

Notopronocephalus peekayi gen. et sp. n. (Digenea: Pronocephalidae) from Australian freshwater turtles

Thomas H. Cribb¹ and Sylvie P. Pichelin²

¹ Department of Parasitology, University of Queensland, Brisbane, Queensland 4072, Australia;

² South Australian Museum, North Terrace, Adelaide, South Australia 5000, Australia

Abstract. *Notopronocephalus peekayi* gen. et sp. n. is described from the intestine of *Elseya latisternum* Gray, 1867, *E. dentata* (Gray, 1863) and *Emydura signata* Ahl, 1932 from rivers in Queensland. The new genus is distinguished by the absence of ventral glands, simple (neither diverticulate nor sinuous) caeca terminating at the anterior margin of the testes, excretory arms not uniting in forebody, single ovary, two opposite testes close to the posterior end of the body, intra-acaecal genital pore, vitelline follicles anterior to the testes, cirrus-sac orientated obliquely and not divided into two portions, and the uterus intra-acaecal. This is the first pronocephalid to be described from an Australian freshwater turtle and the first from the family Chelidae.

The Pronocephalidae Looss, 1902 is one of the main families of trematodes found in turtles. The greatest numbers of species are found in marine turtles but species have been reported previously from fresh waters of North and South America, Africa, Asia and Europe. Hitherto, however, no pronocephalids have been recorded from Australian freshwater turtles. Australia has a fauna of about 18 species of turtles from two families, the Chelidae and Carretochelidae. This paper reports a pronocephalid collected from three species of chelid turtles from Queensland.

MATERIALS AND METHODS

Turtles were caught in baited traps, on lines or in beach seine nets and killed by a lethal dose of sodium pentobarbital. Trematodes were removed from the alimentary tract, washed in normal saline, and fixed in near boiling formalin. Specimens were stained with Mayer's haematoxylin, cleared in methyl salicylate and mounted in Canada balsam. Sections were cut at 7 µm and stained with Mayer's haematoxylin and eosin. Measurements are given in micrometres with means in parentheses. Figures were drawn with the aid of a drawing tube.

Abbreviations: QM – Queensland Museum, Brisbane; AHC – Australian Helminthological Collection at the South Australian Museum, Adelaide; IPCAS – Institute of Parasitology, České Budějovice.

RESULTS

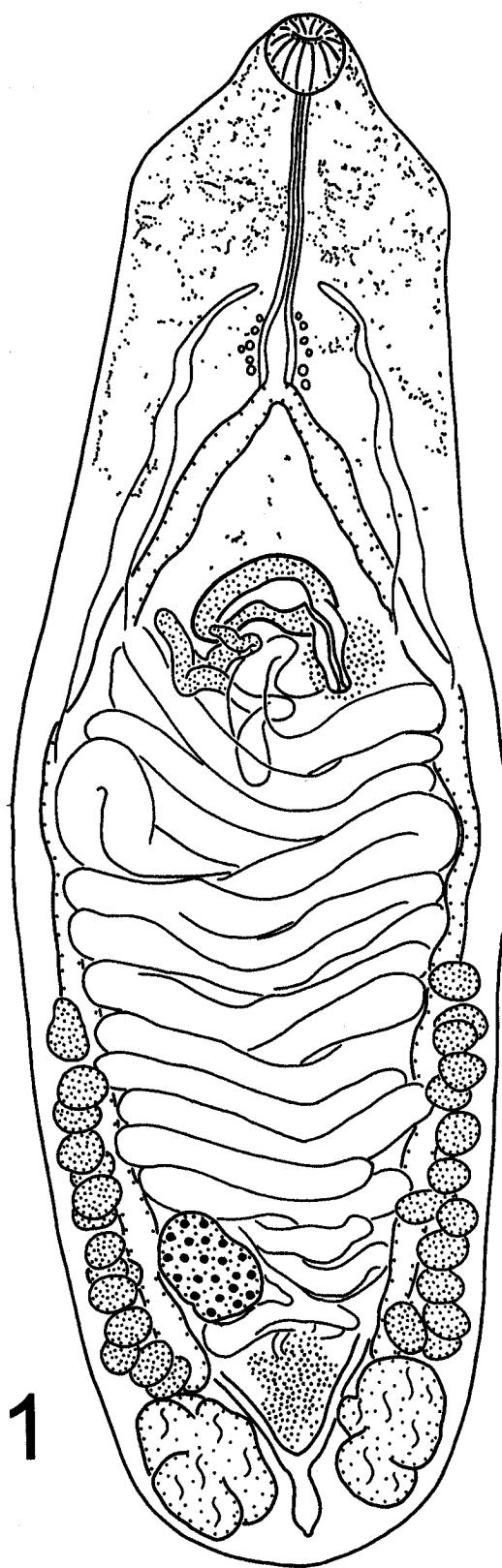
Notopronocephalus gen. n.

Pronocephalidae, Pronocephalinae. Body elongate oval, flattened, without posterior projections. Tegument

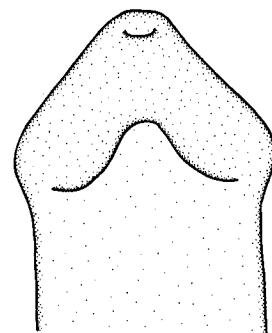
smooth. Head collar present. Oral sucker opens subterminally. Oesophagus distinct. Caeca simple, terminate close to testes. Excretory vesicle Y-shaped; stem short; arms terminate separately at level of oesophagus. Excretory pore dorso-subterminal. Testes 2, symmetrical, lobed, at posterior end of body. Cirrus-sac intercaecal, orientated obliquely or transverse relative to body, contains narrow muscular duct leading to *pars prostatica* and distinct eversible ejaculatory duct. External seminal vesicle tubular. Male genital pore intra-acaecal, sinistro-medial. Ovary entire to slightly lobed, dextrally intercaecal. Uterine seminal receptacle present. Laurer's canal absent. Mehlis' gland median, posterior to ovary and between testes. Vitelline reservoir median. Vitelline follicles extend anteriorly from testes along lateral margins in posterior half of body. Uterine coils predominantly intercaecal, between ovary and metraterm; small loops may run between ovary and testes; metraterm short, muscular. Female genital pore opens close to but independent of male pore. Eggs with single filament at each pole.

Notopronocephalus peekayi sp. n. Figs. 1–4

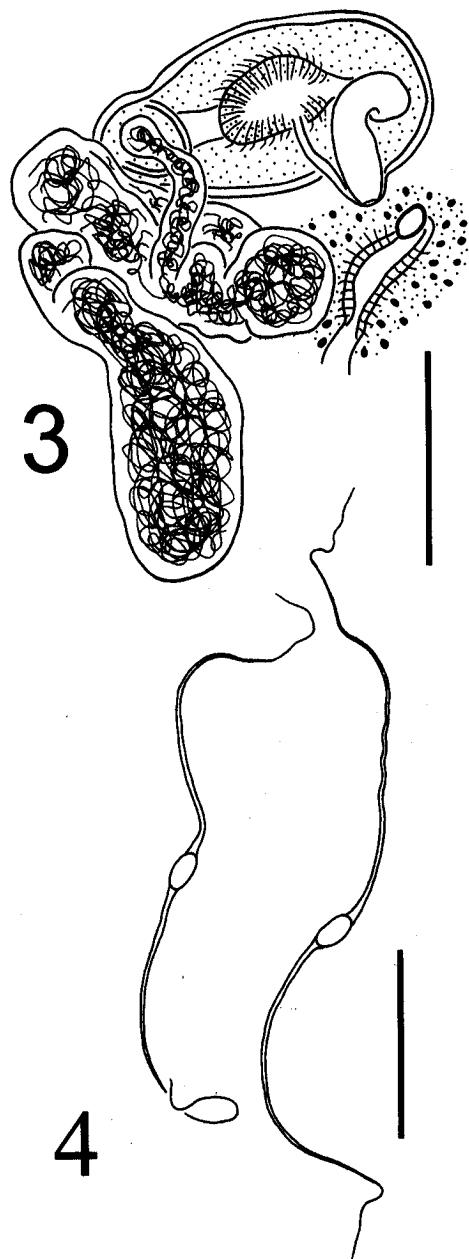
Description (measurements from three different hosts given in Table 1): Body elongate oval, strongly flattened, broadest in mid-body. Tegument completely smooth. Head collar not strongly developed but appears variable depending on state of contraction (Figs. 1, 2). Paired caudal projections absent. Pigment distributed throughout body, most concentrated around oral sucker and head collar. Oral sucker opens ventro-subterminally. Oesophagus distinct, widest posteriorly, surrounded by distinct gland cells at junction with caeca. Caeca



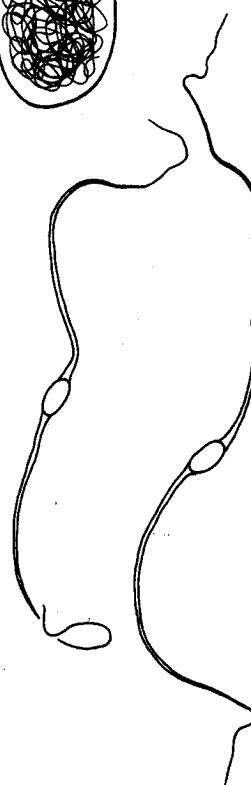
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3



4



Figs. 1–4. *Notopronocephalus peekayi* gen. et sp. n. **Fig. 1.** Adult from *Elseya latisternum*, cirrus everted, ventral. Scale bar = 200 μ m. **Fig. 2.** Head collar, ventral. **Fig. 3.** Cirrus-sac, ventral. Scale bar = 100 μ m. **Fig. 4.** Eggs. Scale bar = 100 μ m.

Table 1. Measurements of *Notopronocephalus peekayi* sp. n. from different hosts.

	<i>Elseya latisternum</i> n = 8	<i>Emydura signata</i> n = 8	<i>Elseya dentata</i> n = 8
Body length	890-1432 (1240)	755-1555 (1224)	896-1536 (1302)
Body width	252-445 (379)	271-385 (337)	340-512 (424)
Length/width	2.98-4.36 (3.34)	2.79-4.17 (3.60)	2.61-3.69 (3.06)
Oral sucker length	63-76 (68)	57-93 (72)	71-93 (83)
Oral sucker width	59-69 (63)	53-82 (68)	74-90 (80)
Oesophagus length	210-271 (244)	168-289 (245)	225-424 (337)
Genital pore from anterior end	392-584 (510)	323-578 (481)	449-674 (596)
Cirrus sac length	116-161 (136)	109-161 (145)	128-228 (174)
Cirrus sac width	48-72 (56)	42-80 (62)	48-74 (64)
Ovary length	57-110 (83)	53-107 (88)	64-125 (104)
Ovary width	46-99 (76)	61-96 (78)	48-119 (85)
Testes length	76-145 (123)	95-217 (145)	100-193 (154)
Testes width	57-137 (92)	69-191 (103)	61-138 (99)
Testes to anterior end	735-1238 (1059)	629-1336 (1026)	736-1368 (1117)
Testes to posterior end	19-57 (39)	15-67 (39)	29-64 (47)
Vitellarium to anterior end	571-871 (775)	464-968 (747)	559-982 (877)
Vitellarium to posterior end	115-177 (152)	108-223 (168)	103-224 (187)
Caeca from posterior end	114-168 (150)	80-217 (167)	80-202 (154)
Egg length	20-27 (23)	20-25 (23)	21-24 (22)
Egg width	10-12 (11)	9-14 (12)	10-13 (12)

simple, neither sinuous nor diverticulate, terminate immediately anterior to or just overlapping antero-dorsal margin of testes. Excretory vesicle Y-shaped; bifurcation at level of mid-testes; arms of excretory vesicle merge smoothly with excretory system proper, terminate slightly anterior to caecal bifurcation. Excretory pore slightly dorso-subterminal. Testes 2, symmetrical, distinctly lobed, at posterior end of body. Cirrus-sac inter-caecal, orientated obliquely to almost transverse relative to body, with distal end bending posteriorly, contains narrow muscular duct leading to swollen *pars prostatica* and distinct eversible ejaculatory duct. External seminal vesicle tubular, winding posteriorly from posterior end of cirrus-sac. Male genital pore opening close to but independent of female pore, slightly sinistrally submedian near middle of body. Ovary entire to slightly lobed, dextrally intercaecal. Uterine seminal receptacle present. Laurer's canal absent. Mehlis' gland median, posterior to ovary and between testes. Vitelline reservoir median, dorsal to Mehlis' gland. Vitelline follicles extend anteriorly from anterior margin of testes to middle of uterine field. Uterine coils predominantly intercaecal, occasionally bulge extra-caecally, transverse, extend between ovary and metraterm; at least one loop may run between ovary and testes; metraterm short,

muscular, surrounded by prominent gland cells. Female genital pore slightly posterior and sinistral to male pore. Eggs with single filament at each end.

Type material: Holotype ex intestine of *Elseya latisternum* (Chelidae) (type host), Moggill Ck., south-east Queensland, 27°30'S; 152°56'E (type locality), 17 Jan. 1990, S. Pichelin (AHC 27844).

Paratypes ex *E. latisternum*: 5, same data as holotype; 1, Moggill Ck., 20 Oct. 1986, T.H. Cribb; 1, Lockyer Ck., south-east Queensland, 27°35'S; 152°07'E, 3 Mar. 1991, S. Pichelin (AHC 27845-8; QM G 213521-3; IPCAS D-377).

Paratypes ex *Emydura signata*: 7, Pinjarra Hills, Brisbane, south-east Queensland, 27°32'S; 152°54'E, 1990-1, S. Pichelin; 1, Lockyer Ck., south-east Queensland, 3 Mar. 1991, S. Pichelin (AHC 27849-54; QM G 213524-5).

Paratypes ex *Elseya dentata*: 7 Fitzroy Riv., Queensland 23°09'S; 149°55'E, Oct. 1981, J. Parmenter (AHC 27855-8; QM G 213526-8).

Other material: numerous (including 5 sets of serial sections) ex *E. latisternum* and *E. signata* from localities as above and Kholo Crossing, Brisbane River, south-east Queensland, 27°34'S; 152°45'E and College's Crossing, Brisbane River, south-east Queensland, 27°34'S; 152°48'E.

Site in host: intestine.

DISCUSSION

We compared this species with all nominal genera of *Pronocephaloidea sensu* Groschaft and Tenora (1981). The combination of absence of ventral glands, simple (neither diverticulate nor sinuous) caeca terminating at the level of the anterior margin of the testes, excretory arms not uniting in forebody, ovary single, testes opposite and close to the posterior end of the body, genital pore intracaecal, vitelline follicles anterior to the testes, cirrus-sac orientated transversely and not divided into two portions, and the uterus intracaecal distinguishes it from all genera. Combinations of these characters have been used previously to recognise genera within the *Pronocephalidae* (e.g., Groschaft and Tenora 1981). Accordingly, we propose the new genus *Notopronocephalus* for this species.

According to the classification given by Groschaft and Tenora (1981), this species falls into the subfamily *Pronocephalinae* Looss, 1902. Of the 15 genera they recognised in this subfamily, *Notopronocephalus* is closest to *Parapleurogonius* Sullivan, 1976 and *Epibathra* Looss, 1902. The new genus differs from *Epibathra* which has diverticulate caeca and the genital pore extra-caecal, and from *Parapleurogonius* which has the genital pore ventral to the left caecum and the excretory arms united dorsal to the oesophagus. In addition, the collar of *Parapleurogonius* is much more strongly developed than that of *Notopronocephalus*.

Pérez Ponce de León and Brooks (1995) published a phylogenetic analysis of 20 genera of *pronocephalids* that they considered valid. This analysis led to their recognition of three subfamilies, the *Adenogasterinae* Pérez Ponce de León et Brooks, 1995, *Charaxicephalinae* Price, 1931 and *Pronocephalinae*. In terms of the characters identified by Pérez Ponce de León and Brooks (1995), *Notopronocephalus* does not agree well

with any of these subfamilies. It differs from the *Pronocephalinae* in having the testes at the posterior end of the body, from the *Charaxicephalinae* in lacking both the posterior projections and a truncated posterior end, and from the *Adenogasterinae* in having Mehlis' gland posterior to the ovary and lacking a long and straight *ductus Caballeroi*. Despite this lack of strict agreement with any of Pérez Ponce de León and Brooks' subfamilies, the new genus is clearly most closely aligned with their clade within the *Charaxicephalinae* that includes *Pleurogonius* Looss, 1901, *Renigonius* Mehra, 1939, *Parapleurogonius*, *Iguanacola* Gilbert, 1938, *Himasomum* Linton, 1910, *Pyelosomum* Looss, 1899, *Cricocephalus* Looss, 1899, *Barisomum* Linton, 1910 and *Pseudobarisomum* Siddiqi and Cable, 1960. [Most of these genera were included in the *Pronocephalinae* by Groschaft and Tenora (1981).] We note that, of these genera, the figures of species that we have examined show only *Cricocephalus* possesses obviously the subfamily synapomorphies of "posterior body projections and truncated posterior ends". We have discussed this inconsistency with D. Brooks (*in litt.*) and were advised that Pérez Ponce de León and he had been amazed by the differences between descriptions and actual specimens of *pronocephalids* examined for their study. Clearly the higher level taxonomy of the group is in need of further revision and clarification.

Pérez Ponce de León and Brooks (1995) used their analysis to infer that *pronocephalids* have colonised freshwater turtles from marine turtles on at least five separate occasions. The new species reported here would appear to represent a further such invasion.

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