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ZOOPLANKTON POPULATION AND ITS TIME SERIES IN THE NORTHERN CILICIAN BASIN - TURKISH COAST -

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ABSTRACT: *In this study, zooplankton population and its time series in the Northern Cilician basin of eastern Mediterranean Sea* (Turkish Coast), *about which very little work has been done so far, were examined. It was observed that copepods were the dominant groups as already expected and they constructed the majority of the zooplankton assemblages. Relations between copepods, phytoplankton, and other zooplankton groups were also examined.*

Key words: Zooplankton, Copepoda, Time series, Cilician Basin

KUZEY KİLİKYA BASENİ ZOOPLANKTON POPULASYONU VE ZAMAN SERİLERİ - TÜRKİYE SAHİLLERİ -

ÖZET: *Bu çalışmada, hakkında pek az çalışma yapılmış olan doğu Akdeniz bölgesi kuzey Kilikya baseninin (Türkiye Kıyısı) zooplanktonu ve onun zaman serileri incelenmiştir. Çalışma sonunda beklenildiği üzere Kopepodların baskın grup olduğu ve zooplankton populasyonunun temelini oluşturduğu görülmüştür. Ayrıca kopepodların fitoplankton ve diğer zooplankton gruplarıyla olan ilişkileride incelenmiştir.*

Anahtar kelimeler: Zooplankton, Copepoda, Zaman serileri, Kilikya baseni

INTRODUCTION

In comparison with the other basins in the Mediterranean Sea, very little work has been done on the plankton of Northeastern Mediterranean Sea. First two attempts to plankton studies were carried out in İskenderun Bay by AKYÜZ (1), who studied on the Iskenderun Red Mullets and reviewed their overall environment, including plankton and this was followed by GÖKALP (2). Further, KIMOR and WOOD (3) have carried out a synoptic study of the plankton distribution in eastern Mediterranean Sea as a whole. Another similar study have been done by PASTEUR et al., (4).

Thus, in order to obtain basic information about zooplanktonic community structure and their change in time, a series of plankton study covering a whole year period, were carried out.

MATERIAL AND METHODS

Samples were collected on biweekly basis from November 1984 to November 1985, as much as technical, weather and ship facilities have permitted. Zooplankton were sampled by means of a 175 mm mesh sized plankton net, as described by TONOLLI and SCHLIEPER (5, 6). The station which was approximately 3.5 n. miles far from coast line (Figure 1), whith a depth of 100 m, was chosen off Erdemli-Campus in the western part of Mersin Bay (36 31'N, 34 18'E). By each cruise three successive vertical hauls were carried out, covering 0-75 m depth ranges (7). Samples were fixed and preserved. Each sample, then splitted into two parts, each for counting and wet weigth determination (7-9). Taxonomic background for the identification of the species has been gained mainly from the related publications of CARLI and CRISAFI (10), DAVIS (11), DEMİR (12, 13), NEWELL and NEWELL (7), HERON and DAMKAER (14), KOGA (15), NISHIDA et al. (16), ROFF (17), TREGOUBOFF and ROSE (18) and NEUNES (19). Methods applied for wet weight measurements were extracted from SCHLIEPER (6) and BEERS (8).

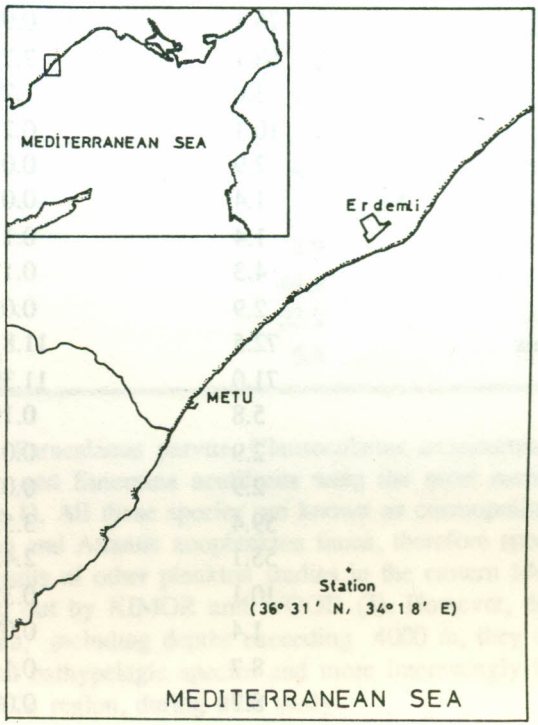

Figure 1. Location of sampling station

RESULTS AND DISCUSSION

Copepods were by far the dominant zooplankton group, as already expected, and comprised more than 80 % of the total zooplankton assemblages. General picture represented by the zooplankton assemblages is typical for the continental shelf habitats in temperate latitudes (20). Contributors, and their contributions to the zooplankton and copepod populations are listed in Table 1 and 2.

Table 1. Percentage of Occurrence, Percentage of Relative Occurrence and Maximum Densities of Copepod Species Recorded off Erdemli.

Species	% of occur.	% of abund.	Max (ind/m^3)
Acartia clausi	20.3	0.70	72
Acartia danae	5.8	0.16	17
Aetideus armatus	1.4	0.02	5
Augaptilus glacialis	1.4	0.02	6
Calanus minor	11.6	0.60	71
Calanus tenuicornis	26.1	0.96	59
Calocalanus pavo	68.1	7.77	227
Calocalanus sp.	13.0	1.29	204
Candacia armata	10.1	0.21	19
Candacia bipinnata	2.9	0.07	14
Candacia oethiopica	1.4	0.01	1
Centropages kroyeri	1.4	0.11	28
Centropages typicus	4.3	0.17	42
Centropages violaceus	2.9	0.03	7
Clausocalanus arcuicornis	72.5	11.81	330
Clausocalanus furcatus	71.0	11.39	443
Clytemnestra sp.	5.8	0.19	34
Copilia mediterranea	2.9	0.01	2
Copilia quadrata	2.9	0.01	1
Corycella rostrata	59.4	3.55	102
Corycaeus spp.	55.1	2.45	75
Ctenocalanus vanus	10.1	0.35	37
Euaetideus giesbrechti	1.4	0.02	5
Eucalanus elongatus	8.7	0.11	10
Euchaeta marina	8.7	0.07	7
Euterpina acutifrons	36.2	7.74	665
Haloptilus longicornis	4.3	0.04	6

Tablo 1. Continued

Species	% of occur.	% of abund.	Max (ind/m^3)
Isias clavipes	1.4	0.01	3
Lubbockia sp.	2.9	0.07	14
Lucicutia flavicornis	17.4	0.59	43
Lucicutia ovalis	2.9	0.04	6
Mecynosera clausi	42.0	1.27	57
Metridia lucens	2.9	0.12	20
Oithona nana	62.3	5.02	278
Oithona plumifera	78.3	14.11	325
Oithona similis	44.9	2.50	108
Oncea spp.	62.3	7.45	238
Paracalanus parvus	68.1	13.78	1612
Paracalanus sp.	4.3	0.04	4
Phaena spinifera	1.4	0.02	5
Pleuromamma gracilis	1.4	0.01	3
Potella mediterranea	8.7	0.19	20
Ratania flava	4.3	0.03	3
Sapphirina sp.	8.7	0.22	20
Scolectrix sp.	1.3	0.09	11
Temora longiremis	2.9	0.01	28
Temora spinifera	44.9	2.81	194
Undefined species (I)	23.2	0.82	28
Undefined species (II)	5.8	0.96	244

Oithona plumifera, Paracalanus parvus, Clausocalanus arcuicornis, Clausocalanus furcatus, Calocalanus pavo and Euterpina acutifrons were the most numerous copepod species within samples (Table 1). All these species are known as cosmopolitan, widespread components of Mediterranean and Atlantic zooplankton fauna, therefore species list given is rather consistent with the results of other plankton studies in the eastern Mediterranean, especially with the study carried out by KIMOR and WOOD (3). However, depending on the wideness of the survey area, including depths exceeding 4000 m, they could also record additional mesopelagic and bathypelagic species and more interestingly Red Sea species immigrating from indo-pacific region, during their study.

Table 2. Relative Abundance, Percentage of Occurrence and Maximum Occurrence of Zooplanktonic Groups Detected off Erdemli (Nov.1984-Nov 1985). Max. occ.'s are Given as no of ind./m^3

Groups	% of occur.	% of abund.	Max (ind/m^3)
HOLOPLANKTON			
COELENTERATA			
Hydromedusae	1.24	33.3	49
Siphonophora	0.59	21.7	25
CTNOPHORA	1.04	33.3	30
CHAETOGNATHA	2.55	53.6	134
MOLLUSCA			
Pteropoda	1.91	43.5	311
ARTHROPODA			
Cladocera	1.07	24.6	95
Ostracoda	0.94	26.1	32
Copepoda	81.15	91.3	4594
Amphipoda	0.07	4.4	7
Mysidacea + Euphausiacea	0.62	20.3	57
CHORDATA			
Thaliaceans	0.96	33.3	56
Appendicularia	1.18	30.4	76
MEROPLANKTON			
MOLUSCA	1.54	39.1	88
ANNELIDA			
Polychaeta	0.71	29.0	48
ARTHROPODA			
Cirripedia	0.74	21.7	72
Decapoda	0.55	23.2	42
ECHINODERMATA	0.51	15.9	40
CHORDATA			
Enteropneusta	0.08	2.9	8
Fish eggs	0.22	7.3	37
Fish larvae	0.03	2.9	6
Undefined egg-like org.	2.32	50.7	106

The immigration process of the marine animals and even plants (21, 22), is mainly directed by the prevailing surface current systems of the area and those species are transported along the Asiatic Coast, first in the north and then northwest direction. Along this transportation route, occurrence of the representatives of Red Sea copepod fauna could be isolated by a number of scientists working in the region not exceeding the Lebanon coasts (23). Spreading of planktonic species like copepods, whose locomotion are restricted by the movements of their surrounding waters, is very likely extended in the further north direction within same water system. In the samples examined, three copepod species, which are not common for Atlanto-Mediterranean plankton fauna, were also recorded. Although they could not identified at species level, it is hardly suspected that these species are originated from indo-pacific region. Also surprisingly, some meso- and bathypelagic species, such as Euaetideus giesbrechti, Eucalanus elongate, were found in the surface layers in December and in January. The unexpected occurrence of such species was probably related with mixing due to vertical convectional process taking place during winter period in Levantine Basin (4). As far as known, these processes involve water strate to a depth of 200 m in east of Meridian 30 E, including Cilician Basin. Atlantic water flow into Mediterranean Sea, streamed along the north African coasts at the surface and was overtopped by surface waters with higher salinity and temperature in the Levantine Sea (24). The involvement of this stratification which is detected by the disappearence of the salinity minimum confirm the aforementioned mixing phenomena (4).

Chaetognaths were the second important group. Beside their relatively higher percentage of occurrence (53.6 of all samples) and relative abundance (2.55 % of zooplankton population, in numbers), because of their carnivorous behavior on smaller zooplanktonic organisms, they played an additional role in quantity of zooplankton community. Thus, together with other copepod eating carnivorous organisms, they had an influential role in the dynamic of zooplankton population.

Other groups contributing to the zooplankton community of the studied area, in decreasing order, were Pteropoda, Mollusc larvae, Hydromedusae, Appendicularia, Cladocera, Thaliacea, Ostracoda, Cirriped larvae, Polychaeta larvae, Mysidacea + Euphausidacea, Siphonophora, Decopod larvae, Echinoderm larvae, Fish eggs, Enteropneusta, Amphipoda, and Fish larvae (Table 2).

Wet weight determination of the samples showed similar pattern of distribution with the numbers (Figure 2). Although size and volume of plankton vary in large ranges, because of the preponderance of copepods in the community, they always played the major role in the formation of biomass. However in some certain cases, e.g., in June, considerably higher numbers of Thaliaceans (5.2 %, in numbers) appeared in the samples. Members of this group have relatively large body cavities which can retain water and this probably caused higher wet weight values than real. Inversely, in July, the number of zooplankton attained relatively higher values, while the weight still remained low. This was probably a result of the predominance of small sized, small volumed immature stages of copepods (Stages of Nauplii and Copepodits) at this period. Remarkable decrease of phytoplankton in early August may also be attributed to the grazing of high number of juvenile copepods (Figure 2).

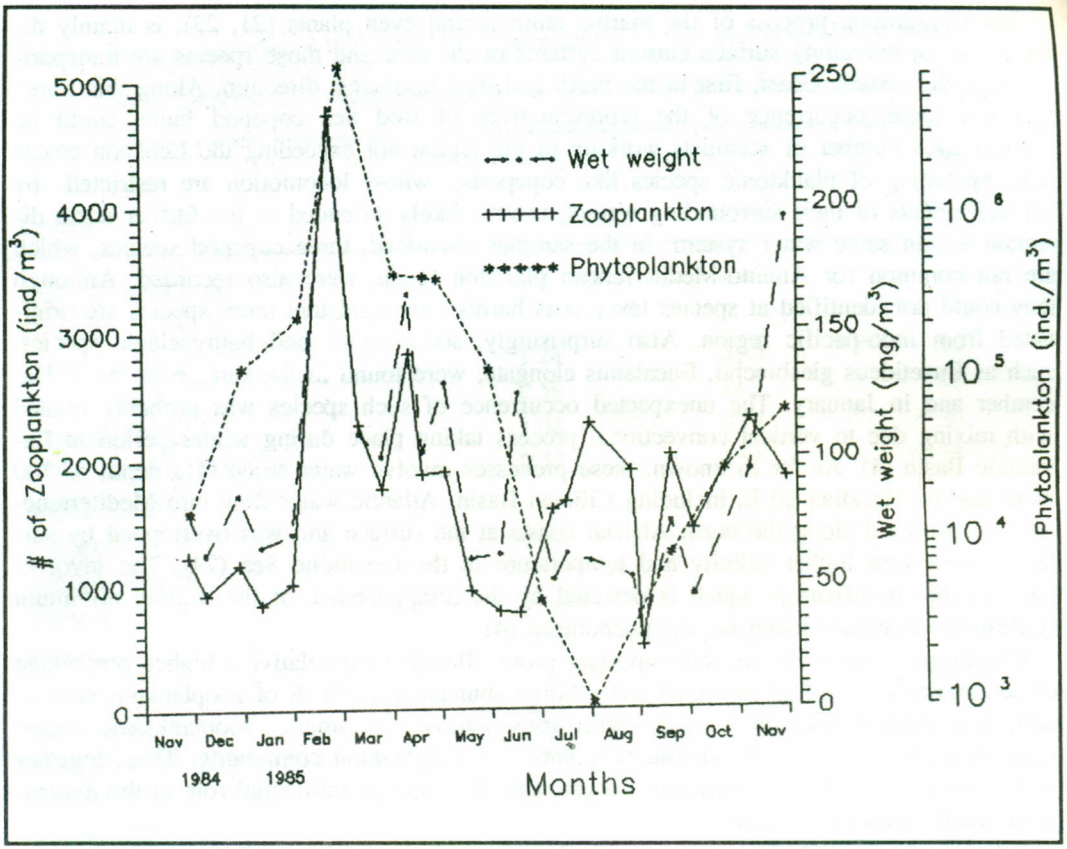

Figure 2. Time series of plankton community in the Northern Cilician Basin. (Number of phytoplanktons were taken from KIDEYS (10).

Peak values in numbers and weights were recorded at the period of spring phytoplankton bloom (25, 26). This was also coincided with sea surface temperature minimum and maximum rain fall. Based on this finding, it may be concluded that, zooplankton production of the region is only and evidently dependent on phytoplankton and (indirectly) on nutrient salts available for organic production.

CONCLUSION

Zooplankton fauna of the Cilician Basin is rich in species diversity, however parallel to the overall Mediterranean productivity picture, it is poor in terms of biomass. Zooplankton itself comprises significant amount of individuals belonging to at least two trophic levels. Therefore, energy produced by the primary producers is diminished by the zooplankton as the energy transferers between producers and larger vertebrates due to the well-known eco-

logical efficiency, before getting available to fish. This feature, beside the other most effective causes, such as low fresh water-nutrient input, narrow continental shelf etc. (27), is another explanation for low fish production of Mediterranean.

Finally, it is to stressed that Red Sea immigrants in the region which represent a interesting ecological context in terms of inhabitation process and competitive relations with their Mediterranean counterpart, are worth to study in a more comprehensive manner.

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