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NOTES ON GEOGRAPHIC DISTRIBUTION

Astyanax argyrimarginatus Garutti, 1999 (Characiformes: Characidae): First Xingu basin distribution record and geographic distribution map

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ABSTRACT: We present new records of *Astyanax argyrimarginatus* Garutti, 1999 for the Xingu basin and distribution extension of approximately 1,000 km towards north-west in Tocantins-Araguaia basin. The species was previously known only from tributary of upper rio Araguaia, Goiás and Mato-Grosso states, Brazil.

The Neotropical genus *Astyanax* Baird and Girard, 1854 includes approximately 90 species whose geographic distributions, although widely recorded in South America, are still poorly understood (Lima *et al.* 2003; Garutti and Venere 2009). In 1999, *Astyanax argyrimarginatus* Garutti was described as a new species based on 45 specimens collected from a tributary of the upper rio Araguaia, Goiás and Mato-Grosso states in central Brazil and it remains known only from its locality. Herein, we present the first record of *A. argyrimarginatus* for the Xingu basin and expand the known geographical distribution about 1,000 km north-westward into the Tocantins-Araguaia basin.

The species mentioned here (Figure 1) belongs to the *bimaculatus* species complex and shares with these species the following combination of characters: i) black humeral spot horizontally elongated, ii) two diffuse vertical bars in the humeral region, iii) a lateral black stripe that extends to the middle caudal-fin rays, and iv) a large silver stripe extending along the body. It differs, however, from all other congeners by the presence of many scales in lateral line (equal or higher than 42 scales) and one tooth in the maxillary bone (for more information see diagnosis of the species in Garutti 1999 and Garutti and Langeani 2009).

These new records were obtained during field surveys carried out between 2007 and 2010 in small streams of the Carajás National Forest (Floresta Nacional de Carajás), and the Serra Onça Puma, in Southwestern Pará, Brazil (Figure 2).

Collections were made using sieves (3 mm mesh), casting net (9 mm mesh), seines (2 mm mesh) and gillnet (40 mm mesh). The specimens were preserved in 10 % formalin solution and conserved in 70 % ethanol. Measurements and counts followed essentially Garutti (1999), and were made using a digital caliper nearest to 0.1 mm. Counts were taken under a stereomicroscope (Table 1). Specimens were collected under collection permits 012/2007 and 008/2010 - IBAMA 02047.000384/2007-34 and were deposited at the ichthyology collections of INPA and MPEG (Appendix I).

The expansion of the occurrence area in Tocantins-Araguaia basin is represented by the igarapé Motosserra (Figure 3A, 06°32'33" S, 051°04'55" W) tributary of rio Cateté, and by the rio Cinzento (Figure 3B, 05°51'35" S, 050°31'24" W) tributary of rio Itacaiúnas. Furthermore, the new record of occurrence for the Xingu basin is given by igarapé Paxiubal (Figure 3C, 06°36'53" S, 051°15'09" W) and igarapé Mogno (Figure 3D, 06°33'06" S, 051°10'59" W), both tributaries of rio Carapanã. All are small clear water tributaries with a mean width and depth of 5.2 and 0.9 m, respectively.

Although a review of the genus *Astyanax* with consideration toward a larger distribution has not been performed, no differences were found between specimens from the tributaries of Xingu and Tocantins-Araguaia. Despite some variations in the characters found, the specimens can be only identified as *A. argyrimarginatus*.

FIGURE 1. (a) *Astyanax argyrimarginatus*, INPA 36369, male, 67.6 mm SL, igarapé Mogno, Pará state, Brazil. (b) Specimen photographed alive, captured in the same locality of voucher INPA 36369

Table 1. Morphometric and meristic data of thirteen specimens *Astyanax argyrimarginatus* captured on Xingu and Tocantins-Araguaia basins.

	XINGU BASIN			TOCANTINS-ARAGUAIA BASIN		
CHARACTER	**N**	**LOW – HIGH**	**MEAN ± SD**	**N**	**LOW - HIGH**	**MEAN ± SD**
Standard length (mm)	6	50.3 - 72.2	67.2 ± 8.4	7	55.1 - 102.7	85.3 ± 14.8
Head length	6	13.9 - 19.6	18.0 ± 2.1	7	15.7 - 26.8	22.9 ± 3.6
Body depth	6	18.9 - 29.8	25.8 ± 3.8	7	23.3 - 47.1	37.9 ± 8.5
Predorsal length	6	25.6 - 37.5	32.6 ± 5.5	7	29.7 - 54.0	45.5 ± 7.6
Preanal length	6	34.3 - 51.7	46.4 ± 6.2	7	39.3 - 71.0	58.6 ± 10.1
Dorsal-peitoral distance	6	20.4 - 31.2	27.8 ± 3.9	7	24.5 - 47.5	39.5 ± 7.3
Dorsal-anal distance	6	20.4 - 31.1	27.8 ± 3.8	7	23.8 - 59.1	43.4 ± 10.6
Anal-adipose distance	6	19.7 - 26.8	24.8 ± 2.6	7	22.2 - 40.0	33.6 ± 5.6
Dorsal-adipose distance	6	17.7 - 28.4	25.7 ± 4.0	7	21.9 - 41. 7	36.1 ± 6.7
Orbital diameter	6	5.2 - 7.5	6.8 ± 0.8	7	5.5 - 8.7	7.7 ± 1.1
Interorbital width	6	4.9 - 6.9	6.3 ± 0.8	7	5.3 - 10.7	8.4 ± 1.6
Head depth	6	15.9 - 24.5	21.4 ± 2.9	7	19.1 - 36.7	29.4 ± 5.8
Peduncle depth	6	6.1 - 8.7	7.8 ± 0.9	7	6.1 - 12.5	10.3 ± 2.0
PERCENTAGES OF STANDARD LENGTH						
Head length	6	25.3 - 27.5	26.8 ± 0.9	7	25.8 - 28.5	26.9 ± 0.9
Body depth	6	36.8 - 41.7	38.3 ± 1.8	7	35.4 - 48.7	44.2 ± 4.5
Peduncle depth	6	10.9 - 12.1	11.7 ± 0.5	7	11.1 - 12.9	12.0 ± 0.6
Predorsal length	6	35.4 - 52.5	48.8 ± 6.6	7	51.5 - 55.6	53.4 ± 1.4
Preanal length	6	66.3 - 72.4	69.0 ± 2.1	7	63.9 - 71.3	68.9 ± 2.5
Dorsal-peitoral distance	6	39.6 - 43.6	41.3 ± 1.6	7	44.5 - 48.6	46.2 ± 1.3
Dorsal-anal distance	6	40.4 - 43.5	41.4 ± 1.1	7	43.2 - 68.5	50.6 ± 8.2
Anal-adipose distance	6	35.8 - 39.1	37.0 ± 1.1	7	37.7 - 40.7	39.5 ± 0.9
Dorsal-adipose distance	6	35.1 - 39.3	38.0 ± 1.6	7	39.8 - 44.5	42.2 ± 1.9
PERCENTAGES OF HEAD LENGTH						
Orbital diameter	6	33.8 - 40.2	37.8 ± 2.2	7	31.6 - 35.0	33.7 ± 1.3
Interorbital width	6	33.9 - 36.3	35.2 ± 0.9	7	33.8 - 39.9	36.6 ± 2.0
Head depth	6	114.7 - 125.1	118.5 ± 3.9	7	112.7 - 140.8	128.1 ± 9.8
PERCENTAGES OF BODY DEPTH						
Peduncle depth	6	28.3 - 32.6	30.5 ± 1.7	7	24.5 - 36.6	27.5 ± 4.1
COUNTS	**N**	**LOW - HIGH**	**MODE**	**N**	**LOW - HIGH**	**MODE**
Scales in lateral line (LL)	6	42 - 46	42	7	44 - 46	44
Rows of scales above LL	6	6 - 9	8	7	8 - 10	9
Rows of scales below LL	6	6 - 7	7	7	7 - 8	8
Transverse scales	6	13 - 17	16	7	16 - 19	16
Anal rays	6	iii24 - iii28	Iii28	7	iii23 - iii28	iii25

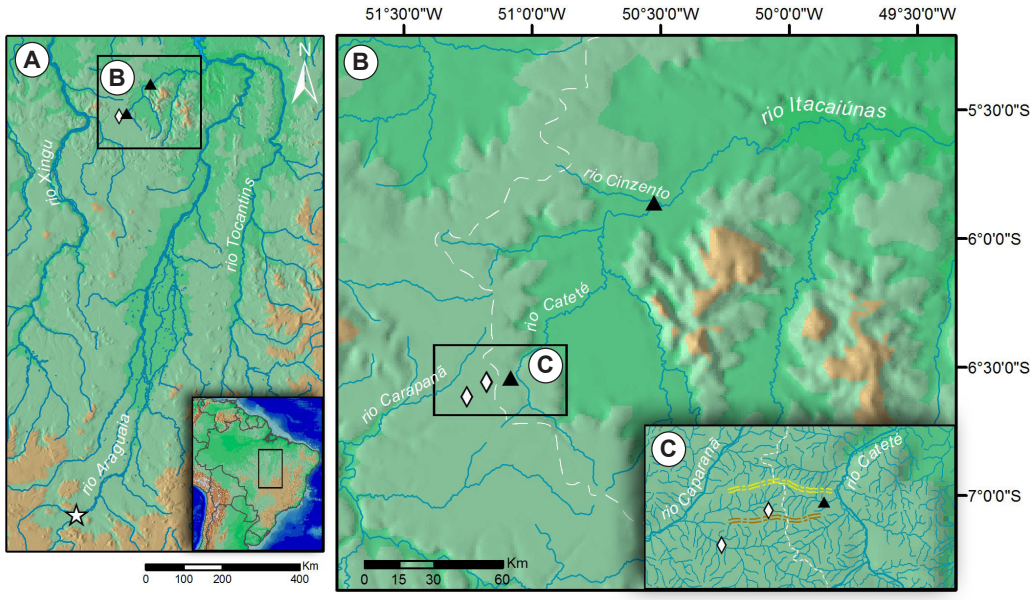

Figure 2. Area of distribution of *Astyanax argyrimarginatus*. (a) The star represents the type locality (Garutti 1999) at rio Araguaia; (b) black triangles represent the new record for Tocantins-Araguaia basin; and (b and c) white diamonds represent the new record for Xingu basin. The dashed white line in figure b and c represents the division of watersheds, at the left has the Xingu basin and at the right has Tocantins-Araguaia. Dashed yellow: Onça mountain range [Serra Onça]. Dashed brown: Puma mountain range [Serra Puma].

The species in life presents fins with red color, more intense on the caudal fin and the anterior anal-fin rays (Figure 1B). Bony hooks on anal-fin are hypothetically a synapomorphy of the family Characidae (Malabarba and Weitzman 2003). These structures were detected on anal-fins of mature males (75-107 mm *TL*) captured in February, 2010 (wet season). In these specimens, three have bony hooks on anal-fin of the last unbranched ray to 8th-11th branched (50.35-93.59 mm *SL*, INPA 36370, INPA 36371 and INPA 36372).

We suggest the possibility that this species may be more widely distributed than first thought. Given that the known locality of *A. argyrimarginatus* is more than 1,000 km away from the newly recorded locations this indicates a wider range within the Tocantins-Araguaia than previously thought. Since one of the new collections is located within the Xingu river basin, we suggest that the species distribution also may include the Xingu, with the possibly that connectivity exists between populations in the two basins. Therefore, new biogeographic directions of ichthyofauna of two main hydrographic basins of South America are indicated.

Figure 3. Environment where *Astyanax argyrimarginatus* specimens were recorded. A) igarapé Motosserra, sub-basin of the rio Cateté; B) rio Cinzento, sub-basin of the rio Itacaiúnas; C) igarapé Paxiubal; and D) igarapé Mogno, both from sub-basin of the rio Carapanã.

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