Distribution of some Chemical Elements in the Marsh Lands of Southern Iraq After Rehabilitation.

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Abstract

This study included the determination of Ten chemical elements: Aluminum, Arsenic, Calcium, Copper, Iron, Lead, Lithium, Magnesium, Mercury and Zinc in water of 12 sites from southern Iraqi marshland. Recorded Calcium and Magnesium values were the highest in the range (5.1- 12.4) and $(33.8 - 41.8)$mg/l respectively, and higher in Al-Izz river of Central Marsh. Iron in the concentration of 0.02 mg/l was recorded in Al-Izz river of central marsh and Al-Tarabah village of Al-Hawiezah marsh only. Zinc is distributed widely in Iraqi marshes, the highest recorded value for Zn was in Hor Abu-Ijel which reached 0.61 mg/l. Copper was in a lower concentrations and reported values in certain places only with the highest value of 0.02 mg/l in Um-Nakhlah. Mercury and Aluminum each were recorded in one site, 0.11 mg/l Mercury in Al-Izz river and 13 mg/l Al in South of Al-Hawiezh marsh. Lead, Lithium, and Arsenic were absent in this study.

1- Introduction

Trace metals are natural constituents of all environments in which traces of all heavy metals are found in fresh water, sea water, aquatic and marine organisms and sediments (Bryan,1976).

Trace metals input may derive from a number of natural and anthropogenic sources. Among anthropogenic sources for several potentially toxic heavy metals such as Lead and Cadmium are sewage, waste water effluent, power plants cooling water discharge, auto emission, Petroleum and petrochemical industry

wastes, Storm drain outfalls and solid waste landfills (UNEP, 1980).

In natural aquatic ecosystems, metals occur in low concentrations, normally at the nano gram to microgram per liter levels. Recently the occurrence of metal problem as a result of the rapid growth of population, increased urbanization, expansion of industrial activities, exploration and exploitation of natural resources, extension of irrigation and other modern agricultural practices as well as other sources (FAO, 1994). Trace metals enter the aquatic environment of southern Iraq from both natural and anthropogenic sources (Mustafa, 1985, Abaychi and Al-Saad, 1988, Al-Saad, 1995). Natural sources include storm dust fall, erosion or crustal weathering and dead and decomposition of the biota in the water, whereas the anthropogenic sources include sewage wastes, industrial effluent, automobile effluent, petroleum and fertilizer industry effluent (FAO, 1994).

Trace metals are incorporate through the food chain of fish either from water via gills or from sediments and marine organisms via gut track (Al-Saad *et al.*,1997).

Shatt Al-Arab and adjacent area receives trace metals from different sources (Al-Khafaji, 1996).

Sediments act as an archive for many pollutants. Many studies in different regions around the word have been used the sediments of rivers and estuaries as indicators for pollution by trace metals (Al-Khafaji, 1996). Abaychi and DouAbul (1985) and Abaychi and Al-Saad (1988) have studied trace metals in the

sediments of Shatt Al-Arab in which high concentrations of Ni and V were recorded. Al-Hashimi and Salman (1985) showed that the concentrations of Ag, Cd, Co, Cu, Fe, Mn, Ni, Pb, V and Zn in the sediments of Shatt Al-Arab estuary were within the natural limits of their occurreness and far below the level of pollution. Concentrations of some trace metals obtained by flameless atomic absorption spectroscopy in sediments from Shatt Al-Arab river in units of μg/gm dry weight were: none-detectable – 0.17 Cd, 5.3-39.6 Cu, 9–19.9 Pb and 16.7–188 V, in that study the concentrations of V were relatively high which could be attributed to the petroleum rich deposits of the area (ROPME, 1986).

A comprehensive study for the determination of trace metal levels in water from southern part of Iraq, which covered Tigris river, Al-Izz river, Shatt Al-Arab, Shatt Al-Basrah and Khor Al-Zubair has been conducted recently (Al-Imarah *et al.*, 2000). Trace metals concentration reported by that study were higher than allowed levels by WHO (1971) or by Iraqi Regulations.

2- Materials and Methods

The determination of trace metals in water have been reported to be analyzed extensively by atomic absorption spectrometry. On the other hand major studies were done by anodic stripping voltametry method (Karadakhi,et al., 1987) and spectrophotometry (Al-Imarah et al., 1996).

Sample collection

Subsurface water samples 5 litters were collected from the selected stations (Fig. 1) by

using polyethylene bottles. Samples were suction filtered and stored in fridge for analysis.

Laboratory works

Filtered water samples were run through 50x 2 cm ion exchange column filled with 50 – 100 mesh chelex-100 resin in a flow rate of 5 ml/min, the column was washed by 200 ml deionised water and the trace metals eluted by 30 ml 2 M nitric acid which was collected in 50 ml plastic beaker.

The eluate was evaporated to near dryness, the residue was then dissolved in 1 ml 0.5 N hydrochloric acid and made up to 25 ml with deionised water and stored in 25 ml anlagen screw cap bottles and sealed for trace metals analysis.

Trace Metals Analysis

For the trace metal analysis, Pye Unicum SP 9 air-acetylene flame atomic absorption spectrophotometer was used, which is fitted with special Hallow Cathode Lamps for each metal

Calculations

The calculation of metal concentration in each water sample was done following literature (Refs, cited in Al-Khafaji, 1996).

3- Results and Discussion

The calculated concentration of chemical elements in each sample of water from the selected stations in southern Iraqi marshland are listed in table 1.

Fig . (1): Map of southern Iraqi marshlands showing the positions of sampling stations (1-12). Source. www.unep.org

Table 1. Concentration of trace metals in water (mg/l) from different sites in southern Iraqi marshlands.

	Stations	Al	As	Ca	Cu	Fe	Li	Mg	Hg	Pb	Zn
1	Um Nakhlah	Nil	Nil	8.2	0.02	Nil	Nil	37.0	Nil	Nil	0.04
2	Al-Izz river(1)	=	=	12.4	0.015	0.02	=	41.8	0.11	=	0.05
3	Al-Izz river(2)	=	=	6.5	Nil	Nil	=	34.1	Nil	=	0.19
4	Ghebaish	=	=	7.6	=	=	=	35.3	=	=	0.05
5	Garmah Beni Saeed	=	=	5.1	=	=	=	36.9	=	=	0.07
6	Tarabah	=	=	5.2	0.013	0.02	=	39.2	=	=	0.11
7	Hawiezh	=	=	8.5	Nil	Nil	=	33.9	=	=	Nil
8	Hammar	=	=	7.9	=	=	=	35.1	=	=	0.04
9	Attiah	=	=	8.1	=	=	=	35.8	=	=	0.07
10	Abu Ejil	=	=	8.5	0.03	=	=	35.4	=	=	0.61
11	Addel	=	=	8.9	0.003	=	=	34.6	=	=	0.24
12	Hawiezh, South	=	=	8.6	Nil	=	=	33.8	=	=	0.11

Trace metals recorded in this study represent the dissolved phase in water samples from Iraqi marshlands after rehabilitation. Most of the hazardous elements were non-detectable specially Arsenic, Mercury and Lead. Only in station 2 which represents Al-Izz river, Mercury was detected in low level of the value 0.11 mg/l, Ca and Mg were recorded in high values as expect according to Iraqi geochemical features. The most abundant metal, Iron, has been recorded in low level due to dilution. Copper, too, recorded in certain stations not all. Generally, values recorded for trace metals in the dissolved phase of water from Southern Iraqi marsh lands were lower than those reported for nearby sites such as Diyala river (Latief et al., 1982), Shatt Al-Arab estuary (Mustafa, 1985; Abaychi and DouAble, 1985, Al-Khafaji, 1996), which explained on the basis of low potential source of trace metal pollution in the Marsh lands.

Sediments act as an archive for many pollutants. Many studies in different regions around the word have been used the sediments of rivers and estuaries as indicators for pollution by trace metals (Al-Khafaji,1996). Abaychi and DouAbul(1985) and Abaychi and Al-Saad (1988) have studied trace metals in the sediments of Shatt Al-Arab in which high concentrations of Ni and V were recorded. Al-Hashimi and Salman (1985) showed that the concentrations of Ag, Cd, Co, Cu, Fe, Mn, Ni, Pb, V and Zn in the sediments of Shatt Al-Arab estuary were within the natural limits of their occurrence and far below the level of pollution. Concentrations of some trace metals obtained by flameless atomic absorption spectroscopy in sediments from Shatt Al-Arab river in units of μg/gm dry weight were: none-detectable – 0.17

Cd, 5.3 – 39.6 Cu, 9 – 19.9 Pb and 16.7 – 188 V, in that study the concentrations of V were relatively high which could be attributed to the petroleum rich deposits of the area (ROPME, 1986).

This study revealed that most of marshland waters in southern Iraq are free from pollution by trace metals especially the most toxic ones, Arsenic, Lead and mercury. For other metals low levels were recorded and fall within the limits of threshold levels. Higher concentrations of trace metals reported were in water from Al-Izz river probably due to Highly residential area located on its banks.

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توزيع بعض العناصر الكيميائية في مياه اهوار العراق الجنوبية بعد التأهيل

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الخلاصة

تضمنت هذه الدراسة تقدير عشرة عناصر كيميائية وهي: الحديد والخارصين والرصاص والنحاس والكالسيوم والمغنيسيوم والزئبق والالمنيوم والزرنيخ و الليثيوم في مياه اثنتي عشرة موقع في اهوار جنوب العراق بعد عودة المياه اليها . كان لعنصري الكالسيوم والمغنيسيوم اعلى القيم المسجلة اذ تراوحت تراكيزهما مابين 5.1 – 12.4 و 33.8 – 41.8 ملغم\تر على التوالي, حيث سجلت اعلى القيم في مداخل نهر العز ضمن الهور المركزي وسجل الحديد قيمةً واحدة وهي 0.02 ملغ\لتر في موقعين فقط وهما نهر العز ضمن الهور الوسطي ومنطقة الترابة ضمن هور الحويزة. واظهر الخارصين انتشاراً واسعاً في مياه الاهوار حيث سجل في اغلب المواقع المدروسة وكانت اعلى قيمة مسجلة في هور ابو عجل حيث بلغت قيمته 0.61 ملغ\لتر بينما سجلت تراكيز واطئة للنحاس وفي خمسة مواقع فقط اعلاها في ام نخلة وبحدود0.02 ملغ\لتر ولم يسجل للزئبق الا في موقع واحد في بدايات نهر العز وبحدود 0.11 ملغم\لتر ولم يسجل للالمنيوم الا في جنوب هور الحويزة وبلغ 13 ملغ\لتر, بينما لم يسجل أي تركيز لكل من الرصاص والليثيوم والزرنيخ في جميع مناطق الدراسة.

كلمات دالة: عناصر نزرة, مياه الاهوار, امتصاص ذري, توزيع, اعادة تأهيل الاهوار.