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EVALUATING THE FISH STRUCTURE COMMUNITY AT EUPHRATES RIVER NEAR AL-HINDYAH BARRIER, BABYLON PROVINCE, IRAQ

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Abstract

The structure of fish the community was evaluated at before and after near Al-Hindyah barrier at Euphrates River, Babylon Province/ Iraq during the period from June 2017 to May 2018. A total of 2389 specimens belonged to 15 fish species were collected and reached to 461.5 Kg of total weights. These fishes were represented by:-

First station (S1) before Al-Hindyah Barrier represented by a total of 1064 specimens reached to 217.75 kg of total weight. These fishes were represented by 13 species and 12 of them belonged to Cyprinidae and only one specimen belongs to Mugilidae. According to fish occurrence in sampling, there were 4 fish species were be as Resident, other, 5 and 4 species as seasonal and rare respectively. The annual values of fish number, weight and catches were 8.8, 266 and 54.44 Kg /hour respectively. Second station (S2) after Al-Hindyah Barrier about 2389 specimens reached to 461.5 kg in total weight. These fishes represents 15 species belonged to three families, 13 of them for Cyprinidae, one for each Mugilidae and Siluridae. According to fish occurrence in sampling, fish species of 5, 3 and 7 as Resident, Seasonal and Rare respectively. The annual values of fish species, its weight and caches were 10.5, 331.3 and 85.94 Kg /hour respectively. Our conclusion showed that section of Euphrates River after Al-Hindyah Barrier (S2) was suitable and comfortable for fish composition and distribution more than the other one before Al-Hindyah Barrier (S1).

Keywords: Freshwater Fishes, Composition, Distribution, Biodiversity.

Introduction

Aquatic resources play an important role in developing countries, because they not only contribute to the daily livelihood of the population, but also provide significant nutrition for the local communities, as in Southeast Asia (Viet and Sakuramoto, 2012). In the Mesotomopeca, Iraq, people occupy an area of about 750000 he as freshwater local bodies, represented by rivers, lakes, marshes, natural and man- made aquatic systems (Coad, 2010). Fish aquaculture can be done in these water bodies using different methods and technologies. Therefore, this community depends heavily on aquatic resources, which contribute significantly to both the incomes and diets of the population (FAO, 2008). A total of 68 fish species which were recorded in the Iraq freshwater ecosystems; most of these belonged to fish family of Cyprinidae, which illustrated as first class from its species and number (Coad, 2010). All the studies deal with fish distribution, abundance, composition and population dynamics are very important to give us a very clear picture on ecological and nature of fish structure in any ecosystem (Al-Temimy, 2004). These studies were showed and gave information's on fish stock assessments, commercial and non-commercial fishes, as well as, this information which support us to take care of fishes as rich national resources and to be as a basic for our planning for future to reserve this fortune (Sediq and Abbas, 2013). The present search focused on fish structural composition and distribution before and after Al-Hindyah Barrier of Euphrates River.

Materials and Methods

The Study Area

The present study was concerned with Al-Hindyah Barrier located on the Euphrates River south of Al-Mussayab city within the province of Babylon approximately 81 Km southeast of Baghdad. Al-Hindyah Barrier was built since 1911. The longest Barrier was about of 250 m, with discharge of 300 m^3/sec. and this did not include the life of rivers branching from the Euphrates River because of rising agricultural capacity in the countryside of the Euphrates. As well as, provide the Shatt Al-Hilla and Al-Hindyah River water in the dry season. Fishes were sampling from two stations, the first site S1 about 3 km before Barrier upstream, whereas, the second S2 located 3 km downstream after Barrier.

Collection of Fishes

Samples of fishes were collected using gill nets of (90 m) in length, (5 m) in depth and mesh size of (1.5 x 1.5, 3 x 3, 4.5 x 4.5, 5 x 5 and 6 x 6 cm), also, cast net (or Selia as a local name) were used with mesh size of (1 x 1, 1.5 x 1.5 and 2 x 2). Monthly fish catches has been done during the period from June 2014 to May 2015. Fresh samples of fishes were brought to the laboratory of the Fish and Animal Resource Center/ Directorate of Agriculture Research/ Al-Zuafaranyah City/ Baghdad. Fish were examined nearest 0.1 cm and 0.1 gm for both Total Length (TL) and Weight (TW), respectively, and identified according to Beckman (1962) and Coad (2010).

Ecological and Biological Index

Some of water quality as water temperature (C°), dissolved oxygen (mg/l), salt concentration (gm/l) and pH were measured during the period of present study. These properties were done using Water Quality Monitor Horiba/ USA. The groups of fish species were divided depending upon Tyler (1971) method as (l) Resident fish group: fish species was appeared through 9 to 12 months, (ll) Seasonal fish group: fish species was appeared through 5 to 8 months and (lll) Rare fish group: fish species was appeared through 1 to 4 months. The Values of fish biodiversity were calculated

according to the equation of Shannon and Weaver (1949): Diversity Index (H) = - Σ Pi Lo Pi Whereas Pi: number or weight ratio of species from catches.

Results and Discussion

Table (1) indicates that the highest values of some attributes of water quality at the station S1 including ,water temperature from 15.5 to 36.5 ºC with mean value of 27.2 ºC, water salinity from 0.8 to 1.9 gm/l with mean value of 1.3 gm/l and dissolved oxygen from 6.5 to 9.2 mg / l with mean value of 7.8 mg/l, in comparison with the values of the station S2 from 10 to 33.5 C° with mean value of 23.9 ºC for water temperature, from 0.7 to 1.5 gm/l with mean value of 1.13 gm/l for water salinity and from 5.6 to 8.2 mg / l with mean value of 6.9 mg/ l for dissolved oxygen. The mean values for water pH were recorded with slightly minor changes reached to 7.3 for both stations respectively. Our results agree with the study of Al-Emaary (2011) whom noticed that the Euphrates River in the middle of Iraq with good aeration and comfortable for fishes. The fluctuated in water quality characteristic in our results between S1 and S2, such as Temperature, dissolved oxygen, salinity and pH may affected by the Thermal effluents of Al-Mussaib power station which is about 15 km above the Barrier, as well as, the effects of agriculture and human activity, and these are suitable in limit for live and growth for freshwater fishes and may decline the season of growth and reproduction of fishes (Al-Temimy, 2004; Abbas and Al-Rudainy, 2006).

From table (2) we can see that of 15 fish species were cached, belonged to three families, 12 species to *Cyprinidae*, 1 species for each *Mugilidae* and *Siluridae* respectively. The total number of cached fish was 2389 fish with a total weight of 461.5 kg. The highest numbers of fishes recorded were represented by Khishni, *Liza abu* reached 14.8% from total fish cached, followed by Himri, *Barbus luteus* which recorded 12% from total number. Lowest values were recorded by Jirri *Heteropneustes fossilis* and represented by 0.5% from total fish number. The highest weight of catch fish was recorded by Shabbot, *Barbus grypus* and Shilig, *Aspius vorax* which represent 21% and 17.2% respectively from the total cached fished in the study sites. Our present results may agree with some of past local studies were noticed that *Cyprinidae* fish species were the dominant and then decline in fresh water fish species year after year of inland ecosystems in Iraq, (Al-Temimy, 2004; Abbas and Sedik, 2012; Abbas *et al*., 2015). However, the absents of fish numbers and species may affects by temperature which effect directly as a result of changing in climate and decreases in the quality and quantity of available food and the structural of river sediment (Ross *et al*., 2003).

Table (3) illustrated that the first station S1 before the Barrier represented by 1064 fishes reached 217.75 Kg in the total weight, of these, the dominance in fish number abundance of 13.5% was for *Barbus luteus* and for fish total weight abundance of 21.8% for *Barbus grypus*, whereas, the lowest values in number and weight abundance were recorded by *Chondrostoma regium* of 1.3% and 0.6% respectively, while from table (4) a total of 1325 fishes with a total weight of 243.75 Kg were collected from the station S2 after the Barrier, of these *Liza abu* was the dominance species by number reached 15.1%, whereas, fishes of *Barbus grypus* was the dominance in weight abundance with of 20.3%. The lowest values for number and weight abundance were recorded by *Acanthobrama centisquama* with 0.4% and 0.2% respectively. These results indicate that the fish number and weight in the station S2 is improved more than station S1, as well as, station S2 is may be as a point of fish occurrence for feeding or reproduction. As shown from tables (3 and 4) the heights sex ratio (male: female) of 1:2 were recorded by *Carassius carassius* and *Alburnus caeruleus* respectively and the lowest ratio of 1: 0.33 by *Alburnus caterulus* before Barrier (S1), whereas, at S2 after the Barrier the highest was 1: 2.8 recorded by *Barbus belayewi* and the lowest was 1: 1.5 shown by *Barbus esocinus*.

Fu *et al.* (2003) noticed that the number of species and its weight are affect by river hydrology and Dams which building on Yangtze River in China, that is perhaps since availability of the food. These results lead us to thought that the structure of fish community before and after Al-Hindyah Barrier may depend fish life cycle. Abbas *et al.* (2015) indicate that the fluctuation and reduction in fish community near the Tigris River before Al-Kut Barrier was belonged to fluctuation of available nutrients, hydrological alterations of this River part and the method of fishing. Our results here in different case cause the river basin affected by the thermal effluents of Al-Mussaib power station which increase water temperature about 5 to 10 °C compared with the other rivers. These increments in water temperature provide life cycle for different fish size during abundant in number and weight at colder and warmer seasons, and/ or from upstream to downstream depend on availability of food and effect of barrier with escaping in fish number and species which is moved up stream by negative effect during summer (Al-Temimy, 2004), and this may nearest by our results. Jim and Cooper (2006) illustrated that the sex ratio were always affected by water temperature, dissolved oxygen and salt concentration as a limited factors for freshwater fishes for feeding and for reproductive, for this, a suitable conditions of water was provided performance niches for fish hatchery. These, may be agree with our results at the section of Euphrates River after Al-Hindyah Barrier (S2).

According to Tyler (1971) fish species occurrence were shown in tables (5 and 6). These fish species were distributed for three groups. From station S1 before the barrier, fishes of resident group were represented by three species (*Liza abu*, *B. grypus* and *Cyprinus carpio*), fishes of seasonal and rare groups by five species (*Barbus luteus*, *Aspius vorax*, *B. belayewi*, *B. xanthopterus* and *B. barbulus*) and (*Carassius carassius*, *Cyprinion macrostomus*, *Alburnus caetuleus*, *Acanthobrama centisquama* and *Chondrostoma regium*) respectively. Whereas, fish species from station S2 after barrier were represented by five species as resident group (*Liza abu*, *B. grypus*, *B. belayewi*, *Cyprinus carpio* and *B. barbulus*), three species as seasonal group (*Barbus luteus*, *Aspius vorax* and *B. xanthopterus*) and finally, seven species as rare group (*Carassius carassius*, *Cyprinion macrostomus*, *Alburnus caeruleus*, *Acanthobrama centisquama*, *Chondrostoma regium*, *Hetaropneustes fossilis* and *B. ssocinus* . Fu *et al*. (2003) showed that the absence and presence in fish number and species at Yangtze river basin of China were differed from place to place, and fish species occurrence were affected Upper of dams compare with the basin river after it. Also, Pouilly *et al*. (2006) related that the fluctuation in fish number and species at Amazon basin river in Bolivia was affected by the reduction of water

felicity , river regression and increment in water temperature. Our results are nearest of the study of Al-Temimy (2004) whom noticed that fish community structure depending on fish migration for feeding or productivity, and fishes species were always moved upper of Al-Mussaib power station at Tigris river north of Al-Hindyah Barrier escaping from increasing in water temperature during autumn and summer seasons. So, we can see that resident fish species were founded at S2, while, most of species were be as seasonal and rare. These results advocated continuing attempts to check species loss but, in many situations, urge adoption of a compromise position of management for ecosystem functioning and resilience, and human livelihoods in order to provide a viable long-term basis for freshwater conservation (Petesse *et al*., 2007).

From the results of tables 7 and 8, fishes were raised in number and species in its community nearest Al-Hindyah Barrier at Euphrates river during spring at stations S1 (10 and 394 respectively) and S2 (13 and 432 respectively). Whereas, the reduction was founded during summer at the same study stations. As well as, fishes of total cached was 85.94 Kg\h at station S2 that is more than station S2 which recorded 54.44 kg\h. These, certainly may due to the changes of climate and differences in the water temperature between seasons. In the biological and physiological of aquatic organisms, fishes always run away and try to find comfortable deep zoon or places which not affected by water heating during warm months (Stuart *et al*., 2008). Also we were saw that the total cached of fishes before barrier less than after the barrier, this may due to the barrier itself which not allowed these fished to accrues and pass from site to site (Abbas *et al*., 2015). So, fish species up of aquatic reservoir were restricted and may exposed for fishing or escaping from this place toward north of this water restriction (Ibanez *et al*., 2007), and this may agree with our case.

In order to table (9), the weights values of fish's biodiversity were recorded at S2 after Barrier at Euphrates River and reached for fish number of 2.5, fish weight of 2.4 and for species of 2.5 during spring season. A fish biodiversity value has always changed depending on river hydrology, water temperature and available food of any aquatic ecosystems (Pouilly *et al*., 2006). Our results showed that fishes of S2 after Barrier was improved and a best case from fishes at S1 after barrier. Theses fishes may restricted and depending on water depth of river, which may exposed to fishing by fisherman cached or removing toward north of river to meet the harmful thermal effluents of Al-Mussaib power station (Abbas and Al-Rudainy, 2006) .

Our study was indicated that fish distribution and composition were affected by Al-Hindyah Barrier at Euphrates River in the present sites. However, fishes in its community were best and within comfortable situation after Al-Hindyah barrier station S2 in comparison with station S1 before it. The data of our results will help maximize the efficiency of future fish ways against a series of determine performance criteria.

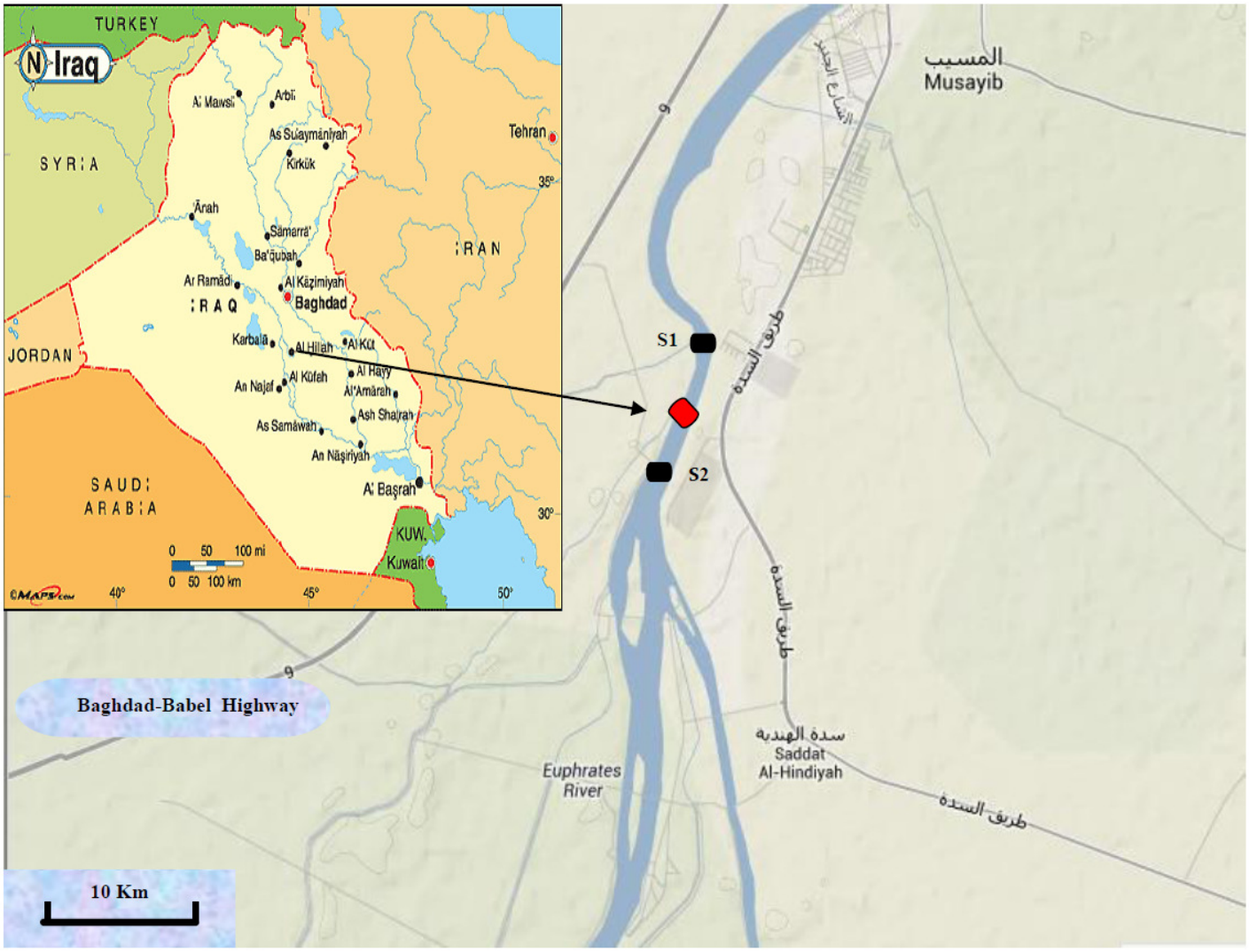

Fig. 1: A Map of Study Area at Euphrates River near Al-Hindyah Barrier

Table 1: Some of Water Quality of Euphrates River before (S1) and After (S2) Al-Hindyah Barrier from June 2017 to May 2018

pH		Salt Conc. (gm/l)		Dissolved Oxygen (mg/l)		Water Temp. (C°)		Factors
Stations		Stations		Stations		Stations		Months
S2	S1	S2	S1	S2	S1	S2	S1	
7.9	8.1	1.3	1.8	7	6.2	31.5	34.5	June 2017
7.6	7.8	1.3	1.9	6.5	5.9	33.5	36.5	July
7.7	7.7	1.5	1.8	6.7	5.7	32.5	35.5	August
7.5	7.2	1.4	1.6	6.9	5.6	30.5	31.5	September
7.3	7.5	1.2	1.5	7.5	6.5	25.5	26.5	October
6.9	7.0	1.0	1.3	8.5	6.8	22	23.5	November
6.8	6.8	0.9	1.1	8.7	7.1	17.5	18.5	December
6.5	6.7	0.7	1.0	9.2	7.8	**10**	15.5	January 2018
6.8	6.9	0.8	0.8	9	8.2	12	17.7	February
7.2	7.2	1.1	0.9	8	8.1	18	21.5	March
7.4	7.4	1.1	1.2	7.7	7.9	25	25.6	April
7.6	7.7	1.2	1.2	7.3	7.5	29	30.5	May
7.3 ±0.5	7.3± 0.6	1.13 ± 0.3	1.3 ± 0.5	7.8 ± 1.2	6.9 ± 1.1	23.9± 9.7	27.2 ±7.5	Mean value± SE

Table 2: Scientific and common name of Fishes collected at Euphrates River before and after Al-Hindyah Barrier During June 2017 to May 2018.

Family	Scientific name	Common name	Fish No.	%	Total weight (Kg)	%
Mugilidae	*Liza abu* (Heckel,1843)	Khishni	344	14.8	35.5	7.7
Cyprinidae	*Barbus luteus* (Heckel,1843)	Hemmri	301	12	43	9.3
	Aspius vorax Heckel,1843	Shiliq	278	11.4	79.5	17.2
	B. grypus Heckel,1843	Shaboot	264	11.5	97	21
	B. belayewi Menon,1956	Tuainy	246	11.9	40.5	8.8
	Cyprinus carpio Linnaeus,1758	Common carp	240	10.5	72.5	15.7
	Carassius carassius	Carsin	231	6.8	37	8
	Cyprinion macrostomus Heckel, 1843	Bonaini kabeer alfam	208	9.1	10	2.2
	B. xanthopterus (Heckel, 1843)	Guttan	71	3.1	19	4.1
	Alburnus caeruleus	Lasafa	61	2.3	2.5	0.6
	B. barbulus Heckel, 1849	Abu-baratum	53	2.7	12.5	2.7
	Acanthobrama centisquama Heckel,1843	Aganthbrama	43	1.1	2	0.4
	Chondrostoma regium (Heckel, 1843)	Baloot maluki	30	1.6	2	0.4
	B. ecosinus (Heckel,1843)	Biz	14	0.7	4	0.9
Siluridae	*Heteropneustes fossilis* (Bloch,1794)	Jirri (Abuelzumair)	5	0.5	4.5	1.0
Total	15 Pisces		2389		461.5	

Table 3: Fishes Collected from Euphrates River before Al-Hindiyah Barrier from June 2017 to May 2018

Scientific Name	Fish No.	Abundance (%)	Total weight (Kg)	Abundance (%)	Sex		
					♂	♀	ratio*
Barbus luteus	144	13.5	20.5	9.4	60	84	1: 1.4
Liza abu	138	13	15.5	7.1	21	26	1:1.23
Aspius vorax	123	11.6	40.5	18.6	46	26	1:0.56
Barbus grypus	119	11.2	47.5	21.8	41	43	1:1.04
Barbus belayewi	108	10.2	20	9.2	46	33	1:71
Cyprinus carpio	106	10	31.5	14.5	41	33	1:0.8
Carassius carassius	101	9.5	17.5	8.0	23	45	1:2
Cyprinion macrostomus	93	8.7	6.5	3.0	22	24	1:1.1
Barbus xanthopterus	35	3.3	7.5	3.4	4	2	1: 0.5
Barbus barbulus	33	3.1	6.5	3.0	7	5	1:0.71
Alburnus caeruleus	28	2.6	1.5	0.7	3	1	1:0.33
Acanthbrama centisquma	21	2	1.5	0.7	2	4	1:2
Chondrostoma regium	15	1.3	1.25	0.6	3	3	1:1
13 Pisces	1064		217.75				

(♂): male, (♀): female, sex ratio*: male: female

Table 4: Fishes Collected from Euphrates River after Al-Hindiyah Barrier from June 2017 to May 2018

Scientific name	Fish No.	Abundance (%)	Total weight (Kg)	Abundance (%)	Sex		
					♂	♀	ratio*
Liza abu	200	15.1	20	8.2	30	60	1:2
Barbus belayewi	163	12.3	20.5	8.4	25	70	1:2.8
Carassius carassius	155	11.7	19.5	8.0	24	50	1:2.1
Barbus grypus	145	10.9	49.5	20.3	22	54	1:2.45
Aspius vorax	138	10.4	39.0	16.0	35	75	1:2.14
Cyprinus carpio	134	10.1	41.0	16.8	28	70	1:2.5
Barbus luteus	130	9.8	22.5	9.3	18	33	1:1.83
Cyprinion macrostomus	115	8.7	3.5	1.4	12	28	1:2.33
B. xanthopterus	36	2.7	11.5	4.7	24	52	1:2.16
Barbus barbulus	28	2.1	6.0	2.5	16	30	1:1.87
Alburnus caeruleus	25	1.9	1.0	0.4	4	7	1: 1.75
Chondrostoma regium	22	1.7	0.75	0.3	6	10	1:1.66
Barbus esocinus	15	1.1	4.0	1.6	2	3	1:1.5
Heteropneustes fossilis	14	1.1	4.5	1.9	3	5	1:1.66
Acanthobrama. centisquma	5	0.4	0.5	0.2	1	2	1:2
15 Pisces	1325		243.75				

(♂): male, (♀): female, sex ratio*: male: female

Table 5 : Monthly Occurrence Concerning Fish Species Collected from Euphrates River before Al- Hindiyah Barrier from June 2017 to May 2018

Fish Species	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Group
Liza abu	+	+	+	+	-	-	-	-	-	-	+	+	*
Barbus luteus	+	+	+	+	-	-	-	-	-	-	+	+	**
Aspius vorax	+	-	-	+	-	+	+	+	+	+		+	**
Barbus grypus	+		+		+	+	+	+	-	+	+	+	*
Barbus belayewi	+	+		+	-	-		+	-	-	+	+	**
Cyprinus carpio	+	+	+	+	-	-	+	+	+	+		+	*
Carassius carassius	-	-	-	-	-	-	-	-	-	-	-	-	***
Cyprinion macrostomus	-	-	-	-	-	-	-	-	-	-	-	-	***
Barbus xanthopterus	+	+	+	+	-	-	-	+	+	+	-	-	**
Alburnus caeruleus	-	-	-	-	-	-	-	+	+	-	-	-	***
Barbus barbulus	-	-	-	-	-	-	+	+	+	+	+	-	**
Acanthbrama centisquma	-	-	-	+	+	+	-	-	-	-	-	-	***
Chondrostoma regium	-	-	-	-	-	-	-	-	-	+	+	-	***

+ : Occurrence; - Not occurrence Fish Group: *= Resident, **= Seasonal and ***= Rare

Table 6: Monthly Occurrence Concerning Fish Species Collected from Euphrates River after Al- Hindiyah Barrier from June 2017 to May 2018.

Fish Species	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Group
Liza abu	+	+	+	+	+	+	+	+	+	+	+	+	*
Barbus luteus	-	+	+	+	+	-	-	+	+	-	-	+	**
Aspius vorax	+	+	+	+	-	-	-	-	+	+	-	+	**
Barbus grypus	+	-	+	-	-	+	+	+	+	+	+	+	*
Barbus belayewi	+	+		+	+	+	-	+	-	+	+	+	*
Cyprinus carpio	+	+	+	+	-	-	-	-	-	-	+	+	*
Carassius carassius	-	-	-	-	-	-	-	-	+	-	+	-	***
Cyprinion macrostomus	-	-	-	-	-	-	+	-	+	-	-	-	***
Barbus xanthopterus	+	+	-	+	-	-	-	+	+	+	+	+	**
Alburnus caeruleus	-	-	-	-	-	-	-	-	-	-	+	+	***
Barbus barbulus	+	+	-	-	-	-	-	-	-	-	+	+	*
Acanthbrama centisquma	-	-	-	+	+	+	-	-	-	-	-	-	***
Chondrostoma regium	+	-	-	-	-	-	-	-	-	+	+	+	***
Heteropneustes fossilis	-	-	-	-	-	-	-	-	+	-	+	-	***
Barbus esocinus	-	-	-	-	-	-	-	-	-	+	-	+	***

+: Occurrence; - Not occurrence Fish Group: *= Resident, **= Seasonal, ***= Rare

Table 7 : Seasonal Changes in Fish Number, Species and Catches from Euphrates River before Al-Hindiyah Barrier from June 2017 to May 2018.

Season	Water Tem. (C°)	No. of Fish Species	No. of fish catches	Fish Catches (Kg /hour)
Summer 2017	35.5	7	162	27
Autumn	27.5	8	308	55.75
Winter 2017- 2018	17.2	9	200	50
Spring	25.9	10	394	85
Annual value	26.5	8.8	266	54.44

Table 8 : Seasonal Changes in Fish Number, Species and Catches from Euphrates River after Al-Hindiyah Barrier from June 2017 to May 2018

Season	Water Tem. (C°)	No. of Fish Species	No. of fish catches	Fish Catches (Kg /hour)
Summer 2017	32.5	9	217	64
Autumn	26	9	321	96
Winter 2017- 2018	13.2	11	355	79
Spring	24	13	432	104.75
Annual Value	23.9	10.5	331.3	85.94

Table 9 : Biodiversity Values of Fish Number, Weight and Species at Euphrates River near Al-Hindiyah Barrier from June 2017 to May 2018.

Season	Before Barrier (S1)			After Barrier (S2)		
	Fish No.	Fish Weight	Fish Species	Fish No.	Fish Weight	Fish Species
Summer 2017	1.9	1.2	1.7	2.2	1.6	1.98
Autumn	2.1	1.5	2.1	2.3	1.8	2.2
Winter 2017- 2018	2.2	1.7	1.98	2.4	2.1	2.3
Spring	2.5	2	2.3	2.5	2.4	2.5

References

Abbas, L.M.; Abu-Elheni, A.J. and Radhy, A.G. (2015). Fish Community of Tigris River before Al-Kut Barrier, Southern Baghdad, Iraq. Journal of Chemical, Biological and Physical Sciences (JCBPS); Section B, 5(2): 1639 – 1645.

Abbas, L.M. and Al-Rudainy A.J. (2006). Ecology and Biology of Two Freshwater Fish Species in Euphrates River, Middle of Iraq. Proceedings of the International Conference on Underwater System Technology: Theory and Applications 2006 July 18-20, Penang, Malaysia. 28-37.

Abbas, L.M. and Sediq, S.O. (2012). Some Biological Indexes of Fish Community at Dukan Lake, North of Iraq. Basrah J. Agric. Sci., 25 (Special Issue 2): 228-241.

Al-Emmary, M.J. (2011). Some of Biological and Ecological Aspect Study For Fish Community at Al-Hilla River /Iraq. Ph.D. Thesis. College of Science. University. 141.

Al-Temimy, L.M. (2004). Ecology, biology and assessments of fish community in Euphrates River Near Al-Mussaib Power Station. Ph.D. Thesis, Agriculture Colle. Basrah Univ. 147 pp.

Beckman, C.W. (1962). The freshwater fishes of Syria and their general biology and management. FAO, Fishes. Biol. Tech., No. 8, Fisheries Div. Biology;

Coad B.W. (2010). Freshwater fishes of Iraq. Sofia, Bulgaria, Pen soft Publishers, 273.

Food and Agriculture Organization (2008). Freshwater Lakes of (RDC) Congo in Africa. FAO: www.fao.org-

Fu, C.; Wu, J.; Wu, Q.; and Lei, G. (2003). Freshwater fish biodiversity in the Yangtze River basin of China: patterns, threats and conservation. Biodiversity and Conservation, 12(8): 1649-1685.

Ibanez, C.; Oberdorff, T.; Teugels, G.; Mamononekene, V.; Lavoué, S.; Fermon, Y.; Paugy, D. and Toham, A.K. (2007). Fish assemblage's structure and function along environmental gradients in rivers of Gabon (Africa), Ecology of Freshwater Fish, 16(3): 315–334.

Jim, B. and Cooper, M.M. (2006). The Murray River's 'Sea to Hume Dam' fish passage program: Progress to date and lessons learnedEcological Management & Restoration 7(3): 173–183.

Petesse, M.L.; Jr, M.P. and Spigolon, R.J. (2007). Adaptation of the Reservoir Fish Assemblage Index (RFAI) for assessing the Barra Bonita Reservoir (São Paulo, Brazil), River Research and Applications 23(6): 595–612.

Pouilly, M.M.; Barrera, S. and Rosales, C. (2006). Changes of taxonomic and trophic structure of fish assemblages along an environmental gradient in the Upper Beni watershed (Bolivia), Journal of Fish Biology, 68(1): 137–156.

Ross, R.M.; Bennett, R.M.; Snyder, C.D.; Young, J.A.; Smith, D.R. and Lemarie, D.P. (2003). Influence of eastern hemlock (*Tsuga canadensis* L.) on fish community structure and function in headwater streams of the Delaware River basin. Ecology of Freshwater Fish, 12(1): 60–65.

Sediq, S.O. and Abbas, L.M. (2013). Fish Community Structural in Dukan Dam Lake, Northern Iraq, Jor. of Iraqi Veterinary Medicine, 37(1): 6-12.

Shannon, C.E. and Weaver, N. (1949). The mathematical theory of communication. University of Illinois Press, Urbana, IL

Stuart, I.G.; Zampatti, B.P. and Baumgartner, L.J. (2008). Can a low- gradient vertical-slot fish way provide passage for a lowland river fish community? Marine and Freshwater Res; 59(4), 332–346.

Tyler, A.V. (1971). Periodic and resident components in communities of Atlantic fishes. J. Fish. Res. Bd. Canada; 28: 935-946.

Viet, T.V. and Kazumi S.K. (2012). Population Dynamics of *Metapenaeus ensis* (Decapoda: Penaeidae) in a Coastal Region of the Mekong Delta, Vietnam. Asian Fisheries Science 25 :1-14.