

REPORT OF THE BIOLOGICAL SURVEY OF MUTSU BAY  
34. THE POLYCLADA OF MUTSU BAY<sup>1)</sup>

By

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(With Plates VIII-IX and 10 text-figures)

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The material of the polyclad turbellarians dealt with in the present study is chiefly the collection made by the biological survey of Mutsu Bay which was carried out by the Tôhoku Imperial University, and is partly my own collection made during a short stay at Asamusi in June, 1938. Of the 13 species listed below, 5 are apparently new to science.

ACOTYLEA

Family Stylochidae

1. *Stylochus aomori* KATO

Family Cryptocelidae

2. *Cryptocelis orientalis* sp. nov.

Family Leptoplanidae

3. *Notoplana humilis* (STIMPSON)

4. *Stylochoplana pusilla* BOCK

5. *Hoploplana deanna* sp. nov.

Family Planoceridae

6. *Planocera reticulata* (STIMPSON)

Family Diplosolenidae

7. *Pseudostylochus intermedius* sp. nov.

8. *Pseudostylochus aino* KATO

9. *Pseudostylochus takeshitai* YERI et KABURAKI

COTYLEA

Family Pseudoceridae

10. *Pseudoceros asamusiensis* sp. nov.

<sup>1)</sup> Contribution from the Marine Biological Station, Asamusi, Aomori-ken, No. 164.

## Family Eureleptidae

11. *Cycloporus papillosus* (M. Sars)
12. *Stylostomum hozawai* sp. nov.

## Family Prosthiostomidae

13. *Prosthiostomum auratum* Kato

Before proceeding further I should like to express sincere acknowledgements to Dr. S. HÔZAWA, Professor of the Tôhoku Imperial University, for his kindness in placing the valuable material at my disposal for study. My deepest thanks are also due to Dr. S. KOKUBO and Mr. N. ABE for their kindness shown me during my stay at Asamusi.

1. *Stylochus aomori* Kato

*Stylochus aomori*: Kato, 1937 c, pp. 39-41.

This planarian is commonly found creeping on the muddy beach at Asadokoro near Asamusi at low tide, and is rarely found in the burrow of *Callianassa* sp. I happened to observe the animal moving at about the rate of 30 cm per minute on the beach in the day time in June.

The body is oval in shape, usually attaining 30 mm in length and 20 mm in breadth. The ground colour of the dorsal surface is light brown, over which are uniformly scattered numerous dark green patches and spots. A pair of slender nuchal tentacles are situated at about one-sixth the length of the body from the front.

2. *Cryptocelis orientalis* sp. nov.

(Pl. VIII, Figs. 1, 2; Text-figs. 1, 2)<sup>1)</sup>

A single specimen of this new species was collected at Moura-sima by Prof. S. HÔZAWA on July 11, 1926.

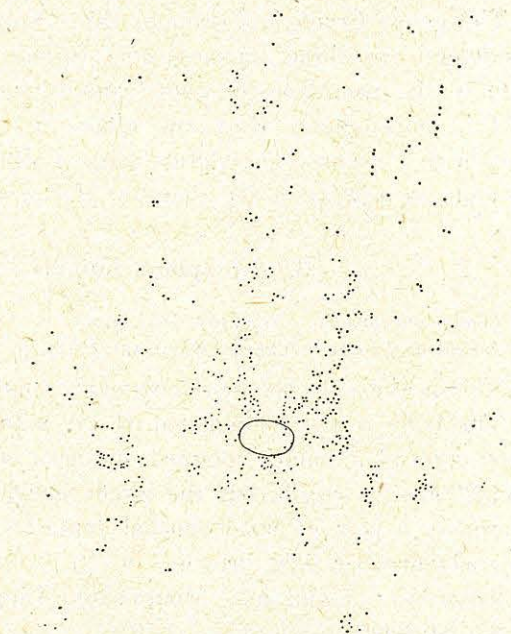
In the preserved state the body is thick, of a leaf-like shape with broadly rounded anterior and posterior ends. It measures 30 mm long by 20 mm broad, and the colour is uniformly brown.

At the rear limit of the first sixth of the body-length a small brain is located on the middle line. A large number of minute ocelli are distributed in the frontal part of the body, more densely scattered around the brain. Tentacles are totally lacking. The tentacular groups of eyes are scarcely distinguishable from the cerebral ocelli in the available specimen.

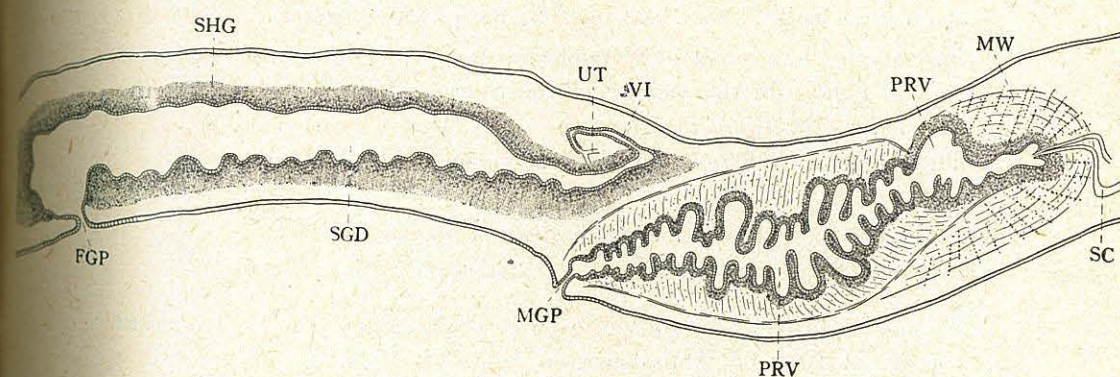
<sup>1)</sup>For abbreviations in this and subsequent figures see p. 153.

Marginal eyes are arranged in rows along the whole dorsal margin, being distributed more densely at the anterior end. The mouth is situated at about the centre of the body, and the plicated pharynx occupies the middle third of the body-length.

Immediately behind the posterior end of the pharyngeal sheath there is a small male genital pore, which passes through the short antrum into the characteristic large prostate vesicle with a thick muscular envelope. The latter vesicle is, as usual, composed of two parts; the distal part, which is continuous with the antrum, and which is a long duct with numerous deep folds, provided with the outer thick layer of sub-epithelial gland cells; the proximal part is an irregularly ovoid body, into which is discharged a large quantity of eosinophilous secretion granules from the extracapsular glands. A pair of seminal canals pierce the



Text-fig. 1. *Cryptocelis orientalis*; arrangement of eye-spots.  $\times 20$ .



Text-fig. 2. *Cryptocelis orientalis*; sagittal section through genital organs.  $\times 17$ .

thick muscular wall to open into that proximal part of the prostate at about the middle point.

The female gonopore is at some distance from the male one, being situated a little behind the level of the last sixth of the body-length. The general plan of the female organs is quite in accord with that of other species of the genus.

The genus *Cryptocelis* contains three European species (*alba*, *compacta*, *glandulata*) and three Japanese ones (*ijimai*, *amakusaensis*, *littoralis*); of these species the planarian under consideration resembles *littoralis* (KATO, 1937 f), more closely than any others in the general structure of the reproductive organs, but differs from it distinctly in the arrangement of eye-spots as well as in the shape of the prostate vesicle.

### 3. *Notoplana humilis* (STIMPSON)

*Leptoplana humilis*: STIMPSON, 1857, p. 9.

*Notoplana humilis*: YERI et KABURAKI, 1918, pp. 11-13.

This is the polyclad most commonly found on the coasts of Japan.

The body is of an elongated shape with a broadly rounded anterior extremity and a bluntly pointed posterior end. It measures usually less than 20 mm in length, but the larger individuals attain 30 mm in length. There are a pair of small nuchal tentacles. The colour of the body is generally grey or light brown.

*Localities*: Gomi-sima, Moura-sima, Tappi-sima, Urata, neighbourhood of the Station.

### 4. *Stylochoplana pusilla* BOCK

*Stylochoplana pusilla*: BOCK, 1924, pp. 1-24; KATO, 1934, pp. 124-125.

This species is a small parasitic form, found in the mantle cavity of *Monodonta labio*. In the vicinity of the Station it also harbours in the mantle cavity of *Cellana toreuma*.

*Distribution in Japan*: Susaki near Simoda, Misaki, Asamusi.

### 5. *Hoploplana deanna* sp. nov.

(Pl. VIII, Figs. 3, 4; Text-figs. 3, 4)

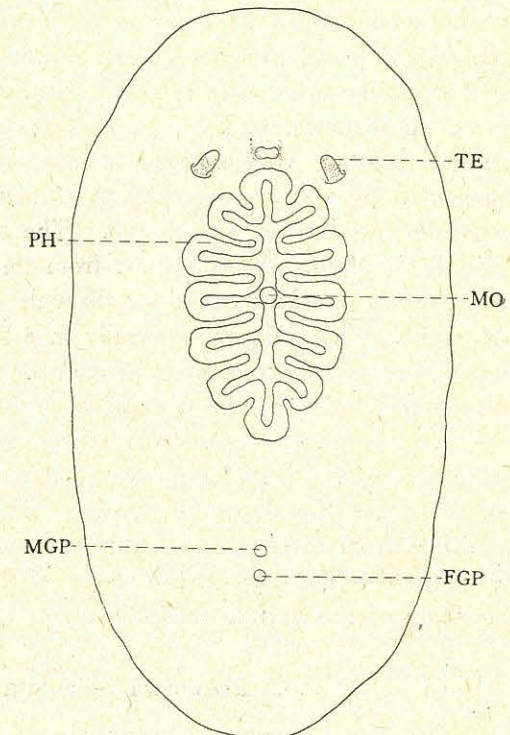
A single specimen of this species was obtained by Dr. S. TAKATUKI at a depth of 10 m off Aburakawa on Sept. 11, 1926.

The body is rather thick, elongated oval in shape, and the anterior

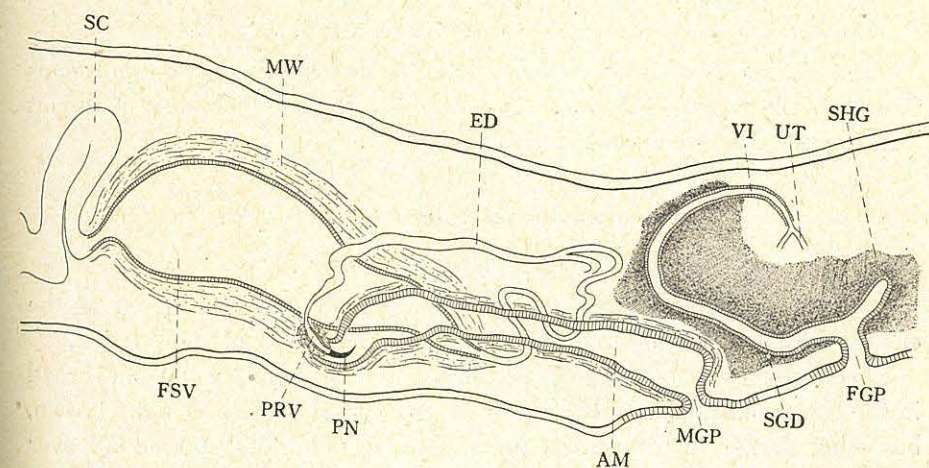
end is more broadly rounded than the posterior. It measures 14 mm long by 6 mm broad. The colour of the body in the preserved state is a uniformly brown. A pair of long, slender tentacles lie a little anterior to the level of the first quarter of the body.

There are a large number of ocelli in the interior of the tentacles. Slightly in front of the level of the tentacles is situated a small brain, on either side of which are arranged a certain number of cerebral eye-spots. The mouth is placed sub-centrally, and the plicated pharynx is very large.

Proceeding forward from the hind part of the body, the seminal canals turn backwards at the level of the mouth, and each dilates into



Text-fig. 3. *Hoploplana deanna*.  $\times 7$ .



Text-fig. 4. *Hoploplana deanna*; sagittal section through genital organs.  $\times 55$ .

a large false seminal vesicle directly behind the posterior end of the pharyngeal chamber. The latter vesicle is of a spindle-shape, provided with a well-developed muscular wall. From its distal end arises a narrow duct, which follows a tortuous course inwards and backwards uniting with the duct of the other side to form an ejaculatory duct. This runs forward for a long distance, and curves postero-ventrally to merge into a small pyriform prostate vesicle, lying at the base of the penis. The penis is represented by a slender, curved stylet with a sharply pointed end, and opens into the antrum masculinum. The antrum is wide and deep, and vertically disposed. A little apart from the male genital pore, there is a female aperture, which continues through the short antrum to the shell gland duct. This duct runs dorsally in a looping course to lead into the vagina interna, which receives a pair of uteri. The genital pores lie between the last fifth and sixth divisions of the body-length.

There have been recorded 7 species of *Hoploplana*, i. e., *grubei*, *inquilina*, *insignis*, *papillosa*, *ornata*, *villosa* and *cupida*; of these the last three are the Japanese species. The present worm is easily distinguished from these species externally in the rather elongated shape of the body, and internally in the shape of the penis, and in the vertical disposition of the antrum masculinum.

#### 6. *Planocera reticulata* (STIMPSON)

*Stylochus reticulatus*: STIMPSON, 1855, p. 381.

*Stylochoplana reticulata*: STIMPSON, 1857, p. 11.

*Planocera reticulata*: LANG, 1884, p. 445.

*Planocera reticulata* (STIMPSON): YERI et KABURAKI, 1918, pp. 19-22.

This is, as *Notoplana humilis*, one of the most common polyelads found on the coasts of Japan. A large number of them are found at Yuno-sima. Multi-tentacular forms also occur.

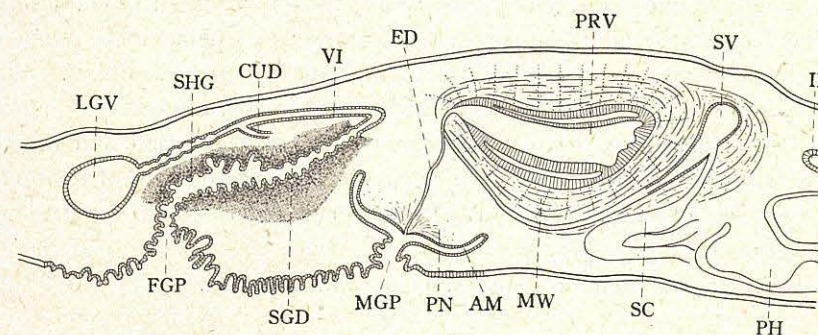
#### 7. *Pseudostylochus intermedius* sp. nov.

(Pl. VIII, Figs. 5, 6; Text-fig. 5)

Several examples of this new species were obtained by myself at the eastern beach of Yuno-sima and in the neighbourhood of the Station.

The body is oval in form, measuring 40 mm long by 20 mm broad in the larger individuals. The colour of the dorsal surface is light brown, becoming darker in the central parts, and is uniformly spotted all over with small brown and darkish green spots.

A pair of nuchal tentacles lie at a distance of about one-fifth the body-length from the anterior end. The tentacular and cerebral eyes are arranged in the manner shown in Plate VIII, Fig. 5. The position of the mouth is nearly in the middle of the body and leads into the pharyngeal chamber, which encloses the elongated and plicated pharynx.



Text-fig. 5. *Pseudostylochus intermedius*; sagittal section through genital organs  $\times 23$ .

Structurally with regard to the genital organs, the present specimen agrees well with other species of the genus.

The genus *Pseudostylochus* contains 13 species, which are divided into two groups by the existence or absence of the sucking structure around the female genital pore. The group A (no sucking structure) includes *obscurus*, *takeshitai*, *fulvus*, *fuscoviridis*, *elongatus* and *longipenis*; the group B (with sucking structure) includes *okudai*, *stimpsoni*, *aino*, *edurus*, *maculatus*, *meridialis* and *nationalis*. Among the species contained in group B, *stimpsoni*, *edurus* and *maculatus* have the male genital pore lying at the centre of the antrum, while in the remaining species it opens outside near the posterior portion of the antrum. This flatworm, therefore, belongs to the *stimpsoni*-group, and is clearly distinguished from the allied species by the shape and position of the prostate vesicle.

#### 8. *Pseudostylochus aino* KATO

*Pseudostylochus aino*: KATO, 1937 e, pp. 129-130; 1939, pp. 75-76.

A single specimen was collected by myself at Yuno-sima.

In the external appearance this species closely resembles *Pseudostylochus intermedius* mihi, but differs markedly from it in the minute structure of the reproductive organs. The body in life is of an oval shape, the

posterior end being a little narrower than the anterior.

*Distribution in Japan:* Muroran, Onagawa, Asamusi.

#### 9. *Pseudostylochus takeshitai* YERI et KABURAKI

*Pseudostylochus takeshitai:* YERI et KABURAKI, 1918, pp. 26-28; KATO, 1939, pp. 74-75.

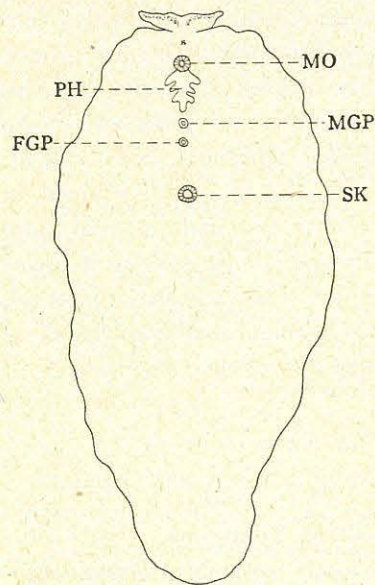
A single example of this species was obtained by myself at Gomi-sima. The body is broadly elongated, the anterior end being more rounded than the posterior. It measures 25 mm long by 10 mm broad. The colour of the dorsal surface is buff with minute brown spots, and darker along the median line. The nuchal tentacles are very small and bluntly conical, situated at about the hind border of the first quarter of the body. The structure of the genital organs has been described in detail in my last paper.

*Distribution in Japan:* Misaki, Onagawa, Asamusi.

#### 10. *Pseudoceros asamusiensis* sp. nov.

(Pl. IX, Figs. 4-6; Text-figs. 6, 7)

The collection contains a large specimen of *Pseudoceros*, which represents a new species. It was obtained by Dr. S. TAKATUKI by dredging among the sea-weeds between Yuno-sima and Benten-sima on May 26, 1926.

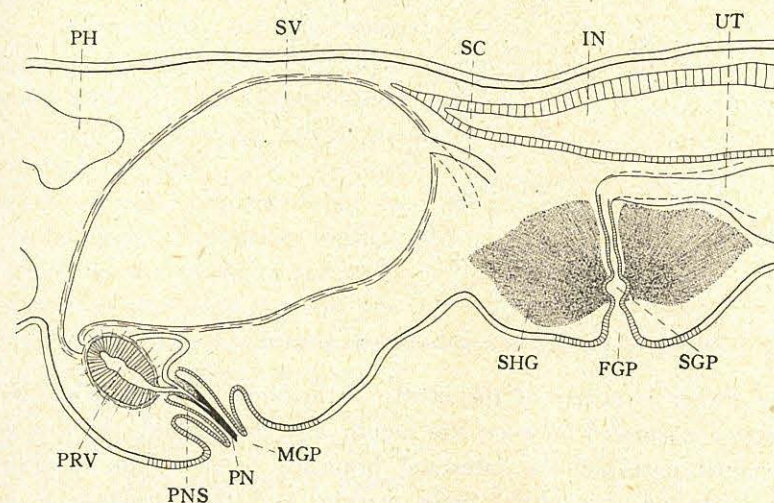


Text-fig. 6. *Pseudoceros asamusiensis*.  $\times 2/3$ .

The body is leaf-like, elongated oval in shape with very frilled margin, and the anterior end forms a pair of prominent marginal tentacles, over which are scattered numerous ocelli. On the median line and near the base of the tentacles, there is a cluster of cerebral eyes with a couple of ventral ocelli. The body, in the preserved state, measures about 10 mm in length. The colour has totally faded.

The mouth is placed just behind the brain, and leads into the lobed pharyngeal chamber. The intestinal branches finely anastomose. The sucker lies at the posterior end of the

first third of the body-length. Between the rear end of the pharyngeal chamber and the sucker, there are a male and a female genital pore. The principal structure of the reproductive organs is similar to that of other *Pseudoceros*.



Text-fig. 7. *Pseudoceros asamusiensis*; sagittal section through genital organs.  $\times 17$ .

The genus *Pseudoceros* contains a large number of species recorded from various localities all over the world, and of these 14 are Japanese species. This planarian differs from the other members of the genus in the arrangement of eye-spots, as well as in the shape of the marginal tentacles.

#### 11. *Cycloporus papillosus* (M. SARS)

(Text-fig. 8)

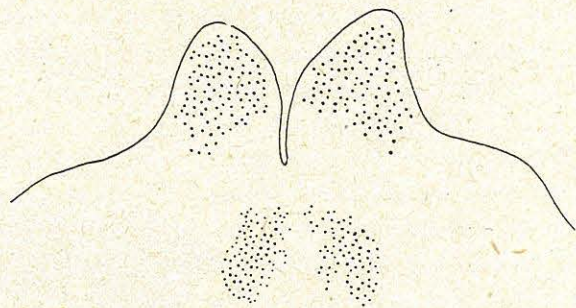
*Cycloporus papillosus:* LANG, 1884, pp. 568-571.

*Cycloporus papillosus* (M. SARS): BOCK, 1913, pp. 262-264; YERI et KABURAKI, 1918, pp. 40-41; KATO, 1937 a, pp. 229-230.

Five specimens referable to *Cycloporus papillosus* var. *misakiensis* were found by myself on compound ascidians at Gomi-sima.

The body is oval in shape, provided with a pair of rudimentary marginal tentacles at the anterior end of the body. The larger specimens measure 20 mm in length. The colour of the body is fairly variable, but usually ochraceous, flecked with numerous russet spots. The tentacular

eyes are distributed at the base of each marginal tentacle, and cerebral eyes are arranged in two distinct groups over the brain region. The number of ocelli is more abundant in the present specimens than in those from the southern regions. The mouth lies immediately behind the brain,



Text-fig. 8. *Cycloporus papillosus*; arrangement of eye-spots.  $\times 14$ .

and the sucker is nearly at the centre of the body. The male and female gonopores are situated between the mouth and the sucker. In this genus the terminal parts of the intestinal branches open to the exterior by minute pores on the lateral body margin, and this structure is easily recognized under a lens in the living state of the animal.

#### 12. *Stylostomum hozawai* sp. nov.

(Pl. IX, Figs. 1-3; Text-figs. 9, 10)

This new species is based on two specimens collected by myself at Gomi-sima on a certain orange-coloured compound ascidian between tide-marks on June 15, 1938.

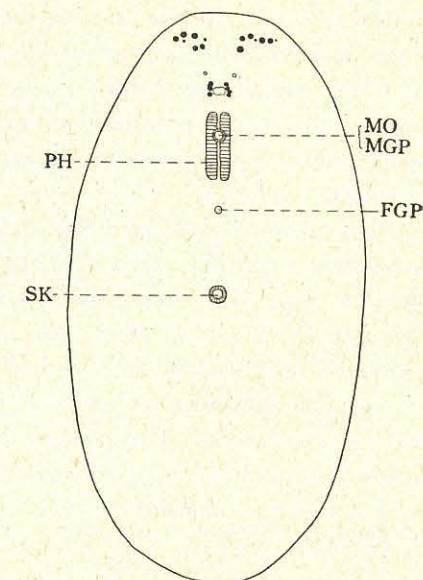
The body in life is elongated oval in form with broadly rounded ends, measuring 6 mm long by 3 mm broad. The translucent body appears to be orange in colour owing to the contents of the finely branched intestine. Judging from the similarity of colouration, this worm seems to obtain nourishment from the said ascidian.

This worm has no recognizable marginal tentacles, while all other known members of the genus are provided with them. However, at the normal position of the tentacles are present a few eye-spots on either side of the midline. A small brain lies at the posterior end of the first seventh division of the body, and on each side of the brain are arranged the cerebral eye-spots with a pair of ventral ocelli. The dorsal epidermis is three times as high as the ventral one. They are composed of ciliated

columnar cells, which contain a large amount of rhabdites and other eosinophilous secretions.

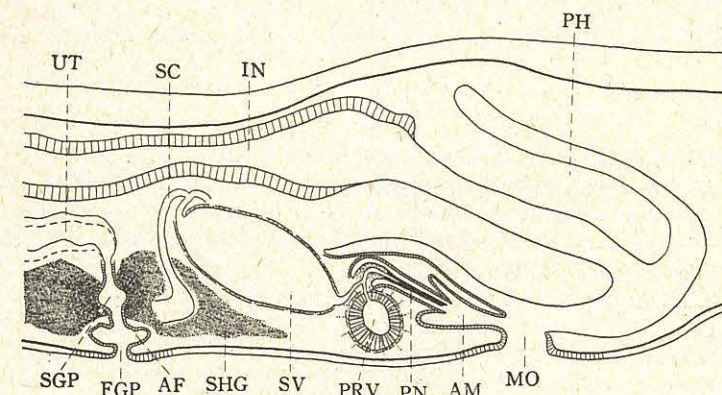
A little behind the brain lies a pharyngeal chamber having a simple pharynx represented by a cylindrical tube. The mouth and the male genital pore communicate with a common atrium, which opens outside close behind the anterior end of the pharyngeal chamber. The intestinal branches are finely bifurcated, but do not anastomose. The sucker is situated nearly in the middle of the body.

A pair of the seminal canals proceed forward from the hinder part of the body, and a little in front of the level of the female gonopore they turn medially to unite into a single duct. This immediately opens into a large elongated seminal vesicle



Text-fig. 9. *Stylostomum hozawai*.  $\times 22$ .

containing a mass of spermatozoa. Springing from the anterior end of the seminal vesicle, the ejaculatory duct soon unites with the duct of the prostate vesicle at the base of the penis, and makes its way at the pointed penial stylet into a deep and long penis sheath. The antrum masculinum, as mentioned above, opens



Text-fig. 10. *Stylostomum hozawai*; sagittal section through genital organs.  $\times 90$ .

outside with the mouth. The prostate vesicle is almost elliptical in shape, provided with numerous extracapsular glands and a thin muscular wall. It lies ventrally to the seminal vesicle, while in all other species of the genus it is dorsally disposed.

Close behind the mouth, there is a female gonopore which leads upwards into a large antrum femininum; this passes into the shell gland pouch supplied with a large quantity of a shell secretion. The uteri are expanded with ova.

The genus *Stylostomum* has hitherto included three valid species viz.: *S. ellipse* (DALYELL) (BOCK, 1913) from Europe, *S. lentum* HEATH et MCGREGOR (1912) from the Pacific coast of North America and *S. frigidum* BOCK (1931) from the Indian Ocean. But the species under consideration is clearly distinguished from these three forms by the absence of marginal tentacles, as well as by the smaller number of the tentacular and cerebral ocelli. The position of the prostate vesicle is also a characteristic feature.

I take great pleasure in naming this species in honour of Professor S. HÔZAWA.

### 13. *Prosthiostomum auratum* KATO

*Prosthiostomum auratum*: KATO, 1937 f, pp. 363-364; 1938 b, p. 589.

Several specimens were collected by myself at Yuno-sima, and a single example at Urata by Dr. S. TAKATUKI on July 13, 1926.

This is a slender, delicate form, measuring 25 mm long by 4 mm broad in the larger individuals. The colour is uniformly yellow. The sucker is nearly in the central part of the body.

*Distribution in Japan*: Asamusi, Misaki, Susaki, Seto, Tomioka, Nanao.

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#### EXPLANATION OF PLATES

##### ABBREVIATIONS

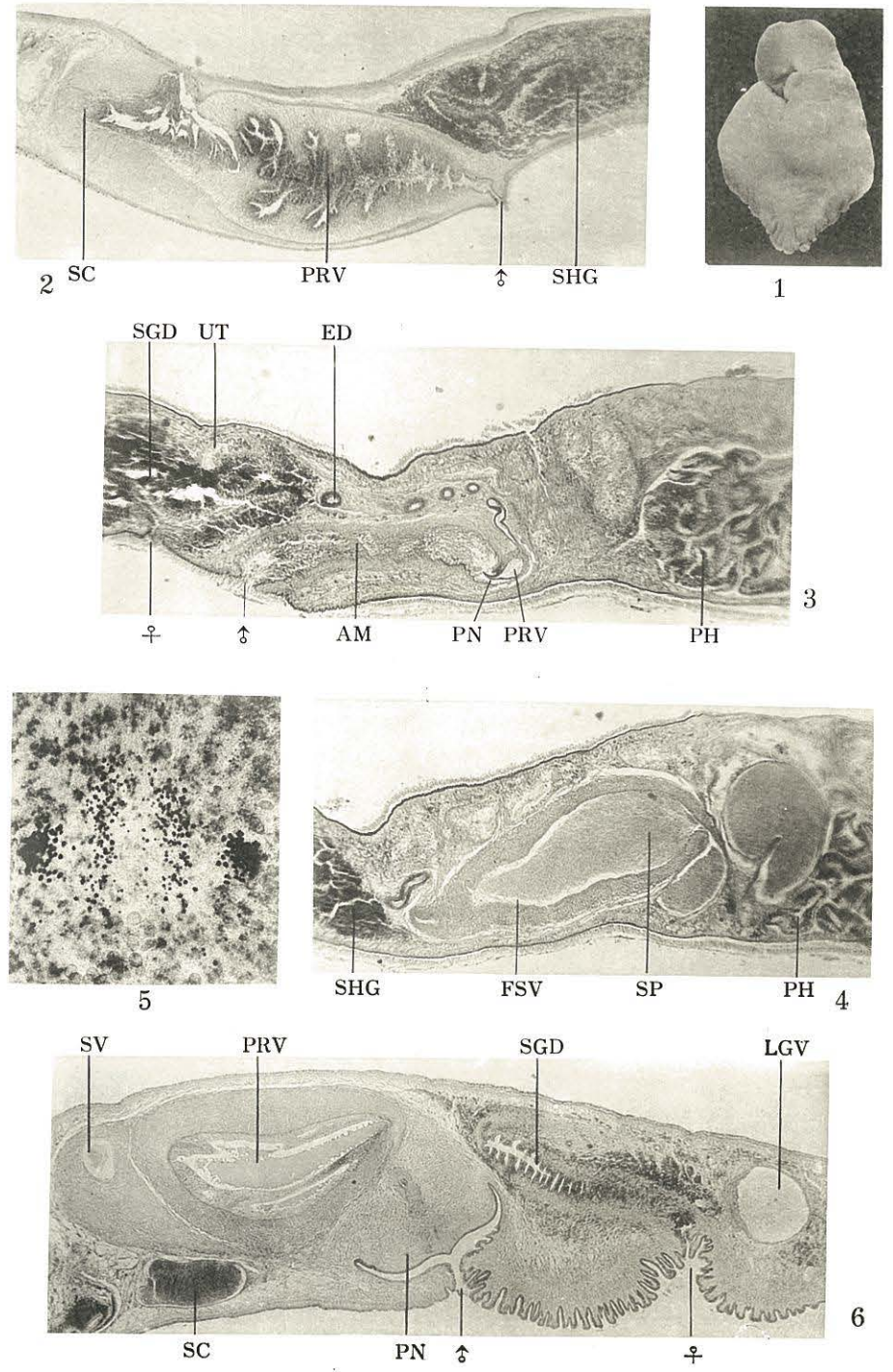
AF antrum femininum; AM antrum masculinum; CUD common uterine duct; ED ejaculatory duct; EP epidermis; FGP female genital pore; FSV false seminal vesicle; IN intestine; LGV LANG's glandular vesicle; MGP male genital pore; MO mouth; MW muscular wall; PH pharynx; PN penis; PNS penis sheath; PRV prostate vesicle; SC seminal canal; SGD shell-gland duct; SGP shell-gland pouch; SHG shell-gland; SK sucker; SP sperm; SV seminal vesicle; TE tentacle; UT uterus; VI vagina interna; ♂ male genital pore; ♀ female genital pore.

##### PLATE VIII

1. *Cryptocelis orientalis* sp. nov. ×1.
2. Ditto, sagittal section through genital organs. ×15.
- 3 and 4. *Hoploplana deanna* sp. nov., sagittal section through genital organs. ×40.
5. *Pseudostylochus intermedius* sp. nov., arrangement of eye-spots. ×15.
6. Ditto, sagittal section through genital organs. ×12.

##### PLATE IX

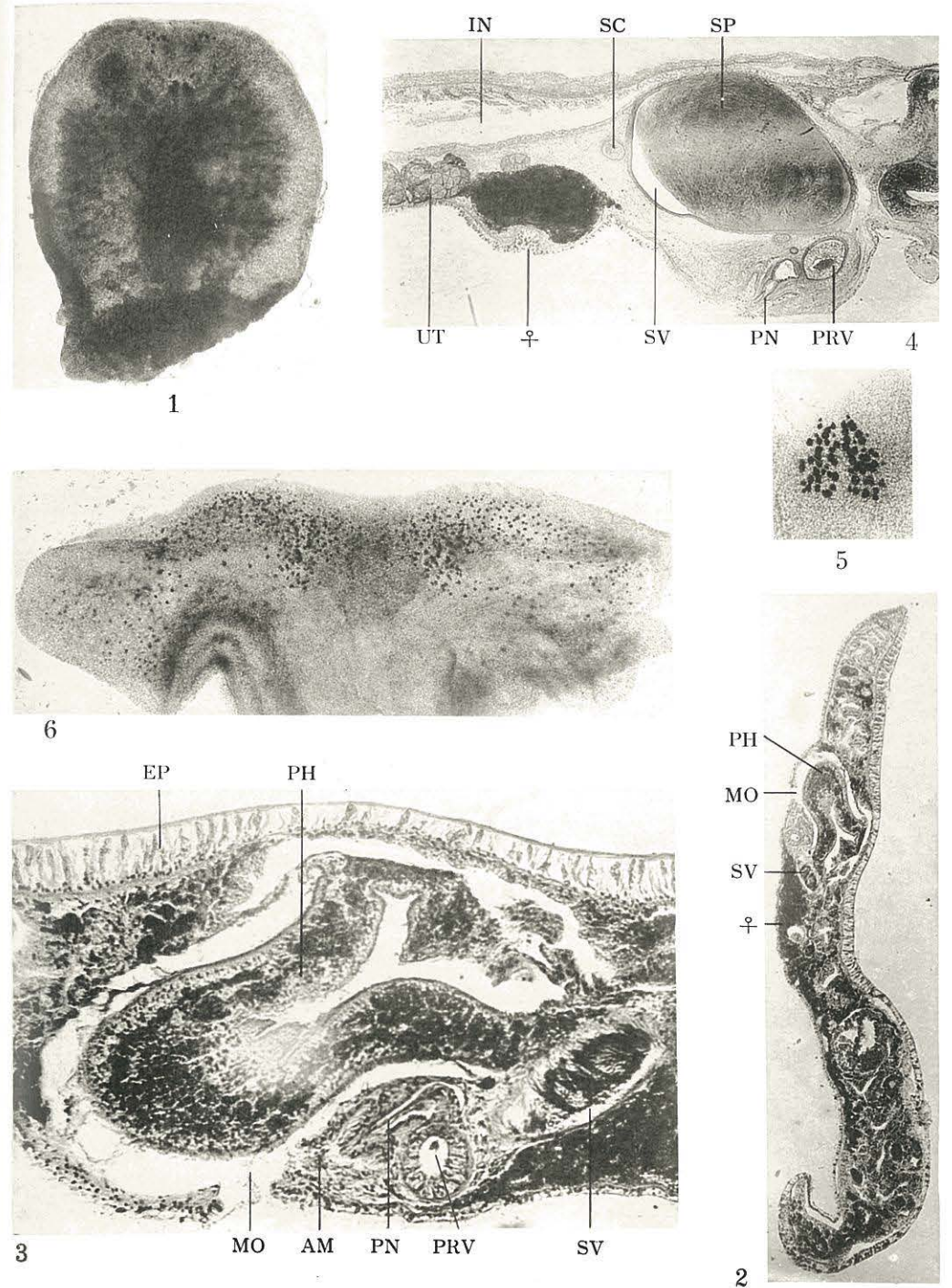
1. *Stylostomum hozawai* sp. nov. ×13.
2. Ditto, sagittal section of the body along the median line. ×30.
3. Ditto, sagittal section through genital organs. ×130.
4. *Pseudoceros asamusiensis* sp. nov., sagittal section through genital organs. ×15.
5. Ditto, cerebral group of eye-spots. ×26.
6. Ditto, marginal tentacles with eye-spots. ×12.



K. Karo photo.

Polyclada of Mutsu Bay.





K. KATO photo.

Polyclada of Mutsu Bay.