Redescription of *Prosthenhystera obesa* (Diesing, 1850) (Callodistomidae, Digenea) with New Host Records and Data on Morphological Variability

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Prosthenhystera obesa *(Diesing,1850) Travassos, 1922 from the gall bladder of* Astyanax bimaculatus, Caranx gibbosus, Galeocharax humeralis, Leporinus copelandii, Pimelodus fur, Pseudopimelodus roosevelti, Salminus brevidens, Salminus maxillosus *and from the new hosts,* Cynopotamus amazonum *and* Triurobrycon lundii *is redescribed, demonstrating a large morphological variation, mainly in body and testes size and shape. New hosts harbouring immature specimens of* P. obesa *are presented:* Brycon *sp.*, Leporellus vittatus, Pachyurus squamipinnis, Pimelodus clarias, Pseudoplatystoma corruscans *and* Salminus hilarii. *Scanning electron microscopy micrographies, original figures and measurements of adult and immature specimens from different Brazilian hosts and localities are presented.*

Key words: *Prosthenhystera obesa* - scanning electron microscopy - freshwater fish parasites - Brazil

Prosthenhystera obesa (Diesing, 1850) was well described by Travassos (1922b) and Travassos et al. (1928) and also recorded by other authors from different hosts and localities in Brazil (Travassos & Freitas 1941, Travassos & Kohn 1965, Kohn & Fernandes 1981, 1987, Pavanelli et al. 1992), Mexico (Caballero & Jimmenez 1969) and Colombia (Thatcher 1991).

The study of a large number of specimens, collected mainly by Travassos since 1918, from different hosts and localities in Brazil and from specimens of *Salminus maxillosus* collected by the authors from the Paraná River, in the localities of Guaira in 1985 and Foz do Iguaçu in 1991, allowed the redescription of the species and the demonstration of the large morphological variability of this parasite.

MATERIALS AND METHODS

Fish were collected with nets and kept alive until they were examined. Prior to light microscopy, the specimens were fixed in AFA (alcohol, formalin, acetic acid) under slight coverslip pressure, stained in alcoholic-acid carmine, dehydrated in an alcohol series and mounted in Canada balsam. Measurements were made using a calibrated filar micrometer and are given in micrometres. For scanning electron microscopy (SEM), specimens were previously fixed in glutaraldeyde 2.5%, post-fixed for 1 hr with 1% osmium tetroxide in 0.1M phosphate buffer, dehydrated in graded ethanol, critical point dried using CO_2, and coated with gold. The observations were made using a Zeiss DSM 940 scanning electron microscope. Eighty six specimens from different hosts and localities, were studied and deposited in the Helminthological Collection of the Oswaldo Cruz Institute (CHIOC). Part of the material deposited by Travassos in the CHIOC, was preserved in Railliet and Henry's fluid, and part on whole mounts.

RESULTS

Prosthenhystera obesa (Diesing,1850)
Travassos, 1922
Figs 1-7

Synonym: *Pseudoprosthenhystera microtesticulata* Kloss, 1966

Hosts: *Astyanax bimaculatus* (Linnaeus) (= *Cichlasoma bimaculatum* (L); *Brycon* sp. (new host record); *Caranx gibbosus* (Linnaeus); *Cynopotamus amazonum* (Guenther) (new host record); *Galeocharax humeralis* (Valenciennes) (= *Cynopotamus humeralis, Acestrorhamphus* sp.); *Leporellus vittatus* Valenciennes (new host record); *Leporinus copelandii* Steindachner; *Pachyurus squamipinnis* Agassiz (new host record); *Pimelodus clarias* Linnaeus (new host record);

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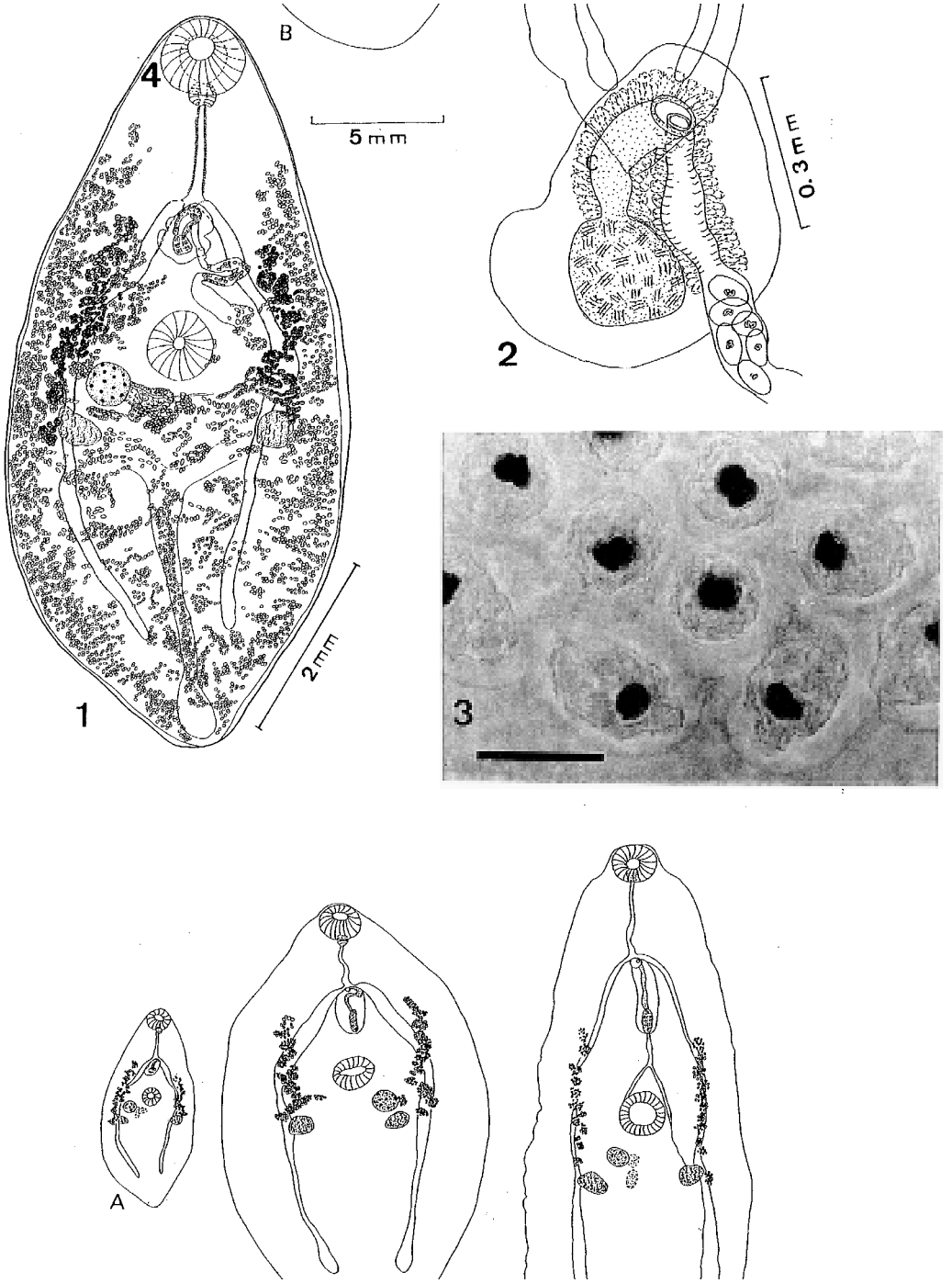


Prosthenhystera obesa from *Salminus maxillosus.* Fig. 1: total view, no. 33.243b. Fig. 2: terminal genitalia no. 33.243b. Fig. 3: photomicrography of eggs, no. 33.244, bar= 0.04mm. Figs 4 A-C (figs in same scale): total view of mature specimens (uterus not represented) showing the large variation of body size: 4A: no. 33.243b, 4B: no. 33.244, 4C: no. 33.246.

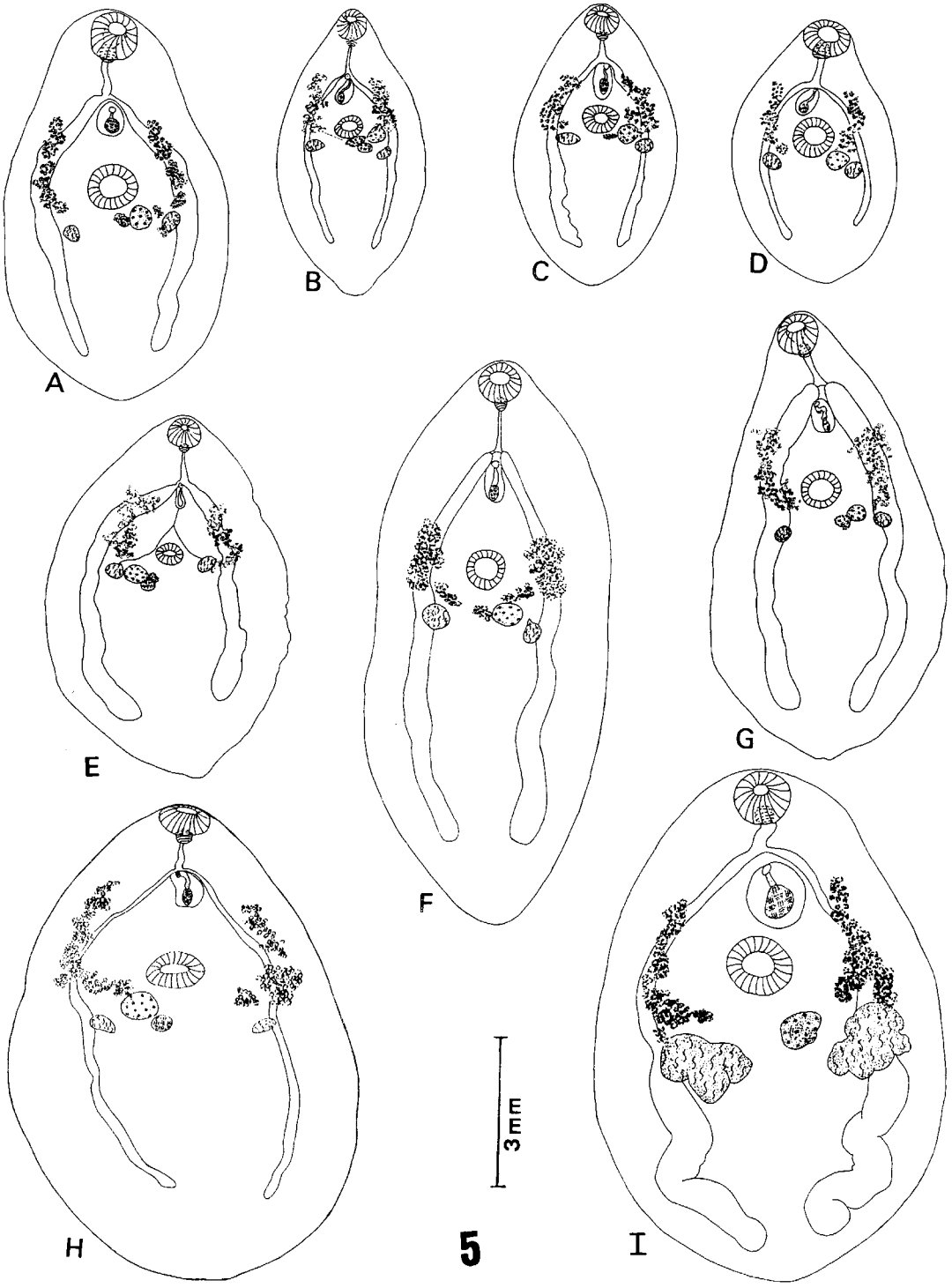


Fig. 5 (figs in same scale): *Prosthenhystera obesa.* Total view of mature specimens (uterus not represented) demonstrating variation in body and testes size and shape of specimens from different hosts. A: no. 16.563 from *Triurobrycon lundii*. B: no. 31.818a from *Caranx gibbosus*. C: no. 33.234 from *Cynopotamus amazonum.* D: no. 33.256 from *Pseudopimelodus roosevelti*. E: no. 11.270 from *Astyanax bimaculatus*. F: no. 33.266 from *Galeocharax humeralis*. G: no. 33.240 from *Leporinus copelandii*. H: no. 33.252a from *Salminus brevidens*. I: no. 16.231 from *Pseudopimelodus roosevelti*.

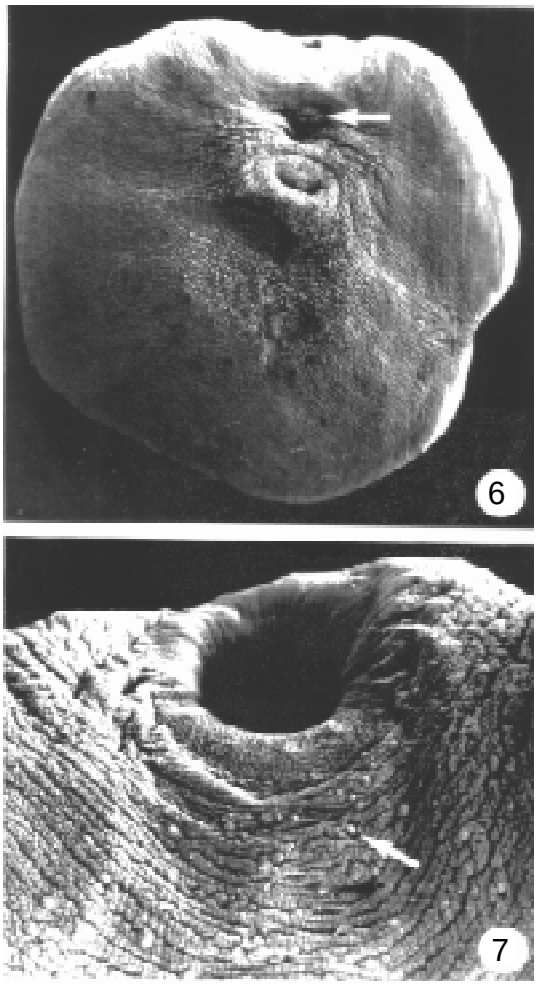
Pimelodus fur (Lutk); *Pseudopimelodus roosevelti* Borodin; *Pseudoplatystoma corruscans* (Agassiz) (new host record); *Salminus brevidens* (Cuvier); *Salminus hilarii* Cuvier & Valenciennes (new host record); *Salminus maxillosus* (Cuvier & Valenciennes); *Triurobrycon lundii* Reinhardt (new host record).

Site in hosts: gall bladder.

Data on the morphometric variation of 49 adult specimens are summarized in Tables I and II and of 21 immature specimens are presented in Table III.

Redescription: body flattened, usually oval, may be elliptical to round with rounded posterior end, narrowing in forebody, with large variation in size. Oral sucker rounded, subterminal. Ventral sucker muscular, pre-equatorial. Suckers nearly of the same size, width ratio within the range of 1:0.8-1:1. Pharynx small, rounded. Oesophagus long, slender, surrounded by glandular cells, extending back to about the level of genital pore; at this point the gut bifurcates, originating two narrow caeca, slightly sinuous, ending blindly near the posterior extremity of the body. Testes two, irregular in shape, usually smooth and smaller than ovary, may also be lobed and larger than ovary, lateral, symmetrically situated in ovarian zone or below, intracaecal, caecal or extracaecal. Vas efferentia extending from anteromedial margin of testes to form short vas deferens in front of acetabular level; vas deferens entering seminal vesicle at the posterior region of cirrus-sac. Cirrus-sac median, between two suckers, extending back from genital pore, may reach pre-acetabular zone, contains saccular or elongated seminal vesicle, pars prostatica tubular surrounded by gland cells and well developed ejaculatory duct. Genital atrium small; common genital pore mid-ventral, immediately below oesophageal bifurcation. Ovary rounded to oval, posterolateral to acetabulum, equatorial. A large Mehlis' gland and a well developed seminal receptacle lie next to ovary; the oviduct receives the common vitelline duct and the Laurer's canal which opens dorsally. Vitellaria follicular, in two lateral fields, caecal, intracaecal and extracaecal, may extend from ovary level to mid-forebody. Uterus coiled, intracaecal, caecal and extracaecal, filling most of hindbody in mature specimens, reaching the posterior extremity, extending to forebody, to level of oral sucker, opening into genital atrium through the muscular metraterm, which is surrounded by glands. Eggs very small, oval, operculated, present miracidium with an irregular "v" or "8" shaped black spot (Fig. 3). Excretory vesicle long and wide, Y-shaped. The excretory pore opens at the posterior end of the body.

One specimen from *S. maxillosus* from the Paraná River observed by SEM, showed round shaped body (Fig. 6) and tegument with aciliated papillae (Fig. 7) irregularly distributed on the surface, more evident around the oral sucker and not observed around the acetabulum, genital and excretory pores.



Scanning electron micrographs of *Prosthenhystera obesa.* Fig. 6: whole mount (ventral view), X 22. Fig. 7: anterior end of body with oral sucker showing ridge tegument and button-like papillae (arrow), X 150.

TABLE I

Original measurements (in mm) of *Prosthenhystera obesa* from *Salminus maxillosus* from different localities

CHIOC no.	2.147	3.279, 33.249	33.246, 33.253	33.247, 33.248	16.220, 16.224	33.252, 33.254	33.243	33.244
Specimens measured	1	2	2	2	2	3	2	1
Body L	14,027	11,092-15,040	16,315-23,160	8,757-17,412	13,615-17,712	9,517-17,900 (12,349)	7,740-7,860	15,977
Body W	8,157	4,960-7,632	6,545-8,570	6,507-7,632	9,367-10,530	6,170-9,930 (7,561)	3,497-3,572	10,155
Oral sucker L	1,305	1,045-1,091	1,387-1,530	1,076-1,137	1,137-1,290	566-1,499 (970)	733-769	1,259
Oral sucker W	1,244	1,045-1,183	1,484-1,660	1,091-1,395	1,275-1,305	877-1,407 (1,079)	806-879	1,499
Ventral sucker L	1,290	908-1,290	1,500-1,537	1,015-1,302	1,091-1,244	709-1,484 (1,023)	659-711	1,183
Ventral sucker W	1,259	1,030-1,350	1,350-1,660	1,122-1,422	1,198-1,275	908-1,575 (1,181)	689-696	1,575
Sucker width ratio	1:1	1:1	1:0.9-1:1	1:1	1:0.9-1:1	1:1	1:0.8	1:1
Pharynx L	361	260-407	271-453	466	336-438	229-535 (336)	251-306	392
Pharynx W	321	392-469	271-484	354	453-469	260-469 (335)	242-275	242
Oesophagus L	1,290	724-647	1,591-2,785	535-1,244	678-1,499	392-1,214 (692)	738-939	1,468
Seminal receptacle L	336	275	-	275	290-306	321-825 (538)	184	-
Seminal receptacle W	484	275	-	392	469-535	321-525 (423)	122	-
Cirrus-sac L	1,805	1,259	2,822	1,321-1,545	1,637	632-739	602	1,606
Cirrus-sac W	1,076	571	750	938-1,244	1,336	550-678	587	969
Seminal vesicle L	617	602	-	-	-	260-392	199-251	785
Seminal vesicle W	137	306	-	-	-	183-229	139-199	306
Testes L	586-602	535-602	709-900	846-1,061	423-816	244-787 (460)	326-480	602-617
Testes W	602-663	514-755	750-1,000	602-1,407	724-1,106	469-1,050 (695)	298-420	862-877
Ovary L	908	678	525-663	520-816	785-1,015	602-787 (664)	457-480	693
Ovary W	816	816	562-755	647-785	908-1,061	709-900 (788)	480-494	938
Eggs L	73-76	49-75 (58)	60-64 (62)	60-75 (68)	56-66 (62)	60-75 (65)	58-81 (70)	52-64 (57)
Eggs W	47-48	30-45 (34)	37-41 (39)	34-41 (37)	30-35 (34)	34-45 (38)	36-40 (38)	37-41 (38)
Locality	Tibiriçá São Paulo	Lassance Minas Gerais	Porto Esperança Mato Grosso	Pirassununga São Paulo	Pirassununga São Paulo	Pirapora Minas Gerais	Guaira Paraná	Foz do Iguaçu Paraná
Date of collection	1918	1921	1922	1927	1946	1958	1985	1991

CHIOC: Helminthological Collection of the Oswaldo Cruz Institute; L: length; W: width

TABLE II

Original measurements (in mm) of *Prosthenhystera obesa* from different hosts and localities

CHIOC no.	11.270, 11.271, 11.272	31.818	33.234	33.263, 33.264, 33.266	16.567, 33.240, 33.241	16.230-16.236, 16.238, 33.255, 33.256-33.258	33.242, 33.245	16.563
Specimens measured	3	2	1	6	4	13	4	1
Body L	7,196-7,242	5,340-5,420	5,207	6,770-10,792 (7,934)	5,795-9,367 (6,716)	4,960-14,665 (10,099)	7,782-12,330 (10,112)	7,332
Body W	4,575-4,952 (4,721)	2,820-3,160	3,075	2,485-4,397 (3,422)	4,285-5,110 (4,866)	3,085-8,007 (5,737)	5,823-9,517 (7,463)	3,988
Oral sucker L	566-587	510-570	550	484-755 (610)	550-785 (676)	678-1,515 (1,149)	1,015-1,393 (1,215)	908
Oral sucker W	602-678	560-570	644	550-816 (667)	571-831 (728)	938-1,545 (1,271)	1,122-1,484 (1,284)	908
Ventral sucker L	484-515 (489)	382-440	531	475-724 (580)	566-693 (626)	737-1,407 (1,116)	1,015-1,321 (1,202)	816
Ventral sucker W	515-520 (517)	460-499	709	438-724 (600)	586-709 (628)	766-1,422 (1,168)	1,107-1,545 (1,345)	923
Sucker width ratio	1:0.8	1:0.8-0.9	1:1.1	1:0.8-1.0	1:0.8-1:1	1:0.8-1:1	1:1	1:1
Pharynx L	158-168 (164)	170-220	158	186-275 (227)	168-223 (186)	244-484 (383)	377	229
Pharynx W	183-198 (189)	170-220	214	198-290 (252)	168-225 (197)	290-550 (429)	438	306
Oesophagus L	469-587	354-535	345	306-831 (510)	183-709 (498)	469-1,137 (795)	469-535	678
Seminal receptacle L	137-183	170-180	-	177-535	392	229-632 (379)	183-484 (379)	-
Seminal receptacle W	260-306	210-240	-	198-233	571	362-862 (562)	275-306 (296)	-
Cirrus-sac L	466-468	429-541	634	541-785 (658)	205-447	606-1,259 (922)	801-1,392 (1,154)	586
Cirrus-sac W	111-373	205-223	298	205-469 (362)	166-279	289-862 (561)	770-999 (885)	566
Seminal vesicle L	120	142-176	335	186-382 (264)	225	186-770 (487)	408-647	233
Seminal vesicle W	75	75-127	242	121-321 (170)	48	168-984 (773)	153-275	214
Testes L	290-321 (309)	190-200	242-261	214-770 (520)	289-514 (342)	260-877 (624)	306-659 (419)	275-306
Testes W	306-361 (327)	290-350	354-401	261-800 (674)	233-571 (418)	321-1,168 (807)	423-816 (547)	306-336
Ovary L	306-392 (345)	290-320	373	307-484 (385)	321-438 (361)	336-785 (613)	469-484 (476)	453
Ovary W	392-514 (448)	350-420	373	391-602 (489)	354-484 (421)	407-1,030 (675)	648-709 (682)	438
Eggs L	51-75 (62)	56-67 (63)	59-68 (63)	47-62 (56)	58-87 (69)	52-73 (60)	67-75 (71)	67-79 (73)
Eggs W	23-37 (27)	34-37 (35)	23-30 (27)	35-48 (40)	35-59 (44)	31-52 (37)	37-45 (41)	36-40 (37)
Host	*Astyanax bimaculatus*	*Caranx gibbosus*	*Cynopotamus*[a] *amazonum*	*Galeocharax humeralis*	*Leporinus copelandii*	*Pseudopimelodus roosevelti*	*Salminus brevidens*	*Triurobrycon*[a] *lundii*
Locality	Ilha Seca São Paulo	Salobra Mato Grosso	Foz do Iguaçu Paraná	Pirassununga São Paulo	Pirassununga São Paulo	Pirassununga São Paulo	Barra, Rio Grande Bahia	Pirassununga São Paulo
Date of collection	1940	1941	1994	1962	1946	1962	1962	1946

CHIOC: Helminthological Collection of the Oswaldo Cruz Intitute; *a*: new host record; L: length; W: width

TABLE III

Original measurements (in mm) of immature specimens of *Prosthenhystera obesa* from different hosts and localities

CHIOC no.	16.988, 16.997	33.260	16.989, 16.990, 16.992,16.998	5.596, 12.028, 33.231-33.233	11.269	33.261	33.239, 33.250. 33.251	33.262
Specimens measured	4	1	4	4	1	1	5	1
Body L	1,560-3,381 (2,578)	2,642	1,468-2,376 (1,923)	3,102-6,573 (4,912)	3,010	7,120	2,972-6,441 (5,155)	3,880
Body W	1,015-2,285 (1,436)	1,501	923-2,030 (1,374)	1,852-3,228 (2,586)	2,500	3,180	1,612-4,247 (2,985)	1,390
Oral sucker L	261-484 (351)	373	251-345 (286)	447-550	469	831	499-831 (731)	466
Oral sucker W	298-499 (389)	373	279-345 (307)	503-678	514	831	499-862 (731)	466
Ventral sucker L	242-336 (283)	-	242-279 (258)	522-632	520	816	469-800 (697)	513
Ventral sucker W	289-306 (295)	-	242-317 (272)	522-693	535	755	469-800 (697)	513
Sucker width ratio	1:0.7-1	-	1:0.8-0.9	1:1	1:1	1:0.9	1:0.9-1	1:1
Pharynx L	102-153	139	84-111 (96)	168-214 (188)	153	275	137-244 (180)	-
Pharynx W	112-137	121	102-135 (110)	168-205 (185)	168	290	153-260 (205)	-
Oesophagus L	158-514	298	84-382 (202)	298-1,137 (654)	392	678	307-571 (470)	447
Cirrus-sac L	-	-	186	183-198	-	739	102-550 (416)	-
Cirrus-sac W	-	-	130	107-183	-	306	111-423 (298)	-
Testes L	56-229 (135)	-	102-233 (155)	60-97	-	229-260	56-407 (235)	-
Testes W	75-244 (143)	-	93-195 (144)	75-78	-	198-244	45-453 (307)	-
Ovary L	92-275	-	102-214 (142)	-	-	260	48-275 (159)	-
Ovary W	76-244	-	111-214 (149)	-	-	198	86-321 (182)	-
Host	*Brycon* sp.[a]	*Leporellus*[a] *vittatus*	*Pachyurus*[a] *squamipinnis*	*Pimelodus*[a] *clarias*	*Pimelodus fur*	*Pseudoplatystoma*[a] *corruscans*	*Salminus brevidens*	*Salminus*[a] *hilarii*
Locality	Lagoa Juparanã Espírito Santo	Pirassununga São Paulo	Lagoa de Juparanã Espírito Santo	Porto Esperança Mato Grosso	Ilha Seca São Paulo	Pirapora Minas Gerais	Pirapora Minas Gerais	Pirassununga São Paulo
Date of collection	1948	1947	1948	1925	1940	1957	1957	1962

CHIOC: Helminthological Collection of the Oswaldo Cruz Institute; *a:* new host record; L: length; W: width

DISCUSSION

Diesing (1850, 1855) reported *Distomum obesa* from specimens collected by Natterer from *Salminus brevidens* and *Leporinus friderici* from the State of Mato Grosso and from *Xiphostoma cuvieri* found in the State of Acre, Brazil, with the following description.

"Corpus ellipticum erassum, supra planum, subtus ventricosum. Os subterminale anticum circulare. Acetabulum magnitudine oris, subcentrale superum, apertura circulari. Penis retractus, apertura genitali ampla, in medio inter os et acetabulum. Longit. 3-7''' ; latit. 2-5''' ; erassit. 1 ½''' ".

(Paiva in 1983 referred that the commonly named fish "dourado" from the São Francisco River belongs to the species *Salminus brevidens* and the ones from Southeast, Center-West and South of Brazil (Paraná and Paraguai River basins), belong to *Salminus maxillosus*. Considering this, *S. brevidens* mentioned by Diesing (1850, 1855) from the State of Mato Grosso and by Travassos (1922a, 1922b) from the States of Mato Grosso and São Paulo, belongs to *S. maxillosus*.)

In 1920, during a meeting of the Brazilian Society of Sciences, Travassos proposed the new genus *Prosthenhystera* for *D. obesum*, with a description, without figures, of specimens from *Salminus maxillosus (= S. brevidens)* and *Leporinus* sp. from "Tibiriçá", State of São Paulo (Travassos 1922a). In another paper, Travassos (1922b) presented original figures of *P. obesa* with the description also based on histological sections.

In these papers, Travassos refers to the measurements of *P. obesa* according to Diesing (1855) as 3-7 mm long and 2-5 mm wide. Kloss (1966), mentioned that these measurements must be corrected to 3-7 and 2-5 austriac lines, which correspond to 6.6-15.4 mm long and 4.4-11 mm wide.

In 1928, Travassos et al. published a large paper about the helminthological fauna of the freshwater fishes of Brazil. In this paper, the authors refer to new hosts for *P. obesa*, with the same data as Travassos (1922a).

In 1941, Travassos and Freitas reported the presence of adult specimens of *P. obesa* in *Astyanax bimaculatus* (= *C. bimaculatum*). In the present paper, original measurements of these specimens are presented (Table II).

Pseudoprosthenhystera microtesticulata Kloss, 1966 from *A. bimaculatus* and *A. fasciatus*, was considered by Travassos et al. (1969) as a synonym of *P. obesa***.** The type specimen of *P. microtesticulata* (no. 2.515) from "Museu de Zoologia da Universidade de São Paulo" has been examined by the authors. It represents, a very young trematode, not well diaphanized. Parenchyma cells, present over the entire body, and more condensed in the borders, were erroneously described by Kloss (1966) as vitellaria, the characteristic used by this author to erect the new genus and species.

P. obesa presents a large variation in body shape and size. The large range in body size of worms from the same host and from different hosts, from different localities, collected in different periods is demonstrated in Tables I and II.

The variation in body size of *P. obesa* was also observed by Pavanelli et al. (1992) in three specimens from *S. maxillosus* measuring 8.46 to 18.64 mm long by 5.65 to 9.88 mm wide.

Large morphological variation in size and shape of body and in position and shape of testes was already demonstrated by Travassos (1944) in other gall bladder parasites of the family Dicrocoeliidae as in *Dicrocoelium dendriticum*, *Eurytrema coelomaticum*, *Lubens lubens* (=*E. (Lubens) lubens*), *Platynosomum illiciens* (= *P. fastosum*), *Zonorchis microrchis* (Travassos 1944, pls: 3-4, 14, 17, 19-26, 27-30, 53-55).

This high variability was also confirmed in other species of Digenea as in *Mesocoelium monas* by Freitas (1963), *Plagiorchis koreanus* and *P. verpertilionis* by Groschaft and Tenora (1974), *Fasciolopsis buski* by Roy and Tandon (1993), and others.

The tegumental papillae now observed in *P. obesa* by SEM, were also described in other species as in *Gorgoderina vitelliloba* (see Hoole & Michel 1981), *Echinostoma revolutum* (see Smales & Blankespoor 1984), G*igantocotyle explanatum* (see Ahmad et al. 1988), *Zygocotyle lunata* (see Irwin et al. 1991), *Transversotrema licinum* (see Abdul-Salam & Sreelatha 1992), *Fasciolopsis buski* (see Roy & Tandon 1993). At higher magnification we observed in body surface, long and slender structures resembling spines, not referred to previously. As these structures were not visible using light microscopy or by SEM in low magnification, we consider that further observation is required in order to confirm it.

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