Turkish J. Marine Sciences 6(3):201-214 (2000)

Abundance and Distribution of Zooplankton in CoastalArea of Gökçeada Island (Northern Aegean Sea)

Gökçeada Kıyı Bölgesinde Zooplankton Dağılımı ve Bolluğu (Kuzey Ege Denizi)

Ahmet Nuri Tarkan

University of İstanbul, Faculty of Aquatic Products, Department of Marine Biology, Ordu Caddesi, No. 200, Laleli 34470 İstanbul, Turkey

Abstract

This study was carried out in order to determine population of zooplankton in the coastal waters of Gökçeada. At the 10 stations of those depths ranging from 20 m to 30 m, the measurements of temperature, salinity and oxygen were made, and zooplankton samples were collected vertically and horizontally using plankton nets. In the neritic waters of the island, the effects of the Black Sea waters through Dardanelles were observed and zooplankton species of the Black Sea found. From laboratory examinations of samples, it was determined that the most important group of zooplankton was copepods. The number of *Mnemiopsis leidyi*, ctenophor, increased excessively during the periods of summer and autumn. Larger copepod species, such as *Centropages typicus, Calanus helgolandicus, Ctenocalanus vanus, Anomalocera patersoni,* appeared during winter and spring periods; however, *Acartia clausi,* which is considered as a indicator of polluted waters, was found to be abundant at every station all around the year. Relatively smaller species such as *Corycella rostrata, Oithona helgolandica, Euterpina acutifrons* were determined in smaller numbers at most stations. Cladocers were observed at every period: of them, *Penilia avirostris* was found to be the most observed species. In the samples collected from 40 stations during the year, 51 species were determined.

Keywords: Aegean Sea, zooplankton, composition,abundance

Introduction

Plankton fauna is one of the important communities of marine ecosystem. Particularly herbivore and omnivore zooplankters have a crucial importance in the feeding of commercially valuable fish species and their larvae as well as other zooplankters.

Zooplankton studies in the Turkish Seas are very scarce restricted at a very narrow area or have been limited to a few significant species. Demir (1955,1958), Tarkan and Ergüven (1988), Özel (1992), Sever (1991,1997) examined the plankton systematically. The planktonik fauna of the Edremit Bay (Aegean Sea),Bodrum (Aegean Sea) and Iskenderun Bay (Lavantine Sea) has been studied by Gökalp (1972). Pavlova (1966) studied the zooplankton samples collected between 1958 and 1961 in terms of its composition and distribution in the Aegean Sea. Kocataş and Bilecik studied on the biological diversity Sıokou-Frangou *et al.* (1990) carried out some researches on the distribution of zooplankton in the Aegean and Ionion Seas. Kovalev et al.(1999), Lakkis *et al.*(1999) and Siokou-Frangou *et al.*(1999)studied on composition and distribution of zooplankton in the Aegean Sea

We took the samples from the coastal waters of Gökçeada, the largest island of Turkey, stretching between $25^0$40'06"-$26^0$01'05" of eastern longitudes and 40^0 05'12"- $40^0$14'18" of northern latitudes in the northern Aegean Sea. The surface area of the island is 284 km^2. It is about 20 km off the Gallipoli Peninsula. Its longest axis throughout direction of southwest and northwest is 30 km and its width is about 13 km. In the northern coasts of the island the continental slope is steep and Saros Graben, a tectonic pit, is there immediately off the coast. Therefore the continental shelf is narrow and its width does not exceed 2 km. Other coasts of the island are surrounded by a shelf region not exceeding 80 m (Ulutürk, 1984) (Fig. 1).

The Black Sea water inflow in the Aegean Sea through the Dardanelles Strait in the upper layer is characterised by low salinity (Theocharis and Georgopoulos,1993). Normally, Black Sea waters with 22-25 ‰ salinity pass through the Dardenelles and form into a thin layer with low density over the saline waters of northern Aegean Sea. After leaving the Dardanelles, the Black Sea originated waters spread towards northwest, from between the Islands of Gökçeada and Limnos and then following the eastern coasts of Greece, they spread in the direction of south and southwest. With strong northern winds, these waters go southwards,

following western coast of Anatolia; When the southwest gale blows, they turn towards northeast, reaching Gallipoli Bay. The Black Sea waters diluted with fresh waters from the rivers during the spring are observed in Northern Aegean Sea in August-September. The Black Sea originated waters are carried to the Aegean Sea via the Turkish Strait System have an effect particularly on northern part of the Aegean Sea and this effect can be traced down to 125 m depth. The waters carried by cyclonic current system towards north are originated from southern the Aegean Sea. The waters reaching Anatolian continental shelf form deep waters of the Dardenelles and enter the Sea of Marmara. The current system between the Black Sea and the Mediterranean Sea is stemmed from a volume difference (6 500 m^3 / sec.) between surface current from the Black Sea to the Mediterranean (12 600 m^3/ sec.) and deep current from the Mediterranean Sea to the Black Sea (6 100 m^3/ sec.) (Yüce and Türker ,1991). The movements of waters in the northern Aegean Sea exhibit a complex and specific structure because of the presence of the islands. These movements of water mass with different structure have impacts largely on the distribution and abundance of zooplankton. Moreover, factors such as salinity and temperature play an important role in geographical distribution of zooplankton species. Therefore, it is possible to find species both of the Black Sea and of the Mediterranean Sea in a sampling station of the study.

The study of marine zooplankton fauna of Gökçeada has an importance in order to monitor their population fluctiations and abundance related to fish populations. Our objective was to determine seasonal fluctuations of zooplankton in the coastal water of the island, systematical identifications of species and their abundance.

Materials and Methods

This study was carried out between 1996 and 1998 on board of Yunus I and Yunus II the research vessels of our faculty. Because of the inconvenient atmospheric conditions, sampling of winter period in January 1997 could not carried out and samples of that period were collected in January 1998. Zooplankton samples were collected seasonally at ten stations determined in the coastal waters of Gökçeada Island (January,April,July,August and October)(Fig. 1).

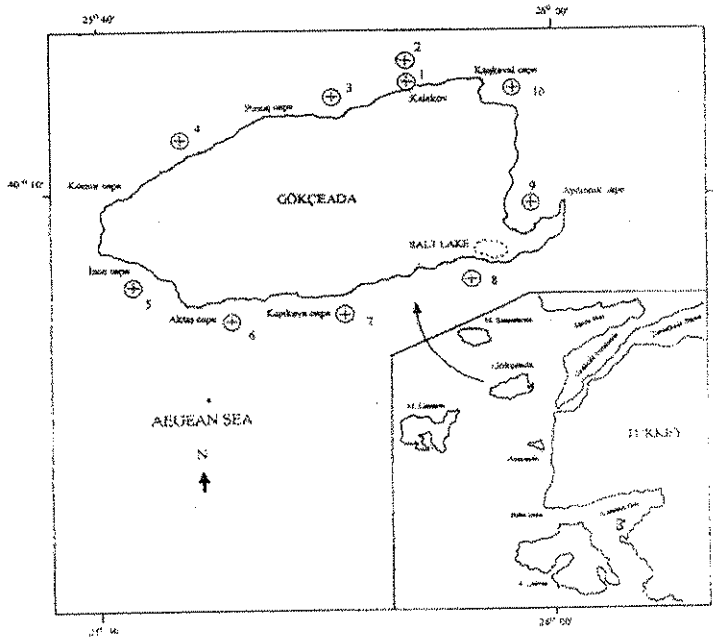

Figure 1. Sampling area

Sampling was performed by a WP2. Samplings were conducted both horizontally and vertically. The horizontal samplings were performed for 15 min. while vertical tows were done from the sea bottom to surface at an appropriate speed. Samples were preserved in the glass jars with 4 % formaldehide and the solution was neutralized with borax. Moreover the speed and direction of wind, cloudiness, barometrical pressure, air temperature, horizontal visibility, sea condition and vertical water transparancy were determined as well as sea water temperature, salinity and oxygen. The measurements of salinity were conducted using the Method of Inductive Salinometer and oxygen was determined by the method of Winkler.

In this study, about 80 zooplankton samples collected from 40 stations were examined. Subsamples were obtained from the jars by means of unit sampling method.

Results

Hydrographical Parameters

Temperature

At the stations Nr. 2, 3 and 4 which were placed at the north of the island the temperature change of the waterbetween 0-40 m was only 1°C in spring. The thermocline was positioned 2 were between 10 and 20 m at the station while this change occurred at the depths between 30 and 40 m.at the other stations. Temperature of intersection of water column in the southern part was 1.25°C higher than that in the northern part. The Most frequent temperature change at the stations, 6, 7 and 8 was seen at the station 8 and the depths between 10-20 m while at the station 6 and 7 a homogenous distribution of temperature was observed. According to summer the measurements, the temperature difference between north and south intersects was 0.5 °C. At the water column between 0 and 40 m depths there was not any stratification based on temperature distribution. The water temperature was 24 °C at the surface while it dropped to 17°C at the 30 m depth. In the autumn period at water columns of both intersects an even distribution of temperature was observed. The temperature difference between the surface and deep water was 2 °C. Winter period had the similarities to that of the autumn and the temperature values of the surface and deep waters varied from 13.5 to 15.5 °C.

Salinity

Salinity values at both intersects ranged from 35 ‰ to 38.5 ‰ according to the measurements carried out in the spring and summer. It was determined that rapid changes occurred at first 20 m depths. The existence of the Mediterranean water was dominant. According to the results of the autumn, the layer of rapid change dropped to the depths between 25-35 m. Concentration of salinity at upper layer was diluted by the Black Sea originated waters. The lowest concentration of salinity was measured at the surface water during the winter. It was measured as 33 ‰ salinity at northern and 31 ‰ at the southern intersect.

Oxygen

During the spring period, it was observed similar values of dissolved oxygen at both transection. These values ranged from 5.20 to 4.80 ml/l at the north and from 5.10 to 4.80 ml/l at the south. The depth in which changes occurred rapidly, seemed to be 20 m uppermost. Values of the summer period were found to be lower at the surface waters. The highest values for dissolved oxygen were determined between 20 and 30 m depths. During the autumn and winter periods, the highest values for

dissolved oxygen were measured at the surface waters. Oxygen concentration became lower while the sea level is getting deeper. According to measurement of both seasons, the lowest dissolved oxygen values were obtained between 20 and 30 m depths.

Zooplankton

In the spring, *Acartia clausi* with a percentage of 31 % among copepods took the first place. It was followed by *Centropages typicus* with a percentage of 16 %. *A. clausi* was dominant at the stations 1, 2, 5, 6, 7 and 9, while *C. typicus* was dominant at the stations 3, 4, 8, 10. They were followed by *Paracalanus parvus*, *Calanus helgolandicus* and *Oithona helgolandica*. These five copepod species had a percentage of 79.7 % among copepods and 60 % among the total zooplankton. Moreover *Ctenocalanus vanus*, *Oithona plumifera* and *Euterpina acutifrons* were found almost at all stations. After copepods the cladocers came in terms of the amount. *Evadne nordmanni*, which mostly prefers more clear waters, seemed to be the only representative of Cladocers and dominant with a percentage of 69 % in this group. Nauplii, of mostly copepods, took the third place in terms of the abundance, with a percentage of 9.7 % in the total zooplankton. The species of the groups apart from those above consisted of individuals which were negligible in their number. Cirriped larvae were found only in the stations 1 and 3, located in north during the spring and at the same period veliger larvae were observed at all four stations in the north. At three stations from north and three stations from south a few zoea larvae were found. Among the zooplankton observed during the spring, the doliolids *Doliolum denticulatum* and *D. mülleri* had a percentage of 2.7 % in the total zooplankton (Table 1).

During the summer period a total of 11 species of generally smaller copepods were determined. *A. clausi* took the first place among copepods with 25.9 %. *C. vanus* took the second place with 17.7 %. Copepodits and nauplii, and fish eggs took the third place. At the fourth place there were cladocers with predominantly *Penilia avirostris*. *Globigerina bulloides* (foraminifera) was observed during the summer period. It was followed by *Sagitta sp.* and *S. setosa* of Chaetognaths. Then it was followed by Appendicularians *Oikopleura dioica and O. fusiformis* as well as *Stegosoma magnum*, a deep sea form (Table 2).

Table 1. Fluctuations of species and groups abundance (ind./m^3) in spring

SPRING

STATION No: (ind./m^3)	1	2	3	4	5	6	7	8	9	10	Total
SPECIES											
Centropages typicus	154	196	210	224	84	119	70	105	84	182	1428
Centropages kröyeri	1	-	2	1	-	1	2	-	1	3	11
Acartia clausi	280	252	154	168	196	224	126	98	252	84	1834
Acartia negligens	1	2	-	-	-	-	1	-	1	-	5
Oithona helgolandica	42	56	70	56	21	91	56	28	21	77	518
Oithona nana	14	7	21	42	35	-	21	7	-	-	147
Oithona plumifera	28	21	28	49	14	56	35	35	21	7	294
Paracalanus parvus	42	70	56	28	28	84	63	98	42	91	602
Ctenocalanus vanus	7	14	28	42	28	56	21	49	35	63	343
Corycella rostrata	7	7	14	14	42	-	14	7	-	14	119
Calanus helgolandicus	21	56	70	98	70	14	35	14	63	105	546
Metridia lucens	7	14	-	7	14	-	-	-	14	-	56
Euterpina acutifrons	21	28	21	7	21	-	7	21	-	7	133
Evadne nordmanni	35	21	63	14	35	14	56	63	35	28	364
Evadne spinifera	7	-	14	14	7	7	-	-	14	14	77
Penilia avirostris	7	-	7	21	21	7	7	14	-	7	91
Doliolum denticulatum	14	-	49	28	35	-	14	7	21	28	196
Doliolum mülleri	7	7	-	7	-	14	14	-	-	21	70
Copepodit	42	63	35	49	35	56	56	84	56	77	553
Nauplii	119	105	84	105	63	77	42	70	63	56	784
Veliger larvae	7	-	14	-	7	-	-	7	-	-	35
Zoea larvae	21	7	7	-	7	14	7	-	-	-	63
Cirriped larvae	7	-	14	-	-	-	-	-	-	-	21
TOTAL	891	926	961	974	763	834	647	707	723	864	8290

A. clausi and *E. acutifons* were predominant among the copepods. As the examples of large species, *C.typicus*, *C.helgolandicus*, *C.vanus* and *Temora stylifera* can be given. *P. avirostris* was found at all stations and was followed by *Evadne spinifera* and *Podon polyphemoides*. The proportion of the cladocers in the total zooplankton was 17.2 %. of tunicates *D. denticulatum* and *D. mülleri* were found at 9 and 5 stations respectively. Many larvae and fish eggs belonging to various species were observed. Only two species of the phylum Chaetognatha were found. These were *Sagitta setosa* and *S. inflata* which were epiplanktonic species and found mostly in neritic waters (Table 3). In the autumn period samples, as in the summer samples *Mnemiopsis leidyi* had the highest density. In the winter period, larger copepod species found in cold waters such as *C. helgolandicus, C. typicus* and *Anomalocera patersoni* were dominant; the latter was found only in the winter period.

Table 2. Fluctuations of species and groups abundance (ind./m^3) in summer

SUMMER

STATION No: (ind./m^3)	1	2	3	4	5	6	7	8	9	10	Total
SPECIES											
Acartia clausi	126	84	63	84	63	49	35	70	161	140	875
Acartia negligens	-	-	-	3	-	-	-	-	2	-	5
Oithona helgolandica	30	42	56	56	14	21	7	14	7	42	289
Oithona nana	-	-	14	49	-	-	7	-	-	14	84
Oithona plumifera	-	7	14	-	-	14	-	-	-	7	42
Paracalanus parvus	7	21	7	-	14	14	28	21	14	35	161
Ctenocalanus vanus	14	42	35	21	98	84	56	35	81	105	571
Corycella rostrata	-	7	28	49	35	7	-	7	7	21	161
Euterpina acutifrons	84	98	56	77	49	21	133	21	7	35	581
Microsetella norvegica	21	35	21	7	-	14	7	-	-	14	119
Temora stylifera	7	28	28	14	28	7	42	84	56	91	385
Clytemnestra scutellata	7		14	-	-	35	42	7	21	7	133
Evadne spinifera	7	21	14	28	49	7	-	14	7	7	154
Evadne tergestina	7	-	-	-	-	7	7	-	-	-	21
Penilia avirostris	49	35	84	35	63	98	42	42	28	119	595
Podon polyphemoides	21	-	14	-	7	7	-	14	-	21	84
Doliolum denticulatum	21	42	35	28	28	21	14	21	7	7	224
Doliolum mülleri	-	-	7	-	14	-	-	7	-	-	28
Oikopleura dioica	-	14	-	-	7	-	21	-	14	7	63
Oikopleura fusiformis	3	-	1	2		-	4	-	2	-	12
Sagitta sp.	5	3	3	2	-	-	2	4	4	6	29
Sagitta setosa	7	7	-	-	7	-	7	-	-	-	28
Stegosoma magnum	7	-	-	7	-	3	-	-	-	-	17
Mnemiopsis leidyi	20	21	26	32	22	11	3	5	6	12	158
Globigerina bulloides	42	14	28	14	7	7	42	56	56	63	329
Lensia conoidea	7	14	-	-	14	14	7	-	7	-	63
Copepodit	84	70	63	77	70	91	49	49	35	119	707
Nauplii	42	77	84	126	63	35	70	84	63	56	700
Veliger larvae	-	7	-	-	7	-	-	7	-	14	35
Echinid larvae	3	2	-	-	-	1	-	-	3	-	9
Poliket larvae	3	-	-	-	-	5	-	4	-	-	12
Gastropod larvae	3	4	-	2	3	-	7	8	-	-	27
Fish eggs	14	21	7	42	28	-	21	7	14	35	189
TOTAL	641	716	702	755	690	573	653	581	602	977	6890

Moreover *A. clausi* was on the second place in the number of individuals. Smaller species such as *O. helgolandica*, *O. nana* and *Corycella rostrata* were found in smaller number and at a few stations. Among the cladocer population *E. spinifera* took the first place and was followed by *P. avirostris* and *E. nordmanni*. Four species of siphonophora found in the samples of winter period could not identified because of deformation.

Table 3. Fluctuations of species and groups abundance (ind./m^3)in autumn

AUTUMN

STATION No: (ind./m^3)	1	2	3	4	5	6	7	8	9	10	Total
SPECIES											
Centropages typicus	7	21	-	-	-	-	-	7	-	-	35
Acartia clausi	77	63	35	70	35	63	56	112	28	126	665
Acartia negligens	-	-	-	-	-	-	2	-	-	-	2
Oithona helgolandica	21	14	35	35	-	14	21	7	28	49	224
Oithona nana	14	7	-	21	-	7	-	-	7	-	56
Oithona plumifera	28	7	14	64	-	14	14	35	14	7	197
Paracalanus parvus	7	-	-	14	-	7	-	-	-	7	35
Ctenocalanus vanus	21	14	21	28	63	35	14	21	21	35	273
Calanus helgolandicus	21	7	28	7	-	21	7	-	14	28	133
Euterpina acutifrons	70	77	28	63	63	35	77	21	14	28	476
Microsetella norvegica	-	7	-	-	-	7	3	-	-	7	24
Temora stylifera	28	35	42	21	14	7	28	49	63	70	357
Clytemnestra scutellata	-	-	-	-	-	7	8	-	-	-	15
Neocalanus gracilis	3	-	-	5	-	-	7	-	-	-	15
Pseudocalanus elongatus	7	7	-	-	7	14	21	7	-	-	63
Oncea venusta	-	3	-	6	-	7	6	-	-	7	29
Evadne spinifera	14	7	21	14	14	-	7	7	35	35	154
Penilia avirostris	42	28	56	63	84	77	70	63	49	112	644
Podon polyphemoides	7	-	7	-	-	7	-	14	14	-	49
Doliolum denticulatum	28	56	14	7	-	14	14	28	49	14	224
Doliolum mülleri	-	5	-	3	-	7	7	-	-	7	29
Oikopleura diocia	-	-	7	-	14	-	-	7	7	-	35
Oikopleura fusiformis	2	-	7	-	3	-	1	-	2	2	17
Sagitta setosa	14	-	7	14	-	7	7	14	-	14	77
Sagitta inflata	3	7	-	3	1	-	-	1	2	3	20
Mnemiopsis leidyi	84	63	21	8	16	80	17	12	10	6	317
Globigerina bulloides	42	-	14	7	14	-	14	56	21	7	175
Copepodit	7	7	21	-	7	35	14	7	-	-	98
Nauplii	21	14	21	7	-	35	14	21	28	28	189
Veliger larvae	7	7	14	-	-	-	7	-	-	-	35
Zoea larvae	14	7	-	-	21	7	7	-	14	7	77
Anamura larvae	3	-	-	-	-	2	-	-	2	-	7
Fish eggs	23	10	21	14	20	30	14	-	7	21	160
TOTAL	615	473	434	474	376	539	457	489	429	620	4966

The winter was the most unproductive period in terms of the number of species (Table 4).

Table 4. Fluctuations of species and groups abundance (ind./m^3)in winter

WINTER

STATION No: (ind./m^3) SPECIES	1	2	3	4	5	6	7	8	9	10	Total
Centropages typicus	105	126	168	98	161	133	63	84	112	189	1239
Centropages kröyeri	4	2	-	-	-	3	1	-	-	-	10
Acartia clausi	126	98	182	147	119	210	140	84	105	77	1288
Acartia negligens	1	-	-	3	-	-	-	-	-	-	4
Oithona helgolandica	56	77	70	105	56	77	63	35	63	42	644
Oithona nana	21	-	3	49	42	21	4	3	2	5	150
Oithona plumifera	-	-	-	-	-	-	-	3	-	7	10
Paracalanus parvus	-	7	-	14	-	14	-	-	7	21	63
Ctenocalanus vanus	-	-	-	-	-	7	7	-	-	-	14
Corycella rostrata	7	-	21	-	-	3	-	7	-	2	40
Calanus helgolandicus	63	77	126	105	84	42	126	63	84	119	889
Anomalocera patersoni	56	35	56	35	63	84	49	21	56	70	525
Evadne nordmanni	14	21	3	21	42	28	14	35	28	35	241
Evadne spinifera	63	84	105	56	70	126	112	42	35	63	756
Penilia avirostris	35	49	21	28	35	14	21	49	42	42	336
Creseis acicula	7	-	7	-	-	-	-	-	14	-	28
Maia sp.	-	5	-	-	-	7	-	-	-	4	16
Ophiothrix fragilis	3	2	-	-	8	-	-	-	-	-	13
Siphonophora (unident.)	28	14	-	-	7	-	-	-	-	-	49
TOTAL	589	597	762	661	687	769	600	426	548	676	6315

Discussion and Conclusions

The effect of the Black Sea-originated waters with low salinity on the distribution and abundance of the plankton in the neritic region of Gökçeada is relatively high. But this effect was on the plankton species mainly living in the surface or near the surface. Deeper waters are under the effect of the Mediterranean current system. The zooplankton population in the surrounding waters of Gökçeada was composed of mostly neritic species of cold waters with low salinity (Sever ,1997).Dominant species of the Northern Aegean Sea,which was influenced by the Black Sea via Çanakkale Strait, was *A. clausi* and *P.avirostris*, but this influence seems to be locally restricted (Siokou-Frangou et al.1999). The dominant group of zooplankton in the neritic waters of Gökçeada was copepods. The abundance and distribution of the copepods in the samples were much more than that of the others. The average annual percentage of the copepods in the total zooplankton was 63.7 %, and the cladocers with 14.1 % took second place. Copepods such

as *C. typicus, T. stylifera, Anomalocera patersoni, C. helgolandicus* and Tunicates such as *D. denticulatum, D. mülleri* were found frequently in the spring and winter samples. Tarkan and Ergüven (1988) noted in the study on copepods in the Sea of Marmara that larger species such as *C. helgolandicus* and *C. typicus* were very common almost everywhere in the Sea of Marmara. Cebeci and Tarkan (1990) stated that in the Black Sea-originated waters, spreading on the Aegean Sea via Dardanelles, copepods were dominant zooplankton group and had an average percentage of 80 % in the total zooplankton over year. In the winter samples of Gökçeada, this percentage reached a maximum of 77.4 %; the samples of spring, autumn and summer had percentages of 75.4 %, 52 %, and 47.5 %, respectively.Gökalp (1972) recorded in his studies on plankton in Edremit Bay, Aegean Sea in 1970 that percentages of copepods, appendicularians, cladocers and chaetognaths in the total zooplankton were 59 %, 12 %, 9 % and 5 % respectively.

Mesozooplankton community exhibited huge differences between Mediterranean and Black Sea in terms of their group composition.Based on the historical data, it was calculated that the total zooplankton consisted of 70-80 % copepods. The other groups were cladocers with 20%, apendicularian with 3.6 % and jelly organisms with 40 %. Abundance of total mesozooplankton in epipelegic waters of theMediterranean Sea (0-200 m) was 100-1000 ind./m^3 (Kovalev *et al.* 1999). Avarage abundance in Eastern Mediterranean by vertical haul was 200-45 ind./m^3 (Lakkis et al. 1999).

A similar research was carried out in the Adriatic Sea by Regner (1985). In the study of a five year period he noted that percentage of copepods in the total zooplankton ranged from 18.72 % to 99.43 %. He found that the percentage of total numbers of *C. typicus, C. vanus, T. stylifera* and *A. clausi* in the total numbers of copepods was 76.29 %. The average percentage of these four species in total zooplankton of Gökçeada over year was determined as 31.5 %.

The results indicated that smaller copepods such as *A. clausi, E. acutifrons* and *O. helgolandica* were in the majority. Larvae and fish eggs with an average annual percentage of 13.9 % took the third place after cladocers. Abundance total zooplankton in costal area of Gökçeada was in spring 829 ind./m^3, in summer 689 ind./m^3, in autumn 429 ind./m^3, in winter 632 ind./m^3.Biomass of *M. leidyi*, which is an invading species particularly at the depths between 10 and 30 m, was calculated as 1.7 kg/catch. These results were lower than those calculated for the Sea of

Marmara by Shiganova *et al.* (1995). In their calculation done for Dardanelles near Marmara it was determined as 11-13 kg/catch.

Özet

Bu çalışma Gökçeda kıyı sularının plankton populasyonunu belirlemek amacıyla gerçekleştirilmiştir.Derinliği 20 ile 30 metre arasında değişen 10 istasyonda sıcaklık,tuzluluk ve oksijen ölçümleri yapılmış, her istasyonda plankton kepçeleriyle vertikal ve horizontal çekimlerle zooplankton örnekleri alınmıştır.Adanın neritik sularında Çanakkale Boğazı'ndan gelen Karadeniz kökenli suların etkileri gözlemlenmiş ve Karadeniz'de var olan türler saptanmıştır.Laboratuvar çalışması sonuçlarına göre zooplankton içinde biyomas açısından en önemli gurubun kopepoda ordosu türlerinden oluştuğu,Özellikle yaz ve sonbahar periyodunda Kteneforlardan *M.leidyi*'nin aşırı çoğaldığı belirlenmiştir.Kopepodlardan *C.typicus,C. helgolandicus,C. vanus,A. patersoni* gibi iri türlerin kış ve ilkbahar periyodunda ortaya çıktığı, buna karşılık, bir kirli su indikatörü sayılan *A. clausi* türünün yıl boyunca her istasyonda yüksek oranlarda bulunduğu saptanmıştır. *C. rostrata, O.helgolandica, E. acutifrons* gibi nisbeten küçük türler çoğu istasyonda az sayılarda tesbit edilmiştir.Kladoserler her periyotta bulunmuştur.Bunlardan *P. avirostris,* en fazla rastlanan tür olmuştur. Çalışmalarda yıl boyunca 40 istasyondan toplanan örneklerde 51 tür saptanmıştır.

Acknowledgement

Thanks are due to Mr. Rahmi Gürsel Öğdül, Mr.Bülent Topaloğlu,Mr Ayhan Dede and Miss Melek İşinibilir for their kind asistance during the field work, and also to the crew of R/V Yunus I and Yunus II. This study was granted by the Research Support Fund of the University of İstanbul, Project Number 797/131295.

References

Cebeci,M. and Tarkan, A.N. (1990). Marmara Denizi'nde zooplankton Organizmaların dağılımı. *İ.Ü. Su Ürünleri Dergisi*, 4(1):59-72.

Demir, M. (1955). Denizel su pireleri (Cladocera) ve bunların Karadeniz sahil sularımız ile Marmara'da bulduğumuz nevileri. *Hidrobiyoloji Mecmuası*, 3(1):Seri A.3747

Demir, M. (1958). Kuzeydoğu Ege, Marmara ve Güney Karadeniz'in pelajik kopepodlar (Copepoda) faunası. Kısım I-II. *Hidrobiyoloji Mecmuası*, Seri A, 4-5: 110-120.

Kocataş,A, Bilecik,N. (1992) Ege Denizi canlı kaynakları. Tarım ve Köyişleri Bakanlığı Su Ürünleri Araştırma Enstitüsü,Seri A. Yayın No: 7, p. 88 Bodrum.

Gökalp, N. (1972). Edremit, Bodrum ve İskenderun Körfezlerinin plankton durumunun karşılaştırmalı incelenmesi. *Hidrobiyoloji Mecmuası*, Sayı 3: s. 1-33

Kovalev,A.V., Mazzocchi M.G, Siokou-Frangou I.and Kideys H.E.(1999). Change in zooplankton composition and abundance occuring from the Eastern Mediterranean to the Black Sea. Oceanography of the Eastern Mediterranean to the Black Sea. International Conference 23-26 February, 1999. Scientific Report. P: 113 Athens. Greece.

Lakkis, S., Siokou-Frangou I, Christou E., Mazzocchi M.G. and Zeidane R. (1999). Distinctive Features of the mesozooplankton from the Levantine Basin and adjacent Seas (Eastern Mediterranean). Oceanography of the Eastern Mediterranean to the Black Sea. International Conference 23-26 February 1999. Scientific Report. P: 274 Athens. Greece.

Özel, İ.. (1992). Pelajik kopepodların ve önemli familyaların tayin özellikleri. *Su Ürünleri Dergisi* : 9:33-35.

Özel, İ. (1992). Ege Denizi'nin başlıca planktonik kopepodları. *Su Ürünleri dergisi* :9:.236-254.

Pavlova, E. (1966). Composition and distribution of zooplankton in the Aegean Sea: *Investigation of plankton in South Seas*,7:38-61.

Regner, D. (1985). Seasonal and multiannual dynamics of copepods in the middle Adriatic.*Acta Adriat.*26 (2): 91-93.

Sever, T.M. (1991). Ege Denizi'nde bulunan planktonik kopepod, *Temora stylifera* Dana,1848 (Copepoda,Crustacea)'nın biyoekolojisi üzerine araştırmalar.Y.L. Tez.D.E.Ü.Deniz Bilimleri ve Teknolojisi Enstitüsü,1-42.

Sever, T.M. (1997). Ege Denizi pelajik kopepodlarının belirlenmesi ve önemli türlerin nitel ve nicel dağılımları. Doktora tezi. D.E.Ü. Deniz Bilimleri ve Teknolojisi Anabilim Dalı,Canlı Deniz Kaynakları Programı.115-119.

Siokou-Frangou, I., Shiganova, T., Christou, E., Gubanova, A., Kamburska, L., Konsulov, A., Musaeva, E., Pancucci-Papadopoulou and Skryabin, V. (1999). Mesozooplankton communities in the Aegean and Black Seas: A Comparative study. Oceanography of the Eastern Mediterranean to the Black Sea. International Conference 23-26 February 1999. Scientific Report. pp. 64-65 Athens. Greece.

Shiganova, T., Tarkan, A.N., Dede, A. and, Cebeci, M. (1995). Distribution of the ichthyo-jellyplankton (October 1992) *Mnemiopsis leidyi* (Agassiz,1865) in the Marmara Sea.*Turkish J. Mar.Sci.*I:3-12

Siokou-Frangou, I.,.Pancucci-Papadopoulou M.A and Kouyoufas, P. (1990). Etude de la répartition du zooplancton dans les Mers Egée et Ionienne.*Rapp.Com.Int.Mer Médit.*, 32:221.

Tarkan,A.N., Ergüven, H. (1988). Marmara Denizi'nde önemli kopepod türleri.*Su Ürünleri Dergisi.* 2:7184

Theocharis, A. and Georgopoulos D. (1993). Dense water formation over the Samothraki and Limnos plateaux in the north Aegean Sea (Eastern Mediterranean Sea). *Continental Shelf Research*,13: 8/9, p.919.

Ulutürk,T. (1984). Gökçeada çevresinin oseanografisi,balık faunası ve çevre fon radyoaktivitesi. Doktora tezi. İ.Ü. Deniz Bilimleri ve Coğrafya Enstitüsü.

Yüce, H., Türker, A. (1991). Marmara Denizi'nin fiziksel oşinografik özellikleri ve Akdeniz suyunun Karadeniz'e girişi. Uluslararası çevre sorunları sempozyumu. İstanbul Rotary Kulübü 285-294.

Received 30.3.2000
Accepted 20.5.2000