Neotropical Monogenoidea. 24. *Rhinoxenus bulbovaginatus* n. sp. (Dactylogyridae, Ancyrocephalinae) from the Nasal Cavity of *Salminus maxillosus* (Osteichthyes, Characidae) from the Rio Paraná, Paraná, Brazil

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Rhinoxenus bulbovaginatus *n. sp. is described from the nose of* Salminus maxillosus *(Characidae) collected in the basin of the Rio Paraná, near the city of Porto Rico, State of Paraná, Brazil. The new species can be differentiated from the other three species in the genus by the morphology of the copulatory complex, vagina, and ventral anchor. The sister group relationship of the known species of* Rhinoxenus *was determined using techniques of Phylogenetic Systematics (Cladism). The resulting cladogram (C.I.=100%) indicates that the new species is most closely related* to R. piranhus *Kritsky, Boeger and Thatcher, 1988. The other two species of the genus,* R. arietinus *Kritsky, Boeger and Thatcher, 1988 and* R. nyttus *Kritsky, Boeger and Thatcher, 1988, both parasites of Anostomidae fishes, have a paraphyletic position in the cladogram, suggesting that the origin of at least one of them can not be associated to cospeciation.*

Key words: Dactylogyridae - Ancyrocephalinae - *Rhinoxenus bulbovaginatus* n. sp. - *Salminus maxillosus* - phylogeny

Only two genera of Dactylogyridae are known to include species from the nasal cavities of Characiformes fishes of the Neotropical region: *Rhinonastes* Kritsky, Thatcher and Boeger, 1988, and *Rhinoxenus* Kritsky, Boeger and Thatcher, 1988. *Rhinonastes pseudocapsaloideum,* the type and only species of the genus, parasitizes prochilodontid characins (Kritsky et al. 1988a). All known species of *Rhinoxenus* occur on members of two characin families. *Rhinoxenus arietinus* and *R. nyttus* parasitize Anostomidae fishes while *R. piranhus* is found in Serrasalmidae. During a survey of nose parasites of fishes from the Paraná River, a new species of *Rhinoxenus* was collected from the "dourado", *Salminus maxillosus* Valenciennes, 1849, a Characidae. This species is described herein and its phylogenetic position within the genus determined using techniques of Phylogenetic Systematics.

MATERIALS AND METHODS

Hosts *(S. maxillosus)* were collected by the personnel of the NUPELIA, Universidade of Maringá, in the basin of the Rio Paraná near the city of Porto Rico, State of Paraná, Brazil. Methods of parasite collection, preparation, measurement, and illustration are as described by Kritsky et al. (1986). Measurements are in micrometers, the mean is followed by the range in parentheses. Type specimens are deposited in helminthological collections of the Instituto Oswaldo Cruz (IOC), Rio de Janeiro, Brazil; U.S. National Museum (USNM), Beltsville, Maryland, and the University of Nebraska State Museum (HWML) Lincoln, Nebraska. Transformation series used in the phylogenetic analysis were defined from the literature and available specimens. Homologous series in which apomorphic state represents an antapomorphy of a single ingroup taxon were not utilized. Ingroup taxa included all known species of *Rhinoxenus* - *R. piranhus, R. arietinus, R. nyttus,* all described by Kritsky et al. (1988a) and the new species described herein. The hypothesis on the evolutionary relationship of the species of *Rhinoxenus* was constructed using Hennigian Argumentation (Wiley 1981); the topology of the resulting cladogram was then subjected to PAUP (Phylogenetic Analysis Using Parsimony, Version 2.4.1; D L Swofford, Smithsonian Institution, Washington, DC) to confirm that it was among the most parsi-

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monious trees. A total of 11 character states comprising six transformation series was utilized in the analysis. Polarization of homologous series was determined by outgroup comparison (Watrous & Wheeler 1981). *Amphithecium* Boeger and Kritsky, 1988 and *Rhinonastes* Kritsky, Thatcher and Boeger, 1988 were utilized as outgroups. Homologous series follow numbers in parentheses, preceeding the definition of a character state, refer to the coding that state received in the data matrix (Table); numbers in brackets, following the definition, refer to respective evolutionary changes depicted in the cladogram (Fig. 9). 1. *Eyes*: plesiomorphy - (0) pairs 4 equidistant, apomorphy - (1) members of posterior pair closer together than members of anterior pair [5]; 2. *Ventral anchor:* plesiomorphy - (0) basal protuberance at articulation of bar absent, apomorphy - (1) protuberance at articulation of bar present [1]; 3. *Point of ventral anchor:* plesiomorphy - (0) almost as long as shaft, apomorphy - (1) shorter than shaft [6]; 4. *Base of ventral anchor:* plesiomorphy - (0) superficial and deep roots well developed, apomorphy - (1) superficial and deep roots inconspicuous [2]; 5. *Bar:* plesiomorphy - (0) with slightly expanded end, apomorphy - (1) with protuberance for articulation of ventral anchor [3]; 6. Hook pair 2: plesiomorphy - (0) at level of germarium, apomorphy - (1) posterior to level of germarium.

TABLE

Matrix of characters of *Rhinoxenus* spp.

R. arietinus	0 0 0 0 0 0
R. piranhus	1 1 1 1 1 1
R. nyttus	0 1 0 1 1 1
R. bulbovaginatus	1 1 1 1 1 1
Ancestor	0 0 0 0 0 0

DESCRIPTION

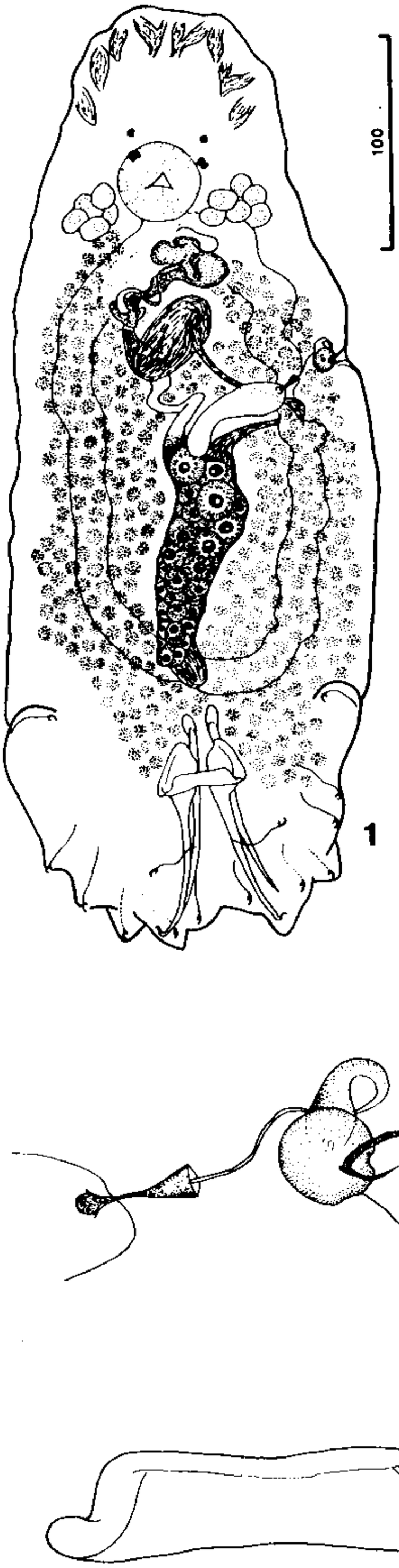
Rhinoxenus bulbovaginatus n. sp.
Figs 1-8

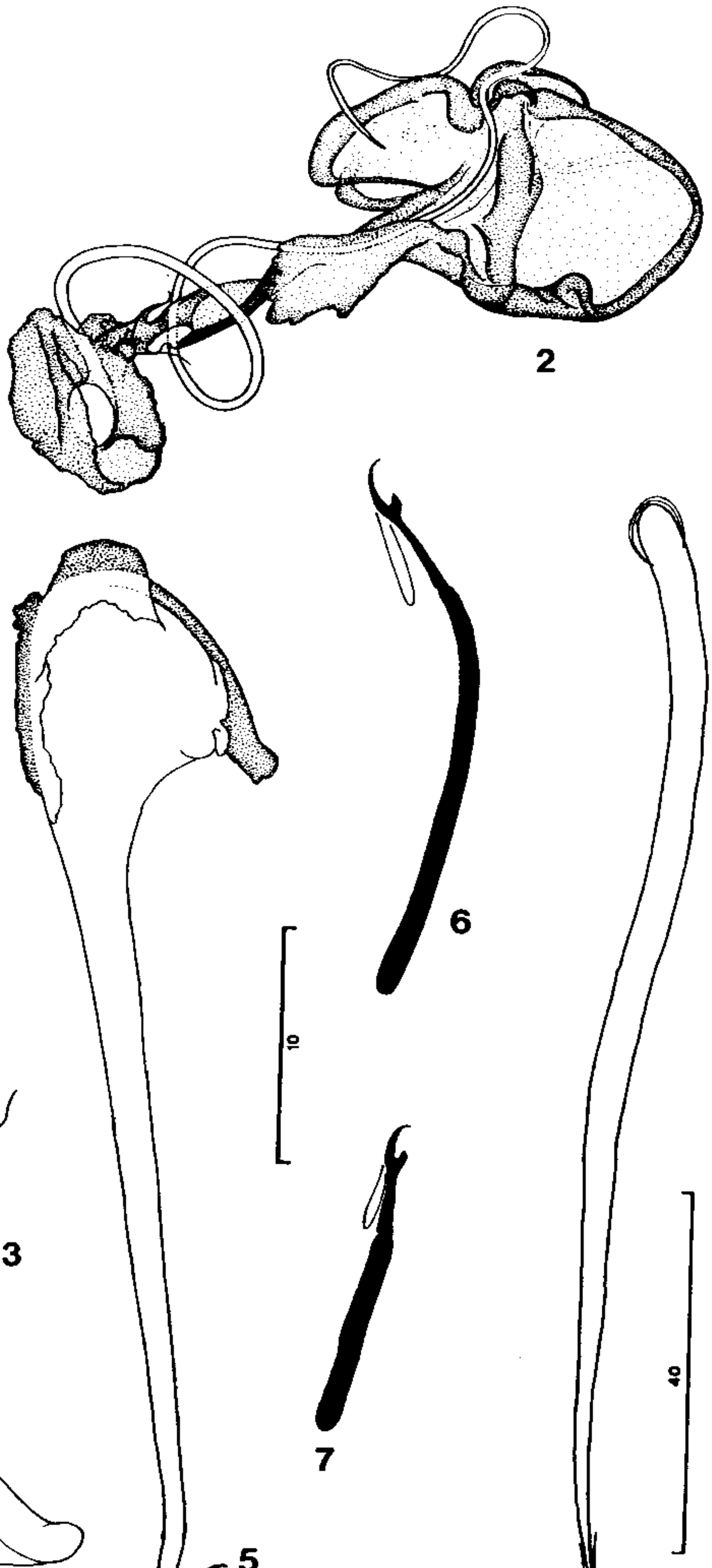
Type host: *Salminus maxillosus* Valenciennes, 1849, the "dourado", (Characidae, Characiformes)
Type locality: Rio Paraná basin, near the city of Porto Rico, State of Paraná, Brazil
Site: nasal cavities
Type specimens: Holotype-IOC 33269 a; paratypes-IOC 33269 b-e (4 specimens), USNM 84481 (3 specimens), HWML 38025 (3 specimens).
Description (based on 20 specimens): body 441 (430-454; n=4) long, flattened dorsoventrally; greatest width 160 (115-190; n=4) at body midlength. Cephalic area with poorly developed terminal lobes; head organs conspicuous, usually 4 pairs; cephalic glands conspicuous, unicellular, posterolateral to pharynx. Eyes usually equidistant, members of anterior pair smaller than those of posterior pair; eye granules ovate, small; accessory granules not observed. Pharynx spherical, 41-43 (n=2) in diameter. Haptor trapezoidal, 100-105 (n=2) long, 102-110 (n=2) wide. Ventral anchor 113 (110-119; n=8) long, with undifferentiated superficial and deep roots, base with protuberance serving as articulation for bar, straight shaft, fish-hook-shaped point; base 26 (23-29, n=9) wide. Dorsal haptoral spike 119 (115-122; n=5) long, with bulbous proximal end, tapered shaft, pointed distal end with conspicuous cap of tissue. Ventral bar trapezoidal, with short posterolateral protuberances, anterolateral margin heavily sclerotized; bar 42 (35-54- n=8) long. Hook pair 2, 31 (29-33; n=3) long, lying on 2 bilateral lobes on posterior trunk, erect thumb; proximal 2/3 of shank inflated; other hooks 41 (29-52; n=16) long, elongate, with curved point, erect thumb, shank sligthly inflated proximally, FH loop extending to near beginning of dilated portion of shank. Copulatory organ a coil of about 1½ rings, with wide, flat sclerotized base. Accessory piece articulated to base of copulatory organ, with expanded distal end. Testis elongate, 95 (81-118; n=3) long, 24 (20-27; n=3) wide; seminal vesicle fusiform, without median constriction; prostatic reservoirs not observed. Germarium elongate, 82-102 (n=2) long, 27-32 (n=2) wide; ootype, uterus not observed. Vagina sclerotized, connected to seminal receptacle through a sclerotized cone-shaped duct, widening distally, with distal loop and bulb; vaginal aperture wide, with sclerotized walls. Vitellaria dense, coextensive with gut.

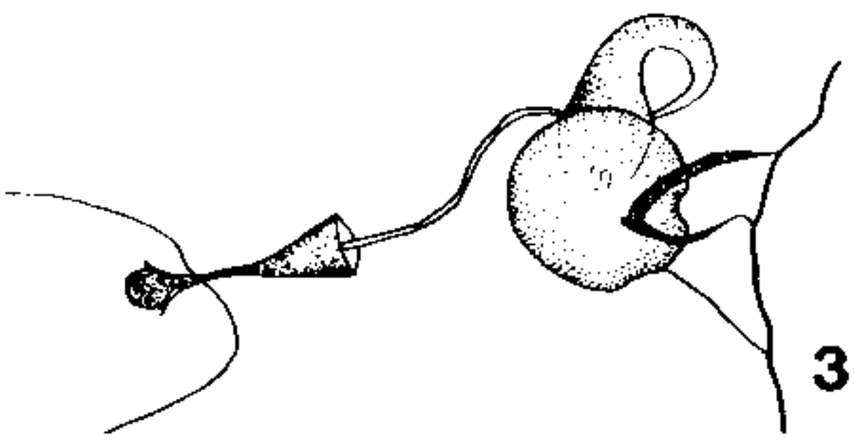
REMARKS

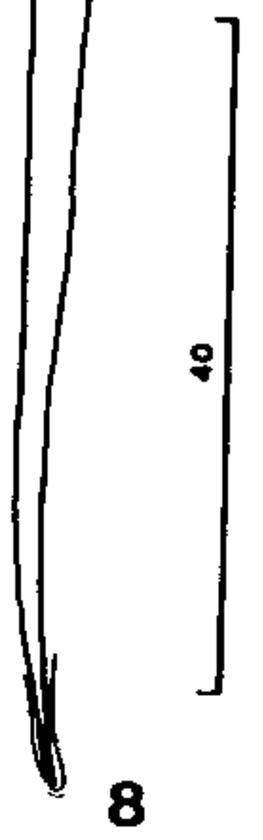
Rhinoxenus bulbovaginatus n. sp. is morphologically distinct from the previoulsy described species of the genus based mainly on the morphology of the copulatory complex, vagina, and ventral anchor. It represents the first species of the genus described and/or reported from outside the Amazon and on a Characidae. The specific name refers to the presence of a bulb in the vagina of this species.

The cladogram (C.I. = 100 %), depicting the sister group relationship of species of *Rhinoxenus*, is presented in Fig. 9. *Rhinoxenus bulbovaginatus* is the sister species of *R. piranhus* with which it shares a reduced point on the ventral anchor, eyes equidistant, and point of ventral anchor shorter than shaft. The other two species of the genus, *R. arietinus* and *R. nyttus*, are both parasites of Anostomidae fishes, but do not depict an exclusive single ancestor. Assuming monophyli of this









Rhinoxenus bulbovaginatus n. sp. Fig. 1: holotype (ventral). Fig. 2: copulatory complex. Fig. 3: vagina. Fig. 4: ventral bar. Fig. 5: ventral anchor. Fig. 6: hook (pairs 1, 3-7). Fig. 7: hook (pair 2). Fig. 8: horsal haptoral spike.

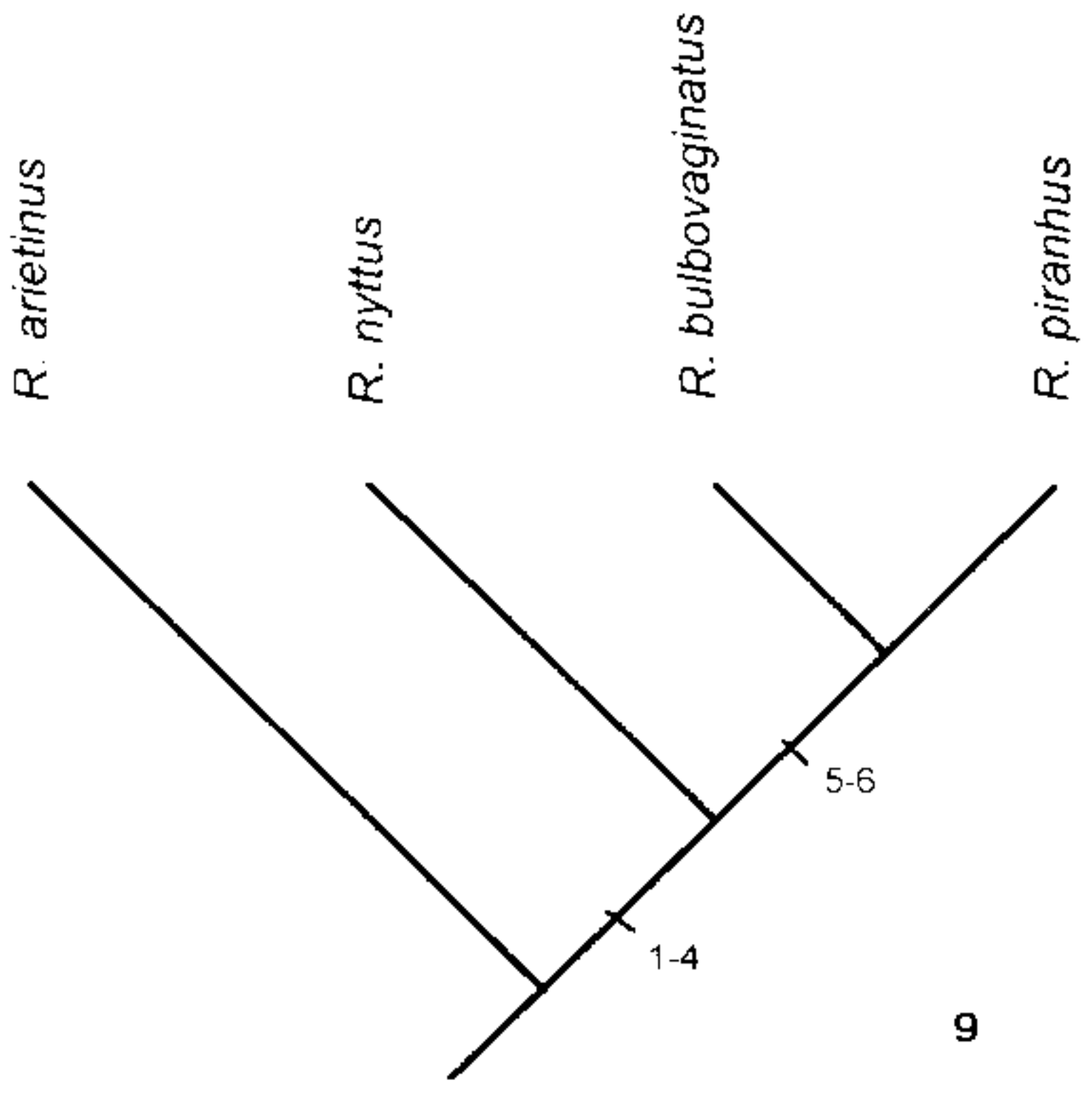


Fig. 9: cladogram depicting phylogenetic relationships of *Rhinoxenus* spp. (C.I.–100%). Slashes with numbers refer to character changes indicated in the text.

fish family, the position of these species of *Rhinoxenus* in the cladogram suggests that the origin of at least one of them can not be associated with cospeciation.

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