

TRACE METALS DISTRIBUTION IN A DREDGE MATERIAL DISPOSAL SITE OF THE NORTHERN TYRRHENIAN SEA

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About 100.000 m³ of sediments dredged in the harbour of Livorno (of the 507.000 m³ authorized) had been dumped in a circular area of about 0.2 km² at a depth of 40 m, when the present study was carried out. Sediments were collected by a gravity core or by box corer in 19 stations (fig. 1) during March 1992. Subsamples for chemical and grain size analysis were obtained from 3 cm sections of the cores. Harbour dredged sediments were characterized by elevated sand content whereas the natural sediment texture in the disposal area is silty clay (IMMORDINO *et al.*, 1993). Surficial grain size composition shows an increase of the sand percentage in the dumping site and westwards (Fig. 2); a sand increase was also evident in the deeper sections of O5 core (8-11 cm: 33.1%; 16-19 cm: 32.0 %), inside the disposal site. The more elevated sand content in the south-east stations may be due to a northwest transport of biodegradable sediments from Meloria Shoals (GABELLINI *et al.*, 1994). Lead, cadmium and chromium concentrations were determined by GFAAS and mercury by CVAAS, after total digestion with HF/HClO₄/HNO₃/HCl mixture in a microwave system under pressure (GIANI *et al.*, 1994). On the basis of previous studies (ENEA, 1992) lead and cadmium concentrations resulted more elevated in harbour sediments (Pb : 26 - 213 mg/kg d.wt., Cd : < 5.3 mg/kg d.wt.) than in the disposal site before dumping (Pb : 29 mg/kg d.wt., Cd : 0.11 mg/kg d.wt.). Mercury concentration in harbour sediments were highly variable, chromium on the contrary was less concentrated in harbour sediments. Comparisons with our data are complicated by the use of different acid digestion (hot HNO₃/HCl mixture) which not always allow the total dissolution of the matrix. The Cd and Pb surficial distributions show similar patterns (fig. 2). Lead and cadmium, as well sand, seem to be useful tracers of the bulk of the dredge material. Lead concentrations found in surficial sediments range from 27 to 54 mg/kg with an average content similar to that found by LEONI *et al.* (1991) in silty clay and clayey silt of the Northern Tyrrhenian Sea, considered polluted by a diffuse anthropogenic input. Pb concentrations decrease from the top downwards in the cores, reaching 16-29 mg/kg in the 16-19 cm sections. The profiles are similar to the ones found in other short cores of the Northern Tyrrhenian Sea (LEONI *et al.*, 1991). Cadmium reaches the maximum concentrations in the O5 and P5 (up to 1.13 mg/kg) stations, these values are up to 10 times more elevated than in stations less influenced by the dumping. Cadmium distribution along the cores shows an increase at the top layer at the disposal site and in the stations S5 and R2, probably due to the Arno river sedimentation. The more elevated mercury concentrations correspond to the core collected inside the disposal site and are about three times more elevated than the average surficial concentration of all the other stations (0.11±0.02 mg/kg d.wt.). Average chromium concentration in the stations less influenced by the dumping is 265±98 mg/kg d.wt. with a decrease in the stations inside and around the dumping site (176±59 mg/kg d.wt.), probably due to a lower chromium content in the dumped harbour sediments. Other elevated concentrations have been reported by LEONI *et al.* (1991) south of the study area (127-176 mg/kg d.wt.), and by COSMA *et al.* (1980) in the zone just north of the study area (300 mg/kg as average value). Further determinations on the samples collected over a wider area in a survey carried out in 1994, will allow a better evaluation of the Arno river influence in the study area.

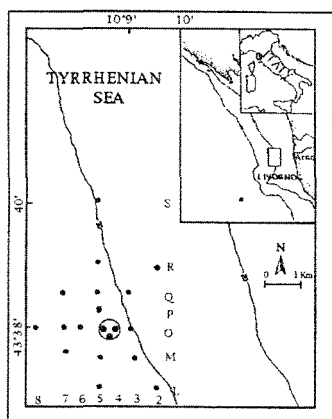


Fig. 1. Sampling stations (●) in the dumping site (○) and in the surrounding area.

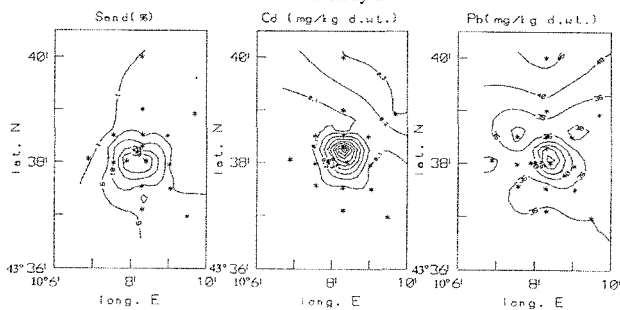


Fig. 2. Surficial distribution of sand, cadmium and lead.

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