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Biological Aspect of Nona Tengra (*Mystus gulio*) in Khulna Region, South West Bangladesh

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Abstract: The present study deals with hepatosomatic index (HSI), alimentosomaticindex (ASI), gastro-somatic index (GaSI), condition factor, relative gut length and food and feeding habit of Nona Tengra (*Mystus gulio*) collected from Khulna region during August to December, 2015. A total of 100 specimens were collected from different fish market of Khulna region. Total length, standard length and head length ranged from 11.7-21.00, 9.5-17.00 and 2.5 - 4.3 cm respectively. The body weight (BW), gonad weight (GdW), liver weight (LW) and gut weight (GtW) ranged from 20.13-35.81, 0.03-0.05, 0.3-0.53 and 0.39-0.69 g respectively. The relationships between different features of the fish body were found to be linear. The mean values of hepatosomatic (0.41±0.06) and alimentosomatic index (0.53±0.083) indicated greater liver activity and feeding intensity in *Mystus gulio* during the experimental period. Present investigation also showed that the chlorophyceae, planktonic crustacea, rotifera, insect body parts and shrimp were the main food items of *Mystus gulio*, which suggested that the species is carnivorous. However, the biological knowledge of this study will help to conserve this species as well as develop new culture system.

Keywords: *Mystus gulio*, Gonadosomatic Index, Alimentosomatic Index, Hepatosomatic Index, Condition Factor and Food Habit

1. Introduction

Mystus gulio, locally known as nona tengra, is an euryhaline estuarine catfish commonly occurres in coastal waters of Bangladesh. It belongs to the family Bagridae. The species feed and thrive well in low salinity. If the salinity exceeds 10‰, they migrate into waters of low salinity (Pandian, 1966). The adults occur mainly in larger water bodies (with mud or clay substrates) and rarely found in smaller streams (Sarker *et al*, 2002). Shafi and Quddus (2001) have documented its availability in canals. Due to increasing demand in export market and high price, the increased fishing pressure on this species has been resulting in progressively reduced catch. Therefore, to protect and conserve the natural stock it is essential to develop seed production technology in captivity. Furthermore, the success of good scientific planning and management of fish population largely depends on knowledge of their biological aspects (e.g., hepatosomatic index, alimentosomatic index and gastrosomatic index). Consequently, the present experiment was conducted with a view to enrich idea about different morphometric, meristic, biological aspects and feeding habit of *Mystus gulio*, which would be useful for stocking, successful farming and management of this species.

2. Materials and Methods

2.1. Sample Collection and Study Period

A total number of 100 specimens of *Mystus gulio* were collected from Shondha bazar fish markets of Khulna region during August to December 2015 and stored in ice box. The morphometric and meristic characters were studied in Fish Biology Laboratory, Fisheries and Marine Resource Technology Discipline of Khulna University, Bangladesh.

2.2. Morphometric and Meristic Characters

Morphometric characteristics were recorded using centimeter scale, fine pointed divider, forceps and slide calipers. Furthermore, meristic characters viz. anal fin ray,

dorsal fin ray, pectoral fin ray, caudal fin ray number were recorded separately.

2.3. Biological Study

The gonadosomatic index (GSI), hepatosomatic index (HSI), alimentosomatic Index (ASI) and condition factor (CF) were calculated following Islam *et al* (2013).

GSI = (Weight of gonad / Body weight) x 100

HSI = (Liver weight / Body weight) x 100

ASI = (Weight of the gut / Body weight) x 100

CF = (Body weight x Total length) / TL^3 (TL=Total length)

2.4. Food and Feeding Habit

Food and feeding habit were analyzed for 50 specimens collected from culture ponds at Dumuria upazilla under Khulna district. The fish samples were dissected by giving a vertical incision on the ventral side. Guts were removed and weighted. The gut of each was dissected out and the contents of the stomach were removed very carefully in a Petri dish and then diluted in distilled water for determining the different food items. Food particles were identified by investigating the external morphology. Attempts were made to identify the chief constituents of the stomach contents.

2.5. Data Analysis

Linear regression analysis was used to determine the relations between different characters of the species. Microsoft Office Excels and kalida Graph software was used for different statistical analysis.

3. Results

3.1. Morphometric Characters of Mystus gulio

A variety of morphometric traits was observed. Since, *Mystus gulio* samples were sampled randomly from different local markets, the samples were obviously of heterogeneous. Thus the proportion would give the real picture. The mean of various body proportions of *Mystus gulio* were presented in Table 1.

Table 1. *Proportions of different morphometric characters of Mystus gulio.*

Proportion	(Mean ± SD)	Range
TL: SL	1.24 ±.02	1.14-1.23
SL: HL	3.82 ±.11	3.8-3.95
SL: PrOL	11.92± 1.22	11.88-12.14
SL: ED	25.03 ± 2.29	23.75-24.28
SL: PsOL	6.91 ±.48	6.79-7.08
SL: HOB	4.18 ±.16	4.05- 4.52
SL: WOB	9.28 ±.38	8.95-10.56
SL: DBFtDTScDFL	7.13 ±.14	7.08-7.31
SL: AFL	6.25 ± 1.37	7.72-7.92
SL: FtDFL	10.54 ± 0.49	10.63-11.88
SL: ScDFL	17.7 ±1.05	17-19
SL: CFL	3.96 ±.31	3.96-4.05
HL: PrOL	3.12 ± 0.31	3.07-3.13
HL: ED	6.55 ± 0.54	6.14-6.25
HL: PsOL	1.81 ± 0.09	1.78-1.79
HL: FtDFL	2.76±.15	2.68-3.12
HL: ScDFL	4.63±.36	4.3-5
HL: CFL	1.04±.07	1.02-1.04
HL: LUJ	2.27 ± 0.16	2.15-2.5
HL: LLJ	2.53 ± 0.17	2.39-2.78
HOB: ED	5.98 ± 0.63	5.25-6

* TL - Total length, SL - Standard length, HL - Head length, PrOL - Pre orbital length, ED - Eye diameter, PsOL - Post orbital length, AFL – Anal fin length, FtDFL - Length of First dorsal fin, ScDFL- Length of Second dorsal fin, CFL – Caudal fin length, LUJ – Length of upper jaw, LLJ - Length of the lower jaw, HOB - Height of the body, WOB – Width of the body, DBFtDTScDFL - Distance between first dorsal fin to Second dorsal fin.

Furthermore, a positive linear relationship was obtained between standard length and total length (Figure 1), total length and body weight (Figure 2), standard length and caudal fin length (Figure 3), standard length and head length (Figure 4), standard length and first dorsal fin length (Figure 5), standard length and height of body (Figure 6), standard length and depth of body length (7) as well as height of body length and depth of body (Figure 8).

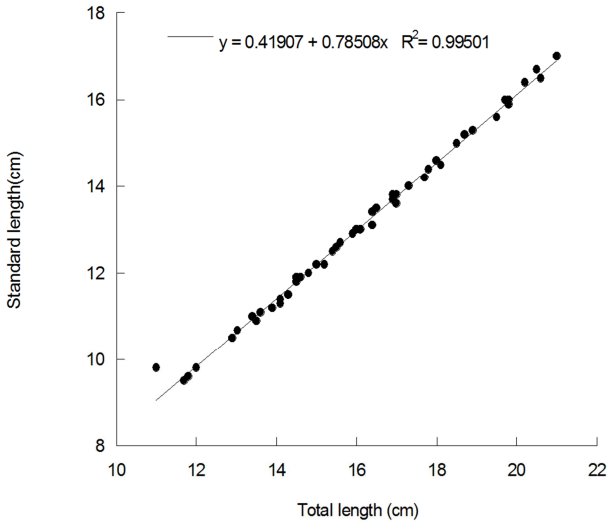

Figure 1. *Relationship between total length (cm) and standard length (cm).*

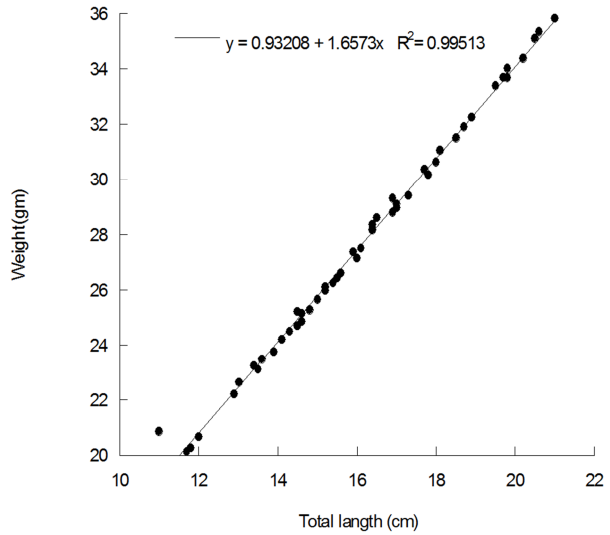

Figure 2. *Relationship between total length (cm) and body weight (gm).*

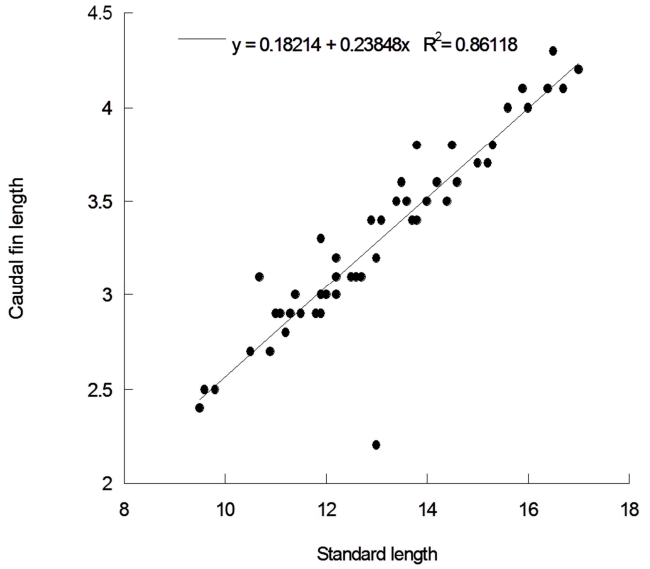

Figure 3. *Relationship between standard length (cm) and caudal fin length (cm).*

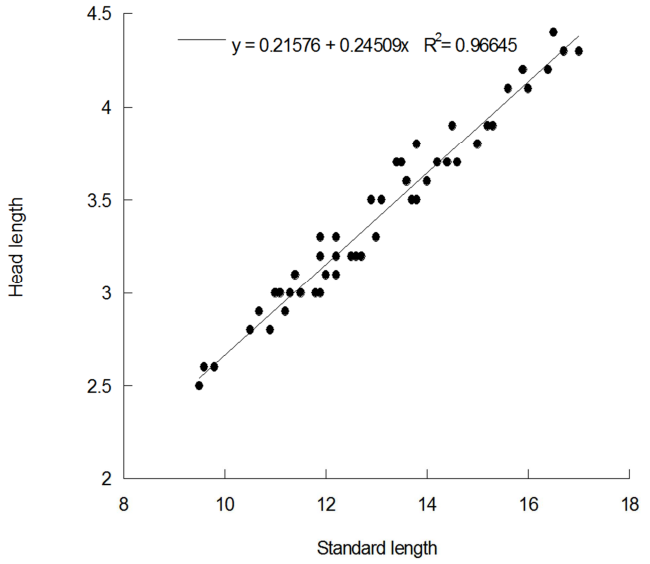

Figure 4. *Relationship between Standard length (cm) and Head length (cm).*

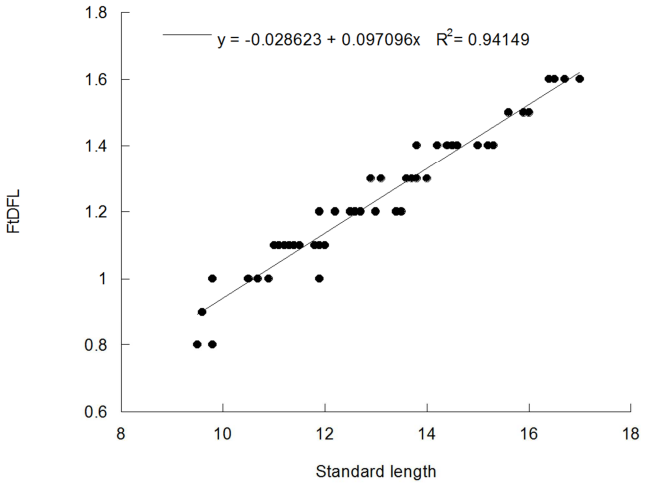

Figure 5. *Relationship between Standard length (cm) and First dorsal fin length (cm).*

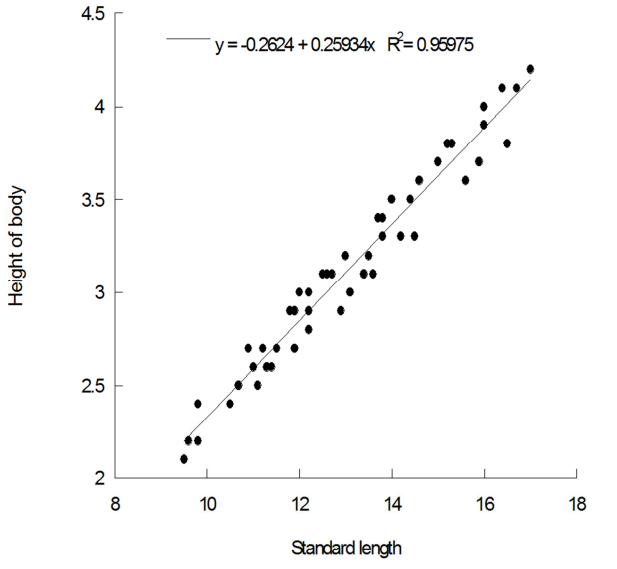

Figure 6. *Relationship between Standard length (cm) and height of body (cm).*

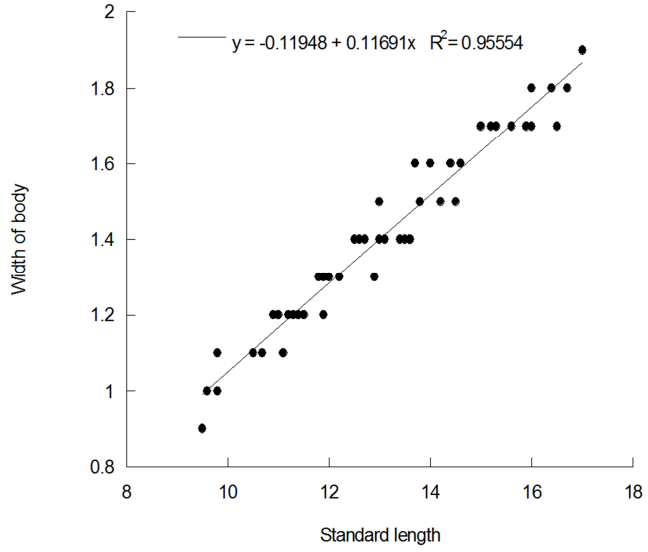

Figure 7. *Relationship between Standard length (cm) and width of body length (cm).*

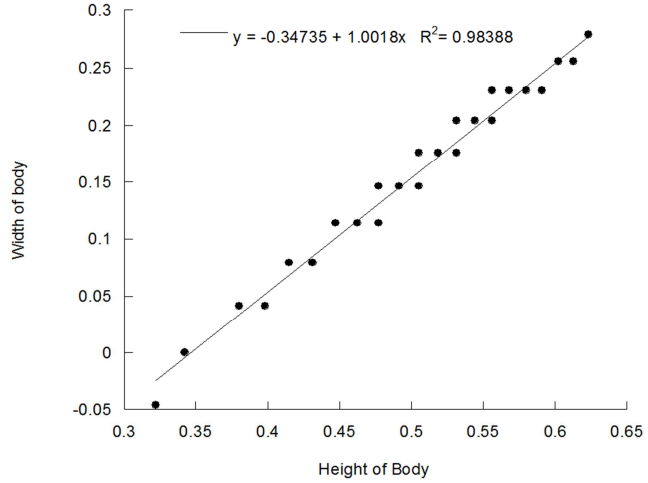

Figure 8. *Relationship between height of body length (cm) and width of body (cm).*

3.2. Meristic Characters of Mystus gulio

Meristic characters i.e. the number of first dorsal fin ray, pectoral fin ray, anal fin ray and caudal fin ray number were recorded separately for *Mystus gulio* (Table 2).

Table 2. *Meristic characters of Mystus gulio.*

Characters	Mean ± SD	Range
Number of total first dorsal fin ray	8.04 ± 1.28	6 – 11
Number of total pectoral fin ray	6.86 ± 1.16	5 – 9
Number of total caudal fin ray	27.52 ± 4.29	20 – 36
Number of total anal fin ray	14.14 ± 2.26	10 – 18

3.3. Biological Study

The mean condition factor of *Mystus gulio* was found 0.72 ± 0.28. A negative linear correlation was observed between the body weight and the condition factor (Figure 9). Mean liver weight was found 0.41 ± 0.06 g. Besides, mean hepatosomatic index of *Mystus gulio* was found 1.5 ± 0.01.

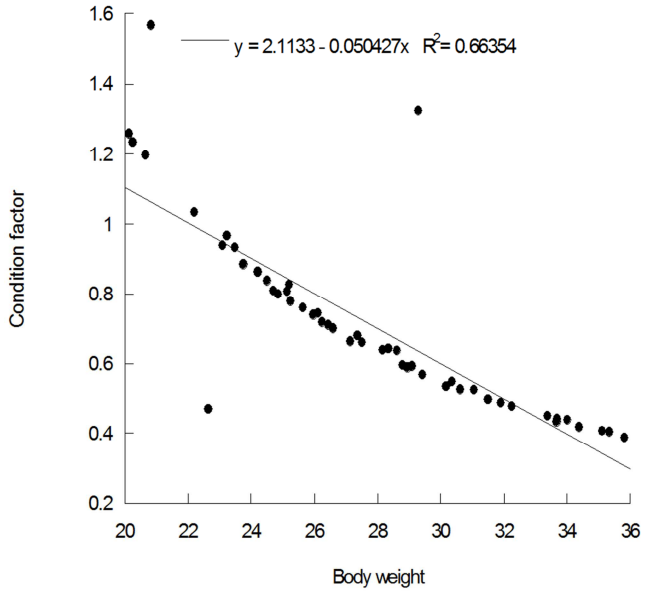

Figure 9. *Relationship between body weight (gm) and condition factor.*

A positive linear correlation was observed between the body weight and hepatosomatic index (Figure 10). The mean Gut weight (g) of all samples *Mystus gulio* was found 0.53± 0.083. Mean alimentosomatic Index of all *Mystus gulio* samples was found 1.94 ± 0.01 (1.94 to 1.95). Furthermore, the mean gonadosomatic index of *Mystus gulio* was found 0.13 ± 0.01 (0.14 to 0.15). A positive linear relation was observed between body weight and gonad weight (Figure 11).

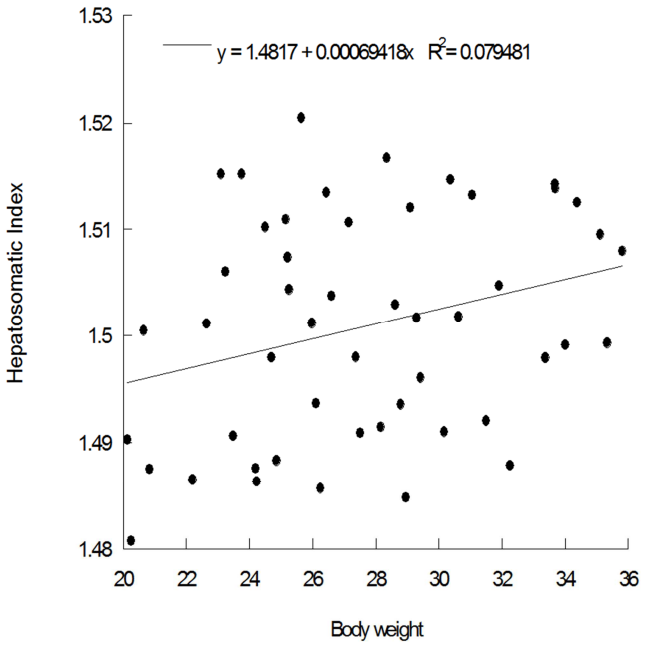

Figure 10. *Relationship between body weight (gm) and hepatosomatic index.*

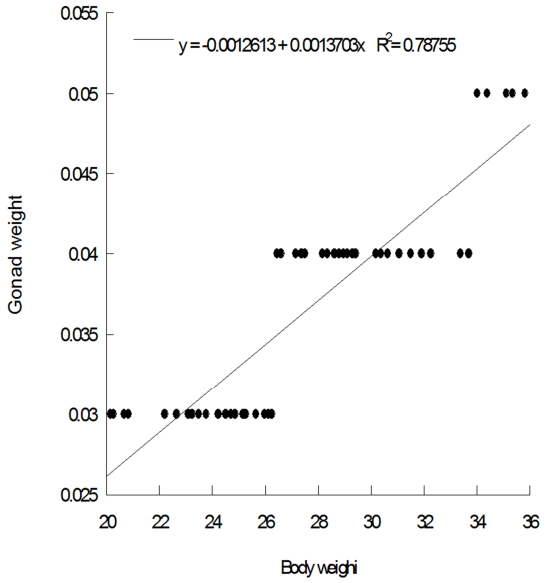

Figure 11. *Relationship between body weight (gm) and gonad weight (gm).*

3.4. Food and Feeding Habit

The stomach contents were found to contain mixed food items. The gut content analysis of *Mystus gulio* revealed that the food consisted of chlorophyceae (5%), bacillariophyceae (2%), planktonic crustacean (32%), rotifer (60%), insect larvae (1%).

4. Discussion

The total length of *Mystus gulio* ranged from 11.7 - 21.00 cm and total weight ranges from 20.13 to 35.81 g. Similarly, Kaliyamurthy (1981) stated that total length of *Mystus gulio* ranged from 10.5 to 24.5 cm and total weight ranged from 20.6 to 42.2 g. Furthermore, regression analysis revealed a linear relationship between total length and standard length as well as total length and body weight, which agreed well with the results reported for *Mystus gulio* by Kaliyamurthy and Rao (1972). Likewise, Rahman *et al*. (2004); Khan *et al.* (2002); Banu *et al.* (1984); Kabir *et al.* (1998), Islam and Hossain (1990) and Kaliyamurthy (1981) observe a linear relationship with total-length, body-weight, gonad-length and gonad weight in case of *Liza parsia, Plotosus canius, Colisa fasciata, Gadusia chapra, Puntius stigma* and *M. gulio* respectively.

The condition factor is not constant and found to vary in an individual, species or a population having relationship between seasonal changes in the environment and with the changes of physiological conditions of the fishes (Doha and Dewan 1967). In our study, mean condition factor of all samples of *Mystus gulio* was found 0.72±0.28. Further, mean gonadosomatic index of all samples of *Mystus gulio* was recorded nearly 0.13 ± 0.01. The relationships between fish weight, gonad weight and GSI were linear. Similar findings are reported by Kaliyamurthy (1981). However, Begum et al. (2014) stated that the mean gonadosomatic index (GSI) of *Mystus vittatus* was 0.88±0.06. Likely, the findings of the present study stated that the mean hepatosomatic index of *Mystus gulio* was 1.5 ± 0.01. This indicated the greater activity of liver in *Mystus gulio*. Chaturvedi and Saksena (2013) stated that the range of variation in the value of hepatosomatic index of *M. cavasius* was from 1.87±0.39 to 3.55±0.17. The highest hepatosomatic index of *M. cavasius* was obtained in December (3.55±0.17), while the lowest was recorded in June (1.87±0.39).

The gut content analysis and hepatosomatic index of our study clearly indicated that *M. gulio* is a carnivorous species. Parihar and Saksena (2010) also stated similar findings. They concluded that carnivorous fishes require more intense liver activity than the herbivorous fish. The intensity of feeding was studied by determining alimentosomatic Index. Present study stated that mean alimentosomatic index of *Mystus gulio* was 1.94 ± 0.01. This indicated the greater feeding intensity in *Mystus gulio*.

The gut content analysis of *Mystus gulio* revealed that the food consisted of chlorophyceae, bacillariophyceae, planktonic crustacea, rotifera, insect larvae, insect body parts, fish body parts and scale, shrimp body parts and unidentified species. Bhatt (1971) has reported Copepods, insect larvae, rotifer and daphnids as main food items for *Mystus gulio* species. The findings of present study further agreed with the finding of Pantulu (1999), Pandian (1966) and Kaliyamurthy and Rao (1972) as well as Gupta and Banerjee (2013).

5. Conclusion

The morphometric study revealed that the total length, standard length, head length, and body weight ranged from 11.7-21.00, 9.5-17.00, and 2.5-4.3 cm respectively. The biological and investigation showed that the body weight (BW), gonad weight (GdW), liver weight (LW) and gut weight (GtW) ranged from 20.13-35.81g 0.03-0.05g, 0.3-0.53g and 0.39-0.69g respectively and gonadosomatic index, alimentosomatic index, hepatosomatic index and condition factor ranged from 0.14-0.15, 1.94-1.95, 1.4-1.5 and 0.4043-1.2568 respectively. The mean values of hepatosomatic (0.41±0.06) and alimentosomatic indices (0.53±0.083) indicated greater liver activity and feeding intensity in *mystus gulio* during the investigation period.

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