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Origin of species diversity in the catfish genus *Hypostomus* (Siluriformes: Loricariidae) inhabiting the Paraná river basin, with the description of a new species

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Abstract

Within the Loricariidae, the genus *Hypostomus* is one of the most diversified freshwater catfish groups. Using new sequence data from the mitochondrial Control Region (D-loop) we examined the phylogeny of this genus. Our phylogenetic analyses suggest that, in the Paraná river basin, species diversity in the genus *Hypostomus* has been shaped by two processes: 1) by inter-basin diversification, generating groups of species that inhabit different basins, as a result of dispersal events; and 2) via intra-basin speciation as a result of basin fragmentation due to past marine transgressions, which produced groups of species within a basin. Using the D-loop as a molecular clock, each event of diversification was dated and linked with documented hydrological events or sea level changes. We also assessed the possible dispersal routes between the Paraná and Uruguay rivers, in addition to the obvious dispersal route via the Río de la Plata estuary. Finally, we describe a new species of *Hypostomus* inhabiting Middle Paraná river, *Hypostomus arecuta* n. sp. This species can be separated from all other *Hypostomus* by having light roundish dots on a darker background and by number of premaxillary/dentary teeth.

Key words: Armored catfish; Control Region; phylogeny; Paraná river.

Introduction

In South America, the Loricariidae is the most species-rich endemic family of freshwater fishes. This family of suckermouth-armored catfishes comprises 818 species (Eschmeyer and Fricke, 2011) and new species are frequently discovered and described (e.g. Hollanda Carvalho *et al.*, 2010; Zawadzki *et al.*, 2010; Rodriguez *et al.*, 2011; Cardoso *et al.*, in preparation). Within the Loricariidae, the genus *Hypostomus* constitutes a rich assemblage of species, with approximately 130 recognized species (Weber, 2003; Ferraris 2007; Zawadzki *et al.*, 2010, Hollanda Carvalho *et al.*, 2010). Representatives of *Hypostomus* are bottom-dwelling fishes widely distributed throughout tropical and subtropical South America, occurring in a variety of freshwater ecosystems such as mountain streams and large lowland rivers and ponds. Species delineation and diagnosis in *Hypostomus* is difficult, in particular due to the diversity and widespread distribution of the genus, to elevated intra-specific morphological variability, and because some older descriptions are too short or incomplete.

Numerous species of *Hypostomus* inhabit the La Plata basin, which comprises the Paraguay, Paraná, and Uruguay rivers and the Río de la Plata (López and Miquelarena, 1991). Understanding the diversification history of *Hypostomus* as a "model" genus might allow the development of a comprehensive view of the processes that shaped the rich ichthyological diversity in the Paraná river basin.

According to the reconstruction of paleo basins in South America, from about 60 to 10 million years ago (Ma), the paleo Amazon–Orinoco system was a large watershed with waters flowing northward toward the Caribbean Sea, while the La Plata basin was already oriented as present (Lundberg, 1998). This author suggested that at 12–10