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First record of *Apistogrammoides pucallpaensis* Meinken, 1965 (Perciformes, Cichlidae) for Brazil, in addition to fecundity information

Primeiro registro de *Apistogrammoides pucallpaensis* Meinken, 1965 (Perciformes, Cichlidae) para o Brasil, em adição informações da fecundidade

Jomara Cavalcante de Oliveira[1]*, Jonas Alves de Oliveira[1] and Danielle Pedrociane Cavalcante Rossato[1]

[1]Grupo de Pesquisa em Ecologia e Biologia de Peixes, Instituto de Desenvolvimento Sustentável Mamirauá, Estrada do Bexiga, 2584, Fonte Boa, CEP 69553-225, Tefé, AM, Brasil
*e-mail: jomaracoliveira@gmail.com

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Abstract: Aim: The objective of this work is to record the occurrence of *Apistogrammoides pucallpaensis* in Brazilian territory, since so far its distribution is restricted to Peru and Colombia. **Methods:** The collections were carried out in the year of 2013, during the research of ichthyofauna of the region of Auati-Paraná, located in the Mamirauá Reserve in the state of Amazonas. In the floating aquatic vegetation was used net and on the coastal region rapichés. *Apistogrammoides* is the only one among Geophaginae that has 6-9 spines in the anal fin, while *Apistogramma* has 3-4. **Results:** Note the presence of three evident mark on the caudal fin and presence of a black stripe on the side of the body that follows from the eye to the caudal peduncle feature thet differentiate the genre. **Conclusions:** This work extends the distribution of *A. pucallpaensis* being the first record of the species for Brazil.

Keywords: dwarf cichlid; floating vegetation; spawning type.

Resumo: Objetivo: Este trabalho tem como objetivo registrar a ocorrência de *Apistogrammoides pucallpaensis* no território brasileiro, pois até o momento tem sua distribuição restrita ao Peru e Colômbia. **Métodos:** As coletas foram realizadas no ano de 2013, durante o levantamento da ictiofauna da região do Auati-Paraná, localizada na Reserva Mamirauá no estado do Amazonas. Nas vegetações aquáticas flutuantes foram utilizadas rede de cerco e na região litoral foram utilizados rapichés. *Apistogrammoides* é o único entre os Geophaginae que possui de 6-9 espinhos na nadadeira anal, enquanto *Apistogramma* possui de 3-4. **Resultados:** Nota-se a presença de três manchas evidentes na nadadeira caudal e presença de uma listra preta na lateral do corpo que segue desde o olho até o pedúnculo caudal, característica marcante para diferenciar a espécie. **Conclusões:** Este trabalho amplia a distribuição de *A. pucallpaensis*, sendo o primeiro registro da espécie para o Brasil.

Palavras-chave: ciclídeo anão; vegetação flutuante; tipo de desova.

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Apistogrammoides is a monotypic genus similar to *Apistogramma* in most respects, including synapomorphous separate pores of adjacent preopercular and anguloarticular lateralis canal foramina, distinguished especially by a long anal fin (Kullander, 1986; Mesa & Lasso, 2011). It is distinguished from the genus *Apistogramma* especially by the number of spines of the anal fin, which is the only important character that differentiates the genus, since *Apistogrammoides* is the only Geophaginae that has 6-9 spines in the anal fin, while *Apistogramma* has 3-4 (Kullander, 1986).

Apistogrammoides pucallpaensis Meinken, 1965 is a small species commonly known as a dwarf cichlid. This cichlid freshwater species inhabits lentic water bodies and is commonly found around of roots of floating vegetation and litter of the littoral zone (Crampton, 1999; Kullander, 2003).

The new record *Apistogrammoides pucallpaensis* was described in the Auati-Paraná region, which is a complex of lakes of different sizes and habitats. It is also an important water carrier between Solimões and Japurá rivers. This complex drainage network certainly works as an efficient corridor of diversity between the marginal areas and the floodplain ecosystems (ICMBio, 2011).

The collections were performed quarterly in the flooding, full, ebb and dry seasons in the 2013 year. We used drag net for the collections in floating vegetation and hand nets in litter of the littoral zone. The collected samples were dipped in benzocaine hydrochloride solution at a concentration of 250 mg/L until the total loss of equilibrium (according to Resolution No. 714 of June 2002 the Federal Council of Veterinary Medicine), subsequently immersed it in 10% formalin and later transferred into 70% ethanol. They were subsequently measured using digital calipers to the nearest 0.1 mm. We adopted a previous classification system proposed by Brown-Peterson et al. (2011) for the macroscopic analysis of the gonads. To estimate fecundity and to determine spawning type, we analyzed spawning capable ovaries. They were immersed Gilson solution (Vazzoler, 1996) and shaken gently until obtaining oocyte dissociation from the ovarian matrix. After separated, all oocytes had their diameter measured under a microscope-stereoscope, with a micrometric ocular lens (at 0.1 mm accuracy). The frequency distribution of oocyte diameters for each of the spawning capable ovaries analyzed us to infer the spawning type of each species, and the position of the more advanced modes identified the oocyte developmental stage. We established total fecundity from the amount of vitelogenic oocytes present in each of the mature ovaries analyzed.

A total of 1047 specimens of *A. pucallpaensis* were collected (Figure 1) in the floodplain lakes of the Auati-Paraná region, during a field trip conducted by the research group Ecologia e Biologia de Peixes, Instituto de Desenvolvimento Sustentável Mamirauá, which aimed to study the fish diversity of the region of the floodplain lakes.

Twenty-four specimens were deposited in the Coleção Ictiológica of the Instituto de Desenvolvimento Sustentável Mamirauá with the code IDSMICTIO002616.

Comparing the morphometry described for *A. pucallpaensis* in Kullander, 1986, we found the following measurements for the specimens collected in the floodplains lakes of the Auati-Paraná region (Table 1).

Distribution: Previously, *A. pucallpaensis* was known only to Colombia and Peru (Figure 2A) - Isla Santa Sofía about 30 km upstream from Leticia (Colombia); Samiria, Pacaya and Ucayalli drainage (Peru). In this study we recorded *A. pucallpaensis* in two Amazonian lakes of Brazil - Onça Lake (2°01'24.7"S; 66°00'07.0"W) and Remanso Lake (2°04'09.8"S; 65°55'07.0"W) (Figure 2B).

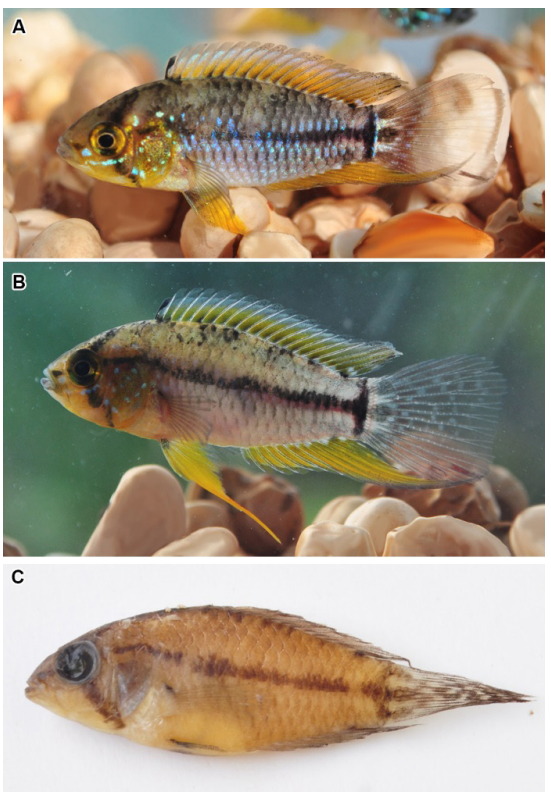

Figure 1. Examples of *Apistogrammoides pucallpaensis*. (A) Living example; (B) Living example in stress situation; (C) Alcohol example. Standard length 40 mm.

Table 1. Morphometry of 50 specimens of *Apistogrammoides pucallpaensis*, including sample range, mean and standard deviation (S.D.).

	Range (mm)	Mean	S.D.
Standard length	15.6-25.9	20.0	1.8
Head depth	5.0-9.2	5.3	0.5
Head length	5.3-9.5	7.2	0.7
Head width	2.1-4.2	2.9	0.3
Body depth	5.0-9.2	6.5	0.7
Predorsal length	5.3-9.5	7.7	0.8
Prepelvic length	5.6-9.9	8.0	0.7
Caudal peduncle depth	2.4-4.3	3.2	0.3
Caudal peduncle length	0.9-2.5	1.7	0.3
Dorsal-fin base length	8.2-15.5	11.3	1.2
Anal-fin base length	4.1-6.9	5.6	0.6
Pectoral-fin length	3.8-7.4	5.6	0.8
Orbital diameter	1.9-3.5	2.8	0.3
Snout length	1.0-1.7	1.5	0.2
Cheek depth	1.2-2.2	2.2	0.2
Preorbital depth	0.5-1.1	0.6	0.1
Upper jaw length	1.6-2.7	1.9	0.2
Lower jaw length	2.6-3.5	2.9	0.2
Last dorsal-fin spine length	2.8-6.0	5.0	1.1
Last anal-fin spine length	2.5-6.0	4.0	1.0

Environment: Freshwater species *Apistogrammoides pucallpaensis* can be found in the roots of floating vegetation (Crampton, 1999) and is in the litter of the littoral zone as described in this study. The species was collected in white water environments and presented the following physicochemical conditions: mean temperature 27.5 °C, pH 7.6, dissolved oxygen (O_2) 2.0 mg.l-1 and conductivity 113.0 µS.m-1.

Spawning type and fecundity: We measured the diameter of the oocytes from ten spawning capable ovaries and found a variation between 0.1 and 1.2 mm and mean size 0.7 mm (S.D. = 0.3 mm). The size distribution presented two evident batches. The first batch was observed in diameters between 0.1 and 0.3 mm and the second in diameters between 0.6 and 1.2 mm. This distribution characterizes the spawning of the total type, i.e. in each reproductive season a single batch of oocytes is spawned (Figure 3). Spawning characterization of the total type has been found for other representatives of Geophaginae, such as

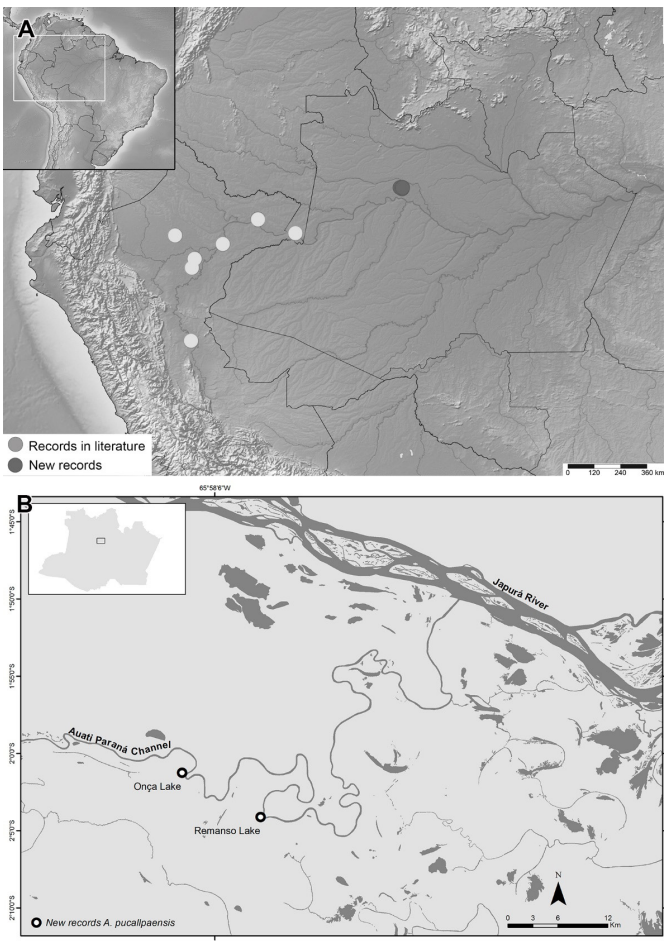

Figure 2. Geographical records of *Apistogrammoides pucallpaensis*. (A) Known geographical distribution; (B) Two new records in Amazonian lakes of Brazil.

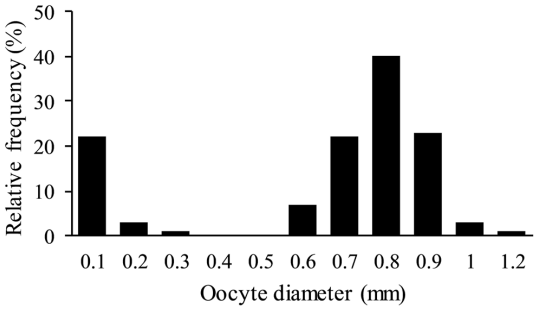

Figure 3. Oocyte size distribution from ten spawning capable ovaries of *Apistogrammoides pucallpaensis*.

Apistogramma agassizii and *A. bitaeniata* (Oliveira & Queiroz, 2017). It is believed that the reproductive strategy of these small cichlids differs from that of medium and large cichlids. The small species invest in a single spawn in the reproductive season, when the oocytes are larger and generate larger larvae and increase the chance of survival of the offspring. Therefore, nutrients are conditioned for the development of oocytes, reducing the number of oocytes produced. The average fecundity total found for *A. pucallpaensis* was 87.7 oocytes (S.D. = 28.6) and corroborates the hypothesis that this Geophaginae also invests in oocyte size and in a single spawn per reproductive season.

This note extends the distribution of *A. pucallpaensis* and is the first record of the species in Brazil. This record suggests that the fish diversity in floodplain lakes, although relatively high, is still poorly investigated in the Amazon River basin (Brazil) and future studies on the reproductive biology of *A. pucallpaensis* will increase the knowledge about this still little-known species.

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