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Article *in* Turkish Journal of Zoology · December 2021

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Turk J Zool
(2021) 45:
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doi:10.3906/zoo-2101-26

Infestation and effect of parasitic isopod *Epipenaeon ingens ingens* Nobili, 1906 on commercial shrimp species in the eastern Mediterranean: a case study of the population of brown shrimp *Penaeus aztecus* Ives, 1891

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Received: 19.01.2021 • **Accepted/Published Online:** 12.07.2021 • **Final Version:** 00.00.2021

Abstract: Monthly samples of seven species of penaeid shrimps, namely, *Penaeus aztecus* (Ives, 1891), *Penaus hathor* (Burkenroad, 1959) *Penaus japonicus* (Spence Bate,1888), *Penaus kerathurus* (Forskål,1775), *Penaus semisulcatus* (De Haan,1844), *Metapenaeus monoceros* (Fabricus, 1798) and *Metapenaeopsis aegyptia* (Galil & Golani, 1990) were collected from Antalya Bay in the Eastern Mediterranean Sea from March, 2019 through March, 2020. Except for *P. aztecus* and *P. semisulcatus*, no other shrimp species were infected with the parasitic isopod *Epipenaeon ingens ingens*. Of the 3043 *P. aztecus* shrimp inspected, 541 individuals were infected (17.8%) with the bopyrid parasite *E. ingens ingens*. However, the annual infestation rate in recruiting year class (28 mm < CL: 5.7%) was much less than in larger and sexually mature (CL ≥ 34 mm: 36.2%) individuals. Monthly infestation rates varied from 0.86 to 84.8%, and the size of infested shrimps ranged from 20 mm to 44 mm CL. The left branchial chamber was more likely infected (43.1%) than the right one (39.8%), and 17.1% appeared to be doubly infected. The percentage of the ovigerous female *E. ingens ingens* fluctuated between 31.7% (August) and 90.0%. We report for the first time the size at first accompaniment ($FAS_{50\%}$) and at first maturity ($FMS_{50\%}$) for the female parasite *E. ingens ingens*, 11.0 mm TL and 13.0 mm TL, respectively. The gonad weight (0.779 ± 0.73 g) and GSI (0.223 ± 0.333) value of uninfected female *P. aztecus* were about eight times greater than it was for infected shrimps (0.094 ± 0.18 g and 2.006 ± 1.669, respectively).

Key words: Bopyrid isopod, *Epipenaeon ingens*, brown shrimp, *Penaeus aztecus*, *Penaeus semisulcatus*, parasite

1. Introduction

The Northern brown shrimp *Penaeus aztecus* Ives 1891, the most commercially important and native to Western Atlantic, was first recorded in the Mediterranean Sea in December 2009, and it was hypothesized that its introduction to the eastern Mediterranean Sea was due to ballast water (Deval et al., 2010). Within only eight years after the first finding, its distribution area has expanded very quickly in the northern areas (Egypt, Israel, Turkey, Greece, Montenegro, Italy, Malta and France) of the line between Egypt and France (Figure 1).

enter the branchial chamber of the infected host will attach to the female parasite and will become male (Anderson, 1975; Dale and Anderson, 1982; O'Brien and Van Wyk, 1985) within 24 h after contact with the females (Anderson, 1990). Parasitism poses a metabolic drain on the decapod host because females feed on haemolymph and ovarian fluids after piercing the inner cuticle of the host (Bursey, 1978). Effects on the host are manifold (lower fecundity, castration, reduced moult frequency, etc.) and can be dramatic (Klompmaker et al., 2018).

The parasitic *Epipenaeon ingens ingens* Nobili, 1906