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ACOEL AND POLYCLAD TURBELLARIA FROM  
BERMUDA AND THE SARGASSUM

BY LIBBIE H. HYMAN

*American Museum of Natural History, New York City*

and

*Bermuda Biological Station for Research, Inc.*

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# ACOEL AND POLYCLAD TURBELLARIA FROM BERMUDA AND THE SARGASSUM

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## INTRODUCTION

The material on which this study is based comes from four sources: Turbellaria personally collected during a stay at the Bermuda Biological Station in the summer of 1935; some preserved polyclads and notes and water-color sketches of Bermuda polyclads generously turned over to me by Dr. Wheeler; Sargassum polyclads from the Bingham Oceanographic Collection, Yale University, obtained during several expeditions to the western and Central North Atlantic, the Gulf of Mexico, and the Caribbean; and four vials found at the Peabody Museum, Yale University, of polyclads collected by Verrill at Bermuda in 1898. Probably more of the last could be found but time did not permit a thorough search through the hundreds of vials of the Verrill collection at the Peabody Museum. Thanks are expressed to Dr. Wheeler for the material mentioned above, to the Bingham Oceanographic Foundation for turning over to me the Sargassum polyclads, to Mr. Burkenroad for assisting in locating the Verrill specimens, and to Dr. S. C. Ball of the Peabody Museum for the loan of the latter for examination. I am also deeply indebted to Dr. E. G. Conklin, then president, and Dr. J. F. G. Wheeler, director, for the privileges of a stay at the Bermuda station.

It seems best to give a list of the Verrill vials. One contains a label on which is printed: Bermudas, 1898, A. E. Verrill and party. On the label is written the words: *white planarians, see notes, Bailey Bay*. This vial contained two large specimens of *Notoplana binocularata*, two specimens of *Notoplana lactoalba*, and one specimen of *Prosthiostomum cyclops*. The specimens of *N. binocularata* have been left in this vial, the *N. lactoalba* have been put into another vial, and the *P. cyclops* has been sectioned. Vial 2 contains a printed label reading: Loc. Bermudas. Coll. A. E. Verrill and party; and a specimen of *N. lactoalba* with an egg mass, presumably belonging to the specimen. Vial 3 incloses a specimen of *Cestoplana microps* and a label on which are

printed the words: Bermudas Exped. 1898; and written: *pale grey planarian*. The fourth vial had the same printed label as the third with the word *Leptoplana?* written on it; the single specimen inside proved to be a *Prosthiostomum cyclops* and has been made into a whole mount. Vials 2 and 3 have been left as they were and have been returned intact to the Peabody Museum, labelled.

The polyclads of Bermuda were previously studied by Verrill, on expeditions to the islands in 1898 and 1901. Verrill published his results on this group in two papers (1900, 1901) describing a number of new species. These descriptions are, however, quite inadequate to meet the requirements of modern systematics of the polyclads, which necessitate the study of serial sections of sexually mature specimens. Most of Verrill's species are wrongly placed generically and his accounts do not suffice to enable one to allocate them properly. It has therefore been long desired by specialists on polyclads that his species be re-examined. Verrill apparently did not select or label type specimens but my experience at the Peabody shows that some Bermuda polyclad material, unnamed, was preserved by Verrill and can be exhumed by sufficient search. For a proper evaluation of Verrill's species such material as he left behind must be re-examined or new material obtained. It was my experience at Bermuda and this was borne out by Dr. Wheeler, who had interested himself to some extent in the polyclads there, that most of the polyclad species at Bermuda do not correspond as satisfactorily as could be desired with Verrill's descriptions. Wherever possible, however, I have adopted his names and hope my descriptions will serve to fix the species so that they can be readily identified in the future. Some of the species named and described by Verrill could not be discovered and apparently have not been seen in recent years. However, such changes in polyclad fauna seem to be of common occurrence. Most of the specimens taken were of much smaller size than given by Verrill but this may be attributed to the fact that the Bermuda shore fauna has not yet recovered from the poisoning of the waters by chemicals released from a shipwreck.

The present account is limited to the orders Acoela and Polycladida. No attempt was made to study or collect the marine Rhabdoacoela of Bermuda of which two or three species were seen, most often a calyptorhynchid form. A brown and yellow rhabdoacoel was also found upon the Sargassum but was not studied further. No Alloecoela were seen.

Material of the species herein described, so far as available, has been deposited in the Peabody Museum and the Bingham Oceanographic Collection (hereafter designated as P. M. and B. O. C.), Yale University.

Order **ACOELA**

Family CONVOLUTIDAE

Genus **AMPHISCOLOPS** Graff 1905

*Amphichoerus* Graff 1891 (preoccupied).

**Amphiscolops langerhansi** (Graff) 1882

Remarks.—This species has been thoroughly described and figured by von Graff (1904). I have elsewhere (Hyman, 1937) illustrated the reproductive system and described the mode of copulation. The chief feature of the sexual anatomy is the seminal bursa with several nozzles directed forward into the parenchyma. The species is abundant in certain aquaria at the Bermuda Biological Station and has inhabited these particular tanks for several years, according to Dr. Wheeler. He has never found it in nature at Bermuda and I also saw no specimens in my collecting there. The species breeds freely in the aquaria. The food consists of copepods and other small animals.

Specimens.—One whole mount to B. O. C., No. 1058.

**Amphiscolops bermudensis**, new species

Figures 1-6

Description.—This species much resembles *A. langerhansi* in general appearance. It is about 2 mm. long, stout, broadest anteriorly, then narrowing slightly to the posterior end, which is forked into the two caudal lobes characteristic of several species of the genus. In addition there is a median dorsal lobe at the posterior end, peculiar to the species (fig. 1). This dorsal lobe is a rounded eminence containing the penis. Near the anterior end there is a conspicuous median pit receiving the frontal glands (figs. 1, 5); behind this occur the two eyes and the statocyst. The dark brown color is caused by the numerous parenchymal zooxanthellae (fig. 3). As in *A. langerhansi*, there are also areas of parenchymal granules, the "concrement" granules of Graff, of unknown nature, probably excretory, brown by transmitted and white by reflected, light. They form a pattern showing much individual variation but having the general arrangement illustrated in the stippled areas of fig. 1. The pattern in a smaller specimen is outlined in fig. 2, where the zooxanthellae are also indicated as small circles. The mouth is slightly posterior to the middle as usual and the copulatory complex is at the rear (fig. 5) as usual in the genus.

Two specimens were fixed and sectioned, one sagittally and the other frontally; the former was poor and no sex organs were found in the sections. The frontal

series is in a fair state of fixation, but not adequate for any detailed study of the histology, which is very similar to that of *A. langerhansi* (Graff, 1904). The epidermis is finely granular, without nuclei or cell walls, penetrated by the outer ends of the cutaneous glands (fig. 3). There is a thick and conspicuous basement membrane, internal to which occurs a wide, coarsely granular area with nuclei, presumably the epidermal nuclei; the granules of this layer are presumably the concrement granules. To its inner side this granular zone is bounded by the subepidermal musculature, consisting chiefly of well-developed longitudinal fibers. The superficial parenchyma next to the musculature contains the numerous large pyriform bodies of the cutaneous glands, considered by von Graff to be rhabdite-forming glands. Their outlets are conspicuous features of the granular zone and the epidermis. The general parenchyma forms the usual granulo-fibrous reticulum in which are imbedded the brain, reproductive system, various free cells, and the zooxanthellae, most numerous near the bodies of the cutaneous glands (fig. 3).

A general view of the best of the frontal sections is given in fig. 5. At the anterior end, in front of the brain, is shown the cluster of frontal glands. The brain is broadened transversely and consists of four lobes, each of which gives off a conspicuous nerve trunk. In the center of the brain lies the statocyst. The testes are follicular in midlateral regions of the body and the groups of ova occur medial to the testes. The copulatory apparatus in the posterior fourth of the body consists of the seminal bursa and the penis. To either side of the bursa is a group of cells, presumably gland cells associated with the sexual function.

The copulatory apparatus was studied in living pressed specimens (fig. 4) and in the frontal series (fig. 3). The seminal bursa is a bilobed body composed of loose fibrous parenchyma and with two curved nozzles projecting forward into the parenchyma. A lumen is lacking. From each side of the posterior surface of the bursa a curved ciliated tube extends posteriorly and opens ventrally to the exterior alongside the penis mass. These two tubes are undoubtedly vaginae, by which the sperm reach the seminal bursa. The penis in live pressed specimens (fig. 5) appeared as a pyriform mass inside the dorsal lobe with the male genital pore near its smaller end. It was encircled by an indeterminable structure. For the correct understanding of the penis sections are necessary but in the one available series, the penis is torn away from the rest of the section. In fig. 5 it has been replaced into its probable position and an enlarged view of it is given in fig. 6. The penis is a pyriform body with a muscular base and a conical papilla composed of vacuolated cells and lined by an apparently heavily cuticularized layer. In the life the penis probably points downward and slightly backwards. The vasa deferentia were seen neither in life nor in the sections; they presumably enter the muscular penis base.

The bursa type of *A. bermudensis*—a bilobed mass with two nozzles—is also seen in other species of the genus, namely, *A. cinereus* (Graff) 1874 (described in

Graff, 1891) and *A. fuliginus* Peebles 1915. *A. cinereus* also has two vaginal ducts from the bursa but these open into the female genital pore below the bursa and not independently to the exterior as in *A. bermudensis*. Graff's idea that these vaginae in *A. cinereus* are sheaths for the nozzles is obviously erroneous. The separate openings of the vaginae to the exterior in *A. bermudensis* is unique for the genus and for the whole order Acoela. *A. bermudensis* thus has three genital pores, two female and one male.

Differential diagnosis.—*A. bermudensis* is characterized by the combination of the following features: anterior end with pit receiving the frontal glands; posterior end with paired caudal lobes and median dorsal lobe; seminal bursa with two nozzles and two ciliated vaginae opening separately on the ventral surface to either side of the penis; therefore with two female and one male genital pore.

Locality.—On rooted seaweeds in the Reach, Bermuda, July–August, 1935.

Holotype.—One slide of frontal serial sections, B. O. C. No. 1044. Unfortunately no whole mounts or preserved specimens are available.

#### ***Amphiscolops sargassi*, new species**

##### Figure 7

Description.—The species has the same general appearance as several other members of the genus. It is slender, 2–3 mm. long, widening from the blunt anterior to the posterior end, which is scalloped into two caudal lobes as in the two preceding species. There are no evident frontal glands nor frontal pit. Two eyes were seen in the usual position near the anterior end but no statocyst could be discerned in any of the four specimens studied, even after much pressure under a cover glass. The brown color results as in the preceding species from numerous zooxanthellae, indicated as small circles in fig. 7. Concrement granules are present in a small area from the eyes to the anterior tip and in a longitudinal middorsal band in the posterior half of the specimen (stippled areas in fig. 7). No trace of sex organs was seen in any of the four specimens.

Differential diagnosis.—In the absence of knowledge of the sex organs, diagnosis must be limited at present to external characters. *A. sargassi* is distinguished from other species of *Amphiscolops* with caudal lobes by the slender form and absence of a statocyst.

Locality.—On floating Sargassum (whether of pelagic or of neritic origin unknown) at Bermuda; obtained by shaking the weed in considerable quantities of sea-water; not common, only four specimens secured from a considerable amount of Sargassum; August, 1935.

As all four specimens were crushed in an attempt to determine the presence of sex organs, no specimens are available.



Order **POLYCLADIDA**Suborder **ACOTYLEA**Family **LEPTOPLANIDAE**Genus **NOTOPLANA** Laidlaw 1903**Notoplana lactoalba** (Verrill) 1900, new comb.

## Figures 8-12

*Leptoplana lactoalba* Verrill 1900.

Description.—This species, probably the most common of Bermuda polyclads, is one of Verrill's species which can be identified with complete confidence. Several specimens were collected at Bermuda and studied alive and later as serial sections; specimens were also found among Verrill's material unearthed at the Peabody Museum, as already mentioned, and Dr. Wheeler also gave me some preserved specimens, and lent me his notes and water-color sketches of the species. Verrill discovered this species on his 1898 Bermuda expedition and reported taking numerous specimens again in 1901 when he also described a color variety *tincta*. I did not find any such variety.

*N. lactoalba* is always white, in my experience. My specimens did not exceed a length of 20 mm., but Verrill reports a length of 30-50 mm. and Wheeler records one in his notes that was 56 mm. long. The body is thin, with ruffled edges, broadest at the anterior end and gradually tapering to the bluntly pointed posterior end. The animal drawn from life in an extended condition is shown in fig. 8. The eyes are not grouped into four clusters, as is common in leptoplanids, but instead form a longitudinal band enlarged at the level of the brain into a cluster which presumably corresponds to the tentacular cluster of other leptoplanids (fig. 9). This eye arrangement alone serves to distinguish *N. lactoalba* from all other Bermuda polyclads. There are no tentacles.

The general anatomy is typically leptoplanid and appears to offer nothing worthy of comment. There is the usual elongated ruffled pharynx slightly anterior to the middle behind which is found the male copulatory apparatus and posterior to that the female apparatus. The structure of the male copulatory apparatus shows that the species belongs to the genus *Notoplana*, and not *Leptoplana* in which Verrill placed it, as was customary at that time for polyclads of this general appearance.

The reproductive system was studied in pressed live specimens and in serial sections. It is shown in dorsal view in fig. 10 and in a median sagittal section in fig. 12. The vasa deferentia follow a typical leptoplanid course, being continuous across Lang's vesicle (fig. 10). They then proceed forward in a sinuous fashion to the level of the anterior end of the copulatory apparatus, and then turn sharply backwards, paralleling their course as far as the rear end of the

seminal vesicle which they enter separately. The large and very muscular seminal vesicle is an oval body with a thick muscular wall composed chiefly of circular fibers (fig. 12). At its anterior end it narrows to a short duct which enters the rear end of the granule vesicle (or prostate as it is called by some authors). This is also of oval form with a typical chambered interior such as is characteristic of the genus *Notoplana*. Fig. 11 gives a cross-section of the granule vesicle in a specimen not fully mature. The vas deferens, here termed ejaculatory duct by Bock, traverses the center of the vesicle encircled by granule glands arranged in clusters. In mature specimens, however, the interior of the vesicle seems to break down (fig. 12) and no definite central duct or gland cell clusters are seen. The granule vesicle is also provided with a well-developed muscular wall of inner circular and outer longitudinal fibers. At its anterior end the male duct continues a sinuous course but soon turns sharply posteriorly and enlarges to an elongated tube containing the long slender penis stilette. This tube, termed by Bock (1913) the penis pocket, is lined by a cuboidal epithelium outside of which occurs a thick but somewhat loose muscle layer of intermingled circular and longitudinal fibers. The penis consists practically wholly of the stilette, a long slightly curved tube made of hardened material, presumably a scleroprotein. Its actual length compared to the length of the animal may be seen in fig. 8. It is a little longer than the combined lengths of the seminal vesicle and the granule vesicle. At its posterior end the penis pocket continues as a conical papilla, called by Bock the penis sheath, which projects freely into the male atrium. The latter is a cavity of moderate size which opens below by the male genital pore, situated shortly behind the rear end of the seminal vesicle.

The female system is typical. The female pore occurs some little distance behind the male pore and leads at once into a thick-walled muscular vagina which slopes forward, coming close to the male atrium. It is lined by a ciliated cuboidal epithelium outside of which there is first a thin layer of longitudinal muscle fibers and then a thick stratum of circular fibers. At its anterior end the vagina curves abruptly posteriorly, becomes quickly smaller and less muscular and continues posteriorly as a slender tube which very soon receives the two uteri. Posterior to this point, the tube may be called the stalk of Lang's vesicle. This proceeds backwards following the curve of the vagina, immediately above which it lies, and behind the vagina widens into a large elongated Lang's vesicle. The stalk of Lang's vesicle has a ciliated cuboidal epithelium and a muscular exterior of some width. The vesicle is lined by a somewhat taller epithelium than the stalk and is encircled by loose muscle fibers. What seemed to be sperm were seen in the stalk and vesicle.

Remarks.—This species does not fit entirely into any of the three groups into which Bock (1913) has arranged the members of the large and varied genus *Notoplana*. *N. lactoalba* approaches most nearly his group B, having a very

long muscular penis pocket and a long slender stilette; but differs in the larger masculine antrum and the well-developed penis sheath, simulating a penis papilla. As noted above, one of the chief characteristics of *Notoplana*, namely, the penetration of the ejaculatory duct into the granule vesicle, is evident in *N. lactoalba* only in young specimens. This character is practically the only distinction between the genera *Notoplana* and *Stylochoplana*, as defined by Bock. The breaking-down of the interior of the granule vesicle in mature specimens of *N. lactoalba* would seem to throw some doubt on the validity of the distinction between *Notoplana* and *Stylochoplana*.

Differential diagnosis.—*N. lactoalba* is distinguished from other species of the genus by the elongated slender form, widest at the anterior end, eye arrangement, white color, elongated muscular penis pocket containing the very long slender tubular stilette, and moderately sized male antrum with a well-developed penis sheath.

Locality.—Found chiefly under stones on both shores of Longbird Island, Bermuda. Recorded by Verrill (1900) under stones and corals on the reefs.

Specimens.—One whole mount and one set of sagittal serial sections deposited in the B. O. C., Nos. 1045 and 1046 A-E. Verrill's specimens, sorted out and labelled, returned to the P. M., Nos. A 12373 and A 12374.

***Notoplana binocolata* (Verrill) 1901, new comb.**

Figures 13-14

*Discocelis binocolata* Verrill 1901.

*Notoplana bahamensis* Bock 1913.

Remarks.—I found no specimens of this species during my stay at Bermuda in 1935 and the species apparently no longer exists there; but two specimens were included in one of Verrill's vials as already mentioned (vial 1). One of these specimens is such a fine one that I considered it desirable to leave it intact; of the other specimen, which seemed in rather poor condition, the posterior half was removed and sectioned sagittally. These sections proved adequate for the study of the copulatory apparatus. The anatomy of this apparatus revealed that the species belongs to the genus *Notoplana*, not *Discocelis*, and that it is identical with the *Notoplana bahamensis* of Bock's 1913 description, which thus becomes a synonym of *N. binocolata* (Verrill). As Bock has given a detailed description of the form, I shall here confine myself to a few observations.

The size, shape, and coloration of this species have been stated in detail by Verrill in his original description. The fine specimen referred to above, depicted in fig. 13, is 36 mm. long and 13 mm. wide at the widest region, but is evidently considerably contracted and would be much longer and more slender in life. There are no tentacles. The tentacular eyes form two conspicuous rounded clusters, which are more rounded in my specimens than as given in Bock's description. The cerebral eyes are deeply buried in the interior and difficult

to see; hence it is not surprising that they were completely overlooked by Verrill. They form somewhat elongated groups anterior to the tentacular clusters. There are no marginal eyes as supposed by Verrill.

Bock has figured the copulatory complex in sagittal section and in fig. 14, I give a ventral view of the same. The muscular seminal vesicle receives the two vasa deferentia separately at its posterior end, curves dorsally at its anterior end and enters the spherical granule vesicle which lies somewhat dorsal to it. From the granule vesicle a long slender tube, considered by Bock to be part of the male antrum, proceeds posteriorly near the dorsal body wall. A very small penis papilla projects into the beginning of this at the granule vesicle. Below this tube is a great rounded muscular mass which may be regarded as the anterior wall of the male antrum. As noted by Bock this mass is peculiar to the species and not characteristic of the genus. The main cavity of the male antrum is not especially large and has in its lateral wall on each side a projecting hillock, not noticed by Bock. These two hillocks somewhat resemble the penis sheath seen in other species of *Notoplana*. The female end apparatus is characteristic and presents nothing especial.

It appears to me highly improbable that this species could be identical with *Leptoplana virilis* Verrill 1893, as Bock conjectures.

In 1933, Stummer-Traunfels reinvestigated the types of Schmarda, 1859, and found that Schmarda's "*Polycelis*" *ferruginea* from Jamaica is a *Notoplana*, which he considers conspecific with *N. bahamensis* Bock 1913, here shown to be a synonym of *N. binocolata* (Verrill). I am unable to agree with Stummer-Traunfels' conclusion. Although certainly very similar, *N. ferruginea* and *N. binocolata* are not identical. The chief differences are: in *N. binocolata*, the cerebral and tentacular eyes are of about the same size, whereas in *N. ferruginea*, the former are obviously smaller; the seminal vesicle of *N. binocolata* is somewhat tubular with a thick muscular wall and narrow lumen and the penis papilla is symmetrical whereas in *N. ferruginea*, there is a large expanded seminal vesicle with a thin muscular wall, and the penis papilla is asymmetrically placed; the hillocks in the male antrum described above for *N. binocolata* appear to be absent in *N. ferruginea*. On these grounds I consider the two species distinct. However, *N. caribbeana* which I recently mistakenly described as a new species (Hyman, 1939) is undoubtedly conspecific with *N. ferruginea* and hence becomes a synonym of the latter.

Differential diagnosis.—The species is distinguished from other *Notoplanas* by the deep position of the cerebral eyes, very small unarmed penis, large muscular mass formed by the male antrum, and lateral projections into the male antrum.

Locality.—Shores of Longbird Island, Bermuda, according to Verrill; probably no longer found there. Bahamas, Bock, 1913.

Specimens.—Of Verrill's two specimens found at the Peabody, one left

whole and the anterior half of the other have been retained in the original vial with Verrill's label; the posterior half of the second specimen was made into serial sagittal sections; all have been returned to the P. M., No. A 12375.

Family HOPLOPLANIDAE

Genus **HOPLOPLANA** Laidlaw 1902

*Planocera*, Group B, Lang 1884.

**Hoploplana grubei** (Graff) 1892

*Planocera grubei* Graff 1892.

Remarks.—About a dozen specimens of this species were contained in the B. O. C. They were taken on the pelagic Sargassum in the Gulf of Mexico and the central North Atlantic, chiefly the first-named habitat. None was found among material from the western North Atlantic and the Caribbean. As Graff has given a good description and adequate figures of this species and as Bock, 1913, has made additional comments, there is little for me to add, except as regards external characters. The shape, according to a sketch of Burkenroad's made from a living specimen, is almost perfectly oval. The coloration is stated in Burkenroad's notes to consist of a livid white reticulation on a brown ground. Wheeler's material contains two water-color sketches of Sargassum polyclads, both of which are probably *H. grubei*, although in the absence of the specimens, this cannot be asserted with certainty. One of the sketches shows a polyclad of perfectly oval form, 10 mm. long by 6 mm. broad, of an ochre yellow color with dark-brown marks along the margin. This specimen laid an abundance of eggs in small flat gelatinous masses, each containing several to ten or more eggs. The other specimen of Wheeler's, of which four individuals were taken from the Sargassum, very closely corresponds to Burkenroad's description. Wheeler's colored sketch shows an oval animal 8 mm. long by 5 mm. wide, with a color pattern of narrow white irregular curved markings on a medium brown ground. Graff states the color as yellowish-brown, maximum dimensions 7 mm. long by 4.5 mm. wide.

Four of Burkenroad's specimens were sectioned serially. The sexual anatomy was found to agree in all particulars with von Graff's and Bock's descriptions. Bock is correct in stating that there is a median unpaired intestinal branch above the brain.

Specimens.—Whole mount and set of sagittal serial sections deposited in B. O. C., Nos. 1047 and 1048 A-B. Other specimens returned to B. O. C. in their original vials.

## Family PLANOCERIDAE

Genus **GNESIOCEROS** Diesing 1861*Pelagoplana* Bock 1913.

Diagnosis.—Planoceridae with anteriorly expanded, posteriorly narrowed and pointed, somewhat elongated body; with nuchal tentacles containing eyes in their interior; with relatively few scattered cerebral eyes; true seminal vesicle; elongated interpolated granule vesicle; copulatory organ in the form of an eversible cirrus, covered with many parallel toothed bands of a hard yellow material; vagina with a strong glandulo-muscular fold; Lang's vesicle present, transverse; delicate, pellucid forms.

Remarks.—I greatly regret the necessity of throwing Bock's genus *Pelagoplana* into synonymy but there seems no doubt of the validity of Diesing's genus for "*Planaria*" *sargassicola* Mertens, for which species Bock created *Pelagoplana*. I am able to report the existence of another species of *Gnesioceros*, the "*Imogine oculifera* Girard" of Verrill's 1892 description. This form, recovered at Woods Hole, Mass., is not identical with *Imogine oculifera* Girard, as Verrill supposed, for Girard plainly states that his species is large with eyes around the margin. Verrill's species, which I shall describe in detail elsewhere, is undoubtedly a *Gnesioceros*, very close to *G. sargassicola*.

***Gnesioceros sargassicola*** (Mertens) 1833, new comb.

Figures 15-17

*Planaria sargassicola* Mertens 1833*Gnesioceros mertensi* Diesing 1861*Stylochus sargassicola* (Mertens), Lang, 1884*Stylochoplana sargassicola* (Mertens), Graff, 1892*Pelagoplana sargassicola* (Mertens), Bock, 1913.

Description.—This species, the common polyclad of the pelagic Sargassum, and abundantly represented in the B. O. C. has been bandied about from one genus to another, and several times described as a new species (further synonymy in Lang and von Graff). I am not at all convinced of the identity of Mertens' or Moseley's species with von Graff's but as the latter is very positive of the synonymy, I do not propose to reopen the matter. The first definitely recognizable description of the species is that of von Graff. If we grant that Graff's species is really identical with Mertens' and that the species does not fit into *Stylochoplana* or planoceric genera existing at that time, then we must acknowledge that *Gnesioceros* Diesing 1861 is the first generic name proposed for the animal and that therefore *Gnesioceros sargassicola* (Mertens) 1833 is the legitimate name of the species.

Von Graff (1892) has given a beautiful drawing of the animal (preserved) and a fairly satisfactory description of its anatomy. Several features of the structure

are, however, not clearly stated nor figured by von Graff and I am fortunate to be able to supplement his account. Numerous specimens of this species in the B. O. C. were taken from the pelagic Sargassum in the Gulf of Mexico, Caribbean, and western and central North Atlantic and I also found three or four specimens on the floating Sargassum at Bermuda. The shape in life differs so little from von Graff's drawing (1892) that there seems no necessity of reproducing my drawing of the animal as taken alive from the Sargassum at Bermuda. The color is recorded in my notes as pellucid with a few scattered brown spots. The B. O. C. specimens kindly turned over to me for examination covered all sizes from very small young to specimens 10 mm. in length. It is evident that the species passes its entire existence on the Sargassum.

The most important feature of the reproductive system of this animal is the cirrus, a truly wonderful object, inadequately figured by von Graff. The cirrus is a conical sheath composed of a number of parallel toothed narrow bands made of a hard yellow material (fig. 15). These bands can be pulled back into the interior, in which condition they run lengthwise, parallel to the body axis (fig. 16). The muscle which has this action and which I shall call the retractor of the cirrus, is a powerful bundle of lengthwise fibers running along the left side of the granule vesicle and inserting on the more anterior ends of the cirrus bands. On contraction, this muscle causes these ends of the bands to arch (fig. 16) and so pulls the bands inside. A similar muscle on the right side, the protractor of the cirrus, is fastened to the middle of the toothed bands; when it contracts it pulls the bands to the outside where they take a transverse course (fig. 15). The whole cirrus has somewhat the shape of conch shell except that it is bilaterally symmetrical; it rolls inward along a groove like the edges of a shell at the shell mouth. This groove in most specimens that I have seen is directed towards the left side of the animal so that a side view of the cirrus is obtained as in my figs. 15 and 16; but occasionally the cirrus is so turned that the groove faces the observer and it is this view, the least informative, which von Graff presents in his fig. 3, plate IX.

The entire male copulatory apparatus seen from a ventral view is presented in my fig. 15. The two vasa deferentia enter separately the posterior end of the seminal vesicle, a rounded chamber heavily encircled by a web of muscle fibers. This opens posteriorly into the elongated granule vesicle composed of transverse chambers and having a thick wall of inner circular and outer longitudinal fibers. The latter continue posteriorly as the muscles of the cirrus. Between the granule vesicle and the cirrus there is a chamber lined by a tall epithelium, which seems to serve for the storage of the secretion of the granule vesicle or perhaps has some relation to the formation of the cirrus. There is no penis papilla in *G. sargassicola*.

The most striking feature of the female apparatus has been noted and figured by von Graff. This is a thick wide muscular ring in the vaginal wall into which

there open numerous gland cells. The free surface of this ring appears to lack a definite epithelium and instead is clothed with a hardened yellowish cuticle thrown into longitudinal ridges. Another feature of the female system is the transverse position of Lang's vesicle. This was mentioned by von Graff but as his figures fail to show the vesicle clearly, I have illustrated it in fig. 17. Graff noted the presence of sperm in Lang's vesicle and I also find them in several specimens. In several individuals a club-shaped object was seen attached to the female genital pore. Sections of one such specimen fail to show any recognizable histological features in this object, the nature of which therefore remains problematical. The object is hollow with a structureless wall apparently composed of cuticle. It may represent a secretion of the musculo-glandular ring having some function in reproduction.

Specimens.—A whole mount and a set of sagittal serial sections have been deposited in B. O. C., Nos. 1049 and 1050 A-B. Many other specimens returned to the B. O. C. in their original vials.

***Gnesioceros sargassicola* variety *lata*, new variety**

Figure 18

Description.—This variety is distinguished from the typical members of the species by its shape, shown in fig. 18, drawn from life. The anterior fourth is very broad and then narrows quickly into the slender pointed posterior three-fourths. The shape closely resembles figures by Lang, 1884, for several species of *Stylochoplana*. The maximum length seen was 10 mm., but most specimens were 6-8 mm. long. The animal is translucent and pellucid with small brown spots at regular intervals along the margin. It is very quick and active, swimming prettily by a rapid butterfly-like fluttering of the anterior expansions. The marked difference in shape between this polyclad and the typical *Gnesioceros sargassicola* lead me to believe for a long time that the former was a new species of *Gnesioceros*. However, examination of the reproductive system in pressed specimens and serial sections has shown not the slightest difference between the two and hence I must consider the broad form to be a variety.

Differential diagnosis.—*G. sargassicola lata* is distinguished from *G. sargassicola* by the broad anterior end with wing-like lateral expansions and by the regularly repeated brown marginal spots.

Locality.—Among the rooted sea-weeds in the Reach, Bermuda; fairly common, taken by sweeping the weeds with a net, July-August, 1935.

Holotype.—One whole mount, B. O. C., No. 1051.



## Family CESTOPLANIDAE

Genus **CESTOPLANA** Lang 1884**Cestoplana microps** (Verrill) 1901, new comb.

Figures 19, 21

*Trigonoporus microps* Verrill 1901.

Description.—This species presents the typical appearance and characters of the family and genus. The very elongated slender body (fig. 19) may reach a length of 50–60 mm. according to Verrill; my specimens were mostly about 25 mm. long. The species is white but most individuals present a cream, flesh, or reddish hue because of ingested food, evidently derived from some favorite prey of a reddish color. The rounded, slightly expanded anterior end is covered with a multitude of minute eyes, whose arrangement is shown in my fig. 19, and also by Verrill in his fig. 2, plate V. The eyes are about evenly distributed over the central portion of the head but laterally the marginal eyes are slightly set off from the median eyes by a small eyeless area. Laterally the eyes stop considerably anterior to the brain but medially they continue for some distance behind that organ. Fig. 19 is a drawing of the animal from life.

The digestive tract is typical for the family and genus. The excessively long main intestinal trunk extends from behind the brain nearly to the posterior end where there is a short ruffled pharynx. The main trunk of the intestine continues posteriorly above this pharynx. The mouth is near the rear end of the pharynx.

The copulatory apparatus is found in the short region between the posterior end of the pharynx and the end of the body. The male apparatus is anterior to the female. Both are shown in fig. 20 in sagittal view. The male genital pore leads into a heart-shaped atrium lined by a tall epithelium. From this extends dorsally the penis pocket containing the slender penis and projecting into the male atrium as a papilla, the penis sheath. Dorsal to the penis the male apparatus continues as the oval granule vesicle into whose upper end opens the curved thick-walled seminal vesicle. Most of the male apparatus is rather muscular. A heavy musculature occurs in the walls of the male atrium, the granule vesicle, and the seminal vesicle while the penis pocket is but slightly muscular. The muscle layer of the granule vesicle and seminal vesicle is composed of a bewildering network of fibers.

The female copulatory apparatus is simple. The genital pore leads into a wide passage lined by slender epithelial cells and scarcely provided with any musculature. This part of the female duct receives the tremendous mass of cement glands which open through the epithelium (not shown in the figure). Dorsally, the female passage narrows somewhat and its epithelium rather abruptly becomes lower, cuboidal, and heavily ciliated. The passage curves

ventrally, receives the two uteri at the curve, and then as Lang's vesicle extends ventrally, paralleling its former course. Lang's vesicle is thus an elongated sac oriented vertically in the sagittal plane.

Differential diagnosis.—*Cestoplana microps* is characterized by the combination of plain white color (often reddish from ingested food), slender penis papilla, absence of a wide cement pouch, and entrance of the uteri into the dorsal bend of the female duct.

Locality.—Shores of Longbird Island, Bermuda, July–August, 1935; recorded by Verrill (1901) under stones at low tide in Castle Harbor and "The Scaur."

Specimens.—Whole mount and set of serial sagittal sections to B. O. C., No. 1052 and 1053 A–E. Verrill's specimen, vial 3, labelled and returned to the P. M., No. A 12376.

### Suborder **COTYLEA**

#### Family PSEUDOCERIDAE

Genus **THYSANOZOON** Grube 1840

**Thysanozoon nigrum** Girard 1854

#### Figure 22

Description.—This species still exists sparingly under stones under the causeway from Longbird to Castle Islands. The largest taken was 25–30 mm. long and 8 mm. broad; Verrill (1901) records a length up to 60 mm. The animal is velvety black, of oblong shape, slightly narrowed anteriorly where there is the usual pair of marginal tentacles. The tentacles appear to be devoid of eyes but there is a median rounded cluster of eyes back of the tentacles, just in front of the anterior end of the pharynx. The dorsal surface is covered with blunt papillae which are also black. Small white flecks may occur, especially in the smaller specimens.

The specimens obtained were sectioned serially and found to correspond completely to other members of the genus as regards reproductive system, having a median female terminal apparatus and lateral paired male copulatory complexes. The members of the genus are so alike as regards the copulatory organs that no great taxonomic weight can be placed upon these structures in *Thysanozoon*, contrary to the situation in most other polyclad genera, where taxonomic distinctions rest almost wholly upon the details of the copulatory mechanism. One of the male apparatuses of *T. nigrum* is shown in fig. 22. This differs from the description given by Lang (1884) for the male copulatory apparatus of *Thysanozoon brochi* in that a long coiled tube intervenes between the seminal vesicle and the junction of the male duct with the stalk of the granule vesicle. According to Lang's description and figures, the seminal vesicle unites directly with the stalk of the granule vesicle. In *T. nigrum*, however, the seminal vesicle continues into a wide male duct which curves backward parallel to the

seminal vesicle and then narrows into a slender duct. The latter is somewhat sinuous and as long as the wide portion of the duct or possibly a little longer. It finally unites with the stalk of the granule vesicle, an oval chambered sac with a thick muscular wall.

The single median female copulatory apparatus also does not entirely correspond with Lang's figure (1884, plate 18). As shown in my fig. 22, the female genital pore opens into a rather wide pocket from which the simple female duct proceeds dorsally, receiving the two uteri after a slight posterior bend. The innumerable cement glands open into the pocket and the terminal part of the female duct. This anatomy differs from that of Lang's figure in the absence of a non-glandular female atrium between the pocket receiving the cement glands and the female pore. In short the glandular region of the female duct extends to the genital pore in *T. nigrum*.

These differences in the details of the male and female copulatory complexes together with the differences in body color and in the shape of the papillae show that *T. nigrum* is a distinct species and not simply a variety of *T. brochii* as supposed by Lang.

Specimen.—Set of sagittal serial sections to B. O. C., No. 1054 A-I.

#### ***Thysanozoon flavotuberculatum*, new species**

##### Figure 20

Description.—A small specimen of what was eventually decided to be a new species of *Thysanozoon* was taken in the Reach. Dr. Wheeler also presented me with a larger specimen of the same species, which he had taken in the Reach in July, 1934, and of which he had made a water-color sketch before fixing it. The two specimens were 5 and 12 mm. in length, respectively, both immature. The smaller specimen, drawn from life, is shown in fig. 20. The shape is oblong, narrowing slightly behind the middle to the blunt posterior end. At the anterior end are the usual paired marginal tentacles characteristic of the Pseudoceridae. The dorsal surface bears somewhat scattered oval tubercles, largest along the median region, smaller laterally. The cerebral eyes occurred in a single cluster in the smaller specimen, in paired clusters in the larger one. A few eyes are also present along the tentacles as shown in fig. 20. The general color is grayish with irregular small black flecks strewn over the dorsal surface; the tubercles are yellow and each receives an intestinal branch as in other members of the genus. Both specimens were sectioned and found to be immature although the larger one has the beginnings of the copulatory complexes.

Remarks.—This species was at first thought to be *T. griseum* Verrill 1901. However, it corresponds so poorly to Verrill's description that it has seemed necessary to create a new species for it. Verrill's *T. griseum* is described as having widely separated tentacles, numerous thickly crowded elongated, acute

papillae, a middorsal white stripe on which the papillae are also white, and a spotting of orange, white, and dark-brown on the papillae elsewhere. When only the small, 5 mm. specimen was at hand, it was conceivable that its differences from Verrill's description resulted from its juvenile state. But Wheeler's colored sketch of a considerably larger individual shows an appearance and color pattern identical with the 5 mm. specimen. This larger specimen was at the beginning of sexual maturity and therefore it is clear that its appearance and coloration are those of the adult condition. Consequently it is impossible to assign the yellow-tubercled *Thysanozoon* to any of Verrill's species.

Differential diagnosis.—*T. flavotuberculatum* is distinguished from other species of the genus by the relatively few scattered oval yellow tubercles on a gray ground.

Locality.—On rooted seaweeds in the Reach, July, August, 1934, 1935.

Holotype.—One set of serial sections, B. O. C., No. 1059.

Genus **PSEUDOCEROS** Lang 1884

**Pseudoceros crozieri**, new species

Figures 23–27

*Pseudoceros* sp. Crozier 1917.

Description.—The general external features of this species are given by Crozier, 1917, in an article illustrated with colored figures. The animal is of elongated oblong shape (fig. 23) with the usual two marginal tentacles at the anterior end. One specimen was secured which was larger than any mentioned by Crozier; this was 30 mm. long and 6–8 mm. wide when extended. The ground color of the specimens personally seen was a pale greenish yellow; but Crozier found that the ground color results from ingested ascidians and may be white, brownish, orange, or greenish. The dorsal surface is marked with a conspicuous pattern of black, somewhat wavy cross lines, some of which enlarge at their outer ends into a bulb-shaped black spot. Similar black spots may also occur along the sides independent of the cross lines. Many of the lines extend across the body width; but there are also many short ones. The body margin is encircled with a white band inside of which there is a brown band. The thick broad marginal tentacles have white tips, then a black ring, then a brown ring, and there are also two conspicuous black spots on the region between the tentacle bases (fig. 25). There are the usual paired clusters of cerebral eyes and numerous eyes also occur on the tentacle bases as shown in figs. 23 and 24.

The reproductive system is typical of the genus; there is but a single male copulatory complex. The male complex, although built on the plan usual for the genus, presents specific differences in the details of its anatomy. These are shown in fig. 26, where the shape of the penis papilla, and the truncate form of the penis sheath are noteworthy. There is no stilette. The female copulatory

canal, fig. 27, is typical but also shows specific details. The genital pore opens directly into the cement pouch but this receives cement glands only in its roof. The majority of the cement glands open into the narrow duct continuing dorsally from the cement pouch. Dorsal to the region of the cement glands, the female duct widens into a small chamber which narrows again as it connects with the uteri.

Differential diagnosis.—*Pseudoceros crozieri* is differentiated from other species of the genus by the color pattern, truncate penis sheath, and shape of the cement-receiving part of the female duct.

Locality.—On or near ascidian colonies, Bermuda.

Holotype.—One set of serial sagittal sections, B. O. C., No. 1055 A-G.

### ***Pseudoceros aureolineata* Verrill 1901**

#### Figure 28

Description.—Two specimens were secured of a polyclad which has been assigned with some hesitation to Verrill's *P. aureolineata*. It has seemed preferable to fix the species under Verrill's name than to create a new specific name. The animal has the typical appearance of the genus *Pseudoceros* with oblong body and marginal tentacles. The largest specimen seen was 30 mm. long and 10 mm. wide; Verrill gives a much greater breadth to length (25 mm. long, 18-20 mm. wide) but his drawing shows an obviously contracted individual. The color pattern consists of a broad median dorsal region of a purple or purplish-fawn color and lateral splotches of the same color on a white ground. Verrill's drawing shows the lateral splotches connected with the median area in a radiating fashion. This was not the case in the specimens which I saw but Dr. Wheeler has color sketches of two small specimens in one of which the pattern of the purplish color is quite like Verrill's figure. The other of Dr. Wheeler's specimens has no lateral patches so that the pattern consists of a wide median brownish area and white lateral regions. The margin is edged with a fine orange-brown or purplish-brown line and between this and the beginning of the lateral purplish markings the color is white as already stated. Verrill states that the dorsal surface is irregularly spotted and specked with white but Wheeler's sketches and my notes record small scattered orange spots. The eyes occur as paired cerebral clusters close together and on the ventral surface of the tentacle bases. Verrill's statement that eyes encircle the entire margin is obviously erroneous.

Sagittal sections of the larger specimen show a single median male copulatory apparatus of typical pseudoceran structure (fig. 28). The unarmed penis papilla is slender and the penis sheath of conical form. The female copulatory canal presents certain specific characteristics, chiefly the interposition of a chamber between the genital pore and the cement pouch (fig. 28).

Remarks.—The members of the genus *Pseudoceros* are notable among poly-

clads for their beautiful and often brilliant color patterns and it has been customary to base specific distinctions chiefly on color. While it is true that the copulatory complexes are very similar throughout the genus, nevertheless the study of the two species, *P. crozieri* and *P. aureolineata*, has shown that these complexes do present specific anatomical differences, and hence are more worthy of consideration in taxonomic descriptions of *Pseudoceros* species than has hitherto been the case. The possible loss or alteration of color in preserved specimens makes all the more desirable the utilization of all possible anatomical differences in taxonomic work.

Locality.—Like *P. crozieri*, *P. aureolineata* is commonly found associated with ascidian colonies, Bermuda.

Specimens.—One set of sagittal serial sections to B. O. C., No. 1056 A-G.

#### Other species of **PSEUDOCEROS**

No other species of *Pseudoceros* were personally seen but in 1932 Dr. Wheeler collected a single specimen each of *P. bicolor* Verrill 1901 and *P. superbus* Lang 1884, recorded in 1900 by Verrill as occurring at Bermuda. Both specimens were found under stones under the causeway from Longbird to Castle Islands. The specimen of *P. bicolor* was 9 mm. long and 2.3 mm. broad with a color pattern entirely like Verrill's figure and description. Sections of this specimen, kindly presented to me by Dr. Wheeler, showed that the reproductive system was completely absent. The specimen of *P. superbus* was 19 mm. long by 8.5 wide with a coloration corresponding to Lang's figure and description.

#### Family PROSTHIOSTOMIDAE

Genus **PROSTHIOSTOMUM** Quatrefages 1845

**Prosthiostomum cyclops** (Verrill) 1901, new comb.

Figures 29-32

*Discocelis cyclops* Verrill 1901.

Description.—This species is so typically a *Prosthiostomum* that Verrill's failure to place it correctly is rather surprising. Two specimens were taken at Bermuda, a small one 6 mm. long and a larger one 30 mm. in length. Verrill gives the length as up to 75-90 mm. The body is elongated, bluntly rounded anteriorly and gradually tapering to the somewhat pointed posterior end. The shape of the smaller specimen, drawn from life, is shown in fig. 29. Larger specimens are less tapering with a blunter posterior extremity. The color is white with small brown spots which become more numerous the larger the animal. In large specimens the brown spots are concentrated along the mid-dorsal line, somewhat forming a stripe, and are scattered sparsely over the rest of the dorsal surface. The eyes occur as two somewhat elongated cerebral

clusters and as a band along the anterior margin (fig. 30). The number of eyes in this band and the posterior extent of the band increase with age. In the small specimen of fig. 29, the band is about two rows wide and confined to the anterior margin. In the larger specimens, fig. 30, the band is much wider and extends backwards to about the middle of the cerebral clusters. Verrill states that the marginal eyes extend posteriorly behind the cerebral groups but I have not found this to be the case in any of the available specimens.

The digestive tract is typical of the genus and hence need not be described.

Neither of the specimens personally collected at Bermuda was sexual but fortunately the two specimens found in the Verrill material at the Peabody Museum proved to be in the sexual state. In one of them, made into a whole mount, the eyes of which are shown in fig. 30, the penis was protruded and is drawn in fig. 32. The other specimen, sectioned sagittally, showed a copulatory complex entirely typical of the genus (fig. 31), but nevertheless with certain specific features. The male and female pores are fairly close together. The male pore opens into an elongated male atrium which slants anteriorly and is well provided with a muscular wall, of inner longitudinal and outer circular fibers. This terminates anteriorly in the penis with which the male apparatus curves posteriorly, paralleling its former course so that the seminal vesicle is above the male genital pore. The penis is typical of the genus, an elongated curved structure, terminating in the penis stilette, a hard beak-like object (fig. 32). The penis and stilette traverse a penis pocket into which open the granule glands. The arrangement of the latter suggest a chambered granule vesicle encircling the stilette. The end of the stilette is embraced by a well-developed penis sheath of conical form. The base of the penis receives the much coiled ejaculatory duct and the ducts from the two accessory vesicles. The latter, as is typical of the genus, consist of two spherical extremely muscular bodies lying between the seminal vesicle and the penis, one slightly behind the other. Their function is unknown but their great muscularity suggests some pumping action during copulation, possibly, as Lang and Bock suppose, the ejection of the granule secretion. The seminal vesicle is a large elongated sac with muscular walls which receives the vasa deferentia into its sides asymmetrically, one behind the other. From its posterior end the coiled ejaculatory duct proceeds backwards winding between the accessory vesicles.

The female terminal apparatus is typical of the genus but presents certain specific details: the large cement pouch and the distinct rounded chamber dorsal to this which receives the uteri.

Remarks.—It is improbable that this species is identical with either of the species described by Bock, 1913, from the Bahamas.

Differential diagnosis.—*P. cyclops* is distinguished from other members of the genus by the very elongated, canal-like male atrium, the well-developed penis sheath, and the large cement pouch.

Locality.—Shores of Longbird Island, Bermuda, under stones, August, 1935; recorded by Verrill under stones in Harrington Sound, Castle Harbor, and the Scaur, May.

Specimens.—One whole mount from Verrill's vial 4, and one series of sagittal sections from Verrill's vial 1, returned to the P. M., No. A 12377.

### Family EURYLEPTIDAE

#### Genus **ACEROTISA** Strand 1926

*Aceros* Lang 1884 (preoccupied).

#### **Acerotisa notulata** (Bosc) 1801, new comb.

Figures 33-38

*Planaria notulata* Bosc. 1801.

*Planaria notulata* Bosc, Graff 1892.

Description.—One single specimen of this minute polyclad was found in the B. O. C. Sargassum material. At first believed to be a baby polyclad, the specimen was made into a whole mount. Careful study of this convinced me that the animal, despite its small size, was sexually mature and hence, after it had been drawn (fig. 33), the specimen was dissolved from the slide and sectioned sagittally. Although the sections are imperfect in the region of the genital pores, they show beyond doubt a cotylean polyclad of the family Euryleptidae. Some features, because of the imperfect nature of the specimen, could not be determined with certainty, but the animal appeared to fit best into the genus *Acerotisa* (= *Aceros*).

The specimen (fig. 33) is of oval form, barely 1 mm. in length, hence the smallest known polyclad. It appeared to be colorless. Behind the brain there are two large and conspicuous eyes and two small eyes in front of the brain. There is no trace of tentacles. At the anterior margin there are two groups of eyes, one containing five eyes, the other four. In these groups, the eyes at the margin are larger, those further in the interior, smaller. The eye arrangement is identical with that figured by Graff, 1892, for a pelagic polyclad which he considered probably to be *Planaria notulata* Bosc. Behind the brain is a tubular pharynx and directly behind that is seen the male copulatory apparatus of which there were distinguishable in the whole mount the seminal vesicle, the granule vesicle, and the penis. Immediately behind the seminal vesicle is situated the female pore with its conspicuous cement pouch and posterior to that occurs the relatively large sucker. The paired uteri stuffed with large yellowish eggs occur to either side in the posterior half of the animal. In lateral body regions the numerous testes and the intestinal branches could be distinguished.



Sagittal sections (fig. 34) showed a digestive tract typical of the Euryleptidae. The short, slightly hour-glass shaped pharynx is directed anteriorly. The position of the mouth could not be determined with certainty because the ventral epithelium is here broken. From the pharynx the main intestinal trunk extends posteriorly in the middorsal region, giving off lateral branches. The dorsal epithelium is practically intact and hence it can be stated positively that there is no dorsal pore to the intestine such as has been found in several euryleptid genera. The anterior course of the intestine was not clear. There appeared to be no median trunk but simply several branches radiating from the root of the pharynx. The intestinal branches do not anastomose.

The only noteworthy feature of the general histology is the very tall transparent dorsal epithelium (fig. 35). It contains sparse clusters of rhabdites. At anterior and posterior ends there are numerous rhabdite clusters in the epithelium and the anterior epithelium is also penetrated by the outlets of gland cells (fig. 37). Ventrally the surface epithelium is very flat but is missing from most of the ventral surface. The sucker is much folded and lined by a tall epithelium.

The numerous testes occur throughout the body length in the lateral body regions. The paired vasa deferentia can be traced in the sections for some distance posterior to the male copulatory apparatus. They run forward passing to either side of the female apparatus. Their connection with the seminal vesicle could not be certainly determined but is probably as shown in fig. 38. The oval seminal vesicle is oriented with its long axis vertical to the body plane. Its dorsal end tapers into a canal which could not be followed but which presumably connects with the vasa deferentia. The seminal vesicle has a thin but muscular wall and contains a large mass of sperm. Ventrally it tapers into a slender canal which presumably connects with the granule vesicle although the connection was broken in the sections. The penis is transversely placed in the specimen; this position can hardly be considered normal. This orientation together with the lack of ventral epithelium in the genital region has made it impossible to get a clear idea of the shape and relations of the penis. The relations shown in fig. 38 are somewhat conjectural. The penis papilla is slender and elongated and probably has an armature over its distal end. It is inclosed in a projecting fold of the body wall. At its base it is continuous with a small rounded granule vesicle whose wall shows the typical chambered condition.

The connection of the female apparatus with the body surface was also missing. The genital pore probably leads directly into a large cement pouch whose walls receive the numerous cement glands. From this pouch there leads dorsally a ciliated tube into which the uteri open, apparently after a union. The uteri are large spaces on each side which extend forward a little beyond the female pore and backward to the rear end of the body. Each contains a dozen or more large eggs. There are no indications of any uterine sacs or glands such as occur in other Euryleptidae. Lang described two uterine "glands" as characteristic

of the genus *Aceros* but since his time several species having no uterine glands have been assigned to *Aceros* by various authors. The lack of these glands is not apparently a character of generic significance. The ovaries of *A. notulata* are not easily made out. There appear to be several on each side very close to the uteri and opening directly into them (fig. 36).

Remarks.—The present specimen is undoubtedly identical with a Sargassum polyclad of which the anterior end showing the eyes is figured by Graff, 1892. Graff somewhat doubtfully identified this specimen as *Planaria notulata* Bosc 1801. I have not been able to obtain Bosc's original paper but the 1830 edition which appears to be an exact reprint of the 1801 edition has been available. As is usually the case with old descriptions, Bosc's account is too indefinite to permit any certain identification of his species with the present specimen. However, the facts that Bosc's specimens came from the Sargassum, that they were cotyleans, that they were small and oval and without tentacles, and that they had two conspicuous cerebral eyes lend a considerable probability to the identification. I therefore am adopting Bosc's name for the species, thus fixing his description.

Differential diagnosis.—*Acerotisa notulata* is distinguished from other species of the genus chiefly by the small number and the arrangement of the eyes.

Locality.—On the pelagic Sargassum, central North Atlantic, July, 1934.

Neotype.—One set of sagittal serial sections to B. O. C., No. 1057. In view of the importance of the specimen and the fact that it is the first specimen obtained which can be placed taxonomically, the specimen is hereby created a neotype in accordance with the suggestion of Schenk and McMasters, 1936.

### SUMMARY

1. There are described from Bermuda and the pelagic Sargassum one known and two new species of Acoela, eleven known and two new species of Polycladida, and one new variety of polyclad.

2. The Acoela are all of the genus *Amphiscolops* and comprise *A. langerhansi* (Graff) 1882 in aquaria at Bermuda, *A. bermudensis*, new species, from seaweeds at Bermuda, and *A. sargassi*, new species, from the Sargassum at Bermuda. *A. bermudensis* is notable for the presence of two female pores from each of which a ciliated vaginal canal leads to the seminal bursa. *A. sargassi* lacks a statocyst; no sexual specimens were obtained.

3. The polyclads are chiefly species described by Verrill in 1900 and 1901. They are here assigned to their proper genera with descriptions of their sexual anatomy.

4. *Leptoplana lactoalba* Verrill 1900 is found to belong to the genus *Notoplana* and hence its name becomes *Notoplana lactoalba*, new combination. It is noteworthy for the combination of tentacular and cerebral eyes into single elongated groups, the very long penis stilette, and prominent penis sheath.

5. *Discocelis binoculata* Verrill 1901 is found to belong to the genus *Notoplana* and is renamed *Notoplana binoculata*, new combination. *Notoplana bahamensis* Bock 1913 is synonymous with this species, rather than with *N. ferruginea* (Schmarda) as thought by Stummer-Traunfels 1933. Its distinguishing feature is the thick muscular mass in the anterior wall of the male antrum.

6. *Hoploplana grubei* (Graff) 1892 was taken in small numbers from the pelagic Sargassum in the Gulf of Mexico, and the central North Atlantic, but not in other areas.

7. The genus *Gnesioceros* Diesing 1861 is revived as a valid planocericid genus and the common polyclad of the pelagic Sargassum, "*Planaria*" *sargassicola* Mertens 1833, is transferred to this genus with the new combination *Gnesioceros sargassicola*. *Pelagoplana* Bock 1913 thereby falls in synonymy to *Gnesioceros*. Large numbers of *G. sargassicola* were taken from the pelagic Sargassum in the Gulf of Mexico, Caribbean, and western and central North Atlantic. The cirrus of this species is for the first time adequately described and figured.

8. *Gnesioceros sargassicola lata*, new variety, is described from sea-weeds at Bermuda, differing in the broad expanded anterior end.

9. *Trigonoporus microps* Verrill 1901 is found to be a *Cestoplana* and is renamed *Cestoplana microps*, new combination.

10. The sexual apparatus of *Thysanozoon nigrum* Girard 1854 is described for the first time and shown to have distinctive characteristics.

11. *Thysanozoon flavotuberculatum*, new species from Bermuda is distinguished by its color pattern; available specimens were non-sexual.

12. *Pseudoceros crozieri*, new species, found on ascidian colonies at Bermuda, has a distinctive color pattern and some specific details of its copulatory complexes.

13. Details of the copulatory apparatus are described and figured for *Pseudoceros aureolineata* Verrill 1901, found in small numbers at Bermuda.

14. A single specimen each of *Pseudoceros bicolor* Verrill 1901 and *P. superbus* Lang 1884 was taken at Bermuda in 1932.

15. *Discocelis cyclops* Verrill 1901 is found to be a *Prosthlostomum* and the name is changed to *Prosthlostomum cyclops*, new combination. It is distinguished by the excessively long male antrum.

16. The most important specimen in the collection is *Acerotisa notulata*, new combination for "*Planaria*" *notulata* Bosc 1801, a minute polyclad of which a single mature specimen was present in Sargassum material collected in the central North Atlantic, the first specimen found suitable for taxonomic study. It has fewer eyes than any other members of the genus.

## LITERATURE

- BOCK, S.:  
1913. Studien über Polycladen. Zoolog. Bidrag. 2.
- BOSC, L. A. G.:  
1830. Histoire naturelle des Vers. 2nd ed.
- CROZIER, W. J.:  
1917. On the pigmentation of a polyclad. Proc. Amer. Acad. Arts and Sci., 52.
- DIESING, K. M.:  
1861. Revision der Turbellarien. Abth. Dendrocoelen. Sitz'ber. Akad. Wissensch. Wien, Math. Naturw. Klasse 44, Abth. 1.
- GIRARD, C.:  
1854. Descriptions of a new planaria and a new Nemertes from the coast of Florida. Proc. Boston Soc. Nat. Hist., 4.
- GRAFF, L. VON:  
1874. Zur Kenntniss der Turbellarien. Zeitschr. wiss. Zool., 24.  
1882. Monographie der Turbellaria. I. Rhabdocoelida.  
1891. Die Organisation der Acoela.  
1892. Pelagische Polycladen. Arbeiten Zool. Institut. Graz, 5.  
1905. Acoela. Das Tierreich, Lief. 23.
- HYMAN, L. H.:  
1937. Reproductive system and copulation in *Amphiscolops langerhansi* (Turbellaria Acoela). Biol. Bull., 72.  
1939. Polyclad worms collected on the Presidential Cruise of 1938. Smithsonian Miscell. Coll. 98: 1-13.
- LAIDLAW, F. F.:  
1902. Marine Turbellaria. Fauna and Geography of the Maldive and Laccadive Archipelagoes, I, part 3.  
1903. A collection of Turbellaria Polycladida from the Straits of Malacca (Skeat Expedition). Proc. Zool. Soc. London, 1903, pt. 1.
- LANG, A.:  
1884. Die Polycladen (Seeplanarien) des Golfes von Neapel und der angrenzenden Meeresabschnitte. Fauna und Flora des Golf. Neapel 11.
- MERTENS, H.:  
1833. Untersuchungen über den inner Bau verschiedener in der See lebender Planarien. Mém. Acad. Impér. Sci. St. Pétersbourg, Ser. V, Sci. math. phys. nat., 2.
- PEEBLES, F.:  
1915. A description of three Acoela from the Gulf of Naples. Mitth. Zool. Stat. Neapel, 22.
- SCHENK, E. T. AND McMASTERS, J. H.:  
1936. Procedure in taxonomy.
- STRAND, E.:  
1926. Miscellanea nomenclatoria zoologica et palaeontologica. Arch. Naturgesch. 92 A, Heft 8.

## STUMMER-TRAUNFELS, R.:

1933. Polycladida. Bronn's Klassen und Ordnungen des Tierreichs, Band IV, Abt. 1c, Lief. 179: 3521-23.

## VERRILL, A. E.:

1900. Additions to the Turbellaria, Nemertina, and Annelida of the Bermudas, with revisions of some New England genera and species. *Trans. Conn. Acad. Sci.*, 10.
1901. Additions to the Fauna of the Bermudas from the Yale Expedition of 1901, with notes on other species. *Trans. Conn. Acad. Sci.*, 11.

**EXPLANATION OF NUMERICAL SYMBOLS ON PLATES I-IX**

- |                          |   |
|--------------------------|---|
| 1. Frontal glands.       | 20. Pharynx.                              |
| 2. Eyes.                 | 21. Seminal vesicle.                      |
| 3. Statocyst.            | 22. Granule vesicle.                      |
| 4. Mouth.                | 23. Penis papilla.                        |
| 5. Dorsal lobe.          | 24. Penis stilette.                       |
| 6. Nozzles of bursa.     | 25. Penis pocket.                         |
| 7. Seminal bursa.        | 26. Penis sheath.                         |
| 8. Vagina.               | 27. Vas deferens.                         |
| 9. Penis.                | 28. Uterus.                               |
| 10. Female genital pore. | 29. Lang's vesicle.                       |
| 11. Male genital pore.   | 30. Ejaculatory duct.                     |
| 12. Epidermis.           | 31. Cement glands.                        |
| 13. Cutaneous glands.    | 32. Muscular mass of male antrum.         |
| 14. Zooxanthellae.       | 33. Lateral projections into male antrum. |
| 15. Brain.               | 34. Retractor muscle of cirrus.           |
| 16. Ovary.               | 35. Protractor muscle of cirrus.          |
| 17. Testes.              | 36. Cirrus.                               |
| 18. Gland cells.         | 37. Sucker.                               |
| 19. Brain granules.      | 38. Male antrum.                          |

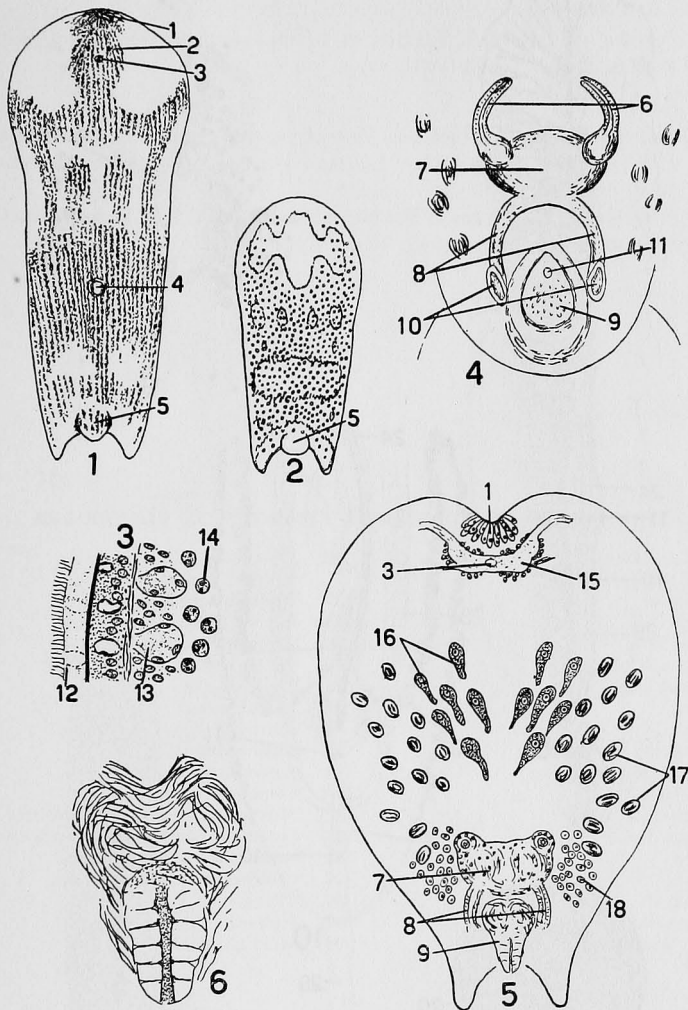


PLATE I. Figure 1. *Amphiscolops bermudensis*, from life; shaded areas show distribution of "concrement" granules. Figure 2. Young specimen of *A. bermudensis*, from life; concretions areas outlined; small circles are zooxanthellae. Figure 3. Body wall of *A. bermudensis*. Figure 4. Copulatory complex of *A. bermudensis* from a living pressed specimen. Figure 5. Frontal section of *A. bermudensis*; the penis, torn loose in the sections has been replaced into its probable position. Figure 6. Penis enlarged.

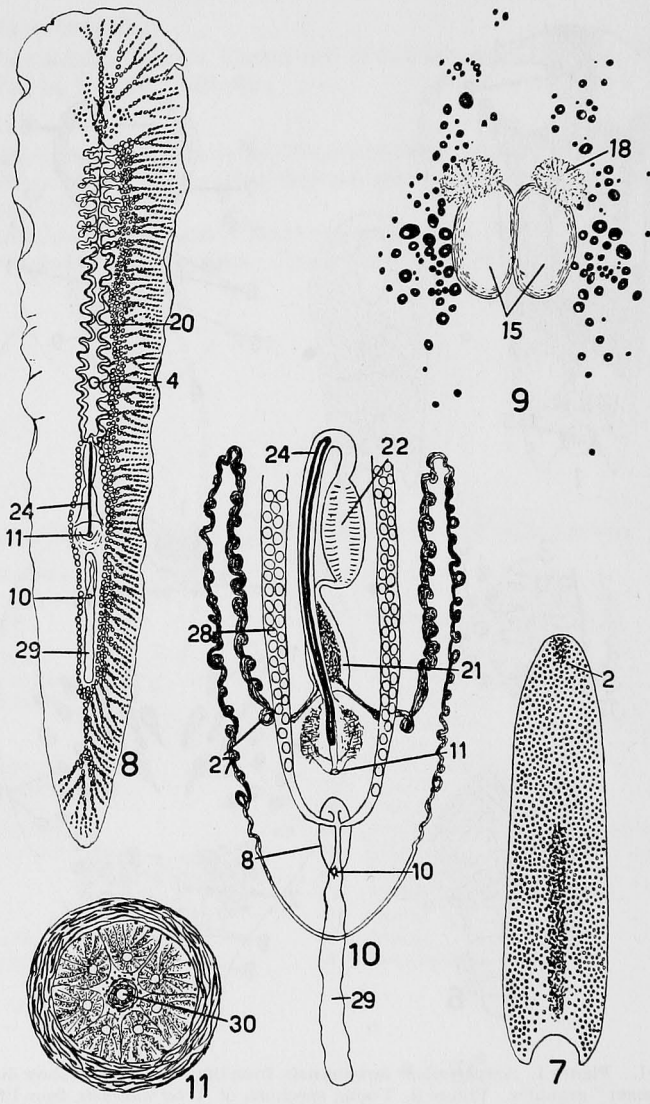


PLATE II. Figure 7. *Amphiscolops sargassi*, from life. Figure 8. *Notoplana lactoalba*, from life. Figure 9. Brain and eyes of *Notoplana lactoalba*, from a whole mount. Figure 10. Copulatory complex of *N. lactoalba*, dorsal view, from a live pressed specimen. Figure 11. Cross-section through the granule vesicle of *N. lactoalba* at the beginning of sexual maturity.

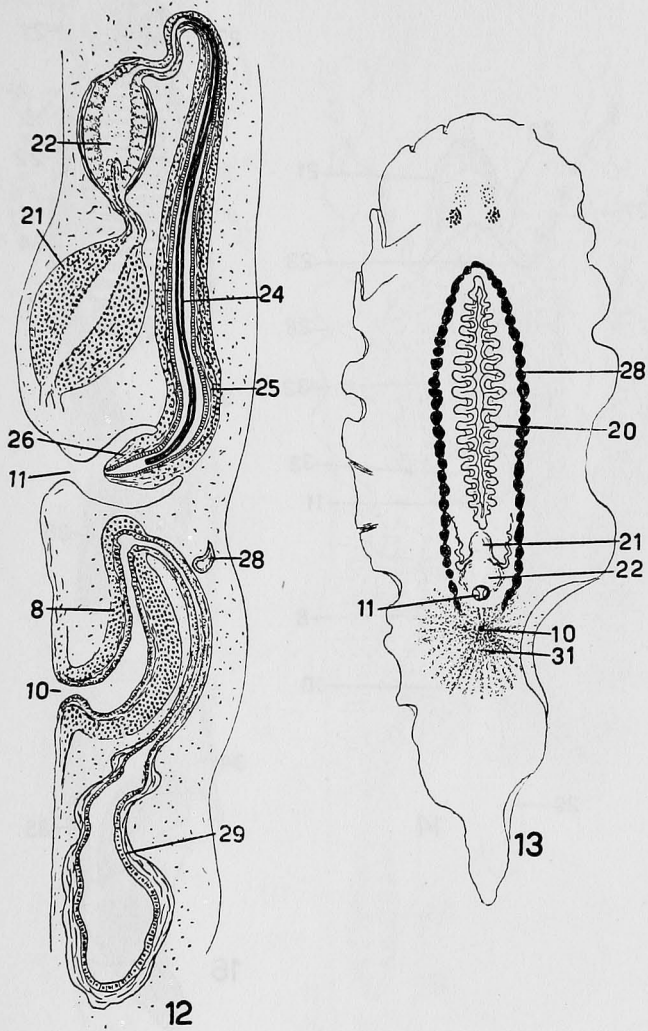


PLATE III. Figure 12. Sagittal section of the copulatory complex of *Notoplana lactoalba*.  
 Figure 13. *Notoplana binoculata*, preserved specimen collected by Verrill.



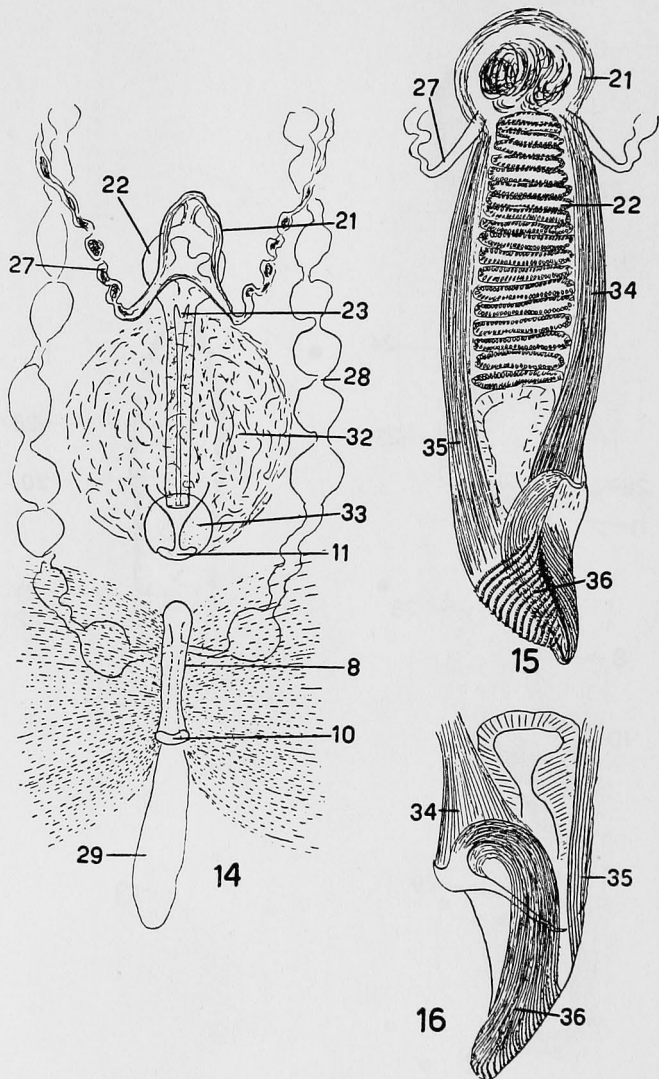


PLATE IV. Figure 14. Copulatory complex of *Notoplana binoculata*, ventral view. Figure 15. Male copulatory apparatus of *Gnesioceros sargassicola* from a whole mount, ventral view, cirrus somewhat protruded. Figure 16. Dorsal view of the cirrus of *Gnesioceros sargassicola*, from a whole mount, cirrus partly retracted.

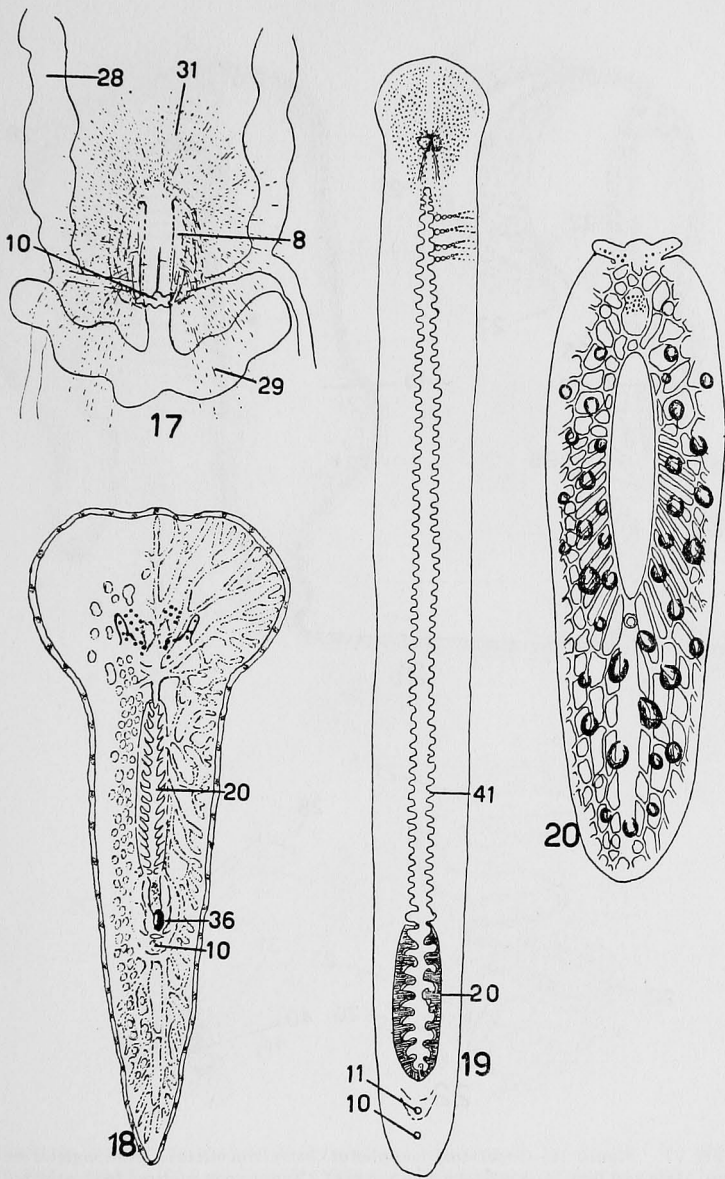


PLATE V. Figure 17. Female copulatory apparatus of *Gnesioceros sargassicola*, ventral view, from a whole mount. Figure 18. *Gnesioceros sargassicola lata*, from life. Figure 19. *Cestoplana microps*, from life. Figure 20. *Thysanozoon flavotuberculatum*, from life.

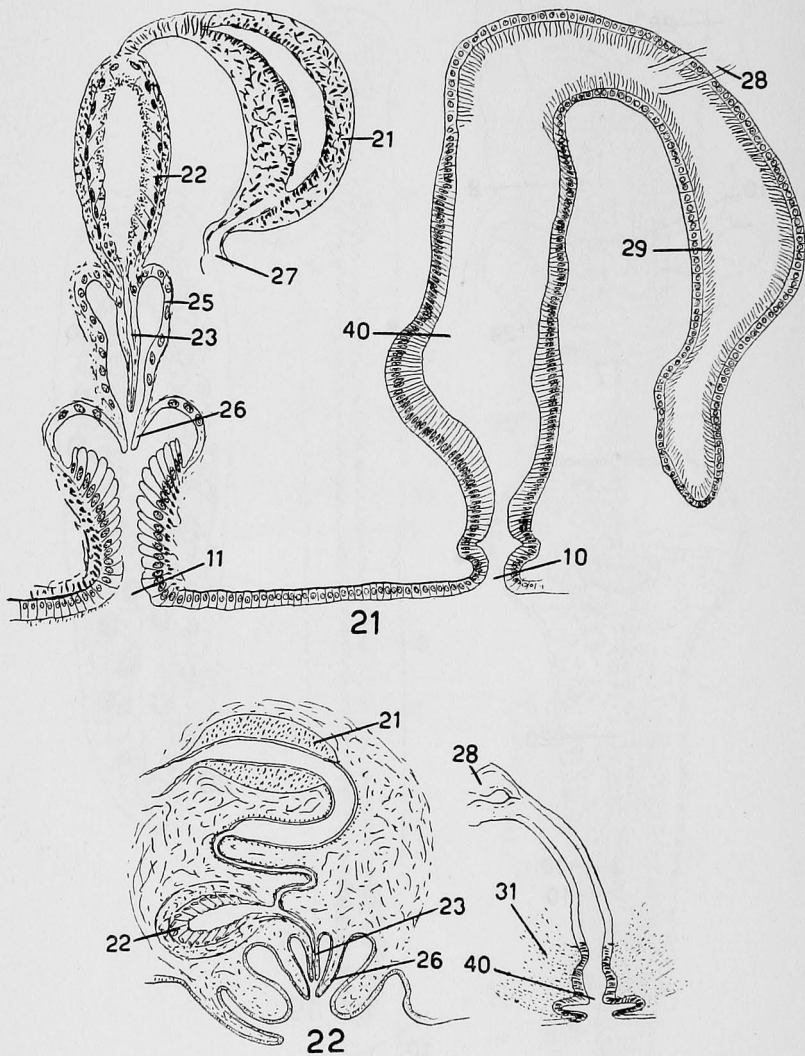


PLATE VI. Figure 21. Copulatory complex of *Cestoplanea microps*, from sagittal sections. Figure 22. Male and female copulatory complexes of *Thysanozoon nigrum*, from sagittal series of sections.

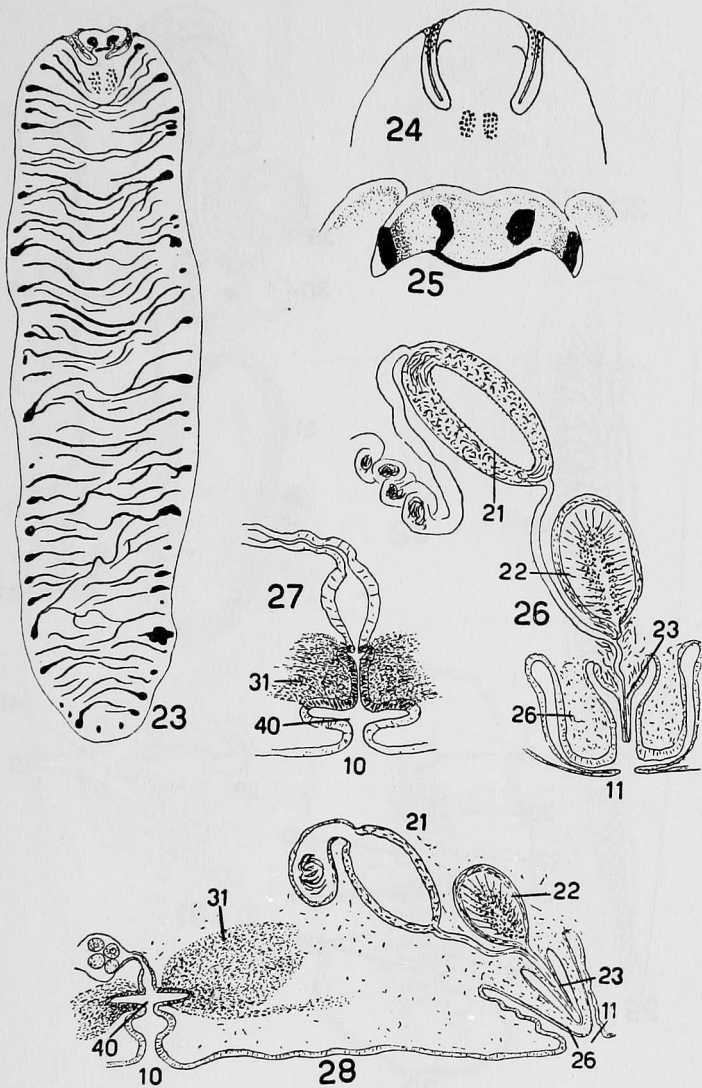


PLATE VII. Figure 23. *Pseudoceros crozieri*, from life. Figure 24. Tentacles and eyes of *Pseudoceros crozieri*, from life. Figure 25. Color distribution on tentacles of *Pseudoceros crozieri*, from life. Figure 26. Male copulatory complex of *P. crozieri*, from sagittal series of sections. Figure 27. Female copulatory complex of *P. crozieri*, from sagittal sections. Figure 28. Male and female complexes of *Pseudoceros aureolineata* from sagittal sections.

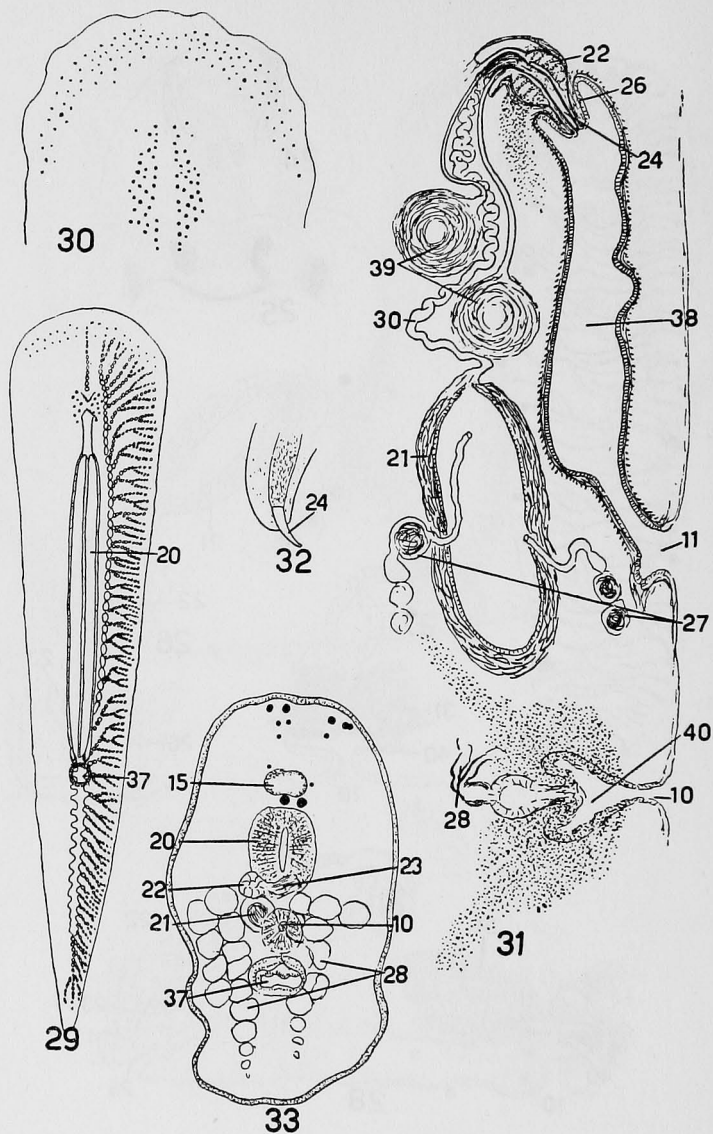


PLATE VIII. Figure 29. *Prothiostomum cyclops*, from life, sexually immature. Figure 30. Anterior end of *Prosth. cyclops*, showing distribution of eyes, from whole mount made of one of Verrill's specimens. Figure 31. Sagittal view of copulatory complex of *Prosth. cyclops*, from sagittal series of sections made from one of Verrill's specimens. Figure 32. Protruded penis of same specimen as fig. 30. Figure 33. *Acerotisa notulata*, stained whole mount.

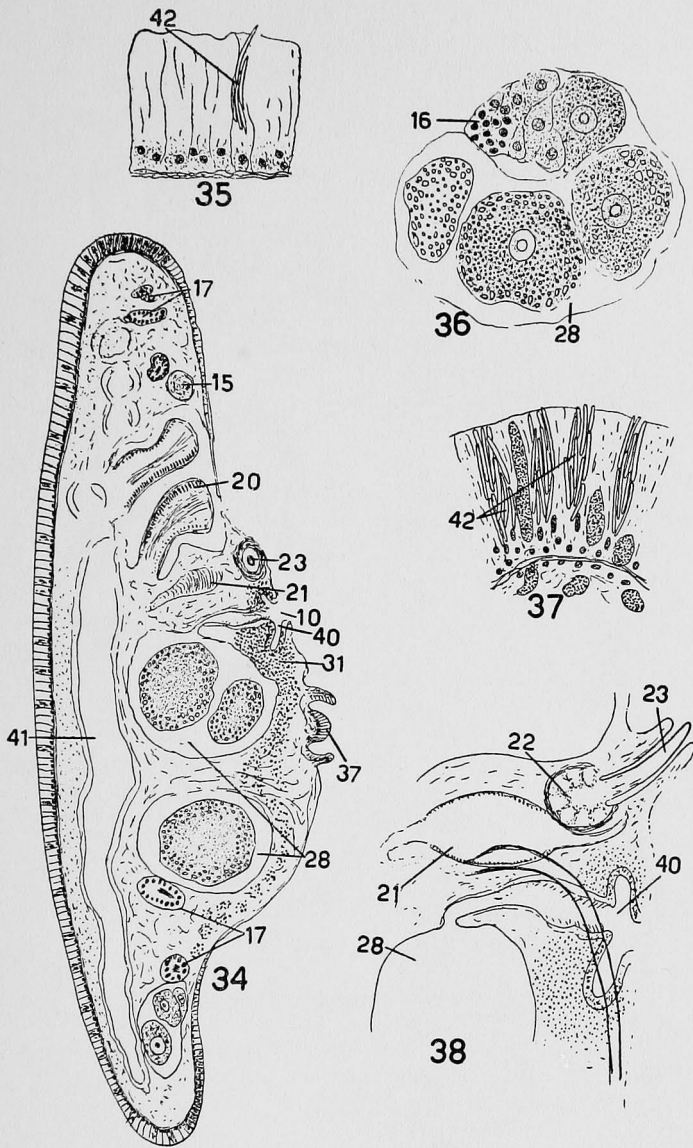


PLATE IX. Figure 34. Median sagittal section of *Acerotis notulata*, same specimen as fig. 33. Figure 35. Dorsal epidermis of *Acer. notulata*. Figure 36. Ovary with various stages of ova opening into uterus containing three ripe eggs. Figure 37. Anterior epidermis of *Acer. notulata* with rhabdite bundles and gland cells. Figure 38. Sagittal view of the copulatory complex of *Acer. notulata*. For conjectural features of this drawing see page 22.