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TOTAL PETROLEUM HYDROCARBONS (TPHS) IN THE SEDIMENT CORES OF TIGRIS, EUPHRATES AND SHATT AL-ARAB RIVERS

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ABSTRACT

Due to their widespread distribution in the environment, petroleum hydrocarbons are pollutants that contain a variety of hazardous organic compounds, many of which have the ability to mutate and have cancerous impacts on natural ecosystems To determine the quantities, distribution, and sources of total petroleum hydrocarbon in sediment samples, sediment samples were collected from six locations along the Tigris, Euphrates, and Shatt Al Arab rivers in December 2021. The highest concentration of TPHs was (10.83µ g/g dry weight) in station 6 at Shatt Al-Arab and the lowest was (1.39 µg/g dry weight) in station 3 at Euphrates. These results were compared with previous studies conducted in the same area since 1998. The current study's results indicated that TPHs concentrations in the sediments at the Tigris, Euphrates and Shatt Al-Arab River were within the permitted limits. Therefore, we can come to the concluded that since 1998, these regions of the study have not been significantly contaminated by petroleum hydrocarbons.

Keywords: Total petroleum hydrocarbons (TPHs), sediments, Tigris, Euphrates, Shatt Al-Arab.

1. INTRODUCTION

After the confluence of the Euphrates and the Tigris Rivers The Shatt Al-Arab River is formed near the city of Al-Qurna in southern Iraq (AL-Saad *et al.*, 2015). The territory flowing to the Shatt Al-Arab region downstream of Al-Qurna is shared by Iran and Iraq. The Shatt Al-Arab River, which runs for 192 kilometers, widens along the way, from (250- 300) meters near the Euphrates-Tigris confluence to about 700 meters around Basrah and more than 800 meters as it approaches the river mouth.

A total of 145,190 km2 of land flows directly into the Shatt Al-Arab region downstream of the Euphrates-Tigris confluence, excluding the Euphrates and Tigris Basins (UN- ESCWA and BGR2013).

This river is the most important source of fresh water in Basrah city , and influenced by freshwater discharges from agricultural runoff , industrial activities , and untreated domestic sewage.

petroleum hydrocarbons and it's derivatives is One of the most dangerous pollutant for water environment , Petroleum hydrocarbons enter the environment as a result of accidents, spills, or leaks, as well as industrial discharges and goods from commercial or residential employment. (Ines *et al.,* 2013). Increased levels of hydrocarbons in the environment can pollute natural resources (Al-Saad , Karem, and Kadhim, 2017).

Sediments can keep low levels of hydrocarbons from natural sources that are "biogenic," such as higher plants. (Zhang *et al.,* 2012). The hydrocarbons in sediments

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can be eliminated through a variety of mechanisms including volatilization, photo-oxidation, chemical reactions, leaching, and biodegradation. (Grimalt and Olive, 1993). Some of these processes could take a long time, and some of these compounds will persist in the sediments and become more resistant as environmental conditions change. (Barakat *et al.*, 2001).

The main sources of hydrocarbons in the environment are crude oil and oil products. Other sources were discovered, such as natural or biogenic hydrocarbons, which are derived from natural sources. (Al- Saad, 1995, Saleh, Salah Mahdi, et al.,2021).

The variety of the composition of biogenic hydrocarbons is because of the wide variety of natural biochemical processes (Klenkin *et al.*, 2010).

Petroleum hydrocarbons, particularly PAHs compounds, are among the hazardous materials because they have the potential to cause cancer. (Bakhtiari et al , 2009) .

After incidents of visible oil stains appeared on the surface of several seas and oceans in 1922, scientists started paying more attention to oil pollution and started researching its effects on the aquatic environment (Al-Saad et al., 2003).

Water has certainly been contaminated with hydrocarbons as a result of oil exploration procedures, seabed extraction, oil refineries' discharges, export ports, and washing of loading platforms (NRC, 2003 and Nasir, 2007).

Due to their quantity, persistence, toxicity (they are on lists of hazardous compounds), long-lasting air transportation, and negative health effects on aquatic life and humans, hydrocarbons have become a global problem in both developed and developing countries (Ukalaska and Smreczak, 2020).

To provide a better understanding of the health of our water bodies and a complete image of these pollutants in sediments, the current study aims to summarize the situation of total petroleum hydrocarbons (TPHs) in the study area since 1998.

2. MATERIALS AND METHODS

The sediment core samples were taken in 4 December 2021 from six sampling stations which represent different sites of the Euphrates and Tigris Rivers and the Shatt Al-Arab River (figure 1) for analyzing and estimating the concentration of hydrocarbons in these sediment core .

Sediment cores pipe of (120 cm length X 5 cm diameter) were collected from six stations. The cores were inserted into the water-sediment interface and pushed to ensure that they reached maximum depth. The cores were slowly retrieved back, closed with its cover immediately and marked as to which is the upward direction.

The samples were dried in an air grinded in an electrical stainless steel mortar and sieved Through 63 µm sieve, 25 gm of sieved sediments were placed in cellulose thimble and soxhlet Extracted using soxhlet intermittent extraction (Goutex and Saliot ,1980) with mixed solvents(120 ml) methanol :benzene (1:1 v/v) for 24 -36 hrs. at temperature doesn't exceed 40° C .At the end of this period ,the combined extracts were saponification for 2 hrs. by adding (15 ml) 4M MeOH (KOH) at the same temperature ,then cooled to room temperature ,using separator funnel to extracted the un saponification matter with (40 ml) n-hexane . After dried, 5

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ml of n- hexane was added to make the sample ready for the measurement of the concentrations of total hydrocarbons with spectrofluorometer .

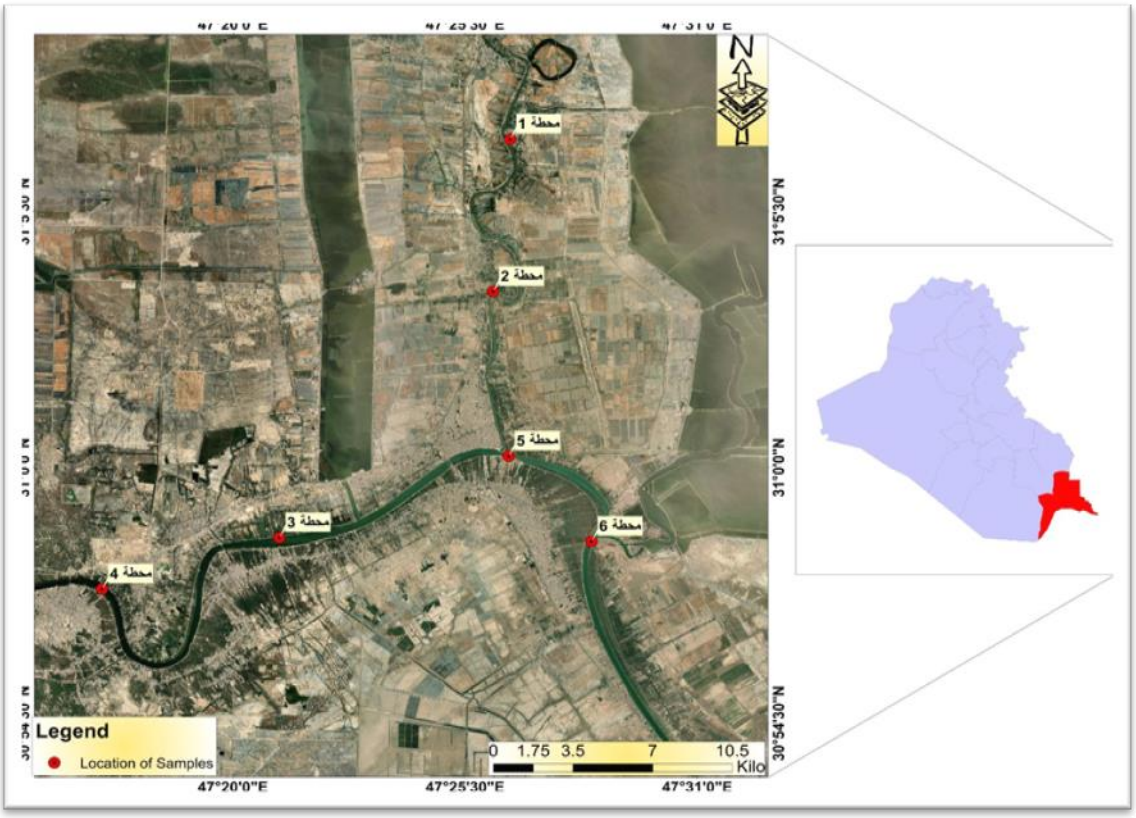

Figure (1): The study stations

3. RESULTS AND DISCUSSION

The current study's results indicated that the concentration of TPHs in the sediments was within permitted limits (CCME-1999).

Station 6(shatt al-arab 2) had the highest concentration (10.83µ g/g dry weight) while station 3(Euphrates1) had the lowest value(1.39 **µ**g/g dry weight) (Table 1**)**

Table 1 shows that the concentration values start to decline with increasing depth,
As shown in figure (2) ,it is clear from the recorded data that there is a gradation of hydrocarbons concentrations with depth. This explains why the surface layer (0-5 cm) of all the examined locations showed the highest total hydrocarbon concentrations due to direct contact with petroleum hydrocarbons as a result of home and industrial waste that hasn't been handled, oil spills, and other contaminants (Al-Saad, 1995; Talal, 2008)· The Shatt Al-Arab River had the highest concentration of total petroleum hydrocarbons, which may have been caused by oil spills, engine exhaust from the nearby moored small fishing boats, and contamination from power boat activities. In conversely, low concentrations in some stations may have been caused by a higher rate of microbial degradation or volatilization. table (2) compares the concentrations

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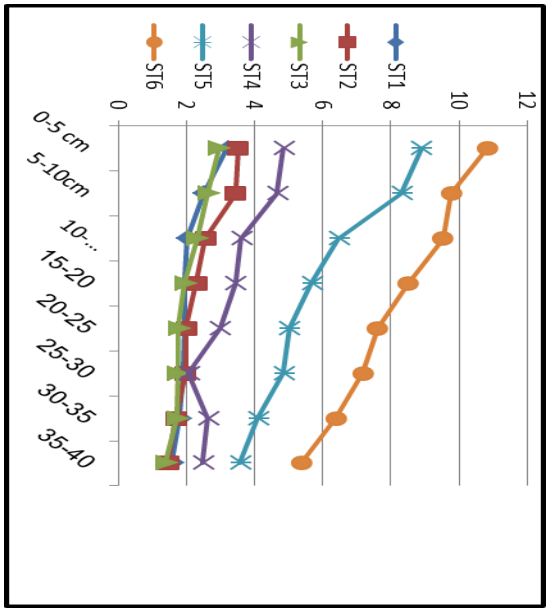
of total petroleum hydrocarbons values of previous studies with the current study and shows that our results are within the range of these previous studies.

Table 1. Concentrations of Total petroleum hydrocarbons (TPHs) (µg/g dry weight) in the sediments core in study stations.

Depth cm	ST1	ST2	ST3	ST4	ST5	ST6
0-5	3.20	3.53	2.95	4.85	8.89	10.83
5-10	2.51	3.44	2.63	4.67	8.32	9.79
10- 15	2.02	2.56	2.31	3.61	6.48	9.53
15-20	1.96	2.30	1.97	3.44	5.69	8.53
20-25	1.97	2.00	1.78	3.00	5.02	7.62
25-30	1.91	1.98	1.75	2.08	4.86	7.19
30-35	1.82	1.69	1.74	2.64	4.11	6.39
35-40	1.59	1.48	1.39	2.49	3.58	5.39



Figure(2)) Gradation of the total petroleum hydrocarbons values with depth

Table (2) Comparison of total petroleum hydrocarbons values of previous studies with the current study

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Table (2) Comparison of total petroleum hydrocarbons values of previous studies with the current study

Refer ance	Concentration µg/g)(	Study area
Shatt Al Arab and Northwest Arabian Gulf	0.108 – 37.02	(Al-Khatib,1998)
Shatt Al Arab	275.433 – 28.821	(Hantoush, 2006)
Northwest Arabian Gulf	66.02 – 34.37	(Nasir, 2007)
Shatt Al Arab and 199stuary	148.42 – 59.52	(Al-Imarah *et al* ., 2007)
Shatt Al Arab and Northwest Arabian Gulf	7.37-24.41	(Al-Imarah *et al* ., 2010)
Iraqi coasts	2.39- 30.88	(Al-Khion , 2012)
Shatt Al Arab	4.76-45.24	(Al-Hejuje , 2015)
Banks of Shatt Al Arab, Khor Al Zubair and Umm Qasr	0.94-26.27	(AL Mahana, 2015)
West Qurna-2 Oil Field	14.82- 41.86	Kareem ,2016)(
local regions of southern Iraq	2.05-14.94	Al-Gizzi *et al.*,2021)(
Shatt Al Arab, Tigris, Euphrates	1.39-10.83	Current Study

Pyrogenic and petrogenic input were the main sources of TPHs in the Shatt Al-Arab estuary and the North-West Arabian Gulf, whereas biogenic sources were rarely detected (Al-Saad et al., 1997 and Qzar,2021).

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There are several factors that influence the distribution of TPHs, including flushing, sedimentation, bacterial degradation, and photo oxidation. When a water-gasoline solution is exposed to sunlight, TPHs compounds may develop. Some TPHs may be oxidized by a variety of species, including bacteria, algae, and fungi. TPHs may degrade by chemical oxidation or biological metabolism (Ehrharat and Burns, 1993; Obayori and Salam, 2010) all these factors effect the distribution of hydrocarbons in sediment core (Al-Saad et.,al 1997) **, also** there were no considerable variations in the concentrations of TPHs in the sediment samples between the different depth and stations. If we compare our study with the previous study(Table 2) it lies with it.

4. CONCLUSION

The study indicate that sediments core in Tigris,Euphrates and shatt Al-Arab river slightly contaminated with petroleum hydrocarbons.

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