



# Structure and Distribution of Fish Community in Middle of Hamrin Dam Lake

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**Abstract:** The nature of structure and distribution of the fish community in the middle of Hamrin Dam lake was studied for the period from July 2020 to April 2021. The lowest temperature was 12.6 m in February and the highest temperature was 34.3°C in August 2020. Furthermore, the lake water was characterized as freshwater, and the lowest salinity was 0.16 g/l during February and the highest 0.38 g/l in September. The levels of dissolved oxygen were high, with highest concentration of 12.5 mg/L in December 2020, while the lowest was 7.4 mg/L in July 2020. A total of 5762 with a total weight of 979.4 kg were collected, where these fishes were represented by 23 species of fish belong to six families. The dominant commercial fishes 13 species were recorded with a total weight of 703.0 kg formed 71.8% of the total fish catches. However, the rest was non-commercial species (10 species) with total weights of 276.4 kg, which represented 28.2% of total fish catches. The fish *Planiliza abu* ranked the first in terms of numbers with 11.7%, followed by the common carp *Cyprinus carpio* by 10.8%, then *Mesopotamichthys sharpeyi* by 8.4%, and the *Luciobarbus xanthopterus* by 8.3%. In terms of weights, the *Silurus triostegus* was ranked the first with 23.7%, followed by *Luciobarbus xanthopterus* by 18.6%, and *Cyprinus carpio* fish by 10.9% ranked third. The *Cyprinion macrostomus* recorded and the lowest numbers by 0.1% and the lowest weights 0.01% of total fish catches. The study indicate that the waters of the Hamrin Dam lake are freshwater, good airing, and there are abundant numbers and weights of commercial fish.

**Keywords:** Fish community, Hamrin Dam lake

The fish has high percentage of animal protein estimated at 15-20% (Fagbenro et al 2005) and is nutritionally balanced because it contains a percentage of fats and essential amino acids such as methionine, lysine, vitamins, and an important source of minerals such as calcium, iron, iodine, zinc, and phosphorous and unsaturated fatty acids (Farhan et al 2015). Fish are one of the largest groups within the animal kingdom, as this group includes about 1000 economic species that are used in food production (Yesser et al 2013). Water temperature affects the physiology and behavior of aquatic organisms and is considered one of the important environmental factors determining its abundance and diversity, especially in fish, as well as affects the physical, chemical, and life characteristics. Temperature controls the metabolic rate and growth rate, which is the main factor behind all aspects of life and its conditions (Silvano et al 2000). Hamrin Lake is one of the largest and most important freshwater lakes in Iraq, Determine the types of fish in the lake and the amount of monthly and total catch for each type of fish, determine the prevalent, seasonal, and rare species, come up with a database on the preparation, lengths and weights of different fish and determine the means of fishing used.

## MATERIAL AND METHODS

Hamrin Dam Lake is in the Diyala Governorate in eastern Iraq, 120 km northeast of Baghdad. The lake can accommodate two billion and 400 million cubic meters. The lake belongs to the Hamrin Dam, which is located on the Alwand River in Diyala Governorate. The main sources of water revenue for the reservoir are the Diyala River, the Alwand River, and the seasonal natural valleys.

**Samples collection:** Water and fish samples were collected from Hamrin Dam lake once a month for a period starting from July 2020 to April 2021 during the morning hours at the middle of each month, where specific physical and chemical properties of the water were measured (30 cm depth from the surface layer of the lake) (Table 1). The air and water temperature were measured using a simple mercury thermometer. Both pH and the electrical conductivity of water was measured using pH type 9811 HI, and Ec -TDS Meter. Conversely, the concentration of water salinity was measured using the following equation:

$$\text{Salinity (g/L)} = \text{Electrical conductivity } (\mu\text{S/cm} \times 0.00064)$$

The Secchi disk was used to measure transparency, and the dissolved oxygen concentration was measured using an oxygen meter. Various types and sizes of nets were used for

fishing, including the gill net, with dimensions of 4 x 100 m , the mesh size ranged between 2.5 to 10 cm) and cast net with a diameter of 2 m and the mesh size 1.5 cm and 2.5 cm. Fishing operations were carried out by 3 throws for 6 hours (at the rate of throwing nets 2 times for every two hours) for 8 km. The Seine net was used by two Seine for an hour and 15 minutes for each Seine, as they were 250 meters in length and 6 meters in height at the middle, and 4 meters at the ends. A fishing boat with a length of 4.5 m, a width of 1.80 m, and a motor of 40 horsepower was used, considering the stability of the same fishing effort (numerically or by weight) in the fishing area during the study period, which was expressed as kg/hour. The total length (TL) were measured Numerical abundance and weight were calculated using percentages of number or weight per month and season.

### RESULTS AND DISCUSSION

The highest water temperature was in August, 34.3°C and the lowest water temperature in February (12.6°C) for the year 2021. The current study results agreed with most of the previous studies conducted on the Tigris River that the highest water temperature in the river is during the hot months and the lowest degree is during the colder months (Al-Sultany 2014). Mahmoud et al (2018) mentioned that the climate has a significant impact on the water temperature in addition to the current speed, as the temperature increases in stagnant places due to the long period of exposure to sunlight, unlike running water. Temperature is an environmental factor that interacted with the growth, reproduction, nutrition, presence, and abundance of species (Taher et al 2011). Similarly, water temperature ranges ranging from 11-30°C were recorded in Lake Habbaniyah (Al-Rudaini et al (1999). Seasonal changes in water temperature

are considered suitable for fish living and were within the appropriate ranges that fish can tolerate. Likewise, it is consistent with many previous local studies of inland water bodies (Al-Tamimi 2002, Salman 2013). The pH was lowest in July 7.4, while the highest 8.9 in January 2021. The current results indicate that the monthly changes in the pH values of the Lake Hamrin waters were close to the results of many previous local studies that indicated the light or semi-neutral basicity of inland waters (Al-Rudaini 2010, Salman 2013). Most studies indicated that the Tigris River waters are neutral, tending slightly to alkaline, where the slight fluctuation in the pH degree is related to the concentration of gases dissolved in the water such as carbon dioxide, hydrogen sulfide, and ammonia, which usually ranges in most natural waters between 4 to 9 (Al-Tamimi 2000). The pH in the current study slight changes t in the different months, were within the appropriate and harmless limits for fish, which ranged from 6.5 to 8.5. Salinity concentration ranged between 0.16 g / l in February 2021 to 0.38 g / l in September 2020, The fluctuation of water salinity concentration in Hamrin Dam lake in indicate the season of cold and warm months and its rise in the season of hot months is due to the variation in water temperatures in this season. In addition, rising water levels are caused by the rains in the winter season and the beginning of the spring season, causing water salinity to be diluted. Either, the high temperature in the summer season and an increase in the rate of water evaporation as well as an increase in agricultural and industrial activities whose waste flows into the rivers feeding the lake itself, leads to increase in its concentration. Salman (2013 ) recorded the lowest value of salinity in February 0.15 and the highest in August 0.33 in Lake Dukan Dam and these results are consistent with the

**Table 1.** Physical and chemical properties of water in Hamrin Dam lake

Properties/Month	Water temperature (°C)	pH	Salinity concentration (g/L)	Transparency (cm)	Dissolved oxygen concentration (mg/L)
July 2020	33.5	7.4	0.36	49.2	7.4
August	34.3	8.2	0.35	52.0	7.7
September	32.2	8.2	0.38	54.3	7.5
October	28.0	8.2	0.26	42.0	8.4
November	27.0	8.1	0.24	38.3	9.5
December	25.5	7.8	0.21	36.2	12.5
January 2021	14.4	8.9	0.19	32.8	12.0
February	12.6	7.8	0.16	42.3	11.2
March	26.0	7.9	0.17	37.4	9.4
April	29.0	7.9	0.20	34.2	8.1
Range	12.6-34.3	7.4-8.9	0.16-0.38	32.8-54.3	7.4-12.5
Average	26.3±2.3	8.1±0.1	0.26±0.25	2.4±41.9	9.4±0.6

current study. On the other hand, the monthly and locational changes of water transparency values for Hamrin Dam Lake throughout the study period showed that the highest value of water transparency was 54.3 cm in September 2020 and the lowest of 32.8 cm in January 2021. The low values of water transparency are due to the lake effect, consequently, the suspended clay material increases, and the lake level varies from the rise and decrease in the amount of water in it during the seasons of the year, in addition to the temperature. Water transparency is related to the density of suspended and dissolved substances, the movement of the water column, light intensity, and the prevailing weather condition (Hadjmtsis et al 2006). The highest value of dissolved oxygen was recorded in December, which was 12.5 mg/l, while was 7.4 mg/l in July. The 5762 fish were caught with a total weight of 979.4 kg, and 23 species of fish were recorded belonging to 6 families. Cyprinidae family formed the largest proportion with 16 species by 76.92% of the total catch. The Cichlidae and Bagridae family recorded 2 species, while the families of Mugilidae, Siluridae, and Mestacembelidae represented one species (Table 2). The current study agreed with that different local environments dominated by the Cyprinidae family (Wahab 2013).

The *Planiliza abu* fish dominated numerically with 11.7% of the total fish catches, followed by *Cyprinus carpio* by 10.8%, and *Barbu sharpeyiy* 8.4%, and the *Luciobarbus xanthopterus* (8.3%) (Table 3). The *Silurus triostegus*, dominated by weight with 23.7%, followed by the *Luciobarbus xanthopterus* fish by 18.6%, then *Cyprinus carpio* by 10.9%, and *Aspius vorax* 10.5% of the total fish catches.

Some local studies dealt with the types of fish caught according to their numbers and weights for different water bodies, in which the *Planiliza abu* and *Carassius auratus* exceeded in terms of number by 39.6 and 24.7%, respectively. The weight dominance of common carp and goldfish was 43.2% and 23.5%, respectively (Al-Radini et al 1999). Fish are caught in different quantities and seasons of the year and from one site to another, and this is due to several factors, the most important of which are the different fishing methods used locally, the time and place of fishing, and the different environments. The monthly changes of the types, numbers, and weights of fish caught in Hamrin Dam lake throughout the study period given in Table 4. Thus, the types of fish fluctuated in the fishing samples throughout the study period, where 15 species of fish were recorded as the lowest number in September of 2020, while the number of fish increased to 20 species in April of 2021. The lowest number of fish caught was 490 fish by 8.5%, in February 2021, and the highest number of fish caught was 644,

representing 11.2% of the total catch. The monthly weight of the fish caught recorded the lowest total weight of 87.6 kg in August 2020, which represented 8.9% of the total fish catch. The fish weight returned to 114.9 kg in April of 2021 and was 11.7% of the total catch. The current results indicate that there are clear changes and fluctuations in the numbers and weights of fish caught throughout the study period. Al-Rudaini et al (2001) in the Haditha Dam Lake and Al-Rudaini (2009) in the Radwaniya Lake, recorded superiority in the number of fish caught for the hot months, especially July and August, respectively, in terms of the number of species, numbers of fish and their weight. The results explained the presence of all types of resident fish that were dominant in the monthly fishing samples for the season of high-water temperature and increased feeding activity. The number of fish caught is usually high in the warm months in Iraqi rivers.

The total quantity of fish caught was distributed among commercial species 13 species, and it was characterized by

**Table 2.** Types of fish caught in Hamrin Dam lake

Local name of the species	Scientific name	Family
Common carp*	<i>Cyprinus carpio</i>	Cyprinidae
Bunni*	<i>Mesopotamichys sharpeyi</i>	
Yellowfin barbell*	<i>Luciobarbus xanthopterus</i>	
Shabout*	<i>Arabibarbus grypus</i>	
Nabbash	<i>Luciobarbus barbulus</i>	
Goldfish*	<i>Carassius auratus</i>	
Himri*	<i>Carasiobarbus luteus</i>	
Leuciscus vorax*	<i>Leuciscus vorax</i>	
Tigris bleak	<i>Alburnus caetuleus</i>	
Sellal	<i>Chalcalburus sellal</i>	
Grass carp*	<i>Ctenopharyngodon idella</i>	
Common bleak	<i>Alburnus mossulensis</i>	
Berzem*	<i>Luciobarbus kersin</i>	
kangal fish	<i>Cyprinion macrostomus</i>	
Bizz*	<i>Luciobarbus esocinus</i>	
Menon	<i>Capoeta damascina</i>	
The blue tilapia*	<i>Oreochromis aureus</i>	Cichlidae
The Nile tilapia*	<i>Oreochromis niloticus</i>	
Tigris Mystus	<i>Mystus pelusius</i>	Bagridae
Stinging catfish	<i>Heteropneustes fossilis</i>	
Abu mullet*	<i>Planiliza abu</i>	Mugilidae
Tire-track eel	<i>Mastacembelus mastacembelus</i>	Mastacembelidae
Cat fish	<i>Silurus triostegus</i>	Siluridae

\*Commercial

dominance in terms of the number of fish (Table 5). Among non-commercial fish 4560 fish recorded with a total weight of 703.0 kg, and among non-commercial fish, 10 species were recorded total 1202 fish with a total weight of 276.4 kg. The

lowest number of commercial fish out of the total catches was 398 fish in February 2021, and the lowest weight was 61.2 kg in July 2020. However, the same fish species formed the highest number of 498 fish in December, and the highest total

**Table 3.** Types of fish caught according to their numbers and weight in Hamrin Dam Lake

Species	Total number	Percent	Total weight (kg)	Percent	Total length ranges (cm)	Total weight range (gm)
<i>Planiliza abu</i> *	672	11.7	35.9	3.7	8.7-26.2	16.2-160.1
<i>Cyprinus carpio</i> *	623	10.8	106.1	10.9	9.3-43.2	12.1665.0
<i>Mesopotamichys sharpeyi</i> *	483	8.4	36.9	3.8	7.8-37.6	13.1-410.0
<i>Luciobarbus xanthopterus</i> *	476	8.3	182.6	18.6	9.3-56.3	14.2-2350
<i>Oreochromis aureus</i> *	472	8.2	18.1	1.8	7.4-23.5	8.1-167
<i>Arabibarbus grypus</i> *	463	8.0	54.2	5.5	11.2-46.7	22-486
<i>Carassius auratus</i> *	462	8	51.1	5.2	9.1-37.1	12.3-395.6
<i>Carasiobarbus luteus</i> *	361	6.2	89.9	9.2	6.1-38.6	5.5-1401
<i>Leuciscus vorax</i> *	359	6.2	102.9	10.5	9.4-58.6	22.1-1664
<i>Heteropneustes fossilis</i>	248	4.3	11.2	1.1	7.2-30.1	11.2-138
<i>Silurus triostegus</i>	239	4.2	231.9	23.7	15.3-71.2	155-3250
<i>Mystus pelusius</i>	237	4.1	7.7	0.8	7.3-23.2	11-81.5
<i>Luciobarbus barbulus</i>	184	3.2	6.1	0.6	7.4-29.3	11.2-186
<i>Oreochromis niloticus</i> *	158	2.7	10.6	1.1	7.3-23.3	11.2-157
<i>Alburnus caetuleus</i>	133	2.3	6.1	0.6	7.2-26.1	11.3-147
<i>Chalcalburuns sellal</i>	129	2.2	4.3	0.4	6.6-22.2	8-62
<i>Capoeta damascina</i>	23	0.4	5.7	0.6	10.5-30.4	97.6-328
<i>Ctenopharyngodon idella</i> *	20	0.3	13.4	1.4	25.7-56.3	142-9101
<i>Luciobarbus kersin</i> *	9	0.1	1.2	0.1	14.3-35.1	53-346
<i>Mastacembelus mastacembelus</i>	6	0.1	3.1	0.3	38.3-61.2	163-606
<i>Alburnus mossulensis</i>	2	0.1	0.16	0.02	18.3-19.2	83.1-86.4
<i>Luciobarbus esocinus</i> *	2	0.1	0.14	0.01	19-23.1	53.1-87.6
<i>Cyprinion macrostomus</i>	1	0.1	0.12	0.01	18.8	122
	5762		979.42			

\*Commercial

**Table 4.** Monthly changes of fish species, total numbers, and total weights caught in Hamrin Dam lake

Month	Number of fish species	Total number of fish	%	Total weight of the fish	%
July 2020	17	553	9.6	88.8	9.1
August	18	592	10.2	87.6	8.9
September	15	592	10.3	100.5	10.3
October	16	578	10.0	96.8	9.9
November	17	591	10.3	97.4	9.9
December	18	644	11.2	89.6	9.1
January 2021	16	550	9.5	105.7	10.8
February	16	490	8.5	103.1	10.5
March	18	540	9.4	95.1	9.7
April	20	632	11.0	114.9	11.7
Total	23	5762		979.42	

**Table 5.** Number and weight of commercial and non-commercial fish caught in Hamrin Dam lake

Month	Commercial fish		Non-commercial fish	
	Number	Weight (kg)	Number	Weight (kg)
July 2020	428	61.2	125	27.6
August	448	63.0	144	24.6
September	463	64.8	129	35.7
October	466	65.5	112	31.3
November	493	76.3	98	21.1
December	498	71.1	146	18.3
January 2021	458	82.1	92	23.6
February	398	71.8	92	31.3
March	418	62.6	122	32.5
April	490	84.5	142	30.4
Total	4560	703.0	1202	276.4

**Table 6.** Monthly changes, commercial and non-commercial catch rates per unit for fish caught in Hamrin Dam lake

Month	Total catch (kg/h)	Commercial catch (kg/h)	Non-commercial catch (kg/h)
July 2020	14.8	10.2	4.6
August	14.6	10.5	4.1
September	16.8	10.8	6.0
October	16.1	10.9	5.2
November	16.2	12.7	3.5
December	14.9	11.9	3.0
January 2021	17.6	13.7	3.9
February	17.2	12.0	5.2
March	15.9	10.4	5.5
April	19.2	14.1	5.1
Total	163.3	117.2	46.1

weight was 84.5 kg in of April of 2021. In non-commercial fish recorded the 92 lowest number of fish with weight of 18.3 kg in December. The highest numbers and weights, amounting to 146 fish in December, with a total weight of 35.7 kg in September. The species, numbers, and weights of fish in water bodies depend on the environment, productivity, and food of fish.

The monthly changes in the values and rates of total, commercial and non-commercial catch in the unit effort of fish caught in Hamrin Dam lake are given in Table 6. The lowest total catch was 14.6 kg/hour (August 2020), 10.2 kg/hour in July 2020 and 3.0 kg/hour of non-commercial fishing December 2020. Though, the amount of fishing increased in the subsequent months and recorded the highest amount of total fishing 19.2 kg / hour and for commercial fishing was 14.1 kg/hour in April and for non-commercial fishing was 6.0 kg/hour in September 2020. Catch per unit Effort (CPUE) expresses the number (individuals) or weight of fish (kg)

caught during the unit of time/hour. It includes the number of fishermen, the number of boats, the number of fishing days, the types of nets and the number of their throws, as well as the lunar phase, which is very important during night fishing operations (Siddig et al 2013). Current results showed that the total and commercial fish catches took a fluctuating pattern during the study period, as the number of fish caught increased in the cold months, and the amount of catch reached its peak with the decrease in water temperature with the beginning of the spring months and the winter months Al-Rudaini et al (2001) confirmed the high number of fish caught during the warm months in some inland water bodies, as fluctuation in the catch per unit effort was observed throughout the different months.

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