



Recent benthic foraminiferal assemblages and chemical pollution in box-core sediments from the SE Sicilian coast, Central Mediterranean

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In this study we compare the distribution and morphology of benthic foraminifera with pollutant (mercury and polycyclic aromatic hydrocarbons – PAHs) concentrations in box-core sediments, in order to establish a historical record of the biological response to pollution. Sediments have been collected along a west-east transect near the Sicilian coast, offshore of the Augusta urban and industrial area, during two oceanographic cruises onboard the oceanographic ship “URANIA” in summer 2003 and 2004. Pollutant inputs in this area are mainly derived from industrial and harbour activities, particularly from chloro-alkali plants active since the 1960s. The sediments display SiO₂ contents generally greater than 50% and carbonate contents ranging between 10 and 67% (mean value 21%). TOC concentration varies from 0.15 to 0.99%, with increasing values (a) from offshore towards nearshore, and (b) with decreasing core depth. TOC maxima in the lower portions of the offshore cores correlate to C/N values higher than 10, thus indicating significant inputs of land-derived organic matter.

Total mercury concentrations range from 0.018 to 1.7 mg kg⁻¹. Offshore samples have an average Hg content of 0.095 mg kg⁻¹, which is slightly higher than the background value calculated in the Sicily Strait (0.038 mg kg⁻¹; Tranchida, 2005). In the nearshore samples Hg is enriched by more than 20 times. These Hg concentrations appear to be hazardous because they grossly exceed national (D.M. 367/2003: 0.300 mg kg⁻¹) and international regulatory guidelines (ERL: 0.150 mg kg⁻¹; ERM: 0.710 mg

kg⁻¹, Long et al., 1995). Total PAH concentrations range from 0.02 to 1.59 mg kg⁻¹ (mean value 0.42 mg kg⁻¹). In nearshore sediments, PAH concentrations exceed national guideline limits (D.M. 367/2003: 0.200 mg kg⁻¹), indicating a low to moderate level of contamination. The majority of values are slightly less than the ERL (4.022 mg kg⁻¹; Long et al., 1995). One of the studied box-cores displays a clear trend of increasing PAH concentrations towards the top of the core, with values ranging between the ERL and the ERM (44.792 mg kg⁻¹; Long et al., 1995).

The microfauna is highly dominated by *Miliolidae*, *Rotaliidae* and *Brizalina* spp. benthic foraminifera. Most samples contain a great percentage of tests with various morphological deformities. In the nearshore box-core the percentage of deformed benthic foraminifera ranges between 3 and 6.5%, with higher values in the upper layer. In the following box-core the dominant aberrant taxon is *Brizalina* spp., with a decreasing occurrence of abnormalities from the top to the bottom of the core (20, 7, and 3% in the upper, middle, and lower portion, respectively). The significant correlation of the percentage of deformed tests with Hg and PAH concentrations and the low values of deformed tests during the pre-industrial time-interval indicate that foraminiferal species in this region may be sensitive and inexpensive biomarkers of human –induced environmental degradation.

References:

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