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Study of the composition of the fish population and some biological aspects of some fish species from the Tigris River near the city of Samarra, Salah al-Din/Iraq

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Abstract

The study was conducted west of the Tigris River in the Qalaa area, west of the city of Samarra, Salah al-Din/Iraq, for the period from October 2023 to March 2024. 117 fish were collected once a month. The number of fish species caught during the study period was 8. These species belong to the family Cyprinidae, *Chondrostoma regium* came in first place in terms of number and weight with 29.91% and 36.76% of the number and weight of the total catch, respectively, followed by *Carassius auratus* in second place in terms of number with 23.93%, then *Carasobarbus luteus* in third place with 13.68%. *Acantho brama marmid*, *Leuciscus vorax*, *Luciobarbus xanthopterus* and *C. macrostomum* and *Cyprinus carpio* have small percentages of numbers, which are 11.97%, 7.69%, 5.13%, 4.27%, and 3.42%, respectively. *Chondrostoma regium* represented the largest percentage of weight, 36.76%, followed by *Carasobarbus luteus*, with 11.55%, then *Carassius auratus*, with 21.89%. The studied fish differed in the values of the regression coefficient (b) for the logarithmic relationship between total length and total weight, which ranged between *Luciobarbus Xanthopterus* 0.55 and *Acantho brama marmid* 3.58.

Keywords: Installation fish, biology fish, species fish, Tigris River

Introduction

Fish play an important role in enhancing food security and alleviating hunger and malnutrition. work must be done to provide fish resources in the long term by generating revenues and preserving life diversity by expanding investment and sustaining natural fisheries and aquaculture (Bennett *et al.*, 2021) [5]. It reached the highest production values for fisheries and aquaculture in Asia, reaching 214 million tons in 2020, including 178 tons of fish and aquatic life and 36 million tons of algae. Global consumption of aquatic life, excluding algae, has increased at an annual rate of 3% since 1961, reaching Its value is approximately 20.2 kg per capita in 2020, which is more than double the consumption recorded in the 1960s (FAO, 2022) [8]. The increase in the world population in recent years and its continued increase significantly has increased the demand for fish because it is considered a balanced food source due to its high nutritional value and low production costs. It can meet the increasing demand for it (Ali *et al.*, 2022) [3]. Due to the lack of studies on the composition of the fish and life aspects such as growth and presence on the types of fish and their presence according to their importance, whether it is economic or unrealistic and the importance of the Tigris River near the city of Samarra as an urban and the living of the names Country leads to a decrease in water quality It was necessary to carry out this study, which aimed to identify the composition of the fish community, determine the presence of fish according to the months of study, and study the growth of fish by studying the relationship of length to weight and condition factor.

Materials and Methods of work

The study was conducted west of the Tigris River in the Al-Qalaa area, west of the city of Samarra/Iraq, for the period from October 2023 to March 2024, which is about 2 km away from the Samarra Dam. The depth of the water in it ranges between 4-8 m, and the speed of water flow is moderate He used the method of fishing with trap nets (worm nets), which were 20 meters long and 2 meters high, and the size of their openings was between (2 x 2)

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inches and ((2.5 x 2.5 inches), and it contained pieces of cork at the top and pieces of lead at the bottom. It took The fishing period is (4-5) hours, with a fishing distance of 2 m from the edge of the river to the fishing area. The caught fish were preserved directly with crushed ice in a cork box and transported to the laboratory, after which the fish were washed to remove any dirt attached to them the fish were classified based on the method of Coad (2010) [7], measure the total weight to the nearest 0.01 g and the total length to the nearest 1 mm. The numbers and weights of each type of fish caught were calculated, and the types of fish were divided according to their presence in the catch samples during the study period according to the method of Tyler (1971) [20]. The relationship between height and weight was determined based on the logarithmic equation used by Lecren (1951) [14]. $\text{Log } W = \text{Log } a + b \text{ Log } L$, W: total fish weight (g), L: total fish length (cm), b, a: constants. Use the condition factor equation which he applied (Carlander, 1969) [6]: $K = W \times 100 \div L^3$. So K: condition coefficient, W: total fish weight in grams, L: total fish length in millimetres. Use the Gonado somatic index for males and females to determine the time of laying according to the equation of West (1990) [21]. Gonad function % = gonad weight (g) ÷ total body weight (g) x 100. The data were statistically analyzed using SAS (2001) [16] software.

Results and Discussion

Composition of types

The number of fish species caught during the study period was 8. These species belong to the Cyprinidae family,

caught from the Tigris River near the city of Samarra (Table 1). The presence of *Chondrostoma regium*, *Carassius auratus*, *Carasobarbus luteus*, *Acantho brama marmid*, *Leuciscus vorax*, *Luciobarbus xanthopterus*, and *C. macrostomum*. And *Cyprinus carpio* family Cyprinidae. Hussein (2018) [11] obtained 23 species of fish, 17 of which belong to the Cyprinidae family, from the Tigris River near Al-Dur district. Al-Kinani (2019) [4] found in the Katiban Canal 24 species of fish belonging to 8 families Cyprinidae, which were dominant among the 12 families that were caught. Hamad (2019) [9] recorded from the Tigris/Salah al-Din River 26 species of fish, 20 of which belong to the family Cyprinidae, at a rate of 76.92%. Shaker (2020) [18] obtained 23 species of fish in the Tigris River near the city of Samarra, 18 of which belong to the Cyprinidae family, from the Tigris River near the city of Samarra/Salah al-Din. Al-Faraji (2022) [2] collected 19 species of fish, most of which belong to the family Cyprinidae, and there were 9 species, representing 47.36% of the number of fish species caught from the Al-Asrji and Al-Rasasi rivers, Salah Al-Din. Hassan (2023) [10] found 28 species of fish. most of which belong to the family Cyprinidae in one of the graveyards of the Al-Alam/Salah al-Din district. The current study agrees with previous studies in the Tigris River regarding the dominance of the Cyprinidae family there. This study is consistent with previous studies in the Tigris River and the rest of the waters in which the Cyprinidae family dominates it.

Table 1: Families and scientific names of fish species caught from the Tigris River near the city of Samarra during the period from October 2023 to March 2024

The scientific name	The family
<i>Chondrostoma regium</i> (Heckel,1843)	Cyprinidae
<i>Carassius auratus</i> (Linnaeus,1758)	//
<i>Carasobarbus luteus</i> (Heckel,1843)	//
<i>Acantho brama marmid</i> (Heckel,1843)	//
<i>Leuciscus vorax</i> (Heckel,1843)	//
<i>Luciobarbus Xanthopterus</i> (Heckel,1843)	//
<i>C. macrostomum</i> (Heckel,1843)	//
<i>Cyprinus carpio</i> (Linnaeus,1758)	//

Total numbers and weights of fish

Shows (Table 2) and (Figure1) the types of fish caught according to their numbers and weights in the Tigris River near the city of Samarra. The number of fish caught reached 117 fish, representing 100% of the total catch. *Chondrostoma regium* came first in terms of number and weight.at 29.91% and 36.76% of the number and weight. The total catch, respectively, followed by *Carassius auratus* in second place in terms of number with a rate of 23.93%, then *Carasobarbus luteus* in third place with a rate of

13.68%. *Acantho brama marmid*, *Leuciscus vorax*, *Luciobarbus xanthopterus* and *C. macrostomum* and *Cyprinus carpio* have small percentages of numbers, which are 11.97%, 7.69%, 5.13%, 4.27%, and 3.42%, respectively. *Chondrostoma regium* represented the largest percentage of weight, 36.76%, followed by *Carasobarbus luteus*, 11.55%, then *Carassius auratus*, 21.89%. *Luciobarbus macrostomum* and *Cyprinus carpio*, with small percentages of 4.80%, 3.46%, and 3.02%, respectively, of the total weight.

Table (2): Types of fish according to their numbers, weight (g), duration of presence, and total length (cm) in the Tigris River/Samarra

Type	Number	Percentage of number %	Weight (g)	Weight percentage %	Number of months in existence	Almadaa length range (cm)
<i>Chondrostoma regium</i>	35	29.91	6006	36.76	4	17.5-34.0
<i>Carassius auratus</i>	28	23.93	3577.3	21.89	4	13.0-28.5
<i>Carasobarbus luteus</i>	16	13.68	1888	11.55	3	16.0-26.0
<i>Acantho brama marmid</i>	14	11.97	785	4.80	3	14.5-20.0
<i>Leuciscus vorax</i>	9	7.69	1496.2	9.16	4	21.5-34.5
<i>Luciobarbus Xanthopterus</i>	6	5.13	1528	9.35	2	14.0-35.0
<i>C. macrostomum</i>	5	4.27	565	3.46	2	17.0-26.5
<i>Cyprinus carpio</i>	4	3.42	494	3.02	1	18.0-22.5
Total	117	100	16339.5	99.99		

The dominance of *Chondrostoma regium* and *Carassius auratus* in the Tigris River in the current study gives an indication of the change in the fish population in the Tigris River over time, which is attributed to the suitability of the aquatic environment for them and the availability of natural food, which made them appear in large numbers. This may be attributed to the presence of algae and aquatic plants in abundance, which *Carassius auratus* mainly depends on it for its food, which makes it occupy second place among the

numbers of caught fish, The low numbers of other fish caught in the study area from the Tigris River may be due to what Jawad (2003)^[12] indicated that human factors led to a change in the distribution of freshwater fish in Iraq, such as the construction of dams, the removal of plants, overfishing, and the increase in pollutants, in addition to alien species that play a role. There is a great deal of disturbance and scarcity of freshwater fish.

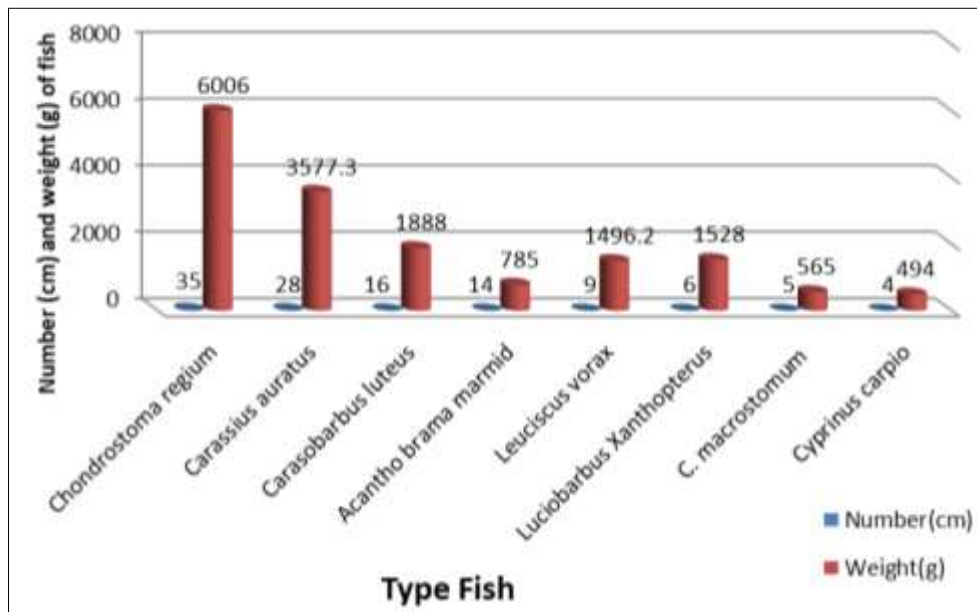


Fig 1: Numbers and weights of fish species

Hussein (2018)^[11] noted that *Carasobarbus luteus* came in second place with a percentage of 16.03%, weighing 15,421 grams, and then followed by *Chondrostoma regium*, with 90 fish, accounting for 15.50%, weighing 13,810 grams from the Tigris River near Al-Dour district. Karim *et al.* (2018)^[13] explained that *Chondrostoma regium* is a fish found in most fisheries from the Diyala River. Hamad (2019)^[9] found that *Chondrostoma regium* ranked second with a rate of 12.43%, and in third place came *Carassius auratus* with a rate of 11.20%, and then *Carasobarbus luteus* ranked fourth with a rate of 10.76% of the total catch from the Tigris River near Tikrit. Shaker (2020)^[18] indicated that in second place came *Carassius auratus* with a percentage of 9.94% and then came in third place with *Leuciscus vorax* with a percentage of 8.50% from the Tigris River near the city of Samarra. Al-Faraji (2022)^[2] recorded that *Carassius auratus* came in first place in terms of number and total weight of fish, with a rate of 24.88% and 23.29%, respectively, and then *Chondrostoma regium* came in second place in terms of number and total weight of fish, with a rate of 18.60% and 16.98% respectively and *Carasobarbus luteus* ranked fourth with 9.07% in number and sixth in terms of weight with 8.44%. *C. macrostomum*, *Luciobarbus* (16)%, respectively, and small weight percentages (4.23, 9.12, 1.05, 3.31, and 3.35)% respectively, in the first station. *Carasobarbus luteus* came in second place with a rate of 17.80%, followed by *Carassius auratus* in third place with a rate of 17.56% of the total number of fish collected from the second station of the Al-Asraji and Al-Rasasi/Salah al-Din Rivers Hassan (2023)^[10] found that *Chondrostoma regium* ranked first in number, reaching 57, 200, and 257 fish, respectively, at a rate of (32.02, 51.55,

and 45.41)%, respectively, of the total number of fish caught at the first and second station and the two stations combined, respectively. Followed by *Carasobarbus luteus* in second place in the first station with a number of 38 and a percentage of 21.34% of the total number of fish caught in that station, while in the second station and the two stations combined, *Carassius auratus* came in second place with a number of 140 and 172 fish respectively and a percentage of 36.08% and 30.39% in the second station. The two stations are combined, respectively, in one of the sewers of the Al-Alam/Salah al-Din district.

Monthly changes in the number of species and the number and weight of individuals

Table (3) indicates that there are clear changes and fluctuations in the types, numbers and weights of fish caught according to the different months. The largest number of species caught was 6 in December and the lowest number of species was 2 in February. The lowest number of fish caught was recorded in November and December. With 18 fish, or 15.38% of the total catch, While the largest number of fish caught was recorded in March, which amounted to 22 fish, representing 18.80% of the total catch. This is due to the largest number of *Chondrostoma regium* caught in January. The lowest weight of fish caught was recorded at 1605 grams, representing 9.82% of the total weight of the catch in December. The highest weight was 4349 grams, or 26.62%, in January. The weight of the total catch of caught fish reached 16,339.5 grams, or 100% of the weight of the total catch. Through this study and other studies, it has been shown that the percentages of numbers and weights of these fish decrease in the cold seasons of the

year and increase in the spring and summer due to high temperatures and the availability of natural food. The discrepancy in the percentages of numbers and weights of fish obtained from the current study with other studies is due to different factors. The environmental conditions of those studied water bodies and the change in the rates of fish

presence in quantity and quality in different seasons and in different locations, which is due to several factors, including the difference in the method of fishing used locally, the time and place of fishing, the difference in the lifestyle of each type of fish, and the difference in food found in bodies of water (Mayo and Jackson, 2006) [15].

Table 3: Monthly changes in the number of fish species and the number and weight of total individuals (g) and their percentages in the Tigris River/Samarra.

Variable/Month	Number of species	Total number of individuals		Total weight of individuals (g)	
		Number	Percentage of number %	Weight	Weight percentage %
October 2023	4	19	16.24	2844.5	17.41
November	3	18	15.38	1612	9.87
December	6	18	15.38	1605	9.82
January 2024	3	20	17.09	4349	26.62
February	2	20	17.09	3027	18.53
March	5	22	18.80	2902	17.76
Total		117	99.98	16339.5	100

Hussein (2018) [11] obtained the highest number of fish species 12 species in February and the lowest number of fish species 5 in January in the Tigris River near Al-Dour district. Hamad (2019) [9] recorded the highest number of fish species, 17 species, in April, June, and August, and the lowest number of fish species, 13 species, in March. The lowest number of individuals was 3.40% in April, and the highest number was 13.89% in January, in the Tigris River near Tikrit. Shaker (2020) [18] found the highest number of fish species, 15 species, in January and the lowest number, 5 species, in June. He recorded an increase in the number of individuals in September by 27.14% and a decrease in the number of individuals by 1.42% in January in the Tigris River near the city of Samarra. Al-Faraji (2022) [2] obtained the highest number of fish species caught in the first station, 13 species in December and February, and the lowest number of fish species, 10 species in October, while the highest number of species in the second station was 12 species in January, and the lowest number of fish species

was 8 in October and 2nd from the Asraji and Rasasi rivers/Salah al-Din.

The relationship of height to weight

The studied fish differed in the values of the regression coefficient (b) for the logarithmic relationship between total length and total weight, which ranged between *Luciobarbus Xanthopterus* 0.55 and *Acantho brama marmid* 3.58 shown in Table (4) and Figure (2) in the Tigris River near the city of Samarra, Growth was found to be asymmetrical for *Luciobarbus Xanthopterus*, *Leuciscus vorax*, *Cyprinus carpio*, and *C. macrostomum* and *Chondrostoma regium*, so the value of (b) reached 0.55, 0.70, 1.31, 2.08, and 2.62, respectively, meaning that the weight increases at a rate less than the cube of the height, As for the fish *Acantho brama marmid*, *Carasobarbus luteus* and *Carassius auratus* growth indicates an asymmetrical value of (b) of 3.58, 3.44, and 3.31, respectively, meaning that the weight increases at a rate greater than the cube of the length.

Table 4: Values of the logarithmic relationship between total length and total weight (intercept value Log a, slope value b and correlation r) for fish from the Tigris/Samarra River

Type fish	Number	Average and range of total length (cm)	Average and range of total weight (g)	Logarithmic relationship values		
				Log a	b	r
<i>Chondrostoma regium</i>	35	26.37 (17.5-34.0)	171.6 (45.0-325.0)	-1.52	2.62	0.976
<i>Carassius auratus</i>	28	19.49 (13.0-28.5)	127.8 (103.0-388.0)	-2.26	3.31	0.912
<i>Carasobarbus luteus</i>	16	19.81 (16.0-26.0)	118.0 (53.0-294.0)	-2.42	3.44	0.946
<i>Acantho brama marmid</i>	14	17.29 (14.5-20.0)	56.1 (29.0-101.0)	-2.704	3.58	0.970
<i>Leuciscus vorax</i>	9	29.36 (21.5-34.5)	166.2 (62.0-307.0)	1.01	0.70	0.563
<i>Luciobarbus Xanthopterus</i>	6	27.05 (14.0-35.0)	254.7 (145.0-447.0)	1.59	0.55	0.593
<i>C. macrostomum</i>	5	20.04 (17.0-26.5)	113.0 (84.0-209.0)	-0.69	2.08	0.934
<i>Cyprinus carpio</i>	4	20.25 (18.0-22.5)	123.5 (87.0-211.0)	0.35	1.31	0.405

Hussein (2018) [11] mentioned that growth was standard for *Carasobarbus luteus*, where the (b) value reached 3.005, while growth was asymmetric in *Carassius auratus*, where the (b) value reached 2.870, meaning that the weight increased at a rate less than the cube of the height, and this did not agree with the study. Currently, while growth was record-breaking in *Acantho brama marmid*, reaching a value of (b) of 3.550 in the Tigris River near Al-Dur district, and this is consistent with the results of the current study.

Hamad (2019) [9] noted that the growth of *Leuciscus vorax* and *Carassius auratus* was similar and the b value reached 3.00 and 3.03, respectively, in the Tigris/Salah al-Din River. Abdel Qader (2019) [1] found that the value of (b) for females is 2.976, for males is 3.058 *Carasobarbus luteus* and for both sexes is 2.956, and she noted that growth is asymmetrical, as the weight gain was less than the cube of height for females and both sexes together, and similar for males in the Tigris/Salah al-Din River.

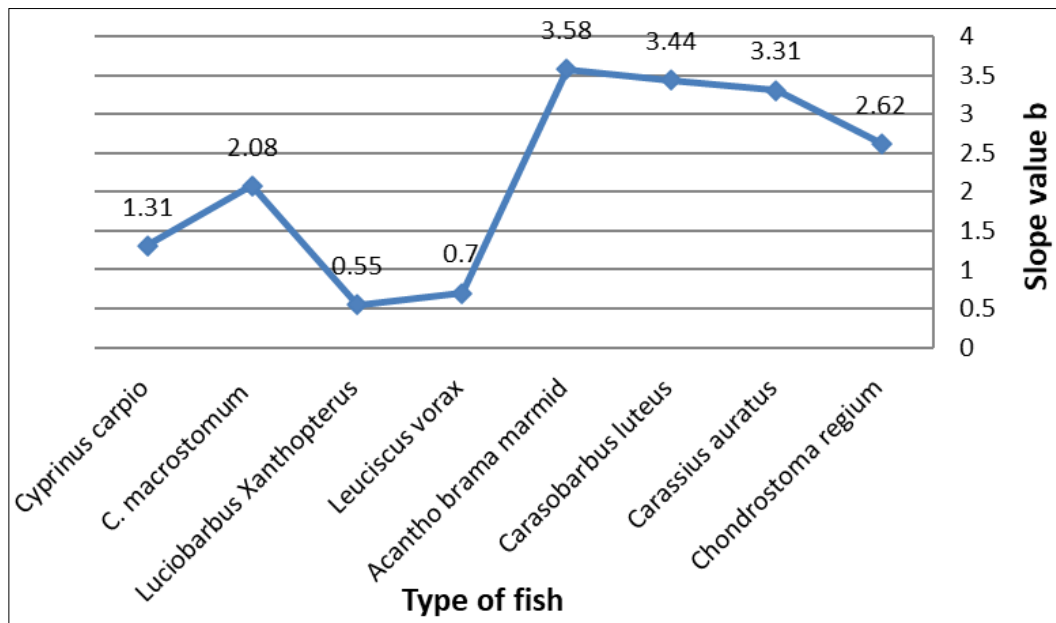


Fig 2: Regression coefficient values (b) for the logarithmic relationship between total length and total weight of fish species

Shaker (2020) [18] recorded a b value of 0.26 for *Luciobarbus Xanthopterus*

The growth was asymmetrical, and the growth was symmetrical in *Cyprinus carpio* and the value of (b) was 3.08, and the weight increased at a rate equal to the cube of the height while growth was asymmetric in *Carassius auratus*, *Acantho brama marmid* and *Carasobarbus luteus*, the value (b) was recorded at 3.19, 3.66, and 3.21, respectively. This is consistent with the current study in the Tigris River, north and south of the city of Samarra. Shaker and Wahab (2021) [19] indicated that the growth of *C. macrostomum*, *Carassius auratus*, *Carasobarbus luteus* and *Cyprinus carpio* fish was symmetrical, and recorded a (b) value of 3.01, 3.02, 3.04, and 3.08, respectively, while growth was asymmetric in *Luciobarbus Xanthopterus* and *Leuciscus vorax* *Acantho brama marmid* The value of (b) was 0.26, 3.19, and 3.66, respectively, in the Tigris River near Samarra. Al-Faraji (2022) [2] obtained asymmetric growth in *Luciobarbus Xanthopterus*, *Chondrostoma regium*, *Carassius auratus*, *C. macrostomum*, *Acantho brama marmid* and *Cyprinus carpio* the values of (b) ranged from 2.99, 2.93, 2.75, 2.66, 2.34, and 2.32, respectively, and the rate of progress moved away less from the backbone of the Al-Asraj and Al-Rasasi/Salah al-Din rivers. Hassan (2023) [10] observed (b) values (2.791, 2.853, 2.870, and 2.996), respectively, in the fish *Cyprinus carpio*, *Carassius auratus*, *Acantho brama marmid* and *Chondrostoma regium*, meaning that the growth is not standard and the

weight increase is less than the cube of the length in one of the science trocars/Salahaddin. Shaker (2023) [17] found that growth is not standard, as the weight decreases at a rate of more than the cube of the length, and the value of (b) for *Carasobarbus luteus* and *Leuciscus vorax* of both sexes is 0.34 and 2.79, respectively, in the Tigris River near the city of Samarra, and this differs from the current study.

Status parameter (K)

Table (5) and Figure (3) show the values of the condition factor K for some species of fish from the Tigris/Samarra River. The values of (K) ranged between (0.023-0.192), and the value of (K) was less than (1), the low value in *Leuciscus vorax* and the high value in *Carassius. Auratus*, and the K value was less than (1) in all fish, *Chondrostoma regium*, *Carassius auratus*, *Carasobarbus luteus*, *Acantho brama marmid*, *Leuciscus vorax*, *Luciobarbus Xanthopterus*, *C. macrostomum* and *Cyprinus carpio*, which reached 0.07, 0.192, 0.149, 0.099, 0.023, 0.167, 0.111, and 0.109, respectively. Fish with a low condition factor (less than one), which may be due to the fact that these fish have not yet reached the age of maturity, reproduction, and spawning, and that they may have passed by in search of food and were caught, or it may be due to the fact that these fish have spawned. As for fish with A high condition factor (greater than one) may be due to the fact that these fish are sexually mature and have not yet spawned.

Table 5: Values of the condition factor K for some species of fish from the Tigris River near the city of Samarra

Type fish	Number	Average total length (cm) and SD±	Average total weight (g) and SD±	K	Extent (K)
<i>Chondrostoma regium</i>	35	26.37±5.03	171.6±77.77	0.07	0.175-0.014
<i>Carassius auratus</i>	28	19.49±3.64	127.8±80.54	0.192	0.204-0.146
<i>Carasobarbus luteus</i>	16	19.81±2.46	118.0±56.68	0.149	0.213-0.08
<i>Acantho brama marmid</i>	14	17.29±1.98	56.1±23.39	0.099	0.163-0.06
<i>Leuciscus vorax</i>	9	29.36±4.20	166.2±98.72	0.023	0.01-0.03
<i>Luciobarbus Xanthopterus</i>	6	27.05±7.16	254.7±113.40	0.167	0.656-0.07
<i>C. macrostomum</i>	5	20.04±3.63	113.0±53.77	0.111	0.285-0.03
<i>Cyprinus carpio</i>	4	20.25±2.33	123.5±59.25	0.109	0.131-0.06

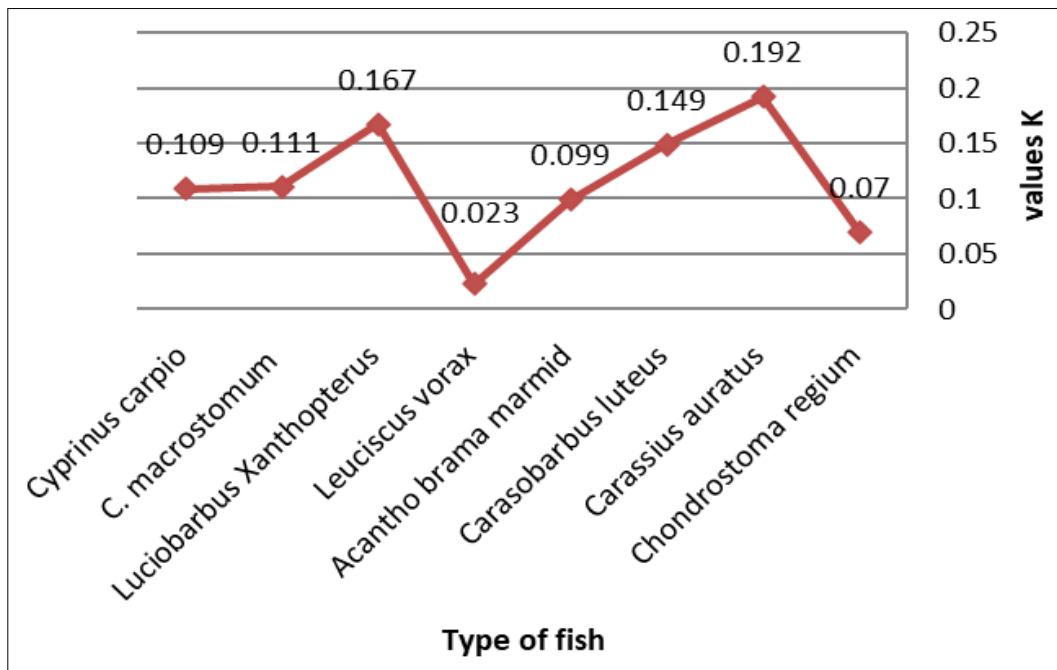


Fig 3: Values of the condition factor K for some fish species from the Tigris River near the city of Samarra

Hussein (2018) ^[11] explained that the (k) values of the studied fish ranged between 1.774-0.195, and the lowest value was recorded in *Mastacembelus mastacembelus* and the highest value in *Cyprinus carpio* in the Tigris River. Hamad (2019) ^[9] recorded that the K values for the studied fish ranged between 1.52-0.26, and found that the lowest value was in *Mastacembelus mastacembelus* and the highest value was in *Carassius auratus* in the Tigris River. Shaker and Wahab (2021) ^[19] showed that the k values for the caught fish were between 2.03-0.69, and that the low value was in *Leuciscus vorax* and the high value was in *Cyprinus carpio* in the Tigris River near the city of Samarra. Al-Faraji (2022) ^[2] indicated that the value of (K) in *Leuciscus vorax* and *Chondrostoma regium* was 0.81 and 0.94, respectively, which is less than one, and that the value (K) is higher than (1) in *Acantho brama marmid* and *C. macrostomum*, *Carasobarbus luteus*, *Carassius auratus* and *Cyprinus carpio*, which recorded 1.17, 1.44, 1.46, 1.69, and 1.81, respectively, from the Asraji and Rasasi/Salah al-Din rivers. Hassan (2023) ^[10] found the value of (K) for *Chondrostoma regium* and *Arabibarbus grypus* and it was 0.839 and 0.849 respectively, and it was less than one in one of the trowels of the Al-Alam/Salah al-Din district, and this is consistent with the current study. Shaker (2023) ^[17] explained that the highest value (K) for both sexes is 1.6 and 0.84 in *Carasobarbus luteus* and *Leuciscus vorax*, respectively, and the lowest value (K) is 1.24 and 0.64 in *Carasobarbus luteus* and *Leuciscus vorax*, respectively, in the Tigris River near the city of Samarra, This did not agree with the current study.

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