New Species of *Proteocephalus* (Cestoda - Proteocephalidae) Parasitic in Fishes from the Paraná River, Paraná, Brazil

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Two species of the genus Proteocephalus *(Cestoda: Proteocephalidae) were collected in fishes from the Paraná River*. Proteocephalus vazzolerae *n. sp. from* Piaractus mesopotamicus *and* Proteocephalus chubbi *n. sp. from* Gymnotus carapo *are new species, and are described and illustrated.* Proteocephalus vazzolerae *n. sp. is characterized mainly by the number of testes and the development of vitellaria.* Proteocephalus chubbi *n. sp. can be differentiated from its congeners by a combination of characters which include, number of testes, number of proglottids, strobila length, scolex shape and disposition of vitellaria. This is the first record of proteocephalidean in* P. mesopotamicus *and* G. carapo.

Key words: Cestoda - Proteocephalidae - P*roteocephalus vazzolerae* n. sp. - *Proteocephalus chubbi* n. sp. - Paraná River - Brazil

During a parasitological survey of fishes from the Paraná River, specimens of the genus *Proteocephalus* were collected from the intestine of "pacu" *Piaractus mesopotamicus* (Holmberg, 1887) and "morenita" *Gymnotus carapo* Linnaeus, 1758. According to Rego and Pavanelli (1992) there is no reference to occurrences of proteocephalidean in *P. mesopotamicus* and in *G. carapo*.

From this collected material two new species are described: *Proteocephalus vazzolerae* n. sp. of *Piaractus mesopotamicus*, and *Proteocephalus chubbi* n. sp. of *Gymnotus carapo*.

MATERIALS AND METHODS

Cestodes were obtained from 59 *Piaractus mesopotamicus* and 110 *Gymnotus carapo* caught in the Paraná River, near Porto Rico, PR, from March 1992 to February 1994. The fishes were identified and eviscerated, and the intestines were isolated and examined in Petri dishes containing a 0.65% physiological saline solution using a stereomicroscope. Specimens for study *in toto* were stained with Delafield's haematoxylin or Langeron's alcoholic chloridric carmine, cleared in beechwood creosote, and mounted in Canada balsam. Pieces of strobila were embedded in paraffin wax, sectioned at 5µm and stained with haematoxylin eosin. Measurements are in millimeters; unless otherwise indicated with ranges followed by mean within parentheses. The holotype and some paratypes were deposited in the Instituto Oswaldo Cruz Collection (CHIOC), Rio de Janeiro, RJ, Brazil. Prevalence, intensity of infection, and mean intensity of infection are used in the sense of Margolis et al. (1982).

DESCRIPTION

PROTEOCEPHALIDAE La Rue, 1911
PROTEOCEPHALINAE Mola, 1929
Proteocephalus vazzolerae n. sp.
(Figs 1-5)

Description: (based on four specimens) - Large worms. Strobila acraspedote, flattened dorsoventrally, 134.82 - 367.41 long, bearing about 313 proglottids. Neck 4.80 long. Immature and mature proglottids wider than long, 1.84 - 2.53 x 0.94 - 1.39 (2.07 x 1.14). Gravid proglottids wider than long, 1.68 - 2.55 x 1.19 - 1.61 (2.08 x 1.49). Scolex 0.60 - 0.69 (0.62) in diameter, with four lateral circular suckers, 0.21 - 0.24 (0.22) in diameter and presence of fifth apical sucker, 0.07 - 0.08 (0.075). Longitudinal groove present on scolex. Internal longitudinal musculature with longitudinal fibres, well developed dorsoventral fibres and transverse musculature internal to longitudinal musculature. Testes spherical arranged in two fields, extending to vitellaria, 239 - 299 (258) in number, with 52 - 60 (57) preporal, 55 - 81 (68) postporal and 115 - 158 (133) antiporal, 0.052 - 0.075 (0.061) in diameter. Cirrus pouch piriform, 0.33 - 0.43 (0.37) long and 0.12 - 0.16 (0.14) wide. Cirrus pouch length to proglottid width ratio 18.94%. Vas deferens coiled, extending to the half of proglottid. Genital pores irregularly alternate,

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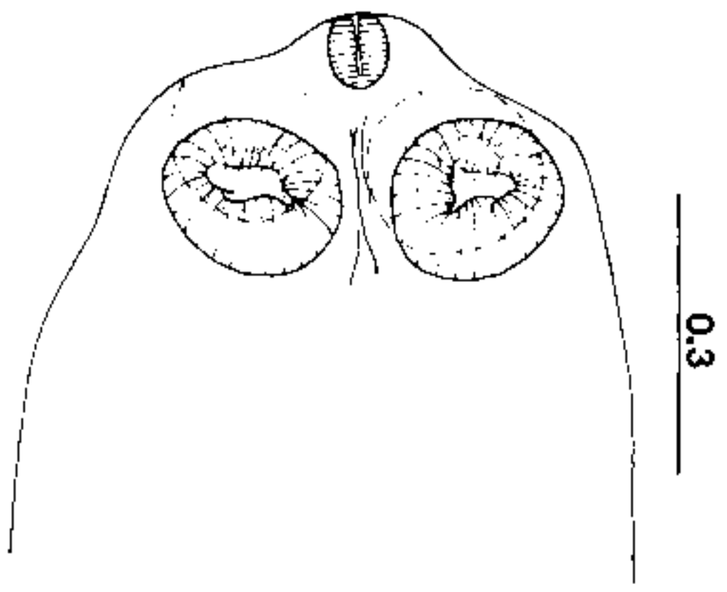

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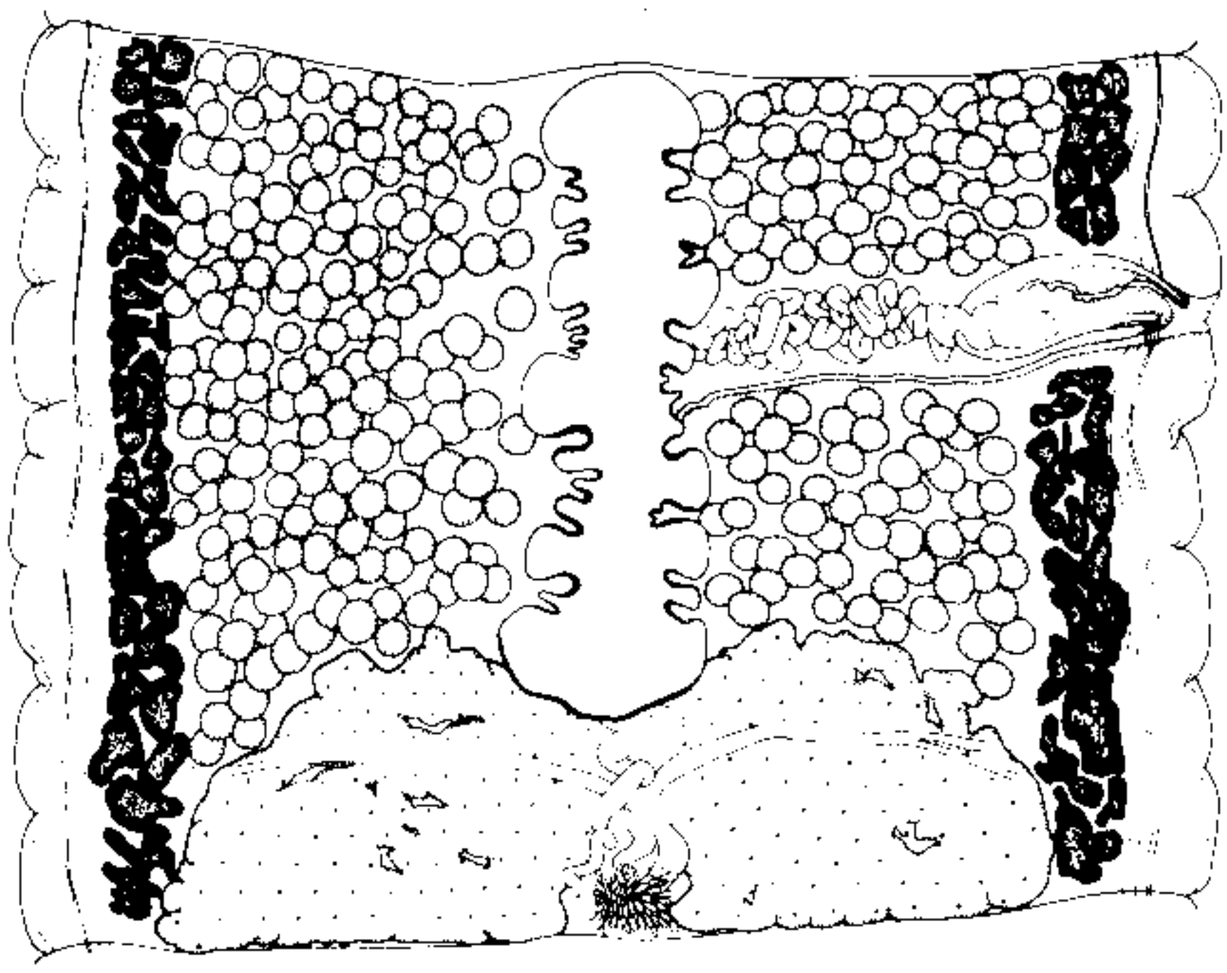

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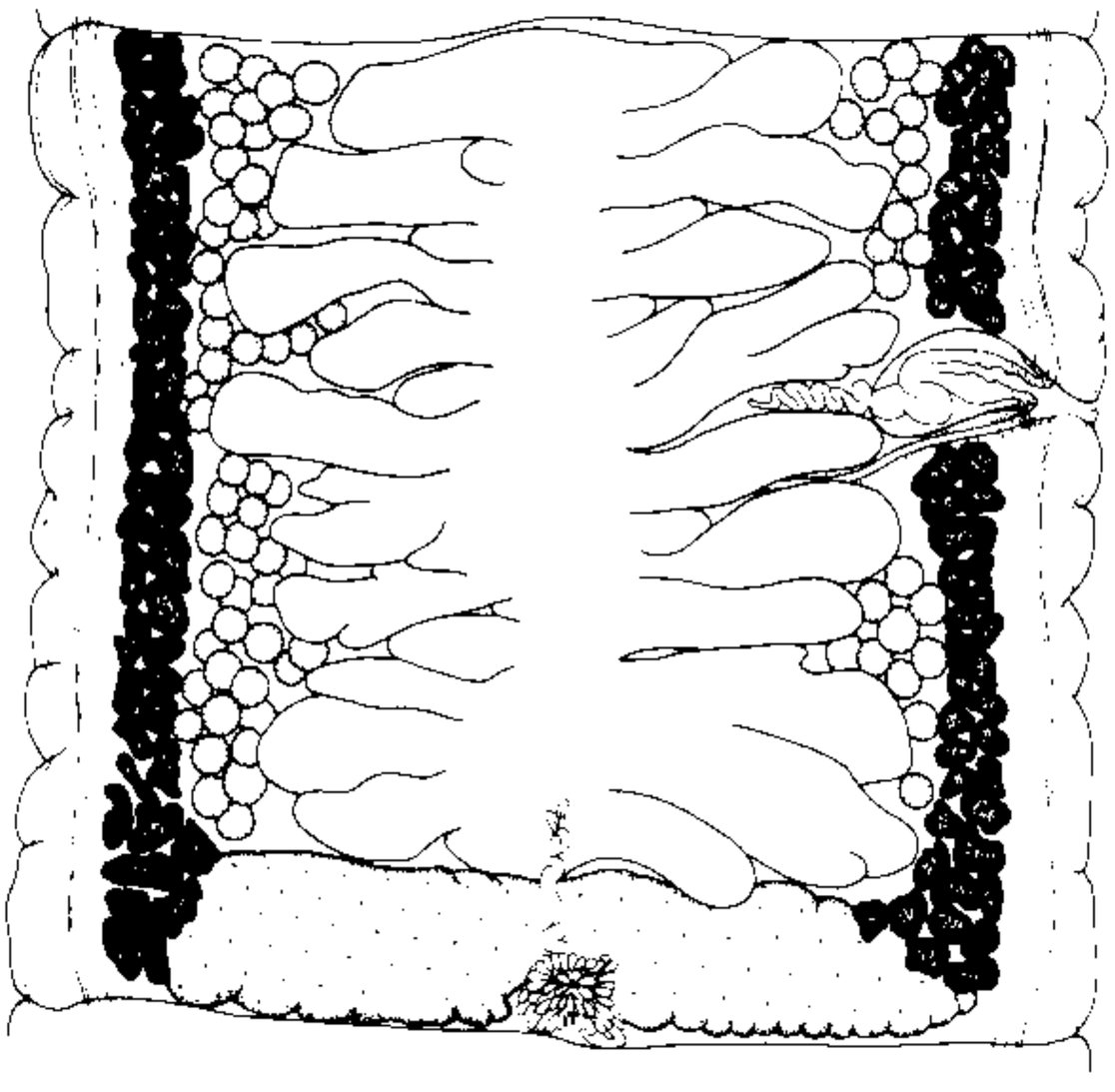

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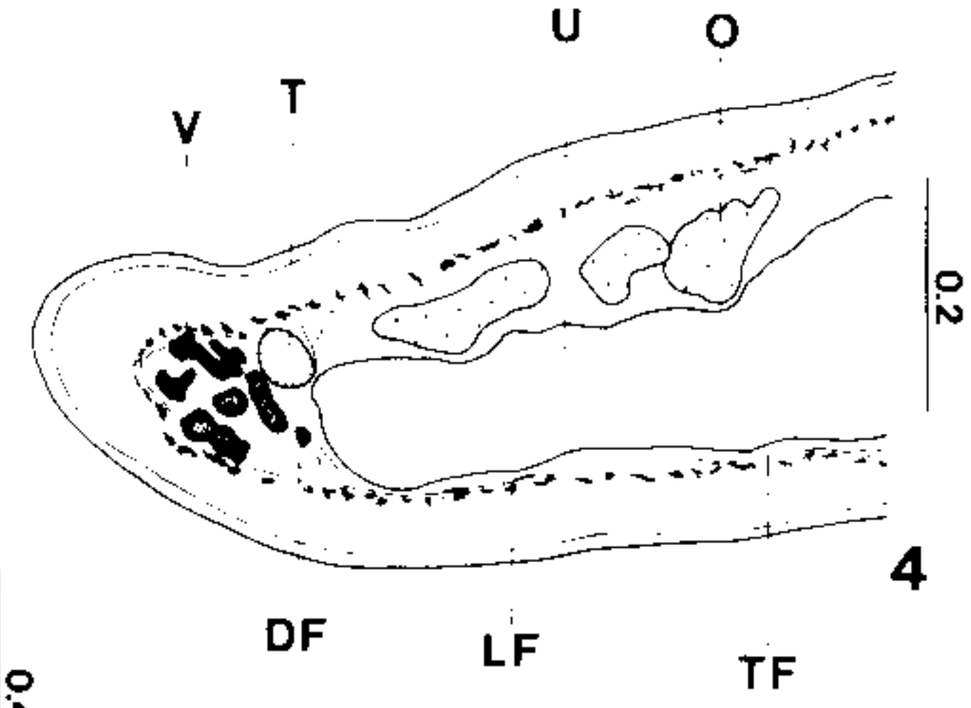

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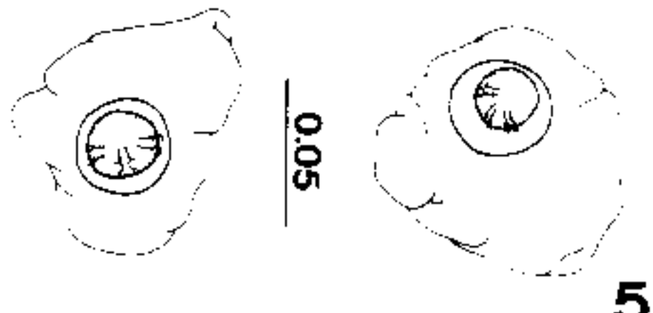

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Proteocephalus vazzolerae n. sp. Fig. 1: scolex. Fig. 2: mature proglottid. Fig. 3: gravid proglottid. Fig. 4: transverse section, gravid proglottid. Fig. 5: eggs. Abbreviations: V = vitellaria; T = testes; U = uterus; O = ovary; DF = dorsoventral fibres; LF = longitudinal fibres; and TF = transverse fibres. Scale in mm.

situated on anterior third part of proglottid. Ovary bilobate in gravid proglottids, 0.28 - 0.40 (0.35) long and 1.37 - 1.87 (1.52) wide. Ovary occupying 73% of proglottid width not extending lateral to osmoregulatory canals. Vagina always posterior to cirrus pouch with inconspicuous sphincter. Vitellaria arranged in two lateral rows, with tendency to become more numerous posteriorly. Uterus preformed, already visible in immature proglottids, as a medial longitudinal tube possessing a thick wall. Uterus with about 16 ramified lateral branches on each side. Uterus occupying up to 75% of the gravid proglottid width. Ventral longitudinal split of the uterus not observed. Eggs with delicate membrane, 0.062 in diameter, embryophore 0.030, oncosphere 0.0175. Testes, ovary, uterus and vitellaria medullar.

Taxonomic and ecologic summary
Host: *Piaractus mesopotamicus* (Holmberg, 1887)
Locality: Porto Rico, Paraná River, State of Paraná, Brazil
Site of infection: anterior intestine diverticles
Prevalence: 20.34% (fishes examined = 59; fishes parasited = 12)

Mean intensity of infection: 2.67
Specimens deposited: Instituto Oswaldo Cruz Collection (CHIOC) Nos 33187 a (holotype) and 33187 b (paratype)
Etymology: this species is in honor of Dr Anna Emília Amato de Moraes Vazzoler ~~in recog~~nition of her contributions to ichthyology.

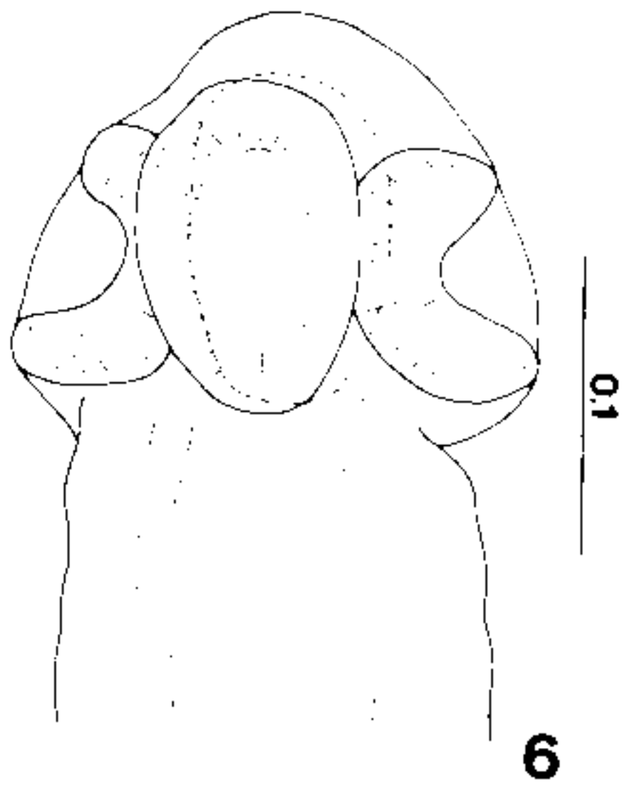
Remarks: the medullar position of the reproductive organs and the vitellaria allow the classification of this species in the genus *Proteocephalus* Weinland, 1858 (Schmidt 1986). *Proteocephalus vazzolerae* n. sp. can be compared with the following species of *Proteocephalus* from South America: *P. fossatus* (Riggenbach, 1896) sp. *inq.*, *P. jandia* Woodland, 1934, *P. kuyukuyu* Woodland, 1935 sp. *inq.*, *P. macdonaghi* (Szidat & Nani, 1951), *P. macrophallus* (Diesing, 1850) sp. *inq.*, *P. microscopicus* Woodland, 1935 sp. *inq.*, *P. piramutab* (Woodland, 1933), *P. platystomi* Lynsdale, 1959, *P. serrasalmus* Rego & Pavanelli, 1990, and *P. gibsoni* Rego & Pavanelli, 1990. *Proteocephalus vazzolerae* n. sp. differs from all the above mentioned species by having a larger number of testes, about 250. Only *P. gibsoni*, of the previously mentioned species, has an fifth apical sucker, but *P. vazzolerae* n. sp. differs from this latter in other features: larger number of testes, greater development of vitelline follicles and by the pattern of development of internal longitudinal musculature.

Proteocephalus chubbi n. sp.
(Figs 6-11)

Description: (based on four specimens) - Strobila acraspedote, 77.04 - 144.61 (106.98) long, bearing about 167 proglottids. Scolex 0.27 - 0.32 (0.29) in diameter, well separated from strobila. Four oval suckers, 0.10 - 0.11 (0.10) in diameter occupying all extension of scolex. Excretory canals visible just behind the suckers. Neck 2.40 - 3.32 (2.58) long. Immature and mature proglottids wider than long, 0.81 - 0.96 x 0.56 - 0.73 (0.89 x 0.63). Gravid proglottids longer than wide, 1.19 - 1.72 x 0.88 - 1.21 (1.34 x 0.89). Internal longitudinal musculature weakly developed and irregular. Teste spherical arranged in two fields, extending to the excretory canal, 0.032 - 0.045 (0.038) in diameter and 73 - 112 (90) in number, where 16 - 28 (21) are preporal, 21 - 34 (25) postporal and 33 - 57 (44) antiporal. Cirrus pouch short 0.23 - 0.25 (0.24) long, and 0.07 wide. Cirrus pouch length to proglottid width ratio 28.74%. Cirrus and vas deferens occupying 80 - 90% of cirrus pouch length. Vas deferens coiled. Genital atrium present. Genital pores irregularly alternate, situated in the posterior third or quarter of the proglottid length. Vagina and vaginal duct often dilated in mature proglottid. Vagina always posterior to cirrus pouch. Vaginal sphincter not observed. Ovary bilobate, with empty space among lobules. Basal ovary, 0.16 - 0.25 (0.19) long and 0.55 - 0.71 (0.64) wide. Ovary occupying 73% of proglottid width extending laterally beyond osmoregulatory canals. Uterus preformed, with about 16 ramified lateral branches on each side. Eggs eliminated by a ventral longitudinal split along the entire length of ultimate proglottids. Uterus voluminous, occupying up to 80% of the gravid proglottid width. Vitellaria arranged in two lateral rows, not interrupted on the cirrus pouch region. Eggs with delicate external membrane, 0.0425 in diameter, embryophores 0.02 in diameter, oncosphere 0.0125 in diameter. Testes, ovary and vitellaria medullar.

Taxonomic and ecologic summary
Host: *Gymnotus carapo* Linnaeus, 1758
Locality: Porto Rico, Paraná River, State of Paraná, Brazil
Site of infection: anterior intestine diverticles
Prevalence: 26.36% (fishes examined = 110; fishes parasited = 29)
Mean intensity of infection: 1.83
Specimens deposited: Instituto Oswaldo Cruz Collection (CHIOC) Nos 33188 (holotype) and 33189 a-b (paratypes)
Etymology: the specific name is in honor of Dr James C Chubb for his contributions to ichthyoparasitology.

Remarks: the new species differs from *P. fossatus*, *P. gibsoni* and *P. vazzolerae* n. sp. by the absence of apical organ or the fifth apical sucker. In addition, it differs from *P. fossatus* and *P. vazzolerae* n. sp. by having a greater number of testes, 120 and 150 *vs* 250, respectively. *Proteocephalus chubbi* n. sp. differs from *P. jandia* by having well developed internal longitudinal musculature. According to Woodland (1934) *P. jandia* lacks muscular fibre bundles. The new species differs from *P. macdonaghi*, *P. microscopicus* and *P. macrophallus* by having an average of 167 proglottids, while there are no more than 20 in the other species. It differs from *P. platystomi* since its scolex extremely wrinkled, by having a lower number of testes (35 to 50 testes) median genital pore and by having unconspicuous internal musculature. The new species differs from *P. kuyukuyu* by a slenderer strobila. Since there is no description of mature and gravid proglottids, a more detailed comparison is not extant. *Proteocephalus chubbi* n. sp. is more similar to *P. serrasalmus*. However, it differs from the latter with regard to the following features: its strobila are larger and its gravid proglottids are longer than wide. Finally, the new species also differs from *P. serrasalmus* by the pattern and position of vitellaria in the proglottids, by its scolex shape, and because the suckers of *P. serrasalmus* are smaller than those of *P. chubbi*.



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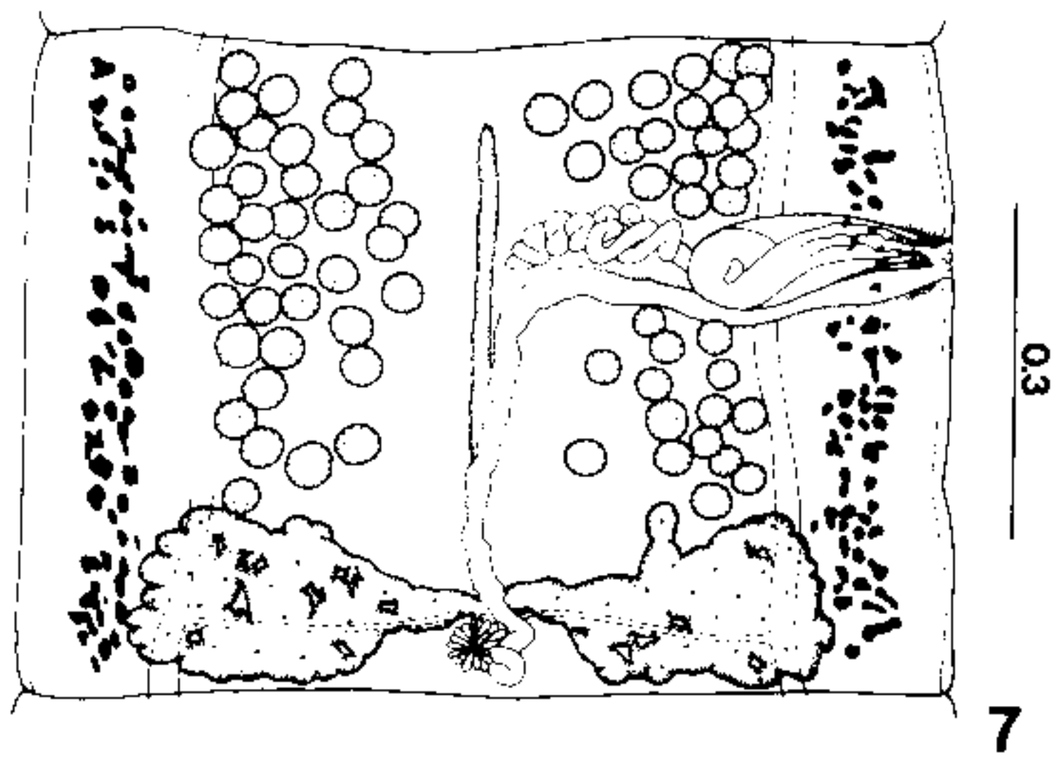

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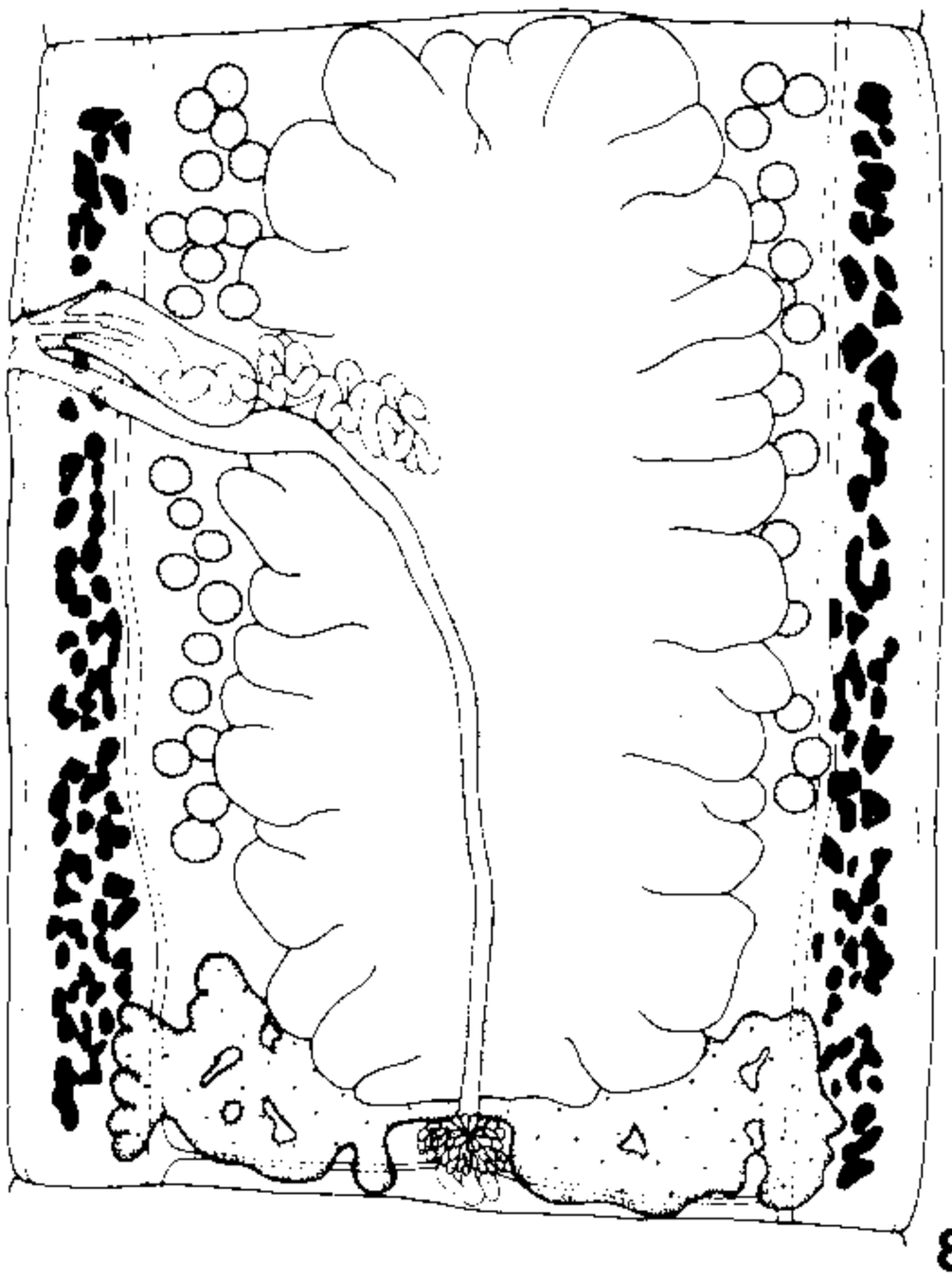

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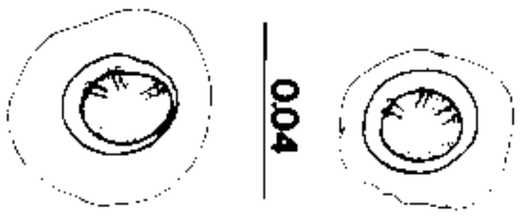

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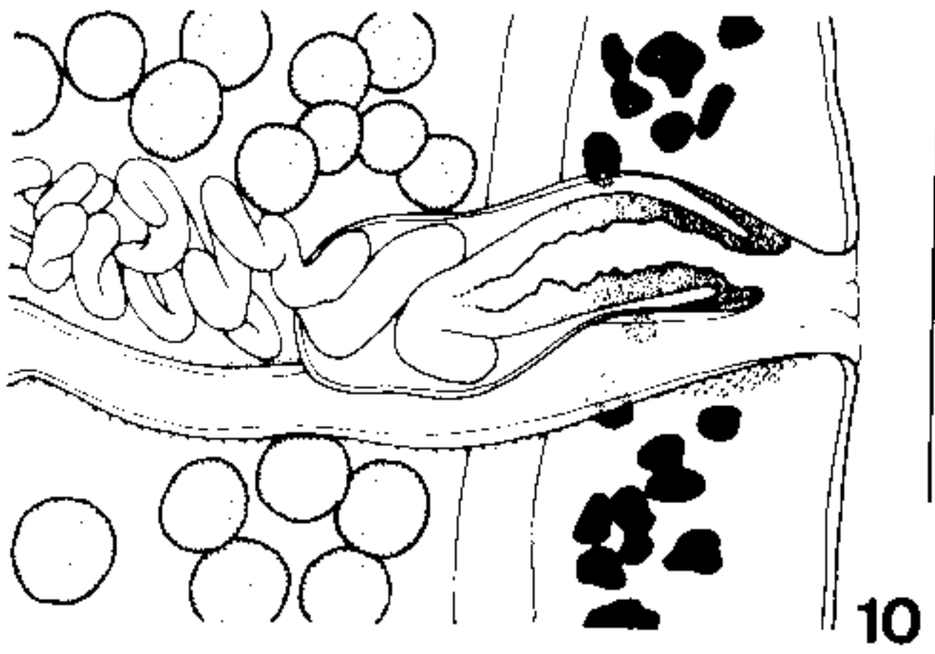

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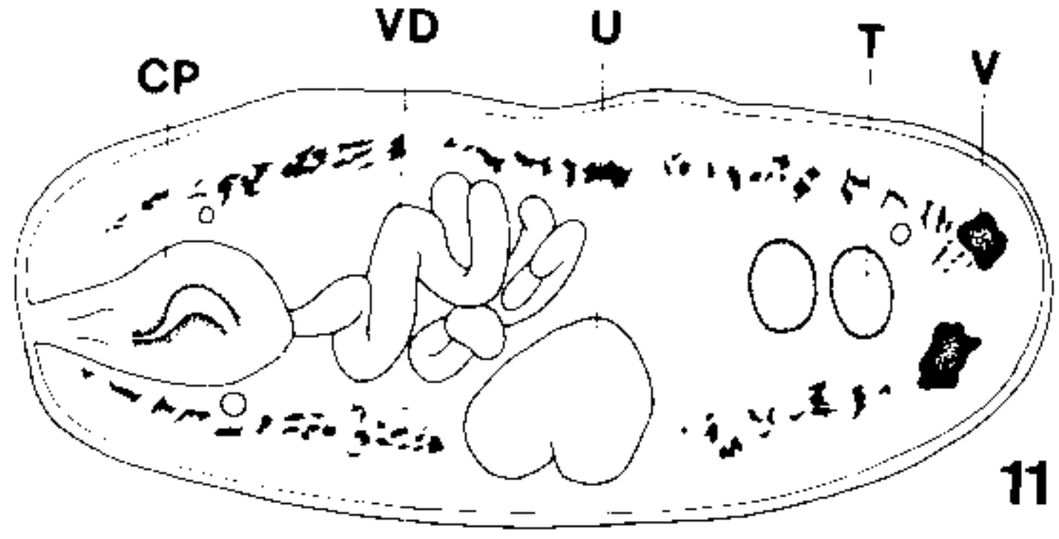

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Proteocephalus chubbi n. sp. Fig. 6: scolex. Fig. 7: mature proglottid. Fig. 8: gravid proglottid. Fig. 9: eggs. Fig. 10: vagina and cirrus pouch, gravid proglottid. Fig. 11: transverse section, gravid proglottid. Abbreviations: CP = cirrus pouch; VD = vas deferens; U = uterus; T = testes; V = vitellaria. Scale in mm.

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