C

Chromium and Nickel in the Egyptian Mediterranean water

Fatma E. EL-NADY and A.R. ABDEL-MOATI

Oceanography Dept. Faculty of Science, ALEXANDRIA (**Egypt**)

Abstract

Seasonal and regional distribution of dissolved and particulate forms of Cr and Ni in the coastal and offshore waters of the southeastern Mediterranean basin off the Egyptian coast were studied throughout the year. High levels were observed in samples collected from nearshore areas specially at stations directly affected by continental runoff. The relating abundance of dissolved and particulate forms varied from inshore to offshore samples for each metal. The particulate concentrations of these metals were correlated with the total suspended matter and with some other metals (Al, Fe, Zn and Cu).

The total concentrations of the studied metals were comparable with other Mediterranean waters.

Introduction

The importance of studying chromium and Nickel lies on their toxic effect on living organisms, corrosive effect particularly chromates (BANERJEE, 1976) and their industrial uses. Cr and Ni compounds are involved in many technical processes; ;chromates are used in the textile, dyes and leather, tanning industries. Chromic acid is used as an oxidizing agent in organic technology. Hexavalent chromium compounds, which are poisonous constitute the main contaminant in the waste water of many industries (MANSOUR *et al*.. 1983 and ZAIDAN, 1983). Nickel compounds are also used in some industrial purposes, as Ni plating and tanning industries. Cr and Ni compounds are mostly used as alloys in electroplating and stainless steel industries (HOPIRTEAN *et al*., 1983, ESPEUT *et al*., 1983).

Material and methods

Twenty four sampling sites were chosen representing the deferent regions of the Egyptian coastal waters (Fig.1). Samples were collected using 10 liters PVC Niskin water sampler. Filtration and Analytical procedures were performed in a dust free clean lab. The technique described by TESSLER *et al*. 1979 was used in determination of total metal concentration associated with particulate matter ($HF/HClO_4$:5/1). After filtration, the preconcentration of dissolved metals was performed using a chelating ion exchanger resin (chelex 100) in ammonia form (ABDULLAH and ROYLE, 1974). Recoveries of Cr and Ni were 92% and 93% respectively.

Results and discussion

The average concentrations of Cr and Ni in dissolved and particulate forms are represented in Table I. The results showed that both metals exhibit clear differences in their distribution between near and off shore waters. Most nearshore waters lay in a higher concentration range than that of the offshore waters. The contribution of water discharged from landbased sources on the inshore environment is clearly reflected on the high levels of TPM and total metals in the neritic waters.

Despite the high toxicity of both metals, only few studies were made on the metal contents discharged to the Egyptian Mediterranean waters. The increased concentration discharged into the water are mainly attributed to the industrial sewage water dumped in the southern part of fresh water lakes.

The impact and magnitude of landbased sources on the inshore environment is clearly reflected on the high metal content recorded in the inshore zone specially in areas directly affected by their discharge. The coastal circulation pattern from west to east parallel to the coast does not permit their long - term accumulation in such areas. When water loaded with metals and nutrients discharged from different sources reaches El-Tina Bay, following the eastward circulation in the coastal zone, the shore configuration and circulation pattern in this bay (anti-clock wise gyre) renders it a store or trap for most metals and nutrients anthropogenically discharged to the area. This explains the appearance of high concentrations of the studied metals in areas far from any direct or brackish water discharge.

The behaviour of both metals tword the other elements were also studied, and showed intrcorrelations with certain metals (Table.2). The significant correlation between Cr and Ni (r=0.755) may indicate that both metals are mostly of the same origin. The ultimately correlations of both Cr and Ni with the other metals particularly Zn, Fe, Al and Cu may explain the wide use of both metals in different industrial purposes as described by DRAGO *et al*. 1983.

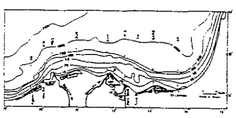
From the biological point of view Cr found at low levels in most biological materials with no evidence of accumulation at any point of the cycle.

Table (1). range, mean concentration (ng/1), standard deviations, number of samples and percent of dissolved metals in the Mediterranean waters of the study area.

METAL	CR	% OF DISSOLVED METAL (CR)	Ni	PERCENT OF DISSOLVED METAL (Ni)
DISSOLVED				
Winter (January)	14-170 66.33 ± 54.9 n = 23		0 - 495 215.78 ± 149.46 n = 23	
Spring (April)	7-21 13.27 ± 4.53 n = 11	17.68%	0 - 101 32.82 ± 25.25 n = 11	53.01
Summer (August)	6 - 14 9.0 ± 2.6 n = 8	14.67%	7 - 59 20.625 ± 19.03 n = 8	45.27%
PARTICULATE				
Spring	6 - 164 61.78 ± 46.43 n = 23		3 - 143 29.09 ± 37.32 n = 23	
Summer	20 - 100 52.36± 35.55 n = 14		3 - 83 24.93 ± 21.50 n = 14	

Table (2). correlation coefficients (R) of Cr and Ni with the other different metals in the study area.

METALS	R
Cr - Si	0.642
Cr - Al	0.697
Cr - Cu	0.628
Cr - Ni	0.755
Cr - Zn	0.724
Cr - Mn	0.580
Cr - Fe	0.481
Cr - Pb	0.617
Ni - Si	0.548
Ni - Al	0.633
Ni - Cu	0.641
Ni - Zn	0.718
Ni - Mn	0.703
Ni - Fe	0.431
Ni - Pb	0.415



REFERENCES

ABDULLAH M.I. and ROYLE L.G., 1974.- J. Mar. Biol. Ass. U.K 54. 581-597.
BANCRJEE R.K., 1976.- Nev. Chem. Metall. Lab., Bombay, India. Indiana. Chem. Manuf. 14(10), 43-47.
DRAGO M., COSMA B. and CONTARDI, 1983. - Atti. Soc. Toscana Sci. Nat. Pisa, Mem. Ser. A. 88, 117-136.
ESPEUT S., PICOT B., RAMBAUD A. and BONTOUX J., 1982.- J. Fr. Hydrol. 13(3), 289-97.
HOPIRTEAN E., KORMOS F. and POPESU V., 1983.- 34(4), 353-6.
MANSOUR, IAS; Mohamed El-Abd and H.S. Gomaa, 1978. J. app. Chem. Biotechnol. 28, 854-856.
TESSLER A, CAMPEIL P.G.C. and BISSON M., 1979.- *Anal. Chem*. 5 .
ZAIDAN H.S., 1983.- Jpn. Kokai Tokyo Koho Jp 58 43, 284.

Dispersion Models and Behaviour of Some Trace Elements in Brackish Waters of an Estuary (Mex Bay)

O.A. EL-RAYIS, Y. HALIM and O. ABOUL DAHAB

Oceanography Department, Faculty of Science, Alexandria University, ALEXANDRIA (**Egypt**)

Mex Bay-west of Alexandria, is one of the Mediterranean bays. It receives effluents from three different landbased sources. Umum Drain (an agricultural drain) is considered as the greatest. Its discharge represents over 96 % of the total input. EL-RAYIS *et al*., (1984) and EL-GINDY *et al*., (1986) showed that Mex Bay is characterized by two water layers ; an upper brackish layer of salinity values ranging between 5 and 38.8 ‰ and lower saline layer. During spreading of the fresh water in the surface layer, the concentration of any element discharged with the fresh water may or may not follow the freshwater-seawater distribution, depending on wheather the elements are conservative or non-conservative (EL-RAYIS, 1990).

The present work is an attempt to study the distributions and ideal dispersion models of some trace elements and assessing their behaviours during the transportation process from Umum Drain to the proper sea via the estuary, following the procedure used by EL-RAYIS (1990). The results reveal the presence of a plume-like pattern directly off the drain outlet, in which the dissolved trace elements behave non-conservatively. Some of the elements, like Fe, Mn, Hg and P show considerable loss while others like Cu, Zn and organic carbon (OC) show slight enrichment than their counterparts found in the conservative dispersion models (Fig. 1). Both P and OC are originated mainly from the drain. In addition to the drain other sources in the region (Chlor-alkali Plant, CAP ; Western Harbour, WH ; and Dredging Activity, DA, Fig. 1) are contributed to the presence of the other elements in the bay. It is estimated that the drain alone contributes between 60 and 99.7 % of the total input of the trace elements to the bay.

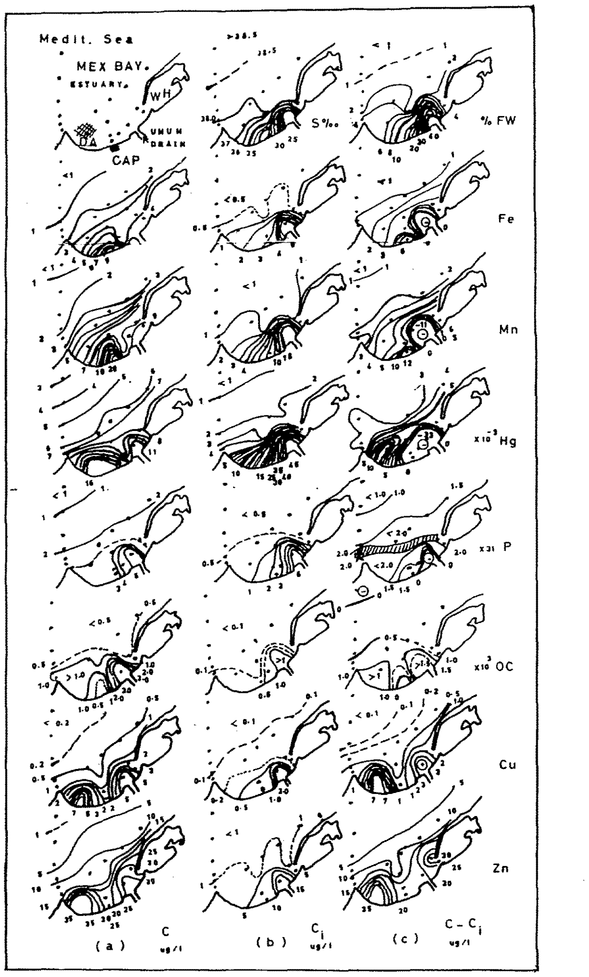


Fig. Distribution of (a) measured element C; (b) Calculated theoritical dilution line value of the element C_i; and (c) the difference between C and C_i, of the element in the surface brackish water of Mex Bay Estuary.

REFERENCES

EL-GINDY A.A. *et al*., 1986.- *Rapp. Comm. int. Mer. Médit.*, 30, 2, p.127.
EL-RAYIS O.A. and KAU J., 1990.- *Mar. Sci*., 1: pp. 27-38.
EL-RAYIS O.A. *et al*., 1984.- *VIIes Journées Etud., Pollutions, Lucerne, CIESM*, pp. 357-365.