



Western boundary of the subfamily Danioninae in Asia (Teleostei, Cyprinidae): derived from the systematic position of *Barilius mesopotamicus* based on molecular and morphological data

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Abstract

Analysis of mitochondrial cytochrome *b* sequences from 198 species confirms the position of *Barilius mesopotamicus* as a species of the Asian genus *Barilius* within the subtribe Chedrina in the subfamily Danioninae. This relationship is supported by a parsimony analysis based on 43 morphological characters, and the morphological examination confirms that *B. mesopotamicus* possesses the synapomorphies of the Danioninae and Chedrina, viz. absence of the Y-shaped ligament and the greatly reduced postcleithrum, respectively. *Barilius mesopotamicus* greatly expands the western boundary of the Asian Danioninae into the Tigris-Euphrates basin.

Key words: cytochrome *b*; Tigris-Euphrates; disjunct distribution; freshwater fish; biogeography

Introduction

The Danioninae are one of the most species-rich subfamilies of the Cyprinidae, comprising some 200 species. The distribution of the Danioninae is disjunct, with two well separated geographic groups, one in tropical Africa and the other in southern and eastern Asia. The Asian distribution extends from the Makran River basin in south-eastern Iran, where the subfamily is represented by *Cabdio morar* (Hamilton) (Coad 2010; as *Aspidoparia morar*), eastward to China and Japan (Howes 1991: fig. 1.7). *Barilius mesopotamicus* Berg has a more western distribution in the Tigris-Euphrates basin, but its position among the Danioninae has been contested (Bănărescu & Coad 1991; Howes 1991).

Barilius mesopotamicus is a small species, generally not surpassing 50.7 mm SL, diagnosed by the presence of an opsariichthin colour pattern (i.e., vertical bars similar to those of *Opsariichthys*) and barbels (Coad 2010). Howes (1980: 181), in the analysis of the systematics of his bariliine group, stated that *B. mesopotamicus* is not a *Barilius* and should be included in the “*Leucaspius* generic complex”. *Leucaspius* is a monotypic genus of the cyprinid subfamily Leuciscinae, widely distributed in Europe (Briolay *et al.* 1998; Kottelat & Freyhof 2007). Despite Howes (1980) claiming the proposed affinity to be based on synapomorphies, characters supporting a close interrelationship between *Leucaspius* and *B. mesopotamicus* were not provided. Bianco & Bănărescu (1982) agreed with Howes (1980) that *B. mesopotamicus* may be generically distinct from South Asian *Barilius* based on the number of pharyngeal tooth rows (two, vs. three in *Barilius*). However, they doubted an affinity between *B. mesopotamicus* and species of *Leucaspius*. Howes (1991), in the overview of systematics and biogeography of cyprinids, retained *B. mesopotamicus* in *Barilius* and considered this species to be a member of the Danioninae. In his map (Howes 1991: fig. 1.7), however, the distribution of the Danioninae was not illustrated accordingly. Bănărescu & Coad (1991) suggested that *B. mesopotamicus* could be a member of the Danioninae, but of uncertain relationships and generic placement. According to Coad (2010), *B. mesopotamicus* can be distinguished from *Leucaspius* by the possession of barbels (absent in *Leucaspius*), lateral line running along the ventral outline (vs. short