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Two Interesting Syllids, with Remarks on their Asexual Reproduction

By

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With Plate XII and 11 Text-figures

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From the Syllidian Polychaetes collected at Seto and Misaki, two most interesting forms are selected for description here, one belonging to the genus *Trypanosyllis* and the other to the genus *Autolytus*, both being found parasitic or semiparasitic on other kinds of animals.

1. ***Trypanosyllis asterobia*** n. sp.

(Pl. XII, Figs. 1–5)

This Syllid was found attached to a large specimen of the Asteroid, *Luidia quinaria* v. MARTENS, not uncommon along the coast of Misaki.

Like the other forms of the same genus the body of the worm is slender and long, the largest specimens attaining more than 10 cm. This is far longer than the diameter of the disc of even the largest specimen of the Asteroid to which the Syllid attaches itself. Therefore, the latter embraces the disc of the Asteroid diagonally from one corner to the other on the dorsal side, the head being brought to the vicinity of its own tail on the ventral side. The greater length of the worm is hidden buried in a deep tunnel-like depression of the host animal. Therefore a superficial observation reveals almost no indication of the presence of such a setigerous parasite in the Asteroid beyond a diagonal line which easily leads us to suppose that regeneration has taken place in such a specimen. Driven by a similar curiosity Mr. N. YOSHII, assistant in the M. B. Laboratory at Misaki, to whom the discovery of the present species is due, examined one of these specimens presenting the questionable diagonal line on the dorsal surface of the disc. He could not find any peculiarity in the structure with respect

to the phenomenon of regeneration, but while dissecting an Asteroid he obtained several small setigerous worms. According to Mr. Yoshii they possibly came forth from somepart of the body of the Asteroid. The small worms were brought to my observation and they were proved to be sexual individuals of a certain type of *Trypanosyllis*, with the head of Tetraglene. Examining once again more precisely the specimen of the Asteroid from which the worms were said to have come, I found at length the parent body lying buried in the tunnel-like depression of the disc externally indicated by the diagonal line mentioned above.

In the fresh state, the segments of the Polychaete are almost uniformly pale yellow or at most cream-coloured. There are neither zebra-bands nor any particular pigmental pattern which is so characteristic in the other species of the same genus. In some specimens the tentacles on the head and the dorsal cirri of the anterior body segments may be more or less purple-coloured. The eye spots only are deeply pigmented.

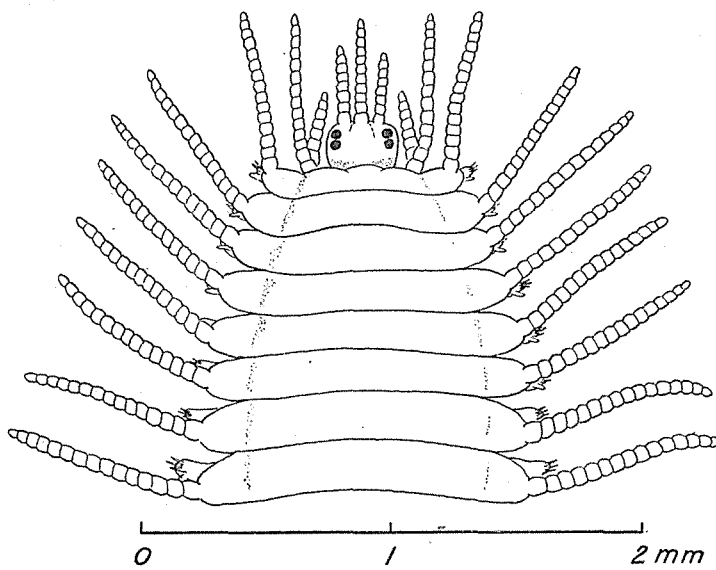

Fig. 1. Anterior region of *Trypanosyllis asterobia* n. sp.

In shape as well as in constitution the parasitic *Trypanosyllis* does not, however, depart much from the other types of the genus, being greatly elongated as a whole, and each segment is dorso-ventrally flattened. The length is from 8 to 12 cm.; breadth 3 mm., not including the dorsal cirri and setae. The number of segments varies from

350 to 420, besides the head (prostomium and peristomium) and the tail (pygidium).

The prostomium is roughly quadrangular and comparatively small (See Fig. 1). It is not distinctly bilobed, but rather tripartite; the ocular regions are raised on slight conical elevations with two pairs of eyes which are separated. The posterior pair of eyes is almost as large as the anterior. The median tentacle is longer than the lateral ones, the former consisting of about 11 annulations and the latter of about 7. *The palpi are greatly reduced* (only visible in the ventral view as two small lip-like elevations in front of the mouth) *and not visible from the dorsal side.* The dorsal cirri of the second segment or peristomium are longer than the median tentacle of the head, and have about 13 annulations; the ventral cirri are shorter, but yet of the same length as the lateral tentacles. They are composed of some 7 annulations.

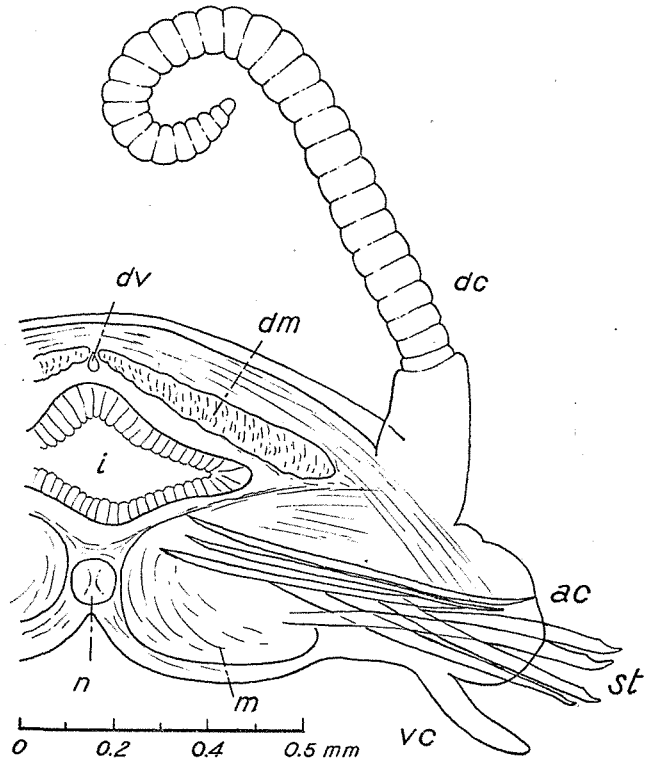

Fig. 2. Transverse section of body segment (semidiagram): *ac*, acicula; *dc*, dorsal cirrus; *dm*, dorsal longitudinal muscle; *dv*, dorsal vessel; *i*, intestine; *m*, ventral longitudinal muscle. *n*, nerve cords; *st*, setae; *vc*, ventral cirrus;

The parapodia are uniramous ; they are comparatively broad and not pointed towards the distal end. Each parapodium (Fig. 2) is internally supported by 3 acicula ; below there are on the outside 3 to 4 stout setae which are strongly modified from their original compound structure, *the distal toothless hooked piece being completely fused together with the shaft.* The setae, therefore, look as if they were single

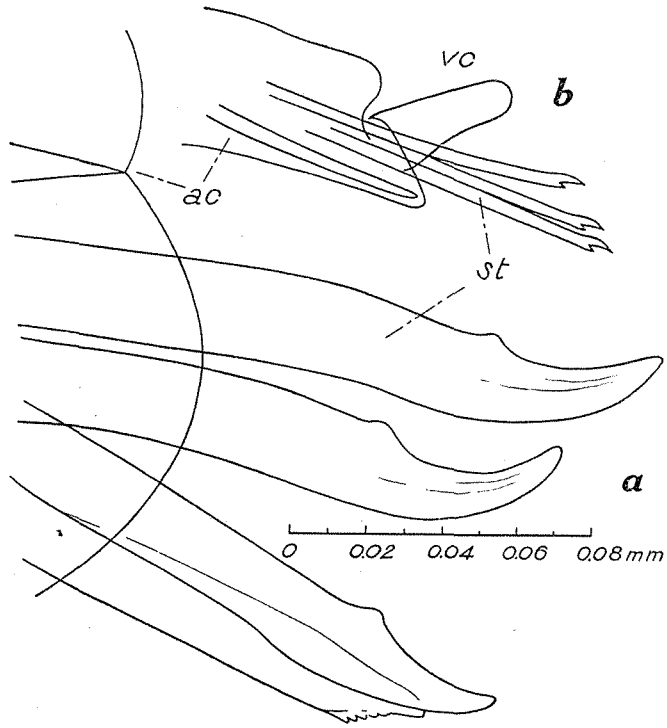

Fig. 3. *a*) Distal portion of stock parapodium and *b*) that of stolon.

structures (See Fig. 3). The dorsal cirri are nearly of the same length in the segments of the anterior part of the body, while they are alternatively long and short in the segments of the middle and the posterior part. Each cirrus begins with an unusually long unjointed base, succeeded by 30 to 35 annulations. The so-called ventral cirri are well developed.

The alimentary tract and other internal structures are nearly the same as in the other forms of the same genus ; for example, the large and straight pharynx is succeeded by the elongated proventriculus and the intestine which is moniliform. It is hardly necessary to repeat here the description of these and other internal organs.

Turning to another side, I should like to emphasize here a peculiar characteristic of the new species as compared with the other Syllids with respect to its method of reproduction. Sexual reproduction takes place in this species by a successive stolonization and results in the production of a cluster of sexual individuals, either male or female, in the posterior part of the body. With regard to this method of successive stolonization, we may readily recall the so-called "collateral budding" of *Trypanosyllis misakiensis* which was discovered by A. IZUKA (1906) in the same locality of Japan about 25 years ago or of the other Pacific *Trypanosyllis* described by H. P. JOHNSTON (1901) as well as by F. A. POTTS (1913) from the American coast. However, instead of being produced in a

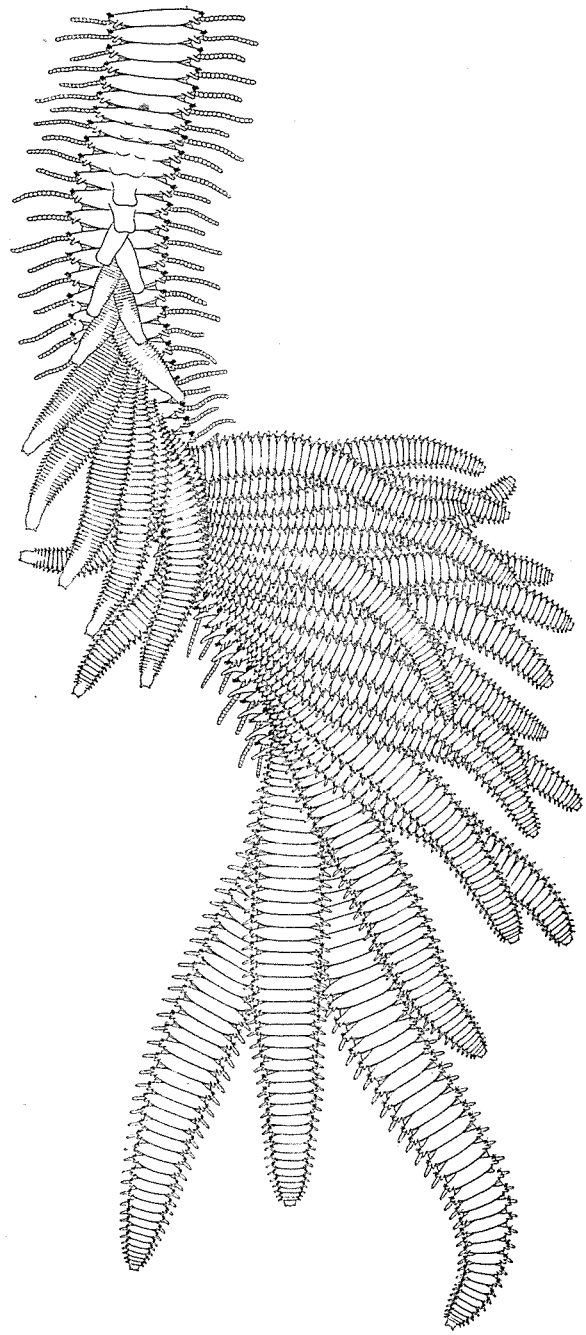

Fig. 4. Ventral view of posterior end of reproducing individual, showing method of formation and arrangement of stolons.

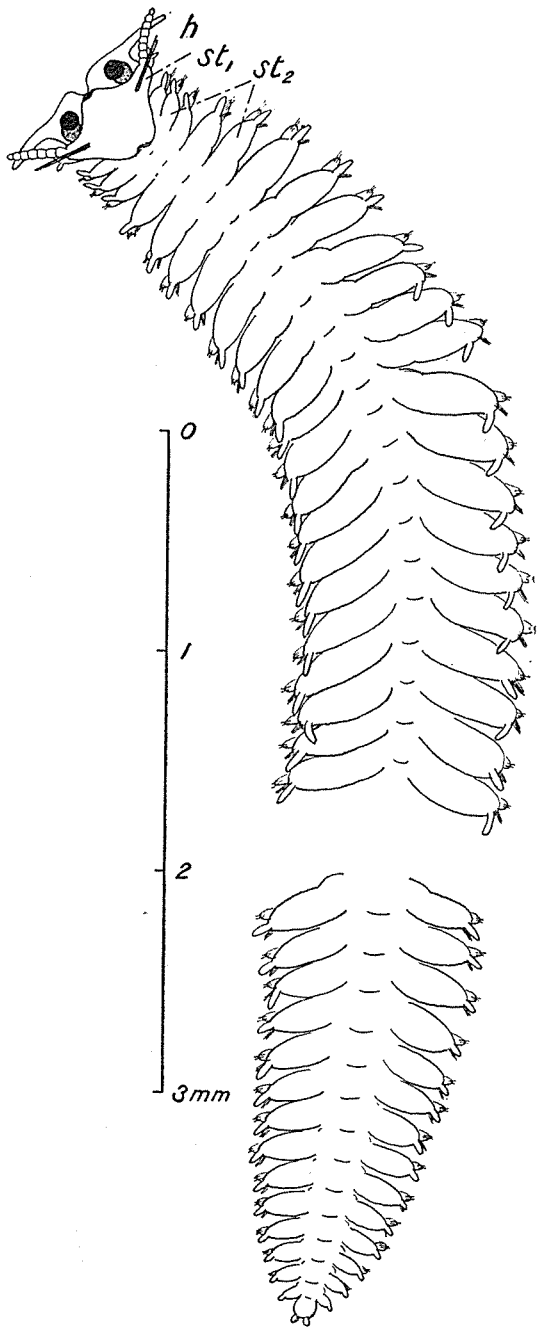

Fig. 5. Dorsal view of detached stolon: *h*, head of stolon; st_1, old segment from parent body; st_2, new segments of stolon.

very limited area comprising only one or two of the most posterior segments of the parent, the stolons of the present species are produced separately from different segments arranged one after another in a linear succession. Accordingly the stolonization takes place in a very wide range of segments, as many segments as the number of existing stolons concerned in this phenomenon. Such a method of successive production of stolons, so far as our still insufficient knowledge goes, has, indeed, never been met with in any other species of *Trypanosyllis* nor even in the entire group of the Polychaetes nor in the Oligochaetes.

However, reserving detailed description for another occasion, we shall here attempt a short sketch of *Trypanosyllis asterobia* in the act of producing sexual individuals.

Fig. 4 is a ventral view of the presumptive "caudal extremity" or stolon-producing part of the parent. In this figure some 34 stolons at different

stages of development are shown, besides some still very small and unformed ones. Each grown-up stolon exhibits the external characters of the caudal extremity of the parent, having an average length of 10 mm. and consisting almost invariably of 42 segments much more flattened than those in the parent. The stolons, as has been mentioned, are not crowded in one place composing a rosette but are arranged one after another in linear succession, i. e. each stolon is produced from a separate segment of the parent. An especially striking peculiarity of the present species with regard to its stolon-formation is that one of the parent segments is always incorporated into the segmental composition of the new animal, contributing to the first setigerous segment of the latter (See Fig. 5). The formation of the stolon is, of course, due to a rapid proliferation of new segments at the postero-ventral corner of a segment of the parent in the area of stolonization, with gradual development of the new head at the antero-ventral corner of the same segment, while the latter is still in closer connection with other segments at the anterior as well as at the posterior side. Therefore the stolons before separation look as though hooked down by the neck from the ventral side near the caudal end of the parent animal.

After full maturity the stolons naturally separate from the parent and swim away as independent animals. Separation takes place between two consecutive segments of the parent, which bestows one old segment on each new animal, or in other words, each stolon carries away one old segment from the parent body at the time of its separation. The old segment of the parent is found on the dorsal side of the stolon between the head and other body segments. The first setigerous segment of the animal is, therefore, not of new formation, but contrary to the general rule, is transmigrated from the parent body. Since the segment in question constituted one segment of the caudal extremity of the parent body before separation of the stolon, it contains a part of the alimentary canal, which may produce a slight diverticulum towards the ventro-posterior side but does not continue to the new segments of the stolon.

The attachment of the stolon to the parent body is direct and the head is deeply bifid, the median insersion being occupied by the narrowed antero-median (i. e. intestinal) part of the old segment. On the antero-lateral angle of each cephalic lobe is a fairly well-developed conical structure which may be regarded as a lateral tentacle. Palps are absent, but dorsally in the angles between the head and the next

segment is a pair of cirri, of greater length than those in the succeeding segments. They are evidently the dorsal cirri of the old segment incorporated secondarily into the segmental composition of the stolon between the head and other new segments. The eyes are very distinct. There are 4 in two pairs. Those on the ventral side are especially large as in the other species of the genus. Of the body segments, the first 3 or 4, besides the old segment, are comparatively small, though they are of the same constitution as those succeeding them; the parapodia are more or less modified and the setae are slightly elongated (See Fig. 3), while the long natatory setae are not developed at all or are only rudimentary in both sexes. For this reason the stolons appear to be fitted rather for crawling than for the natatory locomotion at the time of their liberation at least.

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2. ***Autolytus purpureimaculata*** n. sp.*

(Figs. 6–11)

This second species was first discovered at Seto in the spring of 1930 and then at Misaki in the summer of the next year, always closely attached to a living oyster, *Ostrea gigas* THUNBERG. In spite of this semiparasitic mode of life, the general constitution of the Syllid shows very little modification.

The head (Fig. 6) is smoothly rounded in front with a long median and two lateral tentacles. Palpi are rudimentary. The eyes are deep red in colour and 4 in number; the anterior eyes are wider apart than the posterior ones, while those on each side are rather crowded. The

* The species is closely related to *A. orientalis* WILLEY.

dorsal cirrus of the second segment (peristomium) is longer than the ventral, being about the same length as the lateral tentacles on the head. The dorsal cirri of the third (i. e. first setigerous) segment are particularly well developed. They are even longer than the median

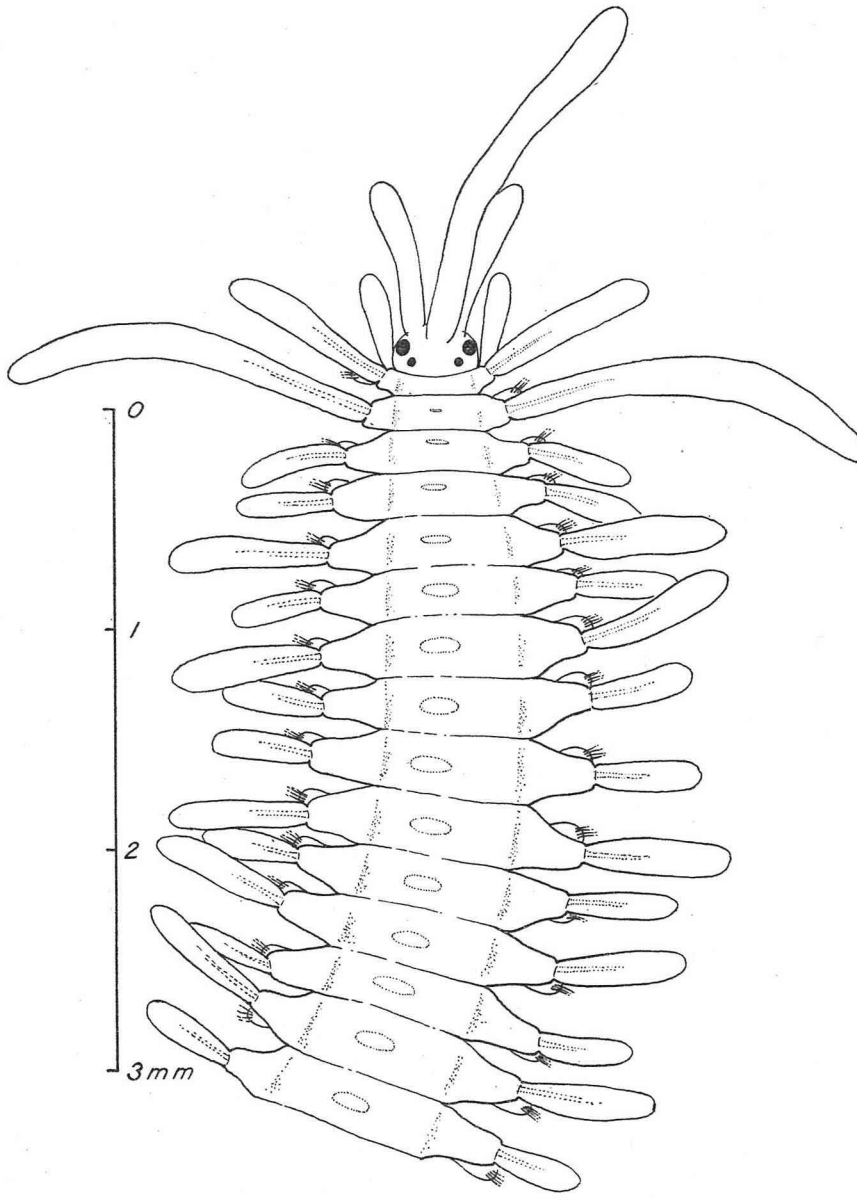

Fig. 6. Anterior region of *Autolytus purpureomaculata* n. sp.

tentacle of the head. The cirri of the following 2 segments are short. Those of the next (4th setigerous) segment are long. The dorsal cirri of the 5th setigerous segment are again short, and those of the 6th segment are again long. The following 2 segments (i. e. 7th and 8th) are of the short cirri type. After the 9th setigerous segment which has long cirri, segments with short and long cirri are arranged alternatively one after another. They are petaloid with strong basal articulation.

Each tentacle on the head or each body segment cirrus is smooth, non-annulated, not filiform but flattened. In this respect the present Syllid resembles in general appearance more *Myrianida pinnigera* than most other species of the genus *Autolytus*.

The body is about 12 mm. (8 mm. of the stock plus 4 mm. of the stolon) in length and presents a pale bluish or greenish hue, with a fringe of orange colour. Each segment bears a deep blue fleck on the median dorsal surface. The lateral tentacles, both pairs of tentacular cirri and the short cirri of the body segments are similarly pale bluish, with or without a yellowish portion at the tip, while the median tentacle, the long body segment cirri and the anal cirri of the pygidium are deep blue as in the median dorsal fleck of the segment.

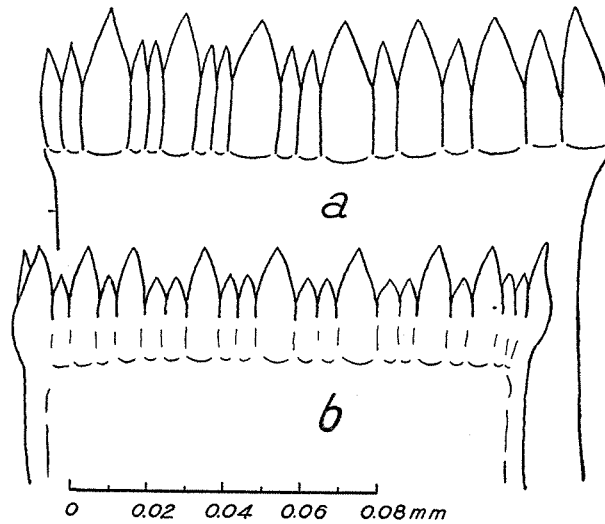

Fig. 7. *a*) "Trépan" of Seto specimen and *b*) the same of Misaki example.

The proventriculus is oval in shape, orange in colour and situated from about the 11th to the 13th setigerous segment. The pharynx is narrow and long, sometimes forming a loop after the manner of this organ of the genus. The dentation is quite characteristic; there are

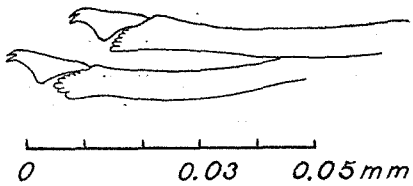

Fig. 8. Setae.

some 15 larger teeth with 2, or in some places only one smaller tooth interposed between them, as shown in Fig. 7.

The parapodium forms a bluntly conical or rounded process with a groove at the spine. The setae (Fig. 8) are somewhat short, curved backward towards the dilatation at the tip, and have a short terminal piece with 2 hooks, the second being the larger. The dilated part of the shaft has minute spikes. 3 acicula are generally present in each parapodium, the tip being bent and tapering to a fine point.

Sexual reproduction in the present species takes place by successive schizogamy and results in the production of a chain of stolons, either male or female (See Fig. 9). In this respect the method of stolonization does not differ from that found in any other species giving a linear succession of stolons such

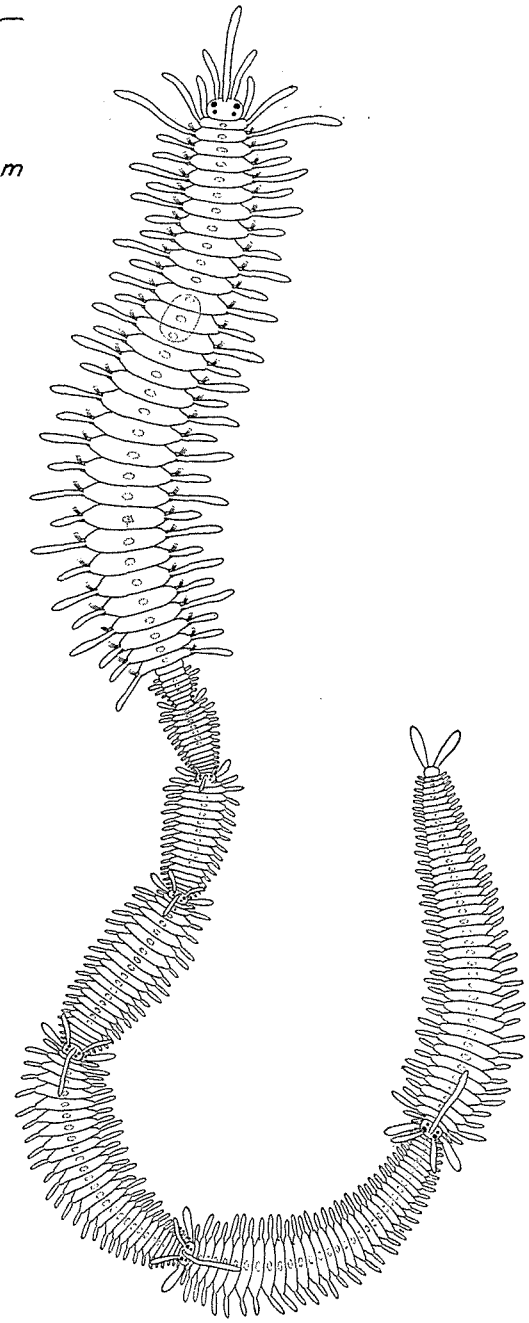

Fig. 9. Female individual in process of stolonization.

as, for example, *Autolytus edwarsi* ST. JOSEPH. However, with great constancy, the stolons are formed after the 30th setigerous segment of the parent body. I have examined more than 50 individuals in the act of stolonization and yet there is no single exception, the fixity

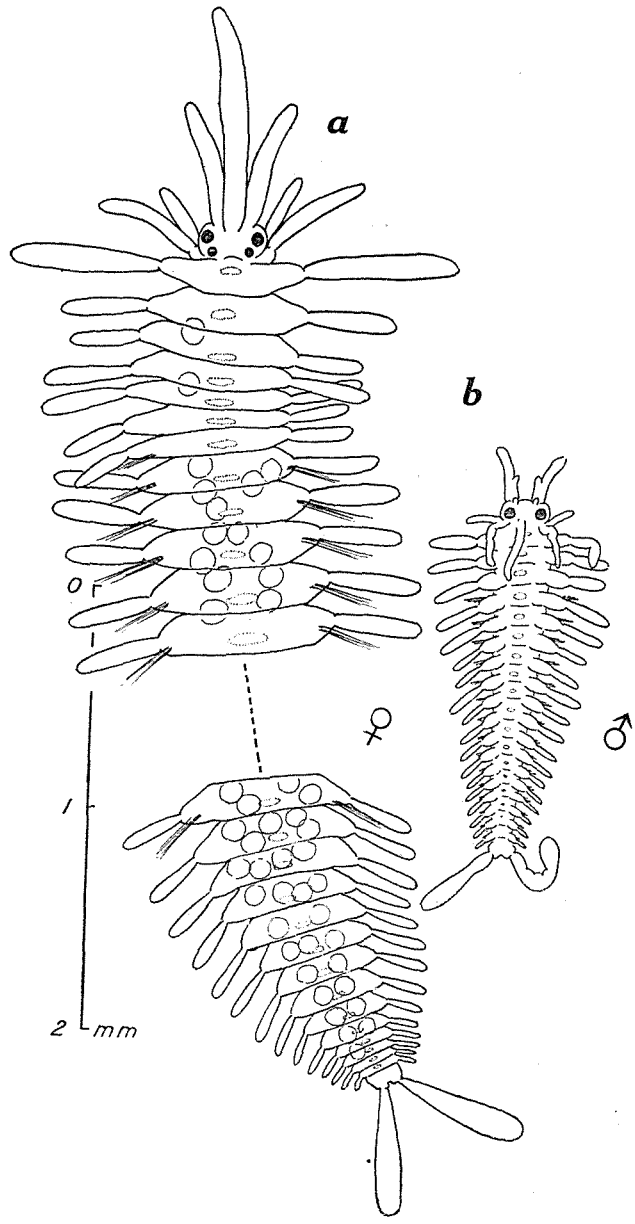

Fig. 10. Dorsal view of *a*) female and *b*) male individual.

of the budding zone being strikingly constant (comparable to the case of *Autolytus maculata*, F. A. POTTS, 1911, p. 36).

The number of stolons in the chains varies greatly according to the sex, that of the male stolons (in more than 20 individuals) being always greater than that of the female stolons (in less than 10 individuals). Different stolons in a chain show different stages of development, those near the budding zone being naturally younger. The stolons which are about to be set free are nearly of the same length in the same sex, and the female ones possess the same number of segments as the parent (36 segments besides the head and the tail), while there are fewer in the male (18 segments). Accordingly the female stolons (4 mm.) are far longer than the male stolons (2 mm.) Comparison can be made in Fig. 10.

The head of the stolon possesses 3 tentacles (one median and 2 lateral) and 2 pairs of large eyes on the prostomium, and a long dorsal and a short

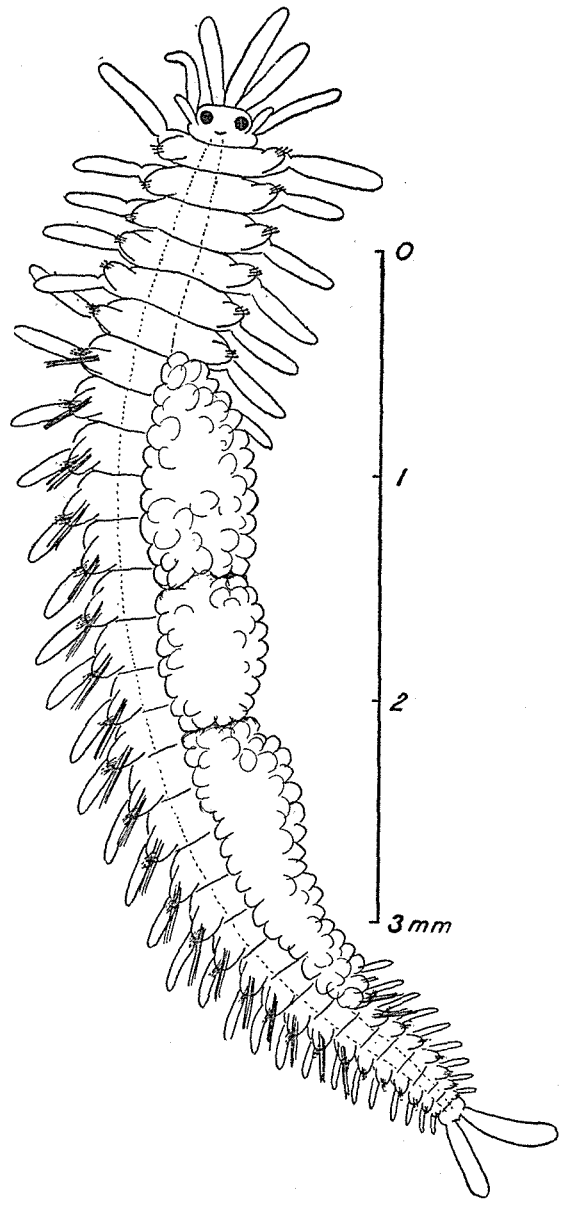

Fig. 11. Ventral view of mature female carrying egg sack.

ventral cirrus on each side of the peristomium. As a whole the head of the female stolon (Fig. 10 *a*) is of the Sacconereis type and that of the male stolon (Fig. 10 *b*) is of the Polybostrichus type, the lateral tentacles being bifid.

Until the time of liberation the segments of the stolons are only very little prepared for swimming. In the free male individuals the segments are more or less flattened on the dorso-lateral side and the old setae are slightly elongated, but there is no addition of long swimming setae. Modification of the segments takes place throughout the entire body length after the 3rd setigerous segment. Therefore the male stolon has only two regions, its composition being H + 3S (unmodified) + 15S (modified) + P, where H represents the head, S the setigerous segment and P the pygidium.

On the other hand, the female stolon or Sacconereis has 3 regions, the swimming setae being developed from the 7th to the 25th setigerous segment— H + 6S (anterior unmodified) + 20S (median modified) + 10S (posterior unmodified) + P. However, the swimming setae are not as long as in the other types of the sexual individuals. The stolons are probably suitable for crawling on the shell of the oyster, rather than for the general habit of natatory locomotion.

One more characteristic point in the present species is that the eggs carried by the female are not massed up into one or two spheres as usual, but are pasted on the ventral surface of the middle region of the body stretching from about the 7th to the 30th setigerous segment (See Fig. 11). The eggs are comparatively large and yellow in colour.

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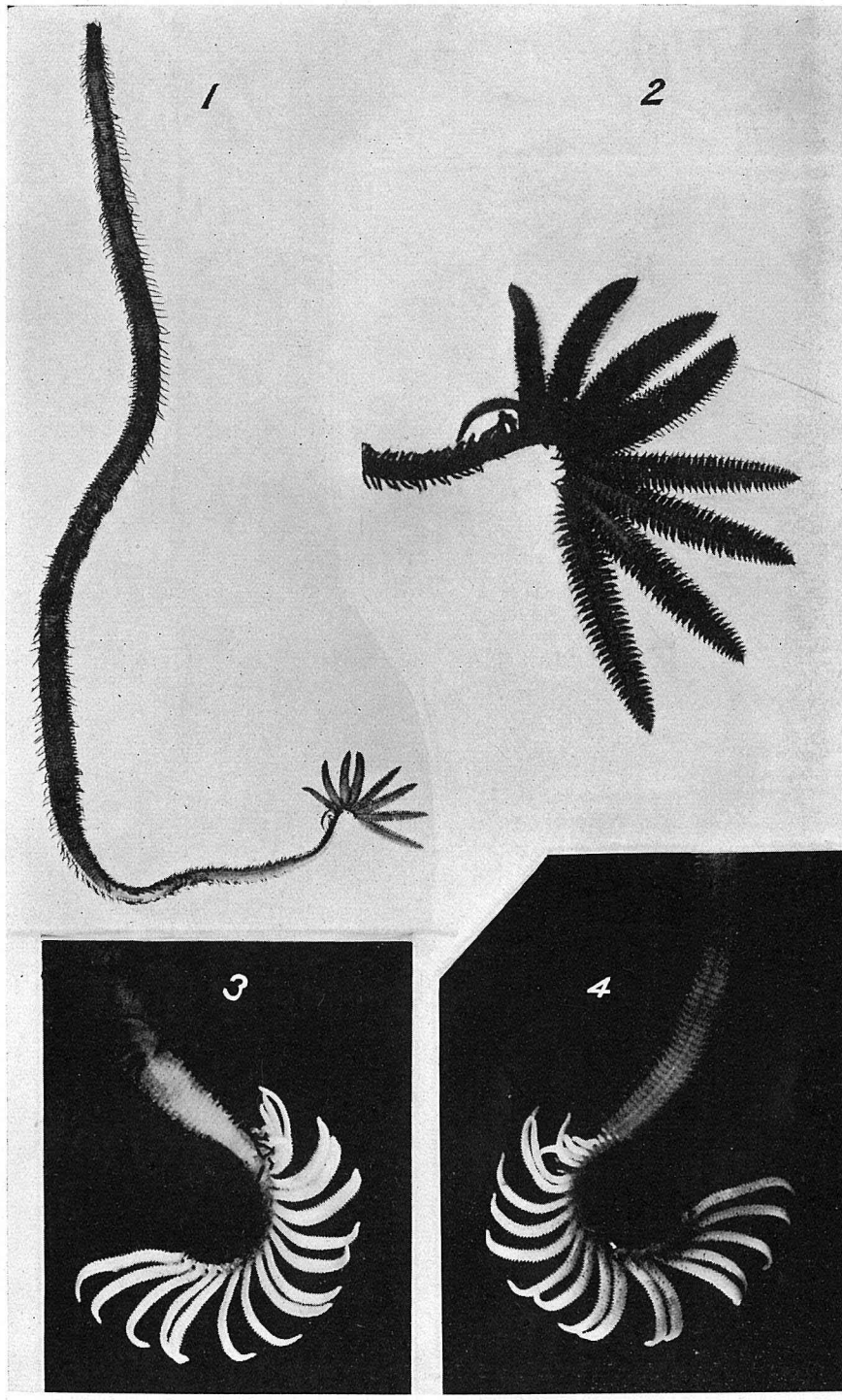
Explanation of Plate XII

Fig. 1. Dorsal view of *Trypanosyllis asterobia* n. sp. in process of stolonization; Fig. 2. Magnification of posterior end of the same animal, showing younger and older stolons in two groups.

Fig. 3. Dorsal view of posterior end of another reproducing individual. (Stolons are still young and in development). Fig. 4. Ventral view of the same specimen.



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