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### **Bicentenary of Ludwig Leichhardt: Contributions to Australia's Natural History in honour of his scientific work exploring Australia**

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# ***Paradiscogaster leichhardti* sp. nov. (Digenea: Faustulidae) in *Chaetodontoplus meredithi* (Perciformes: Pomacanthidae) from Heron Island, Great Barrier Reef**

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## **ABSTRACT**

*Paradiscogaster leichhardti* sp. nov. (Digenea: Faustulidae) is described from the intestine of *Chaetodontoplus meredithi* (Perciformes: Pomacanthidae) from the southern Great Barrier Reef. The new species is distinguished by its elongate, spindle-shaped body and vitellarium which forms separate groups at the level of the anterior and posterior ends of the cirrus-sac. This is the second species of *Paradiscogaster* reported from pomacanthid fishes. □ *Paradiscogaster leichhardti*, *Chaetodontoplus meredithi*, Heron Island, Great Barrier Reef.

This volume of the *Memoirs of the Queensland Museum* celebrates the bicentenary of the birth of the distinguished Prussian explorer and naturalist Ludwig Leichhardt, (1813 – c.1848). Leichhardt was one of several important early explorers of inland Australia and, like many of his contemporaries, his interests in natural history were very broad. However, he was exceptional in having his interests extend to the parasites found in Australian native animals. The journal of his 1844-5 expedition from Moreton Bay in south-east Queensland to Port Essington in the Northern Territory refers to a trematode from the Dawson River as follows:

*The water holes abounded with jew-fish and eels; of the latter we obtained a good supply, and dried two of them, which kept very well. Two species of Limnaea [sic], the one of narrow lengthened form, the other shorter and broader; a species of Paludina, and Cyclas and Unios, were frequent. The jew-fish has the same distoma in its swimming bladder,*

*which I observed in specimens in the Severn River to the southward of Moreton Bay: on examining the intestines of this fish they were full of the shells of Limnea and Cyclas.*

The “jew-fish” referred to here was undoubtedly *Tandanus tandanus* Mitchell, the common Australian freshwater catfish. The “distoma” was almost certainly *Isoparorchis hypselobagri* (Billet, 1898) (Isoparorchidae) the largest and most striking trematode yet reported from an Australian freshwater fish, growing as it does to several cm in length (Johnston 1927; Cribb 1988). The species was described from Australia as *Isoparorchis tandani* Johnston, 1927 but is presently known under the name *I. hypselobagri*. We note that Leichhardt’s keen observations on the diet of the fish would have led him to excellent work in the elucidation of trematode life cycles in another era and with different opportunities. In these circumstances it is our pleasure to celebrate his achievements

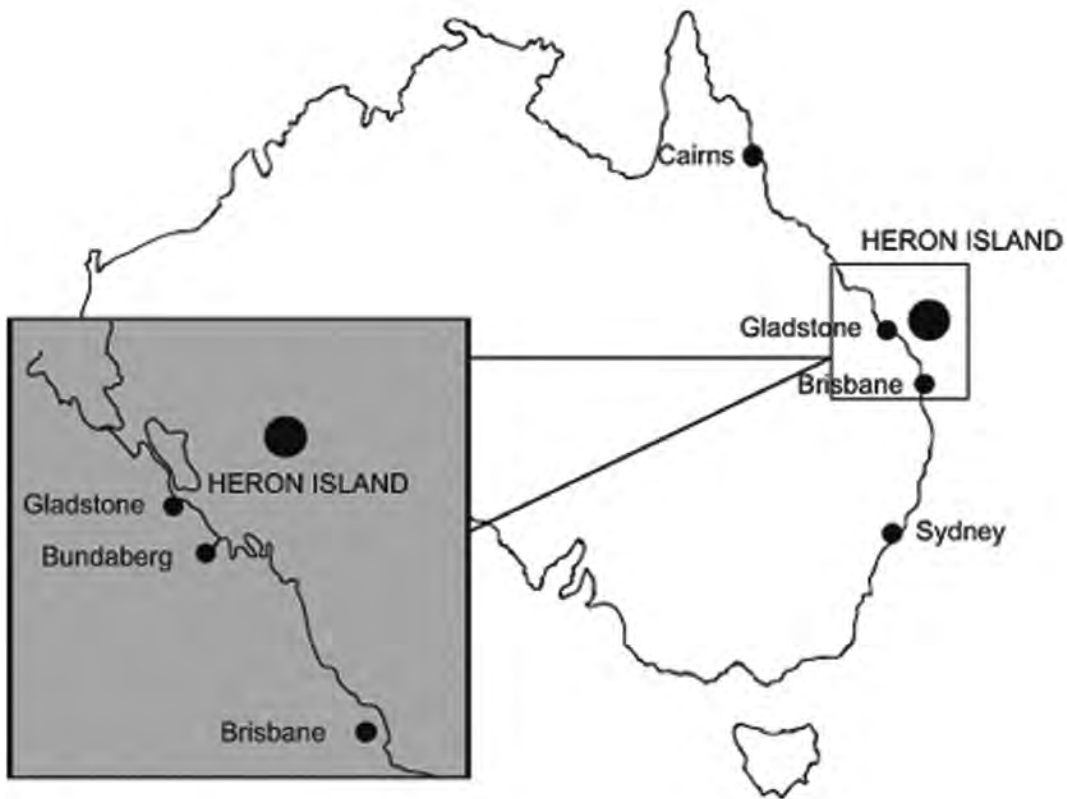


FIG. 1. Position of Heron Island, Queensland.

by the description of a trematode species in his honour.

*Paradiscogaster* Yamaguti, 1934 is the largest genus in the trematode family Faustulidae. It was proposed by Yamaguti (1934) with *Paradiscogaster pyriformis* Yamaguti, 1934 as the type-species. Species of *Paradiscogaster* are known from 13 families of fishes of which seven, the Carangidae, Chaetodontidae, Drepaneidae, Monacanthidae, Ostraciidae, Pomacanthidae and Triacanthidae, each have more than one species. This study describes a new species of *Paradiscogaster* found in the pomacanthid *Chaetodontoplus meredithi* Kuitert, 1990. The Pomacanthidae is infected by one other species of *Paradiscogaster*, *P. machidai* Cribb, Anderson & Bray, 1999 reported from *Pomacanthus*

*semicirculatus* (Cuvier, 1831) and *P. sexstriatus* (Cuvier, 1831) (Cribb *et al.* 1999).

#### MATERIALS AND METHODS

Trematodes were collected from freshly-killed fish hosts from off Heron Island (23° 26' 31" S, 151° 54' 50" E), Great Barrier Reef (Fig. 1). Specimens were fixed by pipetting them into near boiling saline followed by immediate preservation in 5% formalin for morphological study (Cribb & Bray 2010). The worms were washed with fresh water, stained with Mayer's haematoxylin, destained with 1% HCl, neutralized with NH<sub>3</sub>, dehydrated in a graded series of ethanol (50%, 75%, 90%, 95% and 100%), and cleared using methyl salicylate. Specimens were then mounted on slides with Canada

balsam. Measurements were taken using an Olympus BH-2 microscope with a calibrated eyepiece micrometer and Spot Insight™ digital camera (Diagnostic Instruments, Inc.) using SPOT™ imaging software. Worms were drawn using a drawing tube, Intuos3 9×12 and Intuos4 6×9 graphics tablets and Adobe Illustrator and Photoshop CS4 software. All measurements are in micrometers (µm) and are given as the range followed by the mean in parentheses.

#### SYSTEMATICS

**Phylum:** Platyhelminthes

**Class:** Trematoda

**Order:** Plagiorchiida

**Family:** Faustulidae Poche, 1926

***Paradiscogaster leichhardti* sp. nov.**

(Fig. 2)

**Etymology.** The species is named for Ludwig Leichhardt (1813–c.1848) an early explorer and naturalist in inland Australia.

**Type host.** *Chaetodontoplus meredithi* (Cuvier, 1831) (Perciformes: Pomacanthidae).

**Other hosts.** nil

**Type-locality.** off Heron Island, Great Barrier Reef, Australia (23° 26' 31" S, 151° 54' 50" E).

**Site in host.** Intestine.

**Prevalence.** 2 of 29

**Type-specimens.** Holotype - G234287; Paratypes - G234288-234291

**Description.** [Measurements are of 5 gravid specimens.] Body elongate, fusiform, 1722–1912 (1831) × 450–543 (508) (Fig. 2). Tegument spinose and 10–16 thick; spines reaching into anterior hindbody. Forebody 647–747 (692) long, occupying 34.8–41.8 (40.6)% of body length. Oral sucker subglobular, sub terminal, 135–168 (157) × 162–178 (172). Prepharynx short, distinct, always within posterior cavity of oral sucker. Pharynx small, oval, longer than wide, 44–53 (48) × 28–30 (29). Oesophagus 129–391 (260) long. Caeca short, saccular, terminate in forebody, 302–328 (315) long. Ventral sucker large and distinctly

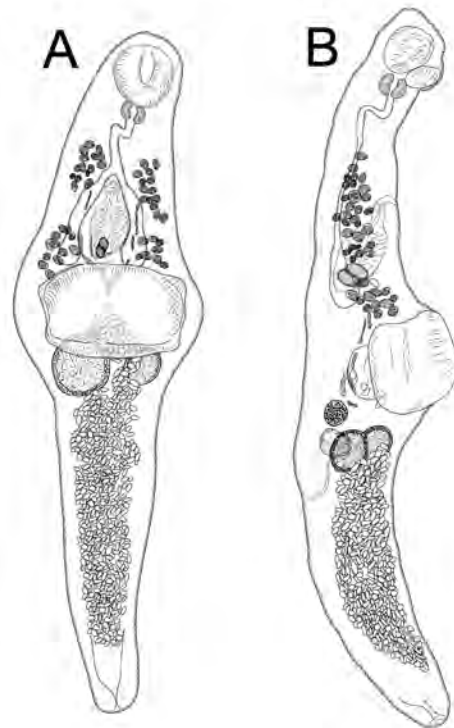


FIG. 2. *Paradiscogaster leichhardti* sp. nov. A, ventral view; B, lateral view. Scale Bar 200 µm.

squared, without anterior or posterior semi-circular muscular appendage, in mid-body, 226–272 (248) × 364–411 (387).

Testes subglobular, opposite, reach to near or overlap posterior margin of ventral sucker; left testis 105–177 (130) × 95–154 (111); right testis 91–122 (106) × 81–97 (88). Cirrus-sac entirely in forebody, 175–220 (192) × 102–137 (119). Internal seminal vesicle bipartite. Pars prostatica narrow, ensheathed by 2 concentric layers, inner with anuclear cell-like bodies and filaments, outer with gland-cells. Ejaculatory duct short. Cirrus small, papilla-like. Genital atrium distinct. Genital pore median, just posterior to intestinal bifurcation.

Ovary subglobular, pre-testicular, at level of ventral sucker, slightly sinistral, separated from testes by uterus or not depending on development of uterus, 61–69 (65) × 68–84 (74). Canalicular

seminal receptacle, rounded, dorsal to testes. Laurer's canal opens dorsally just posterior to testes, sometimes on slight protuberance. Vitelline follicles distributed in two lateral groups; anterior group centred on level of anterior margin of cirrus-sac and intestinal bifurcation to the caeca; posterior group centred on level of posterior margin of cirrus-sac. Uterine coils extensive in hindbody to close to posterior extremity, not at all developed in forebody. Eggs numerous, tanned, operculate, 23–28 (26) × 13–14 (13.5). Excretory pore terminal. Excretory vesicle obscured by eggs in all specimens.

### DISCUSSION

This species clearly agrees with *Paradiscogaster* as conceived by Bray (2008). This genus has grown to 22 species of which the greatest concentration (6 species) occur in chaetodontids (Bray *et al.* 1994; Cribb *et al.* 1999). The current species is clearly distinct within the genus in the body form, being elongated and narrow but widest at the level of the ventral sucker. The vitelline follicles are unique in being distributed laterally in two groups at the level of the anterior and posterior ends of the cirrus-sac.

The Pomacanthidae has some importance as hosts of faustulids. Three genera have been reported. *Antorchis* Linton, 1911 is represented by three species, *Paradiscogaster* is represented by two species (including *P. leichhardti* sp. nov.), and *Pseudobacciger* Nahhas & Cable, 1964 by just one species which is also reported from non-pomacanthids, mainly clupeids and engraulids (Madhavi 1975; Margolis 1965; Korotaeva 1969; Dimitrov *et al.* 1999; Gaevskaya 1996; Chun *et al.* 1981; Chun & Kim 1982). Despite the richness of the genus *Chaetodontoplus*, 14 species according to Froese and Pauly (2013), only one has previously been reported as a host for faustulids; *Chaetodontoplus septentrionalis* (Schlegel, 1844) is reported to harbour *A. tsushimaensis* (Machida 1971) Machida 1975 in Japanese waters (Machida 1971; Machida 1975).

Our records suggest that *P. leichhardti* sp. nov. may be specific to *Chaetodontoplus meredithi* in that we have found it in 2 of 29 specimens of that species at Heron Island, but none of 24

individuals of four species of *Centropyge* or nine individuals of two species of *Pomacanthus*. Both *Pomacanthus* species, *P. semicirculatus* and *P. sexstriatus*, are regularly infected by *Antorchis pomacanthi* (Hafeezullah & Siddiqi, 1970) and *Paradiscogaster machidai* at Heron Island (Cribb *et al.* 1999).

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