P-II10

Tuscan Northern Tyrrhenian netzooplankton Autumn 1986

Serena FONDA UMANI and Alessandra DE OLAZABAL

Department of Biology, University of Trieste, 34127 Trieste (Italy)

During a cruise in the northern area of the Tuscan Tyrrhenian Sea (fig.1) in autumn 1986 zooplankton was sampled with a WP2 net (200 um mesh size) at 24 stations, by vertical hauls from 50 m to surface. Taxonomical analysis were carried out on a significant subsample, ash free dry weight (A.F.D.W.) was obtained as indicated in Lovegrove (1966).

We found 43 species and 9 genera of Copepods, all of these, with the only exception of Diaixis pigmoea and Pseudocalanus elongatus, strictly coastal species, are considered by Scotto di Carlo et al. (1984) as typical epipelagic tyrrhenian zooplankter.

On the contrary there is not a good accordance with Vives (1967) data for the same area, probably because we have sampled only at surface layers.

Copepods prevail in the whole area: the most common genera are Oithona (O. helgolandica, O. plumifera, O. setigera), Clausocalanus (C. arcuicornis, C. furcatus), Temora (T. stylifera), Paracalanus (P. parvus), Corycaeus and Oncaea. Also the copepodits and the juvenile stages of all the Copepods are very abundant. Among the other zooplanktonic groups only Tunicata (with genera Oikopleura and Doliolum) and Chaetognatha (with genus Sagitta) show a relatively high density.

Density values (as individuals . m) range from a minimum of 163 (st. 32) at maximum of 1865 and 1545 ind. . m (st. 7 and 21); generally speaking, the higher values are found around Elba island and near the tuscan coast (fig.2).

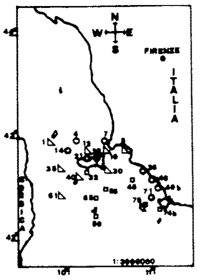

fig. 1

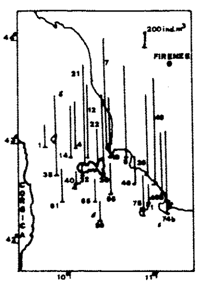

fig.2

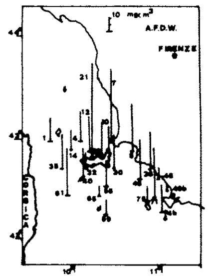

fig.3

Higher values of A. F. D. W. were found at stations 21 and 7 (respectively 74.9 and 57 mg . m^3), the minimum at station 49 bis (3.6 mg . m^3). The A.F.D.W. values have a distribution similar (fig.3) to that of density values (as ind. . m^3), even if not perfectly corresponding. Differences are due to the composition of netzooplankton population and are stronger when the density of Protozoa, antomedusae, doliola and young copepodits are very high.

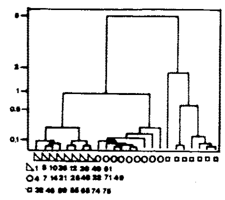
fig. 4 log dissimilarity scale

Based on the Copepod epipelagic populations we have separated the sampling stations into homogeneus groups by using an ordination method (clustering analysis on a distance matrix (option chord) (Lagonegro and Feoli, 1985) (fig.4).

So we can distinguish three areas (fig. 1):
the first, comprising stations 4, 7, 14, 21, 22, 26, 48, 49 bis and 71 strictly associated and characterized by neritic species,
the second (st. 1, 8, 10, 12, 30, 35, 40 and 61), also well associated and with a relatively good correlation with the first, wich we consider also influenced by neritic characters and, at last,
the third, constituted by stations belonging to the central area of the sampling rectangle (st. 32, 46, 55, 65, 74 bis, 75 and 89), with more oceanic characters.

To sum up, the tuscan northern tyrrhenian area is characterized by a relatively rich netzooplankton surface biomass both as regards its density values (as ind. . m^3) and A.F.D.W. values. The epipelagic Copepods prevail all around the sampling rectangle, only near the tuscan coast and Elba island do we find some typical low salinity species.

The stations' rank order, produced by cluster analysis, individualize two distinct neritic groups, located both eastward and westward of an oceanic central group.

Consequently we conclude that not only does the tuscan coast influence the netzooplankton surface distribution, but also that of Corsica and Elba islands.

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P-II11

Copepod community of the Maloston Bay (Middle Adriatic) as affected by natural eutrophication

Dubravka REGNER

Institute of Oceanography and Fisheries, Split (Yugoslavia)

The paper decribes some results on qualitative and quantitative investigations of copepods in the Maloston Bay, unpolluted, but naturally eutrophicated area in the Middle Adriatic.

Since copepods, the best represented group of net zooplankton respond quickly, both by composition and quantity, to the changes of the environment they inhabit, the consequences of eutrophication on the copepod community of the Maloston Bay will be discussed here. Basic hydrographic parameters (T°C, Sal°/oo and density) showed that the whole area is under a very strong influence of the land (Vukadin et al. 1986). The influence of river Neretva is strong too, but of very short duration.

Material for these investigations was collected by a "Hensen" plankton net (73/100, silk No 3), from bottom to surface in the 1985/1986 period, and some results from 1980/1981 were used, too. Station 1 (25 m depth) is situated at the entrance to the bay, station 2 (20 m depth) in front of Klek, station 3 (20 m depth) in front of Neum, station 4 (8 m depth) at the entrance to the creek named Bistrina, and station 5 (75 m depth) in the Mljet Channel (Fig.1). A total of 40 species and 2 genera (with about 6 species) were recorded from the whole area of bay. Most of them are common neritic species, widely distributed in all inshore Adriatic areas. The dominant species were: Ctenocalanus vanus, Paracalanus parvus, Centropages typicus, Centropages kröyeri, Temora stylifera and Acartia clausi.

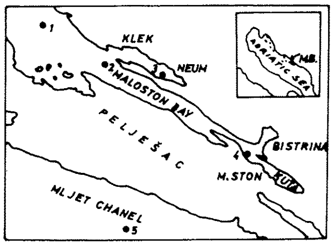

Fig.1. The study area

The occurence of Nannocalanus minor, Calanus tenuicornis, Clausocalanus pergens, Clausocalanus parapergens and some others, is indicative of some open sea effects, since they are predominantly pelagic. The biggest number of such species were found at station 5 in the Mljet channel (as it is under the strongest influence of the open sea), in winter or even in summer, depending on the system of currents in the Adriatic (Zore-Armanda et al. 1974). Besides, we could not find either the seasons for the incoming of pelagic species to the bay, nor the seasons for the maximum number of species, as they were caused by some determined situations (direction of currents, winds etc.).

As the composition of copepods is very similar in the recent investigations to the previous data (Buljan et al. 1973), we can conclude that it has not been changed in the longterm period under the influence of eutrophication from the adjacent land.

Besides the composition the number of species, the number of copepods $/m^3$, the diversity indices were also studied. At Tab.1., the data from 1980/81 and 1985/86 period were compared for all above-mentioned parameters.

Tab.1. The number of copepod species, the number of copepods/m 3 and the diversity indices in 1980/81 and 1985/86 period

	The number of species		The number of copepods/m 3		Diversity indices	
	1980/81	1985/86	1980/81	1985/86	1980/81	1985/86
Station 1	26	26 + 2	399	769	4.00	4.07
Station 2	22	22 + 3	421	959	3.47	3.50
Station 3	23	23 + 2	584	1266	3.45	3.36
Station 4	18+1	18 + 2	293	1595	2.29	2.58
Station 5	33+1	29 + 3	186	370	4.21	4.30

It can be seen that the composition of copepods- number of species, has not been changed in the five-year period inspite the influence of eutrophication from the adjacent land.

The values of diversity indices (Margalef, 1951) - as an impresion of the copepod structure - do not show any difference in 1985/86 year in comparison with these in 1980/81 year.

On the contrary, comparing the abundance of individuals, we found in the last period 2-5.4 times higher values in the whole investigated area. Such an evident increase in the five-year period, we could only connect with effects of eutrophication in the Maloston Bay area, that have caused the first step of changes in the copepod community. Besides, this increase was the highest at the station 4, situated at the creek of the bay, i.e. the most threatened area.

Summing all these results mentioned above, we can conclude that the increase of the copepod number in the Maloston Bay area is the only sign of natural eutrophication for the copepod community of the investigated area.

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