MESOZOOPLANKTON ABUNDANCE IN THE EASTERN MEDITERRANEAN DURING SPRING 1992

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Abstract

Within the framework of the international programme POEM-BC, mesozooplankton samples were collected at 20 stations in the Ionian Sea, Cretan Sea, Cretan Passage and Rhodes area (NW Levantine Sea), in March-April 1992. Vertical hauls were taken from 4 discrete depth layers in the upper 300 m water column. Depth-integrated abundances were decreased as follows: Ionian Sea, Rhodes area, Cretan Sea and Cretan Passage. Strong vertical gradients in zooplankton distribution were evident at almost all stations, especially in the Rhodos area where extremely high abundances at the 0-50 m layer were recorded. It seems that in spring 1992, the region affected by the Rhodes gyre acts as a strong upwelling area, as confirmed by the signal detected in the surface zooplankton abundance.

Key-words: Zooplankton, Eastern Mediterranean

Introduction

In the Mediterranean a west-east gradient in nutrients deficiency creates an oligotrophic environment (1) and even ultra-oligotrophic in its easternmost part (2). The role of mesozooplankton in the pelagic ecosystem of the Eastern Mediterranean and the influence of hydrology upon it were included among the aims of the POEM-BC (Physical Oceanography of Eastern Mediterranean-Biology, Chemistry) project. In the frame of this project, coordinated international cruises were carried out throughout the EMED in October-November 1991 and March-April 1992. In the present study, we present the results on mesozooplankton abundances collected at 20 stations during spring (March-April) 1992.

Materials and methods

A multi-vessel quasi-synoptic survey (POEM BC-O92) was conducted in March-April 1992. Oceanographic data (physical, chemical and biological) were acquired on a grid of stations covering a major area of the Eastern Mediterranean. Mesozooplankton quantitative samples were collected at 20 stations in the Ionian Sea (Western part), Cretan Sea, Cretan Passage and Rhodos area (Fig. 1). The stations were located along transects chosen on the basis of the known circulation patterns, some of them in areas with permanent hydrological features (see 3). Zooplankton samples were collected in the upper 300 m of the water column. Vertical hauls were taken from 4 depth layers (0-50, 50-100, 100-200, 200-300 m) using a WP2 closing net (200 μm) in all studied areas.

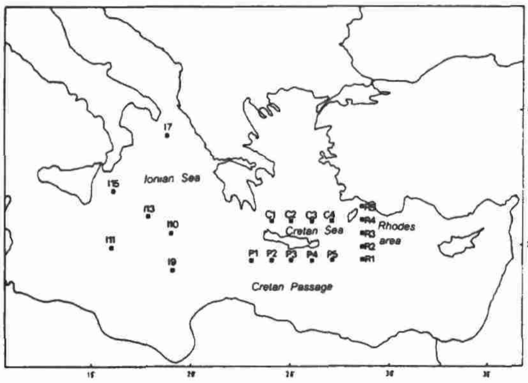

Fig. 1. Position of sampling stations.

Results

The highest depth-integrated (0-300 m) abundances were recorded in the Ionian stations I7 and I11 (341 and 337 ind.m^{-3}), neighboring to the Adriatic Sea and Sicily Channel (Table1, Fig. 1). High values were also reported in the Rhodos area, whereas the lowest value (74 ind.m^{-3}) was observed in the Cretan Passage (St. P2, Table1). The higher mean values were recorded for the Ionian Sea (250 ind.m^{-3}) and the Rhodos area (221 ind.m^{-3}), whereas the lower mean values were recorded for the Cretan Passage (119 ind.m^{-3}) and the Cretan Sea (149 ind.m^{-3}). One way ANOVA on depth-integrated values, revealed significant differences between areas (F= 4.87, P<0.05, 3 d.f.). The Tukey test indicated significant difference between the Cretan Passage and the Ionian Sea. Vertical profiles of zooplankton abundance displayed strong decreasing gradients from the surface to the deeper layers (Fig. 2). In all layers, but the surface (0-50 m), the highest mean abundances were reported in the Ionian Sea. In the surface layer, the highest mean value was recorded in the Rhodos area (988 ind. m^{-3}) being almost three times higher than those in the neighboring regions of Cretan Passage (311 ind. m^{-3}) and Cretan Sea (360 ind. m^{-3}). On the contrary, in the 50-100 and 100-200 m layers the lowest mean values (146 and 55 ind. m^{-3}, respectively) were obtained in the Rhodos area. In the 200-300 m layer, Cretan Sea, Cretan Passage and Rhodos area displayed similar mean

Table 1. Depth-integrated values (0-300 m) of zooplankton abundance (ind. m^{-3}) at each station in the study area.

Ionian Sea						
Sts	I7	I9	I10	I11	I13	I15
ind m^{-3}	341	291	176	337	199	159
Cretan Sea						
Sts	C1	C2	C3	C4		
ind m^{-3}	236	119	138	104		
Cretan Passage						
Sts	P1	P2	P3	P4	P5	
ind m^{-3}	156	74	108	157	106	
Rhodos Area						
Sts	R1	R2	R3	R4	R5	
ind m^{-3}	309	183	246	207	162	

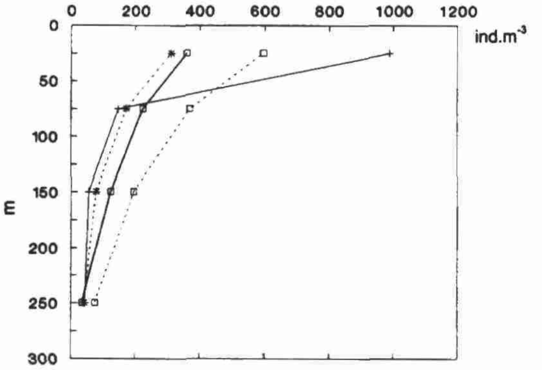

Fig. 2. Vertical profiles of total zooplankton abundances (ind. m^{-3}, mean values for each region).

abundances ranging from 34 to 43 ind. m^{-3}. The sharpest decreasing in the vertical profile was observed in the Rhodos area, with surface numbers representing 80% of the standing stock in the total water column, whereas the 200-300 m layer accounted only for 3% of the total. Although in the other regions this decrease was smoother, the deepest layer (200-300 m) accounted only for 5-7 % of the total water column.

Figure 3 shows the distribution of zooplankton abundance per station and layer. The highest surface (0-50 m) abundance was recorded in the central part of the Rhodos transect (1376 ind. m^{-3}, St. R3) representing the 95% of the total water column numbers, whereas the lowest was recorded in the Cretan Passage (239 ind. m^{-3}, St. P2). In Rhodos area, the lowest surface abundance was recorded at St. R5 (676 ind. m^{-3}). It is worth mentioning the high similarity among the surface abundances of the Cretan Sea stations, ranging from 341 to 375 ind. m^{-3}. One way ANOVA on surface abundances revealed significant differences between areas (F= 14.67, P<0.001, 3 d.f.). The Tukey test indicated significant difference between the Rhodos area and the other regions, while the Cretan Passage was significantly different from the Ionian Sea. In the deepest layer (200-300 m), the extreme low value of 3 ind. m^{-3} was recorded at St. R3 (Rhodos area, Fig. 3). In the same transect, St R1 differed from the other stations by displaying higher values in the layers below 50 m (Fig. 3). In the 50-100 m layer, the abundances recorded at Sts. R1 and R4 were from 1 to 5 times higher than those recorded at the other stations of this transect. The pattern of decreasing gradient with depth was not observed: (a) in the surface of St. C1 (Cretan Sea), (b) in the deeper layers of Sts R2 (Rhodos area), and (c) in the deeper layers of Sts. P1 and P2 (Cretan Passage). In order to check if the variability in the vertical distribution among stations could be attributed to zooplankton diel vertical migrations, one way ANOVA between day and night samples was performed. No significant differences (F= 0.74 P>0.05; 1 d.f.) between day/night data were detected.