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NEW SPECIES OF *POTOROLEPIS* SPASSKII (CESTODA : HYMENOLEPIDIDAE) PARASITIC IN DASYURID MARSUPIALS FROM NEW GUINEA

by C. VAUCHER* & I. BEVERIDGE†

Summary

VAUCHER, C. & BEVERIDGE, I. (1997) New species of *Potorolepis* Spasskii (Cestoda: Hymenolepididae) parasitic in dasyurid marsupials from New Guinea. *Trans. R. Soc. S. Aust.* **121**(3), 95-102, 28 November, 1997.

Potorolepis aruensis sp. nov. is described from the small intestine of *Myoictis melas* from the Aru Islands of Irian Jaya. It is most closely related to *P. bradleyi* from which it differs in mean hook number (17 in *P. aruensis*, 13 in *P. bradleyi*), size of cirrus sac (0.27-0.42 mm in *P. aruensis*, 0.14-0.25 mm in *P. bradleyi*) and arrangement of testes. Cestodes tentatively allocated to *P. aruensis* were also found in *Antechinus naso*. *Potorolepis woolleyae* sp. nov., from the small intestine of *Murexia longicaudata* from Morobe Province, Papua-New Guinea, differs from all congeners in having longer rostellar hooks (163-182 µm). The generic diagnosis is re-assessed as well as the relationships between morphological sub-groups within the genus and the marsupial families they parasitise. A key to the species of hymenolepidid cestodes occurring in Australasian marsupials is given.

KEY WORDS: *Potorolepis*, cestodes, Hymenolepididae, marsupials, Dasyuridae, New Guinea.

Introduction

Cestodes of the family Hymenolepididae Ariola, 1899 are common parasites of birds, rodents and insectivores in most regions of the world (Czaplinski & Vaucher 1994). Vaucher *et al.* (1984) reviewed the species known from Australian marsupials, redescribing the three known species and erecting five new ones. All were allocated to the genus *Hymenolepis* Weinland, 1858 though it was noted that they formed a morphologically distinctive subgroup within this large genus. Subsequently, Jones & Anderson (1990) described a new species from a peramelid marsupial in New Guinea and transferred the other species occurring in marsupials to the closely-related genus *Vampirolepis* Spasskii, 1954. Spasskii (1994) erected a new genus, *Potorolepis*, to contain most of the species found in marsupials, although one, *H. cercarteti*, was transferred to the genus *Rodentolepis* Spasskii, 1954, with the implication that it was originally a parasite of rodents. Spasskii (1994) was apparently unaware of the species erected by Jones & Anderson (1990) and did not include it in his new genus. The hymenolepidid fauna of Australasian marsupials is relatively poorly known (Spratt *et al.* 1991) and its taxonomic and phylogenetic affinities are uncertain.

In this paper, we describe new species of *Potorolepis* parasitic in dasyurid marsupials in New Guinea and re-evaluate the definition of the genus proposed by Spasskii (1994) as well as the host-parasite relationships between sub-groups within *Potorolepis* and families of marsupial hosts, a relationship first suggested by Vaucher *et al.* (1984).

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Materials and Methods

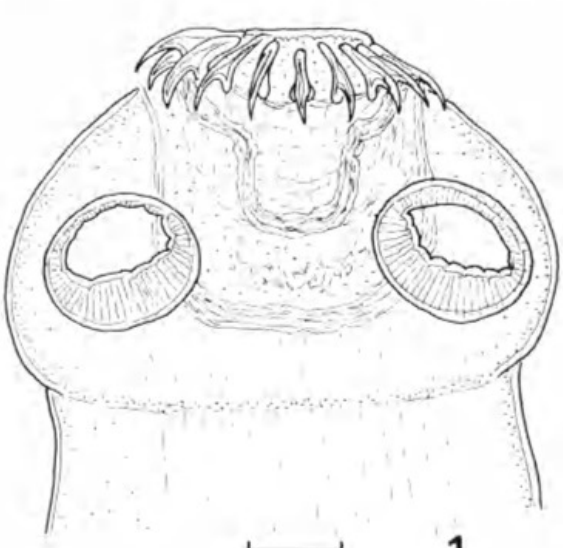
Cestodes from *Myoictis melas* were collected when the host animals were autopsied after a short period in captivity at La Trobe University, Melbourne. The cestodes were relaxed in water and fixed in AFA (Pritchard & Kruse 1982). Cestodes from other hosts were collected in New Guinea. Following the death of the host, the entire gastrointestinal tract was fixed in 10% formalin and the cestodes were subsequently removed and stored in 70% ethanol.

Cestodes were stained in Celestine blue, dehydrated in ethanol, cleared in methyl salicylate and mounted in Canada balsam. In contracted specimens, the tegument and dorsal and ventral musculature were removed with a fine scalpel after clearing (Jones 1990) to improve the visibility of the internal organs. Some scoleces of each species were mounted in Berlese's fluid. Serial sections were cut at a thickness of 9 µm in both longitudinal and transverse planes and stained with haematoxylin and eosin.

Measurements are given in millimetres as the range, followed by the mean and the number of measurements made in parentheses. Drawings were made using a drawing tube.

All specimens studied have been deposited in the South Australian Museum, Adelaide (SAMA) or the Muséum d'Histoire Naturelle, Geneva (MHNG).

Host nomenclature follows Flannery (1995) and



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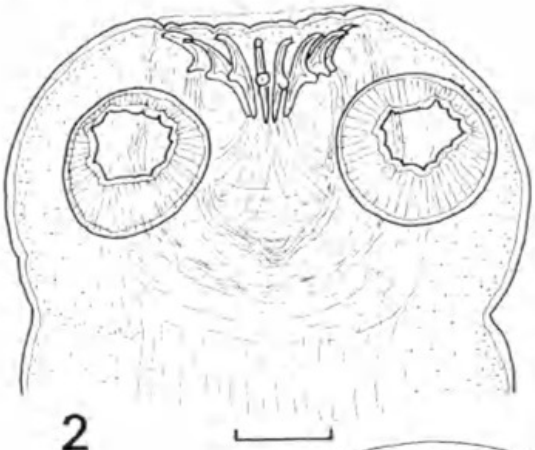

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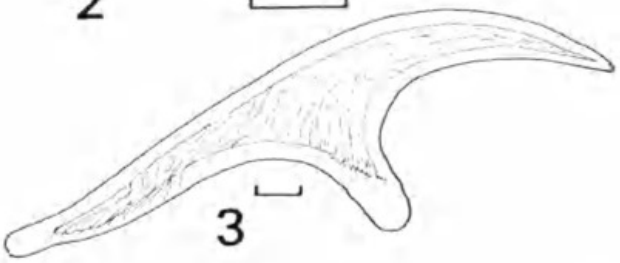

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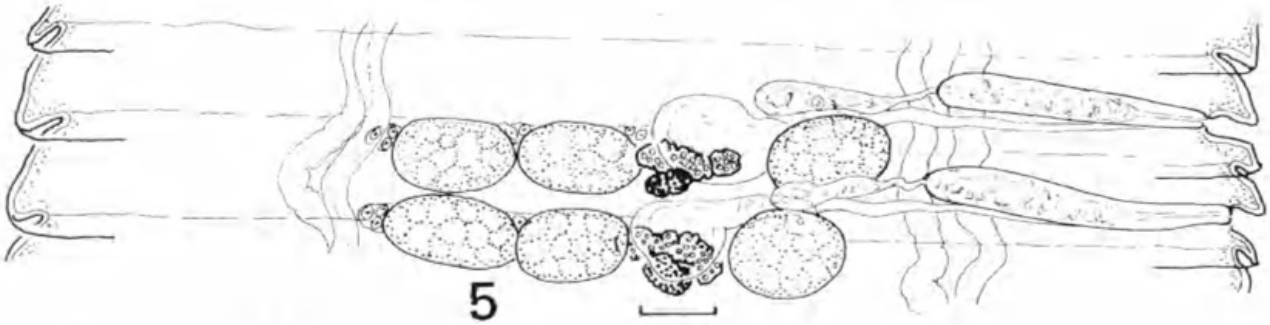

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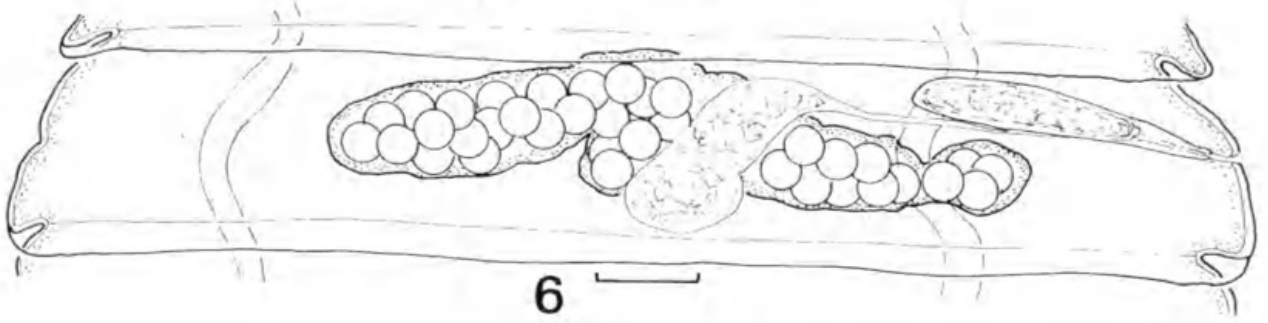

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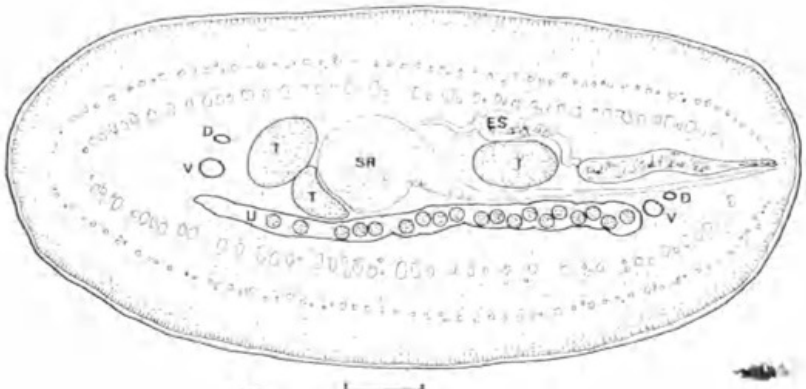

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Spratt *et al.* (1991). Tabulated morphological data were derived from Beveridge & Barker (1975), Vaucher *et al.* (1984) and Jones & Anderson (1990). Host distribution data were derived from Spratt *et al.* (1991).

Potorolepis aruensis sp. nov.
(FIGS 1-7)

Types: Holotype from small intestine of *Myoictis melas wallacei* Gray, 1858, Koboor Is., Aru group (6° 12'S 134° 32'E), Irian Jaya, 16.vi.1993, coll. P. A. Woolley, SAMA AHC 27877; paratypes, 23 whole mounts, 8 scolices mounted in Berlese's fluid, serial sections, SAMA AHC 27878-27905; 2 whole mounts MHNG 23407 INVE; additional specimens: numerous specimens 2. xii. 1992, SAMA AHC 30586-30587; 3 specimens, 3. xii. 1992, SAMA AHC 30588; numerous specimens 16.vi.1993, SAMA AHC 30589.

Material examined: From *Myoictis melas* (Müller,1840): types. From *Antechinus naso* (Jentink, 1911): 5 specimens, Mt Kaindi (7° 21'S, 146° 41'E), Papua-New Guinea, SAMA AHC 27864-27876, 30584-30585.

Description

Based on types. Small cestodes up to 60 in length. Scolex globose, 0.52-0.65 (0.58, n = 10) in diameter. Suckers sub-circular in superficial views, unarmed; cup-shaped in section, with openings directed anteriorly, 0.13-0.16 (0.15, n = 10) x 0.15-0.18 (0.17, n = 10). Rostellum muscular, 0.18-0.26 (0.21) x 0.17-0.23 (0.21, n = 10); rostellar sac 0.26-0.38 (0.30, n = 10) x 0.26-0.31 (0.28, n = 10). Hooks 16-18 (17, n = 10), arranged in single ring with broad, curved blades; slender handles prominent; blunt guards often with irregular surface; core of hook blade hollow. Hooks 0.128-0.147 (0.138, n = 10) long. Neck variable, 0.74-2.05 (1.26, n = 10) long. Segments craspedote; mature segments much wider than long, 0.06-0.17 (0.10, n = 10) long x 0.93-1.63 (1.31, n = 10) wide; near gravid segments longer, but slightly narrower, 0.13-0.29 (0.22, n = 10) long, 0.81-1.22 (1.04, n = 10) wide. Genital pores unilateral. Three testes arranged linearly, one poral, two aporal; very little variation in testis distribution: single segment with 4 testes; single segment with 2 testes; single segment with 2 poral, 1 aporal testes. Testes oval, of similar size, 0.10-0.17 (0.15, n = 10) long x 0.08-0.11 (0.09, n = 10) wide. Vasa efferentia of antiporal testes run along dorsal margin of medulla to elongate, pyriform external seminal vesicle 0.06-0.16 (0.10, n = 10) long x 0.04-0.09 (0.07, n = 10) wide, anterior and dorsal to poral testes; distal region of external seminal vesicle slender, sinuous, enters elongate cirrus sac 0.27-0.42 (0.35, n = 10) long x 0.04-0.05 (0.05, n = 10) wide. Cirrus sac contains elongate internal seminal vesicle occupying two-thirds of volume of cirrus sac; no armature seen on cirrus. Genital ducts cross osmoregulatory canals dorsally.

Ovary median, with 3-4 indistinct lobules, 0.06-0.10 (0.08, n = 10) long, 0.10-0.19 (0.14, n = 10) wide; vitellarium reniform, posterior to ovary 0.03-0.06 (0.04, n = 10) long x 0.05-0.07 (0.06, n = 10) wide. Vagina posterior and ventral to cirrus sac, dilating to form sacciform seminal receptacle dorsal to ovary; seminal receptacle 0.14-0.24 (0.18, n = 10) long x 0.08-0.16 (0.11, n = 10) wide. Uterus originates as transverse sac on ventral aspect of medulla, extends to osmoregulatory canals, developing small number of diverticula, never becoming reticulate. No segments found with fully-developed eggs in uteri. Ventral osmoregulatory canal 0.03-0.05 (0.04, n = 10) in diameter, dorsal canal narrower, 0.01-0.03 (0.02, n = 10) in diameter. Longitudinal strobilar musculature arranged in two concentric rings: outer ring composed of numerous small bundles with only 1-3 fibres per bundle; bundles of inner ring larger with 5-10 fibres per bundle.

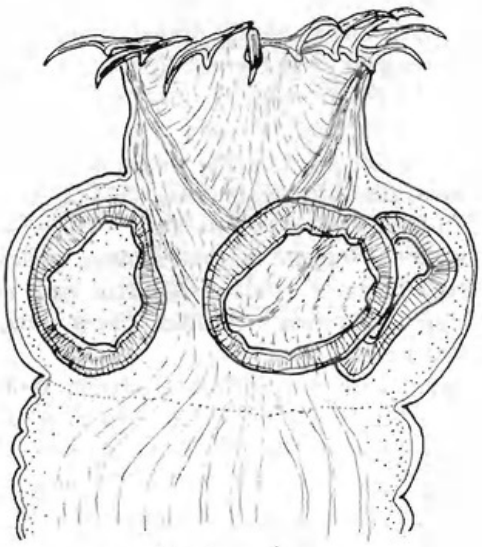
Potorolepis woolleyae sp. nov.
(FIGS 8-14)

Types: Holotype from small intestine of *Murexia longicaudata* (Shlegel, 1866), Mount Missim (7° 13'S, 146° 49'E), Morobe Province, Papua-New Guinea, coll. G. Gossek, 24.x.1984, SAMA AHC 27906; paratypes, 9 fragmented specimens, 1 scolex mounted in Berlese's fluid, serial sections, SAMA AHC 27907-27919, 30590; 2 specimens MHNG 23408 INVE.

Description

Small cestodes, largest fragment 35 long. Scolex globose, 0.44-0.55 (0.50, n = 9) in diameter. Suckers sub-circular, unarmed, 0.13-0.21 (0.17, n = 10) long x 0.10-0.19 (0.15, n = 10) wide. Rostellum muscular 0.13-0.20 (0.17, n = 9) long x 0.19-0.28 (0.23, n = 9)

Figs 1-7. *Potorolepis aruensis* sp. nov. Types. 1. Scolex with rostellum everted. 2. Scolex with rostellum withdrawn. 3. Rostellar hook in profile. 4. Rostellar hook, view from posterior surface showing enlarged hook guard. 5. Mature segments. 6. Near gravid segment. 7. Transverse histological section of mature segment; dorsal aspect towards top of page. Scale bars = 0.1mm 1, 2, 5, 7; 0.01mm 3, 4. Legend: D, dorsal osmoregulatory canal; ES, external seminal vesicle; SR, seminal receptacle; T, testis; U, uterus; V, ventral osmoregulatory canal.



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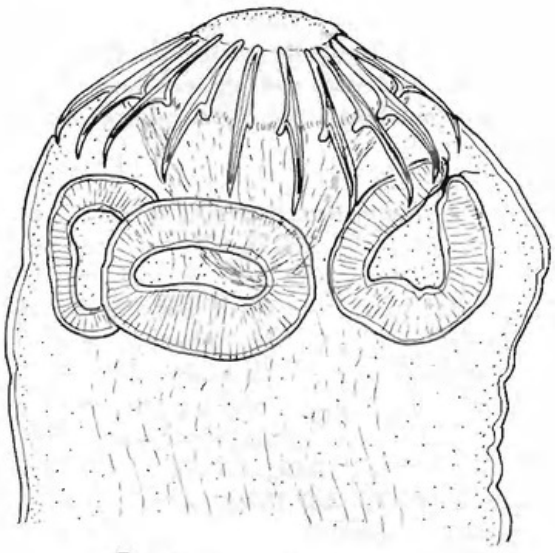

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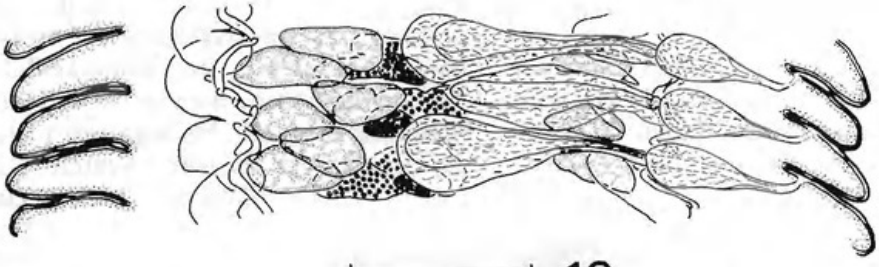

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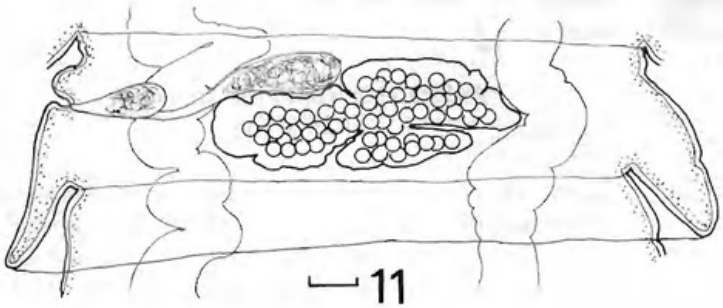

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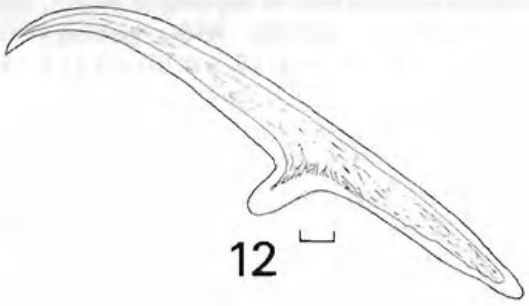

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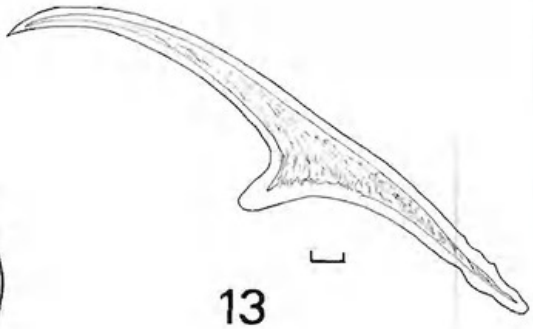

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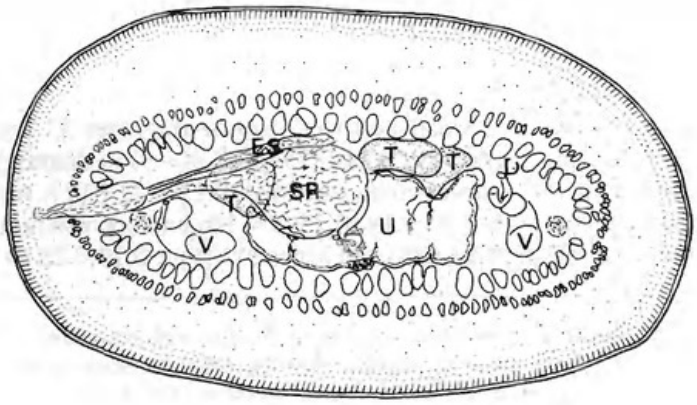

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wide; rostellar sac 0.26-0.29 (0.28, n = 9) long x 0.20-0.29 (0.26, n = 9) wide. Hooks number 15-19 (17, n = 6), arranged in single ring; hooks with elongate, falcate blades, slender handles and blunt guards; core of hook blade hollow. Hooks 0.163-0.182 (0.172, n = 10) long. Neck variable, 0.90-1.41 (1.20, n = 8) long. Segments craspedote; mature segments much wider than long, 0.05-0.06 (0.06, n = 5) long x 0.76-0.90 (0.85, n = 5) wide; gravid segments longer, of approximately the same width, 0.13-0.35 (0.20, n = 5) long, 0.57-1.22 (0.87, n = 5) wide. Genital pores unilateral. Three oval testes arranged in triangular array, with 1 poral and 2 aporal, of similar size, 0.08-0.13 (0.10, n = 5) long x 0.04-0.05 (0.04, n = 5) wide. Vasa efferentia from aporal testes run along dorsal margin of medulla to elongate, pyriform, external seminal vesicle 0.13-0.18 (0.16, n= 5) long x 0.023-0.049 (0.043, n=5) wide, which extends along seminal receptacle. Cirrus sac pyriform, 0.14-0.17 (0.16, n=5) long x 0.036-0.042 (0.040, n=5) wide; cirrus sac contains prominent internal seminal vesicle; cirrus unarmed. Genital ducts cross osmoregulatory canals dorsally. Ovary median, with indistinct lobules, c. 0.06 long x 0.14 wide, on ventral surface of medulla; vitellarium reniform, posterior to ovary, 0.04-0.05 (0.05, n = 5) long x 0.02-0.03 (0.03, n = 5) wide. Vagina posterior and ventral to cirrus sac, dilating to form sacciform seminal receptacle dorsal to ovary; seminal receptacle 0.10-0.13 (0.12, n = 5) long x 0.05-0.07 (0.06, n = 5) wide. Uterus originates as transverse sac on ventral aspect of medulla, extends to osmoregulatory canals, developing few diverticula; never becoming reticulate. Eggs spherical, 0.032-0.045 (0.035, n = 5) in diameter. Ventral osmoregulatory canals 0.03-0.10 (0.05, n = 5) in diameter; dorsal osmoregulatory canals 0.01 in diameter. Longitudinal muscle arranged in two concentric rings; outer ring composed of numerous small bundles with few fibres; inner ring composed of larger bundles with 10-20 fibres per bundle.

Discussion

Spasskii (1994) created the genus *Potorolepis* for several species of cestode from Australian marsupials which had previously been allocated to *Hymenolepis* (see Vaucher *et al.* 1984) or to *Vampirolepis* by Spasskii (1954) and Jones & Anderson (1990). Species included in the new genus by Spasskii (1994) were *P. antechini* (Vaucher, Beveridge & Spratt, 1984), *P. aklei* (Beveridge & Barker, 1975), *P. bettongiae* (Vaucher, Beveridge & Spratt, 1984), *P. bradleyi* (Beveridge & Barker, 1975), *P. isoodontis* (Vaucher, Beveridge & Spratt, 1984) and *P. peramelidarum* (Nybelin, 1917). To these should be added *P. peroryctis* (Jones & Anderson 1990) comb. nov. (syn. *Vampirolepis peroryctis* (Jones & Anderson, 1990), the first species of the genus known from a New Guinean peramelid marsupial, *Peroryctes raffrayanus*. *Potorolepis peroryctis* is morphologically similar to *P. peramelidarum* and *P. isoodontis*, also from bandicoots, and clearly belongs within the genus *Potorolepis*. The species was presumably overlooked by Spasskii (1994) in erecting the new genus.

Spasskii (1994) characterised his new genus as having a rostellum armed with more than 10 hooks each longer than 50 µm, all with a well-developed, elongate blade, longer than the guard and with a tubular uterus which may develop diverticula.

The new species described above possess these key morphological characters and are therefore allocated to the genus *Potorolepis*. They are readily distinguishable from the known species based on hook number and size as well as from the disposition of the testes (Table 1). Based on hook number, the species of *Potorolepis* fall into two distinct groups, those with 10-23 hooks, all of which are parasitic in dasyurid marsupials, and those with 24-40 hooks which occur in peramelid and potoroid marsupials. The two new species, both from dasyurid marsupials, have hook numbers in the range 15-19 and therefore most closely resemble *P. aklei, P. antechini* and *P. bradleyi*. Both *P. aruensis* and *P. woolleyae* are distinguished from these species in having longer hooks. The lengths of hooks of *P. woolleyae* lie well outside the ranges of other species within this sub-group, though hook lengths of *P. aruensis* may overlap with those of *P. bradleyi*. *Potorolepis aruensis* can be distinguished by mean hook number (Table 1) but also by the cirrus sac which is shorter in *P. bradleyi* (0.190 x 0.026 mm) than in *P. aruensis* (0.350 x 0.050 mm). In *P. bradleyi*, the central testis lies dorsal to the ovary (Beveridge & Barker 1975) rather than aporal to it as in *P. aruensis*. For these reasons, the specimens described above from *Myoictis melas* are considered close to but distinct from *P. bradleyi* and warrant the erection of a new species. None of the specimens was fully gravid, the terminal segments instead having developing uteri which were only partly filled with eggs. This is surprising since the animals were transported to Melbourne following capture and maintained in the

Figs 8-14. *Potorolepis woolleyae* sp. nov. Types. 8. Scolex with rostellum everted. 9. Scolex with rostellum withdrawn. 10. Mature segments. 11. Gravid segment. 12-13. Rostellar hooks in profile. 14. Transverse histological section of mature segment; dorsal aspect towards top of page. Scale bars = 0.1mm 8-9, 11; 0.2mm 10; 0.01mm 12-13; 0.15mm 14. Legend: as for Figs 1-7.

laboratory until autopsy, providing adequate time for cestodes to mature.

The specimens from *Antechinus naso* are tentatively allocated to this species. They are poorly preserved and internal features are difficult to discern. Hook lengths are identical to specimens from *Myoictis*. The number of hooks, 18-22 (20) (n = 5), is larger than in specimens from *M. melas* but the range overlaps. They may represent a distinct but very similar species, although the current evidence is equivocal.

The cestodes from *Murexia longicaudata* were quite severely contracted, limiting the morphological details which were visible in whole mounts. Nevertheless, they represent a new species based on the features of the rostellar hooks alone. While they resemble *P. aruensis* in terms of mean hook number, the size of hooks immediately distinguishes the material from all congeners. In having the three testes arranged in a triangular fashion, *P. woolleyae* most closely resembles *P. aklei* and *P. antechini*.

Apart from adding to the hymenolepidid fauna known from marsupials in New Guinea, the new species described support the erection of the genus *Potorolepis* by Spasskii (1994) in providing additional species which conform with the proposed diagnosis. Spasskii (1994) provisionally included in his diagnosis the character 'genital ducts crossing osmoregulatory canals dorsally'. This is unequivocally the case in *P. aklei*, *P. bradleyi*, *P. aruensis*, *P. woolleyae* and *P. peroryctis* and probably is similar in the remaining species of the genus. His generic definition (Spasskii 1994) also needs to be amended to allow for testes in either a linear or triangular array and for cirri which are either armed or unarmed. Apart from these minor modifications, the generic definition provided by Spasskii (1994) appears to be reliable.

The description of the new species also provides evidence in support of the suggestion first made by Vaucher *et al.* (1984) that each family of marsupials was parasitised by a distinctive morphological group of hymenolepidid cestodes. Spratt *et al.* (1991) reported *P. peramelidarum* from *Antechinus swainsonii* which would represent a potential exception. However, the identification was tentative

TABLE 1. *Measurements and key morphological features of species of* Potorolepis *from marsupials.*

Species	Host(s)	Hook Length	No. of Hooks	Testis Distribution
Species from dasyurid hosts				
P. aklei	*Antechinus* sp. (undescribed)* *A. flavipes*, *Pseudantechinus bilarni*, *Sminthopsis leucopus*	83-100 (91)	11-17 (13)	triangular
P. bradleyi	*Antechinus* sp. (undescribed)*	103-128 (114)	10-15 (13)	linear
P. antechini	*Antechinus swainsonii*	56-59 (58)	22-23	triangular
P. aruensis	*Myoictis melas*	128-147 (138)	16-18 (17)	linear
P. woolleyae	*Murexia longicaudata*	163-182 (172)	15-19 (17)	triangular
Species from peramelid hosts				
P. peramelidarum	*Perameles nasuta* *P. gunnii* *Isoodon obesulus*	93-101 (98)	35-38	linear
P. isoodontis	*Isoodon obesulus*	71-82 (79)	33-39	sub-triangular
P. peroryctis	*Peroryctes raffrayanus*	124-192	40	triangular
Species from potoroid hosts				
P. potorui	*Potorous tridactylus*	98-103 (102)	29-33	linear or triangular
P. bettongiae	*Bettongia gaimardi*	79-91 (86)	24-27	linear

* formerly identified as *Antechinus stuartii* (see Strahan 1995)

and based on incomplete specimens. This dubious record has therefore been eliminated from consideration until more material is collected and the host record confirmed. The species found in dasyurids, *P. aklei*, *P. antechini*, *P. aruensis*, *P. bradleyi* and *P. woolleyae*, belong to a group of species with a small number of rostellar hooks (10-23) compared with 33-40 hooks in *P. isoodontis*, *P. peramelidarum* and *P. peroryctis* from peramelid hosts and 24-33 hooks in *P. potoroi* and *P. bettongiae* from potoroid hosts. The relative size of the ovary also separates the first two groups, the ratio of width of ovary to segment width being 9-15% in species from dasyurid hosts compared with 26-39% in those from peramelids. In the first group the uterus contains relatively few eggs, but it is clearly bilobed. More data are needed from hymenolepidids parasitising peramelids and potoroids to confirm the utility of this character. The observations of Jones & Anderson (1990) on a species from a New Guinean peramelid marsupial and the current descriptions of new species from dasyurid marsupials from New Guinea provide additional support for the hypothesis advanced by Vaucher *et al.* (1984). The data also suggest that the hymenolepidids of dasyurids from Australia are similar to those of New Guinea, as are the comparable cestodes of peramelid marsupials. Finally, we agree with Spasskii (1994) in allocating *Hymenolepis cercarteti* Vaucher, Beveridge & Spratt, 1984 to the genus *Rodentolepis*.

Key to the species of hymenolepidid cestodes occurring in Australasian marsupials based on rostellar hooks

1. Hooks small, shorter than 30 µm long, fraternoid in shape 2
   Hooks larger, length greater than 50 µm long, not fraternoid in shape 3

2. Hooks number 20-30, 14-18 µm long ..... *Rodentolepis nana*
   Hooks 17-22, 17-22 µm long ..... *Rodentolepis cercarteti*

3. Fewer than 22 hooks or, if 22 hooks present, hooks >100 µm long 4
   More than 22 hooks or, if 22 hooks present, hooks <100 µm long 7

4. Hooks shorter than or equal to 100 µm ..... *Potorolepis aklei*
   Hooks longer than 100 µm 5

5. Hooks 163-182 µm long ..... *Potorolepis woolleyae*
   Hooks less than 150 µm in length 6

6. Hooks 103-128 µm long, 10-15 in number ..... *Potorolepis bradleyi*
   Hooks 128-147 µm long, 16-22 in number ..... *Potorolepis aruensis*

7. Fewer than 28 hooks 8
   More than 28 hooks 9

8. Hooks 56-59 µm long, 22-23 in number ..... *Potorolepis antechini*
   Hooks 79-91 µm long, 24-27 in number ..... *Potorolepis bettongiae*

9. Hooks 124-192 µm long, 40 in number ..... *Potorolepis peroryctis*
   Hooks less than 120 µm long, fewer than 40 in number 10

10. Hooks shorter than 85 µm ..... *Potorolepis isoodontis*
    Hooks longer than 85 µm 11

11. Hooks number 29-33 ..... *Potorolepis potoroi*
    Hooks number 35-38 ..... *Potorolepis peramelidarum*

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