P-I1

Vertical distribution of Zooplankton and Micronekton in the deep Levantine Sea

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In January 1987, oblique stratified tows from 4000 m to the surface were made in the Levantine Sea southeast of Crete using a 1 m^2 Mocness. The device was equipped with nine black 333 µm nets. Zooplankton (<0.5 cm) and micronekton (>0.5 cm) from two profiles were arbitrarily distinguished on the basis of their total lengths. In addition, a larger, >1.0 cm group was established (Fig. 1). This is commonly defined as micronekton or macrozooplankton (BLACKBURN, 1977).

Maximum concentrations of zooplankton (68,000 specimens/10^3m^3) were found in the 0-100 m surface layer. A secondary maximum (11,000 specimens/10^3m^3) was found at 600 to 750 m. Below this layer, the numbers decreased exponentially to 30 specimens/10^3m^3 or less at depths greater than 2750 m. Copepods were predominant, accounting for 56 to 96 % of the animals. Ostracods were abundant (16 - 23 %) at 1450 to 3000 m, displacing the copepods that decreased to 75 % and less. In the deep-sea, the copepod plankton was largely monogeneric. The genus Haloptilus constituted 83 to 93 % of the calanoids at 100 to 300 m. Eucalanus (75 - 90 %) abounded at 450 to 1250 m, and Lucicutia was predominant (up to 94 %) below 1850 m (WEIKERT and TRINKAUS, in press).

The profiles for the micronekton were similar to those for the zooplankton, but the numbers were 1.5 to 2 orders of magnitude lower than those of zooplankton. There was no secondary maximum in the >0.5 cm group, which outnumbered the >1.0 cm group in the upper 900 m and below 1650 m. Below 2250 m, no organisms >1.0 cm were caught, and the smaller micronekton rapidly decreased from 10 to 1 animal/10^3m^3 and less. The organisms found at these greatest depths are small chaetognaths, which may have been contaminants from the upper layers. In the top 600 m, chaetognaths were predominant, accounting for 72 to 100 % of the individuals caught. In the >0.5 cm group, which seems to reflect the abundance of carnivores in the net samples best (WEIKERT, in preparation), remarkable abundances of about 40 % of the total were also found down to 750 m. Between 450 and 1450 m, fishes numerically increased in importance to between 35 and 75 %, and at 1050 to 1650 m, decapods became abundant (16 - 36 %). Mysids were predominant below 1450 m, constituting 20 to 40 % of the total.

In summary, among the mesopelagic and bathypelagic faunas, there was a clear depth distribution of taxa. In the micronekton, a spatial segregation pattern was indicated among the major groups, whereas in the zooplankton, this was observed only at the genus level. Below about 2000 m, the numbers of zooplankton and micronekton specimens were strongly reduced in comparison with other seas. The overall bathymetric decrease in zooplankton is significantly stronger than in the great oceans (WEIKERT and TRINKAUS, in press). Also, the vertical distribution of micronekton in the Levantine Sea differs from that in the open ocean at similar latitudes. For example, ANGEL and BAKER (1982) collecting micronekton in a net with a 4.5 mm mesh size reported groups at depths of at least 4500 m in the northeastern Atlantic Ocean. Obviously, the zooplankton and micronekton are poorly adapted to the ecological conditions in the Levantine Sea caused by the increased temperatures of its intermediate and deep water masses.

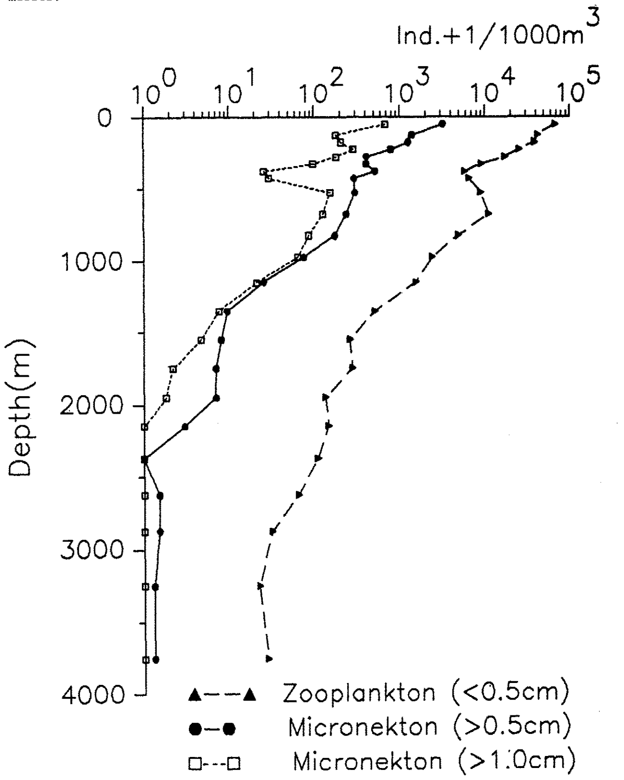

Figure 1: Numerical zooplankton and micronekton profiles from southeast of Crete (day, log-linear scale). Siphonophores omitted.

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P-I2

On the vertical distribution and composition of deep-water Copepod populations in the Eastern Mediterranean Sea

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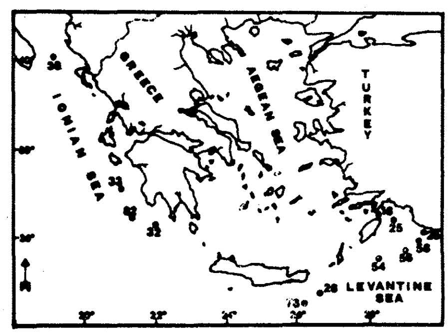
As few studies have been carried out on the synthesis and vertical distribution of deep-water copepods in the Eastern Mediterranean Sea (Greze, 1963; Delalo, 1966; Vaissière & Seguin, 1980; Scotto di Carlo & Ianora, 1983), our knowledge on this subject is still far from being complete. Within the framework of the "Open Sea Oceanography" project, during March 1986 and 1988, zooplankton samples were collected from different layers from the surface to the bottom with a WP-2 closing net at 12 stations situated in the Ionian and Levantine Seas (Fig.1). The results presented here come from the analysis of samples collected at depths greater than 500m up to 4800m (Vavilov deep). Only for two stations the first examined layer was 250-1000m and 300-1000m respectively.

The density (individuals per cubic meter) revealed differences between layers as also between areas. In the Levantine Sea, it varied from 0.38 to 3.66 ind/m^3 and in the Ionian from 3.89 to 6.51 ind/m^3, for the 500-1000m layer. The latter values are in accordance with those recorded by Scotto di Carlo et al. (1984) in the Tyrrhenian Sea. From 1000 to 2000m values ranged between 0.18 and 1.27 ind/m^3, while below 2000m density did not exceed 0.1 ind/m^3. A total of 98 copepod species were identified, their number decreasing with depth. Among those of the deeper layer, some individuals of species usually inhabiting the upper layers were found and must be probably considered as contaminants (Oncaea media, Oithona plumifera, O. helgolandica, Lucicutia flavicornis, Corycella rostrata, Euaetideus giesbrechti and Mecynocera clausi). However, we must point out that, in the Eastern Mediterranean, the water temperature below 500m is higher than that of the western Mediterranean (Miller et al., 1970) and this might explain the presence of surface species in deeper layers. Another point worth mentioning is the presence of many carcasses below 1000m, especially in the Levantine Sea, as well as some unidentified Calanoida (adults and copepodits).



From our results, the prevalling species for the 500-1000m layer were: Eucalanus monachus (the most abundant in both seas), Oncaea mediterranea, Spinocalanus spp., Clausocalanus spp., Haloptilus longicornis and Mormonilla minor. It is notable that the latter was not found at stations 25, 26, 54, 56 and 58, while it was present at the neighbouring stations 18 and 28. The abundance of H. longicornis and E. monachus in the Eastern Mediterranean in comparison with that of the Western Mediterranean has also been reported (Scotto di Carlo and Ianora 1983).

Below 1000m, relatively few species were found, the most common being E. monachus, Oncaea spp. and Clausocalanus spp.. Two species, namely Lucicutia longispina and Lucicutia longiserrata were found only below 1000m. As for the deeper examined layer (3000-4800m), very few copepods were found, most of them surely contaminants from the above layers. At layers deeper than 1000m we must also mention the presence of a discrete number of copepodits, mainly belonging to the genus Clausocalanus, Calanus, Lucicutia, Pleuromamma and some unidentified, as well as some copepod nauplii up to 4800m.

For many of the recorded species our results showed a quite similar vertical distribution with those of previous works in the same layers either in the Western or in the Eastern Mediterranean. However, some differences exist, related to several species. So, as for Lucicutia curta, this species in our samples seems to have a very wide migration or wider distribution in relation with previous informations. The species Monacilla typica and Gaetanus kruppi were not found below 1000m, while they have been referred deeper at the same areas. This could be attribute to their low abundance in the Eastern Mediterranean, according also to Scotto di Carlo and Ianora (1983). On the contrary, Mormonilla minor seems to have a wider distributional spectrum than previously referred, because we found it up to the greatest depth (4800m). As for Oithona helgolandica and Oithona plumifera, their vertical distribution seems to be extended up to 1000m, while their presence in deeper water may be considered as contaminant. Eucalanus elongatus, already referred up to 2000m for the Ionian Sea (Scotto di Carlo & Ianora, 1983) and in the layer 100-500 for the Levantine Sea (Delalo, 1966), did not appear in our samples below 500m.

Of the 98 identified species, we must point out that :

- 14 (Clausocalanus jobei, C. lividus, C. mastigophorus, C. parapergens, Diaixis pygmaea, Euchirella rostrata, Gaetanus kruppi, Haloptilus angusticeps, H. spiniceps, Lucicutia lucida, Oncaea notopus, O.obscura, Pleuromamma robusta and Scolecithricella tenuiserrata) are recorded for the first time in the Levantine Sea.
- 2 (Calocalanus adriaticus and Chiridius armatus) consist first record for the Ionian Sea.
- 2 (Clausocalanus pergens and Heterorabdus spinifrons) are first records for both Seas.
- 1 (Euchirella intermedia) is first record for the Eastern Mediterranean Sea.
- 1 (Lucicutia longispina) is first record for the Mediterranean.

These results must urge us to continue our investigations on the deep water zooplankton, trying to give answers to the many problems concerned.

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