

DNA barcoding of seven cyprinid fish species in the Iraqi Inland waters using mitochondrial *COI* gene sequence

Mustafa Sami Faddagh Ziyadi  

Department of Marine Vertebrate, Marine Science Centre, University of Basrah, Basra, Iraq.

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Abstract

Family Cyprinidae is the largest fish family in the Iraqi inland waters. The cyprinid fish species were described by traditional biometry. Family Cyprinidae fish species in Iraq are important because of ecological and economic aspects. While the morphological similarity among the cyprinid species made the identification not easy. DNA barcoding was chosen to confirm the taxonomy and ensure genetic diversity. Seven cyprinid fish species, *Luciobarbus barbulus*, *L. xanthopterus*, *L. kersin*, *L. esocinus*, *Arabibarbus grypus*, *Cyprinus carpio*, and *Acanthobrama marmaid* were collected from the Shatt Al-Arab River, the Marshes, and the Mosul Dam reservoir. The mitochondrial Cytochrome C Oxidase gene of the specimens was amplified and sequenced. Universal primers were chosen for this purpose. Chromas software was used for processing the sequences. The result showed that the sequence ranged from 600-657 bp. While the neighbor-joining tree created by Clustal Omega software revealed the four *Luciobarbus* species clustering into two central branches, while the other three diverged. Nucleotide distribution statistically for the studied fish species was compared. The results of DNA barcoding using COI gene sequence proved the four independent *Luciobarbus* fish species. The COI gene sequence was successful as a DNA barcode which is accurate in species identification. The sequences were deposited in the gene bank under OM669701, OM669699, OM669702, OM669705, OM669700, OM669703 and OM669704. This study represents the starting line for the DNA barcoding project to detect all fish fauna sequences in the Iraqi inland waters. In addition, it will be very useful in the conservation program of native species in Iraqi inland waters.

Keywords: Cytochrome C Oxidase, Cyprinidae, DNA barcode, Iraq, *Luciobarbus*.

Introduction

Fish represents significant economic value in the lives of the people of Iraq. While freshwater fisheries play a central role in the life of society due to the water bodies that cover the Iraqi land. The Euphrates and Tigris Rivers, lakes, reservoirs, canals, and marshes were suitable habitats for the Iraqi fish fauna. The family Cyprinidae belongs to the order Cypriniformes. It is considered the largest fish family in Iraqi inland waters. It includes the most important genus and species in Iraqi inland waters.

Traditionally, the Iraqi fish species were described using biometry¹. These morphological and meristic characteristics confused the similarity between nearby species, causing overlapping of the morphological and meristic ranges². Therefore, the biochemical composition is utilized as a biomarker to differentiate among similar species. allozyme was the alternative method to differentiate inter-species³. Nevertheless, allozyme cannot discriminate all intra-species⁴. Recently, Polymerase Chain Reaction