INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print); 2222-5234 (Online)
Website: https://www.innspub.net
Email contact: info@innspub.net
Vol. 29, Issue: 1, p. 160-170, 2026

RESEARCH PAPER OPEN ACCESS

Length-weight relationship and population structure of pool barb (*Puntius sophore*) from Jashore, Bangladesh

Md. Almamun Farid*, Abu Shale Md. Nasim

Department of Fisheries and Marine Bioscience, Jashore University of Science and Technology, Jashore, Bangladesh

Key words: Puntius sophore, Length-weight relationship, Population structure, Bangladesh

Received: July 04, 2026 **Accepted:** July 14, 2026 **Published:** July 21, 2026

DOI: https://dx.doi.org/10.12692/ijb/29.1.160-170

ABSTRACT

The pool barb, *Puntius sophore,* is a small indigenous freshwater fish species with food and ornamental value, belonging to the family Cyprinidae. Size structure, length-weight relationship, and condition factor were studied by examining a total of 86 specimens randomly collected from the Jashore region. The sampled species mostly (78%) belonged to the size class 65-98 mm; total length ranged from 116 mm to 45 mm, average of 82±14.69 mm, and body weight ranged from 12.85g to 4.25g, average of 8.165±1.74 g, respectively. The female-to-male ratio was 1.36. The mean Fulton's condition factor (K) was 1.84 ± 0.81 for the overall population. The mean K value was 2.02 ± 0.92 in males and 1.70 ± 0.70 in females. The largest female was recorded from the monsoon, with 116 mm TL and 12.85 g BW, while the largest male was 98 mm TL and 10.5 g BW. Again, the smallest female was observed in summer with 49 mm TL and 4.75 g BW, while the smallest male belonged to a size of 45mm TL and 4.25 g BW. Positively Linear and highly significant relationships were obtained between TL and BW for all fishes in different seasons, with the regression equation BW = 0.1112TL - 0.5522 (r^2 = 0.8803). The result of the length-weight relationship for male specimens was BW= 0.0878TL + 0.943, and the value of the regression r^2=0.9277. The calculated length-weight relationship for females is expressed by BW = 0.1182TL - 0.9441, and the value of the regression r^2=0.8886.

***Corresponding author:** Md. Almamun Farid ✉ farid.fmb@just.edu.bd

INTRODUCTION

The pool barb, *Puntius sophore* (Hamilton, 1822), is a small indigenous freshwater cyprinid widely distributed throughout South and Southeast Asia, including Bangladesh, India, Nepal, Pakistan, and Myanmar. In Bangladesh, it inhabits rivers, floodplains, ponds, beels, canals, and rice fields, where it contributes significantly to inland fisheries production and rural livelihoods (Ahamed *et al.*, 2012). Owing to its high nutritional value, palatable flesh, and affordability, *P. sophore* constitutes an important component of the diet of local communities and plays a vital role in sustaining small-scale fisheries (Choudhury *et al.*, 2015; Rahman, 1989). However, increasing anthropogenic pressures, including habitat degradation, wetland conversion, overfishing, agricultural pollution, and climate-induced hydrological alterations, have adversely affected many populations of small indigenous fish species in Bangladesh (Hanif *et al.*, 2015; Haque *et al.*, 2025; Sunny *et al.*, 2025). Global freshwater ecosystems are experiencing unprecedented biodiversity loss driven by habitat fragmentation, pollution, climate change, and overexploitation, making continuous monitoring of indigenous fish populations increasingly important (Tickner *et al.*, 2025).

Assessment of fish population characteristics is fundamental for understanding growth dynamics, health status, and the sustainable management of exploited fish stocks. Among the most widely applied biometric tools, the length–weight relationship (LWR) provides valuable information on growth patterns, body form, and biomass estimation from length-frequency data (Froese, 2006; Le Cren, 1951). The LWR also enables comparisons among populations from different habitats and environmental conditions, facilitating evaluations of ecological adaptation and fisheries status. The growth coefficient (b) derived from the LWR indicates whether fish exhibit isometric growth ($b = 3$) or allometric growth ($b \neq 3$), reflecting variations in body shape associated with environmental, nutritional, and reproductive factors (Froese, 2006, 2025; Ricker, 1975).

The condition factor is another important biological index that reflects the physiological well-being and nutritional status of fish populations. It is influenced by food availability, reproductive activity, environmental quality, age, and seasonal variation, and is therefore widely used as an indicator of habitat suitability and population health (Blackwell *et al.*, 2000; Le Cren, 1951). Similarly, analyses of population structure based on length-frequency distribution provide insights into recruitment patterns, age composition, and exploitation status, offering essential information for fisheries assessment and conservation planning (King, 2013).

Although several studies have reported the length–weight relationship from open water habitats like rivers, lakes, haors, beels, etc of *P. sophore* from different regions of South Asia, considerable spatial variation exists due to differences in habitat characteristics, climatic conditions, fishing pressure, and resource availability (Awal *et al.*, 2023; Debi *et al.*, 2023; Hossain *et al.*, 2012; Hossain *et al.*, 2006; Kalita and Rajbongshi, 2024; Narzary and Khangembam, 2022; Pal *et al.*, 2013; Rahman *et al.*, 2012; Sarkar *et al.*, 2013). In southwestern Bangladesh, particularly in the Jashore region, captive water *Puntius sophore* information on the growth characteristics, condition, and population structure of this species remains scarce despite its commercial and ecological importance. Such baseline biological information is indispensable for monitoring stock status and developing evidence-based management strategies for small indigenous fish species.

Therefore, the present study aimed to investigate the length–weight relationship and evaluate and characterize the population structure of the fish collected from captive water in Jashore, Bangladesh. The findings are expected to provide updated biological information that will contribute to fisheries management, biodiversity conservation, and the sustainable utilization of this economically important freshwater species. The present research was aimed at studying some aspects of biology, population dynamics, and food and feeding habits of

Puntius sophore fish that will be useful in the future to introduce into culture as well as management of the species.

MATERIALS AND METHODS

Research area

This research on "The Pool barb, *Puntius sophore*: morphometric aspects and population structure was carried out in the Jashore region (Fig. 1).

Fig. 1. Map showing the two Upazilas of the greater Jessore region, viz, Jhikargacha, Jashore Sadar. The red triangle indicates the sampling stations (Source: Google Maps)

Research period

The research was carried out from December 2022 to July 2023. Samples were collected each month from different places.

Sample collection and preservation

The samples were collected in an ice box or in a jar containing 10% formalin to prevent further digestion of food materials (Noor *et al.* 2013) for morphometry.

On the other hand, some collected fish were transported in an oxygenated polythene bag for the morphometric study to the hatchery and laboratory in the Fisheries and Marine Bioscience (FMB) at Jashore University of Science and Technology (JUST). Before examination, fish in each monthly sample were taken out of the jar and kept in tap water; any dirty substances were removed adequately, and formalin was removed. Then the washed fish were left at room temperature for about half an hour to dry the remaining moisture of the fish body. The fish were also tagged with numbers.

Measurement of samples

The morphometric characters, viz., the total length (TL) and standard length (SL), were measured in mm using a mm scale, and the whole-body weight (BW) was measured in gm using an electronic balance, separately and one after another. The specimens were tagged with numbered hard paper.

Condition factor

The Fulton condition factor (K) of fish, which is referred to as fitness, was calculated according to (Fulton, 1904), which relates the fish's body length to its weight:

$$K=100*BW/TL^3$$

Here, BW is considered the individual fish weight in g (grams), and TL is the individual fish total length in cm (centimeters), and to bring the value of K near unity 100 is a factor.

Size structure determination

The collected specimens were divided into seven classes according to 10 intervals from 46 mm to 115 mm for the size structure determination.

Length-weight relationship

For determining the length-weight relationship of the species, a total of 86 specimens were collected randomly. The regression line of total length on body weight was found to be linear and positive. The vertical axis showed the body weight of the specimen in grams, and the horizontal axis showed the total length in mm. It showed a positive linear relationship between total length and body weight of the specimens.

The length-weight relationship of the collected specimens was estimated by the allometric formula,

$$W = aL^b$$

Where W is the dependent variable (i.e., total body weight in g) and L is the independent variable (i.e.,

total length in mm), "a" is the intercept of the regression, and "b" is the regression coefficient (slope). Parameters "a" and "b" of the length-weight relationship were estimated by linear regression analysis based on natural logarithms:

Log (W) =Log (a) + b log (L)

This equation is of the same form as the linear equation Y = a+bX. The linear correlation coefficient measures the strength and the direction of a linear relationship between two variables. The determined coefficient (r2) was used as an indicator of the quality of the linear regressions (Scherrer, 1984). The mathematical formula for computing r is:

$$r = \frac{\Sigma xy - \frac{[(\Sigma x).(\Sigma Y)]}{n}}{\sqrt{\left\{(\Sigma x^2) - \frac{(\Sigma x)^2}{n}\right\}.\left\{(\Sigma y^2) - \frac{(\Sigma y)^2}{n}\right\}}}$$

B values equal to 3, obtained in linear regressions, indicate isometric growth.

b>3 indicates positive allometric growth

b<3 indicates negative allometric growth

Data analysis

Several Indices were analyzed by the Microsoft Excel (MS Excel) computer package as descriptive values such as mean and percentage. Length-weight relationship figure was created by GraphPad Prism. The statistical data analysis was carried out with the aid of the computer software SPSS version 11.5 (Statistical Package for Social Science).

RESULTS

The present study recorded the maximum size as 116 mm TL, and the minimum size was about 45 mm TL, with a mean size of 82±14.69 mm. At the same time, the body weight was recorded as 12.85 g, 4.25 g, and 8.165±1.74 g for maximum, minimum, and mean weight, respectively. The length and weight were recorded during the study period and are mentioned in Table 1 and also Comparison of the total length and body weight of all fish, male and female in Fig. 2.

Table 1. The mean values of total length and body weight with maximum and minimum size of male-female collected from two Upazilas of Jessore region

Samples	Total Length			Body weight		
	Maxi (mm)	Mini (mm)	Mean ±SD	Maxi (g)	Mini (g)	Mean ±SD
All Individuals	116	45	82±14.69	12.85	4.25	8.165±1.74
Male Individual	98	45	75±14.59	10.5	4.25	7.615±1.23
Female Individual	116	49	85±14.82	12.85	4.75	8.975±1.84

Condition factor

The mean Fulton's condition factor (K) of the fishes is mentioned in Table 2.

Table 2. Condition factor of all fish, male and female fish during the study period

Group	Number of fish	K (Mean ± SD)
Overall	86	1.84 ± 0.81
Male	37	2.02 ± 0.92
Female	49	1.70 ± 0.70

Size structure for male fish in different seasons

In terms of different seasons, it was found that in the Summer (March, April, May), most of the male fish (100%) ranged between 45 and 84 mm; however, in the monsoon (June, July) and winter (December, January, February) seasons, it was 60% and 73.33%, respectively.

Overall, the males occupied a wide range (55-104 mm) only during the monsoon season, while it was limited throughout the summer (45-84 mm) and winter seasons (45-94) (Fig. 3).

Size structure for female fish in different seasons

During the summer, most of the recorded individuals had a TL of 79-88 mm. However, during the monsoon season, the population was evenly distributed throughout all size classes, and most individuals

(38.1%) fell between the 89-98 mm range. In the winter, more than half of the female fish were in the range of about 89-98 mm long. During the winter season, however, no individual had a TL greater than 98 mm. The size structure of females during different seasons is shown in Fig. 4.

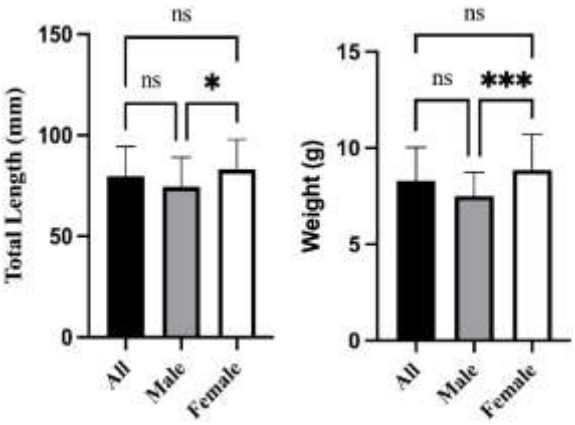

Fig. 2. Comparison of the total length and body weight of all fish, male and female, throughout the study period (* $p \leq 0.05$, *** $p \leq 0.001$)

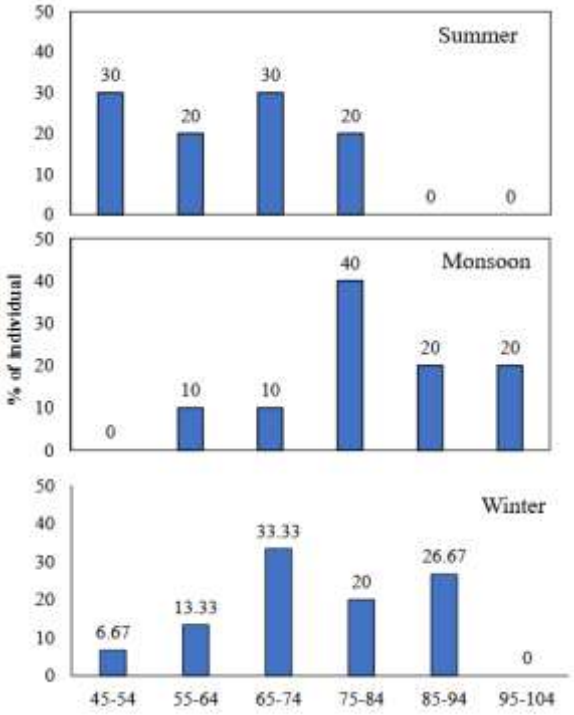

Fig. 3. Size structure (mm) of male fishes in the summer, monsoon and winter seasons collected during the study period.

Sex ratio of males and females

Among the collected samples, the female-to-male ratio was 1.36.

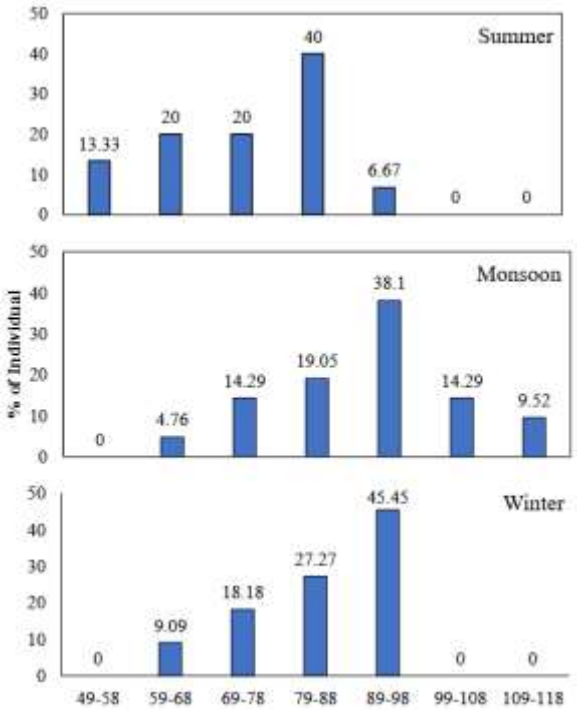

Fig. 4. Size structure (mm) of female fishes in the summer, monsoon, and winter seasons collected during the study period

Length-weight relationship

The coefficient of correlation (r^2) of total length and body weight based on sexes and in different seasons ranged from 0.8805-0.9277 (Table 3).

Table 3. Values of constants "a" and "b" in the linear regression of total length (TL) and body weight (BW) for both sexes in different seasons of the year with respective correlation "r" value

Characters	Intercept a	Regression b	Correlation r^2
TL: BW (AI)	-0.5522	0.1112	0.8805
TL: BW (Male)	+ 0.943	0.0878	0.9277
TL: BW (Female)	-0.9441	0.1182	0.8886

Relationships between different morphometric characters

During the research, over the study period on 86 specimens, the maximum and minimum TL and BW were recorded as 116 mm and 45 mm, and 12.85 g and 4.25 g, respectively. The length-weight relationship for the combined sexes was expressed by the formula, BW = 0.1112TL - 0.5522, and the value of the regression became $r^2 = 0.8803$ (Fig. 5)

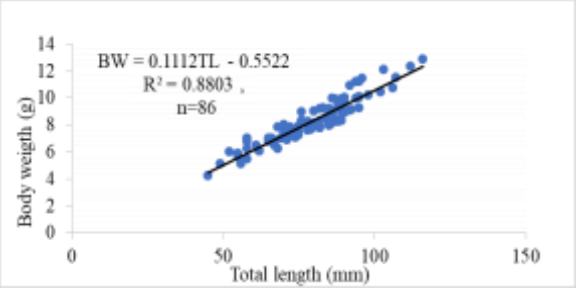

Fig. 5. Relationship between total length (TL) and body weight (BW) for combined of all sexes

The result of the length-weight relationship for male specimens is presented by the equation BW= 0.0878TL + 0.943, and the value of the regression r^2=0.9277 (Fig. 6). For the study, the total number of collected males was 37, and their maximum and minimum TL and BW were 98 mm and 45 mm and 98 g and 4.25 g, respectively.

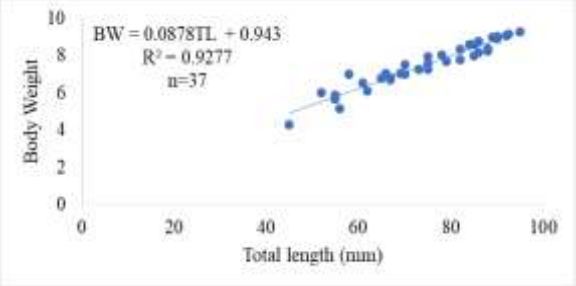

Fig. 6. Relationship between total length (TL) and body weight (BW) for all male fish

But in the case of female fish over 49 specimens, the maximum and minimum TL and BW were 116 mm and 49 mm, and 12.85 g and 4.75 g, respectively. The calculated length-weight relationship for females is given by BW = 0.1182TL - 0.9441, with r2 = 0.8886 (Fig. 7).

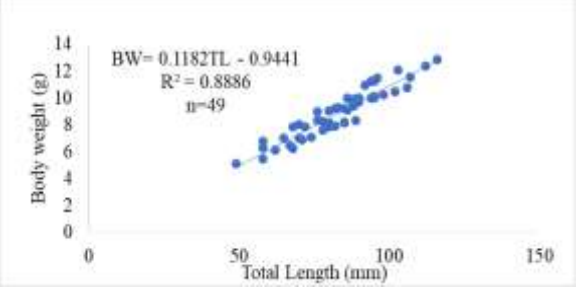

Fig. 7. Relationship between total length (TL) and body weight (BW) for all female fish

DISCUSSION

The present study revealed that the body size of the fish is significantly different among various seasons and sexes of Jashore, Bangladesh. The largest female was 116 mm total length (TL) and 12.85 g body weight (BW) during monsoon, while the largest male was 98 mm TL and 10.50 g BW. However, the smallest male (45 mm TL, 4.25 g BW) and the smallest female (49 mm TL, 4.75 g BW) were observed during the summer. These results show that the growth performance and size structure of cultured pool barb are affected by season and sex that are significantly different. The present finding of a larger maximum size in females than males agrees with the previous study by Rahman *et al.* (2018) on *P. sophore* from natural waters of Bangladesh, in which females were found to be significantly larger and heavier than males due to enhanced somatic growth caused by the development of gonads and an increase in the reproductive investment. In small cyprinids, females are generally larger compared to males and are related to the energy requirements for egg production, which leads to higher body mass before and during the spawning season (Awal *et al.*, 2023; Rahman *et al.*, 2018).

The largest individuals occurred during the monsoon, which is in accordance with the major breeding season of *P. sophore* in Bangladesh. The previous investigations have revealed that the spawning period ranges from May to July and the peak of the gonadosomatic index (GSI) and fecundity is during the monsoon months. At this time, the availability of natural food along with water, dissolved oxygen, and temperature all contribute to the increase in growth and gonadal development that allows fish to achieve their peak body size and weight (Awal *et al.*, 2023; Debi *et al.*, 2023; Hasan *et al.*, 2018).

On the other hand, the smallest size noted in summer may be that of recently recruited fish or of fish that hatched the previous breeding season. Population size structure of small indigenous fish commonly changes due to seasonality of pond productivity, food availability, and recruitment. If young fish are

recruited heavily during warmer months, the average size recorded during the sampling may be reduced as a result, because there will be a higher percentage of smaller fish in the population. This is in line with the seasonality of the length-frequency distribution of *P. sophore* in rivers in Bangladesh (Debi *et al.*, 2023; Rahman *et al.*, 2018). The relatively high maximum size (116 mm TL) of female fish in the present study also indicated that earthen pond culture is an optimum culture condition for fish growth.

Bigger pond fish are typically found in cultured ponds because they have more stable water levels and less predation than wild populations, as well as more consistent food resources, which enable more energy to be devoted to somatic growth. This could be related to their relatively large body size as compared to several riverine populations of *P. sophore* (Awal *et al.*, 2023; Rahman *et al.*, 2018).

A female excess of 1.36:1 was observed based on the sex ratio. This is a common finding in cyprinid fishes and can be attributed to growth rate, longevity, habitat usage, reproductive activity, or sampling time (King, 2013; Nikolsky, 1963). In general, mature females are more prevalent or likely to be captured in sampling gear during the spawning season, leading to the prevalence of females over males (Wootton and Smith, 2014). A female predominance sex ratio has also been reported from natural populations of *P. sophore* from Bangladesh (Awal *et al.*, 2023). In *P. sophore*, Rahman *et al.* (2018) found a (1:1.31) sex ratio with substantially bigger and heavier females than males, which is similar to this study (Rahman *et al.*, 2018).

In various months, female is substantial than males because of the susceptibility of females, which was reported in *Labeo fimbriata* (Bhatnagar, 1972). Also, a greater female component could be beneficial for population productivity as fertility and recruitment are primarily driven by the number of mature females (King, 2013). Theoretically, the ratio should be 1:1, but deviations from this ratio may also be caused by environmental conditions, selective mortality, food availability, habitat characteristics, or sampling bias, and therefore should be interpreted with caution (Nikolsky, 1963; Wootton and Smith, 2014). Fish have been seen to exhibit sex ratio fluctuations throughout the year, especially when migrating for reproduction and spawning (King, 2007). Given this, the present sex ratio of 1.36:1 for females may at least be attributed to the reproductive ecology of *P. sophore* and suggests a good reproductive potential, but only long-term monitoring of the population will confirm or refute a sex ratio bias that appears seasonally.

The mean Fulton's condition factor (K) recorded during the present study from Jashore (1.84 ± 0.81) suggested that the fish population was in good physiological condition. K values are usually considered to indicate favorable nutritional status and environmental conditions favorable to somatic growth when greater than 1. Males had slightly higher K values than females, 2.02 ± 0.92 and 1.70 ± 0.70, respectively, which could be explained by the different allocation of assimilated energy between body mass and gonadal development and reproduction in males and females, especially during the breeding season. In *Amblypharyngodon mola* males appeared to be in slightly good condition rather than female (Das *et al.*, 2018). Similar sex-related and seasonal differences in condition factor also have been reported from the Old Brahmaputra and Mymensingh regions of Bangladesh for *P. sophore*, where the condition factor (K) varied with the reproductive activity and food availability. Thus, it can be inferred that the aquatic conditions of Jashore are relatively beneficial to maintain healthy populations of *P. sophore*, as relatively high K values are obtained in the present study, which may be affected by environmental changes throughout the different seasons and reproductive investment (Awal *et al.*, 2023; Debi *et al.*, 2023).

The overall seasonal size variation observed indicates the interplay between population recruitment, environmental conditions, and reproductive biology. Knowing these seasonal growth rates is useful for selecting broodstock, scheduling when to harvest

them, and for the management of *P. sophore* culture in Bangladesh, especially if larger and more mature females are preferred for seed production. In *Puntius sophore*, this study showed that there was a highly significant positive relationship between TL and BW with a high coefficient of determination for the combined population (R^2 = 0.8803), males (R^2 = 0.9277), and females (R^2 = 0.8886). The high r^2 values suggest that body weight change was well accounted for by fish length and confirm the strong correlation between these two morphometric parameters. Length–weight relationships are thought to be strong in this case, which is characteristic of uniform growth, and are applied to evaluate fish condition, stock characteristics, and habitat suitability in fisheries biology (Froese, 2006). The slightly higher coefficient of determination for males (R^2 = 0.9277) than for females (R^2 = 0.8886) indicates that the growth of males was slightly more consistent during the sampling period, while the females could have had more variability in body weight related to seasonal gonadal development, reproductive investment, and feeding intensity. The body weight of female cyprinids has been reported to vary more than in males, since the maturation of the ovary leads to a significant increase in body weight before spawning. In other small cyprinid species from the country, similar sex differences in morphometric relationships have been reported, with females generally having a larger body size than males and showing more seasonal variations (Ahirwal *et al.*, 2022; Singh *et al.*, 2023).

The positive linear relationship between TL and BW also suggests that the growth rates of the fish were proportional within the range of fish sizes observed, which suggests favorable conditions within the earthen pond and sufficient food and its supply. Similarly, as the other studies mentioned, a highly significant correlation between length and weight has been reported for *P. sophore* in previous studies conducted in Bangladesh and India, with correlation coefficient values being generally higher than 0.80, indicating an increasing body weight with length increase under suitable ecological conditions (Chandran and Singh, 2022; Deshmukh, 2023). These differences from those reported in previous studies are normal and anticipated as length–weight relationships are affected by a variety of biological and environmental factors such as habitat characteristics, water quality, stocking density, food availability, seasonal variation, reproductive stage, age structure and sex. Furthermore, variations in sampling size, statistical approach, and the size range of the fishes can cause differences in the regression coefficients between different studies (Ahirwal *et al.*, 2022; Deshmukh, 2023). In summary, the good linear relationships achieved in this study suggest that TL is an excellent indicator of BW in *P. sophore*. The results are useful to establish baseline data for biomass estimation, fish health assessment, stock assessment, and aquaculture management of this important small indigenous species of fish in Bangladesh (Unicef, 2024).

CONCLUSION

It is established in this study that there is a good condition factor and a strong linear correlation between total length (TL) and body weight (BW) in *P. sophore,* and total length (TL) can be used as a reliable index for body weight (BW). The results of the study will serve as baseline information that may be utilized to improve biomass estimation, fish health assessment, stock assessment, and aquaculture management of this important small indigenous fish (SIF) in Bangladesh. The existing connections have practical implications for sustainable resource management and conservation.

REFERENCES

Ahamed F, Ahmed ZF, Hossain MY, Ohtomi J. 2012. Growth study of the pool barb *Puntius sophore* (Cyprinidae: Barbinae) through multi-model inferences. Zoological Studies **51(7)**, 1077–1085.

Ahirwal S, Singh J, Kumar T, Bharti V, Sarma K, Narayan D. 2022. Biometric evaluation of Gangetic pool barb *Puntius sophore* (Hamilton, 1822) from the River Ganga, Bihar, India. Indian Journal of Fisheries **69(4)**, 52–58.

Awal MR, Yesmine S, Bhadra A, Kohinoor A, Mahmud Y. 2023. Reproductive biology and length-weight relationship of the pool barb *Puntius sophore* (Hamilton, 1832) in Mymensingh, Bangladesh. Archives of Agriculture and Environmental Science **8(3)**, 358–363.

Bhatnagar G. 1972. Maturity, fecundity, spawning season and certain related aspects of *Labeo fimbriatus* (Bloch) of river Narmada near Hoshangabad. Journal of the Inland Fisheries Society of India **4**, 26–37.

Blackwell BG, Brown ML, Willis DW. 2000. Relative weight (Wr) status and current use in fisheries assessment and management. Reviews in Fisheries Science **8(1)**, 1–44.

Chandran SHMS, Singh SNSKS. 2022. Length-weight relationship and condition factor of selected small Cyprinid fishes from river Burhi Gandak in North Bihar, India. Journal of the Inland Fisheries Society of India **54(1)**, 27–32.

Choudhury T, Singh S, Baruah A, Das A, Parhi J, Bhattacharjee P, Biswas P. 2015. Reproductive features of *Puntius sophore* (Hamilton 1822) from rivers of Tripura, India. Fishery Technology **52**, 140–144.

Das P, Uddin M, Islam M, Biswas M, Mia M. 2018. Length-weight relationship and sex ratio of *Amblypharyngodon mola* in Dekar Haor of Sunamganj, Bangladesh. Journal of the Asiatic Society of Bangladesh, Science **44(2)**, 185–193.

Debi S, Salam MA, Rahman ML, Hossain MS, Mazumder SK. 2023. Population size structure and breeding biology of *Puntius sophore* in the Old Brahmaputra River, Bangladesh. Annals of Bangladesh Agriculture **27(2)**, 59–70.

Deshmukh M. 2023. Biometric length weight relationships of the pool barb *Puntius sophore* (Hamilton 1822) (Cyprinidae) from Ujani Wetland of Maharashtra, India. Uttar Pradesh Journal of Zoology **44(22)**, 193–198.

Froese R. 2006. Cube law, condition factor and weight–length relationships: History, meta-analysis and recommendations. Journal of Applied Ichthyology **22(4)**, 241–253.
DOI: 10.1111/j.1439-0426.2006.00805.x

Froese R. 2025. Status of the main commercial fishes in the western Baltic Sea in 2020–2023: Results of working with local fishers.

Fulton TW. 1904. The rate of growth of fishes. Twenty-Second Annual Report of the Fishery Board for Scotland, 141–241.

Hanif MA, Siddik MAB, Chaklader MR, Nahar A, Mahmud S. 2015. Fish diversity in the southern coastal waters of Bangladesh: Present status, threats and conservation perspectives. Croatian Journal of Fisheries: Ribarstvo **73(4)**, 148–161.

Haque MM, Mahmud MN, Ahammad AS, Alam MM, Bablee AL, Hasan NA, Bashar A, Hasan MM. 2025. Building climate resilient fisheries and aquaculture in Bangladesh: A review of impacts and adaptation strategies. Climate **13(10)**, 209.

Hasan T, Hossain MF, Mamun M, Alam MJ, Salam MA, Rafiquzzaman S. 2018. Reproductive biology of *Puntius sophore* in Bangladesh. Fishes **3(2)**, 22. DOI: 10.3390/fishes3020022

Hossain MY, Ahmed ZF, Leunda PM, Roksanul Islam AKM, Jasmine S, Oscoz J, Miranda R, Ohtomi J. 2006. Length–weight and length–length relationships of some small indigenous fish species from the Mathabhanga River, southwestern Bangladesh. Journal of Applied Ichthyology **22(4)**, 301–303.
DOI: 10.1111/j.1439-0426.2006.00801.x

Hossain MY, Rahman MM, Miranda R, Leunda PM, Oscoz J, Jewel MAS, Naif A, Ohtomi J. 2012. Size at first sexual maturity, fecundity, length–weight and length–length relationships of *Puntius sophore* (Cyprinidae) in Bangladeshi waters. Journal of Applied Ichthyology **28(5)**, 818–822.

Kalita M, Rajbongshi MK. 2024. Length-weight relationship and morphometric traits of four freshwater fish species from Assam, India. Indian Hydrobiology **23(2)**, 395–402.

King MG. 2007. Fisheries Biology, Assessment and Management. 2nd ed. Oxford: Blackwell Publishing Ltd. 382 p.
DOI: 10.1002/9781118688038.

King M. 2013. Fisheries Biology, Assessment and Management. 2nd ed. John Wiley & Sons.
DOI: 10.1002/9781118688038.

Le Cren ED. 1951. The length-weight relationship and seasonal cycle in gonad weight and condition in the perch (*Perca fluviatilis*). The Journal of Animal Ecology **20(2)**, 201–219.
DOI: 10.2307/1540

Narzary B, Khangembam BK. 2022. A study on the length-weight relationship and condition factor of five small indigenous fish species of Sareswar Beel in lower Assam, Northeast India. Iranian Journal of Ichthyology **9(4)**, 204–212.

Nikolsky GV. 1963. The Ecology of Fishes. London: Academic Press.

Noor R, Acharjee M, Ahmed T, Das KK, Paul L, Munshi SK, Urmi NJ, Rahman F, Alam MZ. 2013. Microbiological study of major sea fish available in local markets of Dhaka City, Bangladesh. Journal of Microbiology, Biotechnology and Food Sciences **2(4)**, 2420–2430.

Pal M, Mahapatra B, Mondal B. 2013. Length-weight relationship and condition factor of *Puntius sophore* (Hamilton, 1822) collected from Kolkata and suburban fish markets. Environment and Ecology **31(3)**, 1255–1259.

Rahman AKA. 1989. Freshwater Fishes of Bangladesh. Zoological Society of Bangladesh.

Rahman MM, Hossain MY, Jewel MAS, Rahman MM, Jasmine S, Abdallah EM, Ohtomi J. 2012. Population structure, length-weight and length-length relationships, and condition- and form-factors of the pool barb *Puntius sophore* (Hamilton, 1822) (Cyprinidae) from the Chalan Beel, North-Central Bangladesh. Sains Malaysiana **41(7)**, 795–802.

Rahman MM, Hossain MY, Sayed Jewel MA, Billah MM, Ohtomi J. 2018. Population biology of the pool barb *Puntius sophore* (Hamilton, 1822) (Cyprinidae) in the Padma River, Bangladesh. Zoology and Ecology **28(2)**, 100–108.
DOI: 10.1080/21658005.2018.1456401

Ricker WE. 1975. Computation and interpretation of biological statistics of fish populations. Fisheries Research Board of Canada Bulletin **191**, 1–382.

Sarkar UK, Khan GE, Dabas A, Pathak AK, Mir JI, Rebello SC, Pal A, Singh SP. 2013. Length weight relationship and condition factor of selected freshwater fish species found in River Ganga, Gomti and Rapti, India. Journal of Environmental Biology **34(5)**, 951–956.

Scherrer B. 1984. Biostatistique. Boucherville, Québec, Canada: Gaëtan Morin Éditeur. 850 p.

Singh J, Ahirwal S, Kumar T, Bharti V, Gogoi P, Sarma K. 2023. Relationship between fish body and sagittal otolith morphometrics in the pool barb *Puntius sophore* (Hamilton, 1822) from the Ganga and Punpun rivers of Bihar, India. Indian Journal of Fisheries **70(2)**, 86–94.

Sunny AR, Sazzad SA, Bhuyian MS, Hasan MN, Miah MF, Ashrafuzzaman M, Prodhan SH. 2025. Fish genetic resources and wetland conservation in Bangladesh: Comparative insights on biodiversity, sustainable management, and sustainable development goals. Limnological Review **25(2)**, 20.

Tickner D, Schiller L, Cooke SJ, Ordóñez EB, Collier U, Dalton J, Harrison I, Lifeng L, Phang SC, Young WJ. 2025. Addressing the policy and business drivers of global freshwater biodiversity loss. Environmental Reviews **33**, 1–20.

UNICEF. 2024. The State of Food Security and Nutrition in the World 2024.

Wootton RJ, Smith C. 2014. Reproductive Biology of Teleost Fishes. John Wiley and Sons.