POLYCHAETE, BACTERIA AND MICROPHYTOBENTHOS FLUCTUATIONS IN SUBTIDAL SEDIMENTS OF THE LIGURIAN SEA (NORTH WESTERN MEDITERRANEAN)

ALBERTELLI G.[1], DANOVARO R.[2], DELLA CROCE N.[2], FABIANO M.[3] FRASCHETTI S.[2]

[1] Dipart. di Scienze dell'Ambiente e del Territorio, Univ. di Milano, Italy
[2] Istituto Scienze Ambientali Marine, Univ. di Genova,16038 S. Margherita L., Italy
[3] Dipart. di Biologia Animale ed Ecologia, Univ. di Cagliari, Italy

Benthic bacteria and microphytobenthos represent important food source for macrofauna (NEWELL and FIELD, 1983) but their quantitative role in the diet of polychaetes has not been yet assessed (CAMMEN, 1980; MONTAGNA, 1984). The present study was designed to test the presence of a relationship between the fluctuations of the polichaete community and the fluctuations of the abundance and biomass of bacteria and microphytobenthos, representing a possible food source. From January 1991 to February 1993, a sandy bottom community at 10 m depth (Ligurian Sea) was investigated monthly by SCUBA divers. The following parameters were considered in the sediment : polychaete abundance (collected by using a suction device system, mesh sieve used 1 mm size), benthic bacterial density and biomass (estimated by epifluorescence microscopy), micro-phytobenthos biomass (measured as chlorophyll a) organic carbon (OC) and nitrogen (ON) (measured using a CHN analyser). Organic carbon showed the highest values both in winter (3.88 ± 1.89, 2.29 ± 0.57, and 2.02 ± 0.06 mg g^{-1} sediment d.w. in February and December 1991, January 1993) and spring (2.21 ± 0.14, 3.14 ± 1.11 mg g^{-1} sediment d.w. in April 1991 and May 1992, respectively), while the lowest at the beginning of summer (0.85 ± 0.00 mg g^{-1} sediment d.w. in June 1992). Nitrogen showed the highest value in October 1992 (0.46 ± 0.06 mg g^{-1} sediment d.w.) and the lowest in winter (0.14 ± 0.02, 0.19 ± 0.00 mg g^{-1} sediment d.w. in December 1991 and February 1993 respectively). Also chl-a showed wide seasonal fluctuations with minimum values in winter (0.18 ± 0.02 mg g^{-1} sediment d.w. in December 1992 and January 1993, respectively) and maximum in summer (3.96 ± 0.89 mg g^{-1} sediment d.w. in July 1991). Bacterial density and biomass varied seasonally being characterized during both years by spring (density: 2.68 x 108 g^{-1} of sediment d.w. in April 1991, 5.07 x 108 g^{-1} of sediment d.w. in April 1992; biomass: 11.94 and 21.06 mgC g^{-1} of sediment d.w., in April 1991 and 1992) and autumn peaks (density: 26.7 x 108 g^{-1} sed.d.w. in October 1991, 5.8 x 108 g^{-1} sed.d.w. in December 1992; biomass: 88.0 and 20.37 mgC g^{-1} sediment d.w., in October 1991 and December 1992, respectively). Polychaetes showed high seasonal fluctuations with spring peaks, and were significantly correlated with the chl-a trend (Spearman Rank Correlation, r = 0.94, p = 0.016, Fig. 1). On the contrary, no correlation was found with other sediment parameters. Deposit feeders were the most important group (52 %). They were significantly related to bacterial abundance (Spearman Rank Correlation, r = 0.985 p = 0.0004, Fig. 2).

It is well known that the standing stock of organic carbon does not always represent a measure of the amount of food readily available for benthic organisms. Food supply may have a major role in determining seasonal fluctuations of macrobenthos. Winter OC peaks, coupled with high C:N ratios (up to 17 in February 1991), suggest that the composition of the organic matter is mainly of refractory material (allochthonous origin). For this reason, the lack of significant correlations between polychaetes and organic carbon is not surprising. On the contrary, the significant correlation between the whole polychaetes community and microphytobenthos and between deposit feeders and bacteria, is consistent with those previously reported by MONTAGNA (1984), and it suggests the importance of these two components in the diet of polychaetes even though the presence of significant correlation between polychaetes and microbial parameters does not guarantee a cause-effect relationship and must be considered with caution. Nonetheless, since bacteria and microphytobenthos account for the majority of the labile organic matter and considering the oligotrophy of the Ligurian Sea, it is not unreasonable to assume that they may have a major role in structuring the polychaete community, especially as far as seasonal changes in trophic structure are concerned.

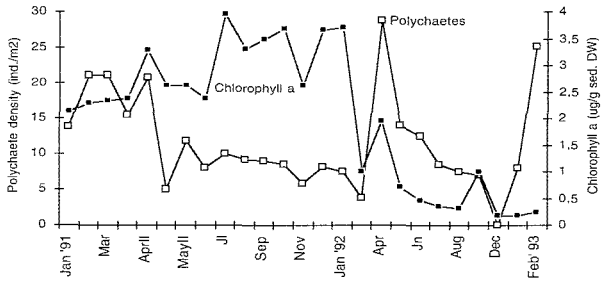

Fig. 1 Seasonal changes of polychetes abundance and chl-a content in the study area.

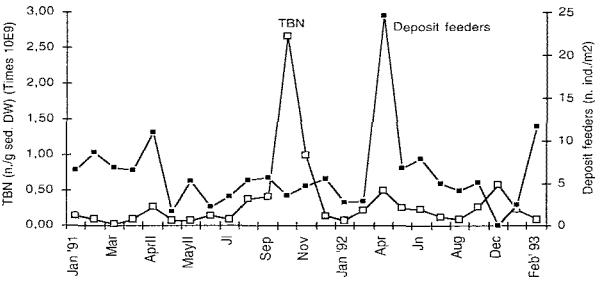

Fig. 2 Seasonal changes of deposit-feeders polychaete density and total bacterial number (TBN).

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