

TRANSACTIONS
OF THE
ROYAL SOCIETY OF NEW ZEALAND
BIOLOGICAL SCIENCES

VOL. 11

No. 11

OCTOBER 13, 1969

Philinoglossa marcus n.sp. (Mollusca: Opisthobranchia:
Philinoglossacea) from the British Solomon Islands Protectorate

By D. A. CHALLIS,

Department of Zoology, University of Auckland
[Received by the Editor, 10 April, 1969.]

Abstract

A NEW species of *Philinoglossa* collected from intertidal shell-sand at three localities in the Solomon Islands Protectorate is described. The anatomy of the animal is described and discussed.

INTRODUCTION

THE Philinoglossacea are a small and little-known order of opisthobranchs of uncertain systematic position. They are all very small, and are members of the interstitial fauna of marine sand. The living animals are not particularly molluscan in appearance but resemble the sand-dwelling kalyptorhynch turbellarians commonly recovered from the same habitat.

Internally their anatomy is very similar to that of the Acochliidae. There is one family, the Philinoglossidae Hertling 1932, containing three genera: *Philinoglossa*, *Pluscula* and *Sapha*, of which the latter are monotypic.

MATERIALS AND METHODS

A detailed account of the methods used in collecting, isolating, photographing and preserving the animals is given in Challis (1969). All drawings other than reconstructions were made from photographs or with the aid of a camera lucida.

Order PHILINOGLOSSACEA Hoffman, 1933

Family PHILINOGLOSSIDAE Hertling, 1932

Genus PHILINOGLOSSA Hertling, 1932

Philinoglossa marcus n.sp.

DESCRIPTION: Fully extended, sexually mature animal (Fig. 1a) approximately 2mm long, ratio of length to breadth approximately 1:6, body shape elongate, rectangular, notum narrowing anteriorly, terminating in a blunt, slightly concave end. Anterior region of foot expanded, extending laterally beyond notum, posterior end tapering to a broad rounded tail. Notum and foot separated by a ciliated groove only in anterior third of body. Colour a dirty, translucent white stippled with black spots on the posterior half of the body. Epidermis completely ciliated except for a small area of anterior region of the left lateral groove where a group of gland cells discharge. Shell, gill and gizzard lacking. Two eyes present and visible externally in the living animal. Radular formula $3-0-3 \times 20$. Inner lateral plate large, curved, having a single point and a broad flattened base with an accessory muscle attachment process (Fig. 1b); second lateral plate smaller, similar to the inner plate in shape, but more curved and pointed and lacking the accessory process (Fig. 1c). Outer lateral plate similar, but smaller and with a reduced basal region (Fig. 1d). Genital aperture situated dorso-laterally on right side at posterior end of lateral groove (Fig. 2b). Anus posterior, ventral, slightly sub-

Published by the Royal Society of New Zealand, c/o Victoria University of Wellington, P.O. Box 196, Wellington.

terminal. Heart and kidney lying side by side at posterior end, heart on right, connected by a transverse renopericardial duct (Fig. 2d).

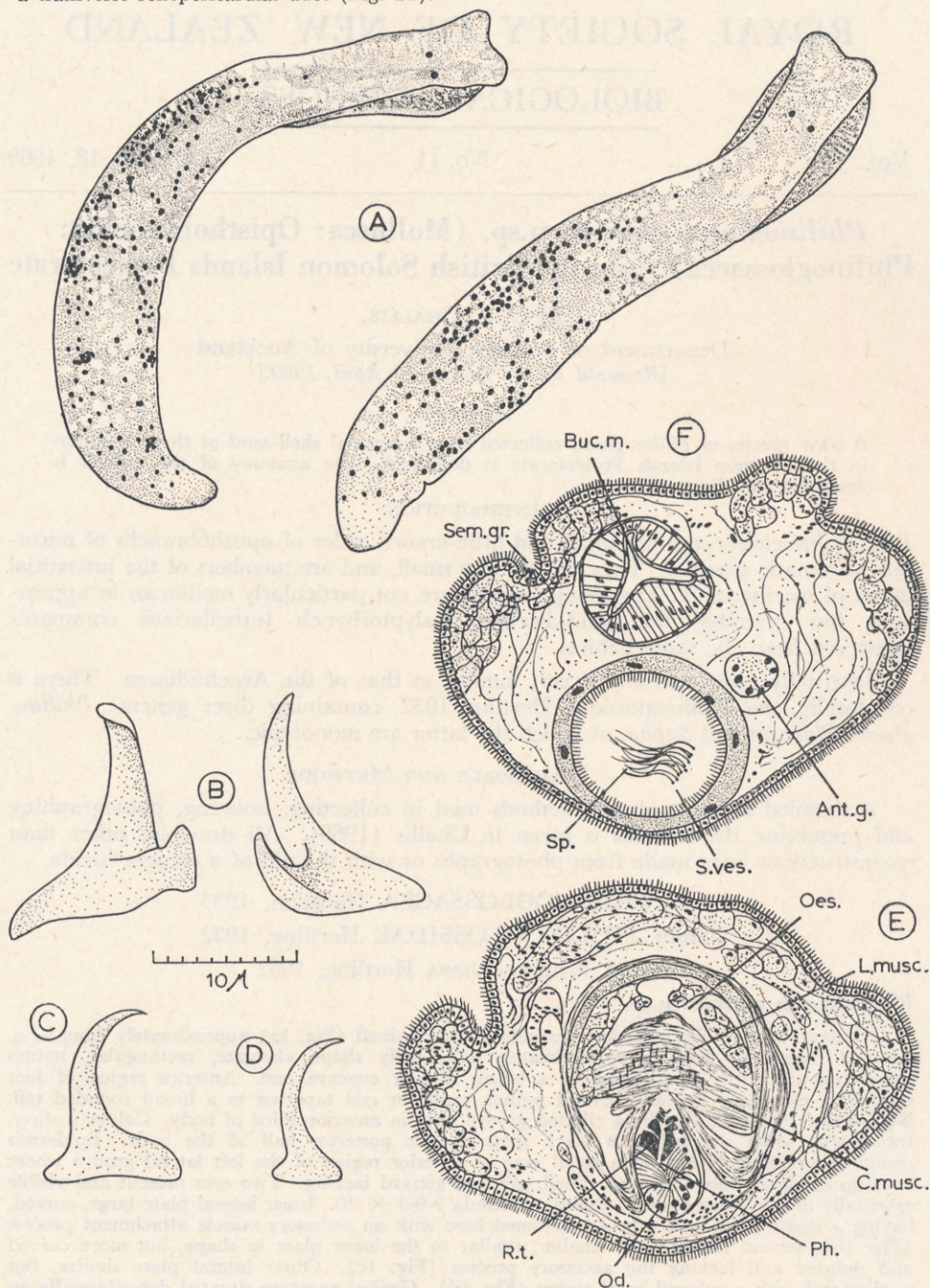


FIG. 1.—*Philinoglossa marcusi* n.sp. A. Two views of the living animal from photographs. B. Two aspects of an inner lateral plate of the radula. C. The second of the three lateral plates of the radula. D. The outer of the three lateral plates of the radula. E. A transverse section through the buccal mass showing the musculature of the buccal mass and the radula *in situ*. F. A transverse section through the oesophagus and through the ventral seminal vesicle. (For abbreviations see Fig. 2.)

Key to the abbreviations used in the figures: Acc.g., accessory ganglia; Al.gld., albumen gland; An., anus; Ant.g., anterior ganglia; Buc.g., buccal ganglia; Buc.m., buccal mass; C.musc., circular muscle; C.pl.g., cerebro-pleural ganglia; Dg.a., anterior lobe of the digestive gland; D.gld., section through the "S"-shaped posterior lobe of the digestive gland; Dg.p., posterior lobe of the digestive gland; Ex.gr., an excretory cell in the lumen of the stomach; Eye, eyes; G.ap., genital aperture; Gld.c., gland cells; H.dct., hermaphrodite duct; H.gnd., hermaphrodite gonad; H.o., Hancock's organs; Ht., heart; Int., intestine; K., kidney; L.musc., longitudinal muscle; Mc.gld., mucous gland; Od., odontophore; Oes., oesophagus; O.t., oral tube; O., ovum; Pc., pericardium; Ped.con., pedal connective; Ped.g., pedal ganglia; Ped.musc., pedal musculature; Ph., pharynx; Rep.dct., renopericardial duct; R.t., radula teeth; Sem.gr., seminal groove; So.dct., sperm-oviduct; Sp., sperm; S., statocyst; St., stomach; Sub.g., sub-intestinal ganglion; Sup.g., suprainestinal ganglion; S.ves., seminal vesicle.

TYPE LOCALITY: The holotype was collected by the author in August, 1965, from coarse, clean, shell-sand at Low Water Neap Tide 200 yards east of the Agricultural Advisory Station, Komimbo Bay, West Guadalcanal.

OTHER LOCALITIES: Further single specimens were collected from the landward side of Maraunibina Island, Marau Sound, East Guadalcanal, and from Banika Beach, Russell Islands.

TYPES: Of the three specimens collected, one was used in the preparation of a radular mount, the second was serially sectioned in the transverse plane and the third has been retained as the holotype. The holotype has been deposited in the British Museum (Nat. Hist.) together with a preparation of the radula of a paratype. The sectioned paratype will be retained by the author.

REMARKS: A general account of the habitat of *Philinoglossa* and of the other interstitial opisthobranchs collected during the expedition is provided in Challis (1969).

While the general body form, the position of the female reproductive aperture and the arrangement of the efferent male apparatus place the animal within the genus *Philinoglossa* it differs from the existing species in the pattern of the renopericardial system, in the lack of a pallial gland and in a number of small, but important details described in the section on the anatomy.

The species is named for the late Dr Ernst Marcus of the University of São Paulo, Brazil.

ANATOMY OF *Philinoglossa marcusii*

ALIMENTARY CANAL: Mouth, situated in the anterior transverse region of the lateral groove, connected to the buccal cavity by a thin-walled oral tube (Fig. 2c and 2e). Oral glands lacking. Wall of buccal cavity (Fig. 1f) having similarly arranged tissue layers to those described by Brown (1934) from *Philine aperta*. Radular sac opening ventrally into buccal mass which has complex and well developed musculature although the odontophore is surprisingly slight. Salivary glands paired, sac-like, discharging into the oesophagus immediately behind the buccal mass. Oesophagus short, opening into a wide stomach (Fig. 3c) which, at this level, occupies most of the left half of the haemocoel. Intestine narrow, ciliated, arising from the left side of the stomach, traversing the body to a dorsal position then extending posteriorly, discharging at the anus. Digestive gland consisting of two lobes: a short anterior lobe, 150 micra in length, leaving the stomach on the left side extending both anteriorly and posteriorly; main and posterior lobe leaving the stomach on the right side, extending backwards as an unbranched "S" shaped sac (Fig. 3d). Unlike *P. heligolandica* distal limb of the "S" much shorter than the proximal "U" section. Histology of digestive gland normal, but a number of distinctive cells filled with spherical inclusions that probably fulfil an excretory function are scattered amongst the digestive cells and in the lumen of the gland (Fig. 3c).

NERVOUS SYSTEM: Central nervous system (Fig. 2a) similar to that described for *P. heligolandica*. Nerve ring pre-pharyngeal, cerebral and pleural ganglia fully

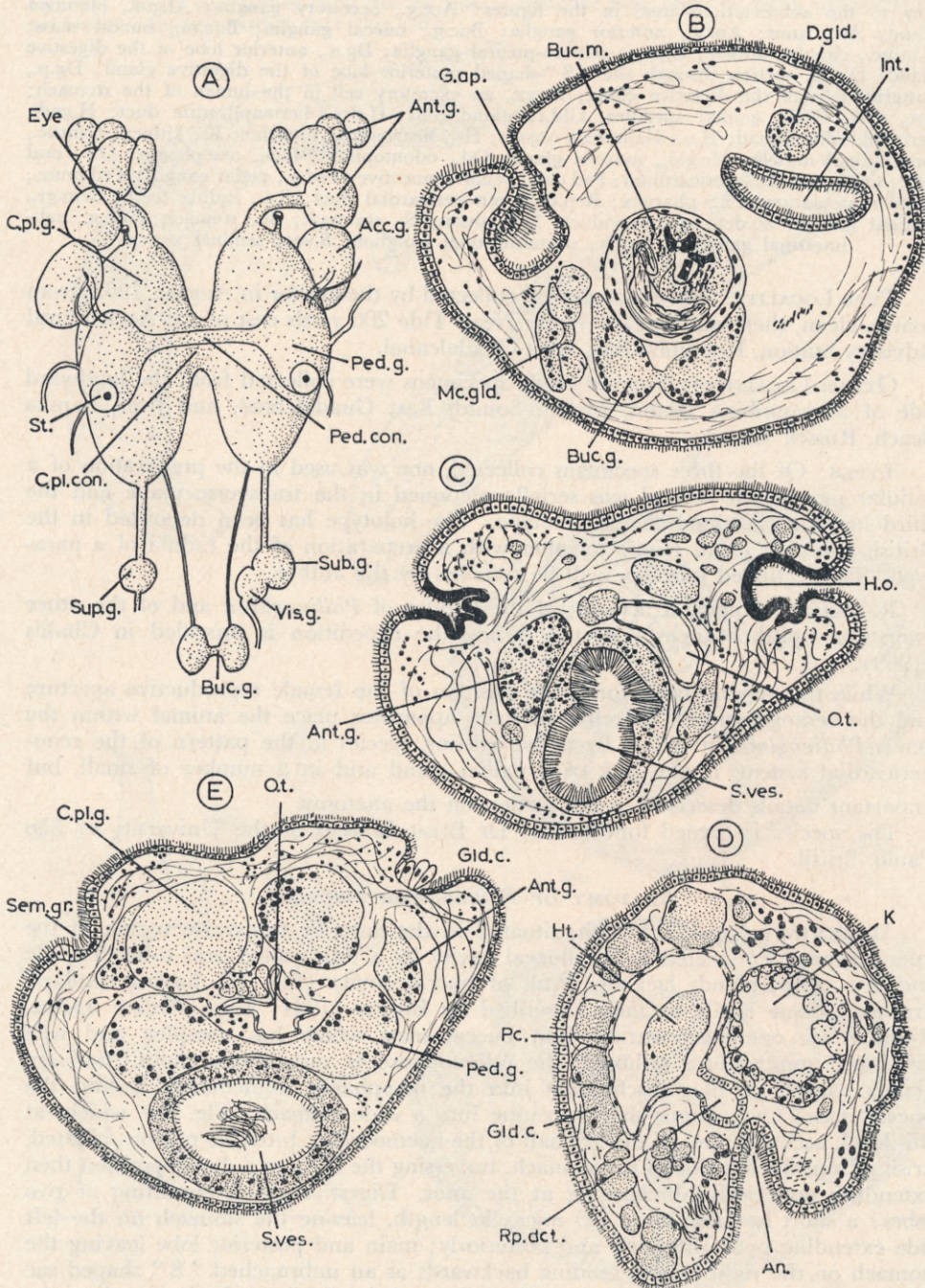


FIG. 2.—*Philinoglossa marcusii* n.sp. A. The central nervous system from the ventral aspect. B. A transverse section at the level of the genital aperture showing the buccal ganglia, the anterior transverse region of the intestine and the anterior region of the mucous and digestive glands. C. A transverse section through the anterior end showing the seminal vesicle, the Hancock's organs and the anterior ganglia. D. A transverse section through the anus showing the pericardium with the heart, the kidney, the renopericardial duct and the hypobranchial gland remnant. E. A transverse section through the central nervous system showing cerebropleural, pedal and anterior ganglia, the seminal vesicle and seminal groove.

coalesced. A pair of prominent accessory ganglia supplying the Hancock's organs (Fig. 2c), situated in the anterior lateral grooves, lie anteriorly on either side of the cerebro-pleural ganglia and are connected to the pedal ganglia. Anteriorly a chain of ganglia similar to those commonly found in the Acochlidiacea is present: nerves from these supply the mouth, anterior foot and epidermis of the head. Eyes carried on short optic stalks connected directly to the cerebro-pleural ganglia. Pedal ganglia linked ventrally beneath the oral tube by a long, narrow pedal connective. Statocysts, each containing a single statolith, situated on the posterior end of the pedal ganglia but supplied with nerves from the cerebro-pleural ganglia. Buccal ganglia closely linked, situated immediately below the buccal mass at the level of the genital aperture, connected to the cerebro-pleural ganglia by a pair of very fine nerves closely following the alimentary canal (Fig. 2b). Visceral loop longer than that described for *P. helgolandica* and, unlike the arrangement in that animal, the sub-intestinal and visceral ganglia are closely connected. Supra-intestinal ganglion lying opposite the sub-intestinal ganglion on the right side and connected to the cerebro-pleural ganglia by a large nerve. The completion of the visceral loop was not found nor was it possible from the single available specimen to reconstruct the finer details of the nervous system.

RENOPERICARDIAL SYSTEM: Renopericardial system (Fig. 2d) restricted to extreme posterior end of the animal, but unlike those *Philineglossidae* from which it has been described, *P. helgolandica* and *Sapha amicorum*, the kidney is confined to the left side and connected to the pericardium by a transverse renopericardial duct. Heart unchambered, anterior aorta lacking. Renal aperture situated ventrally a short distance behind the anus.

REPRODUCTIVE SYSTEM (Fig. 3a): Hermaphrodite gonad lying dorsally above the digestive gland, filling the dorsal body cavity from a point a short distance behind the genital opening to anterior end of the kidney, composed of numerous follicles discharging into a winding hermaphrodite duct. No absolute division of the gonad into male and female areas, production of oocytes and sperms occurring simultaneously in slightly different regions of single follicles (Fig. 3b). Gonad folded and branched in a most complicated way, many of the tubes of which it is composed anastomosed and forming a reticular network. No atrium; instead the follicles join the hermaphrodite duct at all levels. It was not possible from the single specimen available to reconstruct the detailed topography of the gonad. Hermaphrodite duct discharging directly into an albumen gland taking the form of a short, wide ciliated tube with histologically distinctive walls (Fig. 3d). This discharges, in turn, into the mucous gland which extends anteriorly as a wide ciliated tube for a short distance then folds into a simple S-shape (Fig. 3c) before joining the efferent duct. Where the gland folds, the lumen of the sperm-oviduct displaced towards the extreme periphery of the organ taking the form of a very heavily ciliated channel or gutter isolated from the body cavity only by long cilia. Sperm-oviduct displaced at its anterior extremity to the centre of the mucous gland so that it is totally enclosed before joining the efferent genital duct. Efferent duct a closed posterior extension of the right lateral groove into which the genital products discharge. Vagina lacking, bursa copulatrix lacking. Seminal groove extending forward within right lateral groove joining anterior transverse groove of the head.

Efferent male apparatus simple. No prostate gland, autosperm retained in a large, thick-walled seminal vesicle situated ventrally in the anterior region of the body (Fig. 2c and 2e). No penis, seminal vesicle joining the oral tube immediately before it opens to the anterior lateral groove. The absence of any mechanism for the retention and manipulation of foreign sperm and the lack of any system of ducts providing access to a fertilisation site suggests that fertilisation may occur in the region of the mucous gland where descending ova are separated from the body cavity only by the heavy ciliation of the sperm-oviduct. Equally the lack of a penis suggests that autosperm are transmitted during copulation in a spermatophore.

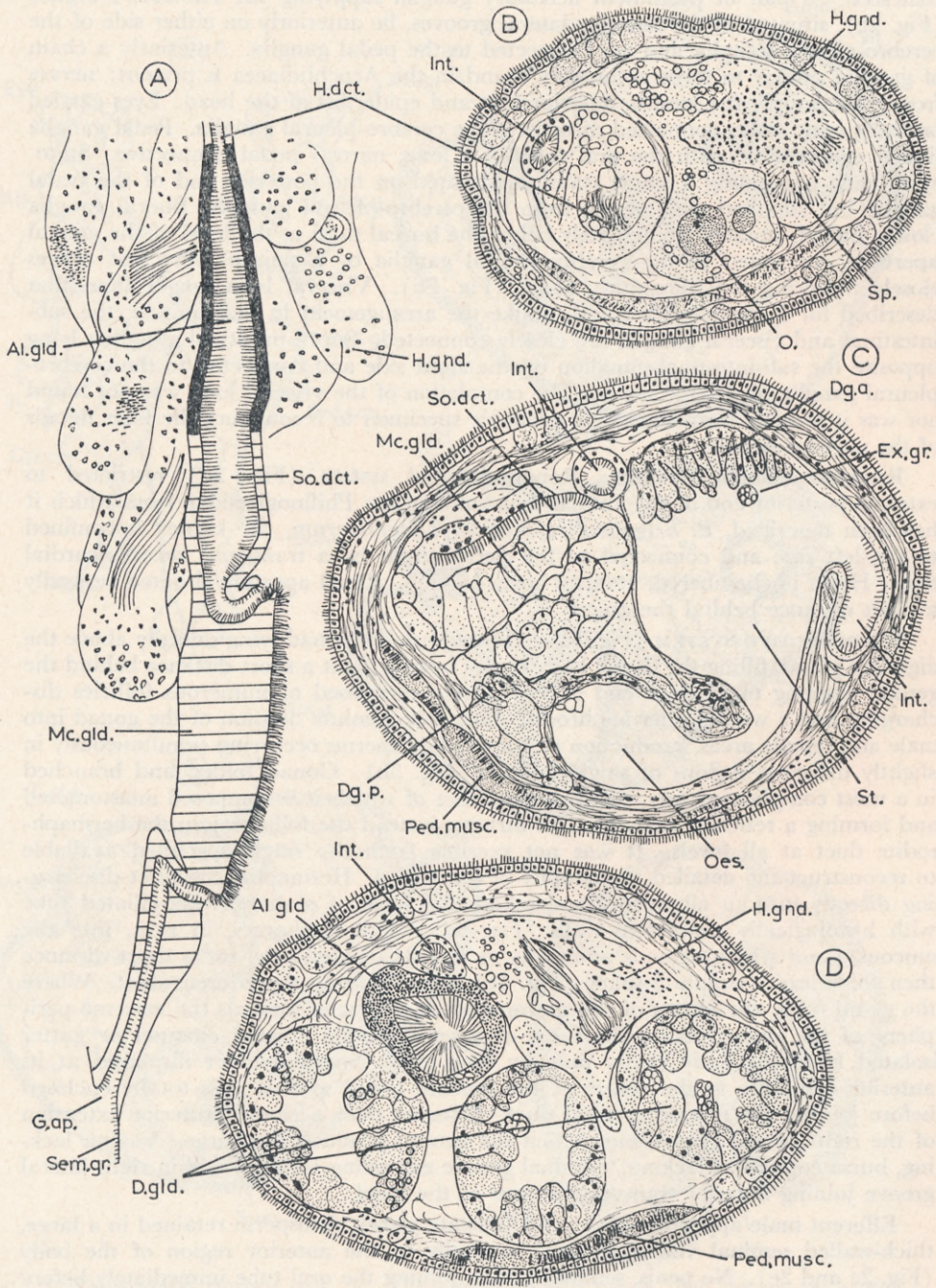


FIG. 3.—*Philinoglossa marcusi* n.sp. A. A reconstruction of the reproductive system. B. A transverse section through the gonad showing ova and sperm *in situ*, the hermaphrodite duct and the intestine. C. A transverse section through the stomach showing the junction with the intestine and digestive gland and the mucous gland. D. A transverse section through the albumen gland, hermaphrodite duct and digestive gland.

MANTLE CAVITY: Unlike *Pluscula* the mantle cavity together with its gill and sense organs has completely disappeared in *Philinoglossa helgolandica* and *Sapha amicorum* leaving only the pallial gland as a remnant. In *P. marcusii* the process of reduction has advanced even further, for the pallial gland is also absent. The sole remnant of the mantle cavity appears to be the group of large gland cells concentrated beneath the lateral epidermis of the right side in the region of the heart (Fig. 2d). It is probable that these cells are all that remains of the hypobranchial gland.

DISCUSSION

It is clear not only that the present animal is a species of *Philinoglossa* but also that, while it is specifically distinct, it differs from *P. helgolandica* and *P. remanei* only in details of the internal anatomy.

ACKNOWLEDGMENTS

I am grateful to the Royal Society of London for their invitation to participate in the B.S.I.P. Expedition, the South Pacific Research Programme Committee for granting funds which enabled me to do so. I thank Professor J. E. Morton of the University of Auckland, the Leader of the Marine Party, for his encouragement and advice during the expedition and Dr M. C. Miller for his interest in this work.

I thank Mrs M. Borowska of the University of Auckland Library who translated Marcus E. (1959), Marcus Ev. and E. (1954) and Hertling H. (1932).

LITERATURE CITED

- BROWN, H. H., 1934. A study of a tectibranch gastropod mollusc *Philine aperta*. *Trans. R. Soc. Edin.* 58, 1(a): 179–210.
- CHALLIS, D. A., 1969. An ecological account of the marine interstitial opisthobranchs of the British Solomon Islands Protectorate. *Phil. Trans. R. Soc. B.* 255: 343–56.
- HERTLING, H., 1932. *Philinoglossa helgolandica*, n.g., n.sp., ein neuer Opisthobranchier aus der Nordsee bei Helgoland. *Wiss. Meeresunters. Abt. Helgoland*, 19, II: 1–9.
- HOFFMANN, H., 1933. Opisthobranchia. Bonn, Kl. Ordn. Tierreichs 3 (Mollusca) 2 Abtlg. (Gastropoda) 3 Buch (Opisthobranchia): 153–312.
- MARCUS, E., 1953. Three Brazilian sand Opisthobranchs. *Bolm Fac. Filos. Cienc. Univ. S. Paulo*, 18: 165–203.
- 1959. Eine Neue Gattung der Philinoglossacea. *Kieler Meeresforsch.*, 15: 117–19.
- MARCUS, EV.; MARCUS, E., 1954. Über Philinoglossacea und Acochliadiaea. *Kieler Meeresforsch.*, 10(2): 215–23.
- 1958. Opisthobranchier aus dem Schill von Helgoland. *Kieler Meeresforsch.*, 14: 91–96.
- PRUVOT-FOL, A., 1954. Mollusques Opisthobranches. *Faune de France*, 58, Paris, 460 pp.
- THIELE, J., 1931. *Handbuch der systematischen Weichtierkunde* v. 1 u. 2 VIu. Jena.

MR D. A. CHALLIS,
Department of Zoology,
University of Auckland,
Auckland.