

Seven new species of the Neotropical electric fish *Gymnotus* (Teleostei, Gymnotiformes) with a redescription of *G. carapo* (Linnaeus)

JAMES S. ALBERT* & WILLIAM G.R. CRAMPTON

Florida Museum of Natural History, University of Florida, Gainesville, FL 32611 USA

* Corresponding author; E-mail. albert@flmnh.ufl.edu

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Abstract

Seven new species of *Gymnotus* are described, and a redescription of the type species *G. carapo sensu-stricto* Linnaeus (*G. carapo s.s.*) is provided, from examination of populations from throughout tropical South and Middle America. The new species are described on the basis of unique combinations of characters. Five of the new species are members of the *G. carapo* species-group: 1, *Gymnotus choco* n. sp., from the Baudó and Atrato basins on the Pacific and Caribbean slopes of Colombia; 2, *Gymnotus esmeraldas* n. sp., from the Esmeraldas and Guayaquil basins on the Pacific Slope of Ecuador; 3, *Gymnotus henni* n. sp., from the Calima and Juradó basins on the Pacific Slope of Colombia; 4, *Gymnotus paraguensis* n. sp., from the Paraguay basin; 5, *Gymnotus*

tigre n. sp., from the Amazon basin of Ecuador, Peru and Brazil. Two of the new species are members of the *G. pantherinus* species-group: 1, *Gymnotus javari* n. sp., from the Amazon, Napo, Javari, and Ucayali basins; 2, *Gymnotus panamensis* n. sp., from Atlantic slope of western Panama. *Gymnotus carapo* s.s. is restricted to the Amazon and Orinoco basins, the Island of Trinidad, the coastal basins of the Guianas, and the Brazilian state of Piauí. Six allopatric populations of *G. carapo* s.s. are recognized from differences in the mean, modal or median values of morphometric and meristic traits: 1, Eastern Amazon; 2, Parnaíba and Itapicuru basins; 3, Branco basin; 4, Guiana Shield, Orinoco basin and Island of Trinidad; 5, Madeira basin of Brazil, Bolivia and Peru; 6, Western Amazon basin of Brazil, Colombia, Ecuador, and Peru. Four of the new species representing both the *G. carapo* and *G. pantherinus* species-groups inhabit waters to the west of the Andean Cordillera. The biogeographic distributions of these species-groups suggest origins and early diversification before the most recent Andean orogeny, c. 8–12 mya.

Key words: biodiversity, classification, comparative morphology, species descriptions, South America

Introduction

The Neotropical electric fish genus *Gymnotus* (Linnaeus 1758) is substantially more diverse than was previously recognized. New methods of sampling, identifying, and collecting electric fishes have unveiled numerous species in previously unexplored habitats and regions (Crampton 1996a; Lundberg *et al.* 1996; Crampton 1998; Albert & Crampton 2001). Further, the use of new techniques for characterizing morphology, electric organ discharges, and genetic differences have demonstrated that much of what was once regarded as intraspecific variation represents interspecific differences (Campos-da-Paz & Costa 1996; Fernandes-Matioli *et al.* 1998a; Fernandes-Matioli *et al.* 1998b; Albert *et al.* 1999; Fernandes-Matioli *et al.* 2000; Fernandes-Matioli *et al.* 2001; Albert & Crampton 2001; Fernandes-Matioli & Almeida-Toledo, 2001).

Gymnotus species are aggressive nocturnal predators of fishes and other small aquatic animals, and most are territorial. The males of at least two *Gymnotus* species build and guard nests of foam and/or aquatic vegetation (Crampton & Hopkins pers. obs.). The type species *Gymnotus carapo* is reported to mouth brood its eggs and larvae (Kirschbaum & Wieczorek 2002). *Gymnotus* is the most geographically widespread of all gymnotiforms, extending from the Río Salado in the Pampas of Argentina (36°S) to the Río San Nicolás of southeastern Chiapas, Mexico (18°N), and is present in the continental waters of all South and Middle American countries except Chile and Belize (Albert 2001). Prior to this report, 25 species names were available for *Gymnotus*, of which five were synonymized with the type species *G. carapo* (Mago-Leccia 1994), and one with *G. coatesi* (Campos-da-Paz 2000). The geographical ranges of the currently valid *Gymnotus* species are summarized in Table 1. *Gymnotus* exhibits its greatest diversity in the western portion of the Amazon basin where 10 species are currently recognized. *Gymnotus anguillaris* Hoedeman is recognized here as distinct from *G. coropinae* Hoedeman with which it has been