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LAND PLANARIANS FROM THE HAWAIIAN ISLANDS

BY

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To the best of my knowledge there are no records or descriptions of the land planarians of the Hawaiian Islands although it seems to have been known for some time that some exist there. Recently through the kindness and interest of Dr. F. X. WILLIAMS, entomologist at the experiment station of the Hawaiian Sugar Planters Association, I have received several vials of land planarians from the island of Oahu, where land planarians are common, according to Dr. WILLIAMS, in wet forests under dead vegetation, disintegrating leaves, stones, etc. Thanks are hereby expressed to Dr. WILLIAMS for the specimens and for notes on the appearance and coloration of the worms in life. The material was found to comprise three species, two *Geoplana* and one *Rhynchodemus*, all new species and hence endemic to the islands. Later a fine specimen of the cosmopolitan *Bipalium kewense* was received from the Bernice Bishop Museum, at Honolulu, thanks to the courtesy of the curator, Dr. E. H. BRYAN, Jr. All of this material came from the island of Oahu and it is to be hoped that the other islands of the Hawaiian group will be investigated since different species may occur on them.

Geoplana septemlineata, new species.

DESCRIPTION. — This is the most common land planarian of Oahu since most of the specimens belong to this species. It may reach a

length of 30 mm. although the majority of the individuals were shorter than this. The shape is typical of the genus, slender, elongated, dorsoventrally flattened, with the head narrower than the posterior end (fig. 1). The animal is longitudinally striped on the dorsal surface with seven brownish-black stripes on a pale brown ground. The stripes do not contrast very uoɹɹsgly with the ground color and hence are not very conspicuous. The stripes are arranged as follows : a narrow middorsal stripe, broad lateral stripes, and two marginal stripes on each side (figs 1 and 2). The outermost marginal stripe contains the eyes. The eyes are arranged in a single row on each side extending from anterior to posterior end. As is usually the case in the genus *Geoplana*, the eyes are larger and closer together on the head and become smaller and more widely spaced towards the posterior end (fig. 1). The eyes do not cross the tip of the head. In most specimens the first eye in the row is rather small and this is followed by large eyes. The characteristic feature of the eyes is their arrangement in a single straight row situated in the most lateral pigment stripe. The ventral surface is pale with an inconspicuous mottling of darkish pigment.

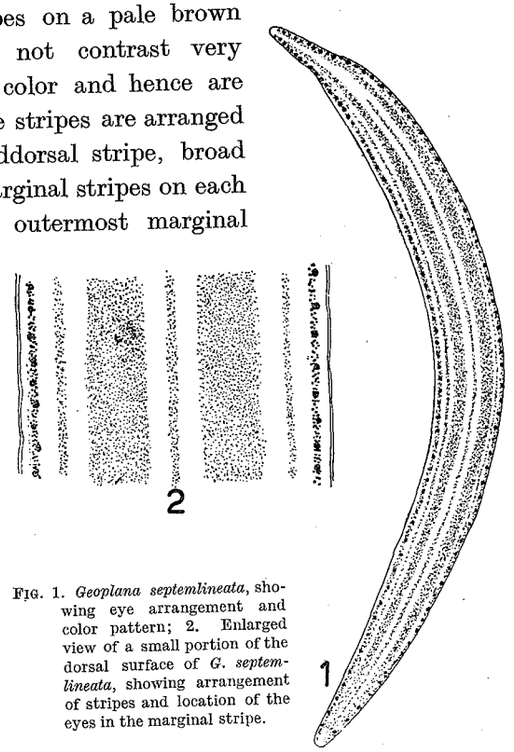

FIG. 1. *Geoplana septemlineata*, showing eye arrangement and color pattern; 2. Enlarged view of a small portion of the dorsal surface of *G. septemlineata*, showing arrangement of stripes and location of the eyes in the marginal stripe.

The histology of the genus *Geoplana* is so well known that the account of the internal anatomy will be confined to the copulatory apparatus. Several of the specimens were in full sexual maturity. A sagittal view of the copulatory apparatus is shown in fig. III. The penis is large and moderately muscular consisting chiefly of the penis bulb with a relatively small truncate penis papilla. The bulb is set off from the parenchyma by a layer of muscle fibers coursing chiefly in a longitudinal direction.

From this layer, which is thicker at the base of the bulb, fibers extend into the interior of the penis to the lining epithelium. The vasa deferentia unite just outside the penis bulb to form a small chamber from which a single duct penetrates the muscular wall of the bulb and opens into the lumen, at the summit of a papilla. This papilla projects into the proximal portion of the lumen of the penis bulb, and this portion is ined by a glandular eosinophilous epithelium. It is succeeded by a transversely expanded cavity having a low epithelial lining. The lumen of the penis bulb or seminal vesicle is thus divisible into two parts, a proximal glandular part encircling the papilla on which the vas deferens opens, and a distal non-glandular chamber. From the latter a broad tube also lined by a tall glandular eosinophilous epithelium proceeds to the end of the penis papilla. The latter is somewhat short and broad with a truncate end.

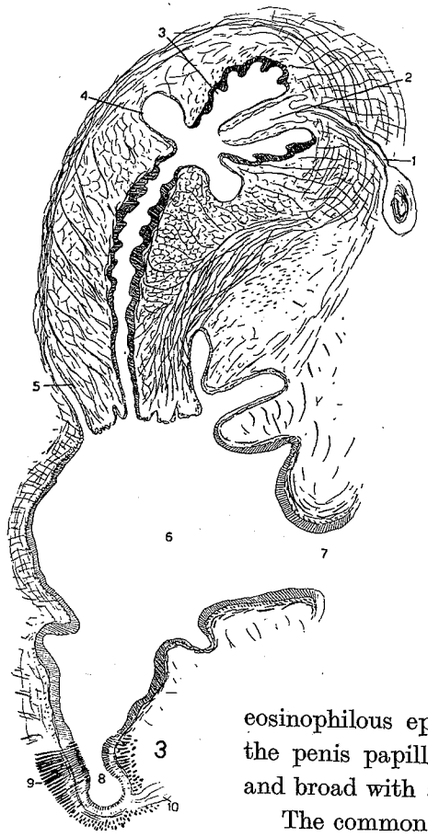

FIG. 3. Sagittal view of the copulatory complex of *Geoplana septemlineata*. 1, vas deferens; 2, papilla on which vas deferens opens; 3, glandular chamber of seminal ve-sicle ; 4, non-glandular chamber of the seminal vesible; 5, penis papilla; 6, common genital atrium ; 7, genital pore; 8, glandular duct of female system ; 9, glands discharging into same; 10, oviducts.

The common genital atrium is a large chamber lined by a tall columnar epithelium and opening below by the genital pore. Its walls have numerous folds and eminences (not shown in the figure) so that its contour must be very irregular. Its epithelium is underlain by muscle fibers. From its dorsal posterior part the wide funnel-like female atrium proceeds posteriorly and narrows into a glandular duct encircled by long-necked eosinophilous glands. The rear end of the glandular duct receives the oviducts.

The female part of the copulatory apparatus presents no distinguishing features but the male part has several characteristic details which serve to distinguish the species from others of the genus.

DIFFERENTIAL DIAGNOSIS. — *Geoplana septemlineata* is distinguishable from other species of the genus by the color pattern of seven dark stripes on a brown ground, the arrangement of the eyes in a single straight row located in the most lateral pigment stripe, the opening of the common vas deferens on a papilla, and the division of the seminal vesicle into a proximal glandular chamber embracing the papilla just mentioned, and a distal non-glandular chamber.

LOCALITY. — Wet forests in the mountains of the island of Oahu, Hawaii; Lulumahu Mt., 1800 feet; Koolan Mts., 1800 feet : Kipapa Ridge, 2400 feet. Under stones, fallen leaves, etc.

HOLOTYPE. — Whole mount; paratype, set of sagittal serial sections; in the atuhor's collection.

Geoplana subpallida, new species.

DESCRIPTION. — The material of this species consists of a single immature specimen. While in general it is inadvisable to base a planarian species on an immature individual, the external features of the species are so distinctive that a description appears justified. The specimen is about 12 mm. long, of characteristic *Geoplana* shape, — anterior end slender and narrow, and body enlarging towards the posterior end fig. 4). The body appears somewhat plump, although this may be a juvenile feature, and is not as dorso-ventrally flattened as in many other species of the genus. The stout shape of the posterior end suggests that the specimen is broken here but the position of the pharynx shows that only a small piece could have been lost from the posterior end. The animal is of a general pale and light coloration. The greater part of the body is of a pale yellow, almost white, hue. There is a well-marked but rather narrow dark-brown or blackish middorsal stripe (figs. 4 and 5) and two indistinct very

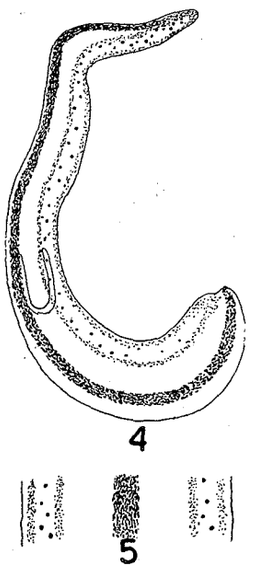

FIG. 4. *Geoplana subpallida* ; 5. Enlarged view of small portion of the dorsal surface of *G. subpallida*, showing arrangement of stripes and location of eyes between the two marginal stripes.

narrow dark stripes on each side near the margin. Between these two lateral stripes is found on each side a row of eyes. The row is single but the eyes are very irregularly arranged in each row, having an almost zigzag placing. This irregularity of the row of eyes contrasts with the very straight row found in *G. septemlineata*. The eyes do not cross the anterior tip.

DIFFERENTIAL DIAGNOSIS. — *Geoplana subpallida* is distinguished from other *Geoplana* by the color pattern and eye arrangement.

LOCALITY. — Wet forests, Koolan Mts., Oahu, Hawaiian Islands, 1800 feet, probably not uncommon.

HOLOTYPE. — One whole mount, in the author's collection.

Rhynchodemus oahuensis, new species.

DESCRIPTION. — This species is represented by a number of individuals of which only one however, is sexually mature. The lenght is arround 20 mm. but probably the species attains a greater length than this. The form is typically rhynchodemid, widest at the middle, tapering towards each end, and dorso-ventrally flattened (fig. 6). There is the usual pair of eyes near the anterior tip. The animal is conspicuously black and yellow striped, hence very pretty and striking in color pattern. On a pale yellow ground there are two narrow dorsal dark stripes and a very broad dark lateral stripe (figs. 6 and 7).

Sections showed that the arrangement of the subepidermal longitudinal musculature is normal and hence the species belongs to the subfamily *Rhynchodeminae* (HEINZEL **1929**). One of the sectioned specimens has a copulatory apparatus, although this is apparently not fully mature and is ventrally broken so that the genital pore is misssing. However, the structure of the copulatory apparatus is typical of the *R. sylvaticus* group of *Rhynchodemus* species, and there is no reason to suppose that a riper condition would alter its essential features, presented in sagittal view in fig. 8. There is no penis papilla but the elongated atrium is encircled first by a layer of circular fibers, then by a bounding stratum of longitudinal fibers. Both layers are thickest at the anterior end of the atrium and here also the longitudianl layer is in contact with the circular layer. Posteriorly the longitudinal fibers diverge somewhat from the atrial wall so that considrable parenchyma intervenes between the muscle stratum and the atrium and this is crossed by sparse muscle fibers. The

vas deferens penetrates the muscle layers at the anterior end of the male atrium and opens there into the lumen. The posterior region of the atrium presumably opens below by the genital pore but this region is broken and missing in the specimen. From the posterior end of the atrium, the female duct proceeds directly backwards as a narrow tube receiving at its posterior end the oviducts. No glands were seen associated with the female duct but this lack probably results from the immaturity of the animal.

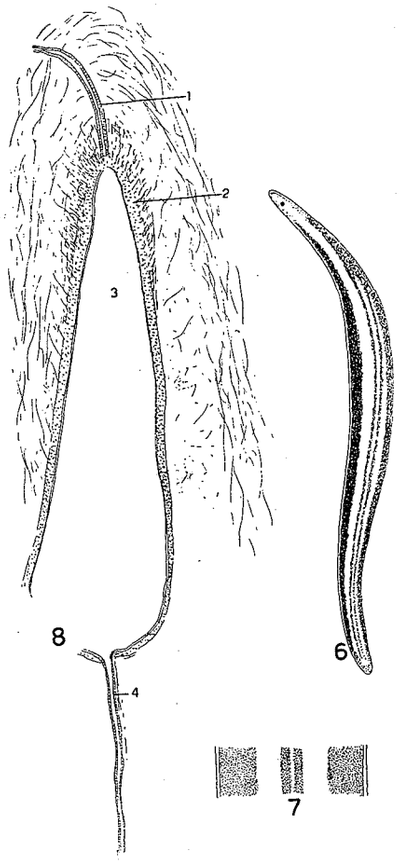

FIG. 6. *Rhynchodemus oahuensis* ; 7. Small portion of the dorsal surface of *R. oahuensis*, showing arrangement of stripes; 8. Sagittal view of the copulatory apparatus of *R. oahuensis*; the specimen is somewhat immature and was broken in the region of the genital pore. 1, vas deferens; 2, muscular wall of male atrium; 3, male atrium; 4, glandular duct of female canal.

Rhynchodemus oahuensis clearly belongs with those *Rhynchodemus* species having a very simplified copulatory apparatus without a penis papilla and lacking a copulatory bursa. It seems to me it may eventually ben ecessary to subdivide the genus into two genera, one with such a simplified terminal apparatus and the other with a complicated copulatory complex. In a recent study of *R. sylvaticus*, the endemic North American land planarian on which LEIDY founded the genus *Rhynchodemus*, I find that this species belongs to the simplified type, having a copulatory apparatus very similar to that of *Rhynchodemus oahuensis*. Hence I propose that the generic name *Rhynchodemus* be retained for species of the *sylvaticus* type while a new generic name should be erected for forms like *R. terrestris* (O. F. Müll.) with a bursa and strongly developed penis papilla.

DIFFERENTIAL DIAGNOSIS. — *R. oahuensis* is distinguished from other

species of the genus primarily by the color pattern combined with a very simple copulatory complex, lacking penis papilla and bursa.

LOCALITY. — Wet forests, under stones, leaves, etc.; Koolan Mts., 1800 feet, Kipapa Ridge, 2400 feet, Oahu Island, Hawaii, common.

HOLOTYPE. — Whole mount; paratype, set of sagittal serial sections; in the author's collection.

Bipalium kewense Moseley 1878.

Syn. *Placocephalus kewensis* (Moseley) GRAFF **1899**

DESCRIPTION. — A single specimen confidently assigned to this cosmopolitan species was sent by the Bernice Bishop Museum, Hawaii. Since very few of the many records and accounts of this species give exact details of the external features and since the existing figures are small and wanting in some respects, an illustrated description of the specimen appears desirable. The animal was stated to have been about 25 cm. long in life but a considerable piece was lost from the posterior end in capturing it. The color pattern in life is described as consistingof five purple stripes on a gray ground. In the preserved animal the stripes are black on a grayish brown ground. The general appearance of the preserved specimen (fig. 9) fits very well with the best published figure, that of BELL (**1886**). The middorsal line is narrow, sharply defined, and darker than the other stripes. The lateral stripes are broad, less definite, and paler and more diffuse than the middorsal line. The marginal lines are again narrow and darker than the lateral bands. The specimen differs from von GRAFF'S figures (**1899**, plate XIII, figs. 3, 4 and 8), especially his fig. 3, in that the lateral bands

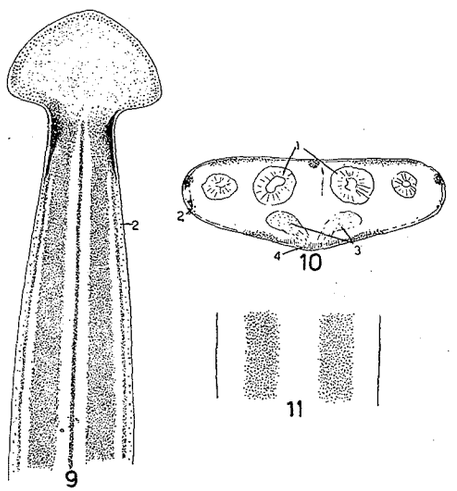

FIG. 9. Anterior of *Bipalium kewense*, showing eye arrangement and pattern of stripes. 2, marginal; eyes. — 10, Cross-section of postpharyngeal region. 1, digestive branches; 2, marginal eyes; 3, nerve cords 4, creep- ing sole. — 11, Ventral surface of *Bipalium kewense* showing stripes bordering the media creeping sole.

or stripes are much broader than he shows them and farther from the middorsal line. His fig. 8 *a*, is, however, much like my specimen. The head of my specimen has well preserved the chopper or lunate shape (fig. 9); it is darkcolored with a pale edge which is broader along the posterior margins. At the « neck » of the animal there is, as all observers have noted, a very dark elongated patch on each side from which the lateral and marginal stripes take their origin (fig.); while the middorsal stripe simply ends in a somewhat light-colored area.

The color and the width of the stripes appear to be very variable in *B. kewense*. The ground color is given by various observers as ochre-yellow, brownish, olive, gray, and greenish; and the stripes vary from violet or purple or purplish brown to dark gray and black. The yellow ground color appears to be the most common hue. As a rule the lateral bands are less dark than the median and marginal lines. Sometimes the median stripe is rather broad and the lateral ones narrower than here shown. As a rule all the bands become paler and less defined towards the posterior end. In my specimen the middorsal line becomes broader and more conspicuous towards the posterior end while the lateral bands become very diffuse and illy defined, so that they hardly seem like stripes at all.

Ventraly (fig. 11), the creeping sole is pure white bordered on either side by broad indistinct stripe which appears gray in the preserved animal but is stated to have been purple in life. Lateral to these stripes, the ventral surface appears grayish-brown.

Von GRAFF has described the arrangement of the eyes but no figures of this feature exist and hence I illustrate it in my figure 9. The eyes form a band along the entire margin of the head. The band is wider and the eyes more scattered along the posterior edges of the head. The eyes could not be traced along the neck region because of the very dark patches there mentioned above; but they seem to be continuous through this region. Eyes occur along the sides in a narrow band througout the entire body length (figs. 9 and 10).

In fig. 10, a cross-section through the postpharyngeal region is illustrated. This shows the position of the seven body stripes, the rounded sides of the body, the position of the eyes, and the creeping sole.

The transversely elongtaed mouth (GRAFF, **1899**, plate XIII, fig. 7), was found about two-thirds of the distance from the anterior end, and the very long tubular pharynx was also seen, extending some distance

both before and behind the mouth. There were no indications of sex organs.

LOCALITY. — The specimen was found on the wooded summit of Mt. Tantalus, a volcanic peak 2013 feet high, on the island of Oahu, Hawaii, near Honolulu. Collected by Mrs. C. D. HERRON, October 11, 1938. The specimen has been returned to the Bernice Bishop Museum, Honolulu, Hawaii.

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XIII

SUR LA RÉPARTITION EN FRANCE DE TROIS ISOPODES TERRESTRES (CRUSTACÉS)

PAR

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Reçu le 15 *décembre* 1938.

Si le recensement de la faune française d'Isopodes terrestres est approximativement établi, la répartition, sur notre territoire, des espèces, même les plus banales, est bien loin d'être connue de façon satisfaisante. Le but de cet article est de préciser les caractères particulièrement remarquables de la distribution de trois d'entre elles. Ces données ne sont pas inutiles, car la connaissance précise de la répartition des espèces indigènes constitue le prélude indispensable à tout établissement d'une Faune isopodologique française.

I. — LIGIIDAE

Ligidium (Ligidium) hypnorum (Cuvier) 1792

La famille des *Ligiidae*, la plus primitive des *Oniscoidea*, comprend cinq genres : *Ligia* Fabricius, *Megaligia* Verhoeff, *Euryligia* Verhoeff, *Ligidioides* Wahrberg et *Ligidium* Brandt. La plupart des *Ligiidae* ne quittent pas le bord de la mer. Certaines espèces se sont cependant adaptées à la vie continentale. C'est le cas pour toutes les espèces du genre *Ligidium*[1].

1. Et, pour quelques formes rangées dans les genres ou sous-genres *Geoligia, Euryligia, Pogonoligia,* qui peuplent les régions montagneuses du Venezuela, de la Colombie, des Hawaï, de la Nouvelle-Calédonie et de l'île de Trinidad.