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UPTAKE –RELEASE OF POLLUTANT BY HILSA SHAD *Tenualosa ilisha* (HAMILTON-BUCHANAN) FISH COLLECTED FROM SOUTHERN IRAQ

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ABSTRACT

The up stream spawning migration of Hilisa Shad, *Tenulosa ilisah* from the Arbian gulf to the Shatt Al-Arab river began during early march and ended during late October; the bulk of migration was between the middle of April and June. Samples of these fish were collected from different locations (Shatt Al-Arab river estuary, North-West Arabian Gulf, and Mesopotamian Marshes). The present study was designed to give some insight to test the ability of Sbuor to absorb/concentrate pollutants. To achieve this, different age group were collected from March-September 2006. Fish muscles as well as gonads were taken, freeze-dried and trace organics were extracted and subjected to spectrofluorometric and gas chromatography analysis. Trace metal concentrations in Sbuor tissues were determined by Automic Absorption after digestion with strong acids. Result obtained in this study showed that Sbuor contain measurable amount of hydrocarbons. The compounds seem to be derived from different sources, while the concentrations of trace metals are acceptable although there was slight increase in the concentrations of some of these metals. Both concentrations of hydrocarbons and trace metals dose not represent a hazard on human health.

INTRODUCTION

Crude oil or oil is a mixture of many different organic compound. Crude oils from various sources differ in their composition and physical properties as well as in the relative concentrations of their individual compound. Hydrocarbons are the most important constituents of petroleum and form up to 98% of certain crude oil. Components such as lower aromatic, paraffin and non hydrocarbons constituents are soluble in water and spread over the surface of the sea, these get dissolved into water rapidly, other oil like fuel oil, motor oil are thick and heavy (AL-Saad, 1995). All crude oil contain compounds toxic to marine organism, different type of oil spills can be expected to have somewhat different effects. Many marine creatures ranging from fish, crustacean to echinoderms response to chemical stimuli due to tar ball deposition that trigger numerous kind of organism, the normal responses are affected in many different way, suggestion that oil pollution may be ecological affect at concentrations far below those proved significant by ordinary toxicity test based on short term mortality.

The water of Shatt Al-Arab estuary is liable to small oil spill of varying magnitude. The major source for the input of petroleum in this estuary are oil refinery effluent, sewage discharge, and losses during loading operations (AL-Saad, 1995), Petroleum hydrocarbons present in the Shatt Al-Arab Estuary have been implicated in situation where biological damage have been reported (Al-Saad *et al*.,1997).Recently, vast industrial, agricultural, economic and social developments have been take place, in addition to an increase in population. This may enhance the magnitude of environmental pollution in this important region year by year.

Many study has been undertaken to assess the concentration of pollutant such as petroleum hydrocarbons in commercial species of fish from the Shatt Al-Arab estuary and North-West Arabian Gulf (Al-Saad & Al-Asadi, 1985, DouAbul *et al*.,1987, Al-Saad, 1990, Al-Saad, 1995, Al-Saad etal, 2006), one of the important fish species in the fisheries of this region is the Hilsa shad *Tenualosa ilisha*, is an anadromous clupeid and its fisheries are important throughout the region. The species is widely distributed, and can be found in the Arabian Gulf, Pakistan, India, Burma and as far east as cochin china, South Vietnam. Around the Arabian Gulf *Tenualosa ilisha* is known as "sbour", and it is found along the Iranian side of the Gulf and in Shatt Al-Arab estuary. Sbour ascend the Shatt Al-Arab and migrates upstream to spawn in the marsh area just north of Basra city, (Al-Hassan, 1999). Despite the fact that this kind of fish is favorite in the region, but no detail study has been undertaken the concentration of petroleum hydrocarbons in different age group during it's migration from Arabian Gulf to the Marshes; Tigris and Euphrates river in the north.

MATRIALS AND METHODS

Fish samples were collected from Shatt Al-Arab estuary and North West Arabian gulf during 2006; the sites were chosen according to their importance, as active fishing spots, and for the suitability of sampling (Fig.1). Fish sample were also taken from fishermen fishing off the Fao

Coast. After collection, the fish samples were wrapped in aluminum foil, stored in cool boxes, and frozen upon return to laboratory. Combined samples of fish, having similar size (length and weight) were chosen for the fish *Tenualosa illisha*

The extraction of fish sample were done according to the method described by DouAbul *et al.* (1997), and based upon that of Grimalt and Oliver (1993). In a brief description, exactly 10 gm of dried fish muscles were placed in a pre extracted cellulose thimbles and soxhelt extracted with 150 ml methanol/ benzene (1:1 ratio) for 24 hours. At the end of this period the extracted samples were transferred to storage flasks, and each sample was further extracted with fresh solvent. The combined extractions for each sample were reduced in volume to about 10 ml by means of a rotary vacum evaporator, and were then saponified for 2 hours with a solution of 4N KOH in 1:1 methanol/ benzene. After extraction of the unsaponified matter with hexane, the extract was dried over anhydrous Na_2So_4, and concentrated by applying a flow of purified Nitrogen. The concentrated extract was cleaned up by column chromatography. The column filled with 8gm; of 5% water deactivated alumina (100-200 mesh) on the top, and silica (100-200 mesh) in the bottom. The extract was then applied to the head of the column, and eluted (washed) with 50 ml of n-hexane to isolate the aliphatic fraction, and 50 ml of benzene to isolate the aromatic fraction. The aromatic fractions were then reduced to a suitable volume prior to analysis for PAHs by means of capillary gas chromatography. The samples were injected in the "splitless mode" on to a "50 mx 0.25 mm" i.d. SE-30 (Methyl Silicone) fused silica capillary column, at an initial temp of 50°C and following temperature regimen programmed at 4°C min, to 280 °C max, then held at the final temperature for 30 min.

The tissue fat content determination of the fish samples, were done in the following methodology: 3gm of each dried sample were soxhlet extracted within 2:1 mixture of petroleum ether and acetone for 24 hours. The extracts were reduced in volume by means of a rotary vacuum evaporator, and subsequently reduced to exactly 1 ml by applying a flow of purified Nitrogen. and weighed after evaporation.

Fish samples were collected from Shatt Al-Arab estuary and North-West Arabian Gulf during 2006 (Fig.1). Trace metals analysis was performed on the <63 fraction of the muscle fish samples which has been separated by sieving after drying and grinding. The determination of trace metals was done according to the following procedure described by Sturgeon *et al.*,(1982). Concentrated HCl and HNO3 (1:1) was added to each sample and evaporated to near dryness on the hotplate at 80̊C , then mixture of concentrated HCLO4 and HF (1:1) was added. After heating to near dryness, 20ml of 0.5 HCL were added and cooled for 10 min. The

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extraction was decanted into 25 ml plastic volumetric flask. This step was repeated twice and all supernatant were combined. Finally the volumes of samples were stored for analysis using Atomic Absorption type SP9 Pye Unicom.

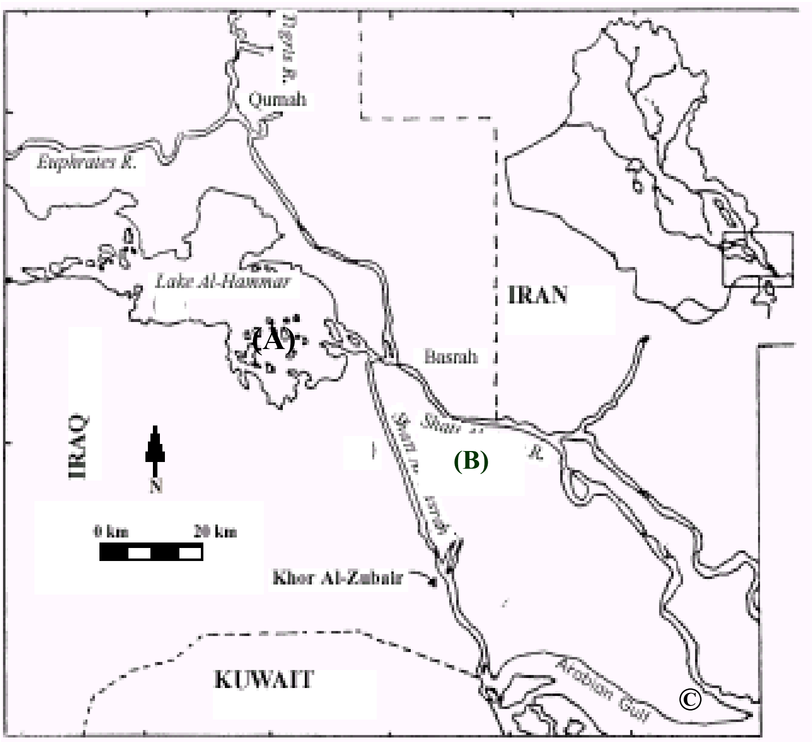

Figure (1): Sample locations: A-Hammar marsh; B-Shatt Al-Arab river and C-Fao city.

RESULTS AND DISCUSSION

The distribution of total petroleum hydrocarbons in *T. ilisha* with fat percentage are presented in Table (1). The mean concentrations of petroleum hydrocarbons in these fish were different due to its lengths and to the month in which has been capture. The lower mean concentration were observed during September in lengths (20±2cm) value 0.29 ug/g dry weight expressed as Basra Crude Oil equivalent, with fat content (45.51%), while higher values of petroleum hydrocarbons observed during March-May in lengths (40±2cm) mean 8.89-5.34ug/g dry weight., and high values of fat% (54.17-78.10) respectively. The result in Table (1) showed two pattern of concentration one during March to May and second from June to August, the hydrocarbons concentration decrease with the decrease of the lengths of fish and also during the months. That may be due to the fat contain of fish which differ in age stages; the migration of Sbour is spawning migration this mean all individual enter Shatt Al-Arab was mature; so spawning season extended from March-October. Hydrocarbons concentrations measured seasonally in the water of Shatt Al-Arab River and Its estuary in the North-West region of the Arabian Gulf by AL-Saad (1995), its reflect the combined effect of input and removal processes. Several factors, acting either singly or in combination, could produce the seasonal variation. The concentration vary inversely to water temperature. The water of Shatt Al-Arab estuary undergo seasonal variation. It was reported that the seasonal range of water temperature encountered at Shatt Al-Arab Estuary about 15C in January to 30C in August (Al-Saad,1995). It was observed that when temperature was exceed 20C during summer the estimated oil residues were lower than that when the temperature was below 20C during winter, so it is well documented that the temperature is the most important factor covering the removal of hydrocarbons from the water(DouAbul and Al-Saad,1985). The timing of the sbour's run into Shatt Al-Arab River, estimated by catches, varies from year to year coupled with rising in water temp. and water level, probably depending upon many factors. The increase in flow during spring and summer appears to signal the spawning migration of sbour. Increases in water temperature in the spring time may also trigger their migration. *T. ilisha* behave similarly in other regions. In the Hooghly River, upriver migration of *T. ilisha* appears to be governed by sudden increases in water temperature. Temperature increases produce phytoplankton blooms that attract more fish to the river. Such phytoplankton blooms have been observed and these may directly affect the abundance of sbour(Al-Hassan,1999).This may explain the different in high concentrations of petroleum hydrocarbons in sbour during spring and summer. The various physical and biological data may reveal the sbour's movements over the year. Gonad maturation data suggest that sbour spawn in the upper reaches of Shatt Al-Arab (probably in the marsh area) during May-August and then migrate to the sea during September-November but also there are many individual of sbour were collected in Shatt Al-Arab river during September-October, when they were landed in Kuwait. The absence of sbour during December-January may be due to their movement toward the Iranian coast of the Gulf near Bushier (Al-Hassan,1999).

Table (1) Range and Mean of Total Petroleum Hydrocarbons in *Tenualosa ilisha* in different length during different months with Fat% during 2006

Month	Length 40±2cm Range (ug/g)	Mean (ug/g)	Fat %	Length 35±2cm Range (ug/g)	Mean (ug/g)	Fat %	Length 30±2cm Range (ug/g)	Mean (ug/g)	Fat %	Length 20±2cm Range (ug/g)	Mean (ug/g)	Fat %	Gonad Range (ug/g)	Gonad Mean (ug/g)	Fat %
March	8.52-9.23	8.89	54.17	6.50-7.23	6.87	50.33	2.96-3.69	3.31	33.57				2.03-3.10	2.73	62.73
April	4.01-4.27	4.11	56.58	3.89-4.17	4.00	52.27	1.03-1.36	1.17	42.06				2.03-2.52	2.23	60.68
May	4.92-5.89	5.34	78.10	3.02-3.41	3.23	57.40	2.31-2.62	2.46	46.58				1.98-2.03	2.00	65.65
June	1.54-1.82	1.66	42.34	0.85-0.89	0.87	42.34	0.62-0.65	0.63	42.15				0.56-0.68	0.56	59.85
July				4.58-4.92	4.79	45.48	2.68-2.85	2.76	38.48	1.02-1.08	1.05	37.10	1.52-1.64	1.58	65.97
August				3.52-3.86	3.60	35.08	1.43-1.58	1.51	34.96	0.88-0.96	0.91	33.62	0.88-1.20	1.05	50.25
Sept.										0.28-0.30	0.29	44.28	ND	ND	44.28

The water of Shatt Al-Arab estuary is liable to small oil spills of varying magnitudes. The major sources for the input of petroleum in this estuary are oil refinery effluent, the loss during loading operation, boating activities, runoff from land and introduction via sewage outfall, and storm water runoff from the urban areas was found anther source (Al-Saad, 1995).

Analysis of total petroleum hydrocarbons in dissolved, particulate water and sediment samples from Shatt Al- Arab estuary and North-West Arabian Gulf are shown in Table (2) indicated that background concentrations of petroleum hydrocarbons in both areas were rather evenly distributed. However, the results showed higher concentrations of petroleum hydrocarbons in Shatt Al- Arab river than those in water of the other stations. This implies that the contributions of oil through shipping activities is high significant, at present. The results also showed high concentrations of hydrocarbons in the vicinity of Abadan oil refinery and in the rich fishing ground of Shatt Al-Arab estuary.

Table (2): Concentration of hydrocarbons in Shatt Al-Arab River and NW Arabia Gulf during 2005-2006*

Station	Con. Of Dissolved hydrocarbons (ppm)		Con. Of particulate hydrocarbons (ppm)		Con. Of hydrocarbons in sediment (ppm)	
	Range	Mean	Range	Mean	Range	Mean
Garmmat Ali	1.10-4.82	3.24	0.62-7.32	4.49	6.67-7.50	6.46
Abo-Al-Khaseb	1.24-8.42	5.27	0.70-8.80	6.56	6.31-8.94	7.87
Al-Sebah	0.68-26.3	19.17	0.38-25.20	21.69	0.718-37.10	20.63
Karon	1.126-28.24	20.47	0.63-33.23	22.44	2.98-32.50	21.23
Al- Fao	1.38-8.85	6.36	0.78-15.23	9.03	2.62-16.20	9.64
Estuary	1.37-8.00	5.74	0.78-12.20	7.07	1.28-11.52	6.76
N.W. Arabian Gulf	1.37-3.10	2.33	0.77-6.52	3.48	1.05-6.50	3.55

* **Adpoted from Al-Saad, H.T (2006)**

Higher concentrations were found near oil refineries on the banks of the Shatt Al- Arab such as Muftyia and Abadan. fluorescence emission spectra for water were similar to those of lubricating and fuel oils indicating that similar sources of pollution were involved. Most of water samples collected during this study showed emission peaks in the range of 340 -380nm and higher. This indicates the presence of highly condensed aromatic ring (2-5) which typically found in crude oil (Al-Saad, 1995).

However hydrocarbons can enter fish through the water or from their food. Entrance from the water is primarily through the gills, but some oil, including tar particles, can enter during drinking or feeding (Al-Saad and Al-ASadi, 1989). Sbour fasting when enter Shatt Al-Arab river and they feed mainly on diatoms, green and blue green algae and, to lesser extent, on zooplankton (AL-Hassan, 1999).

The food of sbuor may contain hydrocarbons which already accumulated in great amount (Al-Saad *et al*., 1996).

The detection of polluting hydrocarbons in marine organism is also complicated, since marine organisms can also synthesis hydrocarbons. So the total amount of petroleum hydrocarbons in these organisms cannot be taken as an index of pollution by petroleum product only. This make the tracing of hydrocarbon pollution in marine environment is difficult since the hydrocarbons originating from crude oil are found together with hydrocarbons produced recently by marine organism, and hence analysis by gas chromatography allows a distinction between hydrocarbons typically for recent production by marine organisms and hydrocarbons from oil pollution. (Al-Saad, 1995).

The concentrations of n-alkanes in sbour samples varied from 0.82 ug/g during September to 8.82 ug/g dry weight during March. The Carbon Preference Index (CPI) which is an important parameters in relation to hydrocarbon sources has a ratio close to unity and its assigned to a polluted environment (Al-Saad, 1990). CPI for sbour in this study ranged from 1-1.90 which may be indicated both biogenic and anthropogenic sources of hydrocarbons in theses fish. The concentration of n-alkanes were very low in comparison with other concentrations reported elsewhere along the Arabian Gulf. (Table 3).

Table (3): Comparison of values of total hydrocarbons in Fish muscles of Shatt Al- Arab estuary with other values of the world

Location	Concentration (µg/l.)	References
West Flamouth	0.3-85	Burns and Teal (1973)
North Sea	17.3-18.6	Whittle *et al.,* (1977)
South Georgia	50-100	Platt and Mackie (1980)
Shatt Al-Arab River	29.6-45.9	Al-Saad&Al-Asadi (1989)
Arabian Sea	0.47-3.67	Sen Gupta et al., (1993)
Saudi Arabia	9.6-310	Fowler *et al.,* (1993)
Kuwait	6	Fowler *et al.,* (1993)
Bahrain	0.8-3.8	Fowler *et al.,* (1993)
UAE	3.6-26	Fowler *et al.,* (1993)
Oman	2.4-33	Fowler *et al.,* (1993)
Shatt Al-Arab Estuary	1.9-6.3	Al-Saad (1995)
Shatt Al-Arab Estuary & NW Arabian Gulf	0.29-8.89	Present study

Variations in n-alkanes content of fish samples in (Table 4) may be attributed to feeding patterns, type of habitat and fat content. The range of carbon chain length of n-alkanes in fish samples were C13 to C32. The bimodal distribution with two peak around C17 and C22 suggested two different sources of hydrocarbons both biogenic and anthropogenic. Biogenic sources of n-alkanes C15, C17, C19, C21 and C29 which have been previously reported to be derived from zooplankton, phytoplankton, benthic algae, bacteria and plant wax (Blumer *et al*., 1971, Grimalt and Albaiges, 1990). It is regarded as a normal occurrence related to food chain, because *T.Ilisha* feed mainly on such food in north-west Arabian gulf (AL-Hassan, 1999).

In Shatt Al-Arab estuary and North-West Arabian Gulf and the Marshes of Iraq the o-group of sbour continuous feeding while the adult fish stop their feeding during spawning migration; the marshes; Shatt Al-Arab river and north west Arabian gulf rich with such food. This indicates that the n-alkanes present in these fish are biogenic origin. On the other hand, the anthropogenic contribution of hydrocarbons is evidence from the presence of Unresolved Complex Mixture (Stephanou, 1992). The concentration of n- alkanes present in these fish are biogenic origin. On the other hand, the anthropogenic contribution of hydrocarbons is evidence from the presence

Table (4): N-Alkanes concentrations in *Tenualosa ilisha* muscles (ug/g dry weight) in different length size during different mounts.

Carbon number	March 40±2cm	April 35±2cm	May 30±2cm	June 40±2cm	July 35±2cm	Aug 30±2cm	Sept. 20±2cm
C13	0.05	0.23	0.04	0.02	0.03	0.03	0.01
C14	0.40	0.31	0.05	0.04	0.04	0.08	0.02
C15	0.76	0.46	0.03	0.03	0.07	0.32	0.04
C16	0.28	0.11	0.36	0.15	0.06	0.03	0.03
C17	0.36	0.31	0.68	0.52	0.12	0.07	0.02
C18	0.43	0.42	0.16	0.44	0.09	0.06	0.12
C19	0.36	0.21	0.40	0.31	0.20	0.08	0.07
C20	0.43	0.29	0.12	0.32	0.19	0.03	0.06
C21	0.82	0.76	0.31	0.46	0.22	0.04	0.10
C22	0.26	0.11	0.20	0.22	0.23	0.04	0.09
C23	0.38	0.12	0.32	0.30	0.24	0.06	0.06
C24	0.28	0.47	0.23	0.32	0.20	0.03	0.04
C25	0.89	0.33	0.48	0.35	0.31	0.05	0.03
C26	0.73	0.51	0.24	0.43	0.28	0.04	0.01
C27	0.96	0.86	0.62	0.50	0.33	0.05	0.04
C28	0.45	0.35	0.40	0.35	0.26	0.03	0.02
C29	0.42	0.13	0.32	0.32	0.20	0.07	0.03
C30	0.30	0.12	0.41	0.35	0.09	0.02	0.01
C31	0.10	0.13	0.02	0.19	0.06	0.03	0.01
C32	0.09	0.06	0.01	0.10	0.05	0.01	0.01
TOTAL	8.85	6.26	5.40	5.99	3.19	1.22	0.82
Odd	5.1	3.54	3.22	3.00	1.78	0.80	0.41
Even	3.75	2.72	2.18	2.99	1.41	0.42	0.41
CPI	1.36	1.30	1.47	1.00	1.26	1.90	1.00

of Unresolved Complex Mixture (Stephanou, 1992). The concentration of n-alkanes were very low in comparison with other concentrations reported elsewhere along the Arabian Gulf. (Table 5).

The bioaccumulation of metals in any organisms depend upon various factors such as bio-availability, amount of uptake, their threshold and the physiological efficiency of the organisms to excrete excess of metals (Nguyen *et al*., 2005).

Table (5): Comparison of concentrations of n-alkanes in fish muscles of Shatt Al-Arab estuary with other concentrations in the world

Location	Concentration (µg/l.)	References
Shatt Al-Arab River	**17.7-22.6**	**Al-Saad & Al-Asadi (1989)**
NW Arabian Gulf	**6.4-32.6**	**Al-Saad (1990)**
Kuwait	**48**	**Fowler *et al.,* (1993)**
Saudi Arabia	**10.3-2290**	**Fowler *et al.,* (1993)**
Bahrain	**5.2-30**	**Fowler *et al.,* (1993)**
UAE	**23-174**	**Fowler *et al.,* (1993)**
Oman	**8.3-190**	**Fowler *et al.,* (1993)**
Shatt Al-Arab Estuary	**3.45-13.11**	**Al-Saad (1995)**
Shatt Al-Arab Estuary & NW Arabian Gulf	**0.82-8.85**	**Present study**

The concentrations of trace metals in *T .ilisha* (sbour) in different length during different months are presented in Table(6).

The concentration ranges of these metals were as fellow: for Co (0.38-2.31), Mn (1.38-5.52), Ni (0.50-3.05), Fe (4.72-89.76), Cu (0.85-102.09), Cd (0.50-2.03), Pb (1.26-25.30) and for Zn (1.22-22.98) ug/g dry weight. There was a variation of the concentrations of these metals within different length of fish during different months. The maximum values of Co (2.31), Ni (3.05) and Cu (102.09) were observed in length 30cm during April. While maximum values of Fe (89.76) and Zn (22.98) observed during May. Also, high concentration of Pb observed in gonad during April.

The accumulation and distribution of these metals in sbour tissues depend on the concentration of these metals, exposure time, physiological conditions of theses organism and environmental factors (Al-Saad *et al*., 1996).

Table (6): Concentration of trace metals (ug/g) dry weight in *Tenulosa ilisha* samples from March to September 2006

Month	length	Co	Mn	Ni	Fe	Cu	Cd	Pb	Zn
	40 ±2cm	0.70	2.76	1.01	47.24	5.10	ND	3.79	9.37
	35 ±2cm	0.70	1.38	2.03	37.79	1.70	1.52	ND	10.71
March	30±2cm	ND	1.38	1.01	33.07	3.40	ND	ND	7.81
	20 ±2cm	-	-	-	-	-	-	-	-
	Gonads	0.77	1.38	2.03	10.39	1.70	ND	ND	15.62
	40 ±2cm	1.54	2.76	2.03	28.34	3.40	1.01	6.32	11.38
	35 ±2cm	ND	ND	2.03	42.52	5.10	0.50	3.79	7.81
April	30±2cm	2.31	1.38	3.05	66.14	102.09	1.01	1.26	11.38
	20 ±2cm	-	-	-	-	-	-	-	-
	Gonads	ND	2.76	1.01	80.31	1.70	0.50	25.30	3.12
	40 ±2cm	1.54	1.38	1.01	13.70	11.91	0.50	1.265	8.70
	35 ±2cm	O.77	1.38	1.01	10.18	68.06	ND	5.06	22.98
May	30±2cm	1.54	1.38	2.03	89.76	5.10	1.01	2.53	7.11
	20 ±2cm	-	-	-	-	-	-	-	-
	Gonads								
	40 ±2cm	0.77	ND	1.01	18.89	5.95	ND	2.53	1.22
	35 ±2cm	ND	ND	ND	ND	ND	ND	5.60	2.00
Jun	30±2cm	0.38	5.52	0.50	16.53	0.85	ND	7.59	1.78
	20 ±2cm	-	-		-	-	-	-	-
	Gonads								
	40 ±2cm	-	-	-	-	-	-	-	-
	35 ±2cm	0.38	ND	ND	ND	0.85	ND	12.65	5.58
July	30±2cm	0.38	2.76	1.01	35.43	0.85	1.01	ND	1.67
	20 ±2cm	0.77	2.76	ND	9.44	1.70	ND	5.06	1.22
	Gonads								
	40 ±2cm	-	-	-	-	-	-	-	-
	35 ±2cm	0.77	2.76	ND	ND	ND	1.01	ND	1.22
August	30±2cm	0.38	ND	1.01	11.81	0.85	2.03	2.56	1.33
	20 ±2cm	0.77	5.52	0.50	25.98	1.70	ND	ND	1.67
	Gonads								
	40 ±2cm	-	-	-	-	-	-	-	-
	35 ±2cm	-	-	-	-	-	-	-	-
September	30±2cm	-	-	-	-	-	-	-	-
	20 ±2cm	0.38	2.76	0.50	4.72	0.85	2.03	5.06	1.22
	Gonads	0.77	2.76	0.50	63.78	0.85	ND	2.53	14.50

These different in concentration related to the food habitat of these fish which played the dominant role in the accumulation of these metals. The uniformity of metal concentrations within different length during different months is perhaps due to the migrate nature and its biochemistry. If, in fact, they do migrate annually they would be similarly exposed to trace metals both from their food and from ambient water. The concentration of trace elements in water and sediment samples from Shatt Al-Arab Estuary and North-West Arabian Gulf shown in Table (7). There are few data available on the concentrations of trace metals in different tissues of fish from Shatt Al-Arab and its estuary and other area of the Arabian Gulf which could used together with values from world wide and heavily polluted site for comparative purpose.

Al-Khafaji, (2005) study metal content in some orgion of selected commercial fishes species *T. illisha, C. carpio* and *A. latus* collected from Shatt Al-Arab river, he found that different pattern of metal accumulation and most metals recorded higher levels in fishes guts.

Al-Imarah *et al*., 1998) studied the distribution of trace metals in gills, gonads, gut, kidney, liver and muscle) from four age group of Gizzard shad *Nematolosa nasus* from Shatt Al-Arab Estuary, higher values were recorded of Co, Cr, Fe, Mn, Ni and Pb in the gut.

Al-khfaji *et al*., (1997). determined the levels of Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb and Zn in in green back mullet *Liza subviridis* from Shatt Al-Arab Estuary, they found higher concentrations of these metals in liver than muscles. AL-Saad *et al.,* (1997) studied the distribution of trace metals in five tissues from ten commercial fresh and marine fish species from Shatt Al-Arab estuary, they found that all tissues in different fish species have contained different concentration of trace metals. Minimum and maximum accumulation were found for Cd and Fe respectively in all species, while Ni was found to be accumulated at high levels in the muscle of all species.

Abdullah and Abdul-Hassan (1993) recorded the distribution of Cu and Zn in tissues of some fish from Shatt Al-Arab Estuary, values reported were 35 and 155 ug/g in the gonad of *Thryssa hamiltoni* respectively.

Fowler *et al*.,(1993) determined trace metals in edible muscle of fish from Arabian Gulf, they reported low values indicating no heavy metals contamination originated from anthropogenic sources.

Al-Edanee *et al*., (1991) determined trace metals in muscle of marine fish from Khor Al-Zubair, they reported high values of Ni, Pb and V. Abaychi and Al-Saad (1988) studied fish from Shatt Al-Arab river and Arabian Gulf, they found low concentrations of Cd, Mn and Pb while other metals were high in concentration. Anderlini *et al.,* (1982) reported values of trace metals in the muscles of commercial fish from Kuwait in which they represented unpolluted in comparison with world wide values. For comparison, mean values of trace metals in the muscles of sbour determined in this study are listed in Table (8) with values reported for nearby area., world wide and polluted sites. All the concentrations of trace metals obtained in the sbour in the present study are much lower than those reported at heavily polluted site (Table 8).

Table (7): Concentration of trace metals in Shatt Al-Arab River and NW Arabia Gulf during 2005-2006*

Stations	Trace Metals									
	Water (mg/L)					Sediment (µg/g)				
	Co	Mn	Ni	Fe	Cu	Co	Mn	Ni	Fe	Cu
Garmmat Ali	0.8243	0.0570	1.023	0.8478	0.0637	288.5	336.65	324.23	6888.7	38.825
Abo-Al-Khaseb	1.2365	0.3423	0.6826	0.4239	N.D	247.3	342.36	170.65	6613.1	2.986
Al-Sebah	0.4121	0.1141	N.D	0.2119	0.0318	123.6	114.12	68.26	4832.6	2.986
Karon	N.D	0.0570	0.6826	0.2119	0.0318	329.7	228.24	119.45	2416.3	23.892
Al- Fao	0.8243	0.1141	0.6826	0.2119	0.0318	164.8	251.06	221.84	5235.4	47.785
Estuary	0.8243	0.1711	2.559	2.7554	0.0637	164.8	171.18	170.65	4387.5	47.785
N.W. Arabian Gulf	4.121	0.1711	3.413	1.6956	0.1275	206.0	148.35	85.325	4048.4	23.892

*Adopted from Al-Saad (2006)

Table (8): Trace metal concentrations in muscle of fish (µg/g dry weight) from Iraqi and NW Arabian Gulf in comparison with word wide average concentration and polluted site

location	Cd	Co	Cr	Fe	Mn	Ni	Pb	V	Zn	Source
Shatt Al-Arab estuary	ND	0.30	ND	43.9	1.40	4.16	0.33	1.73	2.93	Al-Saad *et al.,* (1997)
Khor Al-Zubair	0.90	-	-	51.5	1.70	6.00	3.90	5.40	16.3	Al-Edanee *et al.* (1991)
Shatt Al-Arab	0.10	0.60	4.50	60.5	7.30	-	0.46	1.00	13.0	Abaychi and Douabul (1988)
Shatt Al-Arab	ND	0.11	-	-	0.09	0.36	0.05	0.22	5.70	Al-Khafaji (2005)
Kuwait	0.80	0.40	0.60	148	2.00	0.60	1.40	1.00	70.0	Anderlini *et al.*(1982)
Arabian Gulf	0.05	1.20	0.80	55.2	6.90	4.80	0.50	4.60	10.7	Abaychi and Douabul (1988)
Kuwait	0.35	0.04	0.14	12.5	0.52	-	0.27	0.07	20.0	Fowler *et al.,*(1993)
World wide	0.10	0.20	0.10	50.0	10.0	1.00	3.00	1.00	80.0	Bryan (1978)
Polluted	0.92	-	8.90	-	3.90	7.80	20.1	-	517.8	Dallinger and Kautzky (1985)
Shatt Al-Arab Estuary & NW Arabian Gulf	0.50-2.03	0.38-2.31	-	4.72-89.76	1.38-5.52	0.50-3.05	1.26-25.30	-	1.22-22.98	Present study

In the Shatt Al-Arab Estuary, element inputs may be fluctuated through time. A principle factors causing these fluctuation is the fact that the estuary receive agricultural and civilian wastes, as well as, the amount of untreated sewage have increased in last decade due to increase civilian activities in the region. Since element concentration in these wastes are highly fluctuate, the corresponding levels in sbour may rapidly responded to these variations.

On other hand, trace elements are contributed to the region environment through Aeolian dust, this source is important considering that the south of Iraq is a major dust fallout region. (Mustafa *et al.,*1995). The presence of Ni in the muscles of sbour could be affected by the water and sediment of the Estuary which could be attributed to petroleum rich area (Al-Saad *et al*., 1997), while the levels of Pb may be referred to exhaust of vehicle which used leaded fuel. It is expected that the anthropogenic source is mainly due to industrial and commercial activities, gas burning, oil production and transportation.

Al-Hassan (1999) speculated that there are two races of sbour in Iraqi waters- fresh and marine. The test of fish depend on fat contain or flash and there are many study showed that the fat contain of sbour was differ from shatt Al-Arab river to North west Arabian gulf; so the native people of Basrah can distinguish by taste sbour caught in the estuary and those caught in the Shatt Al-Arab River. It is well known in Basrah that sbour of Shatt Al-Arab River are tastier and yield a higher price than sbour from the sea. This taste difference may suggest the presence of two separate races in the area. To check this contention, morphological and biochemical studies should he conducted. Biochemical studies are more reliable than morphological studies because the latter can be affected by environmental rather than genetic factors. In biochemical studies, the genetic makeup of the stock can be reviewed and stocks can be discriminated.

Therefore, it can be concluded that low levels of hydrocarbons were observed in *T. illisha.* This may be because fish can avoid oil spill and/ or rapidly depurate or metabolize oil, while n-alkanes found in these fish were due to different food source, water mass, feeding pattern, type of habitat, fat content and environmental conditions. The concentrations of trace elements studies are acceptable although there was slight increases in the concentrations of some of these metals. The concentration of both hydrocarbons and trace metals dose not represent a hazard on human health.

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أخذ وطرح الملوثات من قبل أسماك الصبور Hilsa shad *Tenualosa ilisha* (Hamilton-Buchanan) المجمعة من مناطق جنوب العراق

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المستخلص

رحلة التكاثر لسمكة الصبور Hilsa shad تبدى مبكرا خـلال بدايـة شهر آذار حتى نهاية تشرين الأول، لكن العدد الأكبر يهـاجر بـين نيـسان وحزيران. جمعت نماذج الأسـماك مـن منـاطق مختلفـة (مـصب شـط العرب،شمال غرب الخليج العربي واهوار وادي الرافدين)، صممت الدراسة الحالية للتعرف على قدرة الصبور على امتصاص وتركيز الملوثات ولبلـوغ هذا الهدف جمعت نماذج الأسماك وبأعمار مختلفة حيـث عزلـت أنـسجة العضلات والمناسل وجففت باستخدام التجفيف بالتجميد بعدها تم اسـتخلاص بقايا المواد العضوية وفحصت بالمطياف الضوئي، وكروماتوغرافية الغاز أما العناصر النزرة ففحصت بمطياف الامتصاص الذري بعـد هـضم العينـات باستخدام الأحماض القوية. أظهرت نتائج الدراسة الحالية احتـواء الـصبور على تراكيز معتبرة من الهيدروكاربونات المشتقة من مصادر متنوعة، بينما كانت تراكيز العناصر النزرة مقبولة رغم الارتفاع البسيط في بعض العناصر وكلا التركيزين غير مضران لصحة الإنسان.