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# A new catfish species of the genus *Silvinichthys* (Teleostei: Trichomycteridae) from Leoncito National Park, Argentina

**Luis Fernández*, Jael Dominino**, Florencia Brancolini*** and Claudio Baigún******

*Silvinichthys leoncitensis*, new species, is described from Leoncito National Park in the Andes of Argentina. The new species is distinguished from the other two known congeners by the coloration pattern, consisting of a dark marmorated head and body that fades to a paler color ventrally, the pelvic fin and girdle absent, seven to nine opercular odontodes, 18–28 interopercular odontodes, caudal-fin length 19.9–24.0 % SL, length of dorsal fin base 10.1–13.1 % SL, and head width 13.3–15.9 % SL. *Silvinichthys leoncitensis* is endemic to the type locality, which is situated in the Andean Cordillera of the San Juan province, Argentina. *Silvinichthys leoncitensis* is hypothesized to be a sister species of *S. bortayro*.

## Introduction

The family Trichomycteridae includes eight subfamilies, all except for the subfamily Trichomycterinae being diagnosed on the basis of derived morphological characters (Baskin, 1973; de Pinna, 1989, 1998). The Trichomycterinae consists of the genera *Bullockia*, *Eremophilus*, *Hatcheria*, *Rhizosomychthys*, *Trichomycterus*, and *Silvinichthys* (Arratia, 1998; de Pinna, 1998; Costa & Bockmann, 1993; Fernández & Vari, 2000). *Silvinichthys* is an endemic genus to Andean mountains, including two species (Arratia, 1998; Fernández & de Pinna, 2005). Arratia (1998) erected *Silvinichthys* for *Trichomycterus mendozensis* on the basis of a suite of apomorphies, such as the entire skin surface perforated by pores of the ampullary organs, the absence of head and body pit lines and reduction of the cephalic laterosensory canal system to the nasal portion of the supraorbital canal and the postotic canal. The only other species recognized in the genus, *S. bortayro*, was described by Fernández & de Pinna (2005) from phreatic water approximately 1290 km to the north of Río Mendoza basin, where *S. mendozensis* occurs. The aim of the present study is to describe a new species recently collected in San Juan Province, Argentina.

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## Material and methods

The specimens were collected by using a dip net and were fixed in 4 % formaldehyde and later transferred into 70 % ethanol for storage. Morphometric and meristic data were recorded following Tchernavin (1944). Measurements were taken on the left side of each specimen with digital calipers to the nearest 0.1 mm under a binocular microscope. Osteological preparations (c&s) were made according to Taylor & Van Dyke (1985) and osteological terminology follows Baskin (1973) and de Pinna (1989). The numbering system and terminology for laterosensory pores of the head follows Arratia & Huaquin (1995), Arratia (1998), and Schaefer & Aquino (2000). Institutional abbreviations: AMNH, American Museum of Natural History, New York; ANSP, Academy of Natural Sciences of Philadelphia, Philadelphia; BMNH, British Museum of Natural History, London; CAS, California Academy of Sciences, San Francisco; CBF, Colección Boliviana de Fauna, La Paz; FML, Fundación Miguel Lillo, Tucumán; FMNH, Field Museum of Natural History, Chicago; IADIZA, Instituto Argentino de Investigación de Zonas Áridas, Mendoza; IBAUNC, Instituto de Biología Animal, Universidad Nacional de Cuyo, Mendoza; ILPLA, Instituto de Limnología "Dr. Raúl A. Ringuelet", La Plata; KU, University of Kansas, Kansas; MACN, Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires; MLP, Facultad de Ciencias Naturales y Museo, La Plata; MNHNC, Museo Nacional de Historia Natural, Santiago; MCZ, Harvard University, Museum Comparative Zoology, Cambridge; MCN, Museo de Ciencias Naturales, Universidad Nacional, Salta; MCP, Museu de Ciências e Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre; MZUSP, Museu de Zoologia, Universidade de São Paulo, São Paulo; UMMZ, University of Michigan Museum of Zoology, Ann Arbor; USNM, National Museum of Natural History, Smithsonian Institution, Washington. Other abbreviations: SL, standard length; HL, head length.

**Table 1.** Morphometric data for holotype and 9 paratypes of *Silvinichthys leoncitensis*. H, holotype.

| | H | range | mean |
|---|---|---|---|
| Standard length (mm) | 58.2 | 35.8–51.1 | 43.4 |
| Head length (mm) | 8.8 | 6.6–8.3 | 7.4 |
| **In percent of standard length** | | | |
| Body depth | 11.0 | 8.4–12.2 | 10.6 |
| Caudal peduncle length | 22.3 | 19.9–24.0 | 21.9 |
| Caudal peduncle depth | 7.4 | 6.6–8.6 | 7.5 |
| Predorsal length | 65.0 | 62.8–68.6 | 66.0 |
| Preanal length | 69.3 | 67.3–73.1 | 69.7 |
| Dorsal-fin base length | 12.0 | 10.1–13.1 | 11.8 |
| Anal-fin base length | 10.2 | 8.7–11.5 | 10.1 |
| Head length | 15.2 | 15.9–18.5 | 17.3 |
| Head width | 14.2 | 13.3–15.9 | 14.4 |
| Head depth | 8.5 | 7.7–10.5 | 9.4 |
| **In percent of head length** | | | |
| Interorbital width | 25.5 | 26.4–30.3 | 27.8 |
| Snout length | 48.1 | 35.6–47.1 | 42.1 |
| Nasal barbel length | 56.0 | 28.7–53.6 | 43.7 |
| Maxillary barbel length | 72.6 | 30.7–90.7 | 62.9 |
| Rictal barbel length | 46.3 | 20.9–55.2 | 39.3 |
| Mouth width | 46.5 | 36.2–42.4 | 38.9 |

### *Silvinichthys leoncitensis*, new species

(Fig. 1)

**Holotype.** MCN 1511, 58.2 mm SL; Argentina: Provincia de San Juan: Departamento Calilegua, Leoncito National Park, 32°00'S 68°47'W, altitude 1213 m above sea level; A. Carp, M. Ceballos, J. Dominino, L. Fernández & C. Villalobos, 18 Dec 2009.

**Paratypes.** MACN-ict 9674, 1, 38.0 mm SL; same locality as holotype; J. Monguillot, S. Neira & C. Villalobos, 1 Sep 2009. – MCN 1512, 1, 51.1 mm SL, 1 c&s, 35.8 mm SL; same locality as holotype; J. Monguillot, S. Neira & C. Villalobos, 1 Sep 2009. – MCN 1513, 5, 36.9–48.5 mm SL; same locality as holotype; A. Carp, M. Ceballos, J. Dominino, L. Fernández & C. Villalobos, 19 Dec 2009. – ILPLA 2171, 1, 45.7 mm SL; same locality as holotype; A. Carp, M. Ceballos, J. Dominino, L. Fernández & C. Villalobos, 19 Dec 2009.

**Diagnosis.** *Silvinichthys leoncitensis* is distinguished from its two congeners by color pattern, consisting of a dark marmorated head and body that fade to a paler color ventrally (vs. absence of pigmentation in *S. bortayro* or uniform dark lateral midline and dorsum in *S. mendozensis*). It is further diagnosed from *S. bortayro* by the more slender body (depth 9.6–10.5 % SL vs. 10.6–12.8), longer caudal fin (19.9–24.0 % SL vs. 17.6–19.7)

**Fig. 1.** *Silvinichthys leoncitensis*, MCN 1511, holotype, 58.2 mm SL; Argentina, Provincia San Juan, Departamento Calilegua, Leoncito National Park.

and dorsal-fin base (10.1–13.1 % SL vs. 8.0–10.6) and narrower head (13.3–15.9 % SL vs. 16.0–17.7); from *S. mendozensis* by the absence (vs. presence) of pelvic fins and girdle, 7–9 (vs. 9–16) opercular odontodes, and 18–28 (vs. 30–42) interopercular odontodes.

**Description.** Morphometrics for holotype and paratypes of *Silvinichthys leoncitensis* presented in Table 1. Body elongate, cylindrical in trunk region, gradually and progressively becoming more compressed transversely toward tail. Dorsal and ventral profiles of trunk region nearly straight. Caudal peduncle smoothly continuing profile of trunk region, with dorsal and ventral profiles somewhat straight. Epidermal structures absent on head and body.

Head, from dorsal view, triangular overall with broadly rounded margin along narrower anterior portion. Head dorsoventrally flattened with eyes located on dorsal surface. Eyes ovoid, proportionally comparable to that in many congeners. Skin covering eye thin and transparent, separate from surface of eyeball, with eyes readily visible on surface of head.

Anterior nostril slightly smaller than posterior nostril, 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 S2 and S6 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. Premaxillae rectangular, larger than width of palatine and larger than maxilla. Premaxilla with 2 or 3 tooth rows. Outer premaxillary tooth row distally narrowing, incisiform teeth. Lower lip with prominent fleshy lobes along lateral margin, lobes situated internal to base of rictal barbel. Lower lip fleshy anteriorly, with papillae covering anterior, and to lesser degree anteroventral, surfaces. Upper lip fleshy, with numerous papillae.

Barbels relatively short and tapering distally but not threadlike. Maxillary barbel extending posteriorly to interopercular odontodes. Nasal barbel reaching posteriorly to posterior border of eye. Origin of nasal barbel on posterolateral portion of skin flap along margin of anterior naris. Submaxillary barbel shorter than maxillary barbel.

Branchiostegal rays 6. Interopercular patch of odontodes anteroposteriorly elongate; with 18–23 odontodes visible in alcohol specimens and 28 odontodes present in c&s specimen. Opercular patch of odontodes small, rounded, and irregular rows, 7 or 8 odontodes in alcohol specimens and 9 odontodes arranged in c&s specimen.

Distal margin of pectoral fin broadly rounded. First pectoral fin ray terminating at fin margin without forming distal filament. Pectoral fin with 7 branched and 1 unbranched rays in holotype and paratypes. Pelvic fins and girdle absent. Distal margin of dorsal fin rounded, semicircular when fin membranes are spread. Dorsal fin, with 8 branched and 5 unbranched rays. Dorsal-fin base fleshy. Dorsal-fin origin located distinctly anterior to vertical passing through anterior limit of urogenital opening. Dorsal pterygiophores 8. First proximal dorsal-fin pterygiophore inserting posterior to neural spine of vertebra 23. Anal fin with five 5 and 7 unbranched rays. Anal fin about same size as, or slightly smaller than, dorsal fin; slightly elongate with slightly rounded distal margin. Anal-fin origin at vertical passing through anterior third of dorsal-fin base. Anal pterygiophores 6. First proximal anal-fin ptery-

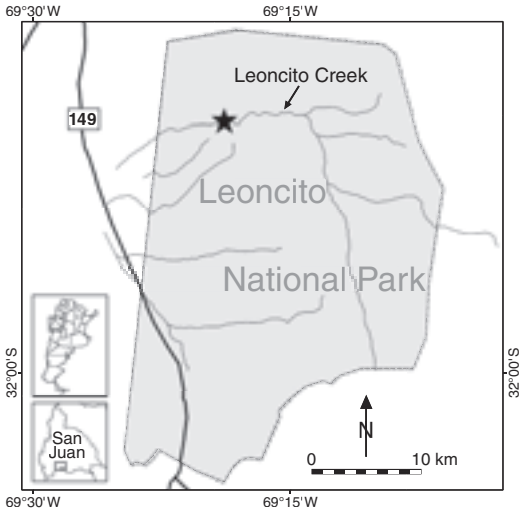


**Fig. 2.** Leoncito Creek location within Leoncito National Park in the Andes Mountains, San Juan, Argentina. ★, type locality of *Silvinichthys leoncitensis*.

giophore inserting posterior to hemal spine of vertebra 24. Caudal fin margin nearly straight and slightly posterodorsally angled along most of length, with dorsal and ventral portions rounded. Principal caudal-fin rays 6 dorsally and 7 ventrally. Dorsal procurrent caudal-fin rays 13. Ventral procurrent caudal-fin rays 12. Total vertebrae 40. Ribs on each side 20.

**Coloration.** Color in alcohol: marmorated head and body, fading to lighter color ventrally; darker pigmentation evident on dorsal surfaces of neurocranium and posttemporosupracleithrum. Area immediately medial to anterior nostril very darkly pigmented. Scattered pigmentation present on remainder of dorsal and lateral portions of head except for interopercle area unpigmented. Barbels with diffuse pattern of small, dark chromatophores. Caudal fin rays delimited by small dark chromatophores. Other fins hyaline other than for few scattered dark chromatophores on dorsal surface of pectoral fin base.

Color in life: dorsolateral portions of head and body darkly mottled. All barbels except for the submaxillary barbels, pigmented with dark chromatophores. Opercular patch of odontodes with weblike pattern of dark pigmentation around base of odontodes. Interopercular patch of odontodes without pigmentation. Ventral surface of head with scattered small, dark chromatophores. Body with dark marmoration on all areas except in abdominal region. Dorsal and anal fins hyaline. Dorsal surface of pectoral fin with scattered, irregular patches of dark pigmentation. Caudal fin dusky, with rays outlined by small dark chromatophores. Dark pigmentation on basal portions of caudal fin rays, forming vertical bar.

**Etymology.** The specific name, *leoncitensis*, is in reference to Leoncito National Park, where the type locality is situated.

**Ecology.** The Leoncito creek extends for about 4 km and disappears underground into a dry lakebed. Mean altitude is 2450 m above sea level. The creek is apparently isolated from adjoining drainages throughout the year. Most individuals were concentrated upstream and under marginal vegetation, mostly inhabiting low gradient rifles. The stream reach where the fishes were observed is characterized by slow waters, 10 to 20 cm deep on average, and bottom formed basically by sand, silt, and gravel. Environmental variables measured in December 2010 were water temperature 21.0 °C, pH 7.5 and conductivity 110 $S \cdot cm^{-1}$ conductivity. Specimens of *S. leoncitensis* were collected under the stones and sand with benthic macroinvertebrates (Trichoptera, Chironomidae, Odonata, and crustacean *Hyalella*).

**Distribution.** *Silvinichthys leoncitensis* is only known from the type locality (Fig. 2). In localities of western and northern Argentina, the species of *Silvinichthys* and *Trichomycterus* are among the few native fishes occupying streams at middle to higher elevations, like the species that we are describing in this paper. *S. leoncitensis* is the third species of the genus. The only other species of fish collected at Leoncito Park was the non-native *Onchorynchus mykiss*.

**Conservation remarks.** Leoncito Park, like the Andean Cordillera, has few drainage systems. Leoncito creek downstream of the park is drastically impacted by the use of its water for agriculture and by the introduction of the rainbow trout *(Onchorynchus mykiss)*. In the Andes of Argentina, habitat modification, overexploitation of natural resources, and the introduction of exotic species (e. g. rainbow trout at high elevation; Fernández, 2005; Fernández & Fernández, 1998) continue to endanger many species, especially the trichomycterids. *Silvinichthys leoncitensis* is highly vulnerable to environmental disturbance, due to their

 

low population sizes. The population densities of *S. leoncitensis* recorded by visual censuses on four occasions, during dry season, may be considered low with 0.05 individuals per square meter.

## Discussion

According to the characters listed by Arratia (1998), de Pinna (1998), and Fernández & de Pinna (2005) the new species is a member of *Silvinichthys*, diagnosed by: the perforation of the entire skin surface by the pores of the ampullary organs; the reduction of the laterosensory canal system, with the posterior portion of that system on the head reduced to the postotic canal enclosed by pterotic and posttemporosupracleithrum, and the nasal portion of the supraorbital canal (pores s1–s2) enclosed by nasal bone; the opercle narrow and elongate; the unossified gill rakers; and the urohyal with two foramina. *Silvinichthys leoncitensis* shares more characters (4) with *S. bortayro* than with *S. mendozensis*, such as the absence of the pelvic girdle and fin (vs present in *S. mendozensis*), reduced numbers of odontodes on the opercular (4–9 vs 9–16) and interopercular odontodes (9–28 vs 30–42), and branched pectoral-fin rays (5–7 vs 7–9).

The absence of the pelvic fins and girdle observed in *S. leoncitensis* and *S. bortayro* is shared with other members of the Trichomycterinae, viz. *Eremophilus mutisii*, *Trichomycterus catamarcensis*, and *T. candidus* (Barbosa & Costa, 2003; Fernandez & Vari, 2000). An asymmetrical reduction of the pelvic girdle, which may represent an incipient state leading towards the loss of that system, has been reported in the troglobiomorphic *T. itacambiensis* (Trajano & de Pinna, 1996). Within *Silvinichthys*, the girdle is absent in *S. bortayro* (Fernández & de Pinna, 2005) and another undescribed species of *Silvinichthys* from the Andean Cordillera. De Pinna (1989) mentioned that pelvic-fin loss had occurred independently at least three times within the Trichomycteridae, perhaps reflecting an underlying propensity for the loss of this system in the members of this family. As such the absence of the pelvic fin and girdle, although striking, is also notably homoplastic and its use as a potential synapomorphy must be considered within the context of the taxa in question (Fernández & Vari, 2000). The loss of pelvic fin and girdle in this species is considered a homoplasic condition, observed in other species belonging to different lineages of Trichomycteridae. The reductions in the numbers of opercular and interopercular odontodes and branched pectoral-fin rays are apparently derived features supporting the hypothesis of a sister group relationship between *S. bortayro* and *S. leoncitensis*.

**Material examined.** Includes material cited in Fernández (2000), Fernández & Vari (2000), Fernández & de Pinna (2005); with the addition of the following:

*Bullockia maldonadoi*: USNM 167872, 2 paratypes; Chile: Nonquén. – ANSP 69145, 1; Chile. – ANSP 69146, 1; Chile. – MNHNC 10A, 2; Chile. – FML 2603, 1 c&s; Chile.

*Eremophilus mutisii*: AMNH 7072, 1 c&s; Colombia. – MCZ 35809, 1; Colombia.

*Hatcheria macraei*: USNM 1546, 1 syntype; Argentina. – MCZ 8298, 1 syntype; Argentina. – USNM 126664, 1 c&s; Argentina. – FML 1139, 1; Argentina: Dique José Ignacio de la Rosa. – MCN uncat., 3, c&s; Argentina: San Juan: Río Calingasta. – MACN 3598, 2; Argentina. – *H. patagoniensis*: CAS 63844, 2 paratypes; Argentina. – CAS 63842, 1; Argentina. – *H. titcombi*: CAS 28557, holotype; Argentina.

*Rhizosomychthys totae*: CAS-SU 37074, 1 paratype, radiograph; Colombia: Lago Tota. – USNM 120130, 4, radiographs; Colombia: Lago Tota. – MCZ 35744, 1 paratype, CT-scan, radiograph; Colombia: Lago Tota.

*Silvinichthys bortayro*: AMNH 233621, 1 paratype; Argentina: Salta: San Luis. – MZUSP 83359, 1 paratype; Argentina: Salta. – FML 2591, 2 paratypes, c&s; Argentina: Salta. *S. mendozensis*: IBAUNC 81, 2 paratypes; Argentina: Mendoza. – FML 2100, 3 c&s; Argentina: Río Mendoza. – IADIZA 42, 3; Argentina: Mendoza. – MNHNC 21A, 1; Argentina: Mendoza. – MCZ 54161, 3 radiographs; Argentina: Río Mendoza. *Silvinichthys* sp.: MCN 1515, 2 c&s; Argentina.

*Trichomycterus alterus*: MCN 1350, 2; Argentina. – FML 2085, 1 c&s; Argentina: La Rioja: San Blás, Andalucas. *T. areolatus*: UMMZ 215386, 1 c&s; Chile. *T. belensis*: FML 2531, 1 c&s; Argentina: Catamarca: Laguna Blanca. *T. borellii*: BMNH 1897.1.27.26, 1 radiograph; Argentina. *T. boylei*: FML 1147, 2, 1 c&s; Argentina: Salta. *T. catamarcensis*: USNM 357449, 1 paratype; Argentina: Catamarca: Belén. – FML 2510, 10 c&s; Argentina. *T. corduvensis*: MCN 1372, 4; Argentina. – FML 1796, 1 c&s; Argentina. *T. chungaraensis*: KU 19394, 3 c&s; Chile. *T. duellmani*: KU 20194, 2 c&s; Bolivia: Potosí. *T. hualco*: MCN 1467, 1 paratype; Argentina: La Rioja: San Blas de los Sauces. – USNM 383794, 1 paratype, c&s; Argentina: La Rioja. *T. laucaensis*: KU 19404, 3 c&s; Chile: Lago Lauca. *T. pseudosilvinichthys*: USNM 374759, 3 paratypes, c&s; Argentina: La Rioja: General Lamadrid. *T. ramosus*: FML 2071, 1 c&s; Argentina: Catamarca. *T. rivulatus*: ANSP 66324, 2 c&s; Bolivia. *T. roigi*: MLP 8538, 5 paratypes; Argentina: Jujuy: Andes. – FML 2075, 1 c&s; Argentina: Jujuy: Andes: San Antonio de los Cobres. *T. schmidti*: BMNH 1898.9.23.3, 1 radiograph; Argentina. *T. spegazzinii*: BMNH 1898.9.23.

1–2, 1 radiograph; Argentina: Salta: Cachi. *T. therma*: CBF 9099, 1 c&s; Bolivia: Potosí: Miraflores. *T. tiraquae*: AMNH 39740, 1 c&s; Bolivia. *T. yuska*: FML 1133, 1 c&s; Argentina: Catamarca: Tinogasta: Arroyo Aguas Calientes.

*Ituglanis eichorniarum*: FML 2527, 1 c&s; Argentina: Misiones: Río Paraná.

*Scleronema angustirostris*: BMNH 1944.6.20.1, radiograph; Brazil. – MCP 11169, 1 c&s; Brazil. *S. minutus* BMNH 1891.3.16.84–86, 2 radiographs; Brazil. *S. operculatum*: ANSP 168843, 3 radiographs; Argentina. *Scleronema* sp.: MCP 38344, 2; Brazil. – MCP 37043, 1.

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