Six New Species of Tetraphyllidean Cestodes, Including a New Genus, from a Marine Stingray *Himantura schmardae* (Werner, 1904) from Colombia[1]

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ABSTRACT: Six species of tetraphyllidean cestodes are described from the marine stingray *Himantura schmardae* from the Caribbean coast of Colombia. The new genus *Acanthobothroides* is proposed for *A. thorsoni* which has outer bothridial hooks characteristic of members of *Acanthobothrium* and inner bothridial hooks similar to those of species of *Onchobothrium*. *Acanthobothrium himanturi* differs from *A. southwelli* by having an average of 47 rather than 34 testes per proglottid, a larger cirrus sac, and unequal ovarian lobes; it differs from *A. brevissime* in having hooks averaging 138 μm rather than 115 μm in total length, 47 rather than 25 testes, and a distinct ovarian isthmus, and by lacking a prominent genital atrium. *Acanthobothrium tasajerasi* differs from *A. brevissime* by having hooks averaging 165 μm rather than 115 μm and larger bothridia; it differs from *A. dujardinii* by having smaller hooks, a prominent genital atrium and an indistinct ovarian isthmus. *Caulobothrium anacolum* differs from all other members of the genus by having a cephalic peduncle which is considerably shorter than the strobila, acraspedote proglottids, and quadrate rather than canoe-shaped bothridia which lack a median longitudinal septum. *Rhinebothrium magniphallum* has a cirrus sac which is relatively much larger than any other known species. It resembles *R. monodi* and *R. scobinae* in number of bothridial loculi, *R. hawaiiensis*, *R. euzeti*, and *R. cadenati* in number of testes per proglottid, and *R. scobinae* and *R. cadenati* in lacking a median longitudinal septum. *Rhinebothrium tetralobatum* resembles *R. spinicephalum* by having two testes and craspedote proglottids, but differs by having 50 to 54 rather than 32 to 34 bothridial loculi and 82 to 100 rather than 36 to 49 proglottids per strobila. The ovary resembles that of *R. lintoni*, but has four lobes rather than six to eight.

The genus *Himantura* Müller and Henle, 1837 (Chondrichthyes: Dasyatidae) comprises approximately 12 species of marine and estuarine stingrays distributed throughout the western Indo-Pacific Ocean and Red Sea regions, one species from the Pacific coast of Costa Rica, and one species from the Caribbean Sea. Little is known about their parasitic helminths: Williams (1964) described two species of tetraphyllidean cestodes from *Himantura granulosa* (Macleay) from Australia and Diaz-Ungria (1973) reported a nematode, *Echinocephalus ungriai* Troncy, 1969 (erroneously reported from *Potamotrygon hystrix*), from *H. schmardae* (Werner) from Lake Maracaibo in Venezuela. This report describes six new species of tetraphyllideans from *H. schmardae* from the Caribbean coast of Colombia.

[1] Funds for this study were provided through a grant from the National Geographic Society to Dr. T. B. Thorson, University of Nebraska.
Part of this study was conducted in cooperation with the U.S. Department of Commerce, NOAA, Office of Sea Grant, under Grant No. 04-5-158-54. The U.S. government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright notation that may appear hereon.

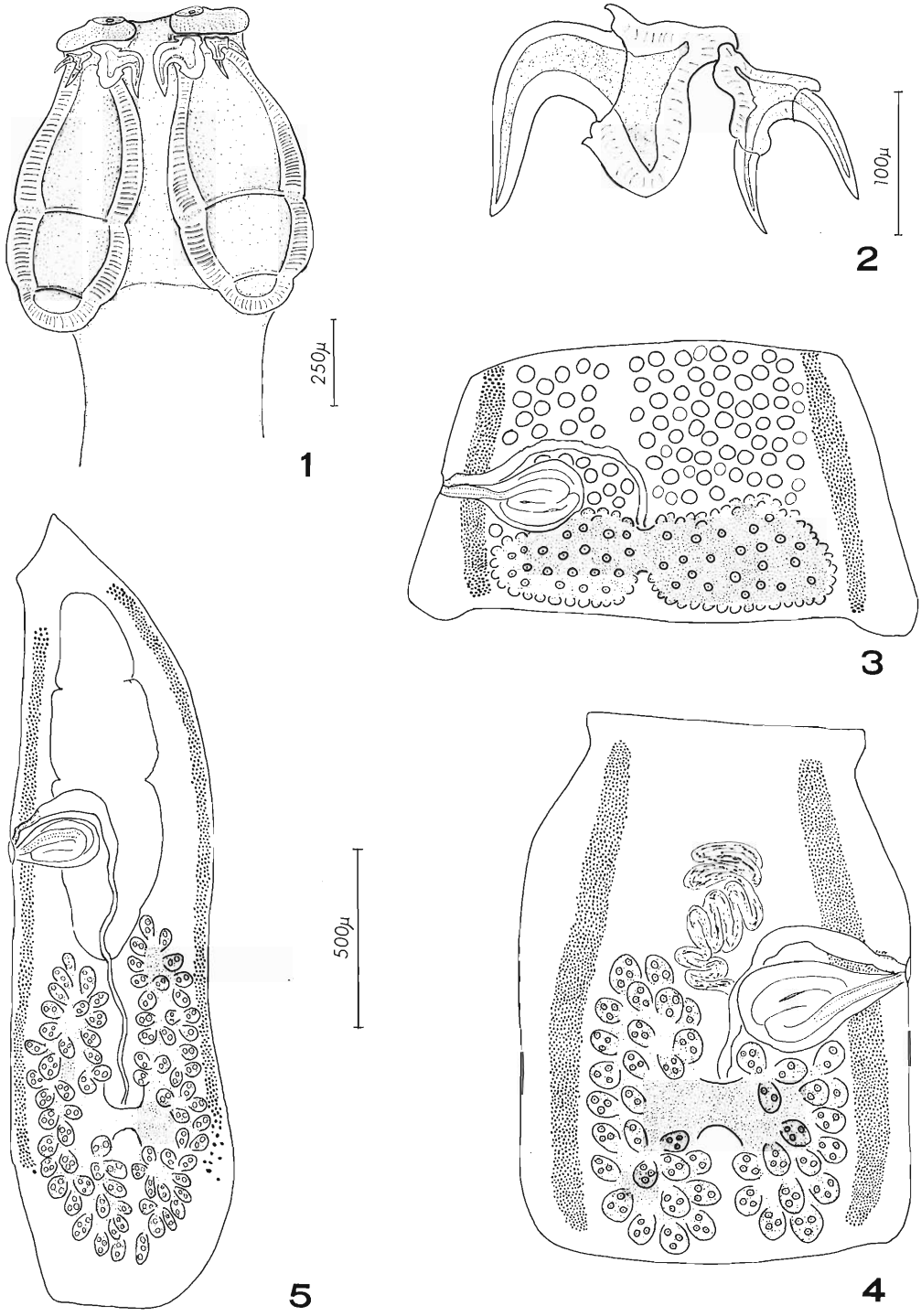
Materials and Methods

Local fishermen harpooned rays at night in the Caribbean Sea 15 kilometers west of La Cienaga, Departamento Magdalena, Colombia and kept them alive in seawater over night. Worms were fixed *in situ* or removed from the host, relaxed in cold seawater and fixed with AFA. All were stored in 70% ethanol. Whole mounts were stained with Ehrlich's acid hematoxylin and mounted in Histoclad. Serial cross-sections, cut at 8 micra and stained with hematoxylin-eosin, were used to confirm some aspects of proglottid morphology. Mean values and standard deviations are included for some characters. Measurements are in micra unless otherwise stated; figures were drawn with the aid of a drawing tube.

Cestoidea

Acanthobothroides gen. n.

DIAGNOSIS: Onchobothriidae. Scolex with four sessile, triseptate bothridia each with apical sucker and pad armed with pair of dissimilar



Figures 1–5. *Acanthobothroides thorsoni*. 1. Scolex. 2. Bothridial hooks. 3. Proglottid with testes. 4. Proglottid without testes but with sperm in vas deferens. 5. Gravid proglottid.

hooks; outer bothridial hooks bifid with handle, inner hooks with single prong and base. Genital pores marginal, irregularly alternating. Ovary bilobed in frontal view, X-shaped in cross-section. Vitellaria follicular, in marginal area of proglottid. Parasites of elasmobranchs. Type and only species:

Acanthobothroides thorsoni sp. n. (Figs. 1–5)

DESCRIPTION (based on 6 specimens): Strobila slightly craspedote, anapolytic, up to 400 mm long; composed of up to 700 proglottids. Internal musculature as follows: single layer with bundles of longitudinal muscles immediately below basement membrane of tegument; few poorly developed and poorly organized circular muscles in cortex; ring of longitudinal muscle bundles central to circular muscles. Scolex 665–1080 long by 820–1150 wide. Bothridia 675–880 long by 160–220 wide; anterior loculus 410–513 long, middle loculus 190–247, posterior loculus 76–95. Ratio of loculi lengths 1: 0.5: 0.2. Outer bothridial hooks 168–198 long; handle 66–90, inner prong 90–108, outer prong 90–108. Inner bothridial hooks 220–288 long; base 162–168 long. Cephalic peduncle 4.5–20 mm long. Immature proglottids wider than long. Proglottids containing testes 852–876 long by 1560–1680 wide. Testes occupying anterior ½ of proglottid, 87–97 in number, 90–145 in diameter; 12–15 postporally, 26–36 preporally, 46–50 antiporally. Cirrus sac near mid-proglottid, 415–504 long by 180–240 wide, containing spined eversible cirrus. Genital pore 50% of proglottid length from anterior end. Vagina anterior to cirrus sac; vaginal sphincter present. Ovary follicular, 468–852 long by 648–1080 wide at isthmus. Vitelline follicles extending entire length of proglottid. Proglottids not containing testes but with sperm in the vas deferens 948–2160 long by 900–1500 wide. Genital pore 41–45% of proglottid length from anterior end. Gravid proglottids 1220–2200 long by 636–720 wide. Genital pore 36–41% of proglottid length from anterior end. Ovary 780–960 long by 420–580 wide. Vitelline follicles extending from level of ovarian isthmus to near anterior end. Uterus saccate with irregular shallow constrictions, occupying most available preovarian space. Eggs 10–20, unembryonated.

HOST: *Himantura schmardae*.

SITE: Spiral valve.

LOCALITY: Caribbean Sea, 15 km. west of La Cienaga, Magdalena, Colombia.

HOLOTYPE: USNM Helm. Coll. No. 73959. Paratypes: USNM Helm. Coll. No. 73960; Univ. Neb. State Mus., H. W. Manter Lab. No. 20259.

ETYMOLOGY: The generic name means *Acanthobothrium*-like, and is masculine in gender. The species is named in honor of Dr. Thomas B. Thorson, University of Nebraska.

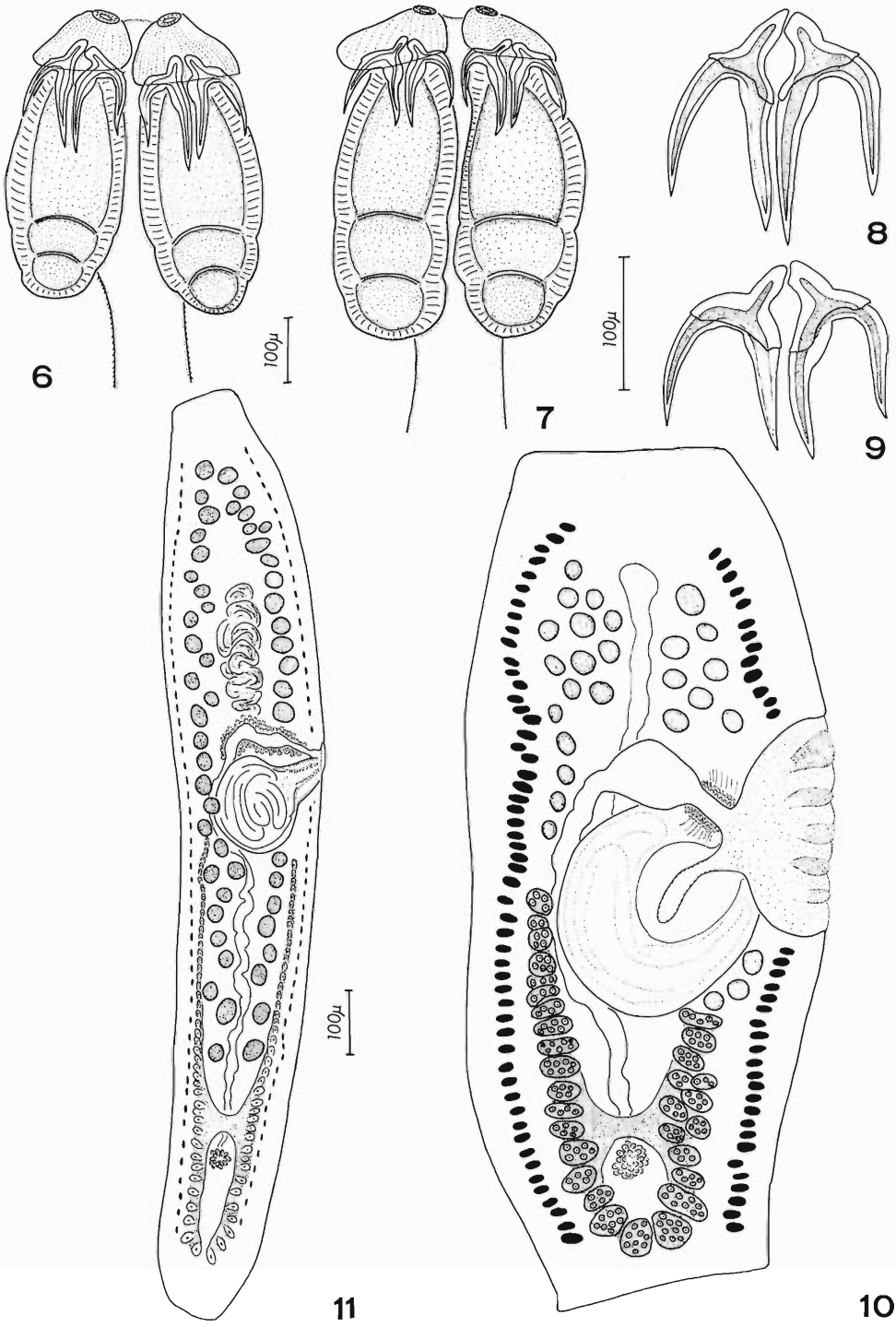
Three known genera of tetraphyllidean cestodes possess armed, triseptate bothridia, vitelline follicles restricted to the lateral margins of the proglottids, and ovaries which appear X-shaped when seen in cross-section: *Onchobothrium* Blainville, 1828; *Acanthobothrium* Beneden, 1850; and *Calliobothrium* Beneden, 1850. The morphology of the outer bothridial hooks of *Acanthobothroides thorsoni* is typical of species of *Acanthobothrium* while the inner hooks resemble those of members of *Onchobothrium*. The new genus is proposed because of this composite nature of the bothridial armature.

Acanthobothrium himanturi sp. n. (Figs. 7, 9, 11)

DESCRIPTION (n = number of measurements used): Strobila acraspedote, apolytic, 3.84–9.30 mm long; composed of 17–26 (n = 40) proglottids. Scolex 240–350 ($\bar{x}$ = 300, n = 20) long by 247–360 ($\bar{x}$ = 310, n = 20) wide, composed of four sessile, triseptate bothridia; each bothridium with apical sucker and pad, armed with pair of bifid hooks. Bothridia 297–432 ($\bar{x}$ = 372, n = 40) long by 111–185 ($\bar{x}$ = 161, n = 40) wide; anterior loculus 142–185 ($\bar{x}$ = 163) long, middle loculus 42–111 ($\bar{x}$ = 73), posterior loculus 31–86 ($\bar{x}$ = 64). Ratio of loculi lengths 1: 0.45: 0.40. Apical sucker 20–62 ($\bar{x}$ = 45) in diameter, pad 105–167 ($\bar{x}$ = 157) in diameter. Hook formula (modified from that of Euzet, 1956) for 40 hooks:

$$\frac{43\text{–}61\ (52 \pm 4)\quad 86\text{–}116\ (101 \pm 7)\quad 73\text{–}99\ (86 \pm 6)}{119\text{–}157\ (138 \pm 10)}.$$

Cephalic peduncle 0.3–1.0 mm long. Immature proglottids wider than long; mature ones 0.78–1.26 mm long by 0.18–0.34 mm wide. Testes in anterior ⅔ of proglottid, 38–57 (47 ± 5, n = 90) in number, 29–58 in diameter; 6–12 (9 ± 1.5) postporally, 9–17 (13 ± 2) preporally,



Figures 6–11. *Acanthobothrium himanturi* and *A. tasajerasi*. 6. Scolex of *A. tasajerasi*. 7. Scolex of *A. himanturi*. 8. Bothridial hooks of *A. tasajerasi*. 9. Bothridial hooks of *A. himanturi*. 10. Mature proglottid of *A. tasajerasi*. 11. Mature proglottid of *A. himanturi*.

18–30 (25 ± 2) antiporally. Cirrus sac near midproglottid, 120–180 long by 96–144 wide, containing spined eversible cirrus. Genital atrium indistinct. Genital pore 40–48% of proglottid length from anterior end, irregularly alternating. Vagina anterior to cirrus sac; vaginal sphincter present. Ovary near posterior end of proglottid, bilobed in frontal view, X-shaped in cross-section, 480–600 long by 120–180 wide at isthmus in terminal proglottids; ovarian lobes unequal length, aporal lobes reaching level of anterior margin of cirrus sac, poral lobes reaching posterior margin of cirrus sac. Isthmus near posterior end of ovary. Vitelline follicles extending from level of isthmus to near anterior end, 10–15 in diameter.

HOST: *Himantura schmardae.*

SITE: Spiral valve.

LOCALITY: Caribbean Sea, 15 km. west of La Cienaga, Magdalena, Colombia.

HOLOTYPE: USNM Helm. Coll. No. 73963. Paratypes: USNM Helm. Coll. No. 73964; Univ. Neb. State Mus., H. W. Manter Lab. No. 20260.

ETYMOLOGY: The specific name refers to the genus of host.

Acanthobothrium himanturi most closely resembles *A. brevissime* Linton, 1908 as redescribed by Goldstein (1964) and Campbell (1969) and *A. southwelli* Subhapradha, 1955. It differs from *A. southwelli* by possessing a much larger cirrus sac, an average 47 rather than 34 testes per proglottid, and unequal ovarian lobes. It differs from *A. brevissime* by having an average of 47 rather than 25 testes per proglottid, an indistinct genital atrium, and hooks averaging 138 micra in total length rather than 115 micra.

Acanthobothrium tasajerasi sp. n. (Figs. 6, 8, 10)

DESCRIPTION (n = number of measurements used): Strobila acraspedote, apolytic, 2.5–5.5 mm long, composed of 11–18 proglottids (n = 20). Scolex 309–384 ($\bar{x}$ = 340, n = 20) long by 240–371 ($\bar{x}$ = 310, n = 20) wide, composed of four sessile, triseptate bothridia; bothridia each with apical sucker and pad, armed with pair of bifid hooks. Bothridia 336–429 ($\bar{x}$ = 387, n = 10) long by 123–167 ($\bar{x}$ = 154, n = 10) wide; anterior loculus 175–215 ($\bar{x}$ = 190) long, middle loculus 80–130 ($\bar{x}$ = 100), posterior loculus 70–100 ($\bar{x}$ = 80). Ratio of loculi lengths 1: 0.5: 0.4. Apical sucker 37–62 ($\bar{x}$ = 50) in diameter, pad 111–185 ($\bar{x}$ = 130) in diameter. Hook formula (modified from that of Euzet, 1956) for 60 hooks:

$$\frac{52\text{–}64\,(58 \pm 3)\quad 110\text{–}130\,(119 \pm 4)\quad 90\text{–}114\,(102 \pm 6)}{152\text{–}178\,(165 \pm 6)}$$

Cephalic peduncle 144–240 long. Scolex and peduncle spinose. Immature proglottids wider than long; mature ones 468–840 long by 264–360 wide. Testes in anterior ⅔ of proglottid, 19–33 (26 ± 3, n = 70) in number, 15–30 in diameter; 2–5 (3 ± 1) postporally, 5–12 (9 ± 2) preporally, 9–20 (15 ± 2) antiporally. Cirrus sac spherical, 120–180 in diameter, containing spined eversible cirrus. Genital atrium prominent. Genital pore 37–43% of proglottid length from anterior end, irregularly alternating. Vagina anterior to cirrus sac, vaginal sphincter present. Ovary bilobed in frontal view, X-shaped in cross-section, 240–384 long by 60–144 wide at isthmus in terminal proglottids; isthmus not distinct; ovarian lobes unequal, aporal lobes reaching level of anterior margin of cirrus sac, poral lobes reaching posterior margin of cirrus sac. Vitelline follicles extending length of proglottid, 15–20 in diameter.

HOST: *Himantura schmardae.*

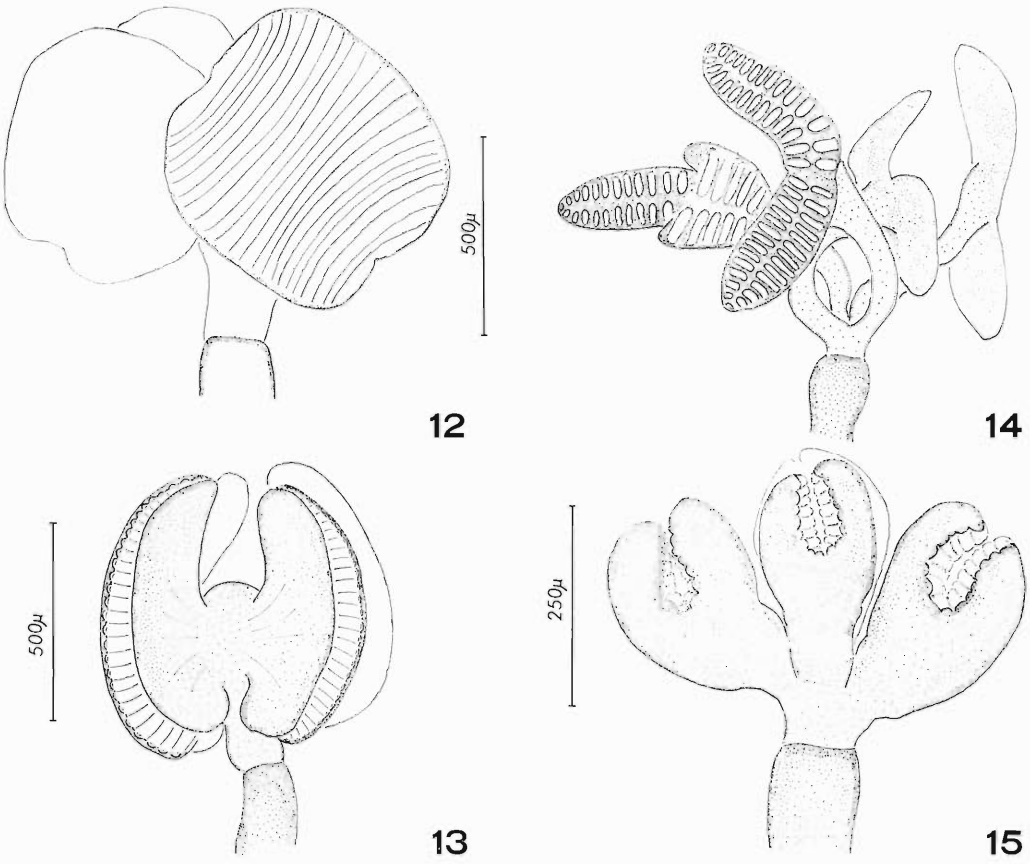
SITE: Spiral valve.

LOCALITY: Caribbean Sea, 15 km. west of La Cienaga, Magdalena, Colombia.

HOLOTYPE: USNM Helm. Coll. No. 73961. Paratypes: USNM Helm. Coll. No. 73962; Univ. Neb. State Mus., H. W. Manter Lab. No. 20261.

ETYMOLOGY: The specific name is derived from the Tasajeras Fishing Cooperative, where the author obtained the hosts.

This species also bears some resemblance to *Acanthobothrium brevissime.* It has a similar number of testes per proglottid, lacks a distinct ovarian isthmus, and has a prominent genital atrium. The hooks of *A. tasajerasi* average 165 micra in total length while those of *A. brevissime* average 115 micra. *Acanthobothrium tasajerasi* further differs from *A. dujardinii* by possessing a prominent genital atrium and lacking a distinct ovarian isthmus; additionally, *A. dujardinii* has hooks 180 to 210 micra long rather than 152 to 178 micra.



Figures 12–13. Scolex of *Caulobothrium anacolum*. 12. Bothridia relaxed. 13. Bothridia contracted. Figure 14. Scolex of *Rhinebothrium tetralobatum*. Figure 15. Scolex of *Rhinebothrium magniphallum*.

Caulobothrium anacolum sp. n. (Figs. 12–13, 19)

DESCRIPTION (n = number of measurements used): Strobila acraspedote, apolytic, 6.8–15.4 mm long, composed of 13–32 (n = 30) proglottids. Scolex with four pedicellated, quadrate bothridia; pedicels 50–150 long, wider at bothridium than at trunk; bothridia 648–804 long by 324–700 wide, with 22–23 transverse septa forming 23–24 total loculi; median longitudinal septum absent. Cephalic peduncle 120–360 long. Immature proglottids wider than long; mature ones 1.14–2.54 mm long by 0.38 mm wide. Testes in anterior ¾ of proglottid, 34–45 ($\bar{x}$ = 41, n = 20) in number, 54–138 in diameter; 10–14 (12) postporally, 5–7 (6) preporally, 18–27 (23) antiporally. Cirrus sac in anterior ⅓ of proglottid, 144–216 long by 108–178 wide, containing spined eversible cirrus. Genital atrium inconspicuous. Genital pore 19–29% of proglottid length from anterior end, irregularly alternating. Vagina anterior to cirrus sac; vaginal sphincter present; posterior portion expanded to form seminal receptacle. Ovary bilobed in frontal view, X-shaped in cross-section, follicular, 144–312 long by 96–300 wide at isthmus in terminal proglottids. Vitelline follicles extending length of proglottid, 12–60 in diameter.

HOST: *Himantura schmardae*.

SITE: Spiral valve.

LOCALITY: Caribbean Sea, 15 km. west of La Cienaga, Magdalena, Colombia.

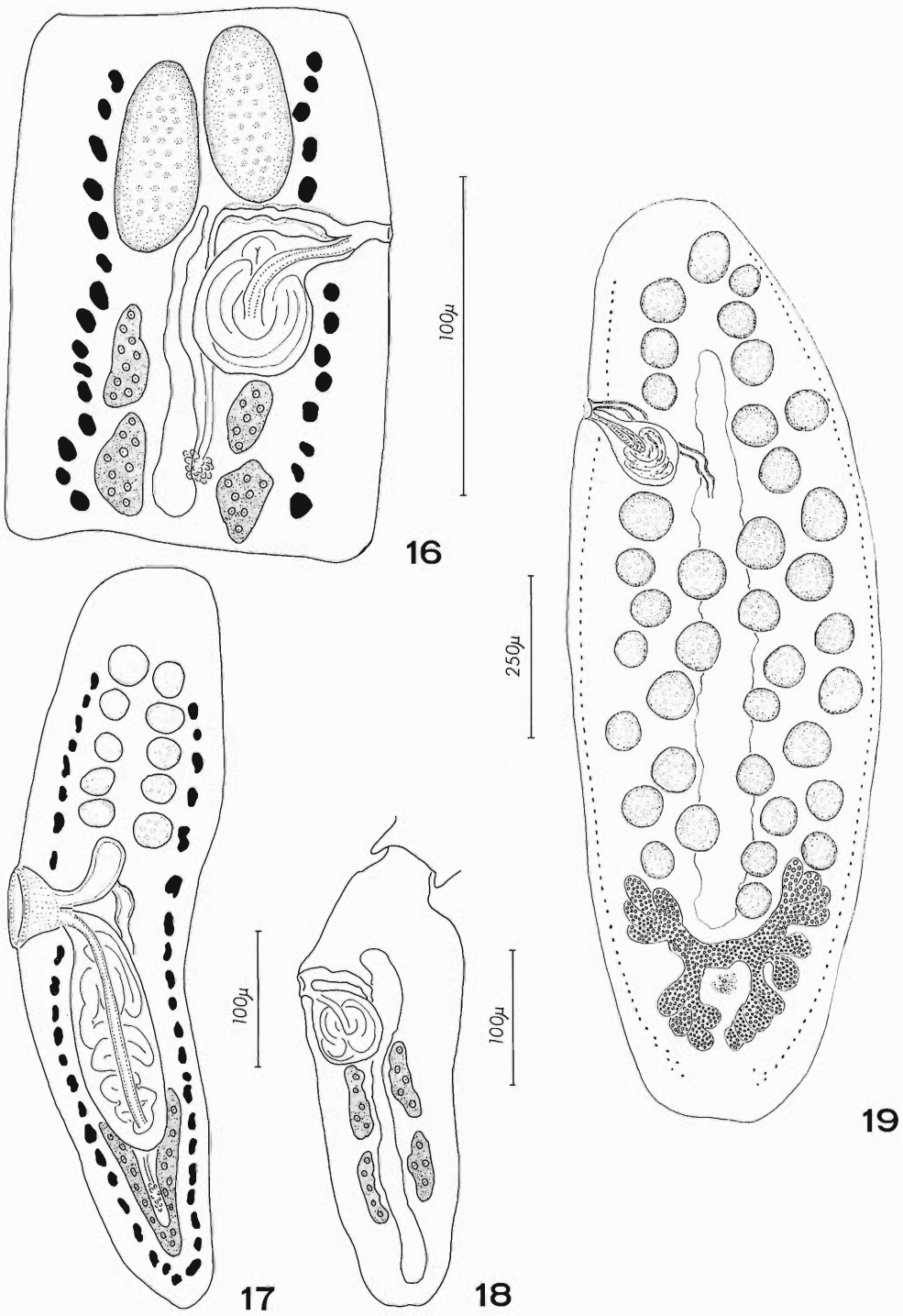


Figure 16. Mature proglottid of *Rhinebothrium tetralobatum*. **Figure 17.** Mature proglottid of *Rhinebothrium magniphallum*. **Figure 18.** Advanced mature proglottid of *Rhinebothrium tetralobatum*, drawn to same scale as 17. **Figure 19.** Mature proglottid of *Caulobothrium anacolum*.

HOLOTYPE: USNM Helm. Coll. No. 73969. Paratypes: USNM Helm. Coll. No. 73970; Univ. Neb. State Mus., H. W. Manter Lab. No. 20265.

ETYMOLOGY: The specific name is derived from Greek "anakolos" meaning stunted or shortened, and refers to the relative length of the peduncle.

Baer (1948) erected the genus *Caulobothrium* for species resembling *Rhinebothrium* but possessing extremely long cephalic peduncles, craspedote proglottids, and postvaginal testes. Five species have previously been described. *Caulobothrium anacolum* differs from all five by having a cephalic peduncle which is considerably shorter than the strobila, acraspedote proglottids, and quadrate rather than elongate bothridia which lack a median longitudinal septum, but is retained in the genus since it does possess postvaginal testes and a cephalic peduncle of some size. *Caulobothrium insignia* (Southwell, 1911) Baer, 1948 has 18 to 26 testes per proglottid while *C. anacolum* has 34 to 45; all other species have more than 100. The new species bears some resemblance to *C. opisthorchis* Riser, 1955 in size of strobila and number of proglottids, and in position of genital pore.

Rhinebothrium magniphallum sp. n. (Figs. 15, 17)

DESCRIPTION (n = number of measurements used): Strobila acraspedote, apolytic, 2.28–3.06 mm long, composed of 8–12 (n = 40) proglottids. Scolex composed of four pedicellated, bilobed, elongate bothridia with indistinct hingelike constriction between lobes; pedicels up to 22 long; bothridia 264–488 long by 128–144 wide, divided transversely by 15–17 transverse septa forming 16–18 total loculi; median longitudinal septum absent. Cephalic peduncle 24–60 long. Immature proglottids wider than long to longer than wide; mature ones 444–912 long by 108–204 wide. Testes in anterior ½ of proglottid, in two longitudinal rows, 10–15 ($\bar{x}$ = 12, n = 21) in number, 17–41 in diameter. Cirrus sac at midproglottid, 145–195 long by 46–75 wide, containing spined eversible cirrus. Genital atrium prominent. Genital pore 36–48% of proglottid length from anterior end, irregularly alternating. Vagina anterior to cirrus sac; vaginal sphincter present. Ovary near posterior end of proglottid, lobes fused posteriorly, X-shaped in cross-section, 116–238 long by 29–87 wide at isthmus in terminal proglottids. Vitelline follicles extending entire length of proglottid, may be confluent posterior to ovary, 10–35 in diameter.

HOST: *Himantura schmardae*.

SITE: Spiral valve.

LOCALITY: Caribbean Sea, 15 km. west of La Cienaga, Magdalena, Colombia.

HOLOTYPE: USNM Helm. Coll. No. 73965. Paratypes: USNM Helm. Coll. No. 73966; Univ. Neb. State Mus., H. W. Manter Lab. No. 20262.

ETYMOLOGY: The species name refers to the relative size of the cirrus sac.

Rhinebothrium magniphallum resembles *R. monodi* Euzet, 1954 (17) and *R. scobinae* Euzet and Carvajal, 1973 (19) in number of bothridial loculi; *R. hawaiiensis* Cornford, 1974 (11–13), *R. euzeti* Williams, 1958 (12) and *R. cadenati* Euzet, 1954 (12–14) in number of testes per proglottid; and *R. scobinae* and *R. cadenati* in lacking a median longitudinal septum in each bothridium. The cirrus sac of *R. magniphallum* is relatively much larger than that of any other species.

Rhinebothrium tetralobatum sp. n. (Figs. 14, 16, 18)

DESCRIPTION (based on six specimens): Strobila craspedote, apolytic, 15–30 mm long, composed of 82–100 proglottids. Scolex composed of four pedicellated, bilobed, canoe-shaped bothridia with distinct hingelike constriction between lobes; pedicels 144–200 long; bothridia 564–804 long by 228–264 wide, divided longitudinally by median septum, transversely by 25–27 septa forming two parallel rows of 24–26 loculi with single loculus at tip of each lobe; total number of loculi 50–54. Cephalic peduncle 96–144 long. Immature proglottids wider than long; mature ones 360–564 long by 96–156 wide. Testes in anterior ⅓ to ½ of proglottid, 2 in number, 35–58 in diameter. Cirrus sac in anterior ½ of proglottid, spherical, 50–70 in diameter, containing spined eversible cirrus. Genital atrium indistinct, 44–48% of proglottid length from anterior end, irregularly alternating. Ovary composed of paired anterior and posterior lobes in frontal view, paired dorsal and ventral lobes in cross-

section, 198–300 long by 60–90 wide at isthmus in terminal proglottids; isthmus indistinct. Vitelline follicles extending length of proglottid, 30–40 in diameter.

HOST: *Himantura schmardae.*

SITE: Spiral valve.

LOCALITY: Caribbean Sea, 15 km. west of La Cienaga, Magdalena, Colombia.

HOLOTYPE: USNM Helm. Coll. No. 73967. Paratypes: USNM Helm. Coll. No. 73968; Univ. Neb. State Mus., H. W. Manter Lab. No. 20253, 20266.

ETYMOLOGY: The specific name refers to the four-lobed appearance of the ovary.

By having two testes per proglottid and craspedote proglottids, *Rhinebothrium tetralobatum* closely resembles *R. spinicephalum* Campbell, 1970. It differs from that species by having 50 to 54 bothridial loculi and 82–100 proglottids per strobila rather than 34 to 36 loculi and 36 to 49 proglottids. *Rhinebothrium himanturi* Williams, 1964, *R. burgeri* Baer, 1948, and *R. lintoni* Campbell, 1970 all have similar numbers of bothridial loculi. The ovary of *R. tetralobatum* is similar to that of *R. lintoni*, but has only four lobes rather than six to eight.

Acknowledgments

The author expresses appreciation to Dr. Thomas B. Thorson for providing the opportunity to collect the specimens; Alvaro Boada, INDERENA, Ministry of Agriculture in Santa Marta for his aid in procuring the hosts; Tom E. Mattis for the loan of specimens of *Rhinebothrium lintoni* and his helpful suggestions; Dr. Ronald A. Campbell for his aid and suggestions; Dr. Robin M. Overstreet for his aid in the preparation of this manuscript; and Ms. Anne Langenfeld for her aid in assembling the plates.

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In Memoriam

MARIO MOLLARI

February 18, 1977

Member 1928–1961