TWO NEW SPECIES OF PSEUDOCHRISTIANELLA CAMPBELL & BEVERIDGE, 1990 (CESTODA: TRYPANORHYNCHA) FROM ELASMOBRANCH FISHES FROM THE GULF OF CALIFORNIA, MEXICO

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INTRODUCTION

The eutetrarhynchid trypanorhynch genus Pseudochristianella Campbell & Beveridge, 1990 is currently represented by a single species, P. southwelli Campbell & Beveridge, 1990, known from sharks and rays from the Indian Ocean (Campbell & Beveridge, 1990). The new genus was erected because this cestode shared an armature pattern similar to that of the genus Parachristianella Dollfus, 1946 in possessing a heteroacanthous, heteromorphous armature with solid hooks and with the initial file of hooks of the principal rows the largest, but differing in having a basal tentacular swelling and a distinctive basal armature on the external surface of the tentacle. The species are distinguished from one another and from the only existing species within the genus, P. southwelli Campbell & Beveridge, 1990, by differences in the arrangement of billhooks on the external surface of the basal swelling of the tentacle and by the number of hooks in each row of the metabasal armature.

KEY WORDS: Pseudochristianella, Cestoda, Trypanorhynch, new species.

MATERIALS AND METHODS

Elasmobranchs were collected in the Gulf of California, Mexico (local name Baja California) (also known as the Sea of Cortez) by local fisherman. Cestodes were fixed in 10 % formalin in situ or were removed from the hosts and were relaxed in water or water containing 5 % lidocaine prior to fixation in AFA. Whole mounts were prepared by staining in Harris’ haematoxylin or Mayer’s paracarmine, dehydrated in a graded ethanol series, cleared in methyl salicylate and mounted in Canada balsam. Drawings were made with the aid of a drawing tube attached to an Olympus BH microscope. Measurements were made with an ocular micrometer. All measurements are presented in micrometres, unless otherwise stated, as the range followed, in parentheses, by the mean and the number of specimens measured (n = ). Specimens have been deposited in the Instituto de Bio-
RESULTS

**PSEUDOCHRISTIANELLA ELEGANTISSIMA** sp. nov. (Figs 1-8)

**DESCRIPTION**

Small cestodes, mature specimens 3.40–4.36 (3.89, n = 5) mm long, maximum width in region of pars vaginalis 260-390 (330, n = 5), with 2-6 (4, n = 8) segments. Scolex acraspedote, 1050-1550 (1270, n = 5) long, maximum width in region of pars vaginalis 260-390 (360, n = 5). Tegument of scolex smooth. Two oval bothria; pars bothrialis 140-230 (190, n = 5). Pars vaginalis longer than pars bothrialis, 450-830 (640, n = 5) long; sheaths slightly sinuous. Bulbs 550-620 (580, n = 5) long, 40-75 (63, n = 5) wide; retractor originates at base of bulb; gland cells present within bulb; prebulbar organ present; pars post bulbosa present or absent, 0-45 (30, n = 5).

Everted tentacle up to 450 long, 30 (30, n = 5) wide in metabasal region; with basal swelling, 40-45 (41, n = 5) in diameter at base. Armature heteroacanthous typical, heteromorphous; hooks solid. Distinctive basal armature present; initial two rows of hooks unicinate to falci-form with elongated bases, 11-20 (15, n = 5) long, base 9-11 (10, n = 5); on remainder of base, hooks arranged in five ascending rows beginning on internal surface, terminating on external surface; prominent space between hook files 1 and 1'; hooks 1 (1') unicinate, diminishing in size along row, becoming spini-form with approx. 15 hooks per row; terminal hook of fifth row and terminal 2-3 hooks of sixth row enlarged, cylindrical, 16-24 (22, n = 5) long, circular base 5-8 (6, n = 5) in diameter, projecting perpendicularly from surface of tentacle; terminal 2-3 hooks of row 6 on bothrial
surface enlarged, elongate, bill-hooked, 18-21 (20, n = 5) long, base 4-7 (5, n = 5). Metabasal armature with distinct space between hooks 1 and 1; with 13 hooks per row; hooks 1 (1') large, uncinate with broad base, 17-21 (19, n = 5) long, base 14-20 (17, n = 5); hooks 2 (2') uncinate, slightly smaller but with much shorter base, 15-19 (17, n = 5) long, base 6-12 (8, n = 5); hooks 3 (3') spiniform, 8-11 (10, n = 5) long, base 3-4 (3, n = 5); hooks 4 (4') spiniform, longer, 14-16 (15, n = 5), base 4-5 (5, n = 5); hooks diminish in size gradually along row, hooks 13 (13') spiniform, 3-8 (5, n = 5) long, base 2-3 (2, n = 5); hook rows overlap and alternate on external surface of tentacle.

Mature segments acraspedote, 1000-2100 (1480, n = 5) long, 130-260 (200, n = 5) wide; genital pore in posterior part of segment margin, 400-1000 (620, n = 5) or 37-59 (47, n = 5) % from posterior end. Testes aligned in two columns; testes 40-90 long by 20-30 wide; total number of testes 79-112 (96, n = 5) distributed as 8-12 (11, n = 5) post-vaginal, 30-46 (36, n = 5) pre-vaginal and 41-55 (49, n = 5) anti-poral. Cirrus sac globular with thick wall, 80-175 (118, n = 5) long by 50-100 (77, n = 5) wide; cirrus unarmed; internal and external seminal vesicles absent. Vagina enters genital atrium posterior to cirrus sac, passes posteriorly to a distinct seminal receptacle. Ovary four lobed, lobes 120-240 (140, n = 5) by 45-110 (68, n = 5); Mehlis’ gland posterior to ovarian isthmus, 40 in diameter. Uterus tubiform, extends from Mehlis’ gland almost to anterior extremity of segment. Osmoregulatory canals: ventral canal sinuous, 50 in diameter, dorsal canal 20 in diameter. Gravid segments absent.

Type host: *Dasyatis brevis* (Garman, 1880) (Dasyatidae).

Other host: *Dasyatis longus* (Garman, 1880) (Dasyatidae).

Site in host: spiral valve.

Material examined: from *D. brevis*: holotype, La Paz, Gulf of California, Mexico (24° 10’ N, 110° 17’ W), coll. J. Caira, 10.ix.1993 (IBUNAM 5468); 19 paratypes, same data (IBUNAM 5469, USNPC 97913, 97914); one specimen, Puertecitos, Gulf of California, Mexico, coll. J. Caira, 22.vii.1993 (USNPC 97915); from *D. longus*: three specimens, San Jose del Cabo, Gulf of California, Mexico, coll. J. Caira, 17.ix.1993 (USNPC 97916).

Etymology: latin, meaning, most elegant, referring to the basal armature.

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**Figures 5-8.** – *Pseudochristianella elegantissima* sp. nov. from *Dasyatis brevis* (armature) and *D. longus* (Dasyatidae) (entire cestode). Fig. 5. Tentacle, abothrial surface, basal and metabasal armature. Fig. 6. Tentacle, abothrial surface, internal surface on right hand side, metabolic armature. Fig. 7. Tentacle, internal surface, bothrial surface on right hand side, basal and metabasal armature. Fig. 8. Entire cestode. Scale-lines: Figs 5,6, 0.01 mm; Figs 7,8, 0.1 mm.
**Pseudochristianella nudiscula** sp. nov.  
(Figs 9-16)

**Description**

Small cestodes, mature specimens 2.13-2.93 (2.48, \(n = 5\)) mm long, maximum width 100-130 (120, \(n = 5\)), with 3-5 (4, \(n = 5\)) segments. Scolex acraspedote, 730-870 (810, \(n = 5\)) long, maximum width in region of pars bulbosa 90-130 (120, \(n = 5\)). Tegument of scolex smooth. Two oval bothria; pars bothrialis 100-130 (120, \(n = 5\)), width 100-140 (120, \(n = 2\)). Pars vaginalis longer than pars bothrialis, 300-420 (380, \(n = 5\)) long; sheaths slightly sinuous. Bulbs 320-430 (380, \(n = 5\)) long; 40-50 (46, \(n = 5\)) wide; retractor originates at base of bulb; gland cells present within bulb; prebulbar organ present; pars post bulbosa present or absent, 0-50 (20, \(n = 5\)). Everted tentacle up to 525 long, 15-20 (18, \(n = 5\)) wide in metabasal region; with basal swelling, 23-28 (25, \(n = 5\)) in diameter at base. Armature heteroacanthous typical, heteromorphous; hooks solid. Distinctive basal armature present on external surface only; initial two rows of hooks uncinate to falciform with elongated bases, 10-20 (14, \(n = 5\)) long, base 5-10 (7, \(n = 5\)); on remainder of base, hooks arranged in ascending rows beginning on internal surface, terminating on external surface; prominent space between hook files 1 and 1'; hooks 1 (1') uncinate, diminishing in size along row; initial rows incomplete; hooks becoming spiniform along row with 4-7 hooks per row; terminal 2-3 hooks of third and fourth rows enlarged, cylindrical, 10-17 (14, \(n = 5\)) long, circular base 3-6 (5, \(n = 5\)) in diameter, projecting perpendicularly from surface of tentacle; billhooks arranged on external surface as alternating pairs with small spiniform hooks interspersed. Metabasal armature with distinct space between hooks 1 and 1'; 10 hooks per row; hooks diminish gradually in size along row, hooks 1 (1') large, uncinate with broad base, 16-20 (18, \(n = 5\)) long, base 10-14 (12, \(n = 5\)); hooks 2 (2') falcate, slightly longer but with much shorter base, 18-21 (20, \(n = 5\)) long, base 6-7 (7, \(n = 5\)); hooks 3 (3') falcate, 16-20 (18, \(n = 5\)) long, base 5-7 (6, \(n = 5\)); hooks 4 (4') spiniform, 12-17 (14, \(n = 5\)), base 3-4 (4, \(n = 5\)); hooks 5 (5') spiniform, 4-14 (11, \(n = 5\)) long, base 3 (3, \(n = 5\)); hooks 6 (6') spiniform

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**Figs 9-13.** – *Pseudochristianella nudiscula* sp. nov. from *Rhinobatos productus* (Rhinobatidae). Fig. 9. Scolex. Fig. 10. Bothria. Fig. 11. Entire cestode. Fig. 12. Premature segment. Fig. 13. Mature segment. Scale-lines: 0.1 mm.
8-11 (9, n = 5) long, base 2-3 (3, n = 5); hooks 7 (7’) spiniform, 4-7 (5, n = 5) long, base 1-2 (2, n = 5); hooks 8 (8’)-10 (10’) tiny, spiniform, 4-5 (4, n = 5) long, base 1-2 (2, n = 5); hook rows overlap and alternate on external surface of tentacle.

Mature segments acraspedote, 1100-1800 (1370, n = 5) long, 110-120 (110, n = 5) wide; genital pore in posterior part of segment margin, 350-700 (550, n = 5) or 27-49 (41, n = 5) % from posterior end. Testes arranged in two columns; testes 45-75 (60, n = 10) by 28-43 (35, n = 10); total number of testes 41-57 (46, n = 5) distributed as 3-5 (4, n = 5) post-vaginal, 16-22 (18, n = 5) pre-vaginal and 20-30 (23, n = 5) anti-poral. Cirrus sac globular with thick wall, 50-55 (53, n = 3) by 35-45 (40, n = 3); cirrus unarmed; internal and external seminal vesicles absent. Vagina enters genital atrium posterior to cirrus sac, passes posterior to ovary. Ovary four lobed, lobes 188-350 (270, n = 3) by 25-33 (30, n = 5); Mehlis’ gland not seen. Uterus tubiform, extends from ovary almost to anterior extremity of segment. Osmoregulatory canals not seen. Gravid segments absent.

Type host: Rhinobatos productus Ayres, 1854 (Rhinobatidae).

Other hosts: Dasyatis longus (Garman, 1880) (Dasyatidae); Myliobatis longirostris Applegate & Fitch, 1964 (Myliobatididae); Zapteryx exasperata (Jordan & Gilbert, 1880) (Rhinobatidae).

Site in host: spiral valve.

Material examined: from Rhinobatos productus: holotype, Santa Rosalia, Gulf of California, Mexico (29° 17’ N, 112° 17’ W), coll. J. Caira, 15.viii.1993 (IBUNAM 5470); four paratypes, same data (IBUNAM 5471, USNPC 97918); one specimen, Bahía de Los Angeles, Gulf of California, Mexico, coll. J. Caira, 7.viii.1993 (USNPC 97917); from D. longus: two specimens, San José del Cabo, Gulf of California, Mexico, coll. J. Caira, 18, 20.ix.1993 (USNPC 97919-20); from Myliobatis longirostris: one specimen, Bahía de Los Angeles, Gulf of California, Mexico, coll. J. Caira, 28(ix.1993 (USNPC 97921); from Zapteryx exasperata: one specimen, Santa Rosalia, Gulf of California, Mexico, coll. J. Caira, 22.viii.1993 (USNPC 97922).

Etymology: Latin, somewhat naked, referring to the external surface of the base of the tentacle.

**DISCUSSION**

Pseudochristianella elegantissima is distinguished from *P. southwelli* primarily on the basis of the arrangement of hooks on the external surface of...
the base of the tentacle. In *P. elegantissima*, anterior to the two rows of hooks which encircle the base are five ascending hook rows with approximately 11 hooks per row (Fig. 4). These ascending rows are absent in *P. southwelli*. The bill hooks on the external surface of the tentacle are larger (16-24 long) in *P. elegantissima* than in *P. southwelli* (9-13) and are confined to the termination of one pair of hook rows, with a single bill hook posterior to these rows, at the apex of two hook rows. In *P. southwelli*, the bill hooks are present at the termination of several hook rows (Campbell & Beveridge, 1990, Fig. 2). The scolex of *P. elegantissima* (1050-1550) is also slightly larger than that of *P. southwelli* (920-1000). In addition, the two species differ in the number of hooks in each row of the metabasal armature with 13 in *P. elegantissima* and 11 in *P. southwelli*.

*P. nudiscula* is a smaller species (2.1-2.9 mm compared with 3.4-4.4 mm in *P. elegantissima* and *P. southwelli*), with bulbs (320-430) shorter than those of *P. elegantissima* (550-620) and *P. southwelli* (450-580). The principal distinguishing feature of the species lies in the arrangement of hooks on the external surface of the base of the tentacle. In *P. nudiscula* anterior to the two rows of hooks encircling the very base of the tentacle, there is a space devoid of hooks (Figs 14, 15). In *P. southwelli*, a small space exists, but is not bounded on either side by principal rows of hooks (Campbell & Beveridge, 1990, Fig. 2), while in *P. elegantissima*, this region is occupied by ascending hook rows (Fig. 4). In addition, the number of testes per segment is lower in *P. nudiscula* (41-57) than in either *P. southwelli* (80) or *P. elegantissima* (79-112). *P. nudiscula* is also distinguishable from *P. elegantissima* by the number of hooks in rows of the metabasal armature, with 10 in *P. nudiscula* and 13 in *P. elegantissima*. For these reasons, both species described herein are considered to be new.

The description of *P. southwelli* was based on material from an unidentified species of *Carcharhinus* and from *Rhinobatos balavi* (Forsskål, 1775) from India (Campbell & Beveridge, 1990). Current collections of *Pseudochristianella* extend the known distribution of the genus to the west coast of North America and indicate a host range of dasyatid, myliobatid and rhinobatid rays. It therefore seems likely that rays are the usual host of cestodes of this genus and that the collection of *P. southwelli* from a species of *Carcharhinus* may have been a chance finding. Little is known of the life cycles of eutetrarhynchid cestodes (Palm, 2004) although all known plerocerci have been collected from crustaceans, molluscs and occasionally teleosts. It may be that the definitive host range of the parasites is determined as much by prey availability than by phylogenetic or physiological constraints imposed by the elasmobranch host.

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