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Seasonal Variation in the Reproductive Biology of Gangetic *Mystus*: *Mystus cavasius* (Hamilton-Buchanan, 1822) from the Brahmaputra River in Assam

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Research on the reproductive biology of fish species is crucial for evaluating their aquaculture potential. *Mystus cavasius*is a commercially important and widely consumed food fish in Assam. However, a comprehensive understanding of its reproductive biology within the specific agro-

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climatic conditions of Assam is currently lacking. Therefore, the present study aimed to investigate the detailed reproductive biology of *Mystus cavasius*, focusing on sex ratio, gonadosomatic index (GSI), hepatosomatic index (HSI), condition factor (K), relative condition factor (Kn), and fecundity. The present study observed a female-biased sex ratio. Monthly analysis of the gonadosomatic index (GSI), condition factor, and mean ova diameter indicated that the reproductive period for this fish species spans from May to September, with a single peak spawning event occurring in July. A high hepatosomatic index (HSI) observed during winter (December) likely indicates a state of good nutritional condition characterized by substantial energy reserves in the liver. Conversely, a low HSI value recorded in July may suggest a period of nutritional stress, potentially indicative of starvation or reduced feeding activity. The findings indicated a significant positive linear relationship between fecundity and total length, body weight, and ovary weight. Furthermore, the relative condition factor being consistently above one in both sexes suggested that the species maintains a good physiological condition throughout the year in this region.

Keywords: Length-weight; sex ratio; gonadosomatic index; condition factor; relative condition factor; fecundity and hepatosomatic index.

1. INTRODUCTION

Understanding the biological attributes of fish species is paramount for effective fisheries research, given its substantial economic and nutritional contributions. Aquaculture has gained prominence in rural India as a strategy for achieving self-reliance and poverty alleviation. (Al -Amin *et al*., 2012, Roy *et al*., 2021). Fish biology is a fundamental aspect of ecological stewardship, preventing unsustainable exploitation of fishery resources, and ultimately safeguarding fish biodiversity. Specifically, the reproductive biology of fish constitutes a critical and foundational element for the improved conservation and management of these resources. A comprehensive understanding of fish reproductive biology is indispensable for evaluating the commercial viability of fish stocks, their genetic makeup, the development of aquaculture techniques, and the implementation of effective resource management strategies (Dopeikar *et al*., 2015; Roy *et al*., 2021).

Research into the reproductive biology of fish species is crucial for evaluating the commercial viability of their populations, understanding their life history traits, developing effective aquaculture practices, and implementing sound fisheries management strategies (Doha and Hye, 1970).Assessing the reproductive potential of a fish population is fundamental for categorizing individuals based on their gonadal development (Jhingran and Verma, 1972).For successful fish culture, determining the annual breeding cycle of cultivable species is essential. Spawning in fish is a phase-specific event within the reproductive cycle, with some species exhibiting annual spawning and others spawning at regular intervals throughout the year.Understanding gonadal development and the spawning season enables subsequent investigations into the spawning frequency of a population, which is vital for its management. Furthermore, examining the sex ratio, length at first sexual maturity, maturation cycle, and spawning periodicity constitutes an integral component of reproductive biology research in fishes (Chakravorty *et al*., 2007).

The Brahmaputra drainage system, a major hydrographic basin in Southeast Asia, exhibits a substantial average annual discharge of 510,450 million cubic meters and encompasses an area of 580,000 square kilometers. Ranking as the fourth largest river globally by average discharge at its mouth (19,830 m^3s^{-1}), the Brahmaputra traverses Tibet, India (Arunachal Pradesh and Assam), and Bangladesh before its confluence with the Bay of Bengal delta.Within the Indian state of Assam, this significant river system extends for approximately 900 kilometers and is characterized by an extensive network of 103 major tributaries, providing habitat for a diverse array of aquatic fauna. Recognized as a global hotspot for freshwater fish diversity (Kottelat & Whitten, 1996), the Brahmaputra River harbors a rich and varied aquatic gene pool, particularly concerning its fish populations (Ahirwal et al., 2025). Despite its ecological and ichthyological significance, research on the ecology and fisheries of this river system remains limited (Boruah & Biswas, 2002).

Mystus cavasius (Hamilton-Buchanan, 1822), commonly known as the Gangetic mystus, is a catfish species belonging to the order Siluriformes and the family Bagridae. This species exhibits a wide distribution across South and Southeast Asia, including India, Bangladesh, Pakistan, Nepal, Sri Lanka, Thailand, and Myanmar(Talwar & Jhingran, 1991; Tripathi, 1996; Rahman *et al*., 2004; Chakrabarty & Ng, 2005). *M. cavasius* is a small indigenous catfish (SIS) predominantly found in freshwater ecosystems such as rivers, canals, beels, wetlands, ditches, and seasonally inundated fields, and has also been reported in floodplains, swamps, tidal rivers, and lakes. It is a highly favored food fish among consumers, commanding significant market demand and a moderate price. The species is recognized for its high flesh protein content. Furthermore, *M. cavasius* has recently been classified as an ornamental fish and is considered a native aquarium species originating in India (Siddiqui *et al*., 2010; Ashashree *et al*., 2013; Gupta & Banerjee, 2014).

Recent alterations in natural hydrological patterns resulting from extensive flood control infrastructure, coupled with anthropogenic disturbances within aquatic ecosystems—including the reduction of water body areas, siltation, riverbank erosion, pesticide application in agricultural fields, and the discharge of industrial chemical effluents—have led to a decline in the natural breeding grounds and habitats of *Mystus cavasius*. This environmental degradation has presented a significant threat to the genetic resources of this commercially valuable silurid catfish, rendering it increasingly vulnerable in north-east India (Hussain & Mazid, 1999). Research on the reproductive biology of tropical fish species inhabiting the Central Brahmaputra Valley is currently limited and lacks in-depth analysis.Despite the economic significance of *Mystus cavasius* within this region, its reproductive parameters remain uninvestigated, hindering the assessment of its aquaculture potential. Therefore, this study aims to elucidate the reproductive biology of *Mystus cavasius* in the Central Brahmaputra Valley to inform sustainable management practices for this valuable fish resource.

2. MATERIALS AND METHODS

2.1 Study Area and Period

This research was carried out in the College of Fisheries, AAU, Raha from January to December, 2023. During the reproductive period, the sexes of *M. cavasius* were readily distinguished through the observation of secondary sexual characteristics.

2.2 Sex Ratio

Sex ratio was determined monthly by calculating the proportion of males to females within the sampled population. The sex ratio was quantified using the formula:

$$\text{Sexratio}=\frac{Number\ of\ females}{Number\ of\ males}$$

This calculation, following the methodology of Pena-Mendoza *et al*. (2005), provides a numerical representation of the balance between male and female individuals in the *M. cavasius* population over the study period.

2.3 Gonadosomatic Index

Specimens were dissected ventrally from the anal opening anteriorly to the lower jaw to expose the visceral cavity. The stomach and intestine were carefully excised using fine forceps. The ovary was then gently removed and placed in a Petri dish. Subsequently, the ovary was cleansed by rinsing with distilled water. Morphometric measurements, including ovary length and weight, were recorded, and the macroscopic appearance, specifically the color, was documented. The Gonadosomatic Index (GSI) was employed as a quantitative measure to assess the reproductive cycle of female fish. This index reflects the proportional relationship between gonadal development and somatic growth, with GSI values typically increasing as the gonads mature towards spawning readiness. The GSI was calculated according to the equation provided by Parameshwaran *et al*. (1974):

GSI= [Weightofbody/Weightofgonad] ×100

2.4 Condition Factor and Relative Condition Factor

The condition factor (K) in fish serves as an indicator of their overall physical and biological state, reflecting the interplay between factors such as nutritional availability, parasiticLoad, and physiological processes (Le Cren, 1951). Consequently, variations in the condition factor can indicate changes in stored energy reserves and provide insights into the general well-being of the fish. The formula used to calculate the condition factor was given by Ricker (1975) as:

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

Where,

K = condition factor
L= total length (cm) and
W= total weight (g).

The relative condition factor (Kn) was employed to evaluate the condition of the studied fish species.

Kn is defined as the ratio of the observed weight (Wo) to the calculated weight (Wc) (Le Cren, 1951). A value of Kn≥1 suggests that the fish exhibits good growth condition, whereas a value of Kn<1 indicates poor growth condition relative to an average individual of the same length. The formula used to calculate the relative condition factor was given by Le Cren (1951) as:

Kn=Wo/Wc

Where,

Kn= relative condition factor,
Wo = observed weight, and
Wc= calculated weight

2.5 Hepatosomatic Index (HSI)

The Hepatosomatic Index (HSI) is a widely utilized biometric indicator in fish biology, providing valuable insights into the physiological condition and energy reserves of individuals and populations. Calculated as the ratio of liver weight to body weight, expressed as a percentage, the HSI serves as a proxy for liver size relative to the overall mass of the fish. The formula used to calculate the hepatosomatic index was given by Parmeshwaran (1974) as:

HSI (%) = {Liver weight (g)/ total body weight (g)} x 100

2.6Fecundity

Fecundity, defined as the number of maturing oocytes present in a female immediately prior to spawning (Bagenal, 1978), is a fundamental parameter in understanding fish population dynamics and genetic structure (Kapoor & Khanna, 2004). In this study, gravimetric methods were employed to estimate fecundity. The external connective tissues were meticulously removed from the ovarian surface. Excess moisture was absorbed using blotting paper, and the weight of the ovaries was precisely measured using an electronic balance. Fecundity was calculated following Le Cren's (1951) approach using the formula:

$$\textbf{Fecundity}= \frac{Number\ of\ eggs\ in\ the\ sample \times Gonad\ weight}{Sampleweight}$$

To explore the relationship between fecundity and morphometric characteristics, such as body length and body weight, logarithmic transformation and least squares regression analysis were performed using the equation:

Log F=log a+b logX

Where:

F = Fecundity (clutch size)
X = Body length or body weight
a = Regression constant (intercept)
b = Regression coefficient (slope)

2.7 Statistical Analysis

This biological study employed a suite of statistical methods to analyze relationships among key reproductive and morphometric parameters. Specifically, a Chi-square test was utilized to assess the sex ratio of the studied population against an expected distribution. Furthermore, coefficients of correlation were calculated to quantify the strength and direction of linear associations between fecundity and total length, fecundity and body weight, and fecundity and ovary weight. To model these relationships and enable potential predictions, regression equations were derived. Finally, standard deviation was determined for each parameter to quantify the dispersion or variability within the respective datasets.

3. RESULTS

3.1 Sex Ratio

A total of 328 specimens of *M. cavasius* consisting of 197 females and 131 males (were examined from the Brahamaputra River. The overall sex ratio of male: female=1:0.66 was significantly different from 1:1 (df=1, $\chi 2=5.11$, $P<0.023$) (Table1).

3.2 Gonadosomatic Index (GSI)

The Gonadosomatic Index (GSI) in both female and male *M. cavasius* exhibited a unimodal annual pattern, reaching its maximum value in July. The lowest value of GSI was recorded in December. Subsequently, GSI began to increase from January, culminating in the July peak, followed by a decline in the months from August to November, returning to the annual minimum in December (Table 2 and Table 3). This cyclical pattern suggests a distinct annual reproductive cycle with peak gonadal development occurring in July.

Table 1. Monthly variation in sex ratio (male: female) of *Mystus cavasius* during the experimental period

Month	Male	%	Female	%	M: F	Chi Square	P-value	Remark
January	9	34.61%	17	65.39%	1:0.52	2.181	0.204	NS
February	12	38.70%	19	61.30%	1:0.63	1.369	0.241	NS
March	10	38.46%	16	61.54%	1:0.62	1.226	0.268	NS
April	14	43.75%	18	56.25%	1:0.77	0.431	0.511	NS
May	16	51.61%	15	48.39%	1:1.06	0.027	0.867	NS
June	12	46.15%	14	53.85%	1:0.85	0.136	0.712	NS
July	5	46.87%	17	53.13%	1:0.29	5.914	0.015	S
August	10	57.14%	22	42.86%	1:0.45	3.889	0.048	S
September	13	54.16%	11	45.84%	1:1.18	0.148	0.699	NS
October	12	48.00%	15	52.00%	1:0.92	0.293	0.587	NS
November	8	40.00%	19	60.00%	1:0.42	3.95	0.046	S
December	10	41.66%	14	58.34%	1:0.71	0.595	0.440	NS

Table 2. Month-wise gonadosomatic index of female *Mystus cavasius* during the experimental period

Month	No. of fish examined	Total length(cm)	Body weight(g)	OvaryMean weight(g)	Mean GSI
January	17	10.21-12.45	14.50-18.90	0.15±0.02	0.88±0.12
February	19	11.21-14.89	14.55-23.55	0.89±0.03	4.52±0.79
March	16	12.21-14.56	19.21-25.21	1.71±0.41	5.56±0.45
April	18	12.21-16.23	20.23-27.41	2.33±0.67	10.07±0.79
May	15	12.29-17.21	21.89-28.91	4.21±0.82	17.11±0.99
June	14	13.01-16.89	20.34-26.34	5.61±0.82	24.82±0.79
July	17	12.21-14.76	20.23-24.21	4.15±0.68	18.34±0.95
August	22	10.51-14.56	19.89-23.77	2.55±0.09	11.74±0.55
September	11	12.01-15.61	17.21-22.67	0.74±0.16	3.67±0.21
October	15	12.03-15.61	14.41-20.21	0.03±0.01	0.18±0.07
November	19	10.01-14.34	14.56-19.21	0.07±0.03	0.39±0.09
December	14	9.89-13.66	14.41-20.34	0.12±0.08	0.56±0.31

Table 3. Month-wise gonadosomatic index of male *Mystus cavasius* during the experimental period

Month	No. of fish examined	Total length(cm)	Body weight (g)	Ovary Mean weight(g)	Mean GSI
January	9	6.90-7.30	11.18-11.21	0.04±0.01	0.26±0.11
February	12	7.80-8.60	11.21-13.32	0.07±0.02	0.57±0.18
March	10	6.70-8.30	11.21-13.89	0.09±0.01	0.75±0.27
April	14	7.10-7.90	13.33-18.22	0.12±0.06	0.79±0.19
May	16	5.20-7.90	9.92-12.77	0.11±0.03	1.09±0.72
June	12	7.50-8.90	9.10.11.23	0.13±0.02	1.33±0.67
July	5	6.80-8.90	8.35-12.36	0.17±0.05	1.76±0.47
August	10	6.67-7.90	10.11-12.67	0.16±0.04	1.48±0.11
September	13	6.80-7.16	10.10-12.31	0.15±0.01	1.39±0.13
October	12	6.20-7.40	10.11-12.21	0.13±0.07	1.25±0.54
November	8	7.10-7.90	10.13-12.67	0.06±0.01	0.59±0.09
December	10	7.03-7.80	9.01-12.45	0.03±0.01	0.30±0.07

3.3 Hepatosomatic Index (HSI)

The monthly fluctuation in the hepatosomatic index of fishes showed the lowest value in the months of July (3.41) for males (3.41) and females in the month of June (1.34) while the highest value was found in the month of January (7.22) for male and December (8.48) for female (Table 4 and Fig.3).

3.4 Condition Factor (K) and Relative Condition Factor (Kn)

The condition Factor 'K' value in females ranged from 0.71 (June) to 1.1(December) while in males it ranged from 1.95 (June) to 3.71(April). On an average, these values were found to be higher in females than in males in almost all months (Table 5 and Fig.4). The values of relative condition factor (Kn) ranged from 0.89-1.34 for males and 1.01-1.52 for females (Table 6 and Fig. 5). The K values for pooled samples were also found highest in the months of April (2.01) and lowest in the month of June (1.12) (Table 5 and Fig.6). The Kn values for pooled samples were also found highest in the months of March (0.97) and lowest in the month of July (1.38) (Table 6 and Fig.6).

3.5 Fecundity

The absolute fecundity of 30 mature female specimen of*Mystus cavasius* ranged from 981.31 (with length 122.1 mm, body weight 19.7 g and ovary weight 3.45 g) to 3079.33 (with length 167.8 mm, body weight 24.51 g and ovary weight 6.45 g) with an average of 2304.19± 99.5 were randomly selected for the estimation of fecundity during the study period. The relative fecundity ranged from 44.34 to 149.97 with an average of 101.45 ± 4.43.

Relationship between total length (TL) and fecundity (F) of *Mystus cavasius*: The estimated regression line (Fig.7) showed that the relationship between fecundity and total length was linear. A test of significance showed that the value of the regression coefficient was significant (P<0.01). The regression equation of fecundity with total length of fish could be expressed as:

Log F= 0.6971 + 1.8524 Log TL (r^2 = 0.0519, r= 0.2277) {where, F-Fecundity, TL- Total Length}

Relationship between total weight (TW) and fecundity (F) of *Mystus cavasius:*The linear relationship (Fig.8) between log of fecundity and total length showed a positive correlation (r=0.6635). The value of regression equation of fecundity with total weight was worked out as:

Log F =0.0251 + 1.2723 Log TW (r^2= 0.0178, r= 0.1333) {where, F-Fecundity, TW- Total Weight}

Relationship between ovary weight (OW) and fecundity (F) of *Mystus cavasius:* The logarithmic relationship {Fig.9} between ovary weight and fecundity provided a positive linear correlation. The equation can be stated as:

Log F = -0.0186 + 0.7267 Log OW (r^2=0.0009, r=0.0295) {where, F-Fecundity, OW- Ovary Weight}

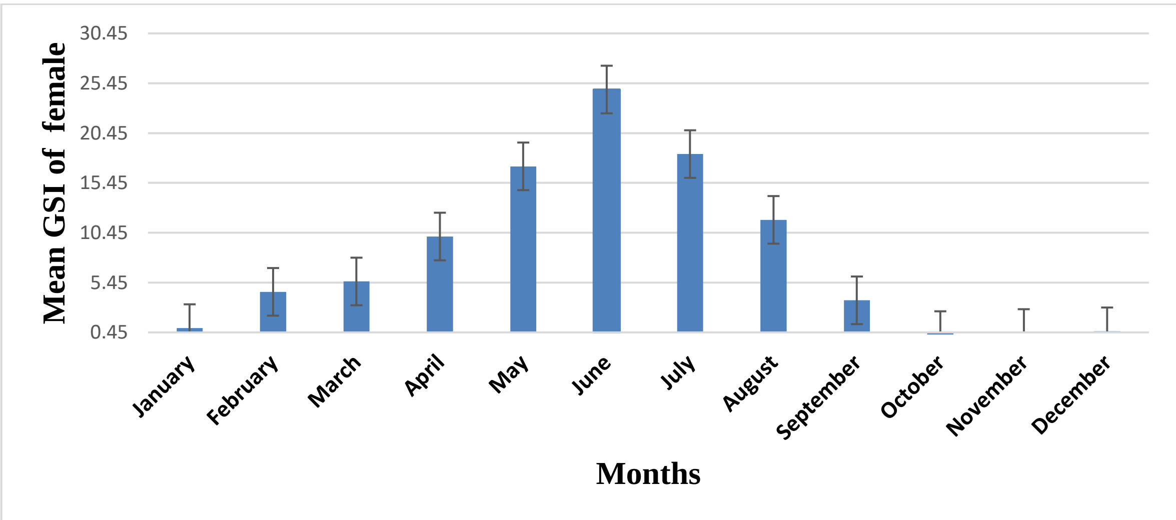

Fig. 1. Monthly variation in the mean gonadosomatic index (GSI) of female *Mystus cavasius*

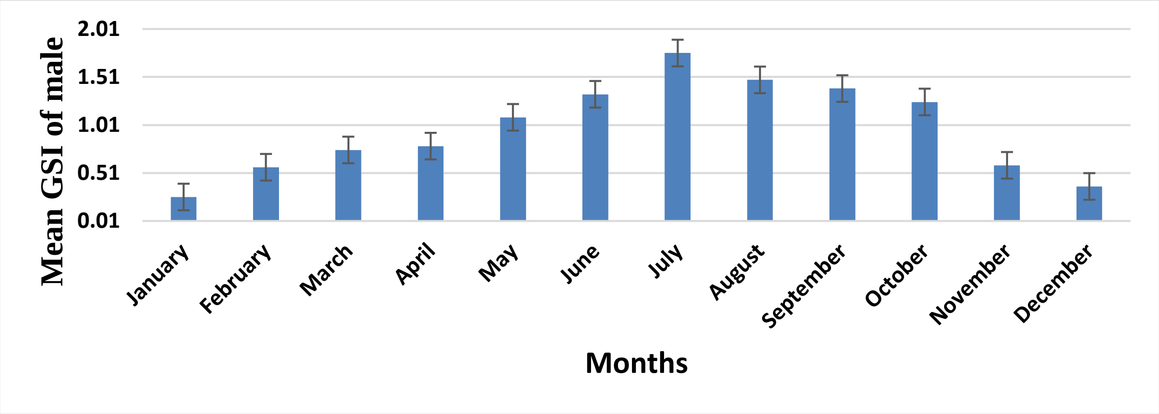

Fig. 2. Monthly variation in the mean gonadosomatic index (GSI) of male *Mystus cavasius*

Table 4. Month-wise hepatosomatic index of male and female *Mystus cavasius* during the experimental period

Months	No. of Males	No. of Females	Body weight (g)		Hepatosomatic Index	
			Male	Female	Male	Female
January	9	17	11.18-11.21	14.50-18.90	7.22±0.34	6.89±0.13
February	12	19	11.21-13.32	14.55-23.55	6.68±0.21	5.25±0.09
March	10	16	11.21-13.89	19.21-25.21	6.77±0.13	3.72±0.14
April	14	18	13.33-18.22	20.23-27.41	5.33±0.19	3.32±0.13
May	16	15	9.92-12.77	21.89-28.91	3.39±0.07	2.08±0.16
June	12	14	9.10.11.23	20.34-26.34	2.86±0.11	1.69±0.31
July	5	17	8.35-12.36	20.23-24.21	3.41±0.05	2.51±0.15
August	10	22	10.11-12.67	19.89-23.77	5.46±0.23	4.68±0.14
September	13	11	10.10-12.31	17.21-22.67	6.45±0.42	8.04±0.13
October	12	15	10.11-12.21	14.41-20.21	7.10±0.89	8.64±0.99
November	8	19	10.13-12.67	14.56-19.21	5.61±0.11	9.16±0.76
December	10	14	9.01-12.45	14.41-20.34	6.96±0.52	8.48±0.65

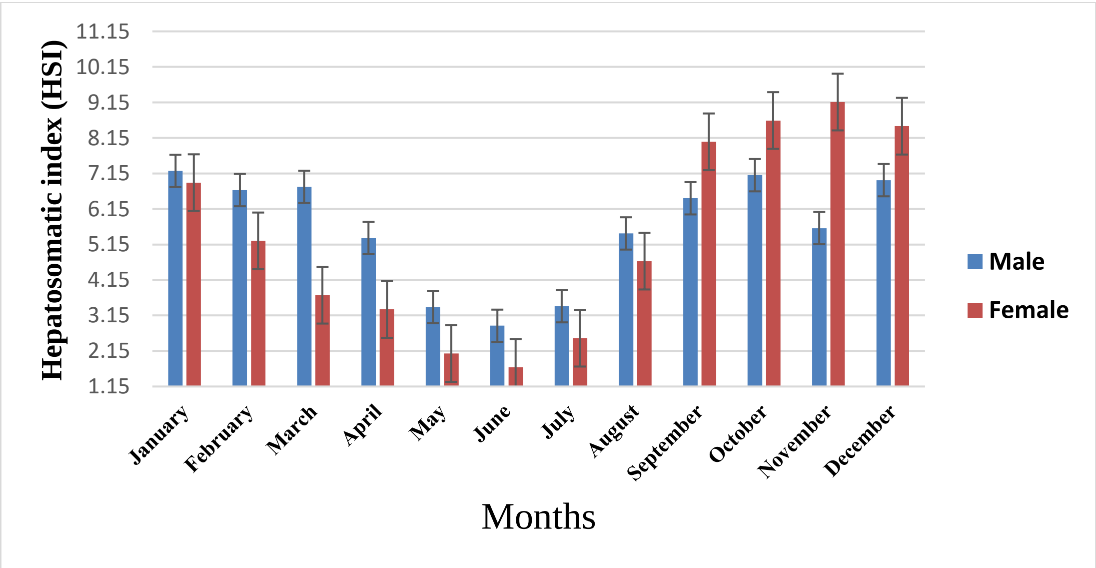

Fig. 3. Fluctuation in hepatosomatic index (HSI) of male and female *Mystus cavasius* during different months

Table 5. Month-wise condition factor of *Mystus cavasius*

Months	No. of Males	No. of Females	Mean Condition factor(K)		
			Male	Female	Pooled
January	9	17	2.98	1.10	1.53
February	12	19	2.27	1.03	1.42
March	10	16	3.28	0.94	1.86
April	14	18	3.71	0.90	2.01
May	16	15	3.57	0.87	1.81
June	12	14	1.95	0.71	1.12
July	5	17	2.07	0.97	1.48
August	10	22	2.70	1.05	1.66
September	13	11	2.97	0.85	1.62
October	12	15	3.34	0.72	1.43
November	8	19	2.66	0.85	1.33
December	10	14	2.79	1.10	1.21

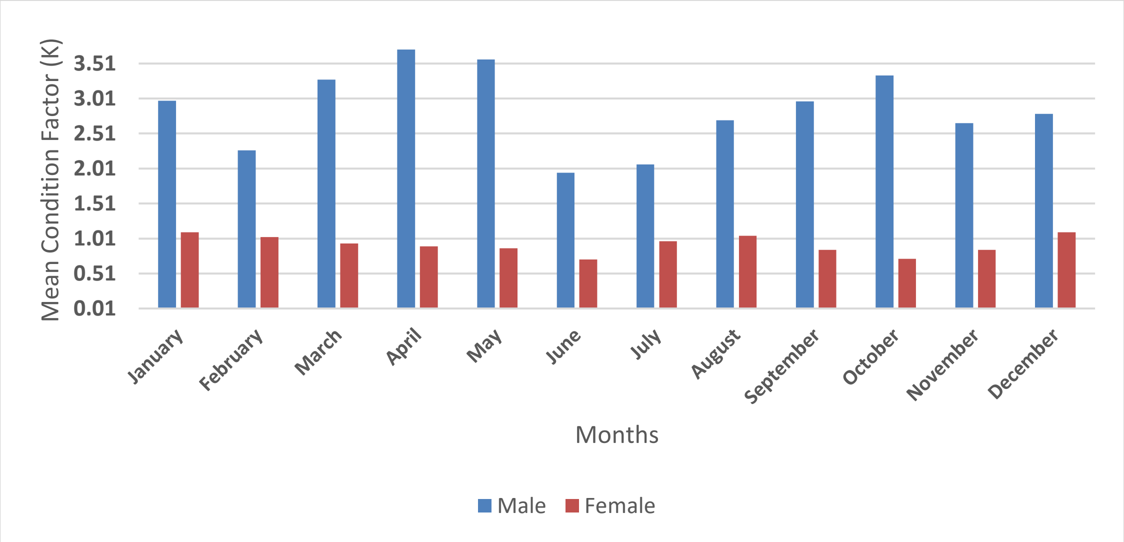

Fig. 4. Fluctuation in mean condition factor (k) of male and female *Mystus cavasius* during different months

Table 6. Month-wise relative condition factor of *Mystus cavasius*

Months	No. of Males	No. of Females	Mean Relative Condition factor(K)		
			Male	Female	Pooled
January	9	17	0.97	1.09	1.06
February	12	19	0.93	1.06	1.01
March	10	16	0.89	1.01	0.97
April	14	18	1.12	1.23	1.09
May	16	15	1.27	1.31	1.19
June	12	14	1.34	1.45	1.33
July	5	17	1.22	1.52	1.38
August	10	22	1.16	1.46	1.21
September	13	11	1.09	1.21	1.14
October	12	15	1.10	1.13	1.05
November	8	19	1.11	1.15	1.08
December	10	14	1.01	1.07	1.02

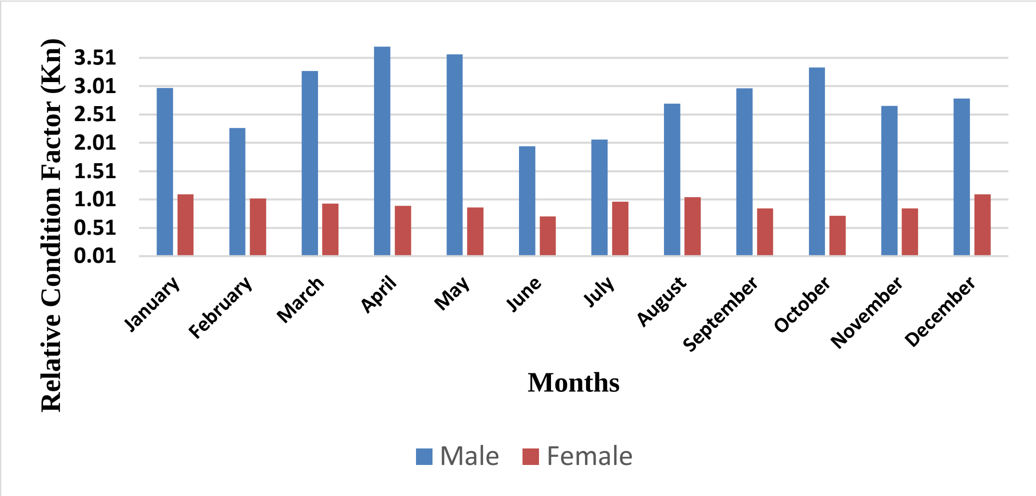

Fig. 5. Fluctuation in mean relative condition factor (kn) of male and female *Mystus cavasius* during different month

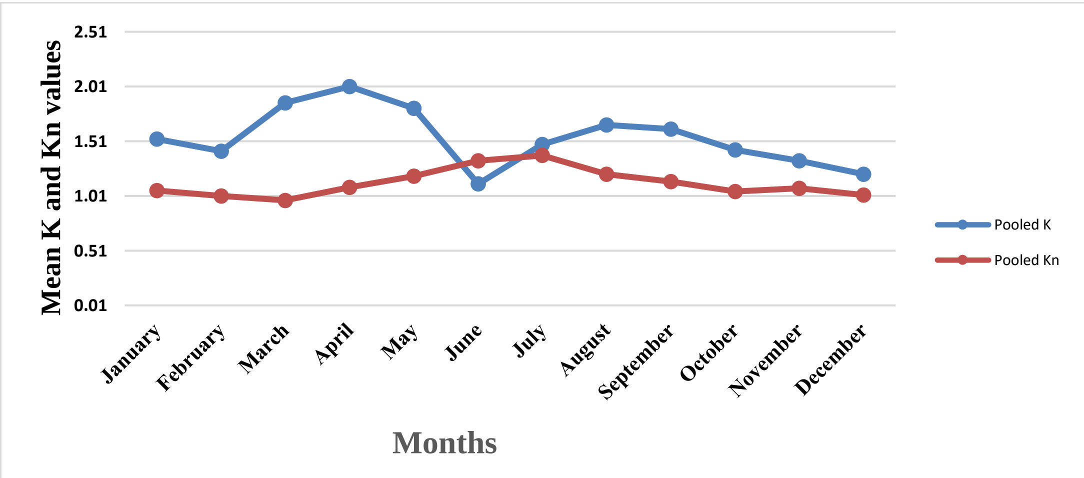

Fig. 6. Fluctuation in mean condition factor (k) and mean relative condition factor (kn) of male and female *Mystus cavasius*during different months

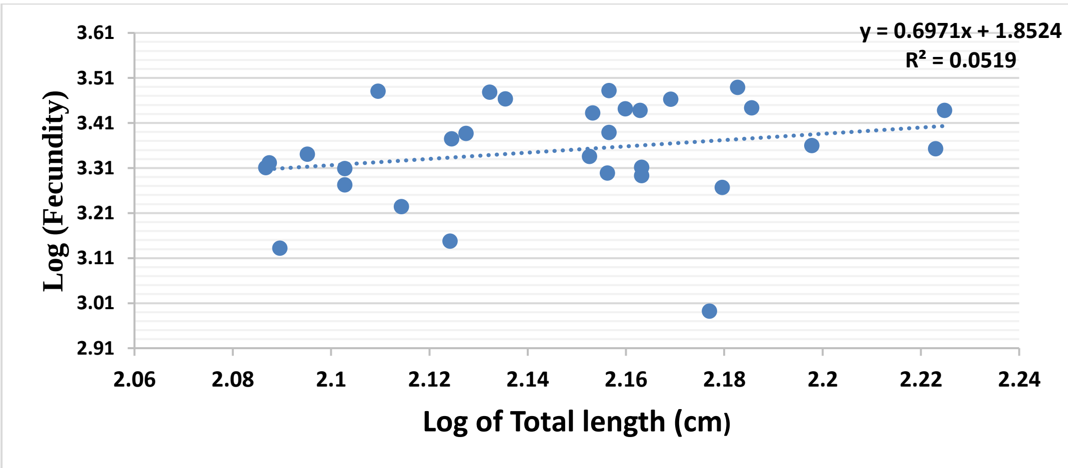

Fig. 7. Relationship between total length and fecundity of *Mystus cavasius*

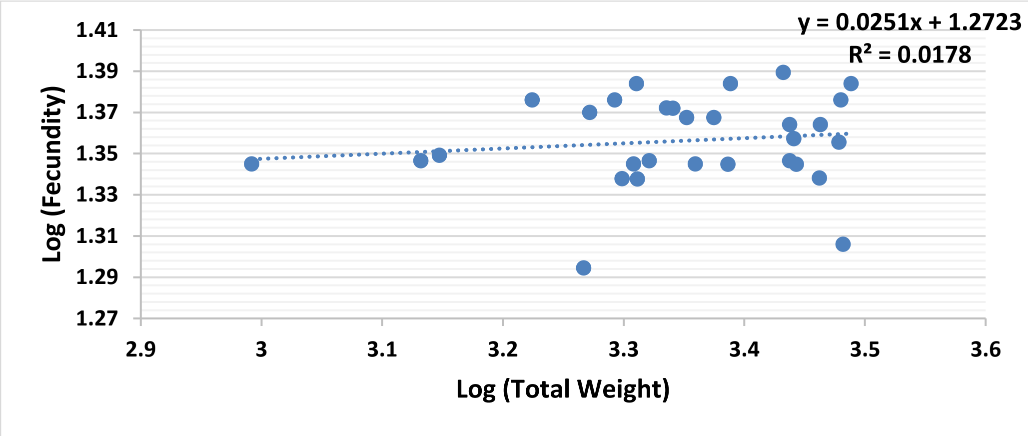

Fig. 8. Relationship between total weight and fecundity of *Mystus cavasius*

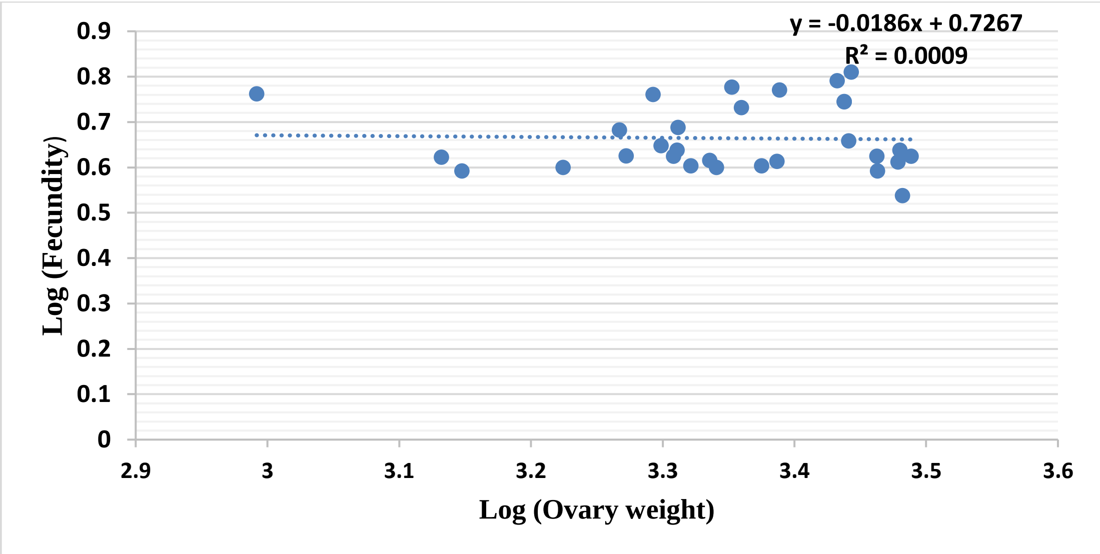

Fig. 9. Relationship between ovary weight and fecundity of *Mystus cavasius*

4. DISCUSSION

The adult sex ratio is a key demographic parameter that can significantly influence population size. This occurs through its impact on differential mortality rates between sexes (Webster, 2003) and variations in reproductive output (Solberg *et al*., 2002). In the present study, it was seen female dominance over males. This finding aligns with previous research on *Mystus cavasius* populations, where female dominance has been documented by Roy and Hossain (2006), Krishna Rao (2007), and Santoshsing and Gupta (2007), Bhatt (2012), Roy *et al*., (2021), Ahirwal *et al*., (2025).

Monthly analysis of the Gonadosomatic Index (GSI) revealed a single peak in July for both male and female *Mystus cavasius*. Elevated GSI values were consistently observed from May to September. As previously established, GSI typically increases with gonadal maturation, reaches its apex during peak maturity (indicating the spawning season), and subsequently declines sharply following gamete release or resorption (Le Cren, 1951; Nikolsky, 1963; Olurin & Savage, 2011). Therefore, the month(s) exhibiting peak GSI values denote the spawning period, while months with high GSI values represent the breeding periodicity of the species. The findings of this study suggest that *Mystus cavasius* is a single-spawning species with July as its spawning month and a breeding season spanning from May to September. Notably, throughout the maturation process, female GSI values were significantly higher than those of males, indicating a greater allocation of somatic energy reserves towards gonadal development in females (Chatzifotis, 2004). Maya *et al*. (2012) have documented July as the peak breeding season for *Mystus cavasius* at Mymensingh region of Bangladesh. Qasim and Qayyum (1961) have later reported single spawning nature of *Mystus cavasius* which later has been supported by Bhatt (2012), Krishna Rao (2007) and Santoshsing & Gupta (2007).

The HSI is closely linked to reproductive investment, particularly in female fish. During vitellogenesis, the liver undergoes significant hypertrophy (enlargement) as it synthesizes large quantities of vitellogenin for developing oocytes. Consequently, a marked increase in HSI in mature females often precedes and coincides with the spawning season. Monitoring HSI fluctuations can thus provide valuable information about the timing and intensity of reproductive cycles within a population. Comparing HSI values between sexes and across different reproductive stages can illuminate the energetic demands associated with reproduction. In this study, Hepato-somatic index showed highest level in winter season, which decreased in monsoon and reached to the lowest level in summer season. This is attributed by high food availability and energy intake. Therefore, a high HSI in winter (December) suggested a fish in good nutritional condition with ample energy stores, while a low HSI value in July, may indicate starvation, emaciation, or insufficient food intake. This information is particularly valuable in fisheries management for understanding the impact of environmental changes or fishing pressure on the nutritional well-being of fish stocks.

The condition factor, denoted as 'K', serves as a quantitative metric for assessing the overall physiological state of fish. This condition is subject to modulation by a variety of intrinsic and extrinsic factors, encompassing ontogenetic stage, sex and gonadal maturation, gastrointestinal fullness, dietary composition, lipid reserves, muscularity, and temporal variations associated with seasonality. Fluctuations in the condition factor have been consistently correlated with the reproductive cycle of fish, as substantiated in the literature (Saliu, 2001; Narejo *et al*., 2002). In the present study, the condition factor (K) in female specimens exhibited a range of lowest values in the month of June and highest recorded in the month of December. In contrast, male specimens showed a broader range, fluctuating between lowest in June and in April. Notably, the average condition factor values were consistently higher in females compared to males across the majority of the sampling period. In the present investigation, the mean relative condition factor (Kn) values for both male and female specimens were greater than unity, suggesting that the studied species generally exhibited a relatively high level of adiposity and were in favorable physiological condition. However, temporal variations observed in the relative condition factor are likely attributable to a complex interplay of factors, including the availability of high-quality food sources, feeding intensity, gonadal development, physiological stress associated with pre- and post-spawning phases, and prevailing environmental conditions. Similar attributes were reported by Akhter *et al*., (2017), Chaturvedi *et al*., (2016), Ahirwal *et al*., (2025).

In the present study, statistical analysis revealed a highly significant ($p < 0.01$) relationship between fecundity and total length (TL), total weight (TW), and gonad weight (GW). Regression analysis and the corresponding scatter plot demonstrated a positive linear relationship between body weight and fecundity. This observation, indicating an increase in fecundity with increasing body weight, is consistent with findings reported by several researchers Faruq *et al*., (1995); Bhatt *et al*., (2012); Islam *et al*., (2006); Ahirwal *et al*., (2025). In the present investigation, fecundity exhibited a positive correlation with both ovary weight and total length in the studied fish species. The highest number of oocytes was recorded in July, coinciding with the period of peak ovarian maturity. Similar cases were reported by Safiullah *et al*., (2004) in *Hilsa illisha* , Rao *et al*., (2009) in *Epinephelus diacanthus* and Mishra *et al*., (2012) in *Labeo calbasu.*

5. CONCLUSION

The results of this investigation offer fundamental baseline data regarding the reproductive biology of *Mystus cav*asius and its associated determinants. This information can be valuable for optimizing artificial breeding programs, fry rearing protocols, and grow-out strategies to marketable size. Consequently, the present research contributes to the knowledge base for future studies on *M. cavasius* and facilitates the development of suitable aquaculture technologies for this species. Ultimately, this will aid in the improved management of its fishery resources and the effective conservation of the species.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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