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Morphological and Molecular Identification of Four Species of Aquatic Beetles (Coleoptera: Hydrophilidae, Dytiscidae) in Thi Qar Governorate, Southern Iraq

Muthenna M. Al-Abadi* and Alaa N. Hatem*
Department of Biology, College of Education for Pure Sciences, University of Basrah

***Corresponding Author: mustafafadil837@gmail.com**

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ABSTRACT

Aquatic insects are a group of arthropods belonging to the class *Insecta* that live in or spend part of their life cycle in water. They form a dominant and functionally important component of freshwater ecosystems, occupying diverse ecological niches as herbivores, detritivores, predators, and prey. This study investigated the morphological and molecular identification of four aquatic beetle species—two from the family *Dytiscidae* and two from *Hydrophilidae*. Specimens were collected from various freshwater habitats in Thi Qar Governorate, southern Iraq. Morphological identification was carried out using standard taxonomic keys. Molecular analysis involved DNA extraction and amplification of the mitochondrial cytochrome oxidase subunit 1 (COI) gene. The resulting sequences were compared with reference data from GenBank to confirm species identity. Morphological characteristics were consistent with established species descriptions, and high genetic similarity to GenBank reference sequences confirmed the identifications. This is the first taxonomic study of aquatic beetles in this region and provides new distributional records for Iraq's aquatic fauna. The findings highlight the value of integrating morphological and molecular approaches in freshwater biodiversity assessment. The identification of four aquatic beetle species was confirmed through molecular analysis. The combination of traditional morphological methods and DNA barcoding proved effective for accurate species diagnosis. The mtCOX1 gene is a reliable marker for determining the molecular identity of aquatic beetles, supporting species differentiation and evolutionary studies.

INTRODUCTION

Aquatic insects represent a group of arthropods (Phylum: Arthropoda) belonging to the class Insecta that live in or spend part of their life cycle in water **(Arimoro & Ikomi, 2008)**. This group includes approximately 45,000 species that inhabit diverse freshwater environments and are found in ponds, marshes, lakes, and rivers worldwide, constituting an important component of aquatic biodiversity **(Balaram, 2005)**.

Aquatic insects are a dominant and functionally significant part of freshwater ecosystems. They occupy a wide range of ecological roles—as herbivores, detritivores,