دراسة بعض الخصائص الفيزيائية والكيمائية لقناة خور الزبير

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الملخص

درست الخواص الفيزيائية والكيميائية للماء بـ(محطتين أ و ب) في قناة خور الزبير خلال العام٢٠١٤ . تضمنت الدراسة قياس التيارات المائية، الحامضية، التوصيلية الكهربائية، الملوحة، درجات الحرارة للهواء والماء، الأوكسجين المذاب، الاضطراب، الكبريت، النترات، النتريت والفوسفات. أشارت النتائج الى ان قيم الحامضية بحدود (٧ – ٨.٩) لكلتا المحطتين. قيم الملوحة للمحطة ب عالية. الحرارة تزداد تدريجيا خلال الصيف بتأثير الغلاف الجوي والإشعاع الشمسي. تراكيز الأوكسجين المذاب قليلة خلال الصيف. تركيز باقي العناصر متغير خلال فترة الدراسة. بالإضافة إلى ذلك ارتفاع تراكيز النترات بالمحطة ب (١٢.٤٥ ملغ/لتر). سجل الكبريت أعلى قيمة له خلال الشهر التاسع بالمحطة ب (١٠٨٩.٤٥). قيم الأضطراب عالية في المحطة ب بسبب الملوثات الصناعية. أن زمن التبديل خلال فترة الدراسة هو ٦ أيام.

Study some physical and chemical properties of Khor Al-Zubair Lagoon

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Abstract

The Physical-chemical properties of water in khor Al-Zubair channel was studied during along year 2014.The current study included measurements of (pH ,Ec ,Salinity, temperature ,DO., Turbidity, Sulfate, nitrite, nitrate,&phosphate)at two stations . The results revealed that the averages of pH values of both stations ranged between (7-8.٩).Values of salinity increased in station(B).Temperature increase gradual in summer directly related to atmospheric conduction and radiation.DO concentrations low in summer.Concentrations of other parameters were variable during the whole study period. In addition, the highest concentrations of nitrate in station (B) were high12.45 mg/l. Sulfate was recorded the highest value during September in station(B) which is 1089.45 mg/l. Because of the presence of industrial pollutants the turbidity is high in station (B) than in (A).Flushing time was found 6 days.

Introduction:

BasinKhor Al Zubairlagoon is a naval arm supply anddischarge sea water during the tidal processes[1] Khor Al Zubair(Fig. 1) is located in the northern part of the Gulf affected by tidal system mixed. The tidal regime of Khor Al-Zubair is a mixture of the semidiurnal and diurnal types, but the semi-diurnal type is dominant, hence two high waters and two low waters occur daily with inequalities in heights and time of occurrence [2]. Use this arm for navigational purposes as Khor Al Zubair can be accessed through the navigation channel is approximately long (40 km), the depth of the navigation channel between 10 to 20 meters display the channel, between (1-2km) at High tide,at the top level of the water surface when tide spring. [3]. They constitute an important source of fishery and maritime navigation. Industrial wastewater from petrochemical plant are put into the Shatt Al-Basra and next to the lagoon.The plant of iron, steel and fertilizer raises water discharged into KhorAl-zubair lagoon leads to change quality Water constantly [4]. The information published on the oceanographic study area particularly both physical and chemical is limited, so the present study reflects how the distribution of these properties during tidal cycles through stations distributed along the lagoonfortwo phase spring ,and neap through field and laboratory measurements.

A study of physical and chemical properties of lagoons and estuaries are essential to know the pollution movement and the ability of lagoon or estuary to inflow pollutant from industrial facilities and ships movement to the open sea.

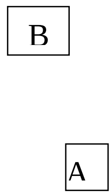


Fig (1)Study area

Method and materials:

Study Area is an extension of the Arabian Gulf waters lays between 47°30´- 47º55´ East and 31º10´-30º30´ North. The first station (A) at located 47°57´ East, 30°1´ North and second station (B) at located 47°52´ East, 30°12´ North(figure(1)).

During the course of the field work measurements,the currents and salinity were achieved hourly at one meter intervals through the water column over complete tidal cycles (13hours)at the two stations.

The column depth of water was monitors by using Echo-sounder , there observation are achieved hourlyfrom a sea –boat which in anchored from the front of the back in order to avoid rotations when the tide changed phase.

This work was down every month over the year 2014 for different periods (spring-neap) of the tide which included high and low discharges in order to obtain depth-mean values of salinity and current speed .The method described in[**5**]. By the help of Acoustic Doppler Current Profiler (ADCP) type Rio

Grande 600 HZ can also draw the cross section for the two stations.

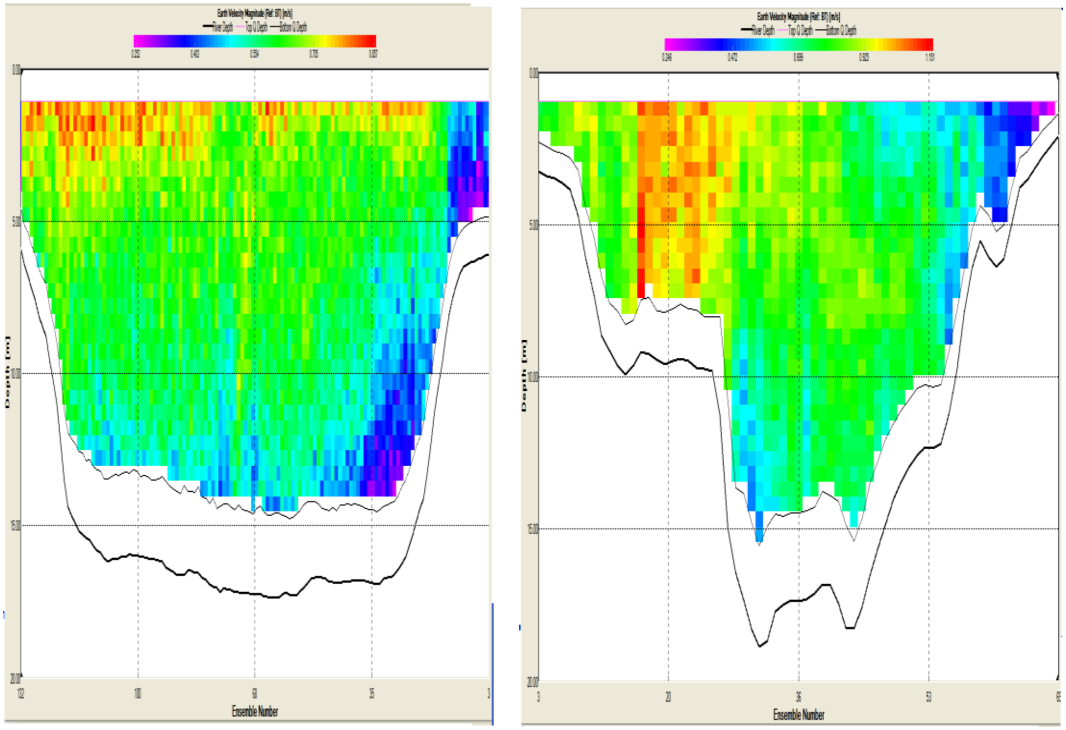
Temperature for air and water was measured using a standard Celsius thermometer with the accuracy of ± 0.5 °C. Salinity was measured with the help of a Refract metermodelE-2 . The electric conductivity (EC) was measured with digital conductivity meter Jlassco-India.The turbidity was measured with Lamotte 2020 code 1979-EPA.The pH was measured with the aid of an Ellice model LI 120 pH meter. Dissolved oxygen, and Biochemical Oxygen Demand (BOD) were analyzed immediately after collection by bottles, following Winkler's method as described by [6].

Tides and currents:

The tidal phenomenon mainly represents the influencing factor in the

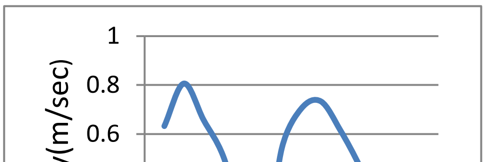
change of hydrological situations in this area. The flow is strongly affected by the range of water levels and phase of tide in the Khor Al-ZubairChannel. It means that the water velocity, water level,flow direction, and tidal fluctuations could be changed. In general, the nature of the tidal for the studies areas is a mixed type of diurnal and semidiurnal with semidiurnal is dominant [7]. The calculated tidal range was 4m and 3.5m in spring tide and 3.5m and 2.9m in neap phase in station A and station B respectively. The time period of the ebb phase was longer than of the flood period phase in Khor Al-Zubair. The time period in station Bfor the ebb phase reach up to 8 hours and up to 5 hours for the flood phase. These time periods could be change from one site to the other along the Channel according to tidal effect and section topography(figure (2)).

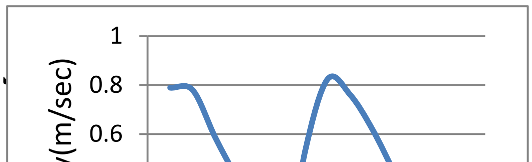
It can be seen that the current velocities reached up to maximum values of 1 m/sec and 0.95 m/sec are inspring tide, and 0.75 m/sec and 0.72 m/sec for neap tide in stations A and B respectively(figure (3)). The currents velocity for flood period was faster than the ebb period along the Channel, this is due to long period of the ebb and the strong tidal effect in the area, which is corresponds with the results of [3].



(A) **(B)**

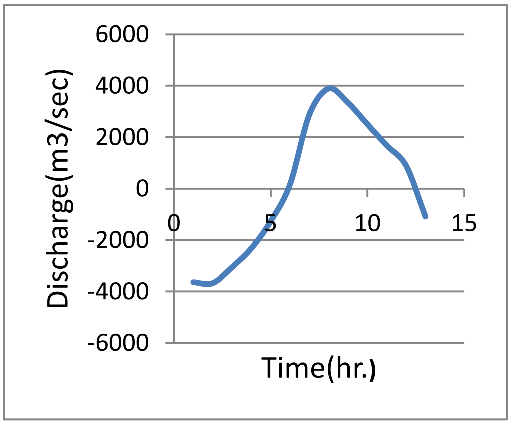
Fig. (2)Cross-sectionby(ADCP), in Khor Al-Zubairta station A & B



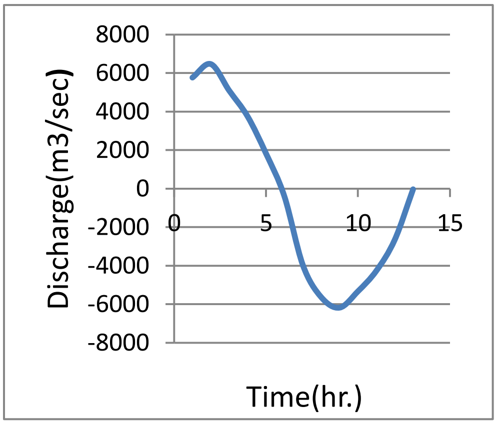


(B) **(A)**

Fig. (3)The relationship between the velocityand time for one cycle tidal(13 hours)in Khor Al-Zubair at station A&B



(A)



(B)

Fig.(4)shows the relationship between the dischargeand time for one cycle tidal (13 hours)inKhor Al-Zubairat station A & B

Flushing characteristics:

Measurements of the current speed and direction at the entrance of KhorAl-Zubair Lagoon(Station A) and(Station B)away fromKhorAl-Zubair portfor one complete tidal cyclewere taken at 22-23/9/2014(figure(3)). Then to be were used to calculated the Flushing time .Flushing time iscalculated to investigate the renewal of KhorAl-Zubairwater . The rate at which the exchanges with the open sea depends greatly on the geometry , depth and circulation near the entrance .

Flushing Time = Lagoon volume / α . Flow rate …………..(1)

Average Width = 1500 m

Average depth = 15 m

Average Long = 40 Km

Flow rate = 4389.55 m^3 /sec

α = 0.4 (constant).

Applying equation (1) tocalculateFlushing timeof the study area showed about 6 days renewal of the water of KhorAl-Zubair, While [8] found it 5-6 days .

RESULTS &DISCUSSION:

The presence of difference between topography of two station, thatreflect the change in discharge due to the effect of topography(Figure (2) and figure (4)) shows that respectively. Most of the natural waters are generally alkaline due to the presence of sufficient quantities of carbonate (table (1))[9].The hydrogen-ion concentration (pH) often changes with timedue to temperature-salinity changes and biological activity. The pHremained alkaline throughout the study period in two stations withmaximum values during the summer, which could be attributed to high salinity of water and also due to the uptake of carbon dioxide bythe photosynthetic organisms(table (2,3)). The photosynthetic activity may causehigh pH, because of bicarbonate degradation by carbonic anhydraseassociated with photosynthesis [10].Salinity is considered to the basic and prime factor among theenvironmental variables in the marine environment which influencesgreatly the dynamic situation of the lagoonand coastal waters bythe inflow of freshwater and the prevailing temperature (table(2,3)).The gradual increase in water temperature from summer is directly related to atmospheric conduction and radiation (table (4,5)) and (figure(5,6)).Dissolved oxygen is one of the most important parameters, whichreflects the physical and biological processes of water. The dissolvedoxygen content, depends upon the photosynthetic activities, monsoonalfloods and the turbulence caused by winds(table(6,7))and (figure(7,8))[2].Because of the presence of industrial pollutants the turbidity is high in station (B) than in (A). In the present study, the dissolved oxygen concentrationwas low in summer(table (2,3)). Solubility ofoxygen in water is inversely proportional to temperature [4]. Thelow dissolved oxygen concentration observed during summer maybe attributed to the higher salinity of the water, higher temperatureand less inflow of freshwater coupled with biological processes such asconsumption of available oxygen by the organisms for respiration andactive decomposition of organic matter during summer month(table(8,9) and figure (9,10)).Variation in atmospheric temperature can influence the physicochemicalproperties of coastal and lagoon waters to a greatextent. Figure (5,6)shows the higher values of atmospheric temperature in summer.

Table (1) measured factors in two stations

Station(B)	Station(A)	Unit	Measured factors
±٢١١.٢٢ ٦٩.٢٢	٥١.٤٤±٢٣٣.٣٣	mg/l	Chloride
±٩٨٩.٤٣ ١٠٠.٠٢	٩٦.٨٨±٧٩٧.٤	mg/l	Sulfates
٠.٧١ ±٢.١١	٠.٣٣ ±٠.٤١	mg/l	Nitrites
٤.٥٦±١٢.٤٥	١.٨٨ ±٨.٣٢	mg/l	Nitrates
٠.١٢ ±٠.٥٦	٠.٣١ ±٠.٣٣	mg/l	Phosphate

Table(2)physical parameters for tidal cycle for station A

Date	Sample No	EC	Turbidity	S	pH	DO%	Twater	Tair
		mS/m	NTU	ppt			C°	C°
20.1.2014	1a	68.4	108	43.776	7.9	8.8	32	39
	1b	68.5	311	43.84		8.4	31.7	
	1c	68.8	441	44.032		8.2	31.6	
22.3.2014	2a	66.2	71.3	42.368	7.8	8.2	31.4	39.5
	2b	67.4	272	43.136		8.2	30.3	
	2c	67.8	422	43.392		8.1	30.1	
22.5.2014	3a	67.2	412	43.008	7.5	8.2	30.4	30.5
	3b	67.6	101.9	43.264		8.2	29.7	
	3c	67.9	450	43.456		8.1	29.4	
23.7.2014	4a	67.5	170	43.2	7.4	8.2	30.4	39.8
	4b	67.7	256	43.328		8.1	30.6	
	4c	67.8	280	43.392		8.1	30.6	
23.9.2014	5a	67.9	67.3	43.456	7.3	8.7	30.2	40
	5b	68.2	230	43.648		8.6	29.6	
	5c	68.2	286	43.648		8.4	29.3	
21.11.201	6a	68.6	92	43.904	7.5	8.4	30.1	40.2
	6b	68.2	228	43.648		8.3	30.2	
	6c	68.5	267	43.84		8.2	30.2	

Table (3)physical parameters for tidal cycle for station B

Date	Sample No	EC	Turbidity	S	pH	DO%	Twater	Tair
		mS/m	NTU	ppt			C°	C°
20.1.2014	1a	61.4	108	39.296	7.4	8.8	32	39
	1b	62.5	311	40		8.4	31.7	
	1c	62.8	441	40.192		8.2	31.6	
22.3.2014	2a	64.2	71.3	41.088	7.5	8.2	31.4	39.3
	2b	63.4	272	40.576		8.2	30.3	
	2c	62.8	422	40.192		8.1	30.1	
22.5.2014	3a	65.2	412	41.728	7.1	8.2	30.4	30
	3b	65.6	101.9	41.984		8.2	29.7	
	3c	64.9	450	41.536		8.1	29.4	
23.7.2014	4a	65.5	170	41.92	7	8.2	30.4	39.2
	4b	66.7	256	42.688		8.1	30.6	
	4c	66.8	280	42.752		8.1	30.6	
23.9.2014	5a	65.9	67.3	42.176	7.2	8.7	30.2	39.9
	5b	66.2	230	42.368		8.6	29.6	
	5c	66.2	286	42.368		8.4	29.3	
21.11.2014	6a	67.6	92	43.264	7.2	8.4	30.1	40.6
	6b	67.2	228	43.008		8.3	30.2	
	6c	67.5	267	43.2		8.2	30.2	

Table (4) average water temperature (C˚) for one year in station A

Date	Surface	medium	deep	W.T. Average in station (A)
20.1.2014	30.9	31	31.04	30.98
22.3.2014	30.64	31.13	31.18	30.9833333
22.5.2014	30.55	30.99	30.9	30.8133333
23.7.2014	30.11	30.47	30.53	30.37
23.9.2014	30.54	30.67	30.64	30.6166667
21.11.2014	31	30.8	30.8	30.8666667
			Avarage	30.7716667

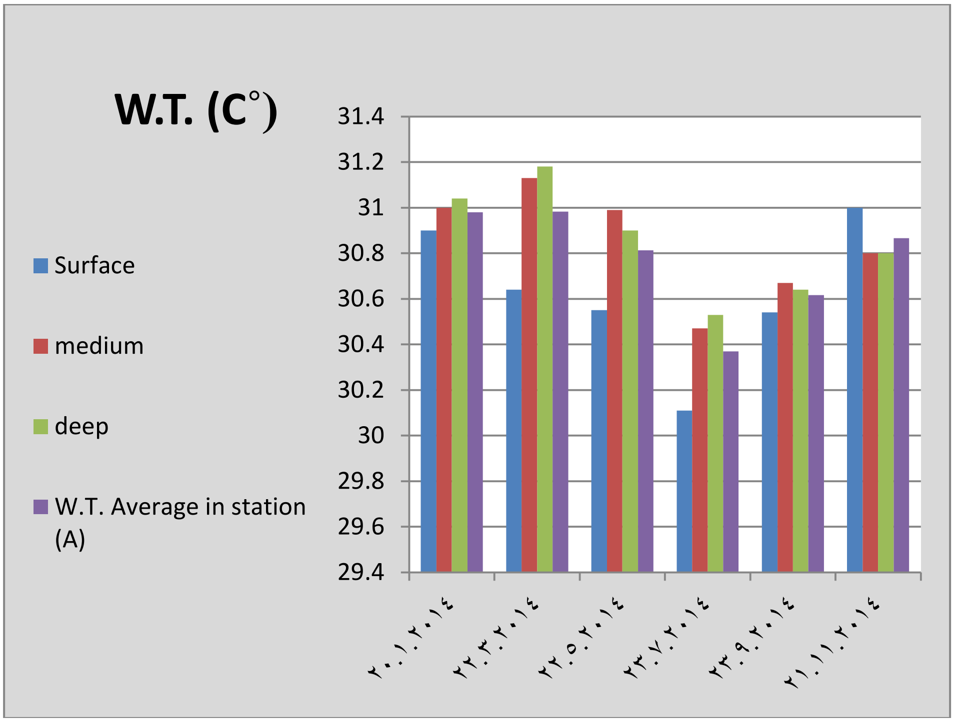


Fig. (5) average water temperature (C˚) for one year in station A

Table (5) average water temperature (C˚) for one year in station B

Date	Surface	medium	Deep	W.T. Average
20.1.2014	28.1	28.1	28.25	28.15
22.3.2014	31.13	31.17	31.17	31.15667
22.5.2014	31.13	31.13	31.1	31.12
23.7.2014	31.9	31.9	32.2	32.1
23.9.2014	31.1	31.2	31.11	31.1
21.11.2014	30	30.1	30.1	30.06667
			Avarage	30.61556

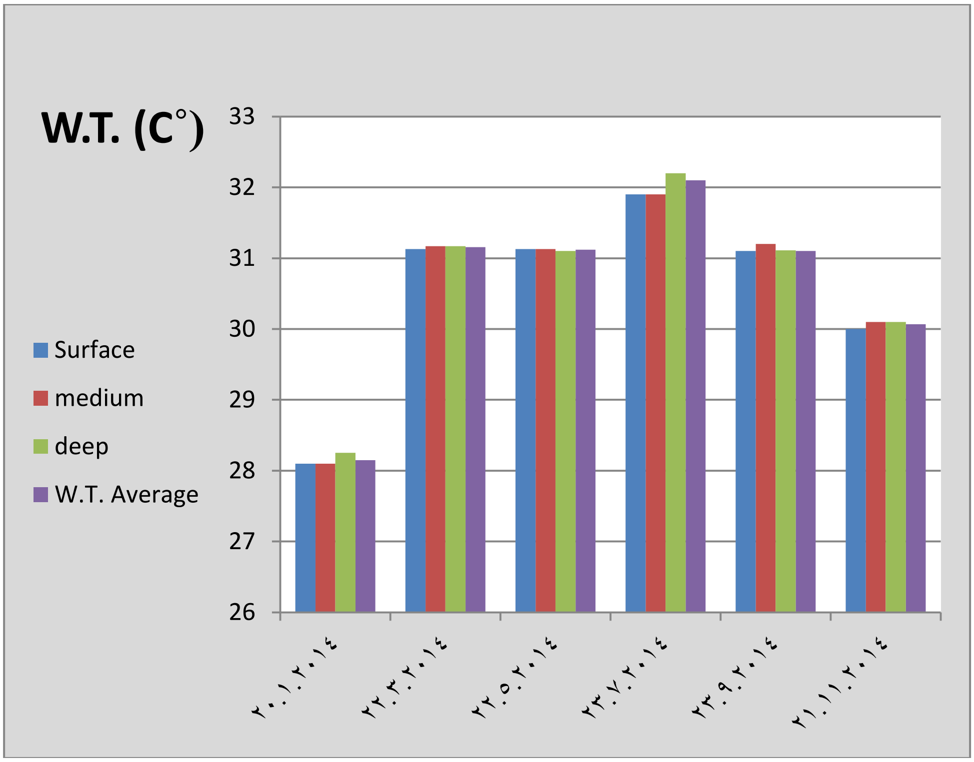


Fig. (6)) average water temperature (C°) for one year in station B

Table (6) turbidity for one year in station A

Date	Surface	medium	deep	Turb. Average in st. A
20.1.2014	65	75	79	72
22.3.2014	79	83	97	86.33333
22.5.2014	113	123	134	3.3333
23.7.2014	139	142	152	144.3333
23.9.2014	140	147	155	147.3333
21.11.2014	136	147	152	145

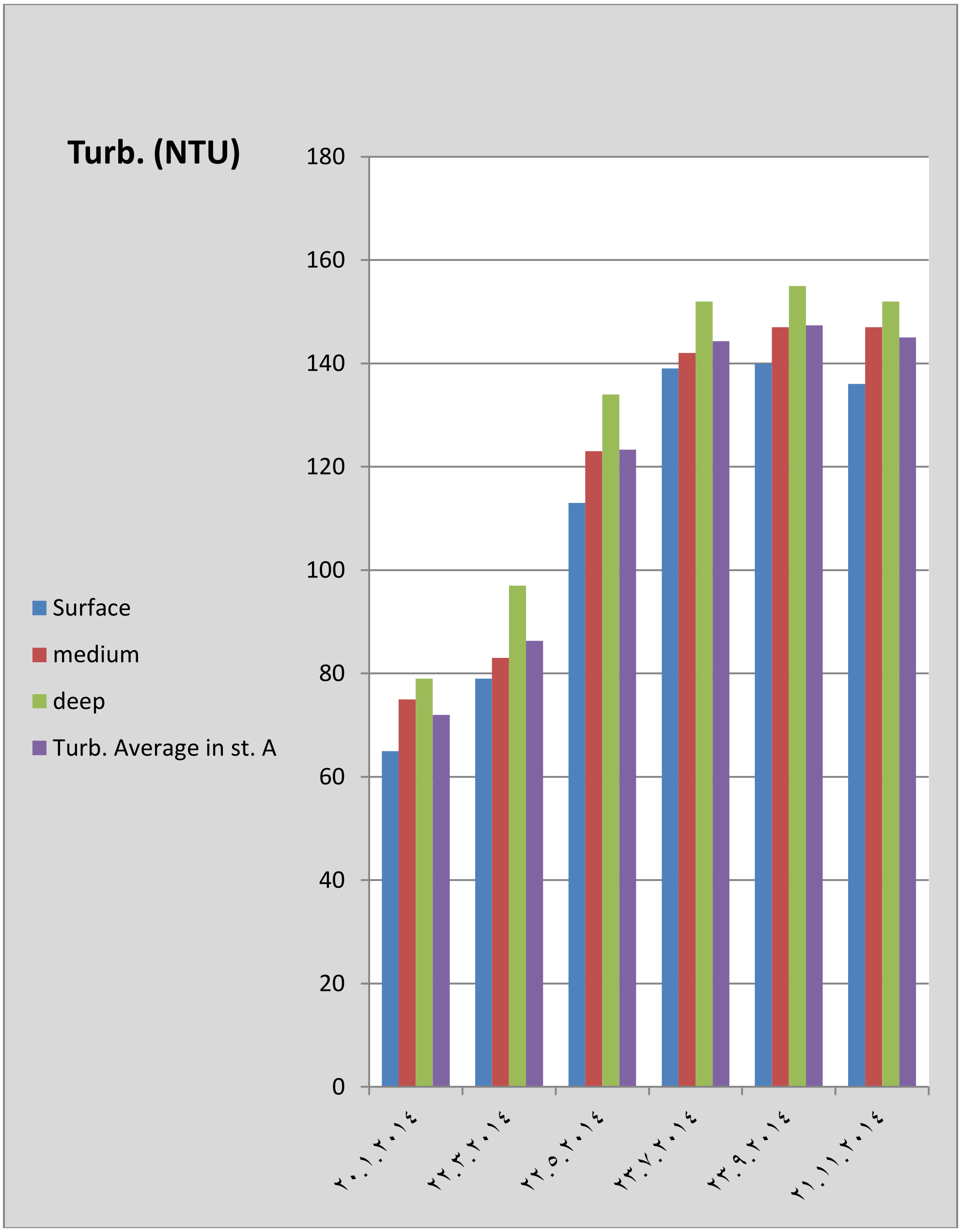


Fig. (7) turbidity for one yearin station (A)

Table (7) turbidity for one year in station B

Date	Surface	medium	deep	Turb. Average
20.1.2014	132	140	155	143.5
22.3.2014	139	144	166	149.6667
22.5.2014	145	149	170	154.6667
23.7.2014	147	155	172	158
23.9.2014	143	149	167	153
21.11.2014	145	150	169	154.6667

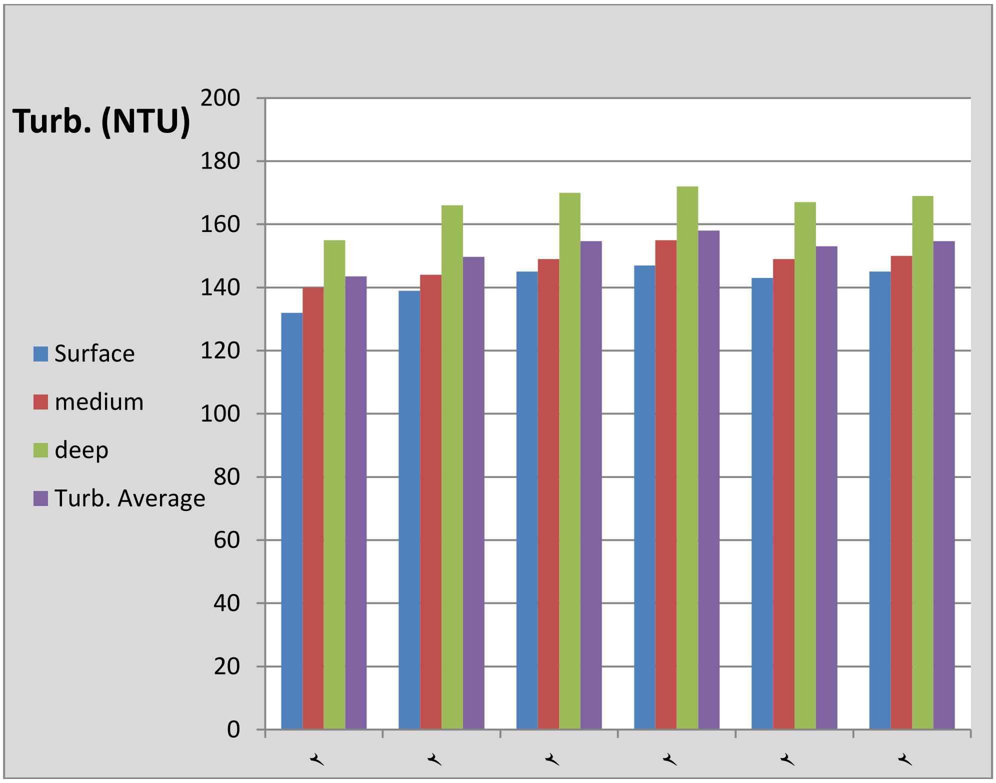


Fig. (8) turbidity for one year in station (B)

Table (8) D O.(mg/l) in station (A)

Date	**Surface**	**medium**	**deep**	**D O. Average**
20.1.2014	6.1	5.95	6.08	6.043333
22.3.2014	6.7	5.93	5.97	6.2
22.5.2014	10.16	6.02	6.16	7.446667
23.7.2014	7.95	5.6	5.67	6.406667
23.9.2014	6.33	5.9	6.12	6.116667
21.11.2014	5.73	5.56	5.9	5.73
			Avarage	6.323889

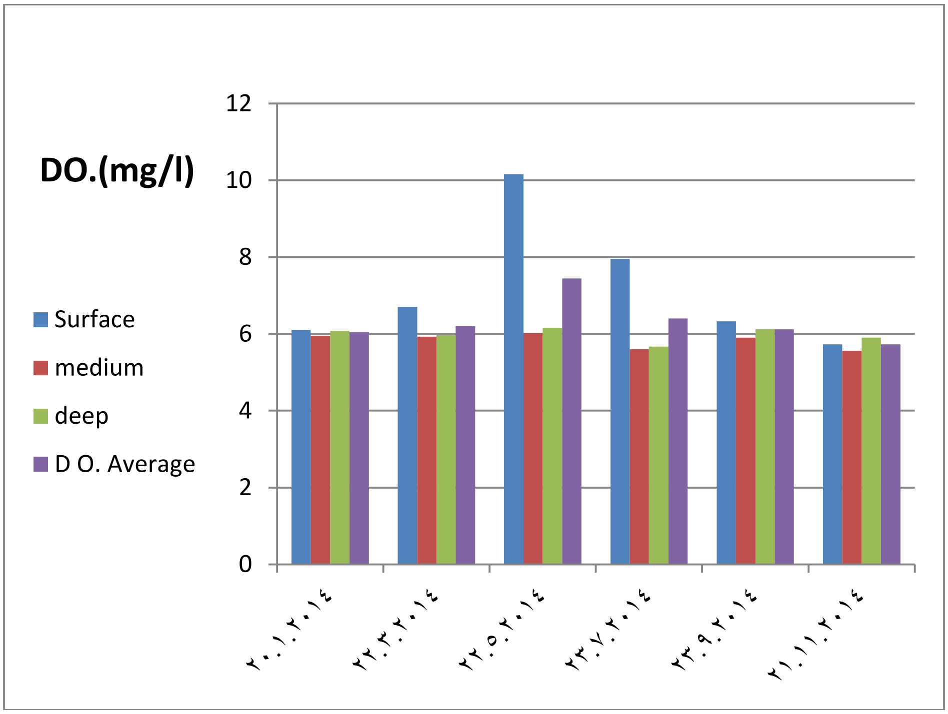


Fig. (9)D O. for one year in station A

Table (9) D O. (mg/l)in station B

Date	Surface	medium	deep	DO. Average
20.1.2014	8.77	5.74	6.86	7.123333
22.3.2014	11.59	6.37	6.27	8.076667
22.5.2014	11.44	6.44	6.24	8.04
23.7.2014	11.55	6.65	6.25	8.15
23.9.2014	11.73	7.72	6.02	8.49
21.11.2014	8.99	6.89	6.54	7.473333
			Avarage	7.892222

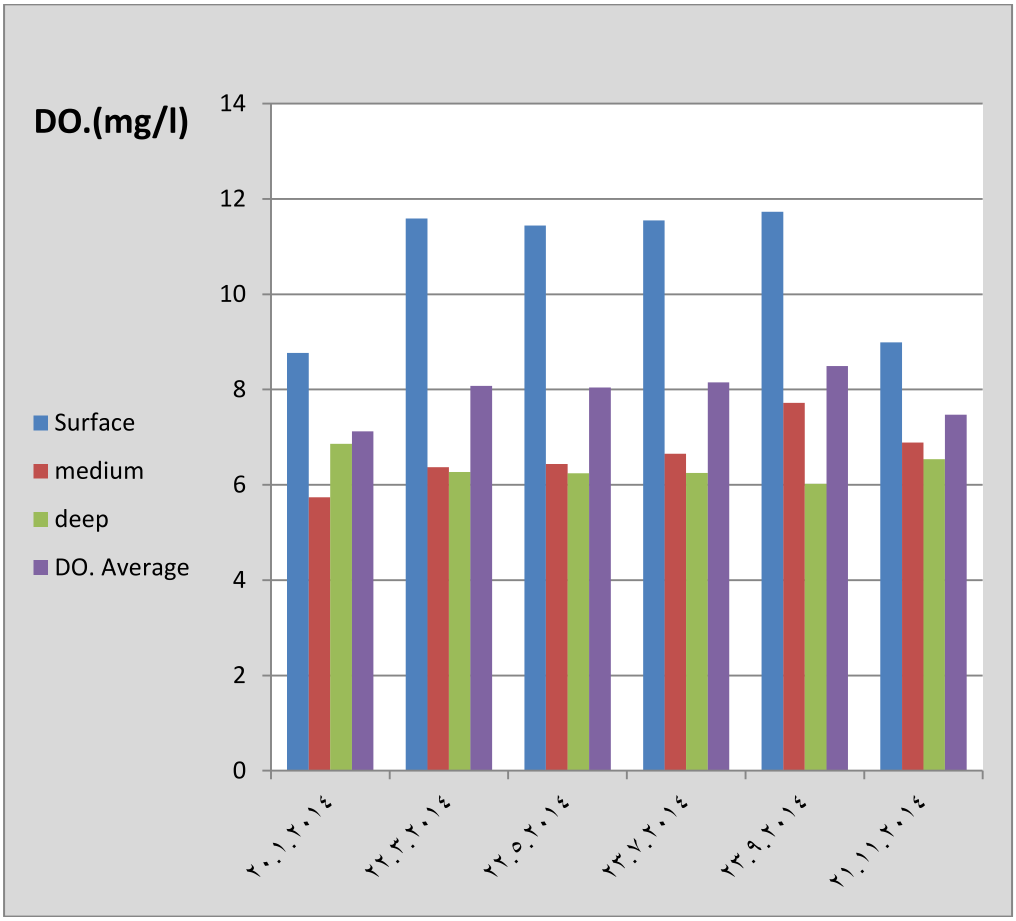


Fig. (10)D O.(mg/l) for one year in station B

Recommendations

1-It requires that the relevant ministries and research centers to hold periodic measurements to assess the water quality of the Khor Al-Zubair lagoon.

2- Put continuous treatments for industrial waste plan inKhor Al-Zubair lagoon.

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