CHEMICAL PHYSICAL PARAMETERS OF MARINE SEDIMENTS AND DISTRIBUTION OF RECENT BENTHIC FORAMINIFERA NEAR THE ARGENTARIO HEADLAND (NORTHERN TYRRHENIAN SEA, ITALY)

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Abstract

Grain size, PCBs, pesticides, PAHs, TOC, N and trace elements have been studied in marine sediments near the Argentario headland to investigate the accumulation and distribution mechanisms of some contaminants. In addition, benthic foraminiferal assemblages were analysed because they well reflect the ecological conditions of sea bottom and some single species may be considered as bio indicators of particular environmental parameters. A correspondence analysis on the analytical data enabled to understand that only agriculture is source of significant pollution. Pesticides are mainly distributed along a belt parallel to the coast, following the dominant currents.

Key words: Pesticides, Organic Matter, Grain Size, Foraminifera

Introduction

The marine area comprised between the Ombrone River mouth and the Argentario headland (Tuscany) was been the object of a broad interdisciplinary research aimed to study the depositional processes in the coastal environment near the Ombrone River mouth (1). In this context, the effects of human activity have been studied by means of analyses on trace elements (Cd, Cr, Cu, Ni, Pb), PCBs, pesticides (DDs, HCHs, HCB), TOC, N, taking into account the natural characteristics of sediments (grain-size). Benthic foraminiferal assemblages have been analysed because their composition and structure well reflect the ecological conditions of sea bottom, showing typical features as response to organic or chemical pollution (2). Six sampling sites have been selected on two perpendicular transepts: the first one has the inshore-offshore direction, between 30 and 120 m water depth (A15, A7, A5); the second one has the direction parallel to the coast, at water depth of about 90 m (A11, A10, A7, A3).

Results and Discussion

A correspondence analysis was performed processing the analytical data, to highlight possible associations among variables. The output is given in two distinct diagrams due to the large number of variables; dimension 1 and 2 cover 50.8% of variability (Fig. 1).

Grain-size analyses show silty clayey sediments for all stations, with very low sand contents (3). TOC and organic nitrogen have particular statistical affinity with the finest fraction of sediments.

PAHs and PCBs concentrations are always lower than the mean recorded by UNEP (1996), showing the highest correlation with stations A5 and A10, respectively. Pesticides, that show generally relevant concentrations, have lower correlation with both the shallowest (A15) and deepest (A5) station in the statistical analysis. Trace elements show generally low concentrations and have a narrow range of values for dimension 1 and 2, indicating similar distributional patterns.

Foraminifera are mostly distributed in the 2nd and 4th quadrant: positive values of dimension 2 characterise shallow water species (i.e. *Ammonia* spp.) while deep-water species (i.e. *Uvigerina mediterranea*) have negative values. Some species included in the 4th quadrant show statistical correlation with trace elements while *Valvulineria bradyana*, that is located in the 2nd quadrant, demonstrates a marked statistical affinity with TOC, silt and clay.

Conclusions

A preliminary evaluation about the human impact on the coastal marine environment suggests that only the agriculture input is source of significant pollution. Pesticides are mainly distributed along a belt parallel to the coast, following the dominant currents, without involving coastal and offshore areas. The correlation occurring between trace elements and some foraminifera probably indicates the preference for the same sediments characteristics, more than a direct link. Trace elements, due to their low concentration, do not influence negatively the assemblages that show a good species diversity and no significant percentages of deformed specimens. Finally, our results confirm the hypotheses that *Valvulineria bradyana* is a good indicator of organic matter-enriched environments (5).

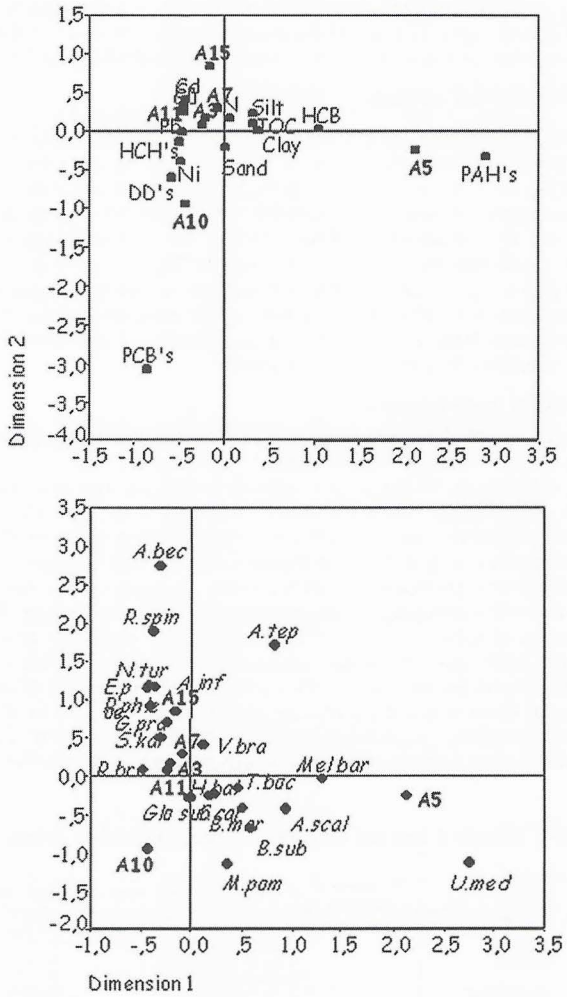

Fig. 1. Output of the correspondence analysis.

References

1 - Chiocci F.L., La Monica G.B. and Ombrone Scientific Party, 1997. Present day sedimentary processes on central Tyrrhenian continental shelf as the results of a 20 kyr environmental evolution. Abstract Volume International Progress in Oceanography of the Mediterranean Sea, pp. 263-264.

2 - Alve E., 1995. Benthic foraminiferal response to estuarine pollution: a review. *J. Foraminiferal Res.*, 25 (3): 190-203.

3 - Cicero A.M., Finoia M.G., Romano E., Celia Magno M. and Gabellini M., 2002. Composti organici persistenti in sedimenti marini costieri (Mar Tirreno centrale): un caso di approccio multivariato. *Studi Costieri*: 5: 23-34.

4 - UNEP, 1996. State of the marine and Coastal Environment in the Mediterranean Region. MAP Technical Report Series n° 100, UNEP, Athens.

5 - Bergamin L., Carboni M.G., Di Bella L., 1999. *Valvulineria bradyana* (Fornasini) in organic matter-enriched environments. *Il Quaternario*, 12 (1): 51-56.