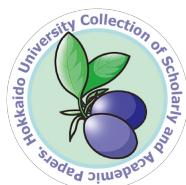
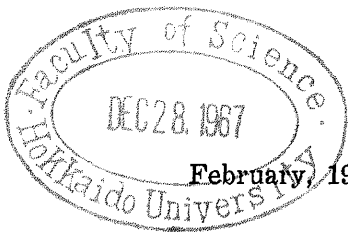




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Title	Nemerteans from Sagami Bay (With Plates I-VII)
Author(s)	Iwata, Fumio
Citation	Publications from the Akkeshi Marine Biological Station, 7, 2-31
Issue Date	1957-02
Doc URL	https://hdl.handle.net/2115/68006
Type	departmental bulletin paper
File Information	Akkeshi_No07.pdf





No. 7

PUBLICATIONS
FROM
THE AKKESHI MARINE BIOLOGICAL STATION

Nemerteans from Sagami Bay

By
Fumio IWATA

SAPPORO, JAPAN

Nemerteans from Sagami Bay

By

Fumio IWATA

(Akkeshi Marine Biological Station, Akkeshi, Hokkaido)

(With Plates I-VII)

This report is based on the nemertean specimens which were collected by His Majesty the Emperor of Japan from eastern coasts of Sagami Bay and off Shimoda, between the tide marks or below it to the depth of 410 m, during the years from 1939 to 1956. The specimens are represented by 21 species, of which 14 are new to science, including two new genera and 14 new species. Besides two new genera, a member of *Drepanophorus* has been first recorded from Japan. The specimens examined are all preserved in alcohol, appended with colour-films of *Cerebratulus marginatus* and *Drepanophorus longiceps* in living state. All materials are deposited in the Biological Laboratory of the Imperial Palace in Tokyo.

The author wishes to express his sincere gratitudes to the members of the Biological Laboratory and also to Professor Tohru Uchida and Assist. Prof. M. Yamada for their supervision.

List of species

Subclass Anopla

Order Palaeonemertea

Fam. Hubrechtidae Bürger, 1895

1. *Tetramys ramicerebrum* n. g. et n. sp.

Order Heteronemertea

Fam. Baseodiscidae Bürger, 1904

2. *Cephalomastax brevis* n. g. et n. sp.

Fam. Lineidae McIntosh, 1874

3. *Euborlasia proteres* n. sp.
4. *Lineus geniculatus* (Delle Chiaje), 1828
5. *Lineus fuscoviridis* Takakura, 1898
6. *Cerebratulus marginatus* Renier, 1804
7. *Cerebratulus zebra* Punnett and Cooper, 1910
8. *Cerebratulus penniger* n. sp.
9. *Cerebratulus superniger* n. sp.
10. *Cerebratulus formosus* n. sp.
11. *Cerebratulus albocirculus* n. sp.
12. *Micrura japonica* Iwata, 1952
13. *Micrura multinotatum* n. sp.

Subclass Enopla

Order Hoplonemertea

Suborder Monostylifera Brinkmann, 1917

Fam. Emplectonematidae Bürger, 1904

14. *Paranemertes plana* n. sp.

Fam. Amphiporidae McIntosh, 1874

15. *Amphiporus punctatulus* Coe, 190516. *Amphiporus reduncus* n. sp.17. *Amphiporus nagaiensis* n. sp.18. *Amphiporus parmiornatus* n. sp.19. *Amphiporus retrotumidus* n. sp.

Fam. Tetrastemmatidae Bürger, 1895

20. *Tetrastemma nigrifrons* var. *bilineatum* Iwata, 1954

Suborder Polystylifera Brinkmann, 1917

Fam. Drepanophoridae Verrill, 1892

21. *Drepanophorus longiceps* n. sp.

Description

Tetramys n. g.

The cephalic glands are well developed. The inner circular muscle layer is thin and extends posteriorly beyond the oesophageal region. The inner longitudinal muscle layer enclosing the gut is present only in the oesophageal region. The brain is composed of the dorsal and the ventral ganglion. The dorsal ganglion is posteriorly divided into two lobes. The dorsal lobe is small and short, while the ventral lobe is large and long, immediately enclosed by the cerebral sense organ. The oesophageal nerves and the dorsal nerve are present. The ocelli are wanting. The intestine is devoid of the lateral diverticula.

Type species: *Tetramys ramicerebrum* n. sp.

The new genus belongs to the family Hubrechtidae in which the lateral nerve is situated between the basement membrane and the circular muscle layer, the muscle layer of the body is mainly composed of an outer circular and an inner longitudinal muscle layer, and the dorsal blood vessel is present. In the family Hubrechtidae there are three genera hitherto recorded, namely *Hubrechtia*, *Hubrechtella* and *Coia*, of which the genus *Hubrechtia* is most differentiated in the organization of the body. The genus *Hubrechtia* is characterized by the basement membrane with the nerve plexus, the presence of the inner circular muscle layer, and the brain which is composed of the dorsal and the ventral ganglion. The new genus is closely related to the genus *Hubrechtia* in the above characters, but differs from the latter in the following features: the dorsal ganglion is posteriorly divided into two lobes, of which the ventral one is connected with the cerebral sense organ; the cerebral sense organ is

long, cylindrical, and is not protruded backward in the lateral blood lacuna; the inner longitudinal muscles surround the gut only in the oesophageal region; the intestine is devoid of the lateral diverticula; the oesophageal nerves are present.

Tetramys ramicerebrum n. sp.

(Pl. I, fig. 1; Pl. II, figs. 1-6)

External characters in preserved state. The body is slender and cylindrical, about 5 cm long and 1.5 mm wide. The head is somewhat wider than the portion immediately following. The mouth is represented as a longitudinal slit, about 1.2 mm in length. The cephalic furrow is wanting. The body is wholly milky white in colour.

Internal structure. The epithelium is thick, containing a number of the small nuclei stained with haematoxylin and a small number of the elliptical glandular cells which are filled with numerous minute dots stained with eosin. There are also found the elliptical glandular cells wanting the eosinophile dots. The basement membrane is thick in the anterior portion of the body, being about a half the thickness of the epithelium. The muscular wall of the body is composed of an outer circular, an outer longitudinal, an inner circular, and an inner longitudinal muscle layer. The inner circular muscle layer, which is piled up into a fused layer with the circular muscle layer of the proboscis sheath, is thin and surrounds the gut not only in the oesophageal region but also in the intestinal region throughout. The inner longitudinal muscle layer enclosing the gut is thin and limited only to the oesophageal region of the body (Pl. II, fig. 5). The muscle bands running at right angles between the outer and the inner circular muscle layers are well developed in the oesophageal region. The circular muscle layer of the rhynchodaeum is thick and connected with the outer circular muscle layer of the body wall by a few muscle bands across the cephalic blood lacuna. Between the basement membrane and the outer circular muscle layer there are the brain, the lateral nerves, the dorsal nerve, the oesophageal nerves and the peripheral nerve plexus composed of the nervous cells and fibres. The peripheral nerve plexus is about a half the thickness of the basement membrane in the oesophageal region. The dorsal and the ventral ganglions distinctly separated each other, are in nearly same size in cross section, whereas the dorsal is about two times the length of the ventral. In the brain there are found two kinds of the nervous cells, of which one is small and numerous, while the other is large and small in number and located in the dorsal side. The dorsal ganglion is posteriorly divided into two lobes, of which the dorsal one is short and small, ending freely, while the ventral one is long and large, being enclosed by the

cerebral sense organ, with the posterior portion of which the end is connected (Pl. II, fig. 3). The oesophageal nerves, in a pair, originate from the anterior portions of the ventral ganglions behind the ventral commissure of the brain, and a connected mass of them is found at the posterior portion of the ventral ganglion. The oesophageal nerve plexus is thin and found only in a short length in the oesophageal region. The dorsal nerve running posteriorly in the peripheral nerve plexus originates from the dorsal commissure of the brain. The posterior portion of the brain reaches the anterior end of the mouth.

The cerebral sense organ is large, cylindrical, and covered with a thin layer of a few circular muscles, running posteriorly inside the muscle layers of the body along the cephalic blood lacuna. It is composed of the anterior small and the posterior voluminous glandular masses, the main portion enclosing the long and large ventral lobe of the dorsal ganglion, and a narrow ciliated canal which is situated at the lateral side of the ventral lobe of the dorsal ganglion and runs from the anterior opening of the cerebral sense organ on the dorsolateral surface of the body to the posterior end of the ventral lobe of the dorsal ganglion. The cephalic glands containing nuclei are well developed, extending posteriorly to the anterior tip of the brain. They are large and round, grouped in many masses (Pl. II, fig. 1). The epithelium of the rhynchodaem inside the circular muscle layer is also filled with those cephalic glands (Pl. II, fig. 1). Ocelli wanting.

The proboscis sheath is composed of an outer circular and an inner longitudinal muscle layer. It is long and extends posteriorly throughout the body. In the present specimen the posterior portion was damaged. The rhynchocoel is enormously vast in the oesophageal region and gradually narrows posteriorly. The proboscis is long and slender, being composed of three muscle layers of which the longitudinal muscle layer lies between the circular ones.

The cephalic blood lacuna is situated between the cephalic glands and the circular muscle layer of the rhynchodaem, and is rather large, irregular in shape in cross section, but not so clearly separated into two lateral lacunae (Pl. II, fig. 1). In the oesophageal region the lacuna is found on the ventral margin of the gut between the outer longitudinal and the inner circular muscle layer of the body wall. The dorsal blood vessel is situated inside the proboscis sheath in the oesophageal region. The nephridia and the efferent ducts are not found in the present preparation. The gonads are small, situated on the dorsal side of the lateral blood vessel, containing a few large oocytes, the most anterior one being found in the intestinal portion.

Habits and habitat. The body preserved in alcohol was cut automatically in the posterior portion and the proboscis curled in a small

mass was exposed outside the posterior end of the damaged body. The material was collected at the depth of 20 m on February 9th, 1955.

Locality. Higashiône.

Cephalomastax n. g.

The body is short and broad, being flattened dorsoventrally. The head is helmet-shaped from above and demarcated from the body by a transverse groove on the neck. The lateral cephalic furrow is wanting. The rhynchodaeum opens at the tip of the head. The mouth is situated under the brain. The outer circular muscles are differentiated to form a layer in addition to the ordinary three layers. The cutis glands are not voluminous. The connective tissue is thick and contains numerous large, rounded cells. The cephalic glands extend backward beyond the brain in the foregut. The proboscis is composed of an outer circular and an inner longitudinal muscle layer. The dorsal ganglion does not branch posteriorly into two lobes. The cerebral sense organ does not extend beyond the dorsal ganglion. The foregut is clearly marked off from the intestine which is cylindrical in shape and with the lateral diverticula metamerically arranged. The dorsoventral muscles and the parenchyma are well developed. The cephalic blood lacuna is a single crescent-shaped canal situated above the rhynchodaeum. The ocelli and the frontal organ are wanting.

Type species: *Cephalomastax brevis* n. sp.

The new genus belongs to the family Baseodiscidae in which the proboscis is composed of an outer circular and an inner longitudinal muscle layer and the cephalic glands posteriorly extend behind the brain in the foregut region. The difference of the new genus from the genus *Baseodiscus* lies in the absence of the oblique cephalic furrow, the ocelli, and the frontal organ and the connective tissue with numerous large cells. In comparison with the characters of seventeen genera belonging to the order Heteronemertea the new genus has several specific features such as the head of helmet-shape, the mouth not situated behind the brain, the connective tissue containing numerous large round cells, the outer circular muscles differentiated as a layer like other three ones (outer longitudinal, circular, and inner longitudinal), the dorsal ganglion not branching posteriorly, and the foregut which is clearly marked from the intestine with the lateral diverticula.

Cephalomastax brevis n. sp.

(Pl. I, fig. 9; Pl. II, fig. 7; Pl. III, figs. 1-7)

External characters in preserved state. The body is sword-shaped,

short and broad, flattened dorsoventrally, round in the lateral margin, and tapers posteriorly into a blunt end, being about 2.5 cm long and 3.5 mm wide. The head demarcated from the body is helmet-shaped or semi-circular from above in the anterior margin. The conspicuous cephalic groove surrounds the neck behind which the body becomes steeply broader. The openings of the rhynchodaeum and the mouth are not found with the naked eye. The lateral cephalic furrow is wanting. The body is pale chestnut in colour on the dorsal side except only the portion of the neck which is whitish; the ventral surface is white.

Internal structure. The epithelium is thick and about three times the thickness of the inner circular muscle layer in the anterior portion of the body. The eosinophile gland cells are small, globular in shape, and irregularly arranged in the superficial portion of the epithelium. The basement membrane is rather thick and its dorsal line is undulated. The muscular wall of the body is composed of the outer circular, the outer longitudinal, the inner circular and the inner longitudinal muscle layers, being respectively 1, 18, 3 and 6 in ratio of thickness in the dorsolateral side of the body in the stomach region. The dorsoventral muscles are well developed through the whole length of the body except the cephalic region. The cutis is situated in the upper part of the outer longitudinal muscle layer, from which the cutis is clearly marked off. The cutis glands are large, nearly spherical in shape and arranged in a row. The connective tissue layer contains numerous large round cells, in each of which a small blotch stained with haematoxylin is always embeded, and is about three times thicker than the cutis glands. The dorsal ganglion is cylindrical in shape, longer and about two times larger in cross section than the ventral one, and being not divided posteriorly into two lobes as is found in the families Lineidae and Baseodiscidae. The dorsal commissure of the brain is not immediately connected with the dorsal ganglion but runs posteriorly at a short distance along the dorsolateral side of the dorsal ganglion (Pl. III, fig. 2). The dorsal nerve running on the inner circular muscle layer originates from the dorsal commissure. The oesophageal nerves, in a pair, originated from the posterior portions of the ventral ganglions are fused into a small mass in front of the mouth. The peripheral nerve plexus surrounding the inner circular muscle layer is not found. The lateral nerves are situated between the outer longitudinal and the inner circular muscle layers.

The cerebral sense organ being in contact with the lateral side of the dorsal ganglion, extends from the anterior portion to the end of the dorsal ganglion. It is lod-shaped and narrowed anteriorly, tapering into the opening situated at the ventrolateral surface of the body. The lateral

cephalic furrow is entirely wanting. A thick nerve cord of the dorsal ganglion enters into the cerebral sense organ at the posterior portion near the end. The cephalic glands are well developed and extend backward beyond the brain to the stomach region. The ocelli and the frontal organ are wanting.

The rhynchocoel is narrow, limited posteriorly to about $2/3$ times the length of the body. The rhynchodaeum opens at the ventral side of the tip of the head as a short and narrow slit. The proboscis is composed of the outer circular and the inner longitudinal muscle layers and is not provided with the muscle cross. The nerve ring of the proboscis lies in the longitudinal muscle layer in cross section (Pl. III, fig. 7). The cephalic blood lacuna is a large crescent-shaped canal situated horizontally above the rhynchodaeum, being separated by a few dorsoventral muscle bands in the uncompleted chambers (Pl. 2, fig. 7). The dorsal blood vessel is divided from the cephalic blood lacuna in the middle portion of the brain, running posteriorly in the rhynchocoel at the anterior region of the foregut. The mouth is represented by a narrow and short slit situated under the brain ranging between the middle and the posterior portion of the dorsal ganglion. The intestine is marked off from the foregut which is rather long and is divided into the oesophagus, the stomach and the pylorus as is found in the species belonging to the Enopla. The oesophagus is a folded, short and narrow canal and its wall contains the large gland cells stained with haematoxylin. The stomach is long, large and unfolded, the wall being thinner than that of the oesophagus. The pylorus forms a short and narrow canal and is surrounded by several circular muscles. The intestinal caecum such as in the Enopla is wanting. The intestine is nearly cylindrical throughout the length and provided with about 40 lateral diverticula, which are arranged metamerically and do not branch dorsoventrally (Pl. III, fig. 4). The nephridia ranging from the anterior portion of the stomach to that of the intestine are provided with seven pairs of the efferent ducts opening on the dorsolateral surfaces of the body. The parenchyma is very well developed throughout the body except the cephalic region. The gonads situated metamerically between the lateral diverticula of the intestine contain a small number of the large oocytes.

Habits and habitat. A small number of the fine wrinkles running irregularly on the dorsal and the ventral surfaces of the body are found in this specimen. The worm was collected in the depth from 200 m to 300 m on August 7th, 1953.

Locality. Southern Maruyamadashi at Aamadaiba.

Euborlasia proteres n. sp.

(Pl. I, fig. 2; Pl. IV, figs. 1-3)

External characters in preserved state. The body is stout and cylindrical, coiled like a snail, and steeply narrowed into blunted points in two extremities, being about 6 cm long and 3.5 mm wide. The head is rather slender and long, demarcated from the rest of the body. The lateral cephalic furrow is found as a longitudinal line situated on the lateral side of the head. The mouth is represented as a small spot. The proboscis emitted is about 4 cm in length and 1.5 mm in width. The body is yellow in colour, stained with Bouin's fluid used for fixation.

Internal structure. The epithelium is thin, containing the flask-shaped eosinophile gland cells densely arranged. The basement membrane is clearly found as a line coloured in blue with haematoxylin. The cutis and the epithelium are nearly the same in thickness in the oesophageal region. The cutis is not marked off from the outer longitudinal muscle layer. The connective tissue layer is wanting. Between the epithelium and the cutis there is a thin layer of a few circular muscles surrounding the body in cross section. In the head these muscles branch into two layers (Pl. IV, fig. 1). The outer longitudinal muscle layer is about 1.5 times the thickness of the circular muscle layer in the oesophageal region. The inner longitudinal muscle layer is thick. The proboscis sheath is of a flattened triangle in shape in cross section in the oesophageal region and is suspended to the circular muscle layer of the body by three muscle bands, one of which is situated at the apex, while the others run horizontally from the center of the base towards the lateral sides of the body between the proboscis sheath and the gut. The rhynchocoel is narrow, limited to the posterior portion of the body. The proboscis is composed of three muscle layers (outer longitudinal) and provided with two muscle crosses. The cephalic glands are well developed, extending posteriorly to the anterior portion of the brain. Ocelli wanting. The lateral cephalic furrow is shallow, flask-shaped in cross section and reaches posteriorly the anterior portion of the mouth. The dorsal ganglion is posteriorly divided into two lobes, of which the dorsal one is rather thick and long, ending freely among the circular muscle layer (Pl. IV, fig. 2). The cerebral sense organ is present laterally to the lateral nerve, posteriorly floating in the cephalic blood lacuna, a short canal being sent out from the anterior tip and opening in the posterior portion of the lateral cephalic furrow. The oesophageal nerves, in a pair, originated from the anterior portions of the ventral ganglions are connected each other by a narrow transverse commissure in front of the mouth. The nephridia are provided with a pair of the efferent ducts opening on the

dorsolateral surfaces of the body at the posterior end. The cephalic blood lacunae are narrow.

Remarks. The main characters different from other species of this genus lies in the external features of the body, such as the head which is demarcated from the body and is blunted in the tip and the posterior portion of the body which is not distinctly widened.

Habits and habitat. The worm was collected in the depth of 380 m on September 28th, 1953.

Locality. Nakafukari at Hayama.

Lineus geniculatus (Delle Chiaje), 1828

Lineus geniculatus: Bürger, 1895 and 1904; Wheeler, 1934; Coe, 1940; Iwata, 1954.

Lineus digueti: Joubin, 1905.

Lineus mitellatus: Takakura, 1898; Iwata, 1952.

External characters in preserved state. The body is long and broad, flattened dorsoventrally, being not pointed at the lateral margin, about 22 cm long and 10 mm wide and 5 mm thick in the anterior portion. On the dorsal side there is a narrow longitudinal groove along the lateral margin of the body. The head is spatulate in shape and is not demarcated from the immediately following portion of the body. The mouth is represented as a short longitudinal slit. The body is darty yellowish brown in colour.

Internal structure. The epithelium is thin and provided with the columnar gland cells densely arranged in a row. The basement membrane is indistinct in feature. The cutis glands are not well developed and the connective tissue is about two times the thickness of the epithelium in the oesophageal region. The outer longitudinal muscle layer is about 1.5 times thicker than the circular muscle layer in the oesophageal region. The inner longitudinal muscle layer is thin. About 60 ocelli are counted in each side of the head in the serial cross sections of the head. The cephalic glands are wanting. The dorsal ganglion is about two times the size of the ventral one in cross section and is posteriorly divided into two lobes, of which the dorsal one is short and small, ending freely, while the ventral one is large, connected with the cerebral sense organ. The ventral ganglions are provided with an anterior thick and a posterior fine transverse commissure. The oesophageal nerves, in a pair, originated from the ventral ganglions behind the posterior commissure are connected each other by a transverse commissure in front of the mouth. The anterior end of the mouth reaches the anterior portion of the brain. The cerebral sense organ is posteriorly protruded in the cephalic blood lacuna. The lateral cephalic furrow is deep and shaped

like an isosceles triangle in cross section, extending posteriorly to the posterior portion of the brain. The cerebral sense organ opens in the posterior end of the lateral cephalic furrow and is situated at the lateral side of the lateral nerve. The cephalic blood lacunae are small. The nephridia lying between the mouth and the anterior portion of the oesophageal region send out in the posterior portion a pair of the efferent ducts opening at the lateral surfaces of the body. The rhynchocoel is narrow, extending to the posterior portion of the body.

Remarks. The specimen agrees in the internal structure of the body with *L. geniculatus* described by Iwata (1954) except the presence of two pairs of the efferent ducts of the nephridia.

Habits and habitat. The worm was collected on July 16th, 1939.

Locality. Najima at Hayama.

Geographical distribution. Kushimoto, Shirahama (by Utinomi and Iwata), Misaki (by Takakura), Tomioka and Tanegashima (by Iwata, 1954), Japan; Mediterranean and Black Sea; west coast of Africa; from California to Mexico and Panama in the east Pacific.

Lineus fuscoviridis Takakura, 1898

Lineus fuscoviridis: Takakura, 1898; Iwata, 1952 and 1954.

External characters in preserved state. The body is broad and thick, elliptical in shape in cross section, being about 13 mm wide and 8 mm thick in the oesophageal region. The head is much smaller than the portion just following and spatulate in shape from above, about 4 mm long and 5 mm wide and 1.5 mm thick in the posterior portion. The anterior tip of the head is somewhat bended inwards. The mouth is represented as a large pore. The body is pale flesh in colour.

Internal structure. The epithelium is thin, containing two kinds of the eosinophile gland cells, one of which is large, oval in shape and paler in colour, while the other is small and round, being deeply stained. The cutis glands are not well developed but the connective tissue is about three times the thickness of the epithelium in the oesophageal region. The outer longitudinal muscle layer is about four times the thickness of the circular muscle layer in the oesophageal region. The cephalic glands are wanting. About 80 ocelli are counted in each side of the head in the serial cross sections of the head. The lateral cephalic furrow is deep and widens up and down in the inner terminal in cross section, extending posteriorly to the posterior portion of the brain. The dorsal and ventral ganglions are nearly same in size in cross section, and the dorsal ganglion is posteriorly divided into two lobes as is found in the

preceding species. The oesophageal nerves originate from the posterior portions of the ventral ganglion. The cerebral sense organ is present at the lateral side of the lateral nerve and posteriorly protruded into the cephalic blood lacuna, the duct delivered from the anterior tip opening in the posterior end of the lateral cephalic furrow. The cephalic blood lacunae are narrow. The proboscis is composed of three muscle layers (outer longitudinal) and provided with two muscle crosses.

Remarks. The present specimen agrees with *L. fuscoviridis* described by Iwata (1952) except the presence of two kinds of the eosinophile gland cells in the epithelium.

Habits and habitat. The body was cut autotomically into pieces when the body was fixed in alcohol, and an anterior part of the body and two pieces of the intestinal portion have remained as the sample. The worm was collected on June 5th, 1928.

Locality. Koajiro at Misaki.

Geographical distribution. Kada (by Baba), Tomioka, Misaki (by Takakura).

Cerebratulus marginatus Renier, 1804

(Pl. I, fig. 6)

Cerebratulus marginatus: Bürger, 1895 and 1904; Coe, 1901, 1905 and 1940; Yamaoka, 1940; Iwata, 1954 and 1954 a.

External characters. The body is broad, flattened dorsoventrally and sharpens in the lateral margin. The body is 9 cm long and 6.5 mm wide except the posterior part damaged. The head is not demarcated from the body, tapering anteriorly into a point. The mouth is represented as a longitudinal slit being about 3 mm long. The lateral cephalic furrow posteriorly reaches the anterior portion of the mouth. The body is anteriorly yellowish brown in colour and chestnut in the intestinal region. The head is pale yellowish brown and whitish in the marginal portion. The brain is found through the skin as a reddish patch.

Internal structure. The epithelium is thin. The eosinophile gland cells in oval shape are not well developed. The basement membrane is thick. The cutis is not marked off from the outer longitudinal muscle layer. The connective tissue is wanting. The outer longitudinal muscle layer is about three times the thickness of the circular muscle layer in the oesophageal region. The cephalic glands are rather well developed but posteriorly disappear in front of the brain. The dorsal ganglion is somewhat larger than the ventral one in cross section and is posteriorly divided into two lobes as is found in the species *Lineus geniculatus*.

The lateral cephalic furrow extending backward to the anterior portion of the mouth is shallow and round in terminal, though it becomes deeper posteriorly, being cross-shaped in cross section at the region between the opening of the cerebral sense organ and the posterior end of the furrow. The anterior end of the mouth is situated at a short distance behind the brain. The cerebral sense organ is posteriorly floating in the cephalic blood lacuna, opening anteriorly into the posterior portion of the lateral cephalic furrow through a short and narrow duct. The cerebral sense organ is anteriorly situated at the dorsal side of the lateral nerve, though in the posterior portion it is situated laterally to the lateral nerve. Ocelli wanting. The cephalic blood lacunae are small. The oesophageal nerves, in a pair, originate from the middle portions of the ventral ganglions and are connected each other by three transverse commissures. The proboscis sheath reaches the end of the body. The proboscis is composed of an outer longitudinal and an inner circular muscle layer and is provided with two muscle crosses. The nephridia lying in the oesophageal region send out a pair of the efferent ducts from the posterior end. The rhynchocoel is vast and cylindrical, being convexed dorsally on the middle line.

Remarks. The present material agrees with the description of *C. marginatus* described by Yamaoka (1940) except the cephalic glands extending backward to the brain and the cephalic blood lacunae separated off into several chambers by the muscle bands.

Habits and habitat. The worm was collected in the depth from 200 m to 280 m on February 5th, 1955.

Locality. Southern Maruyamadashi at Aamadaiba.

Geographical distribution. Misaki (by Iwata, 1950), Shirahama, Kushiro, Akkeshi and Nemuro, Japan; the Mediterranean Sea; Greenland; the Pacific Ocean (from Alaska to California).

***Cerebratulus zebra* Punnett and Cooper, 1910**

Cerebratulus zebra: Punnett and Cooper, 1910.

External characters in preserved state. The body is flattened dorsoventrally, sharp in the lateral margin, and the longitudinal shallow groove runs along the lateral side on both the dorsal and the ventral surfaces of the body. The body is about 8 mm wide and 4 mm thick. The body is brownish white in colour with dark brown rings, which are variable in thickness, being a few millimeters.

Remarks. The present specimen agrees with the description of *L. zebra* reported by Punnett and Cooper (1910) in the external features of the body.

Habits and habitat. Three pieces of the intestinal portion were preserved in alcohol. The worm was collected in the depth of 410 m on July 16th, 1940.

Locality. Aamadaiba.

Geographical distribution. Ceylon.

Cerebratulus penniger n. sp.

(Pl. I, fig. 3; Pl. IV, figs. 4-6)

External characters in preserved state. The body, about 7.5 cm long and 4.5 mm wide, is anteriorly elliptical in cross section, flattened dorsoventrally in the intestinal portion, nearly same in width in the anterior and the middle portion of the body. The lateral wall of the body, outside the longitudinal groove which runs along the lateral side on both the dorsal and the ventral surfaces of the body, is enormously flattened dorsoventrally and protruded laterally like a narrow longitudinal fin, being sharpened in a point at the margin. The head is spatulate in shape and becomes abruptly narrower from the portion just behind. The shallow cephalic groove, owing to the constriction of the body, is found on the neck. The mouth is in the form of a longitudinal slit being about 1 mm long. The proboscis extruded is about 5 cm long and 1 mm wide. The opening of the rhynchodaeum is situated at the subterminal portion of the head. The body is yellow in colour owing to Bouin's fluid.

Internal structure. The epithelium is thin, containing the eosinophile flask-shaped gland cells densely arranged in a row. The basement membrane is indistinct in feature and the gland cells in the epithelium insert in the cutis. The cutis is not well developed and marked off from the outer longitudinal muscle layer. The cutis glands are globular in shape and are faintly distinguishable under the epithelium. The connective tissue, blue-coloured, is composed of numerous fine stripes of a short length and is weaved like a net among the longitudinal muscles. The outer longitudinal muscle layer is about two times the thickness of the circular muscle layer in the dorsal side of the body at the oesophageal region. The cephalic glands are wanting. The head is round in cross section (Pl. IV, fig. 4). The lateral cephalic furrow is shallow, anteriorly round in the terminal end and widens up and down in the posterior portion, extending backward to the middle portion of the mouth. Ocelli wanting. The dorsal ganglion is somewhat larger than the ventral one and is posteriorly divided into two lobes, of which the dorsal one is short and small, ending freely, while the ventral one is large in size in cross section and long, being connected with the cerebral sense organ at the end. The cerebral sense organ posteriorly floating in

the cephalic blood lacuna, is situated on the dorsal side of the lateral nerve and anteriorly sends out from the tip a narrow duct opening in the posterior portion of the lateral cephalic furrow. The anterior end of the mouth is situated at a short distance behind the cerebral sense organ. The oesophageal nerves originated from the anterior portions of the ventral ganglions are not connected each other by any transverse commissure. The nephridia lying in the oesophageal region are provided in the posterior end with a pair of the efferent ducts opening on the dorsolateral surfaces of the body. The cephalic blood lacunae are narrow. The dorsal blood vessel runs inside the proboscis sheath in the oesophageal region. The proboscis is composed of three muscle layers (outer longitudinal) and is provided with two muscle crosses. The rhynchocoel is narrow and limited to the anterior portion of the body. The parenchyma is enormously well developed in the oesophageal region.

Remarks. The present species is easily distinguishable in the external features of the body.

Habits and habitat. The worm was collected in the depth of 380 m on September 28th, 1953.

Locality. Nakafukari at Hayama.

Cerebratulus superniger n. sp.

(Pl. I, fig. 5; Pl. IV, figs. 7 and 8)

External characters in preserved state. The body is long and ribbon-like in shape, anteriorly elliptical in cross section, flattened dorsoventrally in the intestinal region, and sharpened in the lateral margin, being about 20 cm long and 6 mm wide. The body damaged in the anterior portion including the head, the mouth and the anterior portion of the oesophageal region by an accident when living, has a part newly regenerated (Pl. I, fig. 5 b). The body is blackish brown in colour on the dorsal surface and pale yellowish brown on the ventral side.

Internal structure. The epithelium is thin, containing the oval gland cells not densely arranged. The basement membrane is obscure in feature. Between the epithelium and the cutis a thin layer of a few circular muscles is clearly found. The cutis is well developed and marked off from the outer longitudinal muscle layer by the connective tissue, which is somewhat thinner than the cutis glands in the oesophageal region. The cutis glands are about two times the thickness of the epithelium and contain two types of the gland cells different in colour and shape. The flask-shaped one is numerous and stained with eosin, while the other is blackish with the double stainings of eosin and haematoxylin and roughly scattered

among the eosinophile gland cells (Pl. IV, fig. 8). The outer longitudinal muscle layer is nearly the same in thickness as the circular muscle layer in the oesophageal region. The diagonal muscle layer is present between the outer longitudinal and the circular muscle layer (Pl. IV, fig. 8). The peripheral nerve plexus runs through this layer. The inner longitudinal muscle layer is thick. The proboscis sheath is thick and the rhynchocoel is narrow, limited to the anterior portion of the body. The parenchyma is rather well developed in the oesophageal region.

Remarks. Although the characters of the anterior portion of the body are left to be unknown, the state of the external features of the body, the cutis and the diagonal muscle layer seem to be sufficient to establish this new species.

Habits and habitat. The worm was collected in the depth of 10 m on January 10th, 1930.

Locality. Ithishiki at Hayama.

Cerebratulus formosus n. sp.

(Pl. I, fig. 4; Pl. V, figs. 1-5)

External characters in preserved state. The body, about 6 cm long and 4.5 mm wide, is flattened dorsoventrally and convexed in both the dorsal and the ventral surfaces of the body, being anteriorly broad, tapering gradually in the intestinal region into a point, being sharp in the lateral margin, a longitudinal wrinkle being found along the lateral margin of the dorsal side of the body. The head is shaped in a triangle from above and the posterior part of it is widened from the portion just behind. On the neck there is a clearly marked cephalic groove, which is straight on the dorsal side but on the ventral surface it is V-shaped and comes in contact with the anterior end of the mouth in the apex. The body is pale yellowish white in colour with many pale brownish blotches scattered on the large part of the body surface. These blotches are paler on the ventral surface and the posterior portion of the body. The lateral cephalic furrow reaches the transverse cephalic groove. The mouth is represented as a large elliptical pore being about 1.5 mm in length.

Internal structure. The epithelium is thick, nearly the same in thickness as the circular muscle layer in the oesophageal region. The eosinophile gland cells are small in size and number, being arranged in the lower portion of the epithelium. The basement membrane stained with eosin is found as a thick layer being about one third the thickness of the epithelium in the mouth region. A thin layer of several circular

muscles running under the epithelium is conspicuous. In the portion between the posterior end of the brain and that of the mouth, two layers of these circular muscles are clearly distinguished (Pl. V, figs. 2 and 3). The cutis is not well developed and marked off from the outer longitudinal muscle layer. The connective tissue is wanting. The outer longitudinal muscle layer is somewhat thicker than the circular muscle layer in the oesophageal region. The cephalic glands are well developed, extending posteriorly to the portion of a short distance in front of the brain. The lateral cephalic furrow is deep and round in terminal in cross section, the end extending to the posterior portion of the cerebral sense organ. Inside of this furrow there are two shallow grooves sinking up and down at a right angle in the inner portion or being cross-shaped in cross section at the region between the opening of the cerebral sense organ and the back end. Ocelli wanting. The head is flattened dorsoventrally. The dorsal ganglion is about three times larger than the ventral one in cross section and is divided posteriorly into two lobes, which are the same in feature as those of *C. penniger*. The cerebral sense organ situated on the dorsal side of the lateral nerve is not posteriorly floating in the cephalic blood lacuna but lies in the muscular bridge running transversely across the lacuna. The posterior end of the cerebral sense organ is situated at a short distance in front of the mouth. The oesophageal nerves originate in a pair from the posterior portions of the ventral ganglions and are once connected each other by a transverse commissure in front of the mouth. Between the anterior portions of the mouth and the head the cerebral nerve is delivered upward from the dorsal nerve, which runs on the circular muscle layer, extending anteriorly among the outer longitudinal muscle layer. The proboscis nerves originate in a pair from the ventral commissure of the brain and enter into the proboscis at the posterior end of the rhynchodaeum. The cephalic blood lacunae situated at the lateral sides of the rhynchodaeum are voluminous and the anterior lacuna on the rhynchodaeum is very long. The dorsal blood vessel is sent out from the cephalic blood lacunae ahead the brain and runs posteriorly in the rhynchocoel in the oesophageal region. The opening of the rhynchodaeum is situated at the subterminal portion of the head. The proboscis sheath extends to the tail of the body. The rhynchocoel suddenly enlarges in the oesophageal region and pushes the oesophagus downward to form a sack in the anterior tip of the rhynchocoel. The proboscis is narrow and long, composed of two muscle layers (outer longitudinal) and provided with two muscle crosses. The nephridia lying in the posterior portion of the mouth and in the oesophageal region, open through a pair of the efferent ducts on the lateral surfaces of the body, the ducts being sent out laterally from the posterior ends of the nephridia.

Remarks. The remarkable characters of this new species lie in the external features of the body, as also the cerebral nerve and the outer circular muscle layer.

Habits and habitat. Numerous transverse fine wrinkles are found on the dorsal and the ventral surfaces of the body. The worm was collected in the depth of 100 m on December 13th, 1952.

Locality. Nakafukari at Hayama.

Cerebratulus albocirculus n. sp.

(Pl. I, fig. 7; Pl. V, figs. 6 and 7)

External characters in preserved state. In alcohol the body is anteriorly cylindrical and flattened dorsoventrally in the intestinal region, being 16 cm long and 6 mm wide and 3.5 mm thick in the middle portion. The lateral folds are conspicuous. The head is not demarcated from the following portion and tapers in a blunted end, being flattened dorsoventrally. The mouth is represented as a small elliptical pore, 1 mm in length. The distance between the tip of the head and that of the mouth is 5 mm in length. The lateral cephalic furrow is long, extends backward beyond the mouth and is connected to a depression. The body is yellowish green in colour without other markings and the ventral side is somewhat paler than the dorsal side. The head is dark green with a white transverse ring situated near the snout. The ring becomes narrowed in the middle portion of the head. The inside of the lateral cephalic furrow is whitish in colour. The caudal appendage is not found in this preserved specimen.

Internal structure. The epithelium is thin and contains a layer of the flask-shaped glands. The basement membrane is thin, though thicker in the cephalic region. A layer of several circular muscles is found under the basement membrane. The cutis is not well developed throughout the body. The connective tissue is wanting. The cutis glands are composed of the eosinophile cells and the cells stained with haematoxylin; the former cells are better functional than the latter and situated at the lower portion of the cutis (Pl. V, fig. 7). The outer longitudinal muscle layer is thick, being about three times the thickness of the circular muscle layer in the oesophageal region. The inner longitudinal muscle layer is thin. The frontal organ is wanting. About ten ocelli are arranged in each lateral side of the snout. Though the cephalic glands are not found, the cutis glands extend to the anterior portion of the head. The dorsal and the ventral ganglions are nearly same in size in cross section. The dorsal lobe of the dorsal ganglion is rather thick and short, closely situated

to the point just the cerebral sense organ commences. The cerebral sense organ opens in the posterior portion of the lateral cephalic furrow through a short and narrow canal ciliated and is posteriorly protruded in the cephalic blood lacuna. The oesophageal nerves, in a pair, originated from the posterior portion of the ventral ganglions are each other connected by a transverse commissure in front of the mouth. The anterior tip of the mouth is situated at a short distance behind the brain. The lateral cephalic furrow is deep and round in a terminal in cross section, extending posteriorly beyond the mouth. The proboscis sheath is limited to the middle portion of the body. The rhynchocoel is not voluminous. The proboscis is composed of three muscle layers (outer longitudinal) and provided with two muscle crosses. The cephalic blood lacuna situated at the lateral and the dorsal sides of the rhynchodaeum is large in cross section and by a few muscle bands it is divided into two large lateral and one to three small dorsal chambers (Pl. V, fig. 6). The dorsal blood vessel branches from the cephalic blood lacuna in the anterior portion of the brain, extending backward inside the proboscis sheath in the oesophageal region. The nephridia commence at the portion far back the cerebral sense organ and send off ten pairs of the efferent ducts which open on the dorsolateral surfaces of the body.

Remarks. The present new species is closely related to *C. insignis* reported by Punnett (1901) in the external features, but largely differs in the internal structure such as the frontal organ, the lateral cephalic furrows, the cutis, and the nephridia.

Habits and habitat. In alcohol the body shows several deep depressions in the oesophageal region and many shallow wrinkles in the intestinal region which run longitudinally. The worm was collected in the depth of about 10 m on July 23th, 1956.

Locality. Mosaki at Kamezyo.

Micrura japonica Iwata, 1952

Micrura japonica: Iwata, 1952.

External characters in preserved state. The body is short and slender, cylindrical, about 3 cm long and 1 mm wide. The head is somewhat demarcated from the body. The body is blackish brown in colour. The lateral cephalic furrow and the mouth is not found with the naked eye.

Internal structure. The epithelium is thick, and the eosinophile columnar gland cells are well developed. The cutis glands are thick, marked off from the outer longitudinal muscle layer. The connective

tissue is wanting. The outer longitudinal muscle layer is about two to three times the thickness of the circular one in the oesophageal region. The frontal organs are present. The cephalic glands are well developed but do not reach the brain. Ocelli wanting. The head is round in cross section. The lateral cephalic furrow is shallow and round in terminal, extending posteriorly to the posterior portion of the brain. The dorsal ganglion is nearly similar in size to the ventral one, being posteriorly divided into two lobes, which are the same in feature as the preceding species. The mouth anteriorly reaches the brain. The cerebral sense organ is situated at the dorsal side of the lateral nerve in the anterior portion, while posteriorly it is present at the lateral side of the lateral nerve. It opens into the posterior end of the lateral cephalic furrow through a short and narrow duct delivered from the anterior tip. The proboscis is composed of three muscle layers (outer longitudinal) without the muscle cross.

Remarks. The present specimen is similar to that of *M. japonica* reported by Iwata (1952), except the presence of the muscle cross. The specimens collected by Iwata at Shimoda (1950) are also deficient in the muscle cross of the proboscis.

Habits and habitat. The worm was collected between the tide marks on January 18th, 1930.

Locality. Samejima at Hayama.

Geographical distribution. Tomioka, Fukue, Kagoshima (by Iwata, 1954) and Shimoda (by Iwata, 1950).

***Micrura multinotatum* n. sp.**

(Pl. I, fig. 8; Pl. V, figs. 8 and 9)

External characters in preserved state. The body, about 6 cm long and 4 mm wide, is anteriorly broad and convex from the ventral side to the dorsal side, being posteriorly narrowed and flattened dorsoventrally, being round at the lateral margin. The head is not demarcated from the body and tapers anteriorly into a blunted end. The cephalic groove made by a constriction of the body surrounds the neck. The lateral cephalic furrow is conspicuous. The mouth is represented by a small spot situated under the cephalic groove. The body is pale yellow in colour with thirty-five pale brown rings irregularly arranged throughout the body and narrowed in thickness towards the lateral side of the body. The first ring is found behind the head, which is brownish in colour on the dorsal surface. The tail is somewhat indented inward and the caudal cirrus can not be found.

Internal structure. The epithelium is rather thick, being nearly the same in thickness as the circular muscle layer in the oesophageal region, containing the eosinophile flask-shaped gland cells irregularly arranged in the lower portion. The basement membrane is obscure and the gland cells are protruded inward on the circular muscles surrounding the cutis. The cutis is not well developed and clearly marked off from the outer longitudinal muscle layer. The cutis glands are not voluminous. The connective tissue is thick, being about two times thicker than the epithelium in the oesophageal region. The outer longitudinal muscle layer is about three or four times the thickness of the circular muscle layer in the oesophageal region. The frontal organ is present. The cephalic glands are well developed, extending posteriorly to the portion at a short distance anterior to the brain. Ocelli wanting. The lateral cephalic furrow is anteriorly round in terminal and shallow, while it becomes posteriorly deeper and is cross-shaped in cross section at the region between the opening of the cerebral sense organ and its end. It is long, extending to the posterior portion of the mouth beyond the brain. The dorsal ganglion is somewhat larger than the ventral one in cross section, being posteriorly divided into two lobes, which are the same in feature as the preceding species. The mouth anteriorly reaches the posterior end of the brain. The cerebral sense organ is situated at the lateral side of the lateral nerve. The proboscis sheath extends posteriorly to the tail of the body. The proboscis is composed of two muscle layers (outer longitudinal) and provided with two muscle crosses. The oesophageal nerves, in a pair, originated from the posterior portions of the ventral ganglions are connected each other by a transverse commissure in front of the mouth. The cephalic blood lacunae situated at the lateral sides of the rhynchodaeum are rather large in size in cross section. The nephridia lying in the oesophageal region are provided in the posterior portion with a pair of the efferent ducts opening on the dorsal side of the body.

Remarks. The present species markedly differs from the other species in this genus in the external features.

Habits and habitat. The worm was collected in the depth from 30 m to 40 m on January 20th, 1949.

Locality. Tateishi at Ogashima.

Paranemertes plana n. sp.

(Pl. I, fig. 10; Pl. VI, figs. 1-5)

External characters in preserved state. The body is anteriorly slender and cylindrical in shape, broad and flattened dorsoventrally in

the intestinal region, being 57 mm long and 3 mm wide. The head is somewhat demarcated from the body. On the ventral surface of the head there is a oblique V-shaped cephalic groove and a short and straight groove running from the apex of the V-shaped groove to the opening of the rhynchodaeum. The body is pale brown in colour with numerous minute dots and twenty-two rings, both whitish in colour. The rings are about 0.3 mm in thickness and arranged in a transverse rows. The first ring is situated behind the head.

Internal structure. The cephalic glands situated on the rhynchodaeum are not well developed, ending posteriorly far ahead the brain. The submuscular glands are voluminous, extending from the tip of the head to the middle portion of the pylorus. In this preparation these glands on the dorsal side of the body do not show the affinity to haematoxylin, though the ventral ones are stained in dark blue. The ocelli are arranged on the lateral side of the head, being about 30 in each side. The cerebral sense organ is small, situated in front of the brain, anteriorly sending out a narrow duct opening on the distal end of the oblique cephalic groove at the ventrolateral aspect of the body. The intestinal caeca extend anteriorly to the portion at a short distance behind the brain. The parenchyma is well developed in the anterior portion of the body. The nephridia lying on the lateral sides of the stomach and the pylorus are provided with a pair of the efferent ducts opening on the ventrolateral surfaces of the body. The rhynchocoel is narrow and short, limited posteriorly to about two-fifths the length of the body. The proboscis is short and slender, provided with 10 nerves. The basis of the central stylet is conical in shape, being about 0.08 mm long. The lateral pouches of the accessory stylets are two in number, containing a few stylets which are about 0.015 mm in length.

Remarks. The present species largely differs from others in the colour pattern of the body in comparison with four existing species of this genus.

Habits and habitat. The body preserved in alcohol shows numerous shallow wrinkles running longitudinally. The worm was collected in the depth from 250 m to 300 m on July 16th, 1955.

Locality. Near Gorombo of southern Minamiaamadaiba.

Amphiporus punctatulus Coe, 1905

Amphiporus punctatulus: Coe, 1905 and 1940; Iwata, 1951, 1952, 1954 and 1954 a.

External characters in preserved state. The body, about 4.5 cm long and 2.5 mm wide, is rather slender and flattened dorsoventrally,

being convex from the ventral side to the dorsal side. The head is not demarcated from the body from above, rounded in the anterior margin, the cephalic groove on the dorsal side of the body being white in colour. The body is white in colour, thickly mottled with dark brown blotches on the dorsal side.

Habits and habitat. The worm was collected from the hand-reeled net on March 16th, 1956.

Locality. Samejima at Hayama.

Geographical distribution. Oshoro and Rishiri Island in Hokkaido and Amakusa, Seto, Shimoda and Asamushi (by Iwata, 1955) in Honsyu; Kurile Islands; Isthmus Cave, Catalina Islands, California.

Amphiporus reduncus n. sp.

External characters in preserved state. The body is anteriorly narrow and cylindrical in shape, posteriorly becomes much broader and is flattened dorsoventrally, though arched on the dorsal side in cross section, ending steeply into a point in the tail. It is about 12 mm in width and 2 mm in thickness in the posterior intestinal region. The head is demarcated from the body, rounded in the anterior margin, and somewhat narrowed in the neck, being about 4 mm in width. The body is pale brownish yellow in colour. The proboscis extruded is about 4 cm long and 4 mm wide.

Internal structure. The epithelium is wanting in the serial cross sections of the body. The cephalic glands are not well developed, situated at the dorsal and the lateral sides of the rhynchodaeum, arranged in three groups and anteriorly open outside through short and thick ducts in the dorsal epithelium of the rhynchodaeum at the tip of the head. The ocelli are numerous, numbering 112 and 119 on the lateral sides of the head in the serial cross sections of the head. The cerebral sense organ is large, situated on the lateral side of the brain. A big tube delivered from the middle portion of the cerebral sense organ runs obliquely backward and opens on the lateral surface of the head. The posterior portion of the brain and the anterior tip of the cerebral sense organ are connected by a thick and long nerve cord. The anterior branches of the intestinal caeca extend to the portion being about $\frac{2}{3}$ times the length between the back of the brain and that of the pylorus. The parenchyma is very well-developed in the anterior portion of the body. The nephridia, lying on the lateral sides of the stomach and the pylorus, are provided with a pair of the efferent ducts opening on the lateral surfaces of the body. The proboscis sheath reaches the tail of the body. The proboscis is

provided with 16 nerves. Two lateral pouches of the accessory stylets contain several stylets. The central stylet and the basis were damaged in the preparation of this specimen. The dorsal blood vessel originates from the right lateral blood vessel.

Remarks. The present species is characterized in the following points; the external features of the body, the proboscis nerves, the ocelli, the cerebral sense organ and the intestinal caeca.

Habits and habitat. Only four pieces of the body are preserved as the sample. The most anterior piece is about 4.5 cm long and 8 mm wide in the tail, while the other ones are shorter in length. The worm was collected on July 16th, 1936.

Locality. Najima at Hayama.

Amphiporus nagaiensis n. sp.

(Pl. I, fig. 11; Pl. VI, figs. 7 and 8)

External characters in preserved state. The body, about 7 cm long and 5 mm wide, is anteriorly narrowed gradually, broad and flattened dorsoventrally in the intestinal region, convex on the dorsal side in the middle portion of the body, tapering posteriorly into a blunted tail. The lateral margins of the body are very thin in the intestinal region. The head is round on the anterior margin and separated from the body by a transverse cephalic groove, blackish brown in colour. On the dorsal side of the body this groove becomes narrower from the margin to the median portion of the body, while on the ventral side the median portion of this groove is protruded towards the tip of the head. The body is pale brown in colour on the dorsal surface and pale yellow on the ventral side. On the dorsal side of the head there is a round marking, blackish brown in colour.

Internal structure. The cephalic glands are not well developed, situated above the rhynchodaeum. The ocelli are arranged in two pairs of groups on the lateral sides of the head, numbering 30 and 34 in the anterior pair and 14 and 17 in the posterior one. The cerebral sense organ is large, situated behind the brain, and connected immediately with the posterior part of the brain by a short and thick nerve cord. A short tube running laterally from the posterior end of the cerebral sense organ opens on the lateral surface of the body. The parenchyma is well developed in the anterior portion of the body. The intestinal caeca are very short, limited only to the posterior portion of the pylorus.

The proboscis sheath reaches the tail of the body. The basis of the central stylet is short in height and much broad, being conical in shape, measuring 0.036 mm in height and 0.046 mm in width. The lateral pouches of the accessory stylets are 7 on each side of the proboscis, containing several stylets of about 0.009 mm in length. The central and the accessory stylets are nearly the same in length. The proboscis nerves are 26 in number. The nephridia lying on the lateral sides of the foregut send out a pair of the efferent ducts opening on the lateral surfaces of the body. In this specimen there are found the caecal appendages of rhynchocoel, which are long, cylindrical, transversely extruded near above the lateral blood vessels, and ending freely in the parenchyma (Pl. VI, fig. 7). The wall of the caecal appendages is composed of the thin layer of a few circular muscles, which are the same in feature as the proboscis sheath. These are arranged metamerically throughout the proboscis sheath, with the first one at the stomach region or at a short distance behind the cerebral sense organ. The proboscis sheath is thick except the lateral portions which are concave in wedge-shape.

Remarks. The main characters of this new species lie in the caecal appendage of the rhynchocoel, the cerebral sense organ provided at the posterior end with the duct running towards the outside of the body, and the dorsal pattern of the head. It is interesting that the present material has the caecal appendages of the rhynchocoel. This character seems to be the first record in the species belonging to the suborder Monostylifera.

Habits and habitat. The worm was collected in the depth from 100 m to 130 m on August 7th, 1950.

Locality. Northeastern Nakafukari near Nagai.

Amphiporus parmiornatus n. sp.

(Pl. I, fig. 12; Pl. VI, fig. 6)

External characters in preserved state. The body is flattened dorso-ventrally, convex on the dorsal side, tapering posteriorly into a point in the tail, being about 2.5 cm long and 2 mm wide. The proboscis extruded is 22 mm in length. The head is round on the anterior margin and narrowed from the portion just behind. The body is pale orange in colour on the dorsal surface and yellowish white on the ventral side. The head is provided with a shield-shaped brownish marking on the dorsal side.

The thin transverse band, white in colour, is found on the dorsal side of the neck.

Internal structure. The cephalic glands are not well developed, arranged in three groups on the dorsal and the lateral sides of the rhynchodaeum. The ocelli number 26 and 24 on the lateral sides of the head. The cerebral sense organ is large and situated behind the brain, sending out a narrow and short tube running obliquely from the anterior tip to the lateral surface of the head. The anterior branches of the intestinal caeca are short, extending to the portion, about a half the length between the posterior end of the brain and that of the pylorus. The proboscis sheath reaches the end of the body. The basis of the central stylet is conical in shape, being 0.03 mm in length and 0.042 mm in width. The lateral pouches of the accessory stylets are five on each side of the proboscis, containing several stylets of 0.01 mm in length. The central and the accessory stylets are nearly the same in length. The proboscis is provided with 16 nerves. The parenchyma is not well developed in the anterior portion of the body. The nephridia ranging from the back of the brain to the anterior portion of the pylorus send off in the anterior portion a pair of the efferent ducts which open on the ventral side of the body.

Remarks. The main characteristics of this species lie in the following points; the basis of the central stylet, the number of the proboscical nerves, the lateral pouches of the accessory stylets, the ocelli and the regional relationship between the brain and the cerebral sense organ.

Habits and habitat. The worm was collected in the depth from 50 m to 55 m on December 6th, 1951.

Locality. Kamejyo.

Amphiporus retrotumidus n. sp.

(Pl. I, fig. 13)

External characters. A coloured sketch of the dorsal side of the body shows some specific features as follows; the body, which was damaged in the posterior portion, is rather stocky and broad, being about 10 cm long and 7 mm wide. The head is not demarcated from the following portion and tapers in a blunted end. The body is vermilion in colour and a paler longitudinal stripe, of about 0.6 mm thick, runs throughout the body on the middle portion of the body width.

The body in alcohol is stout and voluminous, elliptical in shape in

cross section, anteriorly narrowed gradually from the boundary between the foregut and the intestine. It is 8 cm long, 7 mm wide and 5 mm thick except the posterior portion damaged. The head is wider than the portion immediately followed, round at the anterior margin and short in length, provided with the cephalic groove surrounding the neck. The cephalic groove is arched towards the tip of the head on the dorsal side and nearly parallel to the anterior margin of the head, while on the ventral side it is shallow in curvature. On the middle portion of the dorsal side of the intestinal region there is found a longitudinal swelling of the epithelium, which is caused by the excessive fatness of the basement membrane and the circular muscle layer. The body is pale brownish yellow in colour.

Internal structure. The head is more or less flattened dorsoventrally and the cephalic glands are well developed in the anterior portion of the head. The submuscular glands extend posteriorly along the lateral side of the body to the anterior portion of the intestine. The ocelli are irregularly arranged on the lateral sides of the head, numbering 72 and 67 in the serial cross sections of the head. The cerebral sense organ is large, situated at the lateral side of the brain. It is long and elongated pear-shaped, extending from the anterior portion of the brain to the portion far behind the brain, sending out from the anterior tip a short and narrow duct opening on the lateral surface of the head. The anterior branches of the intestinal caeca extend to the middle portion between the posterior end of the brain and that of the pylorus. The proboscis sheath reaches the tail of the body. The rhynchocoel is enormously vast in the intestinal region. The proboscis is provided with 15 nerves. The parenchyma is not well developed in the anterior portion of the body. The nephridia ranging from the back of the brain to the posterior portion of the pylorus are provided with in the posterior portion a pair of the efferent ducts which open on the ventrolateral surfaces of the body. The large eggs are mature in this specimen.

Remarks. Excepting the character of the proboscidial armature, the external features of the body, the submuscular glands, the ocelli, the proboscidial nerves and the regional relationship between the brain and the cerebral sense organ differ from those of the other species of this genus.

Habits and habitat. Two pieces of the body which were cut automatically when the body was fixed in alcohol are present as the sample. Numerous fine wrinkles run transversely throughout the body. The worm was collected in the depth from 30 m to 55 m on August 6th, 1953.

Locality. Shuragane at Hayama.

***Tetrastemma nigrifrons* var. *bilineatum* Iwata, 1954**

(Pl. I, fig. 14)

Tetrastemma nigrifrons: Coe, 1904, 1905 and 1940; Iwata, 1954 a.

Prostoma nigrifrons: Yamaoka, 1940.

Tetrastemma nigrifrons, var. *bilineatum*: Iwata, 1954.

External characters in preserved state. The body is short and slender, being about 2 cm long and 0.5 mm wide. The head is not demarcated from the body. The body is pale orange in colour with two brownish longitudinal stripes on the dorsal side of the body. The head is provided with a shield-shaped brownish marking on the dorsal side.

Internal structure. The cephalic glands are not well developed. The cerebral sense organ is large, situated in front of the brain. The opening of the duct running obliquely from the tip of the cerebral sense organ is situated at the ventrolateral aspect of the head. The intestinal caecum reaches anteriorly the brain. The proboscis is provided with 11 nerves. The basis of the central stylet is pear-shaped. The lateral pouches of the accessory stylet are 2 in number, containing a few stylets, about 0.07 mm in length. The ocelli found in the serial cross sections of the head are 4 in number, arranged in a rectangular shape.

Habits and habitat. The worm was collected in the depth from 4 m to 6 m on December 8th, 1953.

Locality. Samejima at Hayama.

Geographical distribution. Oshoro, Akkeshi and Onagawa (by Iwata, 1955).

***Drepanophorus longiceps* n. sp.**

(Pl. I, fig. 15; Pl. VI, figs. 9 and 10; Pl. VII, figs. 1-8)

External characters. The body, about 1.5 cm long and 2 mm wide, is rather broad and thick and becomes gradually narrower posteriorly at the posterior portion of the body, tapering abruptly in the tail into a shape point. Along the lateral margin a longitudinal band formed by the thin protruded lateral wall of the body is very remarkable in shape from above. The rod-shaped gonads and the lateral nerves are coloured in milky white in both the body photographed in the colour film and

that preserved in alcohol. The head before the brain is suddenly narrowed and flattened from the portion immediately following, being slender and sword-shaped, tapering to a sharp point in the tip, and being semi-transparent white in colour. In the preserved specimen this part is shorter and wider than that of the specimen photographed. The mouth and the opening of the rhynchodaeum are indistinct in shape. The intestine is orange in colour, though that of the preserved specimen is white.

Internal structure. The epithelium is entirely wanting. It seems that the epithelium of the worm is damaged during raising from the sea bottom to the surface. The basement membrane is rather well developed, thicker than the circular muscle layer of the body. The muscle layers of the body are two; an outer circular and an inner longitudinal. In addition to these layers there are the inner circular muscle layer surrounding only the foregut and the dorsoventral muscle bands running between the lateral diverticula of the intestine and between the underside of the proboscis sheath and the ventral side of the circular muscle layer. The muscle layers of the body extend anteriorly to the tip of the head. The longitudinal muscle septum runs from the longitudinal muscle layer of the body to the proboscis in the anterior portion of the brain. The septum from the ventral side of the body covers the front of the brain and enters into the proboscis (Pl. VII, fig. 4). The septum from the lateral side and the dorsal side of the body enters into the proboscis at the portion behind the dorsal commissure of the brain. The muscle layers of the proboscis sheath are not remarkable as usual.

The brain is divided into the dorsal and the ventral ganglion, being nearly the same in size in cross section. The ventral commissure of the brain is short and thick, and behind which the ventral ganglion is delivered in a direction of the ventrolateral aspect of the body and the dorsal ganglion in an opposite direction (Pl. VII, fig. 7). The dorsal ganglion is divided into two lobes, of which the dorsal one is slender and long, ending freely in the posterior portion of the cerebral sense organ, while the ventral one is short and thick, being immediately connected with the cerebral sense organ. The dorsal ganglion near the ventral commissure of the brain sends out a nerve running posteriorly through the dorso-lateral side of the ventral ganglion along the dorsal side of the lateral nerve (Pl. VII, fig. 7). The oesophageal nerve, in a pair, originated from the boundary between the ventral ganglions and the ventral commissure runs posteriorly between the proboscis sheath and the foregut. The dorsal nerve is not found. The cerebral nerves extending to the tip of

the head are 4 in number on each side of the head. The lateral nerve is situated inside the lateral margin of the body, being about one-third the distance between the lateral margin and the middle of the ventral surface in cross section. The cerebral sense organ is rather large, situated behind the dorsal ganglion and composed of the upper glandular part and the lower large caecal sack, opening on the dorsolateral surface of the head (Pl. VII, fig. 8). The ventral lobe of the dorsal ganglion posteriorly disappears in the dorsal wall of the sack.

The mouth is a small pore situated at a short distance ahead the brain. The oesophagus extends to the anterior portion of the brain, containing posteriorly the gland cells. The stomach is short and vast, being nearly the same in length as the oesophagus. The pylorus is long, about 6 times the length of the stomach. The intestinal caecum, anteriorly unbranching, reaches the back of the brain. The intestine is voluminous. The intestinal diverticula are not lobed laterally.

The rhynchocoel extends posteriorly to the tail and becomes vaster in the posterior portion of the body. The rhynchodaeum opens on the tip of the head. The caecal appendages of the rhynchocoel are short and never branch dorsoventrally in the lateral side. The first one situated at the posterior portion of the brain is very shallow (Pl. VII, fig. 1). The proboscis is provided with 9 nerves, which can be counted only in the portion near the armature. The basis of the central stylets is sickle-shaped. The lateral pouches of the accessory stylets are 3 in each side, containing several stylets, about 0.006 mm long.

The cephalic blood lacunae are narrow and connected each other above the rhynchodaeum in the tip of the head, extending posteriorly through the ring formed by the brain and the commissures towards the lateral side of the body in the portion where the brain is separated into the dorsal and the ventral ganglions. The dorsal blood vessel runs posteriorly inside the proboscis sheath in the foregut region. The lateral blood vessels are metamerically connected with the dorsal blood vessel by the transverse blood vessels.

The nephridia lying between the posterior portion of the brain and that of the pylorus send out in the posterior portion a pair of the efferent ducts running downward inside the lateral nerve and opening on the ventral side of the body. The gonads arranged between the intestinal diverticula are V-shaped rods in shape, ranging on the dorsal and the ventral sides of the body, their apexes being situated at the lateral margin of the body. The ripe spermatogonia are present in this specimen. The

gonads open on the ventral side of the lateral margin of the body. The parenchyma is well developed in the head, but disappears in the intestinal region.

Remarks. The present species belongs to the genus *Drepanophorus* in the following points; the body adapted for creeping and not specialized for pelagic life, the proboscis sheath provided with the caecal appendage, the cerebral sense organ provided with the saccular appendage, the mouth separated from the opening of the rhynchodaeum, the cephalic blood lacunae running inside the ring of the brain and the commissures, the intestinal diverticula and the intestinal caecum which are both unbranched, and the dorsal and the ventral ganglions delivered up and down from the ventral commissure of the body.

The main characters different from other species of this genus are as follows; the ocelli wanting, the head extremely long, the mouth largely separated from the opening of the rhynchodaeum, the dorsal ganglion posteriorly bilobed, the gonads V-shaped, and the efferent ducts of the nephridia running inside the lateral nerve.

Habits and habitat. The worm was collected at the depth of 50 m on November 7th, 1954.

Locality. Shimoda.

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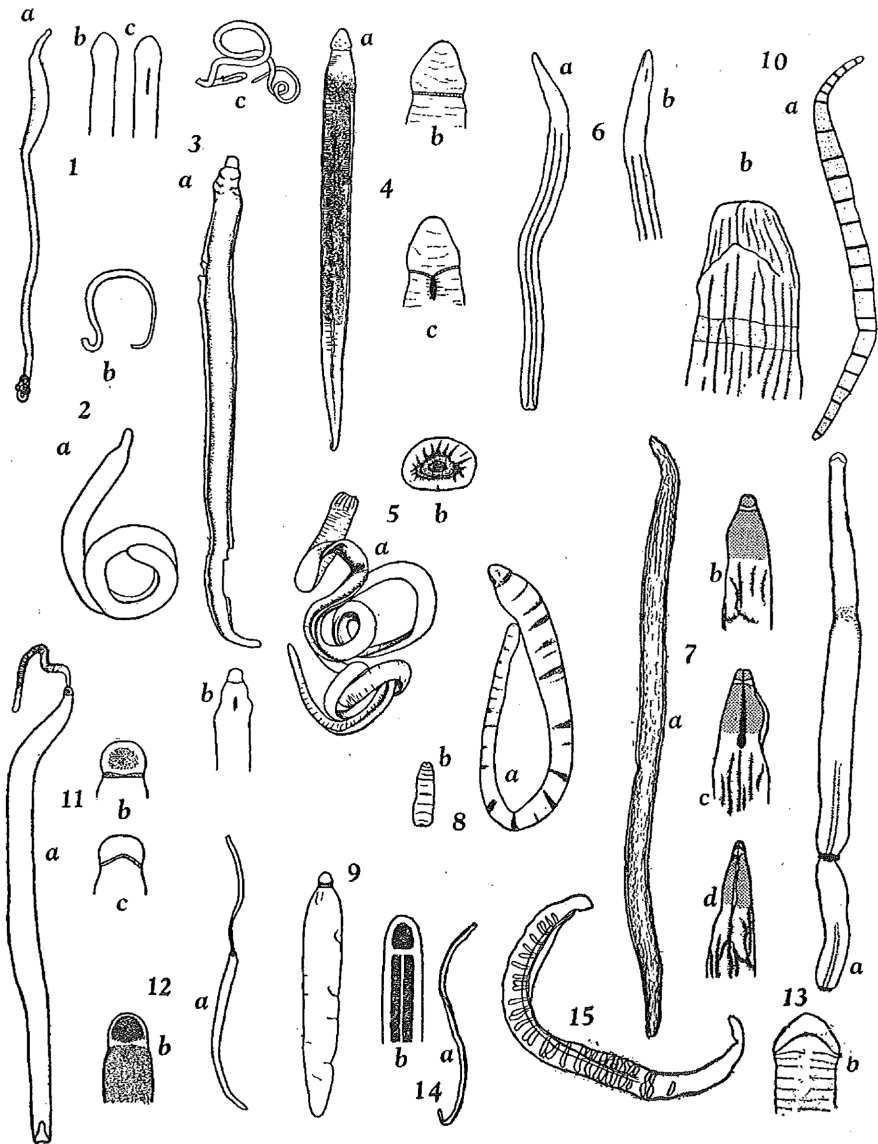
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Abbreviations

as. accessory stylet, *b.* brain, *bcs.* basis of central stylet, *bd.* branch of dorsal ganglion running on lateral nerve, *bm.* basement membrane, *c.* cutis, *ca.* caecal appendage of rhynchocoel, *cbi.* cephalic blood lacuna, *ceg.* cephalic gland, *cg.* cutis gland, *cm.* circular muscle, *cmi.* circular muscle layer, *cmp.* circular muscle layer of proboscis, *cmr.* circular muscle layer of rhynchodaeum, *cn.* cerebral nerve, *cps.* circular muscle layer of proboscis sheath, *cso.* cerebral sense organ, *ct.* connective tissue, *dbv.* dorsal blood vessel, *dc.* dorsal commissure of brain, *dg.* dorsal ganglion, *dl.* dorsal lobe of dorsal ganglion, *dn.* dorsal nerve, *dvm.* dorsoventral muscle, *e.* epithelium, *eg.* eosinophile gland cell, *epp.* epithelium of proboscis, *f.* foregut, *g.* gonad, *gct.* glandular cell of connective tissue, *ge.* cutis glands stained with eosin, *gh.* cutis glands stained with haematoxylin, *gl.* glands of cerebral sense organ, *i.* intestine, *ibcm.* inner branch of circular muscles, *ic.* intestinal caecum, *icm.* inner circular muscle layer, *icp.* inner circular muscle layer of proboscis, *iep.* inner epithelium of proboscis, *ilm.* inner longitudinal muscle layer, *lbv.* lateral blood vessel, *lef.* lateral cephalic furrow, *ldi.* lateral diverticulum of intestine, *lml.* longitudinal muscle layer, *lmp.* longitudinal muscle layer of proboscis, *ln.* lateral nerve, *lps.* longitudinal muscle layer of proboscis sheath, *m.* mouth, *mb.* muscular band, *n.* nephridium, *np.* nerve plexus, *nr.* nerve ring of proboscis, *o.* oocyte, *ocp.* outer circular muscle layer of proboscis, *ocs.* opening of cerebral sense organ, *oe.* oesophagus, *oed.* opening of efferent duct, *oer.* oesophageal region, *og.* opening of gonad, *olm.* outer longitudinal muscle layer, *on.* oesophageal nerve, *ord.* opening of rhynchodaeum, *p.* parenchyma, *pc.* parenchyma of connective tissue, *pnp.* peripheral nerve plexus, *pr.* proboscis, *ps.* proboscis sheath, *py.* pylorus, *rc.* rhynchocoel, *rd.* rhynchodaeum, *s.* stomach, *sc.* sack of cerebral sense organ, *se.* septum, *smg.* sub-muscular gland, *vc.* ventral commissure of brain, *vg.* ventral ganglion, *vl.* ventral lobe of dorsal ganglion, *vp.* ventral side of proboscis, *w.* wedge-shaped groove of rhynchocoel.

EXPLANATION OF PLATE I.

- Fig. 1. *Tetramys remacerebrum* n. g. et n. sp., a. Dorsal view. b. and c. Dorsal and ventral views of the anterior portion of the body.
- Fig. 2. *Euborlasia proterus* n. sp., a. Dorsal view. b. Proboscis extruded.
- Fig. 3. *Cerebratulus penniger* n. sp., a. Dorsal view. b. Ventral view of the anterior portion of the body. c. Proboscis extruded.
- Fig. 4. *Cerebratulus formosus* n. sp., a. Dorsal view. b. and c. Dorsal and ventral views of the head.
- Fig. 5. *Cerebratulus superniger* n. sp., a. Dorsal view. $\times 0.7$. b. Frontal view of the anterior end.
- Fig. 6. *Cerebratulus marginatus* Renier, a. Dorsal view. $\times 0.5$. b. Ventral view of the anterior portion of the body.
- Fig. 7. *Cerebratulus albocirculus* n. sp., a. Dorsal view. $\times 0.5$. b. Dorsal view of the head. c. Ventral view of the head. d. Lateral view of the head.
- Fig. 8. *Micrura multinotatum* n. sp., a. Dorso-lateral view. b. Dorsal view of the posterior portion of the body.
- Fig. 9. *Cephalomastax brevis* n. g. et n. sp., Dorsal view.
- Fig. 10. *Paranemertes plana* n. sp., a. Dorsal view. b. Ventral view of the head. $\times 15$.
- Fig. 11. *Amphiporus nagaiensis* n. sp., a. Dorsal view. b. and c. Dorsal and ventral views of the head.
- Fig. 12. *Amphiporus parmiornatus* n. sp., a. Dorsal view. $\times 0.5$. b. Dorsal view of the head.
- Fig. 13. *Amphiporus retrotumidus* n. sp., a. Dorsal view. b. Dorsal view of the head.
- Fig. 14. *Tetrastemma nigrifrons* var. *bilineatum* Iwata, a. Dorsolateral view. $\times 1.7$. b. Dorsal view of the anterior portion of the body.
- Fig. 15. *Drepanophorus longiceps* n. sp., Lateral view. $\times 3.3$.



EXPLANATION OF PLATE II.

- Fig. 1. Cross section of *Tetramys ramicerebrum* n. g. et n. sp. in the cephalic region, showing the cephalic glands, the cephalic blood lacunae. $\times 50$.
- Fig. 2. Cross section of *Tetramys ramicerebrum* n. g. et n. sp. in the cephalic region, showing the brain. $\times 50$.
- Fig. 3. Cross section of *Tetramys ramicerebrum* n. g. et n. sp. in the cephalic region, showing the cerebral sense organ and the dorsal and the ventral lobes of the dorsal ganglion. $\times 50$.
- Fig. 4. Cross section of *Tetramys ramicerebrum* n. g. et n. sp. in the oesophageal region. $\times 18$.
- Fig. 5. Magnified feature of the lateral side of the cross section of *Tetramys ramicerebrum* n. g. et n. sp. in fig. 4, showing the inner circular and the inner longitudinal muscle layer. $\times 140$.
- Fig. 6. Cross section of *Tetramys ramicerebrum* n. g. et n. sp. in the intestinal region. $\times 23$.
- Fig. 7. Cross section of *Cephalomastix brevis* n. g. et n. sp. in the cephalic region. $\times 23$.

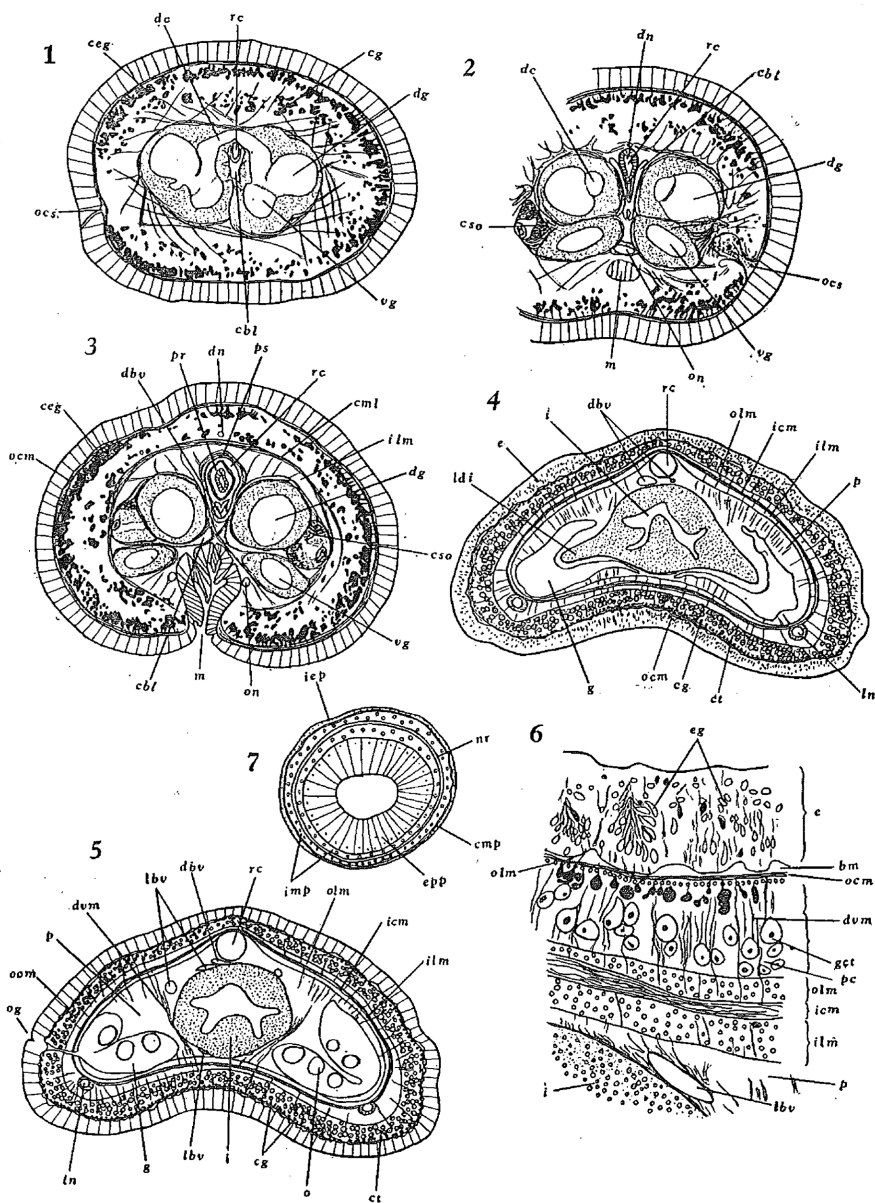
EXPLANATION OF PLATE III.

Figs. 1-3. Cross section of *Cephalomastax brevis* n. g. et n. sp. in the cephalic region.
×23.

Figs. 4 and 5. Cross section of *Cephalomastax brevis* n. g. et n. sp. in the intestinal region. ×15.

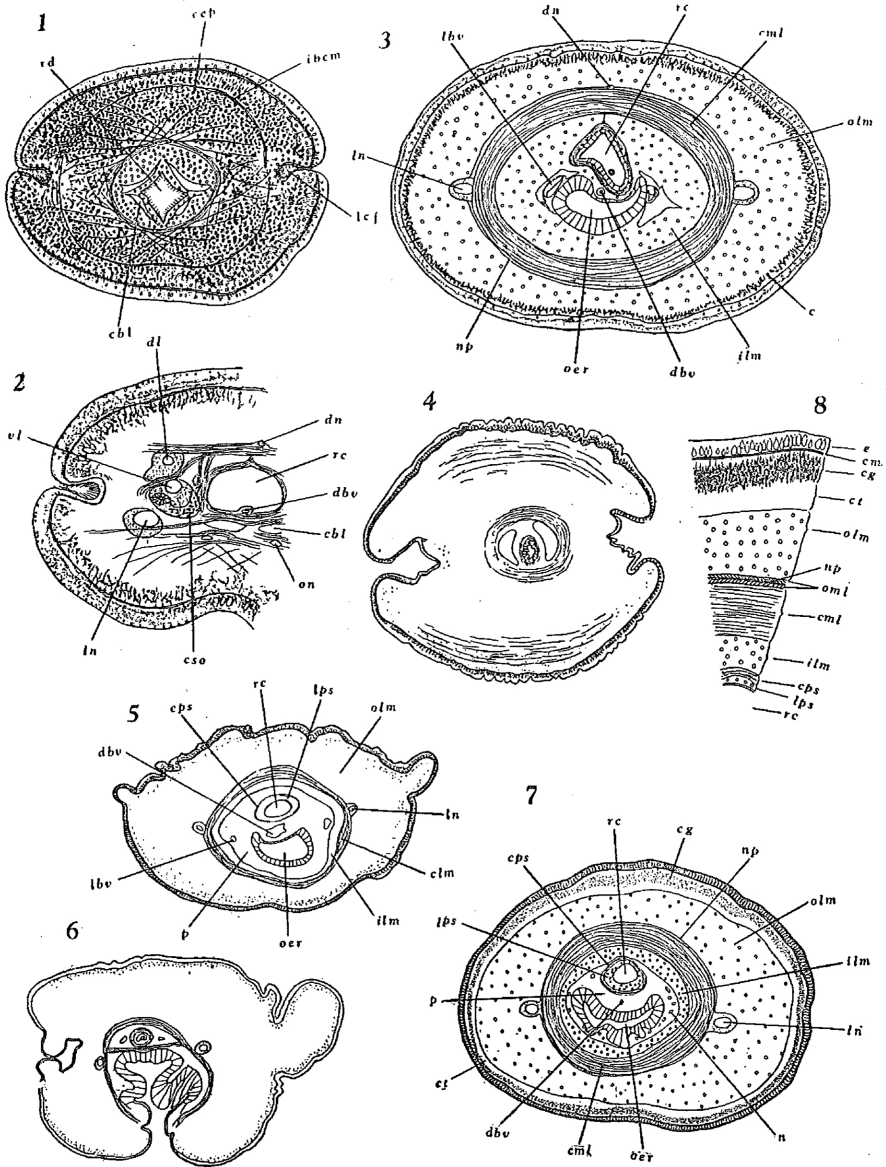
Fig. 6. Magnified feature of the ventral side of the cross section of *Cephalomastax brevis* n. g. et n. sp. in fig. 4. ×80.

Fig. 7. Cross section of the proboscis of *Cephalomastax brevis* n. g. et n. sp. ×80.



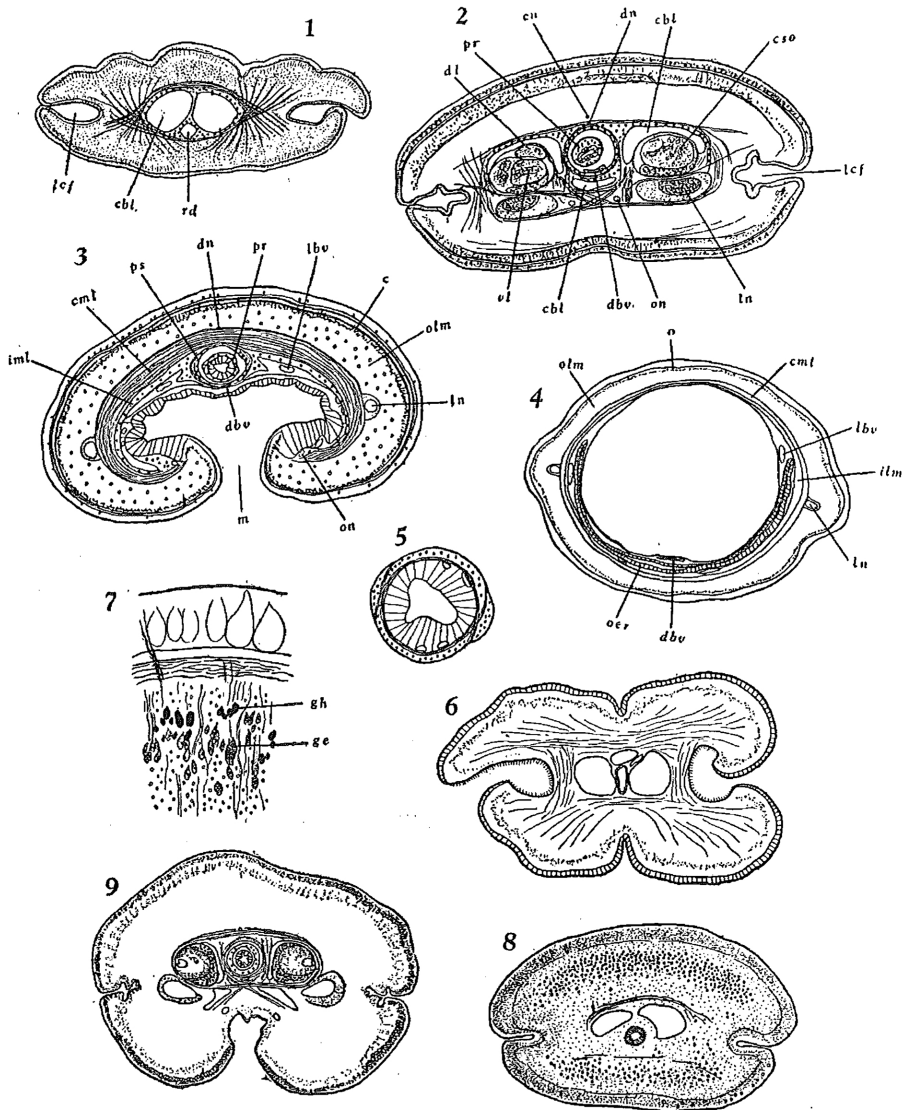
EXPLANATION OF PLATE IV.

- Fig. 1. Cross section of *Euborlasia proteres* n. sp. in the cephalic region, showing the internal branch of the outer circular muscles. $\times 23$.
- Fig. 2. Cross section of *Euborlasia proteres* n. sp. in the cephalic region, showing the dorsal and the ventral lobes of the dorsal ganglion. $\times 23$.
- Fig. 3. Cross section of *Euborlasia proteres* n. sp. in the intestinal region. $\times 15$.
- Fig. 4. Cross section of *Cerebratulus penniger* n. sp. in the cephalic region. $\times 15$.
- Fig. 5. Cross section of *Cerebratulus penniger* n. sp. in the oesophageal region. $\times 9$.
- Fig. 6. Cross section of *Cerebratulus penniger* n. sp. in the mouth region. $\times 9$.
- Fig. 7. Cross section of *Cerebratulus superniger* n. sp. in the oesophageal region. $\times 9$.
- Fig. 8. Magnified feature of the dorsal side of the cross section of *Cerebratulus superniger* n. sp. in fig. 7, showing the cutis glands and the diagonal muscle layer. $\times 23$.



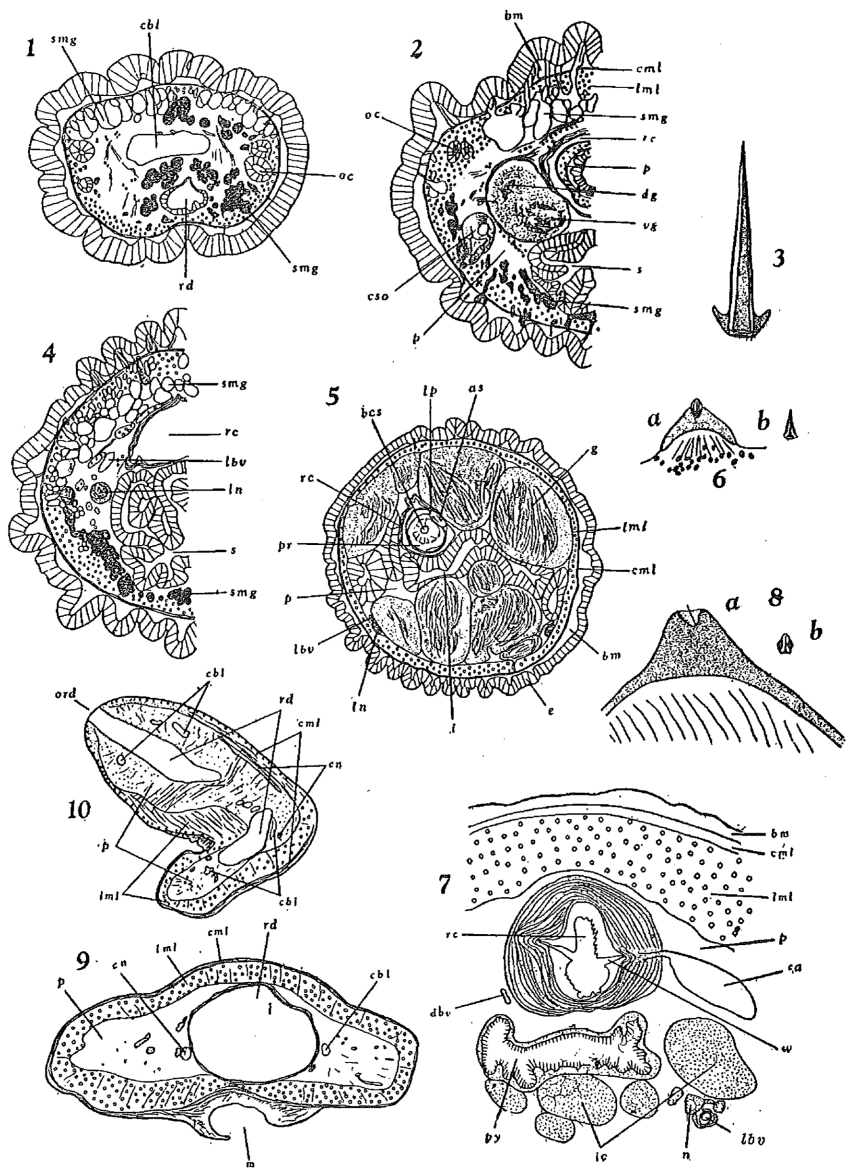
EXPLANATION OF PLATE V.

- Fig. 1. Cross section of *Cerebratulus formosus* n. sp. in the cephalic region. $\times 18$.
Fig. 2. Cross section of *Cerebratulus formosus* n. sp. in the cephalic region. $\times 18$.
Fig. 3. Cross section of *Cerebratulus formosus* n. sp. in the mouth region. $\times 15$.
Fig. 4. Cross section of *Cerebratulus formosus* n. sp. in the oesophageal region. $\times 9$.
Fig. 5. Cross section of the proboscis of *Cerebratulus formosus* n. sp. $\times 50$.
Fig. 6. Cross section of *Cerebratulus albocirculus* n. sp. in the cephalic region, showing the cephalic blood lacuna. $\times 11$.
Fig. 7. Cutis glands in the oesophageal region of *Cerebratulus albocirculus* n. sp. $\times 67$.
Fig. 8. Cross section of *Micrura multinotatum* n. sp. in the cephalic region. $\times 23$.
Fig. 9. Cross section of *Micrura multinotatum* n. sp. in the mouth region. $\times 15$.



EXPLANATION OF PLATE VI.

- Figs. 1 and 2. Cross sections of *Paranemertes plana* n. sp. in the cephalic region. $\times 40$.
- Fig. 3. Accessory stylet of *Paranemertes plana* n. sp. $\times 300$.
- Fig. 4. Cross section of *Paranemertes plana* n. sp. in the stomach region. $\times 40$.
- Fig. 5. Cross section of *Paranemertes plana* n. sp. in the intestinal region. $\times 40$.
- Fig. 6. Proboscoidal armature of *Amphiporus parmiornatus* n. sp. $\times 300$, a. Central stylet and basis. b. Accessory stylet.
- Fig. 7. Cross section of *Amphiporus nagaiensis* n. sp., showing the caecal appendage of the rhynchocoel in the pyloric region.
- Fig. 8. Proboscoidal armature of *Amphiporus nagaiensis* n. sp. $\times 300$, a. Central stylet and basis. b. Accessory stylet.
- Fig. 9. Cross section of *Drepanophorus longiceps* n. sp. in the mouth region. $\times 40$.
- Fig. 10. Cross and longitudinal section of *Drepanophorus longiceps* n. sp. in the cephalic region. $\times 23$.



EXPLANATION OF PLATE VII.

- Fig. 1. Cross section of *Drepanophorus longiceps* n. sp. in the stomach region, showing the cerebral sense organ and the dorsal and the ventral lobe of the dorsal ganglion. $\times 40$.
- Fig. 2. Proboscoidal armature of *Drepanophorus longiceps* n. sp., showing the sickle-shaped basis and the lateral pouches.
- Fig. 3. Magnified feature of the lateral pouch of the proboscis in fig. 2, showing the accessory stylets. $\times 300$.
- Fig. 4. Cross section of *Drepanophorus longiceps* n. sp. in the oesophageal region, showing the septum of the longitudinal muscles running from the ventral side of the longitudinal muscle layer of the body to that of the proboscis. $\times 40$.
- Fig. 5. Cross section of *Drepanophorus longiceps* n. sp. in the intestinal region, $\times 18$.
- Fig. 6. Cross section of *Drepanophorus longiceps* n. sp. in the nephridial region, showing the efferent duct. $\times 40$.
- Fig. 7. Serial cross sections of the brain of *Drepanophorus longiceps* n. sp., showing the dorsal and the ventral ganglion, the origin of the nerve running on the lateral nerve, and the oesophageal nerve. $\times 50$.
- Fig. 8. Serial cross sections of the cerebral sense organ of *Drepanophorus longiceps* n. sp., showing the glands and the saccular appendage and the dorsal and the ventral lobes of the dorsal ganglion. $\times 100$.

