Asian Journal of Fisheries and Aquatic Research

Volume 24, Issue 5, Page 40-50, 2023; Article no.AJFAR.104544
ISSN: 2582-3760

Estimation of Fecundity and Gonadosomatic Index (GSI) of *Somileptes gongota* (Hamilton, 1822) from the River Padma in Rajshahi District, Bangladesh

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Authors' contributions

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

Article Information

DOI: 10.9734/AJFAR/2023/v24i5646

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/104544

Original Research Article

Received: 09/06/2023
Accepted: 14/08/2023
Published: 22/08/2023

ABSTRACT

The study focused on assessing the fecundity and gonadosomatic index (GSI) of the Gongota Loach species, scientifically known as *Somileptes gongota*, during the period spanning from April 2019 to March 2020. The fecundity of *S. gongota* exhibited a range of values, spanning from 3375

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to 73459.75. Out of a total of 36 specimens, 16 were identified as male while 20 were identified as female. The typical length of female specimens varies between 5.4 cm and 12.5 cm, with a corresponding body weight range of 3.72g to 19.52g. The recorded mean GSI values for the twelve-month period from April to March were as follows: 0.158, 0.231, 0.225, 0.242, 0.176, 0.00, 0.00, 0.13, 0.00, 0.00, 0.00, and 0.134. The lowest mean GSI value of 0.00 was observed during the months of September, October, December, January, and February. Conversely, the highest mean GSI value of 0.242 was recorded in the month of July. According to the monthly mean GSI of female individuals, the observed spawning season for this species spanned from April to July throughout the duration of the study, with the peak season occurring in July. The highest recorded level of fecundity was observed in the month of July, reaching a value of 73459.75. Conversely, the lowest level of fecundity was recorded in August, with a value of 3375. The study revealed a significant correlation between fecundity and body weight, as represented by the equation F=4.51BW-40115, with a coefficient of determination (r^2) of 0.835. The observed fecundity values varied between 3375 and 73459.75, while the corresponding body weights ranged from 3.72g to 19.52g. The correlation between fecundity and standard length was determined to be F=0.012 SL3.628 (r^2=0.794). The results of the regression analysis revealed a cubic relationship between fecundity and standard length, as well as a linear relationship between fecundity and body weight. A comprehensive understanding of fecundity and gonadosomatic index (GSI) is imperative for effective fish management.

Keywords: Fecundity; Gonadosomatic Index (GSI); Somileptes gongota.

1. INTRODUCTION

Bangladesh is characterized by its abundant river systems and regarded as the home to a diverse network of approximately 700 rivers, varying in size and scale. Water bodies serve as vital reservoirs of resources that are dispersed throughout the country. The water bodies encompass various ecological habitats such as rivers, haors, baors, beels, lakes, ponds, canals, and estuaries. The Padma, the Meghna, the Jamuna, and the Brahmaputra represent the prominent river systems within our nation. The rivers in question exhibit a rich biodiversity, serving as habitats for a diverse range of fisheries resources. Additionally, they play a crucial role as breeding grounds for numerous commercially significant fish species. In addition to the presence of numerous endangered and threatened species, it is worth noting that these particular aquatic ecosystems serve as habitats for such organisms. The decline in biodiversity within these aquatic ecosystems is a cause for concern, as it can be attributed to a combination of human activities and natural factors. The loss of aquatic biodiversity can be attributed to various anthropogenic factors such as over-exploitation, habitat degradation, alterations in breeding and feeding grounds, aquaculture practices, and the unintended disruption of migratory patterns, particularly in species like the Hilsa (*Tenualosa ilisha*). The ecological factors contributing to this phenomenon encompass volcanic activity, fluvial erosion, and the inherent climatic fluctuations that disrupt the water quality parameters in a manner that leads to a significant decline in biodiversity within the habitat.

From an ecological perspective, the aquatic ecosystems can be classified into various types, such as inland open water bodies (including rivers, beels, haors, floodplains, etc.), inland closed waters (including ponds, baors, coastal shrimp farms, etc.), and marine water bodies [1,2]. The water bodies mentioned in the study by Miah and Dewan [3] are characterized by their abundant fisheries resources. The reproductive cycle of fishes is significantly impacted by the aquatic environments in which they reside [4,5]. The certain water bodies exhibit favorable conditions for the habitation of pelagic fish species, while others provide a suitable environment for demersal fish species. Additionally, a few of these aquatic ecosystems support a diverse array of both exotic and indigenous fish species [6]. In our water territory, we have a diverse array of fish species. Specifically, we have identified a total of 293 species that inhabit freshwater environments. Among these, we have observed the presence of 30 exotic species, which are non-native to the area. Additionally, our water territory is home to 475 species that thrive in marine ecosystems. Numerous species find themselves in a precarious state, facing threats or existing in an endangered condition, while regrettably, certain others have already succumbed to extinction [7]. Numerous ongoing research endeavors are dedicated to enhancing the quality of water and the environment [8]. The commercial viability of these resources is experiencing a promising upward trend. The annual fish production in Bangladesh exhibits a positive trend of growth. According to the Department of Fisheries (DoF) in 2023, Bangladesh has achieved the notable position of being ranked fifth globally in terms of inland freshwater fish production. The total production contribution has experienced a significant decline of approximately 50 percent over the past few decades, raising concerns among ecologists.

To ensure the conservation of a balanced protein cycle and promote the productivity and diversity of aquatic ecosystems, it is imperative to prioritize the protection and conservation of endangered and threatened species of the country. The Pahari Gutum, scientifically known as *Somileptus gongota*, is currently facing a precarious situation as it falls under the endangered category on the IUCN red list (2015). The assessment of fecundity and the gonadosomatic index (GSI) is of utmost importance in safeguarding the species from extinction [9]. The expression of fecundity can be quantified by considering the quantity of eggs produced by each brood fish during a specific breeding season, as described by Lagler in 1956. It is occasionally denoted as total or absolute fecundity in ecological contexts. When the quantification of egg production in a given species is obtained, it enables the formulation of appropriate strategies for the successful generation of viable offspring [10]. Understanding the life cycle pattern of a species is imperative in safeguarding its survival. These organisms exhibit a range of morphological variations, characterized by their robust and substantial physique, resembling either the form of a worm or even that of an eel. Several species of loaches can be found in various regions, including *Somileptus gongota*, *Botia dario*, *Syncrossus berdmorei*, *Yasuhikotakia nigrolineata*, *Sinibotia robusta*, *Pangio oblonga*, *Leptobotia guilinensis*, *Botia almorhae*, and others. The *S. gongota*, a species of aquatic organism, is obtained through the process of collection from the river Padma, located within the Rajshahi district. The species is also observed inhabiting the ancient Brahmaputra River of Mymensingh, the Kangsha river of Netrokona district, the Korotoa river of Bogura district, and various other aquatic ecosystems present in Bangladesh. The presence of the species within these aquatic ecosystems is observed, yet its population size remains notably constrained. Henceforth, it is imperative to acknowledge that the aforementioned species holds the status of an endangered species within the ecological realm of Bangladesh.

The species exhibits a wide distribution within the Rajshahi area during the rainy season, as documented by Bhuiyan et al. [11]. This particular species is commonly bred and raised within a controlled aquatic environment, such as an aquarium. The Rajshahi area lacks the availability of the mentioned product in local markets. The fish species in question fulfills a crucial ecological function by exerting control over the insect population, as documented by Rahman in 1989. The species under consideration exhibits a distribution pattern encompassing various habitats across Bangladesh; however, it does not display high population densities in any specific location [12,13,14]. Notably, this species has not been designated as threatened according to the IUCN Red Book of threatened fish in Bangladesh, as assessed by IUCN Bangladesh [15].

The understanding of population biology and its trajectory for this particular species remains largely elusive. Hence, the current evaluation designates it as being in close proximity to a state of vulnerability within the red list classification [16]. The population of the *S. gongota* has experienced a notable decrease in abundance in recent years, as reported by Alam et al. [17]. The piscine species under consideration is not only renowned for its delectable flavor, but it is also subject to constraints in terms of its availability within the ecosystem. The study from Banu and Bhakta [18] provides valuable insights into implementing effective conservation measures aimed at enhancing fish production, thereby contributing to the overall increase in our country's total fish production. The species exhibits a notable level of nutritional value, as indicated by Das et al. [19]. This has the potential to enhance the financial resources of fishermen, thereby fostering a beneficial transformation for economically disadvantaged fishing communities. This species plays a crucial role in providing a significant source of animal protein, effectively meeting the protein requirements of the population in Bangladesh. In order to ensure the sustainable management of the species, it is crucial to undertake the estimation of fecundity and GSI as a primary measure. Urgent measures must be promptly implemented to conserve the species, as failure to do so may result in its imminent extinction. The main objectives of the research were to determine the fecundity, gonadosomatic index (GSI) and spawning season to provide an effective recommendation for the conservation and management of the species [20-23].

2. MATERIALS AND METHODS

2.1 Site of Sampling

The research work was conducted with the Gongota Loach *S. gongota* collected from the river Padma of Rajshahi district in Bangladesh (Fig.1). It is originated from the Gongotri himbaha of the Himalay Mountain. In India the river is known as the Ganga River and flows through the Chapainawabganj district into Bangladesh and named as the river Padma. Among the four largest rivers of Bangladesh, it is one of them. The river is full of fisheries resources. Many of the endangered and vulnerable species of Bangladesh are available in the river. The river acts as the breeding ground of Hilsa and many of the commercially important and nutritious fish species. *S. gongota* is one of them although the species is now in the endangered situation.

2.2 Collection of Samples

Total thirty-six (36) number of *S. gongota* both male and female were collected from the river Padma in each month over the year round. Sample collection started from April 2019 and ended in March 2020. The loaches were caught by cast net from the river Padma randomly. The collected samples are transported oxygen filled polybag from the study area to BAU campus. Then they are preserved in the refrigerator. Each month the sample were collected and mentioned the collection date, month name, number of species and then they were compiled in the refrigerator. During the collection of samples some cautions were taken to avoid injury.

2.3 Length-weight Data

The distance from tip of the snout to the end of the longer lob of caudal fin is known as total length (TL). Again, the distance from tip of the snout to the end of the caudal fork or end of the last vertebra is known as standard length (SL). By using a measuring scale, the Total Length and Standard Length were measured. By using potable weighting machine weight of each sample were recorded. All of the length data were recorded in cm and the body weight was taken with the help of a portable weighting balance in g. The length weight data of every month were recorded carefully.

Fig. 1. The sampling site of the River Padma in Rajshahi district, Bangladesh

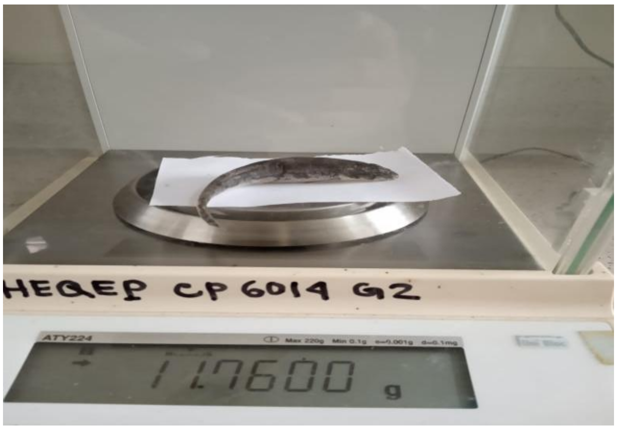

Fig. 2. Measuring weight of *S. gongota* (g) through an electronic balance

Fig. 3. Recoding length of *S. gongota* (cm) through a measuring scale

2.4 Sampling of Gonad

The ventral side of the samples were cut and opened from the anus toward the lower jaw by using scissors carefully and the belly is opened. Then the muscle of the abdomen was cut from the anus toward the ventral column vertically. Muscles, fat tissue, digestive organs and blood vessels were removed in a proper way. After this the ovary were taken out by using forceps. The weight of ovary was measured very carefully with the help of a portable electronic balance in g and recorded length in cm. For estimation of fecundity, small portion of the gonad was taken weighed that is known as sub sample weight.

2.5 Preservation of the Collected Samples

After taken the weight and length of the ovary and immediately after collection the fishes were preserved carefully with 10% formalin in order to cease further digestion of food materials and to stop the enzymatic activity of gut content. The containers were labeled, which included the date of collection and gender. Afterwards, the fishes were brought to the laboratory and kept in a safe place.

2.6 Study on Gonadosomatic Index (GSI)

Sexually maturity attains in peak breeding season. After spawning they spawns several times in their life spawn. With the increase of the body mass the gonad increases in size. GSI is frequently applied to determine the reproductive cycle of a fish species over the year at monthly or less interval. Most of the fishes become mature in the same year of birth when favorable conditions are available. GSI assumes that a gonad increases in size with increasing development comparing with the mass of the gonad (GW) to the total mass of the animal (BW). The gonado somatic index of each *Somileptes gongota* was calculated by the following formula:

GSI=100×GW/BW

Where,

GW=Gonad weight
BW=Body weight

2.7 Study on Fecundity

The fish samples were collected every month. The preserved samples were brought in laboratory and washed properly. The gonads from each specimen were removed out by dissecting the samples. Moisture from gonad was thoroughly wiped out with tissue paper. To collect eggs sample, fishes were handled properly. Only the matured ovaries were selected for fecundity analysis. The matured ovaries were weighed by using portable electronic balance in g. These ovaries were then spilt longitudinally and kept in petri-dish. Three samples, each were taken from the anterior, middle and posterior region of each ovary. Weight of each sample was measured by the electronic balance. All the ovaries were preserved in 10% formalin solution which helped in preserving the ovaries as well as made it much easier to separate the eggs from wall of ovary. After some hours, eggs become large and small amount of water added to separate from each other with the help of needles. All the eggs were not equal in size. Some were larger and some of them were tiny in size. The number of eggs in each of the sub sample were counted and mean value of eggs were calculated. The average number in sub sample were multiplied by the weight of the ovary, and calculated the value of fecundity of the gonad. The number of eggs of the sub sample was multiplied by the ratio of gonad weight (GW) to the weight of the sub sample which gives the fecundity of the species.

F=N× Gonad weight/Sub sample weight
F= Fecundity of fish
N= Number of eggs in the sub sample

2.8 Standard Length-fecundity Relationship

The relationship between fecundity and standard length are as follows: -

$F = a\,SL^{b}$ (Bagenal and Cochran)

Where,

F=Fecundity
SL=Standard Length

Logarithm transformation of the equation becomes the following: -

$\ln F = a + b \ln SL$

2.9 Body weight –Fecundity Relationship

The relationship between body weight and fecundity is as follows: -

$F = a + b\,BW$

Where,

F=Fecundity
BW=Body Weight
b = Slope of the regression line
a = Intercept of the regression with the y – axis.

3. RESULTS

3.1 Fish Size

Total 36 specimen of *S. gongota* were collected for the experiment. Among the specimen of *S. gongota*, 16 specimens were males and 20 specimens were females. Over the 12 months study period male lowest standard length was recorded 5.4 cm and highest standard length was recorded 10.6 cm. Again, for the female lowest standard length was recorded 6.4 cm and highest standard length was recorded 12.5 cm. In case of body weight of male lowest point was 2.25 g and highest point was 16.92 g. Again, the lowest body weight of female was 3.72 g and highest body weight was 19.52 g recorded from 12-month sample.

3.2 Standard Length

The experiment was conducted from April 2019 to March 2020. Whole 12 months various sizes of female specimens were collected and recorded the data. The lowest standard length was 5.4 cm found in September and highest standard length was 12.5 cm found in April. The standard length of female varied 10.6-12.5 cm,9-9.6 cm,8.9 cm,8.7-10.2 cm,8-9.2 cm,7.2 cm,6.4 cm,8.6-10.7 cm,8.5 cm,8.8-9.7 cm,7.2-8.5 cm,9.2-10.1cm respectively during April 2019 to March 2020 (Table 1).

Table 1. The yearly GSI of *S. gongota*

Sampling Month	Fish no.	TL (cm)	SL (cm)	BW(g)	GW(g)	Small part GW(g)	No of eggs in small part
April, 2019	1	14	12.5	19.52	3.191	0.028	403
	2	12	10.6	15.12	2.314	0.076	351
	3	9	7.5	9.23	-	-	-
May, 2019	1	8.4	7.5	4.237	-	-	-
	2	9.8	7.2	6.021	-	-	-
	3	10.2	8.9	9.031	2.031	0.004	126
June, 2019	1	10.5	9	10.101	2.755	0.075	674
	2	11	9.6	10.412	1.986	0.008	165
	3	9	7.6	6.723	-	-	-
July, 2019	1	10.3	8.7	9.793	2.401	0.037	486
	2	11.6	10.2	9.347	2.231	0.0041	135
	3	12	10.6	6.342	-	-	-
August, 2019	1	9.5	8	6.723	0.837	0.031	125
	2	10.8	9.2	9.231	2.105	0.126	450
	3	7.5	6.4	4.321	-	-	-
September, 2019	1	6.2	5.4	2.25	-	-	-
	2	9.7	8.4	7.213	-	-	-
	3	8.3	7.2	3.981	0.00	0.00	0.00
October, 2019	1	7.5	6.4	3.72	0.00	0.00	0.00
	2	11.2	9.7	8.32	-	-	-
	3	9.2	7.8	7.137	-	-	-
November, 2019	1	10.5	9	6.917	-	-	-
	2	12.2	10.7	13.210	1.379	0.032	327
	3	9.8	8.6	6.22	0.972	0.014	129
December, 2019	1	10	8.5	8.143	0.00	0.00	0.00
	2	11.5	10.1	11.42	-	-	-
	3	9.7	8.3	6.025	-	-	-
January, 2020	1	11.5	9.7	11.760	0.00	0.00	0.00
	2	10.3	8.8	7.04	0.00	0.00	0.00
	3	8.4	7.3	5.210	-	-	-
February, 2020	1	11.2	10	11.113	-	-	-
	2	9.7	8.5	10.52	0.00	0.00	0.00
	3	8.8	7.2	5.621	0.00	0.00	0.00
March, 2020	1	12	10.5	16.919	-	-	-
	2	11.5	10.1	12.972	1.013	0.0052	155
	3	10.6	9.2	9.153	1.737	0.0029	115

3.3 Body Weight

Different body weight of female specimen found over 12 months, 3.720 g is the lowest body weight of female fish found in October and the highest body weight was found 19.52 g in April. Body weight of *S. gongota* female specimen varied from 15.12-19.52 g,10.101-10.412 g,9.031 g,9.347-9.793 g,6.72-9.23 g,3.981 g,3.72 g,6.22-13.21 g,8.143 g,7.04-11.76 g,5.621-10.52 g,9.153-12.972 g respectively from April 2019-March 2020. (Table 1).

3.4 Ovary Weight

The highest ovary weight was recorded 3.191 g in April and the lowest one was 0.837 g in August and 0.00 g in September, October, December, January and February. Ovary was collected throughout the 12 months from April to March. Only April, May, June and July specimen contain comparatively higher weight than the other months. Ovary weight of female specimen of S. gongota varied from 2.31-3.19 g, 1.99-2.76 g,2.23-2.4 g,0.837-2.105 g,0.00 g, 0.00 g, 0.97-1.389 g, 0.00 g, 0.00 g, 0.00 g, 1.01-1.74 g respectively from April to March. (Table 1).

3.5 Gonadosomatic Index (GSI)

The highest GSI value of females was recorded 0.245 in July and lowest was 0.104 in November throughout the sampling period over twelve months.

The value ranges of GSI from April to March respectively 0.153-0.163, 0.190-0.272, 0.225, 0.239-0.245, 0.124-0.228, 0.00, 0.00, 0.104-0.156, 0.00, 0.00, 0.00, 0.078-0.189. The months September, October, December, January, February showed 0.00 GSI as seemed 0.00 gonad weight. April, May, June, July showed mostly higher GSI than the other month. The mean GSI value of twelve months from April to March was recorded 0.158, 0.231, 0.225, 0.242, 0.176, 0.00, 0.00, 0.130, 0.00, 0.00, 0.00 and 0.134 respectively (Table 2).

3.6 Spawning Season

In the experiment monthly mean GSI value for females was higher in April, May, June and July and the highest value was in July (0.242). Based on monthly mean GSI of females the spawning season of this species was assumed from April to July over the study period and the peak season was in July (Fig. 4).

3.7 Fecundity

Along with the experiment April, May and July showed mature female specimens of *S. gongota*. From the mature female specimens, highest fecundity was recorded 73459.75 in July and lowest fecundity was recorded 3375 in August. The highest fecundity was recorded with standard length 10.2 cm and body weight 9.347 g. Again the lowest fecundity recorded with 8 cm standard length and body weight 6.723 g.

Table 2. Month wise GSI of female fish *Somileptes gongota*

Month	No of fish examined	GSI ranges	Mean GSI
April-2019	2	0.153-0.163	0.158
May -2019	2	0.272-0.190	0.231
June -2019	1	0.225	0.225
July-2019	2	0.239-0.245	0.242
August-2019	2	0.124-0.228	0.176
September-2019	2	0.00	0.00
October-2019	2	0.00	0.00
November-2019	2	0.104-0.156	0.130
December-2019	3	0.00	0.00
January-2020	2	0.00	0.00
February-2020	2	0.00	0.00
March-2020	2	0.078-0.189	0.134

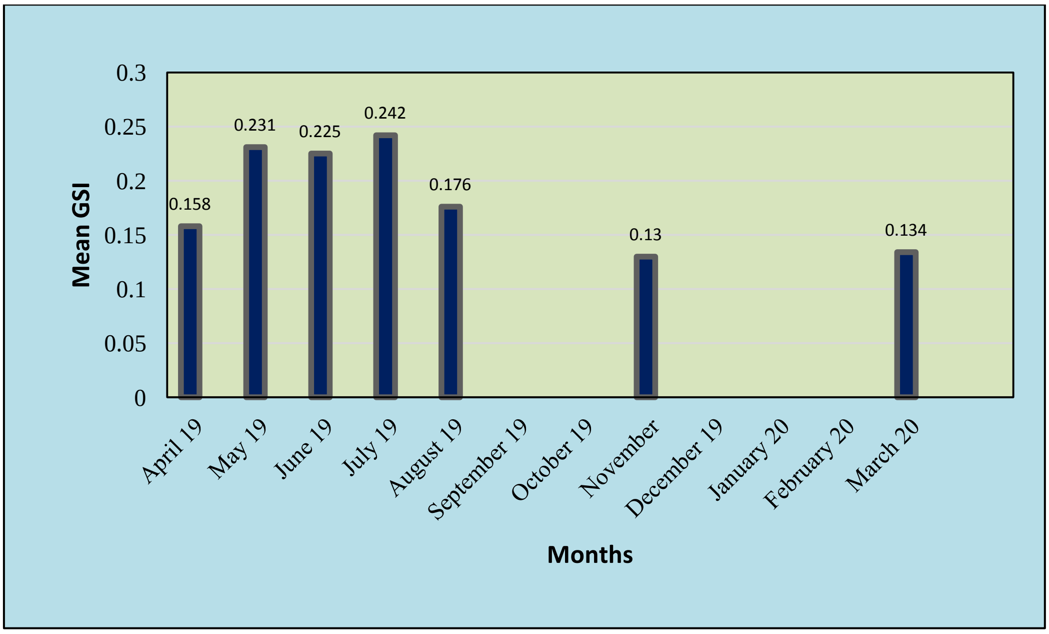

Fig. 4. Highest spawning season in July with highest GSI value

Table 3. Body weight, Gonad weight, GSI and fecundity of female *S. gongota*

Month	Body weight(g)	Gonad weight(g)	GSI	Fecundity
April (2019)	19.52	3.191	0.163	45927.67
April (2019)	15.12	2.314	0.153	10687.02
May (2019)	10.101	2.755	0.272	24758.27
May (2019)	10.412	1.986	0.191	40961.23
June (2019)	9.031	2.031	0.225	63976.5
July (2019)	9.793	2.401	0.245	31537
July (2019)	9.347	2.231	0.239	73459.75
August (2019)	6.723	0.837	0.124	3375
August (2019)	9.231	2.105	0.228	7517.86
November (2019)	13.210	1.379	0.104	14091.65
November (2019)	6.22	0.972	0.156	8956.29
March (2020)	12.972	1.013	0.079	30195.19
March (2020)	9.153	1.737	0.189	68881.03

3.8 Body Weight and Fecundity of *S. gongota*

In regression analysis, body weight was taken as independent variable, while fecundity as dependent variable. The scatter diagram found from the fecundity (F) and body weight (BW) yielded a linear relationship. The relationship between the fecundity and body weight was found as, F = 4.51 BW-40115.

The co efficient of determination (r^2) in the regression analysis was 0.835, which suggested that 83.5% of the variation in fecundity was due to the variation of body weight. This indicated that fecundity increased with the increase of the body weight. So, from regression analysis it showed significant relationship between fecundity and body weight. The calculated fecundity ranged from 3375 to 73459.75, along with the body weight 3.72 to 19.52 g of female specimens (Table 3).

3.9 Standard length and fecundity of *S. gongota*

The fecundity (F) and standard length (SL) of *S. gongota* plotted in the scatter diagram and yielded a nonlinear or power curve equation. In regression analysis Standard length was taken as independent variable, fecundity as dependent variable. As the standard length change a bit fecundity will also change. The relationship between the fecundity and standard length was expressed as $F= 0.012\ SL^{3.628}$. The analysis estimated co efficient of determination (r^2) was 0.794 which suggested that 79.4% of the variation in fecundity is due to variation in standard length. This indicated that the number of eggs per female increased significantly with increasing of the standard length. So, the regression analysis indicated there was strong relation between fecundity and standard length. The calculated fecundity ranged from 3375 to 73459.75, along with the standard length of the female 6.4 to 12.5 cm.

4. DISCUSSION

According to the result the highest standard length was recorded 12.5 cm in April. Again, the lowest standard length was 6.4 cm in October. In case of body weight 3.72 g was lowest and 19.52 g was highest. The GSI is the indicative of the spawning season was found throughout the research session over twelve months. The GSI is the indirect way to find the peak spawning season. The highest GSI value was 0.245 in July and the lowest GSI value in 0.078 in March. September, October, December, January, February showed 0.00 GSI value and their ovary weight was 0.00 g. The rise and fall in the GSI graph showed peak spawning season and July was the highest one. The graph showed gradually rising from April to July and then decrease in August. The gonadosomatic index increases with the maturation of fish and reaches to its maximum at the peak period of maturity. That means the spawning season of *S. gongota* was April, May, June and July was the peak season with maximum GSI. In case of fecundity among 20 female, 13 mature female specimens were taken for the research. From April to August, November and March total 13 female specimens were conducted for fecundity. The highest fecundity was found in July which was 73459.75 and lowest found in August which was 3375.

The standard length of female specimen of *S. gongota* was recorded lowest 6.4 cm in the month of October and highest in 12.5 cm in the month of April. On the other hand, the lowest body weight of female was recorded 3.72 g in October and highest body weight was 19.52 g in April. For male standard length was recorded lowest 5.4 cm in September and highest 10.6 cm in March. Again, body weight of male highest in 16.919 g in March lowest in 2.25 g in September. GSI value was also calculated of all fishes for 12 months. The mean GSI values for female was highest in July (0.242) and lowest in November (0.13). The GSI values for females were become higher from April to July. This indicates that spawning season of that species from April to July and pick in July.

Gravimetric method was followed to estimate the fecundity. From the research work result, it was observed that the number of fecundities varied from 3375 (from a fish with standard length 8 cm, total weight 6.723 g) to 73459.75 (for a fish with standard length 10.2 cm and body weight 9.347 g). Highest fecundity was found in the month of July and lowest fecundity in the month of August.

The regression equation and their relationship between standard length (SL) and body weight (BW) with fecundity were conducted. During the present experiment, the fecundity was plotted against the standard length and body weight of the fishes. The relationship between body weight and fecundity of *S. gongota* was found linear and the relationship was expressed as F= 4.51 BW-40115. But there was a nonlinear cubic relationship between Standard Length (SL) and fecundity of *S. gongota* and expressed as $F = 0.012\ SL^{3.628}$. The present research evolved that the relationship between body weight and fecundity was found to be the most significant and it was a linear relationship.

5. CONCLUSION

The investigation pertaining to the assessment of fecundity and gonadosomatic index (GSI) of *S. gongota* holds significant potential in contributing to the conservation efforts aimed at protecting the red-listed fish species. The reproductive characteristics hold significant utility in the cultivation of the species. The measurement of fecundity and gonadosomatic index (GSI) plays a crucial role in the sustainable management of *S. gongota* fisheries. Without doing a comprehensive assessment on fecundity and gonadosomatic index (GSI), it is difficult to fully comprehend their impact on reproductive behavior. In order to achieve sustainable management and conservation efforts for a fish species facing threats, it is necessary to assess its fecundity and gonadosomatic index (GSI). Hence, this study presents valuable insights regarding fecundity and gonadosomatic index (GSI). The data obtained from this study has the potential to serve as a foundational reference for future research on this particular species of fish.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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