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Nemertini from the Coasts of Kyusyu [1)]

By

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(*With 18 Text-figures*)

The nemerteans here treated were collected by the writer at Tomioka in the Amakusa Islands and in the vicinity of Fukue in the Goto Islands, Southwest Japan. The collection was made during his tour of several days in the spring of 1949 and 1951. The specimens were sketched in colour, and then preserved in Bouin's solution. Out of 17 species, 13 belong to the Anopla and 4 to the Enopla, including 8 new forms to science.

Before going further, I wish to express my appreciation to Prof. Tohru Uchida, under whose kind guidance this study has been carried out. It is a pleasant duty, also, to thank Prof. Masutaro Kuwabara, Mr. Kiei Dohtzu, and the authorities of the Amakusa Marine Biological Station of the Kyusyu University for affording me facilities for the research. I am especially indebted to my wife, Mutuko Iwata for much of work in collecting the specimens.

Tubulanus lucidus nov. sp. (Figs. 1 and 6)

The body is long, slender, filiform, about 25 cm in length and 1–1.5 mm in width. The head is wheel-shaped and demarcated from the body. The colour is milky white in the anterior one-third of the body and is dull orange in the middle portion, varying to brownish orange towards the end. The proboscis pit is opened subterminal on the ventral side of the body. The mouth is represented by a small slit situated shortly behind the head. The cerebral sense organs open on the lateral side of the head. Ocelli are wanting.

Internal structure: The epithelium of the intestine contains a great number of club-shaped gland cells stainable to Eosin and decreasing anteriorly. In oesophageal region the epithelium is very thick and two times or more the thickness of the muscular layers of the body. Muscular layers of the body, composed of an

1) Contributions to the Akkeshi Marine Biological Station, No. 61.

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outer circular, a longitudinal and an inner circular muscle layer are very much thinner than the epithelium throughout the body. The inner circular muscle layer is extremely reduced and limited in the anterior portion of the oesophagus. In the oesophageal region the longitudinal muscle layer is divided into two layers, the inner one is thinner and adheres to the whole periphery of the gut. The outer circular muscle layer is connected at right angles with the gut and the proboscis sheath by several straight muscles, which consist of few muscle fibres. There are not muscle crosses. The dorsal ganglion is not distinctly separated from the

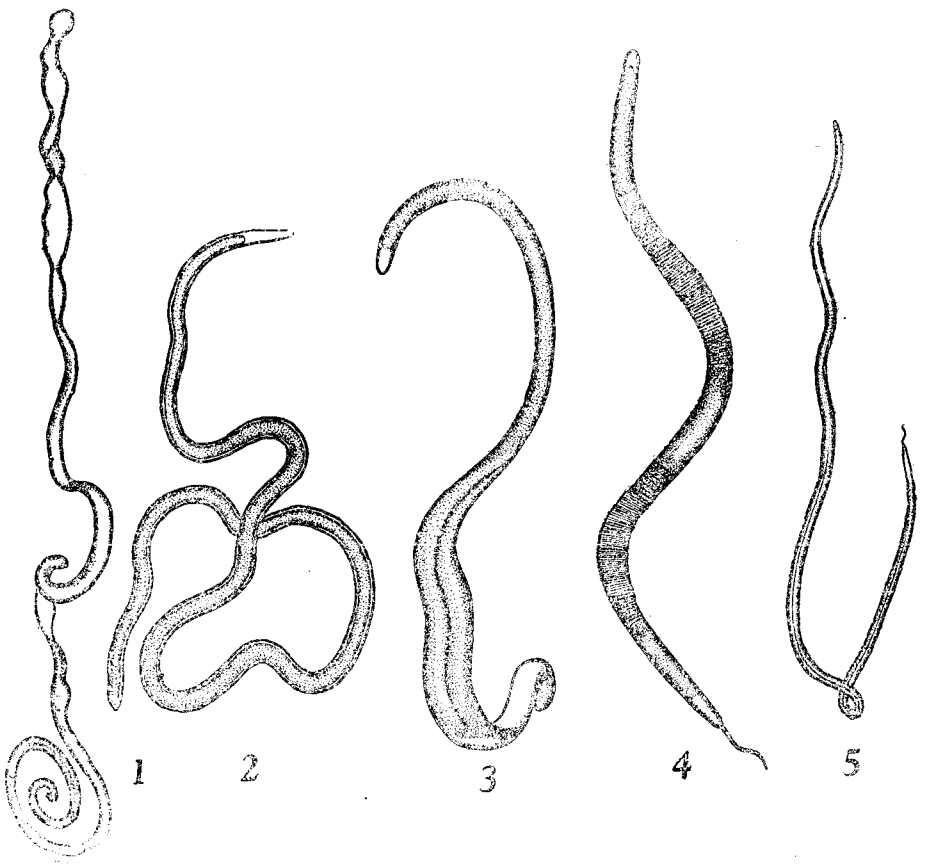


Fig. 1. *Tubulanus lucida* nov. sp., about natural size. **Fig. 2.** *Procephalothrix fasciculus* nov. sp. ×1.5. **Fig. 3.** *Euborlasia gotoensis* nov. sp., about natural size. **Fig. 4.** *Micrura japonica* nov. sp. ×1.5. **Fig. 5.** *Cerebratulus communis* Takakura., About natural size.

ventral ganglion. The oesophageal nerve runs posteriorly from the back of the ventral commissure to the forgut. The median dorsal nerve extends posteriorly under the epithelium and sends out a nerve to the proboscis sheath. The ventral commissure is very thick. The lateral nerves are situated between the epithelium and the outer circular muscle layer throughout the body length. The proboscis sheath is limited in only about the half of the body. The proboscis is composed of an outer circular and an inner longitudinal muscle layers. In the head, two large lacunae, which join anteriorly above the rhynchodaeum lie in contact with the lateral side of the rhynchodaeum and lead posteriorly into three blood vessels, of which the dorsal one runs backward on the inside or outside of the proboscis sheath, while the lateral one runs between the longitudinal muscle layer and the gut. The cerebral sense organs are connected with the hind end of the brain and are situated in the lateral blood lacunae. Their leading ducts immediately open obliquely to the outside of the body. The lateral sense organs are wanting. The excretory system could not be observed in my preparations.

Remarks: This new species agrees externally in general with *T. linearis* (McInt.), found at the north Atlantic Ocean and the Mediterranean, but differs largely from it in internal structures.

Habitat: A few specimens were collected under stones near the low water marks.

Geographical distribution: Fukue, Japan.

***Carinesta uchidai* nov. sp.** (Fig. 7)

The body is about 15 cm in length and 2 mm in width. The head is elongated, tapering to a point, and is not demarcated from the body. The hind part of the body ends in a blunted point. The colour is uniformly dull reddish brown except the head, which is colourless and measured about 3 cm in length. The proboscis opening is represented by a subterminal pit. The mouth, a small longitudinal slit is situated shortly behind the brain. The cerebral sense organs and ocelli are wanting.

Internal structure: The epithelium contains a great number of club-shaped gland cells. It is very thick and is 2/3 times the thickness of the muscular layers of the body in oesophageal region, though posteriorly it becomes same in thickness. Muscular layers of the body are composed of an outer circular, a longitudinal and an inner circular muscle. The longitudinal muscle layer is well developed throughout. The inner circular muscle layer is also thick and becomes four times or more of the outer circular muscle layer in the posterior portion of the oesophagus. The brain, situated under the epithelium is not clearly distinguished from the dorsal and ventral ganglions. The oesophageal nerves run backward from the back of the ventral commissure and disappear immediately behind the mouth. On observing this material, it was very strange that there is a ventral commissure but

no dorsal commissure could be found, although in oesophageal region the trace of the median dorsal nerve can be slightly seen in cross section. The lateral nerves are situated under the epithelium throughout the body. The longitudinal muscle plate is thick and is situated between the proboscis sheath and the gut. The circular muscle layer of the proboscis sheath is at first separated from the inner circular muscle layer of the body, but posteriorly unites into a latter. The rhynchocoel is limited to the anterior portion of the body. The proboscis consists of an outer circular and an inner longitudinal muscle layer; the latter is very much thicker than the former in anterior portion. The proboscis nerves are not found. There are well marked glands in the rhynchodaeum near the proboscis pore. In the head are found two large lacunae, which join anteriorly under the rhynchodaeum, lying in contact with the lateral side of the rhynchodaeum and leading posteriorly to two lateral blood vessels. The lateral blood vessel is enclosed by the inner circular muscle layer, but lies outside of it posteriorly from

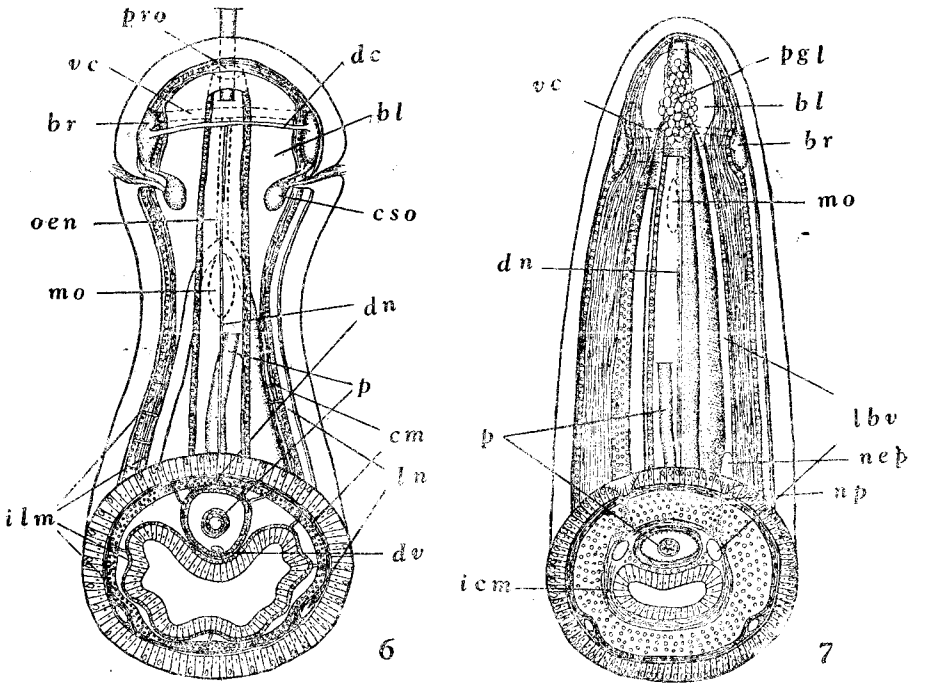


Fig. 6. *Tubulanus lucida.* Diagram of organs in the anterior end of the body and head. **Fig. 7.** *Carinesta uchidai.* Diagram of organs in the anterior end of the body and head.

the nephridium. The excretory organ, situated far back of the brain, is short, glandular, lying above the lateral blood vessels without composing of a definite duct and opens externally through the body wall on the dorsal surface of the body in its posterior portion. The alimentary canal is straight without any caecum or pouches and becomes relatively large with very high epithelium in intestinal region. There are no lateral sense organs and frontal organ.

Remarks: R. C. Punnett (1900) reported the first species of this genus, *C. orientalis*, collected at the South Pacific by Dr. Willey. The second species, *C. uchidai*, though coincided with almost in external features, definitely differs from it in internal structures as the following main points; (1) The longitudinal muscle bands of the rhynchocoelom are not four. (2) The brain is not provided with two dorsal, two ventral commissures, and a well marked nervous layer in front of the brain.

Habitat: One specimen was collected under a stone near the low tide mark.

Geographical distribution: Fukue, Japan.

***Procephalothrix fasciculus* nov. sp.** (Figs. 2 and 8)

The body is rather short, slender, filiform, and about 10 cm in length and 1 mm in width. It is rounded anteriorly, flattend in intestinal region. The colour of the body is greenish ochre anterior to mouth, ochore in intestinal region, and the lateral margins are translucent. The head tapers to a point, and is not demarcated from the body. It is orange, measured about 5 mm in length. The mouth is situated about six times as far behind the brain from the tip of the head, and has a large lip which is formed as a sucher. The proboscis opens in a subterminal pit on the tip of the head.

Internal structure: Muscular layers of the body wall are composed of an outer circular, a longitudinal, and an inner circular muscle layer. The longitudinal muscle layer is about from five to ten times the thickness of the outer circular muscle layer in intestinal region. The inner circular muscle layer, limited only to the oesophageal region is very thin. The proboscis sheath is composed of an outer circular and an inner longitudinal muscle layer, and is supported ventrally by the longitudinal muscle plate. It extends to the hind end of the body. The cephalic lacuna leads into two thin walled lateral vessels adhered to the wall of the oesophageal region. On account of the presence of muscular wall, the lateral blood vessels are contracted after preservation. The foregut is not differentiated into oesophagus and stomach, and the transition from foregut to intestine is also gradual, although minute gland cells increase posteriorly. The brain is relatively small as compared with the size of the body, and is situated near the tip of the head. The dorsal ganglions are not bilobed posteriorly. Four cephalic nerves are sent out from the tip of each ganglions. Unpaired oesophageal nerve, which originates behind the middle portion of the ventral commissure, runs posteriorly

towards the foregut. This is divided into two nerve cords before the foregut, and disappears immediately behind the mouth. No ocelli or specialized sense organs. The gonads are situated on the dorsolateral aspects of the body in contact with the dorsal surface of the lateral blood vessels and the dorsal side of the intestinal lobes. The cephalic glands are well developed in the head, and do not pass through the brain. The median dorsal nerve extends posteriorly above the outer circular muscle layer. The epithelial nerve plexus encircles the outer surface of the outer circular muscle layer.

Remarks: This specimen generally resembles *P. spiralis* (Coe) found in America but differs from the latter in having the different external features and the entire length of the proboscis sheath.

Habitat: One specimen was collected under a stone of the stony beach near the low water mark.

Geographical distribution: Tomioka, Japan.

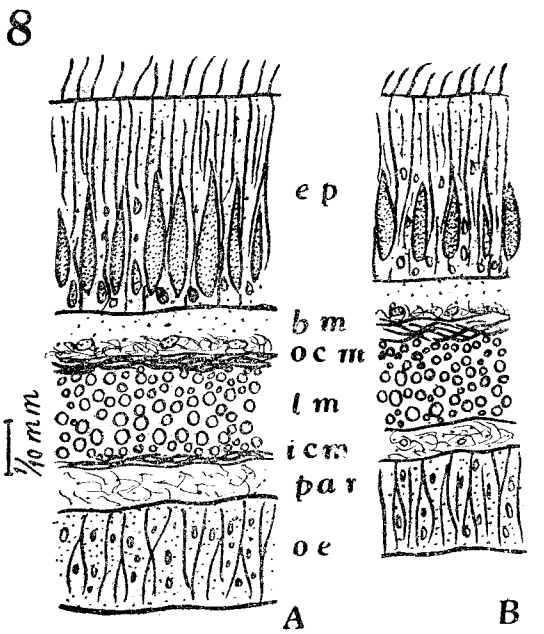


Fig. 8. Cross sections of two parts of body wall of *Procephalothrix fasciculus*. A, anterior end of oesophageal region, showing inner circular muscle layer (icm) beneath the parenchyma (par) surrounding the oesophagus (oe). B, middle of intestinal region, showing complete absence of inner circular muscles.

Procephalothrix simulus nov. sp.

The body is long, slender, filiform, and measured about 30 cm in length and 1–1.5 mm in width. The head is elongated, tapering to a point. The posterior region of the body is very slender and tapers to a blunted point. The colour is yellowish brown except the tip of the head, which becomes pinkish. The proboscis opening is represented by a subterminal pit. The mouth, a longitudinal slit, is situated far behind the brain.

Internal structure: Muscular layers of the body are composed of an outer circular, a longitudinal and an inner circular muscle, of which the latter is present only in oesophageal region and is moderately thick. The lateral blood vessels, situated on the dorsolateral aspect of the body and adhering to the gut, are covered with the inner circular musle layer which is divided into two faces of the blood vessels and joins with the circular muscle layer of the proboscis sheath. The longitudinal muscle plate is entirely wanting. The proboscis sheath extends posteriorly to about the half of the body. The rhynchocoel is large and is thickly filled with the proboscis folded. The peripheral nerve plexus is present. The lateral nerves are situated in the longitudinal muscle layer. The cephalic glands are present.

Remarks: The present species nearly resembles *P. major* (Coe) but differs as to the following points; (1) the body is small and is yellowish brown in colour, (2) the longitudinal muscle plate is wanting.

Habitat: A few specimens were collected under stones near the low water marks.

Geographical distribution: Fukue, Japan.

Cephalothrix linearlis (Rathke, 1799)

Cephalothrix linearlis Bürger, 1895, Fau. u. Flo. Neapel, S. 539, Taf. II, Fig. 20; Bürger, 1902, Tierreich, S. 18; Takakura, 1898. Zool. Mag., 10. pp. 119–120; Coe, 1901, Harriman Alaska Exp., XX. pp. 19–20; Bürger, 1905, Bull. Mus. Comp. Zool. Harvard., vol. 47; Wijnhoff, 1913, Zool. Jahrb., Bd. 34, SS. 291–317; Friedrich, 1935, Arch. f. Naturg., 4, SS. 305–306; Friedrich, 1936, Tierw. Nord. u. Ost-See, IV, S. 31; Yamaoka, 1940, Jour. Fac. Sci. Hokkaido Univ. ser. 6, Zool., vol. 7, No. 3, pp. 215–218; Iwata, 1951, Ibid., vol. 10, No. 2, p. 135.

The body is very slender, filiform, about 30 cm in length and 1–0.5 mm in width. The body is white or dull yellow, without any other markings. The head is slightly dark. The mouth is situated far behind the brain.

Internal structure: Muscular layers of the body wall are composed of an outer circular and an inner longitudinal muscle layer. The inner circular muscle layer is wanting. The longitudinal muscle layer is well developed. The proboscis sheath is limited to half the body length. It is composed of an outer circular and an inner longitudinal muscle layer. Four cephalic nerves are delivered from the each of ganglions. The posterior portion of the dorsal ganglions are not bilobed.

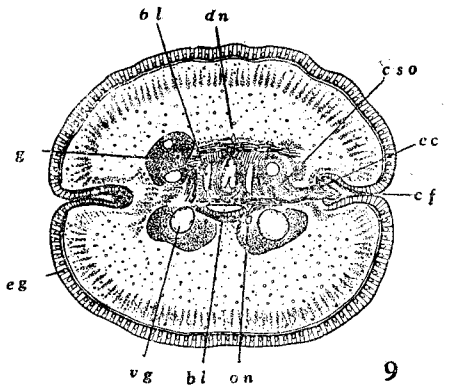
The oesophageal nerve is unpaired. The median dorsal nerve extends posteriorly above the outer circular muscle layer. The epithelial nerve plexus surrounds the body wall above the outer circular muscle layer. The cephalic glands are present in front of the head. The large cephalic lacuna leads into two thin walled lateral lacunae in the foregut region. The lateral blood vessels are situated on the middle portion of the lateral side of the intestine. The reproductive organs are present just above the lateral blood vessels. They are found in the intestinal region.

Habitat: These specimens are very commonly found under stones between the tide marks.

Geographical distribution: Tomioka, Fukue, Onomichi and Misaki, Japan; the Atlantic Ocean (Europe) and the Mediterranean Sea.

Euborlasia gotoensis **nov. sp.** (Figs. 3, 9 and 10)

The body is very contractile, rounded and narrowed anteriorly, and moderately wide in the intestinal region, about 10 cm in length and 3–10 mm in width. The head is pointed in front, white in colour with long cephalic furrows, and is not demarcated from the body. The body is anteriorly dull brown and posteriorly reddish brown. The proboscis sheath is seen through the body wall as a dark coloured line in the intestine.



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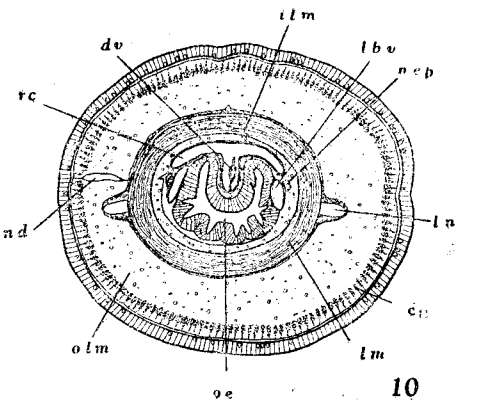

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Fig. 9. *Euborlasia gotoensis.* Cross section through posterior portion of brain.
Fig. 10. *Euborlasia gotoensis.* Cross section through anterior portion of body.

Internal structure: The cutis extends to the tip of the head beyond the brain, and is about the same thickness of the epithelium in oesophageal region,

while in the intestine it becomes thinner than the epithelium itself. It is not marked off from the outer longitudinal muscle layer. Muscular layers of the body wall are composed of an outer longitudinal, a circular and an inner longitudinal muscle layer. The inner longitudinal muscle layer is very thin in oesophageal region. The outer longitudinal muscle layer is well developed. The proboscis sheath reaches nearly all length of the body. The proboscis is composed of three muscle layers, and is provided with two muscle crosses. Cephalic glands and frontal organs are absent. The cephalic furrows are shallow in transverse section. The dorsal ganglion is divided into two lobes, of which the small dorsal one immediately ends freely, while the ventral one extends posteriorly into the cerebral sense organ. The median dorsal nerve extends porsteriorly above the circular muscle layer. The oesophageal nerves, in a pair, are sent out towards the foregut from the posterior portion of the ventral ganglions. The nephridia are situated in the anterior and middle portion of the oesophageal region in contact with the lateral lacunae. Each of them is divided into several canals in the anterior portion of the oesophageal region, while posteriorly they are led to a large main canal in contact with the lateral blood vessel. The efferent ducts are, in a pair, passing through the body wall above the lateral nerves and opening externally on the dorsolateral aspects of the body at the posterior portion of the nephridia.

Remarks: Five species of this genus were recorded from the coasts of England, America and the Mediterranean, but the present new species is unlike as compared with any nemertean hitherto described. The difference of the species is as follows: (1) The body is anteriorly dull brown and posteriorly reddish brown. (2) The proboscis shath is seen through the body. (3) The proboscis sheath reaches nearly all length of the body.

Habitat: One specimen was collected under a stone near the low water mark.

Geographical distribution: Fukue, Japan.

Lineus fuscoviridis Takakura, 1898

Lineus fuscoviridis Takakura, 1898, Zool. Mag., vol. 10, p. 332-333, fig. 13.

The body is very soft, flabby, and so transparent that the intestine, the proboscis sheath, and the gonads are apparently seen through the epithelium. The body is anteriorly convex on the dorsal side, very flattened in intestinal region, about 60 cm in length and 7-15 mm in width. The head is angular in front, with long cephalic furrows, flattend dorsoventrally, and demarcated from the body by an annular constriction. The body is dull green, without any other markings. The head is dark green with a white line in the terminal portion of the head, of which the middle portion of the line slightly protruded posteriorly. The proboscis sheath is seen through the body wall as a reddish purple line in the intestine. The gonads are also found as yellowish minute spots arranged at regular intervals

between the lateral lobes of the intestine. The proboscis is reddish orange, and measured about 50 cm in length and 1-2 mm in width. The proboscis opening and the mouth are arranged as longitudinal slits on the mid-ventral line ; the former being smaller and situated subterminally at the tip of the snout, and the latter opening behind the posterior ends of cephalic furrows.

Internal structure : The epithelium contains a large number of eosinophilic columner cells. The cutis is divided into two layers, of which the outer one is composed of cutis glands, and the inner one is connective tissue. It is about four times the thickness of the epithelium in oesophageal region, and is marked off from the outer longitudinal muscle layer. The dorsoventral muscles, consisted of two straight muscle fibres, are well developed throughout the body length, especially in front of the body. Muscular layers of the body wall are composed of an outer longitudinal, a circular, and an inner longitudinal muscle. The outer longitudinal muscle layer is about 2.5 time the thickness of the circular muscle layer in oesophageal region. The proboscis sheath reaches nearly all the body length. The proboscis is composed of an outer longitudinal, a circular, and an inner longitudinal muscle layer, and is provided with two muscle crosses. The proboscis nerve encircles the inner surface of the circular muscle layer in transverse section, and forms anteriorly three ganglionic masses on the lateral sides of the proboscis. The dorsal ganglions are divided posteriorly into two lobes, of which the small dorsal one ends freely, while the ventral one extends to the cerebral sense organs which open externally by a canal at the posterior ends of the cephalic furrows. The ventral ganglions send out posteriorly lateral nerves and oesophageal nerves. The median dorsal nerve extends posteriorly above the circular muscle layer. Frontal organs and cephalic glands are wanting. The nephridia are located in the anterior region of the oesophagus, and consist of numerous canals in contact with the outer wall of the blood lacunae lying above the lateral side of the oesophagus. Efferent ducts are large and in a pair passing through the body wall below the lateral nerves and opening externally on the dorsolateral aspects of the body at the posterior portion of the oesophagus. The large cephalic lacuna, situated immediately above the rhynchodaeum, leads soon into two lateral lacunae on the lateral

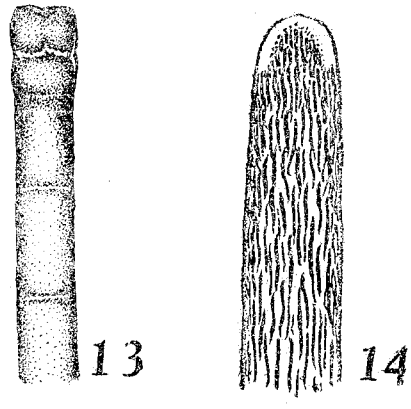

Fig. 13. *Lineus mitellatus*, showing anterior portion of dorsal surface.
Fig. 14. *Basodiscus curtus*, showing anterior portion of dorsal surface.

sides of the rhynchodaeum, and in the middle region inside the brain they are divided into three lacunae, of which the ventral one is the dorsal blood vessels, while the lateral one, after passing through the brain, branches off several canals and posteriorly enters to the lateral blood vessel.

Remarks: The present specimen is identified in external features with *L. fuscoviridis* (Takakura). The internal structures have not been given by the previous writer.

Habitat: One specimen was collected under a stone near the low water mark.

Geographical distribution: Misaki and Tomioka, Japan.

Lineus mitellatus **Takakura, 1898** (Fig. 13)

Lineus mitellatus Takakura, 1898, Zool. Mag., vol. 10. p. 333–334, fig. 14.

The body is soft, flabby, about 25 cm in length and 5–7 mm in width. It is anteriorly somewhat convex on the dorsal side, and flattend in intestinal region. The head is angular in front, with long cephalic furrows, flattend dorsoventrally, and demarcated from the body by an annular constriction. The body is dark purple, with many characteristic white rings. The tip of the head is marked with a white line which is somewhat hollowed on its middle portion. The inner surface of the cephalic furrows are tinged with white. The first ring is found at the middle portion of the cephalic furrows, and is very thicker than any other rings. The middle portion of it, both dorsal and ventral surface, sharply juts out towards the anterior region of the intestine, though slight appears in the posterior region of the body. The distance between the tip of the head and the end of the cephalic furrows is equal to that between the end of the cephalic furrows and the second ring. The mouth is represented by a longitudinal reddish slit situated behind the cephalic furrows on the middle portion of the ventral surface of the body. The proboscis is colourless.

Internal structure: The epithelium contains a large number of eosinophilic columner cells. The cutis, consisted of an outer cutis gland and an inner connective tissue layer, is about 3 times the thickness of the epithelium in oesophageal region, and is marked off from the outer longitudinal muscle layer. The cutis glands are not well developed, and are 1/2 time the thickness of the connective tissue in the oesophageal region. The proboscis sheath reaches nearly the hind end of the body. The proboscis is composed of three muscle layers, and is provided with two muscle crosses. Frontal organs and cephalic glands are wanting. The posterior region of the dorsal ganglions are belobed into two lobes, of which the small dorsal one ends freely, while the large ventral one extends posteriorly above the circular muscle layer. The oesophageal nerves originate from the porsterior region of the ventral ganglions, and are connected with two transverse commisures.

The nephridia are composed of numerous canals in contact with the outer wall of the blood lacunae lying above the lateral side of the anterior region of the oesophagus. Efferent ducts, in a pair, pass through the body wall towards the dorsolateral aspects of the body running above the lateral nerves at the posterior region of the nephridia.

Remarks: The present material agrees in external features with Takakura's species, *Lineus mitellatus*. Takakura has not given accounts of the internal structures. The author also collected several specimens of this species coloured green or dark brown in the vicinity of Seto in the spring of 1951, and found the specimens having the white rings on entire length of the body.

Habitat: One specimen was collected under a stone near the low tide mark.

Geographical distribution: Misaki, Seto, and Tomioka, Japan.

Lineus longifissus **Takakura, 1898**

Lineus longifissus Takakura, 1898, Zool. Mag., vol. 10, p. 336, fig. 19.

The body is narrow in front, long and broad, about 40 cm in length and 10 mm in width. The head is pointed in front, with long cephalic furrows, and is not demarcated from the body. The body is anteriorly convex dorsally, flattened in intestinal region. The colour of the body is dark purple, without any other markings. The proboscis is in dull greenish ting. The mouth is represented by a longitudinal slit situated immediately behind the cephalic furrows on the middle portion of the ventral surface of the body. The proboscis opens as a subterminal pit at the tip of the head.

Internal structure: The epithelium is very thin and contains numerous eosinophilic, club-shaped gland cells. The cutis is about five times the thickness of the epithelium in oesophageal region. The cutis glands are well developed, and marked off from the outer longitudinal muscle layer by the connective tissue. The connective tissue is about same time the thickness of the cutis glands layer in the oesophageal region. The outer longitudinal muscle layer is about three times the thickness of the circular and inner longitudinal muscle layers. The nerve plexus is apparently found on the outer surface of the circular muscle layer. The dorsoventral muscle are moderately developed through the body. The proboscis is composed of an outer longitudinal and an inner circular muscle layer, and is provided with two muscle crosses. The dorsal ganglions are posteriorly belobed into two, of which the dorsal lobe ends freely, while the ventral lobe is connected to the cerebral sense organ. The oesophageal nerves originate from the posterior portion of the ventral ganglion. The dorsal nerve runs posteriorly above the circular muscle layer. The cephalic glands are well developed in front of the brain both above and below the rhynchodaeum, and never extend posteriorly beyond the brain. The frontal organs, three characteristic canals, are found on the tip of the snout. The nephridia are located in the anterior region of the oesophagus, and

consisted of numerous canals in contact with the outer wall of the blood lacunae lying above the lateral side of the oesophagus. Efferent ducts are large and in a pair passing through the body wall above the lateral nerves and opening externally on the dorsolateral aspects of the body at the posterior portion of the nephridia.

Remarks: The present material agrees in external features with *L. longifissus* (Takakura) except the shape of the head. The internal structures have not been given by the previous author.

Habitat: One specimen was collected in the sandy mud about 30 cm in depth near the low water mark.

Geographical distribution: Misaki and Tomioka, Japan.

Lineus alborostlatus Takakura, 1898

Lineus alborostlatus Takakura, 1898, Zool. Mag., vol. 10, pp. 332, fig. 12; Yamaoka, 1940, Jour. Fac. Sci. Hokkaido Univ. ser. 6, Zool., vol. 7, pp. 220-222, fig. 8; Iwata, 1951, Ibid., vol. 10, pp. 135.

The body is long and slender, rounded in front, flattend in intestinal region, and measured about 30 cm in length and 2 mm in width. The head tapers to a blunt anterior end, and becomes broad posteriorly, being marked off from the succeeding oesophageal region by a constriction. The body is deep purple on the dorsal surface and somewhat pale ventrally. The tip of the head is white. The mouth is slit-like, situated as far back as the posterior ends of the cephalic furrows.

Internal structure: The cutis is about two times the thickness of the epithelium in oesophageal region, and marked off from the outer longitudinal muscle layer. The connective tissue layer is wanting. The proboscis is composed of an outer longitudinal and an inner circular muscle layer, and is provided with two muscle crosses. The rhynchocoel extends posteriorly to the middle portion of the body. The cephalic glands are well developed in front of the brain both above and below the rhynchodaeum, and not extend posteriorly beyond the brain. The frontal organ, three canals, are found on the tip of the snout. The dorsal ganglion of the brain is divided posteriorly into two lobes, of which the dorsal small one ends freely, while the large ventral one is connected with the cerebral sense organ. The nerve plexus is present in the oesophageal region. The oesophageal nerves originate from the ventral ganglions and have a transverse connection between them and the lateral nerves. The median dorsal nerve extends posteriorly above the circular muscle layer. The nephridia are situated in the anterior portion of the oesophageal region and are composed of numerous canals in contact with the outer walls of the blood lacunae lying above and below the lateral nerves. Efferent ducts are large and in a pair passing through the body wall above the lateral nerves and opening externally on the dorsolateral part of the body at about 2/3 the distance towards the posterior ends of the nephridia.

Habitat: One specimen was collected under a stone near the low water mark.

Geographical distribution: Yokohama, Onomichi, Fukue, and Akkeshi in Hokkaido, Japan.

***Micrura japonica* nov. sp.** (Figs. 4, 11 and 12)

The body is very contractile, rather short and slender, and measured about 5–10 cm in length and 2–4 mm in width. The body makes numerous wrinkles, as if it has narrow white rings surrounding the body, when contracted. The head is rounded in front, flattend dorsoventrally, with long cephalic furrows, and not demarcated from the body. The head acutely pointed or broadly rounded, according to the state of contraction. The mouth is large in size; the line is whitish in colour. The body is bluish purple or bluish black. The brain is found through the integument as a triangular reddish spot. The short hind part of the body is brownish white in colour. The tip of the snout, both above and below is pure white. This white patch surrounds the proboscis pore and extends backward a short distance along the cephalic furrows. The head of the preserved specimens are always bent upwards from the region of mouth. The caudal cirrus is present.

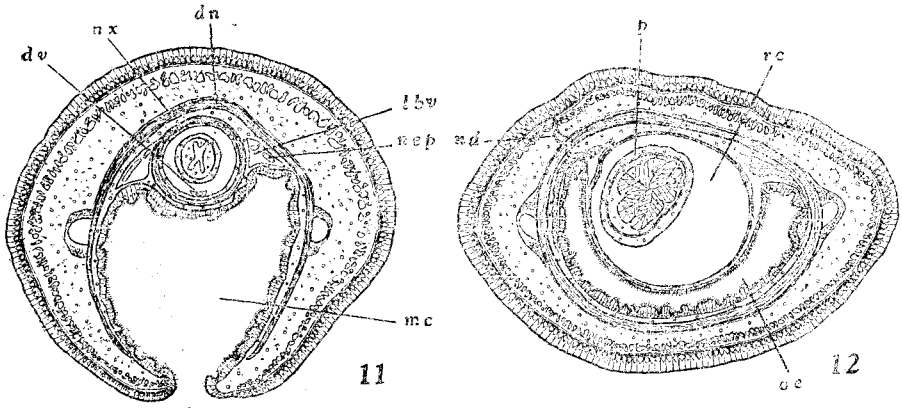

Fig. 11. *Micrura japonica*. Cross section through mouth. **Fig. 12.** *Micrura japonica*. Cross section through anterior portion of body.

Internal structure: The epithelium is provided with a great deal of club-shaped gland cells stained with the Eosin. The cutis is about the same thickness of the epithelium in oesophageal region, and not marked off from the outer longitudinal muscle layer. Muscular layers of the body are composed of an outer

longitudinal, a circular, and an inner longitudinal muscle layer. The proboscis sheath reaches the posterior end of the body. The proboscis is composed of an outer longitudinal, a circular, and an inner longitudinal muscle layer, and is provided with two muscle crosses. The dorsal ganglions are about 1.5 times as big as the ventral ones and each of nucleus is divided posteriorly into two lobes, of which the small dorsal lobe immediately ends freely, while the ventral lobe is connected with the cerebral sense organ which opens externally by the canal at the posterior end of the cephalic furrow. The median dorsal nerve is limited to the anterior portion of the body. The oesophageal nerves are separated off from the middle portion of the ventral ganglions. The frontal organs are composed of three small ciliated canals found at the tip of the snout. The cephalic glands are well developed in front of the brain both above and below the rhynchodaeum, and never extend posteriorly beyond the brain. The nephridia extend from the posterior portion of the mouth to the anterior portion of the oesophagus and their several efferent ducts open externally on the dorsolateral surface of the body. The intestinal pouches are fairly deep, alternative in position with the reproductive organs.

Remarks: This new species is closely related to *M. formosana* found on the coasts of north eastern Formosa but differs from the latter as described by Yamaoka ('39); in having the darker colour of the body; in not having the diverticulum of rhynchocoel, and in other minor details.

Habitat: The specimens were commonly found under stones in sandy beach near the low water marks in the vicinity of Fukue, but a few were collected under stones in the tide pool in the rocky shore near the high water marks at Tomioka. The author collected also the same species in the vicinity of Simoda.

Geographical distribution: Tomioka, Fukue, and Simoda, Japan.

***Cerebratulus communis* Takakura, 1898 (Fig. 5)**

Cerebratulus communis Takakura, 1898, Zool. Mag., vol. 10, p. 337, fig. 22.

The body is narrow anteriorly, flattend in intestinal region, and measured about 15–20 cm in length and 1-2 mm in width. The head is pointed in front, with long cephalic furrows, and not demarcated from the body. The body is colourless anteriorly, about 5 cm or more in length, and dull brown in intestinal region. The proboscis sheath is found through the integument as a slender brownish line in the intestinal region. The hind end of the body is provided with a delicate white caudal cirrus. The mouth is represented by a very small longitudinal slit situated on the middle portion of the back of the brain.

Internal structure: The epithelium is relatively thin and about 1/2 time the thickness of the circular muscle layer in oesophageal region. The cutis is not marked off from the outer longitudinal muscle layer. Muscular layers of the body are composed of three layers. The outer longitudinal muscle layer is

same in thickness of the circular muscle layer and three times of the inner longitudinal muscle layer in the oesophageal region. The proboscis is composed of an outer longitudinal and an inner circular muscle layer, and is provided with two muscle crosses. The dorsal ganglion is divided into two lobes, of which the small dorsal one immediately ends freely, while the ventral one is connected with the cerebral sense organ. The median dorsal nerve extends posteriorly to the middle portion of the body above the circular muscle layer. The oesophageal nerves originate from the posterior portion of the ventral ganglions. The cephalic glands are moderately developed and never extend beyond the brain. The cephalic furrows are very shallow in transverse section. The nephridial canals, profusely branched, lie in contact with the blood lacunae above the lateral side of the anterior region of the oesophagus and posteriorly leads to a main duct ending freely at the posterior region of the oesophagus. The efferent ducts, in a pair, open externally on the dorsolateral aspects of the body above the lateral nerves at the posterior portion of the main ducts.

Remarks: The present species agrees in external features with *C. communis* (Takakura). Takakura has not given accounts of the internal structures.

Habitat: A few specimens were collected in the sandy mud near the low tide marks.

Geographical distribution: Misaki and Tomioka, Japan.

Baseodiscus curtus **(Hubrecht, 1879)** (Fig. 14)

Eupolia curta Bürger, 1895, Faun. u. Flor. Neapel, SS. 601–603, Taf. 4, Figs. 3–5, 7, 9, 17.

Baseodiscus curtus Bürger, 1904, Tierreich, Bd. 20; Takakura, 1898, Zool. Mag. 10, p. 185, fig. 7; Stiasny-Wijnhoff, 1936, Siboga. Exp., XXII, VIII.; Yamaoka, 1940, Jour. Fac. Sci. Hokkaido Univ. ser. 6, Zool., vol. 7, pp. 215–218.

The body is large and broad, about 30 cm in length and 5–10 mm in width. The head is rounded in front, flattend dorso-ventrally, and sharply marked off from the body by lateral constrictions. These lateral constrictions lead to the transverse grooves on both sides of the ventral surface. The proboscis opens by a minute subterminal pit. The mouth opens as a small slit situated far behind the transverse grooves on the ventral surface of the oesophageal region. The oesophageal and intestinal regions are both equally wide and flattend dorso-ventrally. When the oesophageal region becomes swollen, the head is withdrawn into the oesophageal region. The body is dull brown, thickly beset with short irregular brown lines on the dorsal surface of the body. Ocelli are numerous and arranged irregularly on the margin of the head.

Internal structure: In the oesophageal region the cutis is two times as thick as the epithelium, and is composed of an outer layer of glandular tissue and a thicker inner layer of connective tissue, and is clearly distinguished from the outer

longitudinal muscle layer. The outer longitudinal muscle layer is about two times in thickness to the other two muscle layers combined in the oesophageal region. In the intestinal region the inner longitudinal muscle layer becomes extremely thin, being reduced to 2–3 layers of muscle fibres on the lateral sides of the body, while on the dorsal and ventral sides this layer retains its broadness. The cephalic glands are enormously developed. The cephalic glands surrounding the brain on all sides are extended still further backwards into the anterior oesophageal region. The proboscis is short and weak, and is provided with an outer circular and an inner longitudinal muscle layer. The cerebral sense organs are voluminous, and closely united with the posterior lobes of the dorsal brain on the external and ventral surfaces and reach nearly as far as the ventral commisure. At the anterior extremity of each cerebral sense organ, a canal passes obliquelly downwards through the body wall to open into a transverse furrow on the ventro-lateral aspect of the head. The dorsal ganglion greatly exceeds the ventral ganglion in size, and lies somwehat dorso-lateral to the latter. The lateral nerves are bent sharply outward in the region of cerebral sense organs, and run posteriorly along the lateral surface of the body. A median dorsal nerve is found clearly throughout the body. The nephridia are situated in the anterior and middle portions of oesophageal region, with several efferent ducts which pass through the body wall just above the lateral nerve cords, and open on the lateral aspects of the body.

Remarks: The present material agrees in external features with those from Naples (Bürger, 1879) and Misaki (Takakura, 1898). Takakura has not given accounts of the internal structures.

Habitat: One specimen was collected under a stone near the low water mark.

Geographical distribution: Misaki and Fukue, Japan; Naples, the Mediterranean Sea; the Southwest Indian Ocean; the South Pacific Ocean.

Paranemertes incola nov. sp.

The body is fairly long, transparent, 25 cm in length and 3–5 mm in width. The oesophageal region is wider than any other portion, rounded dorsoventrally. The intestinal portion is somewhat flattend dorsoventrally, ending rapidly to a blunted point. The head is rounded in front, wider than the following portion. Two pairs of cephalic grooves are found on the head. The anterior grooves each extend for a very short distance towards the median line on the dorsal surface, while on the ventral surface it takes V-shape with the angle pointed forwards on each side. The posterior grooves on both lateral sides meet each other and take a V-shape with the apex pointed backwards on the dorsal surface, while on the ventral surface they extend forwards for a short distance and soon disappear. The rhynchodeal opening is a small subterminal pit. The colour of the body is anteriorly bright chestnut-brown. The marginal portion is yellow as well as the ventral

surface. The proboscis sheath is found through the integument as a dark brown line. The body has a large number of the transverse rings consisted of very minute dark brown spots on both dorsal and ventral surfaces of the body. (Text-fig. 5).

Internal structure: The proboscis extends posteriorly to about 3/4 the length of the body. The proboscis nerves are 12 in number. The cephalic glands and submuscular glands are moderately developed. A pair of very slender diverticula of the intestinal caecum extends forward a little behind the brain, being situated at both lateral sides of the proboscis sheath. The diverticula of the intestine are very deep and branched off respectively at their distal ends. The cerebral sense organs are very small, situated far in front of the brain. Their cerebral canals open externally on the lateral sides of the snout. The dorsal ganglion of the brain is not distinctly separated from the ventral ganglion in cross section. The nephridia extend from the back of the brain to the anterior portion of the oesophagus. Several blood lacunae are found in front of the brain, besides the brain and the oesophagus. They join into a small commissure at the tip of the snout, and posteriorly they are divided into three main blood vessels, situated under the proboscis sheath or posteriorly above the intestine on each side of the body. The gonads extend throughout all the length of body.

Remarks: The author could not investigate the structure of the proboscis stylets and ocelli but apparently differs from the resembling species, *P. peregrina* (Coe) as followings; (1) the body is chestnut-brown in colour, and have numerous transverse rings consisted of very minute dark brown spots. (2) the proboscis nerves are 12 in number.

Habitat: One specimen was collected under a stone near the low tide mark.

Geographical distribution: Tomioka, Japan.

Amphiporus punctatulus Coe, 1905

Amphiporus punctatulus Coe, 1905, Bull. Mus. Comp. Zool. Harvard, vol. 47, pp. 253–259, pl. 21, figs 129-140; pl. 24, fig. 194; Iwata, 1951, Jour. Fac. Sci. Hokkaido Univ. ser. 6, Zool., vol. 10, pp. 137–138, figs. 1 & 3.

The body is anteriorly narrowed and convex dorsally, rather broad and much flattened in intestinal region, and about 5–10 cm in length and 5 mm in width. The head is sharply pointed in front and demarcated from the body. The cephalic grooves are of remarkably large size and fluted in a very characteristic manner, extending towards the median line for a short distance on the dorsal surface, and on the ventral surface passing forward along the lateral margin of the head and nearly meeting each other just behind the rhynchodeal opening which is situated sub-terminally. The body is dull white or pale yellowish on the dorsal surface of the body and thickly mottled with confluent dark brown blotches and dots which make the ground colour obscure, though these marks are wanting on the ventral

surface. A white median line found on the dorsal surface of the head is especially conspicuous in the anterior part. Ocelli are numerous, fairly large in size, and are arranged in two groups on the head. The anterior groups containing about 20 ocelli are arranged in a row along the lateral margin of the head, but the posterior ones are grouped in an irregular cluster just before the cephalic groove, containing about 2–3 ocelli.

Internal structure: The proboscis is white in colour and its sheath extends nearly to the posterior end of the body. Each of two lateral pouches is provided with 7 accessory stylets. The basis of the central stylets is barrel-shaped, measures 0.093 mm in length and 0.08 mm in width. The central stylet is 0.034 mm in length. The intestinal caecum extends forward only to the posterior ends of the nephridia which are limited between the posterior ends of the cerebral sense organs and the middle portion of the oesophagus. A pair of the efferent nephridial ducts open externally on the ventral surface of the body at the anterior one-thirds of the nephridial extention. The proboscis nerves are 13 in number. The cephalic glands are also well developed on the ventral side of the body at the brain region. The cerebral sense organs are remarkably large, being situated ventrally to the brain. The sense organs increase in size towards the brain and are closely in contact with the ventral sides of the dorsal ganglion, and farther extend backward for a short distance after the disappearance of the latter. The dorso-ventral muscle fibres are well developed in the intestinal region.

Remarks: The present species slightly differs from the Californian form of the same species in the possession of (1) the fluted cephalic grooves, (2) the poor development of the inner circular muscle layer around the rectum. *A. nebulosus* Coe is similar to the present species in the external characters and markings of the body, but quite distinct in the internal characters. *A. angulatus japonicus* also resembles the present species only in the marking of the head.

Habitat: The present specimens are very commonly found under stones near the low water marks.

Geographical distribution: Tomioka, Fukue, Seto, and Simoda, Japan; Isthmus Cave, Catalina Island, California, U. S. A.

Amphiporus formidabilis **Griffin, 1898** (Figs. 15 and 16)

Amphiporus formidabilis Griffin, 1898, p. 211, figs. 21–22; Coe, 1905, pp. 250–252, pl. 17, figs. 101–102, Text-figs. 13, 15, 24, 54.

Amphiporus exilis Coe, 1901, pp. 54–56, pl. 3, fig. 1; pl. 8, fig. 5; pl. 11, fig. 3.

The body is anteriorly convex dorsally, flattend in intestinal region, being about 10–15 cm in length and 2 mm in width. The head is expanded in fan shape, and demarcated from the body. The body is rose-pink in colour. The microscopical minute brown spots are sprinkled on whole surface of the body. Often the anterior portion of the body is tinged with vermilion and the posterior portion

brown owing to the contents of the intestine. The brain and the lateral nerve cords are distinctly reddish in colour. The proboscis and its sheath are found through the integument. The rhynchodeal opening is situated at the ventral side of the tip of the head. The hind end of the body is bluntly pointed. The cephalic groove encircles the neck of the head in V-shape on the dorsal surface, while on the ventral surface in a straight line. An another pair of grooves are situated a little anterior to the broadest portion of the head. Each of them does not meet each other on both dorsal and ventral surfaces. Ocelli are about 50-70 in number and are arranged in two clusters on each side of the head. The anterior marginal cluster is situated on each antero-lateral border of the head and the posterior cerebral cluster is found just in front of the brain. These four groups are separated from each other.

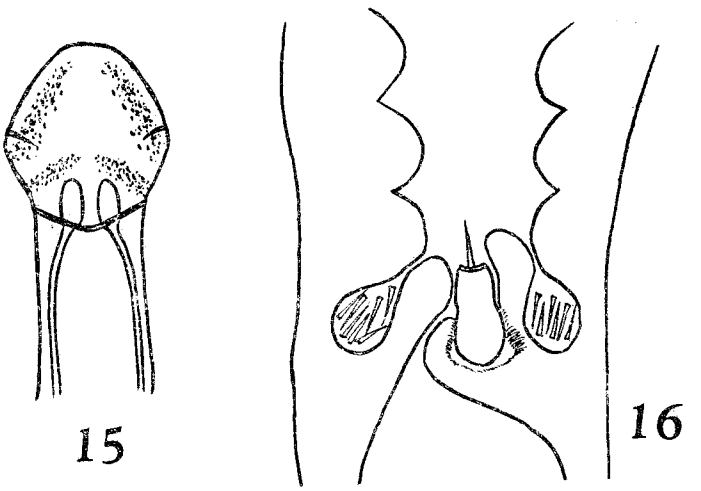

Fig. 15. *Amphiporus formidabilis*, showing anterior portion of dorsal surface. **Fig. 16.** *Amphiporus formidabilis*, showing stylet apparatus of proboscis.

Internal structure: The proboscis sheath extends nearly to the hind end of the body. The lateral pouches of the accesory stylets are 6 in number, each containing 1, 2 or 3 stylets. The central stylet, being 0.24 mm long and 0.12 mm wide. The central stylet is 0.11 mm in length. The proboscis nerves are 18 in number. The cephalic glands and the sub-muscular glands are fairly developed. The nephridia extend from a short distance behind the brain to the posterior portion of the oesophagus. Numerous efferent ducts open externally on the latero-ventral

aspects of the body throughout the whole extension of the nephridia. The intestinal caeca extend forward near the hind end of the brain. The cerebral sense organs are large and situated far in front of the brain. The dorsal ganglion is very small, but the ventral one is remarkably large.

Remarks: The present specimens are slightly different from the Alaskan and Californian specimens in the following points; (1) the body is somewhat smaller in size and is more reddish in colour, (2) ocelli are few in number and its posterior groups do not meet each other on the median line, (3) the efferent nephridial ducts open only latero-ventral aspects of the body.

Habitat: The present species is numerously found under stones on sandy beachs.

Geographical distribution: Tomioka, Fukue, Simoda, and Kominato, Japan; Pacific coasts of America, Alaska and the Aleutian Islands.

Tetrastemma insolens nov. sp. (Figs. 17 and 18)

The body is very small, slender, 2–3 cm in length and 1–2 mm in width. The head is somewhat wider than the posterior portion of the body at the region of the oblique cephalic grooves and tapers to a blunt end. The body is rose-pink in colour. The head is yellow with a rounded rectangular marking of dark brown on the dorsal surface. The lateral nerves and the brain are found through the integument. Ocelli are six in number, of which two are large, situated at the inside of anterior corners of the dark marking, while four of them are small fragmented spots, situated at the inside and outside of posterior corners of it. The cephalic grooves encircle the neck in V-shape on the dorsal surface, while the ventral surface in a straight line. An another pair of grooves are situated a little posterior to the dorsal marking of the head. Each of them does not meet each other on both dorsal and ventral surfaces. The rhynchodeal opening is subterminal pit situated at the tip of the head.

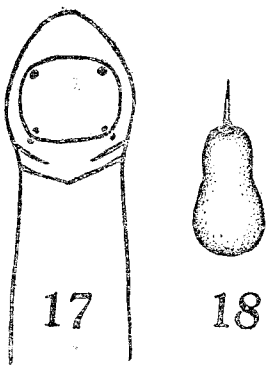

Fig. 17. *Tetrastemma insolens*, showing anterior portion of dorsal surface.
Fig. 18. *Tetrastemma isnolens*, showing central stylet.

Internal structure: The proboscis sheath extends to posterior end of the body. The proboscis is provided with 10 conspicuous nerves. Each of two lateral pouches is provided with 3 accessory stylets. The basis of the ventral stylets is of the swollen form, being 0.12 mm in length and 0.07 mm in width. The central stylet is a little more than the half length of the basis, being 0.05 mm in length. The cephalic glands are fairly well developed in front of the brain and

never extend beyond the brain. The submuscular glands are wanting. The rhynchodaeum is remarkably short. The intestinal caeca extend forward to the dorsal brain lobes, uniting posteriorly beneath the stomach to form a broad median caecum. Nephridial canals are of large size and are situated both above and below the lateral nerves immediately posterior to the brain region. A single pair of large efferent ducts open on the ventro-lateral surface of the body on a little posterior of the middle portion of the nephridia. The cerebral sense organs are situated ventrally at some distance in front of brain.

Remarks: The present species is approximately identical to *T. nigrogrons* (Coe) but differs in following points; there are not the varieties of these species in external features as Coe (1905) described.; these have the characteristic arrangements of the ocelli.

Habitat: The specimens are commonly found under stones between the tide marks.

Geographical distribution: Tomioka and Fukue, Japan.

Abbreviations

bl, blood lacuna. bm, basement membrane. br, brain. cc, cerebral canal. of, horizontal cephalic furrow. cso, cerebral sense organ. cu, cutis. dc, dorsal commissure. dg, dorsal ganglion. dn, dorsal nerve. dv, dorsal blood vessel. eg, eosinophilic gland cell. ep, epithelium. ilm, inner longitudinal muscle layer. lbv, lateral blood vessel. ln, lateral nerve cord. mo, mouth opening. nd, efferent nephridial duct. nx, nerve plexus. oe, oesophagus. on, oesophageal nerve. olm, outer longitudiual muscle layer. p, proboscis. par, parenchyma. pn, proboscis nerve. rc, rhynchocoel. vc, ventral commissure. vg, ventral ganglion.

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