

Comparative Study of the Gut Contents of *Penaeus japonicus* Bate 1888 (Decapoda: Penaeidae) In Semi-Intensive Culture and In Brackish Water Wild Environment

Abstract

The trophic adaptability of a species may influence its dispersion potential and the ability to invade foreign territories. Understanding the factors that facilitate trophic adaptability may help the provision of forecasts about the potential dispersion of allocthonous species, even in a warmer and acidified world, according to the current trends of global changes. Various studies demonstrated the adaptability of *Penaeus japonicus* Bate to variable feeding regimes under natural conditions. To optimize artificial diets for the aquaculture of Penaeid shrimps, gut content data of specimens cultured in ponds were compared to contents from shrimps fed on natural macro benthic communities in a brackish-water lagoon. In addition, the feeding adaptability of this shrimp to scarcely diversified benthic associations was tested in aquaculture ponds. Our comparative analyses confirm that *P. japonicus* feeding pattern may be largely adapted to variations in the available benthic organisms, in different management conditions.

Keywords: *Penaeus japonicus*; Food; Brackish water; Culture; Adaptability; *Marsupenaeus japonicus*

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Introduction

Penaeus japonicus Bate 1888, the “Kuruma shrimp”, whose taxonomical identity is still debated Tsoi et al. [1], is an ideal species for aquaculture purposes, due to its adaptability to different environmental conditions Lumare [2]. The species is still indicated by means of two scientific names, i.e., *P. japonicus* and *Marsupenaeus japonicus*, due to a controversy in the status of the genus *Penaeus* Fabricius, 1798 (see, for example, Pérez Farfante & Kensley Ma et al. [3,4]). Both names are still used by various organizations and databases, eg. WoRMS (World Register Marine Species), FAO, DAISIE (Delivering Alien Invasive Species Inventories for Europe); however, in this study we will follow the most updated results Tsoi et al. [1] for the definition of *Penaeus* and hence we will use the current name *Penaeus japonicus* Bate 1888.

Penaeus japonicus exhibits attractive brownish-red bands and it is named “the kuruma shrimp” because of a characteristic wheel-like banding pattern. It is economically important for the world shrimp market due to an easy management of pond cultures and the fast grow-out [5]. Many aspects of its physiology and reproductive biology have been clarified [6,7], but the available information on its trophic needs in intensive and semi-intensive culture conditions is still incomplete. Previous studies identified the feeding patterns of *P. japonicus* under natural conditions, after its introduction in coastal lagoons [8-11]. In fact, this species appears to be able to easily invade new territories

when accidentally introduced in natural environments [12-13] and the global increase of temperatures in natural basins, even in the Mediterranean area, facilitates its dispersion [14].

At present, *Penaeus japonicus* is widely distributed in Japan, the South China Sea, Korea, the Archipelago of Malay, the Red Sea, the northern coast of Queensland in Australia, and the western Indian Ocean, up to the eastern South Africa [3]. However, according to Galil & Zenetos [13], it was considered as a Lessepsian migrant in the Mediterranean waters since 1924. Obviously, its successful adaptation in the Mediterranean may threaten indigenous species, as *P. keraturos* and other crustacean decapods, as well as its main prey, represented by molluscs and polychaetes [15].

A dynamic feeding model was demonstrated for this species in relationship to the predation on natural benthic populations [16]. This evidence allows us for predicting a destructive influence of *P. japonicus* on wild ecosystems as well as a certain degree of adaptability to benthic communities characterized by low species diversity, as those characterizing the culture ponds. Therefore a study comparing natural feeding patterns with those observed in prawns managed in extensive and semi-intensive conditions was performed by means of gut contents analyses. The results of the present study, in fact, may allow from one side an optimization of inexpensive diets for this species in aquaculture ponds and, on the other side, to explain some of the factors promoting the adaptability of a given species when introduced in new areas.