DUMPING OF HARBOUR-DREDGED MATERIAL: A MULTIDISCIPLINARY MONITORING STUDY OF TWO DISPOSAL SITES IN CENTRAL ADRIATIC SEA (ITALY)

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Abstract
About 600.000 mc of sediment from Port of Pescara (Central Adiatic sea, Italy) were dredged and dumped in two sites located 3-4 Nm from the coast, during the period 1994-2004. In order to assess the potential environmental impacts due to the dumping of harbour-dredged material, the Central Institute for Marine Research (ICRAM) performed a multidisciplinary monitoring plan that carried out during three cruises (1999, 2001, 2004).
Keywords : Adriatic Sea, Chemical Analysis, Coastal Systems.

Accessibility of ports, harbours and navigable waterways is very important for the economic growth of coastal regions. Navigable depths must be maintained by repeated dredging and the disposal of dredged materials is one of the most important problems of coastal zone management. Depending on their chemical and sedimentological characteristics, dredged sediments may be disposed of in different ways. Sometimes good quality dredged materials are dumped in appropriate off-shore disposal sites.
In this context ICRAM (Central Institute for Marine Research) in 1999, 2001 and 2004 performed monitoring activities in two dumping sites of material dredged in the harbour of Pescara (Central Adriatic Sea). In these zones (defined as site A and site B), partially overlapping, about 600.000mc of materials were dumped between 1994 and 2003 . These sites are located 3-4 Nm offshore, between 21 and 60m of depth.

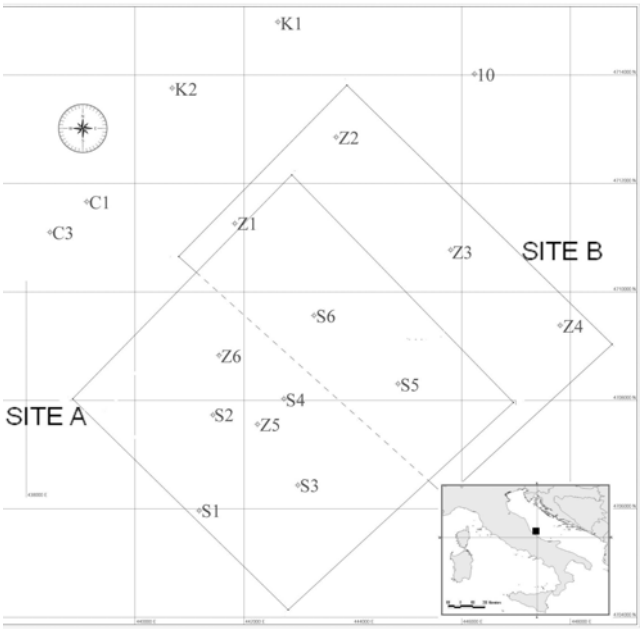

Fig. 1. Location of sampling stations and dumping sites.

During the monitoring activities acoustic investigation and sampling of sediment for physical (grain size), chemical (heavy metals, PCBs, Pesticides, PAHs, TBT, DBT, TOC and organic substances) and biological (benthic fauna) analyses were carried out.
The acoustic investigation performed by side scan sonar highlights a non homogenous distribution of harbour-dredged materials in the dumping sites. In particular the most amount of materials is concentrated in the landward part of site A, with some deposits out of the authorized area. In the overlapping sector between sites A and B sporadic deposits were also observed.
The grain size analysis shows the preponderance of clayey silt and silty clay, with the fine fraction increasing with depth. In the sampling station S1, located in the landward part of site A, a dysfunctional content of coarser sediments (gravel: 7.12%, sand: 29.45%), with respect to the previous monitoring activities is observed. In the same station, an anomalous concentration of lead (604.5 mg/kg d.w.) is found. This value can be associated with the presence of dumping material. Lower values of TOC and organic substance are found in the sampling station S1 and S3, both located in the site A and characterized by low percentage of mud.
PCBs levels detected in the dumping sites could be considered low (range 3.98-9.61ng/g). Lindane and Aldrin are absent in both sites investigated. DDT and its metabolites concentrations are lower middle (max value 5,55 ng/g d.w.).
PAHs concentrations result very low in all sampling stations (range 53 - 194 ng/g). Levels of contamination by TBT ranging from low (30 - 50 ng TBT/g) to moderate (65-85 ng TBT/g). Instead DBT concentrations are lower than the detectable limit.
Finally, the macrozoobenthic communities do not show any effects related at dumping of harbours sediments.
In conclusion, we point out that in site B, located at a gretaer distance of the coast, only sporadic deposits of harbour-dredged materials were observed. Moreover, these deposits were located in the landward part of site B, which is overlapping with site A. Evidence of recent and more consistent harbour-sediments deposition was found in site A; in addition some cumulus were found outside the authorized area on the landward side.
We underline the necessity to limit the dumping of harbour sediments derived from dredging activities in off-shore disposal sites and to prefer other, less impacting solutions.

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