

Soft-bottom decapod and stomatopod crustaceans of Northern Cyprus coast

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The first study on decapod and stomatopod crustacean fauna of cyprus was carried out by Heller (1863). According to research studies, until recently 156 species of decapods are recorded (47 Natantia, 12 Macrura Reptantia, 24 Anomura, 73 Brachyura) (Kocataş *et al.*, 2001; Doğan *et al.*, 2008; Christodoulou *et al.*, 2009).

Cyprus is the only island in Levantine Basin and is surrounded by waters of Levantine Basin, eastern Mediterranean, which are characterized by higher temperature and salinity, in comparison to the rest of Mediterranean (Kocataş *et al.*, 2001). Recently, one study was done on the nearshore soft bottom macrofauna around Cyprus (Hadjichristophorou *et al.*, 1997). They analysed macrobenthic fauna of soft-bottoms in Cyprus coasts, and reported 429 species with 73 Crustacea (71 Decapods and 2 Stomatopods).

The aim of this study was to determine species of decapod and stomatopod crustacea living in different depths of

Cyprus coasts and their distributions according to their soft bottom environment.

The present study also analyzed ecological and structural features of decapod and stomatopod species in a detailed way since there is no extensive study related to the subject in this region.

The study was conducted along the northern coasts of Cyprus in the period of 19.10.2003-25.10.2003. Specimens were obtained by means of a Van Veen grab (14 stations), a dredge (1 station), and a trawl (3 stations) employed over sandy silt bottoms at depths between 8 and 225 m (Table 1). The specimens were preserved in 4% formaldehyde and deposited in the Museum of the Faculty of Fisheries, Ege University, Bornova-Izmir (ESFM).

These species were identified according to the studies of Zariquiey-Álvarez (1968); Ingle (1993) and Ngoc-Ho (2003). Soyer's (1970) frequency index (f%) was used to

determine the abundance of species at stations and in biotopes, and the results were evaluated. Bellan-Santini's (1969)

quantitative dominance index (DI%) were calculated.

Table 1: Characteristics of stations.

Stations	Date	Coordinates	Locality	Depth (m)	Substrate	Sampler
1	19.10.2003	35°35'N - 34°30'E	Güzelyurt	225	Muddy-Sand	Dredge
2	19.10.2003	35°37'N - 33°10'E	Güzelyurt	100-120	Muddy-Sand	Trawl
3	23.10.2003	35°24'N - 34°10'E	Magosa	42	Muddy-Sand with <i>C. racemosa</i>	Grab
4	23.10.2003	35°24'N - 34°09'E	Magosa	37	Muddy-Sand with <i>C. racemosa</i>	Grab
5	23.10.2003	35°24'N - 34°10'E	Tuna Farm	50	Muddy	Grab
6	23.10.2003	35°24'N - 34°10'E	Tuna Farm	50	Muddy	Grab
7	23.10.2003	35°25'N - 34°15'E	Tuna Farm	50	Muddy	Grab
8	23.10.2003	35°25'N - 34°10'E	Magosa	53	Muddy-Sand with <i>C. racemosa</i>	Grab
9	23.10.2003	35°22'N - 34°09'E	Magosa	46	Muddy-Sand with <i>C. racemosa</i>	Grab
10	24.10.2003	35°11'N - 34°01'E	Magosa	27	Muddy-Sand	Grab
11	24.10.2003	35°10'N - 34°00'E	Magosa	27	Muddy-Sand	Grab
12	25.10.2003	35°05'N - 33°59'E 35°06'N - 33°58'E	Maraş	30	Muddy	Trawl
13	25.10.2003	35°06'N - 34°00'E 35°07'N - 33°59'E	Maraş	82	Muddy	Trawl
14	25.10.2003	35°15'N - 34°00'E	Magosa	120	Muddy	Grab
15	25.10.2003	35°07'N - 33°56'E	Magosa port	10	Muddy	Grab
16	25.10.2003	35°07'N - 33°56'E	Magosa port	11	Muddy-Sand	Grab
17	25.10.2003	35°07'N - 33°56'E	Magosa port	7	Muddy	Grab
18	25.10.2003	35°07'N - 33°56'E	Magosa port	8	Muddy	Grab

The salinity values ranged from 39.26 ‰ to 39.56 ‰ and temperature were recorded between 23.4°C and 26.2°C. The maximum temperature value was measured at station 1, while the minimum value was detected at station 15. As a result of the study conducted at 18 soft bottom stations along Cyprus coasts, 101 individuals belonging to 33 species (10 Natantia, 4 Macrura Reptantia, 5 Anomura, 13 Brachyura and 1 Stomatopoda) were recorded (Table 2).

The highest number of species was observed at station number 11 (Magosa)

with 11 species, and this was followed by 4 species at stations 2 and 3. The lowest number of species was observed in 5 stations (4, 5, 9, 14 and 17) with 1 species. The highest number of specimen was observed at station 6 with 31 specimens, and this was followed by 28 specimens at station 11. These 2 stations represent 58.42% of the total individuals' number (Fig. 1, Table 2). Station 6 is near a Tuna farm, but station 11 has only muddy-sand biotope.

Table 2: List of species found and their number of individuals at stations, as well as their dominance and frequency results.

Species	Stations																		F%	D%
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
<i>Achaeus gracilis</i> (Costa, 1839)	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,56	0,99
<i>Aegaeon lacazei</i> (Gourret, 1887)	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	5,56	0,99
<i>Alpheus</i> sp	-	-	-	-	-	-	-	1	1	-	-	-	-	-	1	-	-	-	16,67	2,97
<i>Anapagurus</i> sp	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	11,11	4,95
<i>Athanas nitescens</i> (Leach, 1813 [in Leach 1813-1814])	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	16,67	2,97
<i>Dardanus arrosor</i> (Herbst, 1796)	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	5,56	0,99
<i>Dromia personata</i> (Linnaeus, 1758)	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	5,56	0,99
<i>Eualus occultus</i> (Lebour, 1936)	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,56	1,98
<i>Eualus</i> sp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	5,56	0,99
<i>Galathea intermedia</i> Liljeborg, 1851	-	1	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	16,67	2,97
<i>Gourretia denticulata</i> (Lutze, 1937)	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	11,11	1,98
<i>Inachus parvirostris</i> (Risso, 1816)	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	5,56	3,96
<i>Inachus leptochirus</i> Leach, 1817	-	-	-	-	-	-	-	-	-	-	1	-	4	-	-	-	-	-	11,11	4,95
<i>Liocarcinus navigator</i> (Herbst, 1794)	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,56	0,99
<i>Lysmata seticaudata</i> (Risso, 1816)	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	1	-	16,67	2,97
<i>Macropodia rostrata</i> (Linnaeus, 1761)	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	5,56	0,99
<i>Maja crispata</i> Risso, 1827	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	5,56	0,99
<i>Medorippe lanata</i> (Linnaeus, 1767)	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	5,56	0,99
<i>Paguristes syrtenis</i> De Saint Laurent, 1971	1	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	16,67	3,96
<i>Pagurus</i> sp	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-	11,11	2,97
<i>Parapenaeus longirostris</i> (Lucas, 1846)	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	5,56	0,99
<i>Philocheras bispinosus</i> (Hailstone, 1835)	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,56	0,99
<i>Pisa armata</i> (Latreille, 1803)	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	5,56	0,99
<i>Pisa muscosa</i> (Linnaeus, 1758)	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,56	0,99
<i>Polybius arcuatus</i> (Leach, 1814)	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	5,56	0,99
<i>Polybius depurator</i> (Linnaeus, 1758)	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	11,11	1,98
<i>Polybius</i> sp	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	5,56	0,99
<i>Sicyonia carinata</i> (Brünnich, 1768)	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,56	0,99
<i>Solenocera membranacea</i> (Risso, 1816)	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	5,56	7,92
<i>Upogebia mediterranea</i> Noël, 1992	-	-	-	-	1	29	-	-	-	-	-	-	-	-	-	-	-	-	11,11	29,7
<i>Upogebia pusilla</i> (Petagna, 1792)	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	5,56	0,99
<i>Upogebia tipica</i> (Nardo, 1868)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	5,56	0,99
<i>Erugosquilla massavensis</i> (Kossmann, 1880)	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	5,56	5,94

When the species in soft substratum biotopes were compared according to their frequency index values, it was determined

that there was no constant species, 1 species was common and 32 species were rare (Table 2).

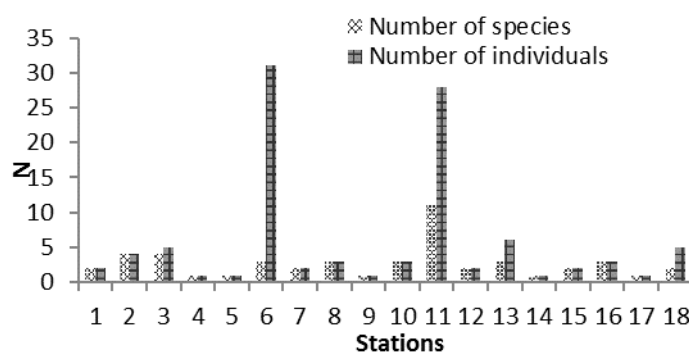


Figure 1: Total number of decapod species and individuals determined at stations.

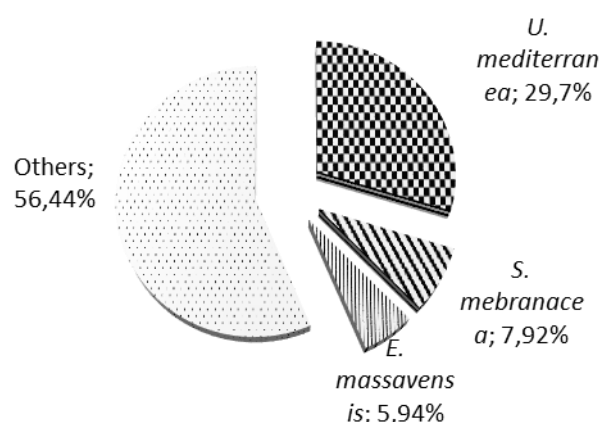


Figure 2: Relative dominance of the determined species.

U. mediterranea was the species having dominance value of 30 individuals, %29.7, while *S. membranacea* had a lower dominance value of %7.92 with 8 individuals. Within this group, 18 species were represented by one individual and a %0.99 dominance value (Fig. 2). When we considered stations with *Caulerpa racemosa* (Forsskål) J. Agardh, 1873 (4 exotic species) which was found in 4 of the 18 stations, they were represented by 11 species and 14 individuals.

This study was done in 18 soft bottom stations along Cyprus coasts, and 101 individuals belonging to 33 species were recorded. In previous studies, Doğan *et al.* (2008) reported 2 decapod species on

sandy-silt bottoms (1 Dendrobranchiata and 1 Thalassinid), and Christodoulou *et al.* (2009) reported 4 decapod species (two species on maerl beds and two species on muddy substratum) while Hadjichristophorou *et al.* (1997) reported 71 decapod and 2 stomatopod species on the soft bottoms of Cyprus coast.

In previous studies, it was reported that polychaetes and bivalvia were common on soft bottom, while crustacean were rare (Çınar *et al.*, 2006). On the other hand, according to Harriague *et al.* (2006) soft-bottom macrofaunal assemblages were particularly dominated by polychaetes and crustaceans. In the previous studies Ateş and Katağan (2008) reported 58 decapod species from the Aegean Sea Coasts of

Turkey. Çınar *et al.* (2006) recorded 231 species belonging to 10 zoobenthic groups (40 Crustacea species, with 11 decapods) in and around Alsancak Harbor, located in the polluted part of Izmir Bay (Aegean Sea, eastern Mediterranean). According to Fanelli *et al.* (2005) on soft bottoms of Montalto di Castro and Gulf of Gaeta, in central Mediterranean Sea (Tyrrhenian Sea), 16 species of decapods (6 Natantia, Caridea; 4 Reptantia Macrura, Thalassinidea; 2 Anomura; and 4 Brachyura) were collected.

According to Hadjichristophorou *et al.* (1997), 1% of macrofauna on soft bottoms of Cyprus coasts represented exotic species (2 decapods). However, in our study no exotic decapod species were observed. The only exotic species in our study was *Erugosquilla massavensis* (Kossmann, 1880), which is a stomatopod. While Hadjichristophorou *et al.* (1997) reported 13 common species, we were not able to find 60 species mentioned in their study. However, we identified 20 species that were not reported in that study; *A. gracilis*; *E. occultus*; *G. denticulata*; *I. parvirostris*; *I. leptochirus*; *L. navigator*; *L. seticaudata*; *M. lanata*; *P. syrtensis*; *P. bispinosus*; *P. muscosa*; *S. carinata*; *U. tipica*; and *E. massavensis* were not reported in that report which was conducted here.

In this study, it was seen that species of Brachyura on the soft substratum were dominant. Ateş and Katağan (2008) reported the same results in their study done in Aegean Sea coasts and Hadjichristophorou *et al.* (1997) in Cyprus coasts as well. However, Fanelli *et al.* (2005) in their study along Italian coasts

reported that species of Natantia (6) were dominant on soft substratum.

We are of the opinion that the results of this study would be useful to understand the abundance, variety, distribution, and bio-ecological features of zoobenthic organisms in terms of further, seasonal and extensive studies to be done on soft bottoms in the northern coasts and all Cyprus coasts.

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