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Cypriniformes of Borneo (Actinopterygii, Otophysi): An Extraordinary Fauna for Integrated Studies on Diversity, Systematics, Evolution, Ecology, and Conservation

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Abstract

Borneo Island is governed by the countries of Brunei Darussalam, Malaysia (Sabah and Sarawak) and Indonesia (Kalimantan) and is part of Sundaland. These countries have a high diversity of freshwater fishes, especially described and undescribed species of Cypriniformes; together these species and other flora and fauna represent an extraordinary opportunity for worldwide collaboration to investigate the biodiversity, conservation, management and evolution of Borneo's wildlife. Much of the fauna and flora of Borneo is under significant threat, warranting an immediate and swift international collaboration to rapidly inventory, describe, and conserve the diversity. The Sunda drainage appears to have been an important evolutionary centre for many fish groups, including cypriniforms (Cyprinidae, Balitoridae and Gyrinocheilidae); however, Northwestern Borneo (Brunei, Sabah and Sarawak) is not connected to Sundaland, and this disjunction likely explains the non-homogeneity of Bornean ichthyofauna. A previous study confirmed that northern Borneo, eastern Borneo and Sarawak shared a similar ichthyofauna, findings that support the general hypothesis for freshwater connections at one time between western Borneo and central Sumatra, and south Borneo and Java island.

Borneo is drained by five major rivers: (1) Rajang and Baram rivers in Sarawak, and (2) Kapuas, Mahakam and Barito rivers in Kalimantan. The Cypriniformes is the most diverse clade in Borneo, and it is represented by at least 285 species in 55 genera and eight major clades (Balitoridae, Cobitidae, Cyprinidae, Gyrinocheilidae, Leptobarbidae, rasborines, cultrines and Paedocyprididae); at least 147 (52%) of these species are endemic to the incredibly diverse habitats of Borneo. Most fish faunal studies in Borneo have involved inventory and discovery; however, none to date have focused their efforts on the great biodiversity and systematics of Cypriniformes. In this paper we briefly discuss the general biodiversity of cypriniforms in Borneo, including recent revisions to the classification of the order through the Cypriniformes Tree of Life and Planetary Biodiversity Inventory efforts supported by the USA NSF basic science initiatives, in conjunction with researchers in countries of Borneo. It is our hope that this particular summary will galvanize individuals to increase worldwide collaborative and integrated efforts on the biodiversity of Cypriniformes, and incite lively discussions among a broad array of interested parties, including those involved in the recent and critically important "Heart of Borneo" initiative funded by all these countries and some NGOs.

Key words: Biodiversity, Borneo, Cypriniformes, Sundaland

Introduction

Borneo is widely known for its great floral and faunal diversity, but many areas of the island require further exploration (Clements *et al.* 2010; Ismail & Din *et al.*1996–2001; Hall *et al.* 2002; Karim *et al.* 2004; Koh *et al.* 2010; MacKinnon *et al.* 1996; Mohd *et al.* 2003; Garbutt & Prudent 2007; Wong & Chan 1997 and references within these contributions). Diversity is especially high given the size of the island. Borneo is one of the few areas on the planet that has a combination of opportunities for rapidly advancing our understanding of the evolution, ecology, and fundamental conservation needs for its biodiversity. Much of the island has not been explored thoroughly, and many areas are not currently accessible. The ecosystems of Borneo are currently under assault from deforestation, plantation development, and major habitat changes brought on by humans. Once the obstacles for study have been overcome, a global consortium of scientists and nonscientists will be able to perform rapid assessments of the island's biodiversity.

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