MARSH BULLETIN 14(2) September (2019) 121–132

MARSH BULLETIN

Aliphatic (n- alkanes) hydrocarbon compounds in core sediments at Al- Chibayish Marsh in Thi-Qar province, southern Iraq

*Hadeel F. Abdoul-Aziz, *Makia M. Al-Hejuje, and **Hamid T. AL-Saad
*Department of Ecology-College of Science- University of Basrah, Iraq.
**College of Marine Science- University of Basrah, Iraq

Abstract

Samples of core sediments from five stations were collected at Al- Chibayish marsh in Thi-Qar province, Southern Iraq, at a depth of 50 cm. These samples were taken one time in August 2018 to determine the concentration of aliphatic hydrocarbon compounds using capillary Gas chromatographic. Also, calculate some of the indices to know the origin and source of aliphatic (n-alkanes) hydrocarbon compounds. The highest values of total aliphatic compounds (n-alkanes) were recorded in the first station (128.20) µg/g dry weight on the depth (35-40) cm, while the lowest values found in the fifth station (4.05) µg/g dry weight on the depth (35-40) cm and the carbon chain length of n-alkanes in sediments samples were recorded from C15-C30. Several indices were calculated to determine the sources of n-alkanes compounds in the station, such as CPI index and Pri/Phy values. The source of n-alkanes hydrocarbons was biogenic and anthropogenic. In contrast, the ratio (pri/C17) (Phy /C18) indicates different bacterial activity in the five study area's depth. The present study aims to evaluate the sediments' pollution by determining aliphatic hydrocarbon compounds in core sediments at Al- Chibayish marsh and know the origin and distribution of hydrocarbons in sediment samples to depths of 50 cm.

Keywords: Aliphatic hydrocarbon, Indices, sediment core, Al- Chibayish marsh

Introduction

The problem of environmental pollution has become a threat to human life and living organisms. This problem has emerged because of industrial progress and the overpopulation problem. Pollution is one of the major global problems that resulted from poor planning and harmful use of natural resources. These resources have resulted in a significant deterioration in their quality, while the need for freshwater resources is increasing, and the decrease in these resources due to high temperatures and droughts that have swept the globe (Alshmery, 2013).

Studying the pollution of sediments in the marshes is of great importance due to its many effects on the water environment. Sediments are a store for all pollutants according to their whether anthropogenic or biogenic (Aboul-Kassim and Simoneit, 1995).

sources. Therefore, sediments are used to assess environmental pollution in water systems (Al-Hejuje, 2014). The study of the core samples is of great environmental and geochemical importance. It is possible to identify pollution sources and give a clear idea of pollution for the past years. It represents a historical record of pollutants (Al–Mahana, 2015).

Normal alkanes come from various sources that may be life or the result of geochemical and decomposition processes. Some of these oil compounds are diving in the water column to settle to the bottom and adsorb on sediment surfaces. There is great importance for studying the normal alkanes, through which the sources of oil pollution are identified

To determine the quantity and quality of normal alkanes in the study areas' sediment

core samples, the gas chromatography (GC) technique was used.

Materials and Methods:

Core sediments samples were collected from five stations in Al- Chibayish marsh (Fig. 1). Core sediments samples were taken to a depth of 50 cm (Fig. 2) using a hollow cylindrical tube, marked samples by writing the name of the station, the date of collection of the sample and marking the surface area and depth, a number of the repeater and then closed the upper and lower openings with plastic bags to save the sample and then transferred the samples cooled to the laboratory. Samples were cut into parts of each 5cm section. Each depth was separated from the other and distributed on aluminum foil until it dried at air temperature. The samples were grinded using a mechanical mill and sifted with a metal sieve with a diameter of (63 µm)

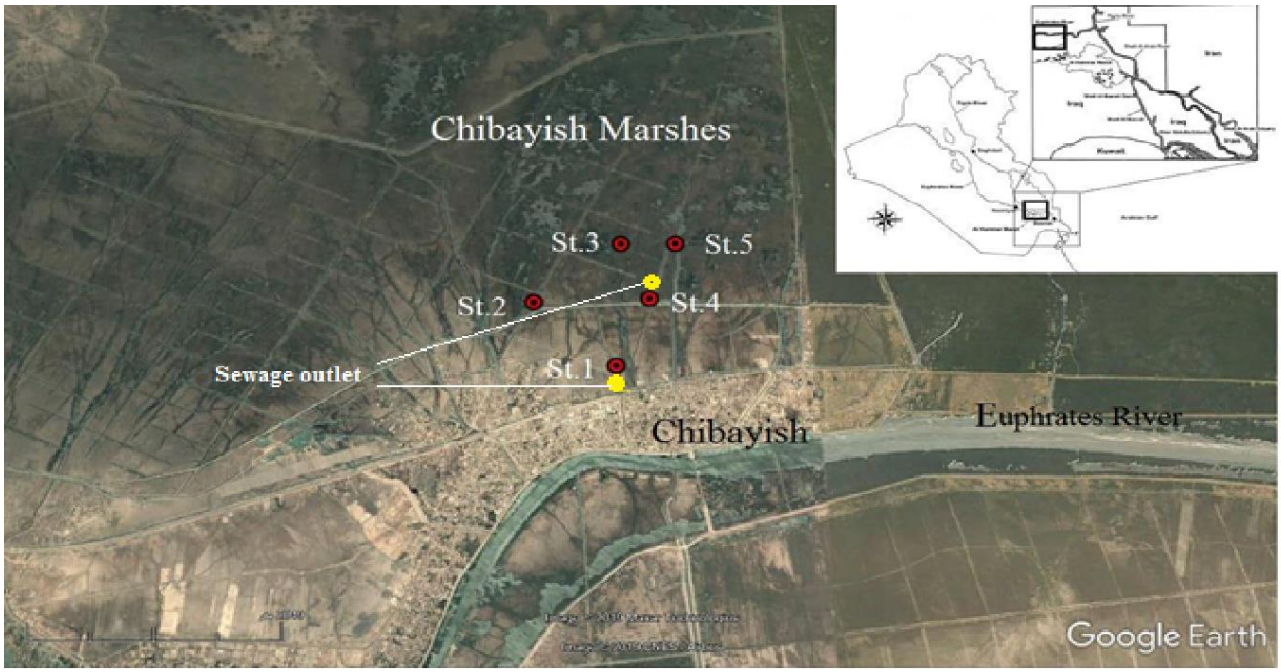

Fig (1) the study stations

Fig (2) : the core sample of sediment

Twenty grams of sieved sediments (for sediment samples) were placed in cellulose thimble and soxhlet extracted using intermittent soxhlet extraction (Goutex and Saliot, 1980) with mixed solvents (120 ml) methanol: benzene (1:1 v/v) for 24-36 hours at

temperature doesn't exceed 40°C. At the end of this period, the combined extracts were saponification for 2 hours by adding (15ml) 4M MeOH (KOH) at the same temperature, with hexane (hydrocarbons) was taking and passed through a chromatographic column provided with glass wool at the thin bottom layer from silica gel and a layer of alumina top-placed layer from anhydrous sodium sulfate.25 ml of n-hexane was added to the column to collect the aliphatic fraction.

Standards of aliphatic compounds were used to inject in gas chromatography to determine the qualities and quantities of aliphatic compounds in sediment samples. Column (model Agilent 125-103KHP-5). Siloxan with dimensions (30 m.*320µm*0.25µm) was used for aliphatic separation. Helium was used as a carrier gas in Gas Chromatography with a linear velocity of 3ml. /min. with a flame ionization detector (FID). The operating temperatures were 280°C and 300°C, for the detector and injector, respectively. The column's temperature was held at 35°C for 10 minutes as the initial temperature, increased then 5°C/minute to 300°C for 17 minutes.

Results and Discussion

The carbon chain length of n-alkanes in the first station for the sediment samples were recorded from C8- C30. The highest concentrations of total n-alkanes (128.20 µg/g dry weight) was recorded at the depth (35-40) cm, while the lowest concentrations (9.82µg/g dry weight) was recorded at the depth (30-35) cm. The index of carbon preference (CPI) was calculated and ranged between (2.59) at the depth (25-30) cm and (0.63) at the depth (10-15) cm, indicating that the source of the hydrocarbons is biogenic and anthropogenic (Table 1). Also, the ratio of Pri / Phy values ranged from (5.10) at depth (30 - 35) cm and (0.68) at the depth (5-10) cm, and Pri / C17 values ranged from (3.26) at the depth (30 -35) cm and (0.59) at the depth (35 - 40) cm while its value Phy / C18 ranged between (0.89) at the depth (35-40) cm and (0.23) at the depth (30 -35) cm, these values confirm that hydrocarbons in the station is origin biogenic and anthropogenic. As for the alkanes of anthropogenic origin, it is natural to be present in the station located near to a sewage plant and residential areas, where it discharges quantities of agricultural and domestic waste through the sewage water that loaded with fertilizers and nutrients, which help to increase the growth of plants, algae, and phytoplankton which is the origin of carbon compounds of individual numbers and this is one of the reasons for the presence of alkanes of biogenic origin. The variation in the values of (Pri / C17) (Phy / C18) in most depths is caused by varying conditions affecting bacterial activity such as sediment temperature, which is directly proportional to bacterial activity (Coulon *et al.*, 2007) and the number of nutrients and Oxygen that control the density and presence of some types of bacteria such as (oil-crushed bacteria and other species bacteria)

The carbon chain length of n-alkanes in the second station of sediment samples was recorded from C13- C30 Table (2). The highest concentrations of total n-alkanes (18.86µg/g dry weight) was recorded at the depth (20-25) cm, while the lowest concentrations (10.44µg/g dry weight) was recorded at the depth (10-15) cm. The index of carbon preference (CPI) was ranged between (0.83) at the depth (20-25) cm and (0.59) at the depth (30-35) cm, indicating that the hydrocarbons are the source of human and also the ratio of Pri / Phy values ranged from (2.01) at depth (20 -25) cm and (1.21) at the depth (10-15) cm indicating that the source of the hydrocarbon was biological and Pri / C17 values ranged from (0.75) at the depth (30 -35) cm and (0.59) at the depth (20 -25) cm while its value Phy / C18 ranged between (0.49) at the depth (30-35) cm and (0.37) at the depth (20 -25) cm indicating that the source of the hydrocarbon was human activities.

Table (1): Concentration of n-alkanes in core samples sediment of first station (µg/g dry weight)

Number of carbon atoms	Depth(cm)									
	0-5	**5-10**	**10-15**	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**	**40-45**	**45-50**
C_8	___	___	___	0.14	___	0.79	0.19	___	___	___
C_9	___	___	___	0.62	___	___	0.81	___	___	___
C_{10}	___	___	___	___	___	___	0.99	___	___	___
C_{11}	0.16	___	___	___	___	___	___	0.74	___	___
C_{12}	0.41	___	___	___	___	___	___	1.54	___	___
C_{13}	0.35	0.33	0.93	0.31	___	___	0.10	1.60	___	___
C_{14}	1.43	1.04	2.02	1.84	___	___		3.98	___	___
C_{15}	1.43	0.76	1.80	2.41	1.23	0.99	0.60	5.23	1.22	___
C_{16}	2.76	1.05	1.62	3.18	2.57	2.30	0.39	8.74	3.69	___
C_{17}	2.49	0.93	1.52	2.89	1.91	1.78	0.30	15.74	2.92	___
C_{18}	3.40	1.41	1.99	3.28	2.06	1.82	0.83	8.43	2.96	___
C_{19}	2.42	0.97	1.72	2.63	1.07	19.40	0.54	8.63	1.67	___
C_{20}	3.86	1.28	2.48	3.50	1.60	1.54	0.53	9.35	2.22	___
C_{21}	3.79	1.15	2.54	3.46	2.03	1.71	0.90	8.41	0.94	___
C_{22}	8.74	2.23	3.17	7.49	1.56	1.27	0.46	8.23	2.86	___
C_{23}	6.54	2.49	3.58	5.36	1.14	0.98	0.11	11.47	0.34	___
C_{24}	8.47	0.78	3.30	7.38	1.08	0.76	0.35	4.84	1.00	___
C_{25}	5.53	0.42	4.28	8.60	0.93	0.56	0.27	11.19	0.49	___
C_{26}	6.19	0.54	9.78	6.15	1.41	0.87	0.40	15.82	0.15	___
C_{27}	5.16	0.57	1.34	5.48	1.50	1.39	0.37	2.82	0.96	___
C_{28}	5.41	1.31	3.26	7.33	1.80	1.10	0.63	0.78	0.92	___
C_{29}	1.44	0.39	0.87	2.37	1.20	0.72	0.39	0.23	0.47	___
C_{30}	3.58	0.59	1.75	3.23	1.45	0.96	0.65	0.43	0.38	___
Total	**73.55**	**18.24**	**47.95**	**77.66**	**24.54**	**38.95**	**9.82**	**128.20**	**23.19**	___
Pristen	2.31	0.77	1.17	2.33	1.32	1.29	0.98	9.29	2.49	___
Phyten	2.19	1.13	1.32	2.05	1.06	1.07	0.19	7.49	1.52	___
pri/phy	1.05	0.68	0.89	1.14	1.25	1.21	5.10	1.24	1.64	___
odd	29.32	8.01	18.58	34.13	11.02	27.53	4.39	66.04	9.01	___
even	44.23	10.22	29.37	43.53	13.52	10.63	5.43	62.15	14.19	___
CPI	0.66	0.78	0.63	0.78	0.81	2.59	0.81	1.06	0.64	___
Pri/C_{17}	0.93	0.82	0.77	0.81	0.69	0.73	3.26	0.59	0.86	___
Phy/C_{18}	0.65	0.80	0.66	0.63	0.51	0.59	0.23	0.89	0.51	___

Table (2): Concentration of n-alkanes in core samples sediment of second station (µg/g dry weight)

Number of carbon atoms	Depth(cm)									
	0-5	**5-10**	**10-15**	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**	**40-45**	**45-50**
C_{13}	___	___	___	___	___	___	0.20	___	___	___
C_{14}	___	___	___	___	___	___	___	___	___	___
C_{15}	___	___	0.19	0.35	2.07	0.53	0.49	___	___	___
C_{16}	2.42	1.68	0.91	1.45	4.50	1.96	2.03	___	___	___
C_{17}	2.54	1.65	1.44	1.72	3.07	2.30	1.86	___	___	___
C_{18}	2.74	1.83	1.73	1.73	2.46	2.31	2.14	___	___	___
C_{19}	1.10	0.90	0.81	1.47	1.47	1.20	1.29	___	___	___
C_{20}	1.57	1.37	1.19	1.11	1.20	1.40	1.69	___	___	___
C_{21}	0.86	0.88	0.78	0.66	0.77	1.09	1.05	___	___	___
C_{22}	0.96	1.03	0.73	0.70	0.71	1.27	3.45	___	___	___
C_{23}	0.35	0.44	0.30	0.23	0.31	0.78	0.70	___	___	___
C_{24}	0.65	0.53	0.52	0.42	0.51	0.63	0.48	___	___	___
C_{25}	0.48	0.39	0.40	0.60	0.44	0.72	0.30	___	___	___
C_{26}	0.61	0.70	0.54	0.44	0.45	0.58	0.25	___	___	___
C_{27}	0.44	0.38	0.39	0.39	0.44	0.98	0.40	___	___	___
C_{28}	0.45	___	0.49	0.68	0.45	1.01	0.43	___	___	___
C_{29}	0.32	___	___	0.30	___	0.35	___	___	___	___
C_{30}	___	___	___	2.88	___	0.94	0.18	___	___	___
Total	**15.50**	**11.75**	**10.44**	**15.11**	**18.86**	**18.04**	**16.93**	**___**	**___**	**___**
Pristen	1.53	1.13	0.89	1.12	1.82	1.44	1.39	___	___	___
Phyten	1.04	0.82	0.73	0.79	0.91	1.04	1.04	___	___	___
pri/phy	1.47	1.38	1.21	1.43	2.01	1.39	1.34	___	___	___
odd	6.10	4.63	4.33	5.71	8.58	7.96	6.29	___	___	___
even	9.41	7.12	6.12	9.40	10.28	10.08	10.64	___	___	___
CPI	0.65	0.65	0.71	0.61	0.83	0.79	0.59	___	___	___
Pri/C_{17}	0.60	0.68	0.62	0.65	0.59	0.62	0.75	___	___	___
Phy/C_{18}	0.38	0.45	0.42	0.46	0.37	0.45	0.49	___	___	___

The carbon chain length of n-alkanes in the third station of sediment samples was recorded from C8, C14- C30 Table (3). The highest concentrations of total n-alkanes (14.05µg/g dry weight) were recorded at the depth (0-5) cm, while the lowest concentrations (5.52 µg/g dry weight) were recorded at the depth (40-45) cm. The index of carbon preference (CPI) ranged between (0.79) at the depth (20-25) cm and (0.62) at the depth (25-30) cm, indicated that the source of hydrocarbons is human and also the ratio of Pri / Phy values ranged from (2.02) at depth (15 -20) cm and (0.57) at the depth (45-50) cm indicating that the source of the hydrocarbon is biological and human and Pri / C17 values ranged from (1.00) at the depth (45 -50) cm and (0.63) at the depth (15 - 20) cm while its value Phy / C18 ranged between (0.91) at the depth (45-50) cm and (0.30) at the depth (35 -40) cm indicating that

the source of hydrocarbons is biological and human. This is because the station is inhabited by several animal breeders, which discharges quantities of agricultural and domestic waste and the movement of boats, which contributes to the pollution of this area and the presence of bacterial activity.

.

Table (3): Concentration of n-alkanes in core samples sediment of third station (µg/g dry weight)

Number of carbon atoms	Depth(cm)									
	0-5	**5-10**	**10-15**	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**	**40-45**	**45-50**
C_8	____	___	___	___	0.66	___	___	___	___	___
C_9	____	___	___	___	___	___	___	___	___	___
C_{10}	___	___	___	___	___	___	___	___	___	___
C_{11}	___	___	___	___	___	___	___	___	___	___
C_{12}	___	___	___	___	___	___	___	___	___	___
C_{13}	___	___	___	___	___	___	___	___	___	___
C_{14}	___	___	0.78	0.16	0.22	___	___	___	___	___
C_{15}	0.69	0.68	0.63	0.81	0.89	0.10	___	0.14	___	___
C_{16}	1.30	2.33	2.33	2.38	2.15	0.70	2.09	0.63	___	0.99
C_{17}	1.85	2.09	2.01	1.81	1.76	0.64	1.89	0.44	___	0.73
C_{18}	2.41	2.26	1.77	1.39	1.44	1.15	1.62	0.99	0.48	1.40
C_{19}	1.24	0.97	0.77	0.41	0.70	0.57	0.72	0.97	0.33	0.80
C_{20}	1.70	1.18	0.94	0.43	0.75	1.24	0.77	0.42	0.42	0.95
C_{21}	0.91	1.01	0.77	0.15	0.73	0.59	0.72	0.20	0.63	0.86
C_{22}	1.33	0.63	0.56	0.35	0.53	0.31	0.41	0.37	0.44	0.59
C_{23}	0.51	0.18	0.13	0.13	0.12	0.23	0.20	0.32	0.41	0.20
C_{24}	0.30	0.40	0.32	0.31	0.32	0.36	0.26	0.49	0.50	0.38
C_{25}	0.20	0.32	0.20	0.26	0.19	0.32	0.29	0.50	0.59	0.44
C_{26}	0.30	0.41	0.29	0.35	0.32	0.28	0.28	0.53	0.55	0.23
C_{27}	0.27	0.32	0.22	0.29	0.27	0.28	0.39	0.50	0.13	0.28
C_{28}	0.50	0.40	0.28	0.40	0.43	0.37	___	1.93	0.71	___
C_{29}	0.20	0.29	0.23	0.30	0.23	___	___	1.19	0.33	___
C_{30}	0.35	0.25	___	___	___	___	___	0.54	___	___
Total	**14.05**	**13.73**	**12.22**	**9.91**	**11.70**	**7.14**	**9.64**	**10.15**	**5.52**	**7.85**
Pristen	1.33	1.42	1.37	1.14	1.17	0.47	1.20	0.29	0.29	0.73
Phyten	1.05	0.96	0.77	0.56	0.66	0.52	0.73	0.30	0.16	1.27
pri/phy	1.26	1.48	1.77	2.02	1.78	0.90	1.64	0.96	1.79	0.57
odd	5.85	5.87	4.95	4.16	4.89	2.73	4.20	4.26	2.42	3.32
even	8.19	7.86	7.27	5.75	6.16	4.42	5.43	5.90	3.10	4.53
CPI	0.71	0.75	0.68	0.72	0.79	0.62	0.77	0.72	0.78	0.73
Pri/C_{17}	0.72	0.68	0.68	0.63	0.66	0.73	0.64	0.66	___	1.00
Phy/C_{18}	0.44	0.42	0.44	0.41	0.46	0.45	0.45	0.30	0.34	0.91

The carbon chain length of n-alkanes in the fourth station of sediment samples was recorded from C9, C14- C30 Table (4). The highest concentrations of total n-alkanes (23.27µg/g dry weight) were recorded at the depth (10-15) cm, while the lowest concentrations (9.67 µg/g dry weight) were recorded at the depth (15-20) cm. The index of carbon preference (CPI) was calculated and ranged between (3.14) at the depth (35-40) cm and (0.51) at the depth (25-30) cm, indicating that the hydrocarbons are the source of biological and human and also the ratio of Pri / Phy values ranged from (1.30) at depth (20-25) cm and (0.53) at the depth (5-10) cm indicating that the hydrocarbons are the source of biological and human and Pri / C17 values ranged from (1.00) at the depth (40 -45) cm and (0.70) at the depth (0 -5) cm while its value Phy / C18 ranged between (0.87) at the depth (5-10) cm and (0.53) at the depth (0-5) cm indicating that the hydrocarbons are the source of biological and human because it is an area near to a sewage plant where it discharges quantities of agricultural, also it will be loaded with fertilizers and nutrients, which help to increase the growth of plants and algae, which adds large amounts of hydrocarbons to the environment.

Table (4): Concentration of n-alkanes in core samples sediment of fourth station (µg/g dry weight)

Number of carbon atoms	Depth(cm)									
	0-5	**5-10**	**10-15**	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**	**40-45**	**45-50**
C_9	___	___	___	0.70	___	0.19	0.24	___	___	___
C_{10}	___	___	___	___	___	___	___	___	___	___
C_{11}	___	___	___	___	___	___	___	___	___	___
C_{12}	___	___	___	___	___	___	___	___	___	___
C_{13}	___	___	___	___	___	___	___	___	___	___
C_{14}	___	0.12	___	0.11	___	0.17	0.96	___	___	___
C_{15}	0.95	0.21	0.91	0.19	0.71	0.30	0.19	0.19	0.13	___
C_{16}	2.59	0.87	2.42	1.03	2.86	1.40	1.23	0.95	1.38	___
C_{17}	1.63	0.84	2.25	0.58	1.85	1.04	0.96	0.74	0.72	___
C_{18}	1.81	1.43	1.89	1.25	1.89	1.76	1.62	1.25	1.85	___
C_{19}	0.70	1.13	1.27	0.68	0.81	1.15	0.80	0.67	0.84	___
C_{20}	0.29	1.25	0.89	0.34	0.36	0.77	0.74	0.34	0.52	___
C_{21}	0.55	0.69	1.03	0.33	0.32	0.80	1.06	0.32	2.36	___
C_{22}	0.73	1.87	2.93	0.89	0.87	2.34	2.70	0.88	0.75	___
C_{23}	0.22	0.38	1.11	0.22	0.27	0.55	1.87	0.25	2.01	___
C_{24}	0.51	0.84	1.68	0.49	0.37	1.12	1.88	0.43	0.72	___
C_{25}	0.37	0.53	3.56	0.34	0.35	0.58	1.61	0.34	0.90	___
C_{26}	0.51	0.73	0.76	0.51	0.36	0.61	0.61	0.45	0.46	___
C_{27}	0.46	0.22	0.81	0.61	1.28	0.10	0.24	2.48	4.19	___
C_{28}	0.58	1.23	0.73	0.65	0.82	1.08	1.07	0.83	1.07	___
C_{29}	0.25	0.69	0.38	0.33	0.25	0.41	0.36	12.48	0.52	___

C_{30}	0.49	-----	0.67	0.43	0.54	0.76	0.70	0.43	0.77	___
Total	**12.61**	**13.02**	**23.27**	**9.67**	**13.90**	**15.11**	**18.83**	**23.03**	**19.19**	**___**
Pristen	1.15	0.66	1.82	0.57	1.38	0.96	0.85	0.60	0.72	___
Phyten	0.96	1.24	1.59	0.91	1.06	1.31	1.23	0.85	1.15	___
pri/phy	1.20	0.53	1.14	0.62	1.30	0.73	0.69	0.71	0.63	___
odd	5.12	4.70	11.31	3.97	5.83	5.11	7.32	17.46	11.67	___
even	7.49	8.32	11.97	5.70	8.08	10.00	11.51	5.56	7.52	___
CPI	0.68	0.56	0.94	0.70	0.72	0.51	0.64	3.14	1.55	___
Pri/C_{17}	0.70	0.78	0.81	0.98	0.75	0.92	0.88	0.81	1.00	___
Phy/C_{18}	0.53	0.87	0.84	0.73	0.56	0.74	0.76	0.68	0.62	___

The carbon chain length of n-alkanes in the fifth station of sediment samples were recorded from C8, C9, C14- C30 Table (5). The highest concentrations of total n-alkanes (10.22µg/g dry weight) were recorded at the depth (20-25) cm, while the lowest concentrations (4.05µg/g dry weight) were recorded at the depth (35-40) cm. The index of carbon preference (CPI) was calculated and ranged between (1.19) at the depth (10-15) cm and (0.51) at the depth (0-5) cm, indicating that the hydrocarbons are the source of biological and human and also the ratio of Pri / Phy values ranged from (3.44) at depth (40-45) cm and (0.27) at the depth (15-20) cm indicating that the hydrocarbons are the source of biological and human and Pri / C17 values ranged from (3.62) at the depth (40 -45) cm and (0.33) at the depth (10-15) cm while the value of Phy / C18 ranged between (0.68) at the depth (0-5) cm and (0.24) at the depth (20-25) cm indicating that the hydrocarbons are the source of biological and human it is caused by the movement of boats which contribute to the increase of pollution of this area in addition to the presence of bacterial activity

Table (5): Concentration of n-alkanes in core samples sediment of fifth station (µg/g dry weight)

Number of carbon atoms	Depth(cm)									
	0-5	**5-10**	**10-15**	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**	**40-45**	**45-50**
C_8	___	___	___	___	___	0.68	___	___	0.11	____
C_9	___	___	___	___	0.84	___	___	___	___	___
C_{10}	___	___	___	___	___	___	___	___	___	___
C_{11}	___	___	___	___	___	___	___	___	___	___
C_{12}	___	___	___	___	___	___	___	___	___	___
C_{13}	___	___	___	___	___	___	___	___	___	___
C_{14}	___	___	___	___	0.76	___	___	___	___	___
C_{15}	0.13	0.84	___	0.91	0.12	0.52	___	0.17	0.17	0.10
C_{16}	1.00	0.78	0.13	0.43	0.87	0.51	___	___	1.00	0.14
C_{17}	0.58	0.55	0.57	0.27	0.54	0.41	0.58	0.29	0.23	0.30
C_{18}	1.49	1.26	0.94	0.96	1.16	0.95	___	0.68	0.63	0.85
C_{19}	0.66	0.52	1.72	0.41	0.45	0.56	0.54	0.30	0.61	0.21
C_{20}	1.49	0.22	0.67	0.18	0.51	0.21	0.26	0.36	0.33	0.90
C_{21}	0.36	0.60	0.50	0.17	0.32	0.27	0.62	0.16	0.14	0.22

C_{22}	0.31	0.68	0.39	0.59	0.73	0.55	0.63	0.43	0.47	0.54
C_{23}	0.31	0.24	0.14	0.18	0.25	0.11	0.10	0.10	0.93	0.86
C_{24}	0.44	0.62	0.32	0.47	0.57	0.22	0.27	0.25	0.23	0.27
C_{25}	0.36	0.41	0.23	0.39	0.52	0.22	0.15	0.17	0.22	0.19
C_{26}	0.38	0.61	0.36	0.57	0.74	0.18	0.24	0.20	0.22	0.16
C_{27}	0.39	0.10	0.34	0.64	0.71	0.20	0.26	0.22	0.24	0.16
C_{28}	0.52	0.62	0.41	0.95	0.11	0.29	0.44	0.39	0.37	0.28
C_{29}	0.25	0.49	0.31	0.51	0.17	0.17	___	___	0.15	___
C_{30}	0.37	0.38		0.80	0.86	___	0.30	0.32	___	___
Total	**9.03**	**8.92**	**7.03**	**8.42**	**10.22**	**6.03**	**4.39**	**4.05**	**6.04**	**5.18**
Pristen	0.70	0.43	0.19	0.10	0.38	0.29	0.29	0.11	0.84	0.16
Phyten	1.01	0.67	0.48	0.38	0.28	0.53	0.54	0.30	0.24	0.42
pri/phy	0.70	0.64	0.39	0.27	1.35	0.55	0.54	0.35	3.44	0.38
Odd	3.04	3.76	3.82	3.47	3.91	2.46	2.24	1.41	2.69	2.04
Even	5.99	5.17	3.21	4.94	6.31	3.57	2.14	2.63	3.35	3.14
CPI	0.51	0.73	1.19	0.70	0.62	0.69	1.05	0.54	0.80	0.65
Pri/C_{17}	1.22	0.78	0.33	0.39	0.70	0.70	0.50	0.37	3.62	0.52
Phy/C_{18}	0.68	0.54	0.51	0.40	0.24	0.56	___	0.45	0.39	0.49

Acomparison between n-alkanes concentration at the present study with the previous studies (Table 6) showed increasing the concentration at the present study.

Table(6):comparison between of n-alkanes(µg/g) content in sediment for present study with the other previously studies .

Studied Areas	n-alkane(µg/g)	References
Hor Al-Hammar	7.04 - 0.373	(Al-Timari *et al.,* 1997)
Shatt Al Arab Estuary and north east Arabian Golf	18.952 - 3.470	(Al-Khatib, 1998)
Southern of Iraq marshes	31.1 - 4.1	(Rushdi *et al*.,2006)
Hor Al-Hammar	31.46 - 6.53	(Talal ,2008)
Hor Al-Howaiza	42.38 - 3.43	Al-Khatib (2008)
Hor AL-Azim	35.41 - 5.331	(Al-Taie,2013)
Shatt Al-Arab river	10.09 - 4.76	(Al-Hejuj,2014)
Shatt Al Arab Estuary and north east Arabian Golf	8.243 - 0.244	(Al- Mahana (2015)
Al-Chibayish marsh	29.75 - 0.62	(Al-Atbee,2018)
Al-Chibayish marsh	128.20 - 4.05	Present study

Table (7): Sources of n- alkanes in core sediments at Al- Chibayish marsh

Station	depth	Pr/ Phy	Type of pollution	CPI	Type of pollution
St.1	0-5	1.05	Biogenic	0.66	Anthropogenic
	5-10	0.68	Anthropogenic	0.78	Anthropogenic
	10-15	0.89	Anthropogenic	0.63	Anthropogenic
	15-20	1.14	Biogenic	0.78	Anthropogenic
	20-25	1.25	Biogenic	0.81	Anthropogenic
	25-30	1.21	Biogenic	2.59	Biogenic
	30-35	5.10	Biogenic	0.81	Anthropogenic
	35-40	1.24	Biogenic	1.06	Biogenic
	40-45	1.64	Biogenic	0.64	Anthropogenic
St. 2	0-5	1.47	Biogenic	0.65	Anthropogenic
	5-10	1.38	Biogenic	0.65	Anthropogenic
	10-15	1.21	Biogenic	0.71	Anthropogenic
	15-20	1.43	Biogenic	0.61	Anthropogenic
	20-25	2.01	Biogenic	0.83	Anthropogenic
	25-30	1.39	Biogenic	0.79	Anthropogenic
	30-35	1.34	Biogenic	0.59	Anthropogenic
St.3	0-5	1.26	Biogenic	0.71	Anthropogenic
	5-10	1.48	Biogenic	0.75	Anthropogenic
	10-15	1.77	Biogenic	0.68	Anthropogenic
	15-20	2.02	Biogenic	0.72	Anthropogenic
	20-25	1.78	Biogenic	0.79	Anthropogenic
	25-30	0.90	Anthropogenic	0.62	Anthropogenic
	30-35	1.64	Biogenic	0.77	Anthropogenic
	35-40	0.96	Anthropogenic	0.72	Anthropogenic
	40-45	1.79	Biogenic	0.78	Anthropogenic
	45-50	0.57	Anthropogenic	0.73	Anthropogenic
St.4	0-5	1.20	Biogenic	0.68	Anthropogenic
	5-10	0.53	Anthropogenic	0.56	Anthropogenic

	10-15	1.14	Biogenic	0.94	Anthropogenic
	15-20	0.62	Anthropogenic	0.70	Anthropogenic
	20-25	1.30	Biogenic	0.72	Anthropogenic
	25-30	0.73	Anthropogenic	0.51	Anthropogenic
	30-35	0.69	Anthropogenic	0.64	Anthropogenic
	35-40	0.71	Anthropogenic	3.14	Biogenic
	40-45	0.63	Anthropogenic	1.55	Biogenic
St.5	0-5	0.70	Anthropogenic	0.51	Anthropogenic
	5-10	0.64	Anthropogenic	0.73	Anthropogenic
	10-15	0.39	Anthropogenic	1.19	Biogenic
	15-20	0.27	Anthropogenic	0.70	Anthropogenic
	20-25	1.35	Biogenic	0.62	Anthropogenic
	25-30	0.55	Anthropogenic	0.69	Anthropogenic
	30-35	0.54	Anthropogenic	1.05	Biogenic
	35-40	0.35	Anthropogenic	0.54	Anthropogenic
	40-45	3.44	Anthropogenic	0.80	Anthropogenic
	45-50	0.38	Anthropogenic	0.65	Anthropogenic

Conclusions:

There is a variation in values of the aliphatic compounds with the depths gradient. The source of n-alkanes was biogenic and anthropogenic for the study stations, reflecting the calculated index.

References:

Aboul-Kassim, T.A. and Simoniet, B.R.T. (1995). Petroleum hydrocarbon fingerprinting and sediment transport assessed by molecular biomarker and multivariate statistical analysis in the eastern harbour of Alexandria, Egypt. Mar. Pollut. Bull., 30(1): 63-73.

Al-Atbee, R.S.K(2018). Accumulation of Some Heavy Elements and Hydrocarbons in the Dominant Aquatic Plants at Al-Chibayish Marshs. M.Sc. thesis. University of Basrah, college of science, Biology department.

Al-Hejuje, M.M. (2014). Application of water quality and pollution indices to evaluate the water and sediments status in the middle part of Shatt Al-Arab River. Ph.D. Thesis, Biology Department, College of Science, University of Basrah, 239p.

Al-Khatib, F. M. (1998)."Distribution of hydrocarbons compound and their sources in sediment cores from Shatt Al-Arab Estuary and North-West Arabian Gulf". M.Sc. Thesis. University of Basrah college of science, biology department, 95 pp(In Arabic)

Al-Khatib, F.M. (2008). Determination the concentrations, origin and distribution of hydrocarbon compounds in water,

sediments and some biota of Hor Al-Howaiza, south of Iraq and their sources. Ph.D. Thesis., University of Basrah, College of Science, Biology Department, 228p. (In Arabic)

Al-Mahana, D. S. (2015)"Distribution and sources of total Hydrocarbons , N-AlKane and Poly Cyclic Aromatic compounds in sediment cores of Shatt Al-Arab coast , Khor Al-Zubair and Um- Qaser". M.Sc. thesis. University of Basrah, college of science, Geology department.

AlShmery, A.Y.H. (2013). Estimation of some heavy metals in clams, sediments and water from Shatt Al-Arab and treatment by porcellanite rocks. M.Sc. Thesis, Chemistry department, College of Education For Pure Science, University of Basrah, 100pp.

Al-Taie, E.O.A. (2013). Evaluation of Pollution in the Hor Al-Azim, Sediments by hydrocarbons and heavy metals, Missan Government,South of Iraq. M.Sc thesis, College of Science, University of Basrah125pp.

Al-Timari, A.A., Al-Saad, H.T. and Darmoian, S.A. (1997). Distribution and Sources of n-alkanes in sediment cores from Al-Hammar marsh southern Iraq. Marina Mesopotamica, 12(2): 315-330.

Coulon, F., McKew, B.A., Osborn, A.M., McGenity, T.J. and Timmis, K.N. (2007). Effects of temperature and biostimulation on oildegrading microbial communities in temperate estuarine waters. Environmental Microbiology, 9: 177-186.

Goutx, M. and Saliot, A. (1980) Relationship between dissolved and Particulate fatty acid and hydrocarbons, Chlorophyll (a) and zooplankton biomass in Ville Franche Bay, Mediterranean Sea. Mar. Chem. 8:299 – 318.

Rushdi, A.I., Douabul, A.A.Z., Mohammed, S.S. and Simoneit, B.R.T. (2006). Composition and sources of extractable organic matter in Mesopotamian marshland surface sediments of Iraq. 1-Aliphatic lipids. Environ. Geol., 50: 857-866.

Talal, A.A. (2008). A Study for the seasonal and regional variations of hydrocarbon levels and origin of n–alkanes in water, sediments and some species of biota Iraqi Southern marshes. Ph.D. Thesis, Biology Department, College of Science, University of Basrah, 143pp.

المركبات الاليفاتية(الالكانات الاعتيادية) في عينات لبابيه لاهوار الجبايش في محافظة ذي قار جنوب العراق

هديل فهد عبد العزيز و مكية الحجاج و حامد السعد*
قسم علم البيئة - كلية العلوم - جامعة البصرة
*كلية علوم البحار – جامعة البصرة

المستخلص:

جمعت عينات اللبابية لرسوبيات من خمس محطات تم اختيارها في هور الجبايش في محافظة ذي قار جنوب العراق لمرة واحدة في أب ،2018 وعلى عمق 50 سم لقياس تركيز المركبات الاليفاتية باستخدام جهاز الكروماتوغرافي المزود بالعمود الشعري. كما جرى حساب عدد من الادلة لبيان مصدر واصل المركبات الاليفاتية (الالكانات) حيث سجلت اعلى معدل لتركيز المركبات الاليفاتية (الالكانات الاعتيادية) في عينات المحطة الأولى (128.20) مايكغم/ غم وزن جاف وعلى عمق (35-40) سم بينما اقل معدل فقد سجل في المحطة الخامسة (4.05) مايكغم/ غم وزن جاف وعلى عمق(35-40) سم و كانت اطوال سلاسل المركبات الاليفاتية في عينات الرسوبيات تتراوح مابين C15-C30. ولمعرفة مصادر المركبات الاليفاتية في المناطق فقد حسبت عدد من الادلة منها قيم دليل تفضيل الكاربون ونسبة البرستين/ الفايتين فقد اعطت دلالة واضحة على ان اصل الالكانات الاعتيادية كانت احيائية وبشرية فيما أشارت قيم Pri / C_{17}، Phy / C_{18} على إختلاف النشاط البكتيري في أعماق مناطق الدراسة الخمسة. تهدف الدراسة الحالية الى تقييم تلوث رسوبيات اهوار الجبايش بالمركبات الهيدروكاربونية و العناصر الثقيلة من خلال: تحديد تركيز المركبات الاليفاتية في عينات الرسوبيات اللبابية لاهوار الجبايش ومعرفة اصل وتوزيع المركبات الهيدروكاربونية في عينات الرسوبيات لاعماق تصل الى 50 سم.