

NEOTROPICAL MONOGENEA. 11. *RHINOXENUS*, NEW GENUS (DACTYLOGYRIDAE: ANCYROCEPHALINAE) WITH DESCRIPTIONS OF THREE NEW SPECIES FROM THE NASAL CAVITIES OF AMAZONIAN CHARACOIDEA

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Abstract.—*Rhinoxenus*, new genus is proposed for ancyrocephalines characterized by 1) possessing a pair of dorsal haptor spikes which replace or are modifications of the dorsal anchor/bar complex; 2) lacking a dorsal bar; and 3) having hook pair 2 situated on two bilateral lobes of the trunk. Species of *Rhinoxenus* infest the nasal cavities of Neotropical charcoid fishes. Three new species are described: *R. piranhus*, new species, from *Serrasalmus nattereri* (Kner), *R. arietinus*, new species, from *Schizodon fasciatum* Agassiz and *Rhytiodus argenteofuscus* Kner, and *R. nyttus*, new species from *S. fasciatum*. Two undescribed species of *Rhinoxenus* are reported from *S. fasciatum* and *Hydrolycus scomberoides* (Cuvier), respectively.

Relatively few species of Dactylogyridae have been recorded from nasal cavities of freshwater fishes. In North America, Rogers (1967) described *Aplodiscus nasalis* (Dactylogyridae) from the nose of the Alabama hogsucker, *Hypentelium etowanum* (Catostomidae). Dechtiar (1969) described two species of Dactylogyridae, *Pellucidhaptor catostomi* and *P. nasalis*, from the nasal cavities of *Catostomus catostomus* and *C. commersoni* (Catostomidae), respectively, in Ontario. Recently, Klassen and Beverley-Burton (1985) reported *Ligictaluridus monticellii* (Ancyrocephalinae) from the nose of *Ictalurus nebulosus* (Ictaluridae) in Ontario. The latter species had previously been reported from the nasal cavities of North American Ictaluridae imported into Europe (Cognetti de Martiis 1924, Prost 1973). Additional records of Dactylogyridae from the nose of freshwater fishes exist from Europe, the USSR, and Asia (Smirnova et al. 1964, Strelkow & Ha Ky 1964, Gussev and Strijak 1972). At present there are no reports of dactylogyrids from the nares of Neotropical or Ethiopian freshwater fish.

Recently, we examined the nasal cavities

of a few species of freshwater fish collected from the Manaus area in Brazil. These preliminary collections from four species of Characoidea, one species of Siluriformes and one clupeid host have revealed several new monogenean species and genera, suggesting that the nose of fishes may be a specific site of infestation for an unique fauna in the Neotropical Region. The present study includes the description of dactylogyrids comprising a new genus from the characoid hosts.

Materials and Methods

Fish were collected by net from the environs of Manaus, Amazonas, Brazil, during 1983 and 1984. The host brain and spinal cord were destroyed by pithing, after which the nasal cavities of each fish were washed with a strong current of 1:4000 formalin solution. After this washing, the nasal cavity was disrupted with a probe and again washed with the formalin solution. The washings were collected and examined with a dissecting microscope; parasites were removed with a fine probe and fixed in a 3% formalin solution. Preparation of helminths

for study followed the procedures outlined by Kritsky, Thatcher & Boeger (1986). Measurements, all in micrometers, were made with the aid of a filar micrometer, except length of the cirrus was approximated using a Minerva curvimeter on camera lucida drawings. Type specimens were deposited in the helminth collections of the Instituto Nacional de Pesquisas da Amazônia (INPA), the U.S. National Museum (USNM), and the University of Nebraska State Museum (HWML).

Rhinoxenus, new genus

Diagnosis.—Dactylogyridae, Ancyrocephalinae. Body robust, divisible into cephalic region, trunk, haptor (peduncle absent). Tegument thin, smooth. Cephalic lobes, head organs, cephalic glands present. Four eyes. Mouth subterminal, midventral; pharynx muscular, glandular; esophagus short; intestinal caeca (2) confluent posterior to gonads, lacking diverticulae. Genital pore midventral. Gonads intercaecal, overlapping; testis dorsal to ovary. Vas deferens looping left intestinal caecum; seminal vesicle a dilation of vas deferens, frequently with constriction near midlength; copulatory complex comprising coiled cirrus with counterclockwise rings, accessory piece basally articulated to cirrus by proximal projection lying within rings of cirrus. Vagina sinistral in anterior trunk; seminal receptacle present. Vitellaria well developed, coextensive with caeca. Haptor armed with ventral pair of anchors, ventral bar, 6 pairs of hooks with ancyrocephaline distribution (Mizelle 1936) (hook pair 2 removed from haptor, lying in lateral or ventrolateral lobes on posterior half of trunk), one pair of dorsal spike-like structures which replace or represent modifications of dorsal anchors. Hooks with proximally inflated shank. Nasal parasites of Neotropical characoid fishes.

Type species, host, and locality.—*Rhinoxenus piranhus*, n. sp. from *Serrasalmus*

nattereri (Kner), Ilha Marchantaria, Rio Solimões, near Manaus, Amazonas, Brazil.

Other species.—*Rhinoxenus arietinus*, n. sp. from *Schizodon fasciatum* Agassiz (type) and *Rhytiodus argenteofuscus* Kner (an apparent accidental host); *Rhinoxenus nyttus*, n. sp. from *Schizodon fasciatum*; *R. spp.* from *Schizodon fasciatum* and *Hydrolycus scomberoides* (Cuvier) (USNM 79264, 79265, respectively).

Etymology.—The generic name is from Greek (*rhin/o* = nose + *xen/o* = guest).

Rhinoxenus piranhus, new species

Figs. 1–8

Host.—*Serrasalmus nattereri* (Kner), the piranha cajú, Serrasalminidae.

Locality.—Ilha Marchantaria, Rio Solimões near Manaus, Amazonas, Brazil (type) 21 Sep 1983, 15 Aug 1984, 14 Sep 1984, 25 and 26 Nov 1984; Furo do Catalaõ, near Manaus, Amazonas, Brazil 27 Nov 1984.

Type specimens.—Holotype, INPA PA287-1; paratypes, INPA PA287-2 to PA287-11, USNM 79180, 79181, HWML 23307.

Description (based on 79 specimens; 20 measured).—Body 758 (582–1014) long, fusiform, slightly flattened dorsoventrally; greatest width 165 (132–206) in posterior trunk. Cephalic lobes poorly developed, 2 terminal, 2 bilateral; 2 pairs of head organs lying in cephalic lobes and adjacent cephalic area; cephalic glands unicellular, bilateral, posterolateral to esophagus. Eyes usually equidistant, members of anterior pair smaller than those of posterior pair; conspicuous lens associated with posterior eyes; eye granules ovate, small; accessory granules absent. Pharynx ovate, with distal sucker-like modification, 34 (27–39) in diameter. Haptor trapezoidal, 113 (93–136) wide, 111 (86–135) long. Ventral anchor 131 (120–137) long, with superficial root modified into ventromedial protuberances serving as articulation point for bar, evenly curved shaft, point with saucer-like termination; base 25

(20–32) wide. Anchor filament conspicuous, basal. Dorsal haptoral spike 116 (97–130) long, with small bulbous proximal end, tapered distal point; each termination with conspicuous cap of tissue. Ventral bar 52 (46–55) long, flattened, with small terminal protuberances. Hook pair 2–24 (23–25) long, lying in small lobe on ventral surface of posterior trunk, stout, with heavy point, erect thumb, inflated proximal $\frac{2}{3}$ of shank. Haptoral hooks 27 (24–29) long, elongate, delicate, with curved point, erect thumb, shank slightly inflated proximally. FH loop extended to near beginning of shank dilation. Cirrus a coil of about $2\frac{1}{2}$ rings; base with bilaterally sclerotized lobes, ring diameter 28 (25–31), cirrus length 175. Accessory piece spathulate distally, with lateral rod-like thickening, proximal projection extending along distal one-half cirral ring serving as cirral guide; length of distal spathulate portion 51 (45–55). Testis elongate ovate, 126 (115–144) long, 36 (34–37) wide; seminal vesicle with medial constriction; prostatic reservoirs not observed. Ovary elongate, with varying diameter, greatest width 34 (23–48), length 183 (137–202); oviduct short; ootype, uterus not observed; genital pore posterior to intestinal bifurcation; vagina with distal double cavity from which simple tube arises; seminal receptacle a dilation of vaginal tube, lying diagonally to left of body midline. Egg lacking filaments, with proximally thickened shell.

Remarks.—*Rhinoxenus piranhus* is the type species for the genus. The specific name is derived from the common or local name of the host.

Rhinoxenus arietinus, new species

Figs. 9–17

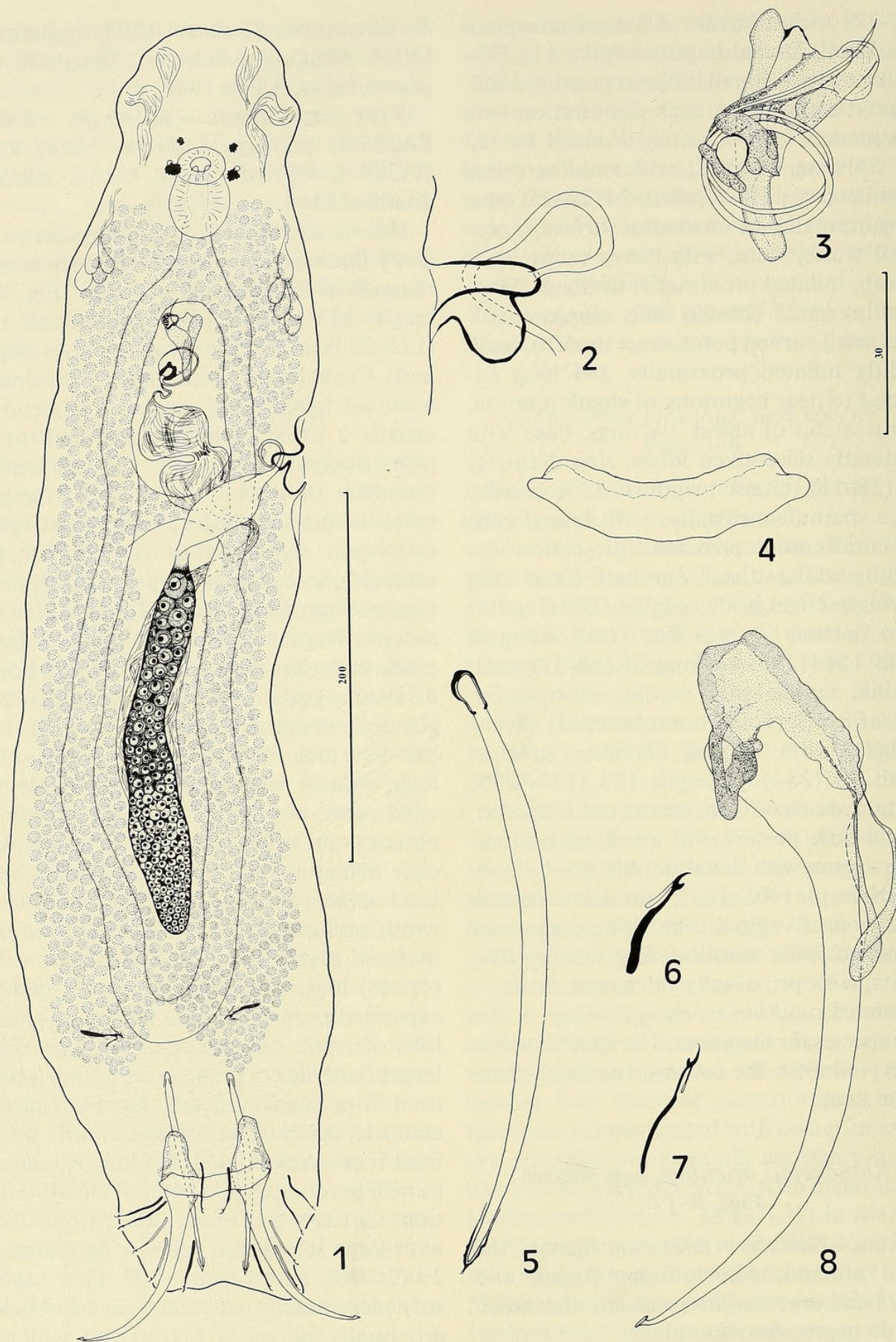
Hosts.—*Schizodon fasciatum* Agassiz, the aracú pintado, Anostomidae (type), and *Rhytiodus argenteofuscus* Kner, the aracú pau de negro, Anostomidae.

Locality.—Ilha Marchantaria, Rio Solimões, near Manaus, Amazonas, Brazil (type)

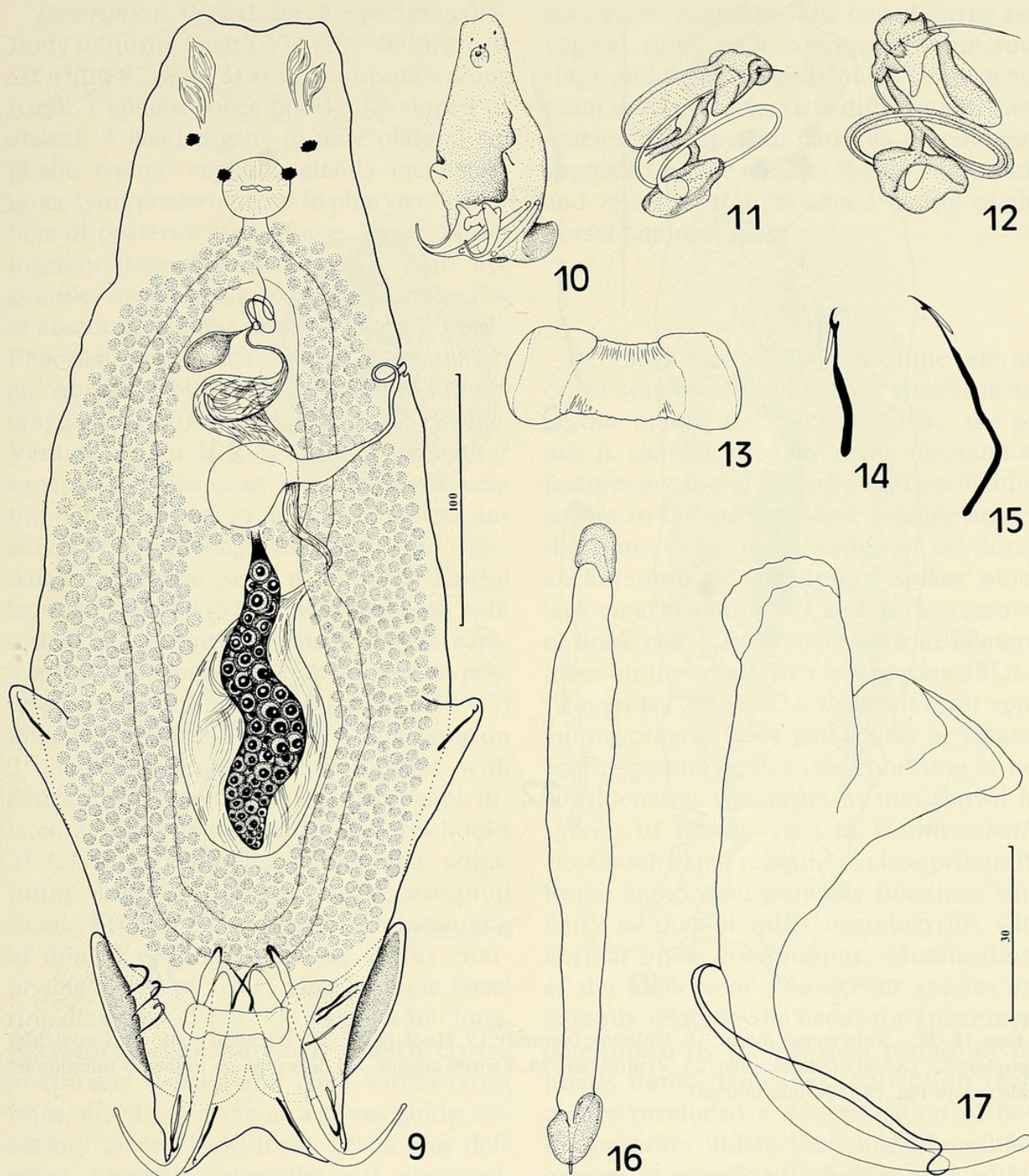
S. fasciatum, 25 Nov 1983; aquarium, INPA, Manaus, Amazonas, Brazil (*R. argenteofuscus*, 8 Feb 1984).

Type specimens.—Holotype, INPA PA288-1; paratypes, INPA PA288-2 to PA288-4, USNM 79183, 79184, HWML 23309, 23310.

Description (based on 17 specimens).—Body flattened dorsoventrally, with lateral margins of trunk curled ventrally (Fig. 10); length 395 (310–501) greatest width 169 (133–202) in posterior trunk at level of gonads. Cephalic area with 2 poorly developed terminal lobes; head organs conspicuous, usually 2 pairs; cephalic glands indistinct, posterolateral to pharynx. Eyes subequal; members of anterior pair approximately twice the distance apart of members of posterior pair; eye granules ovate, small; accessory granules absent or few in cephalic region. Pharynx spherical, 23 (20–27) in diameter. Haptor subquadrate, with 2 large posteriorly directed pads shaped as horns of a ram; pads dense staining, apparently glandular; haptor 126 (111–138) wide, 108 (89–131) long. Ventral anchor 106 (88–115) long, robust, with large base, well-developed roots, evenly curved shaft and point, obtuse point tip; base 54 (50–61) wide. Anchor filament well developed. Dorsal haptoral spike 110 (89–126) long, variable in width, robust, with distal acute tip, proximal and distal tissue caps. Ventral bar 43 (41–46) long, subrectangular, with slightly expanded ends. Hook pair 2 lying on lateral lobe of trunk just posterior to body midlength, with heavy point, erect thumb, proximal $\frac{2}{3}$ of shank inflated. Haptoral hooks elongate, delicate, with blunt thumb, proximal $\frac{3}{4}$ of shank dilated. FH loop extending to near level of termination of shank inflation. Cirrus a coil of about $1\frac{1}{2}$ rings, base with large sclerotized lobes, ring diameter 29 (26–33), cirrus length 107–110. Accessory piece basally articulated to cirral base, proximally follows first cirral ring, with ornate termination; length of terminal portion 32 (27–36). Testis ovate, 80 (78–83) long,



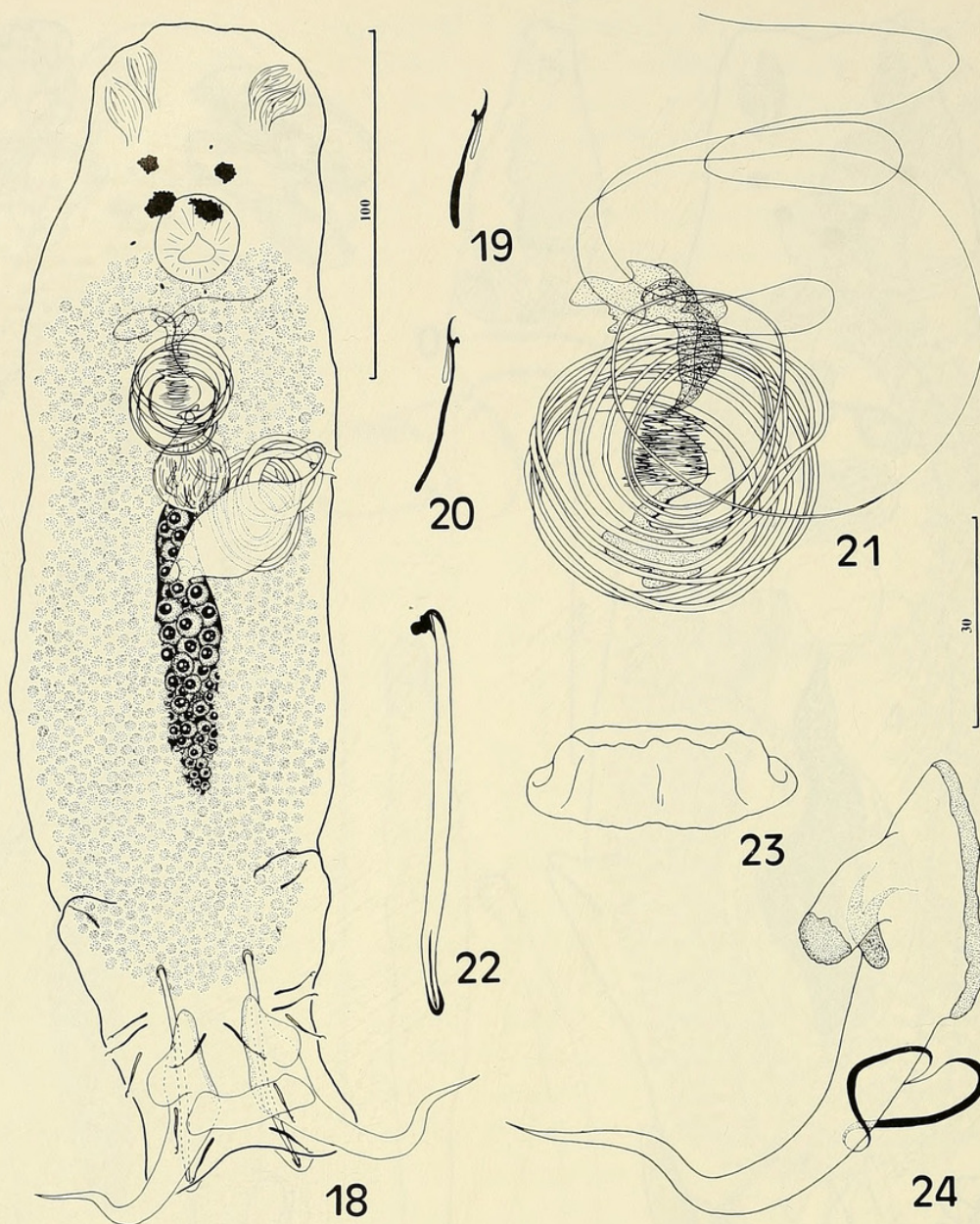
Figs. 1-8. *Rhinoxenus piranhus*: 1, Holotype (ventral); 2, Vagina (dorsal); 3, Copulatory complex (dorsal); 4, Ventral bar; 5, Dorsal haptor spike; 6, Hook pair 2; 7, Haptor hook; 8, Ventral anchor. All figures are drawn to the 30-micrometer scale except Fig. 1 (200-micrometer).



Figs. 9–17. *Rhinoxenus arietinus*: 9, Holotype (ventral); 10, Ventrolateral illustration showing relationship of haptor anchors, pads, and spike, and bilateral body lobes; 11, 12, Copulatory complexes; 13, Ventral bar; 14, Hook pair 2; 15, Haptor hook; 16, Dorsal haptor spike; 17, Ventral anchor; Figs. 11–17 are drawn to the 30-micrometer scale; Fig. 9 to the 100-micrometer scale.

36 (29–43) wide, seminal vesicle with inconspicuous medial constriction, one prostatic reservoir lying to right of cirral base. Ovary 85 (81–88) long, 21 (18–23) wide, usually an elongate sigmoid organ which may appear subovate in contracted speci-

mens as a result of margins between curves being closely appressed; oviduct short; ootype, uterus not observed; genital pore posterior to or at level of intestinal bifurcation; vagina sclerotized, tubular, with distal loop, expanding proximally to large pyr-



Figs. 18–24. *Rhinoxenus nyttus*: 18, Holotype (ventral); 19, Hook pair 2; 20, Haptor hook; 21, Copulatory complex; 22, Dorsal haptor spike; 23, Ventral bar; 24, Ventral anchor. All drawings are to the 30-micrometer scale except Fig. 18 (100-micrometer).

iform seminal receptacle. Vitellaria dense, coextensive with gut.

Remarks. — This species is unique among the Dactylogyridae by possessing two posterior lobes on the haptor. The lobes are apparently glandular and serve in attachment within the nasal cavity of the host. The specific name is from Latin (*arietinus* = like a ram's head) and is based on the dorsal haptor lobes which impart a ram's head appearance to the haptor.

Rhinoxenus nyttus, new species
Figs. 18–24

Host. — *Schizodon fasciatum* Agassiz, the aracú pintado, Anostomidae.

Locality. — Ilha Marchantaria, Rio Solimões, near Manaus, Amazonas, Brazil 25 Nov 1983.

Type specimens. — Holotype, INPA PA 286-1; paratypes, USNM 79182, HWML 23308.

Description (based on 3 specimens).—Body foliiform; length 334 (299–358), greatest width 92 (88–96) at various points along trunk. Cephalic lobes poorly developed or absent; 4 head organs in anterolateral cephalic region; cephalic glands inconspicuous, lying posterolateral to pharynx. Members of posterior pair of eyes larger, closer together than those of anterior pair; eye granules ovate, small; accessory granules few or absent in cephalic area and anterior trunk. Pharynx subspherical, 24–25 in diameter; gut obscured by vitellaria. Haptor subrectangular, 81 (70–93) long, 66 (65–67) wide. Ventral anchor lacking roots, base with 2 superficial projections articulating to ventral bar, shaft curved, point undulated; anchor 76 (71–80) long, base 25 (24–26) wide. Anchor filament well developed. Dorsal haptoral spike 59 (57–60) long, delicate, with distal hollow point, proximal and distal caps. Ventral bar subtrapezoidal, with short posterolateral protuberances; bar 41 (39–42) long. Hook pair 2–18 (16–20) long, lying on 2 bilateral lobes on posterior trunk, with delicate point, erect blunt thumb, shank dilated along proximal half. Haptoral hooks 21 (20–22) long, delicate, with fine point, blunt thumb, slightly dilated proximal shank; FH loop extending to near beginning of dilated portion of shank. Cirrus comprising a coil of 10–15 rings, simple base; ring diameter 35 (33–39); cirrus 1300 long. Accessory piece basally articulated to cirrus, proximally twisted and lying within cirral rings, distally serving as a cirrus guide; accessory piece 29–30 long. Testis, vas deferens, prostatic reservoirs not observed; seminal vesicle pyriform. Ovary elongate, fusiform, 15–16 wide, 54–55 long; oviduct short; ootype, uterus not observed; vagina comprising an elongate coiled tube expanding into large fusiform seminal receptacle; vitellaria dense, scattered throughout trunk.

Remarks.—Based on the morphology of the haptoral bar, the dorsal haptoral spikes, and the ventral anchor base, *Rhinoxenus nyttus* is most closely related to the type

species, *R. piranhus*. The coiled cirrus and vaginal tube, each comprising numerous rings, and the acute and doubly bent anchor point in *R. nyttus* serve to differentiate these species. The specific name is a neologism suggested by the Greek (*Nyss/o* = to prick) and refers to the presumed action of the dorsal haptoral spike.

Discussion

Although the morphology of the internal organ systems of *Rhinoxenus* species is not unique among the Dactylogyridae, the genus is characterized by some outstanding features not found among members of other genera in the family. Most notable among these are: 1) the modification of the dorsal anchors into paired haptoral spikes which lack an articulating bar and 2) the removal of hook pair 2 from the haptor to bilateral lobes on the trunk. In a few species of Dactylogyridae (some *Cosmetocleithrum* spp., among others), hook pair 1 may be located on the peduncle, but this condition is not considered as significant as that shown by species of *Rhinoxenus*. In *Cosmetocleithrum*, hook pair 1 remains in close proximity to the haptor and probably functions similarly to that of other dactylogyrids with normal hook distributions. Modifications of the haptors of *Rhinoxenus* species apparently relate to the needs for attachment determined by the physical surface of the host's nares. However, collection techniques precluded a determination of how the parasites utilize their highly modified haptors at specific attachment sites within the nasal cavity. Determination of haptoral and hook 2 function in *Rhinoxenus* species will most likely depend on observations of living specimens on their hosts.

The uniqueness of *Rhinoxenus* precludes determination of closely related genera, even though the genus clearly is a member of the Ancyrocephalinae (sensu Yamaguti 1963) based on anatomy of the internal organ systems (digestive and reproductive). It is un-

likely that it belongs in the Dactylogyrinae, which includes most North American parasites from nasal cavities of fishes (*Aplodiscus*, *Pellucidhaptor*), since the anchor/bar complex is ventral (dorsal in Dactylogyrinae), 4A hooks are lacking, and species of *Rhinoxenus* parasitize characoid fishes (primarily Cyprinidae in Dactylogyrinae).

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