

MACROZOOBENTHIC COMMUNITIES ON THREE DIFFERENT ECOLOGICAL STATUSES OF THE HABITATS IN THE CILICIAN SHELF SOFT-BOTTOMS


Erhan Mutlu*

Akdeniz University, Fisheries Faculty, 07058, Antalya, Turkey

**Corresponding Author:*

E-mail: emutlu@akdeniz.edu.tr

(Received 17th May 2020; accepted 08th August 2020)

 ORCID 0000-0002-6825-3587

ABSTRACT. In 2005-2007, zoobenthic samples were seasonally collected on the Cilician shelf with a van Veen grab. The aim was to study the biodiversity of vegetated and unvegetated soft-bottom habitats under pristine (ultraoligotrophic) and anthropogenically modified conditions. Faunistic characteristics, zoobenthic assemblages and their relationship with environmental variables were determined. Zoobenthic assemblages along shelf gradients occurred with habitat types and ecological status and then, bottom depths and depth-related sediment grain structure and content. Density of macrozoobenthic communities in *Posidonia* beds, eutrophic areas and sedimentary bottoms were positively correlated with salinity, density, dissolved oxygen content of sea surface and near bottom waters, and negatively correlated with sedimentary variables such as TOC content, and sea surface temperature. *Syllis garciai* was dominant and abundant and the key species in *Posidonia* beds. The key species of pristine and eutrophic soft-bottom types differed; they were *Onchnesoma steenstrupi*, *Nephtys incise*, and *Monticellina heterochaeta* and *Nephtys hombergii*, *Macrophthalmus indicus*, and *Amphipholis squamata*, respectively. For soft-bottom macrozoobenthic assemblages in eutrophic areas the Canonical Correspondence Analyses (CCA) showed impacts related to nutrient (P-PO₄, N-NO₂ + N-NO₃ and Si) enrichment and dependence on Chl level in the water column.

Keywords: *Zoobenthos, biodiversity, oligotrophic sea, habitats*

INTRODUCTION

Globally, the geographical distribution of marine species (especially benthic sessile organisms) is being increasingly studied and described along variety of environmental gradients. The latter affect directly and/or indirectly the species diversity, thus, the related environmental variables are of direct (primary) and Indirect (secondary) influence when patterns of species distribution are defined. Important gradients are those of nutrients, pollutants, energy consumption. Direct variables are sediment grain size, water temperature, salinity. Indirect variables are depth, latitude/longitude [1]. Substrates, e.g. hard or soft and vegetated or unvegetated, primarily shape the pattern of biodiversity [2-4]. Seagrass beds are more diverse than unvegetated sandy and muddy soft-bottoms, and their high species richness drives increased biodiversity in areas adjacent to them. Nevertheless, seagrasses which host many epiphytes along their leaves, are not a favorable food source for the grazing taxa [5-6]. Other sources of biodiversity and species richness are eutrophication and excessive nutrient enrichment followed by primary production growth which is often associated with increase in the evenness of benthos, especially in near shore waters [7-10]. Total Organic Carbon (TOC) is a variable which

excessive increase well explains the shift in a benthic community from intolerant to tolerant (opportunistic) species stable predominance in space and time [11]. Due to bacterial activity TOC is processed depending on its degradability. Long-term burial takes place (e.g. humus-formation) and it depends on the sources of carbon [12-13]. Eutrofied and TOC-loaded regions distinguished the macrobenthic community. On the contrary to the region with high TOC, the eutrophic region is characterized by low species richness, abundance, diversity but high evenness and biomass values of the macrobenthos [14]. Such faunistic characteristics are classified as a normal ecological status with an indication of slight increases in biomass and few species [15].

The Cilician Basin contains a unique wide continental shelf after the Nile Delta in the Eastern Mediterranean Sea which is ultra-oligotrophic with primary production [16]. The many rivers discharging into this basin regulate and largely shape its benthos functional and structural characteristics *inter alia* [14]. For instance, the Nile River influences the Cilician Basin via the rim currents of the Eastern Mediterranean [17]. Geological characteristics of the Cilician shelf were described in Ergin [18] and Ediger et al. [19]. Additionally, a number of national Turkish projects have recently focused on oceanography of the Cilician shelf [17, 20-23].

Coastal ecosystems of the North Levantine Basin (NLB) have undergone permanent changes since increased anthropogenic pressures, resulting with an elevated eutrophication mainly in Iskenderun and Mersin Bays [14, 24]. Insufficiently treated or untreated municipal, industrial and agricultural waste waters bring to increased nutrient loading of the NLB where monospecific phytoplankton blooms have increased with time and in space their frequency and intensity with consequent deterioration of water quality. This was evidenced by prevalence of decomposition over production (microbial loop domination), deoxygenation and decrease in water transparency [17]. The inner Gulf of Iskenderun and Mersin inner bay and western coastal area was rich in population density of phytoplankton. In these areas, the currents flow generally from east to west and the Seyhan and Ceyhan Rivers discharges of nutrients contribute to their eutrophication. *chl-a* concentration in the inner Gulf of Mersin, Iskenderun and Goksu and Seyhan rivers. Therefore, a high concentration of *chl-a* occurred. The Gulf of Iskenderun is higher in nutrients than the vicinity of the Cape Akıncı located off the Gulf of Iskenderun [17].

Alien species have been introduced to the Mediterranean Sea, particularly Levantine Sea. The Cilician Basin of the Levantine Sea is a noticeable location for the reports of the alien species. 78% of total alien species of the Mediterranean Sea exist in the Eastern Mediterranean Sea where more than 500 Lessepsian species have inhabited [25]. Recently, alien species became a subject of the study for the global Mediterranean Sea on base of international wide and national wide interests [25-32]. As the alien species, whose origin were mostly from eutrophic region, Pacific or Indo-Pacific area have been succeed and expanded distribution range, the responded community would change to an environment, especially, ultra-oligotrophic basin such as Cilician Basin. In the area, one of the permanently responded taxa is benthos with the competition, replacement and involvement into the food web among or between native and non-native organisms. Çınar [29] categorized the Mediterranean Sea as one of the global hot-spot areas in terms of non-indigenous species diversity with report of 1000 aliens currently present [32]. A total of 955 alien species in the Mediterranean was found with a contribution of 718 species from the Eastern Mediterranean Sea [32]. Out of total 718 species recorded in the Eastern Mediterranean Sea, 116 species are fishes, 70 - decapods and stomatopod crustaceans, 98 (75% of the alien polychaete species reported for the whole Mediterranean Sea)

polychaete and 137 species - molluscs [32]. Recently, a total of 124 new alien species whose Mollusca was 105 species, followed by 75 Polychaeta species, 64 Crustacea species and 58 fish species has been reported for the Turkish seas in the last decade. The Levantine coast of Turkey comprised 330 of a total of 400 alien species [33].

Alien species have colonized the disturbed environments [34-37]. The alien organisms which could be introduced to a marine environment with low dissolved or particulate nutrients can provide a suitable ecological niche in the local organism community of the different habitats and ecological quality levels. For instance, the fishes or many benthic organisms inhabit and establish the regions dominantly and make the replacements of negative or positive synergetic affects on the potential communities. Furthermore, changing different level of the nutrient levels make the community with dominance of a few alien species in large biomass [15].

Therefore, the present study was aimed both at community response to a broad-scale area of the Cilician Basin with low and moderate levels of the nutrient and at determination of indigenous or non-indigenous key species of the community on the vegetative and non-vegetative soft bottoms.

MATERIALS AND METHODS

The material and methods were partly published for the crustacean and molluscan species distribution as follows [14, 24]: “The area of the Cilicia Basin (Levantine Sea) under study is fed by Seyhan, Ceyhan and Göksu Rivers nutrient discharges. The Mersin and Iskenderun Bays are considered to having unvegetated bottoms while the shallow stations bottoms (A1 and A2) off Cape Anamur are covered by *Posidonia* beds on the matte (Figure 1). The inner part (I1 and I2) of Gulf Iskenderun is generally governed by its own nutrients dynamics dependent on local eddies and anthropogenic activities.

However, some stations (I5 November, I5 - I7 March, and last few deep stations off Anamur) could not be attempted to sample due to the bad weathers and close depth contours of the Bay in the March-January sampling only (Fig. 1). About 0.25 l of sediments taken by the grab at each station were placed into nylon bags and preserved in a deep-freezer for consequent geochemical (grain size, TOC and carbonate contents) analyses.

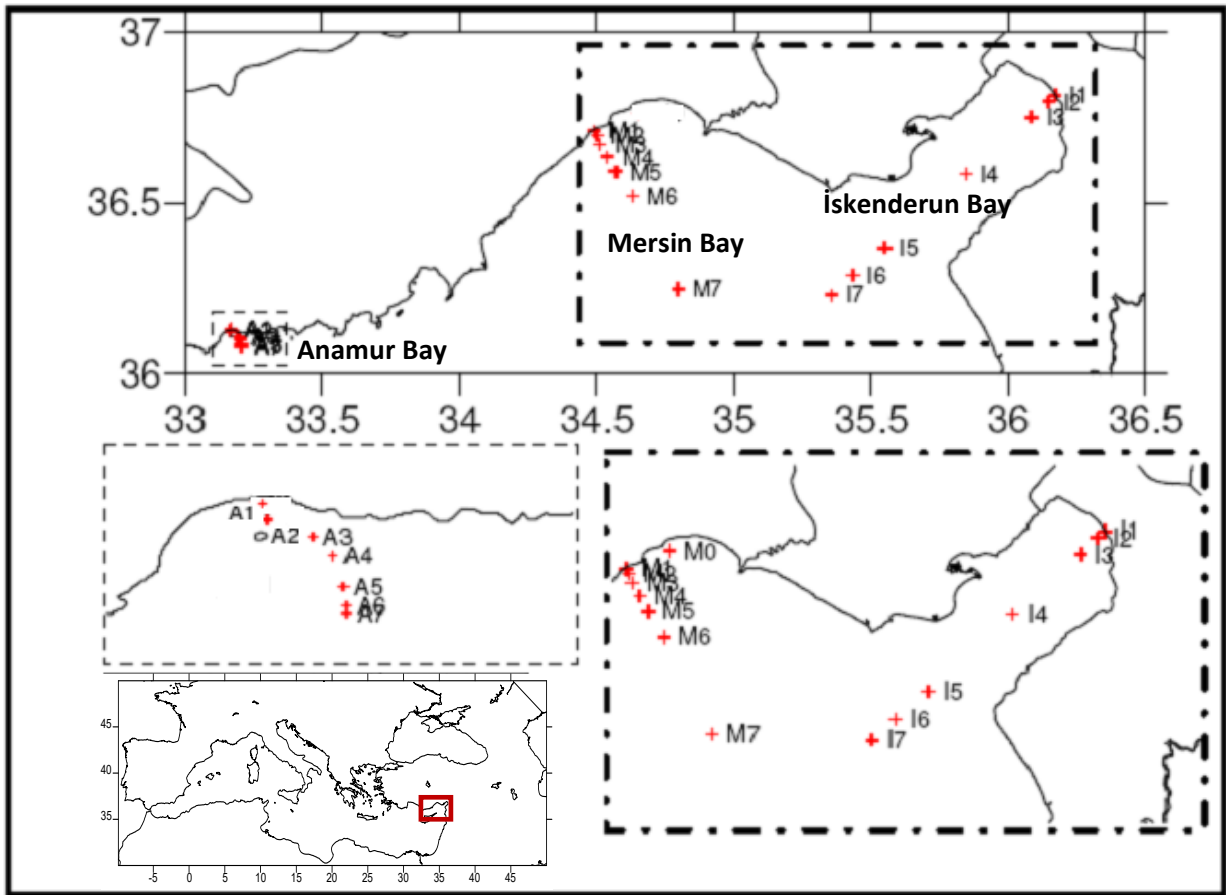


Fig. 1 Study area and Turkish part of the Cilician basin (Transects; M, m: Mersin, I, i: Iskenderun, A, a: Anamur) and location of the sampling stations (Depth code: 1: 10 m, 2: 25 m, 3: 50 m, 4: 75 m, 5: 100 m, 6: 150 m and 7: 200 m) visited in November 2005 (n), March (m), July 2006 (j), and January 2007 (ja).

“Onboard the sampled sediment was sifted through a set of sieves (0.5, 1 and 2 mm²mesh sizes), then benthic materials were left in a 5% MgCl₂ solution for anesthetizing the organisms, and then transferred into a 10% formalin solution for preservation.

Hydrographical parameters of water column were profiled by casting a SeaBird CTD probe (SBE 19*plus* profiler) from sea surface to bottom. In laboratory, nutrients (P-PO₄, N-NO₂ + N-NO₃ and Si) and dissolved oxygen in samples collected at sea surface (SSx) and near bottom (NBx and/or Nx) water by Niskin bottles (rosette-water sampler) were defined by using an auto-analyzer and the Winkler method, respectively (Table 1). Grain size analyses of sediments were carried out following the standard methodology described in Folk [38]. Titrimetrical method standardized by Gaudette et al. [39] was applied to measure Total Organic Carbon (TOC) of sediments, and their CaCO₃ content was determined applying the method described in Müller [40] (Table 1).

The laboratorial studies were performed to determine abundance and biomass, identification of the crustacean species following the checklist of World Register of Marine Species, WoRMS (<http://www.marinespecies.org/>). Identification and confirmation of the species were performed and the species were classified as alien species in reference to [25, 32, 41-45] and related many reference sources. The biomass

of the polychaetes was corrected with sharing weight of their total abdomen parts per the number of individual remained only as a cephalothoraxes.

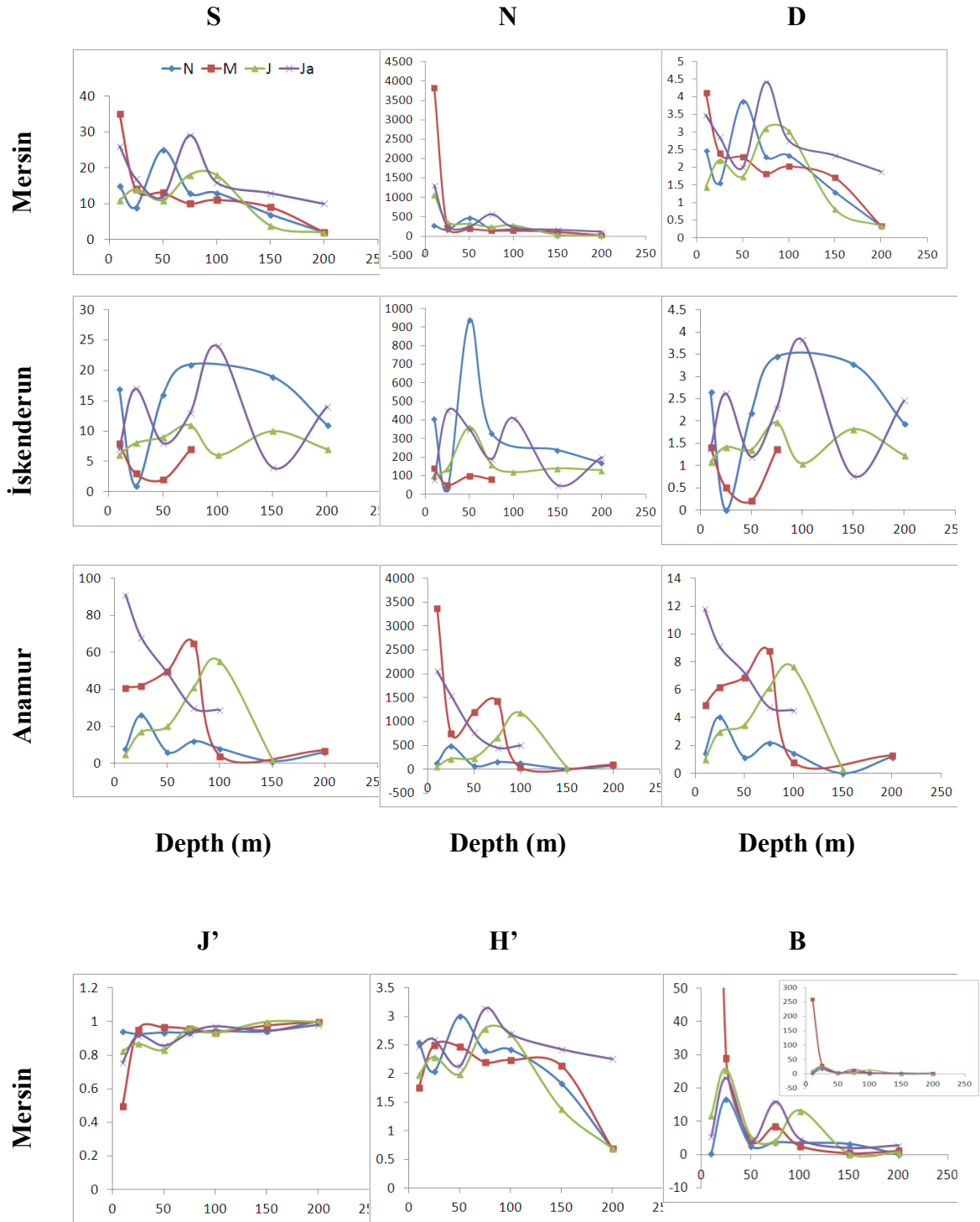
As an indication of crustacean faunistic characteristics, a set of variables was composed including the Shannon-Wiener diversity (H' , \log_2 base) [69], Margalef's species richness (d) [70], and Pielou's evenness (J') [71] indices, and percent *dominance* ($D\%$) and numerical occurrence (NO%). Tukey's least significant difference (LSD) was used to evaluate the sources of variation for the explanatory variables in time and space using MatLab statistical tool (version 7.0, The Math-Works, Inc).

Differences of the crustacean community among seasons, transects and depths were statistically tested applying PERMANOVA [46]. The Bray-Curtis dissimilarity matrix of the \log_{10} -transformed abundance data was applied to the nonparametric PERMANOVA in three-way modeled with fixed transect, random season and depth (FATHOM, [47]). Canonical correspondence analysis (CCA) was applied to determine the crustacean assemblages and then to show their relationships with the spatio-temporal bathymetrical, physical and sedimentary variables (Appendix 1) (CANOCO 4.5) [48]. Choice of CCA for the usage was determined by applying the $\log_{10}(N + 1)$ -transformed abundance data to Detrended Correspondence Analysis and it concluded that the maximum gradient exceeded 3 standard deviations (SD) [49] among the calculated SD (0.000, 0.000, 10.309 and 8.025 for the first four axes, respectively). A similarity of percentage analysis (SIMPER, PRIMER 6) was used to determine the contribution of discriminator and contributor species among the stations groups classified as unvegetated soft bottom, vegetated soft bottoms with *Posidonia* beds and unvegetated soft bottoms of eutrophic areas." Therefore, these all statistics applied will also determine the key species identical to the different ecological status.

RESULTS

Total 511 macrozoobenthic species were found in the study area. The richest taxon in species number was Annelida (Polychaeta) with 267 species, followed by Arthropoda with 154 species and Mollusca (62 species), followed by 17 Sipuncula, 8 Echinodermata, 2 Chordata (1 Actinopterygii and 1 Leptocardii) and 1 Brachipoda. Out of the total species number, 40 species were determined as non-indigenous, of which 18 species had been introduced to the Mediterranean Sea via Suez Canal and were called Lessepsian species. 24 alien Polychaeta species (six Lessepsian species) were found, 5 Arthropoda (4 decapoda; Mutlu, 2015), 7 Mollusca (4 Bivalvia and 3 Gastropoda; [24]), 3 Spincula and 1 fish species (Appendix 2).

Spatio (transect and depth)-temporal (season) faunistic characteristics of the macrozoobenthic organisms are given as number of species, abundance, biomass, species richness, evenness and Shannon-Weiner diversity in Fig. 2. Average number of species was significantly higher at transect Anamur (28 species) than at Mersin (15 species) and Iskenderun (8 species) at a level of $p < 0.05$. The species number was found to be significantly different in January from those in other seasons (Fig. 3).



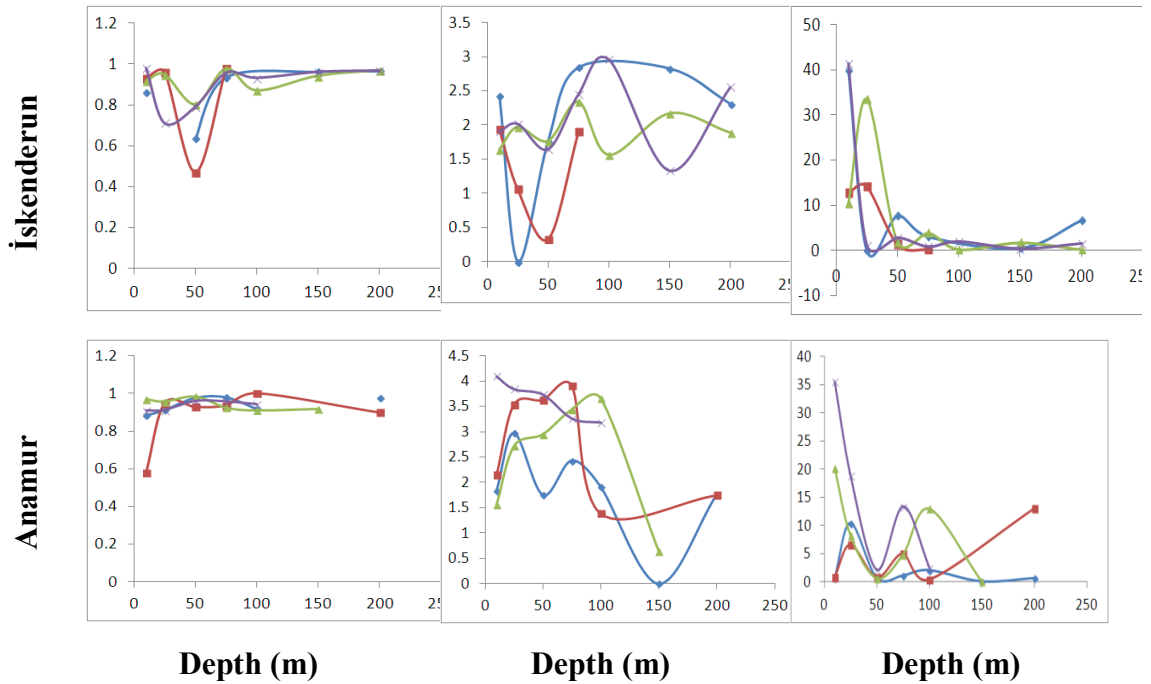
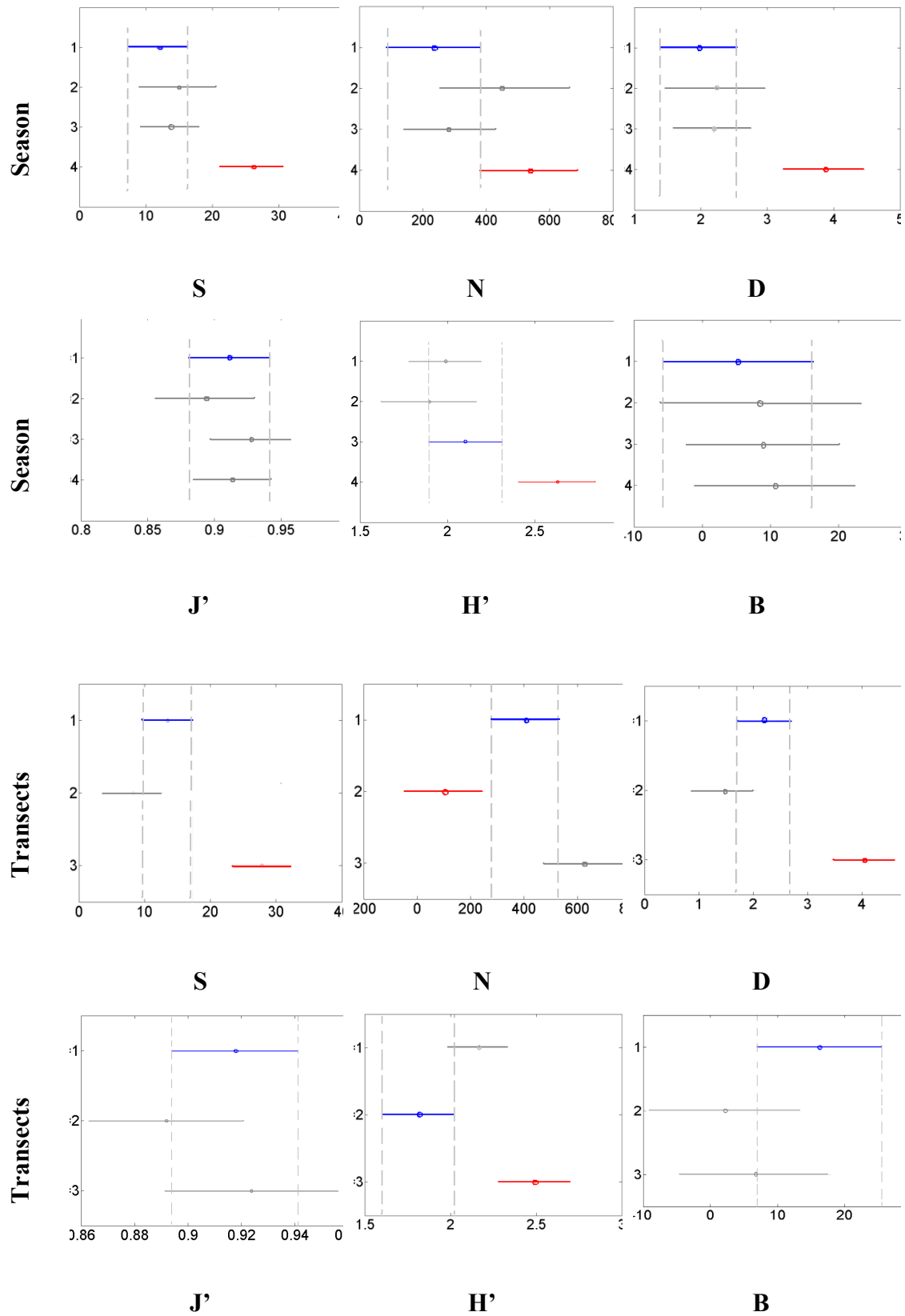


Fig. 2. Spatio-temporal (depths and months) and annual (average) changes of zoobenthic faunistic parameters at each season and transect of the Cilician shelf: Number of crustacean species (S ; a - c), density (N ; ind m^{-2} ; d - f), biomass (B ; $g\ m^{-2}$; g - i), species richness (D ; j - l), evenness (J' ; m - o), and Shannon-Wiener's diversity (H' ; p - s) indices.

Depth-wise significant difference in number of species was observed only between 10 m and 75 m and 200 m (Fig. 3). Number of species (S) found on the pristine soft bottom of the ultra-oligotrophic region of the Mediterranean Sea varied between 4 and 75 with an average of 21 species (Fig. 2). The number in the eutrophic region of the sea ranged from 6 to 40 with an average of 19 species. The vegetated bottom with *Posidonia oceanica* was well diversified between 10 and 104 with an average of 46 species (Fig. 2). Consequently, the regional numbers comprised of maximum values in the range of 1/10 to 1/5 only of the total species number. Number of species was significantly higher in vegetated bottoms than in pristine and eutrophic unvegetated soft bottoms (Fig. 4). The number of species was significantly different between the transects while there was no significant difference among the depths and seasons (Fig. 3). The S was significantly Spearman-correlated only with bottom depth (Depth $r=-0.28$, $n=76$) and near-bottom water dissolved oxygen (Winkler method) (N_DOC ; $r=0.27$, $n=76$) of a total of 27 environmental variables.



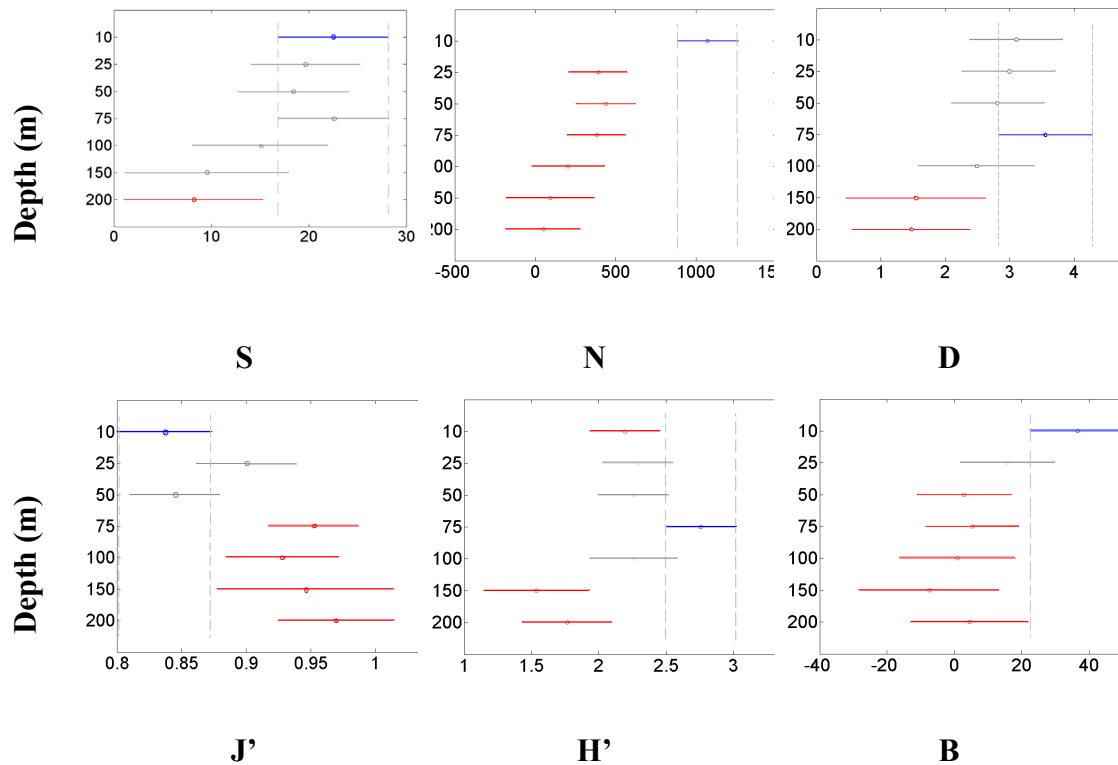


Fig. 3. 3-Way ANOVA of the faunistic characteristics of zoobenthos (Tukey's least significant difference, LSD) among the seasons (1; November, 2; March, 3; July, 4; January), among the transects (1: Mersin, 2; İskenderun, 3; Anamur) and among the bottom depths.

Abundance (N) significantly differed among transects, depths and seasons and their pairwise interactions (Fig. 3). The total number of individuals (abundance) of macrozoobenthos at vegetated bottoms was 2 and 3-fold higher than in eutrophic and pristine unvegetated areas, respectively (Figs. 2-4). The mean abundance on the *Posidonia* beds (1396 ind. m^{-2}) was higher than in eutrophic (851 ind. m^{-2}) and pristine soft bottoms (486 ind. m^{-2}). The maximal density (3863 ind. m^{-2}) was found in eutrophic unvegetated bottoms in March (Mersin transect at 10 m depth). It was close to the density found in March in vegetated bottoms at 10 m depth of the transect Anamur (3455 ind. m^{-2}) and at the same transect in January in normal soft bottoms (3132 ind. m^{-2}) located near *Posidonia* beds (25 m depth) (Figs. 2-3). Indeed, the maximum abundance on the normal soft bottoms was found to be less than 2000 ind. m^{-2} (Figs. 2-4). The abundances showed larger seasonal fluctuations at stations located between 10 and 75 m depths in comparison with deeper stations (Fig. 2). With depth, the abundance of macrozoobenthos decreased from 1000 ind. m^{-2} at 10 m rapidly to a value of 500 ind. m^{-2} at 25 m and then decreased gradually to 10 ind. m^{-2} at 200 m (Fig. 2). The abundance increased with increasing near-bottom oxygen (N_{OX} and N_{DOC} $r=0.23$, $n=76$) and near-bottom fluorescence (N_{F} ; $r=0.34$, $n=76$), whereas it was negatively correlated with near-bottom water nitrogen content ($N_{\text{NO2+NO3}}$; $r=-0.24$, $n=76$). The highest numbers of macrozoobenthic individuals were 3830 ind. m^{-2} at 10 m and 1310 ind. m^{-2} at 10 m on the Mersin transect in March and January, respectively; 940 ind. m^{-2} at 50 m on the İskenderun transect in November; and 3370 ind. m^{-2} at 10 m on the Anamur transect in March (Figs. 2d–2f).

Peak abundances in March were 3830 ind m⁻² at 10 m on the Mersin transect, 140 ind m⁻² at 10 m on the İskenderun transect, and 3370 ind m⁻² at 10 m on the Anamur transect. The dominant species in abundance were found to be native to the study area: e.g. *Jasmineira elegans* (2180 ind m⁻²) in March at 10 m depth of the transect Mersin (unvegetated, eutrophic and TOC-loaded soft-bottom). The most abundant species in other months were *Monticellina heterochaeta* (450 ind m⁻²) in November at 75 m depth of the transect İskenderun (unvegetated and eutrophic soft-bottom); *Protodorvillea kefersteini* (1690 ind m⁻²) in March at 10 m depth of the transect Anamur (*Posidonia* beds); *Jasmineira elegans* (330 ind m⁻²) in July at 10 m depth of the transect Mersin (unvegetated, eutrophic and TOC-loaded soft-bottom) and *Onchnesoma steenstrupi* (1540 ind m⁻²) in January at 25 m depth of the transect Anamur (*Posidonia* beds). Abundance was found to be significantly different among the transects and depths (Fig. 3).

A total of 804.76 g biomass (*B*) and the averaged biomass value of 0.021 g m⁻² were measured in the study area. The macrozoobenthos biomass value (wet weight) was not significantly different among the transects and seasons, whereas it changed significantly with depths (Fig. 2). The highest averaged biomass value was found at the shallowest station of Mersin transect in March (234.85 g m⁻²) and the lowest at İskenderun stations (0.10 g m⁻²) (Fig. 3). The biomass distribution showed a similar seasonal trend with the abundance (Fig. 2). The average biomass value increased gradually from a season of November through spring and summer to a winter season of January (Fig. 3). The average biomass value decreased exponentially from the shallowest stations to the deepest stations, being from 40 g m⁻² at 10 m to 5 g m⁻² at 200 m whilst the annual secondary small peak value occurred at 75 m (Fig. 3). The deeper zone had the biomass less than 5 g m⁻². Significant correlations were found between biomass and bottom depth ($r=-0.50$, $n=76$), sea surface ($r=0.24$, $n=76$) and N_F ($r=0.43$, $n=76$) and sea surface PO₄ ($r=0.26$, $n=76$) contents of the sediment. The predominant species in biomass were found generally to be non-indigenous species to the study area: e.g. *Strombus persicus* amounting up to 19.60% of the total biomass. *Macrophthalmus (Macrophthalmus) indicus* (7.16%), *Amphiura chiajei* (5.62%), *Echinocardium cordatum* (3.82%), and *Nephtys incisa* (1.99%) were other species significantly contributing to the total wet biomass. The dominant species in the biomass during different seasons were as follows: *Echinocardium cordatum* (45.81 g m⁻²), *Amphiura chiajei* (12.89 g m⁻²), and *Bregmacerus atlanticus* (4.80 g m⁻²) in November; *Strombus persicus* (234.85 g m⁻²), *Amphiura chiajei* (24.90 g m⁻²), and *Macrophthalmus (Macrophthalmus) indicus* (13.48 g m⁻²) in March; *Macrophthalmus (Macrophthalmus) indicus* (33.66 g m⁻²) and *Terebellides stroemi* (10.20 g m⁻²) in July; and *Macrophthalmus (Macrophthalmus) indicus* (38.63 g m⁻²), *Amphiura chiajei* (22.58 g m⁻²), *Ophiopsila aranea* (17.69 g m⁻²), and *Nucula nitidosa* (11.28 g m⁻²) in January. Maximum biomass was 18.85 g m⁻² at 25 m in Mersin, 47.80 g m⁻² at 10 m in İskenderun, and 17.11 g m⁻² at both 25 m in Anamur in November (Figs 2). In March, it was 259.00 g m⁻² at 10 m in Mersin, 15.32 g m⁻² at 10 m in İskenderun, and 32.85 g m⁻² at 75 m in Anamur. In July, the biomass peaked at 100 m (20.58 g m⁻²) in Mersin, at 25 m (35.72 g m⁻²) in İskenderun, and at 100 m (33.33 g m⁻²) in Anamur. The highest biomasses measured in January were 27.79 and 27.52 g m⁻² at 25 and 75 m in Mersin, respectively, 43.94 g m⁻² at 10 m in İskenderun, and 63.28 g m⁻² at 10 m in Anamur (Figs. 2-3).

Community indices such as *d*, and *H'* were significantly different among depths, transects, and seasons while *J'* was significantly different only among depths. (Fig. 3).

Only d (species richness) was significantly higher in community of vegetative bottoms as compared to non-vegetative bottoms ones (Fig. 4). The community index values of d and H' were higher in January ($d = \sim 4$, $H' = 2.65$) than in other seasons whereas there was no significant difference in J' , being in the range of ~ 0.88 - 0.93 (Fig. 3). Species richness values calculated at 75 m were significantly higher only to those calculated at 150-200 m (Fig. 3). As an indication of evenness (J') among the species abundance of the community at the shallower stations > 75 m was significantly evenner than those at the shallower waters (Fig. 3). Diversity index values found at 10-75 m ($H' = 2.3$ - 2.8) were higher than those calculated in deeper waters ($H' = 1.5$ - 2.3). The H' at 75 m was maximal as compared with other depths (Fig. 3). The species richness and diversity values had a normal Gaussian distribution across the depth gradient on the shelf. Evenness increased with depth and showed seasonal fluctuations at depths between 10 and 50 m (Fig. 3). Among investigated biotic parameters, species richness (d) correlated with bottom depth ($r = -0.25$, $n = 76$), sea surface temperature ($r = 0.25$, $n = 76$), N_{OX} ($r = 0.31$, $n = 76$) and N_{DOC} ($r = 0.28$, $n = 76$) at $P < 0.05$; there were significant correlations between the evenness (J') and bottom depth ($r = 0.45$, $n = 76$), N_F ($r = -0.37$, $n = 76$), TOC ($r = -0.23$, $n = 76$), PO_4 ($r = -0.28$, $n = 76$), and $N_{NO_2+NO_3}$ ($r = 0.24$, $n = 76$); diversity index (H') positively correlated with N_S ($r = 0.24$, $n = 76$) and N_{OX} ($r = 0.26$, $n = 76$) at $P < 0.05$.

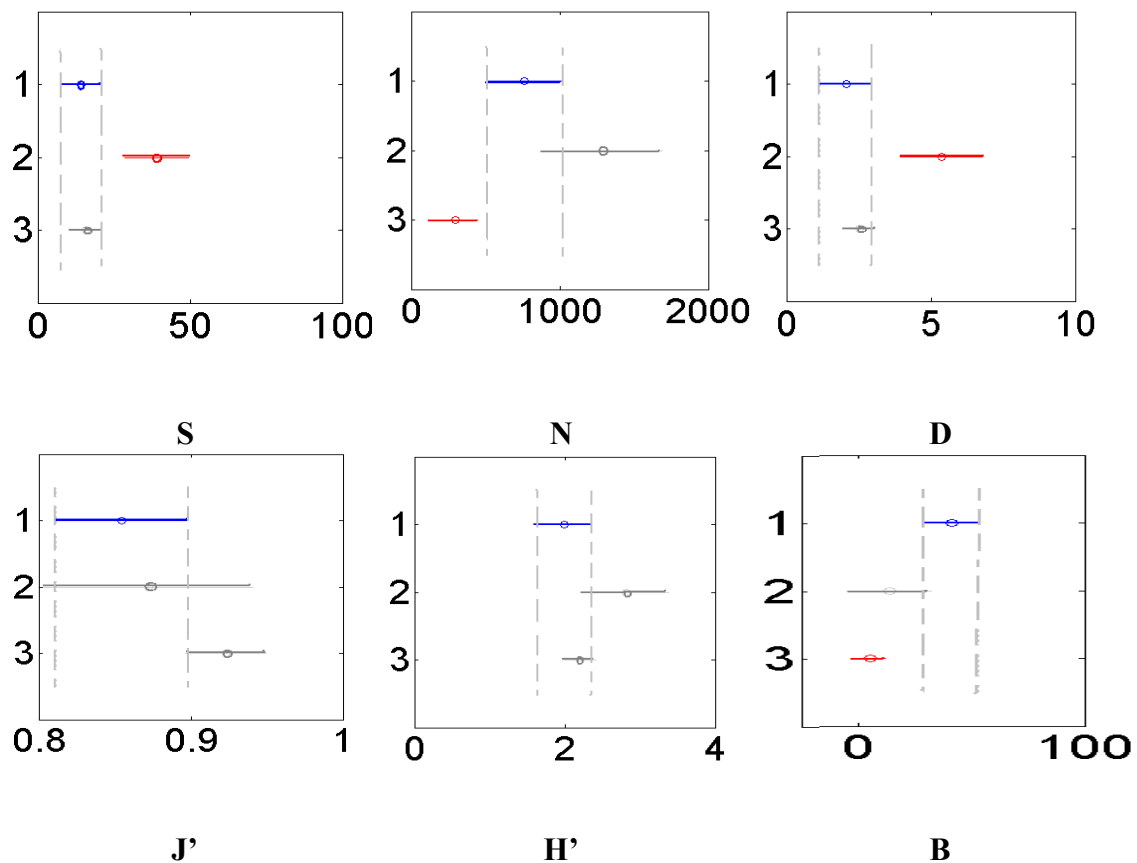


Fig. 4. One-Way ANOVA of the faunistic characteristics among Type 1: non-vegetative eutrophic, 2 vegetated by *Posidonia*, 3 non-vegetated pristine soft bottom

The macrozoobenthic abundance significantly varied between the communities of non vegetative-pristine, eutrophic soft bottoms and vegetative bottoms at $p < 0.05$ (Table 1). Furthermore, three-way PerManova showed significant differences in communities among depths and seasons and interactions of Community Type x Season and Depth x Season. The faunistic characteristics (S , N , d , J' and H' , except biomass, B) were of significantly higher values in vegetative bottoms than in the other types of investigated bottoms (Fig. 4).

Table 1. 3-Way PerMANOVA for the community (Bray Curtis $\log_{10} N$ transformed, model; Type (Eutrophic, vegetated and non-vegetated soft bottoms) and Depth are fixed, Season is random by permuting the data 4999 times). Bold number shows P values < 0.05 .

Source	df	SS	MS	F	p
Type	6	3.861	0.644	1.337	0.002
Depth	3	1.700	0.567	1.252	0.043
Season	2	1.887	0.944	1.414	0.000
Type x Depth	18	6.579	0.366	1.371	0.124
Type x Season	12	5.775	0.481	1.805	0.000
Depth x Season	6	2.716	0.453	1.698	0.000
residual	36	9.597	0.267		
total	75	32.115			

In general, the community abundance was found to significantly differ among transects, bottom depths and seasons (PerManova, $p < 0.05$, Table 2). The faunistic characteristics, with the exception of Biomass, were significantly higher in value in bottoms (meadows) vegetated by *Posidonia oceanica* (Fig. 2). The differences by the transect were more efficient in the community abundance rather than the bottom depth in regard with the interactions of the transect and bottom depth (Table 2).

Table 2. 3-way PerMANOVA for the community (Bray Curtis $\log_{10} N$ transformed, model; Transect, Depth is fixed, Season is random by permuting the data 4999 times). Bold number shows P values < 0.05 .

Source	df	SS	MS	F	p
Transect	2	1.884	0.942	2.080	0.0002
Depth	6	3.863	0.644	1.761	0.0002
Season	3	1.701	0.567	1.028	0.0406
Transect x Depth	12	5.776	0.481	1.805	0.0002
Transect x Season	6	2.717	0.453	1.698	0.0004
Depth x Season	18	6.580	0.366	1.371	0.1246
Residual	36	9.600	0.267		
Total	75	32.121			

However, the biomass-based PerManova did not show same effect for the community difference among the investigated factors (Table 3). Here was transect and bottom depth significant factor to differentiate the community in the biomass values, and interaction transect x depth as well (Table 3). The biomass at the Mersin transect was significantly higher than at Anamur (vegetative bottom) (Fig. 4). The shallowest stations (10 m) were significantly richer in biomass than the deepest stations (Fig. 2).

Table 3. 3-Way PerMANOVA for the community (Bray Curtis, $\log_{10} B$ transformed, model; Transect, Depth is fixed, Season is random by permuting the data 4999 times). Bold number shows P values < 0.05 .

Source	df	SS	MS	F	p
Transect	2	1.794	0.897	2.149	0.0002
Depth	6	4.461	0.744	1.812	0.0002
Season	3	1.397	0.466	0.893	0.2078
Transect x Depth	12	6.916	0.576	1.884	0.0002
Transect x Season	6	2.504	0.417	1.364	0.2014
Depth x Season	18	7.386	0.410	1.341	0.1894
Residual	36	11.014	0.306		
Total	75	35.471			

In general, zoobenthic assemblages along the gradient of the shelf were, in order of the importance, oriented in association with habitat types (sea grasses and soft bottom) and ecological status (eutrophication; dissolved nutrients), and then bottom depths and depth-related sediment structure and contents (Fig. 5). With a cumulative percentage variance of 6.6% for the species data and 19.2% for the species-environment relation on the first two axes, *Posidonia* beds and eutrophic region were located at the opposite corners of CCA ordination while sedimentary bottom was centered (Fig. 5). First CCA with an Eigen value of 0.431 was statistical significantly ($F = 1.895$, $p = 0.0320$) and the statistical significance of the four axes (27.6%) was proved by a Monte Carlo test ($F = 1.186$, $p = 0.0020$). Macrozoobenthic community in the *Posidonia* beds, eutrophic region and sedimentary bottom were positively correlated with salinity, density, dissolved oxygen content of sea surface and near bottom waters, and negatively correlated with sedimentary variables such as TOC contents and sea surface temperature (Figs. 5, 7). *Syllis garciai* was dominant and abundant and contributor species in the *Posidonia* beds (Fig. 6; Table 4).

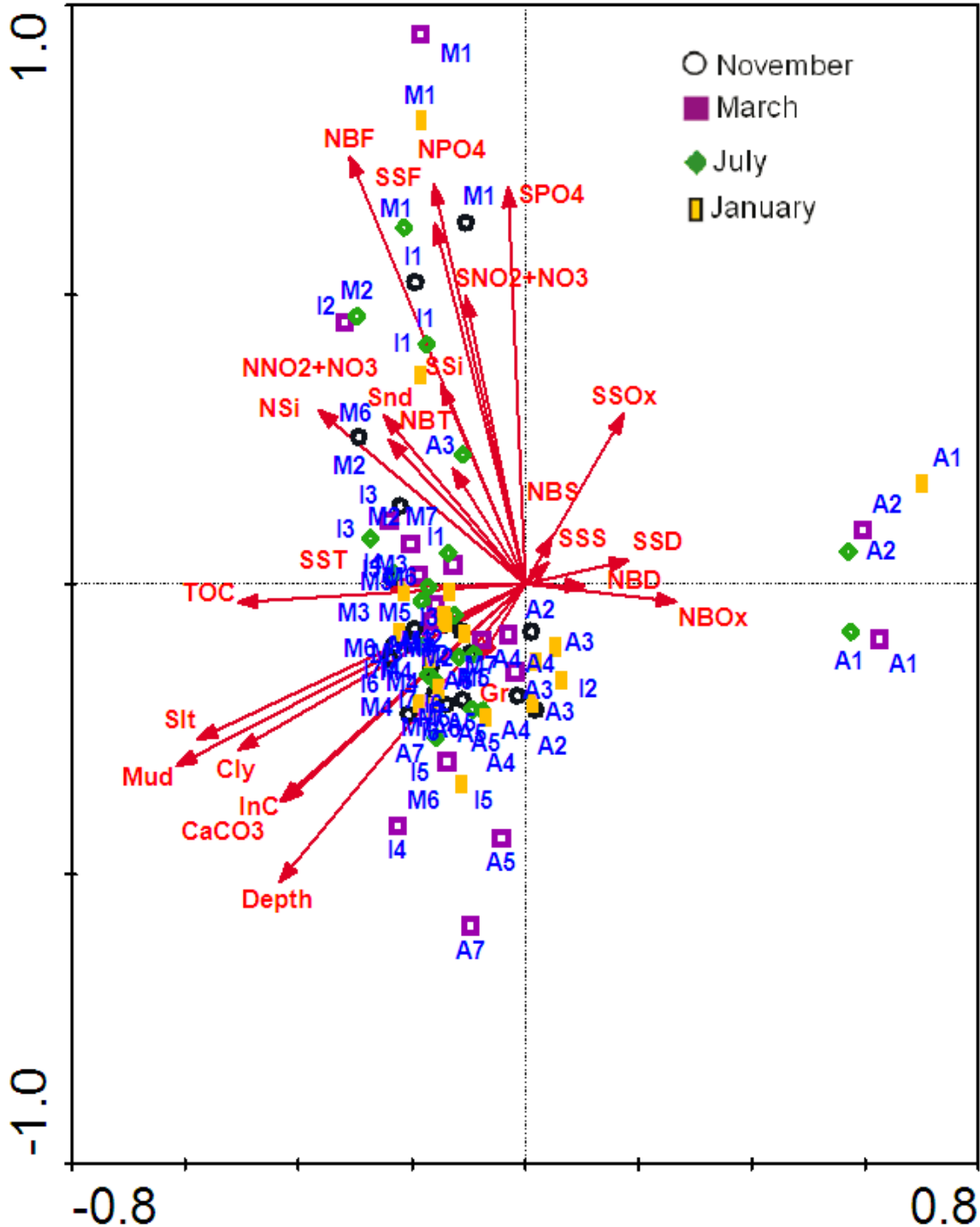


Fig. 5. Biplot of CCA performed on log-transformed ($\log_{10}(N+1)$) density values (N) of the zoobenthos and environmental variables (arrows) at seven depths on three transects (m , i , and a) (1-7; see Fig. 1 for position and depth, and Appendix 1 for codes of the environmental variables) in four sampling months. Arrows refer to the direction and relative importance of environmental variables in the ordination.

The contributor species of pristine and eutrophic soft-bottom types were *Onchnesoma steenstrupi*, *Nephtys incise*, and *Monticellina heterochaeta* and *Nephtys hombergii*, *Macrophthalmus (Macrophthalmus) indicus*, and *Amphipholis squamata* respectively (Fig. 5; Table 4). In the eutrophic soft bottom alone, the CCA were discriminated depending on a particular environmental parameter groups (Fig. 5); one macrozoobenthic assemblage was affected by excessive nutrient enrichment (P-PO₄, N-NO₂ + N-NO₃ and Si) and fluorescence of surface and near-bottom waters (Figs. 5, 6).

The Canonical Correspondence Analyses (CCA) determined contributor species for each type of soft-bottoms with discriminated Eigen values. On CCA1 (Fig. 5), positive high Eigen values showed weight of species on *Posidonia oceanica* vegetative soft bottom. *Amblyosyllis formosa*, *Anobothrus gracilis*, *Antinoe epitoca*, *Brania pusilla*, *Ceratonereis mirabilis*, *Chrysopetalum debile*, *Dialychone arenicola*, *Euclymene santandarensis*, *Sclerocheilus minutes*, *Metavermlia multicristata*, *Microphthalmus sczelkowi*, *Myrianida pinnigera*, *Ophiodromus pallidus*, *Opisthosyllis brunnea*, *Pomatoceros triqueter*, *Prosphaerosyllis tetralix*, *Sabellaria alcocki*, *Salvatoria limbata*, *Syllides bansei*, *Spirobranchus tetraceros*, *Spirorbis (Spirorbis) marioni*, *Syllis beneliahuae*, *Syllis compacta*, *Syllis hyaline*, *Syllis columbretensis*, *Syllis ferrani*, *Syllis westheidei*, *Trypanosyllis (Trypanosyllis) coeliaca*, *Trypanosyllis aeolis*, *Trypanosyllis zebra* and *Vermiliopsis striaticeps* were polychaetes species discriminating vegetated bottoms from the non-vegetative pristine and eutrophic bottoms.

Apeudes talpa, *Bodotria arenosa mediterranea*, *Atylus guttatus*, *Ceradocus* sp., *Gammarella fucicola*, *Harpinia crenulata*, *Leptocheirus guttatus*, *Leptocheirus pectinatus*, *Leptocheirus pilosus*, *Leptocheirus* sp, *Liljeborgia dellavallei*, *Lysianassa costae*, *Maera hironellei*, *Maera inaequipes*, *Melitae* sp, *Microdeutopus armatus*, *Microdeutopus obtusatus*, *Monoculodes subnudus*, *Orchomene grimaldii*, *Socarnes filicornis*, *Microdeutopus* sp., *Urothoe* sp1, *Gnathia oxyuraea*, *Limnoria tripunctata*, *Palaemon xiphias*, *Pilumnus spinifer*, *Plesionika longicauda* and *Anoplodactylus petiolatus* were arthropod species contributing to the community of the *Posidonia* soft bottom. None of them were alien species. *Leptochiton cimicoides*, *Anadara natalensis*, *Cardiomya costellata*, *Centrocardita aculeate*, *Kellia porculus*, *Parvicardium pinnulatum*, *Pitar rudis*, *Septifer cumingii*, *Pseudominolia nedyma*, *Pododesmus patelliformis*, *Strombus persicus* and *Falcidens guttuosus* were molluscan species typing vegetative soft bottoms. *Ophiactis macrolepidota* was one Lessepsian alien echinoderm species weighing in the *Podisonia* beds. *Aspidosiphon (A.) mexicanus* was alien spincula species and some more species characterized near-*Posidonia* bottoms. *Bregmaceros atlanticus* was fish species observed abundantly at the non-vegetative bottoms. On CCA2 (Fig. 5), positive high Eigen values showed weight of species on non-vegetative eutrophic soft bottom. However, number of polychaete species decreased to discriminate the bottom as compared with those of the vegetative bottoms and were *Arenicola* sp, *Leiocapitella glabra*, *Diopatra neapolitana*, *Diopatra marocensis*, *Jasmineira elegans*, *Lanice conchilega*, *Leonnates persicus*, *Nephtys hombergii*, *Phyllodoce longifrons*, *Pelogenia arenosa* and *Sigalion mathildae*. Only two of them were alien species. *Diastylis rugosa*, *Iphinoe maeotica*, *Ampelisca brevicornis*, *Ampelisca sarsi*, *Medicorophium minimum*, *Cheirophotis mediterraneus*, *Medicorophium runcicorne*, *Erichthonius punctatus*, *Urothoe poseidonis*, *Crangon crangon*, *Diogenes pugilator* and *Processa robusta* were reduced number of arthropoda species typical to the eutrophic soft bottom. *Lepidochiton acinerea*, *Abra alba*, *Bathyarca philippiana*, *Paphia* sp., *Musculuc costulatus*, *Williamia gussonii* and *Neverita josephina* were molluscan species with no alien species for the

bottom eutrophic type. *Amphiura filiformis* was the only echinodermata species contributing highly to the eutrophic non-vegetative bottom. Other taxa had no representative species for this bottom community.

Table 4. Dissimilarity result table of SIMPER analyses between pairwise zoobenthic communities in *Posidonia* beds (Group p), eutrophic sedimentary bottom (Group e), and noneutrophic undisturbed sedimentary bottom (Group s). *: Contributor species within the group; N: abundance; δ : dissimilarity.

Species	N	N	δ	δ /SD	Cum.%
Average dissimilarity = 94.41					
	Group e	Group s			
<i>Onchnesoma steenstrupi</i>	0.81	1.77*	2.4	0.78	2.54
<i>Nephtys hombergii</i>	1.87*	0	1.94	0.83	4.59
<i>Jasmineira elegans</i>	2.15	0.21	1.91	0.77	6.61
<i>Macrophthalmus (M.) indicus</i>	1.09*	0.06	1.91	0.56	8.63
<i>Ampelisca diadema</i>	1.61	0.94	1.76	0.88	10.5
<i>Nephtys incisa</i>	0.46	1.15*	1.74	0.61	12.33
<i>Ampelisca brevicornis</i>	1.72	0.08	1.73	0.76	14.17
<i>Monticellina heterochaeta</i>	0.24	1.5*	1.71	0.76	15.98
<i>Prionospio saccifera</i>	1.3	0.59	1.65	0.67	17.72
<i>Amphipholis squamata</i>	1.54*	0.3	1.52	1.01	19.34
Average dissimilarity = 96.75					
	Group e	Group p			
<i>Syllis garciai</i>	0	2.44*	2.47	0.96	2.56
<i>Onchnesoma steenstrupi</i>	0.81	1.81	1.45	0.72	4.05
<i>Nephtys hombergii</i>	1.87*	0.48	1.35	0.78	5.45
<i>Asterina pancerii</i>	0	1.44	1.32	0.67	6.81
<i>Jasmineira elegans</i>	2.15	0	1.31	0.67	8.17
<i>Prionospio saccifera</i>	1.3	0.96	1.19	0.73	9.4
<i>Ampelisca brevicornis</i>	1.72	0	1.19	0.67	10.62
<i>Chrysopetalum debile</i>	0	1.33	1.15	0.57	11.81
<i>Macrophthalmus (M.) indicus</i>	1.09*	0	1.12	0.52	12.97
<i>Amphipholis squamata</i>	1.54*	0.61	1.09	0.91	14.1
Average dissimilarity = 95.34					
	Group s	Group p			
<i>Syllis garciai</i>	0.19	2.44*	2.59	0.9	2.71
<i>Onchnesoma steenstrupi</i>	1.77*	1.81	1.45	0.84	4.23
<i>Asterina pancerii</i>	0	1.44	1.42	0.65	5.72
<i>Chrysopetalum debile</i>	0	1.33	1.24	0.56	7.02
<i>Monticellina heterochaeta</i>	1.5*	0.48	1.16	0.68	8.24
<i>Dialychone collaris</i>	0.23	1.65	1.07	0.92	9.36
<i>Chaetozone</i> sp	0.29	0.48	1.07	0.47	10.49
<i>Ophiura albida</i>	0.18	0.48	1.03	0.45	11.57
<i>Lysidice hebes</i>	0.38	1.44	1.02	0.87	12.64
<i>Prionospio saccifera</i>	0.59	0.96	1.01	0.71	13.69
<i>Metaphoxus</i> sp	0.08	0.48	1	0.44	14.74
<i>Nephtys incisa</i>	1.15*	0	0.99	0.49	15.78

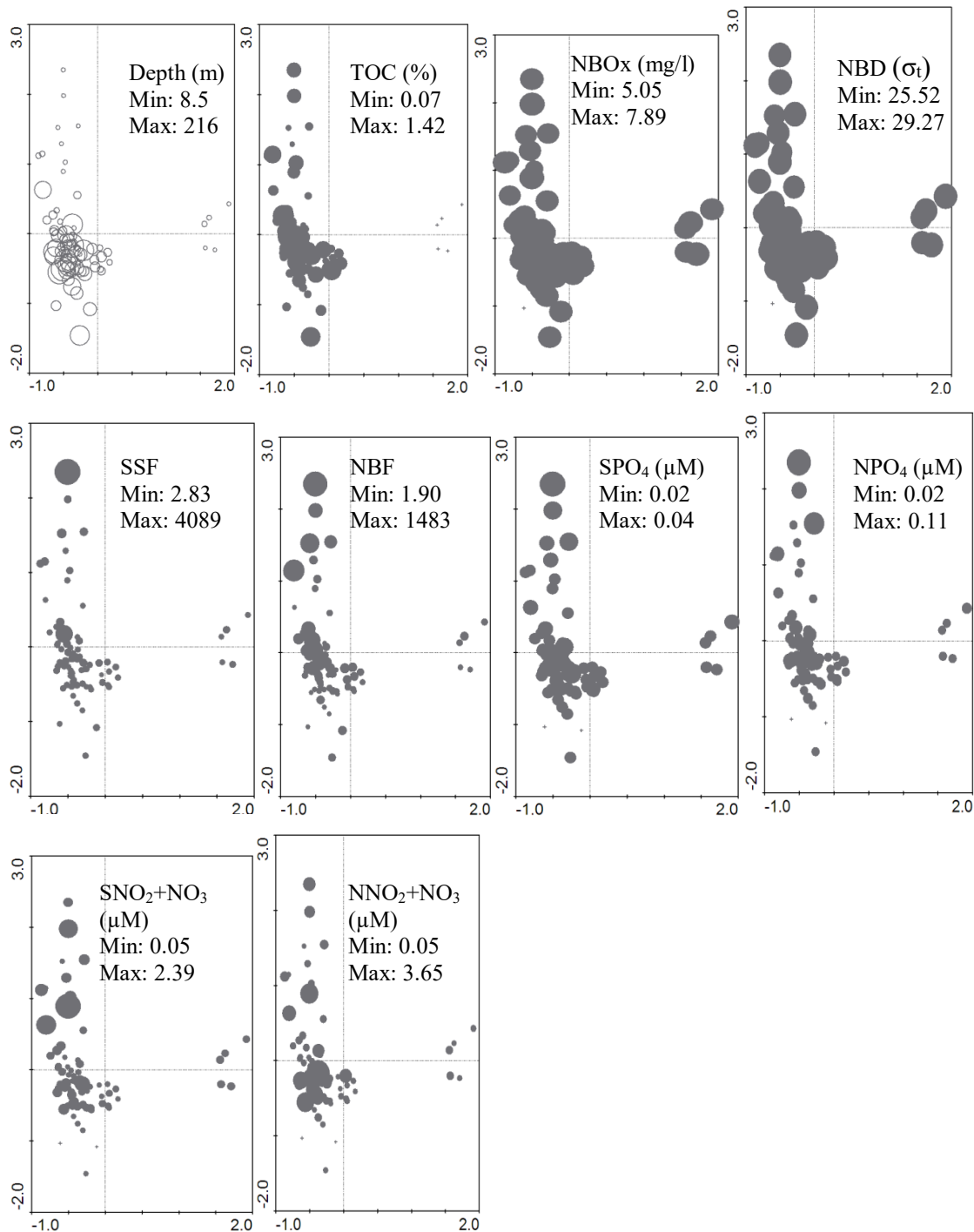


Fig. 6. Abundance distribution of significant environmental variables in each zoobenthic assemblage identified by CCA. Circle diameter is proportional to the values (see Appendix 1 for the abbreviations of the environmental parameters).

DISCUSSION

The duplicate samples at least 3 replicates were generally recommended for the benthic studies. In the present study, a single sample was however conducted for each station. Mutlu [14] discussed practicability and possibility of the replicate samples for determining statistically sufficient number of the sample per station during onboard process and concluded that determination of the number of the samples per station was impossible and impracticable on board. To date, few studies have been simultaneously conducted on natural seagrass and non-vegetative sediment communities which provided evidence on the persistence and magnitude of impact of macrophytes cover on zoobenthos [50]. The Eastern Mediterranean Sea has been under conditions of the establishment and colonization of alien species since the Sea has become open to the Indo-pacific Ocean via Suez Canal and is naturally connected to the Atlantic Ocean. The alien species easily become established and colonize polluted or eutrophic regions [34-35, 37] such as Iskenderun Bay of the Turkish Coast. Therefore, the alien species play an important role as key species in the macrozoobenthic community of such areas. The present study presented key species and biodiversity under such circumstance. Biodiversity and community were governed by certain key species according to the habitat type and nutritional levels. The species composition, faunistic characteristics and density distribution of the macrozoobenthos in the Cilician shelf was structured by habitat types (vegetated and non-vegetated bottom) on the first component of CCA (Fig. 5) and hydrochemistry of the pelagic environment and sedimentary parameters on the second component of CCA.

The habitat type was significant factor leading the distribution of the macrozoobenthos. Çınar et al. [37] found 337 zoobenthic species on the non-vegetated soft-bottom of the Mersin Bay and 427 species in Izmir Bay [36]. Distinguished faunistic characters for the crustacean community on the Cilician shallow water soft-bottom then occurred between bottom dominantly vegetated mainly by *Posidonia oceanica* (stations A1 and A2) and non-vegetated bottom (stations I3 - I7, M2 - M7 and A3 - A7). Vegetated bottom was well diversified with higher values of the faunistic characters with exception of the biomass of the crustacean community than non-vegetated sandy bottom. Ergen et al. [56] described meadows with prominent and higher diversity of benthic infauna as compared to the very coastal bottoms of Gencelli Bay in the Aegean Sea. Colonization of numerous species from different substrates was achieved by living seagrasses [51] playing role in dynamic parameters of population such as recruitment, predation and mortality of the different species. Of the 511 zoobenthic species identified in the present study, 174 species were found on the meadow-covered bottom and 396 (pristine region) + 105 (eutrophic region) species on the sedimentary soft bottom composed of sand to mud fractions. Previously, Cinar et al. [36] found 337 zoobenthic species belonging to 8 systematic groups on non-vegetated soft bottoms of Mersin Bay, namely: Polychaeta (136 species), Mollusca (122 species) and Crustacea (59) whereas a total 395 species of which 80 species were encountered seasonally reported [52-55]. In the neighboring Aegean Sea, Izmir Bay (polluted area), 417 zoobenthic species belonging to 11 systematic groups were identified on non-vegetated soft bottoms [37]. The contributor species of pristine and eutrophic soft-bottom types were *Onchnesoma steenstrupi*, *Nephtys incise*, *Monticellina heterochaeta* and *Nephtys hombergii*, *Macrophthalmus (Macrophthalmus) indicus*, *Amphipholis squamata*, respectively. In Izmir Bay, Ergen et al. [56] found higher polychaete species in soft vegetated bottom than Çınar et al. [37] reported for non-vegetated soft bottom. *Syllis garciai* was abundant and dominant and contributor species

in the *Posidonia* beds. In the Baltic Sea, Włodarska-Kowalczyk et al. [50] found maximal seasonal differences between macrofaunal characteristics of vegetated and unvegetated sediments. Similar assemblage was observed during a study on restructuring of the crustacean assemblages on the meadow beds modified by the bottom trawl (Sanchez-Jerez et al., 2000).

Eutrophicated and TOC-loaded regions (inner Part of Iskenderun Bay and shallowest water of Mersin Bay) were distinguished in terms of macrozoobenthic community. Both regions were typified with faunistic characters as ecological response of macro-benthic community on the non-vegetated soft-bottom. On the contrary to the region with high TOC, the eutrophicated region was characterized by low species richness, abundance, diversity but high evenness and biomass values of the macrobenthic fauna. Such faunistic characters was classified as a normal ecological status regarding the disturbance level to the sediment environment with an indication of slight increases in biomass and few species according to the .Pearson-Rosenberg Model [15]. Non-native crab species, *Macrophthalmus (Macrophthalmus) indicus*, was recorded in Iskenderun Bay [57] and Levantine Sea [58-61], and a polychaete, *Nephtys hombergii* were only discriminator species of the eutrophic regions of the Iskenderun and Mersin Bay. Throughout the year, few species with large shares in the total biomass were found in Iskenderun Bay. Organic matter larger deposits in sediments, resulted from increased primary production [62], was associated with macrozoobenthos biomass growth and consequent shift in assemblages toward the dominance of r-strategy species [63-64]. High nutrient concentrations in surface and near-bottom waters of the the Iskenderun Bay inner parts were measured. Furthermore, a polychaete and echinoderm species (*Nephtys hombergii* and *Amphipholis squamata*) had proliferated increasing the zoobenthic biomass of the studied Bays, particularly in the shallow waters of Mersin Bay (stations M1 and M2). Çinar et al. [37] found that the benthic infauna in shallow waters had high density and low diversity index values in Mersin Bay and, that the shallow water infauna assemblages were correlated with dissolved nutrients and chl-*a* concentrations. The Iskenderun Bay semi-enclosed shallow region with inner water current dynamics (stations I1 and I2) was dominated by decapods and no amphipods were found in all investigated seasons. In this area dissolved oxygen (DO) contents of near-bottom waters varied between 5 mg/l in July and 7.5 mg/l in January. Such values are not critical (e.g. DO<2-3 mg/l; [65-67] for the vitality of benthic organisms and do not lead to habitat degradation. Seitz et al. [72] outlined a sigmoid curve of the relationship between changes in benthic community biomass and DO and concluded that biomass was four-fold higher at the oxygen threshold value (DO > 4.5 mg/l) than at critical DO. Many amphipod species were eliminated with start of the hypoxia [68]. The eutrophic areas of the present study were classified as slightly or moderately polluted after examination with the applications of the ABC (Abundance/Biomass Curve), rarefaction curves and AMBI indices [17].

CONCLUSION

In general, zoobenthic assemblages along the gradient of the shelf were, in order of importance, oriented in association with habitat types (sea grasses and soft bottom) and ecological status (eutrophication; dissolved nutrients level), and then bottom depths and depth-related sediment structure and contents. Mutlu & Ergev [55] determined two main crustacean assemblages formed on shallow bottoms (10, 25 – 100 m) and on deep bottoms (150 – 200 m). Macrozoobenthic community in the *Posidonia* beds, eutrophic region and

sedimentary bottom positively correlated with salinity, density, dissolved oxygen content of sea surface and near bottom waters, and negatively correlated with sedimentary variables such as TOC contents and sea surface temperature. For a restricted small area in the Cilician shelf, the environmental factors structuring these spatial crustacean assemblages were in order of importance, bottom depth, grain size and total organic carbon content of the sediment and water temperature governing the temporal assemblages particularly in deep waters [55]. In the eutrophic soft bottom alone, the CCA were discriminated depending on a particular environmental parameter groups; one macrozoobenthic assemblage was affected by enhanced dissolved nutrients enrichment (P-PO₄, N-NO₂ + N-NO₃ and Si) and fluorescence of surface and near-bottom waters. Çinar et al. [37] found similar spatio-temporal macrozoobenthic infaunal assemblages on the shelf of Mersin Bay.

Acknowledgement. The present study was carried out within the framework of a project (ÇAYDAG - 104Y277) funded by the Scientific and Technological Research Council of Turkey (TÜBİTAK). The author of the present work was a researcher responsible for benthic studies of a project of the Institute of Marine Sciences of Middle East Technical University (IMS-METU). The chemical measurements of the present study's transects were performed by the Chemical Oceanography Branch of IMS-METU. I thank here Violeta Velikova for checking English of the text.

REFERENCES

- [1] Meynard, C.N. & Quinn, J.F. (2007): Predicting species distributions: a critical comparison of the most common statistical models using artificial species. *Journal of Biogeography*, 34, 1455-1469.
- [2] Williams, A. & Bax, N.J. (2001): Delineating fish-habitat associations for spatially based management: an example from the south-eastern Australian continental shelf. *Marine and Freshwater Research*, 52, 513-536.
- [3] Beaman, R.J., Daniell, J.J. & Harris, P.T. (2005): Geology-benthos relationships on a temperate rocky bank, eastern Bass Strait, Australia. *Marine and Freshwater Research*, 56: 943-958.
- [4] Beaman, R.J. & Harris, P.T. (2007): Geophysical variables as predictors of megabenthos assemblages from the northern Great Barrier Reef, Australia. In: Todd BJ, Greene HG, editors. Mapping the Seafloor for Habitat Characterization: Geological Association of Canada, pp. 247-264.
- [5] Jenkins, G. & Wheatley, M. (1998): The influence of habitat structure on nearshore fish assemblages in a southern Australian embayment: Comparison of shallow seagrass, reef-algal and unvegetated sand habitats, with emphasis on their importance to recruitment. *Journal of Experimental Marine Biology and Ecology*, 221, 147-172.
- [6] Fry, B. (2006): Stable Isotope Ecology. New York: Springer.
- [7] Snelgrove, P.V.R. (2001): Diversity of Marine Species. Encyclopedia of Ocean Sciences. Oxford: Academic Press.
- [8] Hillebrand, H., Gruner, D.S., Borer, E.T., Bracken, M.E.S., Cleland, E.E., Elser, J.J., Harpole, W.S., Ngai, J.T., Seabloom, E.W., Shurin, J.B. & Smith, J.E. (2007): Consumer versus resource control of producer diversity depends on ecosystem type and producer community structure. *Proceedings of the National Academy of Sciences of the United States of America*, 104, 10904-10909.
- [9] Poore, G.C.B., McCallum, A.W. & Taylor, J. (2008): Decapod Crustacea of the continental margin of southwestern Australia and central Western Australia: preliminary

- identifications of 524 species from FRV Southern Surveyor voyage SS10-2005. Melbourne, Museum Victoria.
- [10] Seiter, K., Hensen, C. & Zabel, M. (2005): Benthic carbon mineralisation on a global scale. *Global Biogeochemical Cycles*, 19, 1-26.
- [11] Gogina, M., Glockzin, M. & Zettler, M.L. (2010): Distribution of benthic macrofaunal communities in the western Galtic Sea with regard to near-bottom environmental parameters. 1. Causal analysis. *Journal of Marine Systems*, 79, 112-123.
- [12] Danovaro, R., Della Croce, N., Eleftheriou, A., Fabiano, M., Papadopoulou, N., Smith, C. & Tselepidis, A. (1995): Meiofauna of the deep Eastern Mediterranean Sea: distribution and abundance in relation to bacterial biomass, organic matter composition and other environmental factors. *Progress in Oceanography*, 36, 329-341.
- [13] Cartes, J.E., Grémare, A., Maynou, F., Villora-Morenon, S. & Dinarte, A. (2002): Bathymetric changes in the distributions of particulate organic matter and associated fauna along a deep-sea transect down the Catalan sea slope (Northwestern Mediterranean). *Progress in Oceanography*, 53, 29-56.
- [14] Mutlu, E. (2015): Broad-scale ecological distribution of dominant macrozoobenthic taxa of the northern Cilician Shelf, eastern Mediterranean Sea: Crustaceans. *Turkish Journal of Zoology*, 39, 888-905.
- [15] Pearson, T.H & Rosenberg, R. (1978): Macroenthic succession in relation to organic enrichment and pollution of the marine environment. *Oceanography and Marine Biology, An Annual Review*, 16, 229-311.
- [16] Krom, M.D., Herut, B. & Mantoura, R.F.C. (2004): Nutrient budget for the Eastern Mediterranean: Implications for phosphorus limitation. *Limnology and Oceanography*, 49, 1582-1592.
- [17] Uysal, Z., Latif, M.L., Özsoy, E., Tuğrul, S., Kubilay, N., Beşiktepe, Ş.T., Yemencioğlu, S., Mutlu, E., Ediger, D., Beşiktepe, Ş., Ediger, V., Ak Örek, Y., Örek, H., Demirel, M., Tunç, Ş.Ç. & Terbiyik, T. (2008): Kilikya Baseni Kıyısız Ekosisteminde Dolaşım, Taşımım ve Ötrofikasyon Araştırmaları. Final report, 104Y277, TÜBİTAK, 544 pp (in Turkish).
- [18] Ergin, M. (1996): Subaerially exposed Late-Quaternary basinal shelf of the inner Mersin Bay, Eastern Mediterranean: paleoenvironmental evidence. *Geo-Marine Letters*, 16, 95-100
- [19] Ediger, V., Evang, G. & Ergin, M. (1997): Recent surficial shelf sediments of the Cilician Basin (Turkey), northeastern Mediterranean. *Continental Shelf Research*, 17, 1659-1677.
- [20] POEM (1986a): Mesoscale circulation studies based on surveys of 1968 and 1983. First Unesco/ioc Scientific Workshop On Physical Oceanography Of The Eastern Mediterranean (POEM). In: Ozsoy E; Latif MA, Oguz T, editors. Research project report Institute of Marine Sciences, Middle East Technical University, Mersin, Turkey.
- [21] POEM (1986b): On the distribution of the Atlantic waters in the Levantine. First Unesco/ioc Scientific Workshop On Physical Oceanography Of The Eastern Mediterranean (POEM). In: Unluata U, Ozsoy E, Latif MA, Oguz T, editors. Research project report Institute of Marine Sciences, Middle East Technical University, Mersin, Turkey.
- [22] Salihoglu, I. & Mutlu, E. (2000): Ulusal Deniz Araştırma ve İzleme Programı, Akdeniz, Marmara denizi, Türk Boğazlar Sistemi, Karadeniz ve Atmosfer Alt projeleri, 1995 - 1999 dönemi sentez raporu, TUBİTAK publisher, Ankara, Turkey, Ankara (In Turkish).
- [23] SINHA (2010): Türkiye kıyılarında kentsel atıksu yönetimi: Sıcak nokta ve hassas alanların yeniden tanımlanması, atık özümseme kapasitelerinin izleme modelleme yöntemleriyle belirlenmesi ve sürdürülebilir kentsel atıksu yatırım planlarının geliştirilmesi. 107G066, TÜBİTAK, Ankara (in Turkish)
- [24] Mutlu, E. (2019): Broad-Scale Ecological Distribution of Dominant Macrozoobenthic Taxa of The Northern Cilician Shelf, Eastern Mediterranean Sea: Molluscs. *Journal of Applied Biological Sciences*, 13(2): 54-68
- [25] Zenetos, A., Gofas, S., Morri, C., Rosso, A., Violanti, D., Garcia Raso, J.E., Cinar, M.E., Almogi-Labin, A., Ates, A.S., Azzurro, E., Ballesteros, E., Bianchi, C.N., Bilecenoglu, M.,

- Gambi, M.C., Giangrande, A., Gravili, C., Hyams-Kaphzan, O., Karachle, P.K., Katsanevakis, S., Lipej, L., Mastrototaro, F., Mineur, F., Pancucci-Papadopoulou, M.A., Ramos Espla, A., Salas, C., San Martin, G., Sfriso, A., Streftaris, N. & Verlaque, M. (2012): Alien species in the Mediterranean Sea by 2012. A contribution to the application of European Union's Marine Strategy Framework Directive (MSFD). Part 2. Introduction trends and pathways. *Mediterranean Marine Science*, 13, 328–352.
- [26] Simboura, N. (2008): First occurrence of the Indo-Pacific polychaete species *Glycinde bonhourei* Gravier, 1904 in the Hellenic seas (Northern Evvoikos Gulf). *Mediterranean Marine Science*, 9/1, 173-176
- [27] Aydin, I. & Akyol, O. (2013): New record of the antenna codlet, *Bregmaceros atlanticus* Goode and Bean, 1886 (Gadiformes: Bregmacerotidae), from the northern Aegean Sea (Izmir Bay, Turkey). *Journal of Applied Ichthyology*, 29, 245–246
- [28] Çınar, M.E. & Dagli, E. (2013): Polychaetes (Annelida: Polychaeta) from the Aegean and Levantine coasts of Turkey, with descriptions of two new species. *Journal of Natural History*, 47, 911–947.
- [29] Çınar, M.E. (2013): Alien polychaete species worldwide: current status and their impacts *Journal of The Marine Biological Association of The UK*, 93, 1257-1278.
- [30] Goren, M. & Galil, B.S. (2008): Additional records of *Bregmaceros atlanticus* in the eastern Mediterranean—an invasion through the Suez Canal or in ballast water? *Marine Biodiversity Records*, 1, 1-3 e42
- [31] Şahin, G.K., Çınar, M.E. (2009): Eunicidae (Polychaeta) species in and around İskenderun Bay (Levantine Sea, Eastern Mediterranean) with a new alien species for the Mediterranean Sea and a re-description of *Lysidice collaris*. *Turkish Journal of Zoology*, 33, 331-347
- [32] Zenetos, A., Gofas, S., Verlaque, M., Cinar, M.E., Garcia Raso, J.E., Bianchi, C.N., Morri, C., Azzurro, E., Bilecenoğlu, M., Frogli, C., Siokou, I., Violanti, D., Sfriso, A., San Martin, G., Giangrande, A., Katağan, T., Ballesteros, E., Ramos-Espla, A., Mastrototaro, F., Ocana, O., Zingone, A., Gambi, M.C. & Streftaris, N. (2010): Alien Species in the Mediterranean Sea by 2010. A contribution to the application of European Union's Marine Strategy Framework Directive (MSFD). Part 1. Spatial Distribution *Mediterranean Marine Science*, 11, 381-493.
- [33] Çınar, M.E., Bilecenoğlu, M., Öztürk, B., Katağan, T., Yokeş, M.B., Aysel, V., Dağlı, E., Açıık, S., Özcan, T. & Erdoğan, H. (2011): An updated review of alien species on the coasts of Turkey. *Mediterranean Marine Science*, 12, 257-315.
- [34] Occhipinti-Ambrogi, A. & Savini, D. (2003): Biological invasions as a component of global change in stressed marine ecosystems. *Marine Pollution Bulletin*, 46, 542-551.
- [35] Çınar, M.E., Katagan, T., Öztürk, B., Egemen, Ö., Ergen, Z., Kocatas, A., Önen, M., Kirkim, F., Bakir, K., Kurt, G., Dagli, E., Kaymakçi, A., Açıık, S., Dogan, A. & Özcan, T. (2006): Temporal changes of soft bottom zoobenthic communities in and around Alsancak Harbor (Izmir Bay, Aegean Sea), with special attention to the autoecology of exotic species. *Marine Ecology*, 27, 229-246.
- [36] Çınar, M.E., Katagan, T., Öztürk, B., Bakir, K., Dagli, E., Acik, Ş., Dogan, A. & Bitlis, B. (2012a): Spatio-temporal distributions of zoobenthos in soft substratum of Izmir Bay (Aegean Sea, eastern Mediterranean), with special emphasis on alien species and ecological quality status. *Journal of The Marine Biological Association of The UK*, 92, 1457–1477.
- [37] Çınar, M.E., Katagan, T., Öztürk, B., Dagli, E., Açıık, S., Bitlis, B., Bakir, K. & Dogan, A. (2012b): Spatio-temporal distributions of zoobenthos in Mersin Bay (Levantine Sea, eastern Mediterranean) and the importance of alien species in benthic communities. *Marine Biological Research*, 8, 954-968.
- [38] Folk, R.L. (1974): Petrology of sediment rocks, Hephill Publishing Company, Austin.
- [39] Gaudette, H.E., Flight, W.R., Toner, L. & Folger, D.W. (1974): An inexpensive titration method for determination of organic carbon in recent sediments. *Journal of Sedimentary Petrology*, 44, 249-253.

- [40] Müller, G. (1967): Methods in sedimentary petrology. E. Schweizbart'sche Verlags buch. Stuttgart.
- [41] Açık-Çınar Ş. (2014): Checklist of Sipuncula from the coasts of Turkey. *Turkish Journal of Zoology*, 38, 723-733
- [42] Çınar, M.E., Dağlı, E. & Şahin, G.K. (2014): Checklist of Annelida from the coasts of Turkey. *Turkish Journal of Zoology*, 38, 734-764
- [43] Öztük, B., Doğan, A., Bakır, B.B. & Salman, A. (2014): Marine molluscs of the Turkish coasts: an updated checklist. *Turkish Journal of Zoology*, 38, 832-879
- [44] Bakır, A.K., Katağan, T., Aker, H.V., Özcan, T., Sezgin, M., Ateş, A.S., Koçak, C. & Kirkim, F. (2014): The marine arthropods of Turkey. *Turkish Journal of Zoology*, 38, 765-831
- [45] Öztoprak, B., Doğan, A. & Dağlı, E. (2014): Checklist of Echinodermata from the coasts of Turkey. *Turkish Journal of Zoology*, 38, 892-900
- [46] Anderson MJ (2001): A new method for non-parametric multivariate analysis of variance. *Australian Ecology*, 26, 32-46.
- [47] Jones, D.L. (2002): Users manual for FATHOM: a Matlab toolbox for multivariate ecological and oceanographic data analysis. Cooperative Institute for Marine and Atmospheric Science, University of Miami-RSMAS, Miami.
- [48] ter Braak, C.J.F. & Smilauer, P. (2002): Canoco 4.5. Canoco reference manual and CanoDraw for Windows user's guide. Software for canonical community ordination (version 4.5). Microcomputer power, Ithaca.
- [49] Hill, M.O. & Gauch, H.G. (1980): Detrended Correspondence Analysis: An Improved Ordination Technique. *Vegetatio*, 42, 47-58.
- [50] Włodarska-Kowalczyk, M., Jankowska, E., Kotwicki, L. & Balazy, P. (2014): Evidence of Season-Dependency in Vegetation Effects on Macrofauna in Temperate Seagrass Meadows (Baltic Sea). *PLOS ONE*, 9, e100788, 1-13.
- [51] Como, S., Magni, P., Baroli, M., Casu, D. & De Falco, G. (2008): Comparative analysis of macrofaunal species richness and composition in *Posidonia oceanica*, *Cymodocea nodosa* and leaf litter beds. *Marine Biology*, 153, 1087-1101
- [52] Ergev, M.B. (2002): A baseline study for determination of macrobenthic epi/infaunal species in the Northeastern Mediterranean. Middle East Technical University, Institute of Marine Sciences, Master Thesis, Erdemli, Turkey, 364 pp
- [53] Mutlu, E., Çınar, M. E., & Ergev, M. B. (2010). Distribution of soft-bottom polychaetes of the Levantine coast of Turkey, eastern Mediterranean Sea. *Journal of Marine Systems*, 79(1-2), 23-35.
- [54] Mutlu, E. & Ergev, M.B. (2012): Distribution of soft -bottom mollusks (Mollusca) in Mersin Bay (eastern Mediterranean Sea). *Turkish Journal of Zoology*, 36, 430-446.
- [55] Mutlu, E. & Ergev, M.B. (2013) Depth-related gradient of soft-bottom crustacean distribution along the Cilician shelf. *Turkish Journal of Zoology*, 37, 262-276.
- [56] Ergen, Z., Çınar, M.E., Dağlı, E. & Kurt, G. (2006): Seasonal dynamics of soft-bottom polychaetes in Izmir Bay (Aegean Sea, eastern Mediterranean). *Scientia Marina*, 70, 197-207.
- [57] Enzenross, R. & Enzenross, L. (1995): Erstnachweis indopazifischer Brachyura (Crustacea: Decapoda) von der Türkischen Mittelmeerküste. *Stuttgarter Beiträge zur Naturkunde*, Serie A (Biologie), 521:1-4.
- [58] Ksiunin, G. & Galil, B.S. (2004): A new record of an Indo-West Pacific crab (Crustacea: Decapoda) from the Mediterranean coast of Israel. *Israel Journal of Zoology*, 49, 316-317.
- [59] Lakkis, S. & Novel-Lakkis, V. (2005): Benthic populations diversity of soft substratum along the Lebanese coast (Levantine Basin, Eastern Mediterranean). In: Medcore Project International Conference, Firenze, Firenze University Press, Italy.
- [60] Ateş, A.S., Katağan, T. & Kocataş, A. (2007): Decapod crustaceans on the coast of Gokova Bay (the Southeastern Aegean Sea). *Ege Journal of Fisheries and Aquatic Sciences*, 24, 159-164.

- [61] Pancucci-Papadopoulou, M.A., Corsini-Foka, M. & Naletaki, M. (2010): *Macrophthalmus graeffei* A. Milne Edwards, 1873 (Crustacea: Brachyura: Macrophthalmidae): a new Indo-Pacific guest off Rhodes Island (SE Aegean Sea, Greece). *Mediterranean Marine Science*, 1, 195-200
- [62] Elmgren, R. (1989): Man's impact on the ecosystem of the Baltic Sea: flows today and at the turn of the century. *Ambio*, 18, 322-326.
- [63] Paerl, H.W., Pinckney, J.L., Fear, J. & Peierls, B. (1998): Ecosystem response to internal watershed organic matter loading: consequences for hypoxia in the eutrophying Neuse River Estuary, North Carolina. *Marine Ecological Progress Series*, 166, 17-25.
- [64] Grall, J. & Chauvaud, L. (2006): Marine eutrophication and benthos: the need for new approaches and concepts. *Global Change Biology*, 8, 813-830.
- [65] Zimmerman, A.R. & Canuel, E.A. (2000): A geochemical record of eutrophication and anoxia in Chesapeake Bay sediments: anthropogenic influence on organic matter composition. *Marine Chemistry*, 69, 117-137.
- [66] Hagy, J.D., Boynton, W.R., Wood, C.W. & Wood, K.V. (2004): Hypoxia in Chesapeake Bay, 1950-2001: long-term changes in relation to nutrient loading and river flow. *Estuaries*, 27, 634-658.
- [67] Vaquer-Sunyer, R. & Duarte, C.M. (2008): Thresholds of hypoxia for marine biodiversity. *Proceedings of the National Academy of Sciences of the United States of America*, 105, 15452-15457.
- [68] Bishop, M.J., Powers, S.P., Porter, H.J. & Peterson, C.H. (2006): Benthic biological effects of seasonal hypoxia in a eutrophic estuary predate rapid coastal development. *Estuarine, Coastal Shelf Science*, 70, 415-422.
- [69] Shannon, C.E., Weaver, W. (1949). *The Mathematical Theory of Communication*. University of Illinois, Urbana, Illinois.
- [70] Margalef, R. (1958): Information theory in ecology. *General Systems* 3, 36-71.
- [71] Pielou, E.C. (1966): Species-diversity and pattern-diversity in the study of ecological succession. *Journal of Theoretical Biology*, 10, 370-383.
- [72] Seitz, R.D., Dauer, D.M., Llansó, R.J. & Long, W.C. (2009): Broad-scale effects of hypoxia on benthic community structure in Chesapeake Bay, USA. *Journal of Experimental Marine Biology and Ecology*, 381, 4-12.

Appendix

Appendix 1. Environmental characteristics as physical, chemical and sedimentary parameters measured at the sampling stations and abbreviations of the parameters used in the analyses.

Physical parameters	Chemical	Sedimentary
Surface (SSx) and Near Bottom water (NBx)	Surface (SSx) and	Superficial
Temperature (°C); SST and NBT	Dissolved oxygen	Gr; Gravel (%)
Salinity (PSU); SSS and NBS	P-PO ₄ ; SSPO ₄ and	Snd; Sand (%)
Density, Sigma-t; SSD and NBD	N-NO ₂ +N-NO ₃ ;	Mud (%)
Oxygen (mg l ⁻¹); SSOx and NBOx	Si; SSSi and NBSi	Slt; Silt (%)
Flouorences SSF and NBF		Cly; Clay (%)
		CaCO ₃ ; Total
		TOC; Total

Appendix 2. List of the species found at each transect with their abundance/bottom depth ranges during the present study. Crustacea and Mollusca were previously published [14, 24, respectively].

PHYLUM/CLASS/Ordo/Species	Iskenderun	Mersin	Anamur
ANNELIDA			
POLYCHAETA			
<i>Amblyosyllis formosa</i> (Claparède, 1863)	ND	ND	0-10/26-26
<i>Ampharete acutifrons</i> (Grube, 1860)	10-10/77-207	10-20/54-100	10-10/32-83
<i>Anguillosyllis capensis</i> Day, 1963	ND	ND	10-10/95-95
<i>Anobothrus gracilis</i> (Malmgren, 1866)	ND	ND	10-50/12-75
<i>Antinoe epitoca</i> Monro, 1930	ND	ND	10-10/12-12
<i>Aonides oxycephala</i> (Sars, 1862)	20-20/207-207	10-10/216-216	ND
<i>Aphelochaeta filiformis</i> (Keferstejn, 1862)	10-20/54-203	10-10/100-100	10-50/31-75
<i>Arabella iricolor</i> (Montagu, 1804)	ND	ND	10-10/78-78
<i>Arenicola</i> sp. (abdomen)	ND	10-10/12.3-12.3	ND
<i>Arichlidon reysyi</i> (Katzmann, Laubier & Ramos, 1974)	ND	10-10/216-216	10-30/12-95
<i>Aricidea</i> (<i>Acmira</i>) <i>assimilis</i> Tebble, 1959	10-10/153-153	ND	10-10/12-12
<i>Aricidea</i> (<i>Acmira</i>) <i>catherinae</i> Laubier, 1967	ND	10-10/103-103	10-10/83-119
<i>Aricidea</i> (<i>Acmira</i>) <i>cerrutii</i> Laubier, 1966	10-20/26-54	10-10/29-216	10-90/8.5-95
<i>Aricidea</i> (<i>Acmira</i>) <i>lopezi</i> Berkeley & Berkeley, 1956	ND	10-10/79-79	ND
<i>Aricidea</i> (<i>Acmira</i>) <i>simonae</i> Laubier & Ramos, 1974	20-20/26-26	ND	10-40/64-95
<i>Aricidea</i> (<i>Aricidea</i>) <i>pseudoarticulata</i> Hobson, 1972	ND	10-10/79-103	10-20/64-83
<i>Aricidea</i> (<i>Aricidea</i>) <i>wassi</i> Pettibone, 1965	ND	ND	10-10/83-83
<i>Aricidea</i> (<i>Strelzovia</i>) <i>claudiae</i> Laubier, 1967	ND	10-10/54-54	10-10/64-64
<i>Aricidea</i> (<i>Strelzovia</i>) <i>suecica meridionalis</i> Laubier & Ramos, 1974-	ND	ND	10-50/75-83
<i>Aricidea uschakovi</i> Zachs, 1925	10-10/77-77	ND	ND
<i>Axiothella constricta</i> (Claparede, 1870)	ND	ND	10-10/32-32
<i>Branchiomaldane vincenti</i> Langerhans, 1881	ND	ND	10-10/32-32
<i>Branchiomma bairdi</i> (McIntosh, 1885)	10-10/26-26	ND	ND
<i>Branchiosyllis exilis</i> (Gravier, 1900)	ND	ND	30-30/54-54
<i>Brania arminii</i> (Langerhans, 1881)	ND	ND	10-10/8.5-78
<i>Brania pusilla</i> (Dujardin, 1851)	ND	ND	10-10/12-12
<i>Capitella capitata</i> (Fabricius, 1780)	10-30/26-26	30-30/27-27	ND
<i>Ceratonereis mirabilis</i> Kinberg, 1865	ND	ND	10-10/12-12
<i>Chaetopterus variopedatus</i> (Renier, 1804)	10-10/101-153	10-10/26-26	ND
<i>Chaetozone corona</i> Berkeley & Berkeley, 1941	ND	10-10/97-156	ND
<i>Chaetozone</i> sp.	10-20/26-75	10-30/50.9-103	10-40/10-113
<i>Chirimia biceps</i> (M. Sars, 1861)	ND	10-10/79-79	10-10/95-95
<i>Chloeia venusta</i> Quatrefages, 1865	ND	ND	10-10/75-75
<i>Chone duneri</i> Malmgren, 1867	ND	ND	20-70/64-83
<i>Chrysopetalum debile</i> (Grube, 1855)	ND	ND	10-70/10-12
<i>Cirratulus cirratus</i> (O. F. Müller, 1776)	ND	10-10/75-75	10-10/78-78
<i>Cirriformia tentaculata</i> (Montagu, 1808)	ND	ND	10-10/54-54
<i>Cirrophorus branchiatus</i> Ehlers, 1908	10-20/70-203	10-10/29-51	40-50/32-64
<i>Cirrophorus furcatus</i> (Hartman, 1957)	ND	ND	40-40/83-83
<i>Cryptonome turcica</i> (Cinar, 2008)	ND	ND	40-40/95-95
<i>Dialychone acustica</i> (Claparede, 1870)	ND	20-20/13-13	10-50/54-83
<i>Dialychone arenicola</i> (Giangrande, 1992)	ND	ND	20-20/12-12
<i>Dialychone collaris</i> (Langerhans, 1880)	ND	10-10/12.3-69	10-30/12-83
<i>Dialychone longiseta</i> (Giangrande, 1992)	ND	ND	10-10/78-78
<i>Diopatra marocensis</i> Paxton, Fadlaoui & Lechapt, 1995	ND	10-40/12.3-26	ND
<i>Diopatra neapolitana</i> Delle Chiaje, 1841	ND	30-30/10-10	ND
<i>Diplocirrus glaucus</i> (Malmgren, 1867)	10-20/51.2-77	10-70/49-79	ND
<i>Ditrupe arietina</i> (O. F. Müller, 1776)	ND	ND	10-130/95-113
<i>Dorvillea rubrovittata</i> (Grube, 1855)	ND	ND	10-10/83-83
<i>Dorvillea similis</i> (Crossland, 1924)	ND	10-10/12.3-12.3	10-180/8.5-95
<i>Drilonereis filum</i> (Claparède, 1868)	ND	10-10/29-29	10-10/32-212

PHYLUM/CLASS/Ordo/Species	Iskenderun	Mersin	Anamur
<i>Drilonereis</i> sp.	ND	20-20/156-156	ND
<i>Enipo kinbergi</i> Malmgren, 1866	10-10/75-207	ND	10-20/12-95
<i>Erinaceusyllis cryptica</i> (Ben-Eliahu, 1977)	ND	ND	10-40/8.5-83
<i>Eteone barbata</i> (Malmgren, 1865)	20-20/101-101	ND	ND
<i>Eupanthalis kinbergi</i> McIntosh, 1876	ND	ND	10-10/113-113
<i>Euchone rosea</i> Langerhans, 1884	ND	ND	10-40/32-83
<i>Euclymene collaris</i> (Claparede, 1870)	ND	ND	10-10/32-32
<i>Euclymene lombricoides</i> (Quatrefages, 1866)	ND	ND	10-20/32-78
<i>Euclymene oerstedii</i> (Claparède, 1863)	10-10/153-153	ND	10-20/32-119
<i>Euclymene palermiana</i> (Grube, 1840)	ND	ND	10-10/64-64
<i>Euclymene santandarensis</i> (Rioja, 1917)	ND	ND	10-10/12-12
<i>Eulalia mustela</i> Pleijel, 1987	ND	ND	10-20/54-75
<i>Eulycmene</i> sp.	ND	20-20/50.9-50.9	ND
<i>Eunice floridana</i> (Pourtalès, 1867)	ND	10-10/10-10	10-20/12-46
<i>Eunice pennata</i> (O.F. Müller, 1776)	ND	ND	40-40/32-32
<i>Eunice vittata</i> (Delle Chiaje, 1828)	10-10/14.5-14.5	ND	10-10/21-54
<i>Eupanthalis glabra</i> Ben-Eliahu & Fiege, 1994	ND	ND	10-10/113-113
<i>Euphosine foliosa</i> Audouin & Milne Edwards, 1833	10-10/11.3-11.3	ND	10-10/31-31
<i>Euratella salmacidis</i> (Claparede, 1869)	ND	ND	20-20/83-83
<i>Eurysyllis tuberculata</i> Ehlers, 1864	ND	ND	10-10/78-78
<i>Eusyllis blomstrandii</i> Malmgren, 1867	ND	ND	10-30/54-119
<i>Euthalenessa oculata</i> (Peters, 1855)	ND	10-10/10-153	10-10/95-95
<i>Euthelepus kinsemboensis</i> Augener, 1918	ND	ND	20-20/12-12
<i>Exogone</i> sp.	ND	ND	10-10/75-75
<i>Exogone (Exogone) naidina</i> Örsted, 1845	ND	ND	10-10/8.5-64
<i>Exogone (Exogone) rostrata</i> Naville, 1933	ND	ND	10-20/12-78
<i>Exogone (Exogone) verugera</i> (Claparède, 1868)	ND	ND	10-70/8.5-95
<i>Exogone (Parexogone) caribensis</i> San Martín, 1991	ND	ND	10-30/8.5-95
<i>Exogone (Parexogone) cognettii</i> Castelli, Badalamenti & Lardici,	ND	ND	10-20/75-95
<i>Fabricia stellaris adriatica</i> (Banse, 1956)	ND	ND	10-10/78-95
<i>Fimbriosthenelais minor</i> (Pruvot & Racovitza, 1895)	ND	10-10/75-75	ND
<i>Glycera alba</i> (O.F. Müller, 1776)	10-10/13.5-13.5	10-10/12.3-25	10-40/32-108
<i>Glycera capitata</i> Örsted, 1843	10-10/101-101	ND	10-20/54-119
<i>Glycera fallax</i> Quatrefages, 1850	10-10/26-26	10-10/12.3-153	ND
<i>Glycera lapidum</i> Quatrefages, 1865	10-10/75-75	10-20/75-190	10-20/13-78
<i>Glycera rouxi</i> Audouin & Milne Edwards, 1833	10-30/26-136	10-30/13-69	10-20/21-108
<i>Glycera tessellata</i> Grube, 1840	ND	10-10/51-79	10-10/26-83
<i>Glycera tridactyla</i> Schmarda, 1861	30-30/11.3-11.3	10-10/74-149.5	10-10/95-95
<i>Glycinde bonhourei</i> Gravier, 1904	ND	ND	10-10/83-83
<i>Glycinde nordmanni</i> (Malmgren, 1866)	10-10/13.5-13.5	ND	ND
<i>Goniada emerita</i> Audouin & Milne-Edwards, 1833	ND	10-10/100-100	10-10/64-95
<i>Goniada maculata</i> Örsted, 1843	30-30/15-15	10-40/10-26	10-10/12-83
<i>Grubeosyllis</i> sp.	ND	ND	10-10/12-12
<i>Gyptis propinqua</i> Marion & Bobretzky, 1875	ND	ND	10-10/12-12
<i>Halla parthenopeia</i> (Delle Chiaje, 1828)	ND	ND	10-10/64-83
<i>Harmothoe gilchristi</i> Day, 1960	ND	10-10/97-97	ND
<i>Hermodice carunculata</i> (Pallas, 1766)	ND	ND	10-10/21-21
<i>Hesione splendida</i> Lamarck, 1818	ND	ND	10-10/12-12
<i>Heteromastus filiformis</i> (Claparède, 1864)	ND	10-20/49-79	10-40/8.5-176
<i>Hyalinoecia tubicola</i> (O.F. Müller, 1776)	ND	ND	10-10/83-83
<i>Hydroides norvegicus</i> Gunnerus, 1768	ND	ND	20-20/83-83
<i>Inermonephtys foretmontardoi</i> Ravara, Cunha & Pleijel, 2010	ND	ND	10-10/83-83
<i>Jasmineira caudata</i> Langerhans, 1880	ND	ND	10-30/54-83
<i>Jasmineira elegans</i> Saint-Joseph, 1894	ND	10-2180/10-216	20-80/75-83
<i>Kefersteinia cirrata</i> (Keferstein, 1862)	30-30/14.5-14.5	ND	20-40/8.5-83
<i>Labioleanira yhleni</i> (Malmgren, 1867)	ND	10-10/51-51	ND
<i>Laetmonice hystrix</i> (Savigny in Lamarck, 1818)	ND	ND	10-10/119-119
<i>Lanice conchilega</i> Pallas, 1766	ND	20-20/12.3-12.3	10-10/21-21

PHYLUM/CLASS/Ordo/Species	Iskenderun	Mersin	Anamur
<i>Laonice cirrata</i> (M. Sars, 1851)	10-20/14.5-207	10-30/74-153	10-10/12-64
<i>Laonome kroyeri</i> Malmgren, 1866	ND	10-10/50.9-50.9	10-20/64-83
<i>Laonome triangularis</i> Hutchings & Murray, 1984	ND	ND	10-10/83-83
<i>Leiocapitella glabra</i> Hartman, 1947	ND	30-30/12.3-12.3	30-30/12-12
<i>Leiochone leiopygos</i> (Grube, 1860)	10-10/14.5-14.5	ND	ND
<i>Leonnates persicus</i> Wesenberg-Lund, 1949	ND	10-10/12.3-26	ND
<i>Lepidasthenia elegans</i> (Grube, 1840)	ND	10-10/187-187	ND
<i>Lepidonotus tenuisetosus</i> (Gravier, 1902)	ND	ND	10-10/32-54
<i>Levinsenia gracilis</i> (Tauber, 1879)	10-150/11.3-	10-90/11-103	10-30/53-119
<i>Lumbrineriopsis paradoxa</i> (Saint-Joseph, 1888)	10-10/77-153	10-20/79-216	10-20/12-54
<i>Lumbrineris aberrans</i> Day, 1963	ND	20-20/50.9-50.9	ND
<i>Lumbrineris coccinea</i> (Renier, 1804)	ND	10-10/50.9-50.9	ND
<i>Lumbrineris</i> sp.	ND	ND	60-60/119-119
<i>Lumbrineris latreilli</i> Audouin & Milne Edwards, 1834	10-20/13.5-203	10-20/50.9-216	10-40/31-212
<i>Lumbrineris perkinsi</i> Carrera-Parra, 2001	ND	ND	10-10/83-83
<i>Lumbrineris salazari</i> Carrera-Parra, 2001	10-10/71-71	ND	ND
<i>Lysidice collaris</i> Grube, 1870	ND	ND	40-40/64-64
<i>Leodice torquata</i> (Quatrefages, 1866)	ND	10-10/79-79	10-60/12-95
<i>Lysidice ninetta</i> Audouin & Milne-Edwards, 1833	ND	ND	50-50/64-64
<i>Magelona alleni</i> Wilson, 1958	ND	10-10/50.9-50.9	10-10/53-53
<i>Magelona johnstoni</i> Fiege, Licher & Mackie, 2000	ND	10-10/50.9-50.9	ND
<i>Magelona minuta</i> Eliason, 1962	20-70/26-54	10-10/51-51	30-60/31-83
<i>Malmgreniella lunulata</i> (Delle Chiaje, 1830)	ND	ND	10-10/21-32
<i>Marphysa bellii</i> (Audouin & Milne-Edwards, 1833)	ND	10-10/149.5-	10-10/31-32
<i>Marphysa cinari</i> Kurt Sahin, 2014	ND	ND	70-70/32-32
<i>Marphysa fallax</i> Marion & Bobretzky, 1875	ND	ND	10-40/12-54
<i>Marphysa sanguinea</i> (Montagu, 1815)	ND	ND	10-10/54-54
<i>Mediomastus cirripes</i> Ben-Eliahu, 1976	10-10/26-26	20-20/54-54	ND
<i>Megalomma lanigera</i> (Grube, 1846)	ND	ND	10-10/31-31
<i>Melinna palmata</i> Grube, 1870	10-10/101-101	30-30/50.9-51	10-100/8.5-119
<i>Metasychis gotoi</i> (Izuka, 1902)	ND	ND	10-10/119-119
<i>Metavermilia multiristata</i> (Philippi, 1844)	ND	ND	10-10/12-12
<i>Microphthalmus sczelkowi</i> Metschnikow, 1865	ND	ND	10-10/12-12
<i>Monticellina dorsobranchialis</i> (Kirkegaard, 1959)	10-140/15-207	10-30/10-100	10-30/8.5-95
<i>Monticellina heterochaeta</i> Laubier, 1961	10-450/13.5-	10-30/25-150	10-120/8.5-119
<i>Myrianida brachycephala</i> (Marenzeller, 1874)	ND	ND	10-10/95-95
<i>Myrianida pinnigera</i> (Montagu, 1808)	ND	ND	10-10/95-95
<i>Mystides caeca</i> Langerhans, 1880	ND	ND	10-10/8.5-8.5
<i>Naineris laevigata</i> (Grube, 1855)	ND	ND	10-10/54-78
<i>Neoleanira tetragona</i> (Oersted, 1845)	10-10/70-70	ND	ND
<i>Nephtys caeca</i> (Fabricius, 1780)	ND	ND	10-10/32-75
<i>Nephtys capensis</i> Day, 1953	10-10/15-15	ND	ND
<i>Nephtys cirrosa</i> (Ehlers, 1868)	ND	10-20/69-97	10-10/113-113
<i>Nephtys hombergii</i> Savigny in Lamarck, 1818	20-20/13.5-13.5	20-140/10-26	10-10/21-21
<i>Nephtys hystericis</i> McIntosh, 1900	10-20/51.2-53	10-30/25-54	ND
<i>Nephtys incisa</i> Malmgren, 1865	10-130/51.2-	10-100/25-153	10-10/32-32
<i>Nephtys paradoxa</i> Malm, 1874	10-20/11.3-75	ND	ND
<i>Nephtys</i> sp.	10-20/26-101	ND	ND
<i>Nephtys sphaerocirrata</i> Wesenberg-Lund, 1949	ND	10-10/10-10	10-20/32-95
<i>Nereis persica</i> Fauvel, 1911	10-10/54-54	ND	ND
<i>Nicomache lumbricalis</i> (Fabricius, 1780)	ND	ND	10-10/212-212
<i>Ninoe armoricana</i> Glemarec, 1968	ND	ND	10-10/78-95
<i>Nothria conchylega</i> (Sars, 1835)	ND	ND	10-20/75-212
<i>Notomastus (Clistomastus) lineatus</i> (Claparède, 1869)	ND	ND	10-10/32-32
<i>Notomastus aberans</i> Day, 1957	10-10/11.3-11.3	10-10/26-26	ND
<i>Notomastus latericeus</i> Sars, 1851	10-10/54-54	10-130/13-153	10-10/12-176
<i>Notomastus mossambicus</i> (Thomassin, 1970)	ND	10-10/75-75	50-50/32-32
<i>Odontosyllis fulgurans</i> (Audouin & Milne-Edward, 1833)	ND	ND	10-10/73.5-73.5

PHYLUM/CLASS/Ordo/Species	Iskenderun	Mersin	Anamur
<i>Onuphis eremita oculata</i> Hartman, 1951	10-10/11.3-11.3	ND	20-20/12-12
<i>Ophiodromus flexuosus</i> (Delle Chiaje, 1827)	ND	10-10/74-74	10-10/21-21
<i>Ophiodromus pallidus</i> (Claparède, 1864)	ND	ND	10-10/21-21
<i>Ophryotrocha puerilis</i> Claparède & Metschnikow, 1869	ND	ND	10-10/75-75
<i>Opisthosyllis brunnea</i> Langerhans, 1879	ND	ND	10-40/12-21
<i>Paradialychone filicaudata</i> (Southern, 1914)	ND	10-20/11-25	10-50/8.5-83
<i>Paradiopatra bihanica</i> (Intes & Le Loeuff, 1975)	10-10/136-136	ND	ND
<i>Paradoneis lyra</i> (Southern, 1914)	10-10/26-203	10-20/11-100	10-90/8.5-95
<i>Paraehlersia ferrugina</i> (Langerhans, 1881)	ND	ND	10-10/108-108
<i>Paralacydonia paradoxa</i> Fauvel, 1913	ND	ND	10-10/78-78
<i>Parapionosyllis brevicirra</i> Day, 1954	ND	ND	10-20/21-83
<i>Parapionosyllis elegans</i> (Pierantoni, 1903)	ND	ND	10-60/8.5-83
<i>Parapionosyllis minuta</i> (Pierantoni, 1903)	ND	ND	10-50/32-78
<i>Pelogenia arenosa</i> (Delle Chiaje, 1830)	ND	10-10/11-11	ND
<i>Periboea longocirrata</i> Ehlers, 1864	10-10/136-136	ND	ND
<i>Perinereis cultrifera</i> (Grube, 1840)	ND	ND	10-10/32-32
<i>Petaloproctus terricola</i> Quatrefages, 1865	10-10/14.5-14.5	10-10/75-75	ND
<i>Pherusa monilifera</i> (Delle Chiaje, 1841)	ND	10-10/100-100	10-10/32-32
<i>Pholoe inornata</i> Johnston, 1839	ND	ND	10-10/64-64
<i>Phyllodoce longifrons</i> Ben-Eliahu, 1972	ND	10-10/10-10	ND
<i>Phylo foetida</i> (Claparède, 1869)	10-10/13.5-13.5	ND	ND
<i>Phylo grubei</i> (McIntosh, 1910)	10-10/136-136	ND	10-10/8.5-64
<i>Pionosyllis weismanni</i> Langerhans, 1879	ND	20-20/216-216	10-20/119-159
<i>Pista cristata</i> (Müller, 1776)	10-10/98-153	10-10/49-49	10-10/32-32
<i>Pista unibranchia</i> Day, 1963	ND	ND	10-10/12-32
<i>Podarkeopsis capensis</i> (Day, 1963)	ND	10-10/29-49	10-10/32-32
<i>Poecilochaetus serpens</i> Allen, 1904	ND	10-10/75-75	10-10/176-176
<i>Polycirrus aurantiacus</i> Grube, 1860	ND	ND	10-10/32-32
<i>Polycirrus haematodes</i> (Claparede, 1864)	ND	ND	10-10/32-32
<i>Polycirrus twisti</i> Potts, 1928	ND	ND	10-10/32-32
<i>Pomatoceros triqueter</i> (Linnaeus, 1758)	ND	ND	10-10/12-12
<i>Pontogenia chrysocoma</i> (Baird, 1865)	ND	ND	10-30/12-32
<i>Praxillella gracilis</i> (M. Sars, 1861)	10-10/70-70	10-20/75-150	ND
<i>Praxillella praetermissa</i> (Malmgren, 1866)	ND	10-10/100-100	ND
<i>Prionospio (Prionospio) ehlersi</i> Fauvel, 1928	20-30/25-207	10-30/10-216	10-20/31-83
<i>Prionospio (Prionospio) steenstrupi</i> Malmgren, 1867	20-20/207-207	10-20/50.9-153	10-20/13-75
<i>Prionospio cirrifera</i> Wirén, 1883	10-10/207-207	10-10/12.3-12.3	10-10/31-83
<i>Prionospio dubia</i> Day, 1961	ND	ND	10-10/31-31
<i>Prionospio saccifera</i> Mackie & Hartley, 1990	10-230/11.3-	10-40/10-103	10-90/8.5-119
<i>Prosphaerosyllis tetralix</i> (Eliason, 1920)	ND	ND	40-40/12-12
<i>Protodorrvillea kefersteini</i> (McIntosh, 1869)	ND	ND	10-1690/8.5-54
<i>Protomystides bidentata</i> Lagerhans	ND	ND	10-10/8.5-8.5
<i>Pseudofabricia aberrans</i> Cantone, 1972	ND	ND	10-30/64-119
<i>Pseudofabriciella longipyga</i> Fitzhugh, Giangrande & Simbora, 1994	ND	10-10/50.9-50.9	90-90/64-64
<i>Pseudofabriciella</i> sp.	10-10/15-15	10-10/50.9-50.9	10-50/32-83
<i>Pseudoleiocardia fauveli</i> Harmelin, 1964	10-10/26-26	10-10/51-51	10-30/12-32
<i>Pseudomystides limbata</i> (Saint-Joseph, 1888)	ND	ND	20-20/119-119
<i>Pseudovermilia occidentalis</i> (McIntosh, 1885)	ND	ND	10-10/95-95
<i>Pterocirrus macroceros</i> (Grube, 1860)	ND	ND	10-10/119-119
<i>Rhodine loveni</i> Malmgren, 1865	10-10/51.2-77	10-20/54-97	10-20/32-212
<i>Sabella discifera</i> Grube, 1874	ND	ND	30-30/32-32
<i>Sabellaria alcocki</i> Gravier, 1906	ND	ND	10-10/8.5-8.5
<i>Sabellides octocirrata</i> (M. Sars, 1835)	20-30/70-75	20-20/100-100	ND
<i>Salvatoria clavata</i> (Claparède, 1863)	ND	10-10/100-100	10-10/95-95
<i>Salvatoria limbata</i> (Claparede, 1868)	ND	ND	20-20/8.5-8.5
<i>Scalibregma inflatum</i> Rathke, 1843	ND	10-10/97-97	10-10/78-83
<i>Schistomeringos neglecta</i> (Fauvel, 1923)	ND	ND	20-20/95-95
<i>Schistomeringos rudolphii</i> (delle Chiaje, 1828)	ND	ND	10-160/8.5-95

PHYLUM/CLASS/Ordo/Species	Iskenderun	Mersin	Anamur
<i>Scleerocheilus minutus</i> Grube, 1863	ND	ND	10-10/21-21
<i>Scolelepis (Scolelepis) squamata</i> (O.F. Muller, 1806)	ND	10-30/50.9-216	ND
<i>Scolelepis tridentata</i> (Southern, 1914)	10-10/207-207	ND	ND
<i>Scoletoma fragilis</i> (O. F. Muller, 1776)	ND	ND	10-10/32-32
<i>Scoletoma funchalensis</i> (Kinberg, 1865)	ND	10-10/69-69	10-10/13-54
<i>Scoletoma impatiens</i> (Claparède, 1868)	10-10/153-153	10-10/79-149.5	10-20/12-95
<i>Scoletoma ernesti</i> (Perkins, 1979)	ND	ND	10-10/13-13
<i>Scoloplos (Scoloplos) armiger</i> (Müller, 1776)	20-20/26-26	ND	20-30/8.5-31
<i>Sigalion mathildae</i> Audouin & Milne Edwards in Cuvier, 1830	10-10/11.3-11.3	10-90/10-49	ND
<i>Sigambra tentaculata</i> (Treadwell, 1941)	10-10/51.2-54	20-30/27-29	10-10/32-53
<i>Sphaerosyllis austriaca</i> Banse, 1959	ND	ND	10-10/8.5-54
<i>Sphaerosyllis hystrix</i> Claparède, 1863	ND	ND	10-190/8.5-83
<i>Spio filicornis</i> (Müller, 1776)	10-10/11.3-11.3	10-20/12.3-79	ND
<i>Spiochaetopterus costarum</i> (Claparède, 1869)	10-10/101-153	10-10/26-26	ND
<i>Spiophanes bombyx</i> (Claparède, 1870)	10-40/11.3-203	10-570/12.3-74	ND
<i>Spiophanes kroyeri</i> Grube, 1860	10-10/77-77	ND	ND
<i>Spirobranchus tetraceros</i> (Schmarda, 1861)	ND	ND	30-200/8.5-12
<i>Spirorbis (Spirorbis) marioni</i> Caullery & Mesnil, 1897	ND	ND	20-40/8.5-12
<i>Sternaspis scutata</i> Ranzani, 1817	10-10/51.2-101	10-10/74-100	10-10/54-54
<i>Sthenelais boa</i> (Johnston, 1833)	20-20/151-151	10-10/69-69	ND
<i>Sthenelais limicola</i> (Ehlers, 1864)	ND	10-10/25-25	ND
<i>Syllides bansei</i> Perkins, 1981	ND	ND	10-10/8.5-8.5
<i>Syllis alternata</i> Moore, 1908	10-10/207-207	ND	10-20/54-64
<i>Syllis armillaris</i> (O.F. Müller, 1776)	ND	ND	10-10/83-83
<i>Syllis beneliahuae</i> (Campoy & Alquézar, 1982)	ND	ND	10-10/12-12
<i>Syllis columbretensis</i> (Campoy, 1982)	ND	ND	10-70/12-21
<i>Syllis compacta</i> Gravier, 1900	ND	ND	20-320/8.5-12
<i>Syllis corallicola</i> Verrill, 1900	ND	ND	10-70/12-32
<i>Syllis ferrani</i> Alos & San Martín, 1987	ND	ND	10-10/12-12
<i>Syllis garciai</i> (Campoy, 1982)	ND	10-10/100-100	10-50/10-83
<i>Syllis gerlachi</i> (Hartmann-Schröder, 1960)	ND	ND	10-90/12-95
<i>Syllis gracilis</i> Grube, 1840	ND	ND	10-10/95-95
<i>Syllis hyalina</i> Grube, 1863	ND	ND	30-30/8.5-8.5
<i>Syllis rosea</i> (Langerhans, 1879)	ND	ND	10-10/32-75
<i>Syllis westheidei</i> San Martín, 1984	ND	ND	10-10/12-12
<i>Terebellides stroemi</i> Sars, 1835	10-40/26-207	10-40/49-103	10-10/54-212
<i>Timarete filigera</i> (Delle Chiaje, 1828)	ND	20-20/79-79	30-30/32-32
<i>Trypanosyllis (Trypanosyllis) coeliaca</i> Claparède, 1868	ND	ND	10-10/10-10
<i>Trypanosyllis aeolis</i> Langerhans, 1879	ND	ND	20-20/12-12
<i>Trypanosyllis zebra</i> (Grube, 1840)	ND	ND	20-20/12-12
<i>Vermiliopsis infundibulum</i> (Philippi, 1844)	ND	ND	10-40/12-78
<i>Vermiliopsis striaticeps</i> (Grube, 1862)	ND	ND	10-10/12-12
ARTHROPODA			
CRUSTACEA			
Tanaidacea			
<i>Apseudes</i> sp.	ND	ND	10/64,
<i>Apseudes talpa</i> (Montagu, 1808)	ND	ND	20/12,
<i>Apseudopsis latreillii</i> (Milne-Edwards, 1828)	30/27,	80/10,	60/64,
<i>Apseudopsis mediterraneus</i> (Bacescu, 1961)	ND	ND	30/64,
<i>Leptochelia savignyi</i> (Kroyer, 1842)	ND	ND	10/26,32,
<i>Tanaissus lilljeborgi</i> (Stebbing, 1891)	ND	ND	10/95,
Cumacea			
<i>Bodotria arenosa mediterranea</i> (Steuer, 1938)	ND	ND	20/8,
<i>Bodotria gibba</i> (Sars, 1878)	ND	ND	10/64,
<i>Campylaspis glabra</i> Sars, 1878	10/101,	ND	10/64,
<i>Campylaspis legendrei</i> Fage, 1951	ND	ND	20/95,
<i>Campylaspis sulcata</i> Sars, 1870	ND	ND	10/75,
<i>Cumella (Cumella) pygmaea</i> G.O. Sars, 1865	10/71,	ND	20/12,

PHYLUM/CLASS/Ordo/Species	Iskenderun	Mersin	Anamur
<i>Diastylis rugosa</i> Sars, 1865	ND	10/11,	ND
<i>Diastylis tumida</i> (Liljeborg, 1855)	ND	10/153,216,	ND
<i>Eudorella truncatula</i> (Bate, 1856)	10/77,	10/54,	10/83,
<i>Iphinoe</i> cf. <i>elisae</i>	ND	ND	30/75,
<i>Iphinoe</i> cf. <i>serrata</i>	ND	10/25,51,	30/64,
<i>Iphinoe maeotica</i> Sowinskyi, 1893	ND	20/10,	ND
<i>Iphinoe serrata</i> Norman, 1867	ND	ND	70/95,
<i>Iphinoe tenella</i> Sars, 1878	ND	ND	30/83,
<i>Monopseudocuma gilsoni</i> (Bacescu, 1950)	ND	ND	10/75,
<i>Pseudocuma (Pseudocuma) longicorne</i> (Bate, 1858)	ND	ND	10/83,
Amphipoda			
<i>Abلودomelita aculeata</i> (Chevreux, 1911)	ND	ND	20/83,
<i>Ampelisca brevicornis</i> (Costa, 1853)	ND	420/10,	10/95,119,
<i>Ampelisca</i> cf. <i>massaliensis</i>	ND	ND	30/64,
<i>Ampelisca</i> cf. <i>diadema</i>	ND	10/29,	ND
<i>Ampelisca diadema</i> (Costa, 1853)	20/11,207	240/10,	90/83,
<i>Ampelisca gibba</i> Sars, 1883	ND	20/11,	30/95,
<i>Ampelisca massaliensis</i> Bellan-Santini & Kaim-Malka, 1977	10/101,	ND	ND
<i>Ampelisca ruffoi</i> Bellan-Santini & Kaim-Malka, 1977	10/71,	10/75,	20/46,
<i>Ampelisca sarsi</i> Chevreux, 1888	ND	10/11,	ND
<i>Ampelisca spinifer</i> Reid, 1951	ND	10/150,	ND
<i>Ampelisca tenuicornis</i> Liljeborg, 1855	ND	ND	10/119,
<i>Apolochus spencebatei</i> (Stebbing, 1876)	ND	ND	10/46,
<i>Ampithoe</i> sp.	ND	ND	10/73,
<i>Atylus guttatus</i> (Costa, 1851)	ND	ND	40/8,
<i>Autonoe spiniventris</i> Della Valle, 1893	ND	10/49,	ND
<i>Bathyporeia guilliamsoniana</i> (Bate, 1857)	ND	ND	10/46,
<i>Animoceradocus semiserratus</i> (Spence Bate, 1862)	ND	10/103,	20/21,
<i>Ceradocus (Denticeradocus) serratus</i> (Spence Bate, 1862)	ND	ND	10/26,
<i>Cheirocratus</i> sp.	10/153,	ND	ND
<i>Cheirocratus sundevalli</i> (Rathke, 1843)	ND	ND	30/54,
<i>Cheirophotis mediterranea</i> Myers 1985	ND	80/10,	ND
<i>Dexamine thea</i> Boeck, 1861	ND	ND	20/8,
<i>Erichthonius punctatus</i> (Bate, 1857)	ND	40/11,	ND
<i>Eriopisa elongata</i> (Bruzelius, 1859)	70/101,	10/97,103,15,	30/95,
<i>Hyperia galba</i> (Montagu, 1815)	ND	ND	10/64,
<i>Gammarella fucicola</i> (Leach, 1814)	ND	ND	10/26,
<i>Halicoides walkeri</i> (Ledoyer, 1973)	ND	ND	10/83,
<i>Haploops nirae</i> Kaim-Malka, 1976	ND	10/75,	ND
<i>Harpinia ala</i> Karaman, 1987	ND	40/79,	ND
<i>Harpinia antennaria</i> Meinert, 1890	30/136	60/100,	10/73,119,21,64,83
<i>Harpinia crenulata</i> (Boeck, 1871)	10/75,	30/79,	ND
<i>Harpinia dellavallei</i> Chevreux, 1910	20/101,	20/103,	20/12,
<i>Harpinia</i> cf. <i>laevis</i>	ND	ND	10/26,
<i>Harpinia truncata</i> G.O. Sars, 1891	ND	10/75,	ND
<i>Harpinia pectinata</i> Sars, 1891	10/77,207,	ND	10/119,
<i>Hippomedon</i> sp.	ND	ND	10/75,
<i>Hippomedon massaliensis</i> Bellan-Santini, 1965	ND	ND	10/46,
<i>Hippomedon oculatus</i> Chevreux & Fage, 1925	ND	ND	10/75,
<i>Leptocheirus bispinosus</i> Norman, 1908	30/75,	ND	20/12,
<i>Leptocheirus guttatus</i> (Grube, 1864)	ND	ND	50/12,
<i>Leptocheirus hirsutimanus</i> (Bate, 1862)	ND	ND	20/73,
<i>Leptocheirus mariae</i> Karaman, 1973	ND	10/97,156,	10/12,
<i>Leptocheirus pectinatus</i> (Norman, 1869)	ND	ND	30/21,
<i>Leptocheirus pilosus</i> Zaddach, 1844	ND	ND	10/12,
<i>Leptocheirus tricristatus</i>	ND	ND	50/21,
<i>Leucothoe oboa</i> Karaman, 1971	ND	10/27,	ND
<i>Leucothoe lilljeborgi</i> Boeck, 1861	ND	10/74,	10/46,

PHYLUM/CLASS/Ordo/Species	Iskenderun	Mersin	Anamur
<i>Leucothoe richiardi</i> Lesson, 1865	10/136,	110/12,	20/83,
<i>Liljeborgia dellavallei</i> Stebbing, 1906	ND	ND	20/21,
<i>Lysianassa costae</i> (Milne-Edwards, 1830)	ND	ND	60/21,
<i>Lysianassa insperata</i> (Lincoln, 1979)	ND	ND	20/95,
<i>Lysianassa ceratina</i>	ND	ND	10/159,
<i>Maera grossimana</i> (Montagu, 1808)	ND	ND	20/12,
<i>Maera hironellei</i> Chevreux, 1900	ND	ND	10/12,
<i>Maera inaequipes</i> (Costa, 1857)	ND	ND	20/12,
<i>Maera schmidtii</i> Stephensen, 1915	10/71,	ND	ND
<i>Medicorophium</i> sp.	ND	10/74,	ND
<i>Medicorophium</i> cf. <i>affini</i>	ND	30/10,	ND
<i>Medicorophium minimum</i> (Schiecke, 1978)	ND	10/100,150,	ND
<i>Medicorophium rotundirostre</i> (Stephensen, 1915)	20/77,	20/100,	ND
<i>Medicorophium runcicorne</i> (Della Valle, 1893)	ND	250/12,	ND
<i>Melita</i> sp.	ND	ND	20/21,
<i>Metaphoxus fultoni</i> (Scott, 1890)	ND	ND	40/21,
<i>Metaphoxus gruneri</i> Karaman, 1986	ND	ND	20/21,54,
<i>Metaphoxus</i> sp.	ND	10/100,103,	10/10,
<i>Metaphoxus simplex</i> (Spence Bate, 1857)	ND	20/79,	10/21,
<i>Microdeutopus armatus</i> Chevreux, 1886	ND	ND	20/21,
<i>Microdeutopus obtusatus</i> Myers, 1973	ND	ND	30/21,
<i>Microdeutopus spiniventris</i>	ND	ND	10/21,46,
<i>Microdeutopus</i> sp.	ND	ND	10/21,
<i>Monoculodes acutipes</i> Ledoyer, 1983	ND	ND	10/54,
<i>Monoculodes subnudus</i> Norman, 1889	ND	ND	10/21,
<i>Orchomene grimaldii</i> Chevreux, 1890	ND	ND	10/26,
<i>Orchomenella nana</i> (Kroyer, 1846)	10/136,	ND	20/95,
<i>Paraphoxus oculus</i> (Sars, 1879)	20/101,	10/156,100,	10/53,176,
<i>Periculodes longimanus</i> (Bate & Westwood, 1868)	ND	20/10,	20/46,
Phoexidae sp.	ND	40/153,	ND
<i>Phtisica marina</i> Slabber, 1769	ND	ND	20/8,21,
<i>Socarnes filicornis</i> (Heller, 1866)	ND	ND	20/26,
<i>Stenothoe marina</i> (Bate, 1856)	ND	10/156,	ND
<i>Urothoe elegans</i> (Bate, 1857)	ND	ND	10/46,
<i>Urothoe intermedia</i> Bellan-Santini & Ruffo, 1986	ND	ND	50/54,
<i>Urothoe poseidonis</i> Reibish, 1905	ND	10/10,	ND
<i>Urothoe</i> cf. <i>marina</i>	ND	ND	10/8,
<i>Urothoe</i> sp.	ND	10/27,	ND
Isopoda			
<i>Antheluridae</i> sp.	ND	10/156,	10/46,54,
<i>Anthura gracilis</i> (Montagu, 1808)	10/77,98,	10/103,	10/31,12,
<i>Eurydice pulchra</i> Leach, 1815	10/14,26,	20/27,	10/73,113,
<i>Eurydice truncata</i> (Norman, 1868)	10/101,	10/156,	20/54,
<i>Gnathia dentata</i> (G. O. Sars, 1872)	ND	10/216,	10/75,
<i>Gnathia maxillaris</i> (Montagu, 1804)	ND	ND	10/95,
<i>Gnathia oxyuraea</i> (Lilljeborg, 1855)	ND	ND	10/12,
<i>Joeropsis brevicornis brevicornis</i> Koehler, 1885	ND	10/153,	ND
<i>Limnoria tripunctata</i> Menzies	ND	ND	20/8,
Decapoda			
<i>Alpheus</i> sp.	10/51,	10/79,	10/83,
<i>Alpheus glaber</i> (Olivi, 1792)	ND	10/74,100,	10/12,
<i>Alpheus macrocheles</i> (Hailstone, 1835b)	ND	ND	10/12,32,
<i>Alpheus migrans</i> Lewinsohn & Holthuis, 1978	10/25,	ND	ND
<i>Anapagurus chiroacanthus</i> (Lilljeborg, 1856)	ND	10/100,	ND
<i>Anapagurus laevis</i> (Bell, 1845)	20/101,	ND	ND
<i>Callianassa subterranea</i> (Montagu, 1808)	10/51,75,	10/26,	10/95,
<i>Crangon crangon</i> (Linnaeus, 1758)	ND	10/12,	ND
<i>Diogenes pugilator</i> (Roux, 1829)	ND	20/10,	ND

PHYLUM/CLASS/Ordo/Species	Iskenderun	Mersin	Anamur
<i>Ebalia cranchii</i> Leach, 1817	ND	ND	10/46,
<i>Ebalia granulosa</i> H. Milne Edwards, 1837	ND	ND	10/54,
<i>Ebalia nux</i> A. Milne-Edwards, 1883	ND	10/190,	ND
<i>Ethusa mascarone</i> (Herbst, 1785)	ND	20/79,	ND
<i>Galathea intermedia</i> Liljeborg, 1851	ND	10/50,	ND
<i>Galethea</i> sp.	ND	ND	10/32,
<i>Goneplax rhomboides</i> (Linnaeus, 1758)	ND	ND	10/31,
<i>Hippolyte</i> sp.	ND	ND	20/32,
<i>Inachus</i> sp.	ND	ND	10/119,
<i>Leptochela (Leptochela) pugnax</i> De Man, 1916	10/77,	10/156,	ND
<i>Leptochela</i> sp.	20/11,	40/74,	20/46,
<i>Macrophthalmus (M.) indicus</i> Davie, 2012	30/11,26,	20/12,	ND
<i>Pagurus cuanensis</i> Bell, 1845	ND	ND	20/26,
<i>Pagurus forbesii</i> Bell, 1845	ND	ND	30/78,
<i>Pagurus</i> sp.	ND	ND	20/32,
<i>Palaemon xiphias</i> Risso, 1816	ND	ND	30/12,
<i>Palaemonella rotumana</i> (Borradaile, 1898)	ND	ND	10/12,
<i>Pestarella tyrrhena</i> (Petagna, 1792)	ND	ND	10/32,
<i>Pilumnus spinifer</i> H. Milne Edwards, 1834	ND	ND	10/21,
<i>Plesionika longicauda</i> (Rathbun, 1901)	ND	ND	10/12,
<i>Processa canaliculata</i> Leach, 1815	ND	10/74,	ND
<i>Processa edulis</i> (Risso, 1816)	10/51,75,	20/100,12,	ND
<i>Processa parva</i> Holthuis, 1951	ND	10/100,	ND
<i>Processa robusta</i> Nouvel & Holthuis, 1957	ND	10/10,	ND
<i>Thalamita poissonii</i> (Audouin, 1826)	ND	ND	10/32,
<i>Upogebia pusilla</i> (Petagna, 1792)	ND	ND	10/46,
<i>Upogebia stellata</i> (Montagu, 1808)	ND	10/12,54,75, 100	ND
Ostracoda			
<i>Skogsbergia megalops</i> (Sars, 1872)	ND	ND	20/75,
PYCNOGONIDA			
<i>Anoplodactylus petiolatus</i> (Krøyer, 1844)	ND	ND	10-10/64-119
MOLLUSCA			
PLACOPHORA			
<i>Hanleya hanleyi</i> (Bean in Thorpe 1844)	ND	ND	10/21,
<i>Leptochiton cimicoides</i> (di Monterosato, 1879)	ND	ND	10/54,
<i>Lepidochitona cinerea</i> (Linnaeus, 1767)	ND	ND	10/12,
BIVALVIA			
<i>Abra alba</i> (Wood W. 1802)	20/11,	20/11,	ND
<i>Abra nitida</i> (Müller O.F. 1776)	ND	50/12,	ND
<i>Abra prismatica</i> (Montagu 1808)	10/203,207,	50/26,	10/95,
<i>Acanthocardia</i> sp.	10/11,	ND	ND
<i>Anadara natalensis</i> (Krauss, 1848)	ND	10/150,	ND
<i>Anomia ephippium</i> Linnaeus, 1758	ND	ND	10/26,
<i>Arca noae</i> Linné 1758	ND	ND	10/12,
<i>Arca tetragona</i> Poli 1795	ND	ND	130/12,
<i>Arcopagia crassa</i> (Pennant 1777)	ND	ND	20/32,
<i>Barbatia barbata</i> (Linné 1758)	ND	20/10,216,	10/95,
<i>Batharca pectunculoides</i> (Scacchi, 1835)	ND	20/10,216,	10/95,
<i>Batharca philippiana</i> (Nyst 1848)	ND	ND	40/95,
<i>Cardiomya costellata</i> (Deshayes 1835)	10/101,	ND	ND
<i>Centrocardita aculeata</i> (Poli, 1795)	ND	ND	40/12,
<i>Corbula gibba</i> (Olivi 1792)	30/14,	20/50,10,51,	10/31,8,
<i>Dosinia exoleta</i> (Linné 1758)	30/14,	ND	10/32,
<i>Dosinia lupinus</i> (Linné 1758)	ND	ND	10/119,
<i>Dosinia</i> sp. juvenile	10/153,	ND	ND
<i>Glans trapezia</i> (Linné 1767)	ND	ND	150/12,
<i>Glycymeris</i> sp.	ND	ND	10/12,
<i>Goodallia triangularis</i> (Montagu 1803)	ND	ND	10/54,78,

PHYLUM/CLASS/Ordo/Species	Iskenderun	Mersin	Anamur
<i>Hiattella arctica</i>	ND	ND	10/75,78,
<i>Kellia</i> sp.	ND	10/51,	ND
<i>Kellia suborbicularis</i> (Montagu, 1803)	130/11,	20/11,	ND
<i>Musculus costulatus</i> (Risso, 1826)	ND	ND	10/12,
<i>Musculus subpictus</i> (Cantraine, 1835)	ND	ND	20/12,
<i>Myrtea spinifera</i> (Montagu 1803)	ND	10/10,	ND
<i>Nucula nitidosa</i> Winckworth, 1930	20/101,207,	30/79,	30/75,95,
<i>Nuculana pella</i> (Linné 1767)	ND	ND	10/108,
<i>Paphia</i> sp.	ND	10/12,	ND
<i>Paphia textile</i> (Gmelin 1791)	ND	10/12,25,	ND
<i>Parvicardium pinnulatum</i> (Conrad 1831)	ND	ND	10/113,
<i>Parvicardium</i> sp.	ND	30/12,	ND
<i>Petricola fabagella</i> Lamarck, 1818	ND	ND	40/95,
<i>Pinctada imbricata radiata</i> (Leach, 1814)	ND	ND	10/12,
<i>Pitar rudis</i> (Poli 1795)	ND	ND	10/176,
<i>Saccella commutata</i> (Philippi 1844)	ND	ND	100/95,
<i>Septifer cumingii</i> Récluz, 1849	ND	ND	130/12,
<i>Sphenia binghami</i> Turton, 1822	ND	ND	40/12,
<i>Solemya togata</i> Poli, 1795	10/11,	ND	ND
<i>Tellina albicans</i> Gmelin, 1791	50/203,	ND	ND
<i>Tellina tenuis</i> da Costa 1778	20/153,	ND	ND
<i>Thracia phaseolina</i> (Lamarck, 1818)	10/101,	ND	ND
<i>Thyasira flexuosa</i> (Montagu 1803)	10/207,	10/11,	10/119,
<i>Timoclea ovata</i> (Pennant 1777)	10/101,	ND	ND
GASTROPODA			
<i>Alvania testae</i> (Aradas & Maggiore 1844)	ND	30/150,	ND
<i>Bitium reticulatum</i> (da Costa 1778)	ND	50/29,	ND
<i>Eulimella acicula</i> (Philippi 1836)	10/51,	ND	ND
<i>Liostomia</i> sp.	10/77,	ND	ND
<i>Monia</i> sp.	ND	ND	10/95,
<i>Neverita josephina</i> Risso, 1826	10/51,	ND	ND
<i>Philine aperta</i> (Linnaeus, 1767)	ND	10/12,	10/54,
<i>Pseudorhaphitoma iodolabiata</i> (Hornung & Mermod, 1929)	ND	ND	10/12,
<i>Pseudominolia nedyma</i> (Melvill 1897)	ND	ND	10/31,
<i>Retusa truncatula</i> (Bruguère, 1792)	ND	ND	10/119,
<i>Strombus persicus</i> (Swainson, 1821)	ND	10/12,	ND
<i>Tricolia pullus pullus</i> (Linnaeus, 1758)	ND	ND	20/12,
<i>Williamia gussoni</i> (Costa O. G., 1829)	ND	ND	10/12,
CAUDOFOVEATA			
<i>Falcidens guttuerosus</i> (Kowalevsky, 1901)	ND	ND	20-20/119-119
ECHINODERMATA			
<i>Asterina pancerii</i> (Gasco, 1870)	ND	ND	10-10/10-21
<i>Amphipholis squamata</i> (Delle Chiaje, 1828)	10-10/11.3-11.3	10-30/10-79	10-40/21-95
<i>Amphiura chiajei</i> Forbes, 1843	10-10/11.3-11.3	10-70/12.3-75	10-30/12-95
<i>Amphiura filiformis</i> (O.F. Müller, 1776)	ND	10-70/13-149.5	ND
<i>Ophiactis macrolepidota</i> Marktanner-Turneretscher, 1887	ND	80-80/10-10	10-10/119-119
<i>Ophiopsila aranea</i> Forbes, 1843	ND	ND	10-10/12-12
<i>Ophiura albida</i> Forbes, 1839	ND	10-30/29-50.9	10-20/10-95
<i>Echinocardium cordatum</i> (Pennant, 1777)	10-10/11.3-11.3	ND	10-10/31-31
SIPUNCULA			
<i>Apionsoma (A.) misakianum</i> (Ikeda, 1904)	ND	ND	10-60/8.5-21
<i>Aspidosiphon (Akrikos) mexicanus</i> (Murina, 1967)	ND	30-30/97-97	10-20/46-73.5
<i>Aspidosiphon (A.) misakiensis</i> Ikeda, 1904	ND	10-10/79-79	10-30/12-21
<i>Aspidosiphon (A.) muelleri</i> Diesing, 1851	30-30/14.5-14.5	ND	10-50/12-46
<i>Golfingia (G.) elongata</i> (Keferstein, 1862)	10-10/136-136	ND	10-10/64-64
<i>Golfingia (G.) vulgaris vulgaris</i> (de Blainville, 1827)	10-10/136-136	10-10/79-79	10-20/54-83
<i>Nephasoma (N.) diaphanes</i> (Gerould, 1913)	10-10/13.5-26	10-90/13-216	10-90/12-119
<i>Nephasoma (N.) abyssorum abyssorum</i> (Koren & Danielssen, 1876)	ND	10-10/79-79	ND

PHYLUM/CLASS/Ordo/Species	Iskenderun	Mersin	Anamur
<i>Nephasoma (N.) eremita</i> (Sars, 1851)	ND	30-30/100-100	10-10/83-83
<i>Nephasoma (N.) constrictum</i> (Southern, 1913)	30-30/13.5-13.5	20-20/79-79	60-60/78-78
<i>Nephasoma (N.) rimicola</i> (Gibbs, 1973)	10-20/151-207	10-10/51-187	10-10/26-73.5
<i>Onchnesoma squamatum</i> (Koren & Danielssen, 1875)	ND	ND	10-10/64-176
<i>Onchnesoma steenstrupii steenstrupii</i> Koren & Danielssen, 1876	10-1080/13.5-207	10-80/27-156	10-1540/8.5-
<i>Phascolion (Isomya) tuberculosum</i> Théel, 1875	ND	10-10/50.9-50.9	20-20/64-64
<i>Phascolion (P.) strombus strombus</i> (Montagu, 1804)	ND	10-10/79-79	ND
<i>Phascolosoma (P.) stephensoni</i> (Stephen, 1942)	ND	20-20/187-187	10-40/75-212
<i>Thysanocardia procera</i> (Möbius, 1875)	ND	10-40/103-190	10-10/78-83
BRACHIOPODA			
<i>Megathiris detruncata</i> (Gmelin, 1791)	ND	ND	40-40/12-12
CHORDATA			
ACTINOPTERYGII			
<i>Bregmaceros atlanticus</i> Goode & Bean, 1886	10-20/51-77	10-30/50-153	ND
LEPTOCARDII			
<i>Branchiostoma lanceolatum</i> (Pallas, 1774)	90-90/14.5-14.5	ND	ND