

On South American Turbellaria

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The present paper contains the results of DR. WOLFGANG K. WEYRAUCH'S continued collecting of Turbellaria in Peru, and two new Polycladida from the littoral of São Paulo.

All slides, whole mounts and preserved specimens were deposited in the collection of the Department of Zoology, of the Faculty of Philosophy, Sciences and Letters of the University of São Paulo, Caixa postal 8.105.

ORDER RHABDOCOELA

SUBORDER TYPHLOPLANOIDA

Yagua, gen. nov.

Typhloplanidae, Protoplanellinae without dermal rhabdoids and with adenal ones only in the rod tracks. Eyes are present. The pharynx is located in the middle of the body or slightly in front of it. Atrium superius with anterior and posterior, probably uterine, diverticula. Thick-shelled (dormant) eggs retained in the body.

Type Species: *Yagua lutheri*, sp. n. Named for PROFESSOR DR. ALEXANDER LUTHER (Helsingfors).

Testes lying ventrally to the vitellaria, and protonephridia opening by 2 pores to the sides of and behind the pharynx indicate the allocation of the new genus to the Protoplanellinae.

LUTHER's key (1948, p. 86) leads to *Olisthanellinella* Reisinger (1924, p. 6). The only species, *O. rotundula*, has been redescribed by LUTHER (p. 88-91). It has no eyes, the pharynx lies behind the middle of the body (REISINGER 1954, f. 7), and the thick-shelled eggs are not retained in the body.

After LUTHER's synopsis RIEDL (1954, p. 231) described a true protoplanelline form, *Lioniella petiti*, from the Mediterranean. It is clearly distinguished from *Yagua* by a stylet. *Stygoplanellina halophila* Ax (1954, p. 36), from slightly saline subsurface water of the Finnish coast, has post-pharyngeal testes. As the excretory organs are not known, its subfamilial position remains unsettled.

Retention of dormant eggs was reported for 2 species of *Dalyellia* living in vernal ponds that dry out in the summer (LUTHER 1955, p. 160, 163), as well as in the typhloplanid subfamily Mesostominae. Among the Proto-planellinae it is a novelty. MARCUS (1946, p. 91, 167) and PAPI (1949, p. 45) compared retention with freeing of single thick-shelled eggs, the common way in the Typhloplanidae, and consider retention as phylogenetically secondary and biologically disadvantageous, if there are animals preying on the egg-retaining turbellarians. It is as yet unknown whether retention is caused by a mechanical impossibility for the passage of the egg through the gonopore as in some Aeolosomatidae (MARCUS 1944, p. 46; DU BOIS-REYMOND MARCUS 1944, p. 5-7) and Naididae (MARCUS 1943, p. 70-72).

***Yagua lutheri*, spec. nov.**

(Fig. 1-2)

The material consists of 6 preserved worms. The biggest is 0,7 mm. long and 0,46 mm. broad and high. The fore and the rear end are blunt. The eyes are more dorsal, the brain more ventral. Some dark pigment lies in the parenchyma of the anterior region. There are no dermal rhabdoids; adenal ones occur in rod tracks whose details would have required compression of fresh animals. Frontal glands were seen, but no caudal ones. The pharynx (f) begins shortly before the middle of the body. In a 525 micra long section the mouth (m) is located 270 micra, the gonopore (g) 310 micra from the fore end; in a 650 micra long section the mouth lies at 285 micra. The surface pores of the protonephridia are situated on both sides between the levels of mouth and gonopore.

The pharynx is typically rosulate, has a pharyngeal pouch surrounding the ectal fourth of the pharynx and a possibly extense grasping border. The histological state of the material does not allow for a detailed study of the pharyngeal epithelia, muscles and glands. The intestine (i) is thin-walled in the 3 sectioned specimens. It did not contain any food, but thick-shelled, developing eggs, whose length is 0,17-0,18 mm., the breadth 0,11-0,12 mm. Eggs (p) were also seen in the parenchyma. The maximum number of eggs was five.

The testes (t) are massy, lie ventrally to the vitellaria (v) and only in front of the pharynx (f). Their tunic is continuous with the efferent ducts (d) which are full of sperm. The ducts flank the pharynx and open into the pyriform copulatory organ. Entally the latter contains a mass of sperm (s) and granular secretion (q), ectally the invaginated muscular ejaculatory duct (e). The narrowed part of the copulatory organ which lodges the duct may project into the atrium superius (a).

The wall of this atrium dilates into two muscular diverticula, an anterior (x) and a posterior one (u). The caudal pouch seems to be a uterus; it is provided with a tuft of big glands (h). These must be shell glands, since cement glands secreting the substance to fasten the eggs to objects would have

no function in the present species. The anterior dilatation (x) of the atrium superius is similar to the pear-shaped appendages of *Phaenocora* (GILBERT 1935, p. 334-340), especially to the lamellar ones of *Ph. evelinae* Marcus (1946, p. 164, t. 15, f. 84, u), which partake in the enlargement of the atrium. As no eggs were seen in the atrium of the present species, the function of its atrial diverticula can only be presumed. I suppose that the eggs pass from the atrium to the parenchyma and thence to the intestine. Divaricators and constrictors insert at the limit of the atrium superius and inferius (j), and a further sphincter surrounds the tubular outlet of the latter.

The vitellaria (v) are long, thin chains of follicles, dorsal to the testes (t). Behind the pharynx the vitelline ducts come from the sides, the germiduct (r) from the front, and the bursal canal from behind. Where these ducts meet, originates the broad ductus communis (n) which courses downwards and joins the atrium superius (a). The seminal receptacle is not distinctly set off, but recognizable by some sperm in the ectal, widened part of the germiduct. The bursa is a large, probably syncytial, organ composed of numerous vesicles of different size. These are partly contiguous with the epithelium of the intestine (i) and even fused with it. Some of the vesicles (b) contain fresh spermatozoa, others (c) granular masses, probably digested sperm.

Holotype: The slide of sections of the 0,7 mm. long worm.

Occurrence: Central Peru, Quebrada Verde, between Lima and Lurin, at an altitude of 150 m.; July 1950. The worms were found in a 30-40 cm. broad pool on a rock, feeding on dead Anostraca (*Branchinecta*-spec.). These fairy shrimps live in great numbers during the winter-months, June to September, when the pool contains water, due to condensing saline fogs. During the summer-months, November to May, the basin is constantly dry, and the rock warms up to 65° C. (Information by the collector, DR. WOLFGANG K. WEYRAUCH-Lima).

ORDER TRICLADIDA

SUBORDER TERRICOLA

***Rhynchodemus*-spec.**

(Fig. 3-5)

One worm about 20 mm. long and 1,5 mm. broad with the mouth at the end of the anterior third. The back is black with two whitish lateral stripes. The head is dark with light sensory margins and somewhat widened and flattened, forming a cephalic hood (PANTIN 1950, p. 28). The sole is 0,6 mm. broad, whitish and provided with a median furrow. The sides of the belly are dark. The tract of the glandular cells in the parenchyma opens on the ventral side in a localized secretory surface at the beginning of the creeping sole as in *Rh. bilineatus* (see PANTIN, 1. c.). Reproductive organs are not developed.

Occurrence: North Peru, Cerro Macheipungo, 4 km. northwest of Bambamarca, 3000 m. DR. WOLFGANG K. WEYRAUCH leg. 1 specimen together with *Geoplana lareta* in a bromelia, 28. VI. 1956.

Discussion of Rhynchodemus-spec.

The probosciform anterior region, the bundles of the subepidermal longitudinal muscles, and the concentration of secretion at the beginning of the creeping sole characterize the present species as *Rhynchodemus*. Peruvian species of this genus are not known. Those from Colombia (numbers 9, 16, 26 of my list 1955, p. 34-37) differ from the present one in colour. Although the colour of *Rh. bromelicola* Beauchamp (1912, p. V) from Costa Rica is highly variable, none of the 6 described types corresponds to that of the present worm.

Incapora weyrauchi du Bois-Reymond Marcus, 1953

Based on one not quite mature worm with two intestinal-cutaneous ducts (1953, p. 75) the diagnosis could be amplified (DU BOIS-REYMOND MARCUS 1957, p. 161-162) on the basis of 3 further animals, one of which had 4 such ducts. The present rich material contains 36 worms with 2 pairs of intestinal-cutaneous outlets.

Occurrence: Central Peru, Hacienda Maraynioc, common under stones on a pasture, 3500 m. DR. WOLFGANG K. WEYRAUCH leg. 42 specimens, 10. X. 1956.

Geoplana lama DU BOIS-REYMOND MARCUS, 1957 (p. 164)

The second specimen of this species comes from the same region as the first. It is 60 mm. long, 10,5 mm. broad, hence somewhat smaller than the first worm. The back is black, the belly light yellow.

Occurrence: Central Peru, Pano near Huanuco, 2700 m. DR. WOLFGANG K. WEYRAUCH leg. 1 specimen.

Geoplana lambaya, spec. nov.

(Fig. 6-10)

The single worm is 25 mm. long, 7 mm. broad. The tip is sharply pointed, the fore end widens immediately and reaches the full breadth at about 5 mm. from the tip. Then the sides run parallel towards the rounded hind end. The mouth is located at 15 mm., the genital aperture at 20 mm. The animal is broken in two at the level of the gonopore, so that the penial papilla is visible. The pharynx is partly projected from the mouth and forms a disc around it (Fig. 7).

The colour of the back is a rusty brown with a lighter yellowish band, 1 mm. broad, in the mid line. The brown colour of the sides grows a little darker towards the light middle stripe. Around the tip the borders

are yellow for a short distance. The ventral side is yellowish with a dark fore end.

The eyes surround the tip in a single file, which soon becomes irregular, and then spread over the sides of the back. Near the middle of the body the eyes decrease in number and size. As in other species of *Geoplana* that belong to the broad and flat type, the ventral nerve plate is rather solid. The glandular margin is inconspicuous; the height of the bundles of the subepidermal longitudinal muscles, only 20 micra.

The pharynx is cylindrical, contrary to the collar-shaped one of *bogotensis* Graff. Its dorsal insertion is located far in front, not at the posterior end of the pharyngeal pouch as in *bogotensis*. That of *libbieae* (see discussion) is tubular as in *lambaya*, but longer, more slender and posteriorly folded. The pharynx of *lambaya* is 1,4 mm. long, its pouch (j) 2,5 mm.; the diameter of its protruded disc is 1,9 mm. Cyanophilous glands open on both sides, erythrophilous ones (y) only on the margin. A thick layer of annular muscle fibres (k) accompanies the lumen from the centre of the disc inwards to the beginning of the intestine (i). The latter is lined with a 0,25 mm. high epithelium containing blue staining granules. The animal had in the moment of preservation engulfed a slug, whose organs are perfectly recognizable, jaw, radula, eyes, statocysts with statocones, ganglia with giant cells, and others. The anterior limb of the intestine bears 28 ramified diverticula, the paired posterior branches about 24 each.

The worm is in beginning sexual phase. There are small dorsal testes only in front of the pharynx, 1-3 on one side in a transverse section of the prepharyngeal region. The thin efferent ducts (d) unite in a tubular, slightly winding seminal vesicle (s) which is not limited against the ejaculatory duct. It courses through the small penis papilla (p) and forms a little widening before it reaches the tip. There it opens with a transverse slit of 0,1 mm. breadth.

Vitellaria and shell glands are not developed yet. The atrium which is broken in two in the present worm is narrow, and the common ovovitelline duct is tiny and wrapped in a mass of annular muscles. It is bent upwards and the thin ovovitelline ducts (o) descend to the sides and run forwards.

Occurrence: North Peru, Hacienda Yanazara, east of Huamachuco, on the Chusgon River, a western affluent of the Marañon, 2300 m. DR. WOLFGANG K. WEYRAUCH leg. 1 specimen, 22. II. 1949.

Discussion of Geoplana lambaya

Size and colour of the new species are similar to a Colombian species, *G. bogotensis* Graff (1899, p. 324), and a specimen collected by the Yale Peruvian Expedition (HYMAN 1955, p. 19). GRAFF did not describe the copulatory organs of his single worm. BUSSON identified 7 animals with *bogotensis* (1903, p. 404). As he worked (p. 375) under the auspices of GRAFF, it is highly probable that his description of the pharynx and the

copulatory complex really refers to *bogotensis* (DU BOIS-REYMOND MARCUS 1957, p. 153-154), found again by FUHRMANN (1914, p. 750). Pharynx and copulatory organs of *lambaya* differ both from *bogotensis* and from HYMAN's worm. The latter disagrees with *bogotensis* in pharynx and copulatory complex, hence it must receive a new name; I call it *Geoplana libbieae*, nom. nov.

Geoplana lareta, spec. nov.

(Fig. 11-15)

Though the material consists of 44 specimens, only one of them has vitellaria and an open gonopore, so that it may be called nearly mature. This worm is 75 mm. long, the next in size are 72 and 70 mm. These largest animals are 11 and 10 mm. broad and flat, 2 mm. high, tapering gradually in front and towards the hind end. In the 75 mm. long specimen the mouth lies 42 mm. from the tip and the genital aperture 58 mm.

The colour of the back varies; it is greyish black, sometimes with a darker mid-line, or dark grey mottled with black spots. In other worms (Fig. 12) the black pigment forms darker stripes, a fine median one and two broader bands on either side. The belly is more or less dark grey and almost white around the mouth. Numerous light eye spots stand on the dark grey or black anterior part.

The eyes (Fig. 11) begin as a single row, dorsally to the sensory margin. This margin extends 15 mm. backwards. The eyes spread about 8 mm. behind the tip over the back, leaving a little more than one third free. In the beginning they are densely set, beyond 2 cm. they become scattered, and against the hind end they are rather scarce. Transverse sections show the sharp borders of the body, the dense nerve plexus below the digestive tract and a well developed glandular margin. The subepidermal longitudinal muscles form small, 35-40 micra high bundles.

The 5-7 mm. long pharynx (Fig. 13) is sometimes similar to that of *G. quichua* d. B.-R. MARCUS (1951, p. 222), as it is more or less bell-shaped and has the mouth at its hind end. The margin may be smooth or thrown into few or many folds. The dorsal insertion lies rather far behind (Fig. 14); the pharyngeal pouch (j) extends a little beyond the mouth. Cyanophilous glands open on both sides and erythrophil ones on the inner side, generally near the margin. Around the pharyngeal lumen the annular muscles form a layer (k) which is thickest near the inner end, where a short cylindrical oesophagus leads into the intestine (i).

The limit between oesophagus and intestine is sharp; the latter has enormously high cells mixed with granular clubs. Such occur also in the peripheral diverticula of the gut. The black intestine is clearly visible in the clarified worms. The unpaired anterior trunk of the 70 mm. long specimen has about 40 left and 44 right diverticula, the paired posterior rami 25 and 22, which subdivide near their roots and anastomose in some cases. A 50 mm.

long animal had 38 diverticula on one side of the anterior ramus and 30 in one of the posterior limbs, hence there is no difference between the bigger and the smaller worm. In one of 3 clarified specimens the right and left posterior ramus are united by a cross branch a little in front of the hind end.

The dorsal testes lie in front of the pharynx and are rather scarce; in transverse sections there are at most 3 in one section and more often none at all. The efferent ducts (d) are nearly empty and form thin tubes. They open into the T-shaped fundus of the seminal vesicle (s), which receives pink secretion of circumjacent glands (y) in the mature worms. In several cases the course of the ejaculatory duct through the male bulb is oblique: the centre of the ental end lies to one side of the median plane of the bulb and the wide opening to the opposite one. In other worms the duct slants much less, and in still others its course is straight.

The vitellaria are young even in the 75 mm. long worm. The rather thick ovovitelline ducts (o) rise gradually in the region of the genital aperture (g) and curve towards the middle. These horizontal courses receive the secretion of shell glands (x). Such open also into the common ovovitelline duct (q), which is directed downwards. In the 75 mm. long worm the female atrium (f) and the common atrium are spacious. In this animal and in some medium-sized ones the gonopore is open, while it is closed by an erythrophilous plug in the 70 and 72 mm. long worms. The plug consists of rhabdites sticking together, which were produced by the epidermal cells around the gonopore. None of the present worms had coupled yet.

Holotype: The slides containing the sagittal sections of the copulatory organs of the 75 mm. long worm.

Occurrence: North Peru, Department Cajamarca, western and eastern slope of the West Andes, e. g., near Chiclayo, Llama and Chota, 2100-3000 m. DR. WOLFGANG K. WEYRAUCH leg. 44 specimens, 10.-28. VI. 1946. One lot of 21 worms was half of the inhabitants of a single bromelia grown on a rock. The other specimens were found under a rotten log in a meadow and under stones.

Discussion of Geoplana lareta

Though the general form of the body and the colour of *G. lareta* agree with *G. chalonga* d. B.-R. Marcus (1951, p. 218), collected in approximately the same region, and its copulatory organs are compatible, *lareta* must be separated from *chalonga*. The eyes of *chalonga* pass on to the back about 20 mm. from the tip and occupy at most one fourth of the dorsal breadth. The mouth of *chalonga* lies in the centre of the pharynx which has twice the length of that of *lareta*. The diverticula of the digestive tract are the double number of that of *lareta*, viz., 69 on each side of the anterior ramus and 60 in each posterior one. The bundles of subepidermal longitudinal muscles are much higher (60 micra) in *chalonga* than in *lareta*.

***Geoplana irua*, spec. nov.**

(Fig. 16-20)

The specimen is 36 mm. long, 6,5 mm. broad and 1,3 mm. high. The fore end is tapering, the hind end rather blunt. The maximum breadth lies in the second third, approximately at the level of the mouth. The latter is situated 24 mm. behind the tip, the gonopore 30 mm.

The back appears greyish brown due to a strong dark mottling on a yellowish ground colour. The ventral side is somewhat lighter brownish. Over the pharynx and the genital region the back is lighter than in the rest; also the sensory margin is light.

The eyes begin with a single row and extend over the back about 10 mm. from the tip. They occupy at most one fourth of each side and are not numerous. The ventral nerve plexus is dense. The glandular margin is weakly developed. The subepidermal longitudinal muscles are not united in bundles.

The pharynx is cylindrical, and its dorsal insertion is located slightly farther behind than the ventral one (Fig. 18). The pharyngeal border (z) is much folded and bears the openings of erythrophilous glands (y). Those of the cyanophilous glands are scattered all over the surfaces of the pharynx. The mouth (m) lies in the posterior half of the pharyngeal pouch (j). As the worm did not become sufficiently transparent in oil, the number of its intestinal diverticula cannot be indicated exactly, there may be about 100 on each side.

The worm is completely mature. Transverse sections of the prepharyngeal region contain 3-4 testes (t), which are often irregularly and indistinctly limited. Already at the level of the pharynx the efferent ducts dilate into spermiducal vesicles (d) which penetrate into the copulatory bulb (b). Here they are provided with own muscles and unite immediately before they open into the seminal vesicle (s) on a broad papilla. The seminal vesicle contains one ball of sperm and a great quantity of erythrophilous granular secretion of glands (y) lying in front of the penis bulb in the parenchyma. The seminal vesicle continues into an ejaculatory duct (e), which courses through a cylindrical penis papilla.

The vitellaria are mature and richly developed. The ovovitelline ducts (o) rise in the region of the genital aperture (g) and bend to the middle. Their 0,4 mm. long transverse courses receive the shell glands (x), while the common ovovitelline duct (q) is not glandular. This duct comes from behind into the atrium opposite to the outlet of the ejaculatory duct. The epithelium of the atrium is high in its ventral part.

Occurrence: Central Peru, eastern slope of the Andes, east of Tarma, Hacienda Naranjal, valley of the Chanchamayo River, tropical rain forest, under a rotten board in a garden, at an altitude of 950 m. DR. WOLFGANG K. WEYRAUCH leg. 1 specimen, 13. X. 1956.

Discussion of *Geoplana irua*

Two further Peruvian species have granular secretion stored in the seminal vesicle, *G. takia* d. B.-R. Marcus (1951, p. 224) and *G. contamanensis* Hyman (1955, p. 22), the first from Huacapistana on the Tarma River (1800 m), the second from Contamana on the middle course of the Ucayali (300 m.). Each of these 3 species, perhaps in future to be recognized as geographical subspecies of one species, is known by a single specimen. In accordance with the smaller geographic distance *G. takia* (Fig. 21) differs less from *irua* than *contamanensis*. The two species from the region of Tarma are distinguished in the manner how the efferent ducts open into the seminal vesicle (Fig. 20). *G. contamanensis* is much larger than *takia* and *irua*, viz., 72 mm. long, and still not completely mature. The male and the female atrium of *contamanensis* differ widely from the corresponding organs in *takia* and *irua*.

***Geoplana chilihua*, spec. nov.**

(Fig. 22-25)

The available specimen is 35 mm. long, 7 mm. broad, and 2 mm. high, hence rather broad and high. The tapering of the anterior end is pronounced, while the rear end is nearly round. The worm is broadest at the level of the pharynx. The mouth is 23 mm. from the tip, the genital aperture 28 mm.

According to the collector the colour pattern of the living worm consisted of two light olive green stripes on blackish olive green ground. The colour is rather well preserved in alcohol. The dark middle zone is 0,8 mm. broad, each of the light stripes 1,6 mm., and each of the dark marginal zones 1,5 mm. The colour is mottled in the clarified worm. The belly is light olive green as the two dorsal stripes.

The eyes form a simple series in front. Farther behind they become unreconizable and evidently do not spread over the back. In the marginal groove of the sensory strip the pits are distinct. A glandular margin is not developed. The ventral nerve plexus is rather dense. The ventral bundles of the subepidermal musculature attain a height of about 50 micra.

The bell-shaped pharynx is 2,5 mm. long, has a wide ruffled border (z), and the mouth located at its hind end. The dorsal insertion lies 1 mm. behind the level of the ventral one. The pharyngeal pouch (j) extends 2,3 mm. backwards beyond the mouth. The erythrophilous glands (y) of the pharynx open on its border, the cyanophilous ones on its entire surface. Most of the intestinal diverticula are bifurcate, but there are also parts where twice as many single branches occur. The worm had engulfed several snails, which dilate the digestive tract so much and so irregularly, that the diverticula cannot be counted.

The dorsal testes are prepharyngeal. In transverse sections one or two appear on each side. The terminal courses of the efferent ducts (d) are

clothed with thick muscles and enter the seminal vesicle (s) separately from the ventral side. The vesicle lies outside the penial bulb (b) and has its own musculature. The wide ejaculatory duct (e) runs through a massy, nearly cylindrical penis papilla, which fills the most part of the male atrium (a).

The ovovitelline ducts (o) rise to the back in front of the gonopore (g) and receive the shell glands (x) on both sides in an extension of 0,8 mm. The very short common ovovitelline duct (q) has no glands. The folded female atrium (f) is small.

Occurrence: Central Peru, eastern slope of the Andes, east of Tarma, Hacienda Maraynioc, in a basin tributary to the Chanchamayo River, at an altitude of 3500 m. DR. WOLFGANG K. WEYRAUCH leg. 1 specimen, 10. X. 1956.

Discussion of Geoplana chilihua

The colour pattern of the new species is unique among the known Peruvian species. Some of those described in my former papers (1951; 1957) are black or grey with a dark median zone flanked by light stripes. These stripes are quite narrow in *G. aymara* and *vicuna*, and only caudal in *G. talpa*. *G. chalona* differs by its 14 mm. long pharynx from the present species, and *G. garua* by the absence of a penis papilla.

Geoplana quenua, spec. nov.

(Fig. 26-28)

The 2 worms are 24 and 33 mm. long, 6 and 6,5 mm. broad, and 1,7 mm. high. They are pointed in front and blunt behind, rather thick and without sharp borders. The mouth of the larger worm lies 23 mm. from the tip, the gonopore 28 mm.

The black colour of the back passes on to the sides of the light, milky white belly, where it forms a narrow edge (Fig. 26). The sensory margin is marked as a light line.

The eyes form a single line in front and then become irregular. Whether they spread over the dorsal surface cannot be seen, because they are not surrounded by pigment-free halos. The subepidermal longitudinal muscles are arranged in bundles, whose height attains 0,12 mm. on the ventral side. A glandular margin is not developed. The ventral nerve plexus is rather compact.

The pharynx is bell-shaped and has a very wide, frilled border (z). The dorsal insertion of the pharynx lies a little farther behind than the ventral one. The mouth (m) is located behind the middle of the pharynx. Thick pink glands (y) open on the border and farther inwards, cyanophilous glands on the entire surface of the pharynx. The oesophagus is surrounded by a thick layer of annular muscles (k) and sharply set off against the intestine.

The latter has about 50 diverticula on each side, but the black pigment does not allow for counting their number in the clarified worm.

Three or four dorsal testes are situated in each transverse section of the prepharyngeal region. The efferent ducts (d) form spermiducal vesicles, but pass through the loose muscles of the copulatory bulb (b) as narrow canals. These open into the seminal vesicles (s) separated. This tubular vesicle has a thick mantle of muscle fibres, which continues thinner on to the ejaculatory duct (e). The latter begins coiled and then courses nearly straight through the strong, approximately conical penis papilla (p).

Vitellaria and shell glands are not developed yet. The ovovitelline ducts (o) rise behind the genital aperture (g). The common ovovitelline duct (q) runs nearly vertically downwards to the folded female atrium (f), which is lined with a high epithelium. The ectal parts of the ovovitelline ducts, the common ovovitelline duct and the female atrium are enveloped in a spherical mass of loose muscle fibres.

Holotype: The slides containing the sagittal sections of the copulatory organs of the 33 mm. long worm.

Occurrence: At the same locality as the preceding species. DR. WOLFGANG K. WEYRAUCH leg. 2 specimens, 10. X. 1956.

Discussion of Geoplana quenua

Seven black or dark Peruvian species without stripes were described in the paper of HYMAN (1955) and in mine (1951; 1957, and the present one), viz., *Geoplana chulpa*, *idaia*, and *lareta*, whose seminal vesicle lies outside the penial bulb; *G. contaminensis* and *irua*, which store granular secretion in their seminal vesicle; *G. lama* with a collar-shaped pharynx; and *G. unicolor*, whose common ovovitelline duct enters the female atrium from the ventral side.

ORDER POLYCLADIDA; SUBORDER ACOTYLEA

SECTION CRASPEDOMMATA

FAMILY STYLOCHIDAE

Stylochus catus, spec. nov.

(Fig. 29-31)

The measurements (in mm.) of the only worm are: length 5 alive, 2,5 preserved; breadth 3 alive, 1,5 preserved; height 0,55 preserved. Living the worm was white with numerous circular black spots on its back, which form two denser longitudinal stripes (Fig. 29). These spots subsists in alcohol.

The tentacles were long and pointed and contain a file of eyes. In preserved state they are contracted and tucked away in pouches, which are closed over them (Fig. 30). They are located 0,7 mm. from the anterior border and 0,3 mm. apart from one another to the sides of the brain. The latter is 0,21 mm. long, 0,15 mm. broad, and 0,17 mm. high. The strongly

ruffled pharynx is 0,7 mm. long. It occupies the middle of the body, and the mouth lies exactly in the centre. The common genital opening (g) is 0,1 mm. in front of the hind end.

The largest of the inconspicuous marginal eyes have a diameter of 25 micra; they extend to the level of brain and tentacles in a loose row. The 8-10 tentacular eyes stand in a line along the axis of the tentacle. The biggest have a diameter of 15 micra. On each side of the anterior border of the brain there are 2 small cerebral eyes, 14 micra in diameter and 0,12 mm. apart from one another, and in front of these a single frontal eye, 25 micra.

The epidermis and its cilia are of equal height all over the body. On the dorsal side the cells seem to contain a slightly greater quantity of eosinophilous granules (references: MARCUS 1947, p. 104; D. B.-R. MARCUS 1955, p. 38). The basal membrane is strong and underlain with an outer circular, a longitudinal, a strong diagonal, and an inner circular muscle layer. In the connective tissue of the back the pigment (r) that produces the black spots is visible with high power. Beneath this lie the ovaries (o), which are in the beginning of the growth period of the ovocytes. Ventrally to the gut (i) the testes (h) occupy almost half the height of the body. Most of the follicles contain dividing spermatogonia and only small bundles of ripe spermatozoa. In the efferent ducts (d) there are some spermatozoa.

A little in front of the gonopore (g) the efferent ducts bend forwards and become covered with a muscle layer, forming the ental limbs (t) of the seminal vesicle. The vesicle does not contain any sperm. The nuclei of its muscular fibres surround the fibres as a mantle (m). The vesicle measures 0,15 mm. in greatest extent, its wall is 20-30 micra thick. Where the ental limbs unite, the lumen forms a dorsal diverticulum (c) inside the layer of muscles, and bends to the ventral side as ectal limb (v) of the vesicle. Such a quadripartite seminal vesicle with paired ental limbs, dorsal diverticulum, and ventro-median ectal limb differs from the tripartite vesicle frequent in *Stylochus*. The thin ejaculatory duct (e) winds backwards. After receiving the duct of the granule vesicle (q) it opens through a small penial papilla (p) into a wide penial pouch (s). This pouch contains some sperms; it is set off from the male atrium (a) by a constriction, which corresponds to a penial sheath. The granule vesicle, obliquely oriented, is 0,14 mm. long and 0,11 mm. in diameter. Its muscular layer is 14 micra thick; the nuclei accompany the fibres. The epithelium forms 8 deep chambers, whose lining stores the erythrophilous secretion of extra-capsular glands. As these chambers lie in different planes, only 6 of them are shown in the diagram.

Quite near the genital opening the external vagina (u) goes out from the posterior wall of the atrium. As the worm is not quite adult, there are no cement glands developed. The vagina ascends dorsally with a slight anterior slant, then curves posteriorly and downwards (w) and terminates with the entrance of the uterine ducts or oviducts.

Occurrence: Island of São Sebastião, Ilhabela. One specimen in coarse sand near the low water-line, November 1957.

Discussion of *Stylochus catus*

This is the second Brazilian species of the genus with a penial pouch (Bock 1913, p. 38-39) or *antrum masculinum internum* (MEIXNER 1907, p. 484), an exceptional structure in *Stylochus*. The first is *St. ticus* Marcus (1952, p. 79), whose gonopores are separated. The two other Brazilian *Stylochus*, both without penial pouch, have united male and female apertures: *St. martae* Marcus (1947, p. 104) and *St. isifer* du Bois-Reymond Marcus (1955, p. 37).

According to STUMMER-TRAUNFELS (1933) and HYMAN (1939; 1940; 1955a) the further valid West Atlantic species are: *ellipticus* (Girard, 1850), *oculiferus* (Girard, 1853), *megalops* (Schmarda, 1859), *zebra* (Verrill, 1882), *frontalis* Verrill, 1892, and *pulcher* Hyman, 1940. These have all separate gonopores. *St. ellipticus* seems to have its penial stylet enclosed in a small penial pouch (HYMAN 1939, t. 1, f. 3).

It is impossible at present to evaluate VERRILL's *St. crassus* and *bermudensis* (HYMAN 1940, p. 491; MEIXNER 1907, p. 428).

A penial pouch occurs also in some Pacific species of *Stylochus*, for example, in *uniporus* and *hamanensis* Kato (1944, p. 262-264), so that the absence of a penial pouch and sheath (MEIXNER 1907, p. 406; Bock 1913, p. 128) must be omitted from the diagnosis of the genus.

SECTION SCHEMATOMMATA

FAMILY LEPTOPLANIDAE

Stylochoplana lynca, spec. nov.

(Fig. 32-33)

The elliptic or nearly oblong worms are of firm consistency, up to 6,3 mm. long and 3,5 mm. broad, preserved. The back is marked with brown spots and a light mid line, or the middle region is darker than the rest of the back, and the margins are light. The belly is lighter than the back. The fore end is a little rounder than the hind end and bears two folds (h) with eosinophilous glands in its middle.

The tentacles (e) stand in pits and lie 1 mm. from the anterior border and 0,4 mm. from one another. In the anterior half of each tentacular base and partly under it about 18 eyes are located, whose diameter attains 40 micra, and whose cups are directed forward and backwards. Two small groups of about 16 cerebral eyes each are situated between the tentacles. The greatest diameter of the cerebral eyes is 30 micra.

The ruffled pharynx (j) extends from 1,2 to 3,65 mm. behind the fore end. The mouth (o) lies in the middle of the pharynx, in front of the centre of the body. The male pore (n) is situated 4,2 mm., the female (m) 4,8 mm. from the anterior end.

The epidermis, which is both dorsally and ventrally underlain by several layers of annular and longitudinal muscle fibres, contains few rhabdites

and bears 8 micra long cilia on the belly. The height of the cells is 26 micra in the middle of the back, 16 on the borders and 11 on the ventral side. The main intestine (i) attains the brain, where it bends ventrally between pharynx and brain, and extends backwards nearly to the level of the male pore (n). Granular clubs (c) occur in the central intestine and more rarely in the roots of the diverticula, while they are absent in the peripheral parts of the latter.

The testes are ventral, the ovaria dorsal. From the level of the posterior half of the pharynx backwards the efferent ducts dilate into spermiducal vesicles (s). These unite in the middle behind the pharynx near the ventral side of the body. A thin common efferent duct (r) surrounded by muscles rises and enters the copulatory muscle bulb, where it forms a semiglobular vesicles (t). This vesicle is convex in front and flattened behind, where it communicates with the granule vesicle (q) by a short, also intra-bulbar, ejaculatory duct. The granule vesicle is longish, and its diameter is less than one third of that of the entire bulb. The granule glands (g) pierce the outer longitudinal and inner annular muscle fibres of the bulb. The high prostatic epithelium, which stores the granular secretion, is followed by the low epithelium of the short common male duct. The ectal part of the bulb containing this duct projects into the male atrium (a) as a penial papilla (p) of conical form. The atrial epithelium on the cone is low and contains red secretion; on the outer wall it is higher and ciliated. The short duct between the atrium and the ventral surface has the common epithelium of the latter with some rhabdites.

The uteri (x) are united in front of the pharynx. The haploid number of chromosomes is five or six. The quite short oviduct or common uterine duct (u) has a sphincter at its ventral passage to the internal vagina (v), which is wide and ciliated. The duct (z) that receives the cement glands (y) runs backwards, the external vagina (w) to the ventral side. The musculature of the external vagina is very thick (*vagina bulbosa* BOCK 1913, p. 41). The external vagina has several pouches. The moniliform duct (d) of Lang's vesicle is short, the lumen of the vesicle itself (k) narrow, but extended into two lateral diverticula (1) of about 0,6 mm. length and 60-100 micra diameter.

Holotype: The slide containing the sagittal sections of the copulatory organs of a 6,3 mm. long worm.

Occurrence: Cananéia, about 200 km. SW of Santos, from the bottom of a boat: 48 specimens collected by the Staff of the Oceanographic Institute.

Discussion of *Stylochoplana lynca*

The granule vesicle of the present species is long and approximately tubular, but not poorly differentiated, and therefore the salient feature of *Leptoplana* Ehrbg. in HYMAN's definition (1953, p. 310, 314) is wanting. On the other hand all characters required for *Stylochoplana* Stimps. (BOCK

1913, p. 172; HYMAN 1953, p. 301) occur, though the species does not fit into any of BOCK's three groups. Its principal characters are the musculature enclosing the granule and the seminal vesicle in a common bulb, the vagina bulbosa, and the folds of the fore end. In my key (1954) *lynca* would come near the only *Stylochoplana* without stylet, *St. selenopsis* Marcus (1947; 1949), whose male and female efferent organs and eyes differ from *lynca* in many details.

RESUMO

As espécies seguintes foram descritas: a) do Perú: *Yagua lutheri*, g. n., sp. n., encontrada numa pequena poça que contém água somente durante o inverno. Os vermes foram observados comendo Anostraca mortos. *Yagua* pertence às Typhloplanidae Proto-planellinae, caracterizadas pela topografia dos poros protonefridiais e dos testículos. O gênero menos distante é *Olisthanellinella* Reisinger 1924. A única espécie deste gênero não tem olhos, e a faringe situa-se na metade posterior do corpo. *Yagua lutheri* é a primeira espécie da subfamília indicada que acumula os ovos duráveis no parênquima e no intestino.

Um exemplar não maduro de *Rhynchodemus*, gênero ainda não publicado do Peru, foi encontrado numa Bromeliácea. De *Incapora weyrauchi* d. B.-R. Marcus 36 espécimes com 2 pares de dutos intestino-cutâneos foram coligidos. Um segundo exemplar de *Geoplana lama* d. B.-R. Marcus provém da mesma região como o primeiro (1957). São novas: *Geoplana lambaya* semelhante a *G. bogotensis* Gr. no tamanho e na cor, difere desta pela faringe cilíndrica e os órgãos copuladores. O verme da expedição ao Peru da universidade de Yale (HYMAN 1955) deve ser separado de *bogotensis* e de *lambaya*; proponho o novo nome *G. libbieae*. *G. lareta* difere de *G. chalona* d. B.-R. Marcus pela distribuição dos olhos, posição da bôca na extremidade posterior do faringe e pelo número menor dos divertículos intestinais. *G. irua* tem a mesma secreção granulosa na vesícula seminal como *G. takia* d. B.-R. Marcus e *G. contamanensis* Hyman. Tamanho e faringe de *takia* e *irua* são concordantes, mas, os dutos eferentes abrem-se diferentemente (Fig. 20, 21). *G. contamanensis* é muito maior que as duas outras, e os átrios masculino e feminino diferem dos delas. *G. quenua* caracteriza-se pela musculatura forte do complexo copulatório e a cor preta que passa, do dorso, para os dois lados do ventre. Foi comparada com 7 espécies do Peru, pretas ou escuras, sem estrias. *G. chilhua* é verde olivácea com duas faixas mais claras da mesma cor. Das espécies listradas do Peru não se conhece outra semelhante.

b) do litoral de São Paulo: *Stylochus catus*, sp. n., que possui bolsa penial como *St. ticus*, do qual difere pelos orifícios masculino e feminino reunidos. A mesma união existe nas 2 outras espécies brasileiras, *martae* e *isifer*. Nestes, porém, não há bolsa penial. Separação dos poros genitais, como em *ticus*, ocorre em todas as espécies central e norte-americanas do Atlântico ocidental. *Stylochoplana lynca*, sp. n., é a 2.ª espécie do gênero do litoral de São Paulo sem estilete. Os caracteres principais são: bulbo muscular comum, incluindo vesícula seminal e granulorum; músculos fortes ao redor da vagina externa, vesícula de Lang com dois divertículos, e duas dobras com glândulas, no meio do bordo anterior.

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PLATE 1

Yagua lutheri, g. n., sp. n.

Fig. 1 — Clarified worm in ventro-lateral view.

Fig. 2 — Reconstruction of reproductive organs; diagram. Vitellaria only partly drawn.

a — atrium superius. b — bursal vesicles with fresh sperm. c — same with digested sperm. d — efferent duct. e — ejaculatory duct. f — pharynx. g — gonopore. h — shell glands. i — intestine. j — atrium inferius. m — mouth. n — ductus communis. o — ovary. p — eggs in the parenchyma. q — granular secretion. r — germiduct. s — sperm in the copulatory organ. t — testis. u — posterior diverticulum of atrium. v — vitellary. x — anterior diverticulum of atrium.

Rhynchodemus-spec.

Fig. 3 — Outline of worm; m — mouth.

Fig. 4 — Fore end.

Fig. 5 — Tip of head.

Geoplana lambaya, sp. n.

Fig. 6 — Dorsal view with eyes.

Fig. 7 — Ventral view with protruded pharynx.

Fig. 8 — Fore end.

Fig. 9 — Median section of pharynx.

Fig. 10 — Diagram of reproductive organs.

Lettering in Figures 6-28:

a — male atrium. b — copulatory bulb. d — efferent duct and spermiducal vesicle. e — ejaculatory duct. f — female atrium. g — gonopore. h — pharynx. i — intestine. k — annular muscles of pharynx. m — mouth. n — nerve plate. o — ovovitelline duct. p — penis papilla. q — common ovovitelline duct. s — seminal vesicle. t — testes. x — shell glands. y — erythrophilous glands. z — border of pharynx.

PLATE 1

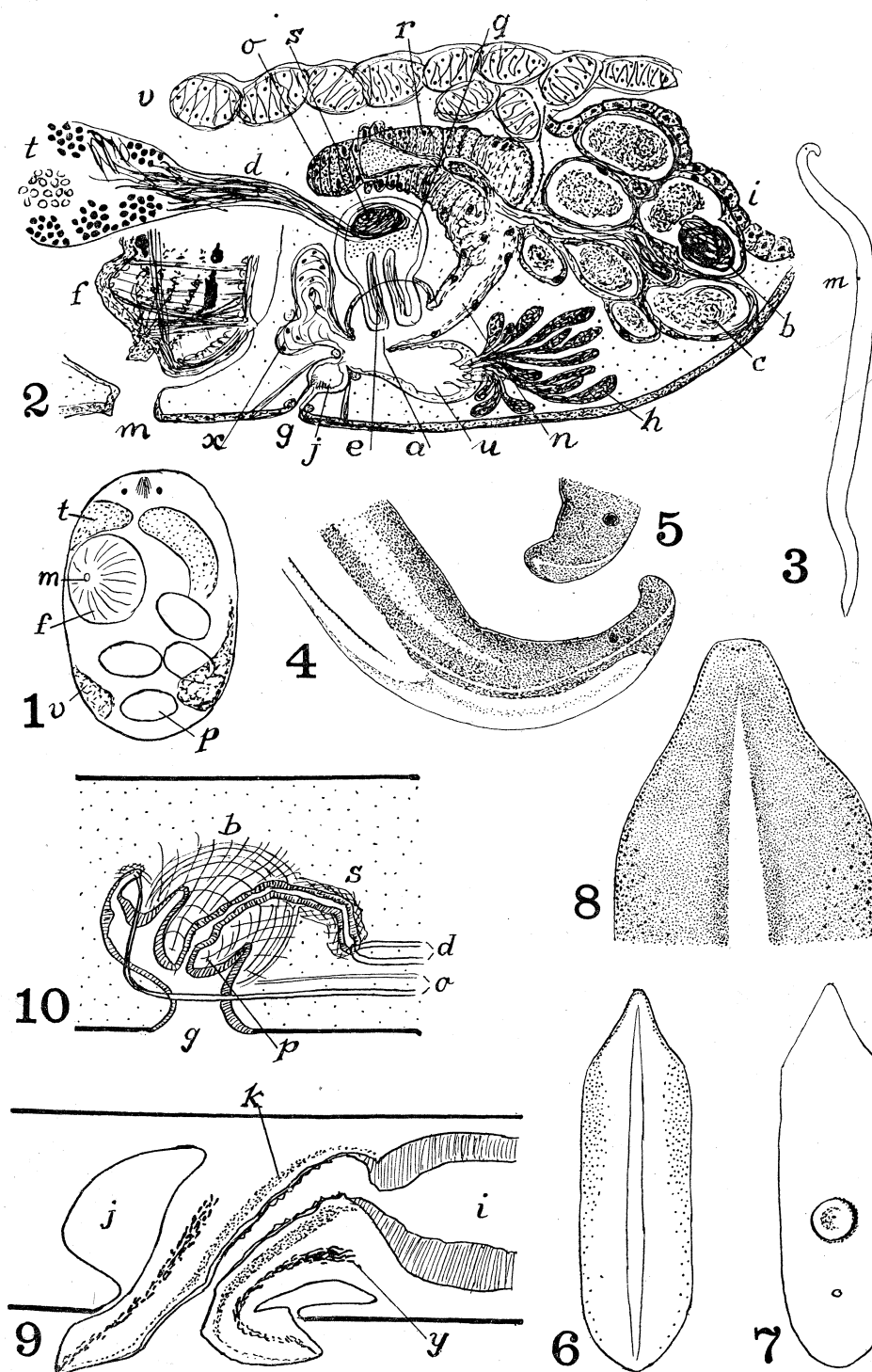


PLATE 2

Geoplana lareta, sp. n.

- Fig. 11 — Total aspect of preserved worm.
 Fig. 12 — Fore end of clarified specimen.
 Fig. 13 — Pharynges of 3 clarified worms.
 Fig. 14 — Median section of pharynx.
 Fig. 15 — Diagram of reproductive organs.

Geoplana irua, sp. n.

- Fig. 16 — Ventral aspect of clarified worm.
 Fig. 17 — Colour pattern of back.
 Fig. 18 — Median section of pharynx.

For lettering see Figs. 6-10 on Plate 1.

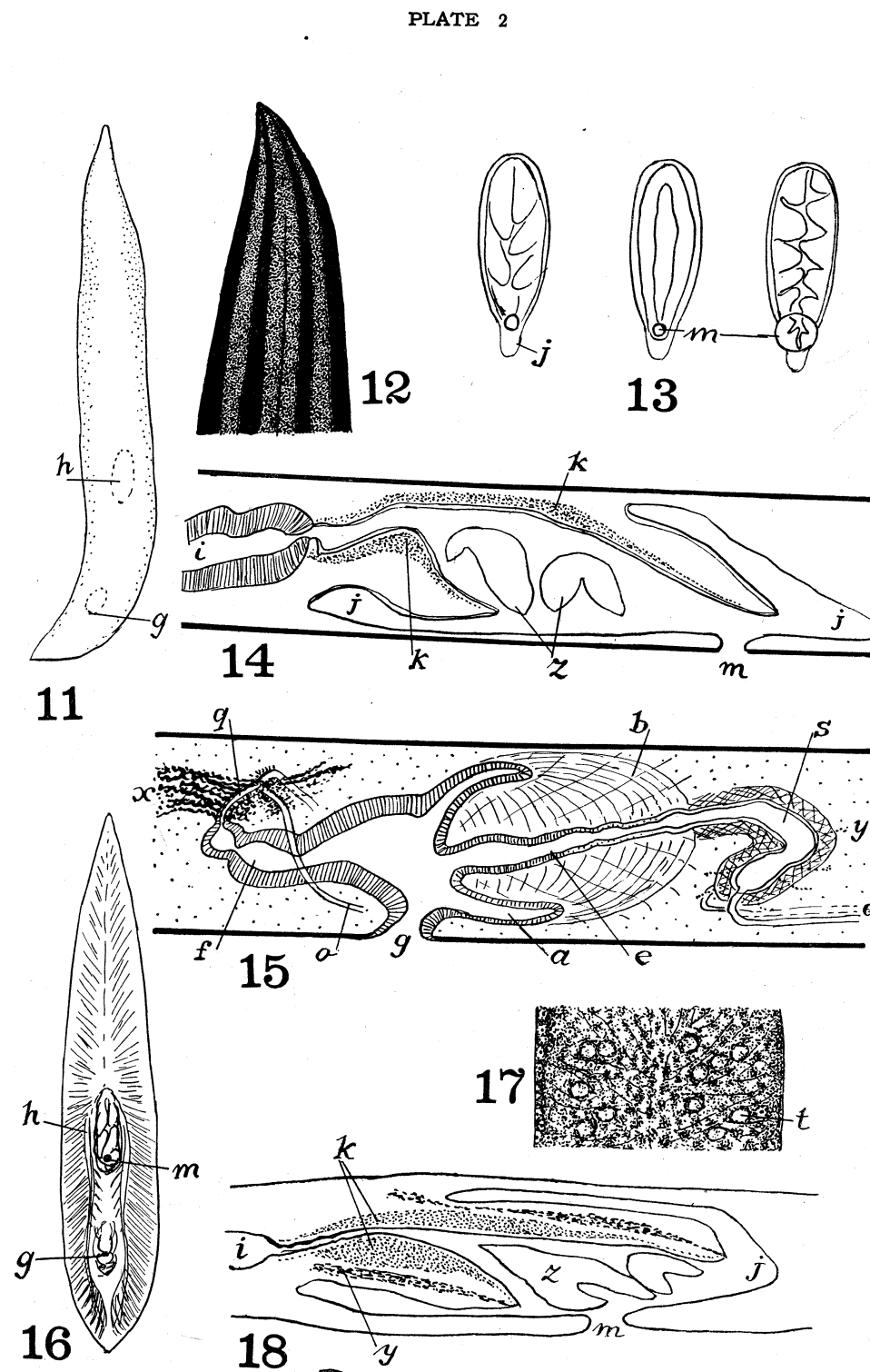


PLATE 3

Geoplana irua, sp. n.

Fig. 19 — Sagittal diagram of copulatory organs.

Fig. 20 — Horizontal diagram of male copulatory organ.

Geoplana takia d. B.-R. Marc.

Fig. 21 — Horizontal diagram of male copulatory organ.

Geoplana chilihua, sp. n.

Fig. 22 — Dorsal view.

Fig. 23 — Ventral view.

Fig. 24 — Median section of pharynx.

For lettering see Figs. 6-10 on Plate 1.

PLATE 3

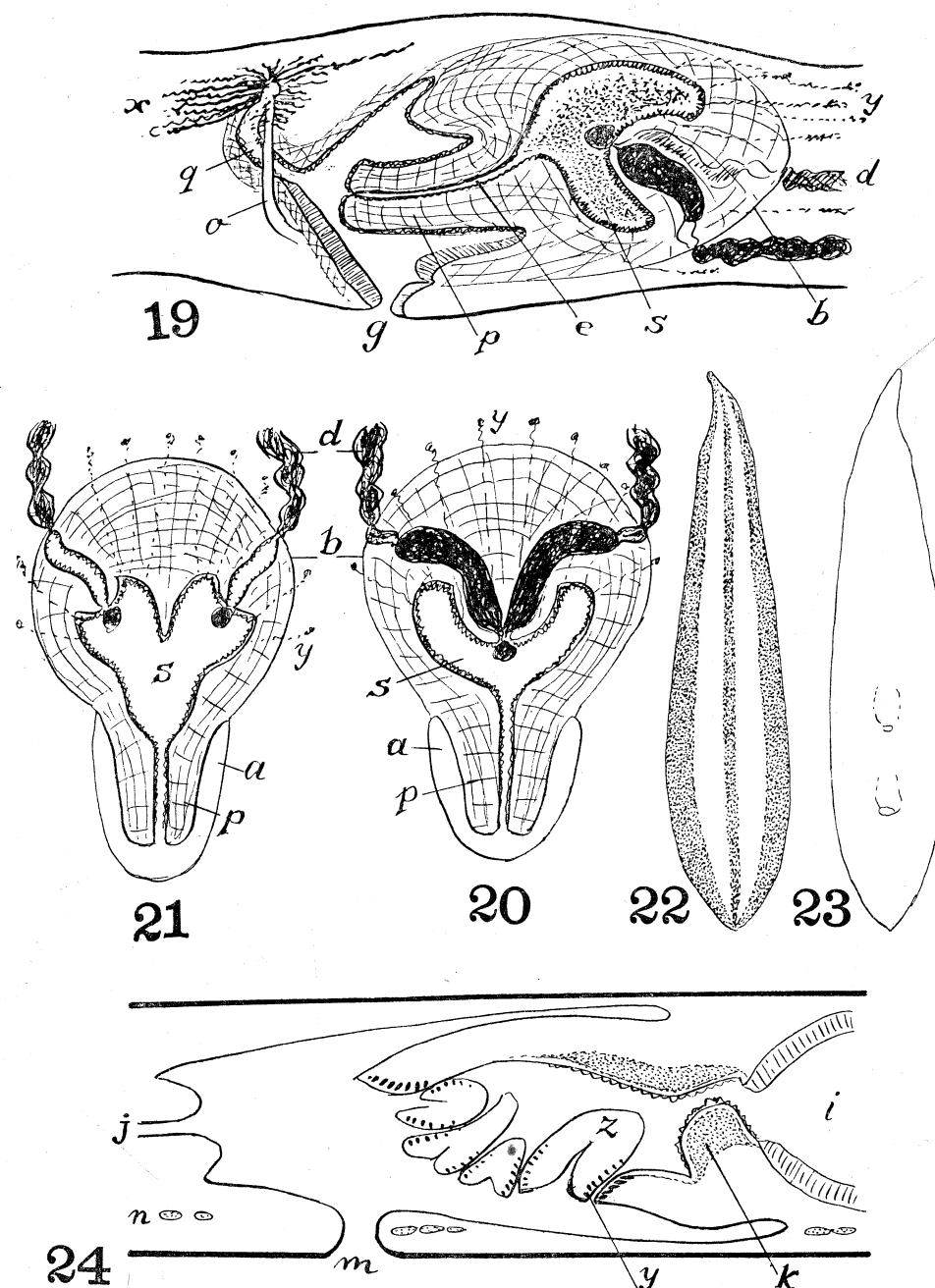


PLATE 4

Geoplana chilihua, sp. n.

Fig. 25 — Diagram of copulatory organs.

Geoplana quenua, sp. n.

Fig. 26 — Ventral aspect of clarified worm.

Fig. 26 — Median section of pharynx.

Fig. 28 — Diagram of copulatory organs.

For lettering see Figs. 6-10 on Plate 1.

PLATE 4

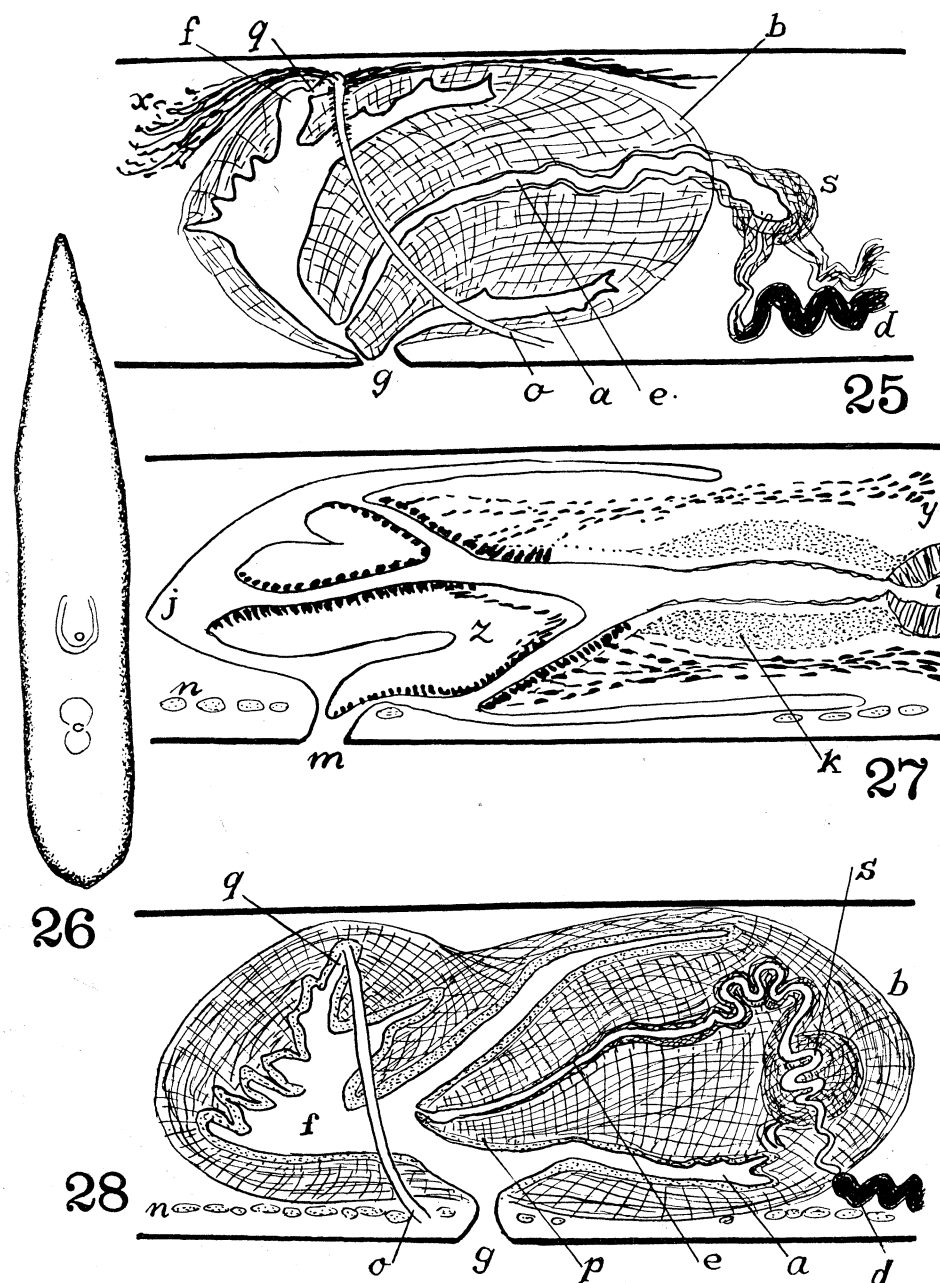


PLATE 5

Stylochus catus, sp. n.

Fig. 29 — Dorsal view of living worm.

Fig. 30 — Longitudinal section of retracted tentacle.

Fig. 31 — Reconstruction of copulatory organs.

a — male atrium. c — diverticulum of seminal vesicle. d — efferent duct.
e — ejaculatory duct. g — common gonopore. h — testes. i — intestine. m — mantle
of nuclei to muscle fibres of seminal vesicle. n — nerve. o — ovary. p — penial papilla.
q — granule vesicle. r — pigment. s — penial pouch. t — left ental limb of seminal
vesicle. u — external vagina. v — ectal limb of seminal vesicle. w — internal vagina.

Stylochoplana lynca, sp. n.

Fig. 32 — Organization.

Fig. 33 — Diagram of copulatory organs.

a — male atrium. c — granular clubs. d — duct of Lang's vesicle. e —
tentacle. g — granule glands. h — folds of anterior border. i — main intestine. j —
pharynx. k — middle of Lang's vesicle. l — one of the diverticula of Lang's vesicle.
m — female pore. n — male pore. o — mouth. p — penial papilla. q — granule vesicle.
r — common efferent duct. s — spermiducal vesicles. t — seminal vesicle. u — common
uterine duct. v — internal vagina. w — external vagina. x — uterus. y — cement
glands. z — duct of cement glands.

PLATE 5

