



Quantification of The Problem Caused By Isopods in The Small Scale Fishery in The Southern Aegean Sea, Turkey

Fikret Öndes

Department of Fisheries and Fish Processing Technology, Faculty of Fisheries, İzmir Katip Çelebi University, İzmir, Turkey

*Corresponding Author

E-mail: fikret.ondes@ikc.edu.tr

Abstract

Isopods are small crustaceans that some species damage to target species of small scale fishery. The objective of the study was to determine the monetary loss in small scale fishery caused by isopods. Data were collected from set netters and long-liners by using face-to-face questionnaires on the southwest of Turkey including 3 fishing sites named (Boğaziçi, Güllük, and Göktürkbükü) in May 2019. Results showed that for the year 2018 the annual mean value of estimated monetary loss of set netters was $10,357 \pm 5,799$ Turkish Lira (TL). All fishers reported that the impacts of isopods were higher at night than at day time. Accordingly, 52% of fishers noticed that they had to change their fishing period. Regarding the seasonal differences, 61% of fishers declared that damaged fish ratio was higher in winter than other seasons. The main potential reasons of this issue were reported by fishers as habitat degradation and pollution caused by fish farms and waste waters of tourism units. In conclusion, this issue decreased the profit of small scale fishers and the rate of fish influenced by isopods showed an increase for the last five years. The bio-ecology of isopods in the study area should be investigated to understand the solution ways of this problem in further research.

Keywords: monetary loss, local ecological knowledge, longline, set net, crustaceans

INTRODUCTION

Isopoda is an order of crustaceans that live in both aquatic and terrestrial ecosystems (Kırkım et al., 2008). It was reported that nearly 950 described species live in continental waters, and possibly 1,400 species remain undescribed (Wilson, 2008). Some parasitic isopods caused the economic loss in commercial fisheries (Ravichandran et al., 2007; Bharadhirajan et al., 2014; Rameshkumar and Ravichandran, 2014). Furthermore, isopod species *Natanolana neglecta* is a carnivorous scavenger, attacking both living and dead fish entangled in fishing nets, by entering into the body of the fishes via their eyes, opercula, and injured body parts and caused the monetary loss (Mizzan, 1995; Kırkım et al., 2019).

Natanolana neglecta (Hansen, 1890) is originally described from Naples (Italy) and Nice (France) and distributed in the Eastern Mediterranean, Levantine basin, Adriatic Sea, Atlantic coast of Africa and the United Kingdom (Rincon et al., 2014). The first record of *N. neglecta* from Turkish waters was given by Geldiay and Kocataş (1972). This species was also reported from İzmir Bay, Çandarlı Bay, Cunda Island, Dikili, Gökova, Bodrum and Güllük (Bakır and Katağan, 2005; Doğan et al., 2005; Kırkım et al., 2006, 2019). Individuals of *N. neglecta* live in various habitats including sandy, muddy and coralligenous (Bakır & Katagan, 2005; Kırkım et al., 2019).

Little is known about the ecology of *N. neglecta* and its impacts on fishery. The present study aimed to assess information on the impacts of isopods on the small scale fishery; changes in fishing activity and estimate the monetary loss.

MATERIAL AND METHODS

Data were collected from small scale fishers including set netters and long-liners using face-to-face questionnaires on the southwest of Turkey including 3 fishing cooperatives (Boğaziçi, Güllük, and Göktürkbükü) in May 2019. Questionnaires gathered 2 types of information: 1) main characteristics of fishing activity (e.g. the annual days at sea, fishing sites) and 2) impacts of isopods on fishery (e.g. temporal changes in the isopods occurrence, monetary loss).

RESULTS

Fishers interviewed spent 100 to 310 working days at sea per year and the mean value of annual working day was calculated as 233 ± 56 . The fishers' experience ranged between 10 and 55 years (Figure 1a), as well as the mean value was calculated as 31 ± 13 years. Fishers declared that they realised isopods on their target species as a first time 19 ± 6 years ago (Figure 1b). Results showed that the occurrence of isopods on target species has increased in last five years (Figure 1c).

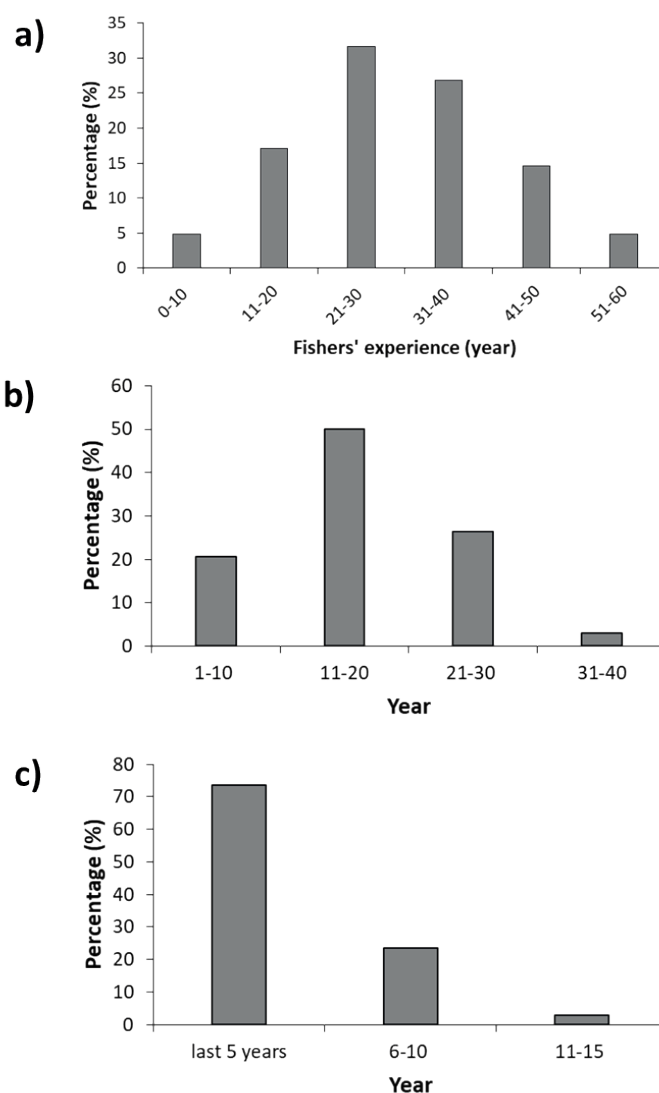


Figure 1. a) Fishers' experience, b) the process when fishers noticed the isopods feeding on fish species, c) the process when the occurrence of isopods on target species has increased.

Fishers noticed that isopods can attacked many economically important fish species (e.g. gilthead seabream *Sparus aurata*, European seabass *Dicentrarchus labrax*, red seabream *Pagellus erythrinus*, striped red mullet *Mullus surmelatus*, red mullet *Mullus barbatus*, bogue *Boops boops*, white seabream *Diplodus sargus*). Results indicated that the impacts of isopods were higher at night than day time. Accordingly, 52% of fishers declared that they had to change their fishing period. These fishers noticed that the mean soak time was 28 ± 25 hours before the isopod impacts. However, their mean soak time was several hours in the last five years. In addition, 61% of fishers reported that damaged fish ratio was higher in winter than other seasons. For the year 2018, the mean value of estimated monetary loss of set netters was $10,357 \pm 5,799$ TL/vessel, whilst for long liners the mean values was 233 ± 408 TL/vessel. Regarding the reason of this phenomenon, many fishers reported that the fish farms and tourism units around the fishing sites can be considered as main factors which may influence the abundance of isopods.

DISCUSSION

The present study showed that the problem caused by isopods changed the fishing period of fishers and caused the considerable monetary losses. Similarly, Mizzan (1995) reported attacks by *N. neglecta* on a specimen of *Sciæna umbra* at a fishing site off Jesolo, Northern Adriatic Sea (Italy) in 1993. Both results of the present study and Kirkim et al. (2019) emphasized *N. neglecta* does not target any specific species. In addition, the current study by Revuelta et al. (2019) noted that *N. neglecta* attacks on not only fish species but also dead loggerhead sea turtle.

The present study and Kirkim et al. (2019) suggested that main reason of the increased isopod abundance may be related to the sea-cage fish farms around the fishing sites. Accordingly, the individuals of *N. neglecta* were collected under mussels' rafts of aquaculture units in Galicia (Lourido et al., 2008; Rincon et al., 2014).

In summary, this study indicated that soak time of fishers (in particular set netters) decreased to several hours and fishers' income was negatively influenced due to isopods' impact. The life cycle and feeding ecology of *N. neglecta* should be investigated deeply based on monthly sampling data in future research. In particular, comprehensive study

should be conducted to better-understand the nature of multiple factors (e.g., fish farms, tourism facilities) that induce the abundance of isopods.

REFERENCES

- Bakır K, Katagan T. Crustacean diversity of the coralligenous beds of Markiz Island (Aegean coast of Turkey). *Crustaceana* 2005; 78: 873-883.
- Bharadhirajan P, Murugan S, Sakthivel A, Selvakumar P. Isopods parasites infection on commercial fishes of Parangipettai waters, southeast coast of India. *Asian Pacific Journal of Tropical Disease* 2004; 4: 268-272.
- Dogan A, Çınar ME, Önen M, Ergen Z, Katakagan T. Seasonal dynamics of soft bottom zoobenthic communities in polluted and unpolluted areas of Izmir Bay (Aegean Sea). *Senckenbergiana Maritima* 2005; 35: 133-145.
- Geldiay R, Kocatas A. Isopods collected in Izmir Bay, Aegean Sea. *Crustaceana* 1972; 3: 19-30.
- Kırkım F, Kocataş A, Katakagan T, Sezgin M. Contribution to the knowledge of the free-living isopods of the Aegean Sea coast of Turkey. *Turkish Journal of Zoology* 2006; 30: 361-372.
- Kırkım F, Kocatas A, Katagan T, Sezgin M. A Report on parasitic Isopods (Crustacea) from marine fishes and Decapods collected from the Aegean Sea (Turkey). *Acta Parasit Turc.* 2008; 32: 382-385.
- Kırkım F, Horton T, Akyol O, Ceyhan T. *Natatolana neglecta* (Isopoda, Cirolanidae): an increasing threat for artisanal fishing in the Turkish Aegean Sea. *Crustacena* 2019; 92: 881-887.
- Lourido A, Sorbe JC, Troncoso JS. Inventario de los crustáceos bentónicos de sedimentos infralitorales de la Ría de Aldán (Galicia, NO Península Ibérica). *NACC Nova Acta Científica Compostelana. Biología* 2008 ; 17: 149-168.
- Mizzan L.. *Cirolana* cfr. *neglecta* Hansen, 1890 (Crustacea, Isopoda, Cirolanidae) nelle coste del Veneziano: note su di un attacco ad una postazione di pesca. *Bollettino del Museo Civico di Storia Naturale di Venezia* 1995; 44: 145-151.
- Ravichandran S, Balasubramanin T, Kannupandi T. Incidence of Parasitic Isopods on the Fish *Sphyræna obtusata*. *Research Journal of Parasitology* 2007; 2: 45-50.
- Rameshkumar G, Ravichandran S. Problems caused by isopod parasites in commercial fishes. *J Parasit Dis.* 2014; 38:138-141.
- Revuelta O, Domènech F, Keable S, Míguez-lozano R. First report of the scavenging isopod *Natatolana neglecta* (Crustacea: Isopoda: Cirolanidae) feeding on a sea turtle. *Mediterranean Marine Science* 2019; 20: 297-301.
- Rincón B, Pérez J, Junoy J. Description of *Natatolana neglecta* (Hansen, 1890) (Peracarida, Isopoda) from Spanish waters. *Crustaceana* 2014; 87: 585-599.
- Wilson, GDF. Global diversity of Isopod crustaceans (Crustacea; Isopoda) in freshwater. *Hydrobiologia* 2008; 595: 231-240.