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Effect of daily variations, diurnal fluctuations and tidal stage on water parameters of East Hammar marshland, Southern IRAQ .

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Abstract

Water parameters of East Hammar marshland were measured during July 2006 in several sites .Spatial and temporal variations existed between the six sites sampled. Water temperature , salinity, conductivity ,total dissolved solids (TDS) and pH values were higher in flood tide ,on contrary dissolved oxygen, oxidation and reduction optional (ORP)and flow rate were higher during ebb tide . Values of air ;water temperatures ,Salinity ,conductivity ,TDS and pH showed increasing trend as time progressing toward mid day, others decrease like dissolved oxygen ,ORP and transparency . Flow rate was faster during ebb than flood. Water level increased with flood tide. Time of the day and tidal stage have pronounced effect on several water parameters and must be taken in consideration during sampling.

1-Introduction

The southern marshland of Iraq , represent the most important pheso –geographical unit in southern Mesopotamia and formed a complex lacustrine sedimentary environment (Yuaqub and Seikian 1992).

The sources of marshland water was of multi origin namely rivers, precipitations and groundwater. Flow from the Tigris and Euphrates rivers almost wholly regulate the marshland since local rainfall, is negligible.

The climate of the southern region characterized by long hot summers and rather short cold winters, the prevailing north-westerly winds have an pronounced influence on the area (Yuaqub and Salman 1992).

These wetlands may range from 8,000 to 30,000 km^2, making them the largest wetland

Key words: marine fungi, tidal zone, soil fungi, Iraq

system in the Middle East (Partow 2001, Richardson et al.(2005) and Richardson and Hussain 2006)

The East Hammer marsh represent the major part of southern marshland, southern to Euphrates river .The major source of water to East Hammar is Shatt Al Arab river with lesser contribution from Tigris ,Euphrates and Main of drainage (MOD), beside groundwater and precipitation (averaging <100-mm year^{-1} Yuaqub and Salman 1992).

Before the massive desiccation of the southern marshland during the nineties ,East Hammer marsh received most of the studies in shape of postgraduate thesis and research articles , in comparison with little or none to the other marshland, like Qurna and Huwayza

The theme of most previous studies mostly on phytoplankton ,aquatic plants ,primary productivity and fish biology. Water quality measurements dealt with as complementary task, for instances {Al-Mayah 1978 , Naama 1982, Al–Mousawi. and Whitton. 1983, Al-Laami 1986 , Dawood 1986 , Kassim, 1986, , Al-Saadi and Al-Mousawi (1988), Hassan 1988, Hussein ,Al-Knnaani 1989 , Al–Rikabi 1992 , Hussein,*et al.* 1992 ,Hussain and Ali 2006} . Specific water quality studies were limited ,like {Al-Saadi *et al.* 1981; Al–Mousawi and Hussain 1992}.

In general several factors controlling water quality of the southern marshland, like quantity and quality of water coming from Tigris , Euphrates and Shatt Al_Arab rivers, evaporation rate, interaction with substratum soil, biological and human activities.

The aim of this study is to examine, the spatial and temporal changes in water quality in July, diurnal variations during hours of the day and the affect of tidal stage.

2-Material and Methods

Sampling sites (stations)bearing were fix by using GPS model : GARMIN eTrex™ .

Water quality parameters including air and water temperatures, electrical conductivity (EC),salinity,pH ,dissolved oxygen(DO) ,total dissolved solids (TDS),oxidation and reduction potential (ORP),Transparency ,water flow rate, tide status and GPS(Global positioning system) . YSI 556 Multi-Probe System (MPS) and Tecanicon/Sontex flow tracker & depth meter model SonTek Flow Tracker**.**

These instruments used were calibrated before deployed in the field.

Six sites were selected; four were located in Sallal part of East Hammar marsh, one in Mashib area and the sixth in between, reference site at Karmat Ali river near the University campus.

3- Results

Water parameters were measured from several sites in East Hammar marshland during different days (3, 8, 14, 18,20 & 31) of July/ 2006 and Karmat Ali river as reference site (Table 1).

In general values of air and water temperatures, pH, EC, salinity , TDS, DO and ORP exhibit significant variations during days of the month ,others showed negligible difference .

Spatial and temporal variations:

Spatial variations existed between the values of water parameters in six sites of East Hammar marshland (Sallal and Mishab) as presented in table (1) , Most parameters exhibited temporal variations depend on date of sampling and state of tide .

1-Water temperatures tend to increase toward the end of the month.

2-Dissolved oxygen showed an increase in 8 & 14 of July and decrease in 18 and 31 of the same month.

3-Electrical conductivity and pH tend to increase toward the end of the month.

4-ORP and transparency exhibited the same levels during July with little fluctuations.

Table: (1) Values of measured parameters in study stations during July

Stations / Parameters	Mashib	Mashib/ Sallal	Sallal	Sallal	Sallal	Sallal	Karmat Ali Ref.
GPS	N 30 41 29 E 47 36 51	N 30 40 35 E 47 33 14	N 30 40 44 E 47 33 14	N 30 41 15 E 47 36 51	N30 40 47 E 47 42 47	N 30 40 44 E 47 33 14	N 30 34 29 E 47 36 51
Time am	9:15	8:04	8:03	8:05	9:03	9:13	8:16
Date	3/7/2006	8/7/2006	14/7/06	18/7/06	20/7/06	31/7/2006	14/7/06
Air temp. C°	34	31	32	33	34	34	30
Water temp. C°	31	26 3	28	30	31	31	26
EC µS/cm2	3.8	3.4	3.5	3.6	3.5	3.3	3.7
Salinity ppt	2.5	2.5	2.5	2.4	2.3	2.1	2.4
pH	7.9	7.6	8	8	8.1	8	79
DO mg/l	6.8	7.2	6.3	6.1	6.5	6.2	6.8
TDS mg/l	2250	2240	2340	2360	2400	2300	2300
ORP mV	49	47	44	42	48	42	42
Trans. cm	60	33	30	55	49	55	49
Depth m	0.5-3.5	0.5-3.0	0.75-2.3	0.5-1.75	1-1.5	0.5-1.0	1-1.5
Flow cm/sec	0.4	0.6	0.5	0.6	0.8	0.8	0.8
Tide	Flood	Ebb	Flood	Ebb	Flood	Ebb	

Effect of tidal stage on water parameters:

1-Water temperature was higher during ebb tide than that of flood tide fig (2).

2-Electrical conductivity, salinity and TDS scored higher values during flood tide than that of ebb tide figs. (3, 4&5).

3-pH values were more on the alkaline side i e. higher fig (6).

4-ORP was higher during ebb tide than that of flood tide fig (7).

5-Transparency was higher during ebb tide than that of flood tide fig(8).

6-Dissolved oxygen values were higher during ebb tide than that of flood tide fig (9).

7-Flow rate was faster during ebb tide than that of flood tide, fig (10).

8-Water level increased with cycle of the tide, increase with flood and decrease with ebb (table 2).

Effect of hour of the day on water parameters

Table (2) represented the measurement of different water parameters in every ½ hours during the morning of 31/July/2006.

Generally various parameters showed increasing in values with progressing hours of the day,

1- Air &water temperatures showed increasing trend with progressing hours of the day, figures (11& 12).

2-Salinity, conductivity and Total dissolved solids (TDS) showed increasing values with progressing hours of the day as exhibited in figures (13, 14& 15)

respectively.

3-pH showed increasing with progressing hours of the day, fig (16).

Other parameters showed decreasing trends with progressing hours of the day including :.

4- Dissolved oxygen decrease with progressing hours of the day, fig.(17)

5-Redox potential(ORP) decrease with progressing hours of the day, fig (18).

6-Transparency increase gradually and then decline with progressing hours of the day, fig (19).

7-Flow rate, showed pattern affect by the stage of tide in that hour of the day, the ascending part of the curve was due to the ebb tide followed by descending due to slack water and then ascending again due to progressing flood tide fig (20).

Table.(2) Values of measured parameters in study stations during different time of day

Date	31/7/06				
GPS	N: 30 40 47.12				
	E:47 34 42.87				
Time (am)	8:00	8:30	9:00	9:30	10:00
WT **C°**	28	29	30	30	31
EC **µS/cm2**	3.2	3.3	3.5	3.4	3.6
Salinity **ppt**	2.048	2.112	2.24	2.176	2.304
pH	7.7	7.9	8.1	7.9	8
DO **mg/l**	6.9	6.6	6.5	6.3	6.2
TDS **mg/l**	1959	2001	2061	2221	2304
ORP **mV**	49	45	42	39	36
Trans. **cm**	56	64	62	75	45
Depth m	0.75-2	0.5-1.5	0.75-1.5	1-1.5	1-2.0
Flow **cm/sec**	0.4	0.5	0.4	0.5	0.4
Tide	Flood	Flood	Flood	Flood	Flood

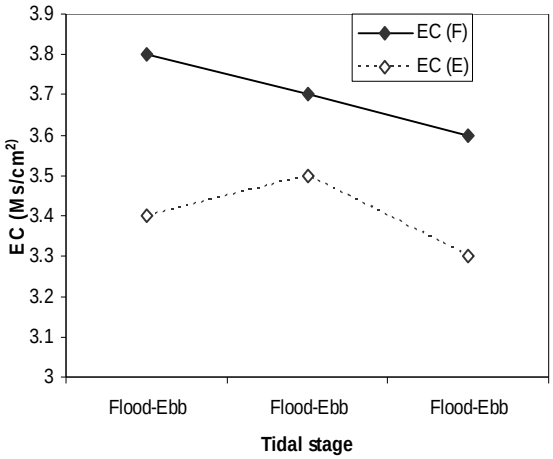

Fig. (3)Coductivity values during Flood and Ebb

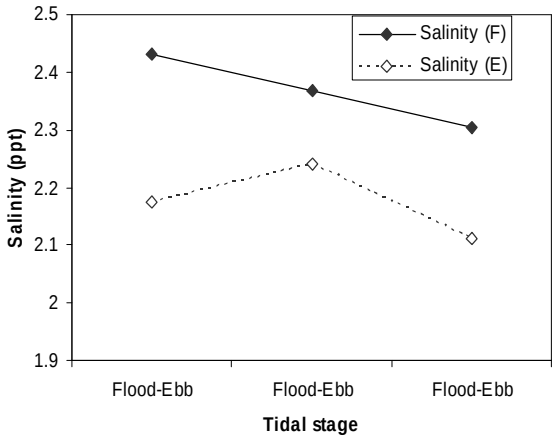

Fig. (4)Salinity values during Flood and Ebb

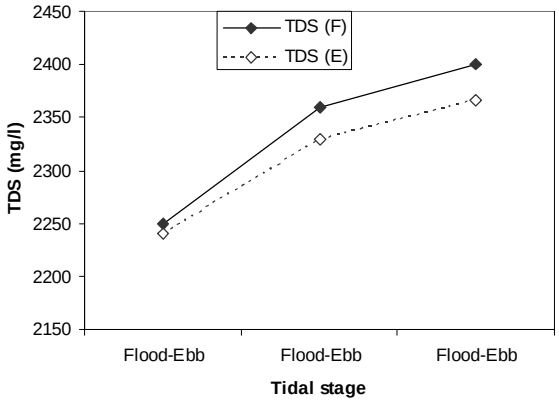

Fig. (5)Total Dissolved Solids values during Flood and Ebb

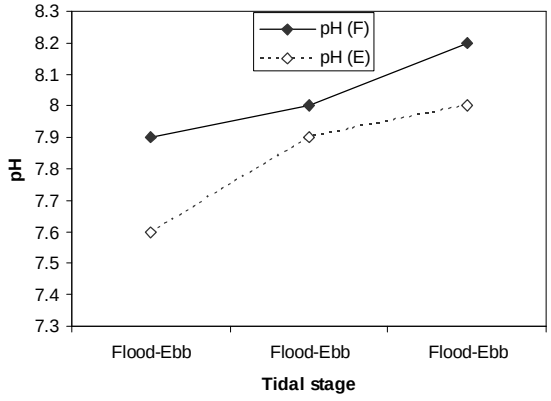

Fig. (6) pH values during Flood and Ebb

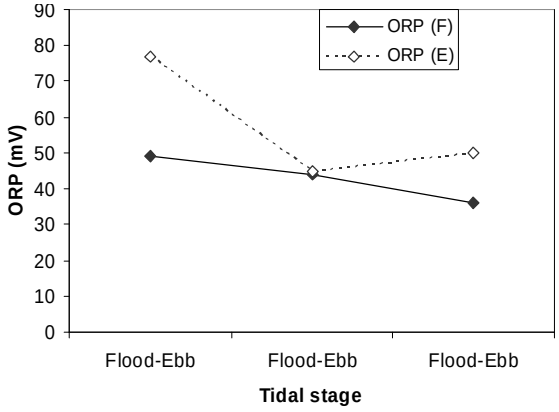

Fig. (7) Redox values during Flood and Ebb

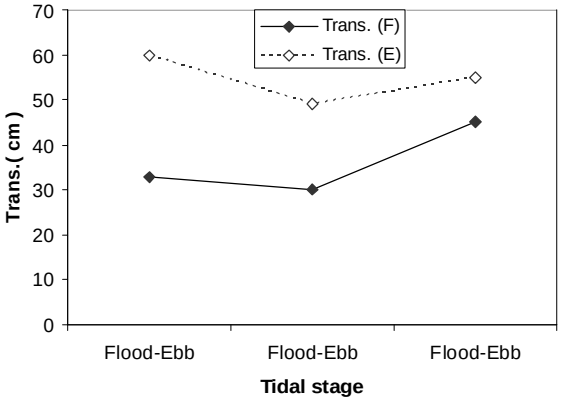

Fig. (8)Transparece values during Flood and Ebb

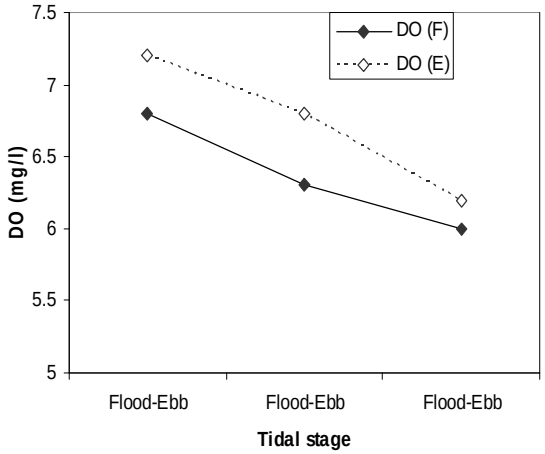

Fig. (9)Dissolved Oxygen values during Flood and Ebb

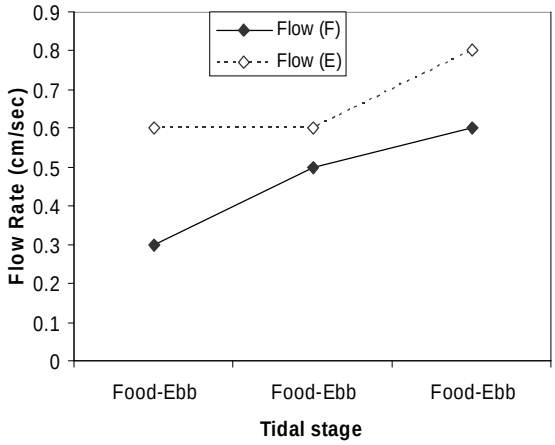

Fig.(10) Flow rate values during Flood and Ebb

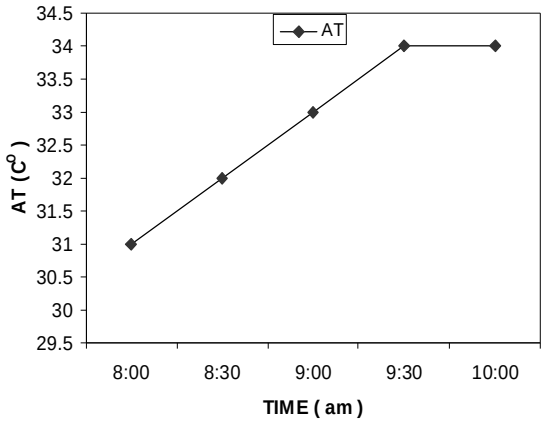

Fig.(11) Air Temperature values during different time of day

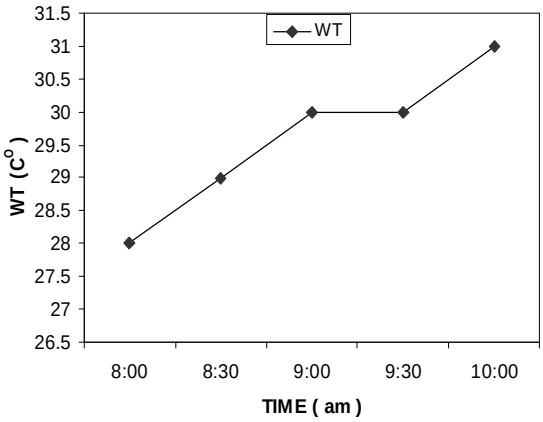

Fig.(12)Water Temperature values during different time of day

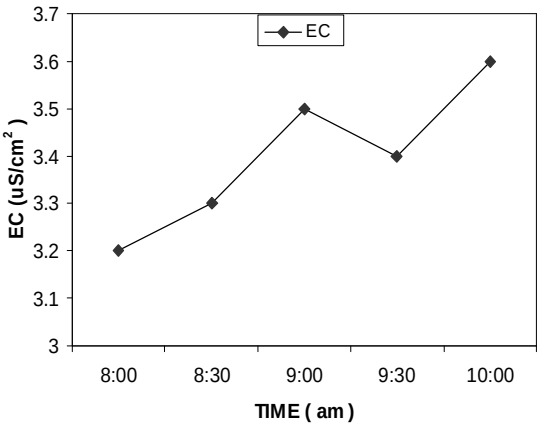

Fig.(13)Conductivity values during different time of day

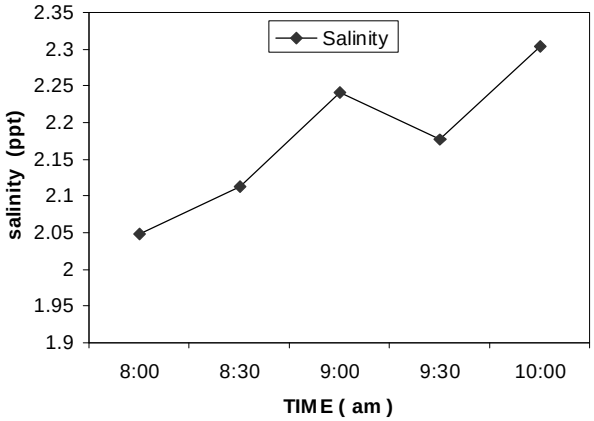

Fig.(14)Salinity values during different time of day

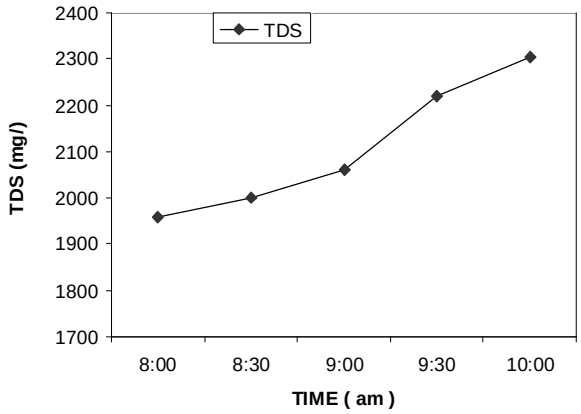

Fig.(15) Total dissolved solids values during different time of day

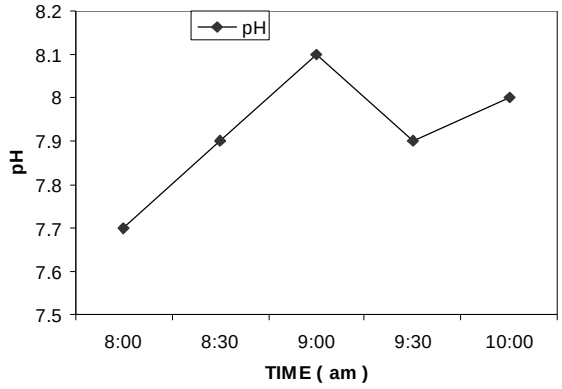

Fig.(16) pH values during different time of day

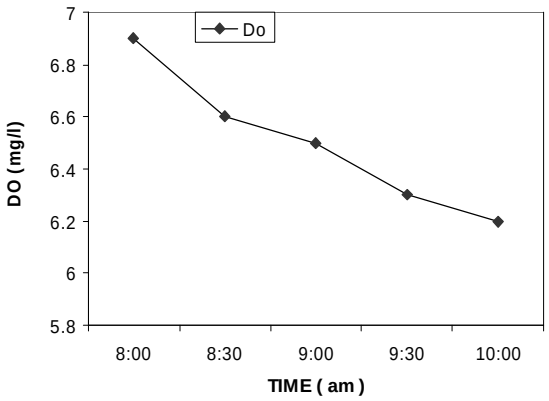

Fig.(17)Dissolved Oxygen values during different time of day

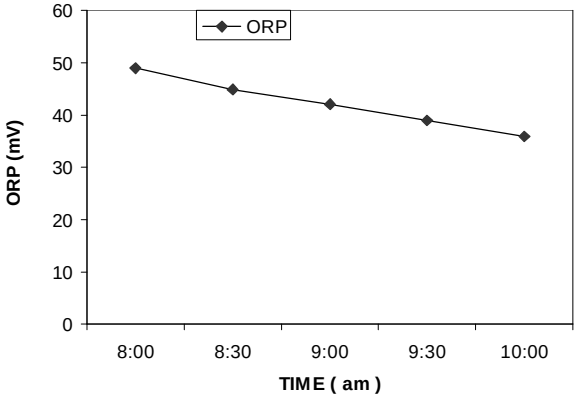

Fig.(18)Redox values during different time of day

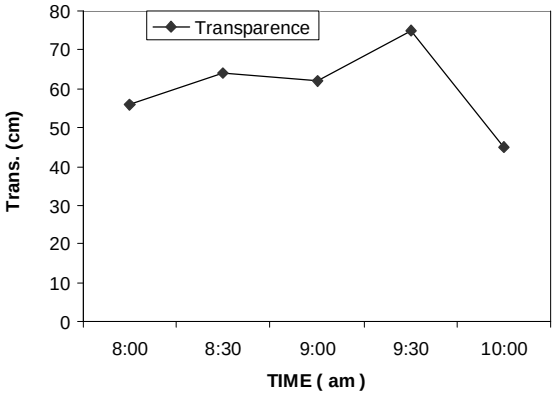

Fig.(19)Transparence values during different time of day

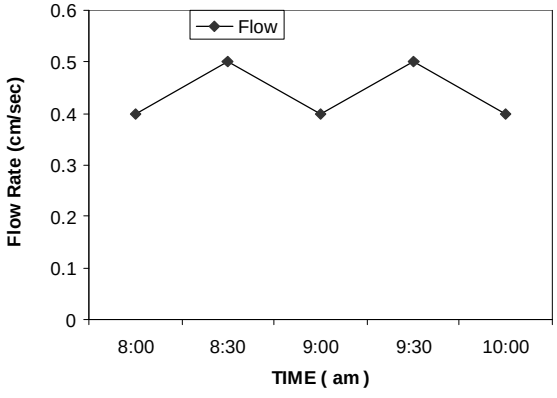

Fig.(20) Flow rate values during different time of day

4- Discussion

East hammar marsh is under the influence of semi diurnal tide from the Arabian Gulf via Shatt Al Arab river. The tide (flood &ebb) drastically affect the water chacteristics of the marsh. During flood tide huge mass of Shatt Al Arab water enter the marsh, increasing the level of water in the marsh and flooding over the banks, covering vast terrestrial areas especially during spring tide. The water quality of Shatt Al Arab river differ from that of Tigris , Euphrates and Main of drainage canal (MOD) , containing the effluents of untreated domestic swage of Basrah city, lead to increase the concentration of nutrients and reduce the level of dissolved oxygen (Richardson *et al*. 2005). As it is known Shatt Al Arab is oligohaline tidal river { Hussain *et al*.(1991)} , consequently tend to increase the salinity of the marsh. Oligohaline water of the marsh allowed some of the estuarine organisms to invade and recolonised the marsh , creating an ecosystem resemble to that of tidal mashland .

Sarker *et al*. (1980) found appreciable diurnal fluctuations in physio-chemical conditions of Shatt Al Arab river, These results coincide with obtained data in East Hammar marshland. At ebb tide Shatt Al Arab water mass retreat leaving only East Hammar marsh water *i e* . original marsh water with its actual size.

Consequently at ebb it is the suitable time for collecting samples representing water and organisms of East Hammar marsh and not at flood due to the confusion brought by Shatt Al Arab water mass.

Yaguob and Salman (1992) indicated that the southern marshes affected by the arid weather prevailing in southern Iraq including the marshes, as result of that temperature of air and water increase rapidly with progressing hours of the day reaching the maximum after mid day and then started to decline at evening

Marsh water temperature was higher during ebb than in flood, because of the shallowness of the marsh and spreading thinly on vast area. Flood water coming from Shatt Al Arab is confined to the main stream with few meters depth turn to be cooler.

Due that shatt Al Arab is oligohaline river and consider as major source of water to East Hammar marshland, leading the marsh water to become more saline during flood tide than in ebb.

Ebb current was faster in East Hammar than flood current ,because ebb current is a resultant of two currents ebb current and marsh current ,the same was noticed in Shatt Al Arab rive by Abdullah (1990).

Transparency was lower at flood tide due to resuspention of soft sediments and increase of water level cause by tidal current .

The results obtained demonstrate beyond doubt that the tidal stage (ebb or flood) affect the water quality of East Hammar marshland.

Water parameter values measured in certain hour represent the situation at that hour and date and not the whole month .this could be true only for East Hammar marsh since it is the only tidal marsh in southern Mesopotamia.

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تأثر الاختلافات اليوميه و ساعات النهار وحاله المد والجزر على الصفات المياه في هور شرق الحمار جنوبي العراق

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الخلاصة

قيست صفات الماء في هور شرق الحمار خلال شهر تموز 2006 في عده مناطق منه .أتضح وجود فروق مكانيه وزمانيه بين المناطق السته لجمع العينات.كانت قيم درجه حراره الماء والملوحه والتوصيليه والمواد الصلبه الكليه الذائبه والاس هيدروجيني أعلى خلال حاله المد وبالعكس للقيم الاوكسيجين المذاب وقابليه التأكسد والاختزال وتيار الماء أعلى في خلال حاله الجزر.

قيم درجه حراره الهواء والماء والملوحه والتوصيليه والمواد الكليه الصلبه الذائبه والاس هيدروجيني ترتفع تصاعدياً مع تقدم ساعات النهار الى منتصف النهار .كما يتخفض الأوكسجين المذاب وقابليه التأكسد والاختزال والشفافيه بينما تزداد سرعه التيار خلال الجزر . أن الوقت في النهار وحاله المد والجزر لها تأثير كبير على صفات الماء المختلفه ويجب أخذها بنظر الاعتبار أثناء أخذ العينات .
