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Mitochondrial phylogeny of Chinese barred species of the cyprinid genus *Acrossocheilus* Oshima, 1919 (Teleostei: Cypriniformes) and its taxonomic implications

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Abstract

Sequences from the mitochondrial control region of 14 putative species of *Acrossocheilus* (Cyprinidae) were examined to elucidate phylogenetic relationships within species of the barred group in that genus. Phylogenetic reconstructions were generated using three tree-building methods: maximum parsimony, maximum likelihood, and Bayesian inference. The resultant phylogenies were consistent with monophyly of the majority of the morphologically recognized species. However, mitochondrial DNA sequence evidence is incongruent with monophyly of *A. fasciatus*, as currently conceived. This species occurs only in the upper Qiantang-Jiang basin in Zhejiang and Anhui provinces, and coastal rivers in the Zhejiang Province. The species formerly recognized as *A. paradoxus* from Zhejiang Province is *A. fasciatus*. The specimens previously reported as *A. fasciatus* from river basins in Fujian Province are misidentified *A. wuyiensis*. The barred group of *Acrossocheilus* is shown to be polyphyletic. *Acrossocheilus* is restricted to the barred species here placed in "Clade II," containing *A. paradoxus* and relatives. Separate generic status is recommended for *A. monticola* and for *A. longipinnis* and their closest relatives, although more information on phylogenetic relationships based on multiple genes is required to develop robust phylogenetic hypotheses and diagnoses. *Masticbarbus* Tang, 1942 is available for *A. longipinnis* and three allied species (*A. iridescens*, *A. microstomus* and *A. lamus*).

Introduction

The cyprinid genus *Acrossocheilus* Oshima, 1919, as conventionally defined, comprises a group of small to medium-sized barbine species characterized by having a medially interrupted lower lip with two thick lateral lobes anteriorly separated from the lower jaw by a groove running along the full length of the lower jaw (Yue, 2000). Species in the genus are currently known from South China (including Taiwan Island), Vietnam and Laos (Zhang, 2005, Yuan *et al.*, 2006; Kottelat, 2013). This genus has been the subject of taxonomic studies during the past two decades or so (Zhao *et al.*, 1997; Kottelat, 2000, 2001a, 2001b, 2013; Nguyen & Ngo, 2001; Chen & Chang, 2005; Yuan *et al.*, 2006; Yuan & Zhang, 2010a; Yuan *et al.*, 2012; Lan *et al.*, 2014). Presently, about 26 species have been placed in it (Froese & Pauly, 2015). Of them, sixteen species have five to eight vertical black bars on the flank (hereafter, the barred group): *A. beijiangensis* Wu & Lin, 1977, *A. clivosius* (Lin, 1935), *A. fasciatus* (Steindachner, 1892), *A. hemispinus* (Nichols, 1925), *A. iridescens* (Nichols & Pope, 1927), *A. jishouensis* Zhao, Chen & Li, 1997, *A. kreyenbergii* (Regan, 1908), *A. lamus* (Mai, 1978), *A. longipinnis* (Wu, 1939), *A. microstoma* (Pellegrin & Chevey, 1936), *A. monticola* (Günther, 1888), *A. paradoxus* (Günther, 1868), *A. parallens* (Nichols, 1931), *A. spinifer* Yuan, Wu & Zhang, 2006, *A. wenchowensis* Wang, 1935, and *A. wuyiensis* (Wu & Chen, 1981). These species are concentrated in South China, which is home to all but one species of the barred group. The exception is *A. lamus*, which is endemic to Vietnam. Three other barred species presently known from Vietnam and Laos are: *A.*