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Crustacean species off the coast of Kıyıköy (Black Sea, Türkiye) with a new record

by

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Abstract

Examination of hard- and soft-bottom samples collected off the coast of Kıyıköy (Black Sea, Türkiye) using grabs, quadrats and trawls revealed a total of 39 crustaceans belonging to eight orders. Among the species, *Medorippe lanata* was recorded in the Black Sea for the first time. Amphipoda dominated on hard and soft substrates in terms of the number of species and individuals. A total of 898 individuals belonging to 27 species were identified on the hard bottom, of which *Ampithoe ramondi* was the most dominant species (47.4%). On the other hand, a total of 123 individuals belonging to 16 species were recorded on the soft bottom, with *Diogenes pugilator* (21.1%) being the most dominant species (21.1%). A total of 441 individuals belonging to nine species were found following bottom and beam trawl hauls, with *Liocarcinus navigator* and *L. depurator* being the most frequent species. Community parameters were estimated in both hard- and soft-bottom samples.

Key words: Crustaceans, biodiversity, new record, alien, Kıyıköy, Black Sea

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1. Introduction

The Black Sea is the largest semi-enclosed sea in the world, covering an area of approximately 4.2 × 105 km^2 and containing a water volume of 547 000 km^3. It is connected to the Sea of Marmara in the south through the Istanbul Strait and to the Sea of Azov in the north through the Kerch Strait. The Black Sea is characterized by anoxic conditions below certain depths, which limit the distribution of macrobenthic species (Zaitsev et al. 2002). The hydrographic regime of the Black Sea is also unique, with low salinity surface waters of fluvial origin overlying deep high-salinity waters of Mediterranean origin (Bakan & Büyükgüngör 2000).

The Black Sea ecosystem differs from the Mediterranean Sea in terms of lower diversity and dominant species groups. However, it has a higher abundance, total biomass and productivity compared to the Mediterranean Sea (Zaitsev & Alexandrov 1998). Unfortunately, the Black Sea is currently facing various challenges, including eutrophication, chemical pollution, including oil pollution, invasion of alien species, habitat loss, overfishing and climate change (Öztürk 1999; Yunev et al. 2005; Bat et al. 2018). These factors have a significant impact on the distribution of crustaceans in the Black Sea due to their sensitivity to pollution and environmental stress.

Crustaceans are a diverse group of organisms found in aquatic environments, including the Black Sea. There are over 52 000 species worldwide (Mahmood Ghafor 2020), of which 1790 species occur along the coasts of Türkiye (Bakır et al. 2024). The Black Sea coast of Türkiye is home to 396 species of crustaceans (Bakır et al. 2024).

Faunistic studies on crustaceans along the coast of the Black Sea of Türkiye were initiated by Holthuis (1961), who reported 13 decapods from the coasts of Trabzon and Samsun. Later, the group was studied in the area by Kocataş & Katağan (1978), Kocataş (1981), Mutlu & Ünsal (1991-1992), Mutlu et al. (1992), Öztürk (1999), Bat et al. (2001), Sezgin et al. (2001), Uysal et al. (2002), Kocataş & Katağan (2003), Bilgin & Çelik (2004), Gönlügür Demirci & Katağan (2004), Bilgin & Gönlügür Demirci (2005), Gönlügür Demirci (2006), Kırkım et al. (2006), Sezgin & Katağan (2007), Bilgin et al. (2007), Karaçuha et al. (2009), Sezgin & Aydemir Çil (2010), Sezgin et al. (2010), Balkıs et al. (2012), Sezgin & Aydemir Çil (2013), Kırkım et al. (2014), Bilgin & Yılmaz (2016), Kurt Şahin et al. (2017), Yıldız & Karakulak (2017), Mülayim (2021), Onay & Bilgin (2021) and Bakır et al. (2024).

However, no previous studies have been conducted on the distribution of crustaceans on the Kıyıköy coast. Therefore, this study aims to fill this gap by providing detailed and up-to-date information on the crustacean fauna in this area. The present study also provides information on the distribution of crustaceans in relation to different habitats and depths.

2. Materials and methods

This study aimed to investigate the structure of benthic crustacean communities off the coast of Kıyıköy, Kırklareli. The project was led by Dokuz Eylül University and funded by Fugro NV. A total of 20 sites were selected for the study. Soft-bottom samples were collected at seven sites in April 2017 using a 0.1 m^2 Van Veen grab, at depths ranging from 5 to 25 m. Hard-bottom samples were collected by scuba divers at five sites in May 2017 using a 2020 cm frame, at depths ranging from 8 to 21 m (Fig. 1, see Table 1). Algae were carefully scraped off the rocks using a spatula.

Epifaunal samples were collected in May 2017 at eight sites, at depths ranging from 14 to 52 m (Fig. 2, see Table 2). Beam and bottom trawls were used to collect samples of epifauna.

All samples were sieved through a 0.5 mm mesh. The retained material was preserved in separate jars containing a 4% formaldehyde solution in seawater. In the laboratory, the samples were rinsed and sorted by taxonomic group using a stereomicroscope. Finally, the samples were preserved in 70% ethanol. Crustacean species were identified and counted using stereo- and compound microscopes. The specimens were photographed using an Olympus Tough TG-4 digital camera and deposited at the Institute of Marine Science and Technology, Dokuz Eylül University, Izmir.

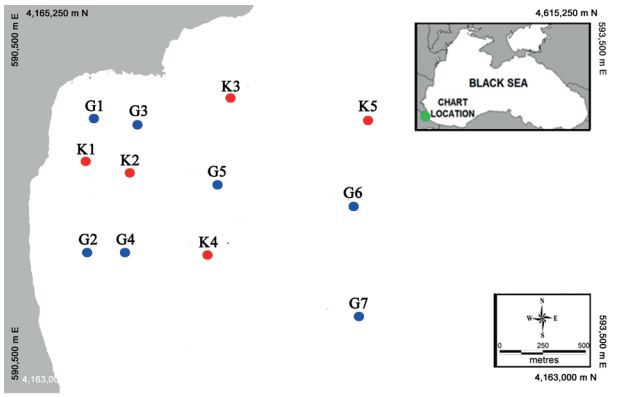

Figure 1

Map of the study area showing the location of soft- and hard-bottom sites (red marks: hard-bottom sites; blue marks: soft-bottom sites).

Table 1

Coordinates, dates, depth, gear and sediment types at the sampling sites.

Site Code	X	Y	Sampling date	Depth (m)	Sampling gear	Sediment type
G1	28.092785	41.661300	5 April 2017	5	Grab	Sand
K1	28.092228	41.659053	12 May 2017	11	Quadrat	Algae
G2	28.092216	41.654303	4 April 2017	8	Grab	Sand
G3	28.095781	41.660881	4 April 2017	8	Grab	Sand
K2	28.095223	41.658636	11 May 2017	8	Quadrat	Algae
G4	28.094545	41.654247	4 April 2017	10	Grab	Sand
K3	28.102329	41.662292	11 May 2017	11	Quadrat	Algae
G5	28.101214	41.657800	4 April 2017	15	Grab	Sand
K4	28.100586	41.654014	11 May 2017	13	Quadrat	Algae
K5	28.111914	41.660953	12 May 2017	21	Quadrat	Algae
G6	28.110797	41.656460	4 April 2017	25	Grab	Sandy mud
G7	28.111203	41.650753	4 April 2017	25	Grab	Gravelly sand

Table 2

Sampling dates, coordinates and depth of beam and bottom trawl hauls in the study area.

Sites	Sampling date	Coordinates		Sampling depth (m)	
		Start	Finish	Start	Finish
Beam Trawl-1	5 Apr. 2017	41°38′20′′N 28°06′28′′E	41°39′14′′N 28°06′05′′E	14	17
Beam Trawl-2	5 Apr. 2017	41°39′01′′N 28°06′08′′E	41°39′22′′N 28°07′18′′E	17	33
Beam Trawl-3	5 Apr. 2017	41°39′03′′N 28°06′13′′E	41°38′27′′N 28°06′36′′E	17	18
Beam Trawl-4	5 Apr. 2017	41°39′02′′N 28°06′11′′E	41°38′39′′N 28°07′24′′E	16	31
Bottom Trawl-1	6 Apr. 2017	41°37′37′′N 28°08′06′′E	41°39′14′′N 28°08′25′′E	19.5	43
Bottom Trawl-2	6 Apr. 2017	41°39′40′′N 28°07′21′′E	41°38′23′′N 28°07′38′′E	27	29
Bottom Trawl-3	6 Apr. 2017	41°39′24′′N 28°06′48′′E	41°38′10′′N 28°07′24′′E	25	26
Bottom Trawl-4	6 Apr. 2017	41°39′01′′N 28°06′11′′E	41°38′54′′N 28°08′20′′E	18	52

The occurrence of crustacean species at each site was calculated using the Soyer (1970) frequency index (F%). The results were categorized into three groups: "Constant" (F% ≥ 50%), "Common" (50% > F% ≥ 25%), and "Rare" (F% < 25%). The dominance values of the collected crustacean species were determined using Bellan-Santini's (1969) quantitative dominance index (Di). The biodiversity of crustacean species was determined using the Shannon–Weaver diversity index (H') and the evenness index (J'), as described by Shannon & Weaver (1963) and Pielou (1966), respectively. Dekos (2014) reported that the threshold values of the Shannon–Weaver diversity index for the Turkish coast of the Black Sea range from 0 to 4, with diversity increasing as the value approaches 4.

Multidimensional scaling (MDS) methods were used to analyze the Bray–Curtis similarity index and the regional distribution model to determine the similarity between the sampling locations. The raw data were square-root transformed. SIMPER analysis was used to determine the percentage contribution of each species to the similarities and differences obtained from the stack analysis. The analysis was performed using Primer 6 software (Clarke & Warwick 2001).

3. Results

A total of 39 crustacean species and 1469 specimens belonging to eight different groups (Cirripedia, Leptostraca, Mysida, Amphipoda, Isopoda, Tanaidacea, Cumacea and Decapoda) were found off Kıyıköy on the Black Sea coast of Türkiye (see Table 3). One of the species, *Medorippe lanata* (Linnaeus, 1767), was recorded for the first time in the Black Sea. A small

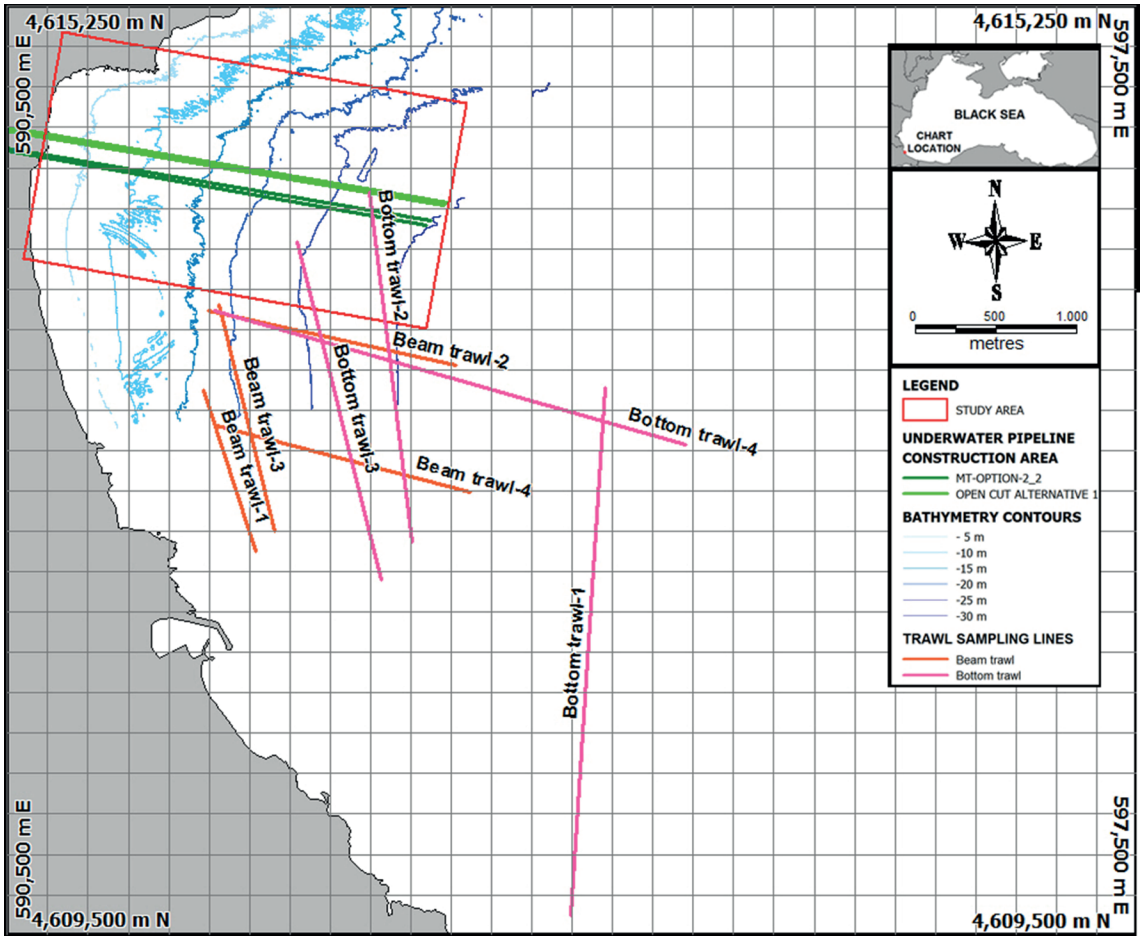

Figure 2

Beginning and ending locations of beam- and bottom-trawl hauling off Kıyıköy.

individual with a carapace length of 1.57 cm and a carapace width of 1.80 cm was encountered at site BT1 (Fig. 3).

Another finding was the presence of the alien cirriped species *Amphibalanus improvises* at sites K1 (2 individuals) and G3 (3 individuals; see Table 3).

3.1. Hard-bottom samples

A total of 27 species and 898 individuals were found on the hard bottom, with Amphipoda accounting for the largest number of species (15 species, 55.6% of all species), followed by Decapoda (5 species, 18.5%). Cirripedia, Leptostraca, Mysida, Isopoda and Tanaidacea were represented by only one species (Fig. 4a).

In terms of the number of individuals, Amphipoda was the dominant taxon, accounting for 88.3% of all individuals (793 individuals), followed by Cumacea (6.0%, with 54 individuals; Fig. 4b). Hard-bottom sites were dominated by the herbivorous amphipod *Ampithoe ramondi* (46% of all individuals) and *Dexamine spinosa* (10.2%; Fig. 4c). Based on Soyer's frequency index, ten species were classified as constant at the surveyed sites (*A. ramondi*, *Apherusa*

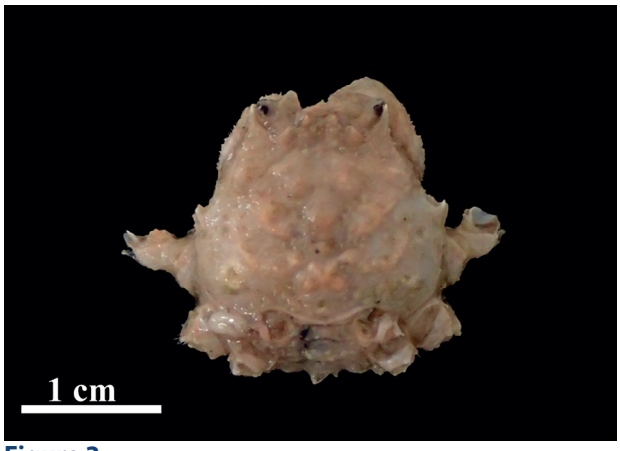

Figure 3

External morphology of *Medorippe lanata*.

Table 3

List of crustacean species: *alien species; **new record for the Black Sea; sampling gear; K – quadrat, G – grab, BE – beam trawl, BT – bottom trawl.

Species	Depth (m)	Sampling gear				Site code
		K	G	BE	BT	
CIRRIPEDIA						
**Amphibalanus improvisus* (Darwin, 1854)	8–11	2	3	–	–	K1, G3
LEPTOSTRACA						
Nebalia sp.	5–25	5	2	–	–	K1, K2, G1, G7
MYSIDA						
Gastrosaccus sp.	5–11	1	1	–	–	K1, G1
AMPHIPODA						
Ampelisca pseudosarsi Bellan-Santini & Kaim-Malka, 1977	8–25	1	3	–	–	K1, G2, G7
Ampithoe ramondi Audouin, 1826	5–21	413	2	–	–	K1, K2, K3, K4, K5, G1
Apherusa sp.	11–13	39	–	–	–	K1, K3, K4
Bathyporeia guilliamsoniana (Bate, 1857)	8–15	–	19	–	–	G3, G4; G5
Dexamine spiniventris (Costa, 1853)	8	27	–	–	–	K2
Dexamine spinosa (Montagu, 1813)	5–13	92	2	–	–	K1, K2, K3, K4, G1
Ericthonius difformis H. Milne Edwards, 1830	8–11	13	–	–	–	K1, K2
Ericthonius punctatus (Spence Bate, 1857)	8–21	24	–	–	–	K1, K2, K5
Ericthonius sp.	5–11	27	1	–	–	K1, K2, G1
Leptocheirus pilosus Zaddach, 1844	25	–	3	–	–	G6
Megaluropus massiliensis Ledoyer, 1976	5–15	–	12	–	–	G1, G2, G3, G4, G5
Microdeutopus gryllotalpa Costa, 1853	8–11	9	–	–	–	K1, K2
Microdeutopus versiculatus (Spence Bate, 1857)	25	–	2	–	–	G6
Monocorophium acherusicum (Costa, 1853)	8–21	23	–	–	–	K1, K2, K4, K5
Monocorophium insidiosum (Crawford, 1937)	11	7	–	–	–	K1
Monocorophium sp.	11–21	39	–	–	–	K1, K3, K5
Parhyale aquilinan (Costa, 1857)	11	36	–	–	–	K1, K3
Perioculodes longimanus (Spence Bate & Westwood, 1868)	5–25	2	10	–	–	K1, G1, G2, G4, G5, G7
Tritaeta gibbosa (Spence Bate, 1862)	8–21	41	–	–	–	K1, K2, K5
ISOPODA						
Eurydice pulchra Leach, 1815	5–15	–	13	–	–	G1, G2, G4, G5
Idotea sp.	11	7	–	–	–	K1
TANAIDACEA						
Chondrochelia savignyi (Kroyer, 1842)	8–21	13	–	–	–	K1, K2, K3, K4, K5
CUMACEA						
Cumella (*Cumella*) *limicola* Sars, 1879	5–13	52	5	–	–	K1, K2, K3, K4, G1
Pseudocuma (*Pseudocuma*) *longicorne* (Bate, 1858)	8–25	2	26	–	–	K2, G2, G3, G4, G5, G7
DECAPODA						
Crangon crangon (Linnaeus, 1758)	19.5–43	–	–	–	6	BT1, BT2
Diogenes pugilator (Roux, 1829)	5–52	–	26	75	4	G1, G2, G3, G4, G5, G7, BE2, BE3, BE4, BT2, BT4
Hippolyte leptocerus (Heller, 1863)	11	3	–	–	–	K1
Liocarcinus depurator (Linnaeus, 1758)	14–52	–	–	27	161	BE1, BE2, BE3, BE4, BT1, BT2, BT3, BT4
Liocarcinus navigator (Herbst, 1794)	14–52	–	–	14	112	BE1, BE2, BE3, BE4, BT1, BT2, BT3, BT4
Macropodia rostrata (Linnaeus, 1761)	11	1	–	–	–	K1
***Medorippe lanata* (Linnaeus, 1767)	19.5–43	–	–	–	1	BT1
Palaemon adspersus Rathke, 1837	18–52	–	–	–	21	BT1, BT3, BT4
Pilumnus hirtellus (Linnaeus, 1761)	11–33	8	–	2	–	K1, BE1, BE2
Pisidia bluteli (Risso, 1816)	8–13	8	–	–	–	K1, K2, K3, K4
Upogebia pusilla (Petagna, 1792)	16–31	–	–	4	9	BE3, BE4, BT3
Xantho poressa (Olivi, 1792)	11–52	3	–	1	4	K1, BE3, BT1, BT4
Total specimens		898	130	123	318	

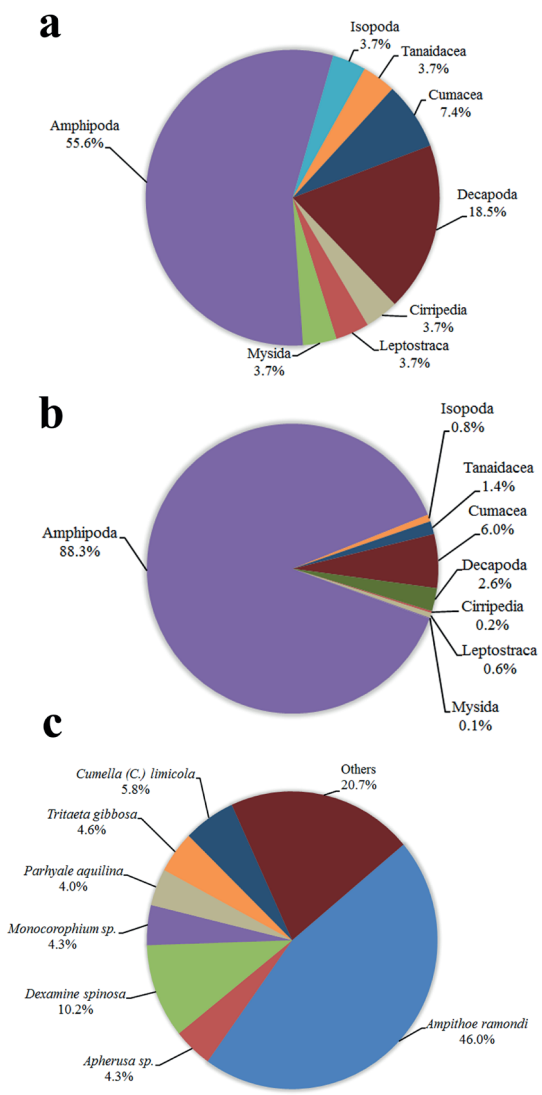

Figure 4

Relative dominance of crustaceans on hard bottom: a) by number of species per group, b) by number of individuals per group, c) by number of individuals per species.

sp., *D. spinosa*, *Ericthonius punctatus*, *Monocorophium acherusicum*, *Monocorophium* sp., *Tritaeta gibbosa*, *Chondrochelia savignyi*, *Cumella* (*Cumella*) *limicola* and *Pisidia bluteli*), five species as common, and twelve species as rare.

For the hard-bottom sites, the largest number of species (25 species) and individuals (598 individuals) were found at site K1. The highest value of the diversity index (H′) was obtained for site K1 (H′ = 3.1), while the lowest for site K3 (H′ = 1.8). The values of the evenness index (J′) ranged from 0.60 (K3) to 0.90 (K5; Fig. 5).

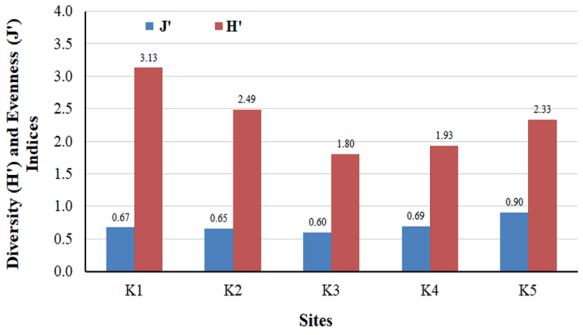

Figure 5

Diversity and evenness indices at hard-bottom sites.

The Bray–Curtis similarity index indicates the presence of two main groups (groups A and B) at the hard-bottom sites. Group A included sites K1 and K2, while group B included sites K3 and K4 (Fig. 6). The highest similarity (61%) was found in group B. *Ampithoe ramondi* (44.6% contribution), *C.* (*C.*) *limicola* (14.5%), *Apherusa* sp. (10.2%) and *D. spinosa* (10.2%) contributed most to this similarity. Sites in group A shared a similarity level of 46.1%. The amphipods *A. ramondi*, *D. spinosa* and *E. punctatus* contributed most to the similarity of group B. Site K5 was found to be different from the other sites. The species that contributed most to the dissimilarity between this site and group A were *A. ramondi* (18.1%) and

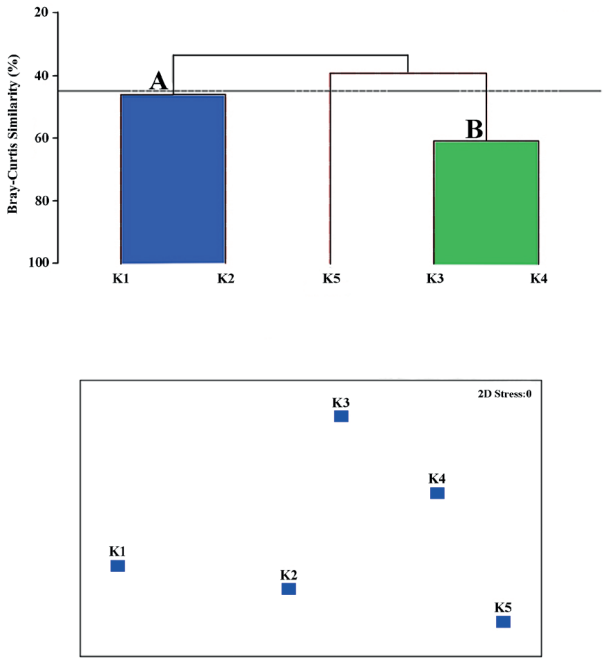

Figure 6

Similarities between hard-bottom sites.

D. spinosa (11.9%), and those that contributed most to the dissimilarity between group B and site K5 were *A. ramondi* (16.1%), *T. gibbosa* (12.4%) and *Apherusa* sp. (12.1%).

3.2. Soft-bottom samples

A total of 16 species and 123 individuals of crustaceans were observed on soft bottom, with Amphipoda accounting for the largest number of species (nine species, 56.4% of all species) followed by Cumacea (two species, 12.6%). Cirripedia, Leptostraca, Mysida, Isopoda and Decapoda were represented by only one species each and no species from the order Tanaidacea were observed (Fig. 7a).

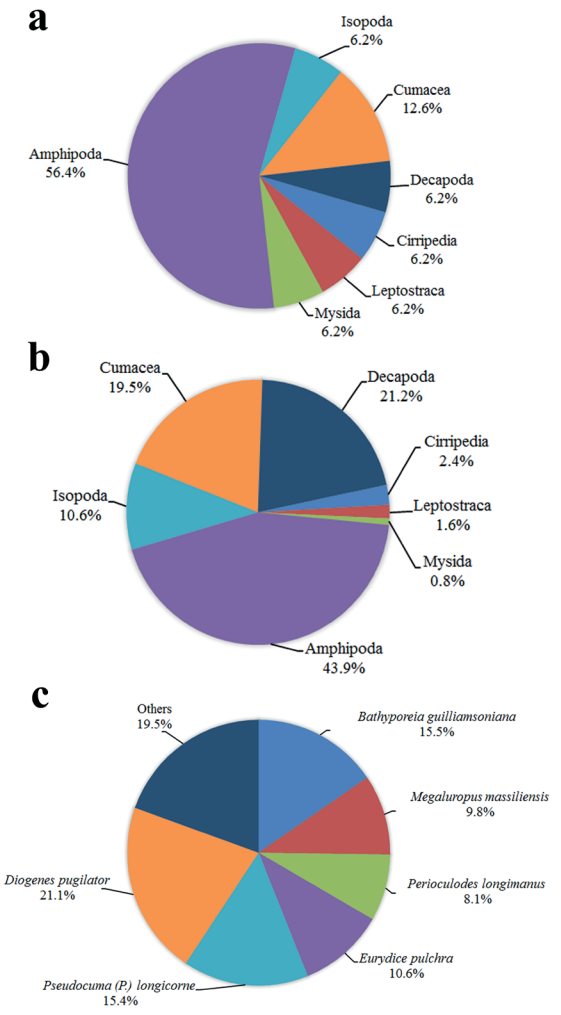

Figure 7

Relative dominance of crustaceans on soft bottom: a) by number of species per group, b) by number of individuals per group, c) by number of individuals per species.

In terms of the number of individuals, Amphipoda was the dominant taxon, accounting for 43.9% of all individuals (54 individuals), followed by Decapoda (21.2%, with 26 individuals), Cumacea (19.5%, 24 individuals) and Isopoda (10.6%, 13 individuals; Fig. 7b). Soft-bottom sites were dominated by *Diogenes pugilator* (21.1% of all individuals), *Pseudocuma* (*Pseudocuma*) *longicorne* (15.4%) and *Eurydice pulchra* (10.6%; Fig. 7c). Based on Soyer's frequency index, five species were classified as constant at the surveyed sites (*D. pugilator*, *E. pulchra*, *Megaluropus massiliensis*, *Perioculodes longimanus* and *P.* (*P.*) *longicorne*), three species as common (*Ampelisca pseudosarsi*, *Bathyporeia guilliamsoniana* and *Nebalia* sp.) and the remaining species as rare.

For the soft-bottom sites, the largest number of species (10 species) was recorded at site G1, while the largest number of individuals (29 individuals) at site G4. The highest value of the diversity index (H′) was determined for site G1 (H′ = 3.1), while the lowest value for site G6 (H′ = 1.0). The values of the evenness index (J′) ranged from 0.75 to 0.97 at site G5 and site G6, respectively (Fig. 8).

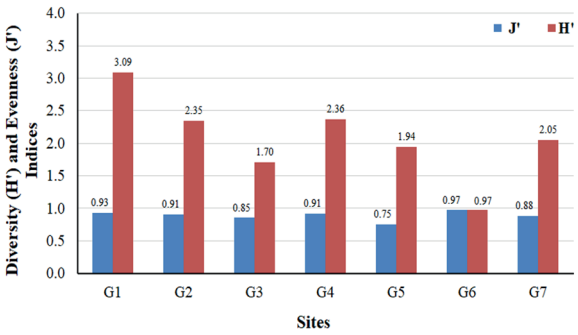

Figure 8

Diversity and evenness indices at soft-bottom sites.

Analysis of the Bray–Curtis similarity index showed that sites G2, G3, G4, and G5 formed a group with a similarity of 67.8% (Fig. 9). It was found that *P.* (*P.*) *longicorne* (28.9%), *D. pugilator* (26.7%) and *M. massiliensis* (17.5%) contributed most to this similarity. Furthermore, it was observed that site G6 has different characteristics compared to the other sites. The species *D. pugilator* (dissimilarity contribution of 17.0%), *P.* (*P.*) *longicorne* (16.3%), *B. guilliamsoniana* (13.6%) and *M. massiliensis* (11.4%), were found at sites G2, G3, G4 and G5, but were absent at site G6. In addition, *Leptocheirus pilosus* (dissimilarity contribution of 13.7%) was found only at site G6.

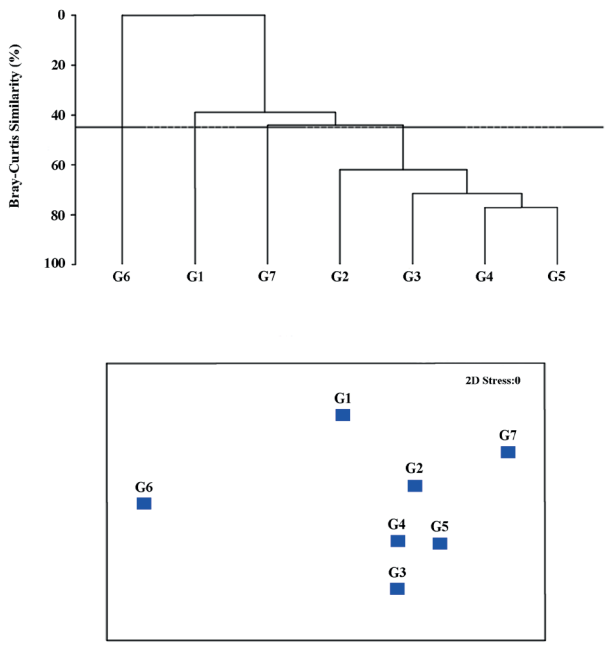

Figure 9
Similarities between soft-bottom sites.

3.3. Beam and bottom trawl sampling

Nine decapod species with a total of 441 individuals were found in trawl hauls. Two species, *Liocarcinus navigator* and *L. depurator*, were found in all samples. The number of individuals varied between 6 and 86 for beam trawl samples and between 57 and 131 for bottom trawl samples. In the beam trawl samples, the largest number of species was found at site BE3 (five species) and the lowest at site BE1 (three species), while in the bottom trawl samples, the highest number of species was encountered at site BT1 (six species) and the lowest at sites BT2 and BT3 (four species). Based on Soyer's frequency index, *L. depurator*, *L. navigator* and *D. pugilator* were constant, three species (*Palaemon adspersus*, *Upogebia pusilla* and *Xantho poressa*) were common, and three species were rare.

4. Discussion

This study determined the structure of crustacean communities in hard- and soft-bottom habitats along the coast off Kıyıköy, where no detailed research on crustaceans has been conducted before. In addition, one species new to the Black Sea fauna and one species alien to the area were encountered.

More than 40 alien species have been identified among the Black Sea crustaceans (Shalovenkov 2017). Only seven species alien to the Black Sea crustacean fauna of Türkiye have been recorded: *Acartia* (*Acanthacartia*) *tonsa*, *Amphibalanus eburneus*, *A. improvises*, *Oithona davisae*, *Callinectes sapidus*, *Penaeus aztecus* and *Pilumnus minutus* (Gönlügür Demirci 2006; Bakır et al. 2024; Çinar et al. 2021). Only one of these species was found in the course of this study. The alien species, *A. improvisus*, is known to prefer salinities below 20 ‰. It typically attaches to natural and artificial hard bottom (Alexandrov & Zaitsev 1998). The species was thought to be native to the southeast coast of America (Naser et al. 2015), but Darwin (1854) knew it from both sides of the Atlantic and the Pacific in tropical South America. The species may have been introduced to the Black Sea as pelagic larvae through ballast water or as adult organisms through hull fouling. It was previously reported along the Black Sea coasts of Georgia (Varshanidze & Guchmanidze 2004), Russia (Milovidova 1969), Ukraine (Alexandrov & Khodakov 1999), Romania (Tiganus 1991), Bulgaria (Marinov 1990) and Türkiye (Mutlu et al. 1992; Kurt Şahin et al. 2017).

A new decapod species for the fauna of the Black Sea, *Medorippe lanata*, is morphologically similar to *M. crosnieri* Chen, 1988, but can be distinguished from that species by the abdominal surface (densely covered with long hairs) and the carapace surface (with prominent granules and tubercles) in the male. The distributions of these species differ: *M. crosnieri* occurs along the coasts of Madagascar, Mozambique and South Africa (Chen 1987), while *M. lanata* is found in the eastern Atlantic Ocean and Mediterranean Sea (D'Udekem D'Acoz 1999). Although *M. lanata* has been reported to be distributed on soft bottoms at depths ranging from 9 m to 952 m, it has been noted that the species generally prefers depths between 20 m and 100 m (Zariquiey Alvarez 1968; Abelló et al. 1988). In Türkiye, Monod (1931), Kocataş (1971) and Demir (1952) previously reported this species from the Levantine Sea, the Aegean Sea and the Sea of Marmara, respectively.

Due to the lack of previous research on hard-bottom benthic crustacean fauna off Kıyıköy, a comparison was made with studies carried out elsewhere on the Black Sea coast (see Table 4). Similar to the findings of the present study, Amphipoda were found in previous studies to be the most dominant taxonomic order in terms of the number of species and individuals.

The most dominant species found on the hard bottom of the Black Sea varied depending on the study. However, *A. ramondi* and *D. spinosa*, which were the dominant species in the present study, were also reported as dominant species by Bat et al. (2001) and Karaçuha et al. (2009). Frequent species also varied between studies, with *Erichthonius* spp. and *A. ramondi*

Table 4

Comparison of studies on hard-bottom crustacean fauna in different localities on the Black Sea coast in Türkiye.

Study	Sampling area	Sampling date	Depth range (m)	Dominant taxonomic order		Dominant species	Frequent species
				Species	Individuals		
Bat et al. (2001)	Sinop	May 1997 to Dec. 1998	0.5–1	Amphipoda (75%) Isopoda (15%)	Amphipoda (78.3%) Isopoda (20.1%)	*E. brasiliensis* (18.6%) *I. baltica* (15.6%) *A. ramondi* (13.8%)	*E. brasiliensis* (60%) *I. baltica* (60%)
Karaçuha et al. (2009)	Sinop	June 2004 to Apr. 2005	2–4	Amphipoda (63%) Decapoda (16%)	Amphipoda (83%) Tanaidacea (8%)	*A. pseudospinimana* (27%) *D. spinosa* (17%)	*P. longimanus* (100%) *D. spinosa* (100%) *A. massiliensis* (100%) *A. chiereghinii* (100%) *A. pseudospinimana* (100%) *S. capito* (100%) *C. savignyi* (100%) *I. tenella* (100%) *C.* (*C.*) *limicola* (100%)
Sezgin & Aydemir Çil (2010)	Sinop	July 2004 to June 2005	0–1	Amphipoda (67%) Isopoda (16%) Decapoda (7%)	Amphipoda (71.4%) Isopoda (24.6%)	*H. crassipes* (15.1%) *E. olivii* (14.1%) *S. serratum* (12.6%)	*H. crassipes (93%)* *E. brasiliensis* (89%) *I. baltica* (82%) *T. dulongii* (82%)
Uzunova (2010)	Bay of Sozopol (Bulgaria)	Aug. 2000	0–3	Amphipoda (60%) Decapoda (16.7%) Tanaidacea (10%)			*D. spinosa* (100%) *M. gryllotalpa* (100%) *M. incidiosum* (100%) *A. acutifrons* (100%)
Sezgin & Aydemir Çil (2013)	Sinop	May 2005 to May 2006	0–10	Amphipoda (54.8%) Decapoda (25.8%)	Amphipoda (90.3%) Decapoda (5.9%)	*S. monoculoides* (30.1%) *J. marmorata* (19.6%) *M. palmata* (14.6%)	
This study	Kıyıköy	11 May 2017 to 12 May 2017	8–21	Amphipoda (55.6%) Decapoda (18.5%)	Amphipoda (88.3%) Cumacea (6.0%)	*A. ramondi* (46%)	*A. ramondi* (100%) *C. savignyi* (100%) *D. spinosa* (80%) *M. acherusicum* (80%) *C.* (*C.*) *limicola* (80%) *P. bluteli* (80%)

being the most frequent species off Sinop and Kıyıköy.

The order Amphipoda dominated in the soft bottom off Kıyıköy in terms of the number of species and individuals. Similar discoveries have previously been reported from the region (Mutlu et al. 1992; Kırkım et al. 2006; Kurt Şahin et al. 2017; Mülayim 2021; see Table 5).

The dominant species in the soft bottom off Kıyıköy were *D. pugilator*, *B. guilliamsoniana*, *P.* (*P.*) *longicorne* and *E. pulchra*, while previous studies reported that only *P.* (*P.*) *longicorne* was the dominant species (Kırkım et al. 2006; Mülayim 2021). In the studies conducted by Kırkım et al. (2006) and Mülayim (2021) on the Black Sea coast of Türkiye, *Iphinoe elisae* and *I. tenella* were reported as the most dominant species, however, no species from the genus *Iphinoe* were found in this study. Frequent species also varied between studies, and only *P. longimanus* was classified as constant by Mülayim (2021).

In the present study, the diversity index values

Table 5

Comparison of studies on soft-bottom crustacean fauna in different localities on the Black Sea coast in Türkiye.

Study	Sampling area	Sampling date	Depth range (m)	Dominant taxonomic order		Dominant species	Frequent species
				Species	Individuals		
Mutlu et al. (1992)	Black Sea coast of Türkiye	Aug. 1998 to Jan. 1999	20–112	Amphipoda (42.9%) Cumacea (23.8%)			
Stoykov & Uzunova (2001)	Bourgas Bay (Bulgaria)	1996–1998	6–128	Amphipoda (60%) Decapoda (23.4%)			*A. diadema* (56%) *A. improvises* (42.7%)
Kırkım et al. (2006)	Anatolian coast of Black Sea	May–July 1999	13–79	Amphipoda (70%) Cumacea (13.3%)	Amphipoda Cumacea Decapoda	*I. elisae* (25.3%) *I. tenella* (16.9%) *A. diadema* (15.7%) *P.* (*P.*) *longicorne* (10.8%)	*P.* (*P.*) *longicorne* (36.6%) *I. tenella* (33.3%) *A. diadema* (33.3%)
Kurt Şahin et al. (2017)	İğneada	Nov. 2012 to Oct. 2013	5–20	Amphipoda (38.5%) Cumacea (23.1%) Decapoda (15.4%)			
Mülayim (2021)	Black Sea coast of Türkiye	4–16 July 2019	8.5–45	Amphipoda (50%) Decapoda (19%)	Amphipoda (56.6%) Cumacea (30.8%) Decapoda (5.7%)	*I. tenella* (14.6%) *A. pseudospinimana* (11.2%) *P.* (*P.*) *longicorne* (6.7%)	*P. longimanus* (65%) *A. pseudospinimana* (60%)
This study	Kıyıköy	4 Apr. 2017 to 5 Apr. 2017	5–25	Amphipoda (56.4%) Cumacea (12.6%)	Amphipoda (43.9%) Decapoda (21.2%) Cumacea (19.5%)	*D. pugilator* (21.1%) *B. guilliamsoniana* (15.5%) *P.* (*P.*) *longicorne* (15.5%) *E. pulchra* (10.6%)	*D. pugilator* (85.7%) *M. massiliensis* (71.4%) *P. longimanus* (71.4%) *P.* (*P.*) *longicorne* (71.4%) *E. pulchra* (57.1%)

ranged from 1.80 to 3.13 (K3–K1) for hard bottom and from 0.97 to 3.09 (G6–G1) for soft bottom off Kıyıköy. Karaçuha et al. (2009) reported diversity index values ranging from 2.70 to 3.97 on hard bottom on the coast off Sinop. Mülayim (2021) also reported diversity index values ranging from 0 to 3.7 along the Black Sea coast of Türkiye, with a value of 2.4 on soft bottom on the coast off İğneada. Karaçuha et al. (2009) determined evenness index values for hard bottom ranging from 0.78 to 0.89, while this study determined values ranging from 0.60 to 0.90. Evenness index values for soft bottom were reported only in this study and ranged from 0.75 to 0.97.

Common crustacean species such as *P. adspersus*, *D. pugilator*, *L. depurator*, *L. navigator* and *X. poressa*, found in the present study, were also frequently found in bottom trawl samples along the Black Sea coast of Türkiye (Balkıs et al. 2012; Bilgin & Yılmaz 2016; Yıldız & Karakulak 2017; Onay & Bilgin 2021). In addition, Balkıs et al. (2012), Bilgin & Yılmaz (2016) and Onay & Bilgin (2021) reported rare occurrences of *Pilumnus hirtellus* and *Crangon crangon* in the area.

In conclusion, this study sheds light on the faunal and ecological characteristics of crustaceans off Kıyıköy. Differences in community parameters in the studies performed on the Black Sea coast can be attributed to several factors, including seasonality, habitat structure, environmental conditions, sampling depth, and potential anthropogenic impact. To better understand the distribution and ecological features of crustaceans in the area, further extensive sampling campaigns should be conducted in a wide range of hard- and soft-bottom habitats.

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