

# Co-occurrence and zoogeography of the freshwater fishes of Iran

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**Abstract.** A zoogeographic analysis of the freshwater fish fauna of Iran based on the distribution of 164 species in 19 basins shows the existence of two major faunas, one influenced by the Caspian Sea basin, the other by the Tigris River basin. A new South basin is proposed, combining three basins in south-eastern Iran.

**Kurzfassung.** Eine zoogeographische Bewertung der Süßwasserfischfauna des Irans, die auf der Analyse von Verbreitungsmustern von 164 Arten in 19 Wassereinzugsgebieten basiert, zeigt die Existenz von zwei prinzipiellen Faunen, von denen die eine vom Becken des Kaspischen Meeres, die andere vom Wassereinzugsgebiet des Tigris beeinflusst ist. Eine weitere dritte Zone wird vorgeschlagen, für die drei Wassereinzugsgebiete im südöstlichen Iran kombiniert werden.

**Key words.** Zoogeography, fishes, Iran, Middle East.

## Introduction

Iran lies in the Palaearctic zoogeographical realm but borders the Oriental and African realms. Its zoogeography is therefore of considerable interest. The modern Iranian ichthyofauna, in part, may be a remnant of movements at various times but these are yet to be resolved in the absence of species-level phylogenies. An alternative form of analysis involves co-occurrences of taxa as defined by their classification. For example, the co-occurrence of species of small terrestrial invertebrates having different area sizes (ranges) has been shown not to be accidental (VILENKIN & CHIKATUNOV 1998, 2000; VILENKIN & SHILEYKO 1979).

In this paper we study the freshwater ichthyofauna of Iran, examining species' co-occurrence and zoogeography as well as the relationships between endemic and non-endemic species. Terrestrial faunas have zoogeographical units whose number and boundaries depend largely on the investigator's preference. One territory may be subdivided by different authors in different ways with respect to distribution of one taxon. Freshwater fishes are more convenient for study of co-occurrence, distribution and endemism as they inhabit drainage basins with boundaries set by nature.

## Material and methods

The initial database comprised 250 species of freshwater fishes and lampreys inhabiting 19 drainage basins entirely or partially lying within Iranian borders. The principal sources for this data are BERG (1948–1949), COAD (1981, 1987, 1995, 1998, 2002), KOTTELAT (1997), RESHETNIKOV et al. (1997), ESCHMEYER (1998) and NALBANT & BIANCO (1998). Many of these 250 species are never found within rivers and lakes of Iran proper. This relates especially to numerous species of the