An Account of the Levels of the Dissolved and Particulate Trace Metals in the Amvrakikos Gulf

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The Amvrakikos Gulf, from ecological and fisheries point of view, is one of the most important coastal areas of Greece. It is a basin of 455Km² with max depth of 60m, surounded by lagoons receiving the outflow of two rivers. It is connected to the Ionian Sea through a narrow (500m width) and shallow (10m depth) natural channel. Virtually nothing is known about the metal levels in its waters apart from a preliminary report of our group. (Scoullos et al, 1986)

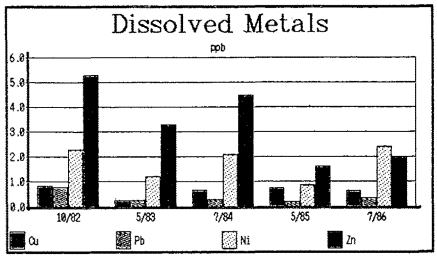

figure 1

The purpose of the present paper is to establish average seasonal levels of Cu,Zn,Pb and Ni as they were obtained from a grid of 15 stations sampled during a five year period (1982-1986). (fig. 1, 2)

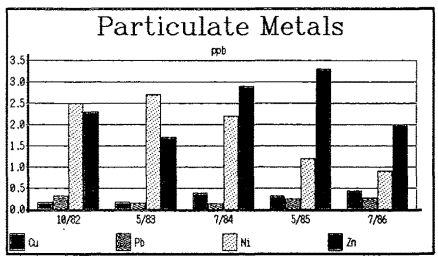

figure 2

Seawater samples were collected using polypropylene IOS bottles and plastic coated steel wires. The samples were filtered through 0.45μ Millipore filters which were treated in PTFE covered beakers with conc. HNO_3 whereas dissolved metals were preconcentrated on Chelex-100 resins using a slight modification (Scoullos and Dassenakis, 1984) of the Riley and Taylor (1968) method. The metals were determined by flameless AAS.
From the five samplings presented here one represents autumn (October 1982), two represent spring (May 1983 and 1985) and two summer (July 1984 and 1986).
The most prominent characteristic followed by all metals is the autumn maximum of their concentrations, particularly of the dissolved species of Cu, Pb and Zn and the particulate phase of Pb and Ni. This phenomenon is attributed to the breakdown of the very stable thermocline which enriches the entire water column with metals accumulated in the near bottom layers throughout spring and summer and also to the contribution of washout of the land and the atmosphere after the first rains.
The two spring samplings offer in general comparable levels of dissolved Pb and Ni, particulate Pb and total Zn although the percentage contributions of the two phases differ. The spring 1985 Cu concentrations, however, were significantly higher than those of the same period of 1983, influenced mainly by much higher levels observed in the deeper waters, (fig.3).

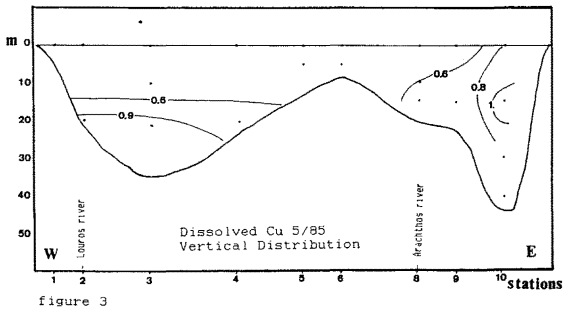

figure 3

The summer samplings of 1984 and 1986 also provide comparable levels for most metals (e.g. in ppb, for total Cu =1.05 and 1.06; Pb=0.43 and 0.58; Ni=4.3 and 3.3 respectively) whereas for Zn the 1984 value 7.4 ppb is nearly double of the 1986 one (4.0 ppb).
It is noteworthy that due to the morphological characteristics of the gulf a prominent stratification prevails already in May. The density gradients allow the surface waters to flush out rapidly, whereas the deep water mass is trapped in the gulf for long periods. The accumulation of all metals below the thermocline is clearly demonstrated during the summer.
The percentage contribution of the dissolved phases to the total is significant (50-70%) for all metals mentioned above.
In the 1984 sampling some extremely high values were observed at stations of the western part of the gulf influenced directly by the town of Preveza and the Ionian sea.

References

Scoullos, M.and Dassenakis, M. 1984. Determination of dissolved metals in sea water. Problems and modifications of the use of Chelex-100 resin. Proc.1st Greek Symp.on Ocean.& Fish.,pp.302-309

Scoullos, M. et al. 1987. Chemical studies of main estuaries and coastal areas of Greece. second version, Project CEC-ENV-560-GR.