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Silvinichthys gualcamayo, a new species of catfish from the central Andes of Argentina (Siluriformes: Trichomycteridae)

Luis Fernández*, Eduardo A. Sanabria and Lorena B. Quiroga*****

Silvinichthys gualcamayo, new species, is described from a stream at 2000 m elevation in the lower slope of the Andean cordillera of San Juan, Argentina. It is distinguished from the three previously described species in the genus by the following combination of characters: the pelvic fin and girdle absent, the caudal peduncle expanded posteriorly toward caudal-fin, the caudal peduncle length 22.0–23.9 % SL, 9–10 dorsal-fin rays, 5–6 branched dorsal-fin rays, 38 vertebrae total, 9 opercular odontodes, 20 interopercular odontodes, 7 pectoral-fin rays, and the wide supraorbital tendon bone.

Introduction

The Andean drainages are temporary endorrheic and occasional permanent watercourses fed by snow melt of higher elevations. These basins usually present small populations of a few or only one fish species able to survive in the severe Andean conditions (Arratia, 1998; Fernandez & Vari, 2000). Small isolated basins have resulted in notable degrees of endemicity in the Andean ichthyofauna, specially among trichomycterines with more than 20 species reported from central and northwestern of Argentina (Fernández & Vari, 2009).

In 1998, Arratia proposed the monotypic genus *Silvinichthys* for *Trichomycterus mendozensis* based on its possession of a number of unusual modifications, such as the entire skin surface perforated by pores of the ampullary organs or the reduction of the cephalic laterosensory canal system to the nasal portion of the supraorbital canal and the postotic canal. Fernández & de Pinna (2005) subsequently described a second species, *S. bortayro,* from phreatic waters situated at 1258–1356 m asl. Recently, Fernandez et al. (2011) described a third species, *S. leoncitensis*, from a small creek at 1213 m altitude in a National Park of the San Juan province.

We herein describe a fourth species of *Silvinichthys*, the third one lacking the pelvic girdle and fins, endemic to the Andean cordillera.

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Material and methods

Morphometric and meristic data were taken following Tchernavin (1944). Measurements were taken on the left side of each specimen with digital calipers under a binocular microscope. Osteological preparations (c&s) were made according to Taylor & Van Dyke (1985) and osteological terminology follows Arratia (1998). Counts of unpaired fin rays, vertebrae and ribs were taken from one c&s specimens. The numbering system and terminology for laterosensory pores of the head follow Arratia & Huaquin (1995). Meristic values for the holotype in the text are indicated by an asterisk (*). Institutional abbreviations: FLBS, Flathead Lake Biological Station, Polson; IBAUNC, Instituto de Biología Animal, Universidad Nacional de Cuyo, Mendoza; MCN, Museo de Ciencias Naturales, Universidad Nacional de Salta, Salta. Abbreviations are head length (HL) and standard length (SL).

Silvinichthys gualcamayo, new species
(Fig. 1)

Holotype. MCN 1518, 51.0 mm SL; Argentina: Provincia de San Juan: Departamento Jachal: El Chepical, Río Gualcamayo, 29°45'09.9"S 68°45' 25.4"W, altitude 2324 m above sea level; E. Sanabria, L. Quiroga, C. De Giovanini & F. Cortez, Dec 2010.

Paratypes. MCN 1531, 5, 27.2–45.8 mm SL; MCN 1532, 1 c&s, 31.9 mm SL; same data as holotype.

Diagnosis. *Silvinichthys gualcamayo* differs from *S. leoncitensis* by the number of pectoral-fin rays (7 vs. 8), the number of dorsal fin rays (9–10 vs. 13), the total number of vertebrae (38 vs. 40); from *S. bortayro* in the shape of the head in dorsal view (triangular vs. rectangular), the number of opercular odontodes in cleared and stained specimens (9 vs. 2–4), the number of interopercle odontodes in cleared and stained specimens (20 vs. 9–12), the number of pectoral-fin rays (7 vs. 6), the number of branched dorsal-fin rays (5–6 vs. 7), the supraorbital tendon bone shape (wide vs. slender), the caudal peduncle length (22.0–23.9 % SL vs. 17.5–19.7), the coloration pattern (presence of a separated dark marmorated band of pigmentation on the head and body vs. the absence of dark pigmentation in larger individuals); and from *S. mendozensis* in the condition of the pelvic-fin and girdle (absent vs. present), the orbitosphenoid bone (absent vs. present) and the number of interopercle odontodes in cleared and stained specimens (20 vs. 30–42).

Description. Morphometrics for holotype and paratypes of *Silvinichthys gualcamayo* presented in Table 1. For general morphology see Figure 1. Body elongate; cylindrical overall in trunk region and gradually and progressively becoming more compressed transversely toward caudal fin. Dorsal profile of head approximately straight overall. Dorsal profile of body slightly convex to point barely beyond vertical through tip of pectoral fin and then nearly straight to insertion of dorsal fin. Dorsal-fin base posteroventrally aligned. Ventral profile of head and body distinctly concave to point approximately at vertical through mid-length of adpressed pectoral fin. Body profile then slightly convex to anus. Anal-fin base posterodorsally inclined. Caudal peduncle expanding posteriorly toward caudal fin, because of diverging dorsal and ventral profiles. Lateral line short.

Head triangular overall from dorsal view with broadly rounded margin along transversely narrower anterior portion. Head dorsoventrally

Table 1. Morphometric data for holotype and 6 paratypes of *Silvinichthys gualcamayo*. Values of holotype not included in range. H, holotype.

	H	range	mean
Standard length (mm)	51.0	27.2–45.8	34.2
Head length (mm)	8.9	4.9–7.6	6.0
In percent of standard length			
Body depth	16.2	10.7–16.8	14.1
Caudal peduncle length	22.6	22.0–23.9	23.1
Caudal peduncle depth	11.1	7.8–12.1	9.4
Predorsal length	68.5	62.9–71.6	67.8
Preanal length	69.3	67.1–69.3	68.2
Dorsal-fin base length	9.7	10.3–11.5	10.8
Anal-fin base length	8.9	8.9–11.2	9.7
Head length	17.4	16.6–19.0	17.7
Head width	15.3	14.4–16.4	15.1
Head depth	9.7	7.9–11.1	9.9
In percent of head length			
Interorbital width	26	24–29	27.2
Snout length	42	38–44	40.2
Nasal barbel length	38	37–58	46.3
Maxillary barbel length	57	59–80	68.7
Rictal barbel length	35	35–58	48.9
Mouth width	41	35–47	40.3

flattened with eyes located on dorsal surface. Eye circular located on dorsal surface of head but visible in both dorsal and lateral views. Skin covering eye thin, transparent and separate from surface of eyeball. Regions ventrolateral and particularly posterior of eyes somewhat expanded laterally as consequence of well-developed jaw muscles, but with degree of development of these muscles less pronounced in some smaller paratypes.

Anterior nostril slightly smaller than posterior nostril and surrounded by fleshy flap of integument medially and by barbel laterally. Posterior nostril partially surrounded anteriorly by flap of thin skin.

Infraorbital canal absent. Supraorbital canal incomplete, with segment between pores So2 and So6 absent. Postotic canal with two pores, with pterotic branch present at junction of pterotic and posttemporosupracleithrum. Laterosensory canal along midlateral portion of trunk reduced to short tube with three pores on anteriormost portion of lateral line, with single terminal pore opening situated slightly posterior to posterior tip of opercular patch of odontodes.

Mouth distinctly subterminal, with rictus directed posteriorly. Premaxilla rectangular and larger than maxilla. Premaxilla with 3 tooth rows. Outer premaxillary tooth row with 9 conical teeth. Maxilla enlarged, L-shaped, with pair of condyles, projecting between premaxilla and anterior border of autopalatine. Lower lip with prominent fleshy lobes along lateral margin; lobes situated internal to base of rictal barbels. Lower lip fleshy anteriorly, with papillae-like structures covering anterior and to lesser degree anteroventral surfaces. Upper lip fleshy with numerous papillae.

Barbels relatively short and tapering distally but not thread-like. Maxillary barbels extending posteriorly over interopercular odontodes to insertion of pectoral fin. Nasal barbel reaching posteriorly to posterior margin of eye. Origin of nasal barbel situated on posterolateral portion of skin flap running along margin of anterior naris. Submaxillary barbels shorter than maxillary barbels.

Branchiostegal membranes narrowly attached to isthmus anteriorly at midline, with wide and almost free branchial openings. Branchiostegal rays 7 in one c&s specimens. Fleshy covering around odontodes on interopercular more developed than in opercular. Interopercular patch of odontodes anteroposteriorly elongate with 7–17 odontodes apparent in whole specimens and 20 odontodes present in one c&s specimen. Opercular patch of odontodes small and elongate with 5–8 straight odontodes arranged in 3 irregular rows apparent in whole specimens and 9 odontodes present in one c&s specimen.

Pectoral-fin insertion approximately horizontally aligned with interopercular patch of odontodes. Distal margin of pectoral fin broadly convex. First pectoral-fin ray terminating at fin margin. Pectoral-fin with one unbranched ray and 6*(7) branched rays. Pelvic-fin and pelvic girdle absent. Distal margin of dorsal-fin semicircular when fin fully expanded. Dorsal-fin with 4*(7) unbranched rays followed posteriorly by 5(1) or 6*(6) branched rays. Base of dorsal-fin fleshy. Dorsal-fin origin located distinctly anterior to vertical passing through anterior limit of urogenital opening. Anal-fin with 3*(4), 4(2) or 5(1) unbranched rays followed by 5*(5) or 6(2) branched rays. Anal-fin approximately same size as, or slightly smaller than, dorsal-fin and slightly elongate with distal margin straight or rounded when fully expanded. Anal-fin origin located approximately at vertical passing through point one-half length of dorsal-fin base posterior of dorsal-fin origin. Caudal-fin distal margin slightly rounded or nearly straight overall. Principal dorsal caudal-fin rays with 6 rays on fused third through fifth hypurals. Principal ventral caudal-fin rays 7 and attached to fused hypurals 1–2 and separate parahypural. Dorsal procurrent caudal-fin rays 11 and ventral procurrent caudal-fin rays 9. Total vertebrae 38. Ribs on each side 17.

Coloration in alcohol. Marmorated dark pigmentation covering dorsal and dorsolateral surfaces of head and body with irregular series of dark chromatophores forming barely apparent pattern of broad marmorated bands on dorsal and lateral surfaces of body. Darker pigmentation overlying dorsal surface of cranium. Remainder of head with scattered dark chromatophores. Ventral surface of head lacking dark coloration pigmented. Area between anterior and posterior nostril very darkly pigmented. All barbels with exception of submaxillary barbels with diffuse pattern of scattered dark chromatophores. Opercular, but not interopercular, patch of odontodes with web-like pattern of dark pigmentation around base of odontodes. Dorsal and anal fins scattered dark chromatophores. Dorsal surface of pectoral fin with scattered, irregular patches of

Fig. 1. *Silvinichthys gualcamayo*, MCN 1518, holotype, 51.0 mm SL; Argentina: Provincia de San Juan: Departamento Jachal, Río Gualcamayo.

dark pigmentation. Caudal fin rays outlined by small dark chromatophores. Darker pigmentation forming obscure vertical bar at base of caudal fin.

Etymology. The specific name, *gualcamayo*, is in reference to the type locality of the species, the Río Gualcamayo. A noun in apposition.

Ecology. *Silvinichthys gualcamayo* was collected in a small, clear water stream approximately 0.1 to 0.4 m deep and 1.5 to 3.0 m wide, running over a rock and cobble bottom (Fig. 2). The Río Gualcamayo has a trickle flow during most of the year. *Silvinichthys gualcamayo* shares cryptic behavior with other trichomycterines. The only others aquatics vertebrates captured at the type-locality were tadpoles and adults of *Rhinella spinulosa* (Anura: Bufonidae) and *Hatcheria macraei* (Siluriformes: Trichomycteridae).

Conservations considerations. The ichthyofauna of drainage systems throughout much of the Andean Cordillera of Argentina across the provinces of Jujuy, Salta, Catamarca, La Rioja, San Juan, and Mendoza is often drastically adversely affected by the introduction of rainbow trout (Salmoniformes: *Onchorhynchus mykiss*). The mining activities could also result in the extinction of the Andean catfishes species (Fernandez, 2005). The record of *Silvinichthys* species in the central Andes of Argentina constitute an attribute important for biological conservation.

Distribution. *Silvinichthys gualcamayo* is only known from the type locality in the Río Gualca-

Fig. 2. Río Gualcamayo (Argentina: Provincia San Juan: Departamento Jachal), type locality of *Silvinichthys gualcamayo*.

mayo (Fig. 3) in a region with few drainage systems and a depauperate ichthyofauna.

Discussion

Silvinichthys gualcamayo is very similar to *S. leoncitensis*, which also occurs in western central area of Argentina. Differences between *S. gualcamayo* and this species are detailed in the Diagnosis section and Table 2.

Silvinichthys gualcamayo, *S. leoncitensis*, *S. bortayro*, and three undescribed species share the absence of the pelvic girdle and pelvic-fin, in contrast to *S. mendozensis* with the presence of both structures. The absence of pelvic girdle and fin of Trichomycteridae was commented on by subsequent authors such as, Fernandez & Vari

Table 2. Comparative data on external morphology of *Silvinichthys* species.

	S. gualcamayo	*S. mendozensis*	*S. bortayro*	*S. leoncitensis*
Pelvic fin	absent	present, small	absent	absent
Odontodes Op	6–9	9–16	2–4	7–9
Odontodes Iop	15–20	30–42	9–12	18–28
Pectoral-fin rays	7	7–8	6	8
Dorsal-fin rays	9–10	11–14	9	13
Anal-fin rays	8–11	10–12	8–10	12–13
Pigmentation	marmorated dark	uniform dark	reduced, yellow	marmorated dark
Eye	present	present	reduced	present

Fig. 3. Map of southern of South America showing distribution of *Silvinichthys* species known. **1,** *S. gualcamayo;* **2,** *S. leoncitensis*; **3,** *S. mendozensis;* and **4,** *S. bortayro*.

(2000), Barbosa & Costa (2003), Ferrer & Malabarba (2011), and Fernandez et al. (2011). It is reasonable to assume that the condition absence of the pelvic girdle and fin in these *Silvinichthys* species would be considered as a potential synapomorphy within the genus supporting the hypothesis of their sister group relationship. *Silvinichthys gualcamayo* also shares three derived characters with *S. leoncitensis* and *S. bortaryro*: the reduced numbers of odontodes on the opercular 2–9 (vs. 9–16 in *S. mendozensis*; Arratia et al., 1978), the interopercular odontodes 9–28 (vs. 30–42 in *S. mendozensis;* Arratia et al., 1978), and the orbitosphenoid bone absence (vs. presence in *S. mendozensis*; Arratia et al., 1978: fig. 10A). Based on these small sampling of characters states, it appears that *S. mendozensis* is the basal group of *S. gualcamayo, S. leoncitensis* and *S. bortayro*.

The native fish fauna of the Andean piedmont region across of the provinces of Catamarca, La Rioja, San Juan and Mendoza in Argentina is relatively depauperate with this pattern also applying to the ichthyofauna of San Juan Province (Fernandez et al., 2011). The native ichthyofauna of the San Juan province includes 9 species, consisting of three species of trichomycterids: *Trichomycterus corduvensis* widely distributed in Argentina and the Patagonian *Hatcheria macraei* (Liotta, 2005) with the additionally *Silvinichthys leoncitensis* above mentioned.

Recently, Fernandez et al. (2011: Fig. 2) described *S. leoncitensis* from the San Juan province, extending the range of the genus *Silvinichthys* beyond Salta (65°30'W 24°50'S) and Mendoza (69°17'W 32°57'S) provinces from which it was reported previously (Fig. 3). It is not surprising because the Trichomycteridae is the only native fish family in this Andino-Cuyana area and they seem well adapted to the high elevation, temporary endorrheic or poorly drained basins (Fernandez & Vari, 2009).

Material examined. Comparative material examined in this study is that cited in Schaefer & Fernández (2009) and Fernandez et al. (2011) with the addition of the following specimens:

Hatcheria macraei: MCN 1521, 1, 1 c&s; Argentina: San Juan: Río Calingasta. – MCN 1561, 2; Argentina: San Juan: Río Castaño.

Silvinichthys bortayro: FLBS 01071A, 1, Argentina: Salta. *Silvinichthys leoncitensis*: MCN 1511, 1; MCN 1512, 1 c&s; Argentina: San Juan. *Silvinichthys mendozensis*: IBAUNC 32, 2; Argentina: Mendoza. *Silvinichthys* sp. A: MCN 1515, 2 c&s; Argentina: San Juan. – MCN 1516, 5; Argentina. *Silvinichthys* sp. B: MCN uncat, 2; Argentina: La Rioja.

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Cover photograph
Cyanogaster noctivaga (photograph by Ralf Britz)
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