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Assessment of Physico-Chemical Characteristics and Macronutrient Distribution in The Water of Khor Al-Zubair, North Weast Arabian Gulf, Iraq

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Abstract

The study was conducted in the Khor Al-Zubair channal in the northwestern Arabian Gulf, where water samples were collected ly (summer and winter) from a depth of 10 cm during low tide at three stations in Khor Al-Zubair (Khor Al-Zubair Port, Al-Nafq, and Umm Qasr Port). A range of physicochemical parameters was measured, including (temperature, salinity, dissolved oxygen, pH, total nitrogen (TN), nitrite, nitrate, total phosphorus (TP), calcium, magnesium, and silica). The results showed clear variations in water quality indicators, with the stations (Khor Al-Zubair Port, Al-Nafq, and Umm Qasr Port) recorded the highest temperature levels (30 °C) during the summer and salinity (50 mg/L) during the summer at the third station (Umm Qasr Port), while the pH (pH) (7.62) during the summer at the third station (Umm Qasr Port), while dissolved oxygen decreased during the summer, recording (6.7 mg/L) at the first station (Khor Al-Zubair Port). As for the major nutrients, the results showed clear spatial and variations, with the highest total nitrogen value recorded during the winter at the third station (Umm Qasr Port), reaching 3.1 µg/L. Similarly, nitrite and nitrate values during the winter also coincided at the Khor Al-Zubair Port station, reaching 1.99 µg/L and 4.49 µg/L, respectively. In contrast, the highest total phosphorus value during the summer was recorded at the Umm Qasr Port station, reaching 0.297 µg/L, accompanied by the highest silica concentration at the same station and during the same season, reaching 6.08 mg/L As for the other elements, the highest concentrations of calcium and magnesium were recorded during the winter at the Tunnel Station, reaching 384.24 mg/L and 1,351.01 mg/L, respectively.

Keywords: KhorAl-Zubair, Nutrients, environment, aquatic systems

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Introduction

Marine ecosystems are among the largest aquatic systems on Earth, as they develop in environments characterized by high salinity levels compared to low-salinity freshwater systems. Seas and oceans cover more than 70 percent of the planet's surface and account for over 97% of the world's total water resources, making them an essential component in sustaining life and regulating vital processes on Earth (Oceanic Institute, 2018). Marine ecosystems are a primary source of food, employment, and vital services, as a large portion of the world's population depends on them. Coastal waters are among the most important ecosystems, covering approximately 7% of the total ocean area and contributing more than 50% of the economic value of marine ecosystem services (Costanza *et al.*, 2014) Nutrients circulate in the oceans through a process known as "biological pumping," in which plankton extracts nutrients from surface waters and incorporates them into its biomass. When aquatic plants die, sink, and decompose, the nutrients return to their dissolved state in the deep ocean. Nutrient abundance is a key factor in ocean fertility, and this is measured by primary production, which is the rate of carbon fixation per unit of water over a specific time period (Ngatia *et al.*, 2019). Nutrients are among the most important substances in aquatic ecosystems because their dynamics can limit primary production and consumer activities; nutrient dynamics affect ecosystem productivity and the interaction between the environment, producers, and consumers. The balance between nutrient consumption and remineralization is the basis for relatively stable nutrient concentrations in the short term (US EPA, 2022)

Macronutrients:The major marine nutrients include nitrate, nitrite, available phosphate, and available silicate (Ma *et al.* 2014). These nutrients are among the most important elements essential for the growth and reproduction of marine organisms and form the basis of primary production and the food chain in marine environments (Louise *et al.*, 2017). Nitrogen and phosphorus are not only sources of metabolic energy in biological cells in marine environments but also important components of the cellular protoplasm (the living part responsible for metabolic activity) (Song *et al.*, 2020). Silicon, meanwhile, is the primary element responsible for the formation of shells and skeletons in plankton such as diatoms (Ma & Byrne, 2012).Due to urban, industrial, and agricultural development, large amounts of nutrients have been discharged into the marine environment, either directly or indirectly, through industrial wastewater, agricultural runoff, excessive fertilizer use, sewage, and domestic wastewater (Wang *et al.*, 2020). Excessive concentrations of these nutrients in marine environments have led to a marked increase in eutrophication phenomena such as red tides (Hong *et al.*, 2015). These excessive concentrations can also negatively impact marine productivity and the marine environment's ability to self-purify, leading to an overall imbalance in the ecosystem (Cloern *et al.*, 2016). Therefore, careful monitoring of spatial and temporal changes, along with tracking the distribution of nutrient concentrations in the marine environment, is not only essential for monitoring marine productivity but also plays a key role in the early prediction of phenomena such as harmful algal blooms and other problems associated with eutrophication (Zhang *et al*., 2007).

Materials And Methods

Aim of the study:

1.Determination of major nutrient concentrations (nitrate, nitrite, phosphorus, silica, calcium, and magnesium).

2. To understand the temporal and spatial variations in the concentrations of major nutrients in seawater.

3. Analyze, understand, and determine the relationship between concentrations of major nutrients and certain important environmental factors in seawater.

- **Nitrogen (N)**: Inorganic nitrogen is present in natural water in the form of nitrate (NO3), nitrite (NO2), and ammonium (NH4) ions (Gruber, 2023). Ammonia is produced as a result of the decomposition of complex organic matter of plant and animal origin, as well as from the decomposition of proteinaceous materials that enter waterways via domestic wastewater(Wang *et al*., 2022). The concentration of total nitrogen in natural water often increases due to the proliferation of aquatic plants, as ammonium ions are the end product of protein decomposition. Furthermore, water rich in ammonium resulting from protein decomposition in wastewater is unsuitable for domestic use (Mohr *et al*., 2022).
- **Silica (Si)**: Silica is the seventh most abundant element in the universe and is considered an essential nutrient in the marine environment, as it plays a vital role in the growth of diatoms, certain types of sponges, and possibly some small bacteria. Although there has long been interest in siliceous organisms and silica sediments (Bernard *et al*., 2011), it was not until the late 20th century that the processes governing the marine biogeochemistry of silicon were identified (Ragueneau *et al*., 2000), and global ocean silica budgets have been calculated (Laruelle *et al*., 2009). The silica cycle is closely linked to atmospheric carbon dioxide stocks (Bernard *et al*., 2010).
- **Phosphorus (P):** Many aquatic ecosystems around the world are negatively affected by phosphorus (P) loading (Xu *et al*., 2010). Phosphorus is considered one of the key limiting nutrients in both riverine and marine systems (Paerl, 2009). Phosphorus enrichment is defined as the excessive accumulation of phosphorus in aquatic ecosystems, leading to accelerated growth of algae or aquatic plants, oxygen depletion, changes in biomass, and shifts in species composition (Bennett *et al*., 2001). Eutrophication is a persistent environmental problem in surface waters and a widespread phenomenon.
- **Calcium (Ca)**: is one of the most abundant elements in the Earth’s crust, playing a key role in the global carbon cycle, the development of marine life, and the global climate (Fantle & Tipper, 2014). Calcium is abundant in carbonate rocks such as limestone and biogenic carbonates, as well as in crystalline silicate rocks and soils. It is also found in

sulfate minerals such as gypsum and anhydrite, and in other minerals such as fluorite and phosphates like apatite and biowapatite. Oceanic carbonate sediments constitute the largest reservoir of calcium and carbon within the atmospheric system, reinforcing the link between the global carbon and calcium cycles (Ridgwell & Zeebe, 2005).

- **Magnesium (Mg)**: is a widely distributed mineral and is ranked as the eighth most abundant element on Earth's surface and the fifth most abundant element in seawater. (Kumar *et al*., 2010) It is found throughout the world either as a free cation (Mg^{2+}) in aquatic environments or in the form of salts or minerals (Al-Taee, 2001). The distribution of magnesium on Earth parallels its distribution in the human body; it is the fourth most abundant cation in the body and the second most abundant ion within cells (Jassim and Al-Amiri, 2023). Due to its unique chemical properties and high solubility, magnesium is present in all cells and contributes to more than 300 enzymatic reactions essential for metabolic processes and numerous anabolic and regulatory processes in the body (Kumar *et al*., 2010). Magnesium is an essential element for the stability of cellular functions, the synthesis of RNA and DNA, and energy production, in addition to its role as an antioxidant in protecting cells It also facilitates the generation of adenosine triphosphate (ATP) and the synthesis of nucleic acids within cells (Koc *et al*., 2008) .

Study Design

This study relied on a field monitoring program to assess the environmental characteristics and physical and chemical indicators in the Khor Al-Zubair area, located in the northwestern Arabian Gulf. Three strategic monitoring stations were selected, including Al-Khor Port (Station 1) (N= 30° 10´ 20.8"; E= 47° 53´ 53.4"), representing the northern part of the khour, where the depth ranges from approximately 12 to 15 m. This area experiences high traffic of commercial vessels and oil tankers, making it one of the khour's regions most exposed to human and industrial impacts.

The Tunnel (Second Station) (N= 30° 4´ 41"; E= 47° 57´ 21. 2″) is located in the middle of the Zubair Creek. The depth of this area reaches approximately 20–25 m. This area is influenced by mixed water characteristics, combining river water coming from the north and seawater coming from the south. This station is characterized by a relative decrease in water current speed compared to areas near the ports and Umm Qasr Port (Station 3) (N= 30° 00´ 41.1"; E= 47° 58´ 40.3") This station represents the southern part of Khor Al-Zubair, where the average water depth is approximately 16 m. It serves as a transitional zone between the estuarine system and the open marine system. This station is directly influenced by the near-daily tidal movement and marine currents coming from the Gulf, leading to continuous water renewal and strong mixing between the saltier water from the Gulf and the less saline water from the creek. Sampling trips were conducted on a basis to monitor the sharp climatic variations between the summer and winter seasons.

Study Area

Khor Al-Zubair is an extension of the Arabian Gulf at the southern mouth of the Tigris and Euphrates river delta. It is approximately 42 km long, about 1 km wide at the islands, and has an average depth ranging from 10 to 20 m (Figure 1). In 1983, Khor Al-Zubair was connected to the Shat Al-Basra Canal, which carries water from the estuary and the Hamar Marsh to the sea (Lafta, Altaei, & Al Hashimi, 2020). The topography of Khor Al-Zubair resembles a spindle with tapered ends at the northern and southern ends. The northern end receives a freshwater inflow averaging 700m^3/s throughout the tidal cycle. The current in the creek flows in a single direction toward the southern end (the Arabian Gulf), with a velocity exceeding 2 m/s during ebb and 0.66 m/s during flood (Al Saad, Abd, Al Hello, & Zuhkair, 2007). At the southern end, the outflow reaches 10,000 m^3/s with a velocity range of 0.8–5.78 m/s (Lafta & Abdullah, 2025). Due to the wide tidal range at Umm Qasr, which reaches 4.3 m, and the low elevation of the coastline, floodwaters penetrate the clay soils further inland, depending on tidal conditions

Figure 1: Map of the Study Sites

The Khor Al-Zubair Port is located 60 km south of the city center of Basra in southeastern Iraq, and 105 km from the northern tip of the Arabian Gulf; the port is situated within the mouth of Khor Al-Zubair. Khor Al-Zubair Port is the second-largest port in Iraq and comprises 13 commercially used berths and docks (Filipova, Aruna, & Prasoon, 2012). The samples for the present study were collected during the (summer and winter) beginning on August 25, 2025, from three selected areas. Surface water samples were collected at a depth of approximately 10 cm using a boat at the study sites, and the collection was conducted during low tide to ensure better representation of the water's environmental characteristics at the three stations.

A range of environmental parameters was measured in the field during the collection process, including water temperature, salinity, and pH, using a Multifunction Water Quality Meter, model C-600. Dissolved oxygen was measured using a portable dissolved oxygen analyzer (Model BLE-9100). Total nitrogen (TN) was measured using the standard Kjeldahl method for determining total nitrogen, in accordance with Standard Methods for the Examination of Water and Wastewater, following standard procedure Norg B–4500 (APHA, 2017).

A 50-mL sample was taken in a beaker, to which 10 mL of digestion solution was added, and the mixture was placed on a hot plate until its volume reduced to approximately 10 mL, noting the color change from clear to pale green. It was then allowed to cool and diluted to 100 mL using distilled water. The method for determining nitrite (NO_2) was adopted as described in (1952) Bendschneider and Robinson, as described in (Parson *et al.*, 1984). A 50 mL sample was mixed with 1 mL of sulfanilamide solution and allowed to stand for 10 minutes; then, 1 mL of N-(1-naphthyl) ethylenediamine dihydrochloride solution until a pink color developed, and the optical density was measured using a spectrophotometer at a wavelength of 543 nm.

The method for determining nitrate (NO_3) was adopted as described in (Wood *et al.*, 1967) and (Parson *et al.*, 1984), wherein nitrate is reduced to nitrite using a cadmium column by adding 2 cm^3 of concentrated ammonium chloride solution to 100 cm^3 of the sample, then passing it through the column and treating it as described in section (3.3.3.2), after which the previously estimated amount of nitrite is subtracted. Total nitrogen (TN) concentration was determined using the ascorbic acid method after digestion, in accordance with Standard Methods for the Examination of Water and Wastewater, Standard Procedure PD-4500

Take 100 mL of the sample in a beaker, then add 5 mL of nitric acid (HNO_3) and 1 mL of sulfuric acid (H_2SO_4). Place the beaker on a hot plate until the volume reduces to approximately 3 mL. Allow the mixture to cool, then dilute to 100 mL using distilled water. The concentrations of magnesium (Mg), calcium (Ca), and silica (SiO_2) in the samples were determined using inductively coupled plasma mass spectrometry (ICP-MS) with an Agilent 7500 instrument (Agilent Technologies, USA), as previously reported, at the laboratories of the Faculty of Chemistry–University of Tehran, in accordance with approved standard methods.

Results and Discussion

1. Temperature: Water temperature is one of the key factors influencing the physical, chemical, and biological characteristics of the aquatic environment, and this may be reflected in the distribution of organisms within it (Larnier *et al*., 2010). In this study, the highest water temperature (30°C) was recorded during the summer at all three sites (Khor Al-Zubair Port, the Tunnel, and Umm Qasr Port). Meanwhile, the lowest water temperature (10°C) was recorded during the winter at the third site (Umm Qasr Port).

Figure(2) The results showed significant variations in water temperatures, with the highest values occurring during the summer and the lowest during the winter. This is attributed to the nature of Iraq's climate, which is characterized by hot, dry summers and cold, rainy winters. It was also found that water temperature is closely to air temperature, as they are influenced by the seasons, wind patterns, cloud cover, and solar radiation intensity, all of which directly affect water temperature (Al-Shahri *et al*., 2016).

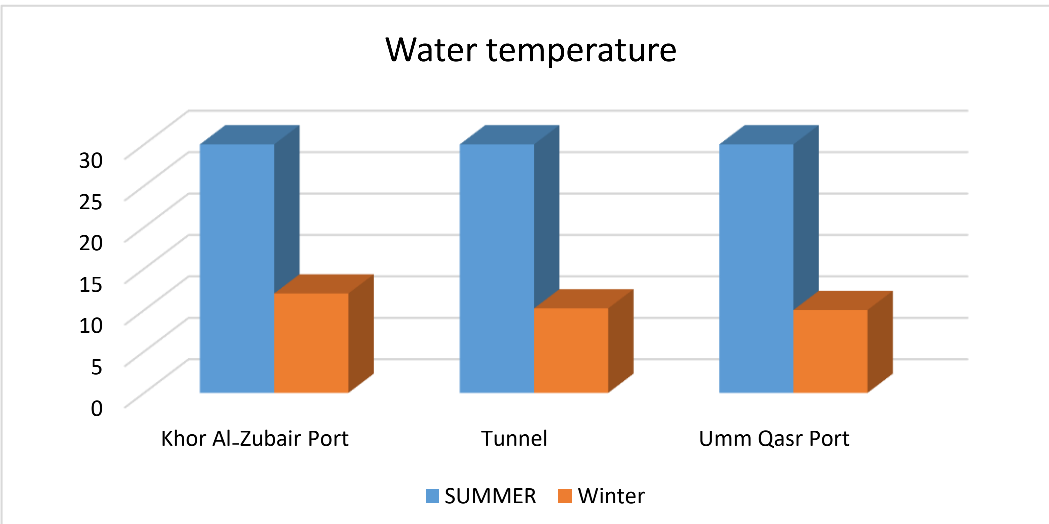

Figure 2: variations in water temperature values at the study stations during summer and winter.

2. Salinity: Salinity is an important indicator of the concentration of dissolved salts in water, including cations such as calcium, magnesium, and sodium, as well as anions such as carbonates, sulfates, and chlorides. High salinity levels place environmental stress on the aquatic system and limit the potential use of water for human and agricultural activities (Florke *et al*., 2019). The results of the current measurements showed that the highest salinity value was recorded in the summer at the third station (Umm Qasr Port) and reached 50.7, while the lowest value was observed during the winter at the first station (Khor Al-Zubair Port) and reached 44.8. Figure 3

The results showed higher salinity values during the summer, which is attributed to higher water temperatures and the accompanying increase in evaporation rates, or possibly due to the discharge of salt-rich wastewater in addition to the products of organic matter decomposition. In contrast, salinity values decreased during the winter season, likely due to rainfall and the resulting dilution of the water and reduction in salinity, as well as lower evaporation rates, since temperature variations lead to changes in evaporation rates, which in turn affect salt concentration, causing it to increase or decrease (Mohammad *et al.*, 2021).

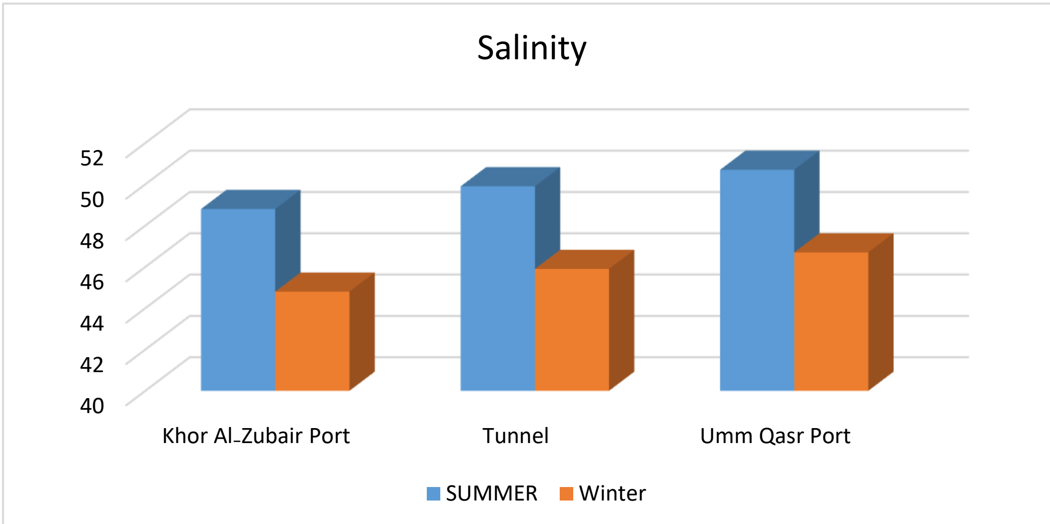

Figure 3: changes in salinity levels across study stations during summer and winter seasons.

3. pH: represents the concentration of hydrogen ions in water and is considered an important indicator in aquatic environments due to its direct impact on organisms that live within specific pH ranges. Most aquatic organisms prefer pH values within the range of 6.5–8.5, and values outside this range expose them to environmental stress (Agarwal and Rajwar, 2010). The results of the current study showed that the highest pH value was recorded during the summer (7.62) at Station 3 (Umm Qasr Port), while the lowest value was recorded during the winter (7.42) at Station 3 (Umm Qasr Port). The pH values indicate that the water is neutral to slightly alkaline, a common pattern in marine environments characterized by active carbonate buffering systems; these values also fall within the normal range for seawater (Mohammad *et al.*, 2021).

4. Dissolved Oxygen: is one of the most important indicators used to assess water quality and the degree of pollution in aquatic environments, as low concentrations cause significant harm to aquatic organisms and serve as evidence of organic pollution (APHA, 2005). The results of the current study showed variation in dissolved oxygen values among the different study stations, with the highest value recorded during the winter (9.8) at the second station (the tunnel), while the lowest value was recorded during the summer (6.7) at the first station (Khor Al-Zubair Port) Figure (5). The results indicate that dissolved oxygen values were high during the cold seasons and decreased during the warm seasons. The increase in dissolved oxygen during the winter is attributed to lower temperatures, which increase the solubility of gases and reduce the rates of organic matter decomposition (Wilson and Floey, 2003).

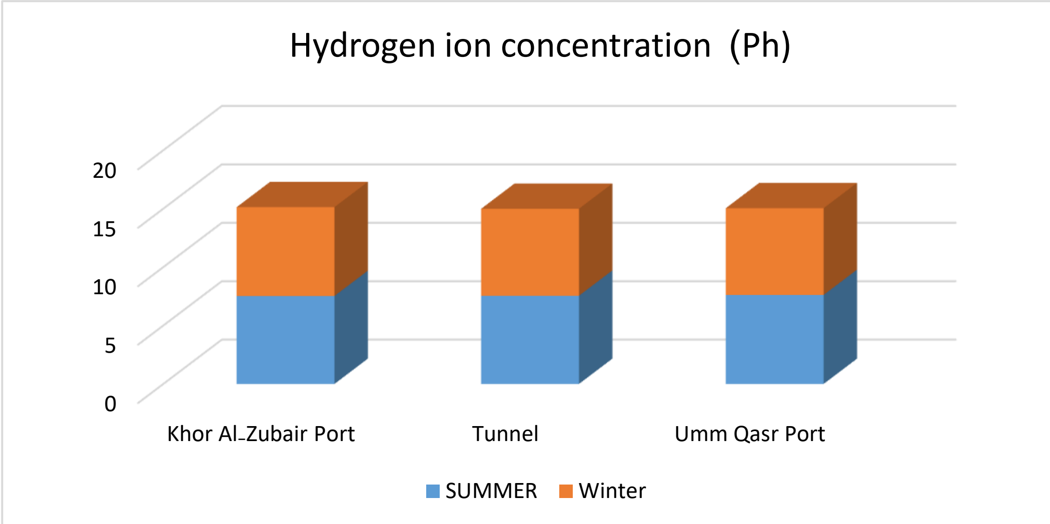

Figure 4: variations in pH values at the study stations during summer and winter.

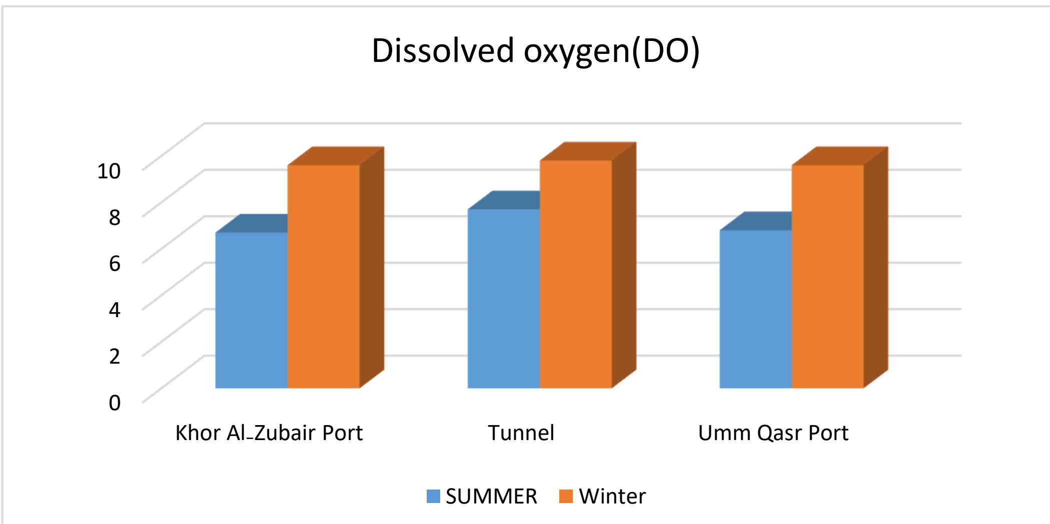

Figure 5: variations in dissolved oxygen (DO) values at the study stations. during summer and winter.

The decrease in dissolved oxygen levels during the summer, however, is associated with rising temperatures, which limit the solubility of oxygen, as well as the activity of microorganisms that consume dissolved oxygen during their metabolic processes in the oxidation of organic matter (Sanchez *et al*., 2007).

5. Total Nitrogen: is one of the key indicators for assessing water quality, as it includes all forms of inorganic and organic nitrogen, such as ammonia, nitrite, nitrate, and organic nitrogen (USGS, 2018). The results of the current study showed that the highest total nitrogen value was recorded during the winter at the third station (Umm Qasr Port) and reached 3.1 µg/L, while the lowest value was recorded during the summer at the same station (Umm Qasr Port) and reached 0.7 µg/L.

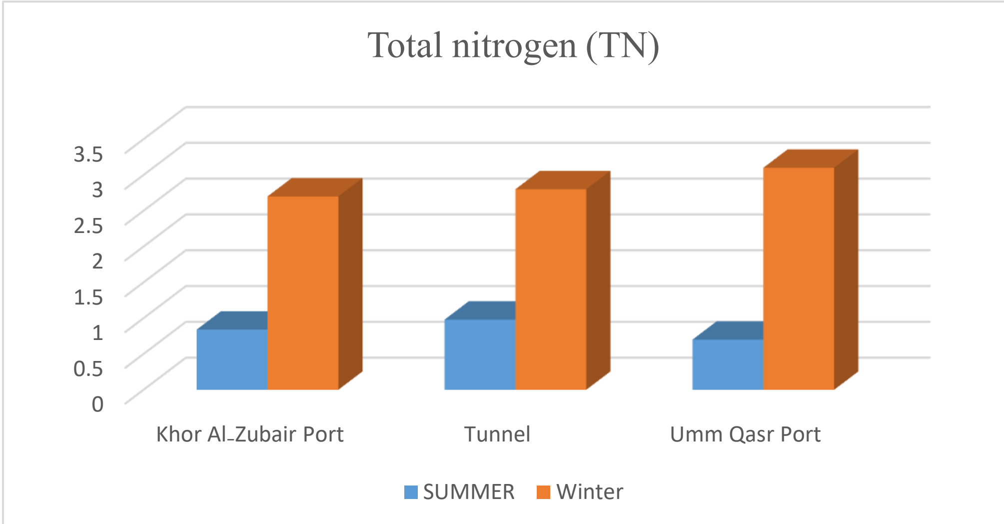

Figure 6: variations in total nitrogen (TN) values at the study stations during summer and winter.

This increase in winter is attributed to rainfall and agricultural runoff, while the lower values in summer were due to reduced river flow and biological assimilation (Li *et al*., 2025).

6. Nitrite: is formed as a byproduct of oxidation and reduction processes; it is an unstable compound resulting from the oxidation of ammonia or the reduction of nitrate. High concentrations of nitrite are toxic to aquatic organisms (Kroupova *et al*., 2005). The results of the current study showed that the highest nitrate value was recorded during the winter at the first station (Khor Al-Zubair Port) and reached 1.99 μg/L, while the lowest value was recorded during the summer at the third station (Umm Qasr Port) and reached 0.37 μg/L. The high nitrite values during the winter may be attributed to untreated wastewater, and the presence of high levels of organic pollutants contributes to the reduction of nitrate to nitrite (Razamkhah *et al*., 2010).

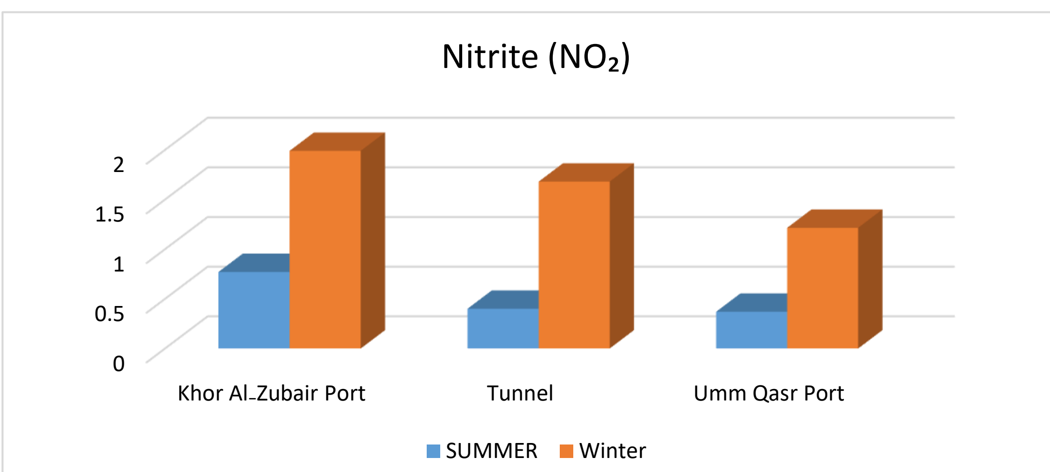

Figure 7: changes in nitrite concentrations across study stations during summer and winter.

7. Nitrates: are one of the most abundant forms of inorganic nitrogen in water and are generally less toxic than ammonia and nitrites (Dewald *et al.*, 2020). The results of the current study showed that the highest nitrate value was recorded during the winter at the first station (Khor Al-Zubair Port) and reached 4.49 µg/L, while the lowest value was recorded during the summer at the same station (Khor Al-Zubair Port) and reached 1.044 µg/L. The high nitrate concentration during the winter is attributed to heavy rainfall, which helps dissolve organic compounds, and to the addition of nitrogen fertilizers to agricultural land. Additionally, the increase in untreated wastewater containing high nitrate concentrations and industrial waste rich in ammonia—which is converted into nitrate through the nitrification process—contributes to nitrate.

The decrease in nitrate concentrations during the summer is due to their consumption by phytoplankton and aquatic plants as a result of reduced dissolved oxygen (Jassim and Al-Amiri, 2023) .

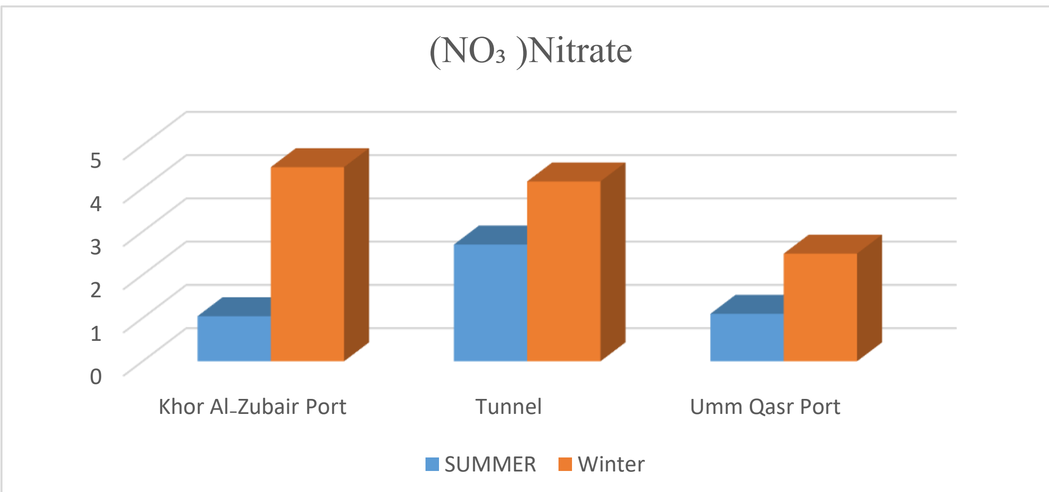

Figure 8: changes in nitrate concentrations across study stations during summer and winter.

8.Total Phosphorus: Phosphorus is one of the major nutrients in aquatic environments, and its concentrations are typically low in freshwater; however, elevated levels lead to increased algal growth and the consequent depletion of dissolved oxygen. Sources of phosphorus vary between natural and anthropogenic, including rocks and soil, as well as runoff from agricultural lands, industrial waste, and commercial cleaning products (Spellman, 2014). The results of the current study showed that the highest phosphorus value was recorded during the summer at Station 3 (Umm Qasr Port) and reached 0.297 µg/L, while the lowest value was recorded during the winter at Station 1 (Khor Al-Zubair Port) and reached 0.123 µg/L.

The reason for the increase in total phosphorus concentrations during the summer and their decrease during the winter is a pattern associated with environmental factors such as temperature, biological activity, and river flow, as it was found that the increase in total phosphorus values during the summer is due to increased biological activity and phosphorus recycling in sediments , while they decrease in winter due to dilution and increased river flow (Li *et al*., 2025).

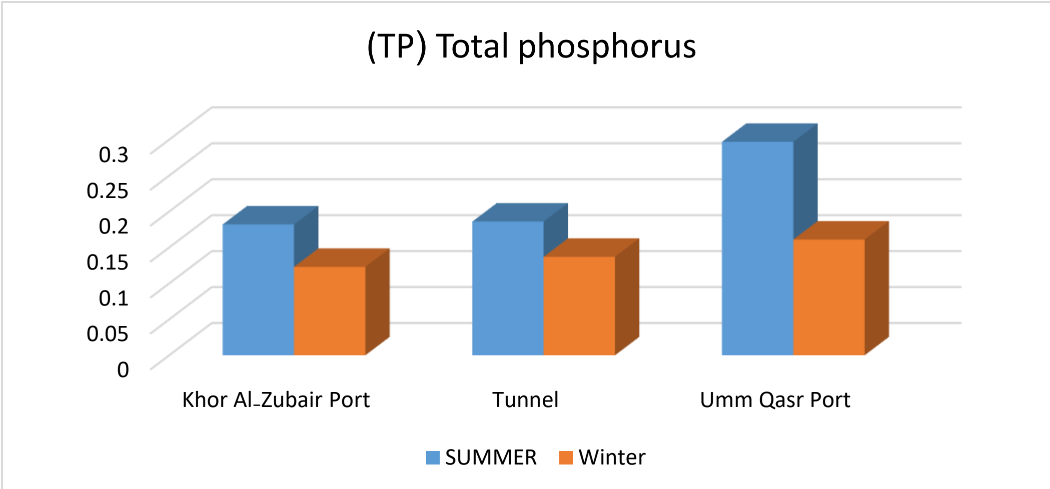

Figure 9: variations in total phosphorus (TP) concentrations at the study stations during summer and winter.

9. Silica: is a common natural component in water, leaching into it from rocks and soil as groundwater and surface water flow through them. Its concentrations are an important indicator in environmental and hydrological studies, as it is involved in the construction of the exoskeletons of certain microorganisms, such as diatoms, and also controls certain sedimentary and geological processes (Yehia & Said, 2023). The results of the current study showed that the highest silica value was recorded during the summer at Station 3 (Umm Qasr Port) and reached 6.08 mg/L, while the lowest value was recorded during the winter at Station 3 (Umm Qasr Port) and reached 0.72 mg/L.

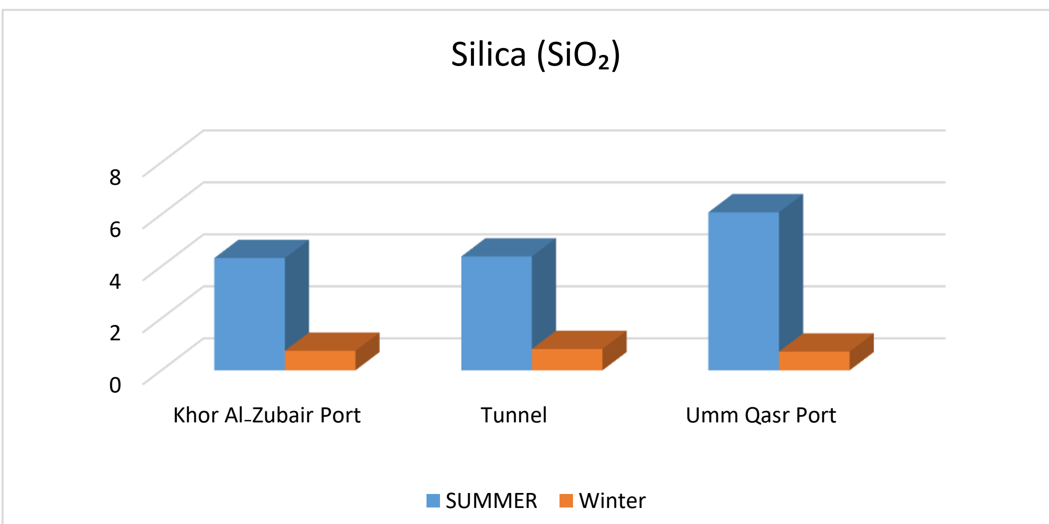

Figure 10: variations in silica concentrations at the study stations during summer and winter.

The reason for the high silica concentrations in the summer is due to increased rates of silicate weathering and the dissolution of minerals under the influence of high temperatures, in addition to reduced river flow, which decreases dilution; whereas the decrease in concentrations in the winter is due to increased flow as well as lower temperatures, which reduce the release of silica from rocks (Quade *et al*., 2003).

10. Calcium: is one of the essential elements required by aquatic plants and other organisms, as it contributes to numerous biological processes within the aquatic environment (Jassim and Al-Amiri, 2023). The results of the current study showed that the highest calcium value was recorded during the winter at Station 2 (the tunnel), reaching 384.24 mg/L, while the lowest value was recorded during the summer at Station 3 (Umm Qasr Port), reaching 112.45 mg/L. The high calcium values in winter are attributed to natural mineral leaching from the surrounding soil and rocks due to rainwater, in addition to the role of agricultural runoff, which transports salts and minerals into water sources (Hammoumi *et al*., 2024).

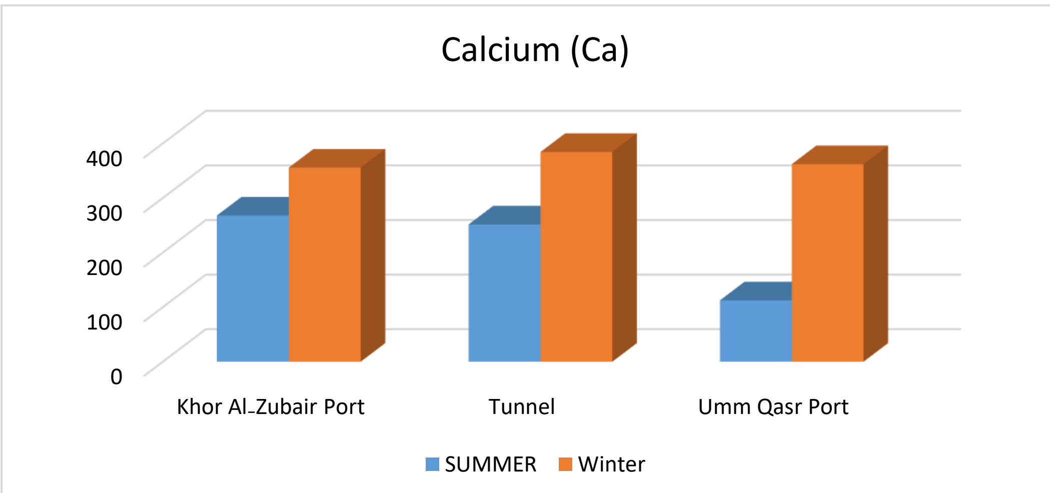

Figure 11: variations in calcium concentrations at the study stations during summer and winter.

11. Magnesium: is a key component in the chlorophyll molecule of aquatic plants and algae; its deficiency leads to a decrease in algae density and a decline in their ability to perform photosynthesis (Jassim and Al-Amiri, 2023). The results of the current study showed that the highest magnesium value was recorded during the winter at the second station (the tunnel), reaching 1351.01 mg/L, while the lowest value was recorded during the summer at the same station (the tunnel), reaching 483.21 mg/L. The increase in magnesium concentrations during the winter is attributed to hydrological factors and agricultural activities, as high rainfall stimulates the leaching of minerals from soil and rocks and the transport of ions extracted from agricultural lands, in addition to salt-rich groundwater flows (Koc et al., 2008).

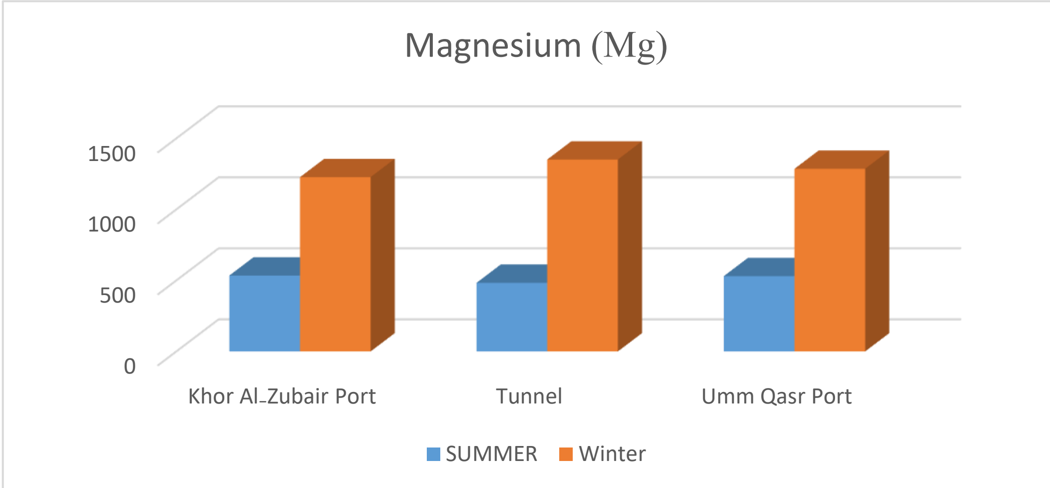

Figure 12: variations in magnesium concentrations at the study stations during summer and winter.

Conclusions

This study investigated water quality at three stations in Khor Al-Zubair (Khor Al-Zubair Port, Al-Nafq, and Umm Qasr Port) to analyze spatial and variations in physical and chemical parameters, as it is a coastal area. The results showed differences between the stations and across different seasons regarding temperature, salinity, dissolved oxygen, pH, total nitrogen (TN), nitrite, nitrate, total phosphorus (TP), calcium, magnesium, and silica). The results showed clear variations in water quality indicators, with the stations (Khor Al-Zubair Port, Al-Nafq, Umm Qasr Port) recorded the highest temperature levels (30 °C) during the summer and salinity (50 mg/L) during the summer at the third station (Umm Qasr Port), while pH (pH) (7.62) during the summer at the third station (Umm Qasr Port), while dissolved oxygen decreased during the summer, recording (6.7 mg/L) at the first station (Khor Al-Zubair Port). As for the major nutrients, the results showed variation, with a noticeable increase in the values of (total nitrogen (TN), nitrite, nitrate, calcium, and magnesium) during the summer, whereas they decreased in the winter, with the exception of total phosphorus (TP) and silica, which exhibited opposite behavior .

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تقييم الخصائص الفيزيوكيميائية وتوزيع المغذيات الكبرى في مياه خور الزبير، شمال غرب الخليج العربي، العراق

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المستخلص

اجريت الدراسة على بيئة خور الزبير شمال غرب الخليج العربي حيث جمعت عينات المياه موسميا (الصيف، الشتاء) من عمق 10 سم اثناء ظاهرة الجزر من ثلاث محطات من مياه خور الزبير(ميناء خور الزبير، النفق، ميناء ام قصر). قيست مجموعة من المعايير الفيزيوكيميائية شملت (درجة الحرارة، الملوحة، الاوكسجين المذاب، الاس الهيدروجيني (PH)، اجمالي النيتروجين (TN)، النتريت، النترات، اجمالي الفسفور (TP)، الكالسيوم، المغنيسيوم، السيليكا). اظهرت النتائج تباينات موسمية واضحة في مؤشرات جودة المياه حيث سجلت المحطات ميناء خورالزبير، النفق، ميناء ام قصر، بلغت اعلى مستويات درجة الحرارة (30°م) خلال فصل الصيف والملوحة 50 ملغم/لتر خلال فصل الصيف في المحطة الثاثة ميناء ام قصر والاس الهيدروجيني (PH) (7.62) خلال فصل الصيف في المحطة الثالثة ميناء ام قصر بينما نلاحظ انخفاظ الاوكسجين المذاب خلال الفصل الصيف إذ سجل 6.7 ملغم/لتر في المحطة الاولى ميناء خورالزبير. اما المغذيات الكبرى قد اظهرت النتائج تباينا مكانيا وموسميا واضحا حيث سجلت اعلى قيمة لاجمالي النيتروجين خلال فصل الشتاء في المحطة الثالثة ميناء ام قصر وبلغت 3.1µg/L كما تزامنت معها قيم كل من النتريت والنترات خلال فصل الشتاء ايضا في محطة ميناء خور الزبير حيث بلغت 1.99µg/L و 4.49 µg/L على التوالي. وعلى العكس من ذلك سجلت اعلى قيمة للفسفور الكلي خلال فصل الصيف في محطة ميناء ام قصر وبلغت 0.297 µg/L مصحوبة باعلى تركيز للسيليكا في المحطة المحطة والفصل نفسه حيث بلغت 6.08 mg/L وفيما يخص العناصر الاخرى فقد تم رصد اعلى تركيز للكالسيوم والمغنيسيوم خلال فصل الشتاء في محطة النفق حيث بلغت 384.24 mg/L و1351.01 mg/L على التوالي.

الكلمات المفتاحية: خور الزبير، المغذيات، البيئة، الانظمة المائية.