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المجلة العراقية لبحوث السوق وحماية المستهلك

COMPARATIVE STUDY OF TOTAL PETROLEUM HYDROCARBON (TPH) LEVELS IN BASRAH GOVERNORATE /IRAQ

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ABSTRACT

As the document of national strategy for Iraqi environment protection from(2013-2017) shows that the environmental awareness concepts is new in the Iraqi society and so limited due to the economic and security priorities under the current conditions, especially aqua environmental awareness side, for verifying this important variable an investigation was carried out to measure the amount of Total Petroleum Hydrocarbon for six water channels in Basrah, which polluted from different sources, these are Al Garmah River, Shatt Al Arab(Corniesh street location), (Abu Floos, Khor Al Zubair, Umm Qasr, and Al Fao) Ports. The highest concentration of TPH was found inUmm Qasr Port, 22.10 µg/L and the lowest concentration of TPH was found in Al Garmah River, 5.35 µg/L.

Keywords : Total Petroleum Hydrocarbon, Shatt Al Arab River, Environmental Awareness, Basrah Governorate.

دراسة مقارنة لمستويات الهيدروكربونات النفطية الكلية في محافظة البصرة / العراق

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الخلاصة

أظهرت الوثيقة الاستراتيجية الوطنية لحماية البيئة العراقية من (2013-2017) أن مفاهيم الوعي البيئي جديدة في المجتمع العراقي ومحدودة للغاية بسبب الأولويات الاقتصادية والأمنية في ظل الظروف الحالية. وعلى وجه الخصوص جانب الوعي البيئي المائي وتلوثها بالهيدروكربونات النفطية من مصادر مختلفة، وللتحقق من هذا المتغير المهم تم إجراء تحقيق لقياس كمية هذه الملوثات لستة قنوات مائية في البصرة وهي نهر الكرمة، شط العرب (موقع شارع الكورنيش) وموانئ (أبو فلوس، خور الزبير، أم قصر، الفاو). حيث وجد أعلى تركيز للهيدروكربونات البترولية في ميناء ام قصر 22.10 ميكروغرام/لتر، وأقل تركيز وجد في نهر الكرمة 5.35ميكروغرام/ لتر

الكلمات المفتاحية: الهيدروكربونات النفطية الكلية ، شط العرب، التوعية البيئية، محافظة البصرة.

INTRODUCTION

The term contamination mean changes caused through humans action, with way or another, from materials and other inputs to the environment in an irresponsible manner, resulting in risks to the general health, damage to living organisms and to ecosystems. In the last decade, petroleum hydrocarbon pollutants have spread widely in the aquatic environment because of the modern society's use of many oil- products such as some kinds of fuels and asphalt Hydrocarbons are one of the important basic components of oil and appear in the environment from natural sources and human activities, such as oil production and transportation, the problems of air and marine pollution resulting from them, and the direct disposal of wastes in the oceans, coastal municipal and industrial wastes. The point discharges, contamination by urban run-offs, refineries are the main resources in causing local, chronic

pollution in the vicinity of estuaries, creeks, harbors and coastal settlements in general the industry activates and pipe line spillage causing this kind of pollution. **(Alinnor & Nwachukwu, 2013).** Many of the human factors that have adverse effects on the environment take the lead in causing hydrocarbon pollution, oil and natural gas meet more than 60% of the world's energy needs, the pressure on energy sources creates especially in the last decade as the modern civilization developed. **(Ahmed & Fakhruddin, 2018)**, but if leaking into the environment during extraction and treatment of transport and storage, they adversely affect ecosystems closer to transportation line and refinery areas **(Sari *et al*., 2018)**. In addition, anthropogenic hydrocarbons are associated with combustion, the thermal decomposition of fossil fuels, unburned petroleum products, fuels waste and man-made fuels hydrocarbons appear to be more pronounced in water-related sites (the oil dispenser and the refinery), the sewage (sewers), shipping activities (dry docking) **(Medeiros *et al*., 2005)**.

The main sources of total petroleum hydrocarbon especially in the port sites like Basrah governorate is the oil and gas production operations, crude oil spills and leakage, natural gas leakage and flaring, pollutants associated with the refining operation, and the petrochemical industry. As the petroleum hydrocarbon is the main source of energy in the world the use of its products cannot be abandonee even its have a short term devastating to the environment and long term effects on water, soil and human health (**Ahmed & Fakhruddin, 2018)**. Oil spills cause serious hazards to aquatic environment, human health and natural resources, for example the crude oil spill at Khor al-Zubair on 22 August 2006, which resulted from an accident when the tanker BFC2 transported 4,750 tons of Basrah crude oil, **(Al Saad *et al*.,2008)**. Oil pollution became the main problem in the Arabian Gulf region, and this pollution became clear after the 1991 Gulf War. More than 740 oil wells in Kuwait were leaked, an estimated 10.8 million barrels of crude oil to the Gulf. **(Abd El Gawad *et al*., 2008).**

Oil spill represented one of the disasters in the environment because total petroleum hydrocarbons describe as a wide variety of chemical complex compounds derived from crude oil **(Cortes *et al*., (2012)**. In areas suffering from an oil spill problem, many of invertebrates, birds, crustaceans, fish, and mammals may decrease greatly, and the plants in the area may die, and they have suffered in the long term from exposure to high concentrations of oil**.**

Essential oil materials have been used for bactericidal, virucidal, fungicidal, antiparasitical, insecticidal, medicinal and cosmetic products and in pharmaceutical, sanitary, agricultural and food industries**,** in the other hand it can caused many health and social impacts In terms of physical health, direct contact with crude oil, or indirect contact through, for example, inhalation of vapors or consumption of tainted seafood can cause deleterious health effects ranging from dizziness and nausea to certain types of cancer **(Chang *et al*.,2014)**.

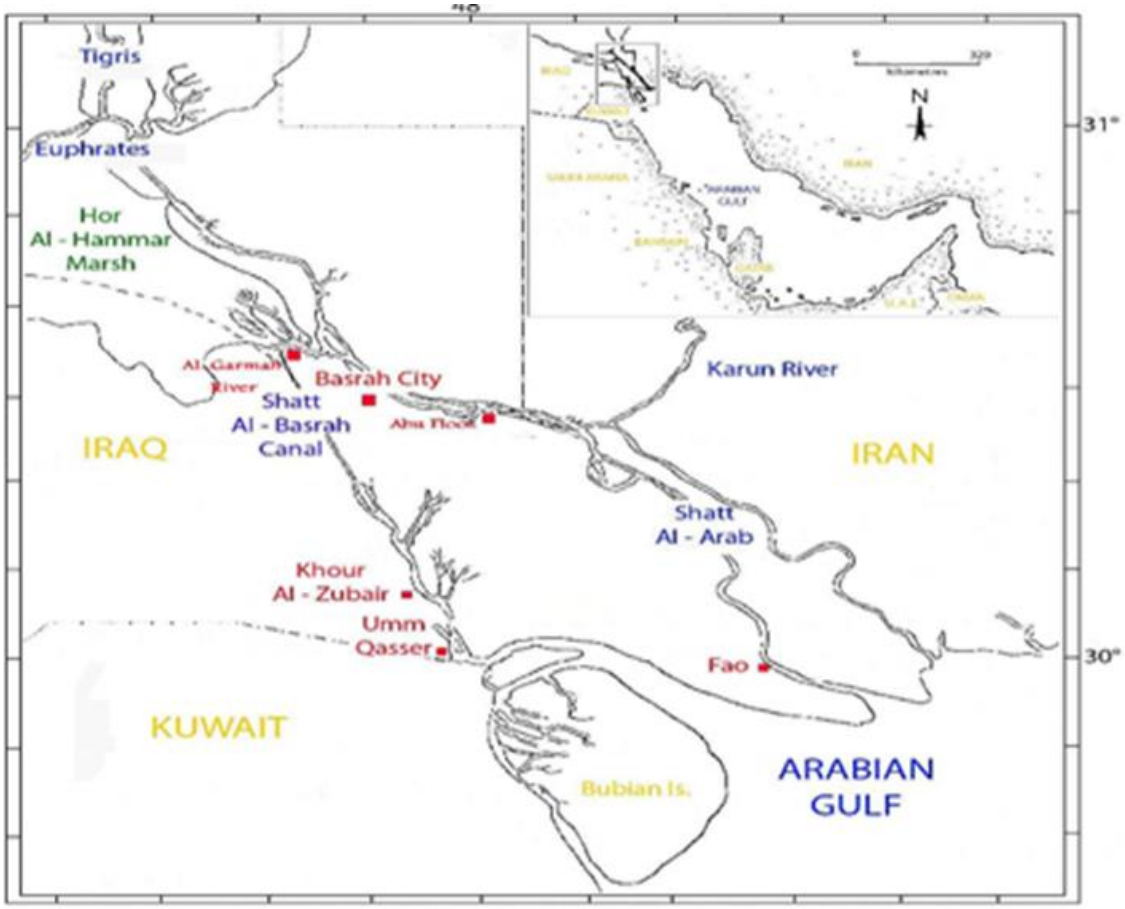
The contamination of total petroleum hydrocarbon cased many health problems, some of the compounds of total petroleum hydrocarbon are known to be carcinogenic and some essential organs of the body such as kidney, liver etc are at risk of being affected by TPH **(Alinnor *et al*., 2014)**.

The major risk currently associated with exposure to environmental petroleum hydrocarbon respiratory problems and cancer because crude oil compounds characterized as strong odor formed by aromatic plants as secondary metabolites, oil consist at least 1,000 and more than 2,000 individual substances, most of it which are poisonous, cytotoxicity, hematotoxic agent, carcinogenic for the overwhelming majority of human and animal organisms because its enter the bloodstream rapidly by breathing the vapor or mist or when you swallow.

The potential for these pollutants to affected on human health as a result of consuming seafood and aquatic products especially between the coastal residents **(Hu *et al.*, 2022)**
This study is aimed to determine the levels of the total petroleum hydrocarbon in some of the Basrah governorate water sites on another hand we can raise the aquatic environmental awareness for saving this water channels from the petroleum hydrocarbons pollution

MATERIALS AND METHODS

Six selected water channels in Southern Iraq, Basrah governorate studied to determine the concentration of total petroleum hydrocarbon these are, Al-Garmah River, Shatt Al-Arab (Cornish Street location), (Abu Floos, Khor Al-Zubair, Umm Qasr, and Al- Fao) Ports . (Figure1) show sampling stations.



Figure(1): Location map of sampling points

The samples were collected from each station, in a clean dark glass bottles 5 L capacity to prevent the photo oxidation and transferred to the oil pollution laboratory according to quality assurance standards.

For each water sample, 10mL from Carbon Tetrachloride CCl_4 was added to prevent the biodegradation. The total petroleum hydrocarbon extracted from the water samples by mixing and 2g of anhydrous sodium sulfate was added to the reduce extract to prevent any emulsion and removing excess water, according to United Nation Environmental Program procedures **(UNEP, 1993).**

Using (UVF- Shimadzu RF– 540, Spectrofluorophotometer with integrator– DR3,) for determination of the total petroleum hydrocarbons TPH in fluorescence emission intensity 360nm, and excitation intensity 310 nm.

RESULTS AND DISCUSSION

The Southern Iraqi channels was affected by many activities that caused the pollution by hydrocarbons, in present study the highest concentration of total petroleum hydrocarbon TPH was recorded as it shows in (Table1).

Table (1): The concentrations of total petroleum hydrocarbons in the 6 locations.

Area	Stations	Temperature(°C)		pH	TPH µg/L
		Air	Water		
Al-Garmah River	1	30	20	7.8	5.35
Shatt Al-Arab (Cornish Street Location)	2	37	24	7.6	6.272
Abu Floos Port	3	38	27	7.7	15.00
Khor Al-Zubair Port	4	35	25	7.9	9.03
Umm Qasr Port	5	34	24	7.4	22.10
Al-Fao Port	6	36	27	7.8	7.08

In Al Garmah River the elevated concentration of TPH have been reported lowest level 5.35 µg/L because the high population density that live in that area that discharge sewage west water to it, also the local transporting and activities of small fishing boats, due to leakage of crude oil pipe supply thermal electrical power station in Al-Hartha with crude oil also the study of **(Medeiros *et al.*, 2005)** show that the anthropogenic inputs of hydrocarbon is caused by sewage outfalls.

The present study also agree with the study of **(Inyang *et al.* ,2018)** that show the main reason for this kind of pollution via oil industries operating, commercial activities such as fishing with speed boats and other anthropogenic activities

In Shatt Al-Arab (Cornish Street location) 6.272 µg/L, because this site was located the main discharge of Basrah city wastes result from the anthropogenic sources from the high population density, also from the refineries industry effluents, the effect of (Nihran Omar) oil field, paper mill industry, hospital clinical wastes, the activities of small boats that used for local transporting and fishing which spilled oil from machine and fuel tank (**Al-Saad, 1995)**. This also agree with the study of **Aldoghachi (2022)**

In Abu Floos Port the concentration of TPH was 15.00 µg/L it's also consider one of the main oil transportation ports and also the effects of the agricultural and irrigation operations and the anthropogenic activities associated with it in Abu Al Khasib area **(Hantoush, 2006)**

Khor Al-Zubair Port the concentration of TPH recorded 9.03 µg/L this because oil transporting, that makes the shipping activities (dry docking) the main sources for oil pollution and the, effect of industrial products associated with the refining operations in Al-Sha`aba refinery station **(Guven *et al.*, 1997)**

In Umm Qasr Port, the concentration of total petroleum hydrocarbon TPH was high 22.10 µg/L because it's a navigation port affected by Khor Abdalla, in Gulf region that is consider one of the widespread oil pollution region **(Abd El Gawad *et al.*, 2008)**.

The concentration of TPH was found in Al-Fao Port 7.08 µg/L because the location consider one of the navigation port in Iraq using for oil transport, shipping activities and

fishing boats, as the study of **Medeiros *et al*., (2005)** that show the level of TPH in the second major tourism port in Brazil.

The present study similar to the study of **Ibrahim (2004)** that show the increasing in TPH concentrations in most of the stations studied like Abu Floos Port and Umm Qasr Port, and study of **Al-Saadon(2002)** indicate that the oil pollution of Khor Al Zubair Port originated from different sources, the most significant of which are sewage discharge, industrial wastes. , and the maine sources of oil pollution in Umm Qasr Port were found near refineries, petroleum loading terminals and port areas because of the commercial activities**. (Olufemi *et al*., 2012)**

This study range of recorded total petroleum hydrocarbon also agree with the study of **Al-Imarah *et al*., (2017)** Comparing the concentrations of TPH from this study with other site of the world, and with the same site from other studies, the present study shows somehow higher and lower concentrations in most of the studied areas (Table 2).

Table (2): Comparatives of TPH levels in water from other locations.

Location	TPH concentration (µg/L)	References
Izmit Bay(Turkey)	32.01-986.53	Guven *et al*. (1997)
Umm Qasr	10.347	Al-Saadon (2002)
Abu Floos Port	12.83	Ibrahim (2004)
Shatt Al-Arab	2.2-50.2	Hantoush (2006)
Al-Fao Port	24.791	Hantoush (2006)
Khor Al- Zubair	36.8-478.2	Al-Saad *et al*. (2008)
Colombian waters	20.0	Cortes *et al.(*2012)
Buffalo River	7.65 - 477	Adeniji *et al*. (2017)
Al-Gharraf River	37.4- 56.3	Ali (2019)
Garmat Ali River	0.37- 5.36	Aldoghachi &Abdullah (2021)
Tigris River	2.85 – 5.22	Lazim & Al-Naqeeb (2021)
Al-Garmah River	5.35	The Present Study
Shatt Al-Arab	6.272	The Present Study
Abu Floos Port	15.00	The Present Study
Khor Al- Zubair Port	9.032	The Present Study
Umm Qasr Port	22.10	The Present Study
Al-Fao Port	7.082	The Present Study

CONCLUSION

This kind of studies supporting the environmental awareness campaigns for protecting the water sites from the most danger source of pollution the crude oil and Total Petroleum Hydrocarbon pollutants. Also because of their effects on fish wealth and fishing, and direct

awareness to fishermen of the dangers of these polluting materials on fish and the health of consumers of these contaminated fish, so we need another studies and more researches in this field and for another areas

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