

MERCURY LEVELS IN THE ATLANTIC AND MEDITERRANEAN WATERS  
IN THE STRAIT OF GIBRALTAR

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## INTRODUCTION

As is well known from the literature(1-2) the Mediterranean waters show mercury levels higher than those reported for the oceans. It must be pointed out, that the investigations were carried out by different researchers by means of various analytical techniques.

In view of these considerations an oceanographic cruise in the Strait of Gibraltar with the N/O "Bannock"(CNR) was held during September 1985.

In this area the presence of the Atlantic inflowing and Mediterranean outflowing waters allows contemporaneous measurements on the two water bodies and therefore a real comparison between the mercury content using the same analytical procedures and instrumentation.

## EXPERIMENTAL

Sampling was performed using pre-treated go-flow Niskin bottles. Surface waters were collected from a rubber boat at about 500 m. from the research ship. Samples showing turbidity values higher than 0.25 N.U. were filtered on board by a closed device under nitrogen pressure. Filters containing particulate matter were digested, as reported elsewhere(3). Dissolved mercury (reactive and total) was transferred on gold traps, as reported elsewhere(3). One liter of each sample was acidified (1 ml of HNO<sub>3</sub> suprapur grade), stored at + 5 °C and than analysed later in the laboratory. Analysis of the mercury content was performed by Atomic Fluorescence Spectroscopy. Images of the studied area received by NOAA-9 satellite and meteorological maps were used to evaluate the dynamics of the anticyclonic gyre and the mixing processes of the waters.

## RESULTS and DISCUSSION

Ten sampling stations were placed in the Alboran sea, in the Strait of Gibraltar, in the Atlantic ocean offshore the Gulf of Cadiz and in the North-West Mediterranean.

In each station salinity and temperature profiles by means of a CTD profiler were achieved to characterized the Mediterranean and Atlantic waters.

In fig 1 some profiles and the related concentration of mercury are reported.

In fig 1 B the existence of the double layer, of which the upper part is Atlantic water, with low salinity (36.8‰) and the lower part is Mediterranean with higher salinity (38.6‰), is reported.

An examination of the mercury concentration in the water column of each station studied allows us to draw the following conclusions:

- The value of the mercury concentration dissolved in Mediterranean waters is comparable to that of the Atlantic waters.
- The range of concentration observed runs between 2-6 ng/l.
- The average value is about 4 ng/l.

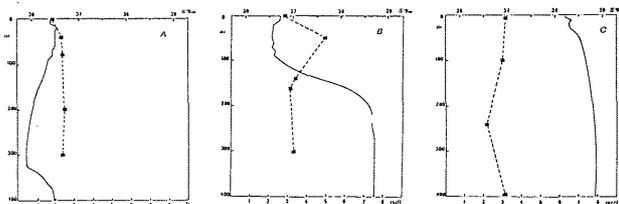


Fig 1. Vertical distribution of dissolved mercury (...) and salinity (-) in (A) Atlantic ocean, (B) Alboran sea, (C) North-West Mediterranean sea.

- No variations of metal concentration related to depth were noted.
- The concentration of "reactive" mercury is very little lower than the "total".
- The concentration of the mercury which is associated to the particulate suspended matter is very low (0.2-0.6 ng/l) partly because of the extreme transparency of the waters.

The results of the analyses of water samples made in the laboratory three weeks after the sampling indicate comparable values, even though slightly lower, to those of the analyses made on board. These results are substantially in agreement with those of Copin-Montegut et al.(4) on the II PHYCEMED Cruise (1984). It must be noted that these researchers consider that the Atlantic waters contain slightly higher mercury levels than those of the Mediterranean.

A comparison of our results in the Strait of Gibraltar and along the Tyrrhenian coast (1) seems to indicate slightly higher levels in the coastal area, especially where the water is less than 200 m. deep.

## REFERENCES

- 1) Ferrara, R., Seritti, A., Barghigiani, C. and A. Petrosino., 1986. Mercury levels in the Dissolved and Particulate fractions of the Tyrrhenian sea. *Mar. Chem.*, 16: 227-232.
- 2) Slerm, F., Seiler, W. and Schuster, G., 1981. Latitudinal distribution of mercury over the Atlantic ocean. *J. Geophys. Res.*, 86: 1159-1166.
- 3) Seritti, A., Petrosino, A., Ferrara, R. and Barghigiani, C., 1980. A contribution to the determination of "reactive and total" mercury in sea water. *Environ. Technol. Letters* 1: 50-57.
- 4) Copin-Montegut, G., Courou, P. and F. Laumond, 1984. Occurrence of Mercury in the Atmosphere and Waters of the Mediterranean. Meeting on the Biogeochemical cycle of Mercury in the Mediterranean. FAO. Siena 27-31/8/1984.

## DISTRIBUTION OF NUTRIENTS IN THE IONIAN SEA

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## ABSTRACT

The paper contains the results of the investigation on nutrients at 11 stations at standard depths covering all the water column in the Ionian Sea in March 1983.

The distribution of nutrients can be considered as a normal pattern for Mediterranean waters. In the euphotic zone, nutrients are practically depleted by the phytoplankton uptake. The oxidation of organic material induces a progressive enrichment of reactive phosphate, nitrate and silica from the layer beneath the thermocline to the bottom. A nitrite maximum is observed at the compensation depth for photosynthesis.

The N:P and Si:P ratios by atoms are characterized by a wide variability with depth at the euphotic zone. On the contrary, from 75m to about 800 m, the ratios rapidly increase and afterwards they tend to constant values of 21 for N:P and 35 for Si:P.

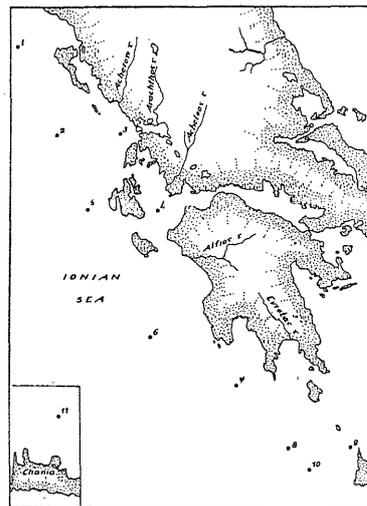


Fig 1. Location of the stations

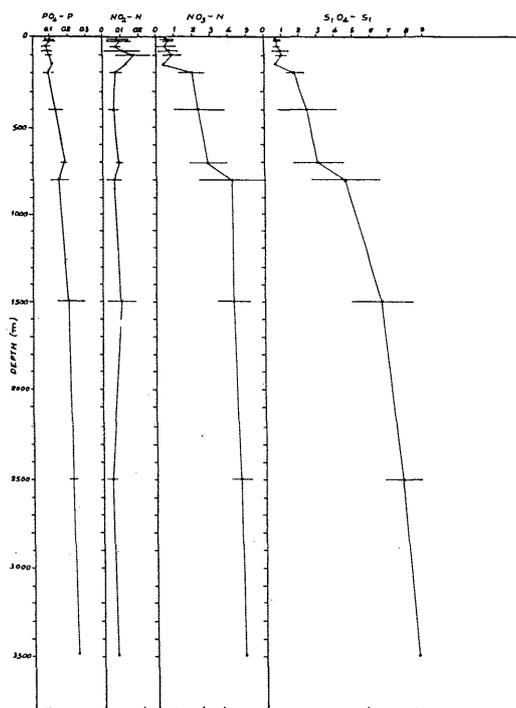


Fig. 2. Vertical distribution of nutrients

Component	Number of observations	Nutrient relationships		Ratio of change	Correlation coefficient
		Minimum and maximum values	Mean concentration (µM)		
PO <sub>4</sub> - P	106	0.07-0.24	0.11±0.05		
NH <sub>4</sub> - N	106	0.08-2.83	0.67±0.59		
NO <sub>2</sub> - N	106	0.05-0.30	0.10±0.07		
NO <sub>3</sub> - N	106	0.20-6.91	1.56±1.53		
DN <sub>1</sub>	106	0.50-7.37	2.33±1.58	DN:P=21.2	0.71
Si	106	0.48-8.56	1.96±2.05	Si:P=37.8	0.70