



First record of the blue-and-yellow grouper *Epinephelus flavocaeruleus* (Lacepède 1802) (Perciformes: Epinephelidae) from the Borneo waters, Malaysia

KAR-HOE LOH^{1,4*}, SZE-WAN POONG^{1,5}, JIANGUO DU^{2,6*}, JOYCE JIA LIN ONG^{3,7}, XINQING ZHENG^{2,8}, YUAN LI^{2,9} & WENJIA HU^{2,10}

¹Institute of Ocean and Earth Science, University of Malaya, Kuala Lumpur 50603, Malaysia.

²Key Laboratory of Marine Ecological Conservation and Restoration, Third Institute of Oceanography, Ministry of Natural Resources, Xiamen 361005, China.

³Asian School of the Environment (ASE), 50 Nanyang Avenue, Nanyang Technological University, 639798, Singapore.

⁴✉ khloh@um.edu.my; <https://orcid.org/0000-0001-8406-6485>

⁵✉ szewan@um.edu.my; <https://orcid.org/0000-0003-4033-864X>

⁶✉ dujianguo@tio.org.cn; <https://orcid.org/0000-0002-8722-903X>

⁷✉ joyce.jl@gmail.com; <https://orcid.org/0000-0003-2133-1354>

⁸✉ zhengxinqing@tio.org.cn; <https://orcid.org/0000-0002-9073-4520>

⁹✉ liyuan1@tio.org.cn; <https://orcid.org/0000-0001-9996-3197>

¹⁰✉ huwenjia@tio.org.cn; <https://orcid.org/0000-0001-5003-9513>

*Corresponding authors

Abstract

Groupers of the family Epinephelidae constitute a diverse and commercially valuable group of reef fishes globally. They comprise an assemblage of carnivorous marine fishes, comprising more than 177 species across 16 genera. The epinephelid genus *Epinephelus*, which consists of over 90 species, is found worldwide in the tropics and subtropics. To date, the ichthyofauna of Malaysia has documented a total of 43 epinephelid species. Apart from these, *Epinephelus flavocaeruleus* (Lacepède, 1802), commonly known as the blue-and-yellow grouper, is rarely reported in the Indo-Pacific Ocean. The present study extends the documented distribution range of *E. flavocaeruleus* eastwards from the Andaman Sea to the Borneo waters of Sabah, Malaysia. Five specimens of the blue-and-yellow grouper were collected from a local fish market. Species identification was confirmed by the color patterns and DNA barcoding of 630 base pairs of the cytochrome C oxidase I gene for all *E. flavocaeruleus* specimens, *Epinephelus cyanopodus* (Richardson, 1846), and 10 closely related *Epinephelus* species. The interspecies genetic distance ranged from 0.002–0.168. Results from the Templeton, Crandall, and Sing (TCS) haplotype network analysis and maximum likelihood phylogeny based on the COI marker indicate a close genetic relationship between *E. flavocaeruleus* and *E. cyanopodus*. However, we refrain from proposing any taxonomic revisions given that more in-depth studies using multiple molecular markers or phylogenomic analysis on a larger sample size are necessary to confirm the taxonomic status of both species. This study significantly contributes to a better understanding of the taxonomy, phylogenetic relationship, and genetic diversity of *E. flavocaeruleus*.

Key words: First records, taxonomy, DNA barcode, haplotype network, grouper

Introduction

The Perciform family Epinephelidae Bleeker, 1874 commonly known as groupers, are economically important members of marine ecosystems, particularly in Southeast Asia (Ma & Craig 2018). They were previously classified as the subfamily Epinephelinae within the Serranidae family (Craig & Hastings 2007). These groupers exhibit a wide distribution across various habitats in tropical and subtropical regions worldwide. According to Eschmeyer's Catalog of Fishes, the Epinephelidae family comprises 177 valid species belonging to 16 genera (Fricke *et al.* 2023). Six new grouper species were described in the last 10 years, between 2014 and 2023, including *Epinephelus insularis* Nakamura & Motomura, 2021; *Epinephelus tankahkeei* Wu, Qu, Lin, Tang & Ding 2020; *Epinephelus*