

Two New Genera of Pseudophyllidean Cestodes from Deep-Sea Fishes

RONALD A. CAMPBELL

Department of Biology, Southeastern Massachusetts University,
North Dartmouth, Massachusetts 02747

ABSTRACT: Two new genera of pseudophyllidean cestodes are described from the deep-sea teleost *Alepocephalus agassizi* Goode and Bean, 1883. *Probothriocephalus muelleri* gen. et sp. n. is a parabothriocephalid distinguished by the combination of a neck, marginal genital pores, indistinct metamerism, unarmed cirrus, and circumcortical vitellaria. Philobothriidae Campbell, 1977 is emended to include a new genus, *Philobothrioides*, which differs from *Philobothrios* in having the testes restricted to the extreme anterior region of the segment, a single embryo per capsule, and scolex lacking an apical disk.

Adult cestodes have been infrequently encountered among more than 1,700 deep sea enchytraeic teleosts examined from trawls in the environs of Hudson Submarine Canyon, northwest Atlantic (39°27'N, 70°28'W). Among those recovered are two new genera of pseudophyllideans from the intestine and pyloric ceca of *Alepocephalus agassizi* Goode and Bean, 1883. Mixed infections were observed on several occasions. Fish were caught in trawls at mean depths of 1,691 to 2,293 m and worms removed and processed from both freshly caught and preserved hosts by methods previously described (Campbell, 1977). Whole mounts were stained with Mayer's paracarmine or Ehrlich's acid hematoxylin and mounted in Kleermount or Canada balsam. Frontal and transverse serial sections of the strobilas were cut at 10 μ m and stained with Harris' hematoxylin and eosin. Descriptive measurements are expressed as length by width, include the range, and the mean in parentheses. Measurements are in micrometers unless otherwise indicated.

Probothriocephalus gen. n.

DIAGNOSIS: Pseudophyllidea; Parabothriocephalidae. Scolex linguiform, bothria shallow, apical disk lacking. Neck present. External segmentation indistinct, internal segmentation lacking. Genital pores marginal, irregularly alternate. Cirrus unarmed. Testes medullary, in lateral fields, continuous in postovarian space and between segments. Ovary in posterior medulla. Vagina enters genital atrium posterior to cirrus pouch. Uterine duct and sac median, invading adjoining proglottis; uterine pores midventral. Vitellaria cortical, continuous. Eggs operculate, unembryonated. Parasites of marine teleosts.

TYPE AND ONLY SPECIES: *Probothriocephalus muelleri* sp. n.

Probothriocephalus muelleri sp. n.

(Figs. 1, 5, 6, 7, 9, 10)

DESCRIPTION (based on 17 specimens; 5 measured): *Probothriocephalus*. Scolex somewhat elongate, tapering anteriorly, 1.4-1.9 mm by 700-940. Neck about 780 by 740. Strobila fairly broad and uniform, 10.5-41.7 cm by 1.7-2.3 mm, longitudinal furrows lacking. Segmentation poorly developed, proglottisation uniform. All segments broader than long, anterior and posterior borders marked by presence of uterine sacs. Mature segments 0.8-1.1 mm by 2-2.1 mm; gravid

segments 1.3–1.4 mm by 2.1–3.4 mm. Genital pores marginal, irregularly alternate, postequatorial. Cirrus pouch (5 worms, 24 pouches) 253–371 (298) by 63–136 (89), small, thin walled, tapering medially to join highly coiled vas deferens. Testes subspherical, 64–112 by 32–48, forming 2 continuous longitudinal bands in lateral medulla, joining in postovarian space; 52–83 (62) per proglottis (5 worms, 30 proglottids). Vitelline follicles irregular, distinctly circumcortical and continuous, 24–56 in diameter. Vagina narrow, nonmuscular, parallel to cirrus pouch along posterior border then turns posteriad near midline to join ootype. Vaginal sphincter lacking. Seminal receptacle absent. Ovarian lobes (5 worms, 50 lobes) 237–427 (308) by 120–237 (192), transversely elongate, bilobed; isthmus narrow, 140–180 by 16. Mehlis' gland posteroventral to ovary, uterine duct highly coiled, passing dorsal to ovarian isthmus and ascending in midline to uterine sac at anterior margin of proglottis. Uterine sac invades preceding proglottis when gravid. Eggs (5 worms, 40 eggs) 95–114 (103) by 61–72 (64), operculate, thin shelled, unembryonated, poles with numerous tubercles.

HOST: *Alepocephalus agassizi* Goode and Bean, 1883 (Alepocephalidae).

LOCALITY: Hudson Submarine Canyon in northwest Atlantic and adjacent continental slope.

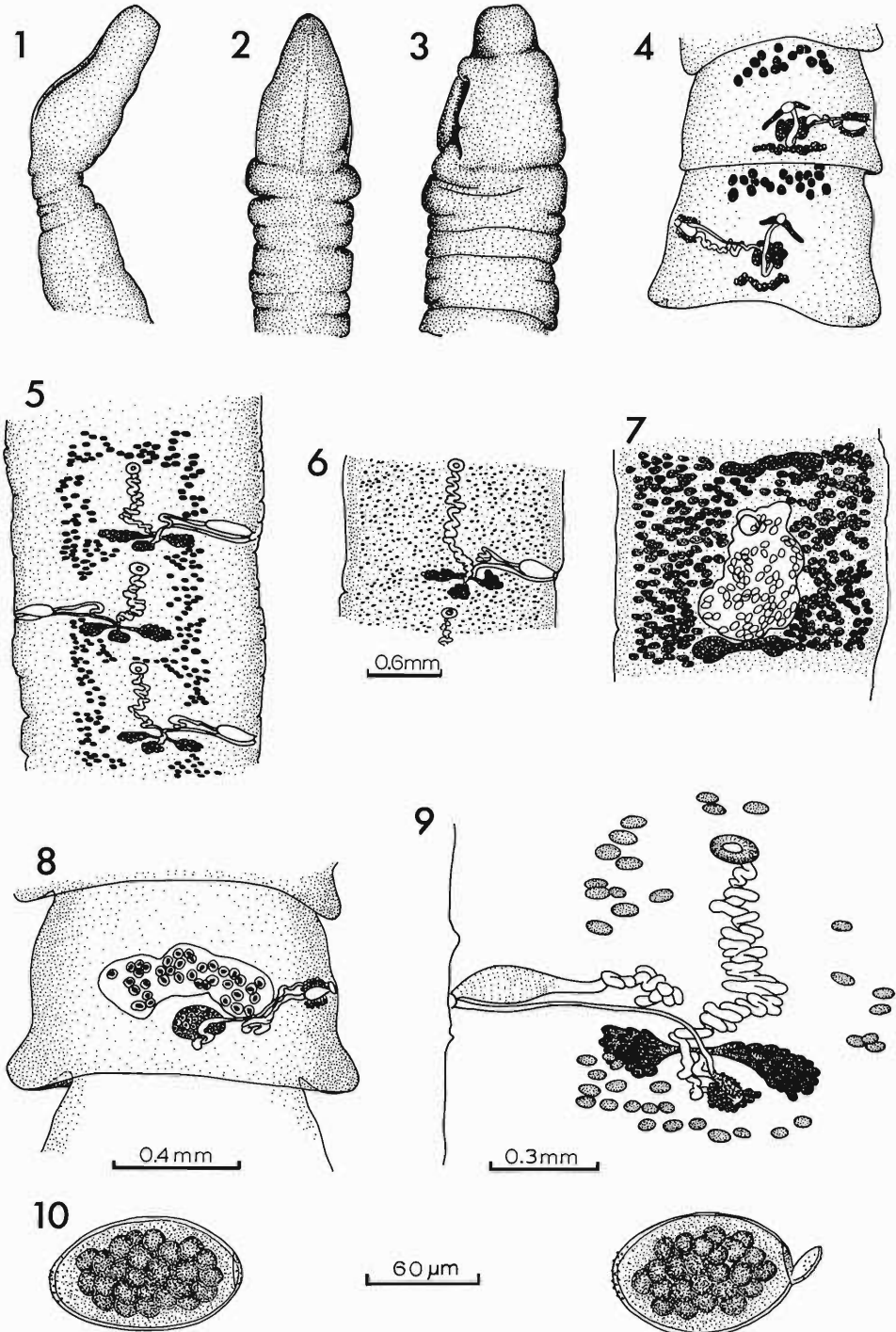
HOLOTYPE AND PARATYPE: USNM Helm. Coll. Nos. 74875 and 74876.

ETYMOLOGY: The species is named after Dr. Justus F. Mueller, parasitologist, S.U.N.Y. Upstate Medical Center, Syracuse, New York.

Remarks

The presence of operculate, unembryonated eggs in this species in combination with its other features does not clearly separate it from the Amphicotylidae Ariola, 1899. Amphicotylids having cortical vitellaria and marginal genital pores like *Probothriocephalus* are *Eubothrium*, *Amphicotyle*, and *Pseudamphicotyla* and comprise the subfamily Amphicotylinae Lühe, 1902. In addition to the differences in eggs, features differentiating *Probothriocephalus* from these genera are: the lack of dorsal and ventral median furrows and distinct segmentation, and the vagina opening posterior to the cirrus instead of anteriorly as in *Eubothrium*; the possession of simple bothria and ventral uterine pore instead of the dorsal pore and bothridial suckers of *Amphicotyle*; and, by lacking the loculate bothria, terminal disk, and segmentation of *Pseudamphicotyla*.

Using the keys of Wardle and McLeod (1952), Wardle et al. (1974), Joyeux and Baer (1961), and Yamaguti (1959) *Probothriocephalus* can be keyed to the Bothriocephalidae Blanchard, 1849 or Parabothriocephalidae Yamaguti, 1959. Yamaguti (1959) separated *Parabothriocephalus*, *Parabothriocephaloides*, and *Glossobothrium* from the Bothriocephalidae and placed them in Parabothriocephalidae. *Probothriocephalus* is clearly closely related to the three genera in this family, especially *Parabothriocephaloides* and *Glossobothrium* which have cortical vitellaria. *Parabothriocephalus gracilis*, the genotype, has medullary vitellaria but *P. johnstoni* Prudhoe, 1969 from *Coryphaenoides whitsoni* has vitellaria intruding from the cortical into the medullary zone. These genera differ from *Probothriocephalus* in having a dorsosubmarginal cirrovaginal aperture, distinct segmentation, vagina divided into two distinct regions, and in lacking a neck. In addition *Glossobothrium* has bothrial appendages and an apical disk. Members of the Bothriocephalidae are widespread among shallow dwelling marine teleosts of the



Figures 1–10. Deep-sea Pseudophyllidean Cestodes. 1, 5, 6, 7, 9, 10. *Probothriocephalus muelleri*: 1. Scolex. 5. Mature proglottids showing testes. 6. Mature proglottid showing vitellaria. 7. Gravid proglottid. 9. Detail of reproductive system. 10. Eggs. 2, 3, 4, 8. *Philobothoides stunkardi*: 2–3. Scoleces. 4. Mature segments. 8. Gravid segment.

world. Yamaguti's *Parabothriocephalidae*, included in the *Bothriocephalidae* by some authors, is known only from inshore teleosts except for *Parabothriocephalus johnstoni* from an Antarctic macrourid (Prudhoe, 1969).

***Philobythoides* gen. n.**

DIAGNOSIS: Pseudophyllidea; Philobythiidae. Scolex conical, bothria well formed, apical disk absent. Segments markedly craspedote. Strobila anapolytic. Testes medullary, clustered near anterior border of segment. Uterus with lateral diverticula forming an inverted V. Embryos develop individually within membranous capsules. Parasites of marine teleosts.

TYPE AND ONLY SPECIES: *Philobythoides stunkardi* sp. n.

ETYMOLOGY: The genus is named for its similarity to *Philobythos*.

***Philobythoides stunkardi* sp. n.**

(Figs. 2, 3, 4, 8)

DESCRIPTION (based on 6 gravid specimens and numerous fragments): *Philobythoides*. Scolex weakly developed, 504–568 (540) by 376–416 (392). Neck absent. Strobila serrate, 7–19 mm (15 mm) by 1.02–1.2 mm (1.12 mm), consisting of 62–188 markedly craspedote segments. Internal segmentation distinct. All segments wider than long; mature, 304–672 by 0.424–1.12 mm; gravid, 700–900 by 0.94–1.2 mm. Cirrus pouch (5 worms, 30 pouches) 73–83.6 (79) by 45.6–49.4 (47), pyriform, delicate, surrounded by glandlike cells. Unarmed cirrus present. Genital atrium protrudes in distinct marginal papilla; pore postequatorial, irregularly alternate. Testes subspherical, 23–48 by 19–40, medullary, clustered in median field of anterior ¼ of segment. Testes per segment (5 worms, 25 segments) 16–25 (20). Vagina opens anterior to cirrus pouch. No seminal receptacle observed. Ovary bilobed, maximum dimensions 114–190 by 32–80. Uterine duct extends anteroventral to ovary to join uterus. Uterus with 2 preformed diverticula. Gravid uterus forms a transverse sac. Uterine pore median. Embryos develop singly within membranous capsules 38–84 in diameter; hexacanth (5 worms, 20 embryos) 56–80 (72) by 34–45 (40). Vitellarium medullary, transversely elongate, 216–456 by 32–80, immediately postovarian. Testes and vitellarium degenerate in gravid segments.

HOST: *Alepocephalus agassizi* Goode and Bean, 1883 (*Alepocephalidae*).

LOCALITY: Hudson Submarine Canyon and adjacent continental slope.

HOLOTYPE AND PARATYPE: USNM Helm. Coll. Nos. 74873 and 74874.

ETYMOLOGY: The species is named after Dr. Horace W. Stunkard, parasitologist, at the American Museum of Natural History, New York.

Remarks

Presently, the family Philobythiidae Campbell, 1977 is monotypic being based on a single species, *Philobythos atlanticus*. *Philobythoides* resembles *Philobythos* in its markedly craspedote strobila, transversely elongate vitellarium, small cirrus pouch, uterus with preformed diverticula, and embryos developing in membranous capsules. However, *Philobythoides* differs from *Philobythos* in having a scolex lacking any evidence of an apical disk, testes restricted to the extreme anterior portion of the segment, and a single hexacanth embryo instead of multiple embryos per capsule.

In view of the discovery of a second genus the family diagnosis is emended and *Philobythos* separately defined as follows:

***Philobythiidae* Campbell, 1977, emended**

DIAGNOSIS: Pseudophyllidea. Small worms with scolex more-or-less well-developed and bearing bothria. Apical disk weakly developed or absent. Neck present or absent. Strobila distinctly segmented. One set of reproductive organs per segment. Testes medullary, medial to nerve trunks. Cirrus pouch contains unarmed cirrus. Genital pores marginal, irregularly alternate. Vagina enters anterior to cirrus pouch. Ovary in posterior medulla. Vitellarium medullary, postovarian. Uterus with preformed diverticula and ventromedian pore. Oncospheres develop singly or in clusters within membranous capsules. Parasites of marine teleosts.

TYPE GENUS: *Philobythos* Campbell, 1977.

***Philobythos* Campbell, 1977, emended**

DIAGNOSIS: Pseudophyllidea; *Philobythiidae*. Scolex with bothria and weakly developed apical disk. Strobila craspedote, anapolytic. Primary and secondary segmentation precede proglottisation. Testes medullary, surrounding female reproductive system. Uterus with lateral diverticula forming an inverted V. Oncospheres develop in clusters within membranous capsules. Parasites of marine teleosts.

TYPE AND ONLY SPECIES: *Philobythos atlanticus* Campbell, 1977.

Remarks

The genera are distinguished as follows: *Philobythos*, with characters of the family; scolex with weakly developed apical disk, testes surrounding female reproductive system, multiple embryos per capsule.

Philobythoides, with characters of the family: scolex lacking apical disk, testes restricted to extreme anterior portion of segment, a single embryo per capsule.

Acknowledgments

The assistance and cooperation of Dr. Richard L. Haedrich, WHOI, is gratefully acknowledged for providing space aboard research vessels and supplying fishes for examination. This research was supported by NSF Grant DEB 76-20103 and in part by NSF Grant 22339.

Literature Cited

- Campbell, R. A. 1977. A new family of pseudophyllidean cestodes from the deep-sea teleost *Acanthochoaenus lutkenii* Gill 1884. *J. Parasitol.* 63:301-305.
- Joyeux, C., and J. Baer. 1961. Classe des Cestodes. Pages 347-560 in Grasse, ed., *Traité de zoologie*. Tome IV. Masson et Cie., Paris.
- Prudhoe, S. 1969. Cestodes from fish, birds, and whales. *B.A.N.Z.A.R.E. Reports, Series B.* 8(9):171-193.
- Wardle, R. A., and J. A. McLeod. 1952. *The zoology of tapeworms*. Univ. Minnesota Press, Minneapolis. 780 pp.
- Wardle, R. A., J. A. McLeod, and S. Radinovsky. 1974. *Advances in the zoology of tapeworms 1950-1970*. Univ. Minnesota Press, Minneapolis. 259 pp.
- Yamaguti, S. 1959. *Systema Helminthum*. Vol. II. The cestodes of vertebrates. Interscience Publishers, Inc., New York. 860 pp.