

國立清華大學
理科報告

第二種 生物學 心理學

第一卷 第六號

The
SCIENCE REPORTS
of
National Tsing Hua University

Series B: Biological and Psychological Science

Vol. I. No. 6.

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National Tsing Hua University

Peiping, China

Feb. 10, 1934

NOTES ON SOME TURBELLARIANS FROM THE TSING HUA CAMPUS

TSENG-JUI TU

INTRODUCTION

Owing to the wide-spread distribution and biological significance turbellarians have long been selected as one of the most suitable experimental materials both for elementary and advanced studies. For this reason they have been known to a considerable extent in the western countries. But so far as I know, this group of animals has not been touched in China. I began my preliminary observation on this group from the summer in the year 1931. The pressure of other works prevented me from making a very elaborate study. The collecting field has been confined to a very small area and seven species have been carefully observed and identified, two of which seem to the author to be new to science.

The descriptions of the old species have been full and exact and little can be added to them. But for the common interest and easy recognition diagnosis and figures seem to be of great assistance. Moreover, some notes concerning their general behavior have been made. The writer wishes to express his heartfelt thanks to Prof. Shisan Chen, Head of the Department of Biology, Tsing Hua University, under whose supervision and constant encouragement this work was carried on. Acknowledgements are also due to Prof. Tren-Hwang Shaw, Tsing Hua University and Fan Memorial Institute of Biology, and Dr. Li-Sun Tai of Tsing Hua University who have aided me in every way possible.

DESCRIPTION OF LOCALITIES

All the materials included in this paper were collected from the different localities within the Campus of Tsing Hua University. The chief source is the

small artificial pond known as the Lotus Pond. It is bound on the southern side by a tall building and the other three sides by small earthy hills overgrown with pines, elms, willowtrees and various kinds of bushes and grasses. Because of these boundaries, the water of this pond is little affected by winds no matter from which direction. The general outline of the pond is rectangular, covering an area of about 2790 square meters. Its depth varies at different times of the year, having an average of about 1.5 meters or so. It has an inlet and an outlet and is fed by a small stream transversing the Campus from west to east. This small stream has its origin from the Jade Fountain, about two miles from the University Campus.

During the rainy season large amount of water flows in. Then passages are blocked and water is prevented artificially from flowing out. It keeps rather a constant level, only a small amount being lost through evaporation during the dry months. In the warmer season of the year the whole pond is overgrown with a luxuriant abundance of submerged vegetations of which the lower algæ play an important role. Thus, they give the water of the pond a greenish coloration. It affords a good breeding place for both vertebrate and invertebrate inhabitants. Of the vertebrates frogs and fishes are the chief members. The latter may attain to a considerable size of more than two feet in length. The invertebrates consist of various kinds of protozoans, sponges, and rotifers. Free-living nematodes, aquatic earthworms and leeches are also very plentiful. But the most remarkable is the abundance of the crustaceans, such as *Cyclops*, *Cypris*, *Gammarus* and *Palæmon*, aquatic insects and their larvæ and the different kinds of molluscs.

The second locality is a large Shallow Pond situated at the south of the Biology Building, with a small island in its center. This pond is much larger in area than the Lotus Pond. It is planted annually with rice or lotus; thus the water is always kept very shallow, about only one foot or so. On account of this, large vertebrate animals can not thrive in it. These two ponds usually begin to freeze at the beginning of December and the ice melts around the first week of March. The third locality is the artificial spring near the West Compound. The origin of this spring is an artesian well and the temperature remains 15°C. throughout the year. The lack of vegetations in it checks the habitation of rhabdocoeles. However, there are large numbers of planarians crawling about on the shaded surfaces of the submerged solid matters.

COLLECTING OF SAMPLES

The collecting of rhabdocoeles may be made in various ways but the plancton-net serves most effectively. By skimming the net through the surface of water large numbers of them floating at the surface may be obtained. Those crawling among the aquatic plants or on the bottom of the water may be collected by taking up the submerged plants or decaying leaves and stems into any available vessels and washing. The collections thus made are brought into the laboratory and poured into a large glass aquarium, more water is added. After the contents of the aquarium stand for a day or two, the organic matter contained begins to decay. The animals are forced to climb up to the upper part of the aquarium for want of oxygen and thus may easily be collected. On account of the large size and delicacy of the body of triclads they may be picked up by means of a Chinese quill pen. Pieces of meat may be used as a bait. Soon after they are thrown into the water, the animals will crowd around them.

METHOD OF STUDY

The rhabdocoeles may be kept alive in the aquarium for several weeks if some of the original debris and aquatic plants from the natural environment are put in. During this time their behavior can be studied to some extent. As they appear to the naked eyes as whitish threads, a hand lens is very helpful for distinguishing them from one another. For the transparency of the integument most of the internal organs can be made out by examining them under the microscope, especially pressed gently with a cover-glass. During examination the animal was mounted on a culture slide on which it could be kept longer without being distorted. In order to retard their quick movement a kind of woody jelly has been used which is made by submerging a few small pieces of pine wood in boiling water and let the solution cool down. This kind of jelly has perhaps the same advantage as that from the quince seed. For narcotization hydrochloride cocaine has been employed. Specimens fixed, for toto, in Beauchamp's and Schaudinn's fixative and stained with Delafield's hematoxylin and alum-cohineal.

For identification of triclads down to species, sections in the several planes have been made by paraffin method. The behavior of the animal has been studied at the natural environment as well as in the aquarium in the laboratory.

SYSTEMATIC ACCOUNT OF SPECIES

KEY TO SPECIES

- I. Intestine a single straight tube, median in position, with or without lateral diverticula; usually small forms;
- A. Anterior end provided with no proboscis; reproductive organs simple;
1. With a single median excretory tube;
- a. Light refracting organs present;
- (1). Excretory tube opening a little before the posterior end of the body; light refracting organs patelliform, consisting of a number of spherical bodies; body rather stout
 *Stenostomum leucops* (Ant. Dugès)
- (2). Excretory tube opening at the posterior end of the body; light refracting organs patelliform; mouth somewhat rigid; body slender
 *Stenostomum tsinghuaensis*
- b. No light refracting organs; ciliated pits semicircular in outline; mouth provided with a pair of rigid lips
 *Stenostomum brevipharyngium* Kepner and Carter
2. With a pair of excretory tubes running along the lateral sides of the body;
- a. A blind sack before the pharynx; with two reddish eye-spots and two small ciliated pits at the anterior end; posterior end of body pointed; reproduction usually asexual; two to four zooids common
 *Microstomum lineare* (Müller)
- b. Without such a blind sack; eyes kidney-shaped and lying near one another at the anterior part of the pharynx; reproduction usually sexual; genital pores two, the female in front of the male; chitinous copulatory organ large and hook-like; posterior end of body spatulate
 *Macrostomum intermedium*
- B. Anterior end of body provided with a proboscis; body spindle-shaped; genital pores two, the female before the male; chitinous stiletto enclosed in a stalked chitinous tube; bursa copulatrix large and opening to the exterior separately
 *Gyratrix hermaphroditus hermaphroditus* Ehrbg.
- II. Intestine consisting of three main branches, one to the anterior and two to the posterior; auricular appendages triangular in shape; color grayish or reddish brown
 *Planaria gonocephala* Dugès

Stenostomum leucops (Ant. Dugès)

(Pl. I, Fig. 3)

(For Synonymy see von Graff, 1913, p. 19)

Diagnosis: Body slender and contractile, anterior end blunt, posterior tapering to a slender tail occupying about 1/10 of the total length; ciliated pits large, situated about as far from the anterior end of the body as from one another; integument transparent and containing numerous rhabdites evenly distributed over the general surface; mouth opening lying at the posterior part of the bilobed brain, the distance between it and the anterior end of the body being as that of the body width; pharynx very prominent, highly glandular; intestine large, but not extending to the posterior extremity of the body; excretory tube opening at the posterior part of the tail, nearer to the end of the body than to the end of the intestine; two patelliform light refracting organs present, situated at the same level with the mouth and consisting of a number of spherical bodies; reproduction usually by fission; chains of two to three zooids common, measuring about one mm. in length.

Remarks: According to the number of individuals collected from the present localities this is the most abundant of all the species composing the local rhabdocoele fauna. In fact it is cosmopolitan in distribution and has become well known in various parts of the world. The animal is usually very small in size. The largest I have ever collected from the two ponds described measures only 1.6 mm. in length. The width of the body is about 1/10 of the total body length. The animal crawls not so actively as most of the rhabdocoele forms. When moving along the head usually protrudes here and there. It seldom swims if not stimulated and its reaction to light is negative. The food materials are composed chiefly of lower algæ, crustaceans and other minute organisms. The intestine is usually loaded with large amount of food substances, thus causing its coloration. Under unfavorable conditions the food is often seen to be ejected out through the mouth in large masses.

The animal usually consists of two or three zooids, but the largest may be composed of five or even more. The ratio of body width to body length varies with ages, the younger ones being usually broader and the old one more slender. The length of the tail is also increased with the increase of age. On account of this it is very easy to distinguish the younger ones from the older forms.

Stenostomum tsinghuaensis sp. nov.

(Pl. I, Fig. 1)

Diagnosis: Body slender, spindle-shaped, about ten times as long as broad, nearly of equal width; ciliated pits shallow, not very close to the anterior extremity; integument thin and transparent, usually of whitish color; cilia short, those on the anterior and posterior end being a little longer; light refracting organs patelliform, situated a little above the frontal margin of the mouth; mouth small and squarish; pharynx long and slender, occupying about two thirds of the length of the head region; intestine extending almost to the posterior end of the body and with no prominent intestinal glands; excretory tube slender and opening subdermally; chains with two or three fission planes usually measuring more than one mm. in length.

Remarks: The first specimen that came to my notice was collected from the Lotus Pond at 6, July, 1932. Later on none of them had been detected till the beginning of November of the same year. At that time several of them were obtained from the Shallow Pond at the south of the Biology Building. Since then collections were made at certain intervals from both of these two sources but only a few were gained from the former. From this it is clear that open water seems to be more preferable to them. The animal swims very well. Shortly after being collected large numbers of them may be seen swimming very actively at the surface of the water in the aquarium. But at ordinary times they usually crawl about for small crustaceans and other minute organisms as their food substance. This species can easily be distinguished from the others even with the naked eyes by the slender body and active movement. The head is extremely sensitive. It dashes backwards with great rapidity when coming into contact with something dangerous.

Ten specimens have been carefully measured, the largest of which is 2.3 mm. in length. The length and width of the body of the animal varies greatly with the number of zooids. Those consisting of three zooids measure about a little more than one mm. long by 0.1 mm. width and those having only one zooid about 0.6 mm. long by 0.09 mm. width. Thus, the longer ones have the body more slender and the shorter ones stouter. The ratio of the head region to the body length is also very different. The former has its head occupying about one-fourth and the latter nearly one half of the total body length. The pharynx is usually proportional to the length of the head, covering about two thirds of the latter. The shape of the animal is rather definite and the diameter of the body

differs very little. However, both the two extremities taper generally to a more or less pointed tip. Comparatively, the anterior end is less pointed and often rounded and the posterior end slopes gradually to a point. But those forms newly separated from their mother chain have the posterior end blunter.

The integument is thin and transparent and between it and the intestinal wall is a small amount of parenchymatous tissues. Under transmitted light the animal appears to be of yellowish or greenish brown. Owing to the presence of large amount of food materials the intestine is sharply marked from the surrounding tissues. The zooids composing the same chain are different in length, the first being usually the longest. One of the noticeable characteristics is the mouth which is very small and often remains open. It contracts and relaxes only within a small limitation. This is perhaps due to the rigidity of the surrounding muscles.

This species is very similar to *Stenostomum glandiformum* Higley (Higley, 1918, pp. 35-37, fig. 47.) but no conspicuous intestinal glands have been perceived. In general outline this is more slender, spindle-shaped rather than cylindrical. The tip in front of the mouth is longer and the posterior end bends not so abruptly. The light-refracting organs are less prominent and are situated far back from the ciliated pits. Furthermore, the connection between the pharynx and the intestine is not thus far constricted and second and third divisions are often found. From these differences it seems to me that this species is new to science.

***Stenostomum brevipharyngium* Kepner & Carter.**

(Pl. II, Fig. 1)

(Kepner & Carter, 1931, pp. 114-116, fig. 6.)

Diagnosis: Body slender, nearly of equal width, anterior end blunter than the posterior; ciliated pits small but deep, semicircular in outline and situated far back from the anterior tip; mouth large, provided with a pair of muscular lips which seem to be supported by some rigid frame; intestine zigzag in outline and extending far to the posterior end of the body; light-refracting organs absent; excretory tube opening to the outside near the posterior extremity; cilia short but uniform; about 0.5 mm. in length.

Remarks: Only one specimen of this species has been found from the Shallow Pond. The collection was made at 29 December, 1932. It came

out to the surface of the aquarium water after the collection stood for four days in the laboratory. The size is very small, measuring about 0.5 mm. by 0.05 mm. So that the body is about ten times as long as its width. Its action is very active and its sensation highly acute. As most of the rhabdocoele forms it retreats suddenly if something uncomfortable occurs on its way. The most peculiarity of this species is that the two lips of the mouth seem to have definite contour and great rigidity. The zigzag outline of the intestine are also very characteristic as no other related forms have been found to have such a peculiar phenomenon.

The cone-shaped portion of the intestine connecting the pharynx and the intestine proper seems highly glandular and the surrounding muscles are well developed. These are not represented in the figure. Though only one specimen has been found, all the observations were made very attentively. The specimen consists of two zooids the first of which is much longer. The body wall of the animal shows no constriction at the fission plane, though this is manifested clearly by the intestine. The latter narrows down at the fission plane to rather slender tube, thus leaving a large space on either side of it, which is fulfilled with parenchymatous tissues. The animal appears yellowish brown under transmitted light. No reproductive organs have ever been observed in this species.

Microstomum lineare (Müller)

(Pl. II, Fig. 3)

(For Synonymy see von Graff, 1913, pp. 37-38)

Diagnosis: Body slender and cylindrical, anterior end usually blunt, posterior tapering to a slender tail; two small eye-spots present, situated nearer to the anterior extremity; ciliated pits small and rounded but rather deep; the blind sack in front of the pharynx short; mouth large and slit-like when closed; pharynx highly glandular; rhabdites replaced by nematocysts; cilia short and uniform; tail with adhesive papillæ; chains of two to five zooids common, usually about more than two mm. in length.

Remarks: This is the only species of the genus *Microstomum* so far as I can find from the present localities. They abound both in stagnant and slowly running waters and act very sluggishly but skillful in swimming. At usual times the animals creep among the aquatic plants or on the sandy or muddy

bottom of the shallow water ponds or pools. Chains or two or three zooids are very common, of which the first is usually the longest. The largest specimen I have ever found measures 14 mm. in length and consists of 31 zooids.

The color of the animal is usually yellowish or greenish brown. Owing to the power of expansion of the mouth they can swallow their preys larger than themselves. For this reason specimens are often seen in a distorted condition. The constrictions between the zooids are very clear both externally and internally. The nematocysts are easily seen when the animal is stimulated chemically or mechanically. After discharging they appear as fine threads from the surface of the body.

Macrostomum intermedium sp. nov.

(Pl. I, Fig. 2)

Diagnosis: Body rather broad, anterior end rounded, posterior spatulate and provided with adhesive papillæ; sensory hairs present, more numerous on the two extremities; eyes kidney-shaped, nearer to each other than to the corresponding edge of the body, and situated rather back as compared with those of its near relatives; pharynx very prominent, occupying more than $1/7$ of the total body length; intestine with numerous short diverticulæ; testes elongated, ovaries rather short; rhabdites numerous, prominent and having great power of light refracting; vesicula seminalis and vesicula granulorum lying nearly at the same level; chitinous organ large and strongly curved; body generally more than one mm. long.

Remarks: This species is very plentiful in the two ponds within the Tsing Hua Campus. The animal is easily distinguished from the other forms by its broader body and milky color. The body length is usually under two mm. and the width about $1/3$ of the former. Ordinarily, the animal moves along very slowly on its support. It does not swim even when strongly stimulated. The color is usually yellowish but that of the intestine somewhat variable. The animal may be found at any season of the year, only that those collected in summer are usually sexually immature. Consequently, very little traces of the reproductive organs can be observed, even the large, chitinous copulatory organ. The sexual maturity is attained generally in the cold months. Great vitality is shown by them, as they can live in the aquarium for a considerable time after the death of the other aquatic animals and even plants. This means that they can endure great changes in their environment, such as oxygen content and Ph-value.

The peculiarities of this species will be rendered more prominent by comparing it with three other closely related species, namely: *M. appendiculatum*, *M. sensitivum* and *M. viride*. At first glance this species seems to resemble very much the most popular species *M. appendiculatum* but a closer examination will reveal that they differ from one another in many respects. The most remarkable of these lies in the fact that the chitinous copulatory organ of this species has a strong curvature, causing it to assume the shape of a hook, while that of *M. appendiculatum* bends only at right angle or nearly so (von Graff, 1882, Pl. IV, Fig. 9-11). It is very large, being about 1/9 of the total body length. The position of vesicula seminalis and vesicula granulorum is also very attractive. *M. appendiculatum* has these two organs situated one above the other, while those of *M. intermedium* lying nearly at the same level. In addition, the shape and relative situation of the eyes are also far from similar, as they are of kidney-shape and placed a little back. The chitinous copulatory organ of *M. viride* seems to be of the same general appearance with that of *M. intermedium*. But the former has it shaped like S rather than bending on the same direction. Moreover, the vesicula seminalis and vesicula granulorum of *M. viride* fuse together nearly at their whole length and those of the former only connected by a narrow canal. In *M. sensitivum* the position of vesicula seminalis and vesicula granulorum is similar to that of *M. intermedium* but they communicate with each other by a rather broad tube and the chitinous copulatory organ bends weakly. Because *M. intermedium* stands between the above three well known species, hence the name.

***Gyratrix hermaphroditus hermaphroditus* Ehrbg.**

(Pl. II, Fig. 2)

(For Synonymy see von Graff, 1913, pp. 345-346)

Diagnosis: Body spindle-shaped, extremely contractile; mostly about one mm. in length; anterior end of body pointed, posterior much blunter; pigments and rhabdites absent, so that the body of the animal appearing very transparent; proboscis very prominent, enclosed in a proboscis-sheath which opens at the anterior extremity of the body; two black eye-spots present, situated at the posterior part of the proboscis and very close to one another; pharynx rosette-like, lying a little before the middle of the body and connected to the intestine by a short oesophagus; two coiled excretory tubes running along the lateral sides and opening at the posterior part of the body; two genital aper-

tures present, the male at the posterior extremity and the female near the anterior part of the bursa copulatrix; male genital organs consisting of a single compact testis at the left side of the body, which is followed by the vas deferens and the seminal vesicle leading to the genital canal and a chitinous stiletto connected with the vesicula granulorum; the stiletto being enclosed in a stiletto-sheath which has a prominent stalk; female genital organs being the cylindrical ovary, the large vitellarium at the right side of the body, the uterus containing usually one or two egg-capsules and the large accessory structure, the bursa copulatrix, which opens separately to the exterior at the dorsal surface; animals usually about one mm. long.

Remarks: The first sample of this species was collected from the Lotus Pond in October, 1932. Later on collections were made every few days from the same pond but none were encountered. In November it was discovered that they abound in the Shallow Pond at the south of the Biology Building. At the time of collecting most of the plant life had died away, only the decaying portions left behind. They were found very numerous from November to December. This shows that they prefer open water to the shaded places. The animal can be observed to some extent in the field. They appear as small whitish dots gliding very actively at the surface of the water or on support of some kind. By continual observation much of their activities can be made out, especially with aid of a small magnifying glass.

Because of the spindle-shaped body the animal swims very well, usually with a rotating movement. Soon after being collected they get out of the bottom sediments and float here and there near the surface of the aquarium water. At ordinary times the anterior end of the body is much more slender than the posterior. But when stimulated, it may contract suddenly into a ball. It seems to me not quite true that the power of contraction of this animal is only manifested in a longitudinal direction as described by Higley (Higley, 1918, p. 79). The animal usually goes on a straight direction, scarcely feeling this way and that as most of its relatives do.

Its unceasing movement and contractions make it very difficult to take exact measurement. However, a number of them have been measured, mostly being a little more than one mm. The width of the body is usually about $1/6.5$ of the total body length, the broadest part being at the posterior. They were usually tinted greenish yellow. This is perhaps due to the contents of the

intestine, as the integument is entirely free from pigments. The transparency of the integument renders the internal organs clearly distinguishable. The cilia on the general surface of the body are short and uniform.

The length of the proboscis is variable but generally about $1/4$ of the body length. According to the opinion of Higley (1918, p. 80) the proboscis is not protrusible but during my observation two or three of them have been seen to thrust out their proboscis. After protrusion it appears as a whitish fine line. When under examination the animals were placed on a slide and covered with a cover-glass. Its protrusion may perhaps be due to the unfavorableness of the condition in which they were examined. The reproductive system is very complicated, which has been worked out carefully by Flory and Showalter (1930, pp. 66-71). The posterior portion of the chitinous stiletto can be thrust out through the male genital opening when the animal contracts. The uterus is often made remarkable by two or three egg-capsules contained in it. Other parts of the reproductive system are also very prominent only that the testis is not so easy to be made out. The latter is usually more or less shadowed by the contents of the intestine and the color of it is very similar to that of the surrounding tissues.

***Planaria gonocephala* Duges**

(Pl III, Figs. 1-2)

(For Synonymy see Kaburaki, 1922, p. 12)

Diagnosis: Head triangular in shape, with one angle pointed forward and the other two laterally, forming two auricular appendages; posterior end of body tapering gradually to a point; eyes two, lying in a plane a little before the apices of the auricles, the distance between themselves being as that from each to the corresponding edge of the body; certain area at the outer side of the eyes being free from pigments; pharynx lying at the middle of the body, a little posterior, occupying about $1/5$ of the total body length; genital aperture nearer to the mouth than to the end of body; penis large, containing at its bulbus portion the sac-like seminal vesicle into which the two vasa deferentia open separately; ejaculatory duct passing through the center of the conical portion of the penis and opening into atrium at the ventral side; two oviducts opening into the vaginal canal without uniting with its fellow to form a common duct; average length about a little more than 10 mm.

Remarks: This is the only species of triclad turbellarians found from the near surroundings of the University Campus. Great abundance of individuals

of this species may be seen crawling about on the under surface of all sunken objects in the surrounding waters. Within the University Campus the artificial spring near the West Compound has a good supply of them. Because the spring maintains always a temperature of about 15°C ., the animals can live in it very actively throughout the year. Two small brooks, one at the near west of the Wofu Temple and the other just outside of the north wall of the Peiyuen Temple at the foot of the Western Hills, are also very suitable homes for these animals. These two brooks are also originated from spring water and do not dry up, though sometimes only a small amount of water left, during the warmer seasons. The animals are so numerous at these two small brooks that one can get a considerable number of specimens from the under side of even a single piece of stone! The Jade Fountain also affords large numbers of them. From this fact it is obvious that they prefer spring or clear running to the stagnant or standing waters.

So far as my experience goes, the largest specimen measures 15 mm. long by 2.6 mm. wide. The ground color of the body of the animal is subject to considerable variations according both to age and individuality. However, most of them are grayish brown, though sometimes a little deeper or lighter. Under reflected light the pigments may be seen grouped together to form numerous blackish spots. But as a whole, the pigments are evenly distributed over the dorsal surface, with the margin of the body a little lighter. The color of the ventral surface is much lighter and no black spots observed. Not a few specimens encountered are tinted brownish yellow. This is due perhaps to the nature of the food taken by them.

Strong light is injurious to them, so that they usually lie under the shaded places or away from the direction where the light comes. However, many specimens are often observed creeping very slowly at mid-day in the spring water in searching for food. The head of the animal is extremely sensitive, investigating continuously the near surroundings into which it goes. When the animal slides on its supports, it has its head and the auricular appendages a little lifted above. It seldom swims even stimulated.

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EXPLANATION OF PLATES

- | | |
|---------------------------------|---|
| 1...mouth | 22...male genital opening |
| 2...pharunx | 23...rhabdite |
| 3...intestine | 24...sensory hair |
| 4...ciliated pit | 25...external opening of proboscis sheath |
| 5...brain | 26...end cone of proboscis |
| 6...light refracting organ | 27...muscular portion of proboscis |
| 7...cilia | 28...vas deferens |
| 8...excretory tube | 29...bursa copulatrix |
| 9...excretory opening | 30...stalk of chitinous tube |
| 10...pharyngeal gland | 31...chitinous tube |
| 11...tail | 32...dorsal opening of bursa copulatrix |
| 12...integument | 33...chitinous stiletto |
| 13...lip | 34...uterus |
| 14...eye-spot | 35...uterine duct |
| 15...adhesive papilla | 36...penis |
| 16...ovary | 37...ejaculatory duct |
| 17...testis | 38...atrium |
| 18...female genital opening | 39...common genital opening |
| 19...vesicula seminalis | 40...oviduct |
| 20...vesicula granulorum | 41...vaginal canal |
| 21...chitinous copulatory organ | |



PLATE I

Figures:

1. Ventral view of *Stenostomum tsinghuaensis* sp. nov., slightly compressed.
2. Ventral view of *Macrostomum intermedium* sp. nov., slightly compressed.
3. Ventral view of *Stenostomum leucops* (Ant. Duges), slightly compressed.

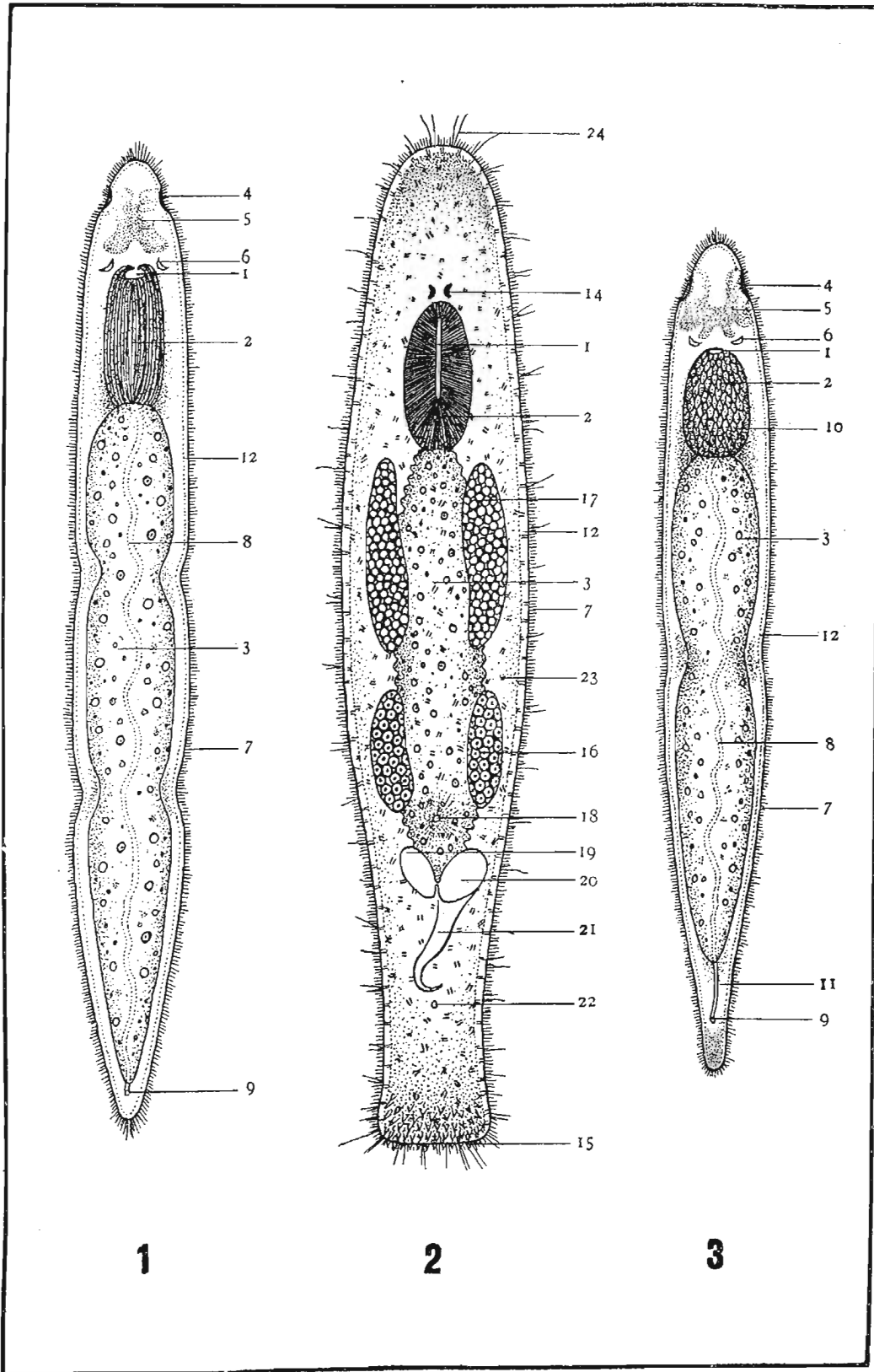
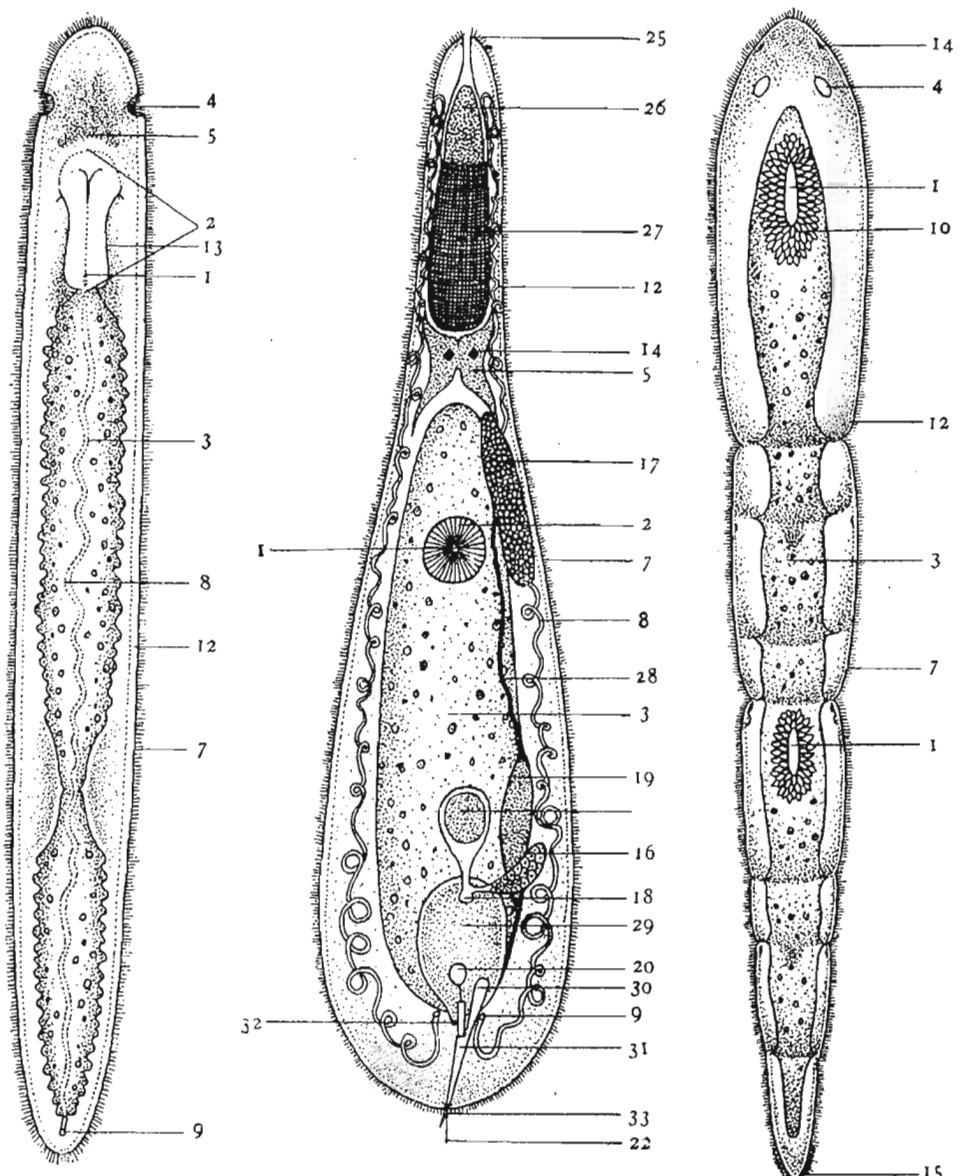




PLATE II

Figures:

1. Ventral view of *Stenostomum brevipharyngium* Kepner & Carter, slightly compressed.
2. Ventral view of *Gyatrix hermaphroditus hermaphroditus* Ehrbg., slightly compressed.
3. Ventral view of *Microstomum lineare* (Müller), slightly compressed.



1

2

3



PLATE III

Figures:

1. Top view of the reproductive organs of *Planaria gonocephala* Duges.
2. Reconstruction of the longitudinal section of reproductive organs of *Planaria gonocephala* Duges.

