

Environmental drivers, feeding habits, and population dynamics of *Planiliza abu* (Heckel, 1843) in the Third River, Iraq

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Article info

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To investigate the aquatic environment and population characteristics affecting the growth of *Planiliza abu* (Heckel, 1843) in the middle sector of the Third River (Main Outfall Drain, MOD) in central Iraq, a comprehensive study was conducted from January to December 2022. The research assessed key water quality variables alongside the feeding ecology, age structure, and reproductive dynamics of this species. The results revealed that water temperatures exhibited profound seasonal fluctuations, ranging from a minimum of 9.15°C in January to a maximum of 37.54°C in August. Salinity concentrations followed a similar pattern, reaching their highest value in August (8.05) and dropping to the lowest level in April (2.58). The potential hydrogen ion exponent (pH) demonstrated a tendency toward alkaline conditions, with peak values recorded in August (8.6). Conversely, dissolved oxygen (DO) concentration reached its maximum during January, peaking at 9.875 mg/L, while never falling below the critical threshold of 4 mg/L throughout the study period. Nutrients also displayed distinct variations; nitrate (NO₃) concentrations fluctuated between 0.66 mg/L in May and 1.12 mg/L in January, while reactive phosphate (PO₄) concentrations mirrored this trend exactly, reaching their minimum in May (0.66 mg/L) after peaking in January (1.12 mg/L). Biological examination revealed an overall sex ratio skewed in favor of females, with 122 males versus 144 females (1 : 1.21). Feeding activity (%) showed clear annual fluctuations, peaking in summer at 87.93% and falling to 80.90 % in winter. Feeding intensity showed a similar pattern, with the lowest level recorded during the winter months (11.73 degree/fish) and the highest level during the summer months (14.11 degree/fish). Dietary analysis proved that *P. abu* exhibits a detritivorous, benthic-feeding behavior; diatoms occupied the foremost position regarding the Index of Relative Importance (%IRI), constituting 47.23 % of the dietary composition, succeeded by algae at 33.20 % and organic detritus at 11.19 %. In conclusion, the veterinary-sanitary analysis of water quality parameters revealed no exceedances of critical ecotoxicant toxicity thresholds, indicating the overall ecological well-being of the surveyed aquatory and the safety of the habitat for maintaining the optimal physiological status and sustainable reproduction of the *P. abu* population.

Keywords: MOD, Water quality, Sex ratio, Index of Relative Importance, *Planiliza abu*.

Екологічні чинники, особливості живлення та динаміка популяції *Planiliza abu* (Heckel, 1843) у Третій річці, Ірак

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З метою вивчення водного середовища та популяційних характеристик, що впливають на ріст *Planiliza abu* (Heckel, 1843) у середньому секторі Третьої річки (Головний магістральний дренажний канал, MOD) у центральному Іраку, з січня по грудень 2022 року було проведено комплексне дослідження. У роботі оцінено ключові показники якості води поряд із тропічною екологією, віковою структурою та репродуктивною динамікою цього виду. Результати показали, що температура води зазнавала глибоких сезонних коливань – від мінімуму 9,15 °C у січні до максимуму 37,54 °C у серпні. Показники солоності змінювалися за подібною закономірністю, досягаючи найвищого значення в серпні (8,05) і знижуючись до найнижчого рівня у квітні (2,58). Водневий показник (pH) продемонстрував тенденцію до лужних умов із піковими значеннями, зареєстрованими в серпні (8,6). Навпаки, концентрація розчиненого кисню досягла свого максимуму в січні, склавши 9,875 мг/л, і жодного разу не опускалася нижче критичного порогу 4 мг/л протягом усього періоду дослідження. Вміст біогенних речовин також демонстрував чіткі зміни: концентрація нітратів (NO₃) коливалася між 0,66 мг/л у травні та 1,12 мг/л у січні, тоді як концентрація реакційноздатного фосфату (PO₄) точно відображала цей тренд, досягаючи мінімуму в травні (0,66 мг/л) після піку в січні (1,12 мг/л). Біологічний аналіз виявив, що загальне співвідношення статей зміщене у бік самок: 122 самці проти 144 самок (1 : 1,21). Активність живлення (%) демонструвала чіткі річні коливання, досягаючи піку влітку (87,93 %) і знижуючись до 80,90 % узимку. Інтенсивність живлення мала аналогічний характер із найнижчим рівнем, зафіксованим у зимові місяці (11,73 бала/рибу), та найвищим – у літні місяці (14,11 бала/рибу). Аналіз раціону підтвердив, що *P. abu* притаманна детритоїдна поведінка з бентосним типом живлення; діатомові водорості посіли провідне місце за індексом відносної важливості (%IRI), складаючи 47,23 % від складу раціону, за ними йшли інші водорості (33,20 %) та органічний детрит (11,19 %). У підсумку, ветеринарно-санітарний аналіз показників якості води не зафіксував перевищення критичних порогів токсичності екоотоксикантів, що свідчить про загальне екологічне благополуччя досліджуваної акваторії та безпечність середовища існування для збереження оптимального фізіологічного статусу і стабільного відтворення популяції *P. abu*.

Ключові слова: головний магістральний дренажний канал, якість води, співвідношення статей, індекс відносної важливості, *Planiliza abu*.**Бібліографічний опис для цитування:** Аль-Зайді К. Д. Л. Екологічні чинники, особливості живлення та динаміка популяції *Planiliza abu* (Heckel, 1843) у Третій річці, Ірак. *Scientific Progress & Innovations*. 2026. № 29 (1). С. 133–140.

Introduction

Life-history studies of fish species – including their distribution, reproduction, and feeding ecology – are among the most important approaches for understanding fish community structure and assessing its development and sustainability [8, 23].

The freshwater mullet *Planiliza abu*, locally known as Khishni, belongs to the family Mugilidae, which is widely distributed in tropical, subtropical, and temperate regions. Species of this family are characterized by a high tolerance to salinity (euryhaline species). *P. abu* is considered an economically important species and is widely distributed in Iraq, Syria, Turkey, Iran, and Pakistan [16, 24]. In Iraqi inland waters, this species is abundant in major rivers such as the Shatt Al-Arab, Tigris, and Euphrates, the southern marshes, as well as smaller rivers, drainage canals, and lakes including Habbaniyah, Tharthar, and Razzaza [19].

The length-weight relationship of *P. abu* in Iraq has been extensively investigated across various habitats. Specifically, studies have been conducted in Naama et al. [35], Al-Daham & Yousif [47], the Al-Dawoodi drainage canals [7], Al-Qadisiyah Dam [4], and Hawr Ad Dalmaj marsh [12]. However, the relationship between length and age, feeding habits, or the effect of seasonal environmental changes on this species in the Third River has not yet been studied.

The aim of the study

Therefore, the present study aims to highlight selected life-history aspects of *Planiliza abu* in the Third River. Particular emphasis is placed on the effects of certain physical and chemical water parameters on its occurrence, distribution, and age structure. In addition, the natural food components of this species were examined to clarify its feeding habits.

Materials and methods

Sampling Stations

Two sampling stations were selected for fish collection and water quality monitoring in the Third River (Main Outfall Drain, MOD) in central Iraq from January to December 2022. The first station was located at coordinates 32°26'58.0"N, 45°06'17.3"E. The second station was situated downstream along the course of the Third River at 32°11'12.5"N, 45°19'33.9"E (Fig. 1).

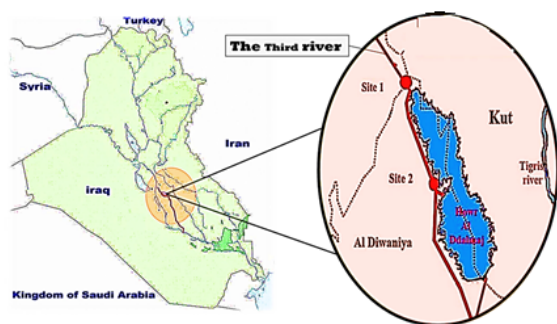


Fig. 1. Map of the sampling area for *Planiliza abu* fish

Water Quality Parameters

Water temperature, pH, and dissolved oxygen (DO) concentration were measured in situ using a YSI Sensorion 156 multiparameter meter. Nutrient concentrations, specifically nitrate (NO₃) and phosphate (PO₄), were determined using the cadmium column method following the procedure described by Parsons et al. [37].

Fish Sampling and Laboratory Processing

Fish specimens were collected using floating gill nets with a 25 × 25 mm mesh size. The captured samples were preserved in cooled containers and transported to the laboratory. Upon arrival, the fish were washed to remove adhering debris and sediments. Total length was recorded to the nearest 1 mm, and body weight was determined to the nearest 0.01 g using a sensitive Citizen balance.

Diet and Feeding Analysis

The fish were dissected to determine sex, after which all internal organs – including the intestines and gonads – were removed. The extracted intestines were preserved in 10 % formalin. The anterior portion of the stomach (cardiac region) was used to examine diet composition under 3.8×, 10×, and 40× magnifications.

Diet analysis was carried out using the points method (P%) and the frequency of occurrence method (O%), as described by Hynes [28]. Stomach fullness was classified into five categories (full, three-quarters full, half full, one-quarter full, and empty) and assigned scores of 20, 15, 10, 5, and 0, respectively [38]. These points were distributed among food items according to their relative volume. The total points for each dietary component were summed to calculate the percentage of total points.

The relative importance of dietary components was assessed using the Index of Relative Importance (%IRI) according to Stergiou [46], calculated as follows:

$$IRI = O\% \times P\%$$

$$\text{This index has been expressed as: } \%IRI = (IRI / \sum IRI) \times 100$$

Feeding intensity and activity were estimated following the method proposed by Sarkar and Deepak [41].

$$\text{Feeding intensity (scores/fish)} = \text{Total score derived from the fullness index} / \text{Number of fish fed}$$
$$\text{Feeding activity (\%)} = (\text{Number of fish fed} / \text{Total number of fish examined}) \times 100$$

The relative importance of dietary components was assessed using the Index of Relative Importance (%IRI) according to Stergiou (1988). Feeding intensity and activity were estimated following the method proposed by Sarkar and Deepak (2009).

Age and Growth Determination

Fish age and growth were determined using scales. For each specimen, 5–10 scales were collected from the body side below the dorsal fin, following the protocol described by Bagenal and Tesch [14].

Results and discussion

Physicochemical Water Parameters

Figure 2 illustrates that water temperature levels during the study period ranged from 9.15 °C in January to 37.54 °C in August. Salinity reached its highest recorded value in August (8.05), while the lowest value was

observed in April (2.58). In the same context, the highest concentration of dissolved oxygen (DO) was recorded in

January (9.875 mg/L), whereas the maximum pH value was observed in August, reaching 8.6.

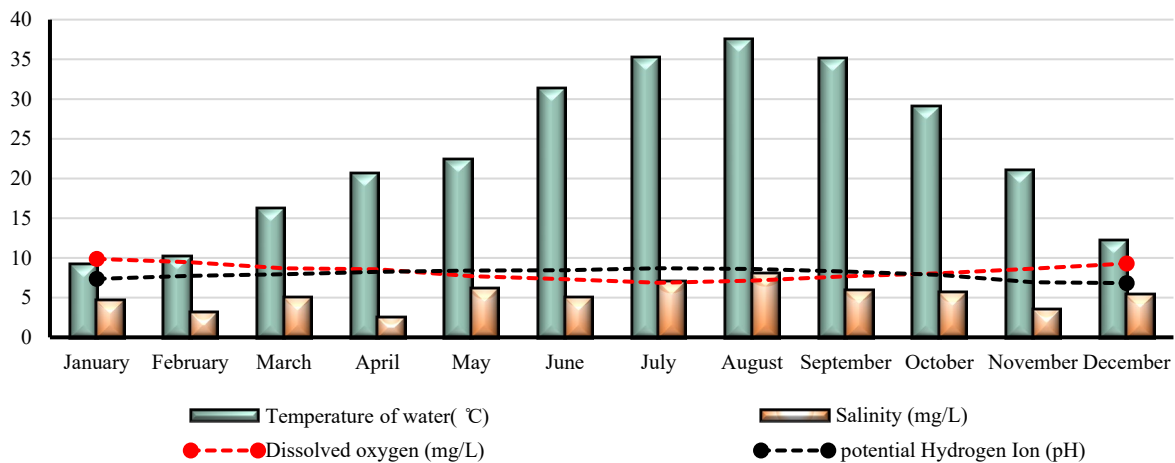


Fig. 2. Monthly changes in temperature, salinity, dissolved oxygen, and pH in the Third River

Throughout the study period, pronounced fluctuations were recorded in the concentrations of both nitrate and reactive phosphate. Nitrate values ranged between 0.66 mg/L in May and 1.12 mg/L in January. Similarly,

reactive phosphate exhibited its highest numerical value in January (1.12 mg/L) and its lowest in May (0.66 mg/L), as shown in **Figure 3**.

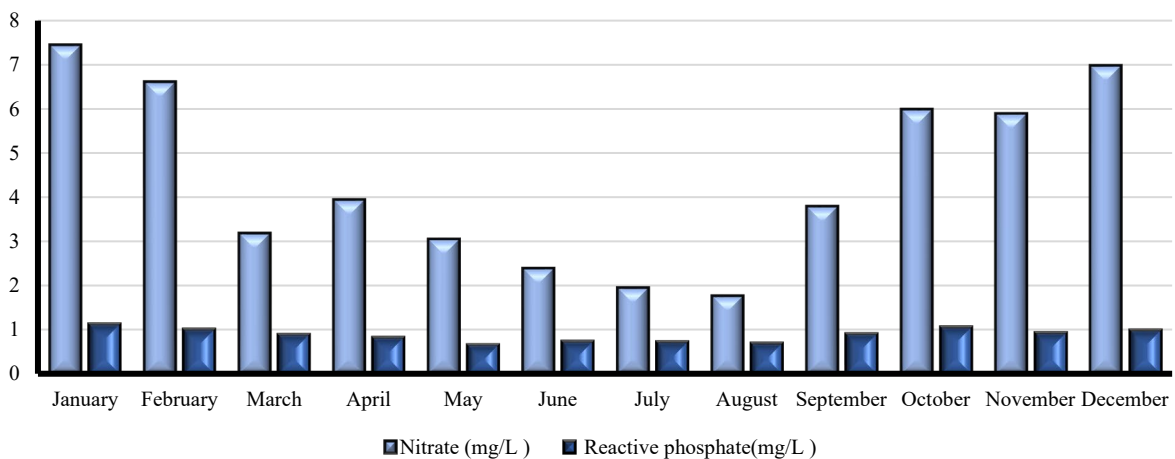


Fig. 3. Monthly variations in nitrate and phosphate levels in the Third River

Feeding Activity and Stomach Fullness

A total of 386 specimens of *Planiliza abu* were collected over the course of the study. Examination of stomach contents revealed that the highest frequency of empty stomachs occurred during the winter, whereas the lowest proportion was recorded in summer. Conversely, summer exhibited the highest proportion of fully filled stomachs. During spring and autumn, the degree of stomach fullness in the examined fish showed noticeable variation (**Fig. 4**).

Table 1 presents the number of stomachs containing food, feeding intensity, and feeding activity of the examined fish across the study seasons. The total seasonal distribution of analyzed individuals was 215 in winter, 63 in spring, 58 in summer, and 50 in autumn. The highest number of empty stomachs was recorded during winter (35 individuals), whereas during spring and autumn, empty stomachs reached 10 and 9, respectively.

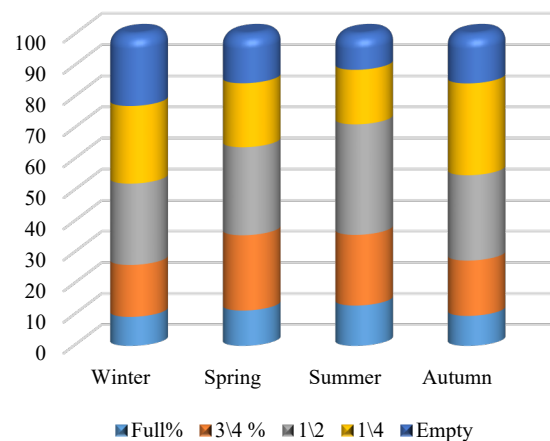


Fig. 4. Monthly variations in stomach fullness of *Planiliza abu* in the Third River

Feeding activity (%) varied seasonally, with the highest value recorded in summer (87.93 %) and the lowest in winter (80.9 %). Feeding intensity also exhibited marked seasonal variation, with the lowest value observed in winter (11.73 degree/fish) and the highest in summer (14.11 degree/fish). In spring and autumn, feeding intensity values were 13.91 and 12.52 degree/fish, respectively.

Table 1
Seasonal variations in *Planiliza abu* feeding parameters in the Third River

Parameter / Method	Winter	Spring	Summer	Autumn
Number of intestines tested	215	63	58	50
Stomachs containing food	180	53	51	41
Empty stomachs	35	10	7	9
Feeding activity (%)	80.90	84.13	87.93	82.00
Feeding intensity (degree/fish)	11.73	13.91	14.11	12.52

Dietary Composition

The dietary components consumed by *P. abu* showed clear variation throughout the study period according to both the points and frequency of occurrence methods. The species fed on algae, plants and seeds, diatoms, organic debris, aquatic insects, crustaceans, mollusks, and worms, all of which were detected in the digestive tracts. In addition, sand and clay particles were consistently present in the intestines of the examined fish across all sampling months.

Table 3
Age distribution, mean total length, mean body weight, and sex ratio of *Planiliza abu* in the Third River

Age group	Juvenile		Females		Males		All fish		Length (cm) Mean ± S.D.	Weight (g) Mean ± S.D.	Sex ratio (♂ : ♀)
	N	%	N	%	N	%	N	%			
0	89	74.17	3	2.08	1	0.82	93	24.09	9.81 ± 0.93	9.02 ± 1.79	1 : 0.33*
1	31	25.83	48	33.33	39	31.97	118	30.57	12.11 ± 0.79	15.96 ± 4.82	1 : 1.23
2	0	0	59	40.97	51	41.80	110	28.50	15.09 ± 0.77	39.82 ± 6.05	1 : 1.16
3	0	0	32	22.22	30	24.59	62	16.06	17.94 ± 0.88	71.27 ± 8.33	1 : 1.07
4	0	0	2	1.39	1	0.82	3	0.78	19.13 ± 0.97	89.11 ± 9.66	1 : 2.00*
Total	120	100	144	100	122	100	386	100	14.18 ± 6.94	50.85 ± 38.27	1 : 1.21

Gonadal examination conducted on all 386 specimens revealed 89 juveniles, 122 males, and a predominance of females (144 individuals). Accordingly, the overall sex ratio significantly favored females at 1 : 1.21. Furthermore, a statistically significant difference was observed in the youngest age group (Age 0) in favor of males compared with the other age groups, with a ratio of 1 : 0.33. In contrast, the fourth age group (Age 4) showed a significant predominance of females, with a sex ratio of 1 : 2 at a statistically significant level ($p < 0.05$), as indicated in **Table 3**.

Physicochemical Properties of Water

Water temperature is considered one of the most influential environmental factors affecting the distribution of aquatic organisms [6, 9], in addition to having a direct impact on their physiological processes [11, 39]. The present study revealed noticeable fluctuations in water temperature throughout the year, which are closely associated with the prevailing climatic conditions. Iraq's geographical location imposes a climate characterized by high temperatures during summer and relatively low temperatures in winter, a pattern reflected in the number

Diatoms ranked first in terms of the Index of Relative Importance (%IRI), accounting for 47.23 %, followed by algae (33.20 %) and organic debris (11.19 %), whereas mollusks occupied the final rank with the lowest contribution (0.08 %), as shown in **Table 2**.

Table 2
Relative Importance Index (%IRI) of digestive tract contents in *Planiliza abu*

Food items	Point method		Frequency of occurrence		%IRI
	N	%	N	%	
Algae	704	28.47	168	93.33	33.20
Plants and seeds	55	2.23	47	26.11	0.73
Diatoms	967	39.10	174	96.67	47.23
Organic debris	309	12.49	129	71.67	11.19
Aquatic insects	0	0.00	0	0.00	0.00
Crustaceans	110	4.45	90	50.00	2.77
Unidentified decomposing matter	51	2.06	48	26.67	0.69
Mollusca	20	0.81	14	7.78	0.08
Worms	257	10.39	57	31.67	4.11

Population Structure: Age, Growth, and Sex Ratio

The results revealed the presence of four age groups of *P. abu* during the study period, with a dominance of the first age group (Age 1), represented by 118 individuals out of the 386 fish. The mean total length of the collected population was 14.18 cm, while the mean total weight reached 50.85 g (**Table 3**).

of *Planiliza abu* individuals collected. This observation is consistent with the findings of Demirci [20], who reported that fish catch rates increase during warmer months compared with colder periods, owing to enhanced fish activity resulting from elevated metabolic and biological processes.

The recorded pH values exhibited only minor monthly variations, with an overall tendency toward alkaline conditions. This characteristic is typical of Iraqi waters due to their high bicarbonate content [3]. Moreover, the Third River was originally designed to convey saline drainage waters resulting from the irrigation of agricultural lands in central and southern Iraq [10]. In this context, monthly variations revealed a clear divergence in salinity concentrations throughout the study period. Salinity values showed a marked decline in January, followed by a gradual increase that reached peak levels from July to August. This pattern is likely attributable to reduced water discharge in the study area, combined with elevated summer temperatures and increased evaporation rates, which collectively led to higher concentrations of dissolved salts.

Dissolved oxygen (DO) concentration represents another key environmental parameter, playing a fundamental role in regulating vital biological functions [17]. In this study, DO concentrations varied over the seasonal cycle, with the lowest values recorded during the summer months. This decline may be related to the density of aquatic vegetation and the associated oxygen dynamics linked to photosynthetic activity, as well as the shallowness of the water column. Furthermore, the decomposition of submerged aquatic plants – often directly exposed to solar radiation during periods of low water levels – may have contributed to these variations. Overall, DO concentrations did not drop below the critical threshold of 4 mg/L, which is commonly used as an indicator of organic pollution [36].

The results also indicated elevated nitrate (NO₃) concentrations during December and January compared with the remaining months at both sampling stations. This increase is likely due to winter rainfall over nitrogen-fertilized agricultural lands, with subsequent runoff transporting nutrients into nearby water bodies [29]. This interpretation is highly applicable to the study area, as most lands adjacent to the Third River are predominantly agricultural. Additionally, nitrate is often reduced to nitrite under low-temperature conditions, subsequently leading to an increase in its concentration [40]. These findings are consistent with those reported by Al-Imarah et al. [2] in the East Hammar Marsh. Conversely, the observed decline in nitrate concentrations during August may be attributed to nutrient uptake by phytoplankton, as well as to nitrate reduction processes under high-temperature conditions [31].

Phosphates are essential nutrients that strongly influence the growth and reproduction of phytoplankton [26]. In this study, elevated phosphate (PO₄) values were recorded during December and January, which may be related to reduced utilization by phytoplankton and other aquatic organisms during the colder season. Rainfall may also play a significant role by dissolving phosphorus compounds from the Earth's crust and washing agricultural soils into the aquatic system. These results are in agreement with Al-Imarah et al. [2]. In contrast, the decline in phosphate concentrations observed during July and August is likely associated with the increased abundance and uptake by phytoplankton and aquatic macrophytes. Based on these findings, the assessment of physicochemical parameters did not reveal any concentrations exceeding critical thresholds that could pose a threat to the natural population dynamics of *P. abu* within this water body.

Nutritional Composition and Feeding Ecology

The gastrointestinal contents of 386 specimens of *Planiliza abu* were examined. Among these, 35 individuals exhibited empty intestines during the winter season, representing the highest proportion of empty stomachs recorded throughout the study period. Conversely, the highest values for feeding activity (%) and feeding intensity were documented during the summer months. These seasonal shifts can be attributed to fluctuations in water temperature, food availability, fish activity, and reproductive processes [10, 45].

An increase in the feeding intensity of *P. abu* during summer typically follows the spawning period [30], as

fish actively replenish the energy expended during reproduction and accumulate somatic reserves to support subsequent reproductive cycles. This seasonal pattern is consistent with the observations reported by Abdul-Razak and Al-Hassani [1] and Batal et al. [15]. Notably, despite the pronounced seasonal variation in feeding intensity, *P. abu* inhabiting the Third River continues to feed even during the winter months.

Based on both the points and frequency of occurrence methods, diatoms recorded the highest Index of Relative Importance (%IRI), accounting for 47.23 %, followed by algae in the second rank. Reynolds [50] reported that algae exhibit bloom phases during spring and autumn within the water column, while settling onto the substrate during periods of reduced activity in summer and winter. Through these sedimentation dynamics, both algae and diatoms eventually reach the bottom, making them highly accessible to benthic-feeding fish.

This explains the high proportion of algae observed in the stomach contents and its ranking immediately after diatoms, confirming that *P. abu* exhibits a detritivorous, bottom-feeding behavior in this habitat. These findings are in close agreement with those reported by Mohamed et al. [33], Mutlak [34], and Hussain et al. [27], who similarly documented diatoms as the dominant dietary component based on the %IRI.

Organic debris was recorded with a total frequency of 129 occurrences across all months of the study, accounting for a frequency of occurrence of 71.67 %. This substantial contribution can be attributed to the increased deposition of organic matter on the substrate of the water body, resulting from the abundance of decomposed materials, particularly toward the end of the phytoplankton bloom period that typically occurs in autumn. Such environmental conditions are directly reflected in the elevated contribution of these detrital components to the diet of *P. abu*.

In contrast, crustaceans, mollusks, and worms were present at relatively low proportions in the diet. Their occurrence in the feeding spectrum of *P. abu* is likely incidental, resulting from accidental ingestion along with the primary food items, a finding that aligns with Al-Zaidy et al. [11, 12].

Furthermore, the analysis revealed that sand and clay particles constituted a noticeable portion of the gastrointestinal contents of *P. abu*. However, the percentages of these inorganic particles were excluded from the primary dietary analysis on the assumption that they do not represent actual nutritional items. Shamma'a & Jasim [48] suggested that the presence of sand in the stomach of *P. abu* is related to sediment deposition and the mechanical difficulty of eliminating such heavy particles from the digestive tract during suction feeding.

Additionally, Mondal (2017) [42] reported a positive relationship between the amount of organic matter and the proportion of sand particles in the diet of *P. abu*, as benthic fish are unable to avoid ingesting sediment while scraping or vacuuming organic detritus and diatoms from the riverbed.

Age Structure and Sex Ratio

Age and growth assessment is regarded as one of the key tools for identifying age classes and associated

indicators used in sustainable fisheries management. Information derived from such analyses represents an essential component for predicting potential changes in population structure [13]. The results of the present study revealed the existence of four age classes for *P. abu*.

This contrasts with the findings reported by Mhaisen and Al-Jaffery [32] in a Babylon Fish Farm, Iraq; Doğu et al. [21] in Atatürk Dam Lake, Turkey; and Shakir and Al-Asadiy [44] in the Euphrates River (Al-Qadisiyah Province, Iraq), where five age classes were identified for the same species. In line with these earlier studies, it may be inferred that *P. abu* does not attain very advanced ages in the present water body. Such discrepancies among studies are likely attributable to differences in environmental conditions, which may not equally provide optimal habitats for the species across all geographical locations.

The overall sex ratio of *P. abu* exhibited a clear tendency toward female dominance, with a ratio of 1.21 : 1 (females to males). This finding is comparable to the ratios reported by Naama et al. [35] in the East Hammar Marsh and Ay and Özcan [43] in the Orontes River, Turkey, who documented an overall sex ratio favoring females at 1 : 1.29. In contrast, Al-Daham & Yousif [47] reported a sex ratio close to the theoretical equilibrium (1.09 : 1) in the Shatt Al-Basrah Canal, while Al-Shawi and Wahab [5] recorded a ratio of 1 : 0.93 in the Tuz-Chi tributary in northern Iraq. Conversely, a more pronounced dominance of females (2.7 : 1) was documented in the waters of Khuzestan [18].

Imbalances in the sex ratio of fish populations may be attributed to the selectivity of fishing gear, which may capture one sex more efficiently than the other, or to age-related differences in natural mortality rates between sexes [25, 49]. The statistically tested differences observed in the present study for the first and fourth age classes ($p > 0.05$) may be associated with the relatively small sample size examined within those specific groups [22].

On the other hand, the overall finding of no significant difference in the total sex ratio suggests that survival probabilities for both sexes may be relatively similar in this environment. This may also reflect comparable exposure to fishing pressure and similar responses to environmental factors influencing the growth and reproduction of this species.

Conclusions

The environmental parameters monitored in the Third River exhibited clear seasonal fluctuations driven by climatic conditions, but remained well within the tolerance limits for freshwater fish, with dissolved oxygen concentrations consistently staying above the critical organic pollution threshold of 4 mg/L, thereby indicating a healthy and non-hazardous aquatic environment for the local ichthyofauna throughout the study period. Within this habitat, *Planiliza abu* exhibits a clear detritivorous, benthic-feeding behavior, consuming a wide spectrum of bottom-dwelling items, where diatoms represent the primary dietary component with the highest Index of Relative Importance (%IRI = 47.23 %), followed closely by algae (%IRI = 33.20 %) and organic debris (%IRI =

11.19 %). This feeding activity and intensity are heavily regulated by temperature and reproductive cycles, reaching their peak values during the warm summer months post-spawning to replenish expended energy; notably, despite these distinct seasonal variations, *P. abu* continues to feed continuously throughout the entire year, including the winter season. Furthermore, the population structure of *P. abu* in the Third River is composed of four distinct age classes, with a marked dominance of the first age group (Age 1), indicating a relatively young population, while the overall sex ratio significantly favors females (1 : 1.21), with a pronounced female predominance observed in the oldest age group (Age 4), suggesting potentially higher survival rates or lower natural mortality for females in the advanced stages of life.

DECLARATIONS

Ethical Statement

All sampling and handling procedures of *Planiliza abu* specimens in this study were conducted in strict accordance with international ethical standards and veterinary-sanitary guidelines for the care and use of aquatic animals in scientific research. Fish collection was performed using standard non-destructive fishing gear (floating gill nets) under official monitoring regulations in the Third River. Since the study was based on the analysis of wild-caught fish obtained from commercial or authorized ecological monitoring catches, and did not involve experimental manipulation of live animals in a laboratory setting, formal institutional animal care committee approval was not required.

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Conflict of interest

The authors state that there is no conflict of interest.

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Declaration of AI and AI-assisted technologies

The author declare that no artificial intelligence or AI-assisted technologies were used in the preparation of this manuscript.

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