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A JUVENILE LAND PLANARIAN OF THE GENUS *CAENOPLANA* MOSELEY, 1877, FROM PAPUA NEW GUINEA (TURBELLARIA, TERRICOLA, GEOPLANIDAE)[1)]

by

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INTRODUCTION

Land planarians have been found previously in New Guinea from the Territoy of Papua (Australian protectorate ; Papua New Guinea) and the western Irian Jaya (Irian Barat) of Indonesia. The species described were primarily from the family Rhynchodemidae VON GRAFF, 1896, the subfamily Rhynchodeminae CORRÊA, 1947, and the genus *Platydemus* VON GRAFF, 1896, as reported by VON GRAFF (1899) and DE BEAUCHAMP (1962, 1972). Of the family Bipaliidae STIMPSON, 1857, no reports are known. Species of the family Geoplanidae STIMPSON, 1857, have not been reported although the geoplanid land planarians are well known in the fauna of Australia including Tasmania and New Zealand (cf. FLETCHER & HAMILTON, 1888 ; DENDY, 1890, 1891, 1892 a, b, c, d, e, f, 1894 a, b, 1895 a, b, c, 1896, 1897, 1901, 1904, 1909, 1915 ; VON GRAFF, 1899 ; WOOD, 1926 ; FYFE, 1938, 1944, 1948, 1953 ; WINSOR, 1977, 1979, 1986). The present worm, which will be described in the present paper as a new species, represents the first report of a member of the family Geoplanidae from some part of Papua New Guinea. Because of ventral testes in the specimen it cannot be assigned to the genus *Geoplana* STIMPSON, 1857, where the testes are dorsal. Hence, we propose to use the genus name *Caenoplana* MOSELEY, 1877, now restored to use by FROEHLICH (1955), as available for geoplanid worms particularly of the Australian and Indopacific area having ventral testes, rather than the genus *Kontikia* FROEHLICH, 1955, according to rules of priority (International Code of Zoological Nomenclature, 3rd Edition, 1985 ; cf. OGREN & KAWAKATSU, 1988)[2)]

MATERIALS AND METHODS

This single specimen was collected by Dr. Philip CHAPMAN of the United Kingdom during

1) This paper is affectionately dedicated to the late Dr. Roman KENK who passed away on November 14, 1988, at Cupertino, California, U.S.A. He would have been 90 on November 25th. The deceased was recognized as the leading authority on turbellariology and was a respected friend of the authors. Sadly, Dr. (Mrs.) KENK (Ada) died shortly afterward (October 2) and now Roman has followed. Pray for the repose of souls of Dr. and Mrs. Roman KENK.

2) *Caenoplana* (kainós, Greek for new or recent) is considered the correct spelling. MOSELEY (1877) used this first in his original description of the genus, even though later in the text, probably due to a printer's error, it is misspelled *Coenoplana*. Cf. OGREN & KAWAKATSU, 1988 (pp. 85-86).

his 1975 visit in the highlands of Papua New Guinea (the Brirish New Guinea Speleological Expedition 1975 ; cf. CHAPMAN, 1976, 1985). The animal was fixed by the collector in de Beauchamp's fluid (*i. e.*, A.F.A. : ethanol 95% (6)+formalin 37% (3)+glacial acetic acid (1)).

When received the specimen was assigned KAWAKATSU's Specimen Lot No. 1677 (a). It lacked a small portion of the posterior body ; hence, complete length is uncertain. The specimen was at first studied, sketched and photographed by KAWAKATSU. Routine histological methods were used for preparation of serial sagittal sections at 7 micrometers and staining with Delafield's hematoxylin and erythrosin. The prepared serial sections, along with photographs and diagram of the copulatory apparatus were mailed to OGREN for further study and identification.

SPECIES DESCRIPTION

Order TRICLADIDA

Suborder TERRICOLA

Family GEOPLANIDAE STIMPSON, 1857

Genus *CAENOPLANA* MOSELEY, 1877

Caenoplana chapmani OGREN et KAWAKATSU, sp. nov.

Description. The cylindrical body, tapered toward the gently rounded anterior, was over 12 mm long with width of 1 mm after preservation (Fig. 1 A, B, C-G). The ventral creeping sole extended nearly the full body length, and occupied about a half of the width of the ventral surface (Fig. 1 B, D, E, G). The cylindrical pharynx was extruded to the dorsal side of the pharyngeal region when the worm was killed ; with mouth located near middle of the body length (Fig. 1 A, B, E). The genital pore was evident a short distance (ca. 2.25 mm) behind the mouth (Fig. 1B, G). The eyes were arranged as a single marginal row of approximately 16 large black spots around the anterior end, not continuing along the sides, nor extending dorsally (Fig. 1 H). The color of the body in the preserved specimen was uniform pale brown above, and lighter underside, except for the nearly unpigmented creeping sole. According to the collector, it was white in life (in litt.).[3] Along lower sides were large, irregular, less pigmented areas, visible on photographs, which were interpreted as produced by pressure of the underlying digestive caeca (Fig. 1 B, D, E, G). There were no dorsal or prominent transverse markings.

The external body covering consisted of tall, columnar epithelium containing elongate or twisted rhabdites. The subepitherial musculature consisted of an outer ring of circular fibers and a thick, inner layer of longitudinal fibers in bundles. Parenchymal musculature was weak dorsally and stronger ventrally, but a full description was not possible since transverse sections were not made.

Inner pharyngeal musculature consisted of three layers, *i.e.*, a thin inner one of longitudinal fibers adjacent to the ciliated epithelium of the pharyngeal lumen, a second thick layer of circular

3) We quote verbatim from Dr. CHAPMAN's field notes : "15 November 1975. After heavy rain yesterday, visited Bone Wells passage with Paul EVERETT. Whole passage appears to have filled with water last night, but is now drained, leaving wet, black, sticky mud on walls and floor ... 2 terrestrial flatworms, thick-bodied with pointed ends, crawling on wall of passage. Pure white, no sign of eyes. Twisted laterally when picked up. Preserved in de Beauchamp's fluid."

fibers, and a third thin layer of longitudinal fibers. The outer musculature of the cylindrical pharynx consisted of an outer thin layer of longitudinal fibers beneath the ciliated epithelium ; an inner,

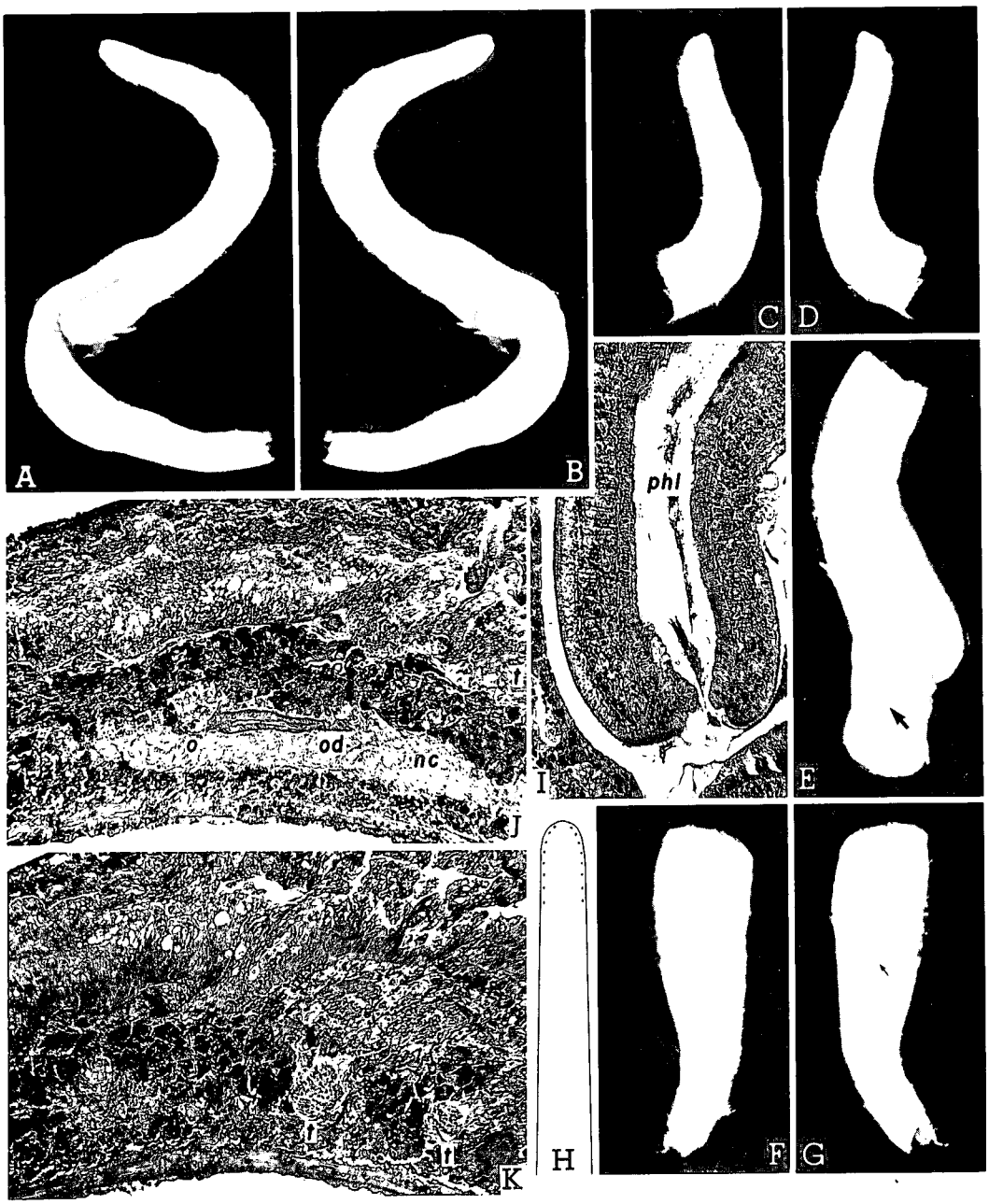


Fig. 1. *Caenoplana chapmani* sp. nov. — No. 1677 a, holotype. A and B, dorsal (A) and ventral (B) views of the preserved specimen. C-G, cut pieces (C and F, dorsal view ; D-G, ventral view). Large arrow indicates the mouth ; small arrow, genital pore. H, sketch of the head showing eyes. I-K, parts of sagittal sections (I, pharynx ; J, ovary and ovovitelline duct ; K, testis). nc, nerve cord ; od, ovovitelline duct ; ov, ovary ; phl, pharynx lumen ; t, testes.

slightly thickened circular layer ; and a third loose layer of longitudinal fibers (Fig. 1 I).

The two ventral ovaries were small but distinct just above the nerve cord about 2 mm behind the anterior tip of the body. The wide opening of the ovovitelline duct was evident here as it entered the main tube which extended posteriorly alongside the nerve cord (Fig. 1 J). The growing oocytes were in various stages of early meiosis, division figures were rare, cytoplasm contained numerous large globules of "vitelline" material. The small size of the gland and of the growing oocytes suggested it was not fully mature. The ovovitelline ducts were located dorsal to the lateral part of the nerve plate.

Testes were small, numerous, located ventrally, alongside the nerve cord and extending posteriorly nearly to the level of the pharyngeal base. Most testes contained cells in some stage of meiosis, but very few sperms were present (Fig. 1 K). The impression was that they were not fully mature. However, there were spermatozoa in the spermiducal vesicle regions of the sperm ducts. The sperm ducts were situated ventrally below the lateral parts of the nerve plate.

Figure 2 shows the semidiagrammatic sagittal view of the copulatory apparatus (holotype). Photomicrographs of parts of the copulatory apparatus taken from sagittal sections are also shown in Figure 3 (A-E ; holotype).

The male copulatory organ was simple, without a penis papilla (Fig. 2). The sperm ducts were very narrow during their passage through the bulbus tissue. They opened separately into the enlarged, somewhat sinous, bulbar cavity, or seminal vesicle (Figs. 2, 3 A, D). There was relatively little difference in structures as this portion opened into the more spacious male genital antrum. The nucleate epithelium of the anterior half of the antrum was uniform columnar, which became taller and more folded in the posterior half (Figs. 2, 3 A-E). A penis papilla was not formed and formative folds suggesting its future development were not recognized (Figs. 2, 3 D). It was not possible to state that the present condition developed into a stage with a penis papilla. Musculature of the male genital antrum consisted of a thick layer of circular fibers adjacent to the epithelium and thick layer of longitudinal fibers below this adjacent to the mesenchyme (Fig. 2).

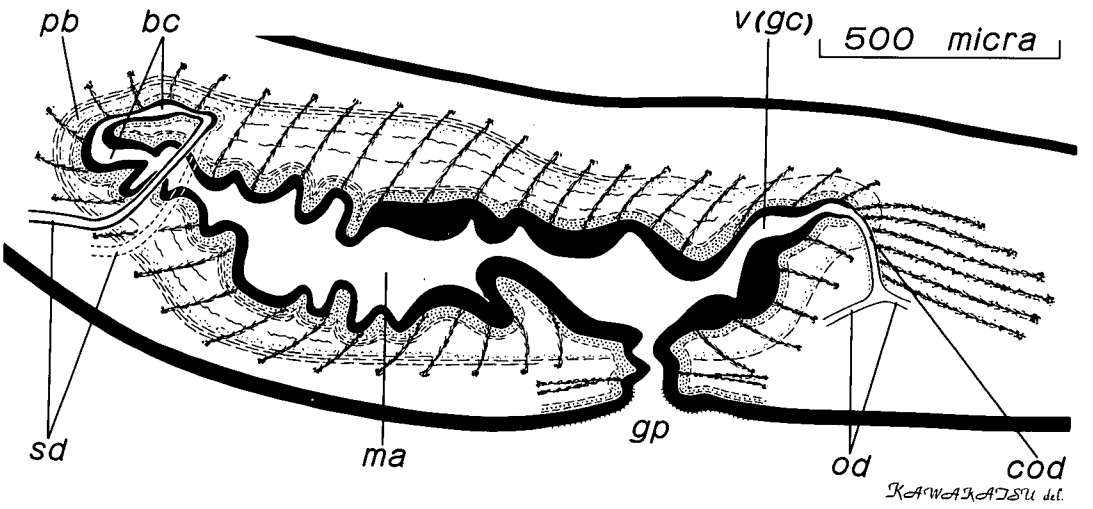


Fig. 2. *Caenoplana chapmani* sp. nov. — Semidiagrammatic sagittal view of the copulatory apparatus (holotype). bc, bulbar cavity ; cod, common ovovitelline duct ; gp, genital pore ; ma, male genital antrum ; od, ovovitelline duct ; sd, sperm duct ; v, vagina or glandular chamber.

The female copulatory organ was quite simple (Fig. 2). The ovovitelline ducts passed around the copulatory complex, then turned medially and dorsally at an acute angle to unite as the common ovovitelline duct. This was a long, medium-sized passageway that communicated with the

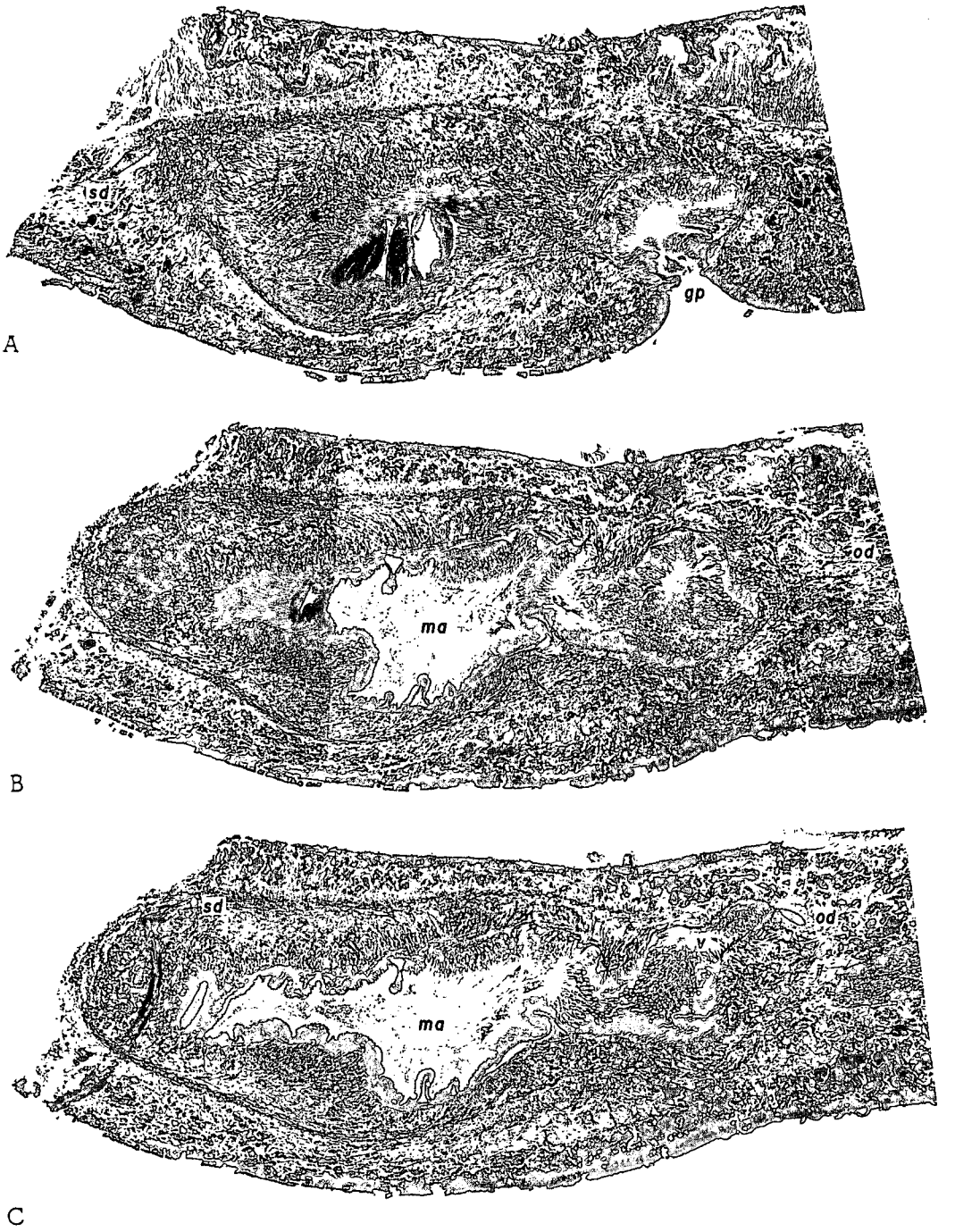
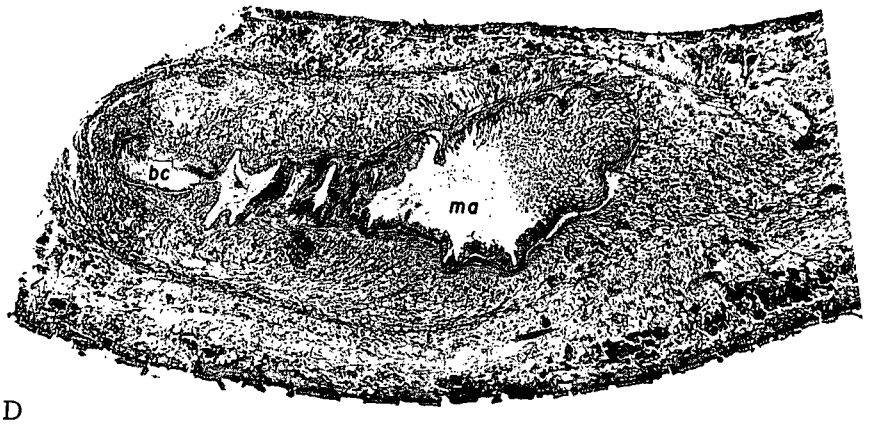


Fig. 3. For explanation see page 98.



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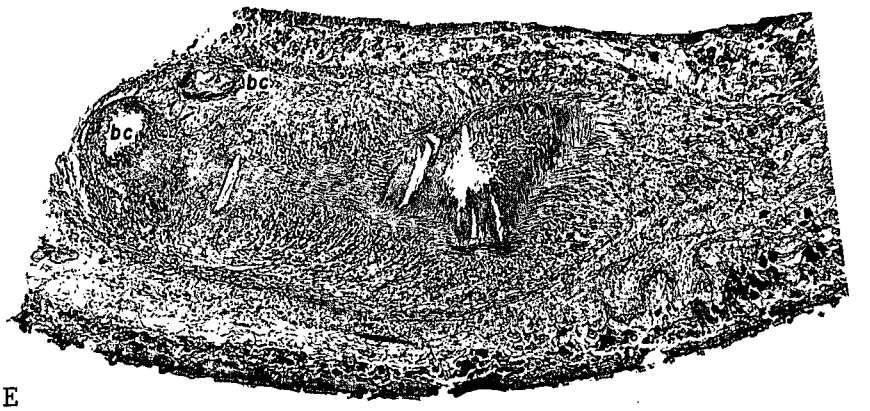

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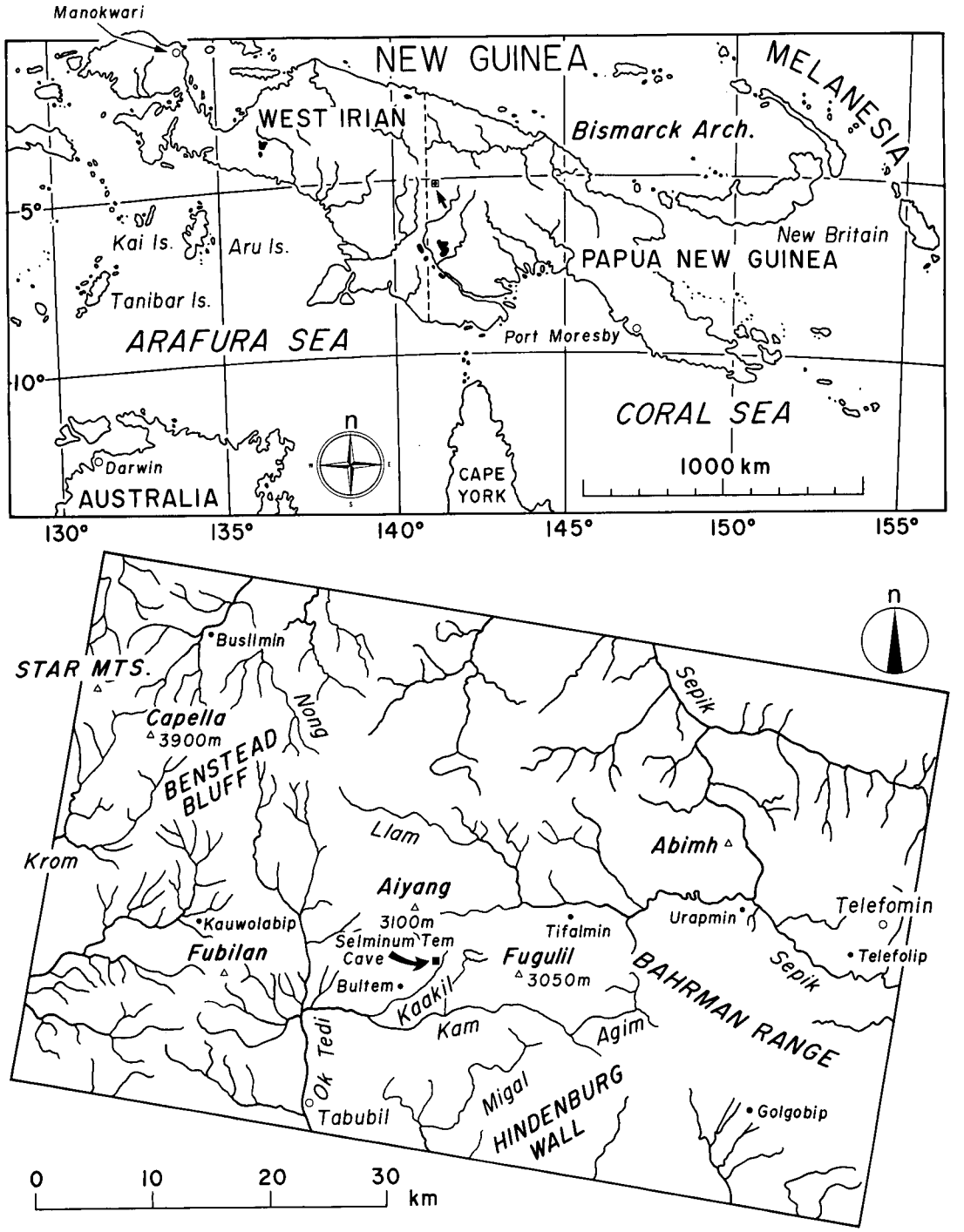
Fig. 3. *Caenoplana chapmani* sp. nov. — Near midsagittal sections of the copulatory apparatus (A-E, holotype). A dust fiber present on the slide can be seen on the left-side of the section C. bc, bulbar cavity ; gp, genital pore ; ma, male genital antrum ; od, ovovitelline duct ; v, vagina or glandular chamber.

narrowed glandular duct on the posterior part of the copulatory organ, and which received numerous erythrophilous gland cells (Figs. 2, 3 B-D). The short, funnel-shaped vagina, had its wide anterior part opening dorsally into the genital antrum. The nucleate epithelium of this part is thicker at the floor than at the roof (Fig. 2). There was no epithelial fold separating male and female genital antra (Figs. 2, 3 A). A glandular sac, arising from the epithelium of the common genital antrum, *was not present* as described in some geoplanid species from New Zealand and Australia (cf. FYFE, 1948 ; WINSOR, 1986).

Type series. Holotype. One set of sagittal serial sections (Speciman No. 1677 a, 7 slides) will be deposited in the Department of Zoology, National Science Museum (Nat. Hist.), Tôkyô, Japan.

Type locality. The Bone Wells passage, a part of a small immature vadose network beneath the huge fossil trunk passage called "Tranquility" in Selminum Tem Cave, located on the southeast slope of Mt. Aiyang (alt. 3505 m), approximately 45 km SWS of Telefomin, the westernmost-central area of the highlands of Papua New Guinea (ca. lat. 5°00′ S and long. 141°15′ E ; Figs. 4 and 5). Collected by Dr. Philip CHAPMAN on 15 November 1975. For other collection data, see "footnote



Figs. 4 and 5. Sketch maps showing the type locality of *Caenoplana chapmani* sp. nov. Fig. 4 (top), New Guinea (West Irian and Papua New Guinea). Arrow indicates the type locality. Fig. 5 (bottom), the vicinity of Selminum Tem Cave (type locality) in Papua New Guinea (after CHAPMAN, 1976, p. 120, fig. 2 ; modified). Additionally, notice the location of the City Manokwari in West Irian, where *Platydemus manokwari* DE BEAUCHAMP, 1962, was first collected (Fig. 4).

3" and CHAPMAN (1976, 1985).

Taxonomic remarks and differential diagnosis. During research for this paper it became necessary to reconsider the synonymy of the genera *Geoplana* STIMPSON, 1857, and *Caenoplana* MOSELEY, 1877 ; the latter was declared to be a synonym of the former years ago based on likeness of external features (cf. FLETCHER & HAMILTON, 1888 ; DENDY, 1890, 1891, 1895 a, b ; VON GRAFF, 1899). However, *Caenoplana* can no longer be considered a junior synonym of *Geoplana* because of the presence of ventrally located testes in two of the originally described species : *Caenoplana coerulea* MOSELEY, 1877, now assigned as the type species, and *Caenoplana sanguinea* MOSELEY, 1877 (cf. FYFE, 1948). We believe that even though complete morphological analysis is as yet unpublished (OGREN's unpublished data), future studies will verify this conclusion. Thus, the genus *Kontikia* FROEHLICH, 1955, erected for neotropical geoplanids with ventral testes and strong subepithelial and parenchymal longitudinal musculature, could in the future be considered a junior synonym of the genus *Caenoplana* (ICZN, Art. 23 (1), p. 51). There is, however, evidence (cf. JONES, 1981, pp. 838 and 842 ; and in litt.) *Caenoplana* species have a weak system of parenchymal musculature. In *Kontikia*, on the other hand (cf. FROEHLICH, 1955), the parenchymal musculature forms a complete strong annular ring. Therefore, to avoid confusion while further taxonomic studies are being made, we will consider the two genera as separate.

Having only one specimen that is not in full sexual maturity has made identification difficult. Dr. CHAPMAN's animal described in the present paper does not conform completely to any species of the key in VON GRAFF (1899), except for *Caenoplana sanguinea* MOSELEY, 1877 (which VON GRAFF placed in *Geoplana*), reported from the vicinity of Sydney, Australia. Thus, it is allied with geoplanids having uniform pale brown pigmentation lacking stripes or markings. VON GRAFF (*op. cit.*) combined the pink to brown color forms of *Caenoplana sanguinea* as *Geoplana sanguinea* (MOSELEY, 1877), with the brownish and flesh-colored variations of *Geoplana alba* DENDY, 1890, to form one variable species. We believe DENDY's species is a member of the genus *Caenoplana*. In the recent description and analysis by JONES (1981), he concluded that the specimens from the Isles of Scilly, southwest of Cornwall, England, Great Britain, should be classified as a separate variation, *Geoplana sanguinea* (MOSELEY) var. *alba* (DENDY), although further study may demonstrate it is once again a separate species (cf. JONES, 1987, 1989). JONES (1981, p. 842), who examined sections of the holotype of *Geoplana sanguinea* (British Museum, Nat. Hist., Reg. no. 77. 11. 2. 10), indicates there are some differences in the copulatory apparatus of *Geoplana sanguinea* and *Geoplana alba*.

JONES (1981, p. 840) wrote about the arrangement and position of testes in his Scilly specimens as follows : "The testes (fig. 2, t) are numerous and they occur in the region between the anterior end and the pharynx. They lie ventrally but just dorsal to the ventral nerve cord and oviduct on either side of animal". Thus, the species cited above should be classified as *Caenoplana sanguinea alba* (DENDY, 1890) (see ICZN, ed. 2, 1961, Art. 45 (e) (ii) ; see also ICZN, ed. 3, 1985, Art. 45 (g) (ii) (1)). If *Caenoplana sanguinea* MOSELEY, 1877, from Australia (type loc., Parramatta, near Sydney) and *Geoplana alba* DENDY, 1890, from Australia (type loc., M'Mahon's Creek, Warragul, Macedon, Croajingolong, Victoria) are different species, their scientific names would be indicated as *Caenoplana sanguinea* (MOSELEY, 1877) and *Caenoplana alba* (DENDY, 1890).

Although *Caenoplana chapmani*, a new species described in the present paper, has external similarities with *Caenoplana sanguinea alba* (DENDY, 1890), sensu in JONES (1981), the specimen lacks the pink coloration of some specimens. Moreover, *Caenoplana chapmani* shows differences in features of its copulatory apparatus from any of published accounts in this animal group : 1) It does not conform to the features shown by FYFE (1948), since *Caenoplana chapmani* lacks a glandular sac and

penis papilla ; its common ovovitelline duct is not enlarged ; 2) it does not completely conform to the description by JONES (1981) of his specimens from Isles of Scilly, because *Caenoplana chapmani* lacks even the poorly developed penis papilla, and the ovovitelline ducts have a long common chamber forming a passage between the vagina and where they unite. Moreover, accirding to JONES (1981, p. 842) his Isle of Scilly worm has a pharynx of "glockenförmig" type of VON GRAFF (1899, p. 109), not cylindrical as in *Caenoplana chapmani*.

Based on anatomical and histological examinations of our holotype specimen from Papua New Guinea, we conclude that this Dr. CHAPMAN's worm should be identified as a new species, *Caenoplana chapmani*, based on absence of pink coloration and the above differences in the copulatory apparatus. Further evaluation can be made when in the future we are sufficiently fortunate to obtain additional specimens that are larger and more mature.

Caenoplana chapmani, the present new species, is characterized as follows : preserved specimen small (over 12 mm long and 1 mm broad) and of a cylindrical form, tapering toward the gently rounded anterior ; with a single marginal row of approximately 16 eyes ; uniform pale brown above (living specimen appeared to be white according to the collector), lighter below, and having a wide creeping sole which extends nearly full body length ; with a cylindrical pharynx (its inner musculature consists of a thin, inner longitudinal layer of fibers, a thick, middle circular ones, and a thin, outer longitudinal ones) ; subepithelial musculature consisted of a thick layer of outer circular fibers and a thick, inner longitudinal fibers in bundles ; ventral testes small and lying in one longitudinal row on either side of the prepharyngeal region ; the male copulatory organ consists of the anterodorsal, tubular, bulbar cavity into which two sperm ducts open separately at its beginning, and the middle and posterior, more spacious male genital antrum of an irregular outline covered with a rather tall, nucleate epithelium ; most of the antrum is surrounded by two thick layers of subepithelial muscle fibers, *i.e.*, an inner circular one and an outer longitudinal one ; without a distinct penis papilla ; the female copulatory organ consists of a posterior, narrow tubular part which receives the long, medium-sized common ovovitelline duct and an anterior, rather short, funnel-shaped vagina which connects anterodorsally with the terminal portion of the male genital antrum ; the genital antrum and vagina open directly into the genital pore (no common genital antrum is differentiated).

SUMMARY

The first example of a land planarian of the family Geoplanidae STIMPSON, 1857, is reported from Papua New Guinea and described as a new species *Caenoplana chapmani* in recognition of the collector. The single, nearly mature, specimen, slightly more than 12 mm long, of uniform pale brown color, without markings or stripes, with vantral testes, copulatory apparatus lacking panis papilla, was most similar to *Caenoplana sanguinea alba* (DENDY, 1890), the Australian species reported from the Isles of Scilly, England, Great Britain, by JONES (1981). It differed primarily on the basis of features of the copulatory apparatus and absence of pink coloration.

ACKNOWLEDGEMENTS

We wish to thank Dr. Philip CHAPMAN, formerly a staff member of the Bristol City Museum & Art Gallery, England, the United Kingdom, for supplying the interesting geoplanid sample from Papua New Guinea and its collection data. We are also indebted to Dr. Hugh D. JONES (University of Manchester, England, U. K) for his review and comments on the manuscript.

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