

Some Roundworms and Flatworms from the West Indies and Surinam.—IV. Land-Planarians. By STEPHEN PRUDHOE, Department of Zoology, British Museum (Natural History). (Communicated by Dr. H. A. BAYLIS, F.L.S.)

(With 9 Text-figures.)

This paper, the last of the present series, deals mainly with seven species of land-planarians collected by Mr. Ivan T. Sanderson in the West Indies in 1937 and in Surinam (Dutch Guiana) in 1938. In addition, some account is given of the copulatory apparatus of *Amblyplana cockerelli* Graff, based on serial sections from one of the type-specimens, and a classified list, as complete as possible, is given of the Rhyndodemidae known to occur in the Americas.

The type-material belonging to Mr. Sanderson's collection is in the British Museum (Natural History).

GEOPLANIDAE.

GEOPLANA GIGANTEA Graff, 1899. (Fig. 1.)

This large species is represented by four specimens found in decaying logs and among damp leaves on Mount Aripo, Trinidad. Two of the specimens are mature and measure up to 18.5 cm. in length and 13 mm. in maximum width, while the others are immature and measure about 5 cm. and 5 mm. respectively. The body tapers to a blunt point at each end. It is dorso-ventrally flattened and measures about 2 mm. in maximum thickness in the larger specimens. In life, according to the collector's notes, the planarians were "rich flesh pink, yellow below, two brown stripes in anterior region." After preservation in alcohol for about ten years, the dorsal surface is now

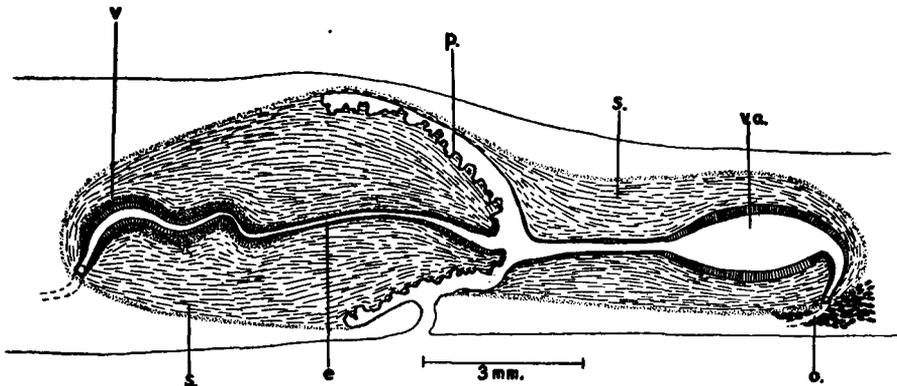


FIG. 1.—*Geoplana gigantea*. Sagittal section of copulatory complex (diagrammatic). e., ejaculatory duct; o., oviduct, with extracapsular gland-cells; p., penis-papilla; s., muscular sheath; v., prostatic vesicle; va., vagina.

yellowish brown, with a pair of submedian, purplish brown longitudinal stripes which are confined to about the anterior fourth of the body. Between the stripes the body is raised into a prominent ridge, which disappears near their posterior ends. The "creeping sole" is pale yellow-brown and apparently extends over the entire ventral surface. The mouth is situated somewhat behind the middle of the body and the genital pore is nearer to the mouth than to the posterior extremity.

The numerous eyes are confined to the anterior third of the body, and in the foremost region they are small and densely arranged in a narrow band on both lateral margins. As the bands extend posteriorly they gradually widen well into the sub-lateral regions beneath the dorsal surface and then narrow towards their hinder ends. Correspondingly, the eyes become larger, then smaller and less crowded.

The longitudinal fibres of the subepidermal musculature are arranged, as is usual in *Geoplana*, in distinct bundles which appear dorso-ventrally elongate in cross-section. In the parenchyme, just beneath the dorsal musculature, lie numerous unicellular glands, each of which contains several narrow fusiform rhabdites, measuring up to $32\ \mu$ in length.

The male and female copulatory organs are invested with an extremely thick muscular sheath, consisting of a thin outer coat of circular fibres and a very thick inner wall, mainly composed of longitudinal fibres. The sheath is somewhat bulbous in outline, and measures about 15 mm. in length and about 3 mm. in maximum width.

Numerous testes lie dorsally to the gut-branches. They appear to be arranged in four longitudinal rows, two rather close together on either side of the median line, and extending from the anterior region of the body to close behind the pharyngeal chamber. The vasa deferentia lie ventrally to the gut-branches and converge posteriorly towards the anterior end of the muscular sheath investing the copulatory organs. At this point they pass separately into the sheath and almost immediately unite to open into a prostatic vesicle. The latter is an elongate, somewhat coiled structure, provided with a highly glandular epithelium, which appears to be thrown into longitudinal folds, and its lumen contains a fine granular material, apparently produced by the epithelial cells.* The posterior end of the vesicle narrows gradually, and the thickness of its musculature diminishes considerably, before it merges with the ejaculatory duct. The duct is long and extends posteriorly to the tip of the penis-papilla. It has a very thin coat of circular muscle-fibres, and is lined with a smooth epithelium consisting of ciliated as well as glandular cells. The latter cells appear to contain a granular material rather similar in appearance to that present in the epithelial cells of the prostatic vesicle. The penis-papilla is large and muscular and its surface is much wrinkled, so that in section it appears to possess numerous small protuberances. It is covered by a low epithelium continuous with the lining of the spacious genital atrium.

There is a pair of ovaries in the anterior region of the body. The oviducts, lying laterally to the vasa deferentia, extend to the posterior end of the copulatory complex, where they open into the vagina. Numerous "shell"-glands lie outside the muscular sheath and open into the hinder regions of the oviducts. The elongate vagina is somewhat club-shaped and opens directly into the genital atrium. The lumen of its hinder half is much wider, and the epithelium taller and more glandular, than that of the anterior half. It might therefore be supposed that the spacious highly glandular portion was really the uterus, and the narrow less glandular region the vagina.

Geoplana gigantea has previously been recorded from the island of Trinidad, at Arima, the Vale of Marácas and the Ortoire Forest. It is also recorded by von Graff (1899) from Venezuela, at Carácas and on the banks of the Apure River, at an altitude of over 3,000 feet. His description of the coloration and markings of the body, as well as the distribution of the eyes, in the specimen from Carácas rather suggests, however, that he is dealing with a different species.

The original description of *G. gigantea* contains only details of external features, and nothing appears to have been known hitherto of the structure of the copulatory organs. According to von Graff, the longitudinal dorsal stripes extend throughout the length of the body. In all the present specimens the stripes are, however, found only in the anterior region. In the British Museum (Natural History) there is a mature specimen of *G. gigantea*, collected in Trinidad nearly fifty years ago, which agrees with

* A somewhat similar vesicle, usually regarded as a seminal vesicle, has been described in many species of *Geoplana*. The writer has been unable to find in the literature of the group any evidence showing that it actually functions as a sperm-reservoir. It seems that the vesicle is, in fully mature land-planarians, very often provided either with a highly glandular epithelium, or a ciliated epithelium through which pass the ducts of numerous extracapsular gland-cells. Both the glandular epithelium and the gland-cells undoubtedly produce the fine granular material frequently seen in the lumen of the vesicle. This material is very similar in appearance to the secretion seen in the prostatic organs of forms belonging to other groups of Turbellaria. Having regard to these observations, the writer prefers to consider the highly glandular organ in the present form as a prostatic vesicle rather than a seminal vesicle.

von Graff's description of the stripes and the darker ground-colour of the body, but otherwise does not appear to differ in any way from the present material.

Whether or not the present specimens from Trinidad should be regarded as representatives of a geographical race or variety of the mainland form is a question which could be settled only by a study of ample material from both regions.

GEOPLANA VAGINULOIDES (Darwin, 1844). (Fig. 2.)

The single specimen assigned to this species was collected from among damp leaves on Mount Aripo in Trinidad. It measures about 44 mm. in length and about 4 mm. in maximum width, which occurs in the middle region of the body. From its widest part the body tapers towards both extremities, more gradually anteriorly than posteriorly. The colour-pattern of the dorsal surface is very distinctive*. A broad, longitudinal median band of glossy black is bordered on either side by a narrower band of primrose-yellow, which is edged laterally with a narrow black stripe. All of these taper towards both ends, but none of them actually reaches the extremities. Finally, bordering the black stripes laterally, and extending over the extremities, is a relatively wide orange band. Ventrally, the whitish "creeping sole" lies between a pair of narrow orange bands which are really extensions of the dorso-lateral bands. The mouth is situated at about 25 mm. from the anterior end of the body and the genital pore about 5 mm. behind the mouth.

The numerous marginal eyes form a continuous series round the body. Anteriorly they are arranged more or less in a row, which gradually widens to a band several eyes deep in the pharyngeal region, but posteriorly the band narrows again to a row of widely-separated eyes.

The copulatory organs are invested with a muscular sheath, consisting of irregularly disposed fibres, except in the peripheral regions of the sheath, where they are mainly longitudinally arranged. The vasa deferentia pass separately into the anterior end of the sheath and soon unite to open into the rather long, coiled ejaculatory duct, which, like the vasa deferentia, is lined with a tall ciliated epithelium and covered with a moderately thick coat of circular muscle-fibres. In the anterior region of the muscular sheath lie numerous gland-cells, which apparently open into the lumen of the ejaculatory duct, near its proximal end. These gland-cells produce a fine granular material, which is stained a distinctive reddish brown by eosin. In appearance and in its reaction to eosin the granular material is very similar to the prostatic secretion of other Turbellaria, and this portion of the ejaculatory duct may function as a prostatic organ. A well-developed, somewhat elongate penis-papilla lies in a spacious male atrium. It appears to be coated with a glandular epithelium, beneath which lies a fairly thick layer of circular and a thinner supporting layer of longitudinal muscle-fibres. In the anterior region of the penis-papilla the external covering appears, however, to be merely an epithelial membrane, and the musculature is very thin. The difference in the thickness of the epithelium in different regions is doubtless due to the activity of its musculature.

The female complex does not appear to be fully developed. The oviducts are situated ventrally to the gut-branches, but well separated from the ventral musculature of the body-wall. In the neighbourhood of the genital atrium they rise steeply to open into the narrow "common glandular canal" which unites with the inner end of the vagina. The oviducts and the "common glandular canal" are lined with a ciliated epithelium and coated with circular muscle-fibres. "Shell"-glands and vitelline glands have not been made out. The vagina is bulbous and entirely filled with a mass of tissue, which has a vacuolated appearance and contains innumerable nuclei. This mass of tissue may possibly serve as a plug to prevent spermatozoa entering the female apparatus before the ovaries are ripe—only the posterior half of the present specimen has been sectioned, and therefore the condition of its ovaries is not known. It also seems possible that when the female apparatus becomes

* An excellent coloured figure of the dorsal aspect of this species is given by Reister (1938 pl. i, fig. 20).

functional the mass breaks down and forms the glandular epithelial lining usually present in the vagina of land-planarians. A distinct lining is not yet differentiated in the vagina of the present specimen. In the literature of the group there are records (e.g. Graff (1899 and 1916), and Reister (1938)) of the presence of a mass of material in the vagina of several species of *Geoplana*. In some of these instances (e.g. Graff) there can be little doubt that the masses represent cocoons, but in others (e.g. Reister) there is evidence that they are comparable with that seen by the writer. The covering of the cocoon in land-planarians is apparently formed by the secretion of the "shell"-glands, which is stained a distinctive reddish brown by eosin, and in the present specimen no part of the mass appears to have been similarly affected by this stain. In support of the suggestion as to the purpose of the mass of tissue in the present specimen, it is again mentioned that "shell"-glands and yolk-glands have not been made out, nor does there appear to be evidence of sperm in any part of the female complex. In fact, as stated above, the complex does not seem to be fully developed.

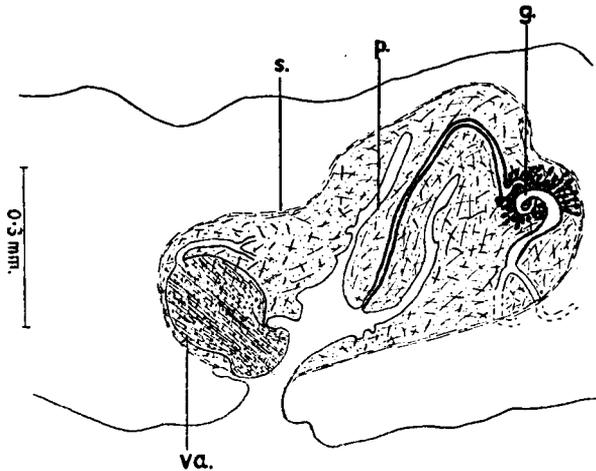


FIG. 2.—*Geoplana vaginuloides*. Sagittal section of copulatory complex (camera-lucida outlines). g., glandular portion of ejaculatory duct; p., penis-papilla; s., muscular sheath; va., vagina.

On the other hand, de Beauchamp (1939) describes and figures a mass of tissue, apparently possessing a very narrow lumen, in the bursa copulatrix of *Geoplana crawfordi*, and the appearance of the mass is unquestionably comparable with that seen by the writer. In the two specimens at the disposal of de Beauchamp the "shell"-glands and yolk-glands are present, and that author records the presence of spermatozoa among the loose outer tissues of the mass in one of the specimens. de Beauchamp's types of *G. crawfordi*, which are in the British Museum (Natural History), have been carefully examined by the writer, but no evidence has been found of the presence of sperm in any part of the female complex of either specimen. It is worthy of mention that the vagina (or bursa copulatrix) of *G. crawfordi* does not appear to possess an epithelial lining which can be differentiated from the nucleated mass of tissue. Furthermore, the presence of a narrow lumen in the mass in *G. crawfordi* tends to support the writer's suggestion that the tissue breaks down and forms an epithelial lining for the vagina. Whether or not the so-called vagina or bursa copulatrix should not, in fact, be regarded as a uterus is a question that must be left in abeyance until more is known of the development of the structure.

Apart from the more advanced development of the female copulatory apparatus, Reister's (1938) description of the copulatory organs of *G. vaginuloides* differs from that given above principally in the size of the penis-papilla. According to that author, the penis-papilla in a quiescent state is very elongate and occupies the whole of the

vaginal cavity, and its narrow apex lies within the "common glandular canal." The entire occupation of the vagina by the "resting" penis-papilla of the same individual is, of course, very exceptional in land-planarians, and it is unfortunate that, although Reister apparently had ample material at his disposal, he omits to state whether or not the position of the penis-papilla in relation to the female apparatus is a normal feature in fully adult specimens of this species.

G. vaginuloides has been recorded hitherto only from Brazil, at Rio de Janeiro (type locality), Barreira and Therezopolis. However, the colour-pattern of the dorsal surface in *G. vaginuloides* is characteristic, and in this respect the specimen from Trinidad agrees so well with previous descriptions that the writer feels no hesitation in regarding it as conspecific with Darwin's species.

GEOPLANA SANDERSONI, sp. nov. (Figs. 3-5.)

A single specimen of this form was collected from among dead leaves on Mount Aripo in Trinidad. It is fairly slender, tapering towards the extremities, and measures about 28 mm. in length and about 3 mm. in maximum width. The dorsal surface is light brown, with a pair of submedian dark brown bands extending throughout the length of the body. The area between these bands is somewhat lighter in colour than the areas lateral to them. Ventrally, the very broad whitish 'creeping sole' is bordered on either side by a light brown stripe. The mouth is situated at about 17 mm. from the anterior end of the body and the genital pore about 5 mm. behind the mouth.

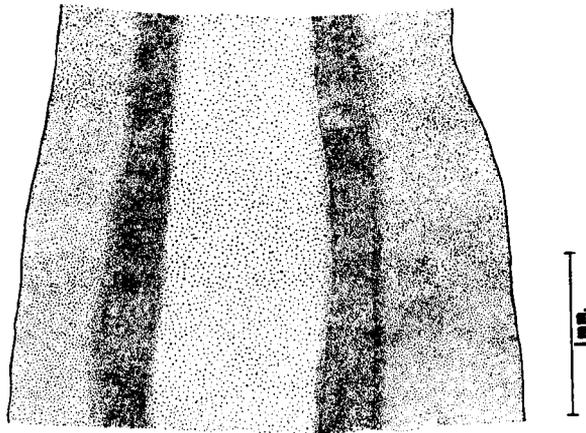


FIG. 3.—*Geoplana sandersoni*. Dorsal view of middle region.

The numerous marginal eyes are distributed in a continuous series round the body. Anteriorly they appear to be arranged in one or two irregular rows, but behind this region they form a band which gradually extends well into the sublateral fields beneath the dorsal surface. Posteriorly, however, the band narrows considerably to form a row of widely-separated eyes.

The entire copulatory apparatus does not appear to be invested with a muscular sheath, as in the previous species, but the musculature of the penis-papilla is very well developed and forms a thick coat of fibres round the seminal vesicle and ejaculatory duct. Behind the pharynx the testes are situated ventrally to the gut-branches, and the vasa deferentia lie above them, between the dorsal and ventral fields of the body, and between the pair of posteriorly-directed intestinal caeca. Near the genital pore the vasa deferentia turn inwardly towards the median line, where they open into a narrow seminal vesicle. The ejaculatory duct is very long, and instead of the

seminal vesicle or the vasa deferentia uniting with its anterior extremity, as is usual in *Geoplana*, the union occurs in the middle region of the duct, so that the latter possesses an anterior appendix. Both the ejaculatory duct and the seminal vesicle are lined with a ciliated epithelium, and coated with a relatively thick layer of circular muscle-fibres. There seems, in fact, to be no histological difference in the appearance of the two organs. The penis-papilla is elongate and strongly muscular. It is covered with an epithelial membrane, and lying in the musculature immediately below this there is a large number of small pyriform organs. Each of these organs possesses an outer sheath of muscle-fibres, and an inner mass of granular material in which there are numerous strands of tissue. In the narrow distal region of each organ lies a second pear-shaped structure or ampulla, the wall of which appears to consist of a thick membrane, perforated in its inner half by numerous ducts. It seems probable that the granular content of the main organ passes through these ducts into the lumen of the smaller organ. Several nuclei are present in the main organ and form a ring round the narrower half of the ampulla. It has not been possible in the present specimen to make out the relationships of these nuclei, but it is possible that they belong to cells which produce the granular material present in the main organ. The ampulla opens to the exterior by a very small pore on the surface of the penis-papilla. The function of these organs is at present unknown, but possibly they represent individual prostatic organs.

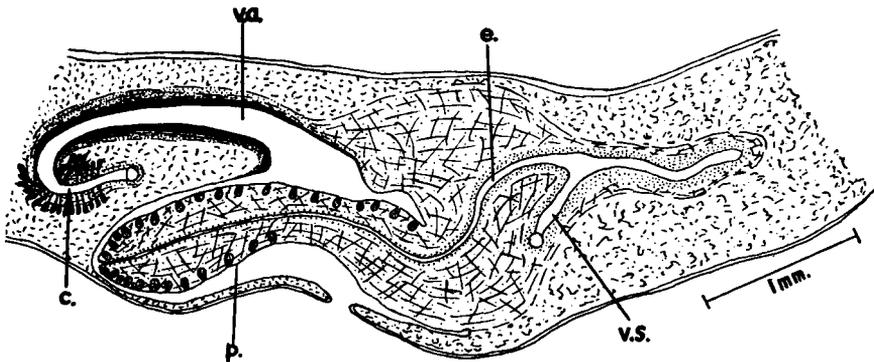


FIG. 4.—*Geoplana sandersoni*. Sagittal section of copulatory complex (camera-lucida outlines). c, 'shell'-chamber; e., ejaculatory duct; p., penis-papilla; va., vagina; v.s., seminal vesicle.

Close behind the genital atrium the oviducts, which are situated laterally to the vasa deferentia, unite to form a short posteriorly-directed "shell"-chamber or "common glandular canal," into the lumen of which open numerous unicellular glands or "shell"-glands. The canal turns sharply dorsally to open into the posterior end of the fairly long, wide vagina. The latter possesses a rather tall glandular epithelial lining, and is coated with a thick layer of circular muscle-fibres lying between two thin longitudinal layers.

The genital atrium is spacious and mainly occupied by the penis-papilla.

With the exception of *Geoplana von gunteri* Fuhrmann, 1914, from Colombia, the present form is distinguished from all known species of *Geoplana* Stimpson, 1857, in which the structure of the copulatory apparatus has been described, by the presence of the small pyriform organs lying in the walls of the penis-papilla. It differs from *G. von gunteri* not only in the colour-pattern of the dorsal surface of the body, but also in several features in the copulatory apparatus.

The structure of the pyriform organs shows a considerable resemblance to similar organs present in the male "adenochire" of *Artioposthia* Graff, 1896—especially *A. diemenensis* (Dendy). In this respect, the present species and *G. von gunteri* form

a group intermediate between *Geoplana* and *Artioposthia*, but otherwise both species appear to be typical members of *Geoplana*. It is possible, of course, that a more detailed study of these two species, based on further material, will show other features which, when correlated with the presence of special gland-organs in the penis-papilla, provide solid grounds for the erection of a new genus.

GEOPLANA sp.

A single immature specimen, tentatively assigned to the genus *Geoplana*, was collected at night on the surface of damp soil above Kaimanston in Surinam. It is, unfortunately, badly damaged, but some of its external characters may be mentioned.

The body is elongate, bluntly pointed anteriorly and rounded posteriorly. It measures about 60 mm. in length and about 2.5 mm. in maximum width. The dorsal surface possesses a narrow longitudinal median band of yellowish brown, which is bordered on either side by a dark brown band of similar width. Laterally to each submedian band there is a much wider yellowish-brown band which is rather darker than the median. The mouth is situated a short distance behind the middle of the body. Numerous marginal eyes appear to be arranged in one or two irregular rows, forming a continuous series round the body.

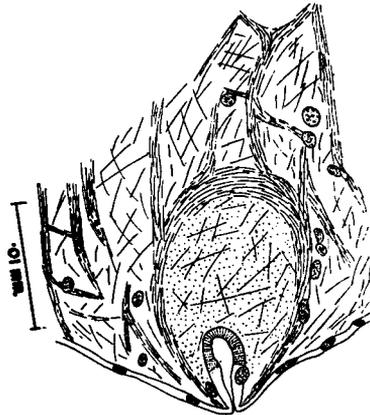


FIG. 5.—*Geoplana sandersoni*. Pyriform organ in wall of penis-papilla.

In coloration and markings this specimen closely resembles several species of *Geoplana* recorded from South America, but it has not been possible to assign it with certainty to any of them. A knowledge of the structure of the copulatory organs of the species is needed before its generic status can be determined with certainty, but until adult material from Surinam becomes available it may be regarded as an indeterminate species of *Geoplana*.

GEOPLANA sp.

A single specimen was found at the base of a tree at night on Mount Aripo in Trinidad. It is immature, and therefore can only be provisionally regarded as a species of *Geoplana*. The body measures about 20 mm. in length and about 3 mm. in maximum width, and tapers to a rounded point at the extremities. The dorsal surface is rather brownish black, except where the epithelium has been lost, and is without stripes or bands of any kind. The greyish white "creeping sole" occupies nearly the whole of the ventral surface, but is bordered by very narrow marginal bands of black. The mouth is situated at about 5 mm. from the posterior extremity.

The marginal eyes are very numerous and form a complete series round the body.

In the middle region they are arranged in a broad band extending into the sublateral zones beneath the dorsal surface, and anteriorly and posteriorly the band decreases in width to an irregular row of eyes, numerous anteriorly and sparsely distributed posteriorly.

Apart from *G. gigantea*, the only species of *Geoplana* that have been recorded hitherto from Trinidad appear to be *G. ehlersi* Graff, 1899, and *G. kenneli* Graff, 1899. In the general coloration of the body the present form shows some resemblance to *G. ehlersi*, but this species apparently possesses a conspicuous yellow median stripe on the dorsal surface, and appears also to have a much more slender body.

RHYNCHODEMIDAE.

Heinzel (1929) divides the Rhynchodemidae into two subfamilies: Desmorhynchinae, in which the longitudinal fibres of the subepidermal musculature are aggregated into distinct bundles; and Rhynchodeminae, in which the longitudinal fibres of the musculature are arranged, not in bundles, but in a very thin simple layer. In the same paper, Heinzel selects *Planaria terrestris* Müller, 1774, as the genotype of *Rhynchodemus* Leidy, 1851. But Miss Hyman (1943) points out that the type of *Rhynchodemus* is *Planaria sylvatica* Leidy, 1851, and that in new material, which she considers to belong to Leidy's species, the longitudinal fibres of the subepidermal musculature are disposed in bundles, as in Heinzel's Desmorhynchinae. This fact leads her to regard *Desmorhynchus* Heinzel as a synonym of *Rhynchodemus* Leidy, and *Rhynchodemus* of Heinzel as a total synonym of *Geodesmus* Mecznikow, 1866. As Heinzel's subfamily names therefore become invalid, Miss Hyman proposes the name Dolichoplaninae for Desmorhynchinae, and Geodesminae for Rhynchodeminae. It appears to be implicit in Article 4 of the International Rules of Zoological Nomenclature that, when a family is divided into two or more subfamilies, the type-genus of the family must also become the type of one of the subfamilies. Hence the root of the generic name must be present not only in the name of the family, but in that of the subfamily. Consequently, if it be thought necessary to divide the Rhynchodemidae into two subfamilies, the name Geodesminae Hyman appears to be available for the Rhynchodeminae of Heinzel, and the writer suggests that the name Rhynchodeminae be retained in a new sense to include the Desmorhynchinae of Heinzel and the Dolichoplaninae of Hyman.

With regard to the Rhynchodemidae recorded from the Americas, it seems desirable to reclassify the known species, and a list of them, including the new forms described herein, is as follows:—

Subfamily RHYNCHODEMINAE, sens. nov. (*nec sensu* Heinzel, 1929).

(=Dolichoplaninae Hyman=Desmorhynchinae Heinzel.)

Genus RHYNCHODEMUS Leidy, 1851, *sensu* Hyman, 1943.

SPECIES.	DISTRIBUTION.
<i>sylvaticus</i> (Leidy, 1851).	U.S.A. (Rhode I., Pennsylvania, Ohio and Missouri).
<i>hectori</i> Graff, 1897.	Argentina (Provinces of Salta, Jujuy and Tucuman).
<i>blainvillei</i> Graff, 1899.	Brazil (Sa. Catharina Prov.).
<i>pellucidus</i> Graff, 1899.	Brazil (Sa. Catharina Prov.).
<i>bromelicola</i> de Beauch., 1912.	Costa Rica.
<i>samperi</i> Fuhrmann, 1914.	Colombia (Eastern Cordilleras).
<i>angustus</i> (Hyman, 1941).	Panama, Canal Zone (Barro Colorado I.).
<i>americanus</i> Hyman, 1943.	U.S.A. (greenhouses in Missouri and New Jersey).
<i>aripensis</i> sp. nov.	Trinidad (Mt. Aripo).
sp. de Beauch., 1939.	Peru (Capachica).
' sp. A ' Hyman, 1943.	U.S.A. (greenhouses, Washington, D.C.).
' sp. B ' Hyman, 1943.	U.S.A. (greenhouses, Missouri).

Genus DOLICHOPLANA Moseley, 1877.

SPECIES.	DISTRIBUTION.
<i>striata</i> Moseley, 1877.	U.S.A. (greenhouses, Missouri).
<i>joubini</i> Hallez, 1894.	French Guiana (Cayenns).
<i>feildeni</i> Graff, 1899.	Barbados, West Indies.
<i>carvalhoi</i> Corrêa, 1947.	Brazil (São Paulo).

Graff (1899) is of the opinion that *joubini* and *feildeni* are probably synonymous, and some recent authors appear to regard *feildeni* as a synonym of *striata*.

Subfamily GEODESMINAE Hyman, 1943.

(=Rhynchodeminae of Heinzl, 1929.)

Genus GEODESMUS Mecznikow, 1866, *sensu* Hyman, 1943.

SPECIES.	DISTRIBUTION.
<i>cockerelli</i> (Graff, 1899).	Jamaica, West Indies.
<i>atrocyaneus</i> (Walton, 1912).	U.S.A. (central States).
<i>maculatus</i> (Fuhrmann, 1914).	Colombia (Eastern Cordilleras).
<i>montoyae</i> (Fuhrmann, 1914).	Colombia (Eastern Cordilleras).
<i>haitiensis</i> , sp. nov.	Haiti (Mt. Commisar).

Genus DIPORODEMUS Hyman, 1938.

SPECIES.	DISTRIBUTION.
<i>yucatanii</i> Hyman, 1938.	Yucatan.
<i>plenus</i> Hyman, 1941.	Panama, Canal Zone (Barro Colorado I.).
<i>indigenus</i> Hyman, 1943.	U.S.A. (Appalachian region).

Forms that cannot yet be classified with any degree of certainty are :—

SPECIES.	DISTRIBUTION.
<i>Rhynchodemus</i> (s. l.) <i>stenopus</i> Graff, 1894.	Argentina and Venezuela.
<i>Rhynchodemus</i> (s. l.) <i>borrellii</i> Graff, 1894.	Paraguay.
<i>Rhynchodemus</i> (s. l.) <i>costaricensis</i> de Beauchamp, 1913.	Costa Rica.

RHYNCHODEMUS ARIPENSIS, sp. nov. (Fig. 6.)

A few specimens of this species were found in the heads of bromeliads, sixty feet above ground-level, on Mount Aripo in Trinidad. They measure up to about 22 mm. in length and about 2 mm. in maximum width. The body tapers more gradually anteriorly than posteriorly. The dorsal surface is light brown, with three longitudinal stripes of equal width. The dark brown median stripe is always conspicuous, but the sublateral stripes are rather indistinct and cannot be seen in some specimens. For a distance of about one-eighth to one-seventh of the total length of the body, the anterior region is much lighter in general colour, and is without stripes. As in many other species of *Rhynchodemus*, this cephalic region is relatively narrow and distinctly marked off from the remainder of the body, having the appearance of an elongate snout or proboscis. Ventrally, the whitish "creeping sole" is slightly raised and occupies the middle third of the body-width. The lateral areas of the ventral surface are light brown. The mouth is situated in the middle region of the body and the genital pore about 4 mm. behind the mouth. Two relatively large eyes lie behind the anterior extremity of the snout-like region.

The longitudinal fibres of the subepidermal musculature are arranged in distinct bundles which appear oval in cross-section.

The numerous testes are disposed in two irregular rows, ventrally to the gut-branches. The male copulatory apparatus is simple and typical of the genus *Rhynchodemus*, *sensu* Hyman. It is contained in a thick sheath of muscle-fibres,

mainly longitudinal, representing the penis-bulb. The vasa deferentia pass separately through the anterior wall of the sheath and open together into a spacious atrium. This atrium, or ejaculatory duct, is lined with a highly glandular epithelium and coated with circular and longitudinal muscle-fibres. The parenchymatous tissue between the walls of the sheath and those of the atrium contains a loose irregular network of muscle-fibres, among the meshes of which lie numerous gland-cells.

The structure of the female copulatory apparatus is simple and agrees well with that usually present in *Rhynchodemus*. The oviducts lie ventrally to the gut-branches and laterally to the vasa deferentia. The vitelline glands are very numerous, lying between, as well as above and below, the gut-branches. At the posterior end of the apparatus the oviducts unite, apparently without bifurcating, to form a ciliated canal which enters a short, narrow "shell"-chamber. This chamber is also ciliated, and surrounding it are numerous "shell"-glands which open into its lumen. The vagina is elongate, but spacious, and possesses a highly glandular epithelial lining. The

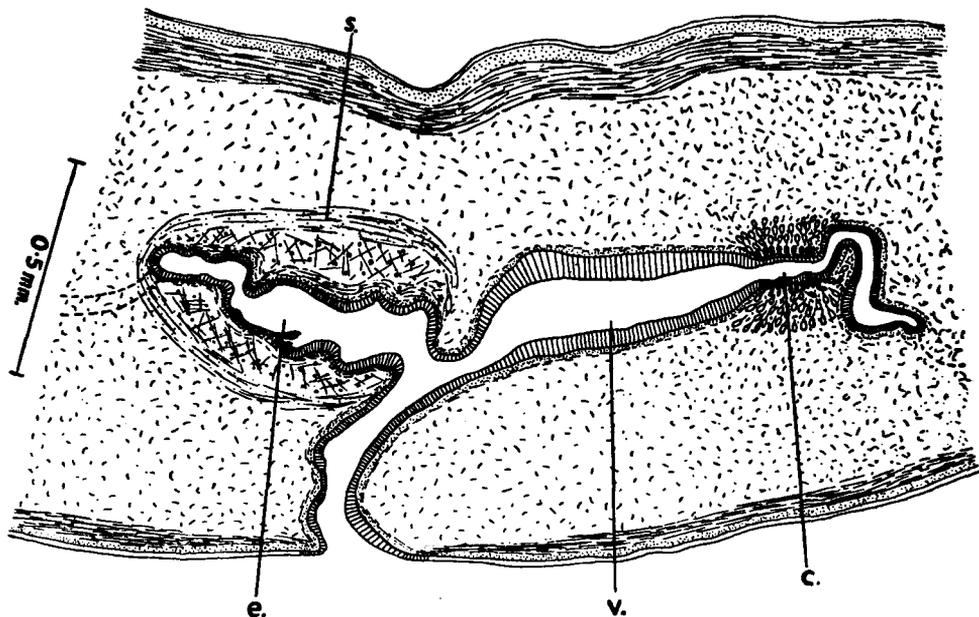


FIG. 6.—*Rhynchodemus aripensis*. Sagittal section of copulatory complex (camera-lucida outlines). c., 'shell'-chamber; e., ejaculatory duct; s., muscular sheath; va., vagina.

apparatus is coated with a relatively thick inner layer of circular and a thin outer layer of longitudinal muscle-fibres. It appears to be as long as, or slightly longer than, the male apparatus.

Of the American *Rhynchodemids* that can at present be assigned with certainty to the genus *Rhynchodemus*, *sensu* Hyman, the species described above closely resembles *R. sylvaticus* (Leidy), *R. pellucidus* Graff and *R. samperi* Fuhrm. The first two of these species are, however, much smaller forms and each bears only two dorsal stripes on its body, while *R. samperi* is a more slender creature, its median dorsal stripe is much narrower than the lateral stripes, and the female copulatory apparatus appears to be considerably smaller than the male. It is therefore considered necessary to regard the form from Trinidad as a new species.

GEODESMUS HAITIENSIS, sp. nov. (Figs. 7 and 8.)

Two specimens of this form were found under the bark of a decaying log on Mount Commissar, Haiti. They are plump and elongate, circular in cross-section, and about

25 mm. in length and about 4.5 mm. in width. In life, according to the collector's notes, the body was: "Jet black. Edges (lateral) yellow ochre. Grey below." After about ten years in alcohol, the coloration of both specimens has only slightly faded. The dorsal surface is now greyish black. On each side of the body there is a wide yellow lateral band, which may be seen in either the dorsal or the ventral aspect. Anteriorly and posteriorly the yellow bands widen to enclose the extremities. Ventrally, the 'creeping sole' is light grey and extends across the middle third of the body-width in different regions. It is bordered on either side by a wide band of black. The mouth is situated at about 17 mm. from the anterior end of the body and the genital pore about 4 mm. behind the mouth. The two eyes are comparatively small and appear to be dorso-ventrally elongate.

The subepidermal musculature is thin, and its longitudinal fibres are disposed in a simple layer. In the parenchyme, well separated from the subepidermal musculature, lie innumerable small bundles of longitudinal muscle-fibres, which are more numerous in the lateral than in the dorsal or ventral regions of the body. The bundles appear to form a sheath around the digestive and reproductive organs.

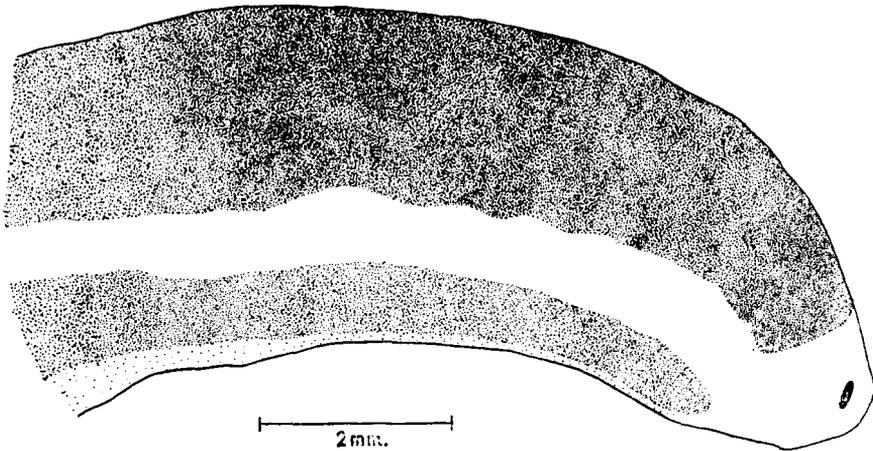


FIG. 7.—*Geodesmus haitiensis*. Lateral view of anterior region.

The male copulatory apparatus is invested with a thin sheath of longitudinal muscle-fibres, which encloses the parenchymatous network surrounding the copulatory organs. The vasa deferentia lie ventrally to the gut-branches. They pass into the antero-ventral wall of the sheath and open together into a rather wide ejaculatory duct. The duct takes a sinuous course posteriorly to the apex of the penis-papilla. It is coated with a thick inner layer of circular and a thin outer layer of longitudinal muscle-fibres, and lined throughout with an exceptionally tall glandular epithelium, the cells of which appear to contain a granular material. The nuclei of this epithelium are not abundant in the proximal or inner region of the duct. The penis-papilla is large and robust, and occupies the whole of the male atrium. It is covered with an epithelial membrane attached to an extremely thin basement-membrane. Beneath the latter lies a thick layer of tightly-packed muscle-fibres which are disposed at right angles to the surface of the penis-papilla. Numerous nuclei lie in the inner regions of the muscle-layer. Supporting this layer is a coat of longitudinal muscle-fibres, the thickness of which is about one-third that of the former. In the parenchymatous tissue, immediately around the ejaculatory duct, there is a fine granular material, rather similar in appearance to that seen in the epithelial lining of the duct.

The female copulatory apparatus is simple and lies in a sheath of mixed longitudinal and circular muscle-fibres. The oviducts open ventrally into a spacious 'shell'-chamber, situated in the posterior region of the sheath. The 'shell'-chamber is

lined with a tall glandular epithelium and surrounded by numerous gland-cells which open into its lumen. The vagina is spacious and lined with an epithelium continuous with that of the 'shell'-chamber. Inside the sheath, round the vagina, is a network of parenchymatous tissue which has a more compact appearance than that investing the male copulatory organs.

The present form may be readily distinguished from all the known species of *Geodesmus*, *sensu* Hyman, not only by the colour-pattern of the body, but also by the peculiar musculature of the penis-papilla.

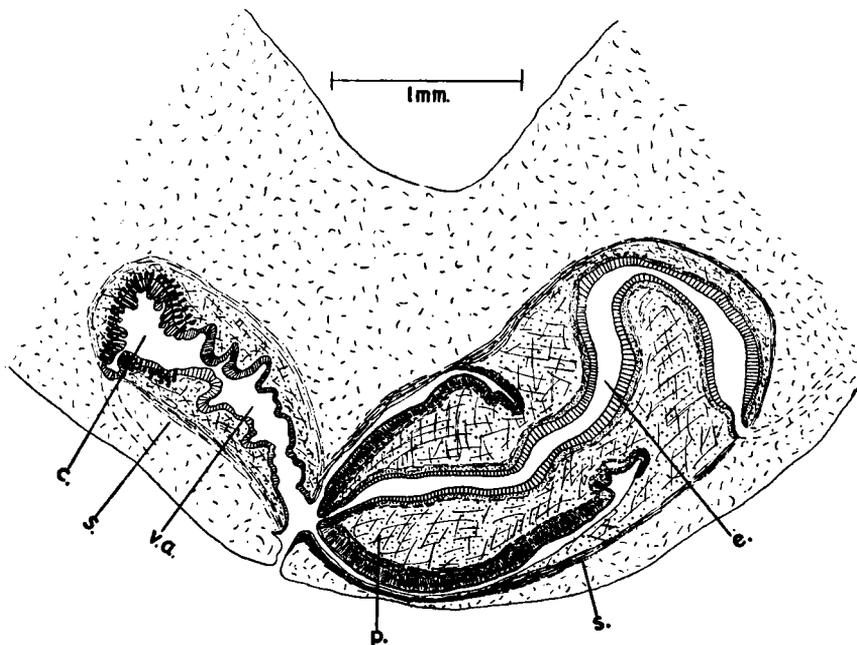


FIG. 8.—*Geodesmus haitiensis*. Sagittal section of copulatory complex (camera-lucida outlines). c., 'shell'-chamber; e., ejaculatory duct; p., penis-papilla; s., muscular sheath; va., vagina.

GEODESMUS COCKERELLI (Graff, 1899). (Fig. 9.)

Syn. : *Amblyplana cockerelli* Graff, 1899.

This species was originally described on the basis of two specimens collected in Jamaica, and only details of its external features were given. Dr. H. A. Baylis has kindly permitted the writer to cut serial sections from one of the two type-specimens in the British Museum (Natural History), so that the systematic position of the species, according to the classification of the Rhynchodemidae adopted by recent authors, might be ascertained.

The original coloration and markings of the type-specimens have faded considerably, but under moderate magnification and a strong light they may be seen rather faintly to agree with von Graff's description, of which the following is a translation :

'Up to 17 mm. in length and 2 mm. in maximum width. Hinder end conically pointed, anterior end tapering; both are sharply marked off from the rest of the body by their coloration. The anterior tip is reddish, and behind this, as at the posterior end, lies a wide circular band of yellow. These bands are united by a median dorsal stripe of similar colour. The remainder of the dorsal surface is deep bluish-black, and this colouring extends over the ventral surface for a distance of one-third of the body width on each side. The 'creeping sole' is yellowish. The mouth is situated at 11 mm. from the anterior end of the body and the genital opening 1.5 mm. behind the

mouth. The two small eyes lie between the reddish tip and the yellow band at the anterior end.'

To this description may now be added the following features, based on the sectioned portion of one specimen :

The body is slightly flattened dorso-ventrally, so that it appears oval in cross-section. Its subepidermal musculature is typical of the *Geodesminae* Hyman. The subepidermal longitudinal layer is thin, and its fibres are not arranged in bundles. In the parenchyme, forming a sheath investing the digestive and reproductive organs, lies a well-developed longitudinal layer, the fibres of which are collected into bundles.

The copulatory complex is rather small, measuring about 0.75 mm. in length and about 0.5 mm. in maximum width. Only the male copulatory apparatus appears to be invested with a thick muscular sheath, which lies somewhat obliquely, its anterior end being tilted towards the dorsal side.

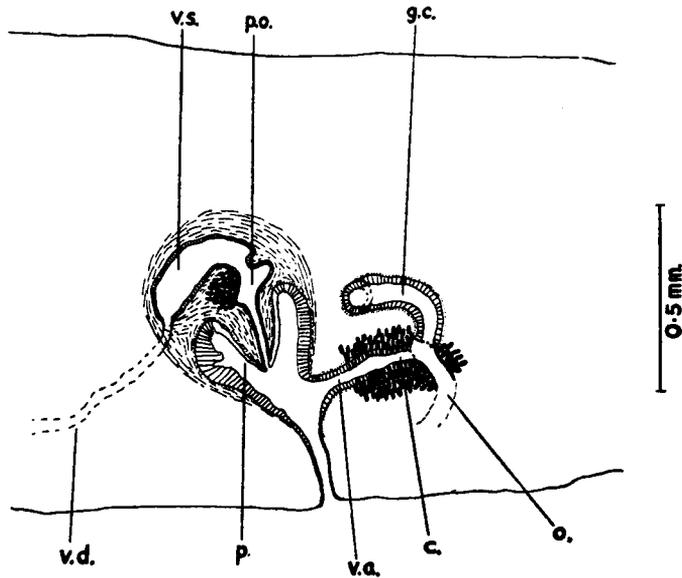


FIG. 9.—*Geodesmus cockerelli*. Sagittal section of copulatory complex (camera-lucida outlines). c., 'shell'-chamber; g.c., genito-intestinal canal; o., oviduct; p., penis-papilla; p.o., prostatic organ; va., vagina; v.d., vas deferens; v.s., seminal vesicle.

The numerous testes are arranged in two irregular rows, situated ventrally to the gut-branches. The vasa deferentia lie ventrally to the testes and open separately into a relatively wide seminal vesicle. The posterior end of the latter turns ventrally to open into a somewhat smaller vesicle, round the ventral half of which lie numerous extracapsular gland-cells opening into its lumen. The latter vesicle probably represents a prostatic organ, from which a short ejaculatory duct extends to the apex of a moderately-developed penis-papilla. The ejaculatory duct and its modifications—the seminal vesicle and prostatic organ—are lined with a ciliated epithelium.

The oviducts lie ventrally to the gut-branches and laterally to the vasa deferentia. They open separately into the hinder end of a 'shell'-chamber, which is situated at the posterior end of the relatively short vagina. Around the 'shell'-chamber and the hinder portions of the oviducts lie numerous gland-cells which open into the lumen of each. The hinder end of the 'shell'-chamber opens, above the openings of the oviducts, into a genito-intestinal canal which runs anteriorly as far as the muscular sheath of the male apparatus, where it turns sharply towards the left side of the body

to enter the main-gut on that side. The female copulatory apparatus is lined throughout with a ciliated epithelium and coated with a moderately-developed musculature, principally of circular fibres.

This species appears to be easily separated from other species of *Geodesmus*, *sensu* Hyman, recorded from the American continents by the colour-pattern of the body and by the possession of a genito-intestinal canal. The latter character occurs in several species of *Geodesmus* recorded from other parts of the world, and is not regarded as of generic importance.

In conclusion, the writer would like to take this opportunity of thanking Dr. H. A. Baylis for advice given during the preparation of this report.

REFERENCES.

- CORRÊA, D. D. 1947. A primeira *Dolichoplana* (Tricladida Terricola) do Brasil. *Bol. Fac. Fil. Cienc. Letr. Univ. São Paulo*, Zool. No. 12, pp. 57-73, pls. i-iii.
- DE BEAUCHAMP, P. 1939. Reports of the Percy Sladen Trust Expedition to Lake Titicaca in 1937. V. Rotifères et Turbellariés. *Trans. Linn. Soc. London* (3) 1, pt. i, pp. 51-79, pl. iv.
- FUHRMANN, O. 1914. Planaires terrestres de Colombie. Voyage d'exploration scientifique en Colombie, in: *Mem. Soc. Sci. nat. Neuchâtel*, 5, pp. 748-92, pls. xv-xvii.
- GRAFF, L. von, 1899. *Monographie der Turbellarien*. II. *Tricladida terricola*. Leipzig.
- HEINZEL, L. 1929. Zur Kenntnis der Rhynchodemiden. *Zool. Jahrb., Syst.* 56, pp. 425-462, pls. x-xi.
- HYMAN, I. H. 1938. Land Planarians from Yucatan. Fauna of the Caves of Yucatan. Carnegie Inst. Washington, Publ. No. 491, pp. 23-32.
- HYMAN, L. H. 1941. Terrestrial Flatworms from the Canal Zone, Panama. *Amer. Mus. Novitates*, No. 1105, 11 pp.
- HYMAN, L. H. 1943. Endemic and exotic Land Planarians in the United States with a Discussion of necessary Changes of Names in the Rhynchodemidae. *Amer. Mus. Novitates*, No. 1241, 21 pp.
- REISTER, A. 1938. Beiträge zur Geoplaniden-Fauna Brasiliens. *Abh. Senckenb. Naturf. Ges.* No. 441, 88 pp., pls. i-ii.