Benthic foraminiferal density and faunal composition in the Southern Adriatic Sea
The relation with the expected downward organic flux

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Assemblages of living (Bengal rose stained) benthic foraminifera were examined from the top 1cm of sediments from the shelf, slope and deep basin of the Southern Adriatic Sea, recovered in box-cores during cruise AD-91 of the Istituto di Geologia Marina of Bologna, in March 1991.

Over the depth-gradient covered by sampling, ranging from 146 m to 1200 m waterdepth, some remarkable changes can be noticed in the overall abundance and composition of benthic foraminiferal fauna's, which may reflect changes in the quantity and quality of the supply of organic food to the benthic ecosystem.

An overall decrease is observed in the abundance of living benthic foraminifera going from the shelf down into the deep basin. Assuming that the abundance of epifaunal foraminifera is proportional to the flux of organic food arriving at the seafloor, which flux according to SUESS (1980) is an inverse function of waterdepth (z), we tested if benthic foraminiferal abundance can be described as a function of 1/z.

The overall decrease in foraminiferal abundance with depth did not match the expected 1/z relationship. After subdividing the fauna in a group of non-opportunistic calcareous perforate taxa, a group of opportunistic calcareous perforate taxa, and a group of arenaceous and miliolid taxa, however, a fairly good correspondance was found between predicted and observed foram abundances for the first-mentioned group (Fig. 1). Notable discrepancies are seen on the steepest part of the basin slope, which has smaller populations than expected, and at the base of the slope, which has larger than expected populations. This phenomenon may be explained by downslope displacement of organic matter.

Opportunistic calcareous perforate taxa (among which species of *Bolivina, Bulimina* and *Uvigerina* are dominant) are most abundant on the shelf, where they compose almost one-third of the total fauna, but decrease rapidly both in absolute and relative number in the deeper water. It may be speculated that these taxa thrive on the short bursts of fresh organic detritus available in the shallow shelf waters.

The group of arenaceous and miliolid taxa, on the other hand, becomes increasingly dominant towards deeper water, and notably the epifaunal tree-like *Rhizammina* is very abundant at the base of the slope and in the deep basin. This clearly reflects the commonly observed shift from predominantly deposit-feeding foraminiferal faunas in shallow waters where food abounds to predominantly suspension-feeding faunas in deeper waters with a more scarce food regime (JONES and CHARNOCK, 1985).

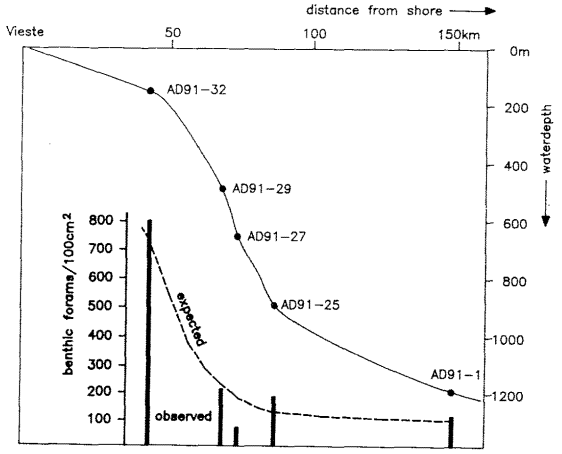

Figure 1. Bathymetric profile of the studied depth-transect, with box-core sites indicated. Bars below sites indicate the observed abundance of non-opportunistic calcareous perforate foraminifera, dashed line represents the expected abundance.

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Recovery of benthos after an anoxic stress. III. Meiofauna

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Response of meiofaunal communities to environmental perturbations, have been less studied than those of the macrofauna, despite of numerous advantages over it (HEIP *et al.*, 1988). Absence in meiofaunal response to seasonal anoxia (GRAY *et al.*, 1988) one can explain by less sensitivity of meiofaunal taxa, or faster recovery time in comparison to macrofauna. Heavy disturbance in meiofauna community structure, provoked by anoxic stress noted in the eastern and central part of North Adriatic, suggested the accuracy of the first possibility. Comparative analyses, carried out in November 1989, immediately after the stress detection, showed a stirring response of meiofauna to anoxic conditions. It was expressed by drastic decrease in nematodes (Ne) copepodes (Co) and total meiofauna densities, a significant increase of Ne/Co ratio, and in an expressive dominance of nematodes in relation to other meiofaunal taxa (TRAVIZI, 1990).

Recovery of meiofauna has been monitored at station SJ-005 (45° 18.4' N, 13° 08.0' E), about in the middle of the area which suffered from bottom anoxia in the autumn 1989. The station is characterized by the 30 m depth, and silty-sand sediment.

According to our results, the recovery of sediment meiofauna consumed a fairly short time, and it occurred very swiftly. Yet about six months after the stress, meiofaunal community structure showed insignificant signs of improvement. Abundance values of main groups remained fairly stable, and manifested only a very slow increase until June 1990 (Fig. 1), when total density increased nearly six times related to that of the preceding month. The Ne/Co ratio, still was distinguished by a very high value.

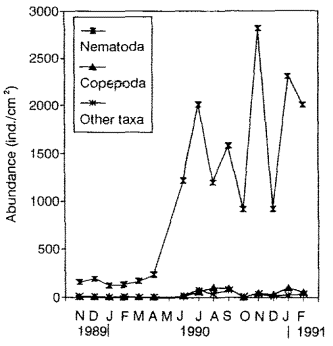

Fig. 1. Densities of meiofaunal taxa in recovery period 1989-1991.

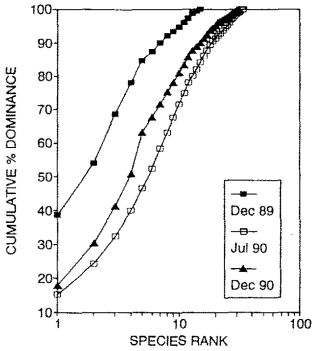

Fig. 2. Recovery steps of nematofauna associations at station SJ 005.

In July, the signs of intensive recovery were noted in nematodes, copepodes, and other taxa densities, and in decrease of percentage nematodes participation in total meiofauna. Total meiofauna and nematofauna densities increased more than 70 %, so in comparison to densities registered immediate after the stress event amounted about thirteen times higher values. Contemporary, copepoda abundance increased about ten times, while Ne/Co ratio decline from 226 to 38. In August a phase of stabilization was achieved, i.e. a phase of normal density oscillations, shortly intensified in October, when hydrographical data suggested the appearance of hypoxia. In December 1990, the oxygen depletion was not registered, but according to structural changes in meiofauna community, it seemed that hypoxia occurred, although it was less expressed, and perhaps shorter in time than one year ago.

The process of nematofauna recovery showed evolution strategy similar to that of total meiofauna. After the initial period of recovery, the species number increased more than 100%. Species dominance decline, and all diversity indices, increased and stabilized, suggested the reestablishment of dynamic ecological balance. The changes in shape and position of k-dominance curves indicate the apparent tendency to a associations recovery. According to some changes surveyed after the subsequent hypoxia appearances, the established equilibrium is not so stable to stand a test of a long-term, or an expressive oxygen depletion.

It is possible that repeated oxygen depletions, which in the North Adriatic recently increased in frequency, resulted in certain modification of benthic communities, in sense of increasing resistance toward certain levels, and duration of oxygen deficiencies. It seems that shortlived hypoxic conditions, as a slightly form of oxygen subsaturation, not significantly influence to meiofaunal community structure, and that could be espied only by repeated, monthly sampling.

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