RECENT STUDIES ON *Neoechinorhynchus curemai* NORONHA, 1973 (ACANTHOCEPHALA: NEOECHINORHYNCHIDAE), IN *Prochilodus lineatus* VALENCIENNES, 1836, FROM VOLTA GRANDE RESERVOIR, MG, BRAZIL

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ABSTRACT

The present work described helminth parasites of curimbatá, *Prochilodus lineatus* Valenciennes, 1836 from Volta Grande Reservoir, MG, Brazil. Eighteen fishes with average 46.7 ± 1.1 cm length and 1,674.8 ± 75.6 g weight were collected. Of the analysed fishes, 15 were parasitized with acanthocephalans in the intestine, showing a prevalence of 83.3%. The helminth was identified as *Neoechinorhynchus curemai* Noronha, 1973 (Acanthocephala: Neoechinorhynchidae). It differs from other species in dimension of characters and morphology. From the original description of *N. curemai*, it differs from the biggest dimension of testis, elongated cement gland, nucleated lemnisci, eggs size, larger proboscis hooks length in the middle and in the third circle in males and larger hooks in the anterior circle in females. A smaller percentage occupied by the reproductive system in female trunk was reported. The observation of paratypes of *N. curemai* of Noronha (1973) showed a great similarity with those of the present work. This fact complements the helminth description from elsewhere.

Key words: Acanthocephala, *Neoechinorhynchus curemai*, *Prochilodus lineatus*, Minas Gerais, Brazil.

RESUMO

Estudos recentes sobre *Neoechinorhynchus curemai* Noronha, 1973 (Acanthocephala: Neoechinorhynchidae), em *Prochilodus lineatus* Valenciennes, 1836, do Reservatório de Volta Grande, MG, Brasil

O presente trabalho estudou a helmintofauna do curimbatá, *Prochilodus lineatus* Valenciennes, 1836, do reservatório de Volta Grande, MG, Brasil. Foram analisados 18 peixes com comprimento médio de 46,7 ± 1,1 cm e peso médio de 1.674,8 ± 75,6 g, sendo que 15 apresentaram acantocéfalos no intestino com prevalência de 83,3%. O helminto foi identificado como *Neoechinorhynchus curemai* Noronha, 1973 (Acanthocephala: Neoechinorhynchidae), que diferiu das outras espécies descritas pelas dimensões dos caracteres e pela morfologia. Da descrição original de *N. curemai* difere pelas maiores dimensões dos testículos, pela glândula de cimento alongada, pela presença de núcleos nos lemniscos, pelas dimensões dos ovos e pelos maiores ganchos da probóscide presentes na segunda e na terceira fileiras nos machos e na primeira fileira nas fêmeas. Foi observada menor porcentagem ocupada pelo sistema reprodutivo em relação ao tronco da fêmea. A observação dos parátipos de *N. curemai* de Noronha (1973) mostrou grande semelhança com os do presente trabalho. Este fato complementa a descrição do helminto em outra localidade.

Palavras-chave: Acanthocephala, *Neoechinorhynchus curemai*, *Prochilodus lineatus*, Minas Gerais, Brasil.

INTRODUCTION

Taxonomic studies of *Neoechinorhynchus* Hamann, 1892, were listed by Nickol & Thatcher (1971), Amin & Heckmann (1992) and Golvan (1994). In Brazil, *N. macronucleatus* (Machado Filho, 1954); *N. buttnerae* (Golvan, 1956); *N. paraguayensis* (Machado Filho, 1959b; Nickol & Padilha, 1979); *N. spectabilis* (Machado Filho, 1959a); *N. curemai* (Noronha, 1973; Kohn *et al.*, 1985); *N. pterodoridis* (Thatcher, 1981) and *N. pimelodi* (Brasil-Sato & Pavanelli, 1998) were described.

The present work describes recent observations on *Neoechinorhynchus curemai* Noronha, 1973, found in curimbatá, *Prochilodus lineatus* collected in the Volta Grande Reservoir, MG, Brazil.

MATERIAL AND METHODS

This work was developed in the Volta Grande Reservoir, MG, Brazil which covers a flooded area of 195 km^2. Eighteen specimens of curimbatá, *Prochilodus lineatus* Valenciennes, 1836 (Osteichthyes: Prochilodontidae), were collected. Acanthocephalans were carefully collected on Petri dishes with distilled water, refrigerated and fixed in AFA for 24 hours for posterior storage in alcohol 70%. Helminths were stained with Mayer carmalumen, dehydrated in alcohol series and cleared with Faia creosote. For Scanning Electron Microscopy the helminths were fixed at room temperature in a 3% glutaraldehyde solution in a 0.1 M phosphate buffer (pH 7.4). Afterwards, they were dehydrated with serial concentrations of alcohol, dried with CO_2 in a CPD 030 BALZERS, assembled and coated with 30 mm gold paladium. Coated helminths were examined with a JEOL JSM-P-15 microscope. The authors studied 15 males and 16 females that were drawn in camera lucida. Parasite identification was according to Yamaguti (1961), Amin (1987) and Thatcher (1991). All measurements are in micrometers (μm) unless otherwise stated.

RESULTS

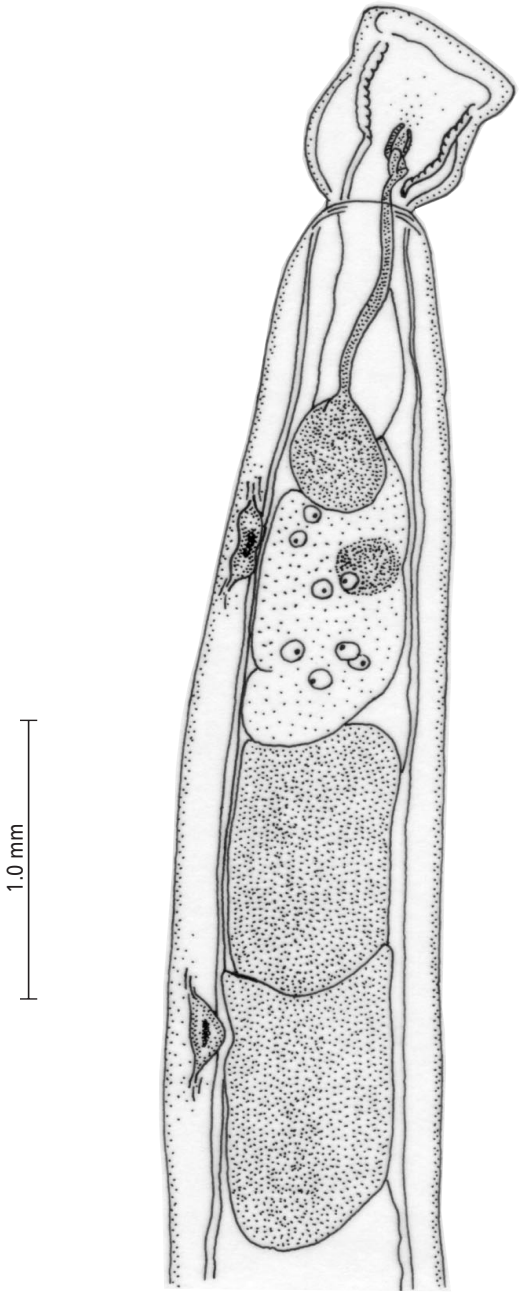
From 18 collected specimens of *P. lineatus*, 15 fishes presented acanthocephalans in the intestine showing a prevalence of 83.3%.

Description: *Neoechinorhynchus curemai* Noronha, 1973 (Acanthocephala: Neoechinorhynchidae).

General: with the characteristics of the genus *Neoechinorhynchus*. Cylindrical trunk and widest in the anterior third. Five dorsal and one ventral hypodermic nuclei in both sexes. Short proboscis, slightly globular in shape, armed with two larger hooks and three circles of smaller hooks. Proboscis receptacle inserted at the base of proboscis provided by single-layered wall. Two lemnisci significantly different in length, one binucleated larger than the uninucleated. Two elliptical testis. Elongated syncitial cement gland with rounded cement reservoir. Elliptical eggs.

Male: trunk 11.4 to 27.6 (17.8) mm long by 850 to 1,200 (940) maximum width. Proboscis 120 to 387 (185.1) long by 122 to 347 (195.7) width. Proboscis armed with two larger lateral hooks measuring 42 to 64 (56.9) long by 14 to 24 (19.6) width. Smaller hooks in the anterior circle with 32 to 42 (38.7) long by 4 to 16 (10.7) width; in the middle circle with 36 to 44 (39.4) long by 4 to 6 (4.2) width; and in the third circle with 34 to 44 (39.6) long by 4 to 6 (4.2) width. Proboscis receptacle 568 to 796 (689.1) long by 143 to 224 (189.6) width. Uninucleated lemniscus 1,469 to 4,898 (2,571.4) long by 184 to 224 (196.7) width; binucleated lemniscus 2,020 to 5,898 (3,521.3) long by 173 to 306 (217.1) width. Anterior testis 918 to 3,061.2 (1,899.5) long by 388 to 612 (488.1) width. Posterior testis 918 to 3,979 (1,961.6) long by 388 to 612 (456.7) width. Syncitial cement gland with 5 to 8 giant nuclei measuring 918 to 4,245 (2,132.6) long by 306 to 592 (446.4) width. Cement reservoir 428 to 714 (601.1) long by 306 to 592 (469.3) width. Everted bursa 408 to 1,032 (757.7) long by 312 to 840 (566.8) width.

Female: trunk 17.3 to 32.4 (22.5) mm long by 800 to 1,500 (1,041) maximum width. Proboscis 102 to 184 (145.9) long by 78 to 204 (148.8) width. Proboscis armed with two larger lateral hooks measuring 58 to 64 (60.2) long by 18 to 22 (20.9) width. Smaller hooks in the anterior circle with 42 to 44 (43.3) long by 6 to 10 (8) width; in the middle circle with 30 to 54 (39.8) long by 4 to 10 (5.1) width; and in the third circle with 38 to 44 (40.6) long by 4 to 6 (4.6) width. Proboscis receptacle 632 to 837 (726.5) long by 122 to 224 (191) width.



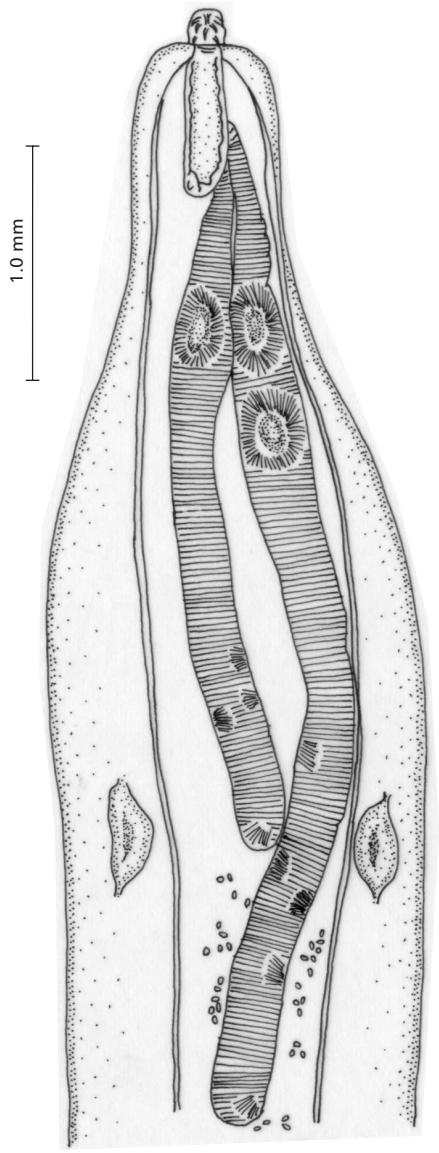
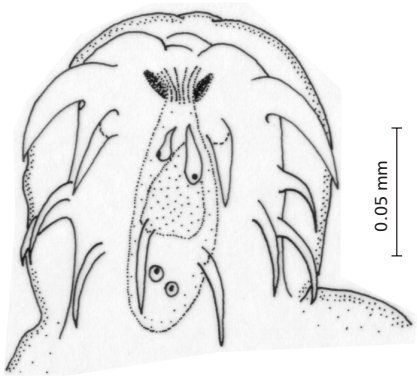


Fig. 1 — *Neoechinorhynchus curemai*, posterior end of male. **Fig. 2 —** *Neoechinorhynchus curemai*, anterior end of female showing lemnisci.

Uninucleated lemniscus 2,469 to 3,510 (2,977.3) long by 143 to 265 (214.9) width; binucleated lemniscus 3,061 to 4,694 (4,053) long by 184 to 367 (283.6) width. Uterine bell 630 to 556 (591) long by 150 to 198 (169) width. Uterus 118 to 170 (139) long by 58 to 78 (70) width. Vagina 84 to 144 (104.8) long by 90 to 114 (102.4) width. Germinal balls varying from 56 to 126 (92.2) in number with 70 to 80 (75.2) mean diameter. Dissecated females presented elongated eggs 41 to 47 (43.9) long by 24 to 35 (29.2) width with membranes surrounding the developed eggs.



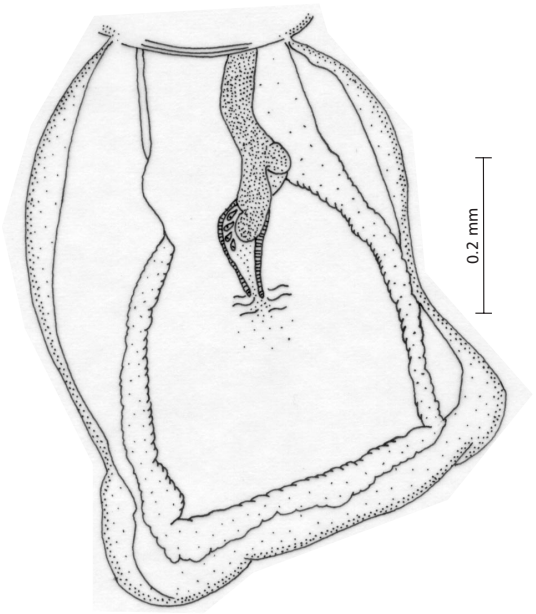
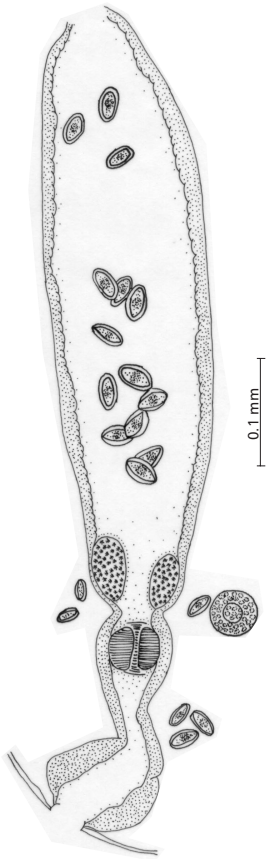


Fig. 3 — *Neoechinorhynchus curemai*, proboscis of male. **Fig. 4 —** *Neoechinorhynchus curemai*, copulatory bursa of male.



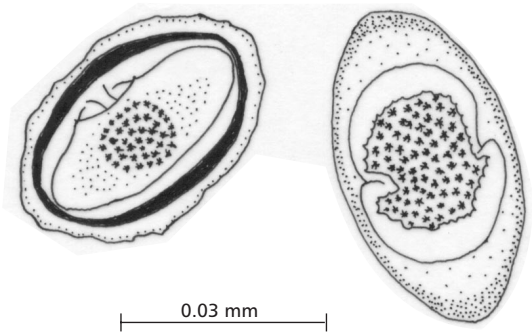
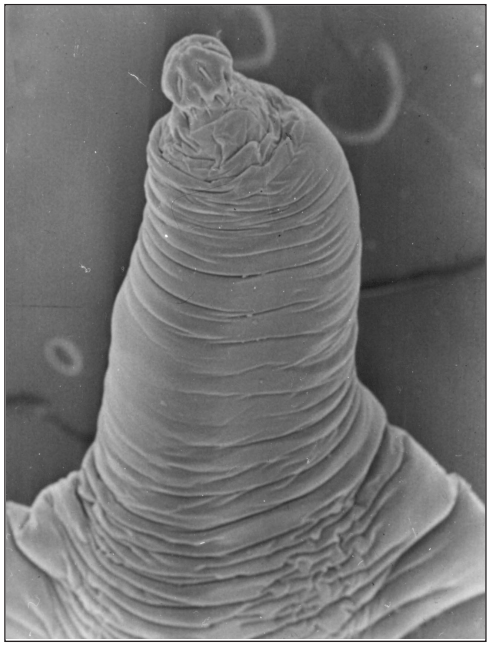
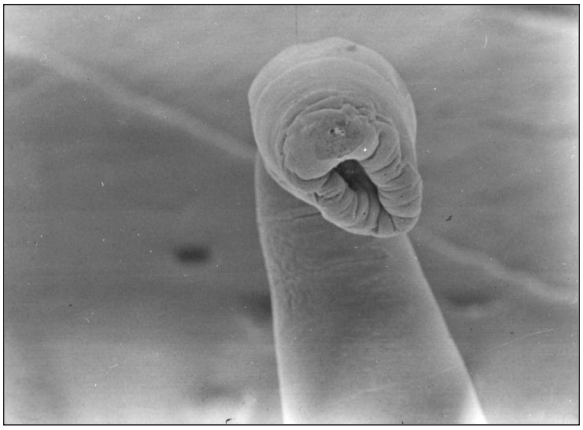


Fig. 5 — *Neoechinorhynchus curemai*, reproductive system of mature female. **Fig. 6 —** *Neoechinorhynchus curemai*, eggs.





Figs. 7 — *Neoechinorhynchus curemai*. Scanning Electron Microscopy, anterior end of male, 80 x. **Fig. 8 —** *Neoechinorhynchus curemai*. Scanning Electron Microscopy, everted bursa of male, 800 x.

Taxonomic summary

Type host: *Prochilodus lineatus* Valenciennes, 1836 (Osteichthyes: Prochilodontidae).

Site in host: intestine.

Type locality: Volta Grande Reservoir, MG, Brazil.

Specimens deposited: In the invertebrates section of the zoology museum of The São Paulo University (MZUSP), C.P. 42694, CEP: 04299-970, São Paulo, Brasil.

REMARKS

The Tables 1 and 2 presents significant differences in length of trunk, proboscis, receptacle, uninucleated and binucleated lemnisci, anterior and posterior testis, cement gland and reservoir as well as reproductive system when the present description was compared with the following species*: N. macronucleatus* from *Licengraulis* sp. (Machado Filho, 1954); *N. buttnerae* from *Colossoma macropomum* (Golvan, 1956); *N. spectabilis* from *Curimata elegans* (Machado Filho, 1959a); *N. paraguayensis* from "peixe-martin" (Machado Filho, 1959b); *Geophagus brasiliensis* (Nickol & Padilha, 1979); *N. prochilodorum* from *Prochilodus reticulatus* (Nickol & Thatcher, 1971); *N. pterodoridis* from *Pterodoras granulosus* (Thatcher, 1981); *N. limi* from *Umbra limi* (Muzzall & Buckner, 1982); *N. idaohensis* from *Catostomus columbianus* (Amin & Heckmann, 1992) and *N. pimelodi* from *Pimelodus maculatus* (Brasil-Sato & Pavanelli, 1998).

Noronha (1973) described *N. curemai* from *P. scrofa* in the Amazon River, Maicuru, Pará State and Marambaia Island, Rio de Janeiro State. Later Kohn *et al*. (1985) studied the same parasite collected from *P. scrofa* for the first time in Pirassununga, São Paulo State.

In the present work some differences were observed between *N. curemai* and the specimens now described. In spite of *N. curemai* reported in *P. scrofa*, that is recently named *P. lineatus*, all measurements of male and female specimens were larger than *N. curemai* of Noronha (1973). Nevertheless, Kohn *et al*. (1985) have not related nuclei in lemnisci. Length and width of eggs were different between both species as shown in the Table 2. In the present work, measurements of testis and cement gland in males and length and width of proboscis in males and females were larger than in *N. curemai* of Noronha (1973) and Kohn *et al*. (1985).

TABLE 1

Comparative measurements of male specimens of *Neoechinorhynchus* (L – length, W – width).

Characters	*N.* Present work	*N. macronucleatus*	*N. buttnerae*	*N. spectabilis*	*N. paraguayensis*	*N. prochilodorum*	*N. curemai*[a]	*N. curemai*[b]	*N. pterodoridis*	*N. pimelodi*
Trunk length (mm)	17.8 (11.4-27.6)	5-7	22	4-5	3.5	4.5-8	14.3-16.4	10.3 (7.7-12.1)	2.2 (1.7-2.1)	1.4 (1.1-1.7)
Trunk width	940 (850-1,200)	300-700	1,000	400-450	1,000	1,000-1,700	1,260-1,470	1,112 (1,000-1,260)	763 (640-850)	623 (400-850)
Proboscis L	185.1 (120-387)	83	300	70-90	130	83 (72-91)	120-140	120 (120-130)	128 (120-144)	111 (102-125)
Proboscis W	195.7 (122-347)	83	300	60-80	136	93 (84-106)	120-140	120 (110-130)	126 (115-144)	116 (107-125)
Receptacle L	689.1 (568-796)	348	1,000	240	320	421 (360-470)	470-700	600 (430-810)	320 (190-360)	354 (260-411)
Receptacle W	189.6 (143-224)	116		95	160		160-380		133 (75-200)	84 (75-98)
Uninucleated Lemniscus L	2,571.4 (1,469-4,898)	1,411		946		3,050 (3,000-3,200)	2,620-4,360	2,260 (2,040-2,500)	473 (450-500)	677 (588-823)
Uninucleated lemniscus W	196.7 (184-224)						210-560		118 (95-140)	97 (78-112)
Binucleated lemniscus L	3,521.3 (2,020-5,898)		2,000	995	140	3,760 (3,740-3,800)		2,800 (2,520-3,170)		667 (588-823)
Binucleated lemniscus W	217.1 (173-306)				86					100 (68-127)

[a] According to Noronha (1973); [b] according to Kohn *et al.* (1985).

TABLE 1 (*Continued*)

Characters	*N.* Present work	*N. macronucleatus*	*N. buttnerae*	*N. spectabilis*	*N. paraguayensis*	*N. prochilodorum*	*N. curemai*[a]	*N. curemai*[b]	*N. pterodoridis*	*N. pimelodi*
Anterior testis L	1,899.5 (918-3,061)	581	2,500	332*	292	930	860-1,120	1,030 (810-1,440)	285 (226-360)	235 (156-343)
Anterior testis W	488.1 (388-612)	166	900		250	720	310-440	360 (320-370)	263 (218-300)	229 (157-312)
Posterior testis L	1,961.6 (918-3,979)	415		298*	268	1,080	1,000-1,050	1,130 (880-1,560)	281 (164-410)	194 (137-274)
Posterior testis W	456.7 (388-612)	132			218	860	350-460	360 (320-370)	288 (245-320)	219 (162-294)
Cement gland L	2,132.6 (918-4,245)	415	5,000	365	362	935 (920-940)	1,260-1,850	1,160 (730-1,920)	336 (270-380)	162 (68-254)
Cement gland W	446.4 (306-592)	132		249		820 (800-850)	40-60	340 (230-480)	336 (320-370)	189 (107-264)
Cement reservoir L	601.1 (428-714)	332	1,000			460*	380-450	350 (270-410)	390 (270-450)	109 (68-166)
Cement reservoir W	469.3 (306-592)	132	800				380-420	290 (240-320)	133 (90-180)	93 (58-127)

* Diameter; [a] according to Noronha (1973); [b] according to Kohn *et al.* (1985).

TABLE 2

Comparative measurements of female specimens of *Neoechinorhynchus* (L – length, W – width).

Characters	*N.* Present work	*N. macronucleatus*	*N. buttnerae*	*N. spectabilis*	*N. paraguayensis*	*N. prochilodorum*	*N. curemai*[a]	*N. curemai*[b]	*N. pterodoridis*	*N. pimelodi*
Trunk length (mm)	22.5 (17.3-32.4)	3-16	30	5.5-6.5	3.5	4.5-8	12.8-19.2	13.2 (8.1-16.8)	2.7 (2.1-3.3)	2.4 (1.2-4.0)
Trunk width	1,041 (800-1,500)	500-1,000	1,500	600-650	1,500	1,000-1,700	1,360-1,470	1,110 (960-1,140)	785 (600-970)	1,090 (556-1,600)
Proboscis L	145.9 (102-184)	83	300	70-90	130	83 (72-91)	120-140	130 (120-130)	125 (96-144)	137 (122-161)
Proboscis W	148.8 (78-204)	83	300	60-80	136	93 (84-106)	120-140	150 (140-160)	108 (96-120)	158 (120-253)
Receptacle L	726.5 (632-837)	348	1,000	240	320	421 (360-470)	470-700	630 (590-660)	400 (360-440)	464 (245-565)
Receptacle W	191 (122-224)	116		95	160		160-380		150 (120-180)	149 (117-191)
Uninucleated lemniscus L	2,977.3 (2,469-3,510)	1,411		946		3,050 (3,000-3,200)	2,620-4,360	2,380 (1,080-3,000)	498 (450-620)	1,310 (707-2,120)
Uninucleated lemniscus W	214.9 (143-265)						210-560		116 (90-138)	171 (100-222)
Binucleated lemniscus L	4,053 (3,061-4,694)		2,500	995	600	3,760 (3,740-3,800)		2,880 (2,040-3,600)		1,330 (727-2,070)
Binucleated lemniscus W	283.6 (184-367)				90					182 (137-250)

[a] According to Noronha (1973); [b] According to Kohn *et al.* (1985).

TABLE 2 (*Continued*)

Characters	*N.* Present work	*N. macronucleatus*	*N. buttnerae*	*N. spectabilis*	*N. paraguayensis*	*N. prochilodorum*	*N. curemai*[a]	*N. curemai*[b]	*N. pterodoridis*	*N. pimelodi*
Uterine bell L	591 (556-630)		250			240	20-630	1,230* (860-1,440)	190	154 (115-207)
Uterine bell W	169 (150-198)					86	100		90	122 (100-160)
Uterus L	139 (118-170)		1,000			139	70-990		320	33.2 (27-40)
Uterus W	70 (58-78)					82			42	
Vagina L	104.8 (84-144)			290		120				57.1 (37-76)
Vagina W	102.4 (90-114)					48				
Eggs L	43.9 (41-47)	42	45	30	29	28 (26-29)	36-42[c]	54 (50-60)	24-27	18 (15-22)
Eggs W	29.2 (24-35)	12	24	10	12	9 (7-12)	18-21[c]	20 (13-23)	7-9	14 (12-15)

* Reproductive system from anterior margin of the uterine bell to terminal genital pore; [a] according to Noronha (1973); [b] according to Kohn et al. (1985); [c] according to corrections of Noronha (1984).

Regarding the proboscis morphology, the authors observed similar hooks in length except those in the middle and third circle that were larger than related in the original description (Noronha, 1984; Khon *et al*., 1985) for male specimens. From the observation of paratypes of the original description of Noronha (1973) the testis length was elongated and larger than *N. curemai* (Noronha, 1973; Khon *et al*., 1985). Cement gland of males was more elongated than *N. curemai*. For female specimens, hooks in the anterior circle were larger than the description of Noronha (1984) and Khon *et al*. (1985). Another significant difference was noted in the reproductive system of female specimens. The original description of *N. curemai* presents the reproductive system from the anterior margin of the uterine bell to the terminal genital pore occupying 8.7% (5.1 to 10.4) of the trunk length, that differs from the present description showing 3.7% (2.9 to 4.4) of female trunk length. However, the authors presents a relation of measurements of males and females of Neoechinorhynchidae that may be studied by the other researchers.

As a result of examination of type-material of Noronha (1973) the authors concluded that both species presents a great similarity on morphology differing in dimensions and locality of occurrence. This is the first report of *Neoechinorhynchus curemai* in fishes collected from Volta Grande Reservoir, Minas Gerais State, Brazil.

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