

A new genus and species of small characid (Ostariophysi, Characidae) from the upper río Bermejo basin, northwestern Argentina

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- A new genus and species of small characid is described in this paper. The new genus, *Nans* gen. n., is diagnosed by the combination of: ii,7-8 dorsal-fin rays, 10-15 branched anal-fin rays, 5 teeth in the inner premaxillary row, rotation of the pelvic bone about 90°, rotation of the pelvic fin muscles, pelvic fin curved and forming a complete tube in mature males, incomplete foramen for exit of the olfactory nerve in the lateral ethmoid. Other characters which help in the identification of *Nans* are the large subcircular foramen in the dorsal vomerine lamella which articulates with the mesethmoid, the absence of an extrascapular sensory canal in the posttemporal, and a laterosensory canal in the anguloarticular. The type species, *Nans indefessus* sp. n. was collected in the río Anta Muerta and arroyo Colorado, tributaries of the río Blanco, and in the río Pescado, upper río Bermejo basin, Salta, Argentina.

Keywords: Characiformes - Characidae - *Nans* - new genus - río Bermejo basin.

INTRODUCTION

The río Bermejo originates in northwestern Argentina and southern Bolivia, forming the political limit between both countries; it flows into the río Paraguay after 1,450 km. The fishes of the upper río Bermejo basin were almost unknown until few years ago. Fowler (1940) published a list about the ichthyofauna of the río Lipeo, including 14 species, four of them new for science. More recently, Fernández (1999) cited 23 fish species found in the National Park Tariquía, southern Bolivia.

In a recent exploration of some rivers and streams of the upper río Bermejo basin, the first and second authors collected 31 species of fishes (Mirande & Aguilera,

in prep.), including specimens of an unknown species. The possession of several distinctive characters excludes this species from other nominal genera of characids. We describe it as a new genus and a new species.

MATERIAL AND METHODS

Measurements are straight distances taken with caliper to the nearest 0.1 mm. Measurements are expressed as percentages of SL or the indicated length. Peduncle length was measured from the insertion of the posteriormost anal-fin ray to the hypural joint. Some specimens examined in this study were cleared and counterstained (C&S) following Taylor & Van Dyke (1985). Vertebrae counts include the four vertebrae of the Weberian apparatus and the caudal CP1+U1 as one element. Material is deposited in the following collections: Asociación Ictiológica, La Plata (AI); Facultad de Ciencias Naturales y Museo, La Plata (MLP); Facultad de Ciencias, Sección Genética, Montevideo (MVD-SG); Fundación Miguel Lillo, Tucumán (CI-FML); Museo de Ciencias Naturales de Salta (MCNi), and Museum d'histoire naturelle de Genève, Switzerland (MHNG).

Comparative material (SL in mm). *Acrobrycon tarijae*: CI-FML 3270, 1 ex., 66.6 mm, Argentina, Salta, Orán, La Bambú, río Bermejo basin, río Blanco. *Aphyocharax paraguayensis*: AI 142, 2 ex. C&S, 18.6-23.3 mm, Argentina, Formosa, flood plain of río Bermejo, in Reserva Ecológica El Bagual. *Astyanax eigenmanniorum*: ANSP 21627, paratypes, 2 ex., 42.5-49.4 mm, Brazil, Rio Grande do Sul. *Astyanax latens*: AI 112, 2 ex. C&S, 41.0-45.0 mm, Argentina, Salta, Orán, arroyo El Oculito. *Astyanax lineatus*: CI-FML 3272, 3 ex., 35.3-72.1 mm, Argentina, Salta, Orán, La Bambú, río Bermejo basin, río Blanco. *Astyanax tupi*: AI 128, 4 ex., 60.8-70.0 mm, Argentina, Misiones, Paraná basin, arroyo Cuñapirú Chico. *Bryconamericus agna*: FML 3700, holotype, 61.5 mm, Argentina, Misiones, arroyo Tabay, Paraná basin; AI 141, 1 ex. C&S, 60.0 mm, Argentina, Misiones, Paraná basin, arroyo Tabay. *Bryconamericus iheringii*: AI 116, 3 ex. C&S, 39.9-44.3 mm, Brazil, Rio Grande do Sul, São Lourenço do Sul, arroios Pinto e Viúva Teresa. *Bryconamericus thomasi*: CI-FML 1969, 94 ex. (2 males, 3 females measured), 40.3-55.4 mm, Argentina, Salta, río Piedras. *Bryconamericus exodon*: MLP 18-IX-80-1, 2 ex., 39.0-43.5 mm, Argentina, Buenos Aires, río de la Plata in Punta Lara. *Characidium* sp.: AI 153, 1 ex. C&S, 29.6 mm, Argentina, Misiones, arroyo Zaimán near its mouth. *Cheirodon interruptus*: CI-FML 3825, 2 ex. C&S, 32.9-33.4 mm, Argentina, Santiago del Estero, Embalse río Hondo; AI 160, 1 ex. C&S, 34.0 mm, Argentina, Buenos Aires, Mar Chiquita coastal lagoon. *Ctenobrycon alleni*: MLP 6774, 5 ex., 50.0-64.2 mm, Argentina, Santa Fe, laguna Setúbal. *Cyanocharax alburnus*: MVD-SG 59, 1 ex. C&S, 42.5 mm, Uruguay, río Yaguarón in Paso Centurión. *Diapoma speculiferum*: AI 151, 1 ex. C&S, 42.6 mm, Brazil, Rio Grande do Sul, Barra de Ribeiro, Açude dos Garcia. *Gymnocharacinus bergi*: AI 143, 1 ex. C&S, 52.4 mm, Argentina, río Negro, arroyo Valcheta. *Gymnocorymbus ternetzi*: CI-FML 3826, 2 ex. C&S, 33.7-35.6 mm, Paraguay, Alto Paraguay, Fortín Patria, río Negro. *Hemigrammus ulreyi*: AI 161, 1 ex. C&S, 34.2 mm, Argentina, Misiones, Nemesio Parma, río Paraná. *Hemigrammus erythrozonus*: CI-FML 3827, 2 ex. C&S, 25.5-26.9 mm, aquarium specimen. *Hyphessobrycon boulengeri*: MVD-SG 122, 1 ex. C&S, 38.1 mm, Uruguay, Rocha, río Yaguarón. *Hyphessobrycon meridionalis*: AI 145, 2 ex. C&S, 26.5-32.0 mm, Argentina, Buenos Aires, Berazategui, lago del Parque Pereyra Iraola. *Hypobrycon maromba*: AI 140, 3 ex., 45.5-47.5 mm, Brazil, Santa Catarina, Concordia, río Jacutinga. *Hypobrycon poi*: MLP 9573, holotype, 50.5 mm, Argentina, Misiones, arroyo Once Vueltas. 1 ex. C&S, 45.5 mm, Argentina, Misiones, arroyo Once Vueltas. *Markiana nigripinnis*: AI 144, 1 ex. C&S, 71.0 mm, Argentina, Formosa, flood plain of río Bermejo, in Reserva Ecológica El Bagual. *Mimagoniates inequalis*: MVD-SG 119, 1 ex., 30.0 mm, Uruguay, Departamento Rocha, environments close to Laguna Castillos. *Moenkhausia* cf. *intermedia*: CI-FML 3257, 60 ex. (5 measured), 20.1-31.5 mm, Argentina, Salta, Orán, La Bambú, río Bermejo basin, arroyo El Oculito. *Moenkhausia sanctaefilomenae*: AI 158, 1 ex. C&S, 31.7 mm, Argentina, Misiones, río Paraná near Posadas. *Odontostilbe microcephala*: CI-FML 3369, 2 ex.,

48.2-51.6 mm, Argentina, Salta, La Bambú, río Bermejo basin, río Blanco. *Odontostilbe pequirá*: CI-FML 3451, 1 ex., 31.5 mm, Argentina, Salta, Rivadavia, río Bermejo basin, Pozo de los Yacarés. *Oligosarcus bolivianus*: CI-FML 3277, 4 ex., 89.8-113.8 mm, Argentina, Salta, Orán, La Bambú, río Bermejo basin, río Blanco. *Poptella paraguayensis*: AI 148, 1 ex., 50 mm, Argentina, Misiones, río Piray-Miní, in Eldorado. *Prionobrama paraguayensis*: AI 149, 1 ex. C&S, 35.5 mm, Argentina, Chaco, flood plain of río Tragadero. *Psellogrammus kennedyi*: AI 150, 2 ex. C&S, 37.4-39.0 mm, Argentina, Formosa, Formosa, flood plain of río Bermejo, in Reserva Ecológica El Bagual. *Roeboides paranensis*: AI 155, 1 ex. C&S, 39.2 mm, Argentina, Corrientes, río Riachuelo. *Serrapinus microdon*: AI 152, 2 ex. C&S, 25.5-29.0 mm, Argentina, Formosa, flood plain of río Bermejo, in Reserva Ecológica El Bagual. *Serrasalmus maculatus*: CI-FML 3827, 1 ex. C&S, 69.2 mm, Argentina, Salta, La Unión, Pozo de los Yacarés, río Bermejo. *Tetragonopterus argenteus*: AI 156, 2 ex. C&S, 55.5-60.0 mm, Argentina, Corrientes, flood plain of río Riachuelo. *Triportheus paranensis*: AI 154, 1 ex. C&S, 129 mm, Argentina, Buenos Aires, río de la Plata, in Atalaya.

RESULTS

Nans gen. n.

Type species. Nans indefessus sp. n.

Diagnosis. *Nans* is a new genus of small characiforms placed within the family Characidae in light of the absence of characters indicating relationships with other families of the order. *Nans* is identified by several probably apomorphic characters: 1- the dorsal fin with ii,7-8 rays, 2- the rotation of the pelvic bone about 90°; 3- rotation of the pelvic fin muscles; 4- the pelvic fins curved, forming a tubular structure in mature males; 5- the incomplete foramen for exit of olfactory nerve in the lateral ethmoid; 6- the posttemporal without an extrascapular sensory canal; and 7- the absence of latero sensory canal segment in the anguloarticular.

The following characters, which are present in other species of characids, also help in the identification of *Nans*, the anal fin with 10-15 branched rays; the reduction of size of infraorbitals 2 and 3; the variable infraorbital number, ranging from 4 to 9; the loss of supraorbital; the short, blunt sphenotic spine; the two rows of ossified gill rakers on the anteroexternal and posteromedial margins of the first to fourth gill arches; the small anterior fenestra between the cleithrum and coracoid in adults; the high number of supraneurals (7-8); the similar number of precaudal and caudal vertebrae; and the naked isthmus.

Etymology. *Nans* is a latin word that means swimmer in allusion to the habit of the new genus specimens of living in torrents. Gender masculine.

Nans indefessus sp. n.

Figs 1-6, Table 1

Holotype. CI-FML 4000, male, 49.4 mm SL, Argentina, Salta, Orán, río Bermejo basin, río Pescado at Estancia Anta Muerta (22°54.3' S - 64°28.2' W); coll. Mirande, Aguilera & Padilla, August 5, 2003.

Paratypes. AI 107, 1 ex. C&S, 42.8 mm SL; AI 138, 1 ex., 41.6 mm SL, Argentina, Salta, Orán, río Anta Muerta tributary of río Blanco; coll. Mirande, Aguilera & Ferro, May 2002. AI 157, 3 ex., 39.7-51.7 mm SL, Argentina, Salta, Orán, arroyo Colorado, tributary of río Blanco; coll. Mirande, Aguilera & Ferro, May 2002. CI-FML 4001, 4 ex., 32.0-41.1 mm SL; MNHNG 2643.87, 6 ex., 31.5-40.9 mm SL; MCNi 911, 2 ex., 30.1-33.2 mm SL, collected with the holotype. CI-FML 4002, 1 ex., 28.4 mm SL, Argentina, Salta, Orán, El Oculto, río Blanco; coll. Mirande, Aguilera & Quoirin, October 2001. CI-FML 4003, 3 ex., 41.6-44.5 mm SL, río Anta Muerta, tributary of río Blanco; coll. Mirande, Aguilera & Ferro, May 2002.

Diagnosis. As for the genus.

Description. Morphometrics of holotype and 18 paratypes are presented in table 1. Body subcircular in cross section, more laterally compressed posteriorly; maximum body depth just anterior to dorsal-fin insertion. Dorsal profile of body straight or scarcely convex between snout and dorsal-fin origin; straight posterior of base of that fin. Dorsal and ventral profiles of caudal peduncle straight or ventral scarcely concave. Ventral profile from lower jaw to pelvic-fin origin convex, almost straight or slightly convex between pelvic and anal-fin insertions, slightly convex above anal-fin base in females and juveniles, markedly so in males; abruptly slanted dorsally, especially in males.

TABLE 1. *Nans indefessus* gen. n., sp. n. Morphometrics of male holotype and 18 paratypes. Minimum, maximum, and mean \pm standard deviation in brackets. SL is measured in mm.

SL	Holotype 49.4	Females (n=9) 28.4-51.7	Males (n=10) 31.5-49.4
% of standard length			
Predorsal distance	51.4	52.0-57.7 (53.9 \pm 1.9)	51.0-53.2 (52.0 \pm 0.9)
Preanal distance	63.6	63.4-71.2 (66.1 \pm 2.6)	62.1-67.4 (64.4 \pm 1.7)
Prepectoral distance	19.2	16.0-20.5 (18.4 \pm 1.6)	16.9-20.5 (18.4 \pm 1.1)
Body depth	31.7	27.5-32.1 (29.5 \pm 1.6)	28.7-33.3 (30.6 \pm 1.4)
Dorsal-fin base	13.2	11.1-12.9 (11.8 \pm 0.6)	11.8-13.3 (12.6 \pm 0.6)
Anal-fin base	18.2	14.1-19.8 (16.8 \pm 1.6)	15.7-19.5 (17.5 \pm 1.2)
Pectoral-fin length	23.3	21.4-23.4 (22.4 \pm 0.7)	22.6-25.5 (24.2 \pm 0.9)
Pelvic-fin length	16.3	14.4-15.6 (15.0 \pm 0.5)	15.0-18.0 (16.6 \pm 0.8)
Pectoral-pelvic fin origins	26.0	25.6-30.6 (27.6 \pm 1.7)	23.4-27.5 (26.1 \pm 1.2)
Pelvic-anal fin origins	19.2	16.0-20.5 (18.4 \pm 1.6)	16.9-20.5 (18.4 \pm 1.1)
Head length	26.8	24.7-28.7 (27.1 \pm 1.4)	25.8-30.4 (27.5 \pm 1.4)
Peduncle depth	13.8	12.3-14.6 (13.3 \pm 0.7)	12.6-14.4 (13.5 \pm 0.6)
Peduncle length	24.6	20.5-22.8 (21.4 \pm 0.9)	20.6-24.6 (22.4 \pm 1.4)
% of head length			
Snout length	23.2	19.3-25.1 (22.6 \pm 2.1)	19.7-23.5 (21.8 \pm 1.4)
Orbital diameter	27.8	28.5-34.4 (30.4 \pm 2.2)	25.5-33.6 (29.7 \pm 2.7)
Interorbital width	29.3	27.0-30.4 (28.9 \pm 1.2)	26.6-30.6 (28.3 \pm 1.1)
Maxillary length	24.4	20.6-25.4 (22.7 \pm 1.5)	18.9-26.7 (22.9 \pm 2.5)
Premaxillary+max. length	36.5	36.9-39.6 (38.0 \pm 0.9)	32.4-40.9 (38.3 \pm 2.6)
Postorbital length	50.7	46.9-58.4 (50.5 \pm 3.9)	44.7-52.7 (49.0 \pm 2.6)

Dorsal-fin origin situated almost equidistant from snout and caudal-fin base. Small adipose fin located posterior to vertical through base of posterior most anal-fin ray. Pelvic-fin insertion lightly anterior to vertical through dorsal-fin insertion. Anal-fin origin located at a vertical through base of posteriormost dorsal fin. Pectoral and pelvic fins short, not reaching vertical through pelvic fin insertion or anal-fin origin respectively.

Dorsal fin with ii,7-8 rays (7 in 2 ex. including holotype, 8 in 16 ex.); posterior margin rounded, bearing first two or three branched rays longest. Anal fin with iii-iv,10-15 rays (10 in 1 ex., 11 in 4 ex. including holotype, 12 in 7 ex., 5 in 5 ex., 14 in 1 ex., 15 in 1 ex.). First branched anal-fin rays longest, their length equal to or scarcely longer than base of anal fin. Distal margin of anal fin straight more so in males, and very slightly concave in females. Hooks on anal fin absent.

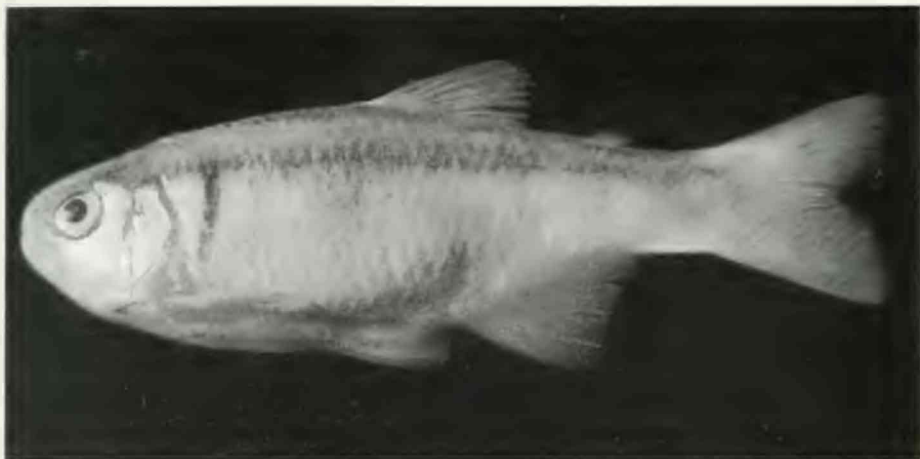


FIG. 1

Nans indefessus gen. n. and sp. n., holotype, 49.4 mm SL, male.

Caudal fin emarginate, with lower lobe slightly broader and longer than upper lobe. Caudal-fin rays numbers variable (10+6 branched and 1 unbranched rays in lower lobe in 1 ex., 10+7 branched and 1 unbranched rays in lower lobe in 1 ex., 9+7 branched and 1 unbranched rays in lower lobe in 1 ex., 10+8 branched and 1 unbranched rays in lower lobe in 16 ex. including holotype).

Pectoral fin with i,10-13 rays (10 in 5 ex., 11 in 10 ex. including holotype, 12 in 3 ex., 13 in 1 ex.). Distal margin of fin rounded. Pelvic fin with pelvic splint and i,7-8 rays (7 in 17 ex. including holotype, 8 in 2 ex.). Males with strong hooks on all branched pelvic-fin rays, even in smallest specimens (Figs 2, 3). Hooks directed anteriorly, one per segment even in unbranched portion of rays, and distributed along all ray branches.

Dorsal profile of snout strongly convex from snout tip to vertical through anterior margin of eye. Head profile slightly convex or straight from that point to top of supraoccipital spine. Mouth terminal, situated just under middle of eye. Eye notably larger than snout. Infraorbitals reduced in size, with ventral margins distant from preopercular sensory canal, leaving a wide area of underlying musculature covered only by skin.

Premaxilla with acute ascending process and short alveolar ramus. Premaxilla bearing two series of teeth; external row with teeth shorter than those of posterior row. Outer tooth series with 2 (1 ex.), 3 (13 ex. including holotype), or 4 (5 ex.) teeth; teeth anteroposteriorly compressed only distally. Inner premaxillary tooth series with 5 conical teeth, compressed only distally, bearing three cusps. Fifth tooth smaller, and slightly posterior to proximate tooth. Maxilla with slender dorsal process and long, relatively narrow, laminar process. Maxilla with 4 (10 ex.), 5 (8 ex.), or 6 (1 ex.) tricuspid, slender, and distally compressed teeth. Dentary bearing 8-10 slightly conical teeth, compressed only distally, with one to three cusps; first four teeth larger, with following teeth smaller.

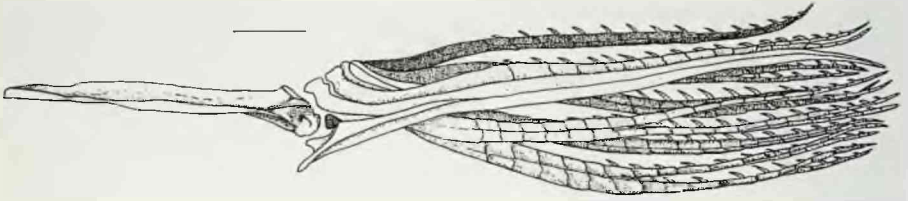


FIG. 2

Nans indefessus gen. n. and sp. n., ventral view of right pelvic girdle. Scale bar= 1 mm.

Scales cycloid, with anterior margin rounded, and circuli absent in posterior field. No radii anteriorly directed. Perforated scales on lateral line 36 (3 ex.), 37 (8 ex.), 38 (4 ex.), 39 (2 ex. including holotype), 40 (2 ex.). Five (14 ex.) or 6 (5 ex.) scales between lateral line and dorsal-fin origin and 4.5 scales between lateral line and pelvic-fin origin. Fourteen or 15 scales between supraoccipital tip and dorsal-fin origin. Thirteen or 14 scales around caudal peduncle. Most specimens with two rows composed of 4-6 scales on anal-fin base, few specimens with 5-6 scales in one row; scales always covering first 6 anal-fin rays. Few scales on caudal-fin base. Isthmus naked.

Four cleared and stained specimens with 13 ribs, 35-36 total vertebrae; 7-8 supraneurals; 10-11 dorsal procurrent rays and 9-10 ventral procurrent rays in caudal fin. Two rows of ossified gill rakers on 1st to 4th branchial arches. First arch with 1-2 gill rakers on hypobranchial, 5-6 on ceratobranchial, 1 on cartilage, 2-4 on epibranchial along anterolateral margin; and 3-4 rakers on ceratobranchial, 1 on cartilage, 3-4 on epibranchial along posteromedial margin.

Color in life. Background silvery, with dorsal portion of flanks darker. Metallic gold lateral band visible, although faint. Notable black humeral spot, vertically expanded, narrow. Dorsal, anal, and caudal fins light pink to intense red. Anterior most dorsal and anal-fin rays white.

Color in alcohol. Background yellowish. Upper part of flanks with chromatophores forming light, reticulate pattern. Uniformly wide lateral band light grey, beginning close to humeral spot and ending on middle of caudal peduncle. Grey humeral spot vertically-expanded, extending from horizontal through dorsal margin of orbital, to horizontal through ventral margin of preopercle. Humeral spot very narrow in many specimens.

Dorsal fin with numerous chromatophores on membranes, forming a diffuse spot, occupying basal two thirds of fin. Anal fin with scattered chromatophores on membranes. Adipose, caudal, pectoral and pelvic fins hyaline.

Dark narrow line on dorsal portion of body between supraoccipital and caudal peduncle. Dorsal portion of head grey. Few chromatophores present on premaxilla, maxilla, and around infraorbitals. Chromatophores concentrated and forming two black spots on dorsal and ventral regions of eye. Some specimens with chromatophores concentrated on upper preopercular process and on preopercular articular area.

Sexual dimorphism. The rotation of the pelvic bone is present also in females, although the curvature of the pelvic fin is more pronounced in males. In mature males



FIG. 3

Nans indefessus gen. n. and sp. n., detail of pelvic fin of one paratype, CI-FML 4003, 44.5 mm SL, male.

both pelvic fins form a tubular structure which is always absent in females. The females have relatively longer length between snout tip and insertion of first dorsal-fin ray, and also between origins of pectoral and pelvic fins. The males have relatively longer pectoral and pelvic fins and caudal peduncle.

Etymology. The specific name *indefessus* is a latin adjective that means untiring, in allusion to the high velocity of the water in which the specimens were collected.

Distribution. The specimens were collected in the río Anta Muerta and arroyo Colorado, tributaries of the río Blanco, and in the río Pescado; all in the upper río Bermejo basin, in the province of Salta, Argentina (Fig. 4). The specimens were collected in areas of the streams or rivers with gravel bottom, low depth, and clear, rapidly flowing water. Submerged vegetation was scarce.

DISCUSSION

Under the traditional concept of *Astyanax* (Eigenmann, 1921, 1927), *Nans* should be included in that genus because both genera share the premaxilla with five teeth in a second series, complete lateral line, the caudal fin naked, and absence of pre-dorsal spine. Nonetheless, *Nans* has many characters that distinguishes it from *Astyanax*. The dorsal fin with two unbranched plus seven or eight branched rays is present in *Nans*, whereas *Astyanax* has the dorsal fin with two or three unbranched and nine branched rays, considered as the primitive condition of the character. *Nans* has

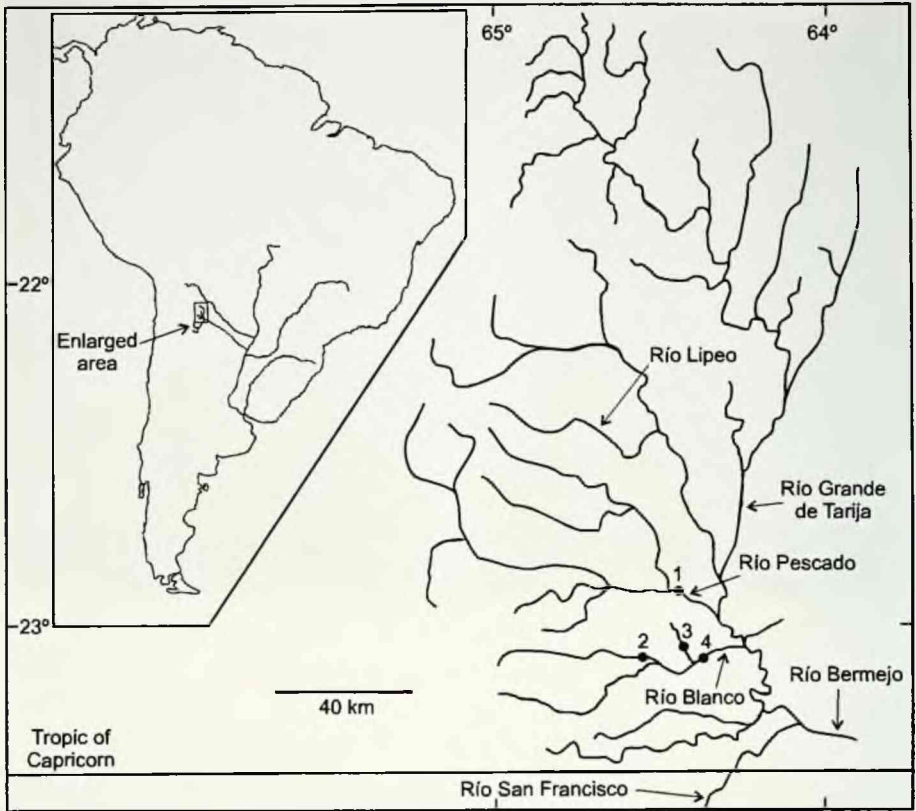


FIG. 4

Geographical known distribution of *Nans indefessus* gen. n. and sp. n. in the upper río Bermejo basin, Orán, province of Salta, Argentina. 1, type locality, río Pescado at Estancia Anta Muerta. 2, río Anta Muerta, tributary of río Blanco. 3, arroyo Colorado, tributary of río Blanco. 4, El Oculito, río Blanco.

short anal fin with 10-15 branched rays. In contrast, *Astyanax* has longer anal fin with more than 18 branched rays, excluded *A. brachypterygium*, *A. cremnobates*, and *A. jenynsii* (Bertaco & Malabarba, 2001). *Nans* has the infraorbitals 2 and 3 reduced in size, with their ventral margins distant from preopercular sensory canal; the ventral margins of the infraorbitals 2 and 3 are situated very near to preopercular sensory canal in *Astyanax*, this is the common condition among characids. Also, *Nans* has the anterior portion of body subcircular in cross section and *Astyanax* has that portion of body laterally compressed. In *Nans*, the gill rakers on first ceratobranchial are short, conical, and located in two rows whereas *Astyanax* has long, setiform gill rakers located in one row. The scales of *Nans* have rounded anterior margin (vs. straight in *Astyanax*). The isthmus is naked in *Nans* and it is covered with scales in *Astyanax*. The premaxillary and dentary teeth of *Nans* are conical although their distal tips are compressed and bear three cusps; in *Astyanax*, premaxillary and dentary teeth have broad crowns with

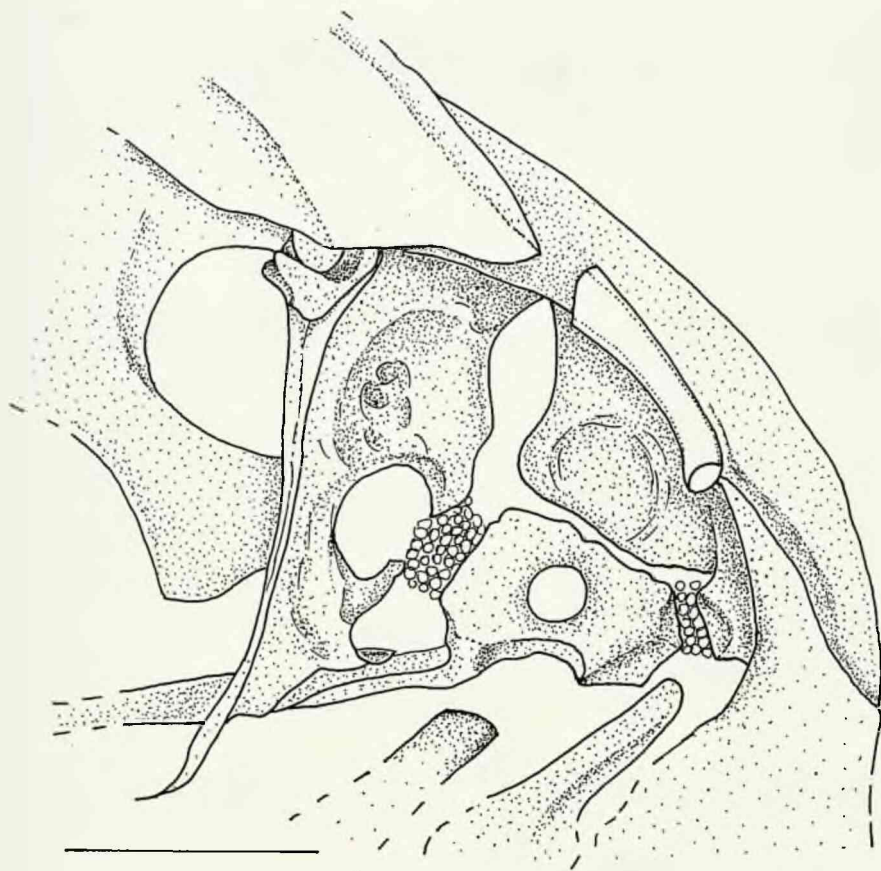


FIG. 5

Nans indefessus gen. n. and sp. n., right anterolateral view of snout bones. Olfactory foramen partially bounded by cartilage; a large foramen placed in dorsomedial vomerine lamella for articulation with mesethmoid. Scale bar= 1 mm.

denticulated free margin. The dorsal margin of dentary between coronoid process and symphysis abruptly tapers ventrally in *Nans*, resembling that of *Bryconamericus*, whereas the same margin is almost straight in the dentary of *Astyanax*. Many osteological characters differentiate *Nans* from *Astyanax*: blunt sphenotic spine (vs. long sphenotic spine in *Astyanax*); very short supraoccipital spine (vs. relatively long); seven or eight supraneurals (vs. four to six); large orbitosphenoid with its anteroventral margin near parasphenoid (vs. short orbitosphenoid); slender postcleithrum 3 (vs. postcleithrum 3 with laminar portion); the short nasals do not surpass the lateral wings of mesethmoid (vs. long nasals, surpassing the lateral wings of mesethmoid); the olfactory foramen is partially bounded by cartilage in *Nans* whereas it is completely bounded by bone in *Astyanax*. The latter and other characters present in *Nans* are discussed below.

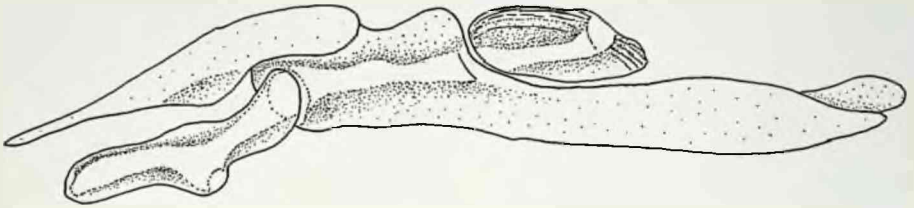


FIG. 6

Nans indefessus gen. n. and sp. n., left lateral view of extrascapula, posttemporal and supraclithrum. Sensory canals developed on extrascapula and supraclithrum; a sensory canal is absent on posttemporal. Scale bar = 1 mm.

The new genus lacks the synapomorphies of phylogenetically defined sub-families or genera, such as the Glandulocaudinae (Weitzman & Fink, 1985; Weitzman *et al.*, 1994; Weitzman & Ortega, 1995; Weitzman & Menezes, 1998), Cheirodontinae (Malabarba, 1998), Stethaprioninae (Reis, 1989), Serrasalminae (Machado Allison, 1983), and the genera *Moojenichthys* (Castro & Vari, 1990), *Hypobrycon* (Malabarba & Malabarba, 1994), *Jupiaba* (Zanata, 1997), *Attonitus* (Vari & Ortega, 2000), *Caiapobrycon* (Malabarba & Vari, 2000), *Creagrutus* and *Piabina* (Vari & Harold, 2001), and *Deuterodon* (Lucena & Lucena, 2002).

The following characters are pertinent to the question of the phylogenetic placement of the new genus:

1- The presence of ii,7-8 dorsal fin rays in *Nans*, separates it from most genera of characids. Recently, Malabarba & Weitzman (2003) published the description of *Cyanocharax*, including the phylogenetic diagnosis of a putative clade A which is diagnosed by the presence of ii,8 dorsal-fin rays and 4 teeth in the inner premaxillary row. The first synapomorphy is present in *Nans* which, however, always have 5 premaxillary teeth in the inner row. Furthermore, the terminal mouth of *Nans* distinguishes it from genera included in clade A, all of which have ventrally-located mouths, or modified teeth. The genus *Cyanocharax*, with terminal mouth and generalized teeth, has 6 branched pelvic-fin rays in contrast to the pelvic fin of *Nans* with 7-8 branched rays.

Modifications related to sexual dimorphism are often found in characids. Males of different genera of Glandulocaudinae (Weitzman & Fink, 1983; Weitzman & Fink, 1985; Menezes & Weitzman, 1990), Cheirodontinae (Malabarba, 1998), and many tetragonopterins have hooks variably present on the anal and pelvic fins; some tetragonopterins also have hooks on pectoral, caudal, and/or dorsal fins. Modifications of the pelvic girdle such as those present in *Jupiaba* (Zanata, 1997), are uncommon in characids. *Nans* has three possibly autapomorphic characters related to the pelvic girdle, and pelvic muscles.

2- In most characids, the pelvic bone is located in a horizontal plane. In males and females of *Nans*, the pelvic bone is positioned in a vertical plane, with the primitively external, posterolateral margin of the bone shifted ventrally (Fig. 2).

3- The pelvic fish muscles are usually located on the dorsal and ventral surfaces of the pelvic bone (Winterbottom, 1974; Zanata, 1997). As a consequence of the

rotation of the pelvic bone, the muscles in *Nans* occupy the lateral faces of the bone, with the *abductor pelvicius* located lateromedially and the *adductor pelvicius* occupying the lateral, external surface. The *adductor superficialis* is a large muscle with many fibers covering the anterior portion of the *abductors*, with muscles inserting on medial surface of the pelvic bone. The *arrector ventralis* is very well developed, being larger than that of other examined characids (e. g. *Astyanax*, *Bryconamericus*, *Markiana*).

4- In the Characidae the pelvic fins usually lie in a horizontal plane. As a consequence of the rotation of the pelvic bone in *Nans*, the external unbranched rays also shift ventrally, resulting in pelvic fins with a degree of curvature, with the inner branched ray dorsomedially positioned. The curvature of the fins is most pronounced in males and most modified in mature males in which the margin of the fins overlap to form a tubular structure (Figs 2, 3), with the primitively lateral unbranched fin ray positioned ventromedially. Different modifications occur in the pelvic fins of some species of glandulocaudins, such as *Scopaeocharax atopodus* and *Xenurobrycon macropus* (Weitzman & Fink, 1985). In males of *Bryconamericus thomasi*, *B. eigenmanni*, and *B. rubropictus*, the curvature of the anal rays is similar to that of *Nans*, but in *Bryconamericus* species the rays are curved while the bases of the rays maintain their usual position.

5- The lateral ethmoid of characids has an opening for the olfactory foramen, as described by Weitzman (1962) in *Brycon meeki*. In *Nans*, more than half of the opening for the olfactory foramen is bounded by the lateral ethmoid (Fig. 5). The medial margin of the aperture is surrounded by a cartilage which also contacts the large orbitosphenoid. That foramen is completely bordered by the lateral ethmoid in other examined species. The rhinosphenoid is absent.

Two characters that differentiate *Nans* from other characids are associated with the laterosensory canal system. 6- The supratemporal canal of the laterosensory system of characids usually exits the extrascapula, passes into the posttemporal, and enters into the supratemporal. This is the most common pattern in characids such as *Astyanax latens*, *Bryconamericus agna*, *Cheirodon interruptus*, *Gymnocorymbus ternetzi*, *Salminus maxillosus*, *Gymnocharacinus bergi*, *Tetragonopterus argenteus*, *Hyphessobrycon meridionalis*, and *Brycon orbignyanus*, and also in species of other characiform families such as *Hoplias* cf. *malabaricus*, *Oligosarcus bolivianus*, *Thoracocharax stellatus*, *Steindachnerina brevipinna*, and *Characidium* sp. (Azpelicueta, 1979). The supratemporal sensory canal is absent on the posttemporal of *Nans* (Fig. 6), an absence that also occurs in other species as homoplasy (e.g. *Hemigrammus erythrozonus* in Weitzman & Fink, 1983; per. obs.). The posttemporal of *Hemigrammus ulreyi* and *Hyphessobrycon boulengeri* have a sensory canal segment. 7- The lower jaw of characids bears a sensory canal- the mandibular canal- that passes through the dentary and anguloarticular (Weitzman, 1962). The mandibular sensory canal does not develop within the anguloarticular of *Nans*, instead the sensory system segment runs through the skin from the dentary to the anterior limit of the preopercle. A reduction in the degree of development of sensory canals often occurs in miniature characids but *Nans* reaches total lengths larger than those of the miniature characids discussed by Weitzman & Vari (1988).

Weitzman & Malabarba (1998) pointed out that characid species with modifications related to sexual dimorphism are an excellent source of phylogenetic infor-

mation. This may be the case of *Nans*, although insemination has not been studied in the genus. The relationships of *Nans* with other genera are unknown as are the relationships of many species and genera of Characidae.

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