

## DETERMINATION OF HYDROCARBON CONCENTRATIONS IN SEDIMENT SAMPLES OF AL-DALMAJ MARSH, AL-QADISIYA – WASIT GOVERNORATES / IRAQ

FARIS N. M. AL-HEMIDAWI<sup>1</sup>, MAHA K.AL-MISHREY<sup>2</sup>, HAMID T. AL-SAAD\*<sup>3</sup>  
AND ABBAS H. MOHAMMED<sup>4</sup>

<sup>1</sup>College of Science, University of Kufa, Iraq

<sup>2</sup>College of Science, Department of Biology, University of Basrah, Basrah, Iraq

<sup>3</sup>College of Marine Sciences, University of Basrah, Iraq

<sup>4</sup>College of Science, Department of Geology, University of Basrah, Iraq

(Received 19 October, 2021; Accepted 15 December, 2021)

### ABSTRACT

Ten surficial sediment samples were collected from 10 locations in Al-Dalmaj Marsh area, which is located within Al-Qadisiya- Wasit Governorates. The sediment samples were analyzed to determine the total concentration of hydrocarbons by using a spectrofluorometer. The average of hydrocarbon concentrations in the study area was ranged between (2.68 µg/g dry weight) at station (1) to (12.99 µg/g dry weight) at station (6). The results show that the spatial variations in hydrocarbon levels among stations, where the high concentrations in station (6) is due to reception of large quantities of organic, chemical dissolved matters in water from domestic and industrial wastes such as agricultural effluents with other matters, while the low concentration at first station is due to its being far away from pollution sources. This study it's a first of its kind in the region and could serves a baseline study for coming study in the futures.

**KEY WORDS:** Hydrocarbons, Sediment, Al-Dalmaj marsh, Al-Qadisiya, Wasit, Iraq.

### INTRODUCTION

The Iraqi marshes, occupy an area of about (15.000 Km) of wetlands. The marshes are formed at swampy lands of shallow water, and they are considered as the most widespread ecosystem in the Middle East (APHA, 2003). Al-Dalmaj Marsh is one of the wetlands, that is located to the west of Al-Qadisiya Governorate, and to the east of Wasit Governorate. This area is recognized by the availability of animal wealth of immigrant birds from different regions many kinds of common fish (Wali, *et al.*, 2015). Pollution in the beside waters of Iraqi rivers is one of the important problems that must be addressed and controlled, so that it does not become as a complicated problem in the future, as happened in some countries that have enjoyed a large industrial and population evolution (Al-Sayegh, *et al.*, 2002). Hydrocarbon pollution causes a

very dangerous problem, in the ecosystem whether it comes from petroleum, pesticides, and other organic matters, as hydrocarbons are harmful to all types of life (Al-Ali, *et al.*, 2016). Hydrocarbon pollution was widespread at the present time because the recent society uses a lot of petroleum products such as fuel oil, gasoline and kerosene (Frena, *et al.*, 2017). These compounds are great environmental interest as they are potentially carcinogenic or turn carcinogenic by microbial metabolism. That is why it is included in the US Environmental Protection Agency's Priority Pollution list (Readman, *et al.*, 2002). In an ecosystem, hydrocarbons tend to bind to organic matter, because of their reluctance to water, and thus are deposited in sediments, so sediments are known as excellent sinks for these and other organic matter, and their pollution leads to significant health risks to living organisms in the aquatic environment.

(Ali, *et al.*, 2015). Hydrocarbons may enter to aquatic system from industrial effluents, sewage, fuel and diesel exhausts, and other vehicles into water bodies (Al-Hejuje, 2014). Thus, the aqueous sediments not only give the historical record of the sedimentary environment, but reveal the nature of the components of the aquatic environment, and the possible source of chemicals in the water, (Hassan, *et al.*, 2000). Therefore, the study of hydrocarbon pollution is of great importance in understanding the successive differences in the aquatic environment (Farid, *et al.*, 2016).

### The Study Area

Al-Dalmaj marsh is located in the Southern part of Mesopotamian plain, bordered by Al-Qadisiya, Wasit and Thi- Qar Governorates, and is bordered easterly by Shatt Al-Gharraf and to the west by Euphrates river represented by Shatt Al-Diwaniya (44° 56' 55"- 45° 44' 52") North, and (32° 38' 00"- 31° 49' 00") East. It administratively located within Al-Qadisiya and Wasit Governorates. It characterized by the presence of Habitats between arid areas, deserts and Sand dunes, also, the presence of large lake with of more than (2.5 m), and dense swamps with shallow waters less than (1m) (Al-Musaw, 2020).

### MATERIALS AND METHODS

Sediment samples were collected from 10 selected stations at Al-Dalmaj Marsh, Fig.(1). Surficial sediment samples were collected by means of a Van veen grab sampler hydrocarbon analysis was performed on the •63  $\mu\text{m}$  fraction of the sediment, which had been separated by sieving after drying

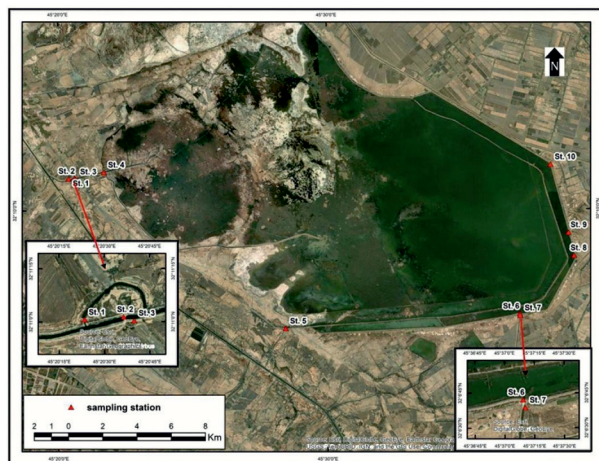


Fig. 1. Location of samples

and grinding. The extraction method of petroleum hydrocarbons was based upon Wade, *et al.*, 1988, in which a total of (50g) of dried sediment was Soxhlet – extracted with methylene chloride for 24 h. and concentrated by using a rotary evaporator. The extracts were then fractionated by using a column chromatograph containing alumina- silica gel (80-100 mesh), followed by, the extracts were in an order eluted from the column with (50 ml) of hexane for aliphatic fraction and with (200 ml) of 1:1 (v/v) n-hexane: dichloromethane for aromatic fraction. The extracts were concentrated for analysis by Spectrofluorometry.

### RESULTS AND DISCUSSION

Distribution and concentration of hydrocarbons in the sediment are good indicators of pollution in the study area. Generally, hydrocarbons are characterized by their hydrophobic nature, so they tend in the water system to bind quickly with suspended matters and then settled in to sediments, therefore, the sediments represent an important reservoir for these compounds. Hydrocarbons in sediments are due to biogenic and anthropogenic sources (Al-Nakeeb, 2015). The concentrations of hydrocarbons in the sediment samples of all stations are shown in the Table (1), Fig. (2).

The hydrocarbon pollution in the region was influenced by industrial, fish and agricultural activities, the existence of transport boats and small fishing. The boats are used by a mixture of gasoline and lubricants as fuel, leaving waste launched in the water system. There are wide agricultural areas used in which the pesticides and chemicals in agriculture, and these matters are falling as dissolved solutions,

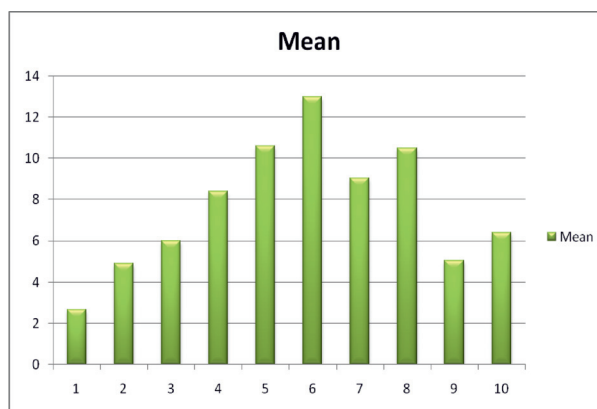


Fig. 2. Mean Concentrations of total petroleum hydrocarbons ( $\mu\text{g/g}$  dry weight) of the sediment samples from Al-Dalmaj marsh

**Table 1.** Range and mean concentrations ( $\mu\text{g/g}$  dry weight) and Standard Deviations ( $\pm\text{SD}$ ), and Standard Error of Mean ( $\pm\text{SE}$ ) of total petroleum hydrocarbons of the sediment samples from Al-Dalmaj marsh

Station No.	Concentration ( $\mu\text{g} / \text{g}$ )	Range	Mean	$\pm\text{SD}$	$\text{SE}\pm$
1	2.31, 2.61, 3.12	2.32- 3.12	2.68	0.409	0.236
2	4.44, 5.41, 4.93	4.44- 5.41	4.92	0.485	0.280
3	5.63, 6.25, 6.12	5.63- 6.25	6.00	0.326	0.188
4	7.96, 8.31, 8.92	7.96- 8.92	8.39	0.485	0.280
5	10.51, 10.71, 10.63	10.51- 10.71	10.61	0.100	0.058
6	12.63, 12.61, 13.75	12.61- 13.75	12.99	0.652	0.376
7	8.65, 9.46, 8.98	8.65- 8.98	9.03	0.407	0.235
8	9.21, 9.65, 12.63	9.21- 12.63	10.49	1.860	1.074
9	5.26, 5.41, 4.49	4.49- 5.41	5.05	0.493	0.284
10	6.32, 6.37, 6.56	6.32- 6.56	6.41	0.126	0.073

which increases the risk of hydrocarbon. In the present study, the lowest concentrations of hydrocarbons were observed at station (1) was (2.68  $\mu\text{g/g}$  dry weight), due to the fact, that this station is far from sources of human and industrial pollution, and also from the feeding area that receives large quantities of water from Al-masub Al-aam project, which organic and chemical dissolved matters in water. One of the factors on sediment hydrocarbons are the of biodegradation, which overlaps with other factors such as temperature, photo-oxidation and sediment texture (Imarah, *et al.*, 2010). In the study area large plant and animal content, and long hours of sunshine, which increase the biodegradation processes and the result is low concentration of hydrocarbon, while the highest concentrations of hydrocarbons were observed in station (6) and it was (12.99  $\mu\text{g/g}$  dry weight), this is due to the fact that it is located in the drainage area of Al-Dalmaj Marsh to Al-Musab Al-aam project at a suitable height for the water in the lake, and here this station receives large quantities of water that coming from multiple drainage branches streams, as well as the resulting use wastes of fishing boats, which are

containing organic and chemical matters, and as a result these materials are concentrated in sediments of this station.

If we compare our data with others in the region it lies within these data (Tehrani, *et al.*, 2014), as shown in Table (2).

## REFERENCES

- Abdoul-Aziz, H.F., Al-Hejuje, M.M. and Al-Saad, H.T. 2020. Aliphatic (n-alkanes) hydrocarbon compounds in core sediments at Al-Chibayish Marsh in Thi-Qar province, Southern Iraq. *Mar. Bull.* 15(1): 71-82.
- Al-Ali, B.S., Al-Aradi, H.J., Al-Khion, D. and Al-Saad H. T. 2016. Petroleum hydrocarbons in water, Soil and tomato plant (*Lycopersicon esculentum L.*) at Basrah city, Iraq. *J. Biol., Agriculture and Healthcare.* 6(12): 155-64.
- Al-Hejuje, M. M. 2014. *Application of water quality and population indices to evaluate the water and sediments states in the middle part of Shatt Al-Arab River.* Ph.D. Thesis, Biology Department, college of science, University of Basrah, 239p.
- Al-Hassan, S.I., Al-Saad, H. T. and Al-Rubaiay, D.J. 2013. An Analytical study on petroleum Hydrocarbons

**Table 2.** Comparison of concentrations of hydrocarbons in sediment samples of Al-Dalmaj marsh with other sites

Location	Mean Conc. ( $\mu\text{g/g}$ )	References
Al- Chibayish Marsh	4.05 – 128.20	Hadeel, et.al., 2020
Tigris River	4.05- 128.28	Al- Nakeeb, 2015
Marshes of Southern Iraq	0.030- 0.96	Al- Saad, et.al., 2009
Marshes sediments, Iraq	0.59 – 2.07	Al-Timari, et.al., 1989
Hor Al-Azim	0.252- 10.363	Al-Taie, et.al., 2015
Urban Environment	0.56- 41.58	Al-Hassan, et.al., 2013
Shatt Al-Arab estuary, NW Arabian Gulf	2.46 – 38.33	Al-Saad, 1995
Shatt Al-Arab river	28.821 – 275.433	Hantoush, 2006
Iraqi Coast regions	2.39 – 30.88	Al-Khion, 2012
Al-Dalmaj marsh	2.68- 12.99	Present study

The study represent available data and could be used as a baseline study for coming study in the future.

- Contamination in the Urban Environment of Basrah city, Southern Iraq. *J. Petro. Res.*
- Ali, S.A.M., Payus, C. and Ali, M. M. 2015. Surface sediment analysis on petroleum hydrocarbon and total organic carbon from coastal area of Paper to Tuaran, Sabah. *Malays. J. Anal. Sci.* 19: 318-324.
- Al-Imarah, F.J.M., Ali, S.A. and Ali, A.A. 2010. Temporal and Special Variations of petroleum hydrocarbons in water and sediments from North parts of Shatt Al-Arab River, Iraq. *Mesopot. J. Mar. Sci.* 25(1): 65- 74.
- Al-Khion, D.D. 2012. *Sources and distribution of Polycyclic Aromatic Hydrocarbons compounds in water, sediments and some biota of Iraqi coast regions*, Ph.D. Thesis, College of Agriculture, University of Basrah, 171 p.p. (In Arabic).
- Al-Nakeeb, N. A.A. 2015. Estimation of hydrocarbon compounds concentrations in water and sediments in Tigris river near Amara City Center in Missan province /Iraq. *Int. J. Adv. Res. Biol. Sci.* 2(5): P.P.165-168.
- Al-Musaw, L.E. 2020. *Effect of seasonal variations on water quality, Epipelagic and Epiphytic algae on some plants of Al-Dalmaj marsh / Iraq*. Ph.D. Department of Biology, College of Education, University of Al-Qadisiya, p.p 27.
- Al-Saad, H.T. 1995. *Distribution and sources of hydrocarbons in Shatt Al-Arab Estuary and North West Region of the Arabian Gulf*. Ph.D. Thesis, Basrah University, 280pp.
- Al-Saad, T.H., Al-Taein, S.M., Al-Hello, M.A. 2009. Hydrocarbons and trace elements in the waters and sediments of the marshland of Southern Iraq. *Mesopot. J. Mar. Sci.* 24(2): 126-139.
- Al-Sayegh, A. Y. and Taka, A. S. 2002. *Environmental Pollution*, Printing and Publication house, Mousel University, P. 248.
- Al-Taie, E.O., Al-Bedhany, A.H., Al-Saad, H.T. 2015. Evaluation of hydrocarbons pollution in sediments the Hor Al-Azim / Missan Governorate / South of Iraq. *Seventh National Conference of the Environment and Natural Resources*.
- Al-Timari, A.A. and Al-Saad, H.T. 1989. Distribution of Polycyclic Aromatic Hydrocarbons (PAH's) in marsh sediments, Iraq. *Bull. Environ. Contam. Toxicol.* 43: 864-869.
- APHA, American Public Health Association 2003. *Standard method for the examination of water and wastewater* 20ed Washington, DC.USA.
- Farid, W.A., Al- Salman, A.N., Ali, W.A., Al-Saad, H.T., Mahdi, S. and Al- Hello, A.A. 2016. Polycyclic Aromatic Hydrocarbons (PAHs) in the surface sediments of Shatt Al-Arab River, Basrah city, Southern Iraq, *J. Nat. Sci. Res.* 6(8): 46-55.
- Frena, M., Bataglioni, G. A., Sandini, S. S., Kuroshin, K. N., Eberlin, M. N. and Madureira, L.A.S. 2017. Distribution and sources of aliphatic and polycyclic aromatic hydrocarbons in surface sediments of Itajaí- Acu Estuarine system in Brazil. *J. Braz. Chem. Soc.* 28(4): 603-614.
- Hantoush, A. A. 2006. A study of Oil pollution status in water and sediments of Shatt Al-Arab river, South of Iraq. Ph.D. Thesis, Barah University, 142 p.
- Wade, T. L., Atlas, E. L., Drooks, J. M., Kennicuttii, M.C., Fox, R.C. Sericano, J.L., Garcia- Romero, B. and Defreitas, D.A. 1988. NOAA Gulf of Mexico Status and Trend Program. Trace organic contaminant distribution in sediments and oysters. *Estuaries*, 11: 171-179.
- Wali, H.A. and Karam, F. F. 2015. Assessment of physical- chemical parameters of water from Al-Dalmaj marsh, Al-Diwaniya province, Iraq. *Int. J. Adv. Res.* 3: 165-173.
- Hassan, M. H. and Dou Aboul, A.A. Z. 2000. Concentration of petroleum hydrocarbons in fish, mussels and sediment samples from the Red Sea-coast of Yemen. *Bull. Nat. Inst. Oceanog. And Fish. A.R.E.* 26: 283-296.
- Readman, J. W., Fillmann, G., Tolosa, I., Bartocci, J., Villeneuve, J.P., Cattini, C. and Mee, I.D. 2002. Petroleum and PAH contamination of the Black Sea Mar. *Pollut. Bull.* 44(1): 48-62.
- Tehrani, G.M., Rosli, H., Sulaiman, A.H., Sany, B.T., Salleh, A., Owfi, F., Savari, A., Iazani, R.K. and Tahrani, Z.M. 2014. Petroleum hydrocarbon assessment in the wastewaters of petrochemical special economic zone and sediment benchmark calculation of the coastal area- Northwest of the Persian Gulf. *Ira. J. Fish. Sci.* 13(1): 119-134.