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VERSITA

Redescription of *Pseudogilquinia pillersi* (Southwell, 1929) (Cestoda, Trypanorhyncha) from serranid and lethrinid fishes from New Caledonia and Australia

Ian Beveridge[1]*, Claude Chauvet [2] and Jean-Lou Justine[3]

[1]Department of Veterinary Science, University of Melbourne, Veterinary Clinical Centre, Werribee, 3030, Victoria, Australia; [2]Laboratoire d'Études des Ressources Vivantes et de l'Environnement Marin, Université de Nouvelle Calédonie, BP R4, 98847 Nouméa Cedex, Nouvelle-Calédonie; [3]Équipe Biogéographie Marine Tropicale, Unité Systématique, Adaptation, Évolution (CNRS, UPMC, MNHN, IRD), Institut de Recherche pour le Développement, BP A5, 98848 Nouméa Cedex, Nouvelle-Calédonie

Abstract

Pseudogilquinia pillersi (Southwell, 1929), a poorly known species of trypanorhynch, is redescribed from plerocerci collected from *Epinephelus coioides* (Hamilton, 1922), *Epinephelus malabaricus* (Bloch et Schneider, 1801) (Serranidae) and *Plectropomus laevis* (Lacépède, 1801) (Serranidae) off New Caledonia. These were compared with specimens from *Lethrinus atkinsoni* Seale, 1910 and *Lethrinus miniatus* (Forster, 1801) (Lethrinidae) off the north-east coast of Australia as well as syntypes from *Protonibea diacantha* (Lacépède, 1802) from Sri Lanka. Although size differences were found in parts of the scolex as well as in the sizes of the tentacular hooks, the hook arrangements were identical in all specimens. The differences observed were attributed provisionally to intra-specific variation across a wide geographic and host range.

Résumé

Une espèce de trypanorhynque peu connue, *Pseudogilquinia pillersi* (Southwell, 1929), est redécrite à partir de plérocerques récoltés chez *Epinephelus coioides* (Hamilton, 1922), *Epinephelus malabaricus* (Bloch et Schneider, 1801) et *Plectropomus laevis* (Lacépède, 1801) (Serranidae) en Nouvelle-Calédonie, et chez *Lethrinus atkinsoni* Seale, 1910 et *Lethrinus miniatus* (Forster, 1801) (Lethrinidae) de la côte nord-est de l'Australie, et des syntypes provenant de *Protonibea diacantha* (Lacépède, 1802) du Sri Lanka. En dépit de la taille différente des constituants du scolex et des crochets des tentacules, l'arrangement des crochets était similaire chez tous les spécimens. Les différences observées ont été provisoirement attribuées à une variation intraspécifique dans une aire géographique étendue et un grande variété d'hôtes.

Key words

Cestoda, Trypanorhyncha, *Pseudogilquinia pillersi*, redescription, fishes, New Caledonia, Australia

Introduction

Many species of trypanorhynch cestodes described from fishes from Sri Lanka (Ceylon) and southern India in the early 1900s are still poorly known (Beveridge et Campbell, 1998). In a re-examination of the remaining collections of authors such as A. Shipley, J. Hornell and T. Southwell, Beveridge and Campbell (1998) redescribed several species and allocated them to currently recognised genera. One of these was *Tentacularia pillersi*, described from plerocerci collected from a number of species of teleost fish by Southwell (1929) off the coast of Sri Lanka. Although their redescription was incomplete, limited by the quality of the material available, Beveridge and Campbell (1998) placed the species in the genus *Dasyrhynchus* Pintner, 1928 following Reimer (1984) who reported new specimens from *Saurida undosquamis* (Richardson, 1848) (Synodontidae) and *Psettodes erumei* (Bloch et Schneider, 1801) (Psettodidae) from Mozambique, but did not provided a detailed redescription. Most recently, Palm (2004) has allocated the species to the genus *Pseudogilquinia* Bilquees et Khartoon, 1980. Since the precise taxonomic position of this cestode appears to be uncertain, the opportunity is

*Corresponding author: ibeve@unimelb.edu.au

taken here of redescribing the species based on new material collected in New Caledonia and comparing this material with specimens from Australia as well as with syntypes.

Materials and methods

Plerocerci collected from fish were dissected free from blastocysts, were flattened or shaken in hot (60°C) saline to ensure that the tentacles were everted and were fixed in 70% ethanol. They were stained in either carmine or celestine blue, dehydrated in ethanol, cleared in clove oil or methyl salicylate and mounted in Canada balsam. Individual tentacles were separated from scoleces with a scalpel blade, mounted individually in balsam and manipulated to display specific surfaces of the tentacle. Drawings were made with drawing tube attached to an Olympus BH microscope. All illustrations have been made from specimens from *Epinephelus coioides*. Measurements are given in micrometres unless otherwise indicated as the range followed by the mean and the number of specimens measured (n) in parentheses. Some specimens were prepared for scanning electron microscopy by dehydrating in ethanol and allowing to dry following transfer to hexamethyldisilasane (Pro Sci Tech, Townsville, Australia). They were then coated with gold and examined using a Phillips 505 SEM at an accelerating voltage of 10–20 kV. Terminology for the morphological features of trypanorhynch cestodes follows Campbell and Beveridge (1994) and Jones *et al*. (2004). Specimens were deposited in the Muséum National d'Histoire Naturelle, Paris (MNHN) or the Natural History Museum, London (BMNH).

Results

***Pseudogilquinia pillersi* (Southwell, 1929) Palm, 2004**
Synonyms: *Tentacularia pillersi* Southwell, 1929; *Dasyrhynchus pillersi* (Southwell, 1929) Reimer, 1984.

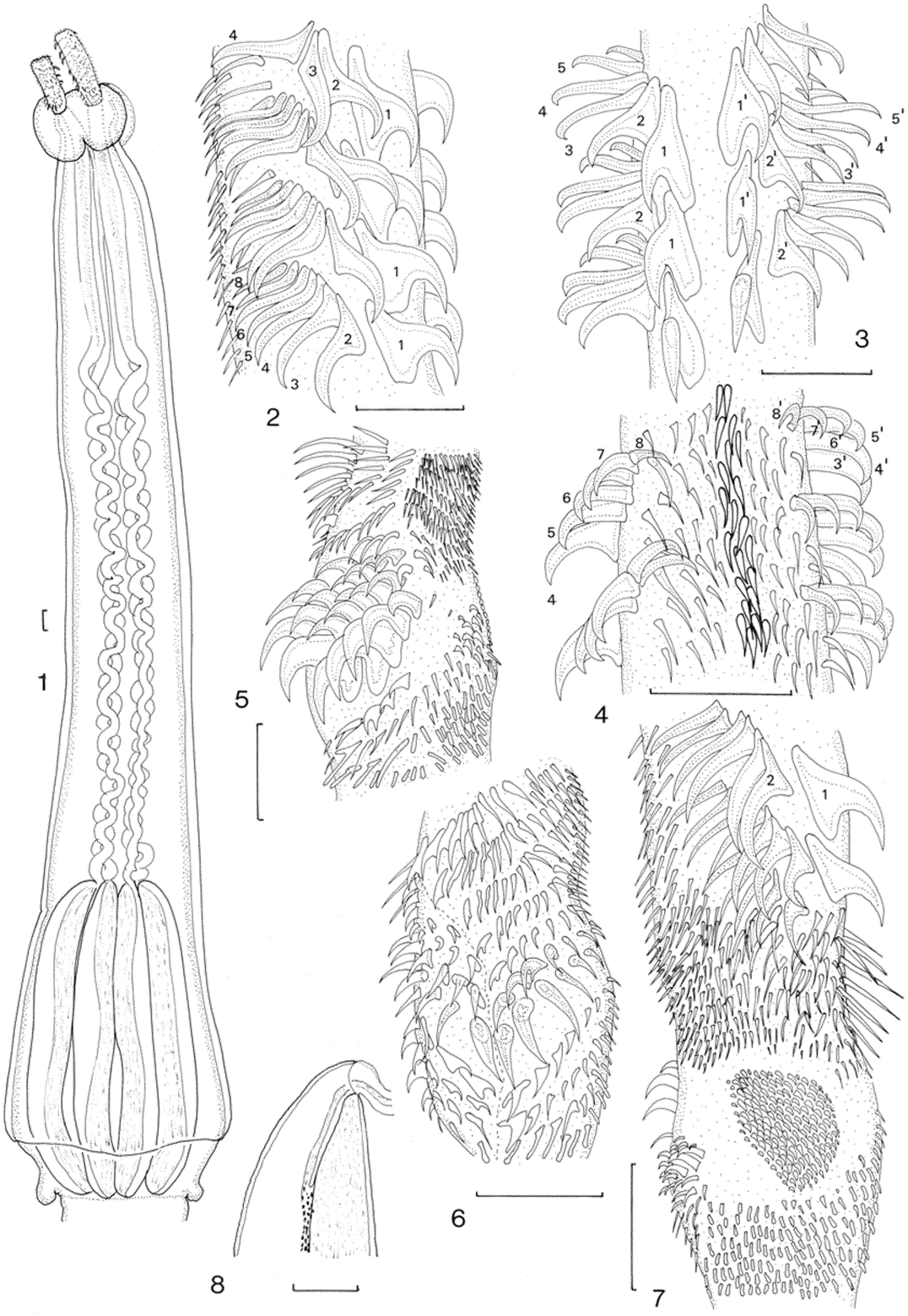
Material examined: syntype from *Protonibea diacantha* (Lacépède, 1802), Sri Lanka (BMNH 1997.10.18.148-155); 1 specimen from body cavity of *Lethrinus atkinsoni* Seale, 1910, Heron Island, Queensland, Australia (BMNH 2004.3.18.98-99); 1 specimen from body cavity of *Lethrinus miniatus* (Forster, 1801) (= *L. chrysostomus* Richardson, 1848, label name), Heron Island, Queensland, Australia (BMNH 2004.3.18.97); 15 specimens from body cavity of *Epinephelus coioides* (Hamilton, 1922), between Ilôt Goëland and Ilôt Maître, off Nouméa, New Caledonia (22°31´S, 166°24´E), 13.v.2005, MNHN JNC 1535; 11 specimens from body cavity of *Epinephelus malabaricus* (Bloch et Schneider, 1801), off Ouen Toro, Nouméa, New Caledonia (22°19´S,166°27´E), 18.v.2005, MNHN JNC 1536; 17 specimens from *Plectropomus laevis* (Lacépède, 1801), Récif Aboré, off Nouméa, New Caledonia (22°20′S, 166°15′E), 2.vi.2006, MNHN JNC 1887; 1 specimen from *P. laevis*, Fausse Passe de Uitoé, external slope, off Nouméa, New Caledonia (22°12´S, 166°7´E), 11.vi.2006, MNHN JNC 1865.

Redescription

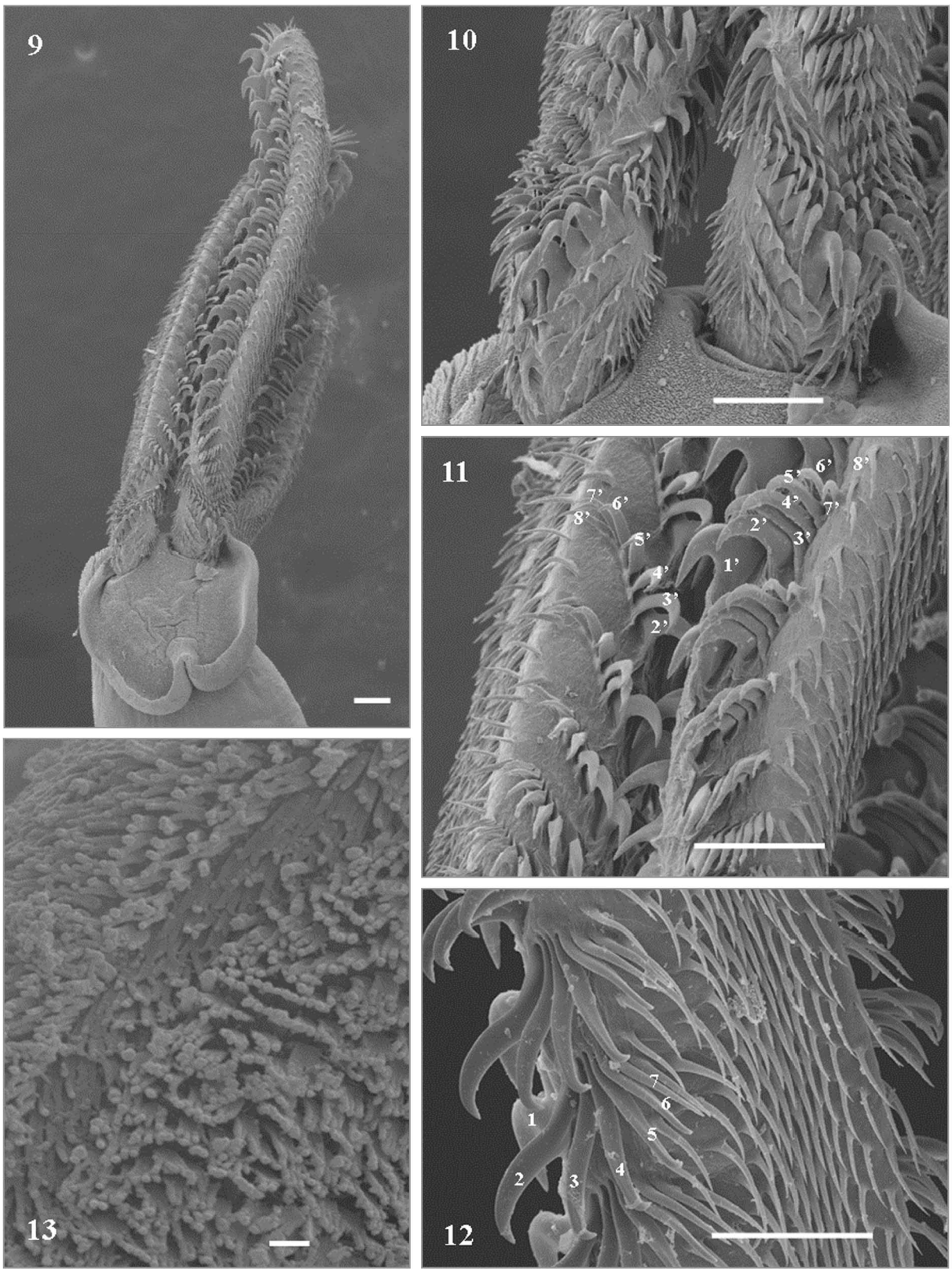
Based on specimens from New Caledonia; measurements from 5 specimens each from *Epinephelus coioides*, *E. malabaricus* and *Plectropomus laevis*. Measurements of specimen from *Lethrinus miniatus* also provided.

Scolex craspedote, 6.1–12.0 (8.03, n = 15) mm long, maximum width in region of pars bulbosa 1.17–2.52 (1.94, n = 15) mm. Bothria generally wider than long, with indistinct margin but with distinct notch in posterior border (Fig. 1); pars bothrialis 320–500 (418, n = 15) long, bothrial width 500–1030 (655, n = 15) bothrial groove prominent; microtriches of adherent surface of bothrium multidigitate with 3–5 elongate, terminal projections (Fig. 13). Pars vaginalis 3.50–7.30 (5.29, n = 15) mm long; sheaths straight in anterior part of scolex, sinuous in posterior part. Bulbs elongate, 2.02–2.63 (2.45, n = 10) mm long, width 230–350 (289, n = 15), bulb ratio 7.06–10.19 (8.40, n = 15); bulbs extend into appendix; retractor originates near anterior extremity of bulb (Fig. 8), band of nuclei present from site of attachment of retractor to posterior extremity of bulb. Scolex ratio (mean): 1:23.3:5.8. Based on incompletely everted tentacles, longest tentacle 1.65 mm; tentacles slightly bulbous at base, diameter at base 110–150 (135, n = 10), diameter in metabasal region 130–150 (146, n = 10). Metabasal armature heteroacanthous, heteromorphous; hooks hollow; in metabasal region, space present between hook files 1 and 1' (Fig. 3); rows begin on internal surface, terminate on external surface (Fig. 2). Hooks 1(1') uncinate, 113–130 (122, n = 10) long, base 88–125 (109, n = 10) long; hooks 2(2') with more slender blade, shorter base, 88–115 (103, n = 10) long, base 55–80 (66, n = 10) long; hooks 3(3') slender, falcate, 93–115 (102, n = 10) long, base elongate, 38–48 (43, n = 10) long; hooks 4(4') slender, falcate, 80–108 (95, n = 10) long, base 35–45 (41, n = 10) long; hooks 5(5') slender, falcate, 80–100 (92, n = 10) long, base 30–38 (33, n = 10) long; hooks 6(6') slender, falcate, 75–95 (80, n = 10) long, base 15–33 (26, n = 10) long; hooks 7(7') slender, falcate, 70–85 (78, n = 10) long, base 15–25 (21, n = 10) long; hooks 8(8') slender, 55–70 (68, n = 10) long, base 13–20 (17, n = 10) long. Intercalary hooks arranged in 2–3 (usually 2) rows; first row of 4–5 hooks, commencing posterior to hooks 5(5'), 25–43 (34, n = 5) long, base 8–10 (9, n = 5) long; second row of 3–4 intercalary hooks, hooks smaller than in first row, 23–30 (25, n = 5) long, base 4–8 (5, n = 5) long; additional row, if present, extending beyond principal row of hooks (Fig. 4). Band of hooks in middle of external surface, arranged as central hook and 2 flanking hooks, as long as intercalary hooks but with much longer base, 23–35 (32, n = 5) long, base 11–18 (15, n = 5) long (Fig. 4).

Basal armature: axis of basal armature initially bothrial-antibothrial, gradually becoming internal-external (Figs 6 and 10); at base, hook rows begin on bothrial surface of tentacle; first row of hooks on bothrial surface tiny, elongate with en-



Figs 1–8. *Pseudogilquinia pillersi* (Southwell, 1929). Specimens from *Epinephelus coioides*. **1.** Scolex. **2.** Metabasal armature of tentacle, bothrial surface. **3.** Metabasal armature of tentacle, internal surface. **4.** Metabasal armature of tentacle, external surface. **5.** Basal armature of tentacle, internal surface on left-hand. **6.** Basal armature of tentacle, internal surface; the dotted line indicates the shift in the orientation of the armature. **7.** Basal armature of tentacle, antibothrial surface, internal surface on right-hand side. 8. Anterior end of bulb showing attachment of retractor muscle and band of nuclei continuing posteriorly from point of attachment. Scale-bars = 0.1 mm



Figs 9–13. *Pseudogilquinia pillersi* (Southwell, 1929), scanning electron micrographs; specimens from *Epinephelus coioides*. **9.** Bothrium and everted tentacles. **10.** Basal armature, bothrial surface. **11.** Metabasal armature, bothrial surface. **12.** Metabasal armature, external surface. **13.** Bothrial groove and microtriches. Scale-bars = 0.1 mm

larged, ovoid tips; on antibothrial surface, whole basal region covered with similar hooks in apparently irregular arrays (Fig. 6); rows 2–3 of hooks on bothrial surface uncinate, decreasing in size around internal and external surfaces of tentacle; rows 4–7 forming array of enlarged hooks, diminishing in size anteriorly as well as internally and externally, hooks 28–65 (50, n = 5) long, base 18–40 (26, n = 5) long, anterior to array of large hooks, rows of slender, spiniform hooks commence, gradually merging into principal rows of metabasal armature; on antibothrial surface of base, prominent tightly-packed array of small spiniform hook 5–15 (10, n = 5) long; approximately 12 hooks in length and 12 hooks across array (Fig. 7); immediately anterior to array, area with tiny spiniform hooks on antibothrial surface before principal rows begin.

Specimen from *L. miniatus*: 4.4 mm long, maximum width in region of pars bulbosa 810, pars bothrialis 230, bothrial width 320, pars vaginalis 3.4 mm, bulb 1050 long, 170 wide.

Discussion

The specimens described here closely resemble *P. pillersi* in the features of the scolex, the small bothria and elongate bulbs, in the metabasal armature with eight hooks in each principal row, with two to three rows of intercalary hooks and with a slender band of very slightly enlarged hooks in the middle of the external surface of the tentacle. The basal armature also resembles that of *P. pillersi* with the area of tiny hooks with lobed tips at the very base and the compact array of spiniform hooks. However, the basal armature of *P. pillersi* is incompletely described (Beveridge and Campbell 1998), being based on a series of syntype specimens, none of which provided all views of the basal armature. Re-examination of one of these (BMNH 1977.10.18.148-155) confirmed that the enlarged hooks on the internal surface at the base of the tentacle describe above are present in the type material but are not clearly visible and could not be illustrated.

Beveridge and Campbell (1998) described the arrangement of hooks on the external surface of the tentacle as a central chainette, with each chainette element flanked by a smaller pair of hooks. In the current specimens from New Caledonia, the arrangement is similar, but there is no difference in the length of the hooks, even though they are distinguishable from the intercalary rows. Although this distinction is not evident in the scanning electron micrographs, as only the hook tips are visible, the principal difference is in the sizes of the hook bases, which are longer in the hooks of the central files (11–15) compared with the intercalary hooks (8–10). There is also some variation within the new material from New Caledonia, with the differences between the central files of hooks on the external surface of the tentacle and the intercalary rows of hooks being more pronounced in some specimens than in others. This variation is not related to the host species from which the specimens originated. In the Australian specimens, there is no obvious difference in the size of the central hooks on the external surface of the tentacle.

The specimens described here from New Caledonia and Australia also differ in size from the type series. Scolex length in the specimens described here from New Caledonia was smaller (6.1–12.0 mm) than in the types (10.1–14.7 mm) as were the bulbs (2.02–2.63 mm in the specimens described here compared with 3.0–5.5 mm in the types). The scolex ratios of the two sets of specimens were 1:23:5.8 for the specimens described from New Caledonia, compared with 1:14:7.5 in the types. The principal difference lies in the ratio of the pars bothrialis to the pars vaginalis, with the latter greatly dependent upon the degree of relaxation of the specimen. The specimen from *Lethrinus miniatus* from Australia was even smaller with a total length of 4.35 mm. In addition, the sizes of hooks in the principal rows were smaller in the specimens described here (hooks 1,1' 113–130 long in specimens from New Caledonia, 60–113 long in specimens from Australia and 173–198 in the syntypes). In spite of these differences, every other feature including hook shape was identical between the types and the specimens from Australia and New Caledonia.

The specimens described here from New Caledonia and Australia may therefore represent new species, very similar to *P. pillersi* or may belong to this species. Given the limited information on variability within the species, a conservative approach has been adopted and the specimens have been referred tentatively to *P. pillersi*. In spite of collections from significant numbers of elasmobranchs from New Caledonia and the Great Barrier Reef, Australia, adults of this species have not been found. The characteristics of the adults may provide insights into whether the cestodes described here represent a single variable species or several very closely related species. Similarly, nucleotide sequences may provide such evidence in the future, but are not available currently.

A feature noted in the current redescription was a shift in orientation of the basal armature, with an initial orientation from bothrial-antibothrial to internal-external in the metabasal region. The syntype material is not adequate to determine whether this character also exists in the original specimens. A similar shift in orientation, but from internal-external to bothrial-antibothrial has been reported in the eutetrarhynchoid genus *Hemionchos* Campbell et Beveridge, 2006 from species of *Mobula* from the Gulf of California, Mexico (Campbell and Beveridge 2006). Although not described as such, examination of illustrations of *Dasyrhynchus pacificus* Robinson, 1959 (see Beveridge and Campbell 1993, fig. 3) and *D. talismani* Dollfus, 1935 (see Beveridge and Campbell 1993, fig. 17) suggests that the same phenomenon may occur in the related genus *Dasyrhynchus* Pintner, 1928.

Palm (2004) distinguished *Dasyrhynchus* from *Pseudogilquinia* and placed the latter in the subfamily Grillotiinae Dollfus, 1942, closely aligned to *Dasyrhynchus*. Both genera were characterised (Palm 2004, p. 255) as having a craspedote scolex with a distinct pars proliferans scolecis and a poeciloacanthous armature, that is with a chainette. *Dasyrchyn-*

chus was differentiated from *Pseudogilquinia* on the basis that *Dasyrhynchus* had cordiform bothria, bulbs not extending into the pars proliferans scolecis and a characteristic basal armature without a trapezoidal array of small hooks while *Pseudogilquinia* had collar-like bothria, the bulbs extended into the pars proliferans scolecis and the trapezoidal array of hooks was absent. In addition, *Dasyrhynchus* had longer bulbs. The current redescription of *P. pillersi* conforms with some of these distinctions. The species is craspedote and the bulbs project into the pars proliferans scolecis; in addition, the bulb ratio 7.06–10.19 (8.4) is generally (though not invariably) smaller than species of *Dasyrhynchus* (9.3–19.0) and the pars bothrialis is extremely short. However a compact array of hooks is present at the base of the tentacle as it is in *P. microbothria* (MacCallum, 1917) rendering this differential character dubious. The principal differentiating character, the presence of a chainette, becomes more difficult as, in the present redescription, the identification of the central files of hooks on the external surface of the tentacle as a chainette is quite subtle. Using the key provided by Palm (2004, p. 255), the species could also be allocated to *Pseudogrillotia* Dollfus, 1969.

The above comments suggest that the definition of genera within this subfamily warrants additional attention and that detailed redescriptions of poorly understood species such as *P. pillersi* may eventually lead to a more robust classification of the Grillotiinae.

Pseudogilquinia pillersi was found only in large species of epinephelines in New Caledonia. Numerous specimens of smaller epinepheline species (*E. fasciatus*, *E. maculatus*, *E. merra*) have been examined by one of us (J.-L. J) and none has been found infected with *P. pillersi*. It is possible that, since the parasite occurs primarily in large predatory fish, that there may an earlier larval stage in smaller fishes.

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