



Research Article

Study of some morphological characters *barbus luteus* and *aspius voted* (Heckel) from the tigris river near the Al-Qalaa area, Salah Al-Din, Iraq

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Abstract

Twenty samples of *Barbus luteus*, were collected with total lengths ranging between 12.2-30 cm and weights between 0.5-4.8 g and 20 *Aspius voted* (Heckel) with a length range between 59.1-20.8 cm and weights between 1600-62 g respectively, From the Tigris River near the Citadel area, west of Samarra, during the period from September to December 2019. The regression value of the relationship between total length and total weight (b) for both sexes was 0.34 and 2.79 in *Barbus luteus* and *Aspius voted* (Heckel) respectively, Variations in the ratio of measurements taken of head parts to head length and their logarithmic relationship values between the two species *Barbus luteus* and *Aspius voted* (Heckel), and the highest ratio was 0.88 and 1.05 for the length of the gill arch to the length of the head respectively, and the lowest ratio of *Barbus luteus* and *Aspius voted* (Heckel) was 0.04 for mouth width to head length, 0.04 for *Aspius voted* (Heckel) for head width to head length, and for *Barbus luteus* for mouth and snout length to head length. The values of the condition coefficient (K) differed for both sexes together, according to the total length and numbers of the two fish *Barbus luteus* and *Aspius voted* (Heckel), and the value of the case coefficient for both sexes together was 1.6 in *Barbus luteus*, with the highest value (K) 2.67 for the group length 12-15-12.2 cm, As for *Aspius voted* (Heckel) the reached (K) value was 0.84 for both sexes, with the highest value (K) 1.5 recorded for the 20-25 cm group length, and The lowest value was 1.24 for the 21-25 cm length group in *Barbus luteus* and in *Aspius voted* (Heckel) the lowest value was 0.64 for the 31-35 cm length group.

Keywords: Morphology, *Barbus luteus*, *Aspius Voted* (Heckel), Fish, Tigris River.

Introduction

Prepare Fish is one of the main sources of protein and fat, which provides the body with many calories and important vitamins, especially vitamin A, B (Borgstrom, 1962), and the second main source of animal protein after red meat, and the demand for river fish is more than marine fish because of consumer tastes and their preference for the taste of river fish meat (Salman, 1978). Fish residues of low nutritional value or undesirable species are used as fishmeal to feed animals and poultry, Humans have used fish as food throughout the ages as it is an easily digestible food rich in proteins and as a medicine for many diseases as it is used as a prevention of pulmonary tuberculosis and poor liver function (Craig and Helfrich, 2002). Belongs *Barbus luteus* to the family Cyprinidae, endemic and widespread in rivers and lakes (Coat, 2010b). A report of the International Food and Agriculture Organization indicated that *Barbus luteus* constituted the equivalent of 43.6% of the total amount of fish offered in seven major fish

markets in Iraq in 1965 (Muhammad et al., 2015). Belongs *Aspius vorax* (Heckel) to the family Cyprinidae, and it is one of the species widespread in Iraqi internal waters, and it is a predatory fish with a length of more than 60 cm (Beckman, 1962).

The fish *Barbus luteus* and *Aspius vorax* (Heckel) are among the economically important and widespread species in Iraq, as they are spread in most of the inland water bodies, especially the central regions, the presence of individuals of these two species differed in the Iraqi flats, and he showed the dominance of *Barbus luteus* fish over the rest of the species in Hamrin Dam Lake (Al-Rudaini et al., 2002), and pointed out Salman (2006) in Dra' al-Tharthar on the Tigris River indicated the dominance of this type if the numerical dominance reached 29.84%, and between Al-Ammari (2011) indicated a decrease in the numbers of these two species in the form of a rate of 3.21% of the total number of catches in the Hilla River.

That studying the relationship between the total length of the fish with other phenotypic measurements such as body height (depth) and body width gives an idea of the growth of fish in a particular water body, and it varies from one water body to another depending on the environmental conditions of each water body, and thus it is possible to compare the growth in the two environments (Abu Al-Hani and Al-Nasser, 2005). That Oral measurements such as mouth width and mouth height (length) are useful in identifying the size and type of food eaten by larger fish, Mouth eating food of a larger size and in a larger quantity and usually fish are vegetarian and mixed diet, is being Its mouth is small compared to animal feeding fish, whose mouth is large, as it allows the entry and devouring of a larger volume of food (Abu Al-Mohanni, 2016). Many studies have been conducted on some aspects of the life of *Aspius vorax* (Heckel) in Tharthar Lake and the Tigris River near Al-Dur District and the Tigris River within Salah Al-Din Governorate (Shaker, 2014; Hussein, 2018; Hamad, 2019; Shaker, 2020). The current study aims to identify some different morphological measurements of two fish *Barbus luteus* and *Aspius vorax* (Heckel) from the Tigris River near the castle area west of the city of Samarra, and their role in determining the final shape of the body of the two fish.

Materials and Method

Collected 20 *Barbus luteus* their total lengths ranged from 12.2-30 cm, and their weights ranged from 0.5-4.8 g and 20 *Aspius vorax* (Heckel) With a length range of 59.1-20.8cm and weights of 1600-62g respectively, From the Tigris River near the Citadel area, west of Samarra, during the period from September to December 2019. Fish were classified according to Coad (2010a), Measure the total length of the fish to the nearest (0.1) cm using a graduated ruler and the total weight with a sensitive scale to the nearest (0.01) g, Preserving the samples by freezing until the study is conducted on them, and the relative dimensions of spinal length, standard length, distance before the dorsal fin, body depth, distance after the dorsal fin, head length, body width, fin bases and their lengths to total length were calculated, and As well as the relative dimensions of each of the length of the gill arch, the depth of the head, the width of the head, the width of the mouth, the length of the mouth, the length of the snout, the diameter of the eye, and the distance between the orbits to the length of the head. The Verinia electronic measuring machine of Chinese origin was used to measure the dimensions of the head and mouth, the depth and width of the body, the length of the snout, the diameter of the eye, and the distance between two eye sockets, and a sensitive electronic balance of Chinese origin to measure the weight of the fish and the weight of the gonads in units (g). The length-weight relationship was determined using the following logarithmic equation (LeCren, 1951) $\text{Log } W = \text{Log } a + b \text{ Log } L$ and according to the coefficient of the condition of the full body of the fish (with internal viscera) according to the equation (Carlander, 1969)

$$K = W \times 100 / L^3$$

Where

W: total weight (with entrails) in grams,

L: total length in centimeters,

a and b: constants,

K: modulus of condition.

The relationship between the total length of the fish, the distances between the external body parts, the length of the head and some parts of the head, and the total weight was studied based on the simple linear regression equation (Hile, 1970) $y = a + bx$, where X is total height, total weight, or head length and the variable y stands for any of the various measurements, a constant represents the correction factor, b constant represents the slope (regression coefficient). The method of fishing was used with gill nets (worm nets), which were 30 m long and 60 cm high, consisting of holes of equal size (4 x 4) cm, and were equipped with pieces of cork from the top and pieces of lead from the bottom, and the fish were classified according to Coad (2010a).

Results and Discussion

Table 1. shows the values of the logarithmic relationship between total height and total weight *Barbus luteus* for both sexes together, as well as according to height groups, The regression value of the relationship between height and weight b for both sexes was 0.34, which indicates that growth is non-standard as weight decreases at a rate more than the cube of height.

The value of b differed in different height groups, as non-standard growth was found in the two groups of height 25-21.2 and 20.6-18 cm, as the value of b was found to be 2.84 and b 1.76 respectively, While the weight was less by an average of more than the cube of the length, the differences in the value of b in the fish were due to differences in age, maturity, sex and species as well as to the geographical location and environmental conditions related to the season and natural feeding performance (Bagenal, 1978). Wahab and Shaker (2017) noted that the growth of *Barbus luteus* is non-standard, as weight increases at a rate more than the cube of height, and the value of b for both sexes together was 3.142, and the growth is non-standard in the height groups 11-15 and 16-20 cm, and the (b) value was 2.945 and 2.845, respectively, while the weight increased by more than the cube of height in the length group 21-25 cm with a value of b3.637 in Tharthar Lake. is found Hussein (2018) in the Tigris River at the time of the role that the growth is similar in *Barbus luteus* and the value was (b) 3.005, that is, the weight increases at a rate equal to the cube of the length. Clearer Hamad (2019) The growth is non-standard and the value of b was 2.54 for the lengths of *Barbus luteus* for both sexes together in the Tigris River/Salah El-Din. Registered Abdul Qadir (2019) non-standard growth in *Barbus luteus* and a b value of 2.95, 3.53 in the Tigris River/Salah El-Din, A difference in growth in the current study with previous studies may be due to different environments.

Table 1. The values of the logarithmic relationship between total height and total weight (Log a value, slope b value, and r correlation value) *Barbus luteus*.

The values of the logarithmic relationship			Average and range of total weight (g)	Average and range of total length (cm)	Number	Variable
r	b	Log a				
0.727	0.34	-0.33	(4.8-0.5) 2.06	(30-12.2) 20.035	20	female and male
						a group height
-0.817	-3.13	3.62	(1.9-0.5) 1.175	(15.3- 12.2) 14.175	4	15-12.2
0.140	1.76	- 2.015	(3.8-1.2) 1.9	(20.6-18) 19.46	10	20-16
0.778	2.84	-3.5	(3.4-1.3) 2.4	(25-21.2) 22.975	4	25-21
1.000	1.19	-1.14	(4.8-3.1) 3.95	(30-27.5) 28.75	2	30-26

Shows Table 2 The value of regression b for a relationship between height and weight, *Aspius vorax* (Heckel) for both sexes together" 2.79, this indicates that the growth is non-standard, as weight decreases at a rate more than the cube of height, The value of b differed in different height groups, as the presence of non-standard growth in the height groups ranged between 20-25 and 56-60 cm, as the (b) value reached -0.65 and (b) 2.03, respectively, and this is explains the weight decreases with the increase in the cube of the length, that is, the growth is linear in this type of fish. Wahab (2013) recorded a value (b) of 2.466 in the Tigris River at the city of Tikrit for *Aspius vorax* (Heckel) and that the growth is non-standard, and this is consistent with the current study. Happened Hussain (2018) Non-standard growth in females and males of *Aspius vorax* (Heckel) the value of (b) was 3.524 in the Tigris River at the role city. Is found Hamad (2019) that *Aspius vorax* (Heckel) has a symmetrical growth of 3.00,

meaning that the increase in length is equal to the increase in the cube of length in the Tigris River /Saladin.

The ratio of some morphological measurements taken to total height and their linear relationship values differed among the two species *Barbus luteus* and *Aspius vorax* (Heckel) (Tables 3 and 4), registered the highest ratio of spinal length measurement to total length in *Barbus luteus* is 0.89 and higher Ratio of standard length to total length in *Aspius vorax* (Heckel) 0.88, and less ratio 0.04 of scapular base to total length *Barbus luteus* and *Aspius vorax* (Heckel). Is found the highest correlation of 0.887 between standard length and total length in *Barbus luteus* and the highest correlation between head length and height the total value of *Aspius vorax* (Heckel) was 0.96, and the lowest correlation value of 0.509 and 0.28 between pelvic fin base and total length in *Barbus luteus* and *Aspius vorax* (Heckel) respectively.

Table 2. The values of the logarithmic relationship between height and weight (intercept value Log a, regression value b, and correlation r) *Aspius vorax* (Heckel).

The values of the logarithmic relationship			Average and range of total weight (g)	Average and range of total length (cm)	Number	variable
R	b	Log a				
0.901	2.79	-1.79	(1600-62) 486.85	(59.1-20.8)37.04	20	female and male
						a group height
-1.00	-0.65	3.00	(212-85) 148.5	(23.6-20.8)22.2	2	25-20
-0.64	1.02	0.75	(313-62)215.33	(29.8-28)29	3	30-26
0.26	0.57	1.5	(312-155)237.33	(35.9-32)33.45	6	35-31
0.95	1.04	1.00	(491-394)438	(39.9-36)37.6	4	40-36
0.87	1.60	0.26	(921-905)915.33	(50-48)48.97	3	50-46
0	-30.17	55	1272	52.2	1	55-51
0	2.03	-0.4	1600	59.1	1	60-56

Happened Shaker (2016) reported the highest correlation of 1.04 between spinal length and standard length in Tharthar Lake. Record Hamad (2019) The ratio of spinal length to total length in two fishes *Aspius vorax* (Heckel) and *Barbus luteus*

0.88 in the Tigris River / Salah El-Din. Have found Abdul Qadir (2019) Highest ratio of 0.890 spinal length to total length *Barbus luteus* in Tigris River/ Salah El-Din.

Table 3. The ratio of some phenotypic measurements to the total height (average, range, and standard deviation \pm SD) and the values of the logarithmic relationship, the value of the intercept a, the regression b, and the correlation r *Barbus luteus*

The values of the logarithmic relationship			SD \pm	The ratio of variable length/total length	Variable length range (cm)	Average length of the variable (cm)	Variable
r	B	Log a					
0.744	1.25	0.38	4.21	0.89	26.7-7.5	17.62	Spinal length
0.887	0.66	0.36	3.12	0.83	23.8-11.3	16.44	Standard length
0.790	0.62	-0.09	1.02	0.27	7.4-3.7	5.28	body depth
0.878	0.33	-0.32	0.60	0.14	4.0-1.7	2.86	body width
0.822	0.57	-0.27	0.56	0.15	4.7-2.3	2.97	head length
0.841	0.67	0.06	1.65	0.44	12.2-5.9	8.61	distance before the dorsal fin
0.653	0.57	0.21	2.01	0.46	13.6-5.8	9.04	distance after the dorsal fin
0.787	0.72	-0.47	0.68	0.15	4.4-2.0	2.95	The base of the dorsal fin
0.703	0.40	-0.02	0.61	0.16	4.2-2.1	3.23	Dorsal fin height
0.705	0.96	-1.35	0.33	0.04	1.7-0.2	0.85	The base of the scapular fin
0.792	0.57	-0.23	0.63	0.17	4.6-2.1	3.28	The height of the scapular fin
0.509	0.93	-1.24	0.41	0.05	1.9-0.4	0.99	The base of the pelvic fin
0.728	0.37	-0.28	0.52	0.15	4.2-1.9	2.92	Pelvic fin height
0.705	0.87	-0.97	0.48	0.08	2.4-0.8	1.51	Exit fin base
0.830	0.92	-0.71	0.81	0.16	4.3-1.6	3.13	Exit fin height

Table 4. The ratio of some phenotypic measurements to the total height (average, range, and standard deviation \pm SD) and the values of the logarithmic relationship, the value of the intercept a, the regression b, and the correlation r *Aspius vorax* (Heckel)

The values of the logarithmic relationship			SD \pm	The ratio of variable length/total length	Variable length range (cm)	Average length of the variable (cm)	variable
r	B	Log a					
0.91	0.83	0.20	8.60	0.87	53.3-18.9	31.74	Spinal length
0.92	0.93	0.05	9.29	0.88	51-17.5	31.96	Standard length
0.93	1.15	-0.96	2.41	0.19	11.3-3.5	7.14	body depth
0.91	1.08	-1.09	1.45	0.11	7.1-2.0	4.05	body width
0.96	1.51	-1.45	3.40	0.22	16.0-3.4	8.51	head length
0.93	1.05	-0.39	5.67	0.49	29.1-9.2	18.08	distance before the dorsal fin
0.89	0.92	-0.24	4.92	0.44	27.0-9.2	16.26	distance after the dorsal fin
0.93	1.10	-1.20	1.12	0.09	5.8-1.8	3.39	The base of the dorsal fin
0.84	0.74	-0.47	1.25	0.14	7.1-2.8	4.93	Dorsal fin height
0.81	0.98	-1.36	0.56	0.04	2.8-0.7	1.57	The base of the scapular fin
0.85	0.84	-0.64	1.28	0.13	6.9-2.7	4.84	The height of the scapular fin
0.28	1.14	-1.61	1.31	0.05	6.6-0.6	1.71	The base of the pelvic fin
0.88	0.94	-0.87	1.20	0.11	6.7-2.1	4.07	Pelvic fin height
0.92	1.23	-1.30	1.69	0.12	8.2-1.7	4.38	Exit fin base
0.83	0.85	-0.69	1.25	0.12	6.9-1.5	4.43	Exit fin height

Variations in the ratio of the measurements taken for the parts of the head to the length of the head and the values of the logarithmic relationship between the two species *Barbus luteus* and *Aspius vorax* (Heckel) (Tables 5 and 6), in *Barbus luteus* and *Aspius vorax* (Heckel) the highest ratio was 0.88 and 1.05 for the length of the gill arch to the length of the head respectively, and lowest percentage *Barbus luteus* and *Aspius vorax* (Heckel) It reached 0.04 for the width of the mouth to the length of the head as well as a ratio of 0.04 in *Aspius vorax* (Heckel) between the width of the head and the length of the head and also in *Barbus luteus* the length of the mouth and snout with the length of the head, found in *Barbus luteus* had

the highest correlation of 0.836 between head depth and head length, and in *Aspius vorax* (Heckel) 0.99 between the length of the mouth and the length of the head, and lowest correlation value *Barbus luteus* -0.025 between eye diameter and head length and in *Aspius vorax* (Heckel) 0.15 the distance between the two sockets with the length of the head. Studied Wahab (2013) the morphological characteristics of two fish *Barbus luteus* and *Aspius vorax* (Heckel) in the Tigris River at the city of Tikrit/Salah al-Din, and showed that the rates of total length, caudal and standard length, and head length and the distance before the dorsal fin, the width of the body, the length of the snout and the width of the mouth It ranged between

(13.7-24.8) cm and (0.7-2.0) cm respectively, and The minimum value was in *Barbus luteus* and upper in *Aspius vorax* (Heckel), as for the distance after the dorsal fin So it ranged between (3.6-7.3) cm and The minimum value was in *Barbus luteus* and supreme in *Aspius vorax* (Heckel). Happened Shakir (2016) reported the highest correlation of 0.98 between snout length with standard length in *Aspius vorax* (Heckel) and the lowest correlation was 0.76 between

head depth and standard length in Tharthar Lake. Record Hamad (2019) The highest correlation in two fish *Barbus luteus* and *Aspius vorax* (Heckel) 0.78 and 0.80 respectively between the diameter of the eye with the total length and less correlation *Barbus luteus* 0.58 between snout length with total length and in *Aspius vorax* (Heckel) 0.70 between the width of the mouth and the total length of the Tigris/Saladin.

Table 5. Ratio of some phenotypic measurements to head length (mean, range, and standard deviation ±SD) and logarithmic relationship values, intercept value a, regression (b), and correlation (r) *Barbus luteus*

The values of the logarithmic relationship			SD±	The ratio of variable length/total length	Variable length range (cm)	Average length of the variable (cm)	Variable
r	B	Log a					
0.508	0.66	0.09	0.57	0.88	4.2-1.7	2.58	Gill arch length
0.836	1.11	-1.04	0.07	0.10	0.48-0.21	0.31	Head depth
0.781	1.04	-1.09	0.06	0.09	0.39-0.14	0.25	Head width
0.633	1.09	-1.45	0.04	0.04	0.19-0.06	0.12	mouth width
0.535	0.73	-1.24	0.03	0.04	0.18-0.07	0.13	mouth length
0.609	0.97	-1.37	0.03	0.04	0.18-0.07	0.12	snout length
-0.025	0.06	-0.16	0.11	0.26	0.93-0.51	0.75	eye diameter
0.749	1.86	-0.76	0.56	0.45	2.54-0.65	1.38	distance between two quarry

Table 6. Ratio of some phenotypic measurements to head length (mean, range, and standard deviation ±SD) and logarithmic relationship values, intercept value a, regression (b), and correlation (r) *Aspius vorax* (Heckel)

The values of the logarithmic relationship			SD±	The ratio of variable length/total length	Variable length range (cm)	Variable length (cm)	Variable
r	B	Log a					
0.72	0.44	0.51	1.80	1.05	11.0-4.9	8.15	Gill arch length
0.94	0.72	-0.98	0.16	0.06	0.88-0.25	0.48	Head depth
0.91	0.59	-1.04	0.096	0.04	0.49-0.19	0.32	Head width
0.97	0.80	-1.18	0.13	0.04	0.68-0.17	0.36	mouth width
0.99	0.95	-1.24	0.18	0.05	0.79-0.18	0.44	mouth length
0.40	0.51	-0.89	0.17	0.05	0.91-0.16	0.40	snout length
0.92	0.57	-0.45	0.30	0.15	1.63-0.77	1.18	eye diameter
0.15	0.13	-0.01	0.22	0.17	1.7-0.87	1.29	distance between two quarry

The values of the case coefficient (K) differed for both sexes, according to the total length and numbers of two fish *Barbus luteus* and *Aspius vorax* (Heckel) shown in Figure (1 and 2) respectively, The case coefficient value was for both sexes 1.6 in *Barbus luteus*, As he reached the highest (K) value was 2.67 for the 12-15 cm length for a group, either in *Aspius vorax* (Heckel) the value of (K) was 0.84 for both sexes, It registered the highest (K) value was 1.5 for the 20-25 cm length for a group, explains high values of (K) indicate that these fish are sexually mature and that they have not laid eggs yet, and the lowest value is 1.24 for the length for a group from 25 to 21 cm in *Barbus luteus* and in *Aspius vorax* (Heckel) reached the lowest value is 0.64 for the length for a group 31-35 cm, low (K) values may be due to the fact that these fish have not yet reached the age of maturity, reproduction and spawning and It you may be passing by in search of food and hunted.

Happened Wahab and Shaker (2017) has the highest value of (K) *Barbus luteus* 1.58 the length for a group 31-35 cm and the lowest value was 1.36 for the group 11-15 cm long in Tharthar Lake. Is found Hussain (2018) The highest value of (K) for two fish *Barbus luteus* and *Aspius vorax* (Heckel) 165.80 and 539.20 respectively and the lowest value of (K) is 1.270 and 0.709, respectively, in the Tigris River at the city of Al-Dur. I noticed Abdul Qadir (2019) that the highest value (K) in *Barbus luteus* It was 1.59 in the Tigris/Saladin River. Record Hamad (2019) The highest value of (K) for two fish *Barbus luteus* and *Aspius vorax* (Heckel) 1.89 and 1.25 respectively and the lowest values of (K) are 0.92 and 0.49, respectively, in Tigris River/Salah Al-Din. The results of the current study converge with previous studies in the high case coefficient values in *Barbus luteus* and lower it with *Aspius vorax* (Heckel).

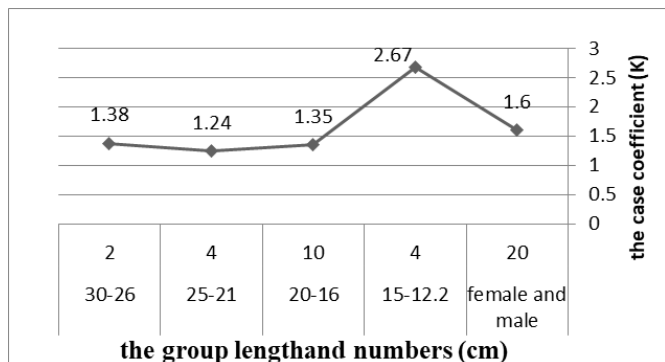


Fig. 1 The values of the case coefficient (K) for both sexes together, according to the totals of height and their numbers *Barbus luteus*

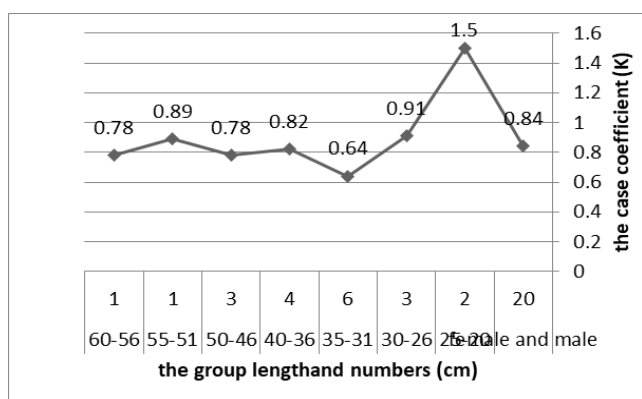


Fig. 2 The values of the case coefficient (K) for both sexes together, according to the totals of height and their numbers *Aspius vorax* (Heckel)

Conflict of Interest

The author hereby declares no conflict of interest.

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