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**Some Land Planarians from the Marquesas Islands**

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INTRODUCTION

During the period between October 1929 and July 1931 a few land planarians were collected, mainly by E. P. Mumford and A. M. Adamson while conducting the Pacific Entomological Survey on the islands of Hivaoa, Nukuhiva, and Uahuka in the Marquesas. These planarians were entrusted to the late Professor Sixten Bock of the Naturhistoriska Riksmuseum, Stockholm, for identification, but, unfortunately, his work on them was not completed before his death in 1946. Acting on the suggestion of Professor Nils Odhner, also of the Riksmuseum, I have obtained the kind permission of Dr. Peter Buck of Bernice P. Bishop Museum, Hawaii, to study and report on the collection.

Apart from several drawings made by Sven Ekblom, Bock appears to have left few notes concerning the planarians, hence I accept full responsibility for the identifications and descriptions given herein. Some of Ekblom's excellent drawings are included in this report, and the artist's name is noted in the figure legends.

The collection includes two species of *Geoplana*, one of which is regarded as new, and two species of rhynchodemids. One of the latter, *Rhynchodemus putzei* Graff, has been hitherto the only land planarian recorded from the Marquesas. Though small, the collection suggests lines of inquiry as to the origins of land planarians in this archipelago; for the species of *Geoplana* show close affinities with several species of this genus recorded from the East Indies, whereas the rhynchodemids appear to be either conspecific with, or closely related to, forms recorded from regions in the southwest Pacific.

FAMILY GEOPLANIDAE

Genus *Geoplana* Stimpson, 1857

*Geoplana insularis*, new species, Bock manuscript (figs. 1, 2).

*External features.* The body (anterior portion missing) measures about 8.8 mm. in length and about 1.8 mm. in maximum width. No notes on coloration in life are available, but a drawing by Bock's artist illustrates the markings of the dorsal surface (fig. 1, *a*). Whitish "creeping sole" about half as wide as the body in different regions, and bordered on either side by a dark band. Marginal eyes well separated and arranged in a simple row, probably forming a complete series round the body. Mouth situated at about 3.2 mm., genital pore at about 2.2 mm., from the posterior extremity.

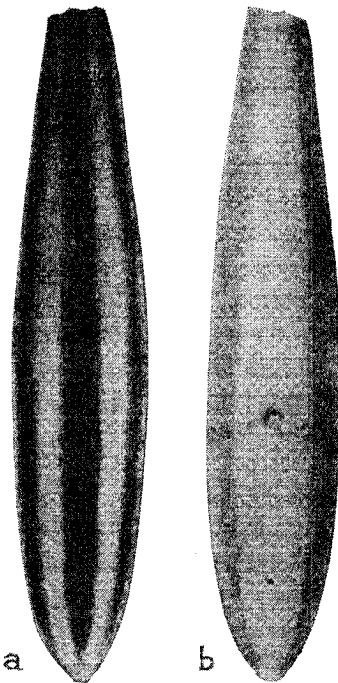


FIGURE 1.—*Geoplana insularis*: *a*, dorsal aspect; *b*, ventral aspect (both  $\times 9$ ; S. Ekblom).

*Musculature.* The subepidermal musculature is typical of *Geoplana*. Its longitudinal fibres are collected into bundles which appear dorso-ventrally elongate in cross-section. A sheath of longitudinal fibres invests the digestive and reproductive organs. Ventrally the sheath is well separated from the subepidermal musculature, but dorsally it almost merges with the musculature.

*Male organs.* The numerous testes appear to lie ventrally to the gut branches, but it has not been possible to make out their arrangement with any degree of

certainly. Copulatory apparatus simple, consisting of a wide ejaculatory duct enclosed in a large penis bulb. Musculature of penis bulb well developed. Its outer circular and longitudinal fibres form a sheath investing a network of irregularly disposed muscle-fibres, among the meshes of which lie numerous gland cells. Vasa deferentia situated ventrally to gut branches. Posteriorly they pass into the anterior region of the penis bulb and open together into the ejaculatory duct. The latter takes a rather sinuous course posteriorly, and opens into the genital atrium. It is lined throughout with a glandular and ciliated epithelium. In the penis bulb and closely surrounding the ejaculatory duct lie gland cells which appear to pour their granular secretion into the lumen of the duct.

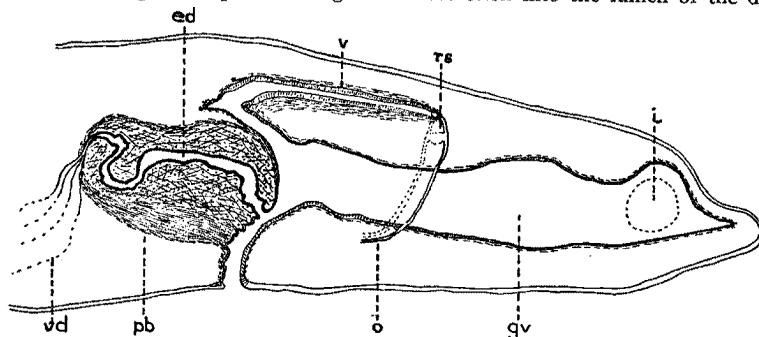


FIGURE 2.—*Geoplana insularis*: sagittal section of copulatory organs, diagrammatic (*ed*, ejaculatory duct; *gv*, genito-intestinal vesicle; *i*, union of intestinal caecum with genito-intestinal vesicle; *o*, oviduct; *pb*, penis bulb; *rs*, receptaculum seminis; *v*, vagina; *vd*, vas deferens).

*Female organs.* The oviducts lie ventrally to the gut branches and laterally to the vasa deferentia. They extend posteriorly to close behind the genital pore, where they turn dorsally and open together into the distal end of the vagina. Shortly before opening into the vagina, the oviducts are united by a relatively large thin-walled vesicle which lies between them. The function of this vesicle is not known, but it appears to be comparable with the structure that von Graff (1)<sup>1</sup> regards as a receptaculum seminis in *Geoplana nasuta* Loman. Vagina long and narrow, lying just beneath dorsal wall of body. It is provided with a tall ciliated epithelial lining and coated with a fairly thick musculature. "Shell" glands were not made out. Ventrally to the vagina, and opening into the genital atrium, lies a spacious elongate vesicle which extends posteriorly to near the hinder extremity of the body. The posterior end of the vesicle unites with the ends of the two posterior branches of the intestine. Though the histological structure of this vesicle is difficult to make out in the present specimen, the epithelial lining appears to consist mainly of ciliated cells, among which lie sparsely scattered glandular cells. Its musculature is extremely thin. Numerous vitelline follicles lie dorsally to the gut branches and mainly anteriorly to the pharynx.

Uahuka, Tauheputa, alt. 1,720 ft., March 23, 1931, one specimen collected by Le Bronnec.

<sup>1</sup> Numbers in parentheses refer to Bibliography, page 255.

This species appears to be closely related to *Geoplana nasuta* Loman from Sumatra, but may be readily distinguished by the structure of the receptaculum seminis and by the presence of an elongate vesicle uniting the genital atrium with the intestinal caeca. With regard to the vesicle, a similar organ, which von Graff considers to be the uterus, is also present in *G. nasuta*, but in this species it does not appear to unite with the intestinal caeca. Whether the structure in the present form can be regarded as a genito-intestinal canal is doubtful, since normally this canal is merely an extension of the inner end of the vagina which opens directly into the intestine.

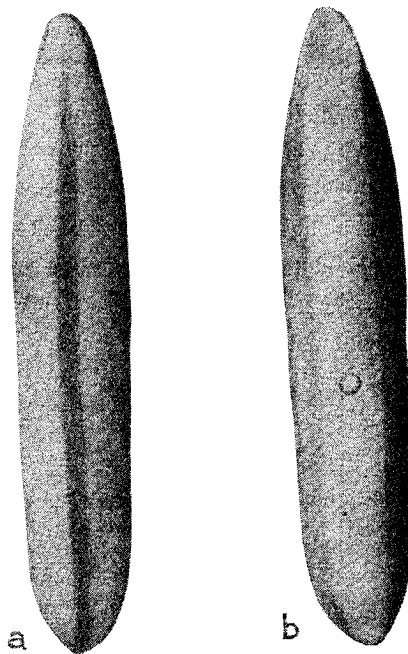


FIGURE 3.—*Geoplana ?canaliculata*: a, dorsal aspect; b, ventral aspect (both  $\times 21$ ; S. Ekblom).

As far as I am aware, this is the first recorded occurrence of a canal or vesicle uniting the genital atrium with the intestine, independently of the vagina, in a species of *Geoplana*. Among the Geoplanidae a typical genito-intestinal canal appears to have been described in only two species of *Pelmatoplana* Graff [*P. braueri* (Graff) and *P. mahèensis* (Graff)]—both from the Seychelles].

**Geoplana ?canaliculata** Graff, Monographie der Turbellarien. II. Tricladida terricola, Leipzig, 1899 (fig. 3).

*External features.* The single specimen available is immature, but its external features seem to agree fairly well with those of *G. canaliculata*. It measures about 5.5 mm. in length and about 1.2 mm. in maximum width. The body is now greenish yellow, but according to Bock's notes it was at one time yellowish brown, with a conspicuous dark median band on the dorsal surface. This band fades away anteriorly and does not reach the foremost extremity. If some allowance is made for loss in the density of colour through the action of preserving and clearing reagents, it seems probable that the colour-pattern of the present specimen was originally indistinguishable from that of *G. canaliculata*.

The marginal eyes are arranged in a continuous row round the body. While relatively close together anteriorly, the eyes gradually become wider apart as they extend posteriorly.

Hivaoa, Matauuna, in humus, alt. 3,900 ft., March 3, 1930, collected by Mumford and Adamson.

*G. canaliculata* has been recorded only from the Philippines. If its presence in the Marquesas were confirmed, it would seem probable that it is widely distributed in the Pacific islands, more especially in those that maintain dense vegetation, and therefore provide the humidity and other conditions necessary for the existence of land planarians.

FAMILY RHYNCHODEMIDAE

Genus **Rhynchodemus** Leidy, 1851

**Rhynchodemus putzei** Graff, Monographie der Turbellarien. II. Tricladida terricola, Leipzig, 1899 (figs. 4, 5).

*External features.* In two specimens the body measures 8 mm. and 11 mm. in length and 1.4 mm. and 1 mm. in maximum width respectively. No notes are available as to coloration during life, but after several years in alcohol the dorsal surface of both specimens is now grayish, variegated with light brown, and with a very faint dark median band. The dorsal epithelium contains rhabdites which appear to be partially responsible for the light-brown variegation of that surface, and the depth of colour in different regions seems to depend upon the density and distribution of the rhabdites. Eyes rather small. Mouth situated in the middle region of the body; genital pore 1.4 mm. behind the mouth in the smaller specimen and 1.8 mm. in the larger.

*Musculature.* The longitudinal fibres of the subepidermal musculature are collected into bundles, as in *Rhynchodemus* Leidy *sensu* Hyman (2).

*Male organs.* The testes lie ventrally to the gut branches. The vasa deferentia pass separately into the anterior region of the well-developed penis bulb, where they open together into the ejaculatory duct. The latter is lined with a relatively tall ciliated epithelium, and near its anterior end is a dilatation which von Graff regards as the seminal vesicle. Whether the dilatation actually functions as a seminal vesicle is questionable, since in the present specimens it appears to contain not spermatozoa, but a coarse granular material, apparently produced

by numerous gland cells lying in the musculature of the penis bulb and closely surrounding the vesicle. In the parenchyme, near the antero-dorsal wall of the penis bulb, von Graff figures a number of "Penisdrusen" which, according to him, open into the lumen of the "seminal vesicle." A number of gland cells are similarly situated in the present specimens, but no evidence can be found showing that they open into the "seminal vesicle." In fact, these cells appear to form a closely packed group of vitelline glands, and, as the histological appearance of the yolk material is rather similar to the granular material seen in the "seminal vesicle," it seems possible that von Graff was mistaken as to their relationships. The ciliated epithelium of the remainder of the ejaculatory duct contains glandular cells, producing a granular material, less coarse in appearance than that present in the "seminal vesicle."

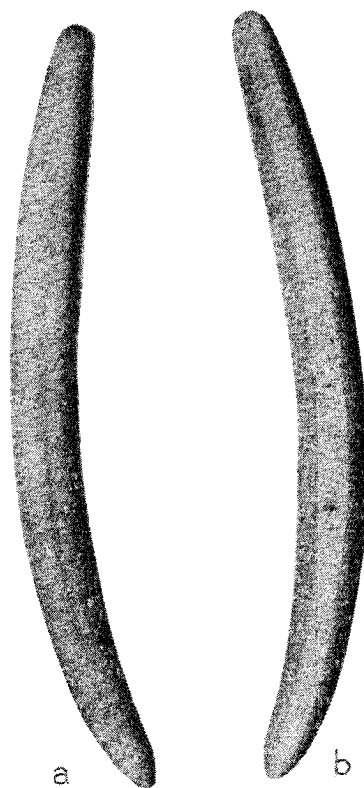


FIGURE 4.—*Rhynchodemus putzei*: a, dorsal aspect; b, ventral aspect (both  $\times 14$ ; S. Ekblom).

*Female organs.* The female complex is similar to that figured by von Graff, but he regards the narrow dorsal region of the genital atrium, situated above the vaginal opening, as the uterus, which, according to him, is provided with a

tall, highly glandular epithelium. In the present material a glandular and ciliated epithelium is similarly disposed, but it does not appear to be very distinct from the rest of the atrial lining. The height and density of epithelial cells must depend to a considerable extent upon the activity of the musculature coating the epithelium, and in this species it is doubtful whether a uterus really exists separately from the vagina.

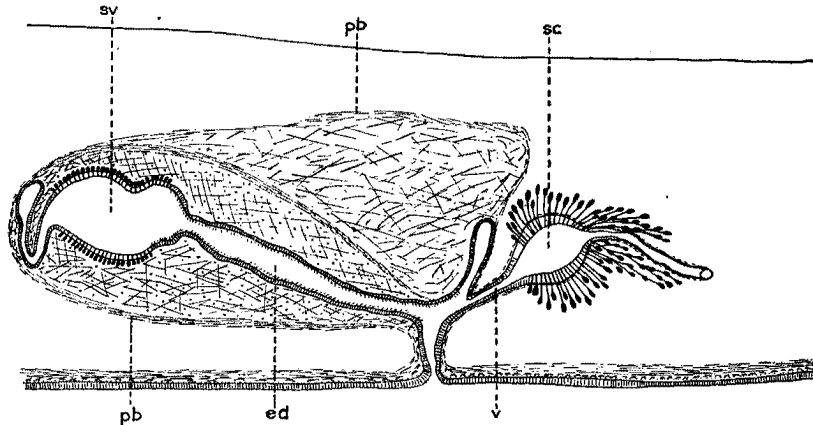


FIGURE 5.—*Rhynchodemus putzei*: sagittal section of copulatory organs, diagrammatic (ed, ejaculatory duct; pb, penis bulb; sc, "shell" chamber; sv, "seminal vesicle"; v, vagina).

Hivaoa, Matauuna, under dead leaves on ground, alt. 3,900 ft., March 4, 1930, two specimens collected by Mumford and Adamson.

As von Graff's description of the copulatory apparatus in this species is based on a specimen in which the male copulatory organ is partially extruded through the genital pore, it has been deemed useful to describe the apparatus in a quiescent state.

*R. putzei* was first recorded some 50 years ago from the Marquesas and Australia (Rockhampton, Queensland). Unfortunately, more precise details of the former habitat are not available, but it seems probable that the species is firmly established among the islands, or at least on Hivaoa.

#### *Unidentified rhynchodemid* (fig. 6).

*External features.* The few specimens available are fragmentary or incomplete, but obviously at one time the material contained at least one complete specimen, as indicated in figure 6. Moreover, the material appears to be immature. The complete worm probably measured about 10 mm. in length. It is rather truncated anteriorly and bluntly pointed posteriorly. The two eyes are relatively small. The original coloration and markings of the body have probably

faded considerably, but it seems likely that normally the dorsal surface is rich brown, with a pair of submedian and a pair of lateral blackish stripes. The whitish "creeping sole," about half as wide as the ventral surface in different regions, is bordered on either side by a brown band, which is merely a continuation of the ground colour of the dorsal surface.

*Musculature.* The longitudinal fibres of the subepidermal musculature are arranged in distinct bundles, indicating that the form belongs to the subfamily Rhynchodeminae (= Dolichoplaninae Hyman = Desmorhynchinae Heinzel; see Prudhoe, 3).

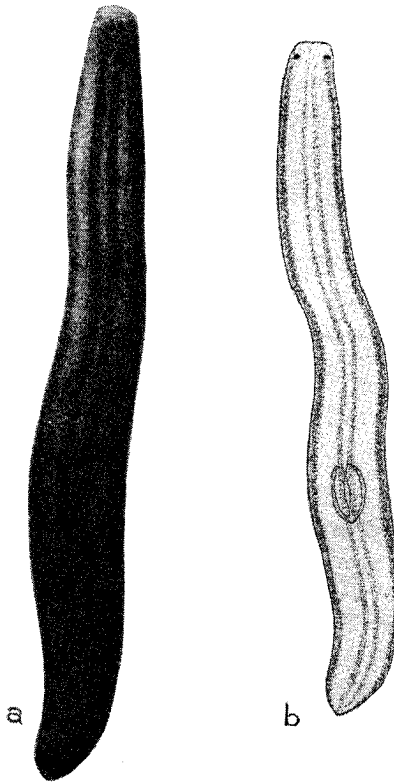


FIGURE 6.—Rhynchodemid: a, dorsal aspect,  $\times 15$ ; b, cleared specimen,  $\times 13$  (S. Ekblom).

Nukuhiva: Ooumu, alt. 3,600 ft., Nov. 13, 1929, collected by Mumford and Adamson; Tekao Hill, alt. 3,250 ft., July 23, 1931, collected by Le Bronnec and H. Tauraa.



In the colour pattern of the dorsal surface, this form closely resembles *Platydemus quadristriatus* (Grube) from Tongatabu Island in the Tongan group, but it does not seem possible to assign it to a genus until adult material from Nukuhiva becomes available.

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