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Spatial and temporal variations of Some Chemical characteristics for water quality of Shatt Al-Arab River/ Basrah-South of Iraq

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ABSTRACT

Freshwater ecosystems support a diverse range of organisms and constitute vital centres of biodiversity on the Earth. However, these environments are subject to various environmental stresses that have impacted water quality. The Shatt al-Arab River, a main waterway in southern Iraq, is continuously influenced by multiple factors that alter its water characteristics. This study aimed to assess the water quality of the Shatt al-Arab at three stations over the period from August 2024 to January 2025. Dissolved Oxygen (DO), Oiological Oxygen Demand (BOD), Total Hardness, Chlorides, Sulfates (SO_4^{2-}), Chemical Oxygen Demand (COD), Alkalinity (expressed as $CaCO_3$), Total Phosphorus, and Total Nitrogen (TN) were measured. The results revealed significant spatial variations in dissolved oxygen, was the highest in Al-Salal 13.307 ± 4.088 mg/L and lowest was in Al-Ashar 10.293 ± 4.437 mg/L. Similarly, the biological oxygen demand recorded the highest mean at Al-Sallal, 6.100 ± 3.846 mg/L, and the lowest mean value observed at Al-Ashar, 2.833 ± 2.697 mg/L. Chloride concentrations also had mostly the same trend, where the highest mean concentration was at the Al-Sallal station, 2457.383 ± 588.847 mg/L,and the lowest was in Abu Al-Khasib was1611.683 ± 407.397 mg/L. Conversely, the concentrations of total hardness, sulphate, alkalinity, total phosphorus, and total nitrogen did not differ significantly across the three sites. Monthly variations were significant for most chemical parameters DO ($P \leq 0.000$), BOD ($P \leq 0.02$), COD ($P \leq 0.001$), TH ($P \leq 0.000$), Cl^- ($P \leq 0.000$), Alkalinity ($P \leq 0.013$), TP ($P \leq 0.000$), and TN ($P \leq 0.000$) except for sulphate, which showed no significant monthly fluctuations in the waters of the Shatt al-Arab.

1. Introduction

Freshwater ecosystems are complex systems in terms of their composition, biological processes, and geological characteristics, which are clearly reflected in their chemical, physical, and biological structures. These include factors such as water temperature, salinity, dissolved oxygen, acidity, and various nutrients, in addition to the diverse biological species inhabiting these systems. These

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components vary from one water body to another, and within different regions of the same watercourse, both longitudinally, laterally, and with depth, as well as under the influence of seasonal or daily temporal variations[1, 2].

Freshwater bodies cover approximately 1% of the Earth's surface and provide numerous ecological services for both humans and other living organisms. These services include the provision of water for drinking, irrigation, and recreational activities, while also serving as suitable habitats for a wide range of organisms[3, 4] . The functions offered by these ecosystems fundamentally depend on the preservation of their natural characteristics and biodiversity. Indeed, freshwater environments support around 10% of all living species[5,6].

Despite their ecological importance, freshwater environments have faced numerous pressures in recent decades, leading to a marked deterioration in their characteristic's properties, which has negatively impacted biodiversity. highlighted several of these adverse influences, including climate change, invasive species, infectious diseases, harmful algal blooms, the expansion of hydropower stations, industrial waste, and various other pollutants resulting from human activities[7]. It is therefore evident that anthropogenic activities are the primary source of unprecedented environmental pressures on freshwater systems, causing a significant decline in water quality[8].

The Shatt al-Arab River stretches between 195 and 200 kilometres in length, is located north of Sindibad Island[9, 10]. This river serves as the confluence of the Tigris and Euphrates rivers and flows into the Arabian Gulf. The waterway holds significant economic and social importance and is the primary source of drinking and irrigation water for Basrah Governorate[11].

This water stream is subjected to numerous pressures that have reduced the suitability of its water for both human and ecological uses. The decline in water availability through the Tigris and Euphrates rivers, due to dam construction at their sources, combined with increased human population density, industrial facilities, recreational establishments, and the direct and indirect discharge of heavy wastewater into the river, has led to a deterioration in water quality. This includes elevated salinity levels caused by saline currents from the Arabian Gulf and increased nutrient concentrations, which have consequently resulted in a decline in biodiversity[11, 12].

The fresh water shortage supply, and increasing the human-made stress on Shatt Al-Arab River have induced serious impacts on water quality of this stream and, consequently, may provoke influences on biodiversity that relies profoundly on chemical and physical analyses of fresh water ecosystem[13]. Hence this study aims to highlight the variations in some chemical characteristics of Shatt Al-Arab river water quality.

Methods

Description of Study Areas

Three distinct sampling sites were systematically selected along the Shatt al-Arab River within Basrah Governorate, southern Iraq, to ensure comprehensive spatial coverage of the study area. The precise geographic, coordinates of each site were determined using a Garmin GPSetrex 10 Global Positioning System (GPS) device. The locations are as follows: Site 1was Al-Sallal (S1) — 474048.804E, 30360.492N, Site 2 was Al-Ashar (S2) — 475045.732E, 303058.902N and Site 3 was Abu Al-Khasib (S3) 4822.052E, 302719.422N

Water Sample Collection

Water samples were collected using 750 mL high-density polyethylene (HDPE) sampling containers for general physicochemical analyses. For the measurement of Biological Oxygen Demand (BOD), samples were collected in 250 mL Winkler titration bottles, designed specifically for dissolved oxygen analysis. Each sampling vessel was filled by submerging it vertically into the water column at a depth of approximately 20 cm to avoid surface contamination and ensure representative sampling. Immediately after collection, samples were preserved in situ by sealing the vessels airtight to prevent gas exchange and contamination. All samples were stored in Icebox to inhibit biological activity prior to laboratory analysis. Expedient transport to the analytical laboratory was conducted to maintain sample integrity and ensure the reliability and accuracy of subsequent physicochemical and biological assessments.

Water Quality Measurements

The study encompassed the laboratory determination of various key chemical water quality parameters, including DO, BOD, TH, Cl, SO_4^{2-}, COD, Alkalinity (expressed as $CaCO_3$), TP, and TN. All analyses were conducted following the standard methods outlined by the American Public Health Association (APHA)[14] .

Statistical analysis of the data was performed using the Statistical Package for the Social Sciences (SPSS), version 26. The datasets were evaluated employing parametric Analysis of variance (ANOVA). The probability $P \leq 0.05$ was used to determine the significant differences between groups.

2. Results

Analysis revealed that the concentrations of Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), and Chloride (Cl^-) differed significantly among the sampling stations, with significance levels of $P \leq 0.013$, $P \leq 0.0001$, and $P \leq 0.0001$, respectively (Figure 1). The highest mean concentration of dissolved oxygen was recorded at the Al-Sallal site, measuring 13.307 ± 4.088 mg/L, which was significantly higher ($P \leq 0.01$) than that at the Shatt al-Arab station, where the mean DO concentration was 10.293 ± 4.437 mg/L. No statistically significant difference was observed between Al-Sallal and Abu Al-Khasib ($P = 0.2$), nor between Al-Ashar and Abu Al-Khasib ($P = 0.4$).

The biochemical oxygen demand exhibited a similar pattern to dissolved oxygen. The highest mean BOD concentration was recorded at Al-Sallal, at 6.100 ± 3.846 mg/L, which differed significantly from the lowest mean value observed at Al-Ashar, 2.833 ± 2.697 mg/L, at a significance level of $P \leq 0.0001$. Furthermore, BOD concentrations at Al-Sallal were significantly different from those at Abu Al-Khasib ($P \leq 0.019$). However, no significant difference was found between Al-Ashar and Abu Al-Khasib with respect to BOD levels (Figure 1).

The chloride ion (Cl^-) exhibited its highest mean concentration at the Al-Sallal station, recorded at 2457.383 ± 588.847 mg/L, which was significantly greater ($P \leq 0.0001$) than the concentrations measured at Al-Ashar (1822.300 ± 388.886 mg/L) and Abu Al-Khasib (1611.683 ± 407.397 mg/L) stations Figure (2).

Conversely, no significant differences were observed in the COD among the sampling sites ($P = 0.255$) (Figure 1). Similarly, the concentrations of TH, SO_4^{2-}, Alkalinity, PO_4, and TN did not differ significantly across the three stations (Figures 2 and 3).

Statistical analysis revealed significant differences among the monthly mean values of various chemical water quality parameters. These included Dissolved Oxygen (DO) ($P \leq 0.000$), Biochemical Oxygen Demand (BOD) ($P \leq 0.02$), Chemical Oxygen Demand (COD) ($P \leq 0.001$), Total Hardness ($P \leq 0.000$), Chloride ion (Cl^-) ($P \leq 0.000$), Alkalinity ($P \leq 0.013$), Total Phosphorus ($P \leq 0.000$), and Total Nitrogen (TN) ($P \leq 0.000$) (Figures 10–12). Conversely, analysis of variance indicated no significant differences in Sulfate (SO_4^{2-}) concentrations across the study months ($P = 0.132$).

The highest mean concentration of dissolved oxygen was recorded in January 2025, measuring 15.813 ± 2.472 mg/L, which differed significantly ($P \leq 0.000$) from the concentrations observed in August, October, and November. No significant difference was found between January and September ($P = 0.140$) or December ($P = 0.642$) with respect to dissolved oxygen levels. The lowest mean dissolved oxygen concentration was observed in November, at 8.360 ± 2.573 mg/L, which differed significantly from the values recorded in September (13.093 ± 2.437 mg/L) and December (14.133 ± 3.323 mg/L) at significance levels of $P \leq 0.01$ and $P \leq 0.000$, respectively (Figure 4).

The BOD recorded its highest mean value in December, measuring 6.378 ± 4.276 mg/L, which was significantly different from the values observed in August (2.960 ± 1.561 mg/L) and November (2.840 ± 1.575 mg/L), at significance levels of $P \leq 0.027$ and $P \leq 0.02$, respectively (Figure 4).

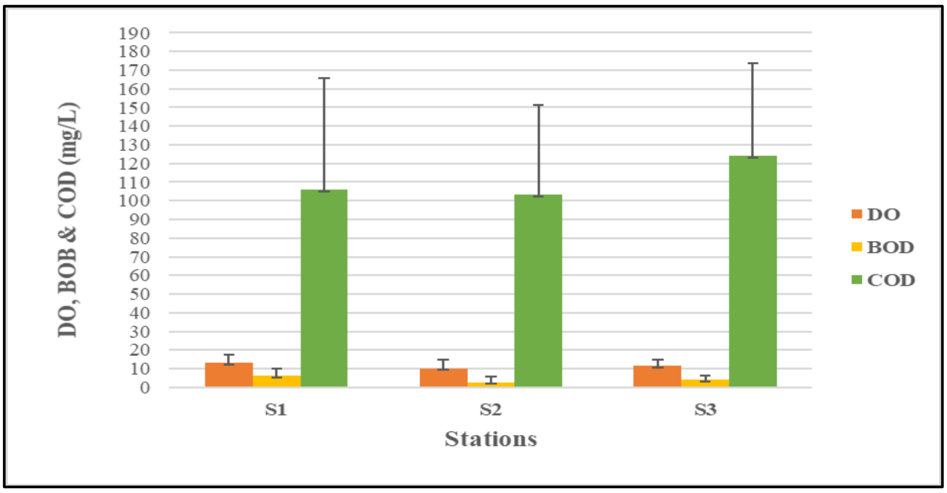

Fig. 1. Spatial variations of Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), and Chemical Oxygen Demand (COD) across the three sampling stations along the Shatt al-Arab River

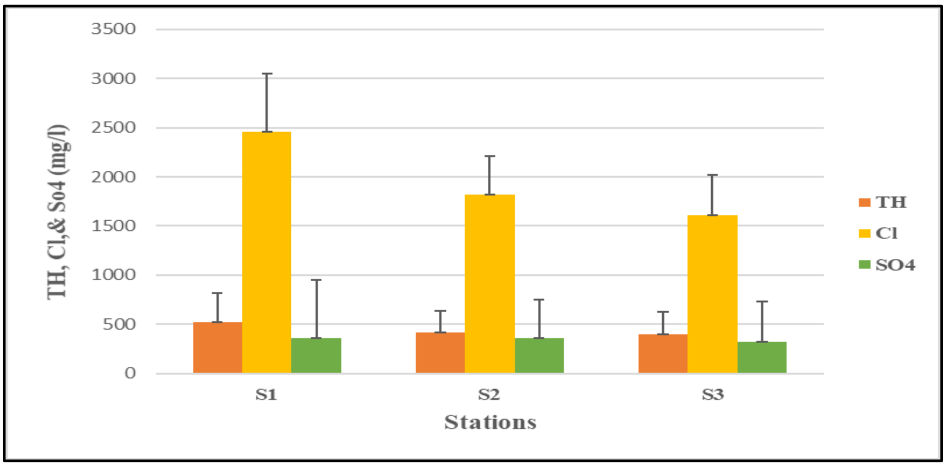

Fig. 2. Spatial variations of Total Hardness (TH), Chloride (Cl^-), and Sulfates (SO_4^{2-}) concentrations across the three sampling stations along the Shatt al-Arab River

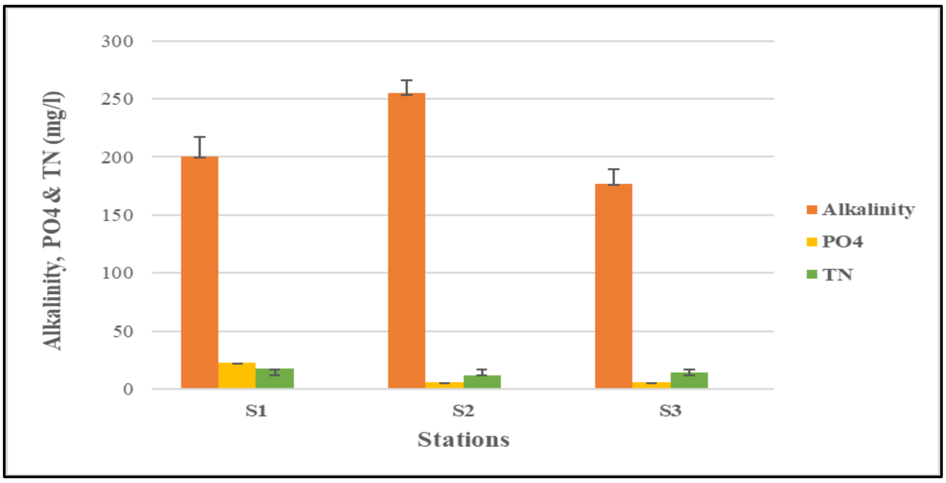

Fig. 3. Spatial variations of Alkalinity, Phosphate (PO_4^{3-}), and Total Nitrogen (TN) concentrations across the three sampling stations along the Shatt al-Arab River

The highest mean concentration of COD was recorded in January 2025, reaching 160.000 ± 49.868 mg/L, which was significantly higher than the COD levels measured in August 2024 (96.000 ± 54.089 mg/L), September 2024 (81.067 ± 26.681 mg/L), and December 2024 (102.400 ± 54.359 mg/L), at significance levels of $P \leq 0.06$, $P \leq 0.000$, and $P \leq 0.018$, respectively (Figure 4).
(Figure 5) illustrates the monthly variations of TH, Cl^-, and SO_4^{2-} concentrations in the Shatt al-Arab River during the study period from August 2024 to January 2025. The highest mean total hardness was observed in November 2024, at 729.333 ± 161.004 mg/L, which differed significantly from all other months except October 2024, where the mean hardness was 693.333 ± 39.761 mg/L, with no significant difference observed ($P = 0.925$). The lowest mean total hardness was recorded in August, measuring 144.252 ± 5.773 mg/L, which was significantly different from all other months at $P \leq 0.05$. Regarding chloride concentration, the highest mean value was recorded in January 2025, at 2622.267 ± 537.892 mg/L. This was significantly different from the chloride levels measured during August, September, October, and November, with significance levels of $P \leq 0.000$, $P \leq 0.015$, and $P \leq 0.001$, respectively. No significant difference was observed between December and January ($P = 0.061$), where the chloride concentration in December was 2139.467 ± 634.117 mg/L (Figure 5).
No significant differences were detected in sulfate (SO_4^{2-}) concentrations across the study months. However, the highest mean sulfate concentration was recorded in January at 459.140 ± 257.240 mg/L, while the lowest mean was observed in November, at 170.466 ± 53.882 mg/L (Figure 5).

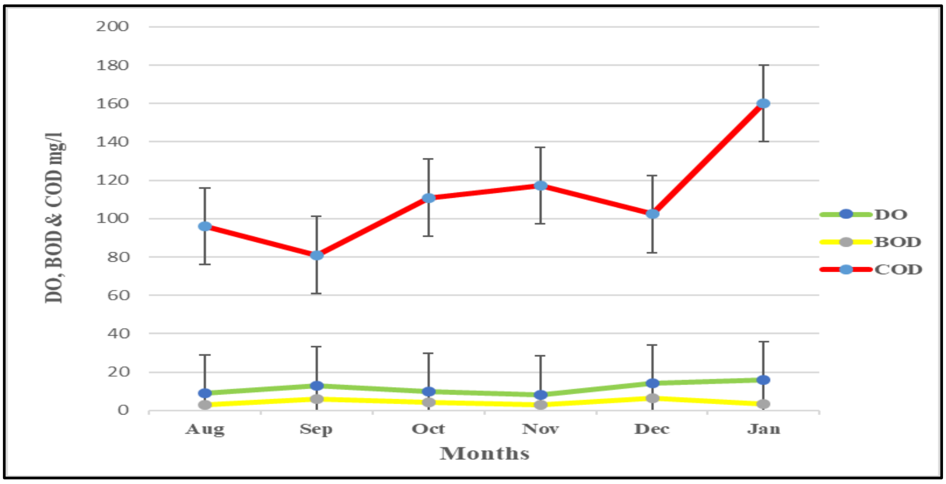

Fig. 4. Monthly variations of Dissolved Oxygen (DO) and Biochemical Oxygen Demand (BOD) in the Shatt al-Arab River from August 2024 to January 2025

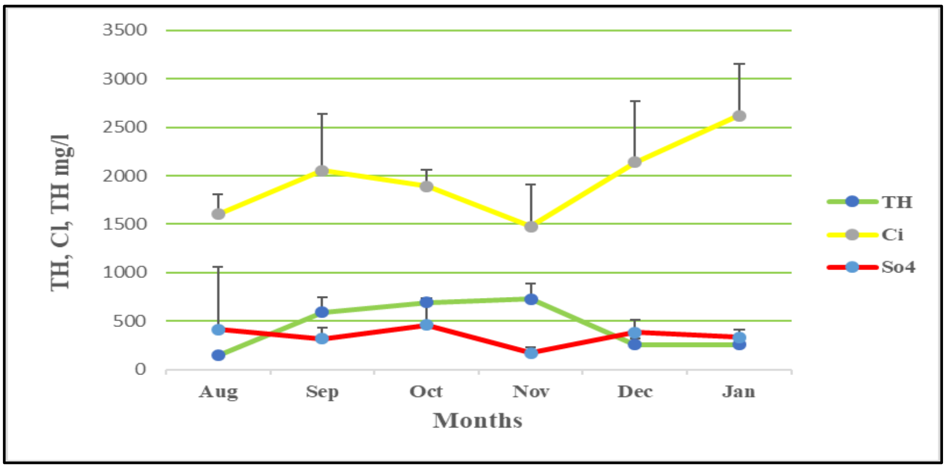

Fig. 5. Monthly variations of Total Hardness (TH), Chloride (Cl^-), and Sulfate (SO_4^{2-}) concentrations in the Shatt al-Arab River from August 2024 to January 2025

Figure (6) revealed the monthly variations of Alkalinity, Phosphate, and Total Nitrogen concentrations during the study period. Despite significant monthly variations in alkalinity concentrations in the Shatt al-Arab River, Tukey's test revealed that these significant differences were specifically between December and September. The highest mean alkalinity was recorded in December, at 304.013 ± 57.182 mg/L, whereas the lowest mean alkalinity was observed in September, at 97.111 ± 16.420 mg/L, with a significance level of $P \leq 0.013$. Phosphate concentrations peaked in August 2024, with a mean value of 46.354 ± 69.956 mg/L, which was significantly higher than the levels recorded in September and October ($P \leq 0.003$ and $P \leq 0.002$, respectively). No significant differences were observed between November, December, and January. The lowest phosphate concentration was recorded in December, at 3.913 ± 1.890 mg/L (Figure 6).

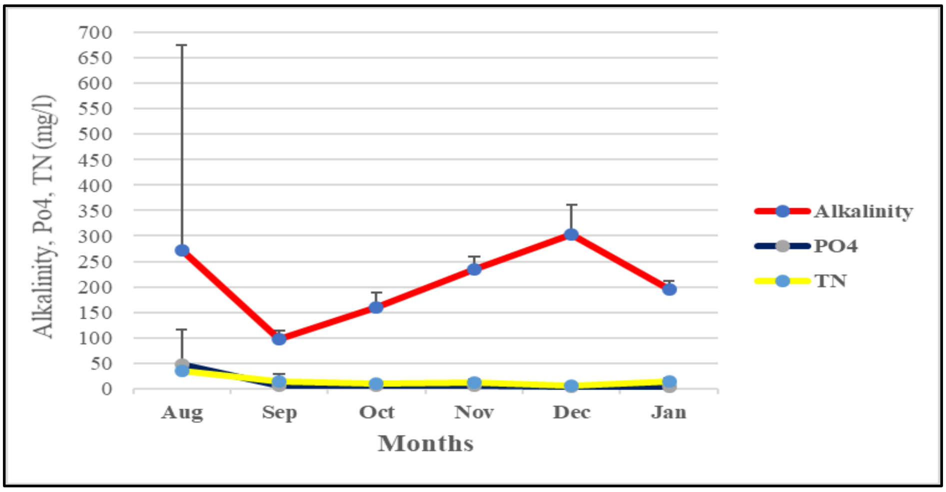

Fig. 6. Monthly variations of Alkalinity, Phosphate, and Total Nitrogen concentrations during the study period.

3. Discussion

A significant difference in the monthly mean values of DO, BOD, and COD was observed. The findings of [15] are consistent with the current study, reporting wide fluctuations in dissolved oxygen concentrations in the Shatt al-Arab River during winter and summer. It is well known that dissolved oxygen content in water is influenced by water temperature and the chemical or biological processes occurring within the aquatic system. The observed decrease in dissolved oxygen levels at certain stations may be attributed to increased inputs of untreated domestic sewage, which introduces reducing substances such as nitrites, or to organic pollutants that accelerate the consumption of dissolved oxygen during warmer months, as observed at the Al-Ashar station. Low dissolved oxygen levels at specific sites serve as indicators of pollution and are therefore critical parameters in water quality assessment. Another study reported DO concentrations ranging from 5.1 to 9.8 mg/L, noting elevated levels during winter and declines in summer[15]. This pattern is explained by the inverse relationship between dissolved oxygen and temperature, whereby colder conditions slow the decomposition of organic matter. Additionally, rainfall, wind, and tidal activity enhance water mixing and circulation. Conversely, higher summer temperatures reduce oxygen solubility, increase evaporation, lower water levels, and intensify decomposition rates, collectively resulting in diminished DO values[16, 17] .

Moreover, the decline in dissolved oxygen in the southern reaches of the river may be linked to elevated salinity, which adversely affects oxygen solubility. Nonetheless, the minimum DO values recorded in this study fall within previously reported ranges for the Shatt al-Arab River. Both BOD and DO exhibit variability throughout the river and its tributaries. Generally, a decrease in BOD coincides with an increase in DO, reflecting the negative correlation between organic matter concentration and bacterial activity during oxidative decomposition, which leads to reduced oxygen consumption during the thermolytic phase. Furthermore, dilution effects from increased water volume contribute to the observed decline in BOD concentrations[18] .

The highest mean of Chemical Oxygen Demand (COD) was recorded in January 2025, significantly exceeding the COD levels measured in August and September 2024. Typically, permissible COD concentrations in freshwater range between 48.2 and 120.7 mg/L[19]. Notably, the COD value observed in January surpassed this threshold, *signalling* contamination of the Shatt al-Arab River by both organic and inorganic chemical pollutants. In contrast, COD values during the summer months remained within acceptable. limits. This pattern is consistent with findings by[19,20], who attributed elevated winter COD levels to increased water volumes compared to the dry season.

The peak mean concentration of total hardness during the study period occurred in January 2025, showing a statistically significant difference from all other months. The water of the Shatt Al-Arab River is characterised by exceptionally high TH, exceeding permissible environmental thresholds throughout the year, except in August 2024 at the Al-Sallal station, where salinity levels notably decreased. Total hardness in the Shatt al-Arab exhibits a seasonal pattern, rising during winter and declining in summer, which correlates with increased salinity observed in the colder months. This phenomenon is primarily attributed to reduced water volumes in the river and its tributary canals, resulting from diminished water discharge. Furthermore, factors such as limited rainfall during the winter study period, the decomposition of organic matter, and the intrusion of highly saline waters from the Arabian Gulf—combined with pollutants originating from groundwater, internal canals, and sewage effluents—contribute collectively to the formation of a complex chemical mixture that adversely affects water quality[21].

The highest concentration of chloride ions was recorded at the Al-Sallal station in January 2025, whereas the lowest concentration was observed at the Abu Al-Khasib station in September 2024. This variation was statistically significant when compared to the levels recorded in August, September, October, and November; however, no significant difference was noted between December and January. Elevated chloride concentrations exceeding permissible environmental limits indicate a decline in water quality in certain sections of the Shatt al-Arab River, particularly around the Al-Sallal area. The increased chloride levels are primarily attributed to geological factors, reduced rainfall, and diminished freshwater inflows resulting from decreased discharge from the Tigris and Euphrates Rivers. Moreover, the rise in salinity further contributes to this phenomenon, given the direct correlation between salinity and chloride ions, which are the predominant anions in salt, combining with sodium to form sodium chloride (NaCl)[22].

The elevated chloride concentrations observed at other monitoring stations are largely attributed to the high chloride content inherent in the local geological formations, as well as increased chloride levels present in domestic sewage and certain industrial effluents.[23] identified two primary drivers behind the degradation of the Shatt al-Arab River's water quality: rising salinity and organic pollution. They characterised the overall water quality as "unstable," vulnerable to further degradation, and fragile, highlighting its susceptibility to pollution and deviation from optimal ecological conditions.

[24]documented chloride concentrations ranging from 137 to 1060 mg/L in their study spanning 1988 to 2001. In contrast, the present investigation revealed elevated chloride levels between 241.06 and 2056.6 mg/L in the northern sector of the Shatt al-Arab River within southern Basra, signalling a notable increase in industrial effluent contamination [25]. similarly reported heightened chloride concentrations during various months of 2021 surpassing the Canadian Council of Ministers of the Environment[26] thresholds for human (<250 mg/L) and industrial use (<600 mg/L), with the lowest values observed in August .

The highest sulfate concentration was recorded at the Abu Al-Khasib station in October 2024, whereas the lowest was observed at the Al-Sallal station in November 2024, indicating elevated sulfate levels during the winter season. This seasonal increase may be attributed to intensified use of petroleum-based fuels, leading to greater release of sulfate compounds into the environment, or alternatively, to wet deposition occurring in the winter months. Furthermore, emissions from power generation facilities, notably the Najibiyah and Turkish power plants, contribute significantly to environmental sulfate levels. Agricultural activities in the surrounding areas also play a role in augmenting sulfate concentration[15].

A significant difference was noted between the monthly mean alkalinity values ($P \leq 0.001$), indicating that alkalinity levels exceeded the permissible limits set by APHA[27]. which range from 20 to 200 mg/L. Alkalinity tends to increase during the winter months, primarily due to the intrusion of saline water from the Arabian Gulf and the dissolution of carbonate rocks. Additionally, reduced discharge from the Tigris and Euphrates Rivers contributes to this rise, as saline water is rich in ions that elevate

alkalinity. Furthermore, lower temperatures diminish biological activities such as organic decomposition and cellular respiration, resulting in decreased production of organic acids that would otherwise reduce alkalinity. Conversely, the decline in alkalinity observed during summer is attributed to higher temperatures and increased evaporation, which enhance biological activity and organic acid production, alongside greater river discharge. These findings align with those reported by[28].
Monthly variations in total phosphorus revealed the highest mean concentration in April 2024, which differed significantly from the values recorded in September and October ($P \leq 0.003$), as well as from those in November, December, and January ($P \leq 0.003$). The lowest mean phosphorus concentration occurred in December. .
There is a marked similarity between the fluctuations in total phosphorus and total nitrogen concentrations, which can be largely attributed to agricultural activities, reduced water discharge, the application of chemical fertilisers, and the discharge of sewage water. Collectively, these factors contribute significantly to the observed variations in phosphorus and nitrogen levels within the Shatt al-Arab River.
Human activities perform a crucial role in elevating phosphorus concentrations in river systems, particularly through the use of detergents and phosphate-based fertiliser[29].[30] reported that the water quality index of the Shatt al-Arab River falls within the ‘very poor’ category during the summer months. The rise in phosphorus concentration at the central station of the river is primarily attributed to the disposal of industrial liquid waste, sewage effluent, and agricultural fertilisers.[31] observed that downstream stations along the Shatt al-Arab River exhibited higher concentrations of nitrogen compounds compared to upstream sites, largely due to increased pollution from domestic sewage discharged in central Basra. Moreover, climate change and variations in river flow have further influenced nitrogen compound concentrations, findings that concur with those reported by[32,15].
(27) documented fluctuations in nutrient concentrations, including ammonia, nitrate, and phosphate, throughout the study period. These variations were attributed to changing climatic conditions and reduced water inflow into the river, which contributed to variability in nitrogen compound levels.
Indeed, this issue require more indispensable and attention to be addressed, however, currently, the financial and time limitations were the most obstruction to do more field and laboratory works. The productivity and consumer organisms are needed necessitated to have a comprehensive view of this issue.

3. Conclusion

The study has demonstrated the presence of chemical pollution within the Shatt Al-Arab River ecosystem, as indicated by elevated concentrations of several water quality parameters exceeding established permissible limits. Moreover, the findings demonstrated that highest concentrations of the most chemical characteristics were recorded from November to January, that may vital for decision maker to resolve this ecological concern.

Conflict of Interest Statement: No potential conflicts of interest were reported by the authors or editors involved in this work.

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References

[1] T. M. Thorp JH, Delong MD, Maasri A. , "The ecological nature of whole river macrosystems: new perspectives from the riverine ecosystem synthesis," *Front. Ecol. Evol.,* vol. 11, pp. 1–11, 2023, DOI: 10.3389/fevo.2023.1184433.
[2] J. W. J. L. S. Schauer, M. J. Cohen, & A. Musolff, "Spatial and Temporal Variability of River Water Quality," *Hydrological Processes*, vol. 39(5), 2025.
[3] J. B. Fewtrell, "Guidelines, Standards and Health: Assessment of risk and risk management for water-related infectious disease," *World Health Organization. Cornwall, UK.,* vol. 424, 2001.

[4] Y. X. M. Faghihinia, D. Liu, and N. Wu., "Freshwater biodiversity at different habitats: Research hotspots with persistent and emerging themes," *Ecol. Indic.*, vol. 129, p. 107926 ,2021 ,DOI: 10.1016/j.ecolind.2021.107926.

[5] D. Dudgeon et al., "reshwater biodiversity: Importance, threats, status and conservation challenges," *Biol. Rev. Camb. Philos. Soc.*, vol. 81(2), pp. 163–182, 2006,DOI: 10.1017/S1464793105006950.

[6] D. L. S. a. D. Dudgeon, "Freshwater biodiversity conservation: Recent progress and future challenges," *J. North Am. Benthol. Soc.*, vol. 29(1), pp. 344–358, 2010,DOI: 10.1899/08-171.1.

[7] L. L. L. Meng, Y. Shi, H.Yin, L. Li, J. Xiao, N. Huang, A .Zahao, Y. Xia & J.Hou, "Biofilms in plastisphere from freshwater wetlands: Biofilm formation, bacterial community assembly, and biogeochemical cycles," *Journal of Hazardous Materials*, vol. 476, 2024.

[8] X. Liu et al., "Water Quality and Its Influence on Waterbird Habitat Distribution: A Study Along the Lieve River, Belgium," *Water (Switzerland)*, vol. 17(4), 2025,DOI: 10.3390/w17040595.

[9] J. K. A. Al-Sodani, "Hydrology of Al- Shafi River in Basrah Governorate," Master Thesis, MA College of Arts, Basrah Univ, 2018 .

[10] MF.Abbas, "An ecological study of Rotifera of the Southern Shatt Al-Arab River, Basrah, Iraq," *Iraqi Journal of Aquaculture*, vol. 18(2), pp. 1-16, 2022, DOI: https://d/oi.org/10.58629/ijaq.v18i2.347.

[11] Z. A. Hamza, "Impact of sub-rivers feeding the Shatt Al- Arab River on its water quality," *Water Environ. Sustain*, vol. 3(3), pp. 59-64, 2023, DOI: 10.52293/wes.3.3.5964.

[12] M. B. Al-Mudaffar Fawzi N, " Iraq's inland Water quality and their impact on the North-Western Arabian Gulf. ," *Marsh Bulletin*, vol. 9(1), pp. 1-22, 2014.

[13] K. R. S. Rameshkumar, S. Aanand, and R. Rajaram, "Influence of physicochemical water quality on aquatic macrophyte diversity in seasonal wetlands," *Appl. Water Sci.*, vol. 9(1), pp. 1–8, 2019,DOI: 10.1007/s13201-018-0888-2.

[14] L. B. R. Baird, "Standard methods for the examination of water and wastewater," *American Public Health Association. Chicago*, vol. 23rd ed, 2017.

[15] N. H. Adlan, & D. A. Al-Abbawy, "Changes in physicochemical characteristics of water along shatt Al-Arab river," *Indian Journal of Ecology*, vol. 49, pp. 300-307, 2022.

[16] R. B. a. D. Jain, "Water quality assessment of lake water: a review," *Sustain. Water Resour. Manag*, vol. 2(2), pp. 161–173, 2016, DOI: 10.100/7s40899-015-0014-7.

[17] W. L. J. M. Testa, W R. Boynton, D. Breitburg, C. Friedrichs, M. Li, D. Parrish, T. M. Trice & D. C. Brady, "Physical and biological controls on short-term variations in dissolved oxygen in shallow waters of a large temperate estuary," *Estuaries and Coasts*, vol. 47(6), pp. 1456-1474, 2024.

[18] M. J. M. a. A. N. A. Hamdan, "2D Hydrodynamic and Eutrophication Modeling in the Shatt Al-Arab River, Basrah, Iraq," *Environ. Earth Sci. Res. J.*, vol. 11(01), pp. 1-19, 2024, DOI: 10/18280.eesrj.110101.

[19] H. Y. Lei, Liu, Z.H., Wang, G., et al., "Characterization of Acute Pesticide Poisoning Cases in Qinghai Province from 2013 to 2022. ," *Occupational Health and Emergency Rescue*, vol. 42, pp. 42-44, 2024.

[20] A. A. HT Al-Saad, DK Al-Kazaeh, MA Al-Hello, WF Hassan, S Mahdi, "Analysis of water quality using physico-chemical parameters in the Shatt Al-Arab Estuary, Iraq," *International Journal of Marine Science*, vol. 5(49), pp. 1-9, 2015.

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التغيرات الزمنية والموقعية لبعض الخصائص الكيميائية لمياه شط العرب/ البصرة- جنوب العراق

وسن علي ثامر، مفيد قاسم محمد

كلية التربية للعلوم الصرفة/ جامعة البصرة

معلومات البحث

الاستلام 22 تموز 2025
المراجعة 18 اب 2025
القبول 21 اب 2025
النشر 31 كانون أول 2025

الكلمات المفتاحية

نهر المياه العذبة، الخصائص الكيميائية، شط العرب

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الملخص

تدعم النظم البيئية للمياه العذبة مجموعة متنوعة من الكائنات الحية وتشكل مراكز حيوية للتنوع البيولوجي على سطح الأرض. ومع ذلك، تخضع هذه البيئات لضغوط بيئية مختلفة أثرت على جودة المياه. يتأثر نهر شط العرب، وهو مجرى مائي رئيسي في جنوب العراق، باستمرار بعوامل متعددة تغير خصائص مياهه. هدفت هذه الدراسة إلى تقييم جودة مياه شط العرب في ثلاث محطات خلال الفترة من أغسطس 2024 إلى يناير 2025. تم قياس الأكسجين المذاب (DO)، والطلب البيولوجي للأكسجين (BOD)، والصلابة الكلية، والكلوريدات، والكبريتات (SO_4^{2-})، والطلب الكيميائي للأكسجين (COD)، والقلوية (معبر عنها بـ ($CaCO_3$))، والفوسفور الكلي، والنيتروجين الكلي (TN). كشفت النتائج عن اختلافات مكانية كبيرة في الأكسجين المذاب، والطلب البيولوجي للأكسجين، وتركيزالكلوريد بين المحطات. أظهر الطلب البيولوجي للأكسجين أنماطًا زمنية ومكانية مماثلة للأكسجين الذائب، وكذلك مستويات الكلوريد. في المقابل، لم يُظهر الطلب الكيميائي للأكسجين أي اختلافات جوهرية بين المحطات. وبالمثل، لم تختلف تراكيزالصلابة الكلية، والكبريتات، والقلوية، والفوسفور الكلي، والنيتروجين الكلي اختلافًا كبيرًا بين المواقع الثلاثة. كانت التغيرات الشهرية ملحوظة في معظم المعايير الكيميائية، باستثناء الكبريتات، التي لم تُظهر أي تقلبات شهرية جوهرية في مياه شط العرب.

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