

***Astyanax chico* sp. n. – a new species from the río San Francisco basin, northwest of Argentina (Teleostei: Characiformes: Characidae)**

JORGE RAFAEL CACIOTTA & ADRIANA EDITH ALMIRÓN

División Zoología Vertebrados, Facultad de Ciencias Naturales y Museo, UNLP, Paseo del Bosque, 1900 La Plata, Argentina. E-mail: jrcas @ fcnym.unlp.edu.ar

Abstract. *Astyanax chico* is described from two tributaries of the río San Francisco located in the northwestern part of Argentina. *Astyanax chico* bears hooks on all fin rays of males like *A. ojíara*, *A. pynandi*, *A. stenohalinus*, and *A. troya*. *Astyanax chico* is distinguished from the remaining species of the genus by the following combination of characters: one maxillary tooth with 2 to 4 cusps; teeth of inner premaxillary row expanded distally, deep dentary bearing 7 teeth decreasing in size anteroposteriorly; males with hooks in all fins; 35–39 perforated scales in lateral series; iii-iv, 19–24 anal fin rays. One humeral spot vertically elongated, a second lateral spot may be faint or well developed.

Resumen. *Astyanax chico* sp. n. – una nueva especie de la cuenca del río San Francisco, noroeste de Argentina (Characiformes, Characidae). – *Astyanax chico* es descripta de dos arroyos afluentes del río San Francisco, localizados en el noroeste de Argentina. *Astyanax chico* lleva ganchitos en todas las aletas de los machos como *A. ojíara*, *A. pynandi*, *A. stenohalinus* y *A. troya*. *Astyanax chico* se distingue de las restantes especies del género por la siguiente combinación de caracteres: un diente maxilar con 2 a 4 cúspides, dientes de la serie interna del premaxilar expandidos distalmente, dentario alto llevando 7 dientes que disminuyen de tamaño anteroposteriormente, machos con ganchos en todas las aletas, 35–39 escamas prefórradas correspondientes al sistema de la linea lateral, iii-iv, 19–24 radios anales. Una mancha humeral elongada verticalmente y una segunda mancha lateral que puede ser notoria o difusa.

Kurzfassung. *Astyanax chico* wird beschrieben von zwei Zuflüssen zum río San Francisco im nordwestlichen Argentinien. Die Männchen von *Astyanax chico* besitzen Hähnchen auf allen Flossen wie auch *A. ojíara*, *A. pynandi*, *A. stenohalinus* und *A. troya*. *Astyanax chico* kann von allen anderen Arten der Gattung durch folgende Merkmalskombination unterschieden werden: Maxillare mit einem zwei- bis vierspitzigen Zahn, Zähne der inneren Praemaxillareihe distal verbreitert, Dentale mit sieben gleichmäßig caudal kleiner werdenden Zähnen; Männchen mit Hähnchen in allen Flossen, 35–39 durchbohrte Schuppen in der Seitenlinie; Anale mit iii-iv, 19–24 Flossenstrahlen. Ein vertikal verlängerter Schulterfleck, ein zweiter Fleck auf den Körperseiten schwach oder kräftig entwickelt.

Key words. Characiformes, Characidae, *Astyanax*, new species, río San Francisco basin, Argentina.

Introduction

Within the genus *Astyanax* bony hooks on all fins of males were described for the first time few years ago by AZPELICUETA & GARCÍA (2000). Bony hooks in all fins of males are rare among species of *Astyanax*. This character was only noted in *A. ojíara* Azpelicueta & García, 2000, *A. pynandi* Caciotta et al., 2003, *A. stenohalinus* Messner, 1962, *A. troya* Azpelicueta et al., 2002, and *A. chico* described herein. Hooks on fins was considered as a derived character for Characidae by MALABARBA & WEITZMAN (2003). The presence of hooks in all fins of males in certain species of *Astyanax* could be a derived feature, although its phylogenetic meaning is still unknown.

Males of *Astyanax* bearing this character inhabit different drainages in southern South America. *Astyanax ojíara* is distributed in the río Uruguay basin in Misiones Province,

A. pynandi in the Esteros del Iberá (río Paraná basin in Corrientes Province), *A. troya* inhabits río Paraná basin in Misiones province, and *A. stenohalinus* is present in the Río de la Plata basin.

The aim of this paper is to describe a new species of *Astyanax* bearing hooks on all fins in males, from the río San Francisco basin in the Provinces of Jujuy and Salta.

Material and methods

The specimens examined in this study were cleared and counterstained (C&S) following TAYLOR & VAN DYKE (1985). Measurements are straight distances taken with caliper to the nearest 0.1 mm. Peduncle length is the distance between last branched anal fin ray and hypural joint. Vertebral counts include Weberian apparatus and CU1+PU1 as one element. Values of holotype are indicated by an asterisk.

Institutional abbreviations are as listed in LEVITON *et al.* (1985), excepted Staatliche Natur-historische Sammlungen, Museum für Tierkunde Dresden, Germany (MTD F), Asociación Ictiológica, La Plata, Argentina (AI), and Fundación Miguel Lillo, Argentina (CI-FML).

Astyanax chico sp. n. (Figs. 1–4, Tab. 1)

Material. Holotype. MACN-Ict 8673, 69.0 mm SL, Argentina, Jujuy Province, río San Francisco basin, río de Zora in route 34, coll. Ringuelet *et al.*, 15 July, 1972.

Paratypes. MHNG 2644.100, 2 ex., 43.3–54.5 mm SL, collected with the holotype. AI 168, 9 ex. (2 ex. C&S), 40.1–74.3 mm SL, collected with the holotype. MTD F 28331–28332, 2 ex., 51.5–51.9 mm SL, Argentina, Salta Province, río San Francisco basin, arroyo Saladillo in route 34, nine km north to ciudad de Güemes, coll. Ringuelet *et al.* July, 1972. AI 169, 2 ex., 47.6–50.0 mm SL, Argentina, Salta Province, río San Francisco basin, arroyo Saladillo in route 34, nine km north to ciudad de Güemes, coll. Ringuelet *et al.* July, 1972.

Comparative material. *Astyanax abramis* (Jenyns, 1842): MLP 9427, 2 ex., 102.0–113.0 mm SL, Argentina, Misiones, río Paraná. *Astyanax allenii* (Eigenmann & McAtee, 1907): MLP 6774, 5 ex., 50.0–64.2 mm SL, Argentina, Santa Fe, Laguna Setúbal. *Astyanax asuncionensis* Géry, 1972: MLP 8660, 5 ex., 43.6–61.4 mm SL, Argentina, Santiago del Estero, Bañado de Añatuya. *Astyanax eigenmanniorum* (Cope, 1894): AI 167, 5 ex., 30.3–54.6 mm SL, Brasil, Rio Grande do Sul, Río Jacui basin, arroyo do Conde. MLP 9160, 6 ex. 36.8–80.2 mm SL, Argentina, Buenos Aires, man-made ponds in Los Talas. *Astyanax cf. fasciatus* (Cuvier, 1819): MLP 8668, 4 ex., 61.0–67.7 mm SL, Argentina, Santiago del Estero, Bañado de Figueroa. MLP 8798, 17 ex., 28.8–39.6 mm SL, Argentina, Formosa, highway from Formosa to Clorinda. *Astyanax ita* Almirón *et al.*, 2002: MLP 9599, holotype, 64 mm SL, Argentina, Misiones, río Iguazú basin, arroyo Tateto. *Astyanax latens* Mirande *et al.*, 2004: CI-FML 3400, holotype, male, 44.3 mm SL, Argentina, Salta Province, río Bermejo basin, arroyo El Oculto. *Astyanax leonidas* Azpelicueta *et al.*, 2002: MLP 9580, holotype, male, 45.6 mm SL, Argentina, Misiones, río Paraná basin, headwaters of arroyo Urugua-í. *Astyanax ojiara* Azpelicueta & García, 2000: MLP 9470, holotype, male, 50.5 mm SL, Argentina, Misiones, río Uruguay basin, arroyo Benítez, headwaters of arroyo Yabotí-Miní. *Astyanax paris* Azpelicueta *et al.*, 2002: MLP 9584, holotype, 75.6 mm SL, Argentina, Misiones, río Uruguay basin, arroyo Fortaleza. *Astyanax pynandi* Casciotta *et al.*, 2003: MACN-ict 8543, holotype, 52.0 mm SL, Argentina, Corrientes, Esteros del Iberá, Laguna Iberá, Lobo-Cua. *Astyanax saguazu* Casciotta *et al.*, 2003: MLP 9603, holotype, 63 mm SL, Argentina, Misiones, Uruguay basin, arroyo Once Vueltas. *Astyanax stenohalinus* Messner, 1962: AI 132, 2 C&S, 42.6–55.7 mm SL, Argentina, Buenos Aires, Río de la Plata basin, Punta Indio, unnamed stream. *Astyanax troya* Azpelicueta *et al.*, 2002: MACN-Ict 8310, holotype, 73.8 mm



Fig. 1: *Astyanax chico* sp. n., holotype, MACN-Ict 8673, 69.0 mm SL, Argentina, Jujuy Province, río San Francisco basin, río de Zora in route 34.

SL, Argentina, Misiones, río Paraná basin, arroyo Cuñapirú Chico. *Astyanax tupi* Azpelicueta et al., 2003: MACN-Ict 8646, holotype, 70.1 mm SL, Argentina, Misiones, arroyo Cuñapirú in Balneario of Aristóbulo del Valle.

Diagnosis. The species is distinguished by the following combination of characters: one maxillary tooth with 2 to 4 cusps; teeth of inner premaxillary row expanded distally, deep dentary bearing 7 teeth decreasing in size anteroposteriorly; males with hooks in all fins; 35–39 perforated scales in lateral series; iii–iv, 19–24 anal fin rays. One humeral spot vertically elongated, a second lateral spot may be faint or well developed.

Description. Morphometrics of holotype and paratypes are presented in table 1. Maximum body depth at dorsal fin origin (Fig. 1). Dorsal profile of body slightly convex on snout, straight over eye and supraoccipital region, gently curved from supraoccipital area to origin of dorsal fin, slanted ventrally from dorsal fin origin to adipose fin. Dorsal profile of caudal peduncle scarcely concave. Ventral profile of body notable curved from tip of lower jaw to anal fin origin, straight at anal fin base, and slightly concave on caudal peduncle. Body rounded between pectoral and pelvic fins and laterally compressed between pelvic and anal fins.

Dorsal fin equidistant from tip of snout and base of caudal fin. Pelvic fin origin anterior to vertical through dorsal fin origin. Adipose fin small, anterior to base of last branched anal-fin rays. Tip of pectoral fin reaching or surpassing pelvic fin origin and tip of pelvic fin reaching or not anal fin origin.

Dorsal fin with ii, 8–9* rays; posterior margin of dorsal fin straight, last unbranched and first branched dorsal fin ray longest. Males with small and slender hooks on first five to 9 branched rays.

Anal fin with iii–iv, 19–24 (iii, 22*) rays. Males with posterior margin almost straight; females with last unbranched and five or six branched rays forming a small lobe. Anal fin of males bearing hooks on last unbranched and twenty two branched rays, directed outward and curved dorsally; one pair of hooks on each segment.

One unbranched and 8 or 9 branched principal caudal fin rays in upper lobe; 8 branched and 1 unbranched principal rays in lower lobe; lower lobe slightly longer. Males with few very slender hooks occurring on distal tips on middle caudal fin rays.

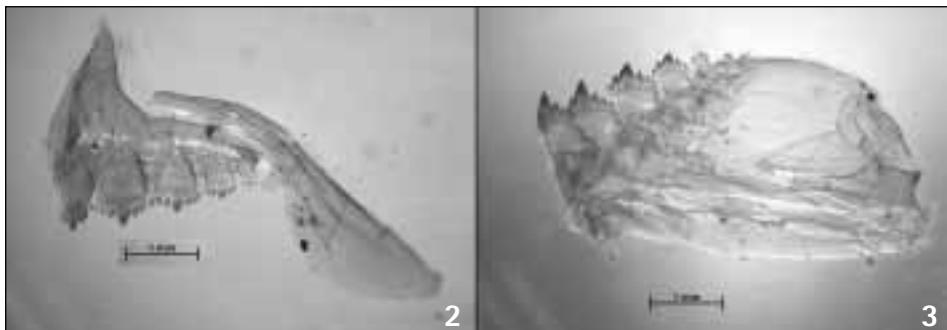


Fig. 2: *Astyanax chico* sp. n., right upper jaw in lingual view.

Fig. 3: *Astyanax chico* sp. n., right lower jaw in lingual view.

Pectoral fin with i,11*–12 rays. Posterior margin of pectoral fin rounded. Slender hooks on first seven to eleven branched rays in males.

Pelvic fin with i,7 rays, posterior margin of fin slightly rounded. Males with hooks on first five branched rays.

Head length less than 1/3 of SL, mouth terminal, horizontal; snout short. Lower and upper jaws equal in length. Premaxilla with 2 series of teeth, each tooth with a central cusp slightly larger. Outer row with 3 to 4 teeth with 3 to 7 cusps, third, or third and fourth teeth, placed inward. Inner series of premaxilla with 5 teeth very expanded distally; symphysial tooth slender, with 4 to 5 cusps; remaining teeth with 3 to 7 cusps (Fig. 2), central cusp scarcely longer than the others. Maxilla with short anterodorsal and laminar processes, the last one scarcely surpass vertical through anterior orbital margin. One maxillary tooth with 2 to 4 cusps (14 ex. and holotype, Fig. 2). Dentary deep, with 7 teeth decreasing in size anteroposteriorly. Four or five largest teeth with 5 to 8 cusps, and the remaining two or three with 1 or 3 cusps (Fig. 3). Eye large, interorbital area convex. Third infraorbital not reaching sensory tube of preopercle. Lateral series with 35–39 perforated scales (3 ex. = 35; 6 ex. = 36; 3 ex. = 37, 4 ex. = 38*; 1 ex. = 39); lateral line running on lower half of caudal peduncle. Six or 7 scales between dorsal fin origin and lateral line; 5 or 6 scales between lateral line and ventral fin origin. Eleven to thirteen scales between supraoccipital process and dorsal-fin origin. Six to eleven rectangular scales placed on anal-fin base. Scales covering basal fifth of caudal lobes. Pelvic axillary scale without hooks on its posterior area in males. First arch bearing 19 gill-rakers (2 ex. C&S). Vertebral counts: 33 vertebrae (2 ex. C&S).

Colour in alcohol. Background pale brown, dorsal region of flanks and head darker. Dark humeral spot vertically elongated bounded by a clear area. Second lateral spot well developed or faint. Dark and broad lateral band ending in a caudal spot, middle caudal fin rays dark. All fins hyaline, dorsal and anal fins with chromatophores.

Sexual dimorphism. Males of *Astyanax chico* sp. n. have pectoral fins longer (23.8–25.8 vs. 22.3–23.8 % SL) and the distance between pectoral and pelvic fin origins is shorter than those of females (21.0–24.6 vs. 24.2–27.2 % SL). Furthermore: males have a deeper caudal peduncle (13.6–15.2 vs. 11.7–13.6) than females. Also they bear bony hooks on all fin rays.

Etymology. The specific epithet *chico* is given in honor to Francisco Alves “Chico” Mendes, a leader of rubber tappers who was a defender of the Amazonian rainforest.

Distribution. *Astyanax chico* sp. n. is known from the río de Zora and arroyo Saladillo, both affluents of the río San Francisco (Fig. 4).

Table 1: Morphometric data of the holotype and 15 paratypes of *Astyanax chico* sp. n. Standard length expressed in mm; SD, standard deviation.

	Holotype	Range	Mean	SD
Standard length	69.0	40.1–74.3		
Percents of SL				
Predorsal distance	51.9	50.0–55.4	52.9	1.52
Prepelvic distance	49.7	47.7–53.0	49.9	1.59
Preanal distance	67.0	61.5–68.8	66.4	1.91
Body depth	41.4	37.3–43.0	40.8	1.81
Dorsal fin base	13.2	13.2–16.0	14.7	0.81
Anal fin base	28.3	27.4–32.6	29.4	1.48
Pectoral fin length	23.8	22.3–25.8	24.0	1.12
Pelvic fin length	17.7	16.7–22.0	18.6	1.82
Distance between pectoral and pelvic fin origins	24.6	21.0–27.2	24.4	1.59
Distance between pelvic and Anal fin origin	20.3	16.9–21.6	19.7	1.42
Head length	28.1	25.4–29.5	28.1	1.00
Caudal peduncle depth	12.8	11.7–15.2	13.1	0.88
Caudal peduncle length	11.3	10.1–12.0	11.1	0.55
Percents of head length				
Snout length	25.8	22.5–27.6	24.6	1.40
Eye	35.6	35.1–42.7	38.2	2.46
Interorbital distance	32.0	28.9–34.7	32.3	1.45
Postorbital length	41.8	40.3–47.2	43.9	1.98
Maxillary length	23.7	21.9–28.3	25.5	2.31
Peduncle length	40.2	36.4–42.9	39.5	2.25

Remarks. The species of *Astyanax* bearing hooks on all fins of males are *A. ojriara*, *A. pynandi*, *A. stenohalinus*, *A. troya*, and *A. chico* described herein. *Astyanax chico* differs from *A. ojriara*, *A. pynandi* and *A. troya* in the lower number of cusps of the maxillary tooth (*A. chico* has 2 to 4 vs. *A. ojriara* and *A. pynandi* 7, and *A. troya* 5 cusps). Also, *A. chico* has higher values in the relation caudal peduncle depth / caudal peduncle length than that present in *A. troya* (108.4–128.8 vs. 70.0–95.6). Finally, *A. chico* differs from *A. stenohalinus* in having lower number of anal fin rays (22–28 vs. 30–36).

Acknowledgements

We would like to express our gratitude to C. Tremouilles (UNLP) for help with figures. The Comisión de Investigaciones de la Provincia de Buenos Aires (CIC) partially support this paper. Pictures of premaxilla and dentary were taken with an equipment Zeiss Stemi 2000-C, AxioCam MRc, software Axiovision 3.1, donated by Alexander von Humboldt Fundation to F. Goin (UNLP).

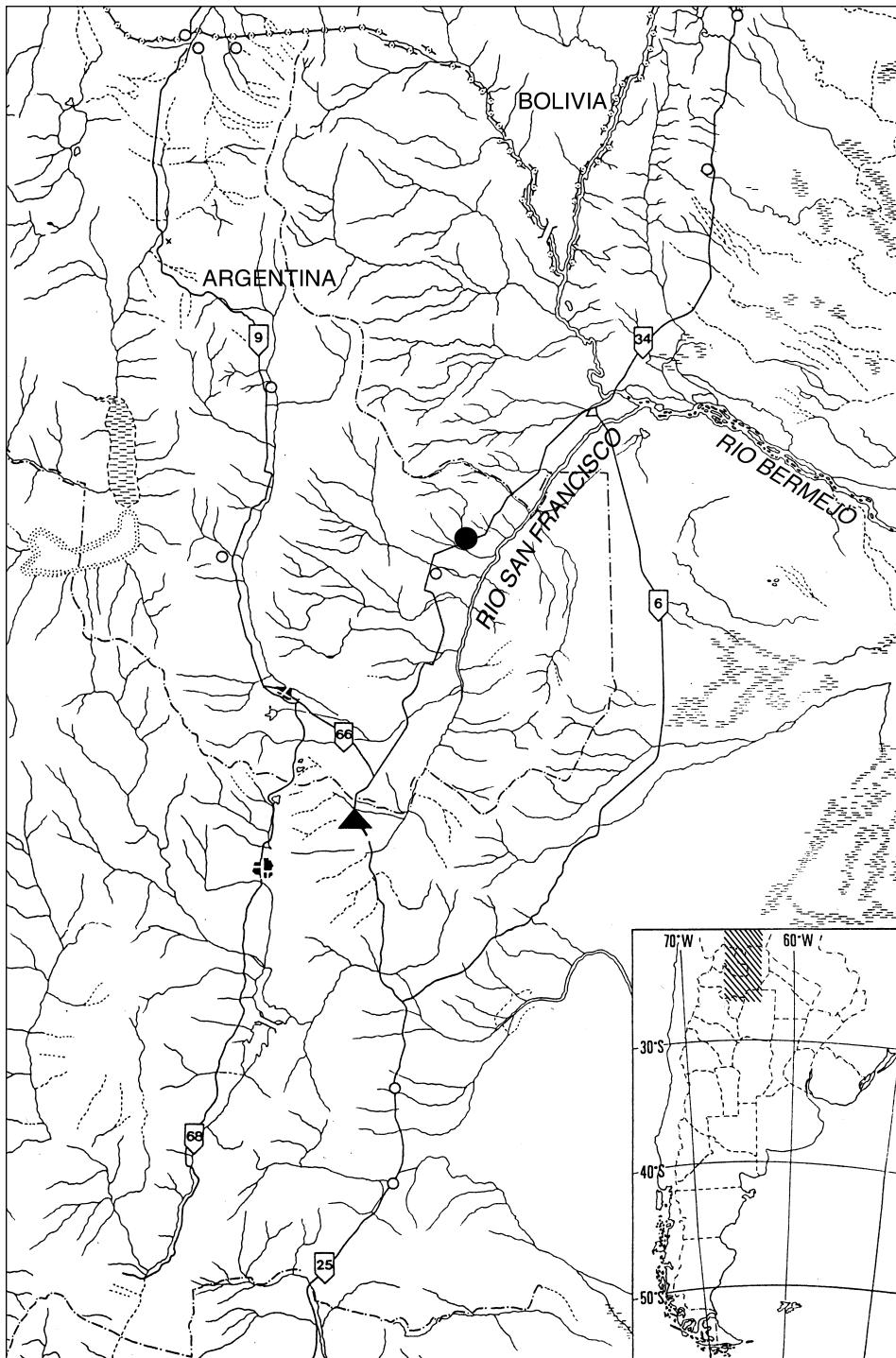


Fig. 4: Geographical distribution of *Astyanax chico* sp. n.: black circle: río de Zora, Jujuy Province (type locality), black triangle: arroyo Saladillo, Salta Province.

References

- AZPELICUETA, M. DE LAS M. & J. O. GARCÍA (2000): A new species of *Astyanax* (Characiformes, Characidae) from Uruguay river basin in Argentina, with remarks on hook presence in Characidae. – Rev. suisse. Zool., **107**: 245–257.
- LEVITON, A. E., R. H. GIBBS, JR., E. HEAL, & C. E. DAWSON (1985): Standards in herpetology and ichthyology: Part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. – Copeia, **1985**: 802–832.
- MALABARBA, L. R. & S. H. WEITZMAN (2003): Description of a new genus with six new species from southern Brazil, Uruguay and Argentina, with a discussion of a putative characid clade (Teleostei: Characiformes: Characidae). – Comun. Mus. Ciênc. Tecnol. PUCRS, Sér. Zool., **16**: 67–151.
- TAYLOR, W. R. & G. C. VAN DYKE (1985): Revised procedures for staining and clearing small fishes and other vertebrates for bone and cartilage study. – Cybium, **9**: 107–119.

Received 15.07.04, accepted 30.07.04.