Cadium, Chromium, Lead and Manganese content in sediment of the Gruz Bay

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The determination of the metal content in sediment of a particular environment is essential for the assessment of its pollution levels. Vertical distribution of metals in sediment, if appropriately determined, may provide historical background of pollution.

The Gruz Bay is situated in the eastern part of the southern Adriatic (near the town of Dubrovnik) (Fig. 1). The area has its special features due to its geomorphological, hydrographic, chemical and biological properties which distinguish it from the similar bays on the eastern Adriatic coast.

This peculiarity is due to a variety of factors of which river Rijeka Dubrovacka freshwater input and strong influence of the open sea are most important. The major contributors to this area are industrial waste waters and smaller amounts of domestic sewage and precipitation run-off. Sediment of the Gruz Bay is formed of two layers. The upper layer (mud) contains very high quantitites of organic matter, its thickness ranging from 0.5 to 5 m. The other layer is formed of clay with fragments of lime-stone. Sediment samples were collected from seven stations (depth range 5-40 m). Five-cm fragments of 54 to 300 μm fraction were analyzed for metal content and percentage of organic substance.

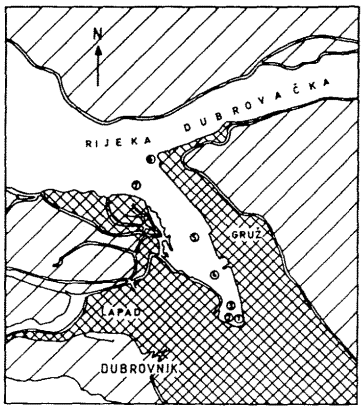

Fig. 1. Study area with station positions

Electrochemical atomic absorption spectrometry was used for Cd, Pb, Cr and Mn determination on Perkin-Elmer atomic absorption spectrophotometer, Model 1100B, with a HGA-700, graphite furnace and AS-70 autosampler system.

Organic matter content was very high, ranging from 8 to 28%, in all parts of the bay. The highest level was recorded from the bottom of the bay in the vicinity of municipal and industrial sewage outfalls. This level was reduced going towards the centre of the bay.

Spatial distribution of cadmium (0.02-3.43 μg g^{-1} DW) and lead (6.98-357.42 μg g^{-1} DW) significantly varied. Like for the organic matter, the highest quantities were recorded from the inner part of the bay, at stations 1, 2 and 3 (Fig. 2). This is quite normal since that area is strongly affected by municipal and industrial waste loads. At the same time manganese content (6.98-357.42 μg g^{-1} DW) is higher towards the bay outlet which is indicative of the fact that pollution loads there largely derive from the river Rijeka Dubrovacka inputs (Fig. 2). Chromium content (95.14-273.99 μg g^{-1} DW) is highest in the central part of the bay (Fig. 2). Even though this may be due to the vicinity of the town port, presumably chromium here is of terrigeneous origin.

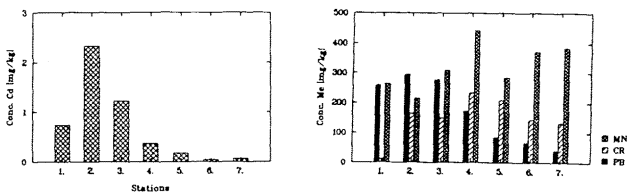

Fig. 2. Mean metal concentrations

Since the effects of organic matter on metal contents has been proved, the relationship between organic matter content and individual metals has been determined.

Table 1. Relationship between metal concentration and organic matter content expressed by linear equation: **metal conc. = a + b x org.matter(%)** (**r** is the correlation coefficient, **P** significance of correlation).

Metal	a	b	r	P
Cadmium (Cd)	-0.592	0.090	0.536	0.005
Lead (Pb)	55.604	7.930	0.417	0.034
Chromium (Cr)	218.148	-3.508	-0.325	0.105
Manganese (Mn)	452.371	-8.055	-0.494	0.010

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