

## SOME BIOLOGICAL ASPECTS OF LESSEPSIAN PENAEID SHRIMP *PENAEUS JAPONICUS* (BATE, 1888) IN THE GULF OF ANTALYA, MEDITERRANEAN SEA

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### Abstract

This study was carried out through monthly deep trawls applications in the waters of 20-100 m of depths in the Gulf of Antalya, between June 2013 and November 2014. The species composition, size frequency distribution and length/weight relationships for each sex of the commercially important shrimp, *Penaeus japonicus* in the Gulf of Antalya, in Mediterranean Sea were studied. A total of 108 individuals of lessepsian penaeid shrimp were sampled during the study. Length and weight of the samples varied between 10.6-20.3 (12.3±2.2) mm total length and 11.33-80.17 (29.17 ± 13.05) g respectively. The smallest individual was sampled in February and the biggest was in April. A total of 63 (% 58) samples were female and 45 (% 42) were male. The relation between total length (CL) and weight (W) was determined as  $W = 0.0038CL^{3.1916}$   $R^2 = 0.9437$ . This was calculated for females as  $W = 0.0036CL^{3.2158}$   $R^2 = 0.953$  and for males  $W = 0.0121CL^{2.7561}$   $R^2 = 0.8582$ . It was determined that total and females showed positive allometric growth and males were showed negative allometric growth.

**Key words:** Lessepsian shrimp, *Penaeus japonicus*, biological aspects, Gulf of Antalya, Mediterranean Sea.

### INTRODUCTION

The Mediterranean Sea is one of the seas of the world most affected by biological invasions (Streftaris et al., 2005). A total of 955 alien species are known in the Mediterranean and the vast majority of them were reported from the eastern Mediterranean (718 species), less from the western Mediterranean (328), central Mediterranean (267) and Adriatic Seas (171). Of these, 535 species (56%) have become established in at least one area. It is worth noting that aliens have increased the total species richness of the Mediterranean Sea by 5.9% (Zenetos et al., 2010). A total of 119 alien crustaceans have been reported in the eastern Mediterranean and 58 species belong to decapod crustaceans, presenting an accelerating entrance rate (Koukouras et al., 2010). According to Galil et al. (2015), 14 identified alien penaeids in Mediterranean Sea, eight of which probably were introduced through the Suez Canal (Scannella et al., 2017).

Turkey is surrounded by four seas (Levantine Sea, Aegean Sea, Sea of Marmara and Black Sea) with different hydrographical characteristics. A total of 400 alien species belonging to 14 taxonomic groups occur along

the Turkish coasts up to 2010, with the crustacean being the third group (64 species) after Mollusca (105 species) and Polychaeta (75 species). The majority of these species (306 species, 76% of the total number of species) have become established in the area (Çinar et al., 2011). The proximity of Turkey to the Suez Canal has resulted in dense settlements of Indo-Pacific migrants (66% of the total alien species in Turkish waters), especially in habitats along the Levantine coast of Turkey. In the last years, some of them have expanded their distributional ranges to other areas of the Aegean Sea, i.e. Gökova Bay (Ateş et al., 2007; Yokes et al., 2007).

*Penaeus japonicus* is a commercially important species in the Mediterranean region around Egypt, Israel, and Turkey. It lives on sandy mud and sandy bottoms waters up to 90 m depth. This shrimp has a maximum length of 25-30 cm, and can survive and grow at low water temperatures (10°C). It is a native species in the Indian Ocean and the southwestern Pacific Ocean. It is distributed along the east coast of South Africa, Red Sea, Indian Ocean, Korea, Japan, Taiwan, Malaysia, Philippines, Indonesia, New Guinea, Fiji Island and north Australia (Hayashi, 1996).

In this study, some biological aspects (sex ratio, substrates features, maximum - minimum lengths and weights, lengths frequency distribution etc.) of lessepsian *P. japonicus*, a shrimp of high commercial value, were determined in the Mediterranean Sea.

## MATERIALS AND METHODS

The data were from monthly catches in the Gulf of Antalya, June 2013-November 2014. Trawling's were carried out in the Gulf of Antalya on 36° 50' N, 30° 34' E - 36° 45' N, 30° 55' E Mediterranean Sea (Figure 1). Samplings of shrimps were made by means of a bottom trawl net (22 mm mesh size) every month during a period of 9 months. Trawl shots of about 180 minutes were undertaken at each sampling station at depths of between 20 and 100 m. The samples were used to determine species composition, size frequency, length/weight relationship of the shrimp. For this reason, the species was identified; females and males were sorted by visible telycum or petesma. All individuals were weighed to the nearest 0.1 g and measured with vernier calipers for their carapax length (CL) from tip of the rostrum to end of the carapax.

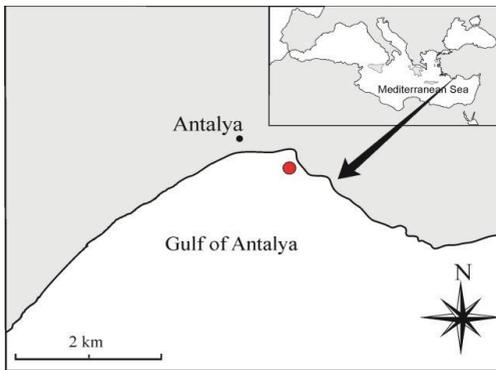


Figure 1. Sampling area in the Gulf of Antalya

The relationship between length and weight were calculated using the formula  $W = a CL^b$ , in which  $W$  is the total weight (g) and  $CL$  is the carapax length (mm). The parameters  $a$  and  $b$  were estimated by functional regression. In the equal  $b$  value for each species was tested by t-test at the 0.05 significance level to verify that it was significantly different from isometric growth (Froese, 2006).

## RESULTS AND DISCUSSIONS

### Length frequency distribution

During this study, a total of 108 specimens of *P. japonicus* were analyzed throughout the research period, 63 (58 %) being females, 45 (42 %) males. The mean size for females was  $34,22341 \pm 2,160858$  mm CL, ranging from 12.2 mm to 22.0 mm; for males  $15,16 \pm 1.21$ mm TL, varying from 12.1 mm to 17.4 mm TL. The mean size of females was significantly larger than the mean size of males ( $P < 0.05$ ). The largest female and male were 22.0 mm and 17.4 mm, respectively. The length-frequency distribution diagrams for female, male are given in figures 2, 3.

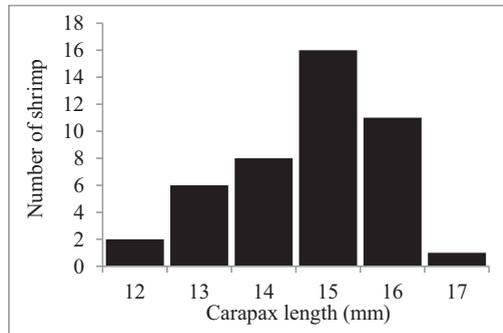


Figure 2. Size frequency distribution of males *Penaeus japonicus* in the Gulf of Antalya

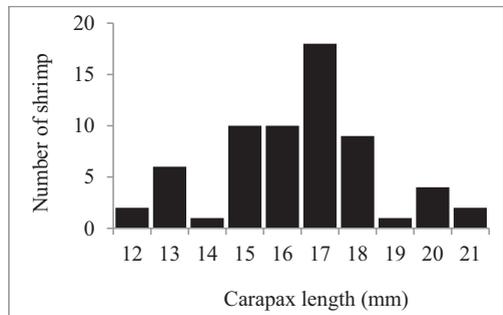


Figure 3. Size frequency distribution of females *Penaeus japonicus* in the Gulf of Antalya

### Length/weight relationship

The length/weight relationships were calculated for pooled data, males and females separately and were showed in Figures 4, 5, 6. These figures show that males of *P. japonicus* have

fusiform body shape. From visual inspection of the length-weight relationship curves, allometry in growth is observed positive in both pooled data and females. Only males were showed negative allometry.

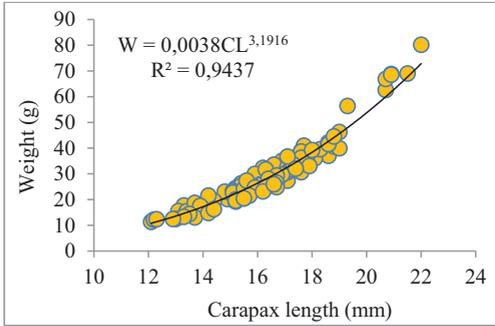


Figure 4. Length-weight relationship of *Penaeus japonicus* in the Gulf of Antalya

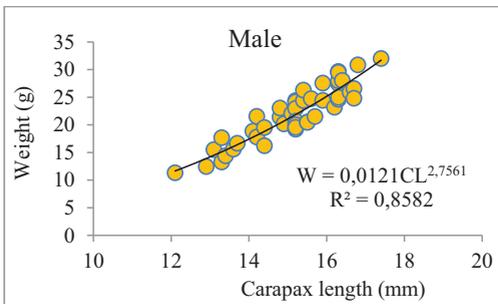


Figure 5. Length-weight relationship for males of *Penaeus japonicus* in the Gulf of Antalya

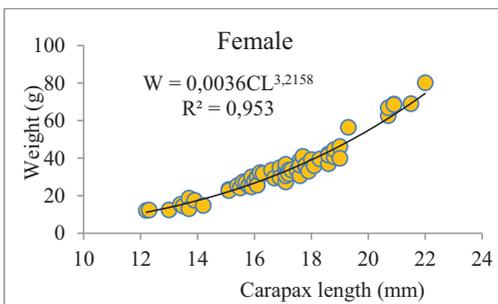


Figure 6. Length-weight relationship for females of *Penaeus japonicus* in the Gulf of Antalya

#### Catch composition and habitat features of the research area

In this study, while *Penaeus semisulcatus* (de-Hann, 1844), *F. aztecus* and *Metapenaeus monocerus* (Fabricius, 1798), species were

living in muddy bottom, *P. japonicus* and *M. hathor* were found in sandy substrates. *P. japonicus* was caught with *M. hathor* and *P. kerathurus* by trammel nets intensively especially in shallow water, in research areas. *P. semisulcatus*, *M. monoceros*, *Merlicertus* (*Penaeus*) *kerathurus* (Forskål, 1775), *M. hathor*, *Metapenaeopsis aegyptia* (Galil & Golani, 1990), *Parapenaeus longirostris* (Lucas, 1846), *Trachypenaeus curvirostris* (Stimpson, 1860), *F. Aztecus* were observed in the catch composition by bottom trawl.

#### Salinity and temperature

The salinity of the gulf did not change much during the course of this study. Salinity was 37.0-39.5 ppt. The water temperature was 17-24°C during study period.

A total of 108 individuals of lessepsian penaeid shrimp were sampled during the study between June 2013 and November 2014.

In this species, it is clear that females grow to a larger size than males. The length/weight relationships showed in Figures 2, 3 also indicated this suggestion. The largest female and male of *P. japonicus* caught in the present study were recorded as 22.0 mm CL (80.17 g) and 17.40 mm CL (30.02 g), respectively.

Our results for *P. Japonicus* were found similar with the findings of Kumlu et al. (1999) who studied same species on the Yumurtalık Bight (North eastern Mediterranean).

## CONCLUSIONS

*P. japonicus* is an indo-Pacific shrimp species and migrated to the Mediterranean Sea. According to study results, this species found similar environmental features in the gulf of Antalya or it could adapt itself to this new habitat. In the study area, it is found maximum 22 mm CL in length and 80.17 g in weight in the gulf of Antalya.

This shrimp species has become one of the commercial shrimp species caught in the Antalya bay.

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