

# *Hypoechinorhynchus robustus* sp. n. from *Notolabrus parilus* (Labridae) from Western Australia with a discussion on the validity of the Hypoechinorhynchidae (Acanthocephala: Palaeacanthocephala)

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**Abstract.** *Hypoechinorhynchus robustus* sp. n. is described from *Notolabrus parilus* (Richardson) (Labridae) from Pt Peron, Western Australia. It has a proboscis with 30 hooks arranged in ten longitudinal rows: 5 rows of a small apical spine, a large anterior hook and a small posterior spine, 5 rows of a large anterior hook, a middle spine and a posterior spine. The new species is distinguished from other species of the genus by having a set of 5 small apical spines anterior to the large hooks on the proboscis, by having lemnisci that barely extend beyond the proboscis receptacle and testes which are more adjacent than tandem. *H. robustus* also has robust trunk spines anteriorly. Re-examination of *Hypoechinorhynchus alaeopsis* Yamaguti, 1939 (type species) revealed trunk spines that had been overlooked previously. The Hypoechinorhynchidae is made a junior synonym of Arhythmacanthidae because there is considerable overlap between the two family diagnoses, particularly in that both families have a proboscis armature that changes abruptly from small basal spines to large apical (or subapical if present) hooks. The genus *Hypoechinorhynchus* is placed in the subfamily Arhythmacanthinae because it has trunk spines and a spherical proboscis with few hooks (relative to other arhythmacanthid genera). It is also proposed that *Heterosentis magellanicus* (Szidat, 1950) be returned to the genus *Hypoechinorhynchus* since it was transferred to *Heterosentis* primarily because it had trunk spines. The other hypoechinorhynchid genus contained only *Bolborhynchoides exiguus* (Achmerov et Dombrowskaja-Achmerova, 1941) Achmerov, 1959 and is relegated to *incertae sedis*.

Small acanthocephalans were found in the intestine of *Notolabrus parilus* (Richardson) (Labridae) during a study of the parasites of fishes off the coast of Western Australia. These acanthocephalans closely resembled species of the genus *Hypoechinorhynchus* (Hypoechinorhynchidae) but also possessed features of genera in the Arhythmacanthidae. An investigation into the validity of the Hypoechinorhynchidae was initiated along with a description of these specimens.

There are only four species of Hypoechinorhynchidae known (Amin 1985, de Buron 1988). One of these, *Hypoechinorhynchus alaeopsis* Yamaguti, 1939, has been found in *Callionymus calauropomus* and *Notolabrus tetricus* (as *Pseudolabrus tetricus*) in Australian waters (Johnston and Edmonds 1947, Edmonds 1989) in addition to its Japanese fish hosts, *Alaeops plinthus* and *Callionymus altivelis*, originally reported by Yamaguti (1939).

## MATERIALS AND METHODS

Acanthocephalans were removed from the intestines of fish, fixed in Berland's fluid (95% glacial acetic acid and 5% formalin) and stored in 70% ethanol. Specimens were stained with Mayer's haematoxylin, dehydrated through a graded series of alcohols, cleared with methyl salicylate and mounted

in Canada balsam. Some specimens were critical point dried, gold sputter-coated and viewed using an XL20 SEM operating at 5-20 kV. Drawings were made with the aid of a camera lucida. Measurements, presented as the range with the mean in parentheses, are given in micrometres. Large proboscis hooks were measured in profile only.

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

## RESULTS

*Hypoechinorhynchus robustus* sp. n. Figs. 1-8, Table 1

**Description** (measurements of males and females given separately in Table 1): Sexual dimorphism not observed; males and females about same size. Proboscis spherical, armed with 30 hooks arranged in 10 longitudinal rows: 5 rows of 1 small apical spine with slightly curved tip 12-18 (17) n = 24, 1 large anterior hook 83-111 (98) n = 74 with root 31-58 (48) n = 35, no middle spine, 1 posterior spine 20-36 (26) n = 55; other 5 rows with no apical spine, 1 large anterior hook, 1 middle spine 38-61 (49) n = 65 and 1 posterior spine. Trunk thick-walled, armed anteriorly, slight antero-

**Table 1.** Measurements of *Hypoechinorhynchus robustus* sp. n. from *Notolabrus robustus* (the ranges with the mean in parentheses, in  $\mu\text{m}$ ).

	Males n = 16		Females n = 19	
Apical spine	12-17 (16)	n = 13	17-18 (17)	n = 11
Anterior hook (= CI)	89-107 (97)	n = 35	83-111 (99)	n = 39
Anterior hook root	31-58 (45)	n = 15	41-58 (50)	n = 20
Middle spine (= CII)	41-56 (47)	n = 29	38-61 (51)	n = 36
Posterior spine (= CIII)	20-33 (25)	n = 23	20-36 (27)	n = 32
Trunk length	624-1165 (920)	n = 14	706-1149 (923)	n = 19
Trunk width	224-377 (308)	n = 13	250-509 (357)	n = 17
Proboscis length	129-145 (136)	n = 9	122-155 (136)	n = 10
Proboscis width	120-145 (130)	n = 9	118-149 (134)	n = 10
Proboscis receptacle length	184-349 (257)	n = 14	178-323 (265)	n = 19
Proboscis receptacle width	90-138 (114)	n = 13	87-142 (110)	n = 18
Distance trunk spines extend posteriorly from anterior margin of trunk	107-291 (208)	n = 5	162-210 (190)	n = 4
Lemnisci length	191-375 (269)	n = 24	194-375 (265)	n = 28
Lemnisci width	46-136 (85)	n = 23	52-103 (76)	n = 28
Testis 1 length	126-239 (162)	n = 14	–	–
Testis 1 width	84-194 (134)	n = 13	–	–
Testis 2 length	110-226 (148)	n = 13	–	–
Testis 2 width	103-197 (141)	n = 12	–	–
Safftigen's pouch length	94-245 (148)	n = 12	–	–
Safftigen's pouch width	84-178 (115)	n = 12	–	–
Cement glands width	42-100 (69)	n = 37	–	–
Bursa (everted) length	129	n = 1	–	–
Bursa (everted) width	171	n = 1	–	–
Egg length	–	–	41-56 (47)	n = 38
Egg width	–	–	8-15 (11)	n = 38

dorsal curvature. Trunk spines large and robust anteriorly, pointing posteriorly, extending from anterior end of trunk to level of mid-proboscis receptacle in a wedge or v-shape; ventral spines become smaller posteriorly and laterally; dorsal and posterior spines absent or not seen. Nuclei on trunk absent or not seen. Proboscis receptacle double-walled with cephalic ganglion at base. Lemnisci equal in length, broad, extend barely beyond posterior margin of proboscis receptacle. Male reproductive system tightly compacted. Testes round to oval, equatorial; anterior margin of one or both testes contiguous with posterior margin of proboscis receptacle, testes usually adjacent, not in tandem. Cement glands 6, pyriform; 3 ducts of cement glands unite into two lateral ducts. Safftigen's pouch surrounded by cement glands. Seminal vesicle thin-walled. Female genital pore subterminal, ventral. Eggs elongated, ovoid with polar extension of fertilization membrane, filaments not observed.

**Remarks:** The new species differs from *Hypoechinorhynchus alaeopsis* Yamaguti, 1939, *Hypoechinorhynchus magellanicus* Szidat, 1950 (see below), and *Hypoechinorhynchus thermaceri* de Buron, 1988) in having small apical spines anterior to the large hooks. Furthermore, the other species have lemnisci that extend well beyond the posterior margin of the proboscis receptacle. The testes in *H. robustus* are generally

opposite one another but in tandem in *H. alaeopsis* and *H. thermaceri*.

**Type specimens:** holotype ex intestine of *Notolabrus parilus* (Richardson, 1850) (Labridae) (QM G 216009), collector T. H. Cribb, 1994; paratypes ex intestine of *Notolabrus parilus* (Richardson, 1850) (Labridae) (QM G 216010-216016 n = 6; IPCAS A-66 n = 1), collector T. H. Cribb, 1994.

**Type host:** *Notolabrus parilus* (Richardson, 1850) (Labridae).

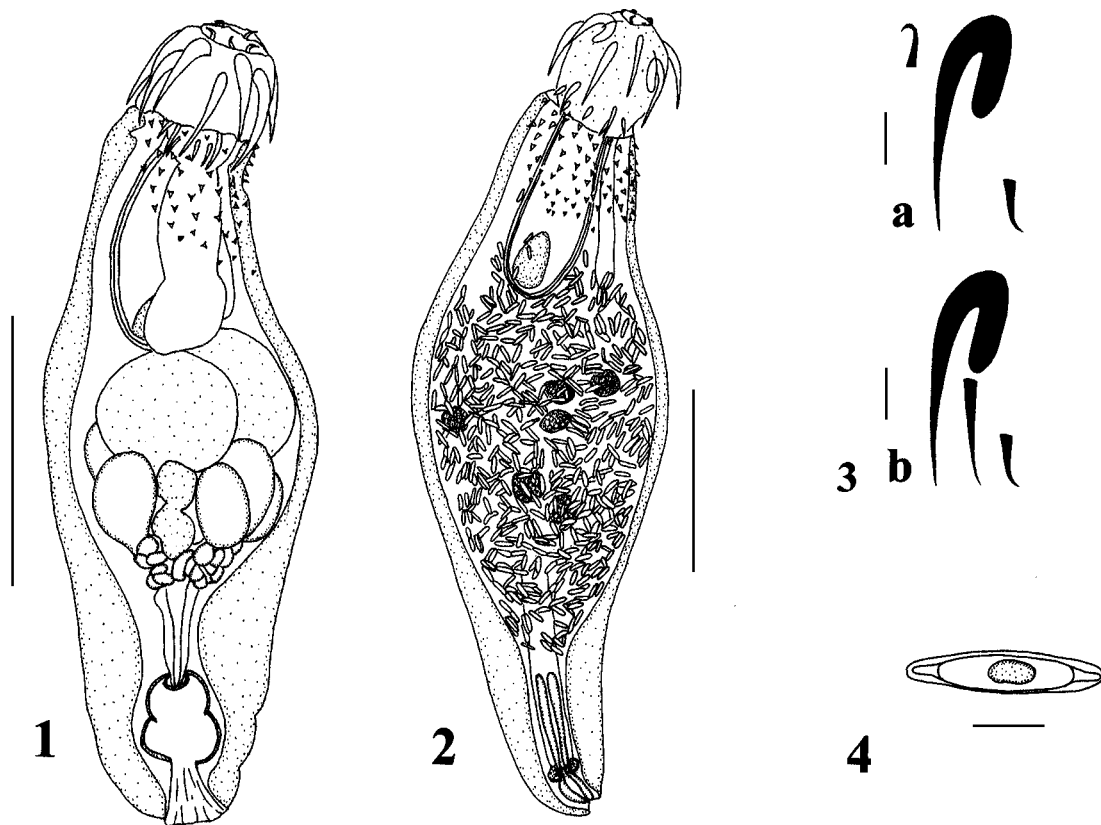
**Type locality:** Pt Peron, Western Australia, Australia.

**Site of infection:** intestine.

**Etymology:** The name *robustus* reflects the robust nature of the trunk spines of this species.

## DISCUSSION

Yamaguti (1939) erected the genus *Hypoechinorhynchus* Yamaguti, 1939 to accommodate *Hypoechinorhynchus alaeopsis* Yamaguti, 1939 from *Alaeops plinthus* (type host) and *Callionymus altivelis* in Maisaka, Japan and placed it in the family Echinorhynchidae. Golvan (1960) later created the family Hypoechinorhynchidae for *Hypoechinorhynchus* and the monotypic genus *Bolborhynchoides* Achmerov, 1959. Diagnostic features of the Hypoechinorhynchidae included small body size, a spineless thick-walled trunk



**Figs. 1-4.** *Hypoechinorhynchus robustus* sp. n. from *Notolabrus parilus*. **Fig. 1.** Adult male, lateral view. **Fig. 2.** Adult gravid female, lateral view. **Fig. 3.** Proboscis armature. **a** – longitudinal row with small apical spine, large anterior hook and small posterior spine but no middle spine; **b** – longitudinal row without small apical spine but with large anterior hook, middle spine and small posterior spine. **Fig. 4.** Egg. Scale bars: Figs. 1, 2 = 250  $\mu$ m; Figs. 3, 4 = 20  $\mu$ m.

with an enlarged region antero-dorsally, a spherical proboscis with only a few large apical hooks with roots and small basal spines, lemnisci that are substantially longer than the proboscis receptacle and testes in tandem and contiguous (Golvan 1969).

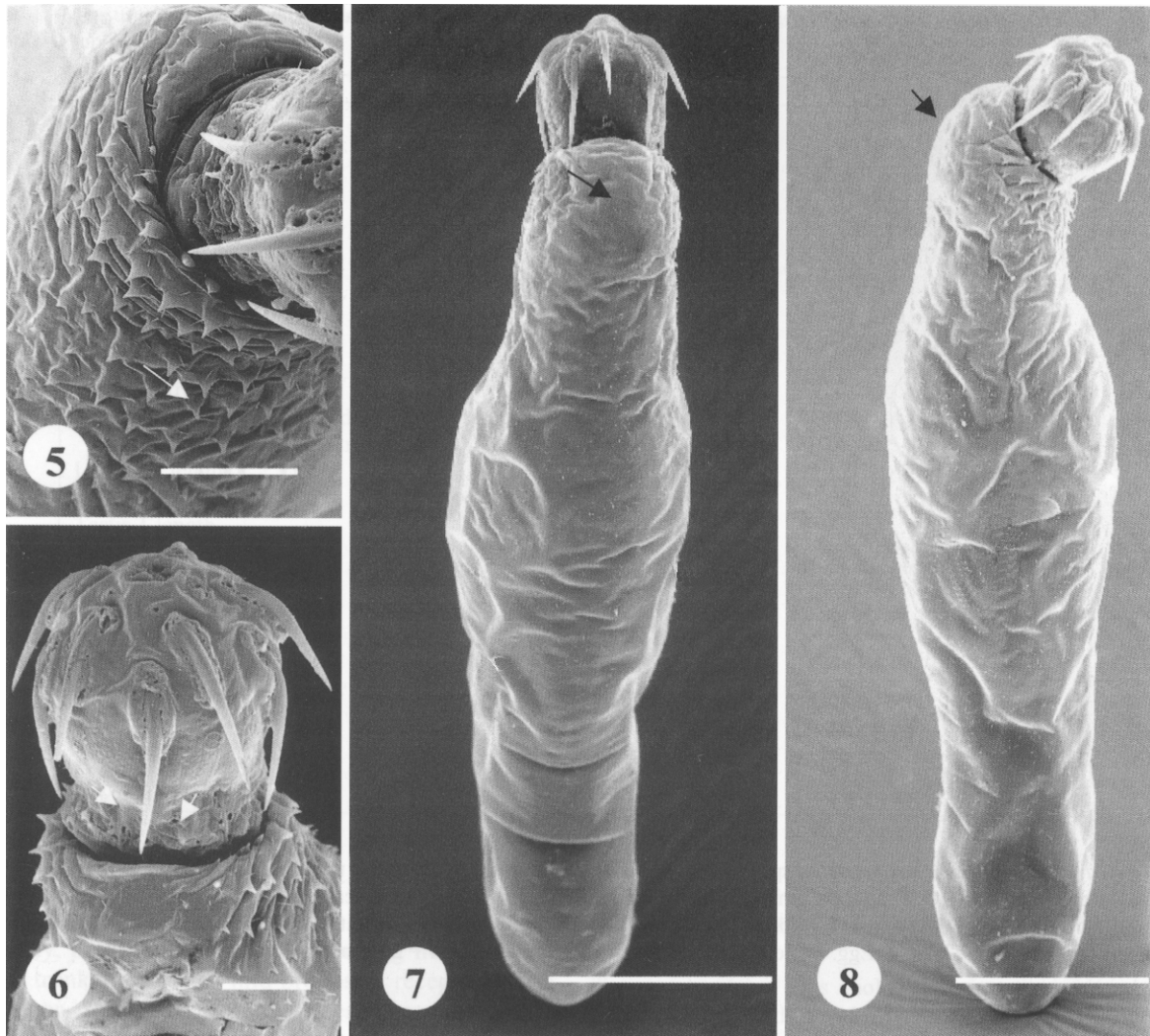
Amin (1985) recognised three species in the Hypoechinorhynchidae in his classification of the Acanthocephala: *H. alaeopis* Yamaguti, 1939 (type species), *H. magellanicus* Szidat, 1950 and *Bolborhynchoides exiguus* (Achmerov et Dombrowskaja-Achmerova, 1941) Achmerov, 1959. *H. thermaceri* de Buron, 1988 was described after this classification was published.

Gupta and Kumar (1983) described *Hypoechinorhynchus golvani* Gupta et Kumar, 1983. *H. golvani* was described from a single male specimen from an estuarine fish in Orissa, India. The proboscis of this specimen is figured as completely withdrawn in Gupta and Kumar (1983, fig. 1). There was no detailed drawing of the individual hooks. This species resembles *Arhythmacanthus zdzitowieckii* Kumar, 1992 described by Kumar (1992) from the same host and locality but differs in the presence of trunk spines and the number of cement glands. The validity of *Hypoechinorhynchus*

*golvani* is questioned and cannot be ascertained with the information available currently.

*Hypoechinorhynchus magellanicus* Szidat, 1950 was transferred to *Heterosentis* by Zdzitowiecki (1990) because he found trunk spines on a male specimen of that species. According to Zdzitowiecki (1990) these trunk spines made this species consistent with the family Arhythmacanthidae rather than the Hypoechinorhynchidae. The present study found spines on material identified as *H. alaeopis* (type species) by Johnston and Edmonds (1947). The spines were clearly present on one specimen (AHC 42332) but could not be seen in other material. It is likely that the type specimens for *H. alaeopis* also has trunk spines that have been lost or overlooked. Thus trunk spines are present in three of the four species of *Hypoechinorhynchus*; the absence of spines needs to be confirmed in *Hypoechinorhynchus thermaceri*. It is proposed that *H. magellanicus* (Szidat, 1950) be reassigned to the genus *Hypoechinorhynchus* since it was transferred to *Heterosentis* primarily because of its trunk spines.

The diagnostic features outlined in Golvan (1969) for the Hypoechinorhynchidae appear to be no longer sufficient to separate hypoechinorhynchids from



**Figs. 5-8.** Scanning electron micrographs of *Hypoechinorhynchus robustus* sp. n. from *Notolabrus parilus*. Nb. anterior small spines lost or fully retracted in this specimen. **Fig. 5.** View of anterior trunk showing ventral trunk spines (arrow). **Fig. 6.** Dorsal view of armature of proboscis; arrows point to a middle spine and a posterior spine. **Fig. 7.** Dorsal view of whole specimen showing absence of robust trunk spines on dorsal surface (arrow). **Fig. 8.** Lateral view of whole specimen showing slight antero-dorsal curvature of trunk (arrow). Scale bars: Figs. 5, 6 = 50  $\mu$ m; Fig. 7 = 250  $\mu$ m; Fig. 8 = 200  $\mu$ m.

arhythmacanthids. These families share important diagnostic features including a proboscis armature that changes abruptly from small basal spines to large apical (or subapical if present) hooks. This abrupt transition combined with the possession of six cement glands are the most defining features of arhythmacanthids. Hypoechinorhynchids also have six cement glands. Other features used by Golvan (1969) to diagnose the Hypoechinorhynchidae can be seen in certain species of arhythmacanthids: such as lemnisci that are much longer than the proboscis receptacle (e.g. *Acanthocephaloides claviformis* – see Araki and Machida 1987); testes in tandem and contiguous (e.g. most arhythmacanthids); and a spherical proboscis bearing only a few hooks (e.g. species of *Heterosentis*). Thus it

is proposed here to make Hypoechinorhynchidae a junior synonym of Arhythmacanthidae.

*Hypoechinorhynchus* is retained as a valid genus predominantly because of its unique proboscis armature. While all four valid species of *Hypoechinorhynchus* have the characteristic abrupt transition from basal spines to apical hooks, they also possess longitudinal rows which alternate in their possession of a middle spine. This arrangement is not seen in other genera of arhythmacanthids. Yamaguti (1939) described the hooks of *Hypoechinorhynchus* as anterior, middle and posterior (= CI, CII and CIII respectively as used in de Buron 1988). The middle and posterior spines are small, thin and without roots (or very reduced roots); the middle spine may be longer than the posterior spine.

Each longitudinal row has at least one large hook with a root. The new species *H. robustus* has in addition to this arrangement a small apical spine in the longitudinal row that lacks the middle spine. The alternating absence and presence of the middle spine on the proboscis combined with the antero-dorsal curvature of the trunk are sufficient to distinguish *Hypoechinorhynchus* from all other arhythmacanthid genera.

The genus *Hypoechinorhynchus* is placed in the subfamily Arhythmacanthinae because specimens have a spherical proboscis with few hooks (compared to other genera) and have trunk spines which is consistent with Golvan's (1969) summary of the subfamily. The subfamily Arhythmacanthinae now contains *Heterosentis* and *Hypoechinorhynchus*. The only other genus

in the family Hypoechinorhynchidae was the monotypic *Bolborhynchoides*. The taxonomic position of *B. exiguus* (Achmerov et Dombrowskaja-Achmerova, 1941) Achmerov, 1959 is uncertain. This species could be an eoacanthocephalan or a palaeacanthocephalan because the original description did not mention the structure of the proboscis receptacle nor the number of cement glands (Golvan 1969); the original description was based on four immature specimens. In view of this, *Bolborhynchoides exiguus* is relegated to *incertae sedis*.

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