Neotropical Monogenoidea. 23. Two New Species of *Gyrodactylus* (Gyrodactylidae) from a Cichlid and an Erythrinid Fish of Southeastern Brazil

Walter A Boeger, Flávio Popazoglo

Departamento de Zoologia, Universidade Federal do Paraná, Caixa Postal 19073, 81531-990 Curitiba, PR, Brasil

Two new species of Gyrodactylus *Nordmann, 1832 (Platyhelminthes, Monogenoidea) are described from fishes collected from southeastern Brazil.* Gyrodactylus geophagensis *n. sp. was collected from the body surface of the "cará",* Geophagus brasiliensis *(Quoy and Gaimard, 1824) (Cichlidae), from the Rio da Guarda, State of Rio de Janeiro; its major diagnostic features are the morphology of the anchor with a short, truncate superficial root and the shape of the hooks - with a long, delicate shaft.* Gyrodactylus trairae *n. sp. parasitizes the body surface of the "traira",* Hoplias *aff.* malabaricus *(Bloch, 1794) (Erythrinidae), from the Rio Guandu, State of Rio de Janeiro and can be easily differentiated from other species of the genus by having a thin, dorsal bridge, connecting the superficial bar with the spathulated shield. These are the first species of* Gyrodactylus *formally reported from Brazil. Presently, 26 species of Gyrodactylidae are known from freshwater fishes in the Neotropical Region; a list of these species is provided.*

Key words: Platyhelminthes - Gyrodactylidae - *Gyrodactylus geophagensis* n. sp. - *Gygrodactylus trairae* n. sp. - *Geophagus brasiliensis* - *Hoplias* aff. *malabaricus* - Brazil

Until recently, Gyrodactylidae were practically unknown for the Neotropical Region (Table). Kritsky and Fritts (1970) were the first to report and describe species from Neotropical freshwater fishes collected in Costa Rica, Central America. Only three additional refererences exist from 1970 to the early 80's: Szidat (1973), Kritsky and Thatcher (1977), and Harris (1983). Considering the species described in this paper, there are, presently, 26 gyrodactylids reported for freshwater fishes of the Neotropical Region. The majority of these forms are related to those studied in Peru and Brazil (see Table for references). Only two species are known from Neotropical marine fishes: *Gyrodactylus curemae* Conroy and Conroy, 1985 was described from *Mugil curema* Valenciennes, 1836 from Venezuela; and *Gyrodactylus* sp. reported by Jara (1986) from *Mugil cephalus* Linné, 1758 from the coast of Peru.

Although many of the species of Gyrodactylidae reported from the region are not closely related to each other but to other Nearctic or Eurasian species (An et al. 1991). Neotropical fishes are the only known hosts of a unique group of this family of worms. Harris (1983) proposed a new family, Ooegyrodactylidae, to include, at that time, two species of oviparous monogenoideans which depicted great morphological similarity to the Gyrodactylidae. Kritsky and Boeger (1991) described four new species of these worms. However, Boeger et al. (1994) rejected monophyly of Ooegyrodactylidae using techniques of Phylogenetic Systematics and transferred all its members to Gyrodactylidae. The Ooegyrodactylidae, according to these authors, is paraphyletic. Thus, the Gyrodactylidae is presently composed of viviparous (the tradicional composition) and of oviparous species (formely members Ooegyrodactylidae). Oviparous Gyrodactylidae have only been found on Neotropical Siluriformes, mainly Loricariidae.

Although species of *Gyrodactylus* have already been reported from South America (Jara 1986, An et al. 1991), none have been previously registered from Brazil. However, during a survey of Gyrodactylidae, two new species of *Gyrodactylus* were collected from fishes of the Southeast Region of the country. These forms are described herein.

This work received financial support from the Fundação de Amparo e Pesquisa do Estado do Rio de Janeiro (Proc. E-291170-033/90) and Conselho Nacional de Desenvolvimento Científico e Tecnológico (Proc. 406184/90 and 500711190-9), Brazil. This is the contibution number 899 from the Departamento de Zoologia, Universidade Federal do Paraná.
Research fellow's CNPq
Received 20 March 1995
Accepted 26 July 1995

TABLE

Gyrodactylidae from freshwater fishes of the Neotropical Region

Parasite	Host Species	Reference
Accessorius		
A. peruensis Jara et al., 1991	*Lebiasina bimaculata* Cuvier and Valenciennes, 1846	Jara et al. (1991)
Anacanthocotyle		
A. anacanthocotyle Kritsky and Fritts, 1970	*Astyanax fasciatus* (Cuvier, 1819)	Kritsky & Fritts (1970)
A. sp.	*Bryconamericanus peruanus* Müller and Troschel, 1845	Jara (1986)
Gyrodactylus		
G. neotropicalis Kritsky and Fritts, 1970	*Astyanax fasciatus* (Cuvier, 1819)	Kritsky & Fritts (1970)
G. costaricencis Kritsky and Fritts 1970	*Poecilia sphenops* Valenciennes, 1836	Kritsky & Fritts (1970)
G. hullatarudis Turnbull, 1956	*Poecilia sphenops*	Kritsky & Fritts (1970)
	P. reticulata Peters, 1859	Harris & Liles (1992)
G. lebiasinus An et al., 1991	*Lebiasina bimaculata*	An et al. (1991)
G. pimelodellus An et al., 1991	*Pimelodella yuncencis* Steindachner, 1920	An et al. (1991)
G. slendrus An et al., 1991	*Lebiasina bimaculata*	An et al. (1991)
G. turnbulli Harris, 1986	*Poecilia reticulata*	An et al. (1991)
		Harris & Liles (1992)
G. geophagensis Boeger and Popazoglo, nobis	*Geophagus brasiliensis* (Quoy and Gaimard, 1824)	Boeger & Popazoglo (nobis)
G. trairae Boeger and Popazoglo, nobis	*Hoplias* aff. *malabaricus* (Bloch, 1794)	Boeger & Popazoglo (nobis)
G. gemini Ferraz et al., 1994	*Semaprochilodus taenirus* (Valenciennes, 1811)	Ferraz et al. (1994)
G. sp.	*Trychomycterus punctulatum* Valenciennes, 1840	Jara (1986)
Hyperopletes[a]		
H. malmbergi Boeger et al., 1994	*Rhineloricaria* sp.	Boeger et al. (1994)
Nothogyrodactylus[a]		
N. clavatus Kritsky and Boeger, 1991	*Ancistrus* sp.	Kritsky & Boeger (1991)
N. amazonicus Kritsky and Boeger, 1991	*Ancistrus* sp.	Kritsky & Boeger (1991)
N. plaesiophallus Kritsky and Boeger, 1991	*Ancistrus* sp.	Kritsky & Boeger (1991)
Ooegyrodactylus[a]		
O. farlowellae Harris, 1983	*Farlowella amazonum* Günther, 1864	Harris (1983)
Paragyrodactyloides		
P. superbus (Szidat, 1973)	*Corydoras paleatus* (Jenyns, 1842)	Szidat (1973)
Phanerothecium[a]		
P. caballeroi Kritsky and Thatcher, 1977	*Cephalosilurus zungaro* (Humboldt, 1833)	Kritsky & Thatcher (1977)
P. harrisi Kritsky and Boeger, 1991	*Hypostomus plecostomus* (Linnaeus, 1758)	Kritsky & Boeger (1991)
P. spinicirrum Boeger et al., 1994	*Hypostomus punctatus* (Valenciennes, 1840)	Boeger et al. (1994)
Scleroductus		
S. yuncensi Jara and Cone, 1991	*Pimelodella yuncensis*	Jara & Cone (1989)
S. sp.	*Parauchenipterus striatulus* (Steindachner, 1876)	Kritsky et al. (1995)
	Glanidium melanopterum Ribeiro, 1920	Kritsky et al. (1995)
	Pimelodella sp.	Kritsky et al. (1995)
	Rhamdia quelen (Quoy and Gaimard, 1824)	Kritsky et al. (1995)

a: genera with oviparous species

MATERIALS AND METHODS

Fishes were collected from two localities of the Southeast Region of Brazil, as indicated in the respective descriptions, by different types of nets. Individual or pooled hosts were placed in vials containing a 1:4000 solution of formalin (Putz & Hoffman 1963). After 1 hr, the vials were vigorously shaken and additional formalin was added to increase the concentration to about 5%. Gyrodactylids were prepared according to procedures described in Kritsky et al. (1995). Illustrations were prepared with the aid of a camera lucida. Measurements are given in micrometers; the average is given followed by the range and the number (n) of structures measured, in parenthesis; anchors were measured following method indicated by Kritsty et al. (1995). Type specimens were deposited at the Instituto Oswaldo Cruz (IOC), Rio de Janeiro, Brazil, the University of Nebraska State Museum (HWML), Lincoln, Nebraska, and the U. S. National Museum Helminthological Collection (USNM), Beltsville, Maryland, USA, as indicated in the respective descriptions.

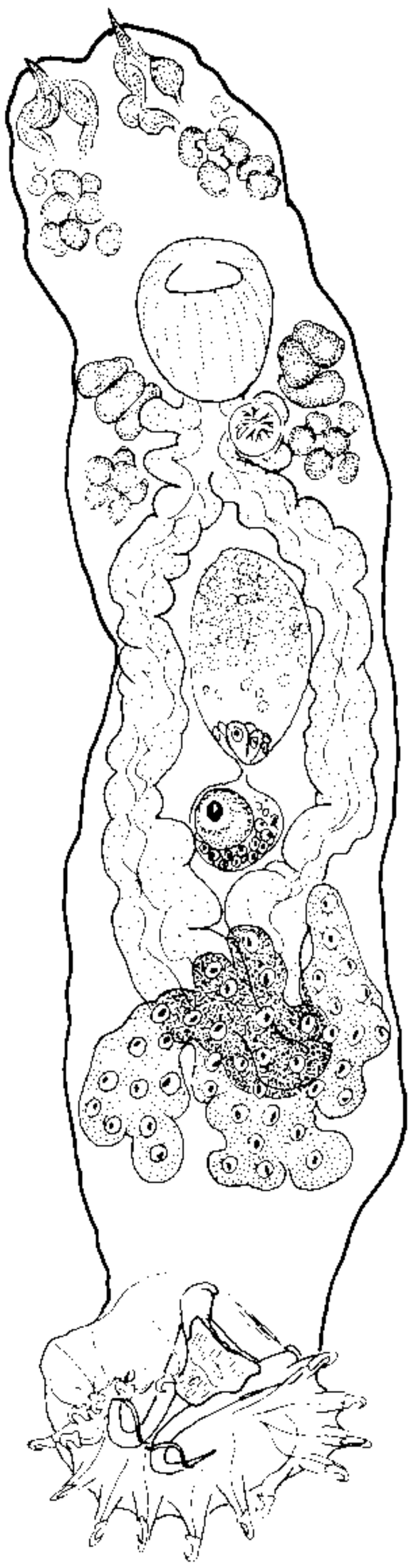
DESCRIPTIONS

Gyrodactylus geophagensis n. sp.
(Figs 1-5)

Host: *Geophagus brasiliensis* (Quoy and Gaimard, 1824) (Cichlidae)
Site of infestation: body surface
Type locality: Rio da Guarda, Itaguaí, State of Rio de Janeiro, Brazil; December 1990
Holotype: IOC 33144a. Paratypes: (4 specimens) IOC 33144b-e; (2 specimens) USNM 84078; (2 specimens) HWML 37095
Description (based on 9 specimens): body elongate, 418 (390-455, n=3) long; greatest width 103 (89-117; n=4) near midlength. Cephalic lobes moderately developed, head organs conspicuous. Pharynx 44 (38-53; n=6) in diameter; pharyngeal process inconspicuous. Testis not observed. Copulatory organ 6-7 (n=2) in diameter, ovate, armed with 8 spinelets, 1 spine. Germarium ovate. Uterus with up to 2 embryos. Syncytial postgermarian mass of cells. Haptor 79 (71-88; n=3) long, 84-96 (n=3) wide. Anchor 57 (55-58; n=5) long; with slightly curved shaft 40 (37-41, n=5) long; point 25 (22-28; n=5) long; truncate, robust superficial root; inconspicuous deep root- base 22 (19-24; n=5) long; angle shaft/point 45° (40°-49°; n=5). Superficial bar 20-23 (n=2) long, 9-19 (n=2) wide, robust with short antero-lateral projections; shield of superficial bar extending to middle of anchor shaft, tapering posteriorly, 13-14 (n=2) long; deep bar relatively robust, flexible. Hooks with straight shaft, shelf with small proximal elevation, straight thumb, conspicuous heel, slender shank; hooklet 7-8 (n=5) long; FH loop not observed.
Remarks: the morphology of the anchor and bar of *G. geophagensis* n. sp. is very similar to those of *G. masu* Ogawa, 1986 and *G. derjarvini* Mikailov, 1975. All three species depict robust anchors with short, truncate superficial root, and superficial bar with shield and anterolateral processes relatively short. *Gyrodactylus geophagensis* n. sp. can be differentiated from these species by having: (1) hooks with delicate, proportionally longer shaft and a straight non depressed toe; (2) copulatory organ with spinelets of about equal size - in *G. masu* and *G. derjarvini* the spinelets lateral to the cirral spine are larger than the remaining ones. The specific name refers to the generic name of the host of this species.

Gyrodactylus trairae n. sp.
(Figs 6-10)

Host: *Hoplias* aff. *malabaricus* (Bloch, 1794) (Erythrinidae)
Site of infestation: body surface
Type locality: Rio Guandu, Nova Iguaçu, State of Rio de Janeiro, Brazil; April and June 1991
Holotype: IOC 33215a. Paratypes: (8 specimens) IOC 33215b-i; (8 specimens), USNM 84079; (8 specimens) HWML 37096
Description (based on 25 specimens): body elongate, 608 (530-667; n=8) long; greatest width 127 (90-175; n=8) near midlength. Cephalic lobes well developed; head organs conspicuous. Distal pharynx 42 (38-47; n=6) in diameter; proximal pharynx 47 (44-49; n=6) in diameter; pharyngeal processes not observed. Testis post germarian, laterally elongate. Copulatory organ 17-18 (n=4) in diameter, ovate, armed with 1 spine and spinelets arranged in two rows; external row with 4 large spinelets; internal row with 4-5 small intermediate spinelets; base of large spinelets large, truncate. Germarium ovate. Uterus with up to 4 generations of embryos. Vitelline follicles not observed. Numerous unicellular glands in peduncle with ducts directed posteriorly. Haptor 108 (97-123; n=12) long, 78 (71-93; n=12) wide. Anchor 107 (102-114; n=11) long, with straight shaft, 46 (41-51; n=11) long; straight point 41 (38-45; n=11); elongate, evenly curved superficial root; base 67 (61-79; n=11) long; inconspicuous deep root; angle shaft/point 52° (46°-60°; n=11). Superficial bar 32 (29-38; n=11) long, 12 (10-18; n=11) wide, with two lateral, anterior processes; processes of superficial bar 34 (27-43; n=11) long; shield of superficial bar 33 (29-38; n=10) long, 16 (14-18; n=7) wide, distally spathulated, connected to bar by thin, dorsal bridge. Deep bar thin, flexible. Hooks long, with evenly curved shaft,



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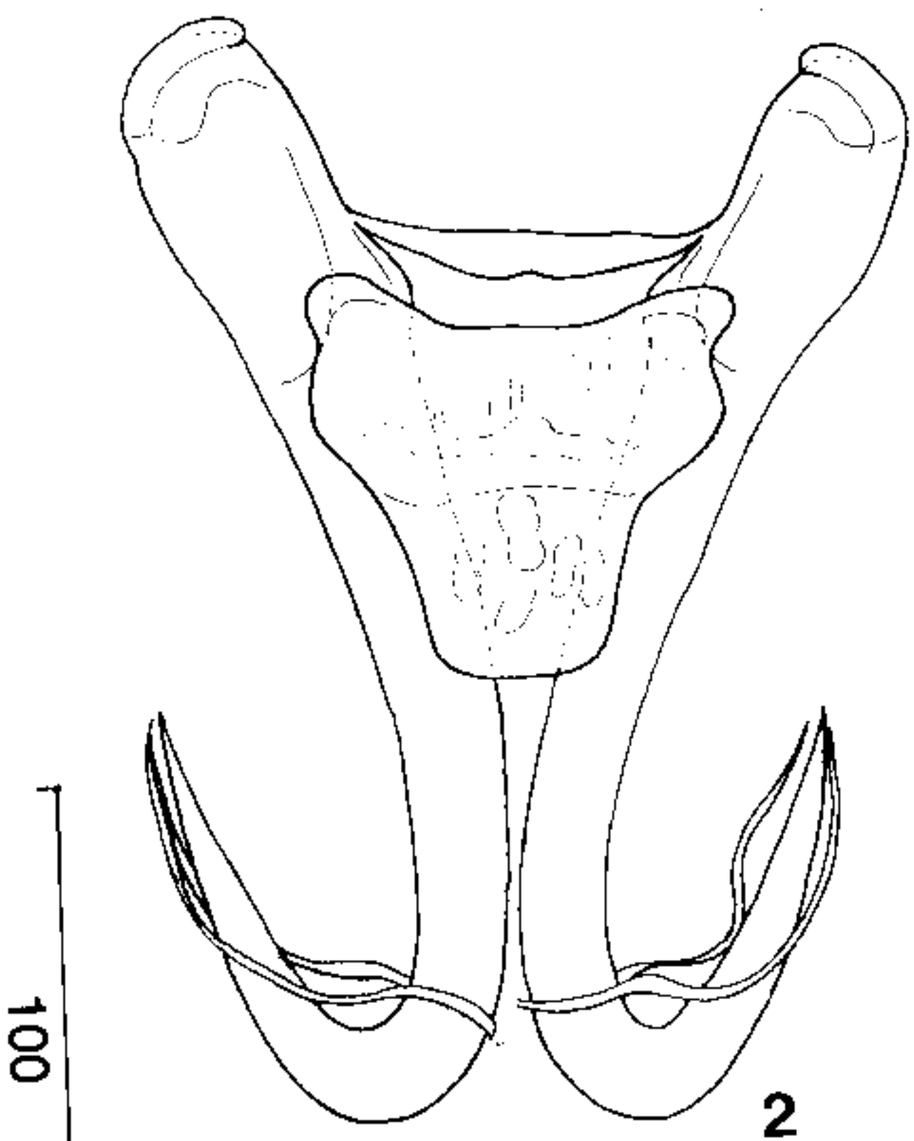

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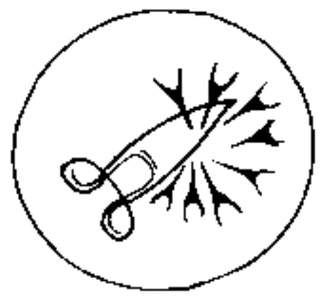

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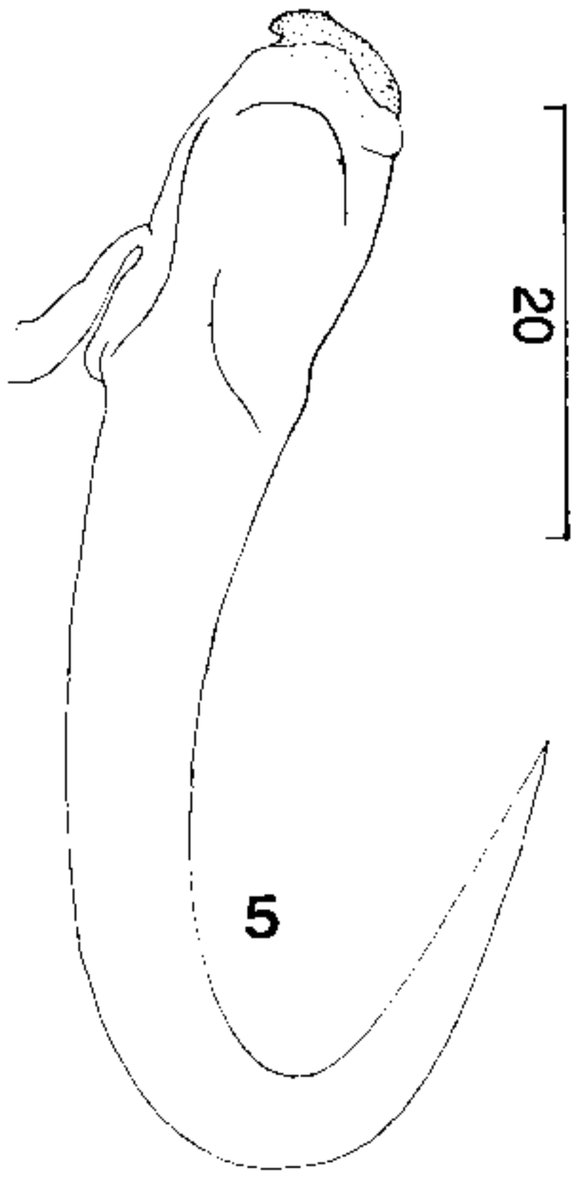

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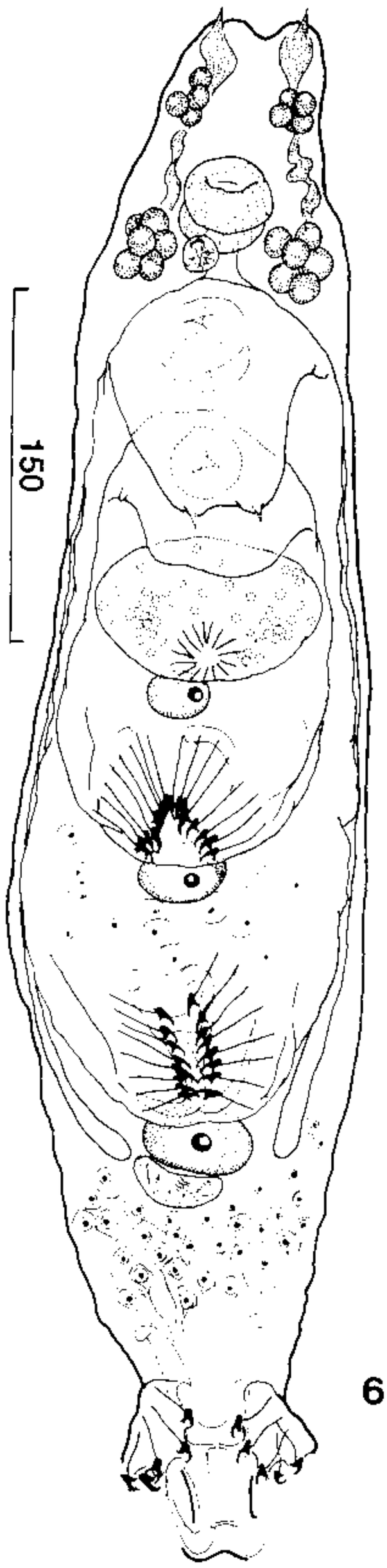
Gyrodactylus geophagensis n. sp. Fig. 1: holotype (ventral). Fig. 2: anchor-bar complex (ventral). Fig. 3: copulatory organ. Fig. 4: hook. Fig. 5: anchor. Figs 2, 3, 5 are to the 20 µm scale; other figures are to their respective scales.

point, depressed thumb, convex shelf, conspicuous heel; hooklet 6 (5-8; n=18) long; FH loop 1/2 shank length.

Remarks: *Gyrodactylus trairae* n. sp. resembles species included in the subgenus *G.* (*Mesonephrotus*) Malmberg, 1964 (see Malmberg 1970) and *G. katherineri* Malmberg, 1964 by the presence of long anterolateral processes on the superficial bar. Although, the presence of two arched rows of spinelets on the copulatory organ and the shape of the hooklets suggest proximity of the new species with those included in the subgenus *Gyrodactylus* (*Gyrodactylus*) (sensu Malmberg 1970). Independently of the subgeneric placement, however, the new species can be easily differentiated from all known *Gyrodactylus* by the morphology of the anchor and shield of the superficial bar. Additionally, the embryos of *G. trairae*, unlike those of other species in the genus, lie almost unfolded within the uterus. The specific name refers to the local name of the fish host ("traíra").

ACKNOWLEDGMENTS

To Dr Heraldo A Britsky (Museu de Zoologia, Universidade de São Paulo) for identification of the host species; Dr Delane C Kritsky (Idaho State University) and two anonymous referees for comments and suggestions.



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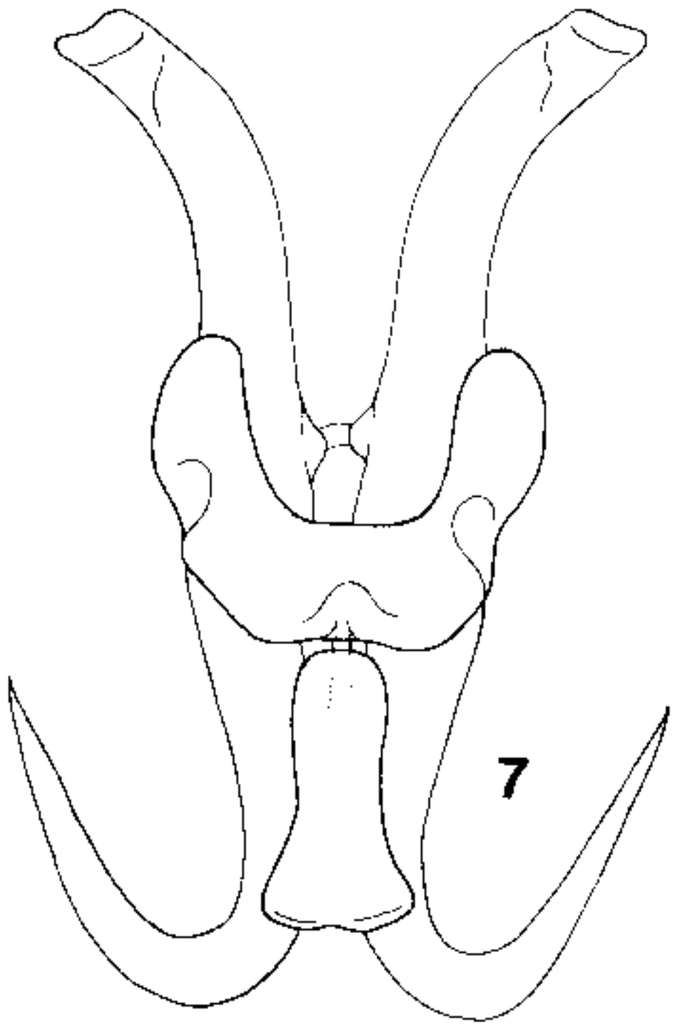

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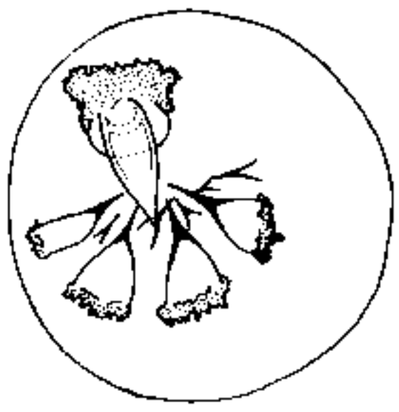

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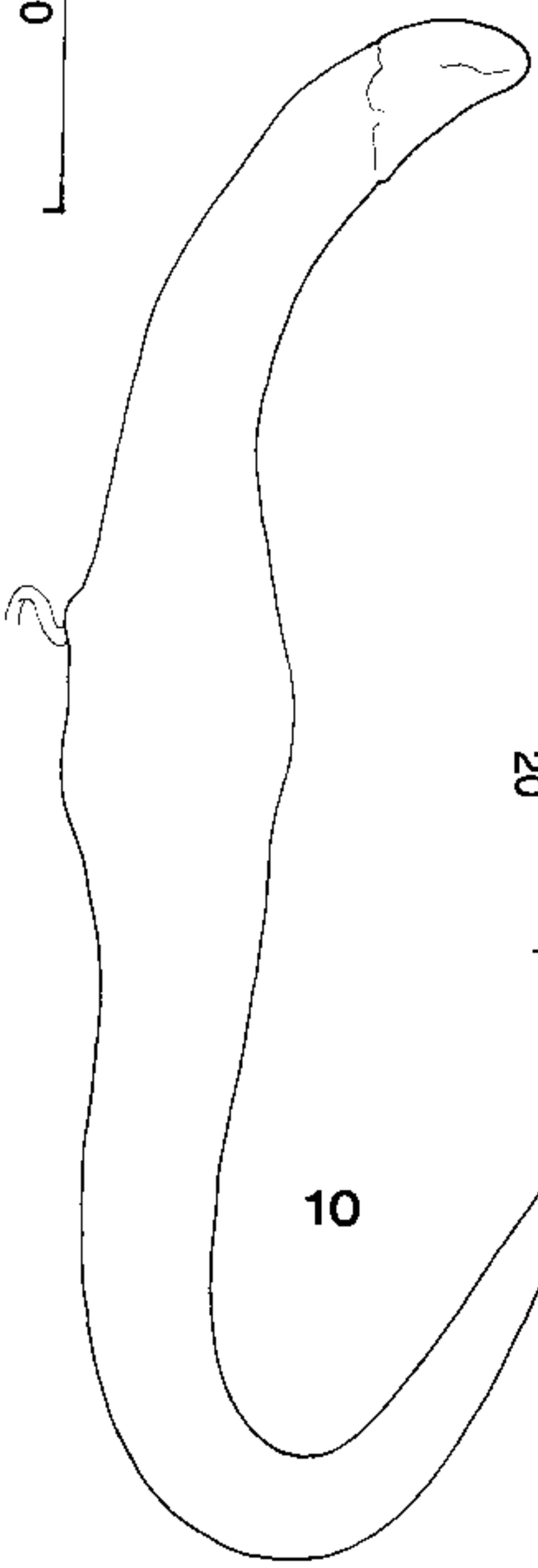

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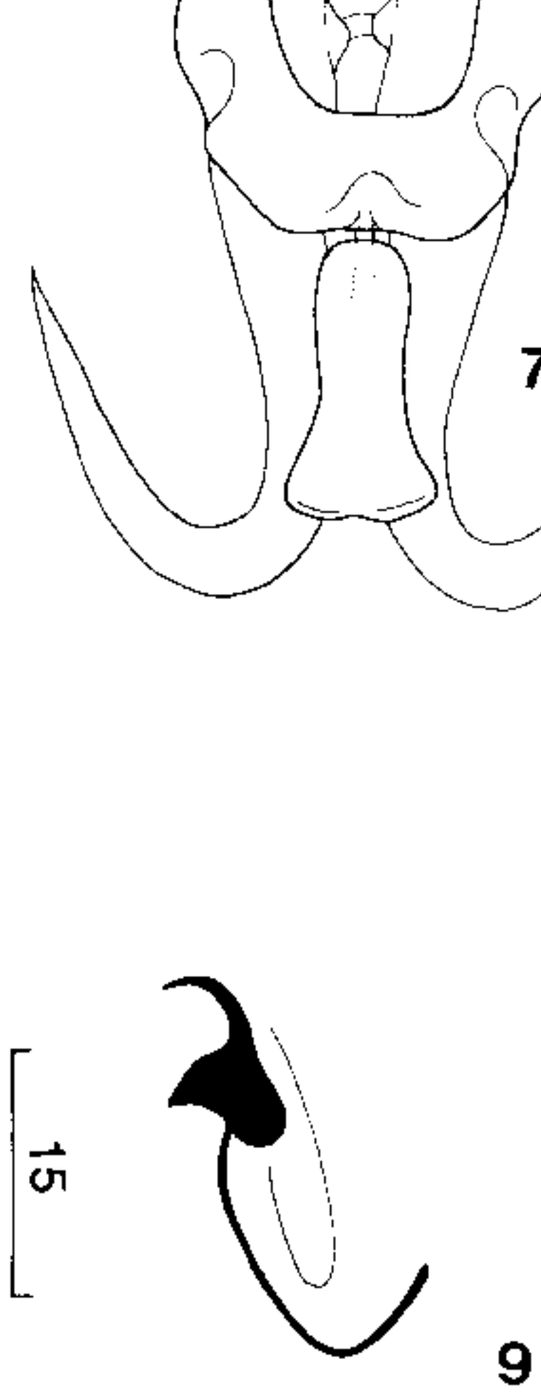

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Gyrodactylus trairae n. sp. Fig. 6: holotype (ventral). Fig. 7: anchor -bar complex (ventral). Fig. 8: copulatory organ. Fig. 9: hook. Fig. 10: anchor. Figs 8, 10 are to the 20 μm scale; other figures are to their respective scales.

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