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RESEARCH ARTICLE

Mesozooplankton fauna and distribution in the Kızılırmak River mouth and Samsun Harbour area (Samsun, Black Sea)

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Abstract

In this study, mesozooplankton fauna of the Kızılırmak River mouth and the Samsun Harbour area in the Black Sea coast of Turkey was determined. Mesozooplankton samples were collected vertically from nine sampling stations in the above area with a standard planktonnet between July 2007 and December 2008. Mesozooplankton (0.2-20 mm) groups in research stations were Copepoda (10 species), Cladocera (8 species), Appendicularia (1 species), Chaetognatha (1 species), Rotifera, Dinoflagellata (1 species), Tintinidae, Bivalvia, Ostracoda, Cirripedia, Decapoda, Gastropoda, Polychaeta, fish larvae and fish eggs. Copepoda, Cladocera, Chaetognatha, Appendicularia, Rotifera, *Noctiluca scintillans* and Tintinnidae were classified in holoplankton while Cirriped nauplius and cypris, Bivalvia, Decapoda, Gastropoda, Polychaeta and fishlarvae, Ostracoda and fish eggs were grouped in meroplankton. When mesozooplankton biomass values were evaluated, the highest biomass values of Copepoda and Cladocera (690.9 mg/m^{3}and 269 mg/m^3) observed in station 7 while the highest biomass values of Chaetognatha, Appendicularia and *Noctiluca scintillans* (23 mg/m^3; 132 mg/m^3; 325.4 mg/m^3) in station 6 and Rotifera and meroplankton (423.1mg/m^3; 383.4 mg/m^3) in station 8.It is aimed to contribute to the knowledge of our biological richness by comparing differences in the density and distribution of the mesozooplankton species in relation to physico-chemical parameters.

Keywords: Black Sea, mesozooplankton, distrubution, MDS, cluster analysis

Introduction

Plankton fauna is one of the most important communities in marine ecosystem. Especially, herbivorous and omnivorous zooplankton have vital importance in feeding commercially valuable fish species and their larvae (Tarkan 2000). Zooplankton include various protozoa species, fish eggs, larvae and adults of metazoa species in pelagic ecosystem (Özel 2003).

According to the classification ofzooplankton in size, mesozooplankton is placed between 2-20mm (Sieburth *et al*. 1978). Mesozooplankton serve as a chain between micro (20-200 μm) and macrozooplankton (2-20cm) communities in marine food web and play a crutial role in the pelagic carbonflow process through their interaction with higher and lower trophic levels within the water column or within the benthic community (Neumann-Leitão *et al.* 1999; Isari *et al.* 2007).

Previous zooplankton researches carried out in the Black Sea (e.g. Zenkevitch 1963; Ergün 1994; Beşiktepe 2001; Yıldız 2010; Deniz 2013) dealt with issues like identification of species, abundance, biomass, vertical distribution, improvement phases and effects of environmental factors on the zooplankton.

In this study, we aimed to obtain information on the spatial/temporal distribution, abundance and biomass of mesozooplankton species in the Kızılırmak River mouth and the Samsun Harbour Area.

Materials and Methods

General Characteristics of Research Areas

The Black Sea is a semi-enclosed sea connected to the shallow Azov Sea through the Kerch Straits and to the Mediterranean Sea through the Istanbul (Bosphorus) Strait, the Sea of Marmara and the Çanakkale (Dardanelles) Strait. The flat abyssal plain is 4.2 x 10^5 km^2, the depth is up to 2200 m rises to the continental shelves and the volume is about 5.3x10^5 km^3 (Unluata *et al*. 1990). The research area Samsun is located at the south of Black Sea between latitudes 40˚52´N - 41˚45´N and longitudes 34˚50´E - 37˚11´E. Samsun is differentiated from the east and west sections of the Black Sea coast of Turkey in total precipitation (Baytut 2004).

The Kızılırmak River is 1,355 km long and is the longest river of Turkey, which begins from the Kızıldag Mountains in the northeast of Central Anatolia andreaches the Black Seaat Bafra.

Sampling Stations

Nine sampling stations were selected between the Kızılırmak River mouth andthe Samsun Harbour on the Black Sea coast (Figure 1 and Table 1).

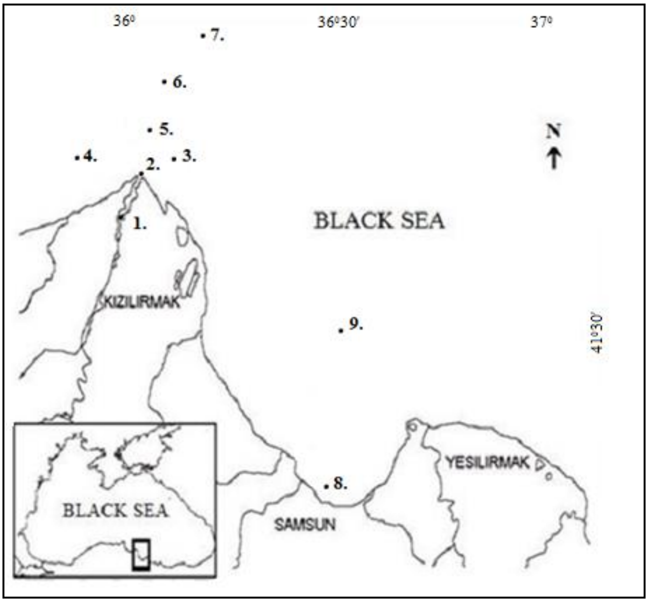

Figure 1. Sampling stations

Table1. Information of the sampling stations

Station	Depth (m)	Coordinates	Distance from the shore (km)*
1.	3	41˚43′49.67′′N / 35˚57′29.59′′E	0.5 KRM
2.	3	41˚44′11.50′′N / 35˚57′19.00′′E	0 KRM
3.	10	51˚44′56.00′′N / 35˚58′47.00′′E	1.2 KRM
4.	14	41˚44′56.00′′N / 35˚56′02.00′′E	1.1 KRM
5.	8	41˚44′11.50′′N / 35˚59′29.00′′E	0.5 KRM
6.	105	41˚44′56.00′′N / 35˚57′19.00′′E	3 KRM
7.	150	41˚45′32.00′′N / 35˚57′19.00′′E	5 KRM
8.	12	41˚18′15.00′′N / 36˚21′49.00′′E	0.25 SH
9.	40	41˚23′34.00′′N / 36˚23′51.00′′E	10 SH

*KRM: Distance from the Kızılırmak river mouth, SH: Distance from the Samsun Harbour

Sampling and Identification

Mesozooplankton samples were collected vertically at the sampling stations with a standard plankton net (a mesh of 115 µm, 1.5 m long and 57 cm diameter) between July 2007 and December 2008. After collecting the mesozooplankton samples, the net was rinsed gently and samples were transferred into 500 ml plastic jars and fixed by formaldehyde buffered with borax to a final concentration of 4%. The samples were then transferred to 50ml glass bottles and systematic identifications were made under the inverted microscope (Prior, UK) using Bogorov-Rass counting chamber. Mesozooplankton species were identified according to Rose (1933), Dussart and Defaye (1995), Boltovskoy (1999), Bradford-Grieve *et al.* (1999), Özel (2003), Boxshall and Halsey (2004), Witty (2004), (www.copepodes.obs-banyuls.fr, www.species-identification.org www.faunaeur.org, www.marinespecies.org). Countings were repeated three times for each sample and the abundance and biomass in1 m^3 seawater was calculated according to the formulae presented by Lagler (1956) and Özel (2000).

Abundance:

$$\text{Ind/m}^3 = \frac{\text{50cc(counting bottle volume)x1cc number of indx 1m3}}{\text{1cc x h}\pi\text{r2}}$$

$h\pi r^2$= Sample volume
r= Net radius
h= Vertical depth

Biomass:

$$\text{Biomass of zooplankton mg/m}^3 = \frac{\text{Total wet weight (mg)}}{\text{The amount of water filtered (V)}}$$

V (The amount of water filtered)= $\pi r^2 L$ (m^3)r= Net radius (m)
L= Vertical depth (m)

Physical and chemical parameters of the water samples were measured during the sampling period. pH was measured with a Consort C534.Total dissolved substance (ppt) (TDS), electrical conductivity (mS) and temperature (C$^{\circ}$)were determined using Cyberscan Con 11 salinometer and chemical parameters (NH_4NO_3, SiO_2, PO_4-^{3}) with Hanna C200. The water transperancy wasexamined with a 20cm diameter Secchi disk. In order to determine the chlorophyll-a concentration, water samples were filtered using whatman GF/F glass fibre filter paper with a pore size of 10 µm, then measured in 90% acetone extracts with Heλios Delta- Gamma brand spectrophotometer (APHA 1995).

Ecometrics
Statistical analyses were carried out using the PRIMER v.5 software. Hierarchical agglomerative clustering was applied to Bray-Curtis similarity matrix from abundance data of mesozooplankton species (Bakus 2007).

Results

Mesozooplankton Fauna
Mesozooplankton fauna were examined as holoplankton and meroplankton. A total of 22 holoplanktonic species were determined, that is, 10 copepoda, 8

cladocera, 1 chaetognatha, 1 appendicularia, 1 dinoflagellata and 1 tintinnid as hown below:
Copepoda: *Acanthodiaptomus denticornis* (Wierzejski 1887); *Acartia (Acartiura) clausi* (Giesbrecht 1889); *Calanipedia aquaedulcis* (Kritschagin 1873); *Calanus euxinus* (Hulsemann 1991); *Canuella perplexa (*Scott, T. and A. 1893); *Centropages ponticus* (Karavaev 1894); *Euterpina acutifrons* (Dana 1848); *Oithona similis* (Claus 1866); *Paracalanus parvus* (Claus 1863); *Pseudocalanus elongatus* (Boeck 1965); Cladocera: *Bosmina longirostris* (O.F. Müller1785); *Ceriodaphnia* sp.; *Daphnia (Daphnia) pulex* (Leydig 1860); *Diaphanosoma lacustris* (Korinek 1981); *Evadne spinifera* (P.E. Müller 1867); *Penilia avirostris* (Dana 1949); *Pleopis polyphemoides* (Leuckart 1859); *Pseudoevadne tergestina* (Claus 1877); Chaetognatha: *Parasagitta setosa* (Müller 1847); Tunicata (Appendicularia): *Oikopleura dioica* (Fol 1872); Rotifera; Dinoflagellata: *Noctiluca scintillans* (Macartney) (Kofoid and Swezy 1921); Ciliophora: *Favella* sp. In meroplankton fauna, however, polychaeta, decapoda, ostracoda, gastropod, bivalvia, cirriped larvae, cirriped cypris, fisheggs and larvae were determined.

Mesozooplankton Abundance, Biomass and Distribution

The hightest number of individuals was observed at the station 9 with 4869 ind\m^3 and the lowest at the stations 1 and 7 with 356 ind/m^3. The abundance percentages of mesozooplankton groups varied between 1 and 40%. Rotifera reached the hightest percentage with 46% while *P. setosa* had the lowest with 1%. The other groups varied as follows: Copepods 18%, Cladocerans 9%, Copepod nauplii 10%, *N. scintillans* and Meroplankton 7%, *O. dioica* 2%.

The abundanceof mesozooplanktonfluctuated monthly. The copepod abundance changed between 812 ind/m^3 (December 2008) and 41 ind/m^3 (July 2008). Two peaks were observed in copepod abundance in October 2007 and January 2008. Copepod nauplii were found throughout the year and its abundance varied as 37-317 ind/m^3. Cladocerans, however, increased in summer and peaked in July 2008 with 624 ind/m^3. *N. scintillans* proliferated in April, peaked in May with 1164 ind/m^3, declined in June and disappeared till August 2008. Meroplankton was observed in all sampling periods; the highest and the lowest numbers were 480 ind/m^3 (May 2008) and 15 ind/m^3 (October 2007), respectively (Figures 2, 3 and 4).

According to observations on biomass among stations, the highest biomass was determined at the station 8 with 1979 mg/m^3 and the lowest was at the station 1 with 100 mg/m^3, respectively. The contributions of mesozooplankton groups to the biomass revealed that copepods (722 mg/m^3) and copepod nauplii (346 mg/m^3) contributed mostly to the total mesozooplankton biomass in December 2007.

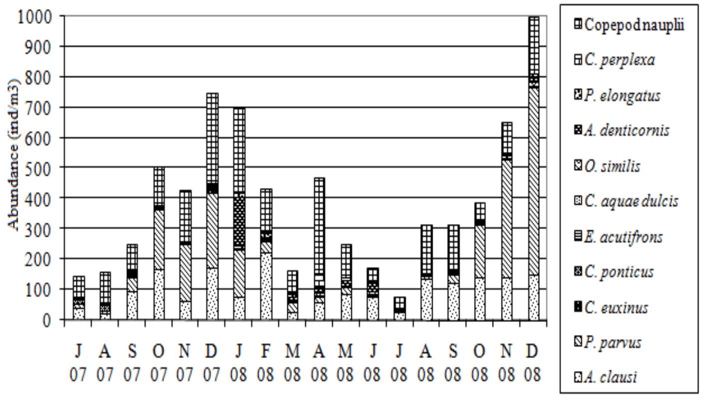

Figure 2. Seasonal change of copepods abundance

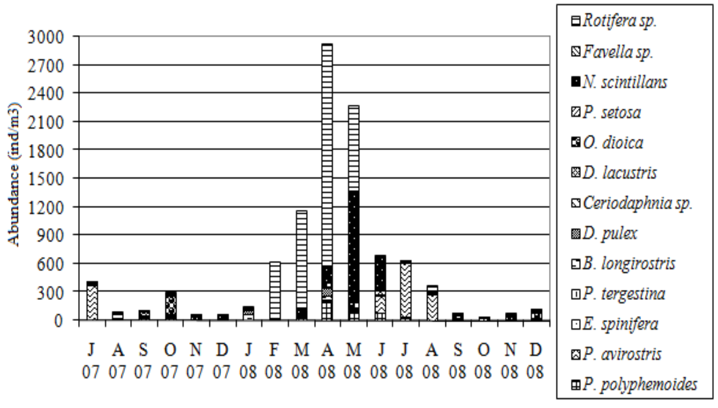

Figure 3. Seasonal change of the abundance of cladocera species, *P. setosa, O. dioica, N. scintillans, Favella* sp.and rotifera

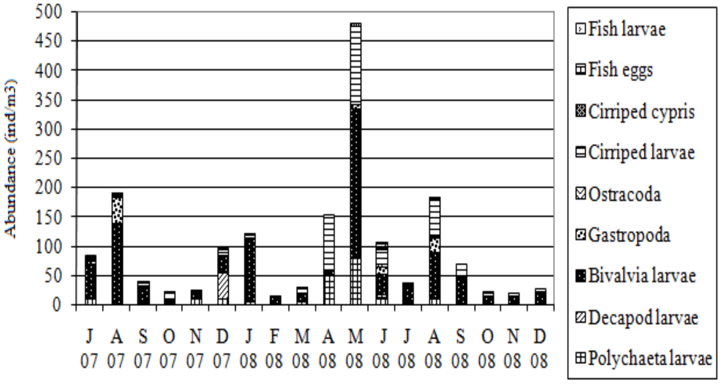

Figure 4. Seasonal change of meroplankton

The highest biomass of cladocerans was observed in July 2008 with 1334 mg/m^3, while *O. dioica* and *P. setosa* peaked in October 2007 with 284 mg/m^3 and 30 mg/m^3, respectively. *N. scintillans*, Rotifera and meroplanktonun reached to maximum in May 2008 with 1280 mg/m^3, 784 mg/m^3, 522 mg/m^3, respectively (Figure 5).

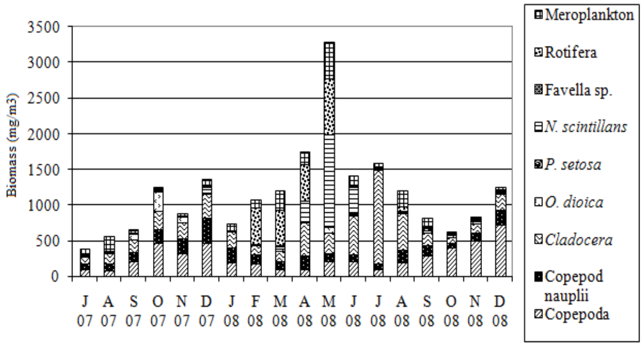

Figure 5. Seasonal changing of mesozooplankton groups biomass

During our sampling period of 18 months, the mesozooplankton abundance and biomass reached very high in spring (March, April, May 2008). While themesozooplankton abundance varied between 12 (September 07) and 108 (April 08) ind/m^3, biomass values varied between 11 (July 07) and 127 (May 08) mg/m^3 (Figure 6).

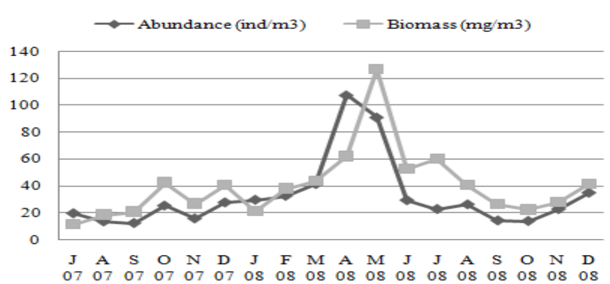

Figure 6. Seasonal change of the biomass and abundance of mesozooplankton

Physico-chemical influence

During studying period, the surface water temperature was measured between 28.5°(sta. 8.) - 4.6°C (sta. 1.) while water temperature varied between 27.5°C (sta. 3. depth 10m) -8.3°C (sta. 7. 40m depth). pH varied between 11.37 (sta. 8. May 2008) - 7.26 (sta. 3. September 2008) in the surface water. In deeper water, it varied between 7.72 (sta. 6. 20m depth, September 2008) and 10.91 (sta. 9. 20m depth, July 2008). The highest transparency was 10.5 m at the station 4 while the lowest was 0.3 m (February 2008) at the stations 1 and 2. TDS values varied in the surface water between 0.54 ppt (sta. 1.) and 31.9 ppt (sta. 8.). It varied in depth between 7.2 ppt (sta. 9. 40m depth) and 31.2 ppt (sta. 9. 40m depth). The conductivity the surface water was found between 1 mS (sta. 1.) and 34.8 mS (sta. 3.) whilein deeper water between 15.2 mS (sta. 9. 40m depth) and 36.3 mS (sta. 7. 40m depth). The amount of ammonia nitrate (NH_4NO_3), silicondioxide (SiO_2) and phosphate (PO_4^{-3}) were measured 0.1-1.75 mgL^{-1}, 0.1-2.2 mgL^{-1} and 0.01-5.7 mgL^{-1} respectively (Table 2 and Figure 7). The highest values withregard to chlorophyll-a were observed at the stations 8 (8,54 mgm^{-3} Aug 2008) and 2 (6,87 mgm^{-3} Sep 2008). We have determined that chlorophyll a recorded three peaks during the entire working period (Figure 8).

Table 2. Seasonal change averagetemperature, pH, Conductivity and TDS

Months	pH	Transparency (m)	Water temperature (°C)	Conductivity (mS)	TDS(ppt)
J 07	8,31	3,84	21,28	30,07	15,05
A 07	8,06	4,17	24,29	28,78	14,46
S 07	8,45	4,13	21,28	23,92	13,44
O 07	8,82	4,31	18,68	16,29	8,10
N 07	9,03	4,31	13,17	16,17	8,40
D 07	9,45	4,20	9,80	16,72	7,16
J 08	9,60	3,39	8,07	14,54	14,12
F 08	9,14	3,65	9,31	28,49	14,18
M 08	9,01	2,43	10,54	28,51	7,95
A 08	9,37	3,11	12,59	15,89	9,08
M 08	8,37	3,56	15,71	18,21	8,76
J 08	8,52	3,42	21,16	17,60	17,62
J 08	9,59	2,88	25,05	25,80	14,44
A 08	9,29	5,22	24,30	28,82	14,73
S 08	8,58	2,61	20,21	26,41	15,30
O 08	8,89	4,39	16,93	30,61	15,89
N 08	8,77	2,49	12,83	28,74	14,18
D 08	9,58	5,46	10,11	24,24	12,29

Statistical Results

The similarity level was determined by the clustering analyses depending on seasonal variation of abundance of mesozooplankton species.The highest andlowest similarity was 85 % and 3 %, respectively. According to these results, three clusters at 20 % similarity level were determined. *C. aquaedulcis*formed the first cluster on its own. Cirriped cipris, *D. lacustris*, Fish eggs, Fish larve, Ostracoda, Gastropoda larvae, *C. ponticus*, *E. acutifrons*, *P. setosa*, *E. spinifera* and *P. tergestina*formedthe second cluster. The third cluster included Rotifera species, *P. elongatus, C. euxinus, Favella* sp., *P. avirostris,* Bivalvia larvae, *P. parvus*, *A. clausi*, Copepod nauplius, N. *scintillans*, *O. dioica*, *P. polyphemoides*, Polychaeta larvae, Cirriped larvae, *C. perplexa*, *D. pulex*, *A. denticornis*, *B. longirostris*, *O. similis* and *Ceriodaphnia* sp. (Figure 9). The configuration of the mesozooplankton showed a convenient grouping with the 0.14 stress value (Figure 10).

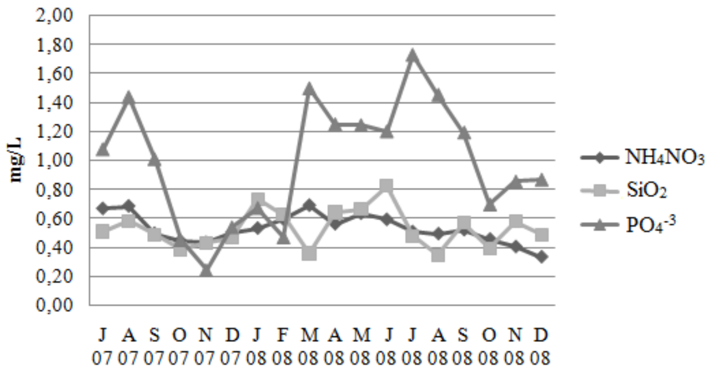

Figure 7. Seasonal change of average PO_4^{-3},SiO_2, NH_4NO_3

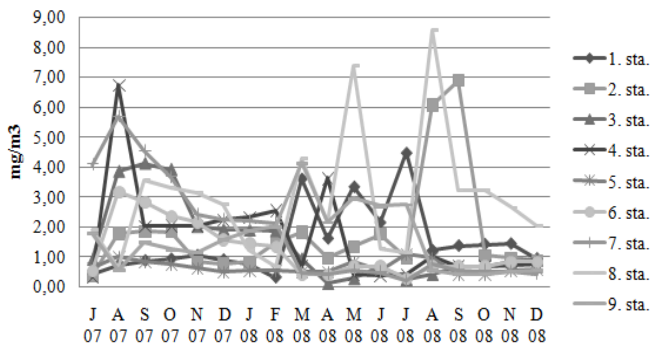

Figure 8. Seasonal change of average chl-a

Discussion

Mesozooplankton fauna, distribution and environmental factors were examined in this study in the Kızılırmak River mouth and the Samsun Harbour area between July 2007 and December 2008. While zooplankton composition varied monthly, its abundance decreased in winter, peaked in spring and increased again in fall as seen in previous studies such as (Özel 2000).

We identified 10 species of copepods (*Acartia clausi*, *Paracalanus parvus, Calanus euxinus, Centropages ponticus, Euterpina acutifrons, Calanipedia aquaedulcis, Oithona similis, Acanthodiaptomus denticornis, Canuella perplexa, Pseudocalanus elongatus*); eight species of cladocerans (*Evadne spinifera, Pseudevadne tergestina, Pleopis polyphemoides, Penilia avirostris, Daphnia* sp., *Bosmina* sp., *Ceriodaphnia* sp., *Diaphanosoma* sp.); one species of appendicularia (*Oikopleura dioica*); one species of chaetognates (*Parasagitta setosa*), rotifers, *Noctiluca scintillans* from dinoflagellates, *Favella* sp. from tintinnids, bivalvia, ostracoda, cirriped, decapods, gastropods, polichaeta larvae, cirriped cypris, fish egss and larvae in this study. Unlike Yıldız (1997, 2010) and Üstün (2005, 2010), we observed *Euterpina acutifrons, C. aquaedulcis, A. denticornis, C. perplexa, Favella* sp. while we did not observe *Tigriopus* sp., *Laophonte* sp. Byrozoa larvae, *Enhydrosoma longifurcatum, Microsetella norvegica, Oithona nana, Paramphiascella robinsoni, Pontella meditterranea, Eudorells truncatula*, foraminifer, *Idotea pelagica*, Epicarid isopod larvae.

It can be concluded that variations in zooplankton composition throughout the year may arise from changing climate conditions. Kovalev *et al*. (1998) and Niermann *et al*. (1998) compared several fluctuations in the oceans of northern hemisphere. Subsequent to their findings that atmospheric conditions in the 1980s caused some shifts in Black Sea phyto-zooplankton communites, they linked climate variations to the sharp decline in anchovy stocks of the Black Sea in 1988-1990.

Yıldız (2010) indicated that the timing of the mesozooplankton abundance peak varied every year from 1999 to 2006 in the southern Black Sea. Mesozooplankton groups varied in respect of individual numbers. The abundance of the mesozooplankton enhanced between February and May 2008 in our study. The highest abundance was observed in April 2008 probably due to excessive rainfall in this month.

Ünal *et al*. (2000) reported copepod biomass between April and May in the Sea of Marmara as 10.2mg/m^3. Copepods occupied 14.97-40.5% of total biomass and cladocerans 20.15-33.06%, appendicularians 9.16-28%, chaetognates 27.27-31.43%, polychaeta 6.67-8.63% and the others constitute 3.6-11.51% in the Istanbul Strait (Tarkan *et al*. 2005). We observed the mesozooplankton percentages as follows; copepods 23%, cladocerans 27%, rotifers 11% and copepod nauplii 13%, *Noctiluca scintillans* 10%, meroplankton 11%, *Oikopleura dioica* 4% and *Sagitta setosa* 1%. The dominant species of the sampling period were *Paracalanus parvus* and *Acartia clausi* (copepods), *Penilia avirostris* (cladocerans), *Noctiluca scintillans* (dinoflagellates), which are eutrophic water species, indicating the eutrophic characteristic of the Black Sea (Elbrachter and Qi 1998; Gubanova *et al*. 2001). TDS, which is usually the product of photosynthesis, consists of organic P, C, N, protein, amino acid, carbonhydrates and vitamins. From surface to 100 m depth, plenty of TDS observed especially in autumn (Geldiay and Kocataş 2012). Abundance of our dominant species *A. clausi* and *P. parvus* in autumn can be explain with increase of TDS amount during this season.

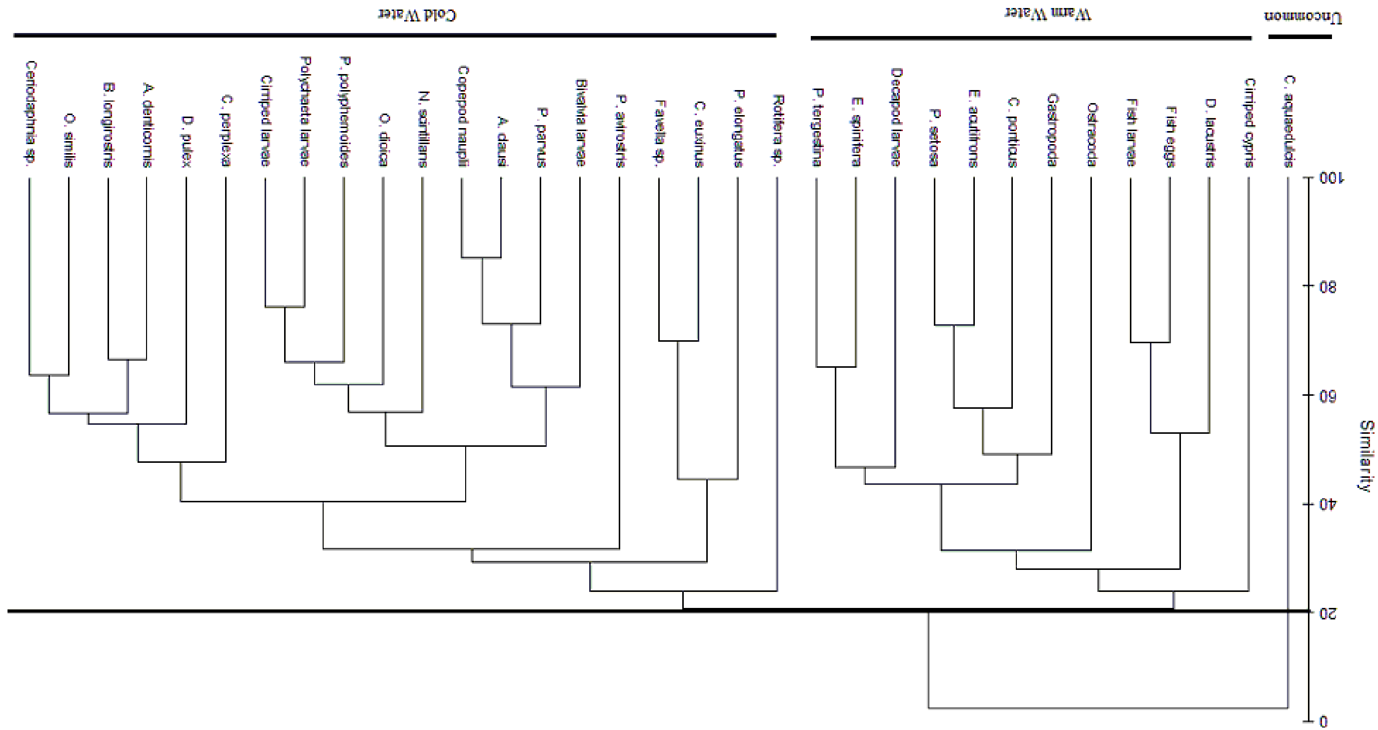

Figure 9. Cluster analysis based on seasonal changes in the number of individuals of mesozooplankton species

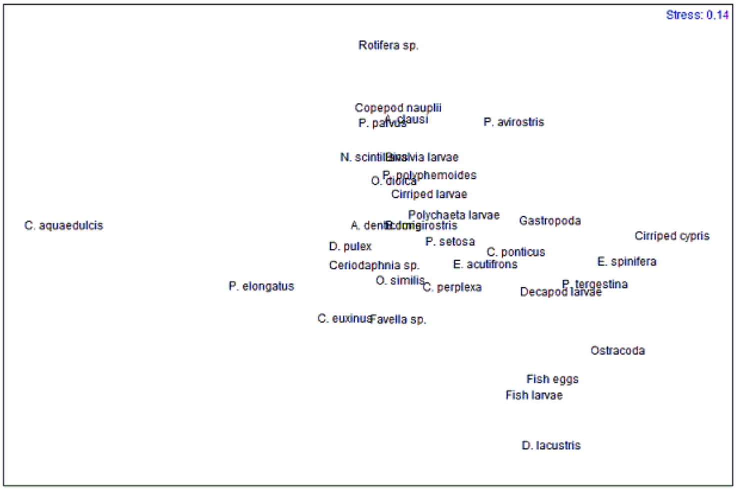

Figure 10. MDS plot from the similarity matrix of mesozooplankton abundance

Sea surface temperature (SST) during sampling period varied between 4.6°C (sta. 1. January) and 28.5°C (sta. 8. August) while in deeper water temperatures, however, varied between 8.3°C (sta. 7. February) and 27.5°C (sta. 3. August). Üstün (2005) determined the SST varying from 6.3°C (March) to 26.3 °C (August) in Sinop Peninsula, Baytut (2010) observed that SST were between 4.6°C (February) and 27.5°C (August) in the Kızılırmak River mouth. All three studies carried our in the same region showed the highest SST was recorded in August while the lowest values were observed in differentmonths.

Sea surface pH varied from 7.26 (September) to 11.37 (May). In deeper water pH, however, varied between 7.72 (September) and 10.91 (July). In the inner river station (sta. 1.), pH changed between 7.7 and 9.53 while the river mouth station (sta. 2.) varied from 8.01 to 9.93. The other varied between 7.7 and 11.32. The range was narrower in inner river and river mouth stations than the others. Particularly, pH peaked in late summer – early fall and late spring – mid summer in accordance with the other studies held in Samsun (Baytut 2004; Deniz 2009). The higher pH levels may be arised from alkalinization of seawater due to proliferated levels of photosynthesis by phytoplankton.

NH_4NO_3, SiO_2, PO_4^{-3} fluctuations were observed as 0.1-1.75 mgL^{-1}(September 2008, sta. 7.), 0.1-2.2 mgL^{-1}(September, October, November, December 2007-2008, sta. 1.), 0.01-5.7 mgL^{-1} (August 2007, sta. 1.). These values were rather high comparedto the other coastal waters or estuaries in the Mediterranean. The Black Sea, however, receives colossal nutrient inputs due to both vast drainage area and upwelling events (Murray *et al*. 1995; Yılmaz *et al*. 1997). Üstün and Bat (2014) observed that chlorophyll-a values were between 0.026-1.161 mg/m^3 in 2008. Our study found chlorophyll-a values varied from 0.11 to 8.54

mg/m^3.Our highest chlorophyll-a values were observed in the river (sta. 1.), river mouth (sta. 2.) and harbor (sta. 8.). Our chlorophyll-a values were higher than those reported by Üstün and Bat (2014). Except for stations 5., 6., 7. and 9., the stations are under the influence of fresh and brackish water or exposed to freshwater input, nutrient input, agricultural and anthropogenic influences.Therefore, it is considered to have high chlorophyll-a value.

The hierarchical cluster analysis which was applied on the mesozooplankton abundance similarity matrix revealed four groups at 20% similarity level. The first group is called "Uncommon". It consisted of *Calanipedia aquaedulcis* which was observed at the inner harbour station only in February throughout the sampling period. The second group is called "warm water". It consisted of Cirriped cipris, *D. lacustris*, fish eggs, fish larvae, Ostracoda, Gastropoda larvae, *C. ponticus*, *E. acutifrons*, *P. setosa*, *E. spinifera* and *P. tergestina* which were observed in summer and early autumn. This observation agrees well with Huys and Boxshall (199l), Boltovskoy (1999) and Özel and Aker (2004).The third group is called "cold water" and included Rotifera species, *P. elongatus*, *C. euxinus*, *Favella* sp., *P. avirostris,* Bivalvia larvae, *P. parvus*, *A. clausi*, Copepod nauplius, N. *scintillans*, *O. dioica*, *P. polyphemoides*, Polychaeta larvae, Cirriped larvae, *C. perplexa*, *D. pulex*, *A. denticornis*, *B. longirostris*, *O. similis* and *Ceriodaphnia* sp. These are very common, salinity tolerant and brackish-freshwater species (Hansen *et al*. 2004; Gubanova and Altukhov 2007) and were observed in autumn and winter period in this study. The third group included Rotifer species of eutrophic waters. *C. aquaedulcis*have been reported from Samsun Bafra Balık Lagoon and Gıcı Lagoon (Ustaoğlu *et al*. 2012) in addition to the Azov Sea, the Caspian Sea, the Danube and the Volga branches (Grigorovich *et al*. 2002; Piontkovski *et al*. 2006; Bagheri *et al*. 2013; Popov 2011). In our research, *C. aquaedulcis* was observed only at the stations 8and 9 in April and December.The number of individuals was higher in December.Ustaoğlu *et al*. (2012) observed this copepod species in Balık and Gıcı Lakes in Bafra, Samsun. Saygı *et al*. (2011) observed this species in Liman Lake in Kızılırmak River delta. Gündüz (1991) observed this species in BafraBalık Lake. The mentioned lakes are lagoons.In our study, the presence of *C. aquaedulcis*in Samsun Harbor area implicated that it was carried via the ballast water of ships coming from the Black Sea riparian countries or via fishing boats or drainage channels in lagoon lakes. *C. aquadulcis* was not detected by Deniz (2013) in Samsun Harbor area during the studies carried out between the years 2011-2013. The reason of this is considered as Samsun Harbor becoming private in 2011, thus closed for fishermen boats, also the regulation which prohibits ballast waters to be discharged in the Harbor and within 50 sea-miles from the closest coast. *D. lacustris*, *D. pulex*, *B. longirostris*, *Ceriodaphnia* sp. and *A. denticornis*are the speciesknown from the Kızırmak River (Yiğit Atasagun 1998). In our research these species were observed in stations 1 (freshwater) and 2 (brackish water).

In conclusion, the mesoozooplankton community structure of the Kızılırmak River mouth and Samsun Harbour area is composed of eutrophic, salinity tolerant and temperate water species and is subjected to the anthropogenic influence.

Kızılırmak nehir ağzı ve Samsun liman bölgesinin mesozooplankton faunası ve dağılımı (Samsun, Karadeniz)

Özet

Mesozooplankton örnekleri Temmuz 2007 - Aralık 2008 tarihleri arasında seçilen 9 örnek alma istasyonundan aylık periyotlarda ağ göz açıklığı 115µm olan standart plankton kepçesi ile dikey olarak toplanmıştır. Araştırma istasyonlarında mesozooplanktonu (0,2 - 20 mm) oluşturan gruplar kopepod (10 tür), kladoser (8 tür), appendikular (1 tür), ketognat (1 tür), rotifer, dinoflagellat (1 tür), tintinid, bivalve, ostrakod, sirriped, dekapod, gastropod, poliket, balık yumurtaları ve balık larvalarıdır. Kopepod, kladoser, ketognat, apendikular, rotifer, *Noctiluca scintillans*, tintinid holoplanktonda, sirriped larvası ve sirriped sipris, bivalve, dekapod, gastropod, poliket, balık larvaları, ostrakod ve balık yumurtaları meroplanktonda sınıflandırılmıştır. Mesozooplankton biyokütle değerleri incelendiğinde kopepod ve kladoserlerin en yüksek biyokütle değerleri 7. istasyonda (690,9 mg/m^3 ve 269 mg/m^3), ketognat, apendikular ve *Noctiluca scintillans*'ın en yüksek biyokütle değerleri 6. İstasyonda (23 mg/m^3; 132 mg/m^3; 325,4 mg/m^3), rotifer ve meroplanktonun en yüksek biyokütle değerleri 8. istasyonda (423,1mg/m^3; 383,4 mg/m^3) gözlenmiştir. Bu çalışmada Kızılırmak nehir ağzı bölgesinin ve Samsun Limanının mesozooplankton faunası belirlenmiştir. Türlerin yoğunluğunda meydana gelen değişimler fizikokimyasal verilerle karşılaştırılmış ve mesozooplankton dağılımı üzerine etkileri incelenerek, bölgemizin biyolojik zenginliklerimize katkı sağlanması amaçlanmıştır.

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