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RESEARCH ARTICLE

Findings on pelagic macro crustacean species of the Finike Seamounts Special Environment Protection Area (SEPA), the eastern Mediterranean Sea

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Abstract

The ecology of seamounts in the Mediterranean Sea is poorly investigated. This paper aims to make contribution to the knowledge of the deep-sea pelagic fauna of the Finike Seamounts Special Environmental Protection Area (SEPA). Eight species of the pelagic crustaceans were recorded during the spring and fall surveys in 2021. The most abundant species was *Euphausia krohnii*, followed by *Robustosergia robusta* and *Allosergestes sargassi*, in this study. The other five species, *Nematoscelis atlantica, Stylocheiron longicorne, Thysanopoda aequalis, Amalopenaeus elegans* and *Lucifer typus*, were found in lower abundance.

Keywords: Finike Seamounts, Euphausiacea, pelagic crustacea

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Introduction

The pelagic ecosystems on the planet are the largest by volume and harbor an extraordinary number of organisms, which interact with each other and with the environment (Etnoyer *et al.* 2004). The pelagic ecosystem contains groups of organisms that are linked by energy and nutrient flows, interacting with each other and with the physical environment as a functional unit. These components are connected in a complex food web characterized by evolving interactions (Etnoyer *et al.* 2004). The pelagic species are thought to serve as important nutrient recyclers, mixing and ingesting sediments and fecal pellets during vertical

migrations (Kathman *et al.* 1986). Pelagic marine food webs appear to have complex and evolving dynamics, operating through multiple and weak trophic interactions between species. It is known that pelagic decapod species play an important role in structuring ecosystems. The food flows between the benthic and pelagic ecosystems seem to take place through the benthopelagic shrimps and the small pelagics. Euphausiids, on the other hand, serve as vertical and horizontal transporters and distributors of organic matter and nutrients (Keen 2012).

The pelagic environment appears to be homogenous and these habitats do often host species specifically adapted to the environmental conditions (Heip and Gattuso 2006). Biomass is often higher over seamounts than in surrounding areas. This is probably a result of the upwelling around the seamounts. The pelagic communities above seamounts are different compared to the pelagic fauna and flora found in surrounding waters (Würtz 2012).

Finike Seamounts Special Environment Protection Area (SEPA) was declared by the Turkish government on 16 August 2013 to protect its biological and ecological importance. It is located off the southern coast of Türkiye and west of Cyprus Island and its surface area covers 1,124,173ha. The Finike Seamounts SEPA consists of three prominent morpho-tectonic elements: the Anaximander Mountain (in the west), the Anaxagoras Mountain (in the east), and the Anaximenes Mountain (in the middle). The sea bottom between the Anaximander and Anaximenes Mountains is referred to as the Sırrı Erinç Plateau (Aksu *et al.* 2009).

Seamounts are of particular biological and ecological importance, also as being breeding and nursery grounds for a wide range of organisms. These structures also serve as migration routes for highly mobile species, such as marine mammals and other top predators (Würtz 2012). Most significantly, the Finike Seamounts SEPA are located in a highly oligotrophic area of the eastern Mediterranean Sea.

Materials and Methods

Surveys were carried out with the research vessel named “R/V Yunus S” (32m in length) in the open waters of the eastern Mediterranean Sea in 2021 (Figure 1). A simple pelagic net with a mouth aperture of 3.2m fitted with a net of 5mm mesh at the cod end was designed for the sampling (Figure 2a). Samples were obtained with a pelagic net, from stations FKI-2 to FKII-3. A beam trawl (BT) was also used, with a beam length of 3m and a vertical net opening of 0.6m (Figure 2b). The towing duration was 1h and the towing speed varied between 2.2 and 2.5 knots. A beam trawl was used for samples collected from stations BT-1 and BT-2. All specimens were fixed in formalin (4%) onboard and sorted. The specimens were later identified in the laboratory.

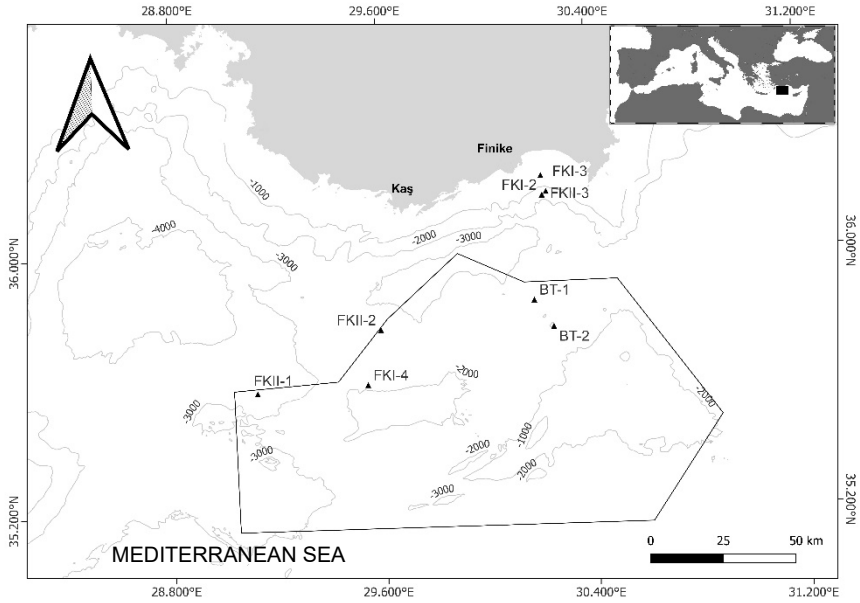

Figure 1. Sampling stations.
The area bordered by solid lines is the Finike Seamounts SEPA.

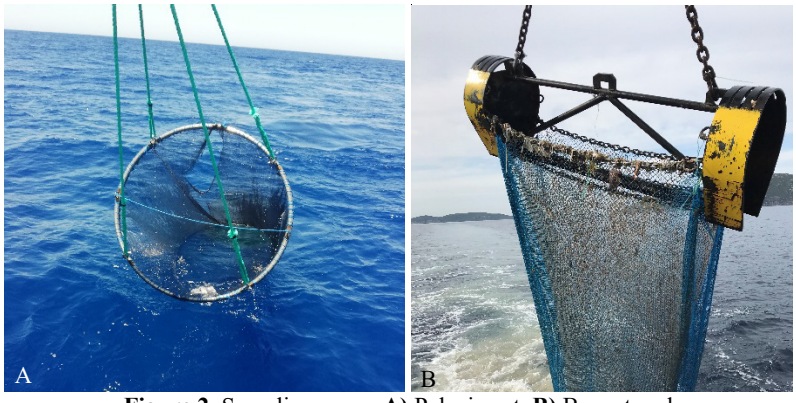

Figure 2. Sampling gears; **A)** Pelagic net, **B)** Beam trawl

Results and Discussion

In this study, eight pelagic crustacean species were recorded in the Finike Seamounts SEPA and the adjacent waters. The specimens were collected from depths up to 2200m. The species were listed in Table 1 together with the number of individuals. A total of four species belonging to the order Euphausiacea and four species belonging to the order Decapoda were identified. The most common species was the euphausiid species, *Euphausia krohnii*, constituting 45% of the

total crustacean samples. It was followed by *Robustosergia robusta* (15%) and *Allosergestes sargassi* (13%). These species constituted over 75% of all crustacean species. The other species were represented under 10%. *Euphausia krohnii* was collected from all pelagic stations, while *A. sargassi* was present only in BT stations.

Table 1. List of crustacean species with the numbers of sampled individuals

	Stations							
Taxon	FKI-2	FKI-3	FKI-4	FKII-1	FKII-2	FKII-3	BT-1	BT-2
Decapoda								
Allosergestes sargassi (Ortmann, 1893)	–	–	–	8	3	5	2	5
Amalopenaeus elegans SI Smith, 1882	–	–	–	–	–	–	9	8
Lucifer typus H. Milne Edwards, 1837	–	1	7	2	3	2	3	–
Robustosergia robusta (SI Smith, 1882)	–	–	6	4	11	3	4	5
Euphausiacea								
Euphausia krohnii (Brandt, 1851)	22	38	9	11	8	14	–	–
Nematoscelis atlantica Hansen, 1910	–	3	4	–	–	5	–	–
Stylocheiron longicorne G.O. Sars, 1883	–	–	–	–	2	7	–	–
Thysanopoda aequalis Hansen, 1905	–	–	2	3	–	4	–	–

Decapoda species

Allosergestes sargassi (Ortmann, 1893) (Figure 3a) is a cosmopolitan, bathypelagic species, inhabiting the Mediterranean Sea and Atlantic from 45°N to 34°S (Farfante and Kensley 1997). This species is also recorded from the eastern Mediterranean Sea (Kensley 2006). The only two records from the Aegean Sea were documented by Koukouras (2000) and (Güreşen and Gönülal 2018).

Amalopenaeus elegans SI Smith, 1882, (Figure 3b) is a bathypelagic Atlanto-Mediterranean species, and it is known in the Aegean Sea (Gönülal *et al.* 2014) and all over the Mediterranean Sea (Farfante and Kensley 1997)

Lucifer typus H. Milne Edwards, 1837, (Figure 3c) is an epipelagic cosmopolitan species. It has been reported from the eastern Mediterranean and the Aegean Sea (Holthuis and Gotlieb 1958).

Robustosergia robusta (SI Smith, 1882) (Figure 3d) is a bathypelagic species, known in several areas including the Aegean Sea (Koukouras 2000) and also the Levantine Basin (Galil and Goren 1994).

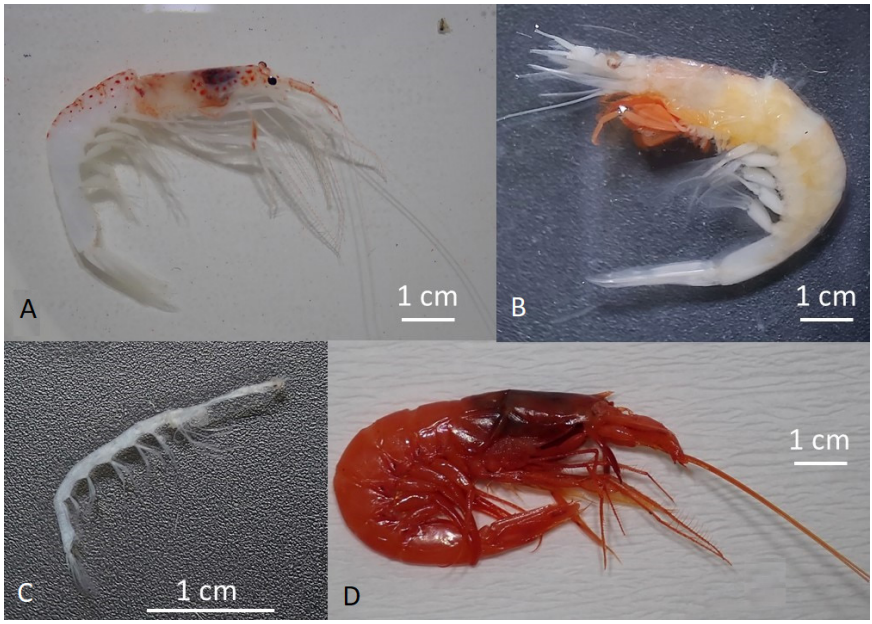

Figure 3. Decapoda species: **A)** *Allosergestes sargassi,* **B)** *Amalopenaeus elegans,* **C)** *Lucifer typus,* **D)** *Robustosergia robusta*

Euphausiacea species

Thysanopoda aequalis (Hansen, 1905) (Figure 4a) is found in the eastern Mediterranean off the Rhodes Island (Wiebe and D'abramo 1972). It is also known in the Aegean Sea (Mavidis *et al.* 2005).

Stylocheiron longicorne (G.O. Sars, 1883) (Figure 4b) is a cosmopolitan and eurybathic species with a wide distribution, existing in all oceans. It is also known in several areas of the Mediterranean Sea and the Levantine Basin (Wiebe and D'Abramo 1972). It typically does not vertically migrate; if it does, only moves in short distances (Mauchline 1980).

Euphausia krohnii (Brandt, 1851) (Figure 4c) is an Atlanto-Mediterranean, bathypelagic species that have been recorded many times in several areas of the Mediterranean. It lives at the depth of 400-600m during the day but migrates vertically to 0-200m at night. They aggregate and are known to be the main food source of many fishes and decapods.

Nematoscelis atlantica (Hansen, 1910) (Figure 4d) is a cosmopolitan, bathypelagic species. It is widely present in the Mediterranean Sea including the

eastern Mediterranean (Casanova-Soulier 1970). Adults are mostly below about 250m by day and above that depth at night. Most immatures and larvae are above 50m, day and night.

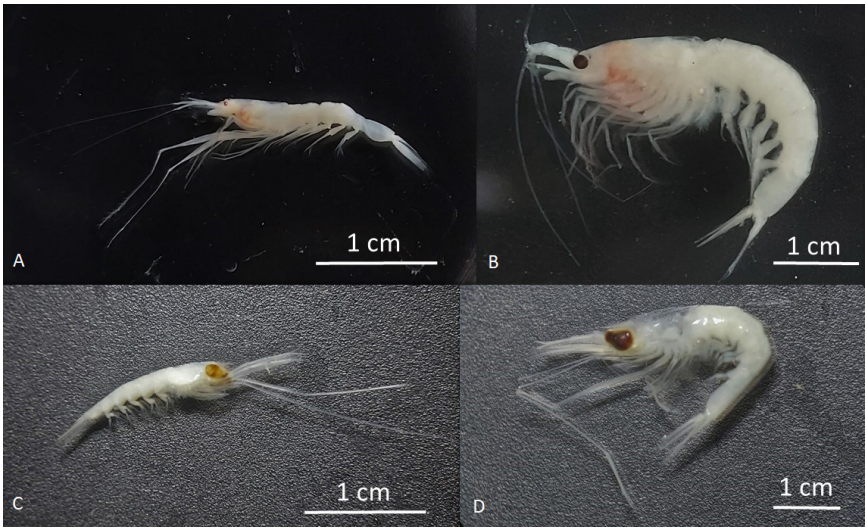

Figure 4. Euphausiacea species: **A)** *Thysanopoda aequalis,* **B)** *Stylocheiron longicorne,* **C)** *Nematoscelis atlantica,* **D)** *Euphausia krohnii*

None of these species have been previously recorded from the Finike Seamounts, possibly because of insufficient sampling efforts. Olu-Le Roy *et al.* (2004) carried out a detailed study on two mud volcano fields (Olimpi and Anaximander mud field) and explored them during the French-Dutch Medinaut cruise with the submersible NAUTILE in 1998. Invertebrate species were sampled on the mud volcanoes, five of which (Amphipoda sp. *Munidopsis marionis*, *M. acutispina*, *Chaceon mediterraneus*, *Paranarthrura intermedia*) belong to Crustacea Subphylum. A three-year survey in the eastern Mediterranean Sea between 2006 and 2008 was conducted by Öztürk *et al.* (2010). In this study, the Finike Seamounts area was sampled at depths ranging from 880 to 1000m by a beam trawl. A total of four crustacean species, *Polycheles typhlops*, *Calocaris macandreae*, *Parapenaeus longirostris* and *Aristaeomorpha foliacea*, were found in the area.

Mud volcanoes with a methane cold seep community have been reported from Finike Seamounts (Aksu *et al.* 2009). This community in the Finike Seamounts is unique and quite different from all other known cold seep communities. These structures may vary in the type and abundance of associated marine organisms (Olu-Le Roy *et al.* 2004).

A more detailed and long-term study is needed in order to understand the unique habitats of the seamounts in the eastern Mediterranean Sea. For the Finike

Seamounts SEPA, the presence of megafauna such as cetacean species is also documented (Akkaya *et al.* 2020; Dede *et al.* 2022). Nevertheless, other species in the pelagic ecosystem also need further investigation.

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Finike Deniz Dağları Özel Çevre Koruma Bölgesi'nde (ÖÇKB) bulanan pelajik krustase türleri hakkında bazı bulgular

Öz

Akdeniz'deki deniz dağlarının ekolojisi yeterince araştırılmamıştır, Bu makalenin amacı, Finike Deniz Dağları Özel Çevre Koruma Bölgesi'nin (ÖÇKB) derin deniz pelajik fauna bilgisine katkıda bulunmaktadır. 2021 yılı sonbahar ve ilkbaharında gerçekleşen bu çalışmada, toplam 8 adet pelajik krustase türü kayıt edilmiştir. En bol bulunan tür *Euphausia krohnii* olup, onu *Robustosergia robusta* ve *Allosergestes sargassi* türleri izlemiştir. Diğer beş *Nematoscelis atlantica, Stylocheiron longicorne, Thysanopoda aequalis, Amalopenaeus elegans* ve *Lucifer typus* ise daha düşük bir bolluğa sahiptir.

Anahtar kelimeler: Finike Denizaltı Dağları, Euphausiacea, pelajik krustase

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