

Short Communication

Misidentification of *Gymnotus interruptus* (Gymnotiformes: Gymnotidae) leads to erroneous karyotype addressing

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Abstract: Recently an article entitled “A unique sex chromosome system in the Knifefish *Gymnotus bahianus* with inferences about chromosomal evolution of Gymnotidae” has presented the chromosomal structure of a *Gymnotus* population inhabiting the Contas River basin, eastern Brazil. We believed that the examined specimens were misidentified as *G. bahianus*. Hence in this work we examined the used material of the above-mentioned work and found that they belong to the species *G. interruptus*. This conclusion was based on a careful examination of materials from both species (type, recently collected, and additional materials). *Gymnotus interruptus* can be distinguished from *G. bahianus* by possessing a colouration pattern in which conspicuous dark obliquely oriented bands occur under lateral line at entire extension of trunk.

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Introduction

Karyotype data are relevant informative characters in fish taxonomy and systematics (Bertollo et al., 1986). Although rarely used, it has yielded satisfactory results in some Neotropical freshwater fishes, especially to better understanding of the taxonomic status of species complexes and cryptic species (e.g. Milhomem et al., 2008). *Gymnotus* Linnaeus, 1758 is a genus of weakly electric fishes occurring from southern Mexico (15°N) to northern Argentina (36°S) (Albert et al., 2005). Current studies unveiled a high diversity of the karyotype arrangements in *Gymnotus* species (2n = 34-54), as well as multiple sex chromosome systems (see Almeida et al., 2015). However, karyotype information of only 10 out of 46 described *Gymnotus* species is available (Almeida et al., 2015). Researchers are working to provide such data for more *Gymnotus* species, although this process requires accurate species identification.

The species *G. bahianus* Campos-da-Paz and Costa, 1996 and *G. interruptus* Rangel-Pereira, 2012

occur as allopatric in the coastal Atlantic basins of North-eastern Brazil (see Campos-da-Paz and Costa, 1996; Rangel-Pereira, 2012). Recently an article entitled “A unique sex chromosome system in the Knifefish *Gymnotus bahianus* with inferences about chromosomal evolution of Gymnotidae” has presented the chromosomal structure of a *Gymnotus* population inhabiting the Contas River basin, eastern Brazil. We believed that the examined specimens were misidentified as *G. bahianus*. Therefore, the present work aimed to clarify this issue by careful examinations of the materials from both species (type, recently collected, and additional materials).

Materials and Methods

Morphological examination follows Albert et al. (2005). Material of *G. bahianus* and *G. interruptus*, including the type and recently collected materials, those examined by Almeida et al. (2005), and other additional specimens were examined (see examined material). Collection's acronyms follow Fricke and

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Eschmeyer (2020), except for those of UFRJ. Almeida et al. (2005) examined 34 specimens that were deposited in the MZUSP) and UFBA collections.

Abbreviations: BND: dark pigment bands; MNRJ: National Museum of Rio de Janeiro; MZUSP: Museum of Zoology at Universidade de São Paulo; PLL: pored lateral-line scales; PLR: pored lateral-line scales to first lateral-line ventral ramus; SAL: scales above lateral line; UFBA, Natural History Museum of Bahia, at Universidade Federal da Bahia; UFRJ: Biology Institute of Universidade Federal do Rio de Janeiro.

Results and Discussions

We identified the materials of Almeida et al. (2015) as *G. interruptus*. *Gymnotus interruptus* is distinguished from *G. bahianus*, even in life, by possessing a colour pattern obliquely oriented wavy margin dark band pairs, presented below lateral line along trunk (vs. dark bands broken into rounded or vermiculate irregularly distributed dark spots in adults (>120 mm) and absent in anterior 60% of body length of juveniles (<110 mm) in *G. bahianus*) (Fig. 1). In addition, counts of the examined material of UFBA 6325 match those of *G. interruptus*, i.e. BND: 23; PLL: 95; PLR: 35 and SAL: 9 (Fig. 1).

More attention should be given to the accuracy of specimens' identification to avoid taxonomic confusion. This step is essential for the establishment of a reliable karyotype database as well as for securing the taxonomic advances (Wheeler, 2008). Since cytogenetic data is applied in the *Gymnotus* taxonomy (Albert et al., 1999; Milhomem et al., 2008, 2012), such misidentifications are potential sources for taxonomical confusion and errors in taxonomic studies. Addressing alien characters to a given species can cause, for example, splitting or lumping bias in which populations are wrongly distinguished from it or grouped with it. Such confusions, if perpetuated, can result in the description of synonyms or in the synonymization of valid species. Therefore, since the specimens examined by Almeida et al. (2015) are actually *G. interruptus*, as showed here, the karyotype pattern published by Almeida et al. (2015) should be

addressed to *G. interruptus*.

Examined materials (All from Brazil. Bahia State): *Gymnotus bahianus*: MNRJ 12316, holotype. — MNRJ 4346, paratypes, 31, Fazenda Almada, Ilhéus municipality, G. Pereira, 16 February 1945. — MNRJ 4188, 2, same locality as holotype; J.G. dos Santos, November 1944. — MNRJ 4381, 3, Urucutuca, Ilhéus municipality, G. Pereira, 1945. — MNRJ 4382, 10, Pirataquicé, Ilhéus municipality, G. Pereira, February 1945. — UFRJ 10105, 5, Rio Água Preta do Mocambo, road BA-655, Uruçuca municipality, F.S. Rangel-Pereira, J.L.O. Mattos, R.C. Rizzieri, W.J.E.M. Costa and O.C. Simões, 20 February 2014. — UFBA 4452, 2, Córrego do Luxo between Ibicaraí and Floresta Azul, Ibicaraí municipality, A.M. Zanata, P. Camelier, A.B. A. Goés, R. Burger, 12 February 2008. — UFBA 5498, 2, wetland near Lagoa Encantada, Ilhéus municipality, P.H. Carvalho, S.M.Q. Lima, D.P. Almeida, 13 February 2009.

Gymnotus interruptus: UFRJ 8218, holotype. — UFRJ 8219, 1. — UFRJ 8243, 1 (c&s), Riacho Cambiriba, Rio de Contas basin, Iguai municipality, P. Bragança et al., 18 June 2011. — UFRJ 10193, 3 (sequenced), Rio Mariana, acima da Cahoeira da Pancada Grande, Ituberá municipality, Rangel-Pereira et al., February 2014. — UFBA 6325, 1, Rio das Pedras, Rio de Contas basin, Jequié municipality, P.R.A.M. Afonso, August 2008. — UFBA 6493, 1, Riacho Serra Grande, Riacho do Canto drainage, Rio das Almas basin, Povoado Nova Esperança, Wenceslau Guimarães municipality, A.M. Zanata et al., 10 October 2010. — UFBA 6494, 2, Riacho Patioba, Rio Petro drainage, Rio das Almas basin, bridge at the border of Wenceslau Guimarães Ecological Station, Wenceslau Guimarães municipality, A.M. Zanata et al., 09 October 2010. — MNRJ 32273, 2, Rio das Velhas, close to serraria 2, Ubaira municipality, M. Cetra and M. Barbosa-Filho, 29 January 2007. — MNRJ 32186, 2, Rio Preto tributary, close to the REBIO on Tres Braços village, Wenceslaus Guimarães municipallity, M. Cetra and M. Barbosa-Filho, 30 January 2007. — MNRJ 32258, 3, tributary of Rio Uruba, close to Valentim village, Boa Nova municipality, M. Cetra et al., 01 February

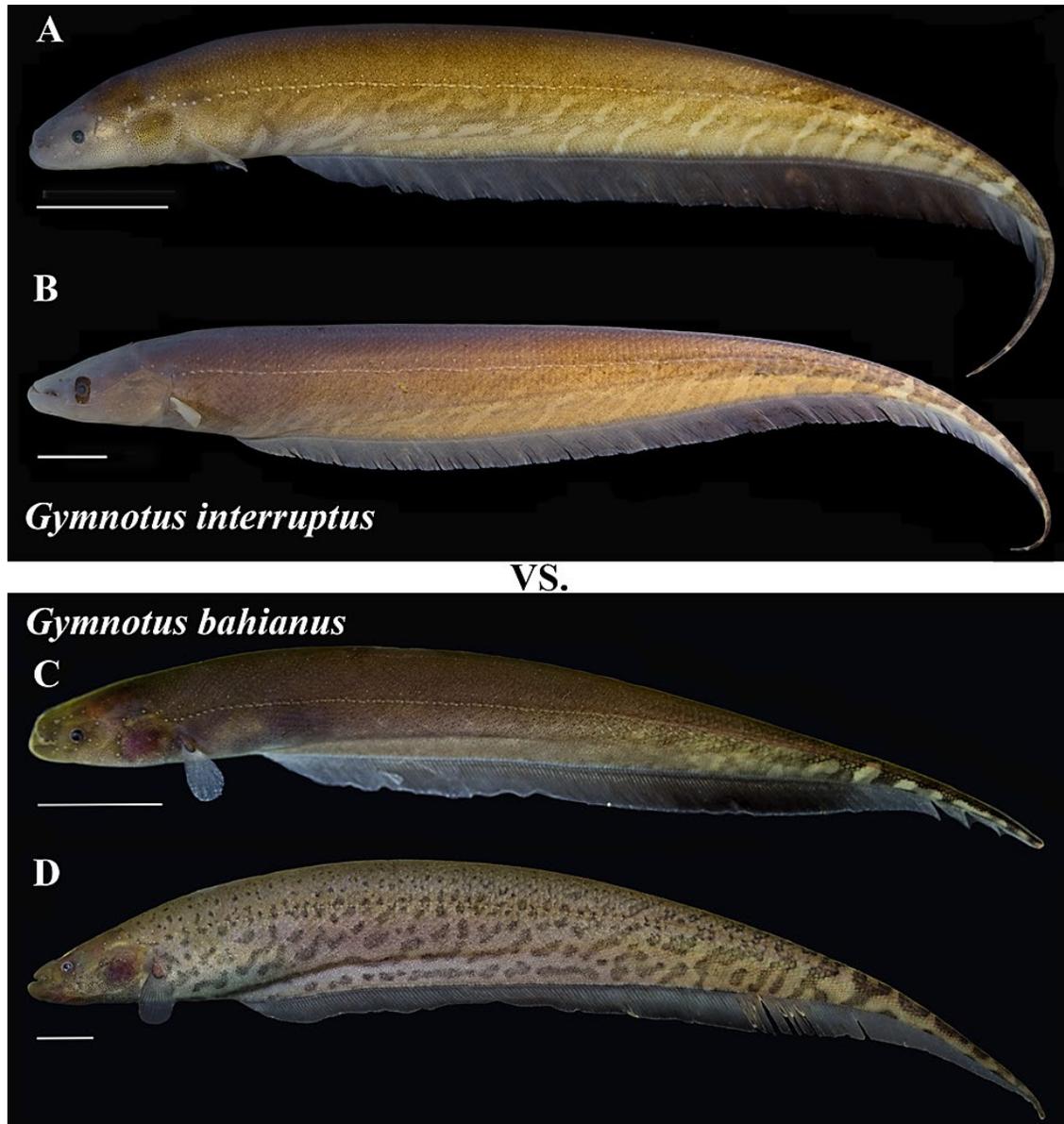


Figure 1. Colour patterns of *G. interruptus* (A and B) and *G. bahianus* (C and D). Note that dark brown bands are conspicuous in *G. interruptus*, despite being faded, while impossible to discriminate in, at least, the anterior two thirds of *G. bahianus*. (A) juvenile specimen 91.0 mm TL (UFRJ 8218), (B) adult specimen 148.6 mm TL (UFBA 6494), (C) juvenile specimen 82.0 mm TL (UFRJ 10105) and (D) adult specimen 192.0 mm TL (UFRJ 10105). (Scale bar = 10 mm)

2007. — MNRJ 32184, 1, tributary of Rio Jequiçá, under road to Jequiçá, Jequiçá municipality, M. Cetra, 30 January 2007. — MNRJ 32260, 6, tributary of Rio Preto, close to Wenceslau Guimarães state reserve, M. Cetra et al., 31 January 2007. — MNRJ 32270, 7, tributary of Rio Jequiçá, under road to Jequiçá, Jequiçá municipality, M. Cetra et al., 30 January 2007.

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