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Some Ecological and Biological Aspects of Shabbot *Arabibarbus grypus* Collected from Lesser Zab River at Kurdistan Region, Iraq

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ABSTRACT

Some ecological and biological aspects of shabbot *Arabibarbus grypus* collected from Lesser Zab River at Kurdistan Region, Iraq were studied at Taq taq a district. In the period of August 2024 to July 2025. The lowest values water temperature reached for was 9.3°C during January and the highest was 29.2°C during July 2025. Water pH values were ranging between 7.4 and 8.3. Salinity concentration values were ranged between 0.21 g/l during January and 0.44 g/l during July 2025. The lower value of water transparency was 21cm recorded during February and the highest was 50 cm reached during July 2025. The highest dissolved oxygen in water was 12 mg/l at January 2025, whereas, the lowest was 7.6 mg/l during August 2024. A total of 342 specimens of shaboot *Arabibarbus grypus* were collected ranging between 14 and 58.8 cm in total length and between 17 and 1850 g in total weight. Length weight relationship showed that fish growth was allometric. Fish condition factor for male was ranging between 0.63 during October 2024 and 0.98 during March 2025, while for female was ranging between 0.68 during October 2024 and 1.00 during June 2025.

INTRODUCTION

Fish contribute significantly to improving food security. The long-term provision of fish resources requires efforts to maintain natural fisheries and aquaculture, generate income, and preserve biological diversity through increased investment **(Bennett *et al*., 2021)**.

Arabibarbus grypus is one of the most important species of Cyprinidae family, which is characterized by its desirable taste and is widely distributed in most inland water bodies. It tends to live in running rivers and fast currents in the middle of the water column **(Coad, 2010)**. The species belongs to the genus *Barbus* and was then changed and placed within the genus *Arabibarbus* by **Borkenhagen (2014)**. Due to the commercial and economic importance of *A. grypus*, some local studies have focused on the biology of this species of fish in different environments in Iraq, including rivers, lakes

and reservoirs **(Al-Temimy, 2004; Al-Rudainy, 2010; Al-Rudainy & Al-Mufty, 2010; Mizory & Abdulrahman, 2019; Mizory, 2021)**.

This species is found in the waters of the Tigris and Euphrates rivers, as well as the reservoir of the Hamrin Dam, Dukan Dam lakes and the Greater and Lesser Zab rivers in Iraq **(Al-Shama'a, 1999; Al-Shama'a *et al.*, 2009; Al-Rudainy & Al-Mufty, 2010; Borkenhagen, 2014)**. It is also found in the Karun, cholvar, Zahra and Zarrineh rivers, South Iran **(Khodadadi *et al.*, 2016)**. Fish are found in the Ataturk Dam Lake and the Keban Dam Lake, in Türkiye **(Parlak *et al.*, 2015)**, also along the Euphrates River in Syria **(Khodadadi *et al.*, 2016)**.

The percentage of *A. grypus* in fish catches across Iraqi waters varies significantly. It ranked first in Dukan Dam Lake, constituting 13.4% of the total catch **(Sediq & Abbas, 2013)**. In the Tigris River at the Al-Kut Barrier, it made up 7.3% of the total number of fishes **(Abbas *et al.*, 2015)**. In the Greater Zab River at Aski-Kalak in Kurdistan, Iraq, *A. grypus* (Shabbot) accounted for 11.1% of the catch **(Sediq, 2023)**. In contrast, in southern Iraq's Al-Hawizeh Marsh, it represented only 0.02% **(Mohamed *et al.*, 2008)**. A study conducted by **Mizory (2021)** across five stations in Duhok Governorate found the percentage abundance of *A. grypus* to be 3.67%.

Other local studies have addressed the length-weight relationship and condition factor calculations for specific fish species in different water bodies **(Abbas & Al-Rudainy, 2004)**. **Al-Rudainy and Al-Mufty (2010)** examined the ecology of the Upper Zab River and studied several biological aspects of *Barbus grypus* (shaboot) in northern Iraq, including age, growth, and mortality rates. Surveys of ichthyofauna in the Great Zab River, particularly near the Deralok Hydropower Plant, were conducted by **Mizory and Abdulrahman (2019)**. Additionally, a broader survey of fish fauna from five stations in Duhok Province, Kurdistan Region, Iraq, was carried out by **Mizory (2021)**.

Given the scarcity of such ecological studies—especially in the Kurdistan Region of Iraq—the current research focuses on the ecological and biological aspects of *A. grypus* in the Lesser Zab tributary. This study aims to assess the suitability of environmental conditions for the species, considering the close relationship between fish community composition and surrounding environmental factors.

MATERIALS AND METHODS

Description of the study area

The Lesser Zab River is one of considered the largest branches of the Tigris River and are located within latitudes between 34°and 36° and longitudes between 43°and 46° (Fig. 1). Lesser Zab River has a total length of 400 km and a drainage area of 21.475 km², with 15.975 km² located within the Kurdistan Region, Iraq. The area was characterized by clay covered with fine gravel, with grasses and shrubs suitable for grazing animals,

other sandy and clay areas suitable for agriculture, and small parts represented by rocky hills **(Talib, 2005)**.

In this study we selected Taq taq, which is located 60 km north of the Kirkuk, 85 km south-east of Erbil and 120 km north-west of Sulaimaniyah, it starts from East by Kani Rash Village and from West by Kani Lala Village **(Wright, 2007)**.

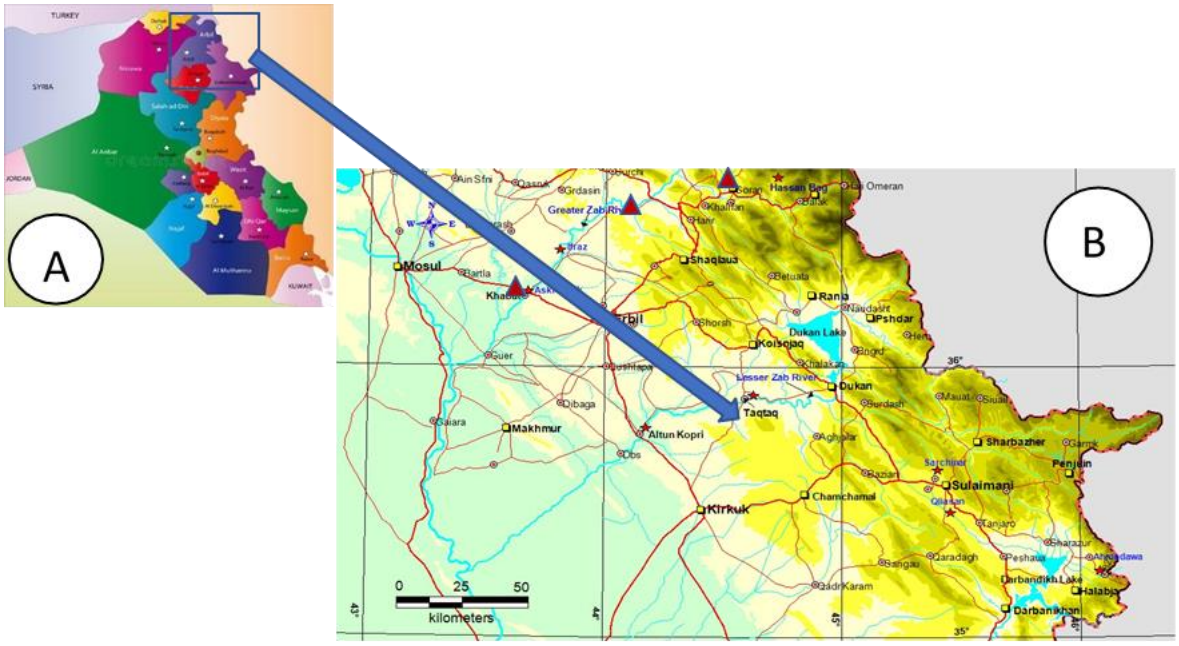

Fig. 1. A- Iraqi map. **B-** Sampling station. Designed with MapInfo Professional. Version 19.0. Dec. 07, 2024

Fieldwork

Physical and chemical measurements

Some physical and chemical parameters of water were measured during the morning hours, from (9 to 11 am), in the middle of each month throughout the study period. Water temperature was recorded with a standard mercury thermometer. To calculate salinity, the following equation was used:

Salinity (g/l) = electrical conductivity (µS/cm) × 0.064

The concentration of dissolved oxygen was quantified via a Romanian-made Dissolved Oxygen meter, model Hanna 2012, and expressed in (mg/l). Employing a pH meter of Romanian origin subsequent to calibration (titration) with standardized solutions (7, 4, and 9). The transparency level was assessed via the Secchi Disc.

Fishing and net description

Fishing involved the use of various types and sizes of nets, including cast nets with mesh lengths ranging from 1.5 to 2.5 cm. Gill nets with mesh lengths of 100 m and 4 m were also used, in addition to fishing electro in areas with dense vegetation, taking into account the stability of fishing effort throughout the study period.

Laboratory work

Morphometry

The total length (TL) of each species were measured by millimeters. Fish were also weighed using a digital sensitive balance OHAUS type.

Anatomical measurement

Each sample was dissected, gonads were examined to distinguish sex and separate males from females, then the gonads weighed to calculate the gonads somatic index (GSI).

Measurements and calculations

Length-weight relationship

The statistical relationship between total length and total weight was calculated using the following exponential equation.

$$\mathbf{TW = a\ TL^{b}}$$

TW = weight of fish in (g), TL =total length of fish in (mm), a = proportionality constant (intercept) and b = regression coefficient (slope). The Condition factor K is calculated using the following:

$$\mathbf{K = (W / L^{3}) * 100}$$

K = Condition factor, W = weight of fish (g) (With or without entrails), L = total length of fish (mm) and 100 is a factor to bring the value of K near unity.

The gonads-Somatic index (GSI) was calculated using the following:

$$\mathbf{GSI = (GW / W) *100}$$

GSI = Gonads-Somatic index, GW = Gonads weight, W= Total weight.

RESULTS

Ecology factors

Table (1) shows that water temperature at the Lesser Zab River had declined during the cold months and recorded the lowest values of 9.3°C during January 2025, then raised during the warm and hot months recorded the highest values of 29.2°C during July 2025. The annual mean value was 18.8°C. The pH fluctuated within a narrow range, between 7.4 and 8.3, with an overall mean of 7.9 during the study period in the Lesser Zab River.

Slightly monthly changes in water salinity values were shown at the Lesser Zab River our study period, which ranged between 0.21 g/l during January 2025 to 0.44 g/l during July 2025 within mean value of 0.30 g/l.

On the other hand, the minimum value of transparency was 21 cm recorded during February 2025, while the highest value was 50 cm during July 2025.

The highest values of oxygen water were raised during winter months and recorded the highest of 12 mg/l in January2025 and reduced at hot months recording minimum of 7.6 mg/l during August 2024 with rate of 9.2 mg/l.

Table 1. Values of physico - chemical properties of water in the study site.

Ecological factors	Lesser Zab River
Water temperature (°C)	9.3 – 29.2 18.8 ± 7.3
pH	7.4 – 8.3 7.9 ± 0.3
Salinity (g/l)	0.21 – 0.44 0.30 ± 0.02
Transparency (cm)	21 – 50 32.7 ± 10.6
Dissolved oxygen (mg/l)	7.6 – 12.0 9.2 ± 1.8

Fish catch rates

A total of 342 specimens of *A. grypus* were collected from Lesser Zab River in the period of August 2024 to July 2025, with a total weight of 82835 gm as fish total weight. Fishes ranged between 14 to 58.8 cm and between 17 to 1850 g in total length and weight

respectively. The lowest number of fish caught was 8 specimens, representing 2.3% of the total catch, in February 2025. This number increased to 45 specimens, accounting for 13.2% of the total fish catch, in July 2025 (Table 2). Similarly, the lowest recorded weight of *A. grypus* was 2,925 g in February 2025, making up 3.5% of the total fish catch, while the highest weight was approximately 9,530 g in July 2025, representing 11.5% of the total catch.

The current results indicate significant changes and fluctuations in both the number and weight of *A. grypus* caught throughout the study period. A clear pattern is observed: lower abundance and biomass during the colder months, and higher values during the warmer and hotter months (Table 3).

Table 2. Total length and weight ranges of *A. grypus* caught in the Lesser Zab River

Months	Fish No.	(%)	Total Weight (g)	(%)	Total Length Ranges (cm)	Total Weight Ranges (g)
August 2024	31	9.1	6520	7.9	22.5 – 45	85 – 1340
September	33	9.6	8330	10.1	33 – 58.5	35 – 1830
October	28	8.2	7915	9.6	24 – 35.5	185 – 1160
November	23	6.7	6150	7.4	15.5 – 26	35 - 210
December	15	4.4	4220	5.1	25.5 – 45	230 – 1200
January 2025	10	2.9	3750	4.5	14 – 22.5	17 – 420
February	8	2.3	2925	3.5	21 – 30.5	150 – 1155
March	30	8.8	7250	8.8	24.5 – 55	100 – 1850
April	38	11.1	8830	10.6	24 – 31	128 – 670
May	41	12.0	8850	10.7	22.5 – 37	90 – 550
June	40	11.7	8565	10.3	18.5 – 35.5	40.5 – 380
July	45	13.2	9530	11.5	15.5 - 48	155- 1830
Total	342	100	82835	100	14 – 58.8	17 – 1850

Table 3. Monthly changes in catch effort (number/hour) and (weight/hour) for *A. grypus* at the Lesser Zab

Months	Fish Catch Effort (Fish No./hour)	Fish Catch Effort (Fish Weight (g)/hour)
August 2024	16	3260
September	17	4165
October	14	3957
November	12	3075
December	8	2110
January 2025	5	1875
February	4	1462
March	15	3625
April	19	4415
May	21	4425
June	20	4283
July	23	4765
Total	174	41417

Fish age groups

Table (4) show that the ages of *A. grypus* in the Lesser Zab River ranged between 1 to 5 years. A clear dominance of fish was observed within the two-year-old group, with 112 specimens, with total lengths ranging from 21.5 to 31.5 cm, with an average total length of 26 cm, and weights ranging from 76 to 240 g, with an average total weight of 148 g.

A regression equation was used to estimate the calculated average lengths at different ages. The lengths reached 16.2, 24.8, 30.6, 35.1 and 39.9 cm for the first five ages of their life, respectively (Table 5). It was noted that the highest increase (16.2 cm) was in the first year, at a rate of 40.6 % and the rate of increase continued to decrease reaching 4.8 cm in the fifth year at a rate of 12% of the total increase.

Table 4. Observed average total length and weight for age groups for *A. grypus* at Lesser Zab River.

Age Group (Year)	Fish No.	Average Total Length (cm)	Total Length Range	Average Total Weight (gm)	Total Weight Range (gm)
1+	46	19.5	16.5 – 21.9	48	24 – 77
2+	112	26	21.5 – 31.5	148	76 – 240
3+	72	37.3	33 – 40.5	342	242 – 417
4+	59	43	41 – 46.5	560	530 – 650
5+	45	49.6	47 – 52	795	700 – 980
Total	334		16.5 – 52		24 – 980

Table 5. Total length averages calculated by the regression method for different age groups of A. grypus in the Lesser Zab River

Age Group (Years)	Fish No.	Average Total Length (cm) at Different Ages					Average Observed Total Length (cm)
		1	2	3	4	5	
1	46	13.4					19.5
2	112	14.3	21.8				26
3	72	16.5	24.1	28.7			37.3
4	59	17.9	25.4	30.8	33.8		43
5	45	19.0	27.8	32.5	36.4	39.9	49.6
Calculated Total Length (cm)		16.2	24.8	30.6	35.1	39.9	
Annual Increase in Length (cm)		16.2	8.6	5.8	4.5	4.8	
Percentage Increase		40.6	21.6	14.5	11.3	12.0	

Table (6) shows that the growth of A. grypus in the Lesser Zab River with its growth in other environments where the species is found. the growth of *A. grypus* in the

first year of their life in the Lesser Zab River was higher than in some environments and lower than in others.

Table 6. Comparison of *A. grypus* growth rates in different environments

Site	Average total Length at different age groups (cm)								Reference
	1	2	3	4	5	6	7	8	
Euphrates River	23.0	39.0	48.0	53.5	58.2	-	-	-	Mohamed *et al*. (2005)
Lesser Zab River	19.1	27.0	36.0	42.9	48.6	53.0	57.2	60.9	Abbas and Al-Rudainy (2010)
Greater Zab River	14.1	19.3	24.2	28	33.1	38	-	-	Al-Rudainy and Al-Mufty (2009)
Al-Hilla River	15.6	21.6	26.5	32.7	36.3	-	-	-	Hussain *et al*. (2012)
Al-Diwanyia River	22.0	32.0	39.0	43.9	48.3	-	-	-	Al-Jubouri *et al*. (2012)
Greater Zab River	16.2	24.8	30.6	35.1	39.9	-	-	-	Current study

Fish total length-weight relationship

The relationship between the total length and weight for both sexes combined of *A. grypus* following:

$W = 7.7\times10^{-3} L^{2.9631}$

$\log W = -2.113 + 2.9631 \log L$ $R^2 = 0.9341$ n= 342

The current results indicate that the b value calculated from the exponential and logarithmic total length-weight relationship for *A. grypus* reached 2.9631 at the Lesser Zab River, that it was significantly lower than the ideal (standard) value b = 3, meaning that the growth of *A. grypus* is allometric, that the increase in growth was in the direction of the cube of length at the expense of weight for *A. grypus* at the current site (Fig. 2).

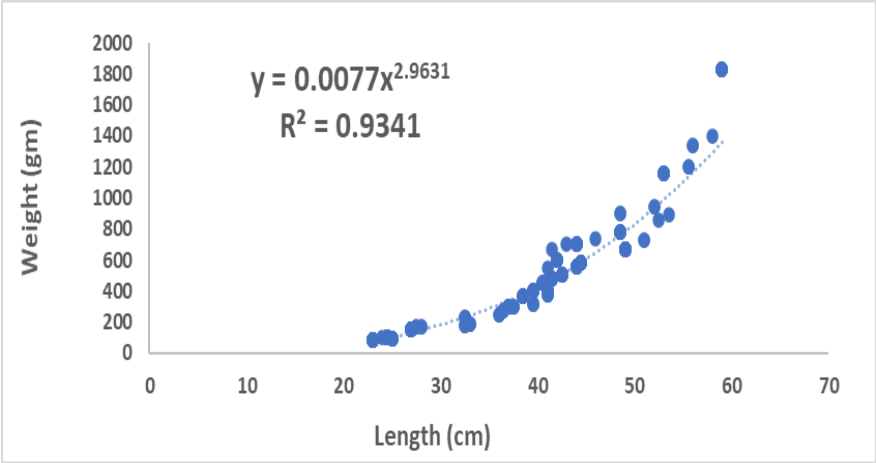

Fig. 2. Length-Weight relationship of *A. grypus* of Lesser Zab River.

Fish condition factor (K)

Table (7) shows that the condition factor values for male *A. grypus* at the Lesser Zab ranched-between 0.63 during October 2025 to 0.98 during March 2025 average 0.77, while condition factor values for female *A. grypus* ranged between 0.68 in October 2025 to 1.00 in April 2025 average 0.84 during our study period. Notes in current study the impact of seasonal environmental factors on fish physiological status.

Table 7. Monthly changes in values condition factor for *A. grypus* at Lesser Zab River.

Months	K values in Greater Zab River	
	Female	Male
August 2024	0.81	0.70
September	0.76	0.77
October	0.68	0.63
November	0.88	0.72
December	0.79	0.77
January2025	0.78	0.88
February	0.79	0.79
March	0.84	0.98
April	1.00	0.84
May	0.97	0.73
June	0.92	0.79
July	0.87	0.73
Average	0.84	0.77

DISCUSSION

Water temperature is an important factor in an aquatic environment that effects on biological processes and directly impacts fish population, as well as growth and reproductive regulation **(Houde, 1989)**. The changes in both air and water temperatures and their fluctuations throughout the year are related to the naturally climate in Iraq, which is characterized as cold rainy winters and hot dry summers.

The seasonal fluctuations in water temperature were limited during the winter and increased during the summer, although they were within ranges that fish could tolerate **(Al-Rudainy *et al*., 2006)**. In present study, these variations may be due to changes in air temperature, differences in collecting times and water depth variations, and this result was similar to previous studies **(Ali, 2010; Sediq, 2023)** at Greater Zab River.

The results revealed that the monthly pH fluctuations were consistent with earlier local studies, which reported slight alkalinity in Iraqi inland waters **(Al-Temimy, 2004; Abbas & Al-Rudainy, 2010; Sediq & Abbas, 2013)**. Generally, pH of the majority of inland waters varies from 6.5 to 8.5 **(Abdullah & Mhaisen, 2002)**, which is considered optimum for fish distribution and habitat **(Al-Rudainy & Al-Mufty, 2010)**. The present findings therefore fall within the normal range and are in agreement with previous findings. It is likely that the continuous mixing of the water column as a result of river runoff assists in maintaining pH levels towards slight alkalinity.

The results were consistent with the known salinity value for Iraqi inland water **(Abdullah & Mhaisen, 2002; Sediq, 2009; Abbas & Al-Rudainy, 2010)**. The salinity variations of water in the Lesser Zab River is seasonally influenced, with salinity declining in winter due to precipitation and increased freshwater flow and rising in summer as a result of evaporation and reduced water flow.The current study recorded salinity at levels lower than those reported in some previous local studies of the freshwater environment in the interior. As a point of comparison, salinity was between 0.57 and 1.92 g/l in parts of Tharthar, and between 0.48 and 1.04 g/l at two distinct sites in the rivers Tigris and Euphrates, and between 2.62 and 4.80 g/l in the northern part of the Shatt al-Arab estuary **(Al-Rubaie, 2001)**. The present results indicate that the salinity of the Lesser Zab River never reaches a value higher than 0.50 g/l, categorizing it as freshwater. This agrees with modern limnological classifications defining freshwater as having salinity concentrations below 0.50 g/l **(Wetzel, 2001)**. Lesser Zab water is certainly very appropriate to shabbot as freshwater fish's performance **(Safeen & Abdulla, 2025)**, which is nearest from our results.

Water transparency in any aquatic body is a crucial physical attribute that signifies the penetration and reflection of light through the water column, hence affecting numerous biological processes within the ecosystem, Transparency also affects the

diversity and composition of fish communities, especially those species that depend on sight, smell, or taste for their nutrition **(Karve *et al*., 2008)**.

Boyd and Tucker (2012) demonstrated that the presence of suspended particles in the water column, such as silt, mud, fine organic and inorganic debris, phytoplankton, and zooplankton, has an inverse relationship with water transparency, also high values of water transparency for any water body indicate a low productivity in it **(Al-Lami, 1998)**. The results recorded in this study were within the ranges or higher recorded in studies conducted on the Greater Zab River **(Abdullah & Mhaisen, 2002; Al-Rudainy & Al-Mufty, 2010)**. This may be attributable to the nature of the solid bottom, slow water flow, the terrain of the region, and numerous anthropogenic activities **(Sediq, 2009; Al-Rudainy, 2010)**.

Water dissolved oxygen is an important component that is very required for all body living and leads to ecological conditions **(WHO, 2006)**. The present results show that the dissolved oxygen concentrations of the water in the Lesser Zab River was not less than 5 mg/l, making it one of the waterways with extremely favourable levels for fish life **(FAO, 1987)**.

This finding is in agreement with many previous local investigations verifying the good aeration of water at different places along the Tigris and Euphrates rivers, and other inland water bodies **(Al-Lami *et al*., 1999; Al-Rudainy, 2002; Al-Rudainy *et al*., 2006)**. The present findings exceeded those documented by **Abdullah and Mhaisen (2002)** and **Ali (2010)**, although were analogous to the results of the investigations by **Al-Rudainy and Al-Mufty (2010)** about the Greater Zab River.

The biological performance of *A. grypus* in the Lesser Zab River also appears directly correlated with water quality conditions. Similar findings were reported by **Hashim *et al*. (2025)** in the Shatt Al-Arab River, where fluctuations in physicochemical parameters categorized the water quality as marginal with direct implications on aquatic animals. This verifies the fact that environmental variability plays a critical role in dictating the ecology of freshwater fishes in Iraq.

Our results were closer to some of previous local studies at interior water surfaces **(Al-Rudainy *et al*., 2006)**. Our findings suggest that *A. grypus* may exist for Micro-feeding or breeding or both together at the Lesser Zab, which coincides with the suitable environmental conditions for occurrence within abundance in food available and water temperature preferred, as well as the rapid runoff of present location. **Mizory (2021)** noticed that *A. grypus* represents 3.67 % of total fish catches in Duhok province, as well as, others noticed that these fishes with problems and suffer because of the creation of dam and reservoirs on rivers and streams without taking into consideration account immigration movement (feeding during warm and hot months or breeding during spring) of these fishes as occurrence at follow current-waters.

The ages recorded in this study were less than or within the estimated ages of fish of the same species in inland water bodies. In some previous local studies of the different

inland water environment recorded ages of *A. grypus* which were 5 years old **(Al-Temimy, 2004; Al-Jubouri *et al*., 2012; Hussain *et al*., 2012)**. These results are consistent with the current study. **Abbas and Al-Rudainy (2010)** recorded ages of shabbot in Lesser Zab River 8 years old and the dominance was the second age group. In the Greater Zab River **Al-Rudainy and Al-Mufty (2009)** recorded ages of 6 years old and a clear dominance of fish was observed within the three-year-old group, which is not agree with our findings. The short ages for *A. grypus* in the present study may be due to the fishing intensity, which did not allow most of fishes continue in their lives, especially large sizes during breeding season, which might affect fish stock communities for long time.

The annual increase in total length gradually declined in subsequent years. The decline in the annual increase in the average total length of fish with age is a common characteristic of cyprinidae family. The relatively short lifespans of *A. grypus* recorded in this study are due to the intensive fishing operations at the site, which prevents most fish from surviving, especially large fish during the maturation season. This may affect their long-term presence in their populations **(Al-Rudainy, 2002)**.

The variations in the growth of the same species in different environments is due to the varying environmental conditions of these water bodies and their suitability for fish, such as the abundance of available food, the prevalence of aquatic plants. This results in an increase in fish size throughout their lifespan in general, and in their early years in particular **(Mohamed *et al*., 2005)**.

Five age groups were recorded for *A. grypus* in the Lesser Zab River, which is consistent with those recorded in some waters of the Middle Euphrates River **(Mohamed *et al*., 2005; Hussain *et al*., 2012)** and lower than those recorded in other waters **(Abbas & Al-Rudainy, 2010)**. The reason may be due to the exposure of large fish to intensive fishing.

The length-weight relationship (LWR), a statistical correlation between the average weight of fish at a specific length, is crucial for forecasting various facets of fish biology. Length-weight data is frequently utilised as an indicator of body size and overall health, as well as the gonad development of fish **(Bilici, 2021)**. They are valuable for evaluating the well-being of diverse populations, conducting stock assessments, and estimating the biomass of certain species, which fluctuates based on seasonal nutrient variations, age, and habitats of the fish **(Daliri *et al*., 2012)**.

Our b value is nearest within that recorded for *A. grypus* which ranging between 2.68 to 3.25 at different local inland ecosystems **(Al-Rudainy & Al-Mufty, 2009; Abbas & Al-Rudainy, 2010; Hussain *et al*., 2012)**.

This may be due to fish large sizes which represented by total catch samples during warm and hot months. Fish health, food status, size, sex, sexual maturity stages, and fishing time can all have an impact on the b values, which can vary even within the same species **(Al-Temimy, 2004)**, as well as difference in water temperature **(Abbas & Al-**

Rudainy, 2006). **Silvano and Bigossi (2001)** observed that these values may be changed during the day and could be associated with fish stomach filling degree and its movement activity, which were lost in energy versus feeding active season.

The condition factor (K) in fish indicates variances that provide insights on the physiological state of the fish concerning its wellbeing, age, reproductive stages, and environmental variables such as temperature, salinity, and seasonality **(Bilici *et al*., 2017).**

The low of (K) values in October for both sexes could be attributed to post-spawning energy exhaustion, lower food availability and declining water temperature near the conclusion of the warm season. In contrast, the higher of (K) values in March indicate better feeding conditions and physiological preparation for the spawning season, particularly in females who store energy stores in their body tissues.

The condition factor is closely related to the state of sexual maturity and gonad development of fish, as the values of the condition index of fish decrease during the breeding months, then gradually rise to reach their highest peak when the gonads begin to mature and grow again. The high values of (K) may be due to the good nutritional status of the fish **(& and Al-Raudainy, 2006)**.

Our results were lowest than what recorded for *A. grypus* with 0.91 at Al-Diwanyia river **(Al-Jubouri & Mohamed, 2019)**. Results of current study were closely to those of a previous study conducted by **Al-Rudainy and Al-Mufty (2010)** at the Greater Zab river, results of study conducted by **Abbas and Al-Rudainy (2010)** in Lesser Zab and closely with study conducted of Tigris River before the construction of Ilisu and Cizre dams, Turkey **(Bilici, 2024)**. In contrast, in study conducted **(Cengiz *et al*., 2023)** at Karakaya dam lake, Turkey recorded condition factor of female *A. grypus* ranged between 0.70 to 1.12 and condition factor of male *A. grypus* ranged between 0.70 to 1.35, which not be closer from our results.

Fish condition factor related closely with it's the sexual maturation and ovaries development, as declining values during reproduction months then raised to reach the pike of maturity 'and renewal its ovaries, as well as, increasing in these values may due to its feeding situation **(Mohamed *et al*., 2005)**. Find the results on *A. grypus* in the Lesser Zab River to be consistent with those obtained for *C. luteus* in the same basin, where positive growth patterns and higher condition factors were obtained for the Lesser Zab compared to the Greater Zab River **(Al-Muffti and Abdullah, 2025)**.

CONCLUSION

Our conclusion is that the waters of the Lesser Zab are suitable for the occurrence of *A. grypus*. The species exhibited allometric growth, with an increase in total length occurring at the expense of body weight. Additionally, condition factor values were lower

during the winter months and increased during the spring and summer months. This fluctuation may be related to fish migration for reproduction or feeding.

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