A Comparative Study on Water Quality Assessment of Shatt Al-Arab Estuary and Al-Ashar Canal, Basrah, Iraq

Adian A. Kahami[1]*, Asia F. Abdullah[1] ID, Imad J. Al-Shawi[2] ID
[1]Dept. Ecology, Coll. Science, Univ. Basrah, Basrah, Iraq
[2]Dept. Applied Marine Science, Coll. Marine Science, Univ. Basrah, Iraq
Corresponding Author e-mail: adyanally58@gmail.com

Received 25/03/2023 Accepted 02/07/2023 published 25/12/2023

Abstract

Monitoring water quality is absolutely essential for formulating policies that affect public and environmental health. The study samples were collected during the period from autumn 2021 to summer 2022, The study show the environmental deterioration of Al-Ashar canal compared with Shatt Al-Arab estuary. including some physical parameters: air and water temperature, which had the highest values in station 2 during July and reached 38.9 and 29 C°, respectively while salinity concentrations recorded a high at station 1. achieved (8.8) g/L. Turbidity and total suspended matter concentrations increased at station 3, achieving 106 NTU and 100 mg/L, respectively. Also the chemical and biological parameters in Al-Ashar Canal were very poor compared to the Shatt Al-Arab, including: pH, whose values were in the basal direction, and the highest values were recorded in station 3, achieving 8.89 Also, there was an increase in the values of the biological oxygen demand and chemical oxygen demand, achieving 2400 and 590 mg/L at stations 2 and 3 respectively. While a decrease was recorded in the dissolved oxygen values in station 3, which amounted to 0.13 mg /L, nutrients (PO_4 , NO_2 and NO_3) increased at station 3,2,2. achieving 1.79, 17.982 and 15.51 µg/L, respectively. Also, the values of chlorophyll A increased at station 2 and reached 215.72 µg/L. The aimed of the study is determined the water quality of Al-Ashar canal and compared with Shatt Al-Arab.

Key word: Al-Ashar canal, chemical, biological parameters, physical parameters, Shatt Al-Arab, water quality.

P-ISSN: 1812-237X, E-ISSN: 2788-5720, https://ijaqua.uobasrah.edu.iq/index.pip/iaqua

Introduction

Water quality is a new scientific topic in hydrological studies, so governments and international institutions began to pay attention to this issue, especially in the early twenty-first century, as a result of the increasing water scarcity crisis and the diversity of water uses associated with it. Climate change affected the world in general and our region in particular (Al-Asadi *et al*., 2020); water quality is a term used to describe the physical, chemical, and biological properties of water (Guan, 2011); and Shatt Al-Arab is the main source for supplying the Basrah governorate with surface water, as its water is used for many purposes, such as drinking water supply, irrigation, fishing, navigation, and other industrial uses (Hussein *et al*., 1991), In recent years, this river has suffered from pollution problems despite its importance, which has led to a significant decline in the quality of its water, Many factors contributed to the deterioration of the quality of the Shatt Al-Arab water, including the construction of dams in some countries and the mismanagement of water resources in the southern region of Iraq. In addition to the drainage of industrial and liquid waste, pesticides, butchery residues, fertilization, and untreated sewage water in the Shatt Al-Arab waters (Mohammad *et al*., 2021).

The study of the quality of Shatt Al-Arab water and its suitability for different uses has received more attention from researchers in the fresh water environment than others due to its importance. among the environmental studies conducted on the Shatt al-Arab is a study, by Sarker *et al*. (1980) which studies the daily fluctuations of some physical and chemical factors in the Shatt Al-Arab and Al-Ashar Canal; Al-Saad and Antoine (1982) studied a group of physical and chemical factors for the Shatt Al-Arab and the al-Ashar channel; the study of Resen (2001) dealt with the effect of organic pollutants in three main channels in the Shatt Al-Arab and their effect on the abundance and density of snails; Abdullah *et al*. (2009) studied the physical and chemical properties of the middle part of the Shatt Al-Arab River, Al-Shmery (2013) studied included measuring some physical and chemical properties of the Shatt Al-Arab water in the area extending from Qurna to Abi Al-Khasib. Gatea (2018) conducted a study to assess the water quality of the Shatt Al-Arab River, in which a range of physical and chemical factors were measured; study of Qzar *et al*. (2021) in which the effect of the Karma Ali canal on the water quality of the Shatt Al-Arab was known, and they concluded that the Hammar Marsh affects the water quality of the Shatt Al-Arab through the Karma Ali canal, The study of Adlan and Al-Abbawy (2022) aimed to find out the difference in the concentration of the physical and chemical variables of water along the Shatt Al-Arab. The aimed of the study is determined the water quality of Al-Ashar canal and compared with Shatt Al-Arab.

Materials and Methods

Description of study area

Shatt al-Arab Depression: is one of the most important fresh water resources in Basrah Governorate, with a length of about 200 km and a width ranging from 400 m to more than 2000 m, as it narrows at the centre of the city to 500 m, and its depth is between 8-15 m (Ali *et al*., 2021). There are several sub - rivers on both sides of the Shatt Al - Arab, which were used as irrigation canals, and these branches in the city were, recently used as drainage channels for sewage, and industrial facilities were established on them. The most important of these channels are Rabat, Al-Kandaq, Al-Ashar, Al-Khorra, and Al-Sarraji (Al-Asadi *et al*., 2019).

Al-Ashar Canal: is one of the most important branches of the Shatt Al-Arab, and it is the longest among them. It is characterized by its rectangular shape, with a length of 8 km, a width of 37 m, and a maximum width of 50 m near the intersection with the river. Its depth ranges from 5-10 m. The canal is located in a densely populated area in Basrah. Most of the waste is dumped into it and the canal suffers from sewage pollution (Sarker *et al*., 1980). The water of the Shatt Al-Arab enters the Al-Ashar Canal during the tidal period and returns at low tide, mixed with sewage water and loaded with agricultural waste (Al-Sowaig, 1999).

Three stations were chosen to conduct the present study Fig. 1:
The station 1: Is located north of Al-Ashar Canal, about 1 km^2 near the water purification station of the Shatt Al-Arab district. This station

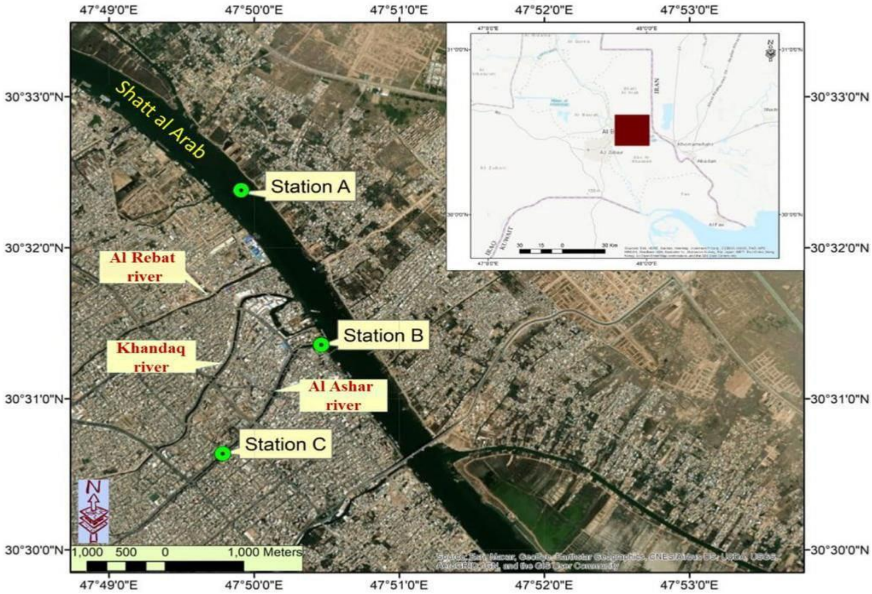

Figure 1: Map of the study area

is characterized by the presence of many palm trees on both banks of the river, in addition to a group of ships, (Table 1). The station 2: Is located at the meeting point of Al-Ashar Canal and Shatt Al-Arab near Al-Ashar Games City (Happy Land). This station is distinguished as a place for draining all the water coming from the Al-Ashar Canal to the Shatt Al-Arab River (Table 1).

The station 3: Is located inside the Al-Ashar channel, about 2 km away, opposite the Old Basrah Governorate Council. This station is characterized by a large number of drained sewages, as its water is stagnant and dark and subject to severe pollution due to the opening of the sewers of the regions of Algeria and Abbasiya to it, in addition to the spread of some plants such as *Frangula alnus* and *Phragmites* (Table 1).

Table1: Latitude and longitude of selected stations in the studied are

Sample ID	Latitude	Longitude
Station 1	N: 30°31.9654’	E: 47°50.2465’
Station 2	N: 30°31.3571’	E: 47°50.4615’
Station 3	N: 30°30.6359’	E: 47°49.7822’

Sampling collection

Samples were collected from the three selected study stations on a quarterly basis during the autumn (November) of the year 2021 and winter (February), and the spring (April) and summer (July) of the year 2022. Water samples were taken using plastic bottles of 1 litre capacity, and the bottles were kept in a cooler box with crushed ice until the tests were conducted, some environmental parameters (physical, chemical and biological) were determined in the field. while others were measured in the laboratory.

Field Measurements

The air temperature, water temperature and salinity were measured using a British-made Aqua meter, While the turbidity using the British-made Turbi Direct Lovibond device. The pH values were determined using a pH meter, and the azide modification method of the Winkler method was used to measure dissolved oxygen in water (APHA, 2005).

Methods of Analysis

Total suspended solids (TSS), biological oxygen demand (BOD_5) and chemical oxygen demand (COD) were measured according to APHA (2005), Nutrients (phosphates and nitrites), they were estimated based on what was stated in the APHA, 2012; nitrates were estimated based on Wood *et al.*, (1967), modified by Parsons *et al.*, (1984),and the concentration of chlorophyll a, was calculated according to Vollenweider (1974).

Results and Discussion

Physicochemical and Biological parameters of the water: The highest air and water temperatures occurred during the summer season, with a rate of 38.9 and 29 C° in the station 2, respectively. While the lowest air and water temperatures, were in the winter season, at a rate of (13, 15.65 C°) in the third and, stations 2 respectively(Fig. 2 and 3), the results of the statistical analysis showed that there were significant differences in air and water temperatures between seasons ($p \leq 0.05$), respectively. The reason for this may be attributed to the nature of Iraq's climate, which is characterized by being hot and, dry in the summer and cold and rainy in the winter (Al-Atbee, 2018), This study agreed with the studies of Ati (1999) and Amer *et al*. (2022).

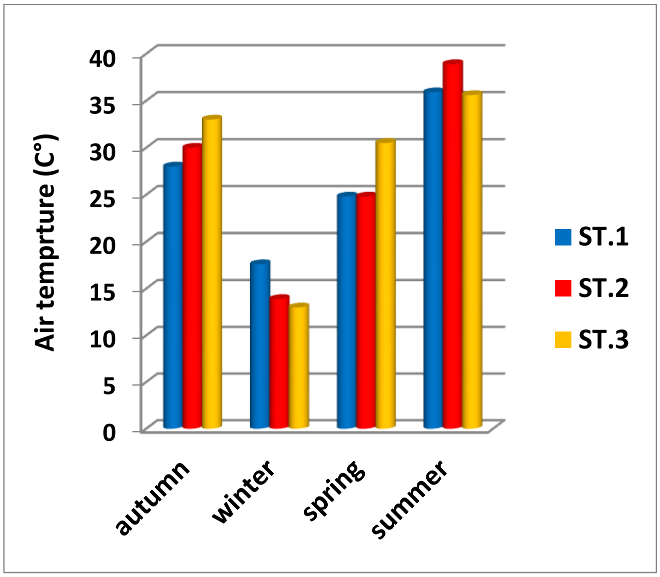

Figure 2: Seasonal variation in air temperatures in three selected study stations from Shatt Al-Arab Estuary and Al-Ashar Canal

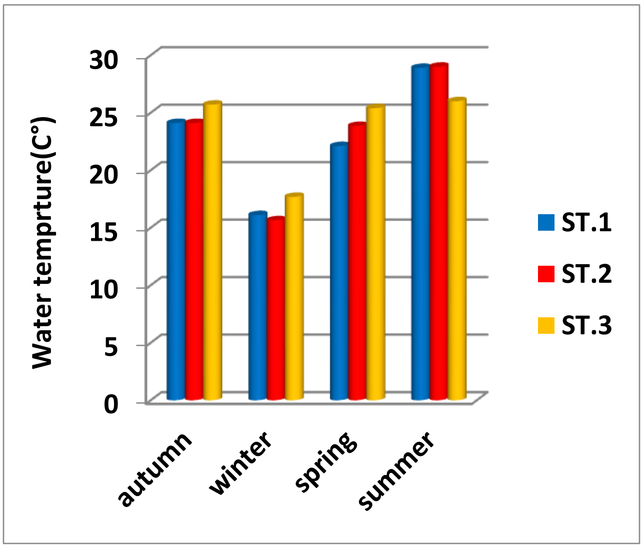

Figure 3: Seasonal variation in water temperatures in three selected study stations from Shatt Al-Arab Estuary and Al-Ashar Canal

Salinity values increased in the station 1 and reached 8.8 g/L during the summer season, while the lowest values were in the station 1 and reached 1.2 g/L in the autumn season (Fig. 4).

The results of the statistical analysis revealed significant differences in salinity between seasons ($p \leq 0.05$) and a significant correlation between salinity and air and water temperatures)r=0.621, r=0.642) respectively. The increase in salinity values during the summer season is attributed to the high water temperature, which leads to a high rate of evaporation, or perhaps as a result of the disposal of wastewater containing high concentrations of salts, or due to the products of decomposition of organic matter, while the values of salinity decreased during the autumn season, perhaps due to precipitation and then water softening and salinity reduction (Al-Tamimi, 2016). This study agreed with the studies of Resen (2001) and Al-Khafaji *et al*. (2021).

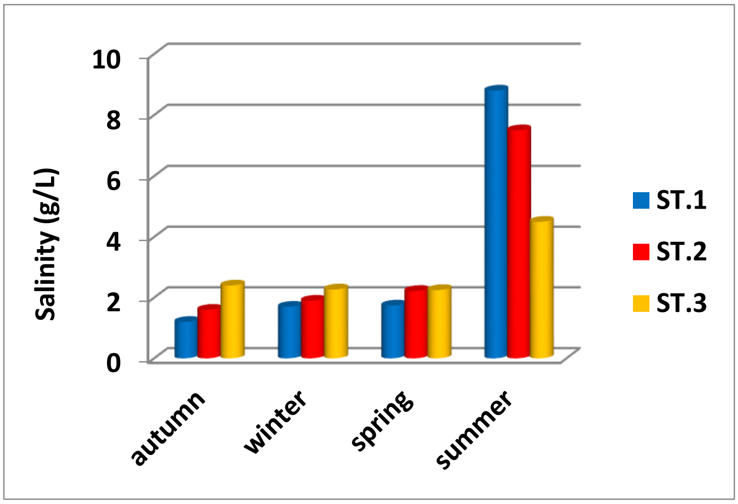

Figure 4: Seasonal variation in Salinity in three selected study stations from Shatt Al-Arab Estuary and Al-Ashar Canal

Fig. 5 showed The highest value of turbidity was recorded (106 NTU) in the station 3 during the summer season and the lowest value (7.74 NTU) during the summer season in the station 1. There were significant differences between stations ($p \leq 0.05$), and there was a significant correlation between turbidity and Total suspended solids (r=0.768). The reason for the high turbidity values in the station 3

May be related to due to the high percentage of pollutants expelled to the water of the station, which then increases the turbidity values, and this is what Al-Saadi and Antoine (1981) noticed. in Al-Ashar channel, as domestic, agricultural and industrial sewage added large quantities of particulate matter to water bodies, organically polluted river water supported a large living mass of bacteria, which effectively caused an increase in turbidity. Dust storms may also have played a role in increasing the values of turbidity as a result of the addition of minutes to the water (Al-Edani *et al.*, 2019). This study agrees with Moyle (2010).

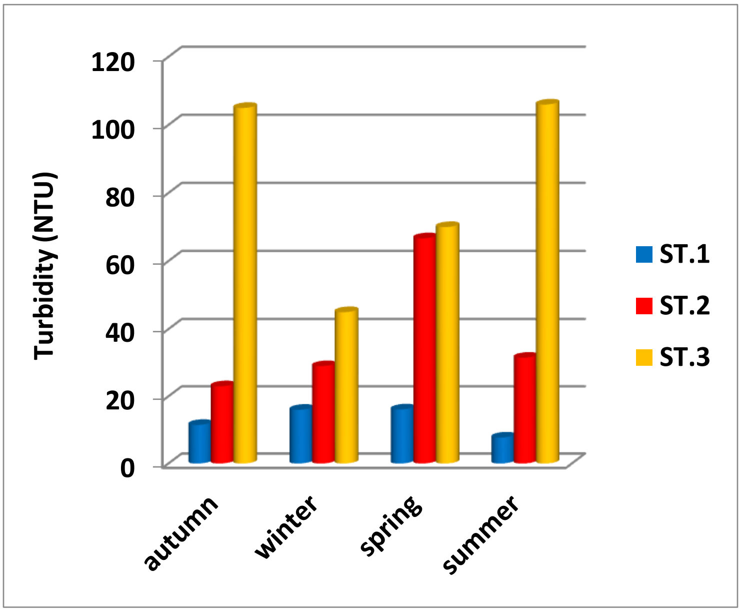

Figure 5: Seasonal variation in Turbidity in three selected study stations from Shatt Al-Arab Estuary and Al-Ashar Canal

The values of total suspended solids showed in Fig. 6 and ranged between the highest value (100 mg/L) in the station 3 in the summer season, and the lowest value (7 mg/L) in the station 1 in the autumn season, The results of the statistical analysis showed that there are significant differences for total suspended solids between seasons ($p \leq 0.05$), as well as the presence of significant differences between stations ($p \leq 0.05$), there is a significant positive correlation between the total suspended solids and air and water temperature, pH, turbidity, and biological oxygen demand (r = 0.474, r = 0.448, r = 0.516, r = 0.786, r = 0.452), respectively. Also, a significant negative correlation was found between the total suspended solids and dissolved oxygen, nitrates (r=-0.564, r=-0.532) respectively. The reason for the high values of total suspended solids in the summer and in the station 3 may be due to the high temperatures and the increase in evaporation rates, in addition to the increase in the speed of water flow and the impact of this station on sewage water and human activities, as the excreted waste also adds a lot of suspended materials, which leads to This indicates an increase in the values of total suspended matter, while the decrease in the values of total suspended matter during the autumn season may be due to a decrease in temperature and an increase in the water level (Khalaf, 2013). The results of this study agreed with those of Al-Saad *et al*. (2015).

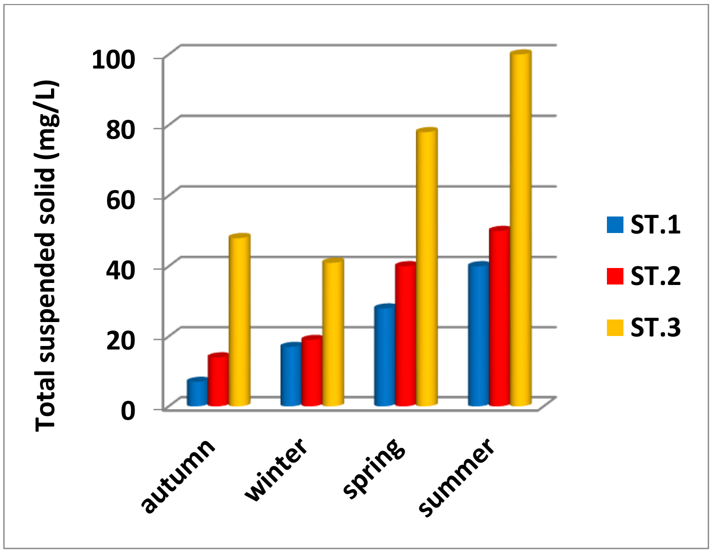

Figure 6: Seasonal variation in Total suspended solid in three selected study stations from Shatt Al-Arab Estuary and Al-Ashar Canal

The highest pH value was recorded (8.89) in the station 3 during spring while the lowest value was (7.42) in the station second during winter (Fig. 7). The results of the statistical analysis showed that there were significant differences in pH between seasons ($p \leq 0.05$), as well as significant differences between stations ($p \leq 0.05$), and a significant correlation between pH and total suspended matter, and chlorophyll a ($r=0.516$, $r=0.502$) respectively. In general, the pH values throughout the study period were within the basal trend, and this is a characteristic that characterizes Iraqi waters, due to the regulatory ability of water resulting from its high content of carbonates and bicarbonates (Fahd, 2005). and that the rise in pH values during the spring may be due to the flowering of phytoplankton that consume carbon dioxide in the form of bicarbonates and carbonates, which causes a rise in pH values (Wilson and Floey, 2003). The results of this study agreed with the study of Hamza (2023).

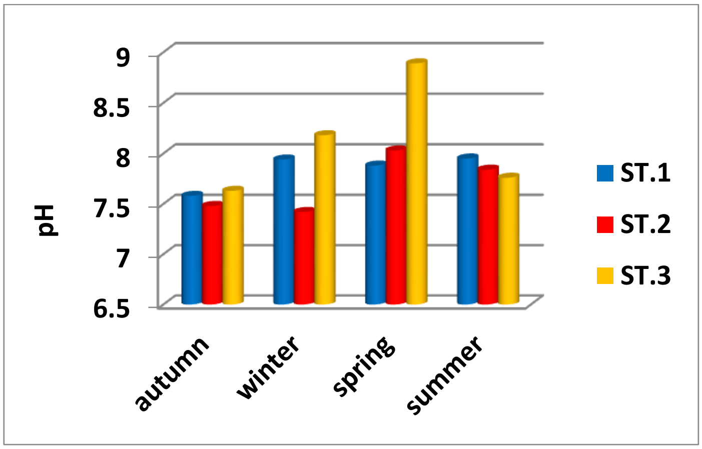

Figure 7: Seasonal variation in pH in three selected study stations from Shatt Al-Arab Estuary and Al-Ashar Canal

The highest value of dissolved oxygen was recorded at 7.8 mg/L in the station 1 during winter, and the lowest was 0.13 mg/L in the station 3 during summer, (Fig. 8). The results of the statistical analysis showed there were significant differences between stations at ($p \leq 0.05$) and a significant negative correlation between dissolved oxygen and turbidity, total suspended solids, and biological oxygen demand ($r = -0.665$, $r = -0.564$, $r = -0.677$) respectively. The results show an increase in oxygen values during the cold seasons, and the increase in oxygen values during the cold seasons is due to a decrease in temperatures, which leads to an increase in the solubility of gases on the one hand and a decrease in the decomposition of organic waste on the other hand (Khalaf *et al*., 2023). Fig. 9 showed, The lowest value of the biological oxygen demand was 0.37 mg/ L in the station 1. During autumn, while the highest value was 2400 mg/L recorded in the stations 2 and 3 in winter. The results of the statistical analysis showed that there are significant differences in the biological oxygen demand between the seasons ($p \leq 0.05$), there are also significant differences in the biological oxygen demand between the stations ($p \leq 0.05$), there is a significant positive correlation between the biological oxygen demand and turbidity, total suspended matter, chlorophyll a, and phosphate ($r = 0.405$, $r = 0.452$, $r = 0.608$, $r = 0.676$) respectively (Table 3) Also, there was a significant negative correlation between the biological oxygen demand and dissolved oxygen and nitrates ($r = -0.677$, $r = -0.428$), respectively. The increase in the values of may be attributed to the effect resulting from untreated wastewater that contains high concentrations of organic matter and thus an increase in the susceptibility of microorganisms to biodegradation and an increase in oxygen consumption (Al-Shawi *et al*., 2007). This study agreed with the study of Saleem (2013).

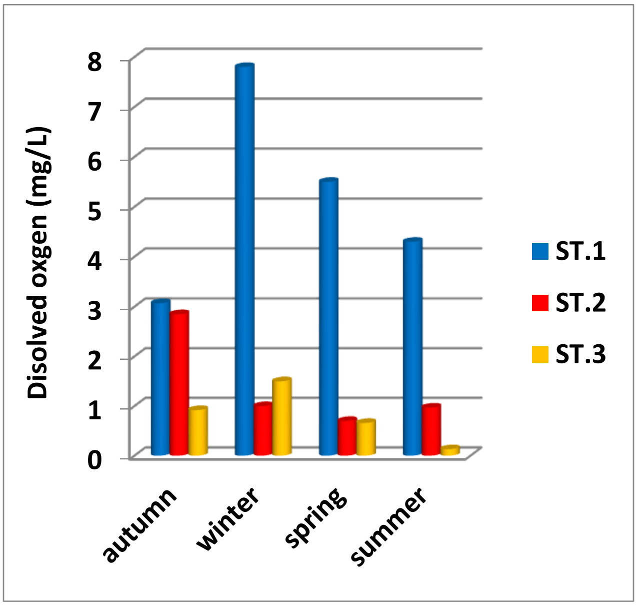

Figure 8: Seasonal variation in dissolved oxygen in three selected study stations from Shatt Al-Arab Estuary and Al-Ashar Canal

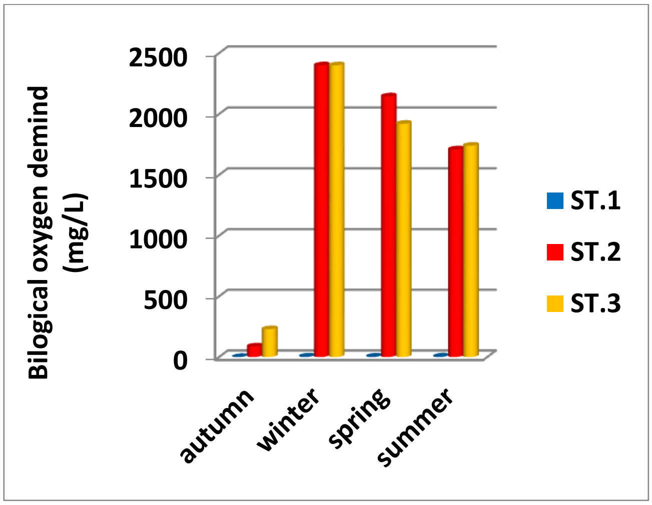

Figure 9: Seasonal variation in BOD_5 in three selected study stations from Shatt Al-Arab Estuary and Al-Ashar Canal

The lowest value of the chemical oxygen demand was recorded at (40 mg/L) in the station 2 during spring, while the highest value was recorded at (590 mg/L) in the third station during autumn (Fig. 10), The results of the statistical analysis showed that there are significant differences in the chemical oxygen demand between seasons ($p \leq 0.05$), and there are also significant differences between stations ($p \leq 0.05$), there is a significant correlation between chemical oxygen demand and turbidity ($r=0.499$) (Table 3) The reason for the increase in chemical oxygen demand may be due to the presence of solid waste as well as organic and inorganic pollutants resulting from human activities, household waste, and dead organisms, which leads to a decrease in oxygen as a result of its use in oxidizing these materials, which leads to an increase in COD (Al-Aumary, 2015). The results of this study were higher than recorded (Hamdan *et al.*, 2018).

The results of the statistical analysis showed there were significant differences between stations ($p \leq 0.05$) and a significant positive correlation between effective phosphates and chlorophyll a and the Biological oxygen demand ($r=0.412$, $r=0.676$) respectively.

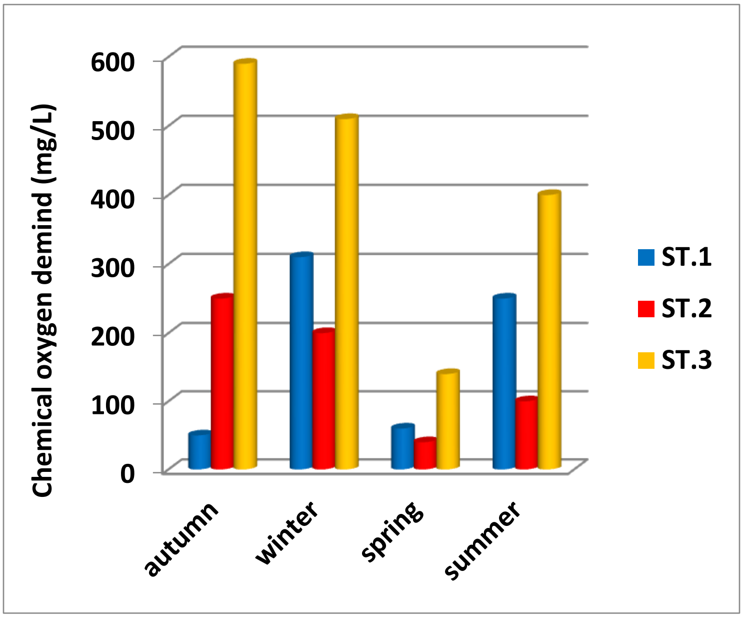

Figure 10: Seasonal variation in COD in three selected study stations from Shatt Al-Arab Estuary and Al-Ashar Canal

While there was a significant negative correlation between active phosphates and nitrates ($r = -0.486$), The high concentration of phosphate during the winter season may be attributed to the lack of consumption by phytoplankton. Rain also plays a role in dissolving phosphorous compounds from the earth's crust, washing agricultural lands fertilized with phosphate fertilizers, and thus drifting into the aquatic environment. (Al-Sowaig, 1999), The results of this study were similar to those recorded in the study of Gdemi and Awad (2022).

The lowest concentrations of nitrite and nitrate in the present study were recorded at (1 and 0.684 µg/L) respectively, at the third station during the summer, while the highest concentrations were recorded at (17.982 and 15.51 µg/L) respectively, (Fig. 12 and 13) at the station 2 during the autumn. The results of the statistical analysis of effective nitrate showed that there were significant differences between the seasons ($p \leq 0.05$), as well as significant differences between the stations ($p \leq 0.05$), and a significant positive correlation between the effective nitrates and nitrites ($r = 0.685$). While there was a significant negative correlation between active nitrates and turbidity, total suspended solids, chlorophyll a, biological oxygen demand, and phosphate (r = -0.672, r = -0.523, r = -0.554, r = -0.453, r = -0.482) respectively, the high concentration of nitrates may be due to dense population centers and the side branches of the Shatt Al-Arab, which leads to an increase nitrates with untreated wastewater that drainage to river (Al-Shawi *et al.*, 2005).

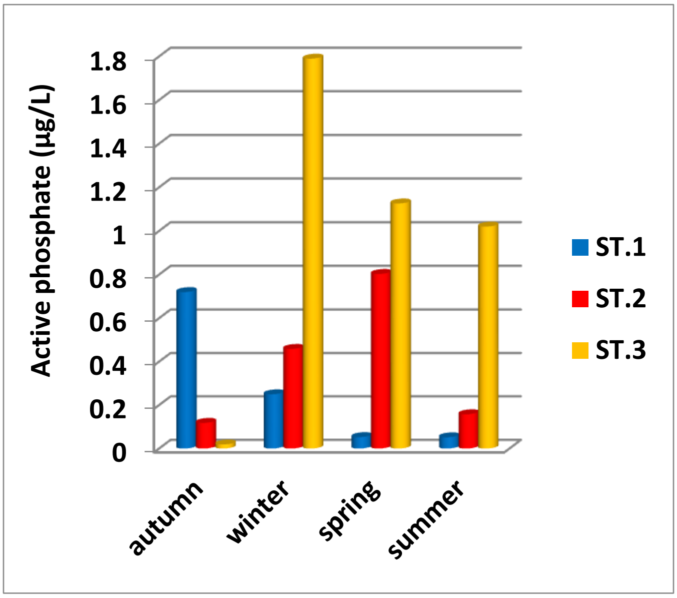

Figure 11: Seasonal variation in PO_4 in three selected study stations from Shatt Al-Arab Estuary and Al-Ashar Canal

Also, there was a significant positive correlation between effective nitrite and chlorophyll a, chemical oxygen demand (r = 0.460, r = 0.685) respectively, while there was a significant negative correlation between active nitrite and turbidity (r = -0.431). The high values of nitrite may be attributed to untreated sewage water (Varol *et al.*, 2012), as well as to the influence of the secondary rivers of the Shatt Al-Arab, which are loaded with household waste, fertilizers, and agricultural fertilizers (Al-Hello and Al-Obeidi, 1997). This study agreed with Al-Waeli (2021).

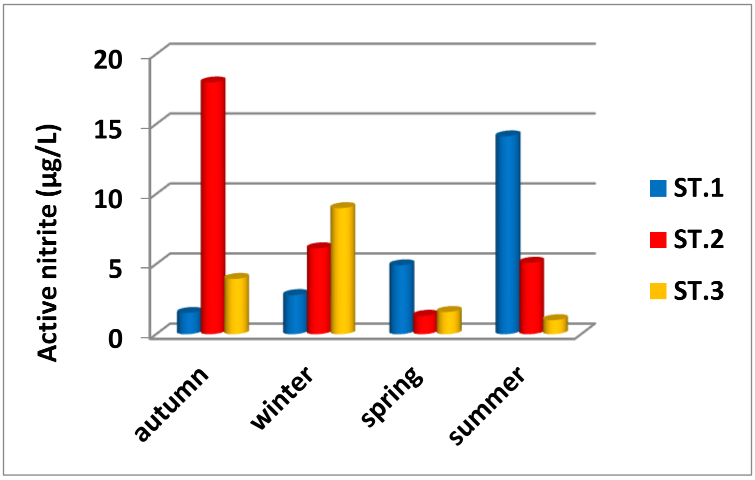

Figure 12: Seasonal variation in NO_2 in three selected study stations from Shatt Al-Arab Estuary and Al-Ashar Canal

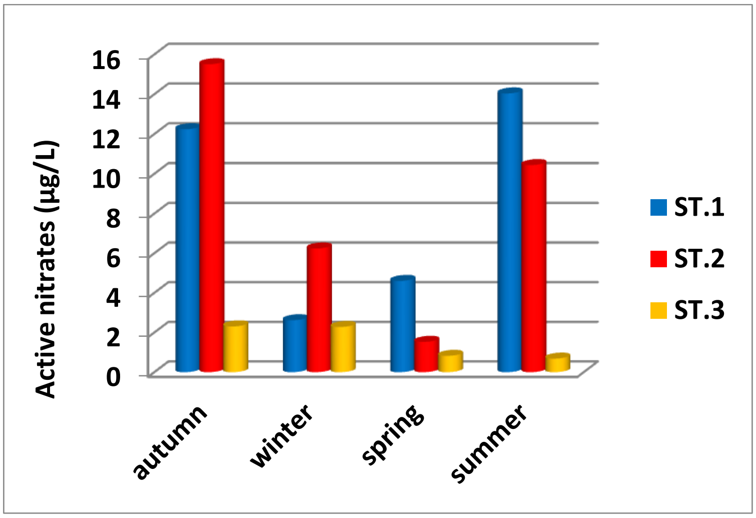

Figure 13: Seasonal variation in NO_3 in three selected study stations

Fig. (14) showed The highest value of chlorophyll was recorded at 215.72 µg/L in the station 2 during the spring, while its lowest value was 0.57834 µg/L in the station 2 during the autumn season. The results of the statistical analysis showed that there were significant differences in chlorophyll among the seasons ($p \leq 0.05$).

There were also significant differences between the stations ($p \leq 0.05$). There was a significant positive correlation between chlorophyll a and pH, turbidity, the biological oxygen demand, and phosphate (r = 0.502, r = 0.409, r = 0.668, r =0.412) respectively (Table 3) , and there was a significant negative correlation between chlorophyll a and nitrates and nitrites (r = -0.554, -0.460), The reason for the high values of chlorophyll a may be due to the high values of nutrients, especially nitrates, which are one of the factors affecting the growth of phytoplankton and aquatic plants. (Saki,2022), Likewise, the large number of nutrients that are thrown out of agricultural lands, and as a result of rain, this leads to the erosion of the soil bearing these materials into the Shatt al-Arab, especially phosphorous, which raises the values of chlorophyll A (Al-Waeli, 2021). This study agrees with Al-Hijaj et al. (2019).

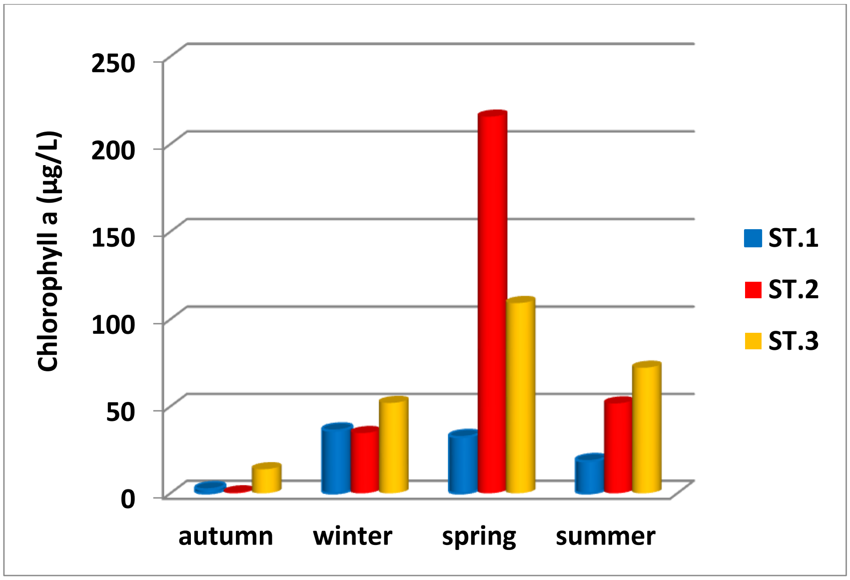

Figure 14: Seasonal variation in Chlorophyll a in three selected study stations from Shatt Al-Arab Estuary and Al-Ashar Canal

Table 2: Comparing the values of physiochemical parameters in the water in the present study with the Iraqi and international determinants

Parameters	WHO 2004	Iraqi standards 1967	The present study
Temperature (C°)	12-25	10-35	29
Turbidity (NTU)	50	< 45	106
TSS (mg/L)	20	–	100
pH	6.5-8.5	6.5-8.5	8.89-7.42
DO (mg/L)	< 5	>5	7.8
BOD (mg/L)	> 3	<5	2400
COD (mg/L)	10	–	590
PO_4 (µg/L)	0.1	0.04	1.79
NO_3 (µg/L)	45	<45	15.51

WHO; World Health Organization (2004)

Table 3: Correlation coefficient between characteristics measured in the current study

	AT	WT	Turb	TSS	pH	DO	BOD_5	COD	PO_4	NO_2	NO_3	Chla
S	0.621	0.642										
Turb				0.768								
TSS	0.474	0.448	0.786		0.516	-0.564	0.452				-0.532	
pH				0.516								0.502
DO			-0.665	-0.564			-0.677					
BOD_5			0.405	0.452		-0.677			0.676		-0.428	0.608
COD			0.499									
PO_4							0.676				-0.486	0.412
NO_2			-0.431					0.685				0.460
NO_3			-0.672	-0.523			-0.453		-0.482	0.685		-0.554
Chla			0.409		0.502		0.668		0.412	-0.460	-0.554	

Table 4: statistical analysis of the characteristics used in the study

characteristics		F	P
Air temperatures	seasons	115.291	0.000
	stations	2.448	0.115
Water Temperatures	seasons	100.715	0.000
	stations	1.351	0.284
Salinity	seasons	33.792	0.000
	stations	0.533	0.596
Dissolve oxygen	seasons	2.956	0.060
	stations	26.300	0.000
pH	seasons	10.251	0.000
	stations	3.668	0.046
Turbidity	seasons	1.659	0.211
	stations	30.516	0.000
Total suspended solid	seasons	51.565	0.000
	stations	100.921	0.000
Chlorophyll a	seasons	9.724	0.000
	stations	4.389	0.028
BOD_5	seasons	11.847	0.000
	stations	30.203	0.000
COD	seasons	8.948	0.001
	stations	19.646	0.000
NO_3	seasons	8.953	0.001
	stations	13.917	0.000
NO_2	seasons	1.124	0.366
	stations	0.898	0.425
PO_4	seasons	1.938	0.160
	stations	6.378	0.008

Conclusion

The present study showed the deterioration of water quality in Al-Ashar canal compared to Shatt Al-Arab. There is an increase in some parameters such as turbidity, total suspended solids, biochemical oxygen demand, and chemical oxygen demand, which refer to the fact that the water quality of Al-Ashar canal is very bad and higher than permissible limits.

Acknowledgement

We are thankful to Dr. Aqeel Abdel-Saheb and Dr. Wissam Razzaq Mutashar from Marine Sciences Centre for help us during study period, and Dr. Wesal Fakhri Hassan from the College of Marine Sciences for her assistance in conducting the statistical analysis

References

Abdullah, A.A.M.; Al-Saboonchi, A.A. and Hassan, M.K. (2009). Physical and chemical properties of water in the middle part of Shatt Al-Arab river. The 6 scientific conferences of fisheries resources Water quality and pollution (SCFRSWQP6), :1-17.

Adlan, N.H. and Al-Abbawy, D.A. (2022). Changes in Physicochemical Characteristics of Water along Shatt Al-Arab River. Indian J. Ecol., (18): 300-307.URL

Al-Asadi, S.A.; Al- Hawash, A.B.; Alkhlifa, N.H.A. and Ghalib, H.B. (2019). Factors affecting the levels of toxic metals in the Shatt Al-Arab River, Southern Iraq. Earth Syst. Environ., 3(2): 313-325. https://doi.org/10.1007/s41748-019-00096-y

Al-Asadi, S.A.; Al-Qurnawi, W.S.; Al Hawash, A.B.; Ghalib, H.B. and Al-Khalifa, N.H.A. (2020). Water quality and impacting factors on heavy metals levels in Shatt Al-Arab River, Basrah, Iraq. Appl.WaterSci.,10(5):1-15. https://doi.org/10.1007/s13201-020-01196-1

Al-Atbee, R.S.K. (2018). Assessment of Some Heavy Elements and Hydrocarbons in the Water, Sediments and Dominant Aquatic Plants at Al-Chibayish marshes. M. Sc. Thesis, Coll. Sci. Univ. Basrah: 208pp.

Al-Aumary, D.A. (2015). The Use of Water Quality Index (Canadian. Model).in Evaluation of Water Quality of Main out full drain and

Euphrates river to feed AL-Hammar Marsh. M. Sc. Thesis, Coll. Sci. Univ. Thi-Qar: 126pp. (In Arabic).

Al-Edani, T.Y.; Al-Tameemi, H.J. and Jasim, Z.F. (2019). Phytoremediation of heavy metals (Cd, Cu, Fe and Pb) by using aquatic plants in Shatt Al-Arab River. Eng. Technol. J., 37(3): 365-369. http://dx.doi.org/10.30684/etj.37.3C.10

Al-Hello, A.A.N. and Al-Obeidi, A.M.J. (1997). Water chemistry Shatt al-Arab from Qurna to Fao. Mesopot. J. Mar. Sci., 12 (1): 189-203. (In Arabic).

Al-Hijaj, M.H.; Talal, A.A.; Hantoush, A.A. and Basrah, B.I. (2019). Polycyclic Aromatic Hydrocarbons (PAHs) in Waters from Northern Part of Shatt Al-Arab River, Iraq Marsh Bull., 14(1): 11-21. https://www.iasj.net/iasj/download/da-647e86d2128c2b

Ali, M.H; Al-Muzaffar, N.A.A.; Yeser, A.A.T.; Rahma, S.A.; Ahmad, A.R; Mohammed, H.H. and Khedr, W.M. (2021). Salt water intrusion in Shatt Al-Arab Estuary A Barrage Construction and its EIA. Dar Al Kutub for printing and publishing, Univ. Basrah. Iraq, 228 pp. URL

Al-Khafaji, K.K; Karim, R.M. and Al-Baghdadi, N.M. (2021). Study of Aquatic Gastropods (Mollusca) in Shatt Al-Arab River, Iraq. Egypt. J. Aquat. Biol. Fish., 25(3): 137-146. https://journals.-ekb.eg/article_172861.html

Al-Saad, H.T.; Alhello, A.A.; Al-Kazaeh, D.K.; Al-Hello, M.A.; Hassan, W.F. Mahdi, S. (2015). Analysis of water quality using physico-chemical parameters in the Shatt Al-Arab Estuary, Iraq. Int. J. Mar. Sci., 5(49): 1-9. https://doi.org/10.5376/ijms.2015.05.00-49.

Al-Saadi, H.A. and Antoine, S.E. (1981). Primary productivity and phytoplankton population dynamics in polluted Ashar canal and Shatt Al-Arab river, Basrah (Iraq). Verh. Int. Ver. Limno., 21(2): 880-885. URL.

Al-Shawi, E.J.; Al-Rubaie, A.A. and Abdullah, S.B. (2007). The southern part of the Tigris and Euphrates rivers and their impact on the physical and chemical properties to the mouth of the Shatt Al-Arab. J. Arab., 11 (6): 125-137. (In Arabic)

Al-Shawi, E.J.; Al-Rubaie, A.A. and Rasan, A.K. (2005). Levels Nutrients in water and sediment organic carbon content as an indicator of organic pollution in the Shatt Al-Arab River. Basrah J. Agric. Sci., 18 (2): 97-98. (In Arabic)

Al-Shmery, A.Y.H (2013). Estimation of some heavy metals in clams, sediments and water from Shatt Al-Arab and treatment rocks porcellanite. M. Sc. Thesis, Coll. Educ., Univ. Basrah: 100pp. (In Arabic).

Al-Sowaig, A.R.A. (1999). Study of the comparative ideology of the Shatt Al-Arab River and Al-Khawra Canal, Basrah, Iraq. M. Sc. Thesis, Coll. Agric, Univ. Basrah: 61 pp. (In Arabic).

Al-Tamimi, M.M.H. (2016). Evaluation of the validity of Al-Gharraf River water in southern Iraq for different uses using the water quality index (Canadian model). M. Sc. Thesis, Coll. Educ., Univ. Dhi Qar: 127 pp. (In Arabic).

Al-waeli, A.A.A. (2021). Ecological and Taxonomical Study of the Phytoplankton (Non- Diatoms) in the waters o of the Shatt Al-Arab. M. Sc. Thesis, Coll. Educ. Pure Sci, Univ. Basrah: 196pp. (In Arabic).

Amer, A.M.; AL-Khafaji, A.H.; Kadhim, K.F. and Haseeb, M. (2022). Polycyclic Aromatic Hydrocarbon Content in Water and Sediments in the Middle Part of shatt AL-Arab River-Southern Iraq. J. Appl. Chem. Sci. Int., 13(3): 35-40. URL.

Antoin, S.E. and Al-Saadi, H.A. (1982). Limnological studies on the polluted Ashar canal and Shatt Al-Arab river at Basrah, Iraq. Int. Rev. Ges. Hydrobiol., 67(3): 405-418. URL.

APHA, American Public Health Association (2005). Standard Methods for the Examination of Water and Wastewater. 21st Ed. Washington, 22621pp. URL.

APHA, American Public Health Association (2012). Standard Method for the Examination of Water and Wastewater. 22 Ed. Washington, 2130pp. URL.

Ati, R.S. (1999). An ecological study to muhejran canal, one of the main tributaries to Shatt Al-Arab river, Basrah-Iraq. M. Sc. Thesis, Coll. Agric, Univ. Basrah:61pp. (In Arabic).

Fahd, K.K. (2005). A study of the seasonal changes of some nutrients and other related indicators of the general estuary river in southern Iraq. J. Adv. Agric. Technol. 18 (3): 114-122pp. (In Arabic). https://www.iasj.net/iasj/article/41926

Gatea, M.H. (2018). Study of water quality changes of Shatt Al-Arab River, South Iraq. J. Univ. Babylon Eng. Sci., 26 (8): 228-241. https://www.iasj.net/iasj/download/c93011cea9ce65ff

Gdemi, H.D. and Awad, E.Y. (2022). The effect of some environmental factors on the production of hepatotoxins (Microcystin) in the Shatt Al-Arab waters in Basrah Governorate southern Iraq. Eurasian Res. Bulletin., 14: 103-117. URL.

Guan, W.Y. (2011). Sustainability Water Quality in UTM river. B.S. Thesis in Faculty of Civil Eng, Univ. Tech, Malaysia: 114pp.

Hamdan, A.; Dawood, A. and Naeem, D. (2018). Assessment study of water quality index (WQI) for Shatt Al-Arab River and its branches, Iraq. Matec Web Conf., 162: 1-7. URL.

Hamza, A.Z. (2023). Impact of sub-rivers feeding the Shatt Al-Arab River on its water quality. Water. Environ. Sustainability., 3(3): 59-64. https://doi.org/10.52293/WES.3.3.5964.

Hussein, N.A.; Al-Saboonich A.; Al-Saad H.T; Karem H. and Hamid I. (1991). Shatt Al-Arab scientific study. Univ. Basrah. Mar. Sci., Publication: 391 pp. (In Arabic)

Iraqi Rivers Maintenance Regulation No. 25 of 1967 and amendments thereto of 1988. The Ministry of Health. Directorate of protecting and improving the environment - environmental legislation. URL

Khalaf, R.Z.; Hussien, N.A. and Al-Hejuje, M.M. (2023). Comparing Study Between Water Parameters of the Tide and Ebb Phase in Shatt Al-Arab River. The 5th International IOP Conference Series Earth and Environmental Science (IICSEES5),1-9. URL.

Khalaf, W.F. (2013). Ecological and taxonomic study of the phytoplankton community in the waters of the southern part of the general estuary, Thi-Qar Governorate, Iraq. M. Sc. Thesis, Coll. Sci., Univ. Dhi Qar: 118 pp. (In Arabic).

Mohammad, A.J.; Alyousif, N.A.; Al-Mosawi, U.A.S. and Al-Hejuje, M.M. (2021). Assessment of water quality supplies in some areas of Basrah Governorate, Iraq. Ecol. Environ. Conserv., 27 (1): 04-409. URL.

Moyel, M.S. (2010). Assessment of water quality of the northern part of Shatt Al-Arab river, using water quality index (Canadian version). M. Sc. Thesis, Coll. Sci, Univ. Basrah: 100pp. (In Arabic)

Parsons, T.S.; Maita, Y. and Lalli, G.M. (1984). A manual of chemical and biological methods for seawater analysis. Pergamon Press. New York.,188 pp.

Qzar, I.A.; Al-Hejuje, M.M.; Talib, A. and Rajab, A.M. (2021). The effect of Qarmmat Ali channel on the water quality of Shatt Al-Arab river. Marsh Bulle., 16(2): 106-112. URL.

Resen, A.K. (2001). Comparative study of ecological characteristics and levels of Organic pollution in three Main Canals of the Shatt AL-Arab river, Southern Iraq. M. Sc. Thesis, Coll. Agri, Univ. Basrah :58pp. (In Arabic).

Saki, S.H. (2022). Water Quality Evaluation for The Southern Al-Hawizah Marsh Using Ecological and Diatom Water Quality Indices. M. Sc. Thesis, Coll. Sci, Univ. Basrah: 152 pp. (In Arabic).

Saleem, F.M. (2013). Using organic pollution Index (OPI)to quantitative and qualitative assessment of Shatt AL-Arab River. M. Sc. Thesis, Coll. Sci, Univ. Basrah: 97 pp. (In Arabic).

Sarker, A.L.; Al-Nasiri, S.K. and Hussein, S.A. (1980). Diurnal fluctuations in the physico-chemical conditions of the Shatt Al-Arab and the Al-Ashar Canal. Proc. Anim. Sci., 89(2): 171-181. https://link.springer.com/article/10.1007/BF03179158

Varol, M.E.T.; Gökot, B.; Bekleyen, A.; and Şen, B. (2012). Water quality assessment and apportionment of pollution sources of Tigris River (Turkey) using multivariate statistical techniques—a case study. River Res. Appl., 28(9): 1428-1438. URL.

Vollenweider, R.A. (1974). A manual on methods for measuring primary production in aquatic environments. Int. Biol. Program

Hand book 12. Blackwell Scientific Publication Ltd. Oxford 225 pp. URL.

Wilson, K. and Foley, A. (2003). Water quality of rivers in the Jordan catchment. Areport forming part of the requirements for state of rivers reporting. Part2 (DPIWE). Tasmania: 8-29. URL.

Wood, E.D.; Armstrong, F.A.J. and Richards, F.A. (1967). Determination of nitrate in sea water by cadmium-copper reduction to nitrite. J. Mar. Biol. Ass. U.K., 47:23-31pp. URL

World Health Organization (2004). Guidelines for Drinking Water Quality. 3rd Edi-tion, Geneva. URL

دراسة مقارنة لتقييم نوعية المياه في مصب شط العرب وقناة العشار، البصرة، العراق.

ادیان علي كحامي[1,*]، اسيا فاضل عبدالله[1] ID ، عماد جاسم محمد الشاوي[2] ID

[1]قسم البيئة ، كلية العلوم، جامعة البصرة ، البصرة ، العراق

[2]قسم علوم البحار التطبيقية، كلية علوم البحار، جامعة البصرة ، العراق

*Corresponding Author e-mail: adyanally58@gmail.com

تاريخ الاستلام: 2023/03/25 تاريخ القبول: 2023/07/02 تاريخ النشر: 2023/12/25

المستخلص

مراقبة جودة المياه أمر ضروري للغاية لصياغة السياسات التي تؤثر على الصحة العامة والبيئية. جمعت عينات الدراسة خلال الفترة من خريف 2021 إلى صيف 2022(شط العرب، نقطة التقاء العشار بشط العرب،قناة العشار)، وأظهرت الدراسة التدهور البيئي لقناة العشار مقارنة بمصب شط العرب. وتضمنت الدراسة بعض العوامل الفيزيائية: درجة حرارة الهواء والماء، والتي كانت لها أعلى القيم في محطة (2) وبلغت (38.9 ، 29) درجة مئوية على التوالي بينما سجلت تراكيز الملوحة ارتفاعًا في المحطة (1) و بلغت (8.8) غم/ لتر في حين زادت قيم العكارة و المواد الصلبة العالقة الكلية في المحطة (3) ، وبلغت (106) NTU و (100) ملغم/لتر على التوالي كما كانت العوامل الكيميائية والبيولوجية في قناة العشار ضعيفة جداً مقارنة بشط العرب، ومنها: الرقم الهيدروجيني الذي كانت قيمه في الاتجاه القاعدية، وسجلت أعلى القيم في المحطة (3) وبلغت (8.89). أيضا، كان هناك زيادة في قيم المتطلب الحيوي للأوكسجين والمتطلب الكيميائي للأوكسجين وبلغت (2400 ، 590) ملغم / لتر في المحطة (2،3) على التوالي، بينما تم تسجيل انخفاض في قيم الأكسجين المذاب في المحطة (3) والتي بلغت (0.13) ملغم / لتر، وقد زادت قيم العناصر الغذائية (PO_4 ، NO_2 ، NO_3) في المحطة (2،2،3) وبلغت (1.79 ، 17.982 ، 15.51) ميكروغرام/ لتر على التوالي، كما ارتفعت قيم الكلوروفيل أ عند المحطة (2) وبلغت (215.72) ميكروغرام / لتر.

الكلمات المفتاحية: شط العرب، العوامل الفيزيائية، العوامل الكيميائية والبيولوجية، قناة العشار ، نوعية المياه.

P-ISSN: 1812-237X, E-ISSN: 2788-5720, https://ijaqua.uobasrah.edu.iq/index.pip/iaqua