

BIJDRAGEN TOT DE KENNIS DER FAUNA VAN CURAÇAO.  
Resultaten eëner Reis van Dr. C. J. VAN DER HORST in 1920.

## ON A COLLECTION OF NEMERTEANS FROM CURAÇAO

BY

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(With Plates V—VIII and 7 textfigures).

This collection of Nemerteans is the largest one, known from these regions. It contains only littoral species, most of them being entirely new to science. Only one species is known from other tropical regions, all others seem to be characteristic of the westindian coasts. They are:

Ordo HOPLONEMERTINI: *Polyschista curaçaoensis* n. g. n. sp.

Ordo PALAEONEMERTINI: *Carinoma caraïbica* n. sp.

Ordo HETERONEMERTINI: *Baseodiscus curtus* (Hubr.).

„ *unicolor* n. sp.

*Micrura leucopsis* Coe.

„ *vanderhorsti* n. sp.

„ *curaçaoensis* n. sp.

?*Cerebratulus ater* (Girard).

*Diplopleura curaçaoensis* n. sp.

and two Lineidae, that are incomplete and too much damaged to be identified at all.

### A. Systematic Part.

#### HOPLONEMERTINI.

##### Subordo POLYSTILIFERA.

*Polyschista curaçaoensis* n. g. n. sp.

(Pl. V fig. 1a, 1b, 1c; pl. VI fig. 1—4; textfig. 1).

Spanish Water, between *Porites furcata*, 13. IV. 1920.

*Polyschista curaçaoensis* is one of the Polystilifera Reptantia with two sensory branches of the cerebral canal. (P. Reptantia aequifurcata WIJNHOF 46). It differs from the three genera, that are known to belong to this subtypus by the behaviour of the cephalic bloodvessels. In the presence of a glandular processus to the cerebral organ it shows a certain relationship to the genus *Punnettia*, from which it differs in the structure of the dorsal brain-lobes, that never show the bifurcation of the fibrous mass, present in our species.

*Material.* Three broad pieces, two of which possess a head, whereas the third one is a tail. The entire length must exceed 25 mm; the largest breadth was 5 mm. The animals show a well defined brown longitudinal marking on their back (Pl. V, fig. 1a); the margins are a milky, transparent white and two to three times as broad as the thick middle part, with its brown dorsum.

The snout in both specimens was rather contracted and is quite brown, much broader than

long and separated from the body by the white circular head-furrows. The ventral side of the head (Pl. V, fig. 1 *b*) is more or less triangular, has a less deep colour and shows a large mouth (the proboscidian pore, not the real mouth). The tail is very transparent, quite white, without any traces of brown pigment, and flat.

#### Anatomy.

The body-wall is thick and consists of a low integument and a thick basement membrane, which eventually reaches the same breadth as the former (in the enteric region). The outer circular and the diagonal muscle-layer together do not exceed in thickness above the basement membrane. The longitudinal musculature is strongest in its ventral part (Pl. VI, fig. 3 and 4) and may be almost reduced in the margins (fig. 4). It develops best in the gastric region (fig. 3).

The body-parenchyma is well developed, especially in the margins (fig. 3), but also in the gonidial region; this, however, may change with the better development of the gonads that in our cases are unripe.

The inner circular muscle-layer or its derivatives may be present in some regions; it shows itself almost unchanged in the pyloric region (fig. 4), encircling the rhynchocoelomic cavity, the pylorus and the blindgut; the ring of fibres may be complete on the ventral side, where only a narrow stripe of tissue fails; on the dorsal side a strong circular layer lies on the rhynchocoelomic wall and gives off a narrow inner part to its ventral side (fig. 4). The dorsoventral musculature is always well developed, even in other regions (fig. 3). The body-margins contain much smaller bundles of dorsoventral muscle-fibres, into which the septa are dissolved (fig. 4).

The snout (Pl. V, fig. 1) shows the same broadness, which is characteristic of the whole body and is well separated from the body. The margins continue even in the precerebral region and contain the eyes and the bloodvessels. They have a well developed parenchyma (fig. 1 and 2, pl. VI, right side). The median part of the head contains the rhynchodaeum and the oesophagus, and a strong *m. retractor capitis* (WIJNHOF 45). The rhynchodaeum has no musculature of its own. Mouth and proboscis-pore are situated very near to each other, but are perfectly separated. The needlepointlike mouth could macroscopically not be distinguished and is not shown in fig. 1 *b*, Pl. V. A very thick septum is present before and at the side of the brains (Pl. VI, fig. 1 and 2).

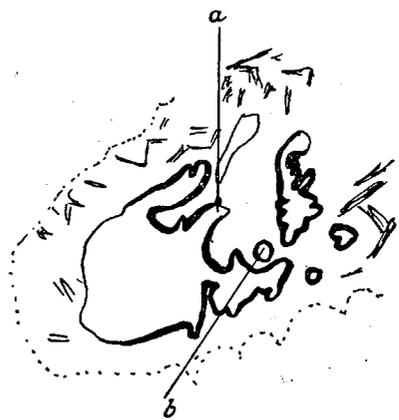


Fig. 1. Marginal part of a section through *Polyschista*, showing the difference between the expanded and contracted wall of the rhynchocoelomic diverticula. *a.* pseudobranch. *b.* transverse section of a pseudobranch.

The proboscidian system shows a well developed sphincter rhynchodaei (Pl. VI, fig. 1) but no other rhynchodaeal musculature. The proboscis fails and the region where it is inserted, has been too much contracted and distorted to show any peculiarities. The wall of the sheath has the usual basketlike structure, which is surrounded by a more or less thick layer of circular fibres; these belong, as their behaviour in the pyloric region (Pl. VI, fig. 4) shows, to the inner circular muscle-layer of the body. The first diverticula lie at the end of the cerebral organs and wind around the glandular processus (Pl. VI, fig. 2). When contracted, they show a rather thick wall (textfig. 1), broken up by irregular thinwalled distensions of the lumen, that fail in the distended parts. Though these small distensions may show themselves as secondary diverticula, they only seem to be present, when contraction of the walls takes place. I found them also in *Drepanogigas albolineatus* (Bürger), a genus of the mediterranean see that belongs to the INAEQUIFURCATA (46). They fail in *Drepanophorus*, *Paradrepanophorus*, *Brinkmannia* and

*Punnettia*. The diverticula are placed peripherally, they distend as a rule in the margins, where they bend ventrally in all parts of the body (textfig. 1). The end does not quite reach the side-nerves.

The exact structure of the brains could not be studied, though two series of sections have been made. In one specimen the loss of the proboscis involved the dislocation of the brain and its several parts, in the other the sections had been made obliquely (Pl. VI, fig. 1 and 2). Only these facts seem to be certain: The pair of brain-lobes shows a clear division into dorsal and ventral lobes. The ventral

ganglia are very short and lie very near to each other. The dorsal lobes are much longer than the ventral ones and contain two fibrous cores: 1<sup>o</sup> the small, swollen bases of the dorsal commissures that lie on the ventral brain-lobes and continue directly into their fibrous mass; 2<sup>o</sup> the large lateral swellings of the dorsal lobes, which receive the smaller part of the commissural fibres, lie at the side of the ventral ganglion and build the free part of the dorsal lobes (Pl. VI, fig. 1). They commissurate only very superficially with the ventral lobes, do not give off fibres to the ventral brain-commissure. The hind-end of this fibrous mass bifurcates into a blind ending dorsal and a ventral part, which continues into the cerebral nerve (Pl. VI, fig. 2). This nerve enters the cerebral organ behind the dorsal ganglion. The position of the brains is rather ventral.

The lateral nerves originate from the ventral ganglia and immediately pass under the dorsal lobes into their lateroventral position (fig. 2). This place they keep throughout the whole body; as the breadth of the animal, however, increases by the development of broader margins, the position of the nerves seems to become a more central one (conf. Pl. VI, figs. 2, 3 and 4).

The sense-organs are well developed. The eyes are large, lie before the brains and are arranged in four stripes. I counted 56 in all. The head-furrows are very large, with eleven secondary ridges, that partly reach the tip of the snout. This number is so great, that I called the genus after this feature, which must be rather conspicuous in the living worm. The cerebral sense-organs lie almost at the side of the brains; when however, as in one of my specimens, the extrusion of the proboscis causes a protrusion of the brains into the rhynchodaeal cavity, the sense-organs are found behind the brains. The cerebral pore and the short cerebral canal keep the organ in its place, whereas the cerebral nerve makes it move forward. The result is a torsion of the cerebral organ and a small displacement. — The cerebral canal bifurcates, as is usual in the Reptantia; the ventromedian sensorial canal receives the glands and the dorsolateral one widens out to the cerebral sac (Pl. VI, fig. 1). Its wall is richly folded and the hind part of the sac may become a certain independence from the organ; the lateral part of the sac opens throughout its length into the sensorial tube, characteristic of the *AEQUIFURCATA*. The large glandular mass ends with a small, perfectly free glandular processus as known from *Punnettia* (Pl. VI, fig. 2).

The mouth is very narrow, as if caused by a needle, and was not observed macroscopically. It is perfectly separated from the large proboscidian pore and no traces of an atrium could be found. The oesophagus is rather wide and continues without a sharp limit into the gastric cavity. This enlarges behind the brains. The gastric pouches are arranged radially around the narrow central part that lies quite ventral; they surround the end of the brains (Pl. VI, fig. 2, left side). More behind the pouches come together into one dorsal pouch that lies on the deep pleas of the ventral wall (fig. 3). When the dorsal bloodvessel leaves the cavity of the sheath, the ventral wall gets flat; the beginning of the entodermal blindgut finds a broad, unfolded pyloric cavity (Pl. VI, fig. 4). The blindgut is very branched, with many thin, finger-shaped diverticula, that reach more forward than the blindgut itself (fig. 4). Eventually such a diverticulum may be found between the pyloric and rhynchocoelomic cavity. The enteric pouches are narrow and do not branch.

The bloodvascular system has developed more than in the other genera of this group. The cephalic vessels have paired side-vessels. A dorsal cephalic anastomosis is probably present, but could not be observed with certainty because of the enormous dilatation of the rhynchodaeum. A pair of lateral vessels originates from the cephalic vessels, which fuse with them before these enter the brain-ring. The ventral anastomosis gives off the ordinary three vessels; the median one enters the wall of the sheath-cavity at the end of the oesophagus and leaves it before the beginning of the blindgut (figs. 2 and 4). The lateral ones leave their central position (fig. 2) by an outward movement on the end of the brains to the cerebral organs. At the outside of these they move upwards to the nephridium, then they wind around the glandular processus of the cerebral organ (fig. 2) to the more central position of fig. 2. They reach their definite position in the region of the blindgut (fig. 4). The metameral anastomoses go all round the enteric diverticula (fig. 4 left side).

The nephridium is found around the hind-end of the cerebral organ (fig. 2) and its processus; it is obvious by its perfectly dorsal position (fig. 2 and 3), which is unknown in any *Polystilifera*, and it reaches to the blindgut. The pori are ventral (fig. 3), underneath the lateral nerves, in the

hinder part of the nephridium. In this region the folds of the gastric wall become less deep. The excretory duct lies at the outside of the nerves.

The genital sacs have a Y-type and are present already in the pyloric region. The ventral legs lie on the nerves, the dorsal ones between a dorsal and a ventral enteric diverticulum. A long common pouch leads to the ventrolateral gonopore. Both specimens were unripe females.

From the same habitat a proboscis of a *Polystilifer* was procured, being large and rather transparent, of a fleshy colour. It was collected on another occasion (5. V. '20), between corals and proved to possess 32 nerves. Possibly it belongs to the same species as the above described specimens.

#### PALAEONEMERTINI.

##### *Carinoma caraibica* n. sp.

(Pl. V, figs. 2, 3, 4, 5. Pl. VI, figs. 5, 6, 7).

Spanish Port, 20. V. 1920.

*C. caraibica* is the only palaeonemertean known from these regions. We know a *Carinoma* species from Woods Hole and another one from the pacific coasts, but from both it differs in many points, as will be seen from the following description. It is the only tropical representative of this genus.

*Material.* One specimen, figured in Pl. V, figs. 2, 3, 4 and 5, with partly extruded proboscis. The animal has a brownish violet colour and had a length of 22 mm to a breadth of 2½ mm after preservation. The head is more rounded than the flattened hind-end, which has an undep median ridge on the dorsal side. The proboscidian pore lies near the tip of the snout and the mouth is small. The head is somewhat swollen and has two unpaired dorsal depressions, as shown in fig. 3. The body is ringed irregularly (figs. 2—4).

##### *Anatomy.*

The structure of the body-wall with its epithelial muscle-fibres, cutaneous glands and outer longitudinal muscle-layer in the precerebral region is exactly the same as described by BERGENDAL (6) in *C. armandi*; behind the brains the outer longitudinal layer is present, but very thin (Pl. VI, fig. 6) and with the closure of the mouth it has disappeared altogether. A cutis is well developed throughout the stomodaeal region and even in the head (Pl. VI, figs. 5 and 6), where it fails in *C. armandi*. The outer circular muscle-layer is present in the head as two horizontal layers inside the glandular mass and surrounds the cephalic vessels and rhynchodaeum here as well as in the brain-region (Pl. VI, fig. 5). The inner longitudinal musculature builds the septa between the bloodvessels and continues in the brain-ring. It is the thickest muscular layer and develops enormously behind the inner circular muscle-coat in the enteric region, where it fills out the whole body (Pl. VI, fig. 7). The inner circular muscle-layer appears first in the region of the mouth (Pl. VI, fig. 6) and always builds the musculature of the rhynchocoelom. At its origin it consists of circular muscle-fibres only and the first longitudinal fibres are found in it at both sides of the stomodaeum after the closure of the mouth. These fail, however, at the side of the proboscidian sheath as far as the rhynchocoelomic vessels are present in the sections. With their disappearance the whole inner circular musculature becomes the same interwoven structure we know from *C. armandi* and the wall of the sheath of most *Polystilifera*. The nephridiopori indicate the end of the inner circular layer. Longitudinal fibres are found all round the stomodaeum and probably those, which enter the inner circular muscle-layer belong to this musculature, as well as those between the rhynchocoelom and the stomodaeum.

The body-parenchyma is very feebly developed, in the snout it is absent and only in the neighbourhood of the bloodvessels outside the inner circular muscle-coat we find it (Pl. VI, fig. 6). In the gonidial region it is almost absent, though the gonads are emptied and have fallen together (Pl. VI, fig. 7). The inner longitudinal layer extends to the walls of the intestine. This peculiarity seems to be characteristic of our new species, as *C. mutabilis*, *armandi* and *patagonica* have rather much parenchyma in this region.

The proboscis is built as in *C. armandi* and *mutabilis*. The rhynchodaeum has a low glandular

epithelium and seems to be surrounded by a few circular fibres (Pl. VI, fig. 5). The insertion of the proboscis takes place in the brain-ring. The longitudinal muscle-fibres of the inner coat are directly continuous with those of the proboscis; as however this muscle-coat surrounds already the rhynchodaeum and in the brain-region lies inside of the brain-lobes, the septum is reduced to a minimum. The rhynchocoelomic wall becomes only circular fibres with which the inner circular musculature from its origin to its end is directly continuous. When with the end of the rhynchocoelomic bloodvessels the structure of the inner circular muscle-coat becomes a network in its whole circumference, a difference in structure between the rhynchocoelomic wall and the inner circular muscle-coat does not exist. The wall of the sheath between the stomodaeum and the cavity at first contains a layer of longitudinal fibres between two very thin circular layers, which interlace afterwards and have altogether disappeared at the end of the rhynchocoelomic vessels. The wall of the sheath keeps the structure of the inner circular musculature after its disappearance.

The nervous system has a pair of cerebral ganglia that is surrounded by the outer longitudinal muscle-fibres and lies outside of the outer circular muscle-layer. The cephalic nerves are found in the same position. The side-nerves keep this place after the disappearance of the outer longitudinal muscle-fibres with the closure of the mouth and so become a subepithelial position from the end of the mouth to the beginning of the nephridium. Here they enter the outer circular muscle-layer and the inner longitudinal musculature, in which they are found all through the nephridial and gonidial region.

The sense-organs are represented by a number of sensory pits before the brains. Eyes, cerebral organs, frontal organs, side-organs seem to fail. The sections reveal no traces of cephalic slits nor furrows.

The mouth is situated directly behind the brains. The stomodaeum shows no differentiation into two parts, though the form of the cavity changes with that of the proboscidian sheath and the inner circular muscle-coat. The digestive tract leaves this muscle-coat with the beginning of the enteric cavity, which at ones has diverticula and a deep ventral gut that is embedded in the longitudinal musculature (Pl. VI, fig. 7). Features, as shown in BÜRGER'S figures of *C. armandi* (7) with small, rounded diverticula, are absent and a branching or radiating of diverticula, as shown by that species, is absent in mine; they are much longer and narrower than in *C. mutabilis* (14, 15, 16) and very numerous.

The bloodvascular system partly shows some characteristics of *C. tremaphoros* (34). The cephalic anastomosis is perfectly terminal and gives rise to two pairs of cephalic vessels that only communicate in the head, because the outer pair opens into the inner one just before the brains. These vessels enter the brain-ring, but do not anastomose. A ventral cephalic anastomosis is absent. Oesophageal bloodvessels are absent; at one side a small vessel may perhaps be present, but as it does not extend over more than two sections, it cannot bear the name of vessel. The lateral rhynchocoelomic vessels originate from the lateral vessels at the side of the insertion of the proboscis and the ventral nerve-commissure. The rhynchocoelomic vessels themselves appear somewhat later. They do not leave the sheath and end blindly, together with the appearance of longitudinal muscle-fibres in the whole inner circular layer, a long way behind their origin. The lateral rhynchocoelomic vessels are much longer and communicate with the lateral bloodvessels in the nephridial region. The lateral vessels lie under the intestinal diverticula.

The excretory system shows the same structure as in the other species. The nephridiopori are found at the end of the inner circular muscle-layer. The glands narrow the lumen of the lateral bloodvessels and give off at their end a backwards directed excretory canal, which doubles in the enteric region and opens more forward with a dorsal pore. The canal lies at the border of the longitudinal musculature in the parenchyma.

The genital sacs were empty and their walls had fallen together; they lie between the intestinal diverticula; the gonopori were not visible.

Characteristic of this species are: 1° the extraordinary thick longitudinal musculature behind the end of the inner circular layer; 2° the absence of a body-parenchyma of some extent; 3° the behaviour of the bloodvessels, which show the features of *C. tremaphoros* in the head, but have no ventral brain-anastomosis nor oesophageal bloodvessels, which in all other species seem to be present. The

long rhynchocoelomic vessels that are short in *C. patagonica* end blindly as in *C. armandi* and do not communicate with the lateral vessels as in *C. tremaphoros*; 4° the presence of a thin outer longitudinal muscle-coat and a thick cutis, which shows a certain affinity to *C. mutabilis* of the western american coasts; 5° the absence of any dorsoventral musculature (see *C. armandi* in BÜRGER'S Monograph); 6° the structure of the intestine.

*C. caraibica* differs from *C. armandi* in: 1° the presence of a well marked cutis and 2° a much thinner and shorter outer longitudinal musculature; 3° in the region, where the lateral nerves enter the circular muscle-coat; 4° in the thickness of the inner longitudinal musculature; 5° the absence of a body-parenchyma; 6° the absence of a network of bloodvessels in the head; 7° in the absence of oesophageal bloodvessels; 8° in the structure of the intestine; 9° the absence of dorsoventral musculature and 10° the position of the nephridial ducts.

From *C. tremaphoros* (34) it differs in: 1° the place where the nerves enter the circular musculature; 2° the extension of the outer longitudinal muscle-coat; 3° the absence of a ventral brain-anastomosis and of 4° oesophageal vessels; 5° the blind ending rhynchocoelomic vessels.

From *C. mutabilis* (14, 15, 16) it differs in: 1° the presence of the outer longitudinal muscle-layer; 2° the development of the inner longitudinal musculature; 3° the absence of the body-parenchyma; 4° the absence of a network of bloodvessels in the snout; 5° the extension of lateral rhynchocoelomic vessels; 6° the place where the side-nerves enter the musculature; 7° the structure of the intestinal diverticula.

BÜRGER'S figures of *C. patagonica* (9) seem not to be right as far as the musculature is concerned; the nervous system does not change its position and nothing is seen of an outer longitudinal muscle-coat in the precerebral, cerebral or stomodaeal regions. The inner circular muscle-layer fails in the region of the mouth. But even if these differences did not exist and only were due to incorrectness, the behaviour of the rhynchocoelomic vessels that in our specimen are present in the region of the mouth (Pl. VI, fig. 6), the position of the nerves in the stomodaeal region, the extension of the nephridium, the presence of a cutis and of a dorsal and a ventral median septum in the longitudinal musculature are characteristics, which suffice to distinguish these species.

#### HETERONEMERTINI.

fam. BASEODISCIDAE.

*Baseodiscus curtus* (Hubr.)

(Pl. V, fig. 6 and textfig. 2).

Spanish Water, 4. V. 1920.

Caracas Bay, 6. V. 1920.

This species is represented by specimens from the Spanish Water and from Caracas Bay. From the drawing (Pl. V, fig. 6) may be seen that it agrees externally with BÜRGER'S specimen of *B. delineatus* from the Mediterranean (BÜRGER 7, pl. 4, fig. 8) as the head shows the same markings on dorsal and ventral side, even on the snout. From BÜRGER'S drawing of this species in his article on „Süd-georgische und andere exotische Nemertinen“ it differs by the extremely small mouth (BÜRGER 8, Pl. 8, fig. 4). The internal anatomy, however, shows a perfect agreement with *B. curtus*, as the nephridia have several pairs of excretory ducts, the lateral nerves lie at the outside of the hind-end of the cerebral organs (textfig. 2c), the cutis is about four times as thick as the integument and the brains show the characteristic situation of the ventral lobes as described by BÜRGER (textfig. 2a, 2b). In all these features it is distinct from *B. delineatus*, as well as in the presence of a ventral pair of cephalic furrows.

The general colour of the body is pink with short, dark brown, narrow longitudinal stripes that do not fuse on dorsal nor ventral side of the body in the figured specimen, but seem to build a network in the proximal part of the second individual; more distally this is longitudinally striped, as usual.

The specimen from the Spanish Water, here figured, has a length of 240 mm to 5 mm of breadth; the incomplete one from Caracas Bay measured 140 mm to 3½ mm of breadth.

VERRILL (39) described this species from the Bermudas; COE, who knew this material and collected at the Bermudas specimens of *B. delineatus*, which he also describes from Porto Rico (13)

and which BÜRGER (9) found in a collection from Barbados, wants to throw them together to one species, *B. delineatus*. A comparison of material from many different habitats must show, whether COE

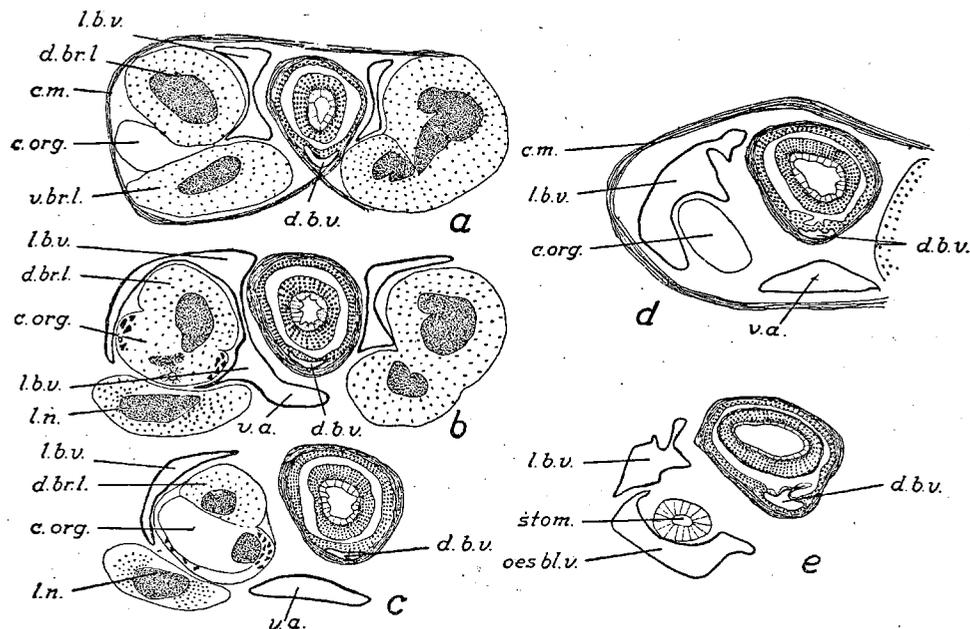


Fig. 2 a—e. Transverse sections through the hinder part of the cerebral region with a distance of  $\pm 100 \mu$  between each pair to show the behaviour of the bloodvascular system in *Baseodiscus curtus*. c. org. cerebral organ; c. m. outer circular musculature of the body wall; d. b. v. dorsal bloodvessel, resp. rhynchocoelomic vessel; d. br. l. dorsal brain-lobe; l. b. v. lateral bloodvessel; l. n. lateral nerve; oes. bl. v. oesophageal lacuna; stom. stomodaeum; v. a. second ventral anastomosis; v. br. l. ventral brain-lobe.

is right or not. As my material internally shows the characteristics of *B. curtus* and also externally agrees with the detailed description of BÜRGER, I see no reason to follow COE.

*Baseodiscus unicolor* n. sp.

(Pl. V fig. 7, textfig. 3).

Spanish Water, 7. IV. 1920.

This species is represented by a single specimen from the Spanish Water. It is a nemertean with well separated snout and a rather deep circular furrow. After preservation with sublimate and alcohol the colour was a dark reddish brown without any markings (Pl. 5, fig. 7). The short and undep horizontal slits, described by COE in *B. discolor* (13), were not visible in the preserved specimen. It has a length of  $\pm 140$  mm and its greatest breadth is 4 mm.

The thinnest layer of the body-wall is the integument; a very thin basement membrane lies between the integument and the cutis, which shows two layers. The glandular outer layer is in the median part of the dorsal and the ventral wall not much higher than the integument but can reach twice its thickness in the lateral parts; the fibrous layer of the cutis is rather thin, never reaching half the thickness of the integument. The outer longitudinal muscle-layer is the thickest of all and well separated from the cutis. In the stomodaeal region it is thicker than cutis and epithelium together at the ventral and lateral sides, when the head-glands already have disappeared; but in the dorsal median line it is much narrower, being about as thick as the cutis. Where the head-glands are still present, as in the region of the nephridiopori, it reaches even a greater thickness than the whole external part of the body-wall. The circular musculature is about as thick as the glandular layer of the cutis and the inner longitudinal musculature is but thin.

The snout shows the same layers as in other Baseodiscidae; the cutis is somewhat different and may be thicker as the head-glands enter this layer too, breaking up its fibrous layer. The inner part of the head is filled up by the outer longitudinal musculature with a few irregularly radiating fibres. The first traces of the outer circular muscle-layer are found in the cerebral region behind the nerve-commissures, where they lie outside the brains. After the origin and outward movement of the

side-nerves they begin to form a regular ring. The side-nerves lie outside the circular fibres, but the cerebral organs inside of them, separated by a thin layer of the inner longitudinal muscle-coat (textfig. 3 e).

The insertion of the proboscis takes place in the cerebral region (textfig. 3 a). The rhynchodaeum has a ventral position and the proboscis-pore lies subterminally. Just before the brains the rhynchodaeum, which has no muscular wall of its own, moves upwards into a more central position. Here the insertion takes place. The proboscis has the usual structure of all Baseodiscidae: the integument, a longitudinal muscle-coat and a circular one, clothed by an endothelium. The proboscidian sheath contains under the endothelial lining one layer of longitudinal fibres and a circular coat, which is separated from the circular musculature of the bodywall. Muscular crosses fail in the proboscis.

The nervous system shows the same behaviour as in *B. curtus*. The cerebral ganglia lie inside the outer circular musculature, whereas the side-nerves are found outside of them (textfig. 3). At the

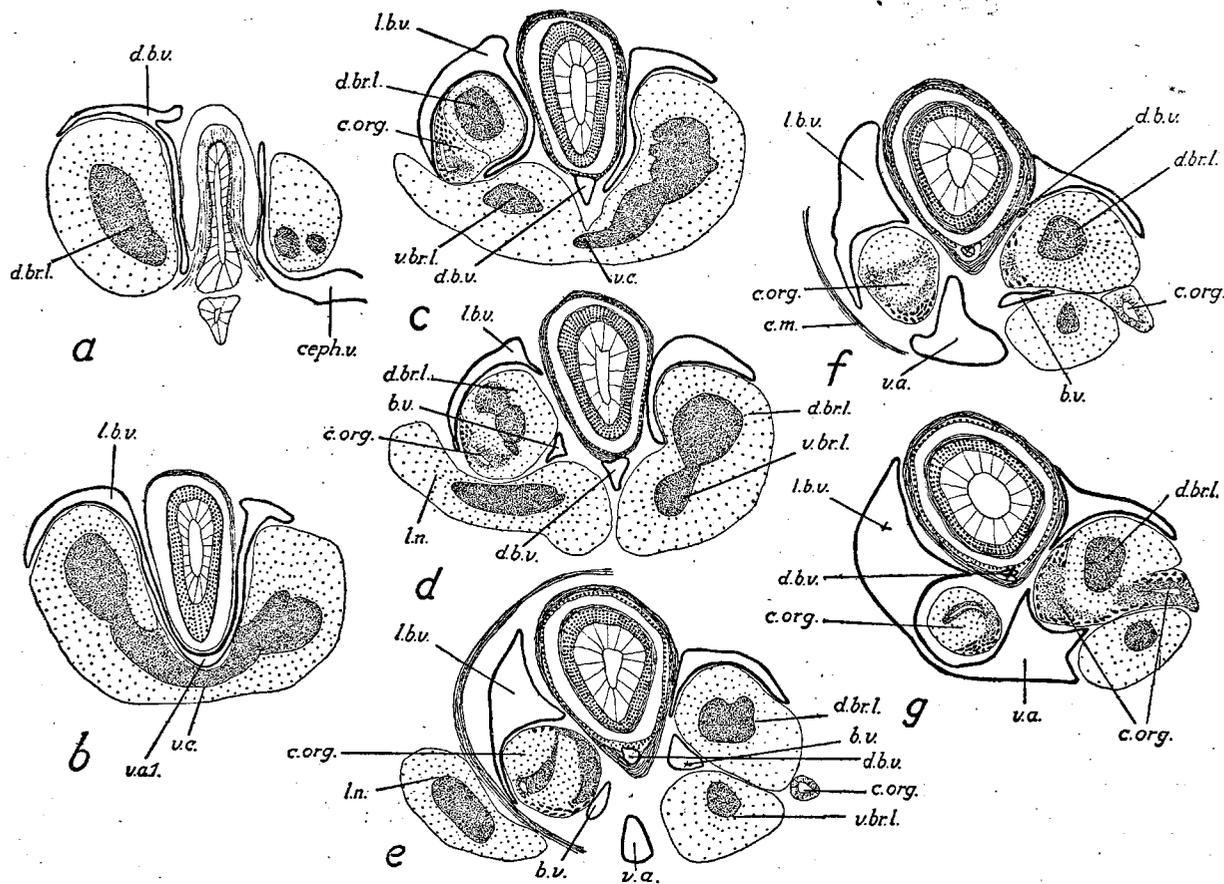


Fig. 3a—g. Seven transverse sections through the cerebral region of *B. unicolor* with  $\pm 100\mu$  between each pair. b.v. buccal vessel; ceph. v. cephalic vessel; v. a. 1 first ventral anastomosis; v. c. ventral commissure. Other letters see textfig. 2.

place of separation of the ganglia the short cerebral canal (textfig. 3 e and f) enters into the brain-mass. Before the bifurcation of the dorsal fibrous mass (textfig. 3 d) the cerebral organ lies at the outside of the dorsal ganglion (textfig. 3 c and d), of which they are the direct continuation (textfig. 3 e, f, g).

A great number of small eyes is present in the cutis between the glands. These are enormously developed and open on the tip of the snout. They reach far into the stomodaeal region, still farther than the nephridiopores and are embedded in the outer circular muscle-layer.

A small, rounded mouth lies somewhat behind the brains and leads into a buccal cavity with a thick glandular epithelium and a well developed pair of buccal nerves. The stomodaeum is surrounded by a network of large lacunae. The enteric cavity has a ventral ridge.

A pair of cephalic lacunae, which communicate before the proboscis-pore and enter the brain-ring under the dorsal lobes (textfig. 3 a), surrounds the dorsal ganglia from inside and above (textfig. 3 a—g) and anastomose above the ventral brain-commissure (textfig. 3 b). From this anastomosis the dorsal parts continue as lateral vessels and an unpaired ventral vessel remains (textfig. 3 c), which enters the rhynchocoelomic cavity immediately (textfig. 3 e) and leaves it about as far behind the head-glands

as these are present in the stomodaeal region. The paired ventral vessels that lie between dorsal and ventral ganglia, resp. cerebral organs and ventral lobes (e. g. in textfig. 3 *d, e, f*) communicate behind the ventral lobes (textfig. 3 *e, f, g*) and with this buccal vessel the upper lateral vessels anastomose behind the cerebral organs and before the buccal cavity (textfig. 3 *f* and *g*). From these vessels the network round the stomodaeum arises, which shows in the beginning of the enteric region a pair of swollen ventral cavities at the side of the ventral ridge, as described by BÜRGER in *B. mexicanus*.

The nephridium is well developed throughout the stomodaeal region. The excretory ducts go at the dorsal side along the side-nerves, that are rather ventral in position and open still more ventrally. Several pairs of nephridiopori are present (I counted three on one side) in the first part of the stomodaeal region.

The internal organisation of this specimen shows a great resemblance to *B. mexicanus* BÜRGER and *B. discolor* COE. As both BÜRGER and COE were in possession of preserved material only, which, however, showed definite external markings that fail in my individual, and the thickness of the different layers of the bodywall shows rather great differences in my specimen, I see no reason to identify them. From BÜRGER's specimen it differs moreover in the absence of the larger eyes just before the brains.

The enormous development of the head-glands seems to be characteristic of the pacific species *B. princeps* COE, *mexicanus* COE, *punnetti* COE and of two west-indian species: *B. discolor* COE and *B. unicolor* mihi, but it is present also in *B. hemprichi* and in *B. curtus*.

Characteristic features of this new species seem to be: the very undeeep ventrolateral head-furrows, the behaviour of the blood-lacunae in the brain-region, the situation of the cerebral organs and the number of nephridial ducts.

fam. CEREBRATULIDAE.

*Micrura leucopsis* Coe.

(Pl. V, figs. 8—10, Pl. VII, fig. 8.)

Caracas Bay.

From Caracas Bay seven specimens of a dark grayish black schizonemertean were collected, which mostly are broken up into small particles. The largest individual has a length of 77 mm and is 5 mm broad. The figured specimen shows clearly the annular constriction of the broadly rounded head (Pl. V figs. 8—10), as described by COE. The tip of the head is white and the lips as well as the cephalic furrows show a white lining. Traces of a narrow white ring all round the head before the mouth seem to be present in some individuals. Eyes are absent. If present, the caudal cirrus got lost by preservation. The mouth is large with protruding lips (Pl. V, figs. 9 and 10, Pl. VII, fig. 8).

They live under stones between tidemarks.

Though this species differs from the other *Micrura*'s by its large mouth, the absence of a diagonal muscle-layer, of eyes, of a cutis free from muscle-fibres, of neurochord cells induced me to enclose it in this genus.

The frontal organ is very well developed; the cephalic furrows are deep with thin edges; the cerebral organs are surrounded by a large vascular lacuna. The cephalic vessels communicate at the tip of the snout by an open anastomosis, which, however, breaks up into three lacunae instead of two. The cutaneous glands build a rather superficial layer, consisting of two types of glandular elements (Pl. VII, fig. 8). The pigment is present everywhere outside the circular musculature, mostly however, just outside this layer and between the glandular elements.

The nephridium is very narrow. Many narrow excretory ducts open on the dorsal side of the body, the first pori lying directly behind the mouth.

*Micrura vanderhorsti* n. sp.

(Pl. V, fig. 11 *a* and *b*, Pl. VII, figs. 9 and 10).

Spanish Water, 12. IV. 1920.

Another dark, greenish brown schizonemertean with proboscis of the same colour, though somewhat lighter. The proboscidian pore lies quite ventral (Pl. V, fig. 11 *a* and *b*) and the undeeep

cephalic furrows (Pl. VII, fig. 9 and 10) do not reach much more backwards (Pl. V, fig. 11 *a* and *b*). The mouth is very small and could macroscopically not be distinguished. The colour is a dark greenish brown without any markings. No eyes. Length 24 mm to  $1\frac{1}{2}$  mm of breadth. Fig. 11 shows that the head is not separated from the body. Perhaps this form is identical with *Micrura caeca* Verrill, which lives on the beach of Long Island Sound (Connecticut) between tidemarks.

Though a caudal cirrus is absent in my specimen, the absence of a diagonal muscle layer, of a well developed cutis, of neurochord cells, of eyes and the presence of a very small mouth proved it to be a species of the genus *Micrura*.

The structure of the head shows the usual features: a well developed head-gland lies much deeper than the superficial cutaneous glands; the outer longitudinal musculature gradually passes into a cutis with widely spread muscle-fibres and glands. The central mass of the head consists of longitudinal fibres, surrounding the narrow lacunar bloodvessels, which communicate in the tip of the snout, but never form an open anastomosis. These lacunae encircle the rhynchodaeum on the dorsal and lateral sides and become lateral vessels behind the insertion of the proboscis (Pl. VII, fig. 9). Perhaps a few circular fibres surround this central mass, at the outside of which the cephalic nerves are found. The septa of the lacunae are formed by radiating and horizontal muscle-fibres, which extend into the outer longitudinal musculature.

The bodywall behind the brains consists of a thick outer longitudinal muscle-layer, into which the cutaneous glands have sunken, that lie very superficially and build a thin layer; a distinct though narrow layer of muscle-fibres lies outside the glands. The circular musculature becomes rather thick in the intestinal region; the inner longitudinal muscle-layer is but slightly developed.

The insertion of the proboscis takes place just before the brains; the outer longitudinal muscle-coat is directly continuous with the same proboscidian layer and forms the equivalent of the precerebral septum of the *Polystilifera* (fig. 9). Inside of the nerve-ring a thin circular layer is present (fig. 9), which is very conspicuous above the ventral nerve-commissure. The inner longitudinal musculature is best developed dorsally and ventrally. The rhynchocoelom has a thin muscular wall (fig. 10), consisting of the ordinary two layers, of which the circular layer becomes the thickest and always is in contact with the outer circular layer of the body-wall (not in the region of the brains). Muscle-crosses are however absent. The proboscis has the usual three layered muscle-wall with two crosses.

The brains are rather large (fig. 10); the proximal part lies outside the outer circular muscle-coat (fig. 9); behind the dorsal brain-commissure the thin circular layer reaches from left to right brain-lobe and lies inside the dorsal nerve, which is continuous with this commissure; a continuation of these fibres inside the brain-lobes was observed in few sections only, though in the ventral part the fibres are very well developed (fig. 10) and though they fail outside the brain-lobes. With the breaking up of the brain-lobes into dorsal and ventral ganglia the dorsal lobes become surrounded by this dorsal part of the circular layer and the ventral lobes move laterally and become sidenerves, outside the same layer. Only the end of the dorsal lobes and the cerebral organs sink into the inner longitudinal musculature. The dorsal lobes are much larger than the ventral ones and show the usual bifurcation.

The sense-organs consist of a very inconspicuous frontal organ, a pair of undep cephalic furrows that do not touch the cerebral ganglia and do not reach beyond the cerebral canal, of which the origin is found just behind the bifurcation of the dorsal brain-lobe (fig. 10). It is very short and immediately enters the ventral part of the dorsal ganglion to form the cerebral organ, which lies not free in the lateral bloodvessel, but is surrounded by the buccal epithelium.

The mouth is very small, a round, needle-like opening, which lies farther behind the cerebral organs than these reach beyond the cerebral pore. The second part of the stomodaeum is very short and gradually passes into the intestine, which has small, rounded pouches.

The bloodvascular system shows a much intersected lacuna in the precerebral region, which surrounds the rhynchodaeum from the dorsal and lateral sides and ends with the dorsal insertion of the proboscis. A pair of lateral vessels pierces through the small septum and enters the brainring from the ventral side; the lateral vessels lie at the side of the rhynchodaeum (fig. 9) and communicate by a broad, much intersected ventral anastomosis, from which the dorsal vessel arises and imme-

diately enters the rhynchocoelomic wall. The dorsal vessel leaves this cavity at the beginning of the intestine. This only ventral anastomosis communicates a second time with the large lateral vessels that surround the dorsal ganglia from the inner and dorsal sides and then continues into the unpaired oesophageal vessel (fig. 10).

The nephridium lies in the hinder part of the oesophageal region and has narrow tubes. The excretory pores and ducts have not been observed as the sections of this part of the animal were quite insufficient.

Small empty gonads lie between the intestinal pouches.

Though at first one might be inclined to identify this species with VERRILL'S *M. caeca* from the neighbourhood of New Haven (Conn.), the differences seem to be too many to justify the identification. Some may be due to the fact, that VERRILL (38) describes the living worm and that this specimen was preserved in formaline, as for instance the shape of the head is not subterete, the body does not taper very gradually to the posterior end. The absence of the caudal cirrus may be due to the same fact.

On the other hand the cephalic slits are not long and deep, the mouth is not elongated and not situated far back. A difference in colour of the anterior part has not been observed, the whole animal is dull greenish brown. The diameter of the preserved specimen is  $1\frac{1}{2}$  mm to a length of 24 mm, whereas VERRILL states, that his species attains a length of 75—100 mm and reaches a diameter of  $1\frac{1}{4}$ —2 mm *in extension*. As no anatomical details are given, it seems rather uncertain, whether the above described species is the same as VERRILL'S *M. caeca*. Only the absence of eyes and perhaps the colour of part of the animal they have in common.

*Micrura curacaoensis* n. sp.

(Pl. V, fig. 12 a—d, Pl. VII, figs. 11, 12).

Spanish Water.

At least two specimens from the Spanish Water, both incomplete and broken up into several pieces, 6 mm broad, oval in crosssection. Short cephalic furrows and a small mouth; the snout is not separated from the body. The colour of the preserved animals is a fleshy yellowish brown, in another specimen somewhat more red, without any markings. The hind end seems to be more flattened. No tail nor cirrus has been found.

The structure of the head shows a small frontal organ, constituted by three pits. The cephalic glands open just beneath the frontal organ; the proboscidian pore lies on the ventral side. The snout before the brains shows a cutis with only a few muscle-fibres and a distinct glandular layer; the outer longitudinal layer is well developed and contains the nerves. The central cylinder is surrounded by a circular muscle-layer, which in the part before the proboscidian sheath only contains the blood-vascular system and the inner longitudinal musculature. More backwards the lacunae surround the rhynchodaeum, which has a longitudinal and a circular musculature of its own. The dorsal blood-anastomosis lies at the side of the insertion of the proboscis. Two bloodvessels enter the brainring.

The brain-lobes lie just outside the circular muscle-layer, the outer longitudinal layer, however, gives off a number of fibres to the proboscis, which pierce through the circular layer just before the brains; the bloodvessels are surrounded by the inner longitudinal musculature; the rhynchocoelomic wall consists of an inner longitudinal and an outer circular layer (Pl. VII, fig. 11).

The proboscis has a three layered muscular coat with the usual muscular crosses, but at the place of insertion the circular layer is not developed.

The first ventral blood-anastomosis is short and gives rise to the dorsal bloodvessel, which enters immediately into the rhynchocoelomic cavity. The second one is wide and dissected by septa; the two lateral vessels and the oesophageal vessel arise from it (fig. 11). The latter becomes a lacuna at the beginning of the mouth. The lateral vessels communicate with the oesophageal lacunae above the cerebral organs. These are found behind the ventral ganglia; the side-nerves lie outside of these organs, which are situated in the same region as the mouth (Pl. VII, fig. 11).

The cephalic furrows are undep and extend from the tip of the snout to the mouth (Pl. V, fig. 12c); a thick layer of longitudinal muscle-fibres separates them from the brains.

Behind the brains a cutis fails absolutely or is so very thin as indicated in fig. 12, Pl. VII. A small layer of longitudinal fibres is found between the submuscular glands and the thin epithelium. The outer longitudinal muscle-coat is very thick and so is the circular layer, which always is separated from the first by a conspicuous nervous layer with a large dorsal nerve. The narrow central part in the enteric region is also conspicuous by the well developed longitudinal musculature in comparison with the oesophageal region, where the central mass is much larger and contains a wide oesophagus. The enteron is narrow with well defined, small pouches that alternate with the empty gonads. The rhynchocoelomic cavity of both sectioned specimens is irregularly contracted and the folds of the enteric wall follow these rhynchocoelomic folds, as may be seen in fig. 12. In the oesophageal region muscular crosses between the rhynchocoelomic wall and the circular muscle-coat of the body are present. Also a layer of longitudinal fibres is found between oesophagus and rhynchocoelom.

The lateral vessels are situated beneath the intestinal pouches and communicate with the dorsal vessel by commissures, which go all round the diverticula (fig. 12). Nephridial ducts have not been observed.

The gonads are small and empty, without gonopori or ducts.

*Micrura* spec. ind.

(Pl. V, fig. 13a and b).

Spanish Water, 6. V. 1920.

A single specimen of a badly preserved nemertean belonging to the „Schizonemertini”, broken into two pieces and figured in Pl. V, fig. 13a and b. The animal is very dark, with a large mouth and very short cephalic slits that do not reach the mouth. The colour is a blackish brown, without any markings. The proboscis and the digestive tract have a much lighter, brownish tint.

*Micrura* sp. ind.

(Pl. V, fig. 14, Pl. VII, fig 13).

From another nemertean of this group nothing but the tail is present. It is a somewhat reddish brown individual, without any markings, as shown in fig. 14, Pl. V. A section shows, that this tail belongs to a holorhynchocoelomic heteronemertean, probably without cirrus. Longitudinal fibres between the glands and the epithelium are absent and so is a cutis in this part of the body (Pl. VII, fig. 13).

*Cerebratulus ater* (Girard) ?

(Pl. V, fig. 15, Pl. VIII, figs. 14 and 15).

Spanish Water, 3. IV. 1920.

Two hind ends of a perfectly black nemertean have been found in the Spanish Water, which show a constriction, as figured in Pl. V, fig. 15. The animal must exceed the length that has been given by GIRARD (18), as each piece already has more than 15 cm of length after preservation. GIRARD measured specimens preserved in alcohol and my material was preserved in formaline, which may partly be the reason of the difference in length. The greatest breadth is 6 mm.

The thin body-margins are separated from the body by the side-nerves that can be distinguished throughout the body (Pl. V, fig. 15). The broad tail, which is separated from the body by a constriction, has the anus at its end and shows an inner structure that differs from the part in front of the constriction.

A section through the body (Pl. VIII, fig. 14) shows a well developed musculature with outside of it a thin layer of connective tissue. Whether this contains submuscular glands I could not distinguish. At any rate this layer does not exceed in thickness the low epithelium. The enteric tract shows deep pouches and has a large lumen, leaving no room to the development of connective tissue of any extent. The proboscidian cavity reaches into the tail (Pl. VIII, fig. 15); the lateral bloodvessels are ventral and lie very near to each other. They communicate with the dorsal vessel.

Traces of gonads have not been found.

A section of the tail (Pl. VIII, fig. 15) shows at once the most obvious differences with the preceding part of the body: a very feebly developed musculature and a well developed parenchyma. The connective tissue outside the musculature contains no glands and is sharply separated from the unicellular body-epithelium. All bloodvessels are embedded in a large body-parenchyma that surrounds the enteric cavity, which has no pouches. The proboscidian sheath is present in one fourth of the tail only; its wall consists of a few circular fibres.

As only hind-parts of this animal are represented in the collection from Curaçao, their identification with *Cerebratulus ater* (Girard) is by no means certain. GIRARD gives a rather incomplete description of the habitus of the animal that he caught near Cape Florida. As, however, the rather exceptional colour of both animals agrees and GIRARD moreover states, that the tail has exactly the same colour as the body (not the snout), all external markings being absent, it seemed not improbable, that we had to deal with the same species. Anatomical peculiarities of this species are unknown.

fam. DIPLOPLEURIDAE.

*Diplopleura curaçaoensis* n. sp.

(Pl. V, figs. 16 and 17, Pl. VIII, figs. 16—20).

Spanish Water; 3. IV. 1920.

Two specimens from the Spanish Water, each broken into pieces and not quite complete, as in both the extreme point of the tail fails. The largest individual is 45 mm long to a breadth of 5 mm, whereas the smaller one is 35 mm to 3 mm (Pl. V, figs. 16 and 17). Measurements have been taken of the preserved material.

As all characteristic regions of both animals are present and the hind end has already lost the rhynchocoelom, it seems almost certain that the complete animals are not much longer. At any rate they never possessed a length comparable with that of *D. formosa* (Hubr.) (7), *D. obockiana* (Joubin) (21) or *D. vivesi* (Joubin) (22). *D. japonica* Stimpson (33) is of the same size as our specimens, differs, however, in its yellowish colour, which in our species is a brownish red or purple. Moreover the Japanese species has only a pair of lateral head-furrows and *D. curaçaoensis* has a very deep dorsal one too (Pl. VIII, fig. 16, Pl. V, figs. 16*a* and 17*a*). Of a ventral one, as this is so very conspicuous in *D. vivesi* and after JOUBIN's description is present in *D. obockiana*, all traces fail. With these species the West Indian agrees in colour, being red, and also with the *Diplopleura*-species of PUNNETT from New Florida, which attains a much greater length and has a colourless tail.

The head is well separated from the body by a circular furrow (Pl. V, figs. 16*a* and 17*a*), into which the dorsal and the lateral head-furrows open, though the cerebral canals are not in contact with it. The snout is heartshaped and rather broad. It has deep head-furrows that almost reach to the brains (Pl. VIII, fig. 16) and a narrow medio-dorsal furrow, which continues from the tip of the snout over the circular furrow into the dorsal furrow of the body. This is deep and narrow (Pl. VIII, figs. 17, 18, 20) till about half way the body. Here the thick dorsal margins (Pl. V, fig. 16*b*) separate and form a wider and less deep dorsal furrow (Pl. V, fig. 16*b* and *e*), which changes its form by the movements of the thick body margins (Pl. V, fig. 17*c*). Towards the tail the furrow always gets a sharper edge at its bottom, as may be seen in Pl. V, figs. 17*c* and 16*c*, and is known also from *D. vivesi*; it fails in *D. formosa*. In our preserved individuals the margins are in no way thin, wedgelike or flabby, but very thick, rigid and massive, as in *D. vivesi*, *obockiana* and PUNNETT's specimens (29, 30). All traces of a ventral head-furrow fail, even in the neighbourhood of the circular groove. The mouth lies behind this furrow and is in no connexion with it. Much behind the mouth a medioventral, short, very deep furrow or pit is found, which penetrates through the circular muscle-layer and corresponds with characteristic features of the digestive tract, from which a thin layer of longitudinal musculature separates it (Pl. VIII, fig. 19). Other traces of a medioventral furrow fail absolutely, as demonstrated by figs. 16, 18 and 20, Pl. VIII that show transverse sections through the body in the region of the brains, between mouth and ventral pit and behind the ventral pit. As the digestive tract above the ventral furrow is influenced in its form, and moreover the epithelium of the buccal

cavity has disappeared but in the dorsal pouches of the cavity, whereas the epithelium of the central cavity shows the characteristics of the enteron, I suppose this ventral pit to be the persisting primitive mouth. Though such a supposition might seem rather natural in armed nemerteans, it would prove to be of great influence and value to our views on the systematic position of the genus *Diplopleura*. As far as we know the primitive mouth of the Anopla never obliterates, as in Enopla; the ectodermal lips of the mouth proliferate inwards and build the stomodaeum, the limit between stomodaeum and enteron constituting the old mouth. In the Enopla, however, the stomodaeum is a separate invagination that comes into contact with the enteron and secondarily breaks through into it; the primary mouth then becomes shut. The peculiar features, shown in fig. 19, make it rather probable, that the stomodaeum of *Diplopleura* originates in the same way and that this genus belongs to another group of Anopla than *Micrura*, *Lineus* and *Cerebratulus*, in which the stomodaeum develops in the other way.

As no traces of gonads are to be found, the ventral pit is present and the dimensions of our specimens are so much smaller than in *D. obockiana* Joubin, with which species our individuals show a great resemblance in colour and internal anatomy, they might prove to be young specimens of the species from the Red Sea. However, as the tissues and structure of the animals show no embryonic traces and the ventral pit is present in both specimens from Curaçao, I did not feel justified in identifying species of so different habitat. Another difference exists in the absence of a ventral head furrow, which JOUBIN describes, but which is not very conspicuous in the ventral view of the animal (21 pl. 1, fig. 3).

The position of the mouth is rather different too, as JOUBIN describes a rather long (5 mm.) forward projecting blindsac of the oesophagus, reaching from the brains to the mouth, whereas in *D. curacaoensis* the mouth lies directly behind the brains (Pl. VIII, fig. 17) and even partly under the cerebral organs. In both species the oesophagus is short and has a circular musculature of its own, which fails the intestine. This has the same structure as in fig. 19 with deep pouches of the same shape as the oesophageal ones in that figure. More behind, however, we get the narrow central intestine of fig. 20, with the extremely deep pouches, characteristic of this genus.

Differences also exist in the bloodvascular system, as I have found only one pair of cephalic vessels and the rhynchocoelomic vessel seems to reach rather a long way behind the mouth (about half way between the mouth and the intestine).

The nephridium is situated above the digestive tract and opens into the dorsal furrow (fig. 18).

As to the brains and cerebral organs the following observations have been made: the structure of the cephalic furrows is as in *D. obockiana* Joubin; the cerebral organs reach to the mouth; their proximal part is found outside the circular musculature, between dorsal and ventral brain-lobes (conf. Pl. VIII, fig. 16); the upper part of the dorsal brain-lobes never becomes separated from the lower part, resp. cerebral organs, by the circular musculature of the body, as indicated in BÜRGER's fig. 1, pl. 22, (7), but is surrounded by the outer neurilemma. After the disappearance of this upper part the lower part of the dorsal ganglion becomes part of the cerebral organ and the circular musculature disappears inside the brain-lobes and fuses outside them.

#### B. Geographical distribution.

The collection of littoral nemerteans above described is the largest one known from westindian coasts. A small collection from Barbados, containing two species of *Baseodiscus*, *B. delineatus* and *B. antillensis* has been described by BÜRGER (9). From the Bermudas-archipelago VERRILL (39) described a collection, made by himself; it contains *Baseodiscus curtus*, *Lineus albocinctus* Verrill, *L. albonasus* Verrill and another, not described *Lineus* species.

A larger collection was studied by COE from Porto Rico (13), in which 8 species are represented:

*Drepanophorus crassus* (Quatr.), the first and only known hoplonemertean.

*Baseodiscus delineatus* (Chiaje), *B. discolor* Coe.

*Micrura leucopsis* Coe.

*Cerebratulus antillensis* Coe and *Cerebratulus* sp. ind.

*Lineus albocinctus* Verrill and *Lineus* sp. ind.

To these collections our present one from Curaçao adds:

*Polyschista curacaoensis* n. sp., another hoplonemertean.

*Baseodiscus unicolor* n. sp.

*Carinoma caraibica* n. sp., the only known palaeonemertean.

*Micrura vanderhorsti* n. sp., *M. curacaoensis* n. sp., two *Micrura* sp. ind.

? *Cerebratulus ater* (Girard), already known from Florida (18).

*Diplopleura curacaoensis* n. sp.

*Baseodiscus curtus* had already been found at the Bermudas (VERRILL), *Micrura leucopsis* at Porto Rico (COE).

All the above species are littoral nemertines, living between tidemarks, with the only exceptions of *Drepanophorus crassus* from Porto Rico that lives at a depth of  $8\frac{1}{2}$  fathoms and of *Cerebratulus antillensis*, also from Porto Rico, that had been dredged near Punto del Algarrobo, Mayaguez Harbor from a depth of 161 to 172 fathoms. From these species *Drepanophorus crassus* is a collective name for all Polystilifera Reptantia without definite external markings and as such is cosmopolitan; recent researches on the european Polystilifera have shown, that the so called *D. crassus* belong to different genera (WIJNHOF, 46). As anatomical details of the species of Porto Rico are unknown, it is impossible to decide, to what genus it belongs. As all external markings are absent, it seems more probable, that it is one of the Inaequifurcata.

*Baseodiscus curtus* and *delineatus* are the only other species that are known from other localities and these species have a very wide distribution, being circumtropical forms that range from the West-Indies over the mediterranean and indic coasts to the east-indian and southern pacific archipelagoes.

All other species are endemic and all are unknown from the pacific coasts of Central America. In this respect the present collection of nemertean agrees with all other groups of marine animals, known from these regions. The endemic species are:

Polystilifera Reptantia: *Polyschista curacaoensis* n. g. n. sp.

Palaeonemertea: *Carinoma caraibica* n. sp.

Baseodiscidae: *Baseodiscus antillensis*, *discolor* and *unicolor* n. sp.

„Schizonemertini”: *Lineus albocinctus*, *L. albonasus*.

*Cerebratulus antillensis* and *ater*.

*Micrura leucopsis*, *M. vanderhorsti* n. sp., *M. curacaoensis* n. sp.

*Diplopleura caraibica* n. sp.

and probably 4 insufficiently known species of this group.

Of these genera only *Polyschista* is endemic; the Aequifurcata, however, have a very characte-

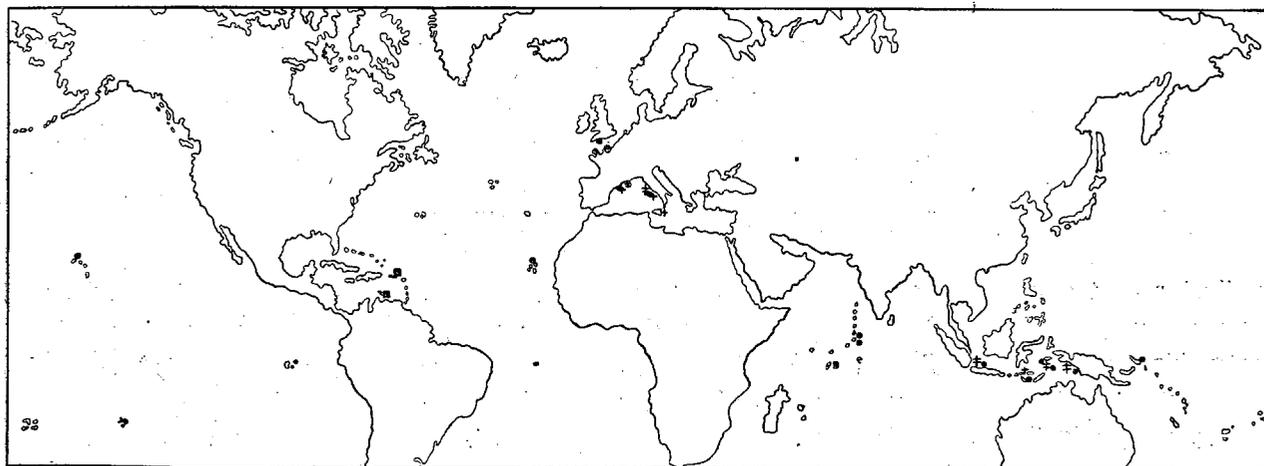


Fig. 4. Distribution of the Polystilifera aequifurcata.

■ *Polyschista*; ● *Punnettia*; + *Drepanophorus*; ≡ mediterranean: *Brinkmannia*, indian: other, not yet described genera.

ristic distribution (textfig. 4): they are represented by many genera in the east-indian archipelago, of

which *Punnettia* reigns from New Caledonia to the Mediterranean Sea and the Channel coasts, and two other genera are found in the neighbourhood of Naples (WIJNHOF 1925).

*Carinoma* has no other tropical representatives; the four known species all live in the same

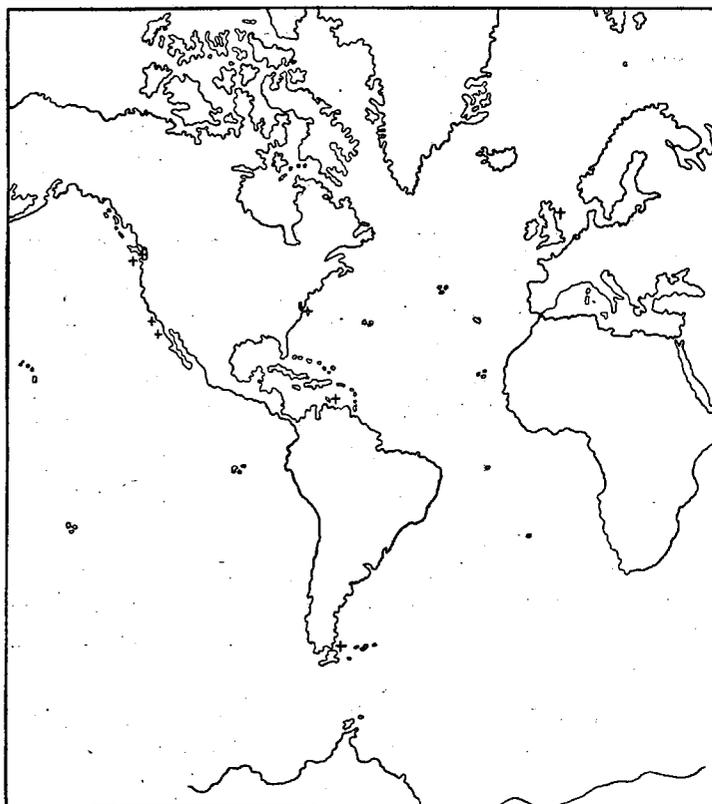


Fig. 5. Distribution of the genus *Carinoma*.

muddy facies, one along the western coasts of North-America, another near Woods Hole, a third one in Patagonia and the only european species near St. Andrews, Scotland (textfig. 5). This shows clearly that *Carinoma* originally is no warmwater animal; the caribbean species is nearer related to the pacific and southamerican species than to the northern atlantic representatives of the genus that are very nearly related to each other. *Carinoma caraibica* might have a pacific origin.

The endemic *Baseodiscus*-species could not be proved on their relationship to the pacific ones, as the structure of these species is too incompletely known. The genus, however, has a circumtropical distribution.

This is not the case with the Schizoneurians. As long as the genera *Lineus*, *Cerebratulus* and *Micrura*, however, cannot be distinguished with certainty and the systematic position of the species, belonging to them, is quite uncertain, it is useless to speculate on their affinities and distributions.

*Diplopleura* is a well defined genus, with only a few species. These show about the same

distribution as the *Aequifurcata* (textfig. 6). *D. formosa* lives in the Mediterranean Sea, *D. obockiana* in the Red Sea and near Zanzibar, another species has been found at the Maldive Archipelago, PUNNETT

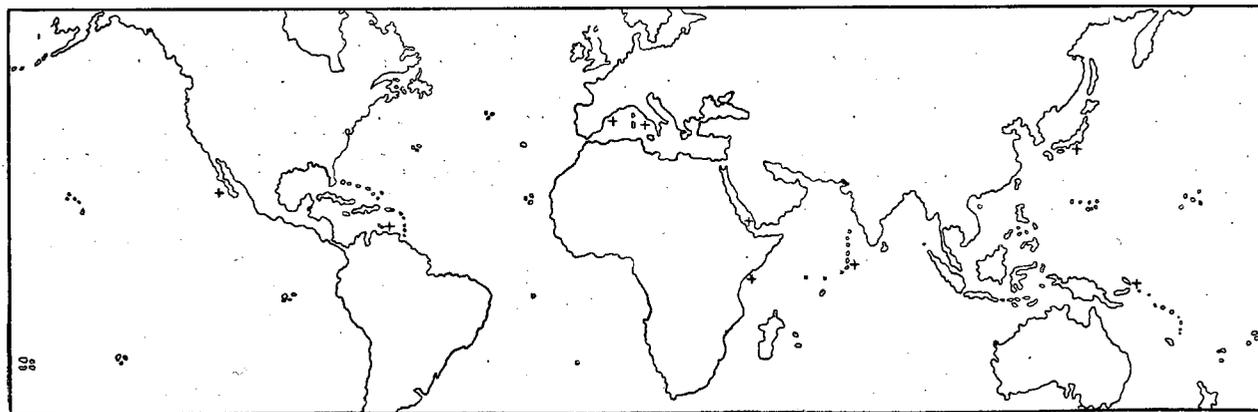


Fig. 6. Distribution of the genus *Diplopleura*.

described a part of a *Diplopleura* from New Caledonia; one species, most nearly related to *D. formosa*, occurs in Japan (*D. japonica*) and another is found along the coast of southern California (*D. vivesi*). Exactly this part of the Pacific Ocean was in open communication with the central american sea and in past times showed a great faunistic resemblance to it. I do not doubt, that the californian species came from the atlantic side of America, as these species are rather nearly related, but show no affinity to the japanese worm, which is the only one of the mediterranean type. The same sea, which connected California with the atlantic side of Central America, connected Japan directly over Central Asia with the eurasiatic aequatorial Ocean, the Tethys. This sea must have played an important part in the distribution of our circumtropical animals.

Obvious too is the almost entire absence of Enopla. Both the parasitic Bdellonemertea and the bathypelagic Polystilifera are unknown from these areas. Much more astonishing is the total absence of Monostilifera, which play such an important part in the nemertean fauna of all other atlantic coasts. This can partly be explained by the differences of physical conditions between the caribbean and eastern-american coasts. Along the atlantic coast of North America goes a cold stream, which comes from the arctic seas and which prohibits the invasion of the warmwater fauna, that lives in the Caribbean Sea and the Mexican Gulf into the more northern districts. On the other side the large quantities of fresh water, that the Amazon- and Orinoco-rivers bring into the Atlantic Ocean must prohibit the southern littoral fauna to extend to more northern areas, as Nemerteans are very sensible to the salinity of their surroundings. Though the Gulfstream may be an impassible barrier to the larvae of the north american Nemerteans it seems rather incomprehensible, why all Monostilifera fail in this region, as the caribbean fauna shows a very great resemblance to that of the mediterranean coasts. Here, however, nearly all northern atlantic genera are represented and form about 40% of the mediterranean Nemerteans. Monostilifera are widely distributed along the pacific coasts of both America's and might have invaded the Caribbean Sea and Mexican Gulf before the definite closure of the central american passage to the Pacific Ocean. Moreover Monostilifera are widely distributed along the coasts of western Africa, and the oceanic water that enters the american mediterranean sea has crossed the ocean and receives much water from the southwestern coasts of Africa.

From this side, however, the fauna cannot have come, as the distance between these coasts is too long for a larva to reach the american coast in a living state. The distance between Brazil and western Africa is round 2000 KM.; as the velocity of the particles of the Aequatorial Stream is about 55 KM. pro day (SCHOTT 31) forty days would be necessary just to pass the narrowest part of the ocean. The stream, however, does not go from coast to coast, but comes from the south and goes northwest, receiving much water from the african coasts to the south of the Gulf of Guinea. At least 7 to 8 weeks must be spent by a larva to cross the ocean. About the life-time of nemertean larvae we possess only a few dates. It is exactly known in one case, of *Malacobdella grossa*; here the young benthonian animal is first found 16 days after fertilization, only part of this time a free floating larva is found. Even if we make an allowance of three to four weeks to the larvae of other genera, it is obvious, that pilidia never can pass the ocean. The migration from the Cape Verde Archipelago and the north african coasts by the northern component of the Aequatorial Stream is impossible too, as the area to be passed is still greater. A direct migration from the mediterranean coasts now never can take place as in these regions a branch of the Gulfstream exactly goes in the opposite direction.

The existence of an endemic fauna may therefore very well be explained by the present conditions in these regions, the northern and southern american fauna's being prohibited from invading this area and larval transport from other coasts being impossible. On the other hand they cannot explain the presence of a warmwater-fauna, which shows only few affinities to that of the pacific coasts and is more nearly related to the european mediterranean fauna. This must be due to the geological history of this sea, which is known to have had a characteristic mediterranean fauna in previous geological ages. The present conditions of isolation without any doubt reigned also during the preceding periods; in the late tertiary and diluvial ice-times, however, the isolation must have been still greater, especially as concerns the Caribbean and Mexican Seas. These could not receive any atlantic water, as by the falling of the water-line, caused by the building of the great ice-cap, the antillean islands were raised to one great bar, that closed them off from the Atlantic Ocean. The Gulfstream did not exist and the water of the Aequatorial Stream swept along this antillean coast to the northern atlantic continent, which wore the ice-cap. From the north cold water streamed as a superficial layer to the south, making the northern Atlantic Ocean to a cold area, with a warm understream (PETTERSSON 27). Even if the Mediterranean had not been separated from this Ocean a transport of elements of a warmwater-fauna along its cold northern coasts would have been impossible. In the closed Caribbean Sea the fauna of earlier tertiary ages was however well preserved and the Aequatorial Stream could only transport the antillean fauna a little way more to the north, as it now has brought this fauna to the Bermudas Archipelago.

The isolation of the american seas is, however, still older and existed in the upper miocene

period just as well (VAUGHAN 36, p. 629); the isolation of the fauna of the Caribbean Sea therefore took place from the miocene till now, and this certainly is one of the reasons, why such a great number of endemic species is found.

In the lower miocene we find open connections with the atlantic and in the eocene and oligocene ages this region connected the Atlantic and Pacific Oceans. Migration of the mediterranean fauna's only could have taken place along the northern atlantic coast, which was continuous from Europe to North America in eocene and oligocene. Strait Davis is supposed to have broken through in miocene ages, but to what extent is unknown. Cold water from the arctic seas in early kainozoic ages cannot have prevented the migration of a warmwater-fauna along these coasts. The possibility of the latter was, however, very small and all evidence is against it. The european Mediterranean was separated from these atlantic coasts by a large peninsular mass, that connected England with Bretagne, the french central plateau and to the east of the Garonne with Spain. Only along the northern part of Africa and a small southern part of Spain the mediterranean waters could get into the Atlantic. It is known, that the atlantic and mediterranean coasts of this peninsula show different fauna's, which fact demonstrates the absence of a direct communication in higher latitudes and the lack of migration along this way.

To the south we find the same conditions as at present: no connecting coast and the Aequatorial Stream coming from the southern Atlantic and going to the antillean islands. The Aequatorial Stream must always have existed, as long as the southern Atlantic was in open communication with the northern Atlantic Ocean, as it is caused: 1° by the prevailing winds in these regions, that themselves are caused by the rotation of the earth; 2° by the Benguela Stream, which always received its waters from the „Westwindtrift“, along the open circumantarctic Ocean. As this movement of the water also is due to the rotation of the earth, and the condition in the southern Atlantic in kainozoic times must have been about the same as nowadays, the Benguela Stream must have existed just as well and so must the Aequatorial Stream. A southern route of migration therefore did not exist in early kainozoic time and if a gulfstream existed or a pacific stream entered into the Atlantic Ocean through the american Tethys, these only would have prevented migration from east to west.

In kainozoic times the european part of the nemertean fauna of the Caribbean Sea cannot have reached its present habitat.

With the Mesozoicum everything changes (ARLDT 1 and 2, KOSSMAT 23). The northern and southern atlantic seas were separated from each other by a large continent that connected Brazil with northern Africa. It existed already in triassic times and possessed a continuous northern coast from the mediterranean coast of Africa to the north of South America. The northern atlantic sea in comparison with the present conditions was rather narrow, as the northern continent, which connected North America over Greenland and Island with the Far Öer, England and Norway existed just as well. It was a part of the Tethys, which connected the american and european mediterranean seas. The littoral fauna's of these seas could freely migrate along two coasts.

From the present conditions it is impossible to conclude anything about the movement of the water. It is obvious, however, that in all mesozoic fauna's of Central America the european mediterranean character is stated to be the most appealing feature; very seldom the presence of pacific fauna's is reported, as for instance the Aucellae in Mexico, whereas often mediterranean elements are found in the mesozoic fauna's of the pacific coast, proving the open communication between the Pacific Ocean and the Tethys. This leads to the conclusion previously arrived at by other authors that the prevalent stream in the Tethys must have been from east to west. As the caribbean fauna is a warmwater-fauna, we naturally look for the migration of the mediterranean components to the southern coast of this mesozoic Tethys, along which the westward stream must have gone.

With the breaking up of the great continent that connected Brazil with Africa (South-Atlantis I shall call it with ARLDT), the Aequatorial Stream must have set in and put an end to this way of migration. Whether this breaking up of the southern route has been in the way supposed by WEGENER (42) or that part of the land disappeared in the present ocean, does not matter to our present problem. In both cases a long time was necessary to change the old conditions into new ones. Probably the different times, at which the disappearance of South Atlantis is supposed to have taken place, are due to this fact. Some take it to have happened in jurassic, others in cretaceous times, but all agree,

that the land-connection existed in triassic and early jurassic ages. Though the cretaceous fauna of the central american seas still has a mediterranean character, this feature is absent in the tertiary fauna's. We cannot go fail very much therefore, if we suppose the southern route of migration to have become blocked in cretaceous times and the last direct migration to have taken place in jurassic and perhaps early cretaceous ages.

In these times the northern atlantic coast existed just as well and was continuous too. About the movement of the water in cretaceous times nothing, however, can be said, as an open communication existed between the european Tethys and the Gulf of Guinea, that possibly absorbed much of the water that the Benguela and Aequatorial Streams now bring to the northern Atlantic. This must have been of great influence on the streams of the Atlantic Ocean, as no south-atlantic water or only a small quantity entered the northern atlantic sea. As after WEGENER the large continents in this period must have been much nearer to each other, or after the older theory islands must have existed as a rest of the old continent, migration of fauna's could still have taken place. We know moreover, that the cretaceous had well defined climatic zones, which made migration of Rudistae and corals impossible along the northern route, even in early cretaceous ages. The same difficulty existed to the Nemertean and the great complex of land from Spain to France, England and Germany increased these difficulties. In Central America we find two well separated seas, the Caribbean Sea and the Mexican Gulf, of which the first one had the same characteristic fauna as the Mediterranean Sea.

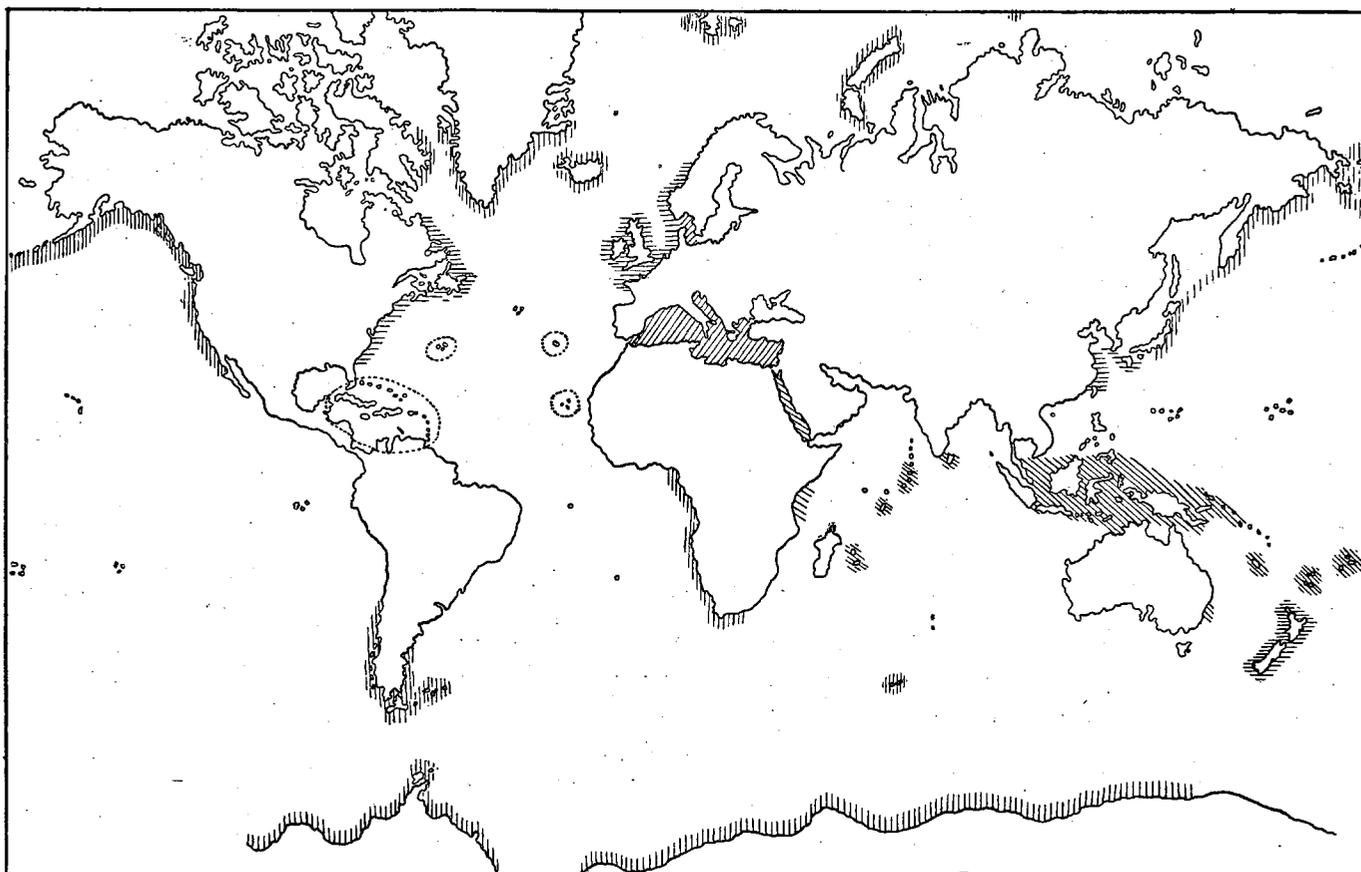


Fig. 7. Distribution of the Monostilifera in % of the nemertean fauna.  
 ||| 75% of the fauna; ≡ 60% of the fauna; /// 40% of the fauna; \ \ \ less than 10% or the genus Prosadenoporus;  
 ○ Monostilifera absent.

Later than in early cretaceous time the migration of this warmwater-fauna from the Mediterranean to the Caribbean Sea seems rather improbable. This conclusion gives an explanation to the other obvious fact in the present fauna of these seas, the absence of Monostilifera.

Monostilifera are coldwater-Nemertines, that are almost absent in the tropical and subtropical seas and on the southern hemisphere seem to be represented by characteristic genera (textfig. 7); we might call them pacifico-boreal animals. More than 60% of the nemertean fauna of both north-american coasts, of the european and northern asiatic coasts belong to the Monostilifera, and so they do in

the southern hemisphere. However, they fail in Central America, are represented by one characteristic genus only in the indomalayan seas and the pacific islands; in the european Mediterranean Sea they are abundant, though forming a lower percentage of the fauna than in the above described regions (40%). We may ask for an explanation to the fact, that a whole group of Nemerteans fails in two different rests of the Tethys and in another one is present. They must have been absent in the Tethys in triassic and jurassic times, as they certainly had entered the caribbean Tethys with the other genera. As they are boreal animals, they probably invaded the Atlantic Ocean in quite recent times, after the breaking through of Strait Davis and the sinking of the Wyville Thompson ridge. The invasion of the Mediterranean must have taken place much earlier. The first open communication of the mediterranean Tethys with the Arctic ocean took place in jurassic times; it is stated however, that this arctic fauna did not enter the Mediterranean Sea and that the periarctic fauna is quite different from the mediterranean fauna. KOSSMAT says (23 p. 97), that the middle cretaceous ages bring the first „Ausgleich der marinen Faunen durch Mehrung der Verbindungswege". If this is true, it is obvious that these genera never could enter the Caribbean Sea, as at that time migration was already stopped by the breaking up of the southern atlantic coast and continent. In tertiary times the formation of the alpine mountains prohibited the invasion of arctic fauna's into the Mediterranean Sea and as a regression of the sea set in in late cretaceous time, the early cretaceous nature of the mediterranean Monostilifera seems to be rather certain. This shows at any rate, that in jurassic ages and not later, perhaps even earlier, the Polystilifera, the Baseodiscidae and Diplopleura, probably also some other Schizonemerteans, must have wandered to the West-Indies.

But it shows also, that in jurassic times Nemerteans did not only exist, they were already differentiated into Anopla and Enopla, the latter even in Mono- and Polystilifera, of which the Monostilifera failed in the Tethys and must have originated from arctic or pacific Polystilifera (WIJNHOF 43, 44, 45).

The Polystilifera themselves must have had both tribes of Reptantia and Pelagica, of which the first were already subdivided in Aequi- and Inaequifurcata. These Aequifurcata are characteristic of the Tethys.

As Nemerteans are unknown as fossils, we can get no other palaeontological evidence of their existance in earlier ages. Being so highly specialized already in jurassic times, that even present tribes and subtribes were represented and showed a different distribution, we can conclude with certainty, that the Nemerteans are of a much older age and must have been at least of triassic, if not palaeozoic origin.

What has been said about the possibilities of distribution of mediterranean Nemertines in the preceding pages is applicable to all littoral marine invertebrates. The first conclusion on this page therefore may be expanded on other animals just as well.

All mediterranean components of the littoral fauna of the Caribbean Sea and westindian coasts must have invaded these regions in mesozoic, probably jurassic times, perhaps even earlier.

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## EXPLANATION OF PLATES.

## PLATE I.

Pl. I, Figs. 16 and 17 J. PRIJS, Utrecht, fecit, all other figures by the author.

- Fig. 1. *Polyschista curacaoensis* n. g. n. sp. *a.* dorsal view of the proximal part; *b.* ventral view; *c.* part of a proboscis, probably belonging to this species.  
 Fig. 2. *Carinoma caraibica* n. sp. with protruded proboscis; whole animal, dorsal view.  
 Fig. 3. *Carinoma caraibica* n. sp. dorsal view of the head with two sensory pits (?).  
 Fig. 4. *Carinoma caraibica* n. sp. ventral view of the head, showing the mouth.  
 Fig. 5. *Carinoma caraibica* n. sp. side view of the head.  
 Fig. 6. *Baseodiscus curtus* (Hubr.) ventral view of the proximal part.  
 Fig. 7. *Baseodiscus unicolor* n. sp. dorsal view of the proximal part.  
 Fig. 8. *Micrura leucopsis* Coe. dorsal view of the head-region.  
 Fig. 9. *Micrura leucopsis* Coe. lateral view.  
 Fig. 10. *Micrura leucopsis* Coe. ventral view.  
 Fig. 11. *Micrura vanderhorsti* n. sp. *a.* ventral; *b.* lateral view of the head.  
 Fig. 12. *Micrura curacaoensis* n. sp. *a.* dorsal; *b.* ventral; *c.* lateral view of the head; *d.* piece of the body.  
 Fig. 13. *Micrura* sp. ind. with protruded proboscis; *a.* lateral; *b.* ventral view of the head.  
 Fig. 14. *Micrura* sp. ind. tail.  
 Fig. 15. *Cerebratulus ater* (Girard)? tail.  
 Fig. 16. *Diplopleura caraibica* n. sp. *a.* dorsal view of the proximal part with head and circular furrows; *b.* middle part, the proximal end with deep dorsal groove to the right and the undep distal groove to the left; *c.* tail-end.  
 Fig. 17. *Diplopleura caraibica* n. sp. The other specimen. *a.* dorsal view of the proximal part with the pit, formed by the circular and dorsal furrows; *b.* distal part; *c.* tail.

## PLATE II.

- Fig. 1. *Polyschista curacaoensis* n. g. n. sp. Transverse section through the brain (left) and precerebral region (right).  
 Fig. 2. *Polyschista curacaoensis* n. g. n. sp. Transverse section through the nephridial (left), brain (middle) and precerebral regions (right).  
 Fig. 3. *Polyschista curacaoensis* n. g. n. sp. Transverse section through the gastric region and the nephridiopore.  
 Fig. 4. *Polyschista curacaoensis* n. g. n. sp. Section through the pyloric region.  
 Fig. 5. *Carinoma caraibica* n. sp. Section through the precerebral region.  
 Fig. 6. *Carinoma caraibica* n. sp. Section through the mouth.  
 Fig. 7. *Carinoma caraibica* n. sp. Section through the enteric region.

## PLATE III.

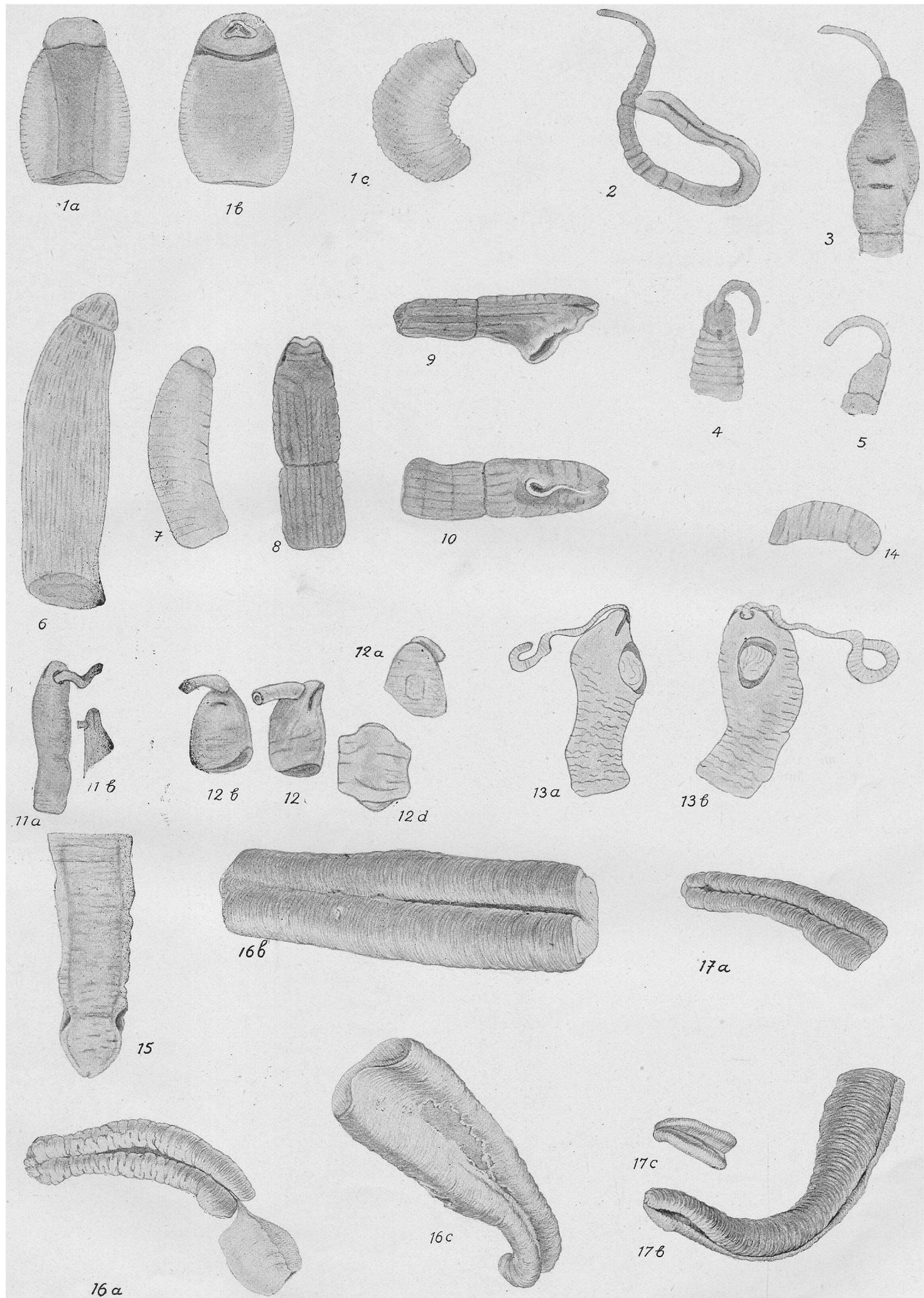
- Fig. 8. *Micrura leucopsis* Coe. Transverse section through the region of the mouth.  
 Fig. 9. *Micrura vanderhorsti* n. sp. Transverse section passing through the proximal part of the brains.  
 Fig. 10. *Micrura vanderhorsti* n. sp. Section passing through the cerebral organs.  
 Fig. 11. *Micrura curacaoensis* n. sp. Section passing through the brains.  
 Fig. 12. *Micrura curacaoensis* n. sp. Section of the enteric region.  
 Fig. 13. *Micrura* sp. ind. (tail). Transverse section.

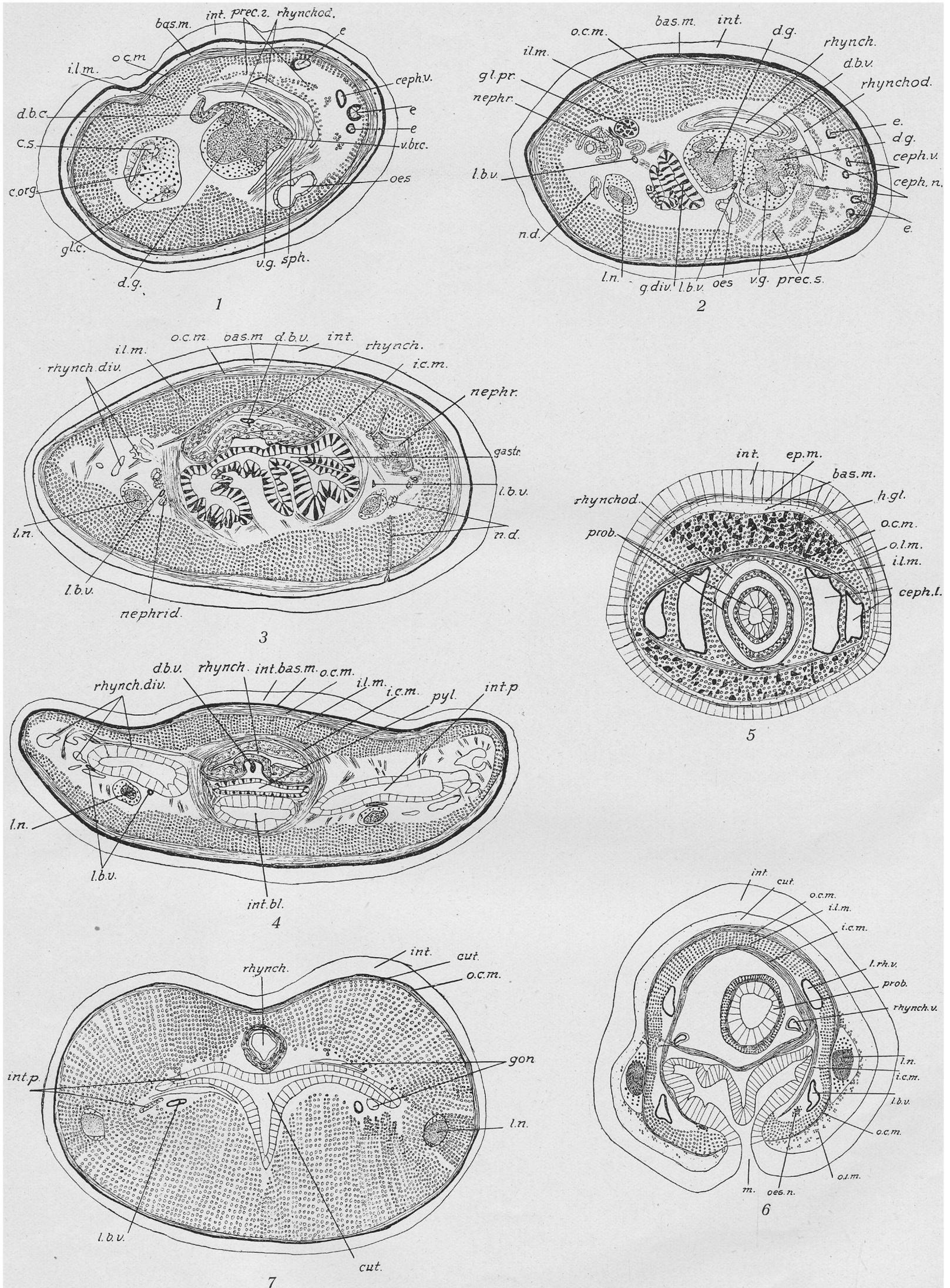
## PLATE IV.

- Fig. 14. *Cerebratulus ater* (Girard). Transverse section through the distal part of the body.  
 Fig. 15. *Cerebratulus ater* (Girard). Transverse section through the „tail”.  
 Fig. 16. *Diplopleura caraibica* n. sp. Transverse section passing through the cerebral pores.  
 Fig. 17. *Diplopleura caraibica* n. sp. Section passing through the mouth.  
 Fig. 18. *Diplopleura caraibica* n. sp. Transverse section through the stomodaeal region.  
 Fig. 19. *Diplopleura caraibica* n. sp. Part of a transverse section showing the „ventral pit”.  
 Fig. 20. *Diplopleura caraibica* n. sp. Transverse section through the enteric region.

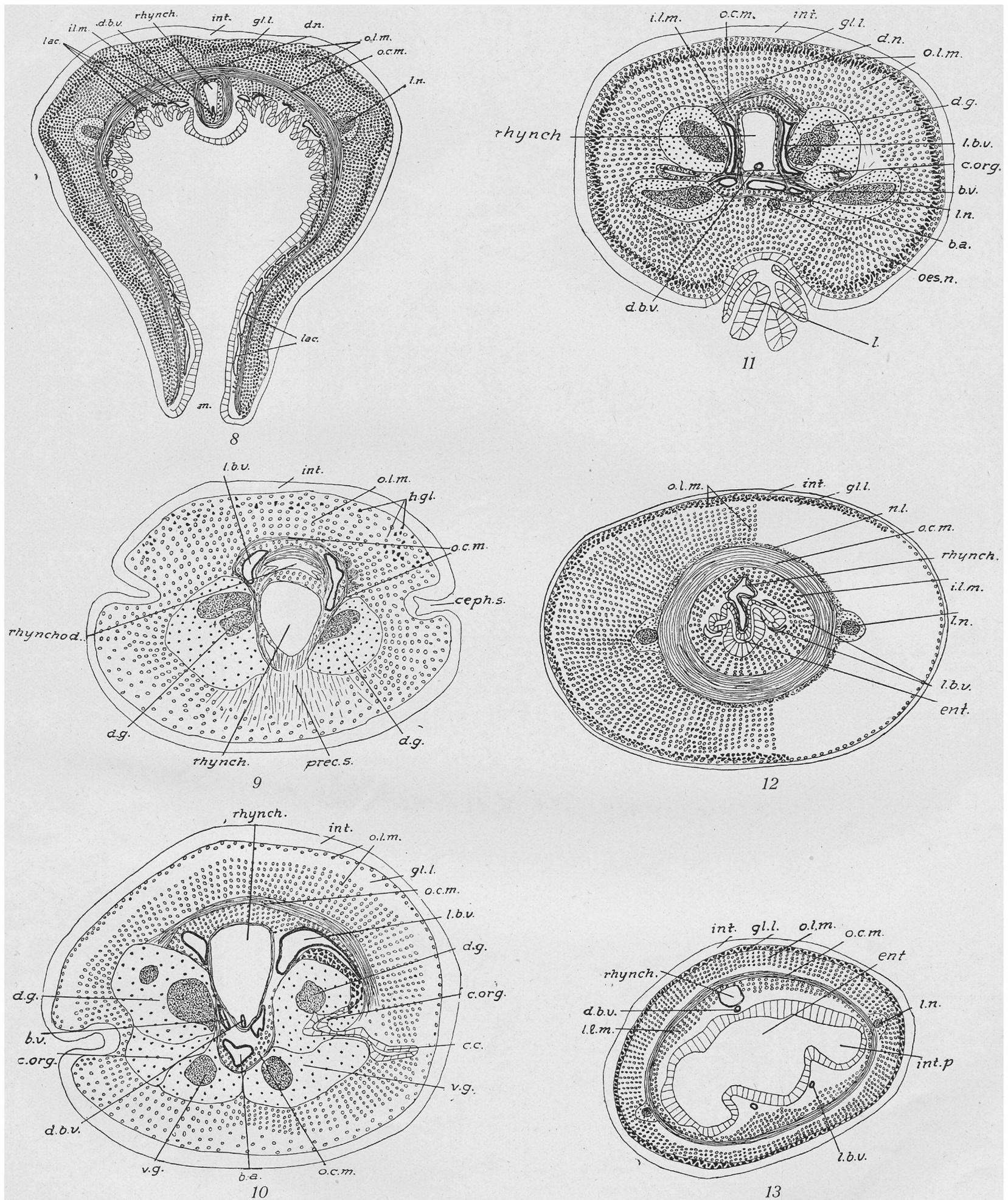
## ABBREVIATIONS.

<i>b. a.</i>	buccal anastomosis.	<i>int. bl.</i>	intestinal blindgut.
<i>bas. m.</i>	basement membrane.	<i>int. p.</i>	intestinal pouch.
<i>b. v.</i>	buccal vessel.	<i>l.</i>	lip.
<i>c. c.</i>	cerebral canal.	<i>lac.</i>	lacunae of bloodvascular system.
<i>ceph. l.</i>	cephalic lacunae.	<i>l. b. v.</i>	lateral bloodvessel.
<i>ceph. n.</i>	cephalic nerve.	<i>l. n.</i>	lateral nerve.
<i>ceph. s.</i>	cephalic slit.	<i>l. rh. v.</i>	lateral rhynchoelomic vessel.
<i>ceph. v.</i>	cephalic vessel.	<i>m.</i>	mouth.
<i>c. org.</i>	cerebral organ.	<i>met. an.</i>	metameric anastomosis.
<i>c. p.</i>	cerebral pore.	<i>n. d.</i>	nephridioduct.
<i>c. s.</i>	cerebral sac.	<i>neph.</i>	nephridium.
<i>cut.</i>	cutis.	<i>n. l.</i>	nervous layer.
<i>d. b. c.</i>	dorsal brain-commissure.	<i>n. p.</i>	nephridiopore.
<i>d. b. v.</i>	dorsal bloodvessel.	<i>o. c. m.</i>	outer circular musculature.
<i>d. g.</i>	dorsal ganglion.	<i>oes.</i>	oesophagus.
<i>d. gr.</i>	dorsal groove.	<i>oes. n.</i>	oesophageal nerve.
<i>d. n.</i>	dorsal nerve.	<i>o. l. m.</i>	outer longitudinal musculature.
<i>e.</i>	eye.	<i>prec. s.</i>	precerebral septum.
<i>ent.</i>	enteron.	<i>prob.</i>	proboscis.
<i>ep. m.</i>	epithelial musculature.	<i>pyl.</i>	pylorus.
<i>gastr.</i>	gastric cavity.	<i>rhynch.</i>	rhynchoelomic cavity.
<i>g. div.</i>	gastric pouch.	<i>rhynch. div.</i>	rhynchoelomic diverticulum.
<i>gl. c.</i>	branch of cerebral canal to glands.	<i>rhynchod.</i>	rhynchodaeum.
<i>gl. l.</i>	layer of subcutaneous glands.	<i>rhynch. v.</i>	rhynchoelomic vessel.
<i>gl. pr.</i>	glandular processus of cerebral organ.	<i>sph.</i>	sphincter rhynchodaei.
<i>gon.</i>	gonad.	<i>stom.</i>	stomodaeum.
<i>h. gl.</i>	head-glands.	<i>stom. p.</i>	stomodaeal pouch.
<i>i. c. m.</i>	inner circular musculature.	<i>v. br. c.</i>	ventral brain-commissure.
<i>i. l. m.</i>	inner longitudinal musculature.	<i>v. g.</i>	ventral ganglion.
<i>int.</i>	integument.	<i>v. p.</i>	„ventral pit”.

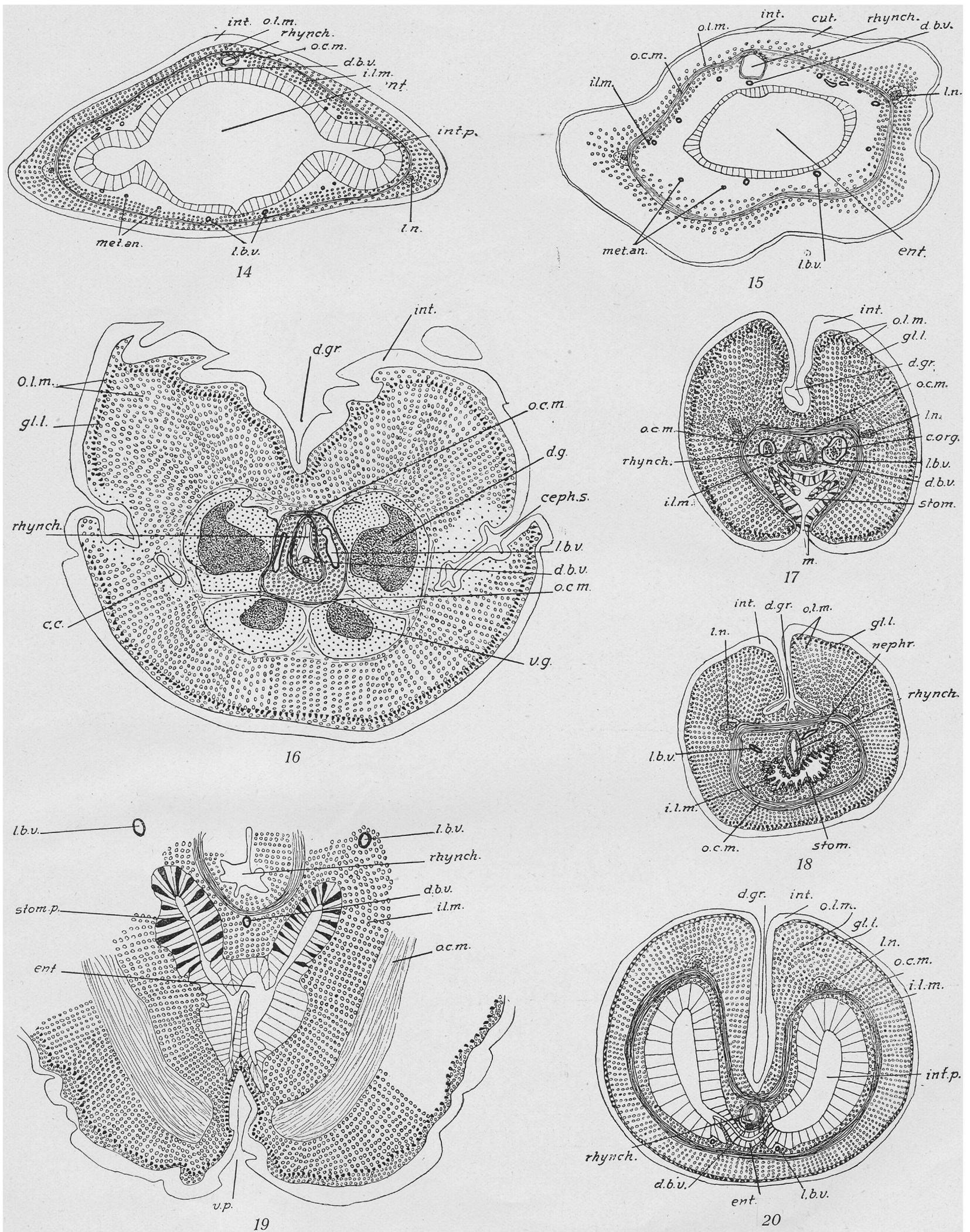




*Polyschista curaçaoensis* and *Carinoma caribica*.



*Micrura.*



*Cerebratulus ater* and *Diplopleura caraibica*.