

Fishery, Growth and Reproductive Biology of *Metapenaeus affinis* (Decapoda, Penaeidae) in the Iraqi waters

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Abstract: The study evaluated the fishery, growth and reproductive biology of the Jinga shrimp (*Metapenaeus affinis*) in Iraqi waters from November 2022 to October 2023. The monthly shrimp landings from Iraqi marine waters ranged from 57 tons in December 2022 to 407 tons in September 2023, with an annual value of 3,515 tons. 8,021 individuals of *M. affinis*, ranging from 2.0 to 15.6 cm, were collected from the East Hammar marsh and Iraqi marine waters. The length-weight relationship indicated that males and females exhibited negative allometric growth patterns, with a significant difference between them. The mean values of the relative condition factor were 0.98 ± 0.037 and 1.02 ± 0.043 for males and females, respectively, referring to the healthy condition for both sexes. The growth model for the species was $L_t = 16.3 (1 - \exp(-0.92(t+0.084)))$. The overall sex ratio (male: female) was 1:1.41. The length at first maturity (L_{m50}) was 8.2 cm. The gonadosomatic index (GSI) values fluctuated from 2.14% in June to 4.34% in April for females of *M. affinis*. These results can assist in fisheries management and conservation of the shrimp species in Iraqi waters.

Key-words: *Metapenaeus affinis*, fishery, growth and reproductive biology, Iraq.

Received: June 21, 2024. Revised: March 14, 2025. Accepted: May 11, 2025. Published: June 23, 2025.

1 Introduction

Penaeid shrimps are commercially important and widely distributed worldwide in sub-tropical and tropical regions. They are the primary catch in shrimp fisheries, accounting for a total catch of 3.2 million tons in 2020 out of 5.6 million tons of crustaceans [1]. They often inhabit different habitats at different stages of their life cycle, requiring them to migrate between these habitats, such as when larvae and post-larvae migrate from spawning areas to nursery grounds, juveniles move out of the nursery area, and adults migrate to deeper offshore waters [2].

In Iraqi waters, *Metapenaeus affinis* (Milne Edwards, 1837), *Penaeus semisulcatus* De Haan 1844, and *Parapenaeopsis stylifera* (Milne Edwards, 1837) were the main shrimp species caught, according to Ali [3]. These species have been crucial for sustaining artisanal marine fisheries in Iraq over the past years. Their catches have increased from 123.4 tons (1.85% of the total catch) in 2008-2009 to 7,288 tons (14.4% of the total catch) in 2020-2022 [4].

A typical *Penaeus* species spawns in the sea and enters inshore waters as a post larvae, usually around three weeks to one month old. It remains in these waters for nearly three months while growing. After this period, the shrimp migrates back to the sea when it is about four months old and measures 8.0-10.0 cm in total length [5]. Authors have noted that the larval stage of *M. affinis* migrates from the northern part of the Arabian Gulf toward the Shatt Al-Arab River, eventually reaching the nursery grounds in the East Hammar marsh. Various sizes of shrimp (ranging from 0.3 to 12.5 cm in total length) have been found in the marsh, indicating that this marsh serves as the primary nursery ground for this species in the northern Arabian Gulf. Later, the larger shrimp migrate back to the spawning grounds to mature sexually and spawn [6-8].

M. affinis is found in two regions within Iraqi waters: marine waters in the Arabian Gulf and brackish inland in the marshes. It is considered the most important species in Iraqi waters. According to Ali [3], the total annual catches of *M. affinis* in Iraqi marine waters during 1998/1999 ranged from