



Seasonal variation for levels of nutrients in water from Southern Iraqi Marshlands after Rehabilitation 2003

F.J. M. Al-Imarah, I.J.M. Al-Shawi, A.M.Issa and M.G. Al-Badran

*Dept. of Chemistry and Marine Environmental Pollution, Marine Science Center,
University of Basrah, Basrah – Iraq.*

Abstract

The levels of nutrients; Nitrites, Nitrates, Phosphates and Silicates were determined seasonally for the period Winter, Spring, Summer and Autumn 2004 in water from eight sites ,1-Al-Tarabah,2-Umm Al-Ward in Al-Hawizeh marshes, 3- El-Harasheen,4-Al-Fartoos,5- El-Saddah along Al-Izz river in the Central marshes, 6- Al-Duboon, 7- Al-Nagarah and 8- Al Barghah in Al-Hammar marshes. Collected water samples from all stations were transferred to Marine Science Center labs for Chemical analysis. Compared to nitrates, the recorded nitrites were low in the range 0.001-1.300 μg at $\text{N-NO}_2^-/\text{l}$, while nitrates characterized by high values specially in stations 1 and 2 and during winter which were in the range 1.939-42.200 μg at $\text{N-NO}_3^-/\text{l}$. Phosphate levels were high in Al-Haweizh marshes while Al-Hammar marsh was characterized by high levels of silicates which were in the range 58.1-146.811 μg at $\text{Si-SiO}_2/\text{l}$. These differences were explained on the basis of the nature of the area and quality of the soil.

1.Introduction

Nutrients especially nitrates and phosphates represented as principal parameters in the aquatic environment, they are important factors for primary productivity and phytoplankton growth which represents the base of pyramid in the food chain(Wetzel and Likens,2000).

There are different sources of nutrients in the aquatic environment, some represent human activities such as using fertilizers for vegetation in agriculture as well as living organisms wastes , and the other source is the degradation residuals of living organism bodies. The later source represents the major

*Corresponding author

source for enrichment of marshlands with nutrients (Al-Mausawi and Hussain,1991).

Many studies were conducted for the estimation of nutrients in the marshlands among which are (Al-Zubaidy,1985; Al-Lami, 1986 ; Kassim, 1986 ; Al-Aaraji, 1988 ; Hassan 1988).

Most of previous studies focused upon the relation between levels of nutrients and growth of phytoplanktons in Al-Hammar marsh. In

their study,Al-Saadi et al.(1981),determined levels of nutrients in Central marsh. Al-Hawiezah marsh did not receive any attention due to difficulties and instability (Al-Mausawi and Hussain,1991).

The aim of this study to determine the levels of nutrients in the waters of southern Iraqi marshlands including Al-Hawiezah marshes.

2.Materials and Methods

During the four seasons of 2004; Jan- Dec., subsurface water samples were collected from eight selected stations in southern Iraqi marshes as shown in figure 1.Water samples were transferred to Marine Science Center labs and kept in fridge for chemical analysis. In the lab nutrients were determined according to standard methods (APHA,1979); Nitrites were determined according to Bender Schneider and Robinson(1952) which explained by Parson

(1984), nitrates were reduced to nitrites by cadmium- copper column according to Wood *et al.* (1967) which explained by Wetzel and Likens(2000), phosphates were determined according to Murphy and Riley(1962) which explained by Wetzel and Likens(2000), while silicates were determined according to Mullin and Riley(1900) which explained by Parson (1984).

3.Results and Discussion

The levels of nutrients (nitrites, nitrates, phosphates and silicates) determined during winter, spring, summer and autumn of the year 2004 in water from Iraqi marshlands are presented in tables 1-4.

Lower nitrites were recorded for all stations during summer season which were in the range of 0.001- 0.062 μg at $\text{N-NO}_2^-/\text{l}$, while higher values in the range of 0.105-1.315 μg at $\text{N-NO}_2^-/\text{l}$. Lower values of nitrates were during

summer in the range of 0,16-4.90 μg at $\text{N-NO}_3^-/\text{l}$ and the higher values were during winter and spring in the range of 11.31-54.3 μg at $\text{N-NO}_3^-/\text{l}$. Phosphates were low in most stations and during the whole period of the year, higher values recorded in the range of 0.86-3.6 μg at $\text{P-PO}_4^{3-}/\text{l}$ during summer 2004. Silicates recorded the highest values in the range up to 24.909- 146.811 μg at $\text{Si-SiO}_2/\text{l}$ in most of the studied stations.

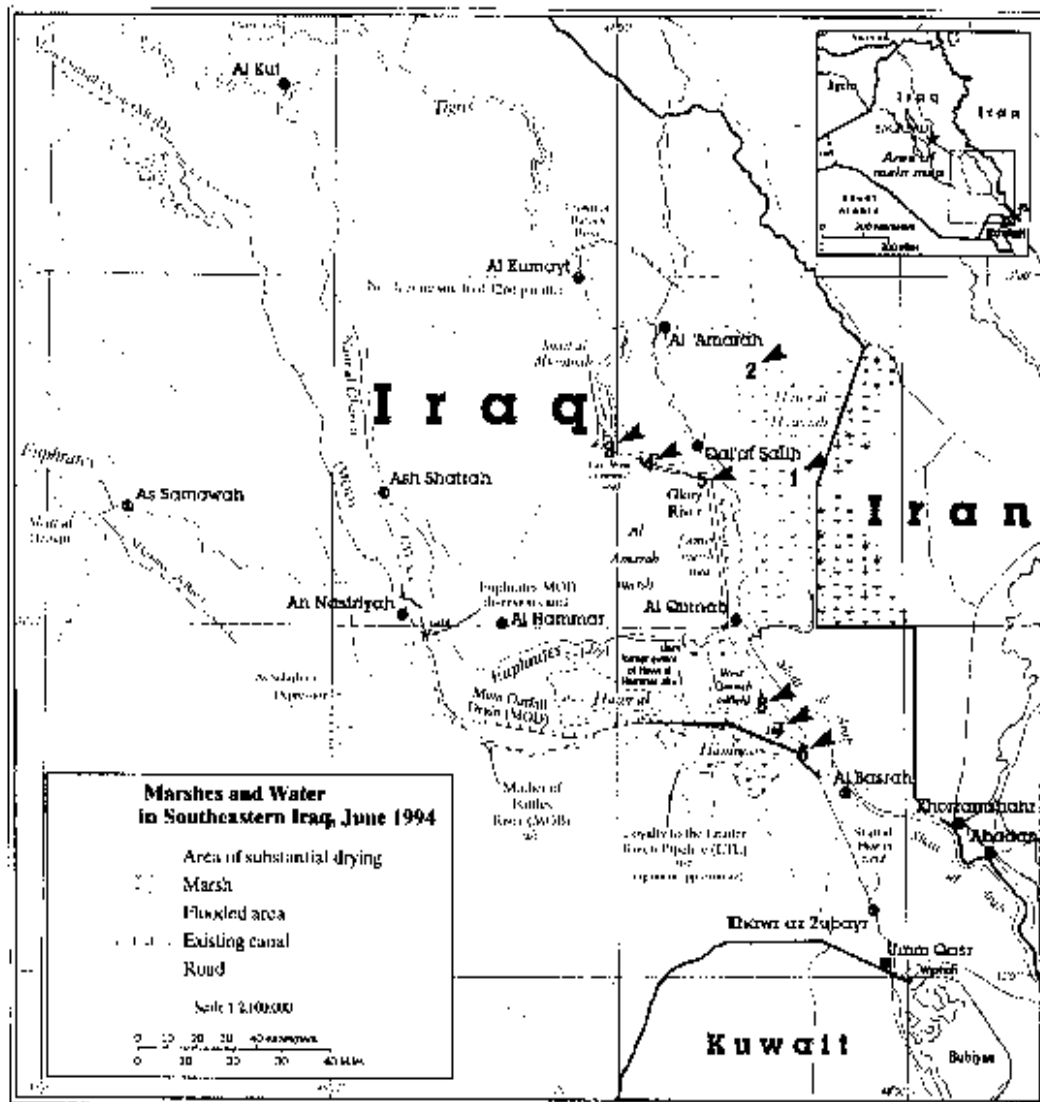


Figure 1 . Map of southern Iraqi marshes showing the position of sampling stations 1-8.

Table (1):

Levels of nutrients recorded in warders from Iraqi marshlands during winter 2004.

Station	Nitrites (μg at N- NO_2^-/l)	Nitrates (μg at N- NO_3^-/l)	Phosphates (μg at P- $\text{PO}_4^{3-}/\text{l}$)	Silicates (μg at Si- SiO_2/l)
El-Trabah	0.420	17.70	0.961	30.80
Umm El-Ward	0.680	42.20	3.509	35.75
Al-Herasheen	0.420	49.50	1.928	56.31
Al-Fartoos	-	-	-	-
El-Saddah	0.420	54.30	1.438	50.15
Al-Doboos	-	-	-	-
Al-Nagharah	0.530	40.10	-	60.35
Al-Barghah	0.450	41.53	1.840	65.71
Standard range	0.01-2.5	0.05-45	0.03-5	0.1-140

- = Non Determined.

Table (2):

Levels of nutrients recorded in warders from Iraqi marshlands during spring 2004.

Station	Nitrites (μg at N- NO_2^-/l)	Nitrates (μg at N- NO_3^-/l)	Phosphates(μg at P- $\text{PO}_4^{3-}/\text{l}$)	Silicates (μg at Si- SiO_2/l)
El-Trabah	0.315	20.517	1.830	25.71
Umm El-Ward	0.530	40.730	1.950	30.73
Al-Herasheen	0.450	40.320	2.550	60.10
Al-Fartoos	0.380	38.750	1.980	63.79
El-Saddah	0.440	40.500	1.700	58.79
Al-Doboos	0.450	11.310	0.870	60.15
Al-Nagharah	0.315	12.450	1.098	70.87
Al-Barghah	0.271	10.650	0.750	60.80
Standard range	0.01-2.5	0.05-45	0.03-5	0.1-140

- = Non Determined.

Table (3):

Levels of nutrients recorded in waters from Iraqi marshlands during summer 2004.

Station	Nitrites (μg at N- NO_2^-/l)	Nitrates (μg at N- NO_3^-/l)	Phosphates(μg at P- $\text{PO}_4^{3-}/\text{l}$)	Silicates (μg at Si- SiO_2/l)
El-Trabah	0.010	4.90	2.00	34.90
Umm El-Ward	0.062	4.70	3.60	36.30
Al-Herasheen	0.012	3.60	0.86	53.10
Al-Fartoos	-	-	-	-
El-Saddah	0.001	1.50	1.50	44.00
Al-Doboos	0.024	4.20	2.60	58.10
Al-Nagharah	0.009	4.40	1.10	73.70
Al-Barghah	0.018	0.16	1.00	61.50
Standard range	0.01-2.5	0.05-45	0.03-5	0.10-140

- = Non Determined.

Table (4):

Levels of nutrients recorded in warders from Iraqi marshlands during autumn 2004.

Station	Nitrites (μg at N- NO_2^-/l)	Nitrates (μg at N- NO_3^-/l)	Phosphates(μg at P- $\text{PO}_4^{3-}/\text{l}$)	Silicates (μg at Si- SiO_2/l)
El-Trabah	0.105	1.939	1.753	24.909
Umm El-Ward	1.315	21.680	2.145	120.817
Al-Herasheen	0.105	0.028	1.778	70.637
Al-Fartoos	1.105	22.645	2.455	112.634
El-Saddah	-	-	-	-
Al-Doboos	0.210	5.66	1.943	94.584
Al-Nagharah	-	-	-	-
Al-Barghah	0.157	-	1.927	146.811
Standard range	0.01-2.5	0.05-45	0.03-5	0.1-140

- = Non Determined.

The waters of marshlands characterized by lower contents of nitrites which reflect the unpolluted water of the studied sites. Most of the levels recorded in the three marshes during this study are lower than previously measured

nitrites in different sites of Al-Hammar marsh which ranged 0.001-2.07 μg at N- NO_2^-/l (Al-Zubaidy,1985; Al-Lami,1986;Al-Aaraji,1988) and lower than recorded levels in the Central marsh (Maulood et al., 1979).

Nitrates were higher than nitrites along the whole year and were higher during winter and spring due to the cover of the area by dead aquatic plants and then decomposed by microorganisms leading to increase the nutrients among which are the nitrates (Tayel, 1996) as well as the shallow nature of the marshes during its early stages of rehabilitation leading to increase the nutrients (Al-Zubaidy, 1985; Al-Aaraji, 1988). Antoine (1984) has pointed that increases could be taking place during different periods of the year due to their releases from sediment surfaces, while the decreases in nitrates during summer due to the growth of aquatic plants and phytoplankton's as they could be seen in the fields, and because of the majority of these plants, nutrients are decrease in the water of marshlands (Al-Mausawi and Hussain, 1991).

Nitrates recorded in this study were higher than values recorded in previous studies which were in the range of 0.01-3.54 μg at $\text{N-NO}_3^-/\text{l}$ (Al-Zubaidy, 1985; Al-Lami, 1986; Kassim, 1986 ; Al-Aaraji, 1988; Hassan, 1988), while they were comparable to those recorded in the central marsh as a mean value of 15.42 μg at $\text{N-NO}_3^-/\text{l}$ (Al-Saadi et al., 1981).

Clear seasonal variations were reported in the studied sites, as shown in tables 1-4 an alternative values were recorded and the highest values recorded were during summer season which indicated the importance of decomposition of plants and dead organisms due to increase of temperature as well as increase phosphorous in water because of decrease consumption by aquatic plants (Al-Aaraji, 1988; Al-Rikabi, 1992) which enhanced by lower absorption of phosphorus by

phytoplankton's than absorption of nitrogen. The values recorded during this study are little bit higher than those recorded in previous studies in which limited ranges were 0.008-1.41 μg at $\text{P-PO}_4^{3-}/\text{l}$ ().

Most past studies indicated that values of silicates were high in the water of different marshlands which were in the range 11.9-242.7 μg at $\text{P-PO}_4^{3-}/\text{l}$ (Maulood et al., 1979, 1981; Al-Saadi et al., 1981; Al-Zubaidy, 1985; Al-Lami, 1986 ; Kassim, 1986 ; Al-Aaraji, 1988 ; Hassan, 1988). Moreover, as shown in tables 1-4 values of silicates were higher in Al-Hammar marsh compared to other studied sites within the marshlands which explained on the bases of nature of lands in which Al-Hammar marsh passes through. In addition to that recorded values of silicates were higher during summer and autumn than those recorded during winter and spring, due to the release of silicon from sediments when temperature is raised (Reynold, 1984).

For comparison, the recorded levels of nutrients in this study are higher than most reported nutrient levels by previous studies, mostly in Al-Hammar marshes, except those reported for silicates, as shown in Table 5.

From table 5 it could be seen that values reported in this study for nitrates and phosphates are greater than all previous studies due to high sediment contents of organic mater resulted from decomposition of aquatic plants as well as other organisms which decomposed after the desiccation of marshlands. After rehabilitation and water returned to the marshlands, quantities of nutrients began to liberate from sediments to water column according to DouAbul et al, (1985)

Table (5):

Comparison between highest levels of nutrients reported in previous studies covered Different sites in Al-Hammar marshes and present study.

Site	Nitrites (μg at $\text{N-NO}_2^-/\text{l}$)	Nitrates (μg at $\text{N-NO}_3^-/\text{l}$)	Phosphates(μg at $\text{P-PO}_4^{3-}/\text{l}$)	Silicates(μg at $\text{Si-SiO}_2/\text{l}$)	References
Al-Barghah	0.095	1.63	0.68	190.0	Al-Lammy)
Umm Al-Hawaly	2.071	3.63	0.78	178.7	(1986& Kassim
Harer	0.335	9.23	0.89	181.0	(1986)
Al-Ghebaysh	0.030	0.55	0.22	11.9	Hassan (1988)
Al-Hammar	0.001	0.20	0.09	11.9	& Al-Aaraj)
Al-Taar	0.001	0.01	0.01	77.0	(1988
Al-Deer	0.410	3.39	1.88	306.0	Al-Zubaidy
Al-Shafy	0.420	3.91	0.68	325	(1985)
UmmAl-Shwaich	0.130	1.20	1.37	325	
Ahwar	0.680	49.50	3.60	146	Present study

4. Conclusion

Through this study it is concluded that the waters of southern Iraqi marshlands are rich in nutrients specially nitrates and phosphates which enhance their suitability for growth and blooming of aquatic plants and phytoplankton's which in turn are necessary

for primary productivity in marshlands water and food chain for different living organisms such as fishes, birds, animals and for the growth of microorganisms such as bacteria and fanjies required for biological degradation.

5. References

- Al-Aaraji, M. J. 1988. Limnological study for phytoplankton and nutrients in Hor Al-Hammar, Iraq. M. Sc. Thesis, College of Science, University of Basrah, 113pp.
- Al-Lammy, A. Az. 1986. Limnological study for phytoplankton of some southern Iraqi marshes. M. Sc. Thesis, College of Science, University of Basrah, 144 pp.
- Al-Rikaby, H. Y. Kh. 1992. Limnological and Histological studies for some aquatic plants in Hor Al-Hammar, Iraq. M. Sc. Thesis, College of Science, University of Basrah, 124 pp.
- Al-Mausawi, A. H. and Hussain, N. A. 1991. Physico – Chemical parameters of southern Iraqi Marshes. Preliminary report presented to Marine Science Center, University of Basrah.
- Al-Saadi, H.A., Antoin, S.E. and Nural-Islam, A.K.M. (1981). Limnological investigation in Al-Hammar marsh area in

*Corresponding author

- southern Iraq. *Nova Hedweigia*,35:157-166.
- Al-Zubaidy,A. M. 1985. Limnological study for algae (phytoplankton) in some marsh areas west to Qurna, south Iraq. M. Sc. Thesis, College of Science, University of Basrah,235 pp.
- APHA, (1979). Standard Methods for the Examination of Water and Waste Water, 18 th Ed., American Puplic Health Association, Washington DC.
- Antoin,S.E.(1984). Studies of the sediments and planktonic algae of the polluted Khora and Shatt Al- Arab Rivers of Basrah, Iraq. *Limnologica*, 15(1):55-61.
- Benderschneider,K. and Robinson,R.J.(1952). A new spectrophotometric method for the determination of nitrites in sea water. *J. Mar. Res.*,11:87-96.
- Hassan,F. M.1988. Limnological and Histological studies for phytoplankton in Hor Al-Hammar, Iraq. M. Sc. Thesis College of Science, University of Basrah,136 pp.
- Kassim, Th. I. (1986). Limnological study for benthic algae in some marshes ,southern Iraq. M. Sc. Thesis, College of Science, University of Basrah,203 pp.
- Moulood,B.K., Hinton,G.C.F.,Kamees,E.S., Saleh,F.A.R.,Shaban,A.A. and Al-Shahwan, S.M.H. (1979) .An ecological survey of some aquatic ecosystems in southern Iraq. *Trop.Ecol.*,20:27-40
- Mullin,J.B. and Riely,J.P.(1955). The colormetric determination of silicates with special reference to sea and natural waters. *Analt.Chem.Acta*,12:162-176.
- Murphy,J. and Riley J.P.(1962). A modified single solution method for determination of phosphates in natural water. *Analt. Chem. Acta*,27:31-36.
- Parson,T.S., Mita,Y. and Lall,G.M.(1984). "A manual of chemical and biological ethods for sea water analysis". Pergamon Press, Oxford.
- Reynold,C.S.(1984). "The ecology of freshwater phytoplankton".Cambridge University Press, Cambridge, 384 pp.
- Wetzel,R.G. and Likens,G.E.(2000). "Limnological Analysis".3rd ed. Springer Verlag, New York Inc. 429 pp.
- Wood,E.D., Armstrong,F.A. J. and Richards,F.A. (1967). Determination of nitrates in sea water Cd-Cu reduction to nitrite. *J. Mar. Biol. Asso.*,47:23-31.

التغيرات الموسمية لمستويات المغذيات في مياه اهورار جنوب العراق بعد اعادة التأهيل 2003

فارس جاسم محمد الامارة و عماد جاسم محمد الشاوي و آمال موسى عيسى و محاسن غفران البدران

قسم الكيمياء وتلوث البيئة البحرية, مركز علوم البحار, جامعة البصرة - البصرة - العراق.

الخلاصة

خلال الفصول الاربعة من عام 2004 تم تقدير التغيرات في قيم المغذيات: النترت و النترات و الفوسفات و السليكات في نم هاييم تان ي ع ثمانية مواقع اثنان منها في هور الحويزة وهما 1-الترابة و 2- ام الورد وثلاث مواقع ضمن الهور الوسطي على طول نهر العز وهي 3- الحريشين و 4- الفرطوس و 5 - السدة وثلاث مواقع ضمن هور الحمار وهي 6- الدبون و 7 - النكاره و 8- البركة. جمعت عينات من مياه المناطق المنتخبة وتم نقلها الى مختبرات مركز علوم البحار, وفي المختبر اجرى التحليل الكيمائية وكانت النتريتات اوطىء من النترات حيث سجلت قيما" بحدود 0.001 - 1.300 مايكروغرام ذرة نتروجين - نترت والتر وكانت النترات مرتفعة في الموقعين 1 و 2 في هور الحويزة وخلال موسم الشتاء وكانت بحدود 1.939 - 42.200 مايكروغرام ذرة نتروجين - نترات التر وتميز هور الحويزة ايضا" بارتفاع الفوسفات بينما تميز هور الحمار بارتفاع السليكات والتي تراوحت بحدود 58.1 - 146.811 مايكروغرام ذرة سليكون - سليكات التر. اعزيت اسباب هذه الفروقات الى طبيعة المنطقة ونوعية التربة.