Oceanological and Hydrobiological Studies

International Journal of Oceanography and Hydrobiology

Volume 45, Issue 1, March 2016

ISSN 1730-413X
eISSN 1897-3191

pages (55-65)

Within-year spatio-temporal variation in meiofaunal abundance and community structure, Sinop Bay, the Southern Black Sea

by

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DOI: **10.1515/ohs-2016-0006**
Category: **Original research paper**
Received: **May 29, 2015**
Accepted: **July 23, 2015**

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Abstract

The first comprehensive meiobenthos study was carried out in Turkey, the Southern Black Sea (Sinop) from August 2009 to July 2010. Sediment samples were collected monthly at eight stations at 3 m and 10 m water depths located on four transects. A metal push core sampler (surface area 12.56 cm^2 and length 10 cm) was used to obtain the material. Meiofaunal abundance and composition were examined. The results revealed that the meiofaunal community consists of twenty five higher taxonomic groups. Four groups dominated the community: Nematoda, Harpacticoida, Foraminifera and Polychaeta. Spatial and temporal meiofaunal abundance fluctuated among stations and over time.

Key words: Foraminifera, grain size, dynamics, Harpacticoida, meiobenthos, Nematoda, Turkey

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Introduction

Meiofauna play a key role in the remineralization of detritus and recycling of nutrients (McIntyre 1969). It has been suggested that the production of meiofauna in shallow waters is much higher than that of macrofauna (Platt & Warwick 1983). Our knowledge about the distribution of meiobenthos in coastal zones of the Black Sea is mainly based on the research conducted in the northern (Kisseleva 1965; Vorobyeva 1999; Sergeeva and Kolesnikova 2003; Sergeeva 2003a; Revkov & Sergeeva 2004; Zaika et al. 2011) and eastern Black Sea (Kisseleva & Slavina 1965; Mokievsky et al. 2010). Partial studies dealing with meiofaunal taxa date back to the 1880s and intensified in the second half of the 20th century (Apostolov 1969; Sergeeva 1972; Groza-Rojankovski 1972; Uzunov 1978).

Generally, before the end of the 19th century, meiobenthos was not thoroughly studied in the Black Sea. In the period between 1951 and 1961, the interest in this subject increased. Intensive surveys were carried out in coastal zones of Bulgaria, Romania, and Crimea and Caucasus in the 1970s (Vorobyeva 2003). In 1980-1990, the species composition of Foraminifera was studied in the Bosphorus strait (Yanko & Vorobyeva 1991). In recent years, much attention has been paid to the studies of meiobenthos in the Black Sea (Sergeeva & Gulin 2007; Sergeeva and Mazlumyan 2011; Sergeeva & Zaika 2013; Sergeeva et al. 2015; Sergeeva & Mazlumyan 2015). In general, surveys on meiobenthos are less compared to those on macrobenthos in the Turkish marine ecosystems and reports come only from the Black Sea coasts of Turkey, focusing mainly on free-living marine nematodes (Ürkmez et al. 2011; 2014; 2015; Ürkmez & Brennan 2013) without any research on the meiofauna of the coastal Turkish waters. Brennan et al. (2013) mentioned the meiofaunal composition of the oxic/anoxic interface off the Sinop shores in the study on the preservation of pre-modern shipwrecks. Therefore, this study is the first attempt at a comprehensive survey of meiofauna in Turkey and all data presented here provide valuable knowledge about the abundance and composition of meiofauna inhabiting shallow waters of the Turkish Black Sea, giving a general overview of their monthly dynamics. We performed an analysis of the annual spatio-temporal variation and the community composition of Sinop Bay, the Turkish Black Sea, as well as we determined the relationship between several environmental parameters and the abundance of major taxa.

Materials and methods

The study area (Sinop Bay) is located in the central and most northern part of the southern Black Sea Region (Fig. 1). The Bay is one of the most important natural harbors of the Black Sea Region. It is characterized by high hydrodynamic conditions and the bottoms close to the shoreline (2-4 m depth) are composed mostly of sand sediments, and the bottoms in the central part of the Bay (>10 m depth) and in the deeper zones – of silty sands, muds and shells. The meiobenthic sampling was carried out once a month from August 2009 to July 2010 at eight stations on four transects. Each transect covered two stations, the first one at 3 m depth and the second one at 10 m depth. Samples were collected as three replicates with a metal sediment corer of 4 cm diameter (sampling area 12.56 cm^2) positioned

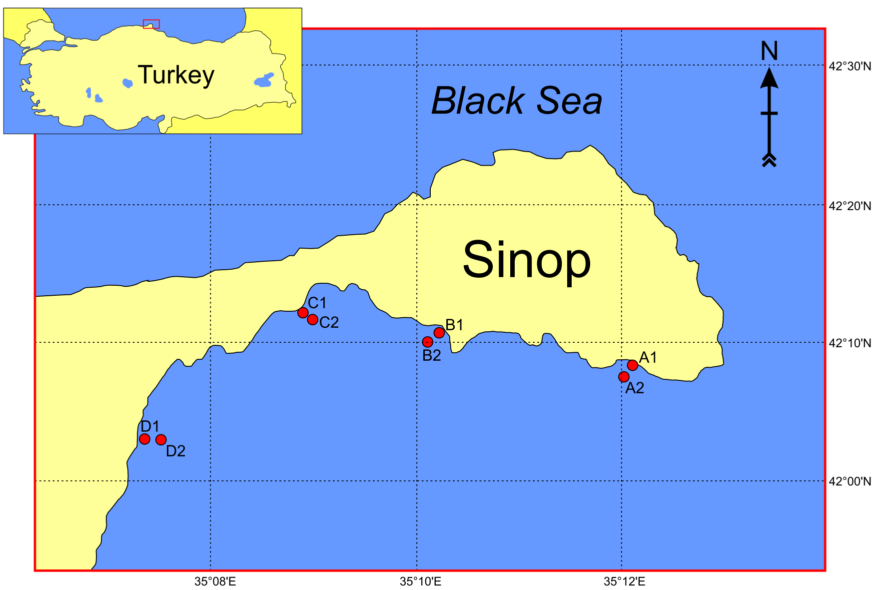

Figure 1

Map of the study area showing sampling stations (A,B,C,D are transects; 1 indicates stations with 3 m, 2 indicates stations with 10 m) into the sediment to a depth of 10 cm. Samples were fixed with 75% ethanol. The material was washed through sieves of 1 mm, 500 µm and 63 µm mesh sizes, and the material retained on 63 µm was analyzed for meiobenthos. Samples were stained with Bengal rose prior to sorting and counting under a dissecting microscope using modified Bogorov chambers (Giere 2009). Water and sediment samples were also collected and brought to the laboratory for physicochemical and granulometric analysis to perform Pearson's correlation analysis. Several parameters, such as temperature (°C) and dissolved oxygen (DO) in the seawater, were recorded in situ by using a YSI 6600 CTD probe. Nitrite, nitrate and phosphate in the seawater were analyzed using a spectrophotometer. In addition to the core samples, sediment samples of 2 kg were collected from each station during each sampling and stored at -21°C for granulometry, pH, % porosity, % organic matter (OM) and oxidation-reduction potential analyzes carried out in the laboratory. Granulometric analysis was performed following Buchanan (1984) and sediment types were determined according to Wentworth's (1922) scale. The possible relationship between the environmental parameters and the distribution of higher taxa was analyzed using Pearson's correlation analysis. All data were analyzed using PRIMER V.5.2.9 (Primer-E, 2002) (Clarke and Warwick 2001). Similarity analysis was performed on the abundance of main taxa using the Bray-Curtis similarity measure. Cluster analysis was applied to data to show the grouping of the stations. Additionally, an analysis of similarity (ANOSIM) was conducted to test the differences between the groups. The analysis was applied to mean abundance of each taxon calculated from three replicates for each sampling period at each station, resulting in 32 samples. The data were fourth-root transformed to down weigh the contribution by abundant taxa such as nematodes and therefore, to increase the importance of less abundant taxa in the analysis (Clarke 1993; Somerfield et al. 1994; Somerfield and Clarke 1995).

Results

Meiofauna was represented by twenty five higher major taxa, including nematodes occurring with high abundance. The leading taxa in terms of abundance were Nematoda, Harpacticoida, Polychaeta, hard shelled Foraminifera, juvenile Bivalvia, juvenile Gastropoda, Ostracoda, Turbellaria, Nemertea, Oligochaeta, Ciliophora and Acari (Halacaridae). A few specimens of rare taxa such as Kinorhyncha and Tardigrada were also found, particularly at station C2.

The mean abundance of total meiofauna showed variations throughout the year, ranging from 18 × 10^3 ind. m^{-2} (St. D1, July) to 1.320 × 10^3 ind. m^{-2} (St. A1, December) at 3 m depth and from 40 × 10^3 ind. m^{-2} (St. B2, June) to 935 × 10^3 ind. m^{-2} (St. A2, October) at 10 m depth (Fig. 2). Seasonal fluctuations were observed at the stations.

In all samples, meiofauna was dominated by Nematoda, Harpacticoida, hard shelled Foraminifera and Polychaeta. During the first six sampling months (from August 2009 to January 2010), in terms of mean meiofaunal abundance the highest number of individuals, i.e. 737 × 10^3 ind. m^{-2}, was recorded at station B1, with nematodes being the major contributor. In September, station C1 showed the highest mean meiofaunal abundance with 672 × 10^3 ind. m^{-2}, 62% of which were nematodes. Station

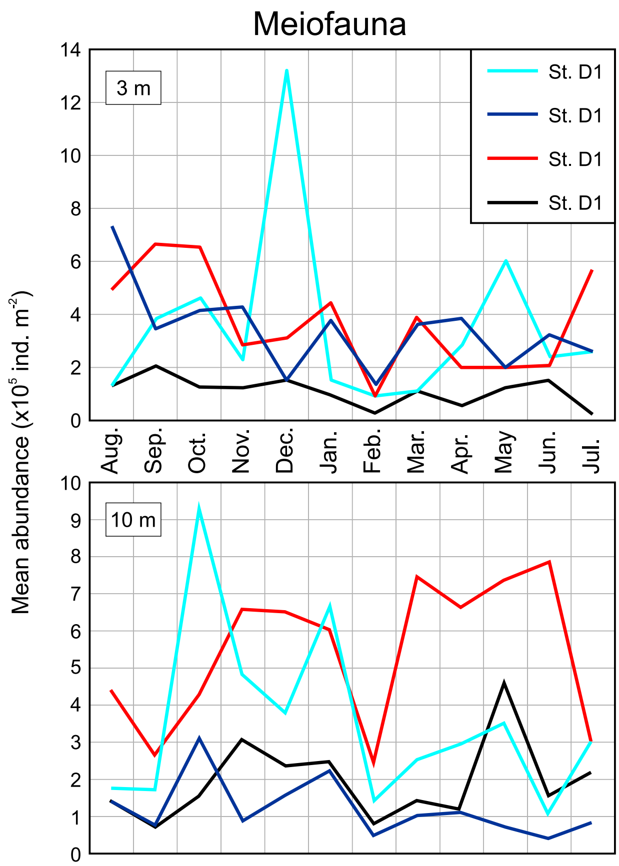

Figure 2

Monthly changes in meiofaunal abundance at sampling stations

A2 showed the highest mean meiofaunal abundance in October, with 935 × 10^3 ind. m^{-2} and a high contribution (72%) of hard shelled Foraminifera. Hard shelled Foraminifera continued to be the most abundant taxon at station C2, represented by the highest meiofaunal abundance values in November and December. Similarly in January, hard shelled Foraminifera represented 79% of the mean meiobenthos (668 × 10^3 ind. m^{-2}) at station A2.

Regarding the second six months from February 2010 to July 2010, mean meiofaunal abundance in February declined at all stations. The mean abundance of 751 × 10^3 ind. m^{-2} at St. C2 was recorded in March, with a decrease in foraminiferal abundance and largely represented by nematodes. In April, St. C2 was mostly represented by nematodes and followed by harpacticoids. In May, the abundance of harpacticoids increased, exceeding that of nematodes at St. C2, while at St. A1 and St. D2 nematodes were represented by the largest numbers. In June, the greatest contribution to the mean abundance (789 × 10^3 ind. m^{-2}) of St. C2 was made by harpacticoids. In July, station C1 showed the highest abundance (576 × 10^3 ind. m^{-2}) with the greatest contribution by nematodes.

Cluster analysis was applied to demonstrate the grouping of sampling stations based on the mean abundance values (Fig. 3). In general, stations and seasons show a high level of similarity revealing three main groups. Group A is composed of samples from station D1, which had a different granulometric structure compared to all the other stations with fine sand and silt, and are characterized by a considerable dominance of hard shelled foraminiferans. Group B represented mainly by stations with 10 m depth, whereas Group C included mostly stations with 3 m depth. Aug-A1 was totally separated from these groups, mainly due to the fact that foraminiferans were absent in that sample. The results of ANOSIM tests of fourth-root transformed meiofaunal abundances revealed a clear distinction in the community structure (Table 1). A significant

Table 1

Results of ANOSIM of the Bray-Curtis similarity for the meiofaunal community structure

	Global *R*	*P* (%)
Aug-A1, Group C	0.718	7.1
Aug-A1, Group B	1	6.7
Aug-A1, Group A	1	20
Group C, Group B	0.727	0.1
Group C, Group A	0.953	0.2
Group B, Group A	0.832	0.3

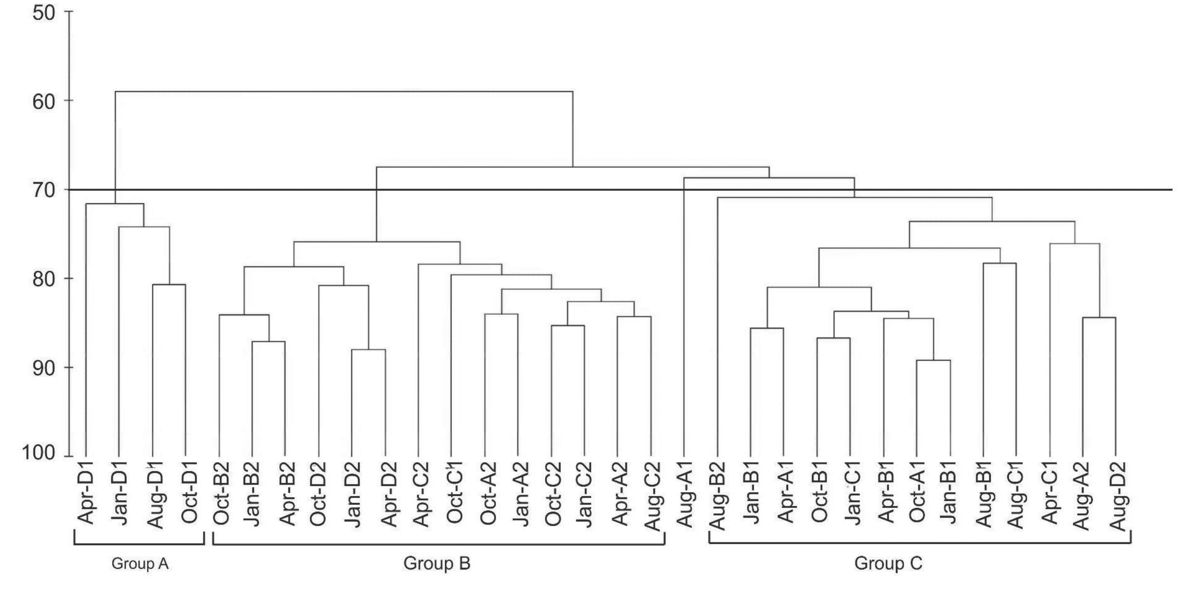

Figure 3

Dendrogram showing similarity of stations-months in terms of meiofaunal abundance (A, B, C, D are transects; 1 indicates stations at 3 m; 2 indicates stations at 10 m) difference was recorded between groups B and C (global R = 0.727, significance level of 0.1%), C and A (global R=0.953, significance level of 0.2%), B and A (global R = 0.832, significance level of 0.3%) but not between Aug-A1 and group A (global R=1, significance level of 20%), B and C.

Meiofaunal percentage composition

With reference to the first six months, Nematoda occurred with the highest percentage in August 2009 at St. A1, B1 and C1 and St. B1 showed the highest share (49%) (Fig. 4). Hard shelled foraminifera made the greatest contributions to stations A2, C2, D1 and D2 in August 2009 with C2 having the highest contribution (55%). Harpacticoida was found to make a greater contribution to meiofauna, particularly in August and September. In August, they occurred with a percentage of 25.7% at St. C1 following the nematodes (45%). The dominance of Nematoda was observed to continue at stations A1, B1 and C1 in September and their highest percentage was recorded at St. C1 (62%) (Fig. 4).

In the second six months period from February 2010 to July 2010, total meiobenthos declined particularly in February compared to January. The abundance of each group decreased to approximately half of the previous values. In February, Nematoda was the most contributing taxa at station B1. The contribution of Harpacticoida started to increase particularly at station C2 reaching high percentages in April and June (Fig. 5). In April, Polychaeta made a high contribution at station C1. Nematoda contributed 80% to meiobenthos at station A1 in May, reaching the highest abundance value among all months and stations (456×10^3 ind. m^{-2}). The highest total meiobenthos value was recorded at station C2 in June (789×10^3 ind. m^{-2}) with the highest contribution by Harpacticoida (213×10^3

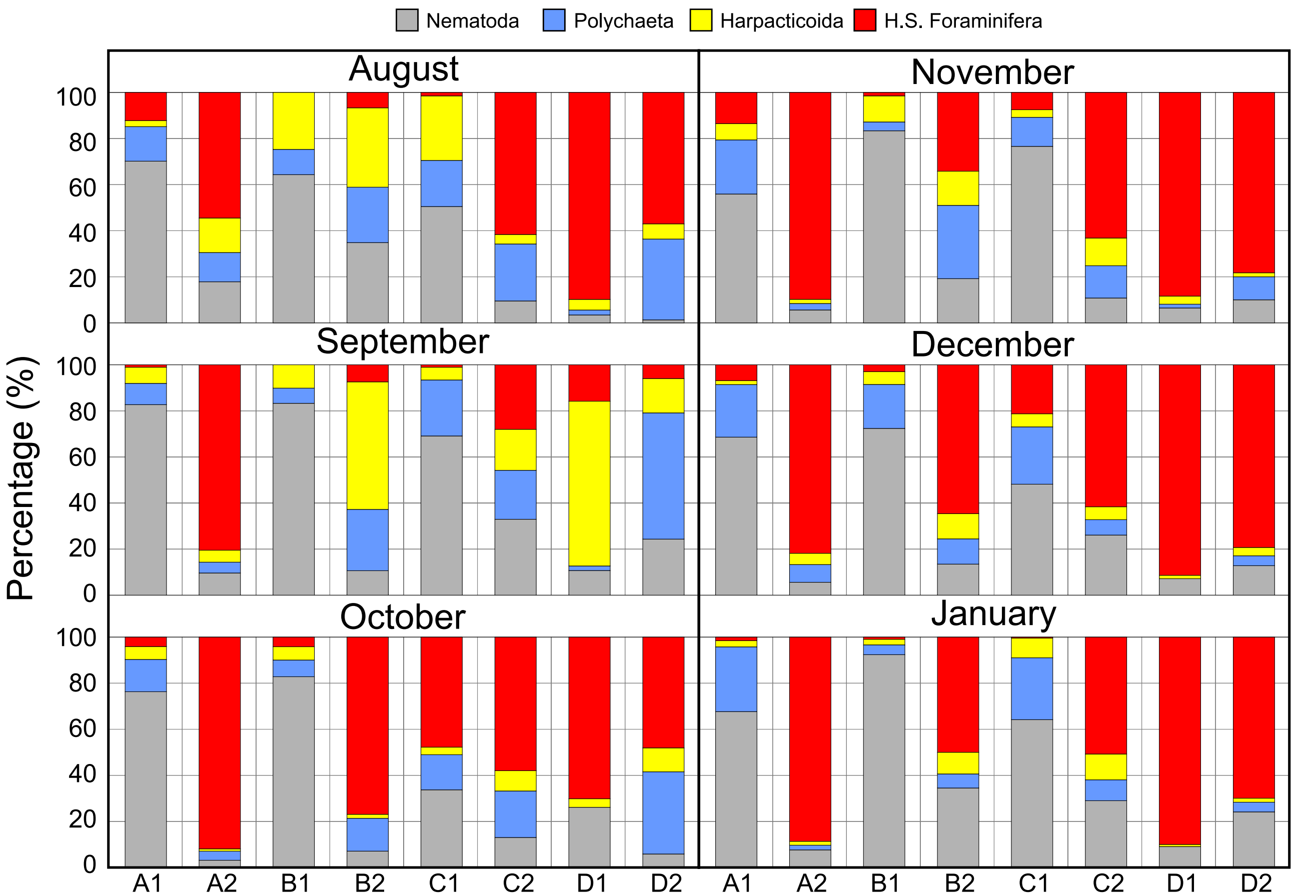

Figure 4

Monthly meiofaunal community structure at sampling stations for the first six months from August 2009 to January 2010 (H.S.: Hard shelled; A, B, C, D are transects; 1 indicates stations with 3 m, 2 indicates stations with 10 m)

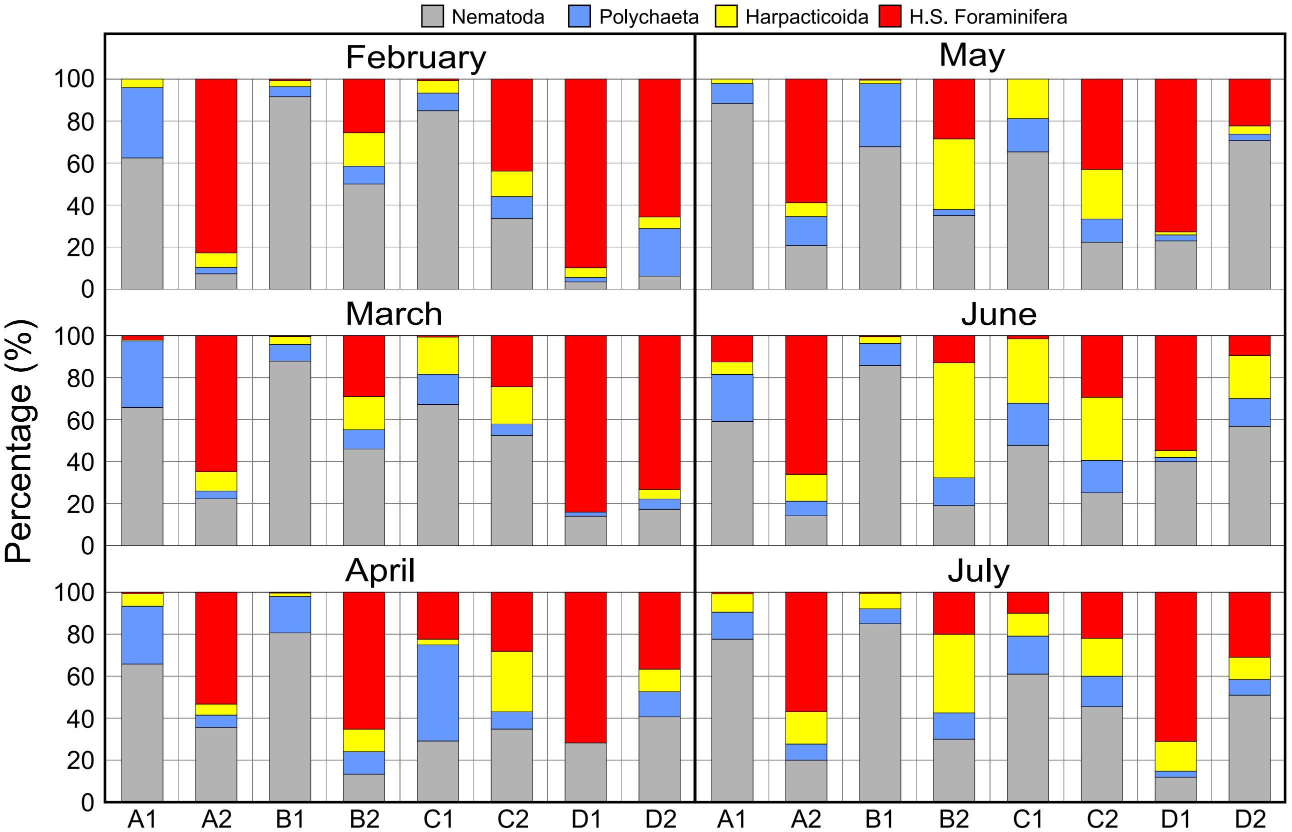

Figure 5

Monthly meiofaunal community structure at sampling stations for the second six months from February 2010 to July 2010 (H.S.: Hard shelled; A, B, C, D are transects, 1 indicates stations with 3 m, 2 indicates stations with 10 m)

ind. m^{-2}), followed by hard shelled Foraminifera and Nematoda. Station B1 revealed the highest contribution of nematodes (77%).

Temporal variations of Nematoda, Harpacticoida, H.S. Foraminifera and Polychaeta were observed during the sampling period. The abundance of nematodes at 3 m ranged from 1 × 10^3 ind. m^{-2} (St. D1, February) to 456 × 10^3 ind. m^{-2} (St. A1, May) (Fig. 6). Seasonal peaks were different among the stations. The peaks of nematode abundance were observed in October and May at station A1 and showed major fluctuations at stations B1 and C1. At station D1, peaks were observed in October and June. The abundance of nematodes at 10 m ranged from 1 × 10^3 ind. m^{-2} (St. D2, August) to 313 × 10^3 ind. m^{-2} (St. D2, May). Seasonal peaks were observed in March at station C2 and in May at station D2. Major declines were recorded at four stations in February (Fig. 6).

The abundance of Harpacticoida ranged from 0 (St. D1, March-April) to 143 × 10^3 ind. m^{-2} (St. B1, August) at 3 m. The abundance at stations B1 and C1 showed clear seasonal fluctuations. Two seasonal peaks were observed in September and July at station A1. Relatively lower values were recorded at station D1. The abundance of harpacticoids ranged from 3.7 × 10^3 ind. m^{-2} (St. B2, February) to 213 × 10^3 ind. m^{-2} (St. C2, June) at 10 m and reached over 50 × 10^3 ind. m^{-2} only at Station C2 making a prominent peak in June (Fig. 7).

The abundance of polychaetes ranged from 0 (St. D1, December-January-April) to 318 × 10^3 ind. m^{-2} (St. A1, October) at 3 m. Major peaks were recorded in October at stations A1 and B1. Relatively regular seasonal fluctuations were observed at station C1, and the lowest values were recorded at station D1. The abundance of polychaetes decreased at 10 m and ranged from 1 × 10^3 ind. m^{-2} (St. B2, May) to 98 × 10^3 ind. m^{-2} (St. C2, June). Seasonal peaks were observed in August and June at station C2, whereas relatively more regular fluctuations were observed at the three other stations (Fig. 8).

The abundance of hard shelled Foraminifera ranged from 0 (St. B1, August) to 225 × 10^3 ind. m^{-2} (St. C1, October) at 3 m. Relatively large seasonal

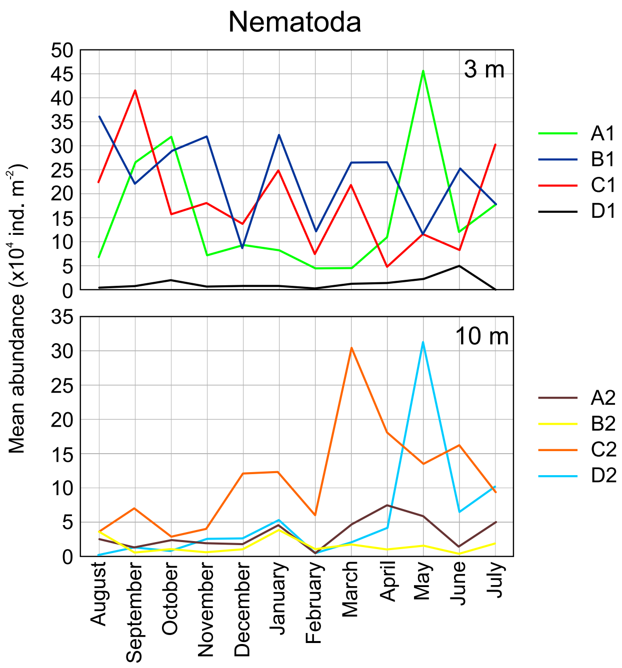

Figure 6

Monthly changes in mean nematode abundance at sampling stations

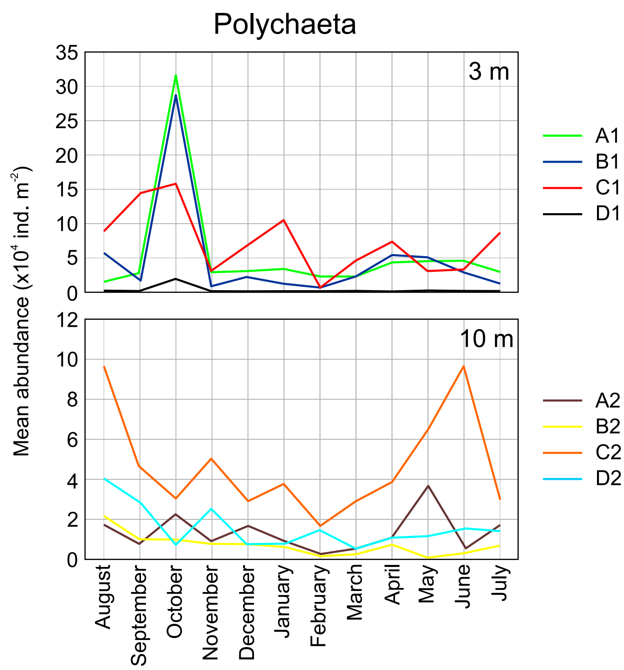

Figure 8

Monthly changes in mean polychaete abundance at sampling stations

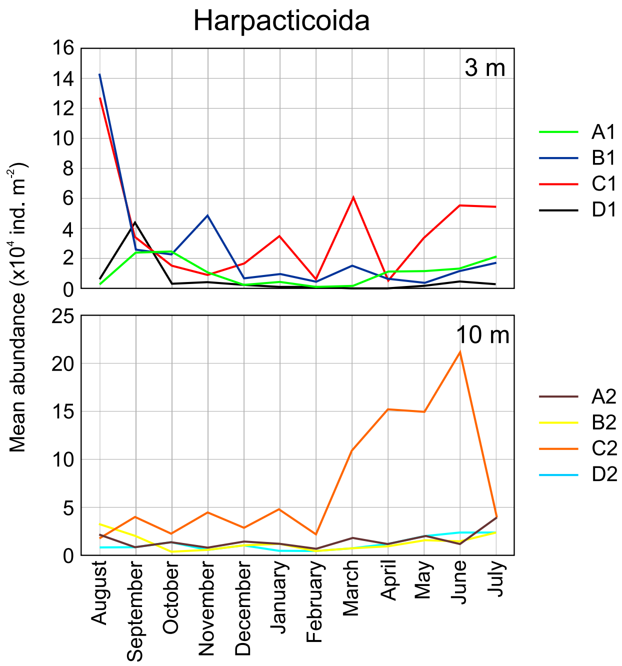

Figure 7

Monthly changes in mean harpacticoid abundance at sampling stations

fluctuations were observed at stations B1 and C1 where a clear peak was recorded in October at station C1. The abundance of hard shelled Foraminifera increased at 10 m and ranged from 3 × 10^3 ind. m^{-2} (St. D2, September) to 674 × 10^3 ind. m^{-2} (St. A2, October). Seasonal peaks were observed at station A2 in October and January. The three other stations showed fluctuations (Fig. 9). The abundance of hard shelled Foraminifera was significantly higher at Station D1 compared to the three other major taxa.

Environmental factors

During the study period, surface water temperatures ranged between 8.02 and 25.02°C and similar values were recorded at all the stations. Bottom water temperatures at stations with 3 m depth ranged between 7.94 and 25.09°C, and at stations with 10 m depth – from 7.77 to 24.79°C. Salinity values ranged between 17.15 PSU and 18.05 PSU and pH values – from 8.7 to 9.06.

The environmental factors that affect the meiobenthic community structure in terms of abundance were examined applying Pearson correlation analysis (Table 2). The values in bold (Table 2) were found to be statistically significant

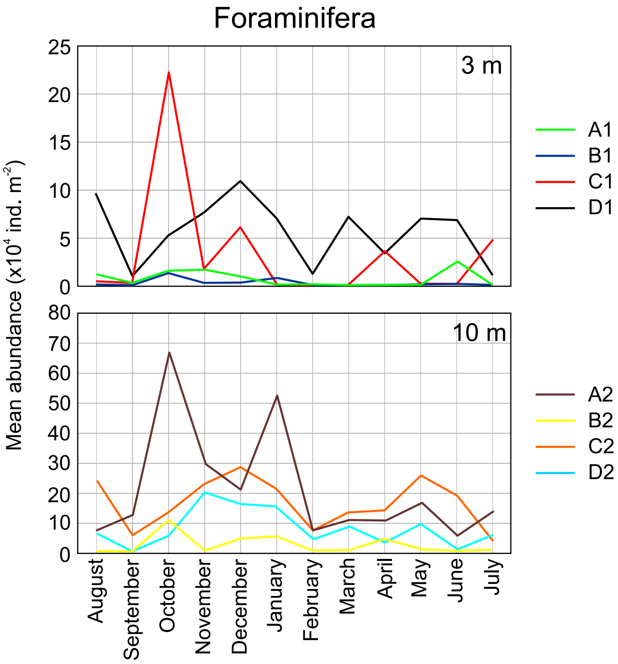

Figure 9

Monthly changes in mean foraminiferal (hard shelled) abundance at sampling stations

($p<0.05$). Nematodes showed positive correlation with coarse sand (r=0.81) and redox (r=0.43), and negative correlation with very fine sand (r=-0.48). Harpacticoida showed positive correlation with pH (r=0.40), very fine gravel (r=0.38), very coarse sand (r=0.40) and nitrate (r=0.48) and negative correlation with porosity (r=-0.35). Polychaetes were positively correlated with coarse sand (r=0.47) and nitrate (r=0.41). Hard shelled Foraminifera were positively correlated with very fine gravel (r=0.47) and very coarse sand (r=0.70) and negatively correlated with coarse sand (r=-0.55) and redox (r=-0.36). Soft shelled Foraminifera were positively correlated with coarse sand and negatively correlated with very fine sand (r=-0.35).

Discussion

Meiofauna was represented by twenty five higher taxa and nematodes occurred with a high abundance, followed by Harpacticoida, hard shelled Foraminifera and Polychaeta. Several individuals of rare taxa such as Kinorhyncha and Tardigrada were encountered as well. In general, the mean meiofaunal abundance ranged from 18 × 10^3 ind.

Table 2

Correlation values between mean abundance of meiobenthic taxa and the environmental parameters

Major taxa	pH	DO	po%	vfg	vcs	cs	fs	vfs	csi	T (°C)	R (Mv)	PO_4	OM (%)	NO_2	NO_3
Nematoda	-0.18	0.03	-0.06	-0.14	-0.09	**0.81**	-0.03	**-0.48**	-0.33	0.10	**0.43**	-0.02	-0.14	0.09	0.21
Harpacticoida	**0.40**	0.02	**-0.35**	**0.38**	0.40	0.01	-0.20	-0.25	-0.23	0.18	-0.13	0.26	0.03	0.16	**0.48**
Polychaeta	0.27	0.12	-0.19	0.14	0.23	**0.47**	-0.04	**-0.52**	-0.30	0.16	0.03	0.12	0.05	0.06	**0.41**
Foraminifera H.S.	0.26	0.10	-0.29	**0.47**	0.70	**-0.55**	-0.10	-0.01	0.13	-0.14	**-0.36**	-0.08	0.05	-0.05	0.05
Foraminifera S.S.	0.01	0.07	0.12	-0.17	-0.15	**0.51**	0.17	-0.35	-0.22	0.21	-0.01	0.02	0.16	-0.06	0.17
Bivalvia	0.17	**0.49**	0.15	-0.13	-0.03	0.08	0.28	-0.25	-0.05	0.17	0.15	0.11	-0.13	-0.28	0.28
Gastropoda	0.19	0.24	-0.06	0.18	0.53	**-0.39**	0.16	-0.03	-0.05	-0.02	**-0.38**	0.03	0.28	-0.14	0.31
Ostracoda	**0.39**	-0.06	**-0.56**	**0.55**	0.81	-0.35	-0.35	-0.12	0.03	-0.13	**-0.35**	0.02	0.07	0.15	0.18
Turbellaria	-0.31	-0.18	0.10	-0.33	-0.28	**0.87**	0.12	**-0.44**	**-0.38**	0.02	0.31	-0.08	-0.07	0.16	0.05
Nemertea	0.09	**0.48**	-0.11	-0.02	0.18	**0.36**	0.00	-0.34	-0.14	0.14	0.29	-0.08	0.13	**-0.35**	0.09
Oligochaeta	-0.31	-0.03	0.16	-0.20	-0.08	**0.35**	0.26	**-0.37**	-0.09	-0.34	0.08	**-0.50**	-0.28	-0.17	-0.16
Acari	0.05	**-0.36**	-0.01	-0.21	-0.17	0.17	0.16	-0.07	-0.15	-0.31	-0.09	0.03	-0.10	**0.47**	0.21
Amphipoda	-0.03	0.06	0.03	-0.01	0.24	0.01	-0.17	0.08	-0.18	0.25	0.09	0.18	-0.13	-0.22	0.33
Insecta	0.06	**0.37**	-0.13	0.11	0.44	0.00	0.04	-0.18	-0.18	0.13	0.14	-0.04	0.00	-0.32	0.15
Ciliophora	-0.10	-0.13	0.02	-0.28	-0.29	**0.60**	0.18	-0.31	-0.32	0.11	0.22	0.11	0.00	0.28	0.19
Echinodermata	-0.03	0.31	-0.12	-0.03	0.19	0.19	-0.05	-0.15	-0.02	0.09	0.24	-0.01	-0.13	-0.21	0.10
Hydrozoa	0.12	-0.07	**-0.52**	**0.38**	0.67	-0.22	-0.31	-0.12	0.24	-0.22	-0.01	-0.11	0.17	0.13	-0.13
Kinorhyncha	0.23	0.12	**-0.46**	0.27	0.69	-0.14	-0.27	-0.14	0.21	-0.10	-0.13	-0.11	0.10	-0.03	-0.04
Tanaidacea	0.03	0.20	0.01	0.04	0.44	-0.10	-0.13	0.09	0.01	0.15	-0.08	-0.06	-0.08	**-0.36**	0.11
Tardigrada	**0.42**	-0.01	**-0.62**	**0.51**	0.74	-0.18	**-0.38**	-0.19	-0.02	-0.05	-0.29	0.10	0.16	0.22	0.25
Cnidaria	0.20	-0.31	-0.27	0.27	0.14	0.09	-0.21	-0.13	-0.14	-0.17	-0.16	0.06	0.01	**0.45**	0.14
Nauplia	-0.16	-0.27	0.04	-0.05	-0.13	**0.37**	-0.08	-0.12	-0.12	-0.09	-0.01	0.03	-0.12	0.30	-0.17
Cumacea	0.08	0.24	0.01	-0.03	0.03	0.29	-0.04	-0.16	-0.21	**0.53**	0.23	0.22	**0.70**	-0.12	0.13
Pycnogonida	0.11	0.00	-0.24	0.32	0.26	-0.10	-0.19	-0.08	-0.10	0.15	-0.19	0.21	-0.12	0.03	0.15
Phoronidae	**0.35**	0.22	-0.25	**0.44**	-0.01	-0.17	-0.20	0.01	-0.01	0.13	-0.16	0.23	0.01	-0.22	-0.04

DO: dissolved oxygen in mg l^{-1}, po%: percentage porosity, vfg: very fine gravel, vcs: very coarse sand, cs: coarse sand, fs: fine sand, vfs: very fine sand, csi: coarse silt, R: redox, OM%: percentage organic matter, H.S.: hard shelled, S.S.: soft shelled m^{-2} to 935 × 10^3 ind. m^{-2} (St.D1-July 2010 and St.A2-October 2009). The percentage contributions were calculated for each month at each station. Nematoda, Harpacticoida, hard shelled Foraminifera and Polychaeta were the main taxa making highest contributions to the mean meiofaunal abundance and their abundance showed seasonal fluctuations at the stations. The three major taxa (Nematoda, Harpacticoida and Polychaeta) occurred with low abundance at station D1, but the abundance of hard shelled Foraminifera was high, which was attributed to the fact that the granulometric structure of station D1 was different from the other stations, and the silt content made a suitable substrate for hard shelled Foraminifera (Mikhalevich 2013). The mean meiofaunal abundance at the stations displayed different patterns, mostly depending on the depth and the grain size structure of the sediment, and cluster analysis showed that the depth and granulometric structure were the main factors in the grouping of the stations.

When the environmental factors were taken into consideration in the present study, Pearson's correlation analysis showed that the granulometric structure of the sediment, redox potential, porosity, pH and nitrate were the main factors affecting the meiobenthic community structure. It is generally known that the abundance and diversity of meiobenthos is mostly determined by depth, biotope and granulometric structure (Sergeeva 1985; Giere 2009). In our study, horizontal distribution of meiobenthos was structured mainly due to the depth and grain size, with the highest abundance recorded at the stations with coarse sand, and the lowest abundance at the stations with the silt content. As evidenced by the correlation analysis, nematodes and harpacticoids were positively correlated with coarse and very coarse sand content of the sediment, respectively. Seasonal variance was observed with peaks in the meiofaunal abundance recorded in October and May, probably due to the reproduction cycle of several taxa such as harpacticoids (Chertoprud & Azovsky 2006) and an increase in temperature and food resources (Rudnick et al. 1985). Meiofaunal assemblages are generally dominated by nematodes in terms of both abundance and biomass in most of the marine samples. The dominance of the free-living nematodes, followed by harpacticoids and foraminiferans, has become a common phenomenon for the soft-bottom habitats (Vorobjeva 1999). In the present study, the meiofauna was mostly represented by four main groups, of which nematodes were the dominant taxon. Harpacticoids and foraminiferans were subdominant taxa at Sinop Bay. Representatives of many main taxa were also found, as reported by Sergeeva (2003a) from Crimea, and nematodes occurred with the highest abundance (249.5 × 10^3 ind. m^{-2}) at 23 m. When different regions of Crimea are considered, the highest mean abundance value of meiobenthos was 596.2 × 10^3 ind. m^{-2}. Meiofauna of shallow sandy sediments is generally recognized by the dominance of nematodes, also in the Mediterranean (Sandulli et al. 2011) and similar European sandy biotopes (Olaffson 1991; Gheskiere et al. 2004).

For the comparison of the meiobenthos abundance in the southern and northern Black Sea, please refer to a recent study by Zaika et al. (2011). The authors studied the meiofaunal community at three locations in the Crimean coastal waters, sampled between July 2009 and July 2010. The highest nematode abundance was recorded for the samples collected from Sevastopol Bay in July 2010 as 1197 × 10^3 ind. m^{-2} and similar fluctuations were observed at three locations throughout the year with declines during September and March. Nematodes from Sevastopol Bay reached the abundance of ≈1000 × 10^3 ind. m^{-2} in July 2009 (Zaika et al. 2011). Higher values were recorded at certain stations of Sinop Bay, with the largest number of meiofauna in October – 935 × 10^3 ind. m^{-2} – at station A2 and changes were observed depending on the season. In our study, the contribution of nematodes to the total abundance of four main groups was higher in April and October, which is attributed to the reproduction periods. The sediment parameters, i.e. the sediment particle size, sediment porosity, and the oxidation-reduction potential of the sediment were determined as the most significant environmental factors affecting the meiobenthic community structure of the survey area. Additionally, several environmental factors related to seawater such as dissolved oxygen, temperature, pH, and nutrient content were also determined to have impact on the meiobenthic community structure.

As a result of this study, meiobenthos of the Turkish marine ecosystem was investigated in detail for the first time and the monthly abundance values of higher meiofaunal taxa were presented. It was found that their distribution is related to the depth and granulometry with significant seasonal fluctuations at some stations.

Acknowledgements

This work is part of a comprehensive joint project financially supported by TUBITAK (the Scientific and Technological Research Council of Turkey) and NASU (the National Academy of Sciences of Ukraine) (Project No. 108Y340) on the meiofauna of Sevastopol (Crimea) and Sinop (Turkey) Bays. Authors are thankful to Prof. Dr. Nelli G. Sergeeva and Dr. Elena Kolesnikova for their guidance through laboratory procedures during our first steps of the study of meiobenthos. Dr. Oylum Gökkurt Baki is also acknowledged for the analysis of environmental parameters within the scope of the project.

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