Article

Crustacean fauna of a mussel cultivated raft system in the Black Sea

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Abstract
The aim of the current study was to make a faunistic analysis of the crustaceans associated with cultivated mussels grown on ropes. Mussel samples from 30 cm ropes were collected from rope-grown mussel beds by hand. The crustacean fauna associated with mussel population were quantified. The density of crustacean fauna associated with mussels was significantly greater within rope-grown mussel assemblages than on other biotopes around.

Keywords Crustacea; *Mytilus galloprovincialis*; raft culture; rope-grown mussels; species richness.

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1 Introduction

A few species of Bivalvia in Black Sea live on hard substrate: the mussel *Mytilus galloprovincialis* fasten themselves with bissal threads to underwater stones, macroalgal stems or pier columns as nature habitats. The biodiversity associated with cultivated mussel assemblages depends partly on the source of the mussels and on the new habitat created by the method of cultivation. To date, no study has been made of the macrofauna associated with mussels in the habitats created by different methods of mussel cultivation in the Black Sea. However, there are some researchs on macrofauna living with natural mussel populations distributed along the Black Sea (Konsulova, 1993; Konsulov and Konsulova, 1993; Gönlügür, 2002). The worldwide catch of marine molluscs in 2004 was 2.05 million tons, 50% of which consisted of the blue mussel *Mytilus edulis* (Linnaeus) representing 6% of all aquaculture production (FAO, 2006). It is essential that to be located and cultivation techniques selected to minimize ecological impacts. Solely, our study has focused primarily on the statement of the crustacean diversity in a mussel cultivated system.

2 Materials and Methods

Mussel samples together with the associated macrofauna were collected monthly from May 2005 to May 2006. The location and general view of raft systems is shown on Fig. 1 and 2.

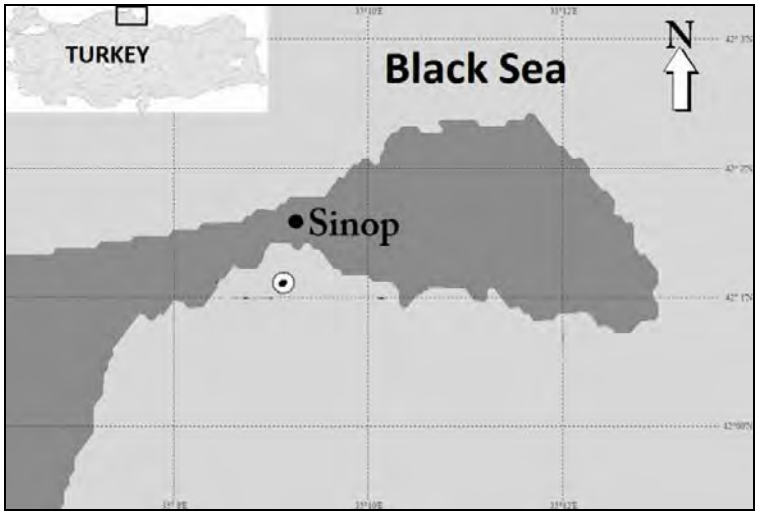

Fig. 1 The study area and location of raft-system.

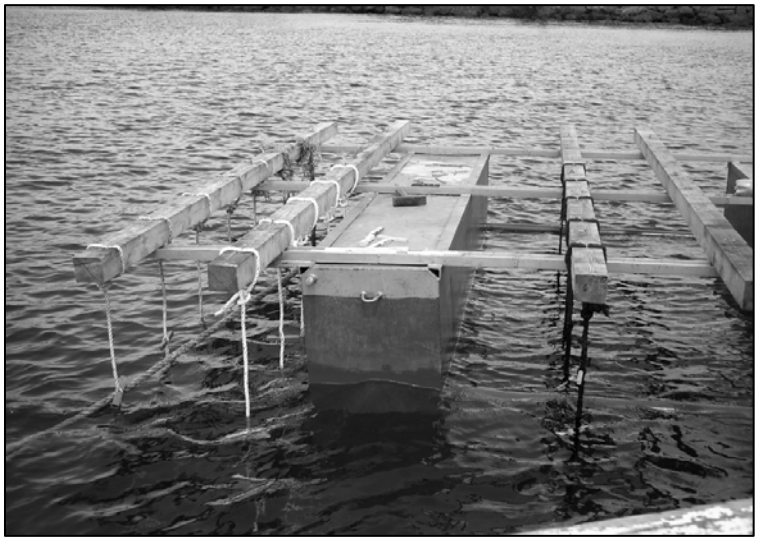

Fig. 2 The raft system for mussel culture.

On the rafts, mussels were grown on ropes approximately 10 m long suspended from the rafts. To sample raft-grown mussel assemblage ropes were lifted on board, and the mussel structure along 30-cm lengths of rope was carefully peeled away and laid flat. All material were sealed in plastic bags and fixed with 4% formalin and returned to the laboratory. After washing through a 0.5 mm mesh sieve with tapwater, all macrofauna were extracted and crustaceans identified to the lowest taxon possible.

3 Results and Discussion

Thirty-one species from 5 orders were recorded across the all months studied (Table 1). Seventeen species of Amphipoda, 8 species of Decapoda, 4 species of Isopoda, 1 species of Tanaidacea, and 1 species of Mysidacea were found (Fig. 3). Amphipods predominated at site; decapods were second abundant (9%), whereas others were most scarce.

Table 1 Species list and total number of individuals.

Taxon	**Total number of individuals**	**Taxon**	**Total number of individuals**
Alpheus sp.	40	*Jassa ocia*	15
Ampithoe ramondi	101	*Leptochelia savignyi*	85
Apherusa bispinosa	4	*Melita palmata*	410
Apherusa chierehinii	1	*Microdeutopus gryllotalpa*	12
Athanas nitescens	112	*Monocorophium acherusicum*	112
Caprella liparotensis	41	*Monocorophium insidiosum*	50
Dexamine spinosa	19	*Pachygrapsus marmoratus*	22
Ericthonius brasiliensis	195	*Palaemon elegans*	5
Ericthonius punctatus	2	*Pilumnus hirtellus*	41
Gammarellus angulosus	21	*Pisidia bluteli*	2
Hyale crassipes	2	*Pisidia longicornis*	82
Hyale pontica	13	*Siriella jaltensis*	1
Idotea balthica	14	*Stenothoe monoculoides*	846
Idotea metallica	1	*Synisoma capito*	1
Idotea pelagic	5	*Xantho poressa*	2
Jassa marmorata	550	**Total**	**2807**

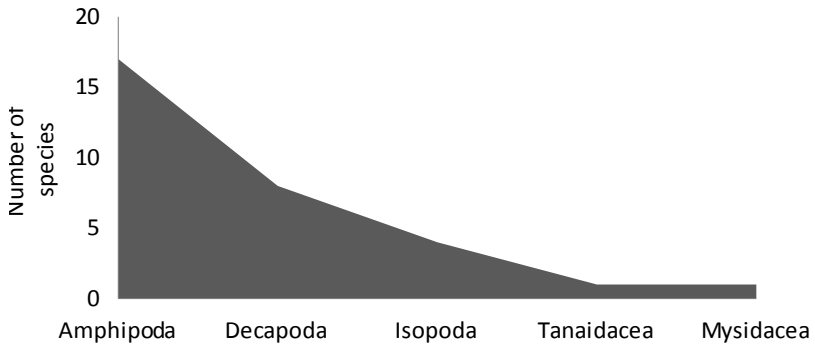

Fig. 3 Species numbers of each of the groups.

Considering the number of individuals collected for a year or a maximum number of individuals belong to Amphipoda. Lowest number of individuals observed in the group of Mysidacea (Fig. 4). Cultivated mussel beds, however, have been found to support increased numbers of amphipod crustaceans (Beadman et al., 2004).

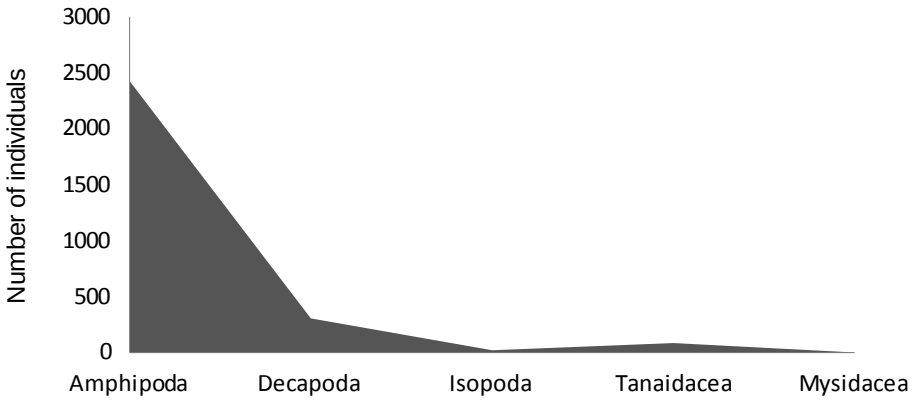

Fig. 4 Individual numbers of each of the groups.

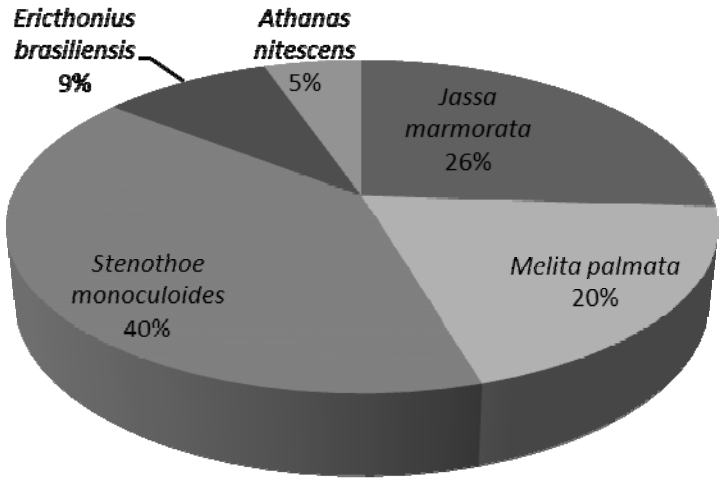

Fig. 5 Relative dominance of the species by number of individuals.

The most abundant species differed between months. In general the most dominant species were *Stenothoe monoculoides*, *Melita palmata*, *Jassa marmorata* ve *Ericthonius brasiliensis* and *Athanas nitescens* (Fig. 5).

These species show high abundance values also in their natural habitats. Species with the highest frequency were parallel to the most abundant species.

Konsulova (1993) was found that in biotopes with *M. galloprovincialis*, polychaets are qualitatively dominant in Bulgarian coast. Crustaceans and molluscs followed it, respectively. However, in quantitative dominancy, crustaceans were the dominant species than the other groups.

Konsulov and Konsulova (1993) in their study on the biological diversity of the mussel facies in the Gulf of Burgas, 90 invertebrate species were identified. Of these, 30 polychaetes, 26 crustaceans and 24 belong to the molluscs. Gönlügür (2002) has identified a total of 111 invertebrate taxa in *Mytilus* facies at Sinop coast. Of these, 49 Crustacea 35 Annelida and 17 belongs to the Mollusca. Among identified crustaceans, *Stenothoe monoculoides* was found to have a very high average abundance. *Jassa marmorata* and *Melita palmata* have

been pointed out as other abundant species.

According to the results obtained during the year, some species were represented by one or two individuals. *Idotea metallica*, *Stenosoma capito*, *Siriella jaltensis* one individual, two individuals were represented in *Xantho poressa* and *Hyale crassipes*.

When we examine the seasonal quality and quantity of species, the highest number of species was observed in July and August as summer season, also in the winter months of December and January (Fig. 6). The maximum number of individuals in March, at least in November was observed.

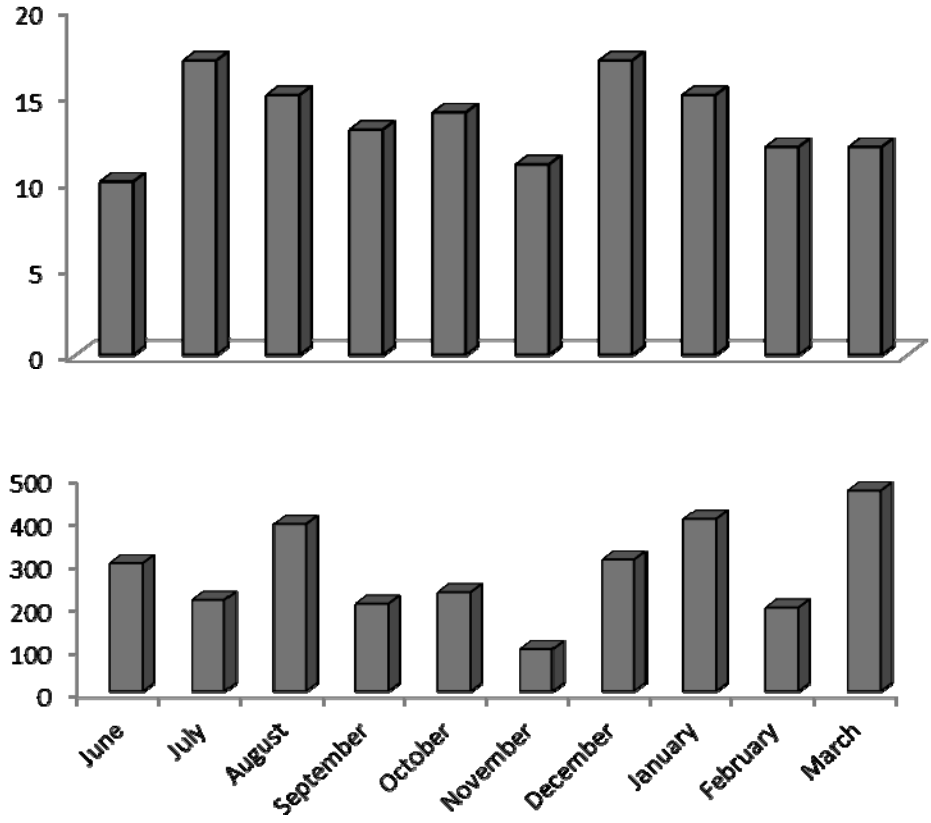

Fig. 6 Monthly distribution of faunal densities and species numbers.

The finding of higher biodiversity at study area can simply be interpreted as a positive effect of mussel culture on biodiversity. Newly created mussel structure provides increased substrate for many species, particularly in the case of raft mussel culture.

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