

## Lumbrineridae of Polychaetous Annelids from Japan, with Descriptions of Six New Species

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The members of the family Lumbrineridae are uniquely uniform in external features because of the simplicity and reduction of many morphological parts. They are typically marine bottom-deposit feeders and as such have to cope with large amounts of sediment to obtain enough organic material.

Lumbrinerids from the Japanese coast have been reported on in studies by MARENZELLER (1879), MCINTOSH (1885), MOORE (1903), IZUKA (1912), OKUDA (1938), IMAJIMA and HARTMAN (1964) and UCHIDA (1968). These authors reported the following seven species: *Lumbrineris heteropoda* (MARENZELLER, 1879), *L. japonica* (MARENZELLER, 1879), *L. bifurcata* (MCINTOSH, 1885), *L. impatiens* (CLAPARÈDE, 1868), *L. brevicirra* (SCHMARDA, 1861), *L. ezoensis* UCHIDA, 1968 and *Ninoe palmata* MOORE, 1903.

In the present study the lumbrinerids occurring in Japanese waters are recognized for 13 species in four genera, *Augeneria*, *Ninoe*, *Lumbrineriopsis* and *Lumbrineris*. The genera *Augeneria* and *Lumbrineriopsis* are newly added to the Japanese fauna; these are also the first record from the Pacific Ocean area. Material includes six new species, one in *Augeneria*, one in *Ninoe*, one in *Lumbrineriopsis* and three in *Lumbrineris*. *Lumbrineris ezoensis*, described from an anterior fragment collected from Hokkaido, is here referred to *L. bifurcata* (MCINTOSH), and *L. impatiens* or *L. brevicirra* reported from Japan are referred to a new species, *L. nipponica*.

Most specimens were collected by the senior author, while others were collected by the research vessel Tansei Maru (KT) or Hakuho Maru (KH), Ocean Research Institute, University of Tokyo, and by various individuals as stated in *Material examined*.

The present study was undertaken by the junior author, M. HIGUCHI, as a graduation thesis of the Japan Women's University, Tokyo, and after that the manuscript was reviewed and corrected by the senior author.

The authors wish to thank Dr. Kristian FAUCHALD of the University of Southern California, Los Angeles, California for critically reading the manuscript.

The bulk of the collections including type-specimens has been deposited in the

National Science Museum, Tokyo.

### **Lumbrineridae MALMGREN, 1867**

The body is elongate cylindrical and attenuated posteriorly. The prostomium is round, conical or depressed spherical lobe without or with (in *Augeneria* MONRO) a few short nuchal antennae. No eyes. The first two anterior segments are apodous rings, and the succeeding segments are provided with small uniramous parapodia with or without dorsal cirri; there are no ventral cirri. Some parapodia (in *Ninoe* KINBERG) have branchial structures shaped as palmate lobes. The mandibles and maxillae of the proboscis are well developed and the maxillae consist of four pairs of toothed plates. Setae include winged capillaries and simple or compound hooded hooks. The pygidium has one or two pairs of anal cirri.

### **Key to Genera of Lumbrineridae from Japan**

1. Branchiae present on anterior parapodia in palmate arrangement.....*Ninoe* KINBERG
- 1'. Branchiae absent ..... 2
2. With some small nuchal antennae on prostomium; mandibles with short, thick divergent shafts; maxillae IV of pharyngeal apparatus with a pair of large, white rectangular plates fringed with black margin.....*Augeneria* MONRO
- 2'. Without nuchal antennae; mandibles and maxillae otherwise..... 3
3. Prostomium long and pointed; maxillary carriers longer than forceps; simple hooded hooks distally bidentate, or with a few small accessory teeth between two main teeth; pygidium with flaring membrane.....*Lumbrineriopsis* ORENSANZ
- 3'. Prostomium conical or globular; maxillary carriers shorter than forceps; simple and composite hooded hooks distally multidentate; pygidium with four anal cirri ..... *Lumbrineris* BLAINVILLE

### **Systematic Account**

#### ***Augeneria* MONRO, 1930**

The prostomium is conical lobe and has one to seven small nuchal antennae partly hidden by a peristomial fold. Eyes are absent. The mandible is well developed and has short and thick divergent shafts. Maxilla I is falcate; the other maxillae consist of three symmetrical toothed plates; maxilla II has three large teeth along a cutting edge on each plate and maxilla IV has a very large, pale base-plate with a black margin. Uniramous parapodia have winged capillaries and hooded compound hooks anteriorly, replaced by hooded simple hooks posteriorly.

The genus *Augeneria* was erected for species having short nuchal antennae on the prostomium by MONRO, 1930. However, FAUCHALD (1970, p. 71) treated *Augeneria* as a synonym of *Lumbrineris* because some species of the genera *Ninoe* and *Lumbrineris*

also have nuchal antennae. For *Augeneria* importance must also be attached to the shape of the pharyngeal apparatus and the mandibles and not only to the presence of the nuchal antennae.

### Key to Japanese Species of *Augeneria*

1. Prostomium with three short antennae; presetal lobe of the 20th setiger shorter than the postsetal lobe.....*A. tentaculata*
- 1'. Prostomium with seven short antennae; pre- and postsetal lobes of the 20th setiger subequal in length.....*A. polytentaculata*

### *Augeneria tentaculata* MONRO, 1930

(Fig. 1, a-j)

*Augeneria tentaculata* MONRO, 1930, pp. 140-142, fig. 52, a-k; DAY, 1967, p. 430, fig. 17.14.h-i; AVERINCEV, 1972, p. 187, pl. 37, figs. 11, 12; ORENSANZ, 1973, pp. 369-371, pl. 11, 1-8.

*Material examined.* Sagami-nada, 35°01.2'N, 139°28.1'E, in 870 m, KT-66-12, VII-1966 (1); Sagami Bank, in 465 m, X-1966 (1); off Jogashima, in 860 m, KT-67-22, X-1967 (1).

*Description.* The three specimens examined lacked posterior ends. The largest one measures 13 mm long and 2 mm wide and consists of 34 setigerous segments. The prostomium is bluntly conical, as long as its basal width; there are three short antennae, but a large part of them is covered by a fold of the peristomium (Fig. a). A pair of nuchal organs is present at the base of the prostomium; eyes are absent. The first two apodous segments are as long as or slightly longer than the succeeding setigerous segments.

The pharyngeal apparatus is partly calcified. The mandibles are fused along half of their length; the anterior cutting edges are flaring and the two posterior free ends diverge (Fig. b); these are very soft. Maxillae I (forceps) are falcate; the carriers are about 2.5 times as long as wide; maxillae II have three teeth on either side, the two distal teeth are the larger; maxillae III and IV have each a single tooth, and the toothed plate of IV is calcified with a black margin (Fig. d).

The first parapodia are proportionately tiny and have a flattened subtriangular postsetal lobe, but the presetal portion is truncated (Fig. e). Farther back, the postsetal lobes are enlarged and triangular; the presetal lobes are similar in form to these in the first setiger (Figs. f, g).

The first parapodia are provided with six superior limbate setae (Fig. h), three composite hooded hooks, and three inferior limbate setae. Composite hooks are present from the first to the thirteenth setiger; each has a long appendage with nine apical teeth (Fig. i). They are replaced by simple hooded hooks from the fourteenth setiger; each hook has eight teeth arranged in a row, reduced distally in size (Fig. j). Acicula are yellowish and have a filamentous tip; they number three to five in each

ramus.

*Distribution.* Off South Orkney Islands, in 244 to 344 m; Antarctic area; Argentine; Japan.

*Augeneria polytentaculata* sp. nov.

(Fig. 2, a-l)

*Material examined.* Off Enoshima, Sagami Bay, in 110 m, KT-70-4, V-1970 (2).

*Description.* Two individuals lacking posterior ends were collected; the smaller one (holotype) measures 17 mm long and 2 mm wide in the anterior part for 22 setigerous segments, and the larger one (paratype) is 20 mm long and 3 mm wide at the fifth setiger for 33 setigerous segments.

The prostomium is conical; the length is about as long as the basal width. Eyes are absent. There are seven digitate antennae partly hidden by a dorsal peristomial fold (Fig. a). A pair of buccal cushions is present in front of mouth ventrally (Fig. b). The pharyngeal apparatus is well chitinized. The mandibles are thick, strong; they are fused over a short distance and diverge basally from one another (Fig. c). The maxillary carriers are longer than broad, laterally incised, basally oblique. Maxilla I (forceps) is falcate with an expanded basal part; maxilla II has three heavy, thick teeth on either side; maxilla III has a single tooth and maxilla IV has a pair of large, white plates without clearly defined teeth (Fig. d).

Parapodia are conspicuous throughout. The first parapodium has a broad, auricular postsetal lobe and a short, truncated, presetal lobe (Fig. e). Thereafter the postsetal lobe elongates and is directed outward, but the presetal lobe is similar to those in the first setiger (Fig. f). Farther back, the presetal lobe is elongated into a triangular lamella, as large as the postsetal one, and both lobes diverge widely anteriorly and posteriorly (Figs. g, h). The anterior segments, through the twelfth (holotype) or the eighteenth (paratype) setigerous segment, are provided with composite hooded hooks, accompanied by limbate setae and two to three yellow acicula. An eighth parapodium is provided with 6 superior limbate setae (Fig. i), 8 composite hooks (Fig. j), and one inferior limbate seta. The composite hooded hooks have comparatively long appendages with seven short teeth in a crest. These composite hooks are replaced by simple hooded hooks from the thirteenth (nineteenth in paratype) setigerous segments. A twenty-second parapodium has four superior limbate setae (Fig. k) and six simple hooded hooks; each hook is thick, and has a long hooded region, the toothed edge of all is about the same (Fig. l). Acicula number two to three in a parapodium; each is yellow.

*Remarks.* *Augeneria polytentaculata* is closely allied to *A. albidentata* EHLERS from South Africa and *A. albidentata sadko* (ANNENKOVA) from the Bering Sea in many characters. However, the first is distinguished from others in having seven nuchal antennae on the prostomium.

*Type-series.* Holotype, NSMT-Pol. H 105; 1 paratype, NSMT-Pol. P 106.



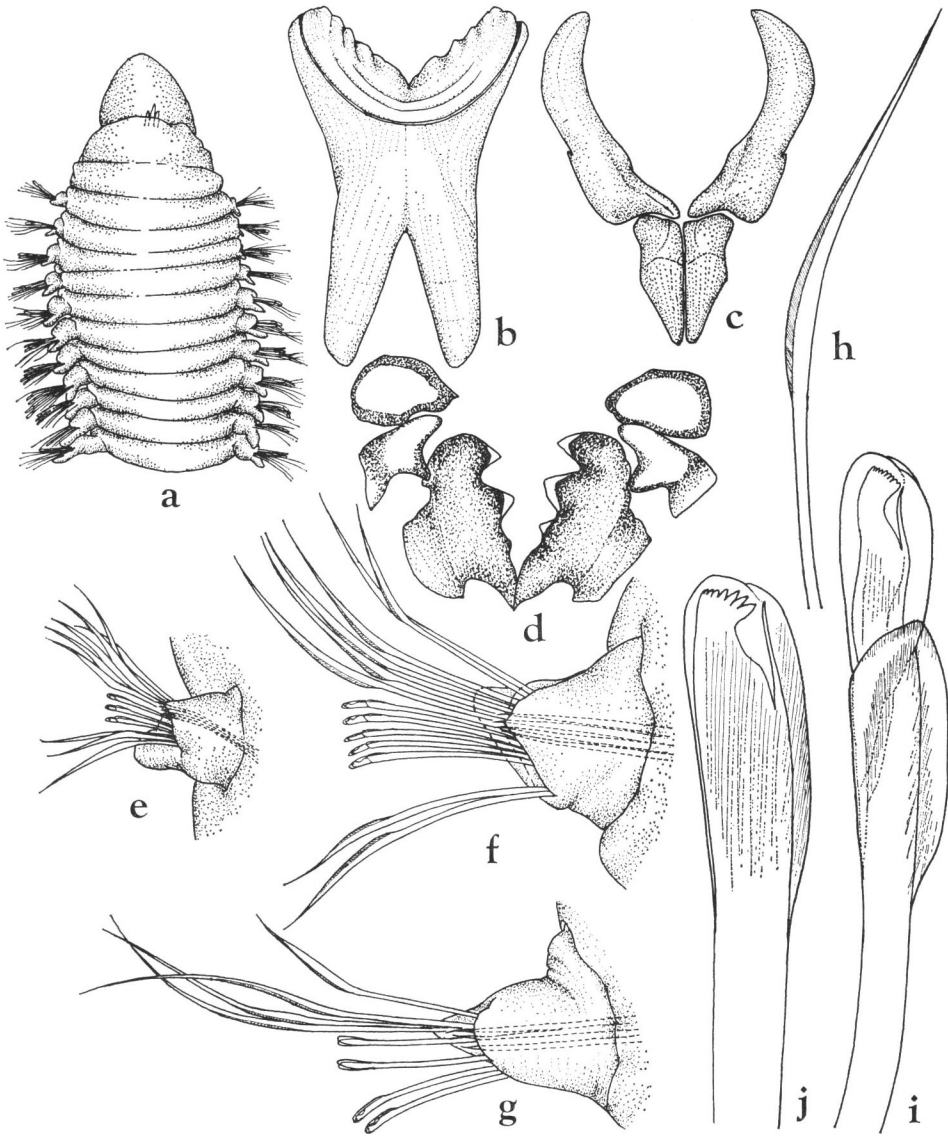


Fig. 1. *Augeneria tentaculata* MONRO. — a, Anterior end, in dorsal view,  $\times 10$ . b, Mandible, in ventral view,  $\times 28$ . c, Maxillary carriers and maxillae I (forceps), in dorsal view,  $\times 28$ . d, Maxillary apparatus showing maxillae II, III and IV, in dorsal view,  $\times 28$ . e, First parapodium, in anterior view,  $\times 50$ . f, Eleventh parapodium, in anterior view,  $\times 50$ . g, Twenty-eighth parapodium, in anterior view,  $\times 50$ . h, Limbate capillary seta from eleventh parapodium,  $\times 150$ . i, Composite hooded hook from eleventh parapodium,  $\times 610$ . j, Simple hooded hook from twenty-eighth parapodium,  $\times 610$ .

*Distribution.* Japan.

*Ninoe* KINBERG, 1865

The prostomium is conical or longer than broad, with or without nuchal antennae. Simple or palmately branched branchiae are present basally on the parapodia or on the ventral surface. Maxillae IV of the pharyngeal apparatus have many minute denticles arranged in a row. Setae include capillaries and hooded hooks.

**Key to Japanese Species of *Ninoe***

1. Hooded hooks present from the first setiger; maxillae III with one tooth. . . . . *N. palmata*
- 1'. Hooded hooks present from setiger seven; maxillae III with two teeth . . . . . *N. japonica*

*Ninoe palmata* MOORE, 1903

(Fig. 3, a-m)

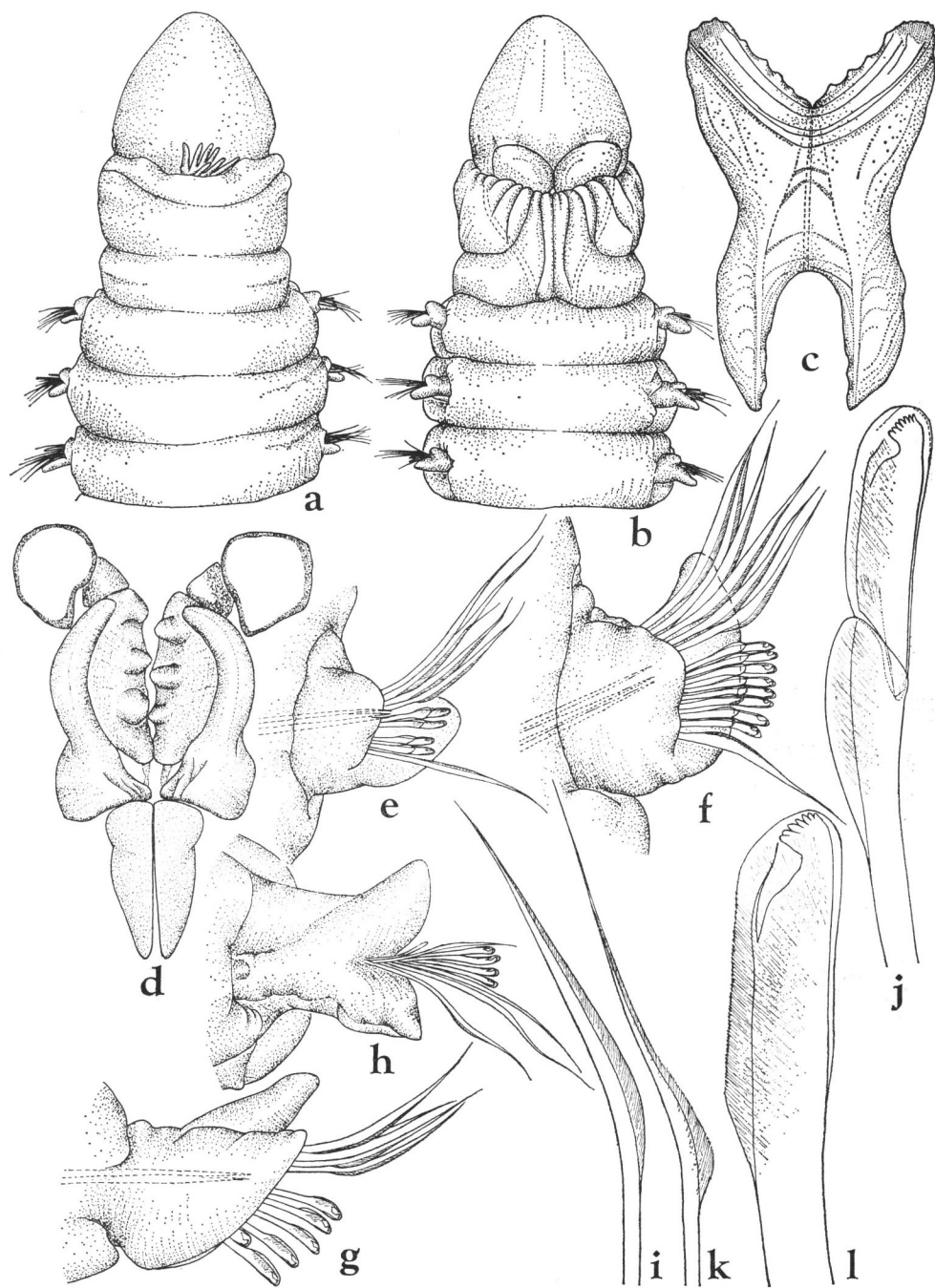
*Ninoe palmata* MOORE, 1903, pp. 456-457, pl. 26, figs. 68-71; IZUKA, 1912, pp. 137-139; USCHAKOV & WU, 1962, p. 120, pl. 4, z-o; IMAJIMA & HARTMAN, 1964, p. 264; IMAJIMA, 1968, p. 141.

*Material examined.* Off Koyahata, Sagami Bay, in 80 m, VII-1966 (2); off Kuno-zan, Suruga Bay, in 60 m, VII-1967 (1); Miyako Bay, in 17-45 m, VII-1967 (374); off Sanriku (39°49.2'N, 143°02.7'E), in 1450 m, KH-69-2, V-1969 (1); off Enoshima, Sagami Bay, in 110 m, KT-70-4, V-1970 (6); Nagasaki Harbor, in 20-40 m, III-1971 (3), T. OKINO leg.

*Description.* The largest specimen measures 35 mm long for 125 setigerous segments and 2 mm wide in anterior region. The prostomium is bluntly conical, as long as the width of its base; a paired nuchal organ is visible at the dorsal junction between the prostomium and the first peristomial segment (Fig. a).

The pharyngeal apparatus includes maxillae and mandibles. The mandibles are thin, delicate, with long, slender, basal ends and flaring distal ends each with two large denticles on the upper edge (Fig. b). The maxillary carriers are much longer than broad, with lateral incisions; maxillae I (forceps) terminate in falcate tips (Fig. c); maxillae II have six teeth on either side, but the second teeth from the tops are very tiny; maxillae III have a single tooth; maxillae IV have a large upper tooth and many, minute denticles arranged in a row (Fig. d).

Fig. 2. *Augeneria polytentaculata* sp. nov. — a, Anterior end, in dorsal view,  $\times 18$ . b, The same, in ventral view,  $\times 18$ . c, Mandible, in ventral view,  $\times 25$ . d, Maxillary carriers and maxillae, in dorsal view,  $\times 25$ . e, First parapodium, in anterior view,  $\times 65$ . f, Eighth parapodium, in anterior view,  $\times 65$ . g, Twenty-second parapodium, in anterior view,  $\times 65$ . h, Nineteenth parapodium, in dorsal view,  $\times 65$ . i, Limbate capillary seta from eighth parapodium,  $\times 185$ . j, Composite hooded hook from eighth



parapodium,  $\times 530$ . k, Limbate capillary seta from twenty-second parapodium,  $\times 185$ .  
 l, Simple hooded hook from twenty-second parapodium,  $\times 530$ .

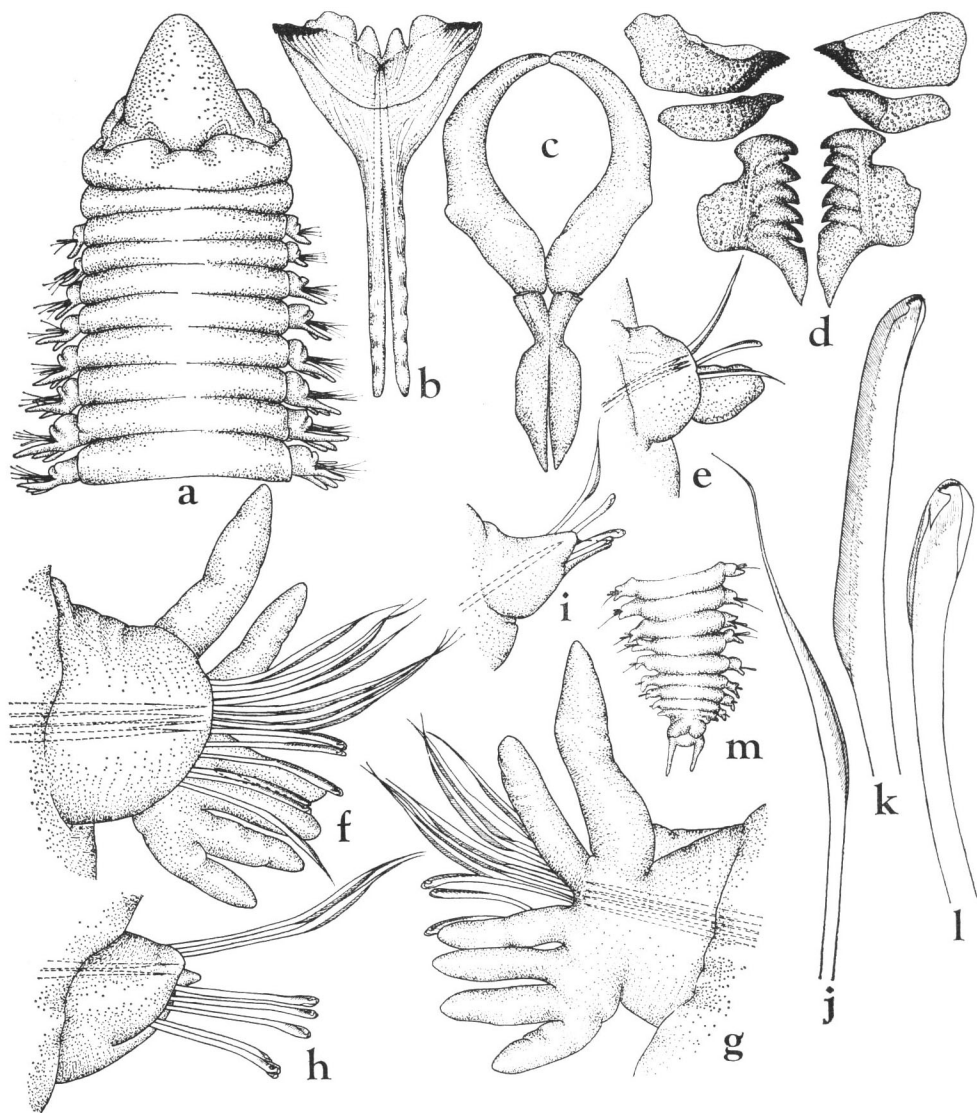


Fig. 3. *Ninoe palmata* MOORE. — a, Anterior end, in dorsal view,  $\times 19$ . b, Mandible, in ventral view,  $\times 43$ . c, Maxillary carriers and maxillae I (forceps), in dorsal view,  $\times 43$ . d, Maxillary apparatus showing maxillae II, III and IV, in dorsal view,  $\times 43$ . e, First parapodium, in anterior view,  $\times 67$ . f, Sixteenth parapodium, in anterior view,  $\times 67$ . g, The same, in posterior view,  $\times 67$ . h, Seventy-fifth parapodium, in anterior view,  $\times 67$ . i, Posterior parapodium, in anterior view,  $\times 67$ . j, Limbate capillary seta from seventy-fifth parapodium,  $\times 185$ . k, Simple hooded hook from anterior parapodium,  $\times 185$ . l, Simple hooded hook from seventy-fifth parapodium,  $\times 320$ . m, Posterior end, in dorsal view,  $\times 19$ .

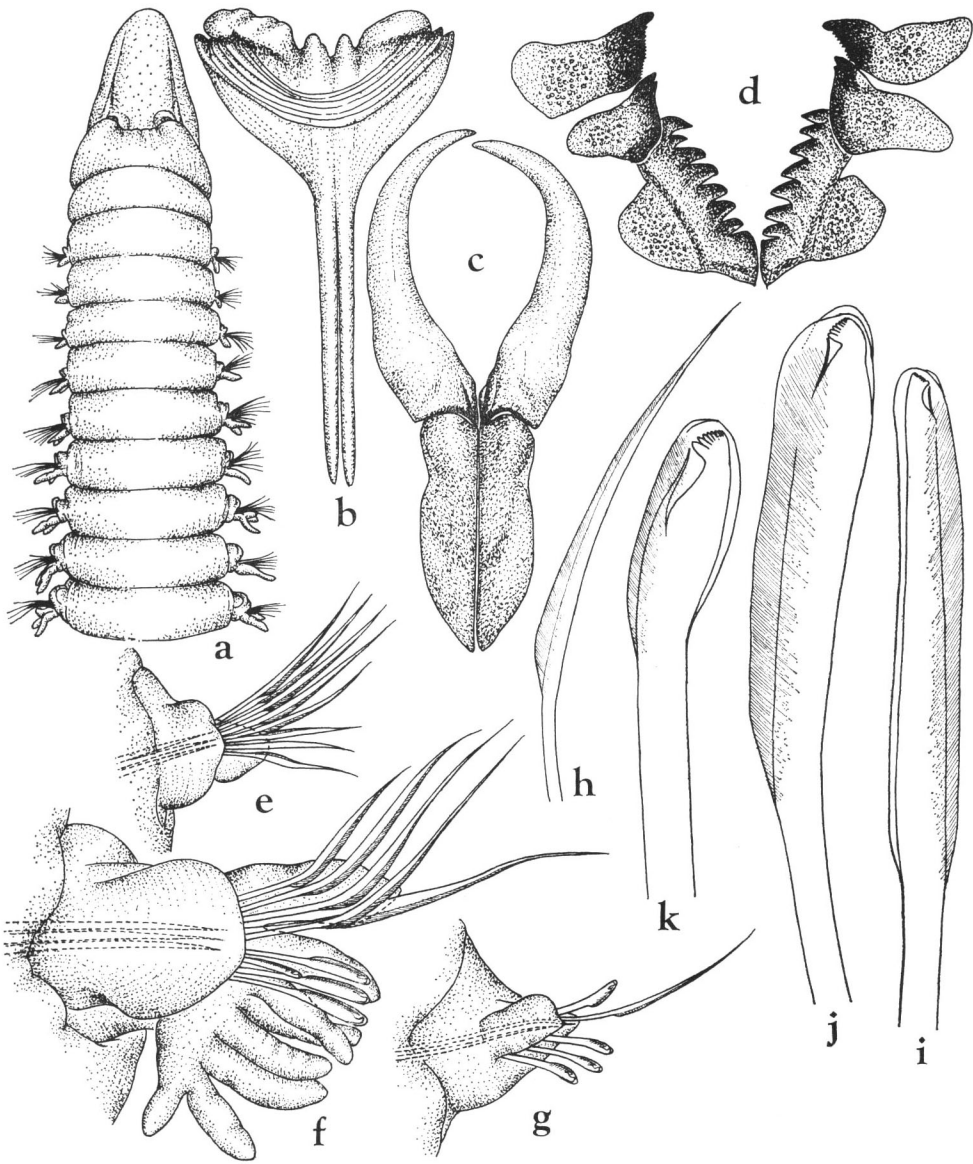


Fig. 4. *Ninoe japonica* sp. nov. — a, Anterior end, in dorsal view,  $\times 20$ . b, Mandible, in ventral view,  $\times 50$ . c, Maxillary carriers and maxillae I (forceps), in dorsal view,  $\times 50$ . d, Maxillary apparatus showing maxillae II, III and IV, in dorsal view,  $\times 50$ . e, First parapodium, in anterior view,  $\times 80$ . f, Twenty-sixth parapodium, in anterior view,  $\times 80$ . g, Ninetieth parapodium, in anterior view,  $\times 80$ . h, Limbate capillary seta from seventh parapodium,  $\times 205$ . i, Simple hooded hook from seventh parapodium,  $\times 610$ . j, Simple hooded hook from twenty-fifth parapodium,  $\times 610$ . k, Simple hooded hook from ninetyieth parapodium,  $\times 610$ .

The first parapodia are short, and have a truncate presetal lobe and a lanceolate postsetal lobe (Fig. e). Branchiae are present from the third setiger as a single short lobe, below the postsetal lobe. The branchiae increase gradually in size and develop five filaments arranged in a series along a main stem by the sixteenth setiger (Figs. f, g). The digitiform postsetal lobe is about 1.5 times as long as the other branchial filaments. The branchiae decrease in the number of lobes from about setiger 26 and disappear at about setiger 50; on setigers 36 to 40 in juveniles. Parapodia are gradually reduced to low folds, each having a short digitiform postsetal lobe (Figs. h, i).

All parapodia have limbate pointed setae with slender tips (Fig. j) and simple hooded hooks. Each anterior hook has a long hood and a very narrow head with six minute teeth (Fig. k); in far posterior setigers the hooded hooks have short hoods; each hook has ten minute teeth distally (Fig. l). Acicula are black and number three in a fascicle in anterior parapodia and are reduced to one posteriorly. Pygidium has two short ventral anal cirri (Fig. m).

*Distribution.* Japan; Yellow Sea.

*Ninoe japonica* sp. nov.

(Fig. 4, a-k)

*Material examined.* Nagasaki Bay, in 28 m, III-1970 (1), T. OKINO leg.; off Enoshima, Sagami Bay, in 110-130 m, KT-70-4, V-1970 (8).

*Description.* All individuals were anterior fragments. The holotype and largest specimen came from off Enoshima; it is 38 mm long and 2 mm wide excluding setae, and setigerous segments number 94.

The prostomium is about twice as long as broad, with two longitudinal ridges dorsolaterally on the dorsal side. The nuchal organ is a pair of dorsolateral pockets; eyespots are absent (Fig. a).

Mandibles are very thin and fragile; they have a broad, flaring, cutting edge and very long, slender, free ends (Fig. b). Maxillary carriers are longer than broad, slightly incised laterally. Maxillae I (forceps) are falcate; maxillae II have seven teeth (eight in paratype) on either side, the second tooth from the tip is smaller than the others in size; maxillae III have two teeth; maxillae IV have a large distalmost tooth and succeeding 10 to 15 minute denticles along one edge (Figs. c, d).

The first parapodium is simple with broadly rounded postsetal lobes (Fig. e). Branchiae are first present from the fifth parapodium, as a triangular lobe arising from the postsetal lobe; the number of filaments increases to seven in palmate arrangement on the setiger 26 (Fig. f). The digitiform postsetal lobe is thicker, and a little shorter than the following filament in length. These branchiae are gradually decrease and are not visible on setiger 39. Posterior parapodia are reduced, and are slightly protruding than the presetal lobe distally (Fig. g).

Anterior segments through six parapodial pairs have only simple, limbate setae (Fig. h). One simple, hooded hook is present from parapodium seven, together with

7 limbate setae; these hooks in anterior parapodia are covered by a long hood and terminate in a fang surmounted by seven teeth in tandem (Figs. i, j); in more posterior parapodia the hooks become shorter, but apical teeth are comparatively conspicuous (Fig. k). Acicula are black and number two to three in a parapodium.

*Remarks.* *Ninoe japonica* is closely allied to *N. armoricana* GLÉMAREC, 1968, from the continental shelf of North Gascony. However, the first differs from the second in the following respects: 1) the denticles on the maxillae IV number 10 to 15, instead of 7 to 8; 2) simple, limbate setae have well developed wings throughout, instead of slightly sigmoid, and are tapering to capillary tips.

*Type-series.* Holotype, NSMT-Pol. H 107; 7 paratypes, NSMT-Pol. P 108.

*Distribution.* Japan.

### *Lumbrineriopsis* ORENSANZ, 1973

The prostomium is long, conical and distally pointed. The mandibles are very long, slender and fused for nearly their entire length. The maxillary carriers are longer than the forceps. Maxilla IV consists of many minute denticles in one row. Each parapodium has simple, limbate setae and simple hooded hooks; hooks are bidentate, or with a few small teeth between the two main teeth. Pygidium has a flaring membrane.

### *Lumbrineriopsis tsushimaensis* sp. nov.

(Fig. 5, a-m)

*Material examined.* Tsushima Strait, in 60–100 m, VII–1968 (7).

*Description.* The holotype is a complete specimen measuring 49 mm long and 1 mm wide for 122 setigerous segments. The body is cylindrical, nearly uniformly thick throughout.

The long prostomium is about as long as the first six segments. Eyes and nuchal organs are not visible (Fig. a).

The mandibles are thin and translucent; they have long, slender basal ends, fused for great part of their entire length, the sides nearly parallel except for the broadly flaring distal ends (Fig. b). The maxillary carriers are longer than the forceps and have a few denticles on the cutting edge distally. Maxillae I (forceps) are strongly falcate, with an extension posterolaterally (Fig. c); maxillae II have four comparatively large teeth on either side; maxillae III have two teeth close to each other; maxillae IV consist of one large distal tooth and 12 to 13 minute denticles in one row (Fig. d).

The first parapodium is small, and has a truncate presetal lobe with a median, small projection; the postsetal lobe is conical (Fig. e). Afterward, the parapodia are well developed in the tenth setiger and the postsetal lobes are especially elongated to be long, erect. The presetal lobes are truncate (Fig. f). The posterior parapodia have conical presetal lobes and large elongate postsetal lobe (Fig. g). Branchiae are absent.

Parapodia have two to four simple, limbate setae in supra-acicular positions and simple hooded hooks in infra-acicular positions throughout. Simple setae are thick,

moderately long with well developed wings (Fig. h). The simple hooded hooks are bidentate throughout with one to two small teeth between the two main teeth; the hoods are elongated in the anterior parapodia (Fig. i) and become gradually shorter, ellipsoidal or round posteriorly (Figs. j, k). Acicula are black and number two in all parapodia; they are subcylindrical with a minute distal tip (Fig. l). Pygidium has a flaring membrane surrounding an anal pore.

*Remarks.* *Lumbrineriopsis tsushimaensis* differs from *L. mucronata* (EHLERS, 1908) from off the mouth of the Congo River (revised by ORENSANZ, 1973, p. 375) and *L. paradoxa* (SAINT-JOSEPH, 1888) from France in the features of the simple hooded hooks.

*Type-series.* Holotype, NSMT-Pol. H 109; 6 paratypes, NSMT-Pol. P 110.

*Distribution.* Japan.

### *Lumbrineris* BLAINVILLE, 1828

The prostomium is a conical or depressed spherical lobe with or without a nuchal antenna. The pharyngeal apparatus consists of mandible and maxillary plates. Each parapodium is uniramous, with a single presetal, and postsetal lobe. Branchiae are absent. Setae include limbate capillaries and simple or composite hooded hooks. Acicula are yellow or black.

### Key to Japanese Species of *Lumbrineris*

1. With a nuchal antenna in a pocket of prostomium; postsetal lobes in antero-median regions well developed.....*L. abyssalis*
- 1'. Without nuchal antennae..... 2
2. Prostomium depressed globular.....*L. inflata*
- 2'. Prostomium conical ..... 3
3. Composite hooded hooks present in some anterior setigers..... 4
- 3'. Composite hooded hooks absent ..... 5
4. Appendage of composite hooks comparatively shorter; acicula black..*L. japonica*
- 4'. Appendage of composite hooks comparatively longer; acicula yellow..*L. latreilli*
5. Hooded hooks first present from first parapodia ..... 6
- 5'. Hooded hooks first present posterior to setiger 7 ..... 7
6. Posterior postsetal lobes greatly prolonged.....*L. longifolia*
- 6'. Posterior postsetal lobes not so prolonged, but erect.....*L. nipponica*
7. Hooded hooks first present from setigers 7 to 14; posterior parapodial lobes distinctly bilabiate, both pre- and postsetal lobes greatly prolonged....*L. bifurcata*
- 7'. Hooded hooks first present from setigers 30 to 45; posterior parapodial lobes distinctly unilabiate, the postsetal lobes obliquely erect.....*L. heteropoda*

### *Lumbrineris abyssalis* sp. nov.

(Fig. 6, a-r)

*Material examined.* Sagami Bay (35°09'N, 139°30'E, in 590 m, 35°00'N, 139°35'E,



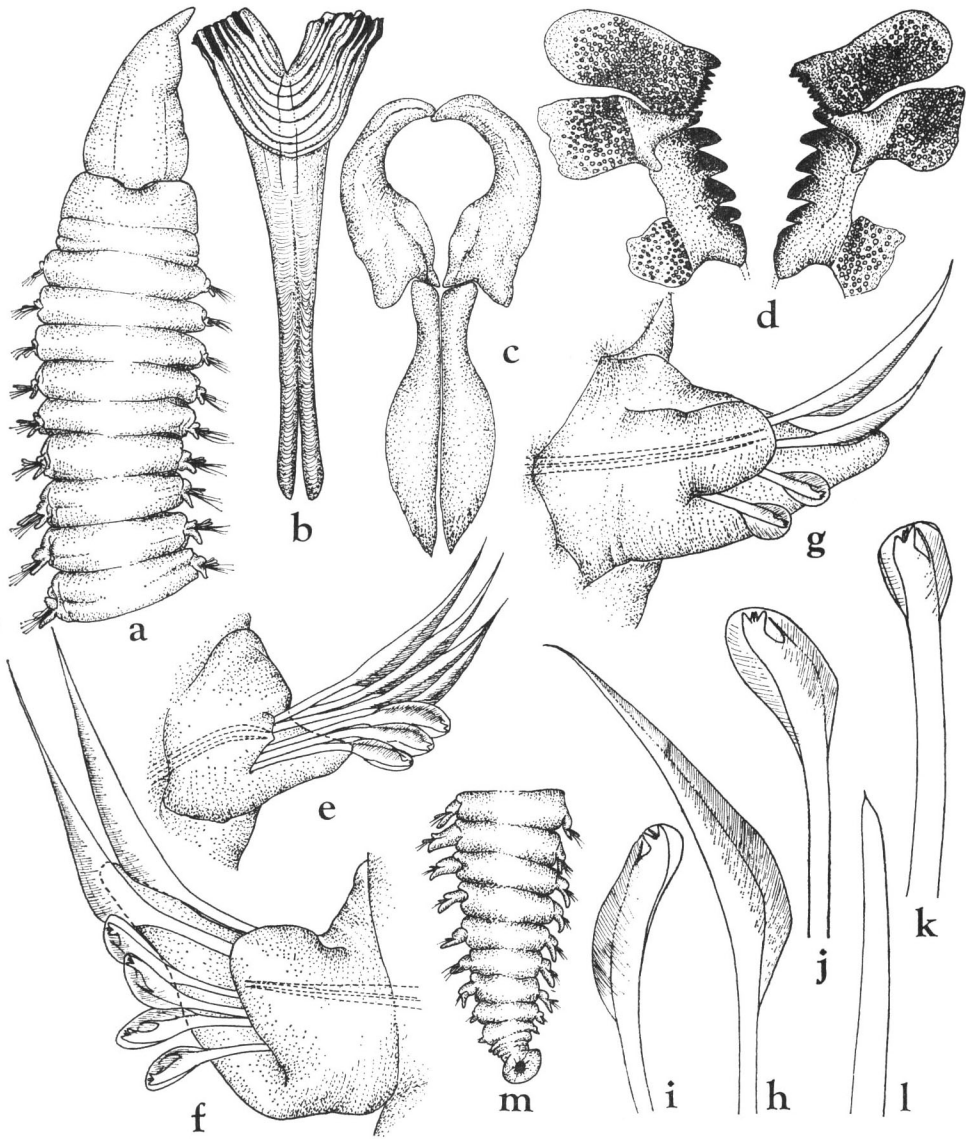


Fig. 5. *Lumbrineriopsis tsushimaensis* sp. nov. — a, Anterior end, in dorsal view,  $\times 20$ . b, Mandible, in ventral view,  $\times 75$ . c, Maxillary carriers and maxillae I (forceps), in dorsal view,  $\times 75$ . d, Maxillary apparatus showing maxillae II, III and IV, in dorsal view,  $\times 80$ . e, First parapodium, in anterior view,  $\times 180$ . f, Eighth parapodium, in anterior view,  $\times 180$ . g, Posterior parapodium, in anterior view,  $\times 180$ . h, Limbate simple seta from posterior parapodium,  $\times 370$ . i, Simple hooded hook from first parapodium,  $\times 370$ . j, Simple hooded hook from eighth parapodium,  $\times 370$ . k, Simple hooded hook from posterior parapodium,  $\times 370$ . l, Aciculum,  $\times 320$ . m, Posterior end, in dorsal view,  $\times 20$ .

in 1055 m), KT-66-12, VI-1966 (1); Sagami Bank, in 1025 m, X-1966 (1); off Oiso, Sagami Bay, in 930 m and off Jogashima, in 860 m, KT-67-22, X-1967 (5); Japan Trench (39°49.2'N, 143°02.7'E), in 1450 m, KH-69-2, V-1969 (3); off Odawara, Sagami Bay, in 800 m, KT-70-4, V-1970 (5).

*Description.* All individuals were anterior fragments. The holotype from off Odawara, Sagami Bay, in 800 m, measures about 40 mm long and 3 mm wide including parapodia; it consists of 121 setigerous segments.

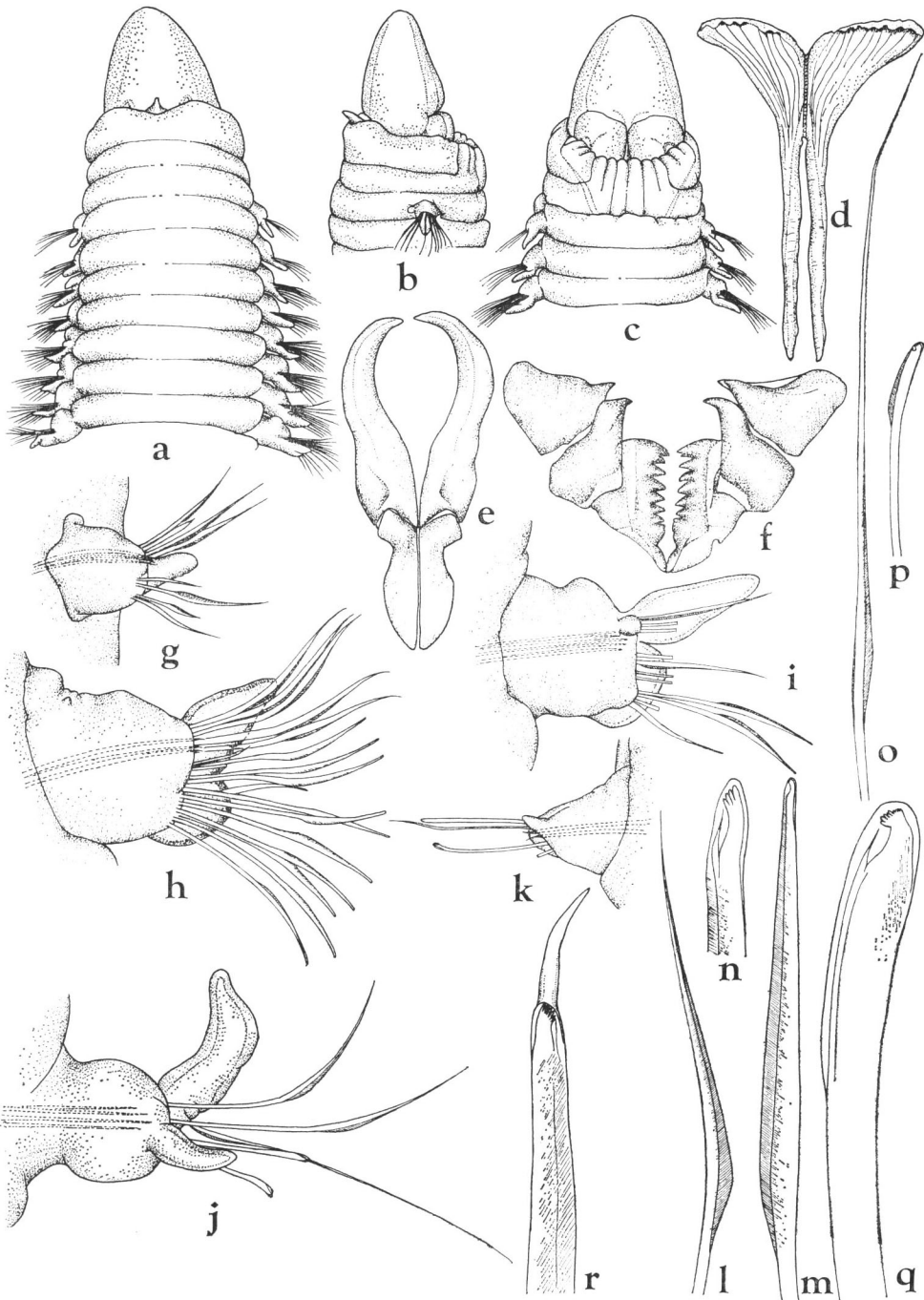
The prostomium is depressed conical and is as long as the following four setigers. The nuchal organ is a centrally placed pocket with one short antenna (Figs. a, b). The first peristomial segment is slightly longer than the second and wider than the prostomium. Both peristomial segments form the lips ventrally so that the posterior edge of the lips is at the junction of the second peristomial segment and the first setiger (Fig. c).

The mandibles are broad, flare distally, and have slender basal ends (Fig. d). The maxillary carriers are longer than broad, basally blunt and incised laterally (Fig. e). Maxillae I (forceps) are falcate; maxillae II have seven teeth on either side, the second teeth from the top are somewhat reduced; maxillae III and IV have each a single tooth, with a broad, flat plate (Fig. f).

The first parapodia are proportionately small; they have a digitate postsetal lobe and a setal lobe, but the presetal portion is reduced (Fig. g). Farther back, the postsetal lobes increase in size and their inferior parts are gradually expanded to a semicircular lobe from the sixth parapodium (Figs. h, i); these lobes disappear near the twenty-fifth parapodium, and the lanceolate postsetal lobes are also gradually reduced to the short digitate lobes from near the fiftieth parapodium. From the fourteenth parapodium a small globular presetal lobe occurs near the superior margin of the parapodium (Fig. i); this becomes about one half as long as the postsetal lobe when fully developed (Fig. j); it disappears in the sixtieth setiger. Posterior parapodia are small; each has an anteriorly rounded presetal lobe and a short digitate postsetal lobe (Fig. k).

Setae include limbate capillary setae (Fig. l) in supra-acicular positions and simple hooded hooks in infra-acicular positions. The simple hooded hooks in the first about twenty setigers are distally slender; they have a long hood and four small distal teeth

Fig. 6. *Lumbrineris abyssalis* sp. nov. — a, Anterior end, in dorsal view,  $\times 14$ . b, The same, in lateral view,  $\times 14$ . c, The same, in ventral view,  $\times 14$ . d, Mandible, in ventral view,  $\times 30$ . e, Maxillary carriers and maxillae I (forceps), in dorsal view,  $\times 30$ . f, Maxillary apparatus showing maxillae II, III and IV, in dorsal view,  $\times 30$ . g, First parapodium, in anterior view,  $\times 50$ . h, Twelfth parapodium, in anterior view,  $\times 50$ . i, Sixteenth parapodium, in anterior view,  $\times 50$ . j, Thirtieth parapodium, in anterior view,  $\times 50$ . k, Posterior parapodium, in posterior view,  $\times 50$ . l, Limbate capillary seta from thirteenth parapodium,  $\times 490$ . m, Simple hooded hook from thirteenth parapodium,  $\times 250$ . n, Distal end of the same hook,  $\times 830$ . o, Limbate capillary seta from thirtieth parapodium,  $\times 130$ . p, Simple hooded hook from thirtieth parapodium,  $\times 130$ . q, Simple hooded hook from posterior parapodium,  $\times 490$ . r, Extra hook in infra-acicular position from tenth parapodium,  $\times 625$ .



(Figs. m, n). Farther back, the limbate capillary setae become extremely elongated with slender tips (Fig. o). The hooded hooks become thicker, with a shorter hooded region; they have nine small distal teeth in tandem (Figs. p, q). An extra hook is present from the ninth parapodium through the next few parapodia in infra-acicular position; it has a long, pointed, translucent hood (Fig. r). Acicula are black and number four in anterior, and one in posterior parapodia; here they taper distally and project from the parapodial lobe.

*Remarks.* *Lumbrineris abyssalis* has affinities with *L. nagae* GALLARDO, 1967, from the Nha Trang, South Viet Nam, in which the following characters are also present: the prostomium has a nuchal antenna; a small globular presetal lobe is present from somewhat posterior parapodium and acicula are black. *L. abyssalis*, however, differs in that the maxillary carriers are basally blunt, and well developed; a presetal lobe is present from the fourteenth, not from the twenty-third setiger; simple hooded hooks are present from the first through all setigers, not after sixtieth or about the one-hundredth setiger.

The species resembles *L. eugeniae* FAUCHALD, 1970, from western Mexico in having a slender nuchal antenna. However, the first is distinguished from the second in the features of the parapodia, in lacking composite hooded hooks and in number of teeth in the maxillae II.

*Type-series.* Holotype, NSMT-Pol. H 111; 4 paratypes, NSMT-Pol. P 112.

*Distribution.* Japan.

### *Lumbrineris inflata* MOORE, 1911

(Fig. 7, a-l)

*Lumbrineris inflata* MOORE, 1911, pp. 289-291, pl. 19, figs. 128-132, pl. 20, figs. 133, 134; HARTMAN, 1944, pp. 160-161; BERKELEY & BERKELEY, 1948, pp. 97-98, figs. 150-152; DAY, 1967, pp. 435-436, fig. 17.16. d-h.

*Lumbriconereis inflata*: USCHAKOV & WU, 1962, p. 66.

*Lumbriconereis cervicalis*: USCHAKOV, 1955, p. 239, fig. 79, A-D.

*Material examined.* Off Atsuga, in 10-20 m (7), off Tokoro, in 30 m (2), Harutachi (12), Hokkaido, VIII-1960; Akkeshi, in 5 m, IX-1960 (31); Shirikishinai, Hokkaido, VI-1963 (23); Asamushi, VI-1964 (2); Koniya, Amami-Oshima, IV-1967 (2); Yamada Bay, intertidal zone, VII-1967 (3); Hachijo-jima, intertidal zone, IV-1968 (11).

*Description.* The longest specimen measures 41 mm long and consists of 120 setigerous segments; it is 2 mm wide including parapodia.

The prostomium is depressed globular; eyes and nuchal organs are absent (Fig. a). The mandibles are thin and translucent; the slender basal ends are fused for about two-thirds of their length, and the distal portion is broadly flaring (Fig. b). The maxillary carriers are longer than broad, laterally incised, and terminate basally in pointed ends (Fig. c). Maxillae I (forceps) are falcate; maxillae II have five teeth on either side, and maxillae III have three (or four in some specimens) teeth and maxillae IV have two teeth

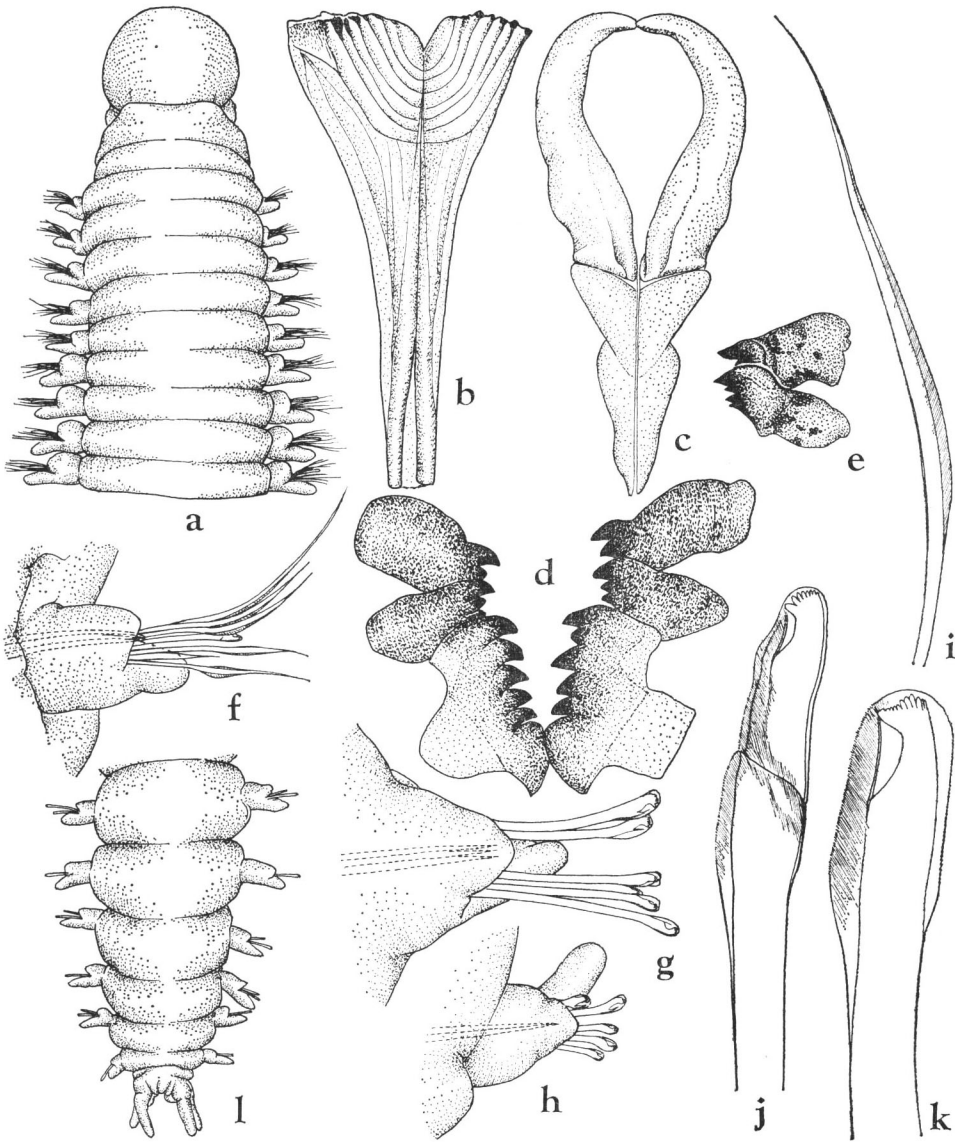


Fig. 7. *Lumbrineris inflata* MOORE. — a, Anterior end, in dorsal view,  $\times 20$ . b, Mandible, in ventral view,  $\times 50$ . c, Maxillary carriers and maxillae I (forceps), in dorsal view,  $\times 50$ . d, Maxillary apparatus showing maxillae II, III and IV, in dorsal view,  $\times 50$ . e, Maxillae III and IV from another specimen,  $\times 50$ . f, First parapodium, in anterior view,  $\times 70$ . g, Median parapodium, in anterior view,  $\times 70$ . h, Posterior parapodium, in anterior view,  $\times 70$ . i, Limbate capillary seta from sixth parapodium,  $\times 190$ . j, Composite hooded hook from sixth parapodium,  $\times 570$ . k, Simple hooded hook from median parapodium,  $\times 570$ . l, Posterior end, in dorsal view,  $\times 20$ .

(Figs. c, d, e).

The first several pairs of parapodia are small and increase in size medially, but are not conspicuously developed throughout; each has a short digitate postsetal lobe, which is pointed obliquely upward posteriorly (Figs. f, g, h).

Composite hooded hook with eight apical teeth (Fig. j) are present from the first setiger through 22 to 26 segments; they are accompanied by broad, limbate setae (Fig. i). Farther back, the composite hooks are replaced by simple hooded hooks, numbering four to six (Fig. k), and the simple setae disappear in about fortieth parapodium. Acicula are brown, and number one to three in each parapodium.

The pygidium has four anal cirri in digitiform (Fig. l).

The species is new to Japan.

*Distribution.* Northeast Pacific, south to the Gulf of California; Gulf of Mexico; Bering Sea; South Africa; Yellow Sea; Japan.

*Lumbrineris nipponica* sp. nov.

(Fig. 8, a-m)

*Lumbriconereis impatiens*: OKUDA, 1938 a, p. 97, textfig. 14; 1938 b, pp. 126-127, textfig. 4; 1940, p. 18; OKUDA & YAMADA, 1954, pp. 188-189; KITAMORI & others, 1959, p. 220, 2 textfigs. (not CLAPARÈDE, 1868).

*Lumbrineris brevicirra*: IMAJIMA & HARTMAN, 1964, p. 263; IMAJIMA, 1968, p. 32 (not SCHMARDA, 1861).

*Material examined.* Tomari, Hokkaido, intertidal zone, VIII-1960 (12); Amakusa, Kyushu, X-1963 (6); Kisarazu, Chiba Pref., I-1964 (3); Tsukumo May, Noto Peninsula, intertidal zone, V-1964 (14); Hayama, intertidal zone, V-1966 (2); off Kuno-zan, Suruga Bay, in 40 m, VII-1967 (1); Hachijo-jima, IV-1968 (13); Nyugawa, Ehime Pref., VIII-1969 (71); Miho Bay, in 10 m, X-1970 (1); Aburatsubo Bay, intertidal zone, VI-1973 (3).

*Description.* The holotype and largest specimen, collected from Amakusa, measures about 200 mm long and 5 mm wide including parapodia; it consists of 468 setigerous segments.

The prostomium is short and acorn-shaped; paired nuchal organs are visible dorso-laterally (Fig. a). Eyes and nuchal antenna are absent. The two peristomial segments are similar in length.

The pharyngeal apparatus is well developed. The mandibles have very long, free basal ends and flare distally (Fig. b). The maxillary carriers are longer than broad, basally slender. The maxillae I (forceps) are falcate (Fig. c); maxillae II have four teeth on each side; some specimens have asymmetrical maxillae with four or five teeth to a side; maxillae III have two teeth and maxillae IV have a single tooth on each side (Fig. d).

The first parapodia are short; the presetal lobe is truncate, but the postsetal lobe is fleshy lanceolate and directed laterally (Fig. e). The median parapodia are well developed; the postsetal lobe tends to stand more or less obliquely upward (Fig. f).

The posterior parapodia are similar to the median one in form, but the postsetal lobe becomes somewhat slenderer than the former (Fig. g). Notopodial rudiments are present in all excepting the first two or three setigers.

Hooded hooks are present from the first setiger accompanied with limbate capil-

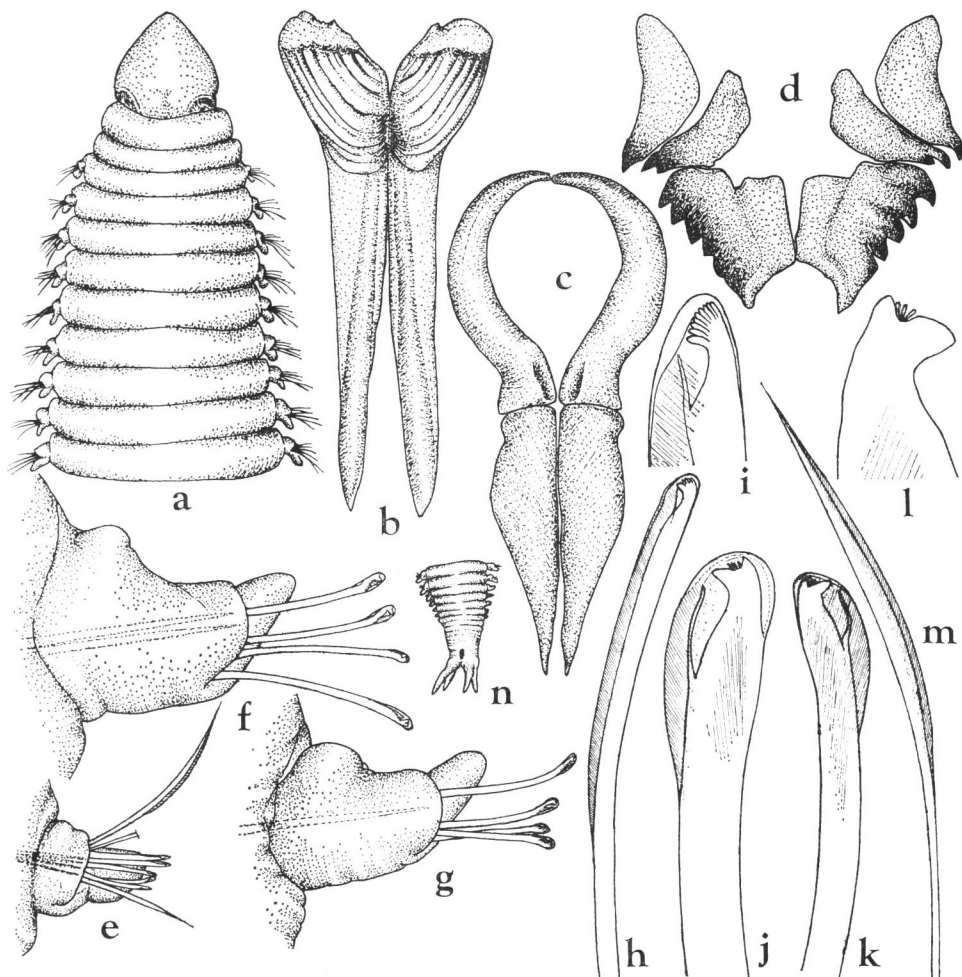


Fig. 8. *Lumbrineris nipponica* sp. nov. — a, Anterior end, in dorsal view,  $\times 10$ . b, Mandible, in ventral view,  $\times 38$ . c, Maxillary carriers and maxillae I (forceps), in dorsal view,  $\times 38$ . d, Maxillary apparatus showing maxillae II, III and IV, in dorsal view,  $\times 38$ . e, First parapodium, in anterior view,  $\times 50$ . f, One-hundred thirtieth parapodium, in anterior view,  $\times 50$ . g, Posterior parapodium, in anterior view,  $\times 50$ . h, Simple hooded hook from tenth parapodium,  $\times 370$ . i, Distal end of the same hook,  $\times 770$ . j, Simple hooded hook from median parapodium,  $\times 370$ . k, Simple hooded hook from posterior parapodium,  $\times 370$ . l, Distal end of the same hook, omitted hood,  $\times 770$ . m, Limbate capillary seta from first parapodium,  $\times 150$ . n, Posterior end, in dorsal view,  $\times 10$ .



lary setae. Each anterior hook is narrow and has eight to nine similar teeth (Figs. h, i). Each median or posterior hook is short and blunt; it is bidentate with two to four small teeth between the two main teeth (Figs. j, k, l). The limbate setae are continued through setigers 40 to 50, and are replaced by the hooded hooks (Fig. m). Acicula number four in anterior and one in posterior parapodia; each is translucent yellow and has a blunt tip. The pygidium has four digitate anal cirri (Fig. n).

*Remarks.* *Lumbrineris nipponica* is closely allied to *L. impatiens* (CLAPARÈDE, 1868) from the Mediterranean Sea. However, the first differs from the second in that anterior hooded hooks have three or four, instead of eight or nine similar teeth in tandem, and the bidentate median and posterior hooded hooks of the first are characteristics.

The species is also very similar to *L. tetraura* (SCHMARDA, 1861) from South Africa. However, the first has a comparatively short postsetal lobe in far posterior setigers, instead of more than three times as long as the presetal ones (FAUCHALD, 1970, p. 110), and the shape and dentition of the posterior hooded hooks is also different in the two species.

*Lumbrineris impatiens* and *L. brevicirra* reported from Japanese waters are referred to the present species.

*Type-series.* Holotype, NSMT-Pol. H 113; 5 paratypes, NSMT-Pol. P 114.

*Distribution.* Japan.

### *Lumbrineris longifolia* sp. nov.

(Fig. 9, a-k)

*Lumbriconereis debilis*: USCHAKOV & WU, 1962, p. 65, pl. 3, k-m; BUZHINSKAJA, 1967, p. 99 (not GRUBE, 1878, p. 170).

*Material examined.* Tomari, Hokkaido, intertidal zone, VIII-1960 (1); Aburatsubo Bay, intertidal zone, III-1968 (16); Ofunado, Iwate Pref., VI-1970 (9); Mutsu Bay, in 20-40 m, VIII-1971 (8), in 5-7 m, I-1973 (13); Ise Bay, in 20-50 m, X-1971 (15), I. YAMAZI leg.; Tsukumo Bay, Noto Peninsula, in 0-25 m, V-1973 (405).

*Description.* The holotype specimen, from Tsukumo Bay, is 34 mm long and about 1 mm wide in the anterior region; it consists of 210 setigerous segments.

The prostomium is depressed conical, slightly shorter than wide at the base, and has a distinct projection at the anterior end. There are no eyes, but the nuchal organs are present on the dorsum. The first two achaetous segments are slightly shorter than the succeeding segments (Fig. a).

The mandibles are thin and translucent; they are distally flaring with some semi-circular black bands and basally slender; the two of a pair are medially fused (Fig. b). The maxillary carriers are a little shorter than broad, laterally incised, and terminate basally in pointed ends. Maxilla I (forceps) is falcate; maxilla II has four teeth on either side, maxilla III has two teeth and maxilla IV has a single tooth (Fig. c).

The first parapodium has a short, truncate presetal lobe and a broad, foliaceous



postsetal lobe (Fig. d). The parapodia develop in length through about the first ten setigers; farther back they become gradually slenderer. Median parapodia have conical pre- and postsetal lobes; the latter are larger than the former (Fig. e). Proceeding back, the postsetal lobes increase their length as a slender, cirriform lobe; they become erect antero-obliquely (Figs. f, g).

Setae through setigers 26 to 36 are simple, limbate capillaries and simple, hooded

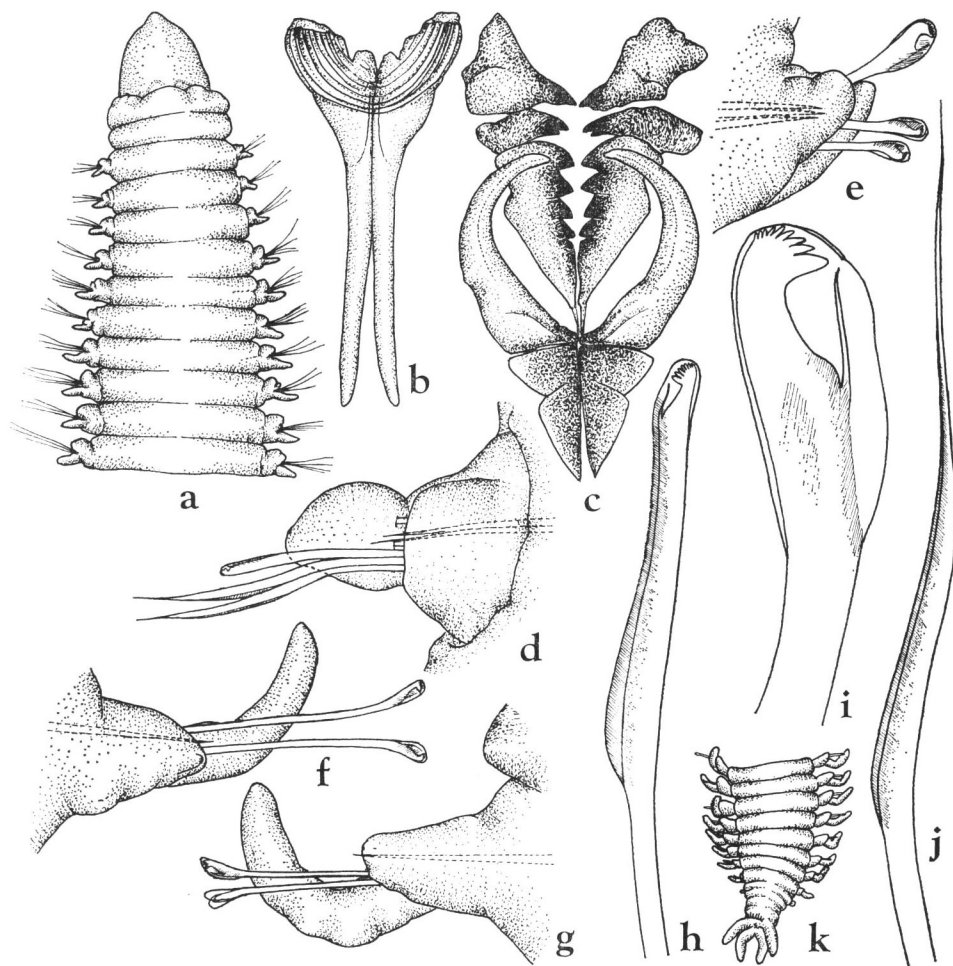


Fig. 9. *Lumbrineris longifolia* sp. nov. — a, Anterior end, in dorsal view,  $\times 23$ . b, Mandible, in ventral view,  $\times 80$ . c, Maxillary carriers and maxillae, in dorsal view,  $\times 80$ . d, First parapodium, in anterior view,  $\times 170$ . e, Seventy-eighth parapodium, in anterior view,  $\times 170$ . f, Posterior parapodium, in anterior view,  $\times 170$ . g, The same parapodium, in dorsal view,  $\times 170$ . h, Simple hooded hook from fifth parapodium,  $\times 610$ . i, Simple hooded hook from seventy-eighth parapodium,  $\times 610$ . j, Limbate capillary seta from fifth parapodium,  $\times 370$ . k, Posterior end, in dorsal view,  $\times 23$ .

hooks in each fascicle; only hooks are present posteriorly. The hooks on anterior parapodia are slender and have a long hood; each hook terminates in a large fang surmounted by seven small teeth in tandem (Fig. h). More posterior hooks become much thicker than the anterior ones; they are covered by an elliptical to round hood; each has a large main fang and eight smaller teeth in a crest (Fig. i). The capillary setae are slightly geniculated and have greatly prolonged whip-like tips which are especially prominent in median setigers (Fig. j). Acicula are yellowish to brown, and number one to three in a parapodium; each is distally protruded from the setal lobe. The pygidium has two pairs of cirriform papillae (Fig. k).

*Remarks.* *Lumbrineris longifolia* is characterized by the following combination of characters: 1) the prostomium has a projection at the anterior end; 2) the maxillary formula of the pharyngeal apparatus is 1-4-2-1; 3) the postsetal lobes of posterior parapodia are greatly elongated into a slender cirriform lobe, antero-obliquely erect; 4) anterior parapodia through setigers 26 to 36 have capillaries and simple hooded hooks, and thereafter capillaries disappear.

*Lumbrineris debilis* reported by USCHAKOV and WU, 1962, from Yellow Sea and by BUZHINSKAJA, 1967, from Possjet Bay, Sea of Japan, are referred to the present new species, *L. longifolia*. *L. debilis* (*sensu* GRUBE) has short postsetal lobes on the posterior parapodia, instead of greatly prolonged ones, and hooded hooks are first present from the setiger 16, instead of from the first.

*Type-series.* Holotype, NSMT-Pol. H 115; 404 paratypes, NSMT-Pol. P 116.

*Distribution.* Japan; Yellow Sea; Possjet Bay, Sea of Japan.

### *Lumbrineris bifurcata* (McINTOSH, 1885)

(Fig. 10, a-n)

*Lumbriconeris bifurcata* McINTOSH, 1885, pp. 241-243, pl. 36, figs. 10-12; pl. 17, fig. 16; textfigs. 7, 8;

IZUKA, 1912, pp. 142-143; USCHAKOV, 1955, p. 242, fig. 80, A-F.

*Lumbrineris bifurcata*: IMAJIMA & HARTMAN, 1964, p. 262.

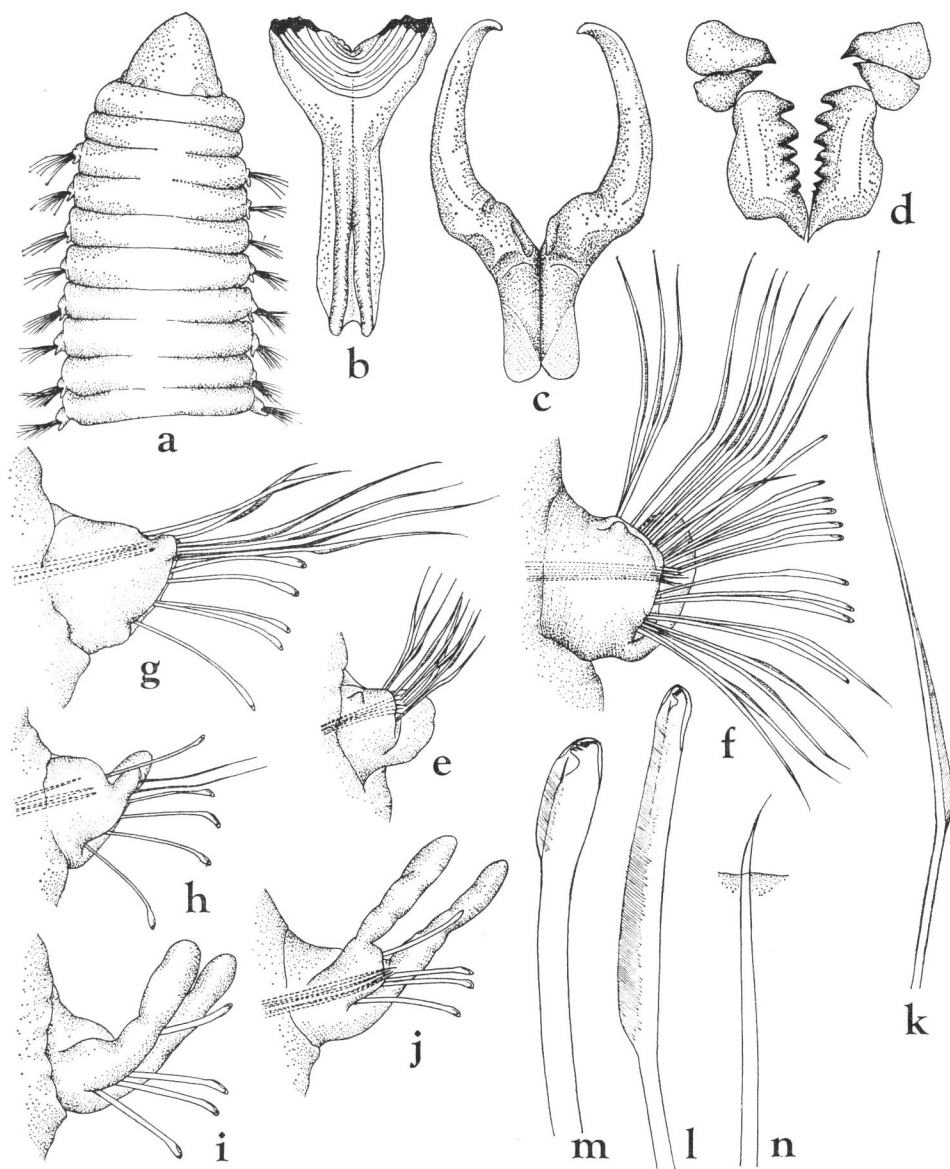
*Lumbrineris ezoensis* UCHIDA, 1968, pp. 599-600, fig. 4.

*Material examined.* Off Oiso, in 930 m (3), off Hiratsuka, in 600 m (2), off Joga-shima, in 860 m (1), Sagami Bay, KT-67-22, X-1967; off Enoshima, Sagami Bay, in 110 m (6), KT-70-4, V-1970.

*Description.* All individuals were anterior fragments; the largest one measures 126 mm long and 5 mm wide excluding parapodia in the anterior region; it has 229 setigerous segments.

The prostomium is depressed conical, more or less acutely pointed in front. A pair of nuchal organs is present dorsolaterally (Fig. a). The mandibles have a broad, flaring, cutting edge and long, slender, free ends (Fig. b). The maxillary carriers are

Fig. 10. *Lumbrineris bifurcata* (McINTOSH). — a, Anterior end, in dorsal view,  $\times 8$ . b, Mandible, in ventral view,  $\times 10$ . c, Maxillary carriers and maxillae I (forceps), in dorsal view,  $\times 10$ . d, Maxillary apparatus showing maxillae II, III and IV, in dorsal view,  $\times 10$ .



e, First parapodium, in anterior view,  $\times 25$ . f, Eighteenth parapodium, in anterior view,  $\times 25$ . g, Fiftieth parapodium, in anterior view,  $\times 25$ . h, Nintieth parapodium, in anterior view,  $\times 25$ . i, One-hundred and fourtieth parapodium, in anterior view,  $\times 25$ . j, Two-hundred and twentieth parapodium, in anterior view,  $\times 25$ . k, Limbate capillary seta from fiftieth parapodium,  $\times 67$ . l, Simple hooded hook from twentieth parapodium,  $\times 250$ . m, Simple hooded hook from two-hundred and twentieth parapodium,  $\times 185$ . n, Aciculum,  $\times 100$ .

longer than broad, basally rounded, with smooth lateral margin (Fig. c). Maxillae I (forceps) are falcate; maxillae II have five to six teeth decreasing in size toward the base; maxillae III and IV have a single tooth each (Figs. c, d).

The first parapodia are tiny, and have truncate presetal lobes and semicircular postsetal lobes (Fig. e). The following parapodia gradually increase in size, and are conspicuously developed in the eighteenth parapodium; each parapodium has a broadly rounded postsetal lobe and a small, papillar superior process (Fig. f). In the fiftieth parapodium the presetal lobe comes to be nearly as long as the postsetal one, with a small depression on the superior margin (Fig. g). In median and posterior segments the presetal and postsetal lobes come to be long, subequally bilabiate, as long as half the body is wide (Figs. h, i, j).

Setae are at first entirely simple limbate, accompanied by one to a few simple hooks from about parapodia 7 to 14. Limbate setae are continued through about parapodium 110; they are slender, with long distal part (Fig. k). Anterior hooks first have long, slender hoods region and seven fine teeth at the distal end (Fig. l). Posterior hooded hooks have comparatively short hood, about a third as long as the anterior hooks (Fig. m). Acicula are dark to black, and number six in parapodia in anterior segments; they are acutely pointed, with long drawn-out, pale tips that project from the parapodial lobe, but diminish to about three in posterior parapodia (Fig. n).

*Remarks.* The type-specimen of *Lumbrineris ezoensis* UCHIDA, 1968, from Hokkaido, which is an anterior fragment, was re-examined. It agrees with the present species.

*Distribution.* Japan; Pacific coast of North America; Okhotsk Sea.

### *Lumbrineris heteropoda* (MARENZELLER, 1879)

(Fig. 11, a-m)

*Lumbriconereis heteropoda* MARENZELLER, 1879, pp. 138-139, pl. 5, fig. 4; pl. 6, fig. 1; MOORE, 1903, p. 454; IZUKA, 1912, pp. 141-142, pl. 14, fig. 19.

*Lumbrineris heteropoda*: HARTMAN, 1942, pp. 121-123, textfig. 10, e-g; USCHAKOV & WU, 1962, p. 64, pl. 2, E-Z; IMAJIMA & HARTMAN, 1964, pp. 262-263; USCHAKOV, 1965, p. 242, fig. 79, E-K; GALLARDO, 1967, pp. 83-84, pl. 31, figs. 5-10, pl. 32, fig. 1 (part).

*Material examined.* Ariake Sea, in 10-30 m, IX-1958 (3); Ise Bay, in 20 m, X-1963 (1); Oyano, Kumamoto Pref., intertidal zone, VII-1973 (1).

*Description.* All specimens were lacking posterior ends; the largest one is 160 mm long and 6 mm wide excluding parapodia for 309 setigerous segments.

The prostomium is subconical, nearly as long as wide; it has a pair of nuchal organs on the dorso-lateral side, but no eyes (Fig. a). Each of the first two apodous segments is slightly shorter than the succeeding setigers.

The mandibles are thick, blackish brown; they are broad, with straight cutting edge, and have long, slender, free ends (Fig. b). The maxillary carriers are longer than broad, basally pointed, and laterally incised. Maxillae I (forceps) are falcate; maxillae II have four teeth on a side, increasing in size distally; maxillae III have two teeth and maxillae

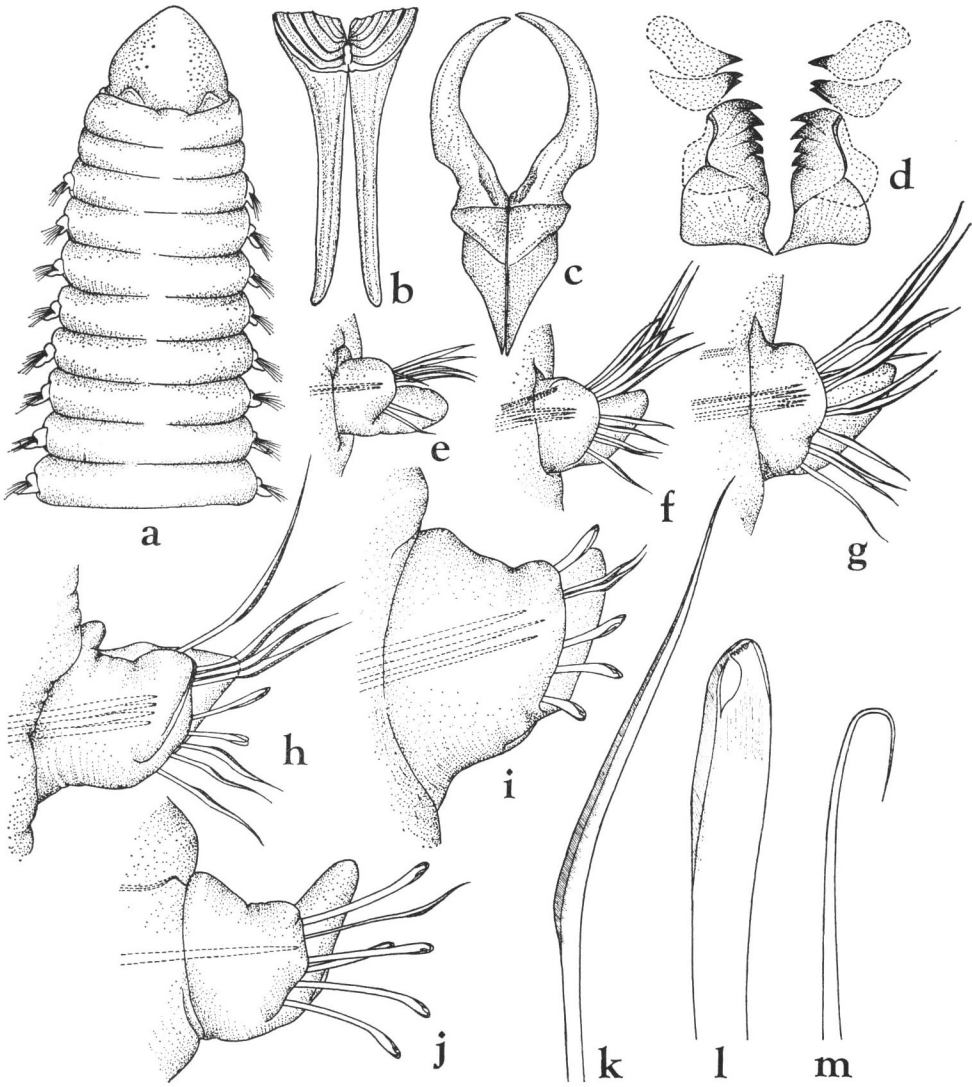


Fig. 11. *Lumbrineris heteropoda* (MARENZELLER). — a, Anterior end, in dorsal view,  $\times 10$ . b, Mandible, in ventral view,  $\times 17$ . c, Maxillary carriers and maxillae I (forceps), in dorsal view,  $\times 17$ . d, Maxillary apparatus showing maxillae II, III and IV, in dorsal view,  $\times 17$ . e, First parapodium, in anterior view,  $\times 43$ . f, Fourth parapodium, in anterior view,  $\times 43$ . g, Tenth parapodium, in anterior view,  $\times 43$ . h, Thirty-eighth parapodium, in anterior view,  $\times 43$ . i, One-hundred and fortieth parapodium, in anterior view,  $\times 43$ . j, Posterior parapodium, in anterior view,  $\times 43$ . k, Limbate capillary seta from tenth parapodium,  $\times 140$ . l, Simple hooded hook from one-hundred and fortieth parapodium,  $\times 320$ . m, Dorsal aciculum from thirty-eighth parapodium,  $\times 320$ .

IV have one tooth (Figs. c, d).

The first several pairs of parapodia are small and increase in size posteriorly; their presetal lobes are rounded or truncated and the postsetal lobes are conspicuously developed and conical to triangular in shape (Figs. e, f, g). A notoacicular papilla is about equally noticeable through setiger 22 to 58; it is located at the dorsal, inner corner of the parapodium near the body wall (Fig. h). Medially, the parapodia are well developed, but the postsetal lobes are relatively short (Fig. i). In more posterior parapodia postsetal lobes elongate and project digitately upward; the presetal ones are obtusely conical (Fig. j).

Setae are at first entirely simple and limbate; limbate setae are present through all fragments (Fig. k). Simple hooded hooks are present from setigers 30 to 48; some of the limbate setae are replaced by hooded hooks. The hooks are distally dentate, with eight small teeth in tandem (Fig. l). Acicula are pale yellow, straight rods, numbering five in anterior parapodia and one posteriorly. The notoacacula are slender and distally recurved, numbering six in the thirty-eighth parapodium (Fig. m). The pygidium is not known.

*Remarks.* *Lumbrineris heteropoda* reported by DAY (1967, p. 440) from Cape Town is questionable in that the postsetal lobes of the posterior parapodia (Fig. 17. 17. o) are conspicuously elongated.

*Distribution.* Japan; southern Sakhalin; Yellow Sea.

### *Lumbrineris japonica* (MARENZELLER, 1879)

(Fig. 12, a-n)

*Lumbriconereis japonica* MARENZELLER, 1879, pp. 137-138, pl. 5, fig. 3; IZUKA, 1912, pp. 139-140, pl. 14, figs. 17-18.

*Lumbrineris japonica*: IMAJIMA & HARTMAN, 1964, pp. 263-264; FAUCHALD, 1970, pp. 91-92, pl. 14, figs. e-f.

*Lumbriconereis latreilli*: USCHAKOV & WU, 1962, pp. 65-66.

*Material examined.* Shirikishinai, Hokkaido, intertidal zone, X-1955 (2); Ariake Sea, in 19-30 m, IX-1957 (2); Atsuga, Hokkaido, VII-1958 (5); Oshima-Hukushima (27), Matsumae (2), Hokkaido, VI-1960; Harutachi (4), Irika (5), Hokkaido, VIII-1960; Saroma-ko Lake, Hokkaido, IX-1960 (1); Moheji, Hokkaido, VI-1961 (1); off Koyahata, Sagami Bay, in 23-168 m, V-1966 (137); Hayama, intertidal zone, V-1966 (3); Miyako Bay, Iwate Pref., in 45 m, VII-1966 (2); off Kunozan, Suruga Bay, in 40 m, VII-1967 (1); Tsushima Strait, in 64-125 m, VIII-1968 (8); off Odawara, Sagami Bay, in 800 m, KT-70-4, V-1970 (3); Nagasaki Harbor, in 32 m, III-1971 (2).

*Description.* A large number of the material examined lacked posterior ends; a complete individual measures 29 mm long 2 mm wide for 110 setigerous segments.

The prostomium is bluntly conical or rounded in front; it is as long as wide. A pair of nuchal organs is present on the dorsum of the prostomium (Fig. a). The first achaetous segment is about twice as long as the second.

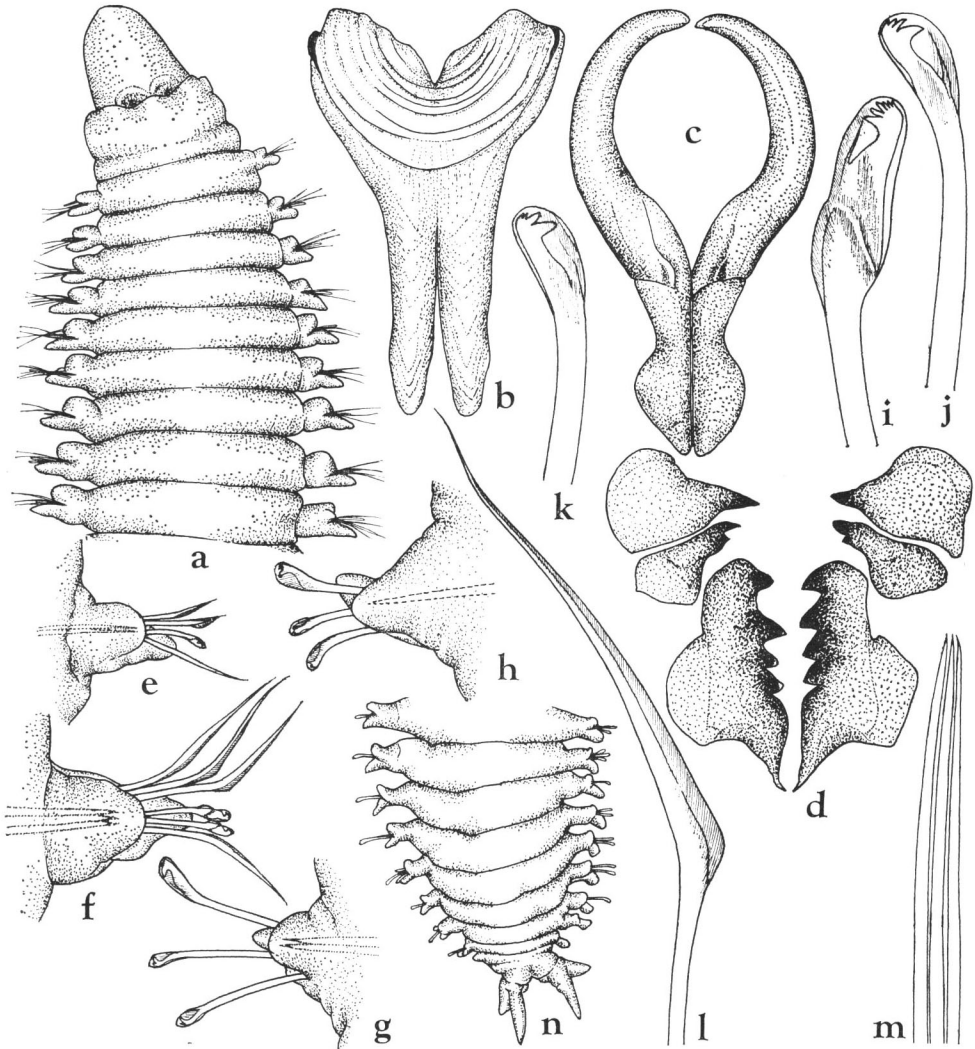


Fig. 12. *Lumbrineris japonica* (MARENZELLER). — a, Anterior end, in dorsal view,  $\times 32$ . b, Mandible, in ventral view,  $\times 20$ . c, Maxillary carriers and maxillae I (forceps), in dorsal view,  $\times 20$ . d, Maxillary apparatus showing maxillae II, III and IV, in dorsal view,  $\times 20$ . e, First parapodium, in anterior view,  $\times 93$ . f, Fifth parapodium, in anterior view,  $\times 93$ . g, Sixtieth parapodium, in anterior view,  $\times 93$ . h, Posterior parapodium, in anterior view,  $\times 93$ . i, Composite hooded hook from first parapodium,  $\times 710$ . j, Simple hooded hook from sixtieth parapodium,  $\times 345$ . k, Simple hooded hook from posterior parapodium,  $\times 345$ . l, Limbate capillary seta from fifth parapodium,  $\times 345$ . m, Aciculum from fortieth parapodium,  $\times 45$ . n, Posterior end, in dorsal view,  $\times 32$ .

The mandibles are very thick, strong; they have a broad, flared cutting edge and the basal ends are free from one another for about two-thirds of the length (Fig. b). The maxillary carriers are longer than broad, laterally incised, and are expanded basally (Fig. c). The maxillae I (forceps) are falcate; maxillae II have four teeth on either side, or four in right and five in left; maxillae III have two teeth on a side and maxillae IV have a single sharp tooth on each side (Figs. c, d).

Anterior parapodia have short, blunt, presetal lobes and somewhat inflated, triangular postsetal lobes (Figs. e, f). Farther back the postsetal lobes become short conical lobes, directed obliquely upward, whereas the presetal lobes do not change in form (Figs. g, h).

The first 10 to 33 parapodia have composite hooded hooks and limbate pointed setae; thereafter the composite hooks are replaced by simple hooks. The composite hooks have a comparatively short appendage, about three times as long as broad; they have a major tooth and five fine teeth in tandem (Fig. i). The appendages of simple hooks are about twice as long as broad, and have three minute teeth on a main fang (Figs. j, k). The limbate setae (Fig. l) disappear from parapodium 22–66, and are replaced by simple hooks. Acicula are black and number four in a fascicle in anterior, and one in posterior parapodia (Fig. m). The pygidium has four digitate anal cirri (Fig. n).

*Remarks.* *Lumbrineris japonica* is distinguished from *L. latreilli* by having black, instead of yellow, acicula and short appendages of hooks, instead of comparatively long one.

*Distribution.* Japan; Indo-Pacific areas; California south to western Mexico; Yellow Sea.

### *Lumbrineris latreilli* (AUDOUIN et MILNE-EDWARDS, 1834)

(Fig. 13, a–m)

*Lumbriconereis latreilli*: FAUVEL, 1923, p. 431, fig. 171, m–r.

*Lumbrineris latreilli*: HARTMAN, 1944, pp. 158–159, pl. 9, figs. 213–216; PETTIBONE, 1963, pp. 258–260, fig. 67, a–c; FAUCHALD, 1970, pp. 94–97, pl. 15, figs. f–h; HARTMANN-SCHRÖDER, 1971, pp. 253–255, fig. 84, a–h; 1974, p. 214.

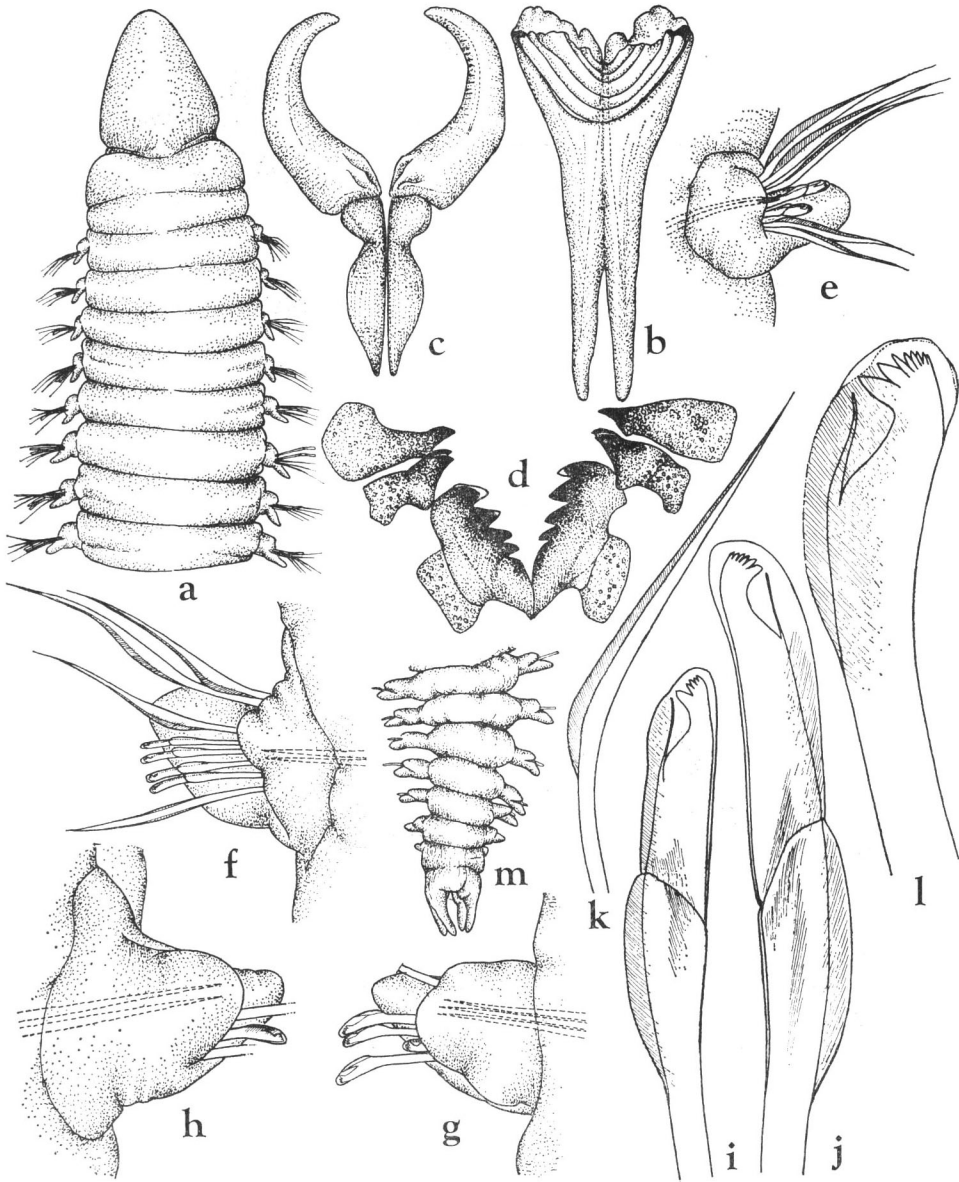
*Lumbrineris latreilli*: BERKELEY & BERKELEY, 1948, pp. 98–99, figs. 154–156.

*Material examined.* Harutachi, Hokkaido, intertidal zone, VII–1960 (1); Akkeshi, intertidal zone, IX–1960 (3); Aburatsubo Bay, intertidal zone, IV–1964 (2); Asamushi, VI–1964 (2); Sagami Bay, in 870 m, KT–66–12, VII–1966 (1); off Yoichi, Hokkaido, in 100 m, KT–67–7, VI–1967 (1); Tsushima Strait, in 100–115 m, VII–1968 (23); Nagasaki Harbor, in 25–40 m, III–1971 (5).

*Description.* A complete specimen measures 57 mm long and consists of 107 setigerous segments; it is 2 mm wide including parapodia. The prostomium is conical

Fig. 13. *Lumbrineris latreilli* (AUDOUIN et MILNE-EDWARDS). — a, Anterior end, in dorsal view,  $\times 23$ . b, Mandible, in ventral view,  $\times 50$ . c, Maxillary carriers and maxillae I





(forceps), in dorsal view,  $\times 50$ . d, Maxillary apparatus showing maxillae II, III and IV, in dorsal view,  $\times 50$ . e, First parapodium, in anterior view,  $\times 100$ . f, Tenth parapodium (right), in anterior view,  $\times 100$ . g, Fifty-fourth parapodium (right), in anterior view,  $\times 100$ . h, Posterior parapodium, in anterior view,  $\times 100$ . i, Composite hooded hook from first parapodium,  $\times 760$ . j, Composite hooded hook from tenth parapodium,  $\times 760$ . k, Limbate capillary seta from first parapodium,  $\times 320$ . l, Simple hooded hook from posterior parapodium,  $\times 370$ . m, Posterior end, in dorsal view,  $\times 23$ .

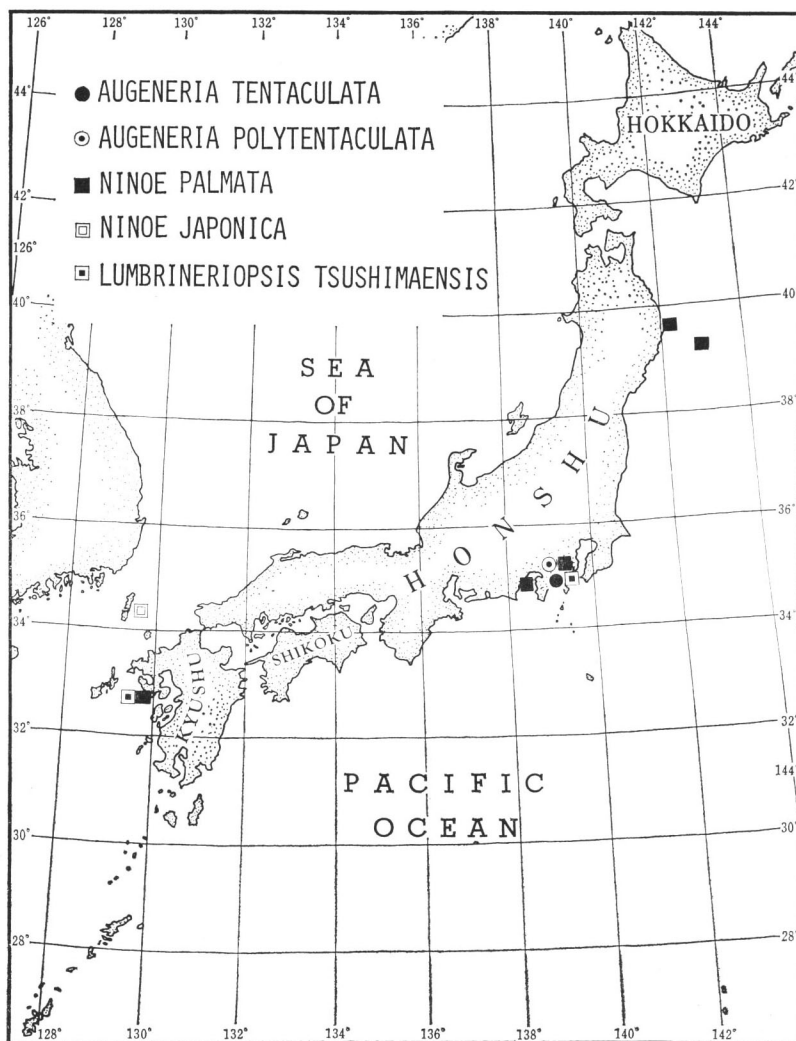


Fig. 14. Distribution of species of *Augeneria*, *Ninoe* and *Lumbrineriopsis* in Japan.

and longer than broad; a pair of nuchal organs is present on the dorsum (Fig. a).

The mandibles are thin, but strong; they are broad, flare distally, and have slender basal ends (Fig. b). The maxillary carriers are longer than broad, laterally incised and basally slender (Fig. c). The maxillae I (forceps) are falcate; maxillae II have four teeth on each side; maxillae III have two well-defined teeth on a side, and maxillae IV have a single tooth (Figs. c, d).

The first parapodium is small and has an inflated, short postsetal lobe (Fig. e).

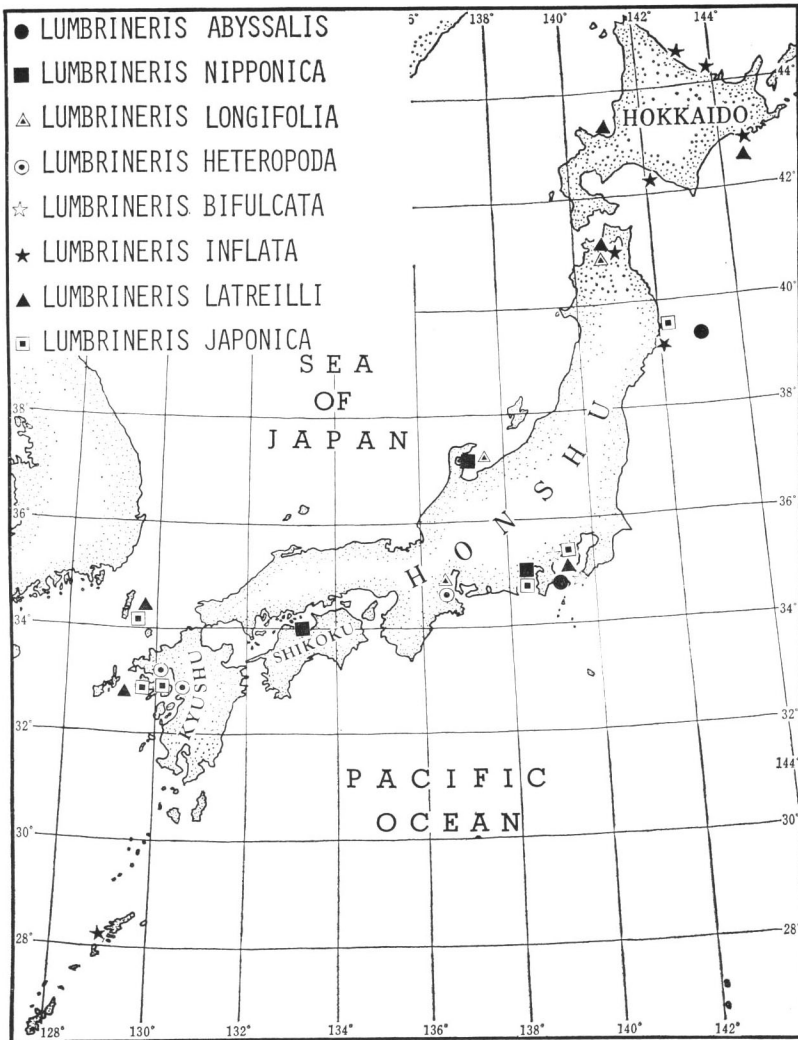


Fig. 15. Distribution of species of *Lumbrineris* in Japan.

Farther back the postsetal lobes rapidly develop into foliaceous lobes, and they attain to maximum size in about tenth parapodium (Fig. f). The median and posterior parapodia are similar in form; the presetal lobe is distally rounded and the postsetal lobe tends to stand more or less obliquely upward (Figs. g, h).

Composite hooded hooks continue through about 18 to 20 setigers, and are completely replaced by simple, hooded hooks. Appendages of the composite hooks are slender, and six to seven times as long as the wide; each has a large main fang and four smaller teeth in a crest (Figs. i, j). Simple hooded hooks are thicker and have

eight apical teeth including two large inferior ones (Fig. l). The slender limbate setae occurring from the first parapodium are continued through about fifty setigers (Fig. k); they are replaced by simple hooded hooks posteriorly. Acicula are yellow and number two to three in a parapodium. The pygidium has four digitate anal cirri (Fig. m).

*Distribution.* Atlantic, Pacific and Indian Oceans; Mediterranean Sea; Japan.

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