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A new species of the catfish genus *Glanapteryx* (Siluriformes: Trichomycteridae)

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Abstract.—A new species of the glanapterygine trichomycterid genus *Glanapteryx* is described from the upper Rio Negro in Brazil, State of Amazonas. The new species, currently represented by a single specimen, is the only fish so far known to occur in the remote "Morro dos Seis Lagos" lake complex, a region with high levels of natural radioactivity. *Glanapteryx niobium*, new species, is distinguished from its only congener, *G. anguilla*, by a white collar immediately posterior to head, the dark pigmentation on the ventral surface of the head, the longer pectoral-fin remnant, the lanceolate caudal fin, and the narrow union of branchial membranes to the isthmus.

Resumo.—Uma nova espécie do gênero *Glanapteryx* (Trichomycteridae, Glanapteryginae) é descrita do alto Rio Negro, Estado do Amazonas, Brazil. A nova espécie, atualmente conhecida por um único exemplar, é o único peixe encontrado até o momento no remoto complexo de lagos chamado Morro dos Seis Lagos, uma região com altos níveis de radioatividade natural. *Glanapteryx niobium*, espécie nova, distingue-se da única outra espécie do gênero, *G. anguilla*, pelo colar branco logo após a cabeça, a pigmentação escura na face ventral da cabeça, o maior comprimento da nadadeira peitoral, a forma lanceolada da nadadeira caudal e a união estreita das membranas branquiais ao istmo.

The remarkable catfish genus *Glanapteryx* was established by Myers (1927) to include a single eel-like species, *G. anguilla*, from the upper Rio Negro in Brazil. The species was subsequently illustrated in Myers (1944), along with descriptions of other members of the subfamily Glanapteryginae, which was established in the same paper. *Glanapteryx anguilla* was redescribed by de Pinna (1989) on the basis of additional material mostly from the rio Negro in Brazil. That publication also included osteological data which formed the basis for a phylogenetic diagnosis of the genus and species, and a hypothesis of phylogenetic relationships among glanapterygines. The occurrence of *G. anguilla* in the Orinoco basin was suggested by de Pinna (1989) and later confirmed by Nico & de Pinna (1996).

Glanapteryx has to date been restricted to its type species, and although representatives of the genus are now being collected regularly, nothing is known of their biology. The present paper reports on a distinctive second species of the genus. The new species is remarkable mainly in its occurrence in a remote region in the Amazon called Morro dos Seis Lagos (meaning "hill of the six lakes"), a large and poorly-known complex of relatively high-elevation lakes in the upper Rio Negro. The region is known for its high level of natural radioactivity. The new *Glanapteryx* seems to be the only fish species occurring in these lakes.

Material and methods.—All measurements are straight-line, taken according to the protocol described in de Pinna (1989).

Abbreviations are: CAS (California Academy of Sciences, San Francisco); INPA (Instituto Nacional de Pesquisas da Amazônia, Manaus); MZUSP (Museu de Zoologia da Universidade de São Paulo, São Paulo); ex (number of specimens); C&S (material cleared and stained); SL (standard length); HL (head length); an (anus); pf (pelvic fin); and up (urogenital papilla).

Comparative glanapterygine material examined-*Glanapteryx anguilla*: CAS 56048 (holotype), MZUSP 36530 (21 ex, 2 C&S); *Listrura nematopteryx*: MZUSP 36974 (holotype), MZUSP 36975 (12 paratypes), MZUSP uncat. (5ex C&S); *Listrura camposi*: MZUSP uncat. (1ex); *Pygidianops eigenmanni*: CAS 11121 (2 paratypes, 1 C&S); *Pygidianops* sp.: INPA 8080 (3ex); *Typhlobelus ternetzi*: CAS 56201 (2 paratypes, 1C&S); *Typhlobelus sp*: INPA 12929 (10 ex, 2 C&S). Comparative material of other trichomycterids is listed in de Pinna (1992).

Glanapteryx niobium, new species
Fig. 1

Holotype.—INPA 12421, 55.3 mm SL; Brazil, State of Amazonas, Pico da Neblina National Park, Morro dos Seis Lagos (approx. 0°17′N, 66°41′W), Lago Esperança. Collected by Ulysses C. Barbosa and Victor Py-Daniel, 11 Sep 1990.

Diagnosis.—Distinguished from its only congener, *G. anguilla*, by the following characteristics: 1—presence of a well-defined wide white collar-like band shortly posterior to head (Fig. 1; coloration uniform in *G. anguilla*); 2—ventral part of head darkly-pigmented (Fig. 1B; dark pigmentation on ventral surface of head scarce or absent in *G. anguilla*); 3—caudal fin lanceolate, its middle portion projecting beyond rest of fin (Fig. 2; caudal fin round in *G. anguilla*); 4—branchial membranes narrowly united to isthmus (membranes more broadly united to isthmus in *G. anguilla*); 5—pectoral fin long (40% of HL), and of even width, not narrowing towards tip (Fig. 3; fin 9–25% of HL and narrowing gradually to tip in *G. anguilla*). Characters 1 to 3 are considered autapomorphic for the species (see Discussion).

Description.—Morphometric data are provided in Table 1. Holotype preserved in strongly contorted position, SL and proportions thereof may be inexact. Overall form of body similar to that of *G. anguilla* (see de Pinna, 1989, fig. 1). Body eel-like, head continuous with trunk. Body round in cross section for most of its length, gradually more compressed posterior to anal opening. Caudal peduncle gently tapering to caudal fin. Dorsal and ventral profiles of body nearly straight. Anterior portion of caudal peduncle slightly deeper than remainder of body. Dorsal and ventral profiles of caudal peduncle converging gradually to caudal fin.

Head small (HL approx. 7% of SL), less deep than body, its dorsal surface flat. Branchial membranes narrowly united to isthmus, gill openings wide, not constricted. Eyes very small but well formed, with distinct lenses and covered by thin transparent integument. Eyes located on nearly vertical surface of head, facing almost laterally. Posterior nares slightly anterior to eyes, very close to mesial margin of eyeball, but separated from it by narrow strip of integument (eye and naris not adpressed as in *G. anguilla*). Anterior nares opening located on short tube of integument, continuous posterolaterally with nasal barbel. Three large sensory pores situated serially on dorsolateral surface of head and anterior portion of trunk. Posterior pore located slightly posterior to vertical through origin of pectoral fin. Middle pore dorsal to uppermost point of branchial membrane. Anterior pore smallest and positioned dorsal and slightly anterior to middle pore. Mouth subterminal, upper jaw slightly longer than lower, corners not markedly externded posteriorly. Lips poorly differentiated, continuous with remainder of head and with covering of sensory papillae comparable to those over rest of head. All barbels large and robust,

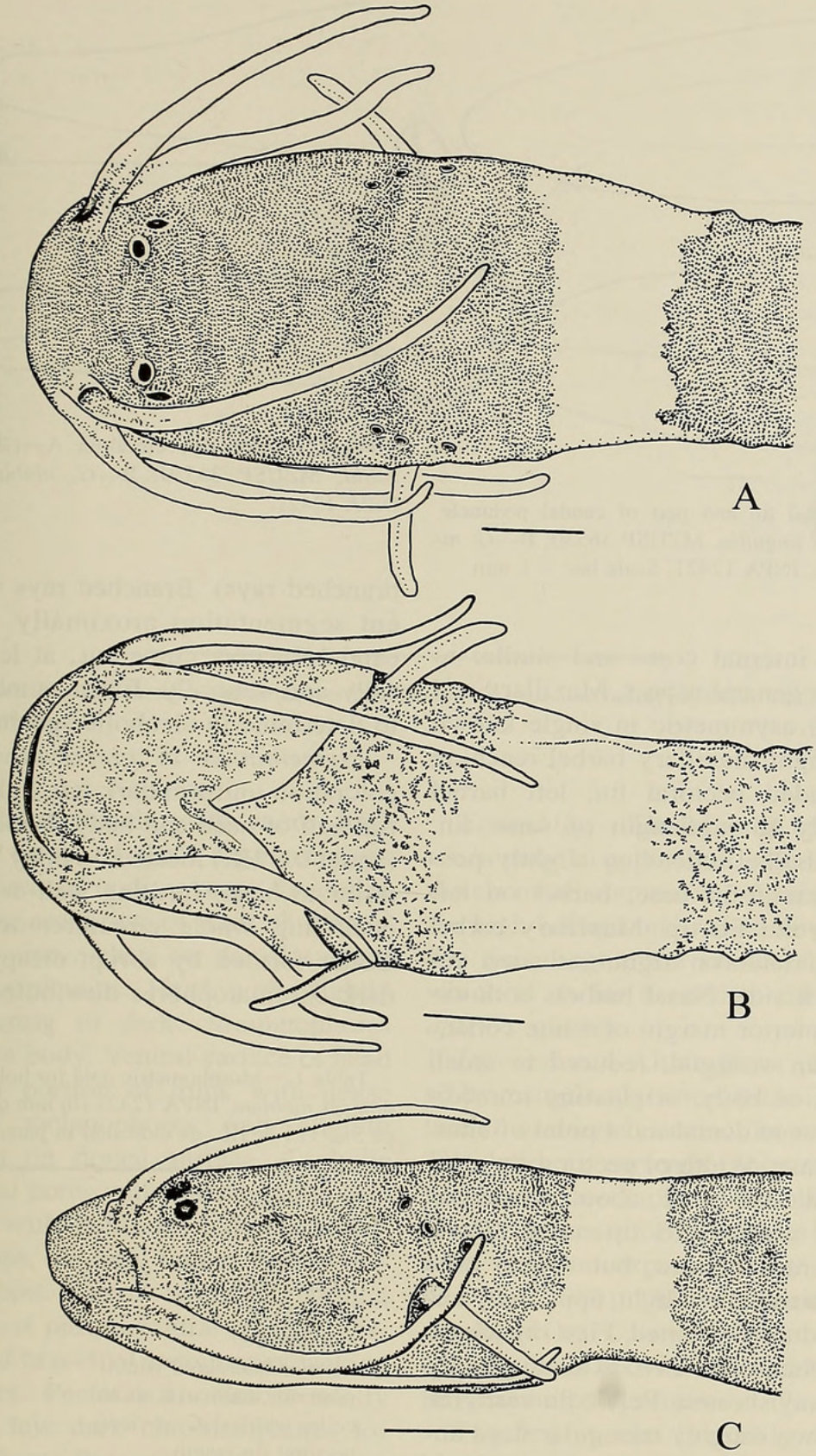

Fig. 1. *Glanapteryx niobium*, holotype, INPA 12421. Views of head. A—dorsal; B—ventral; C—lateral. Scale bars = 1 mm.

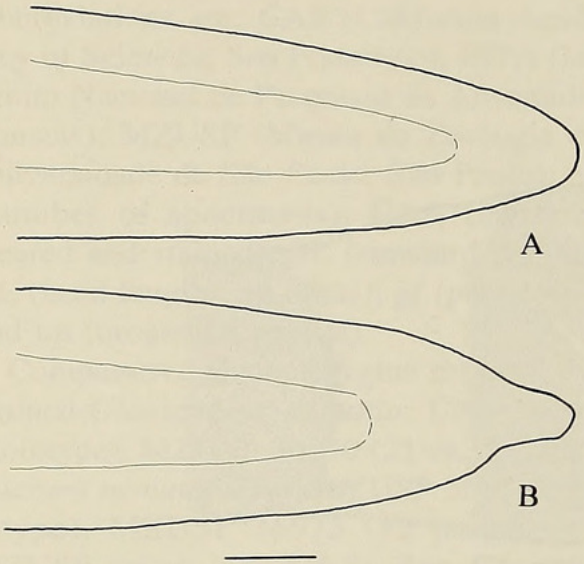

Fig. 2. Caudal fin and part of caudal peduncle. A—*Glanapteryx anguilla*, MZUSP 36530; B—*G. niobium*, holotype, INPA 12421. Scale bar = 1 mm.

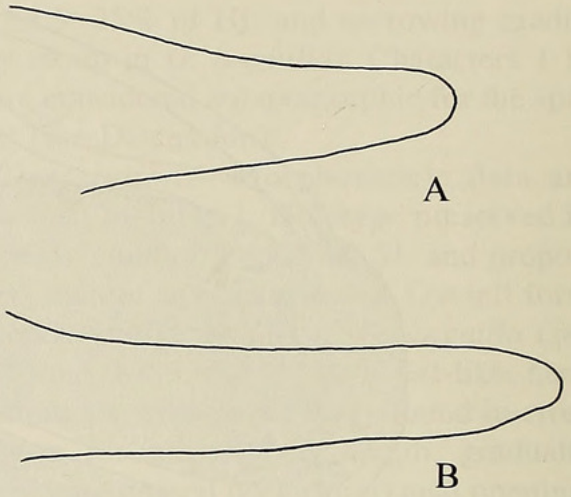

Fig. 3. Profile of pectoral fin. A—*Glanapteryx anguilla*, MZUSP 36530; B—*G. niobium*, holotype, INPA 12421.

with visible internal cores and similar to each other in general aspect. Maxillary and rictal barbels asymmetric in single known specimen. Right maxillary barbel reaching tip of extended pectoral fin, left barbel reaching only to midlength of same fin. Right rictal barbel extending slightly posterior to pectoral-fin base, barbel on left reaching beyond fin tip. Maxillary barbel longer than rictal on right, situation reversed on left side. Nasal barbels both extending to anterior margin of white collar.

Pectoral fin vestigial, reduced to small flap on side of body, originating immediately posterior to dorsal-most point of branchial membrane. Width of pectoral fin nearly even from base to tip, about as wide as rictal barbel at base, its tip round. Three pectoral-fin rays present, but visible only with strong transmitted light, apparently unbranched and unsegmented. First ray longer and thicker than other two, extending to tip of fin, third ray shortest. Pelvic fin vestigial, reduced to two roughly triangular flaps anterior to anal opening (Fig. 4). Dorsal, anal, and adipose fins absent. Caudal fin small and inconspicuous, continuous with remainder of caudal peduncle and body, lanceolate in shape, with middle rays longest. Caudal-fin rays 2 + 2 (i.e., only two branched rays). Branched rays with incipient segmentation proximally. Procurrent caudal-fin rays numerous, at least 25 dorsally and ventrally. Exact number difficult to determine in alcoholic specimen.

Pigmentation in preservative.—Overall coloration uniform dark tan, lighter on ventral half of head and body. Wide white area (about 0.5 HL) located on body shortly posterior to head, forming well-defined collar encircling whole circumference of body. Collar formed by abrupt disappearance of dark chromatophores distributed on rest of

Table 1.—Morphometric data for holotype of *Glanapteryx niobium*, INPA 12421 (in mm or as proportion of SL, TL, or HL, as indicated in parentheses).

head length	4.0 (mm)
head width	0.75 (HL)
head depth	0.52 (HL)
mouth width	0.48 (HL)
interorbital	0.41 (HL)
eye diameter	0.06 (HL)
anterior internarial width	0.33 (HL)
posterior internarial width	0.24 (HL)
collar width (lateral view)	0.40 (HL)
pectoral-fin length	0.40 (HL)
standard length	55.3 (mm)
total length	1.05 (SL)
preanal length	0.65 (TL)
body depth	0.05 (TL)
caudal peduncle length	0.28 (TL)
caudal peduncle depth (max.)	0.05 (TL)

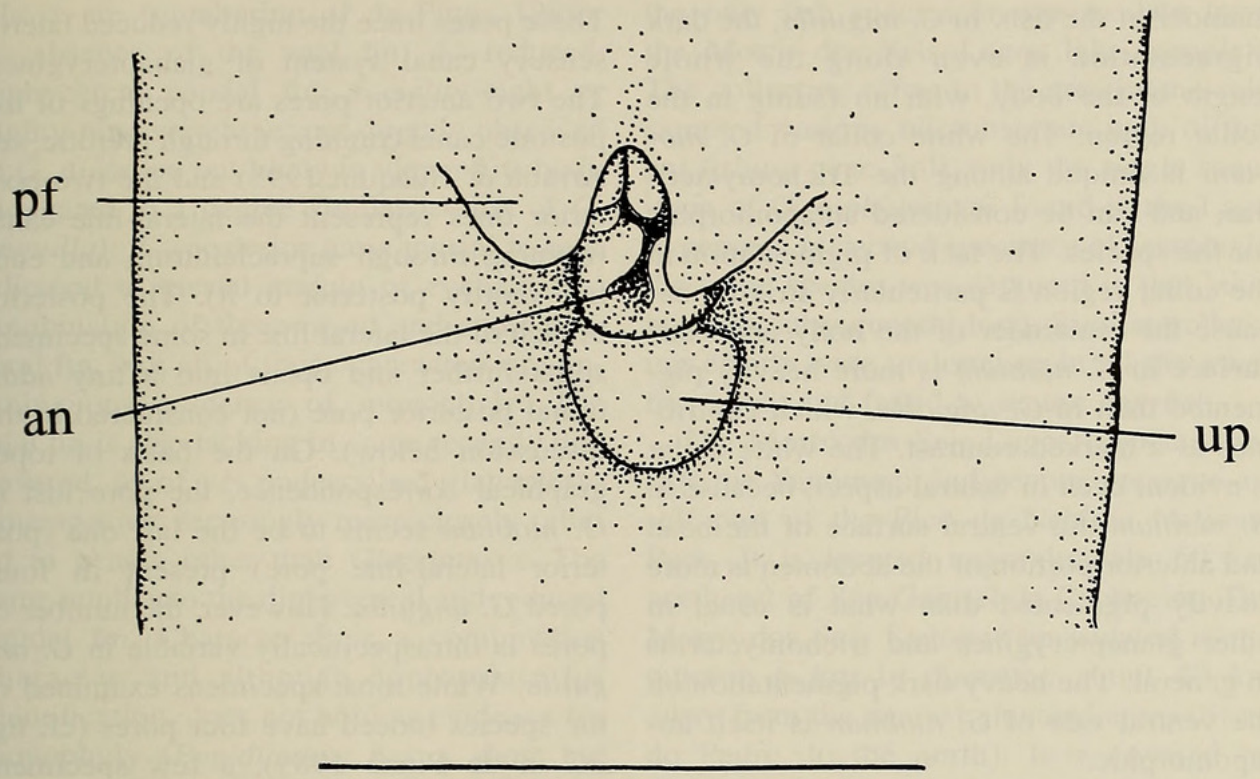

Fig. 4. Pelvic fins and surrounding structures in *Glanapteryx niobium*, holotype, INPA 12421, ventral view. Scale bar = 1 mm.

body. Caudal peduncle with more fragmented covering of dark pigmentation. Ventral surface of body, except for collar, with uniform scattering of dark chromatophores, less dense than on dorsal surface but still conspicuous. Head with slightly denser covering of dark chromatophores than those on body. Ventral surface of head and anterior portion of trunk with dense covering of melanophores, only slightly sparser than on dorsal surface. Cephalic sensory-canal pores with narrow white rim. All barbels with fields of dark chromatophores at base, abruptly fading shortly distal to that point. Narrow white ring around eyes, widest at posteroventral margin. Distal portion of branchial membranes lacking melanophores. Pectoral fin almost totally white, only few dark chromatophores located near base. Base of caudal fin with same pigmentation as caudal peduncle, its distal portion white. Distal portion of procurrent-ray dorsal and ventral areas without dark chromatophores. Pelvic fin remnant lacking dark pigmentation.

Etymology.—The specific epithet, *niobium*, a noun in apposition, refers to niobium, the chemical element chiefly responsible for the high background radiation of the Morro dos Seis Lagos, the known fish fauna of which is so far limited to the new *Glanapteryx* species.

Discussion.—Although as yet represented by a single specimen, there is little doubt that *G. niobium* is distinct from *G. anguilla*. The latter is currently known by tens of specimens, a sample which allows a satisfactory estimate of the degree of intraspecific variation expected for the genus (cf. de Pinna 1989). The differential characters displayed by *G. niobium*, summarized in the diagnosis above, have not been seen in any examined specimen of *G. anguilla*.

The new species is readily distinguishable from its only congener mainly by the white collar formed by a well-defined area lacking dark chromatophores. This area forms a white ring around the whole circumference of the body, and is striking against the dark pigmentation of the re-

mainder of the fish. In *G. anguilla*, the dark pigmentation is even along the whole length of the body, with no fading in the collar region. The white collar of *G. niobium* is unique among the Trichomycteridae, and can be considered autapomorphic for the species. The lack of pigmentation in the collar region is particularly striking because the remainder of the body and head surface in *G. niobium* is more heavily pigmented than in *G. anguilla*, which contributes to a marked contrast. The white collar is evident even in ventral aspect, because in *G. niobium* the ventral surface of the head and anterior portion of the abdomen is more heavily pigmented than what is usual in other glanapterygines and trichomycterids in general. The heavy dark pigmentation on the ventral side of *G. niobium* is itself autapomorphic.

The lanceolate shape of the caudal-fin in *G. niobium* is also unique to that species among trichomycterids. The caudal fin in the family is commonly round, furcate or emarginated, and the unique lanceolate shape in *G. niobium* is considered an autapomorphy for the species. The peculiar caudal shape is a result of the prolongation of the five middle caudal-fin rays, which are far longer than the others.

The pectoral-fin length readily distinguishes *G. niobium* and *G. anguilla*. In *G. anguilla* the length of the fin is at most 25% of HL, never reaching 40% of HL as seen in *G. niobium*. This characteristic, however, is not autapomorphic, because the relative length of the fin varies widely in glanapterygines, making a polarity assessment of the condition in *G. niobium* uncertain. The same uncertainty applies to the shape of the fin, another character that apparently distinguishes the two species but which cannot unabiguously be determined as autapomorphic for either.

An additional difference that may be observed between the holotype of *G. niobium* and most specimens of *G. anguilla* is the number of sensory pores on the posterior part of head (3 versus 4, respectively). These pores trace the highly reduced laterosensory canal system of glanapterygines. The two anterior pores are openings of the postotic canal (running through pterotic, see Arratia & Huaquin 1995) and the two posterior ones represent the lateral-line canal (running through supracleithrum and ending shortly posterior to it). The posterior branch of the lateral line in some specimens splits further and opens into a tiny additional posterior pore (not considered in the discussion below). On the basis of topographical correspondence, the pore lost in *G. niobium* seems to be the last one (posterior lateral-line pore) present in four-pored *G. anguilla*. However, the number of pores is intraspecifically variable in *G. anguilla*. While most specimens examined of the species indeed have four pores (cf. fig. 2C in de Pinna 1989), a few specimens have only three pores, like in the only known specimen of *G. niobium*. Therefore, the difference in sensory-pore number cannot be used to separate the two *Glanapteryx* species confidently. The infraorbital canal in *G. anguilla* (incomplete as in all other trichomycterids except Trichogeninae and Copionodontinae) is bifurcated distally, and opens through two minute pores posterior to the eye (cf. de Pinna 1989, fig. 5A). These pores could not be located in *G. niobium*, but they are also invisible externally in some specimens of *G. anguilla*, and cannot be confirmed as absent in *G. niobium* until more specimens are available for anatomical studies.

Not all characters diagnostic for *Glanapteryx* given by de Pinna (1989: 363) can be checked in *G. niobium*, which is known only from the holotype. Of the eight characters proposed by de Pinna, numbers 2 (triangle-shaped premaxilla), 3 (simplified pelvic bone, when present), and 5 (pronounced interdigitations between frontals, sphenotics and supraoccipital in fully-grown individuals) are internal traits presently unobservable in the new species. *Glanapteryx niobium*, however, demonstrates all of the remaining characters.

Those are (numbering of de Pinna 1989): 1—absence of the anal fin; 4—reduced, diphycercal caudal fin; 6-eighty-eight or eighty-nine vertebrae (not directly observed in *G. niobium*, but likely in view of its body elongated to a degree similar to that of *G. anguilla*); 7—posterior naris mesial to eye, adjoined to mesial margin of eyeball; 8—combination of three-rayed and short pectoral fin. Not all of those characters are unambiguous evidence of monophyly. The anal fin is also lacking in some recently discovered, as of yet undescribed glanapterygine species, seemingly more closely related to genera other than *Glanapteryx*. The same applies to the diphycercal and reduced caudal fin. Character 8 is a combination character, and although appropriate for identification, does not hold as evidence for monophyly (*Pygidianops* has a short but one-rayed pectoral fin, while *Listrura camposi* has a three-rayed but long fin).

Remaining characters seem to provide relatively reliable but still circumstantial evidence of relationships. The position of the posterior nares is indeed unique, but other glanapterygines (*Pygidianops* and *Typhlobelus*) have eyes greatly reduced or lost, making a comprehensive comparison impossible. Still, allocation of *G. niobium* to the genus *Glanapteryx* is the best course of action based on the combination of all the evidence above.

Some internal characters illustrated and described by de Pinna (1989) seem unique to *G. anguilla* among the trichomycterids so far examined, although not yet explicitly proposed as synapomorphic. These are the posteriorly tripartite palatine; the enlarged head of the vomer; the anterior canal-bearing part of the sphenotic separated from the frontal; and the cartilage plug on the posterolateral margin of the premaxilla. All those characteristics are probably either autapomorphies for *G. anguilla* or synapomorphies for *Glanapteryx*. Their exact level of generality will have to await examination of the internal anatomy of *G. niobium*.

Habitat notes.—Glanapteryx niobium is the only fish species known to date from the Morro dos Seis Lagos lake complex. The collecting effort in the area intensively sampled various microhabitats with different fishing gear. Still, only the single specimen of *G. niobium* was found in the Lago Esperança (a second specimen of seemingly the same species was captured in that lake, but was subsequently lost). Similar collecting efforts were undertaken in all the other five lakes, but failed to secure any fish.

The Morro dos Seis Lagos is located inside the Yanomami indigenous preserve, itself part of the Pico da Neblina National Park. It is located approximately 60 km northeast of São Gabriel da Cachoeira. The Morro dos Seis Lagos is an isolated round outcrop 6 km in diameter, about 40 km away from the nearest elevated areas (Serra do Padre, to the north). It is covered by thick laterite crust, reddish brown in color. Morro dos Seis Lagos includes six major lakes at an altitude of 300 m, plus a number of smaller water bodies. Those are the only true lakes in the Brazilian Amazon, and are permanently isolated from other water courses. The lake beds were a consequence of the collapse of underlying rocky blocks.

The level of radiation in the region is extremely high, because of the concentration of radioactive minerals naturally in the soil, mainly niobium, thorium and cerium. Radiation detectors worn by expedition members in the field recorded daily radiation exposures equivalent to the maximum considered tolerable for a whole week according to international standards. In several places the measured emission was well over 25 milliroentgens. One of the creeks around the lake, Igarapé Ya-Mirim, is so radioactive as to cause itching in bathers after repeated exposure, and is called "itching creek" by indians, who avoid settling in the region. There is also a thermal spring in the area.

The spot where *G. niobium* was collected with a hand seine was about 1 m deep, and had a thick layer of leaf litter on the bottom, amidst which the fish was hiding. The water

was transparent, green at distance, still, and acidic (pH 4.0). The invertebrate fauna was reported as rich by the collectors.

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