

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

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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) $\mu\text{g/g}$ dry weight on the depth (35-40) cm, while the lowest values found in the fifth station (4.05) $\mu\text{g/g}$ 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 indicated that 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 (Alshmary, 2013).

To study 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 the state 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)

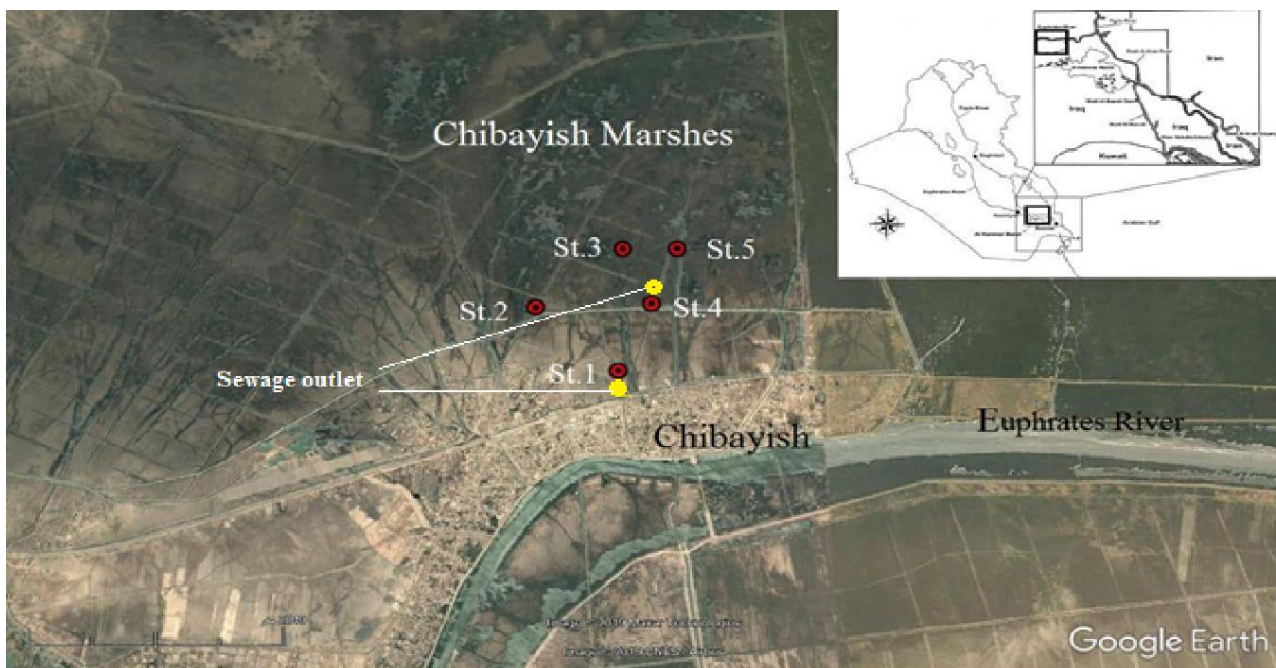


Fig (1) the study stations



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 bottom then 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

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

then cooled to room temperature, using a separating funnel to extracted the unsaponification matter with (40ml) n-hexane. The upper unsaponification matter 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 that 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) (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 ($\mu\text{g/g}$ 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 ($\mu\text{g/g}$ 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 (14.05 $\mu\text{g/g}$ dry weight) were recorded at the depth (0-5) cm, while the lowest concentrations (5.52 $\mu\text{g/g}$ 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 ($\mu\text{g/g}$ 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 (23.27 µg/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

A comparison 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($\mu\text{g/g}$) content in sediment for present study with the other previously studies .

Studied Areas	n-alkane($\mu\text{g/g}$)	References
Hor Al-Hammar	7.04 - 0.373	(Al-Timari <i>et al.</i> , 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 <i>et al.</i> ,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-Hejaj,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 were biogenic and anthropogenic for the study stations, and this reflected from the calculated index.

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

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المستخلص:

جمعت عينات اللبابية لرسوبيات من خمس محطات تم اختيارها في هور الجبايش في محافظة ذي قار جنوب العراق لمرة واحدة في آب، 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 ما بين C15-C30. ولمعرفة مصادر المركبات الاليفاتية في المناطق فقد حسب عدد من الادلة منها قيم دليل تفضيل الكاربون ونسبة البرستين/ الفابتين فقد اعطت دلالة واضحة على ان اصل الالكانات الاعتيادية كانت احيائية وبشرية فيما اشارت قيم C17 / Pri، C18 / Phy على اختلاف النشاط البكتيري في أعماق مناطق الدراسة الخمسة. تهدف الدراسة الحالية الى تقييم تلوث رسوبيات اهور 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.