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Three Proteocephalid Cestodes from Colombian Siluriform Fishes, Including *Nomimoscolex alovarius* sp.n. (Monticelliidae: Zygobothriinae)¹

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ABSTRACT: Three species of proteocephalid cestodes were collected from Colombian siluriform fishes. *Goezeella siluri* Fuhrmann, 1916 is reported from *Ageneiosus caucanus* for the first time, and Colombia is a new locality. *Goezeella siluri* has a metascolex, biloculate suckers, and cortical gonads. Proteocephalideans possessing uniloculate suckers and cortical gonads represent two groupings. Those species possessing metascolices represent the genus *Spatulifer* Woodland, 1934, containing the species *surubim*, *piramutab*, *piracatinga*, *rugosa*, and *rugata*. Those lacking metascolices belong in *Monticellia* LaRue, 1911, comprising *coryphicephala*, *lenha*, *megacephala*, and *spinulifera*. New combinations include *Spatulifer piramutab* for *Goezeella piramutab*, *S. piracatinga* for *Monticellia piracatinga*, *S. rugosa* for *M. rugosa*, and *S. rugata* for *M. rugata*. *Nomimoscolex alovarius* sp.n. from *Pimelodus clarias* most closely resembles *N. kaparari* by having fewer than 100 testes per proglottid and exhibiting two papilla-like protuberances on each sucker, but the new species differs by having 63-100 rather than 40 total lateral uterine branches, single lateral vitelline fields rather than dorsal and ventral lateral fields, anteriorly expanded ovarian lobes, and by lacking an expanded apical portion of the scolex. *Corallotaenia* sp. from *Ageneiosus caucanus* represents the first report of the genus in South America.

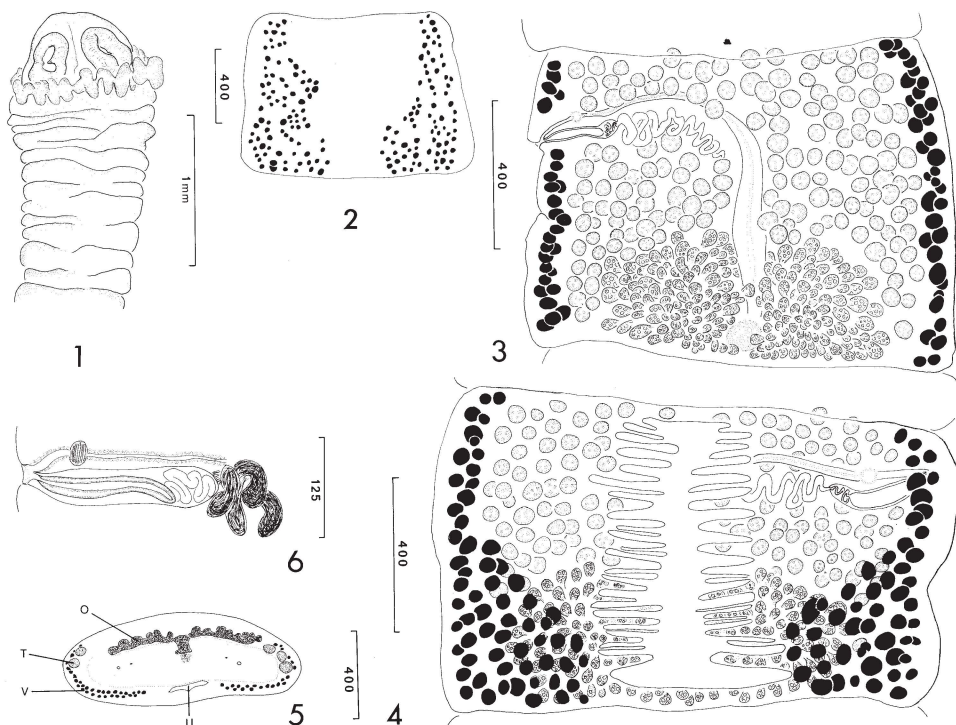
A small collection of cestodes infecting fishes in the Magdalena River of Colombia contained three species of proteocephalideans representing three genera, one of which has not been previously reported from South America. Two appear to be new, but the condition of our material permits description of only one.

Worms were removed from host intestines, relaxed in river water, fixed with AFA, and stored in 70% ethanol. They were stained with Van Cleave's or Mayer's hematoxylin and mounted in Histoclad for study as whole mounts. Serial cross sections cut at 8 μ m and stained with hematoxylin-eosin were used to confirm certain aspects of proglottid morphology. All measurements are in μ m unless otherwise noted; *N* = number of measurements used; figures were drawn with the aid of a drawing tube.

Goezeella siluri Fuhrmann, 1916 (Figs. 1-6)

DESCRIPTION (based on single complete specimen with some proglottids cut in serial cross sections): Strobila approximately 40 mm long. Scolex (Fig. 1) a conical elevation containing 4 biloculate suckers each 358-414 long by 222-266 wide; anterior loculus 185-204 long, posterior loculus 173-229 long. Apical organ lacking. Massive folded metascolex 1.1 mm wide. Immature proglottids wider than long. Mature proglottids (Fig. 3) 605-615 long by 896-1,038 wide (*N* = 10). Ratio of proglottid width to length 1:0.6-0.8 (*N* = 10). Testes in dorsal cortex (Fig. 5), in anterior $\frac{3}{4}$ of proglottid, 183-310 (*N* = 10) in number, 20-28 preporally, 73-

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Figures 1-6. *Goezeella siluri*. 1. Scolex. 2. Ventral view of proglottid showing vitelline configuration. 3. Mature proglottid. 4. Gravid proglottid. 5. Cross section of early gravid proglottid. 6. Terminal genitalia. Abbreviations: O = ovary, T = testes, U = uterus, V = vitelline follicles.

96 postporally, 90-190 antiporally; 32-66 in diameter. Cirrus sac (Fig. 6) 116-290 long by 51-58 wide; ratio of cirrus sac length to proglottid width 1:3.5-4.3 ($N = 10$); basal portion of cirrus thin-walled, up to 7 thick. Genital atrium lacking papillae. Ovary posteromedian with lobes in dorsal cortex; lobes 928-1,044 wide at isthmus, 348-429 long. Vagina anterior to cirrus sac and never crossing it; vaginal sphincter and seminal receptacle present. Uterus not preformed in mature proglottids. Vitelline follicles (Fig. 2) extending entire length of proglottid; follicles not in single file; follicles in dorsal and ventral lateral fields; ventral fields converging toward midline posteriorly; follicles 29-57 in diameter. Gravid proglottids (Fig. 4) 802-1,044 long by 1,264-1,470 wide; ratio of width to length 1:0.5-0.8 ($N = 6$). Uterus medial, with 27-43 ($N = 6$) total lateral branches occupying 34-43% of total proglottid width; preformed ventral uterine pores not seen. Eggs 14-23 in diameter; oncospheres 9-14 in diameter, lacking hooks *in utero*. Excretory system composed of paired dorsal and ventral lateral longitudinal medullary ducts and cortical network of reticulate tubules.

HOST: *Ageneiosus caucanus* Steindachner, 1880 (Siluriformes: Ageneiosidae).

LOCALITY: Magdalena River, vicinity of San Cristóbal, Bolívar, Colombia.

SITE OF INFECTION: Small intestine near juncture of stomach and intestine.

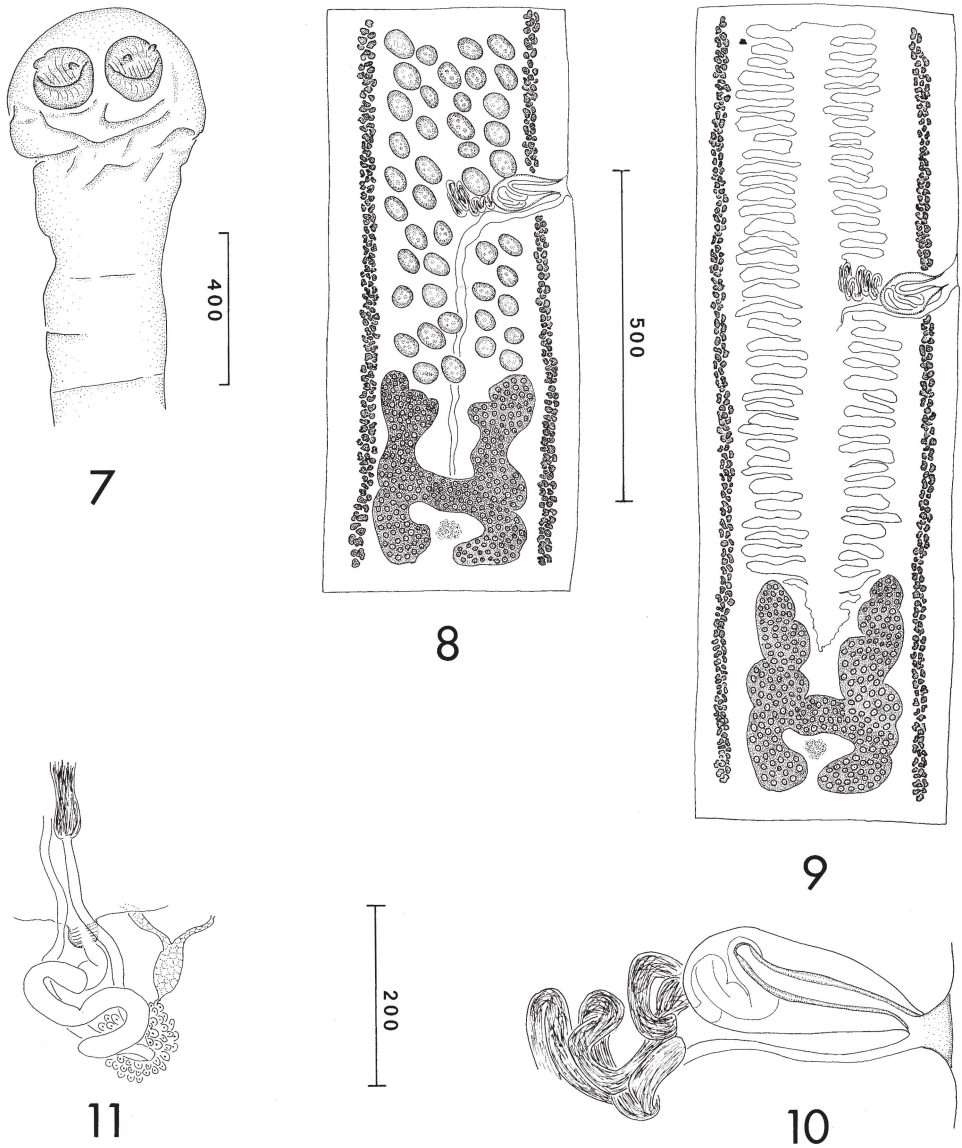
SPECIMEN DEPOSITED: USNM Helm. Coll. No. 74544.

Remarks

Fuhrmann (1916) reported more than 400 testes per proglottid for *Goezeella siluri*, but Rego et al. (1974) and Rego (1975) listed 200–300 testes per proglottid. The Colombian specimen has 183–310 testes, similar to specimens of *G. siluri* from Venezuela (Brooks, unpublished). We conclude that Fuhrmann's number represented an over-approximation of testes number.

LaRue (1911) proposed *Monticellia* for proteocephalidean cestodes possessing simple scolices and having all gonads situated in the proglottid cortex. Fuhrmann (1916) erected *Goezeella* for *G. siluri*, which reportedly resembled *Monticellia* species by having simple scolices and cortical gonads, but which possessed a metascolex. Rego et al. (1974) reported specimens identified as Fuhrmann's species, and illustrated uniloculate (=simple) suckers, but later Rego (1975) reexamined the material and discovered biloculate suckers. Woodland (1933a) previously reported biloculate suckers for specimens of *G. siluri* collected from the type host, *Cetopsis caecutiens*, and emended the generic diagnosis of *Goezeella* to include biloculate suckers. Later, Woodland (1933b) reported specimens identified as *Peltidocotyle rugosa* Diesing, 1850 and described cortical gonads as well as a scolex with simple suckers and a metascolex. After receiving a personal communication from Dr. Otto Fuhrmann, who stated that Diesing's type material of *P. rugosa* possessed biloculate suckers and medullary ovaries (see Fuhrmann, 1934), Woodland (1934) proposed the replacement name *Spatulifer surubim* for *P. rugosa* of Woodland, 1933. Subsequently, however, Woodland (1935), Wardle and MacLeod (1952), and Yamaguti (1959) as well as Rego et al. (1974) and Rego (1975) all considered *Monticellia* the senior synonym of both *Goezeella* and *Spatulifer*. Freze (1965) recognized three groupings among the species assigned to *Monticellia* by the above authors. Those possessing strongly developed metascolices he placed in *Goezeella*; those lacking metascolices or possessing weakly developed ones along with aspinose strobilae and relatively wide uterine branches he assigned to *Monticellia* (synonym *Spatulifer*); and for species lacking metascolices but having spinose strobilae and narrow uterine branches, Freze proposed *Spasskyellina* Freze, 1965.

Brooks (1978a) presented data suggesting that the relative width of uterine branches and the presence or absence of scolex spination were homoplastic traits among proteocephalideans; therefore, we do not consider them useful generic characters. We do consider the Monticelliinae Mola, 1929 a monophyletic group containing several lineages (Brooks, 1978b). Those groupings correspond more to the conceptions of Woodland before 1935 than to any other proposed scheme. Those species lacking a metascolex and possessing uniloculate suckers constitute *Monticellia* LaRue, 1911 (synonym *Spasskyellina* Freze, 1965), containing *M. coryphicephala* (Monticelli, 1891) LaRue, 1911 (type species), *M. lenha* Woodland, 1933, *M. megacephala* Woodland, 1934, and *M. spinulifera* Woodland, 1934. *Goezeella* Fuhrmann, 1916, as defined by Woodland (1933a) and by us, contains species with biloculate suckers and metascolices, namely *G. siluri* Fuhrmann, 1916. We further resurrect *Spatulifer* in its original meaning for monticelliines possessing metascolices and uniloculate suckers. *Spatulifer* thus contains *S. surubim* Woodland, 1934 (type species) (synonym *Peltidocotyle rugosa* Woodland, 1933), *S. piracatinga* (Woodland, 1935) comb.n. (synonym *Monticellia piracatinga* Woodland, 1935, *S. piramutab* (Woodland, 1933) comb.n. (synonym



Figures 7–11. *Nomimoscolex alovarius*. 7. Scolex. 8. Mature proglottid. 9. Gravid proglottid. 10. Terminal genitalia. 11. Ootype region.

Goezeella piramutab Woodland, 1933), *S. rugosa* (Woodland, 1935) comb.n. (synonym *Monticellia rugosa* Woodland, 1935), and *S. rugata* (Rego, 1975) comb.n. (synonym *Monticellia rugata* Rego, 1975).

Nomimoscolex alovarius sp.n.
(Figs. 7–11)

DESCRIPTION (based on 4 complete and 4 fragmented specimens): Strobila fragile, up to 30 mm long. Scolex (Fig. 7) aspinose, 340–445 wide, lacking apical

organ, with 4 uniloculate suckers; suckers 135–179 long by 142–185 wide, each with 2 papillae on anterior surface. Immature proglottids wider than long. Mature proglottids (Fig. 8) 482–882 long by 330–368 wide; ratio of proglottid width to length 1:1.3–2.6 ($N = 20$). Testes in anterior $\frac{3}{4}$ of proglottid, medullary, 40–61 ($N = 20$) in number, 7–13 preporally, 9–18 postporally, 23–33 antiporally; 41–68 in diameter. Cirrus sac (Fig. 10) 156–217 long by 41–72 wide; ratio of cirrus sac length to proglottid width 1:2.1–2.9 ($N = 20$); basal portion of unarmed cirrus up to 10 thick. Genital pores marginal, alternating irregularly in anterior 31–38% ($N = 20$) of proglottid. Genital atrium prominent, lacking papillae. Ovary posteromedian, medullary, bilobed with lobes expanded anteriorly; 90–185 wide at isthmus, lobes 200–358 long. Vagina anterior or posterior to cirrus sac, may cross it; vaginal sphincter lacking, seminal receptacle present. Uterus medial, preformed in mature proglottids. Vitelline follicles in single paired lateral cortical fields extending nearly entire length of proglottid; follicles not in single file. Gravid proglottids (Fig. 9) 882–3,259 long by 414–588 wide; ratio of width to length 1:1.5–7.9 ($N = 20$). Ratio of cirrus sac length to proglottid width 1:3.1–3.6 ($N = 20$). Genital pores in anterior 31–39% ($N = 20$) of proglottid. Ovarian lobes in gravid proglottids expanded greatly, 259–618 long by 247–377 wide at isthmus. Uterus medullary, with 63–100 ($N = 20$) total lateral branches occupying 48–56% of proglottid width; preformed ventral uterine pores lacking. Eggs 16–21 in diameter; oncospheres 15–19, hooks lacking. Excretory system composed of paired lateral longitudinal dorsal and ventral medullary ducts and cortical network of reticulate tubules.

HOST: *Pimelodus clarias* (Bloch, 1785) (Siluriformes: Pimelodidae).

LOCALITY: Quebrada Doña Juana, vicinity of La Dorada, Caldas, Colombia.

SITE OF INFECTION: Anterior $\frac{1}{3}$ of small intestine.

HOLOTYPE: USNM Helm. Coll. No. 74499.

PARATYPES: USNM Helm. Coll. No. 74500.

ETYMOLOGY: The specific epithet is derived from the Latin *ala*, meaning wing, and *ovarium*, meaning ovary, and refers to the structure of the ovarian lobes in gravid proglottids.

Remarks

Nomimoscolex Woodland, 1934 presently contains eight species parasitizing Amazon siluriform fishes in addition to the new species from the Magdalena River. *Nomimoscolex alovarius* differs from all but two species by possessing papilla-like structures associated with the suckers. *Nomimoscolex woodlandi* Freze, 1965 (= *Myzophorus sudobim* Woodland, 1934) and *N. kaparari* Woodland, 1935 possess similar structures, which Freze (1965) termed unguiculate protuberances. The protuberances of *N. woodlandi* appear as four structures situated around each sucker, whereas those of *N. kaparari* appear as two protuberances on the anterior edges of each sucker. Woodland called the structures cornified projections, and specifically stated that they could not be called hooks, so Freze's (1965) term *unguiculate protuberances* has misleading connotations. The papilla-like structures exhibited by *N. alovarius* thus appear to be similar to those which *N. kaparari* possesses, and different from those of *N. woodlandi*. *Nomimoscolex alovarius* and *N. kaparari* resemble each other further by possessing fewer than 100 testes per proglottid. The new species differs from *N.*

kaparari by lacking an umbelliform apical portion of the scolex, by possessing expanded ovarian lobes, and by exhibiting vitelline follicles in single, rather than dorsal and ventral, lateral lines (visible in whole mounts as well as sections). Woodland's (1935) figure of *N. kaparari* further suggests that gravid proglottids of that species possess fewer than 40 total lateral uterine branches, markedly different from the 63 to 100 exhibited by *N. alovarius*. *Nomimoscolex magna* Rego, Dos Santos, and Silva, 1974 parasitizes *Pimelodus clarias* in the Mato Grosso region of Brazil but bears little resemblance to *N. alovarius* beyond the generic characteristics. It lacks the sucker projections, has flat ovarian lobes and approximately 150 testes per proglottid, and possesses approximately 50 lateral uterine branches.

Corallotaenia sp.

HOST: *Ageneiosus caucanus*.

LOCALITY: Magdalena River, vicinity of San Cristóbal, Bolívar, Colombia.

SITE OF INFECTION: Anterior $\frac{1}{3}$ of small intestine.

SPECIMENS DEPOSITED: USNM Helm. Coll. No. 74501.

Remarks

This is the first report of the genus from South America. Our specimens, which lack gravid proglottids, possess 18–30 testes per proglottid, thus resembling *C. parva* (Larsh, 1941) Freze, 1965 more than any other species. They differ from all known species by having a well-developed metascolex and vitelline follicles which may be larger than the testes. They possess proglottids that are longer than wide, have vitellaria not entering the medial portion of the proglottid, and they are relatively small worms, 10–15 mm long. Thus, with the exception of possessing a well-, rather than poorly-, developed metascolex, the Colombian specimens conform to Freze's (1965) generic diagnosis of *Corallotaenia* Freze, 1965 and are assigned to that genus.

Acknowledgments

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