 4 or 5 simple and stout bristles which extend beyond tip of the parapodium, and with a few very fine and long compound setæ.

The simple bristles decrease in number posteriorly becoming single in 13th or 14th segment. The compound setæ gradually increase in number from the first segment, in which there exist only one or two of them; posteriorly to middle segments, in which they constitute a pretty large bundle.

In posterior region of body, the parapodia gradually grow smaller; at the same time the compound setæ diminish in number.

Anal segment bears a pair of long anal cirri.

In a sexually mature male specimen, a pair of elongated bags filled with spermatozoa was observed in each of the 10th, 11th, 12th and 13th segments.

Proboscis short, twice as long as broad, with papillæ on anterior border in the protruded state.

Habitat:—Misaki, March 30th, 1904.

Family **TOMOPTERIDAE.**

Body elongate, thin; segments not numerous, without distinct intersegmental constrictions.

Parapodium long, cylindrical, provided with two broad and soft fins which, in posterior parts of body, are but very little or scarcely at all developed. Setæ and aciculum absent.

Prostomium coalescent with peristomium, the former having a pair of short tentacles, and the latter two pairs of tentacular cirri, of which the second pair is very long and is supported each by a long and very delicate bristle. Eyes two. Mouth ventral; proboscis short.

In this family there is only one genus, *Tomopteris*, known at present.

The body is very transparent; the alimentary canal is straight, and the blood colourless. Eggs lie freely in the body-cavity. Parapodia with or without "rosette-form" organs; fins with fin-glands. The nerve cord, which is scarcely visible in living specimens, is observed in alcoholic specimens to consist of two lateral halves lying close together.

Key to the species found in Japan.

a'. "Rosette-form" organs distinctly present in first 2 pairs of parapodia. Fin-glands and tail-region present ... ... *Tomopteris pacifica*, n. sp.

a''. "Rosette-form" organs absent. Fin-glands distinct. Fins occuring all around margin of parapodial rami.

b'. Both dorsal and ventral fins of 4th parapodium with fin-gland... ... ... *T. elegans* Chun.

b''. Ventral fin only of 4th parapodium with fin-gland.

c'. Fin-gland at tip of ventral ramus; first pair of tentacular cirri absent ... ... *T. septentrionalis Qtfg.*

c''. Fin-gland on ventral side of ventral ramus; parapodia in

the middle parts of body with a fin-gland in each ... ...
... ...*T. Apsteini* Rosa.

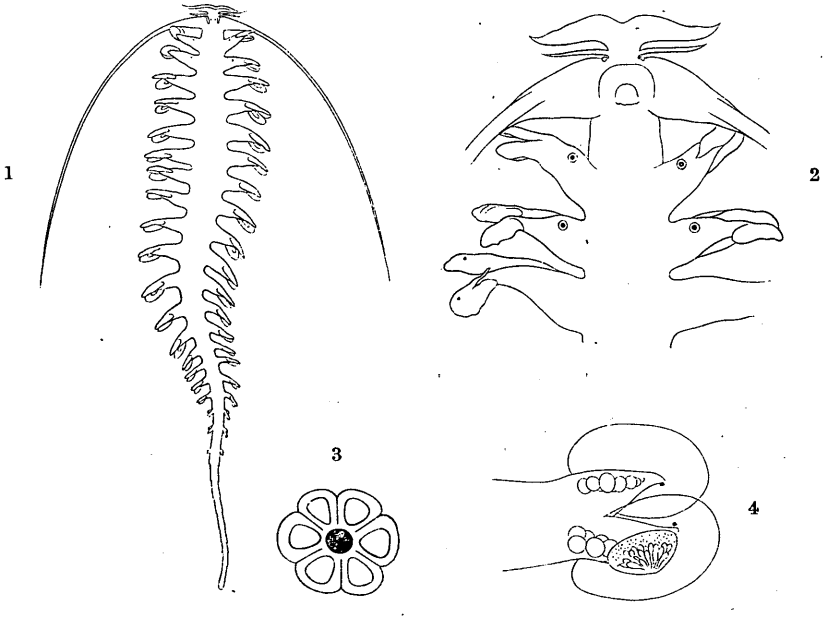
Tomopteris pacifica, n. sp.

Body measures 11.5 mm. in length, 1.7 mm. in maximum breadth, and 6 mm. in same including parapodia and fins at about the 5th parapodiated segment. It consists of 20 segments, in addition to a slender tail-region of about one-third the length of body.

Eyes two, black, dorsal in position; each being of a crescent-like outline with concave external and convex internal border.

First pair of tentacular cirri filiform, slightly shorter than the tentacles, and each with a single bristle within. Second tentacular cirri about $\frac{3}{4}$ as long as body-proper, or about $\frac{2}{3}$ the total length of body together with tail-region.

A nuchal ciliated groove is observed, arising from postero-



Tomopteris pacifica, n. sp.

1, Dorsal view, 5/1. 2, Anterior end in ventral view, 15/1. 3, A " rosette-form " organ, 115/1. 4, 9th parapodium of the right hand side in posterior view, 24/1.

lateral side of each eye and extending to the ventral surface of body running between first and second tentacular cirri.

First and second parapodia each with a "rosette-form" organ (figs. 2, 3), but without pigment spot on the fins. Third and fourth parapodia without "rosette-form" organs, but with a pigment spot on each fin, near tip of dorsal and ventral rami.

Fifth to seventeenth parapodia are provided, instead of "rosette-form" organs, each with a ventral fin-gland in addition to a pigment spot similar to that on third and fourth parapodia (fig. 4). The ventral fin-gland is highly developed in fifth to twelveth parapodia, and then it decreases in size posteriorly to seventeenth parapodium. The remaining three pairs of parapodia are weakly developed, each provided with two small flap-like processes, of which the dorsal one has a pigment spot; without fin-gland.

After that there follows the so-called tail-region, consisting of 11 segments, of which the anterior eight have each a pair of small pigment spots on the lateral surface near posterior border of the segment.

Eggs develop in two separate masses, one in the dorsal and the other in the ventral ramus of each parapodium (fig. 4).

Habitat:—Misaki.

Tomopteris elegans Chun.

1887. *Tomopteris elegans*, Chun, Die pelagische thierwelt in grösseren Meerestiefen, p. 18, Taf. III, Fig. 4.

1908. *Tomopteris elegans*, Rosa, Raccolte Planctoniche fatte dalla R. N. "Liguria," Vol. I, p. 294. Tav. 12, fig. 16.

Body 4.0 mm. in length, 0.5 mm. in breadth, and 1.5 mm. in same including parapodia. It consists of 14 segments. Tail-region does not exist.

Eyes two, very small lightly pigmented. Cephalic tentacles long, gradually tapering towards tip. First tentacular cirri short and slender, being about $\frac{2}{3}$ as long as the tentacles. Second tentacular cirri reach to about $\frac{2}{3}$ the length of body.

Parapodium long biramous; fins broad and thin, occuring all around the margin of rami. Without "rosette-form" organ.

There exists no fin-gland in the first two pairs of parapodia, while all the remaining parapodia have each ventral fin-gland, the fourth having a dorsal fin-gland in addition.

Habitat:—Misaki; Miho in Prov. Suruga.

Tomopteris septentrionalis de Quatrefages.

1865. *Tomopteris septentrionalis*, de Quatrefages, Hist. Nat. des Annelés, tom. II, p. 229.
1883. *Tomopteris septentrionalis*, Levinsen, Systematisk-geografisk Oversigt over de nordiske Annulata etc. p. 248.
1900. *Tomopteris septentrionalis*, Apstein, Die Alciopiden u. Tomopteriden der Plankton-Expedition. pp. 37, 38, 41.
1905. *Tomopteris septentrionalis*, Reibisch, Nordisches Plankton. X. Anneliden. p. 9.
1908. *Tomopteris septentrionalis*, Rosa, Raccolte Planctoniche fatte dalla R. N. "Liguria." Vol. I, p. 297.

Body measures 13.0 mm. in length, 1.0 mm. in maximum breadth and 3.5 mm. in same including fins at about the 8th parapodiated segment. It comprises 20 parapodiated segments in addition to head and anal segment. Without tail-region.

Cephalic tantacles slender. Eyes two, each with a distinct lens which is directed laterally. First pair of tentacular cirri absent; second pair a little longer than $\frac{2}{3}$ the length of body.

Nuchal ciliated grooves extend backward far beyond the line of eyes in dorsal aspect of the worm.

Parapodium long, biramous; fins broad, extending all around margin of the rami.

Fin-gland of a deep yellow colour is found in ventral parapodial fin near tip of the ramus, beginning in the first and ending in the sixteenth parapodium. Twentieth parapodium is rudimentarily developed. Without "rosette-form" organ.

Habitat:—Misaki, March 29th, 1909.

Tomopteris Apsteini Rosa.

1861. *Tomopteris scolopendra*, Keferstein, Einige Bemerkungen über Tomopteris. Arch. f. Anat., Physiol. etc. Jahrg. 1861. p. 360.

1900. *Tomopteris scolopendra*, Apstein, Die Alciopiden u. Tomopteriden d. Plankton-Expedition, p. 42, Taf. XI., Fig. 18.

1908. *Tomopteris Apsteini*, Rosa, Raccolte Planctoniche fatte dalla R. N. "Liguria." Vol. I, p. 288.

Non *Tomopteris scolopendra*, Gosse, 1855.

Body-proper consisting of 12 segments, 9.0 mm. in total length, 1.2 mm. in breadth and 3.8 mm. in same including fins. There is a slender tail-region measuring 11.0 mm. in length.

First tentacular cirri short; the second about as long as the body.

Anteriormost 10 segments with fully developed parapodia; the remaining two segments with lateral processes, but without fin-like structures.

All parapodia, except those of the first two pairs, have each a ventral fin-gland. This is very highly developed, occupying the most part of the fin.

Habitat:—Misaki.

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ON THE PELAGIC ANNELIDS OF JAPAN.

PLATE I.

Explanation of Plate I

Fig. 1. Dorsal view of the anterior region of *Vanadis grandis*, n. sp. 10/1.

Fig. 2. Ventral view of the anterior extremity of same. 10/1.

Fig. 3. Ventral view of an anteriorly placed glandiferous segment of same. 10/1.

Fig. 4. Ventral view of a posteriorly placed glandiferous segment of same. 10/1.

Fig. 5. Posterior view of right parapodium of 18th segment of same. 31/1.

Fig. 6. Posterior view of left parapodium of 563th segment of same. 31/1.

Fig. 7. Compound setæ of same. 760/1.

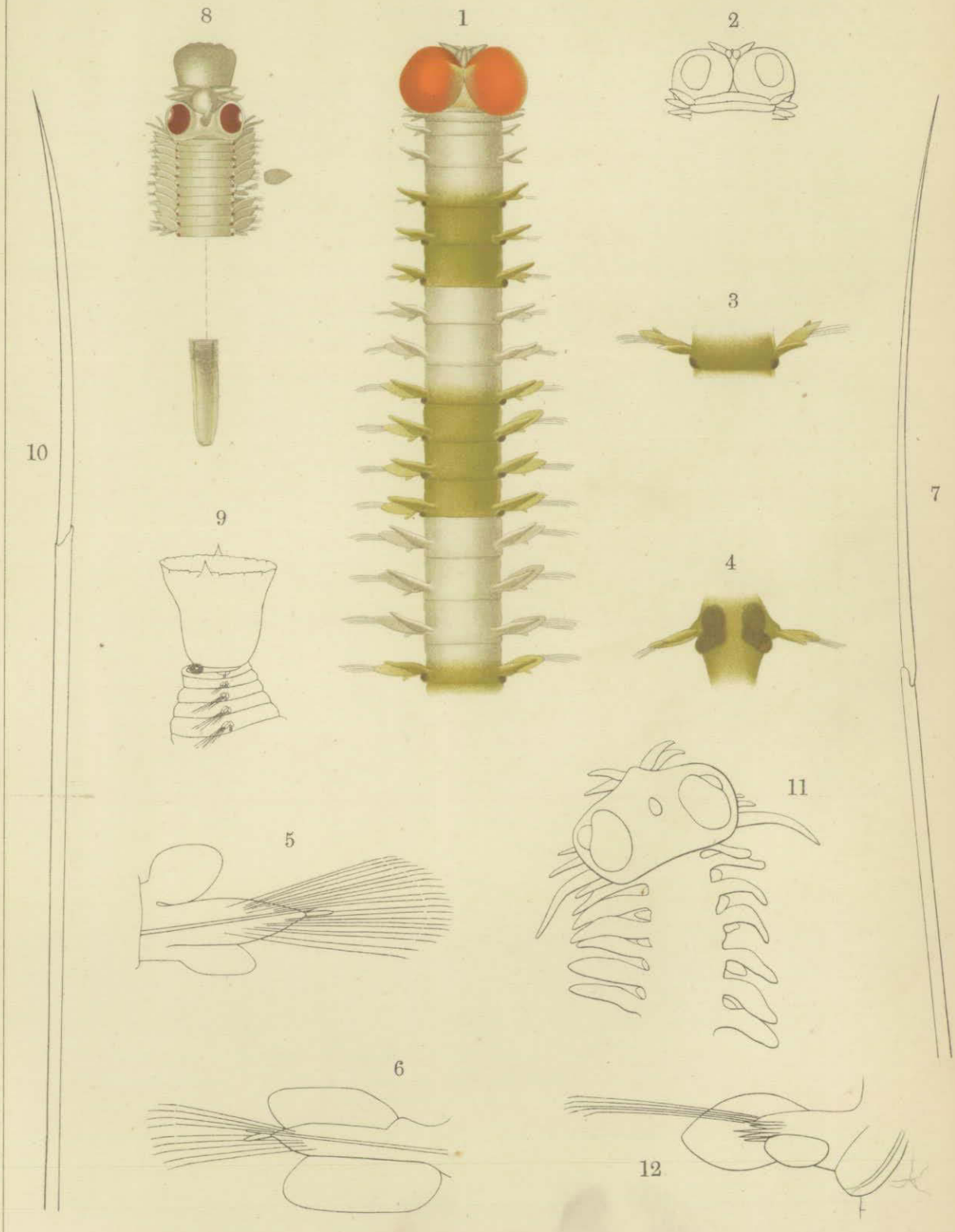
Fig. 8. Dorsal view of the anterior and the posterior extremities of *Callizona japonica*, n. sp. 16/1.

Fig. 9. Lateral view of the anterior extremity of *Alciopa Cantrainii* (delle Chiaje). 5/1.

Fig. 10. Compound setæ of *Asterope candida* (delle Chiaje). 520/1.

Fig. 11. Dorsal view of the anterior extremity of *Rhynchonerella fulgens* Greeff. 31/1.

Fig. 12. Ventral view of right parapodium of 12th segment of same. 62/1.



A. Izuka: Pelagic Annelids of Japan.