

## Morphometric characteristics and reproductive periodicity of fresh water fish, *Lepidocephalus guntea* (Hamilton)

M. Habibur RAHMAN<sup>1</sup>, M. Afzal HOSSAIN<sup>1</sup>, Kenji KAWAI<sup>2</sup> and M. A. HOSSAIN<sup>1</sup>

<sup>1</sup> Fisheries Research Laboratory, Department of Zoology Rajshahi University, Rajshahi 6205, Bangladesh

<sup>2</sup> Fish Disease Laboratory, Department of Aquaculture Kochi University, Nankoku, Kochi 783, Japan

**Abstract:** A total of 600 specimens of *Lepidocephalus guntea* were collected from different fish landing centres of Rajshahi, Bangladesh during the period from July 1994 to June 1995. After collection the fishes were preserved monthly in 5% formalin at separate jar and meristics and morphometric characters were analysed. Five methods were used to determine the reproductive periodicity of *L. guntea*, namely 1) percentage of gravid females against time, 2) gonado somatic index (GSI), 3) gonadal length index (GLI), 4) ova diameter and 5) colouration of gonad. The investigation showed that the breeding season of *L. guntea* starts from April and continue upto July.

**Key words:** *Lepidocephalus guntea*, morphometric, meristics, reproductive periodicity, length and weight.

### INTRODUCTION

*Lepidocephalus guntea* (Ham) is commonly known as gute, gupui, poa, gutum etc. in different parts of the world (Rahman, 1989). It is abundantly found in the ponds, tanks, streams, beels, lakes, paddy fields and inundated fields, and is widely distributed in different parts of Asia (Bhuiyan, 1964). It is a small sized fish having a soft flesh and also a good source of protein for food. Rural people can culture the species very easily in swamps or paddy fields.

It is important for fish culturists to proper management and extension of fish production. And the assessment of the probability of this fish in the fresh water bodies, biological research of this species is essential (Hossain *et al.*, 1991). However, published information on the biology of this fresh water fish *L. guntea* is scanty. Studies on the relative growth and morphometric characters of fishes have been done by several researchers (Mann, 1971; Shafi and Mustafa, 1976; Doha, 1974). Information on length-weight relationship is important in studies on the biology, population and management of this species. Several investigators have provided information about length-weight relationship on fishes (Lecren, 1951; Hossain *et al.*, 1991). The breeding or spawning season of a species is the time when the species breeds. Many work has been done on the reproductive periodicity of different fresh water fishes (Karim and Hossain, 1972; Islam and Hossain, 1984). However, no work has been done on the reproductive periodicity of *L. guntea*. A knowledge of the reproductive periodicity is very useful in fisheries management and population analysis and is therefore of great biological interest, *i.e.* open or close the fishing season on the basis of breeding period. The present study was conducted to make it clear by determining the morphometric characteristics and reproductive periodicity of *L. guntea*.

## MATERIALS AND METHODS

### *Meristics and morphometrics analysis*

A total of 600 specimens of *L. guntea* were collected from different fish landing centres of Rajshahi, Bangladesh during July to December, 1994 and January to June, 1995. The specimens were sampled twice or thrice a month. The specimens were preserved in 5% formalin solution in separate jars for the meristics and morphometric analyses. Lengths were measured with a measuring board fitted with a meter scale (Fig. 1) while the weight of the each fish was taken with a sensitive balance. Total length (TL) of the fish was taken as the length from the snout to the tip of the tail and were measured. Standard length (SL) of the fish was taken as the length from the snout to the end of the caudal peduncle and was measured. The relation between the total length and standard length and total weight were calculated by the method of regression and correlation coefficients. The relation between the total length and standard length was calculated by using this formula,  $Y = a + bx$ ,  $Y =$  standard length,  $a =$  inter section on the ordinate,  $b =$  regression coefficient and  $x =$  total length. And length-weight relationship was calculated by using this formula,  $\text{Log } W = \text{Log } a + n \text{Log } L$  that is  $Y = A + BX$ , where  $Y = \text{Log } W$ ,  $A = \text{Log } a$ ,  $B = n$  and  $X = \text{Log } L$ , which is a linear relation between  $Y$  and  $X$ . The condition factor was calculated by using the formula, condition factor  $(K) = TW \times 10^5 / TL^3$ .

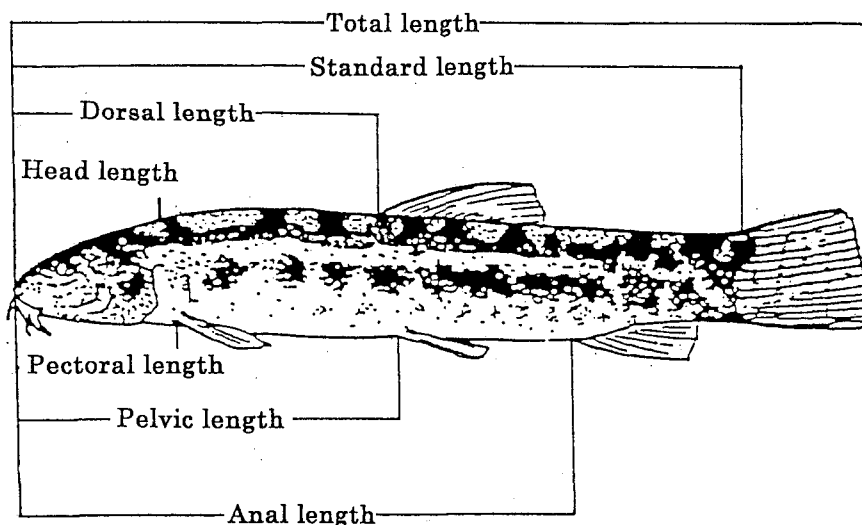


Fig. 1. Showing the different length of *Lepidocephalus guntea*.

For the determination of the reproductive cycle the female specimens were examined frequently monthly as well as the colouration of the gonads were observed throughout the year. The breeding periodicity of *L. guntea* was detected based on the following; 1) percentage of gravid females against time; 2) gonado somatic-index (GSI); 3) gonadal length index (GLI); 4) diameter of ovary; and 5) colouration of the ovary. To calculate the GSI and GLI the following formula were used,  $GSI = \text{gonad weight} / \text{body weight} \times 100$  and  $GLI = \text{gonadal length} / \text{body length} \times 100$ . Ten to 15 ova were collected at random from the anterior, central and posterior regions of each ovarian lobe of the specimen. Diameter of the collected ova were measured with an ocular micrometer (each scale division being equivalent to 0.032 mm).

## RESULTS

### *Meristics and morphometrics*

#### *Body*

The body of *L. guntea* is elongated, slightly compressed, mouth inferior, head length 5.6 mm (5-6 mm), dorsal length 23 mm, pectoral length 15 mm, anal length 35 mm of the total length. Barbels are laterally paired, rostral and one pair maxillary.

#### *Fins and ray*

Pectoral, pelvic, dorsal, anal and caudal fin present in *L. guntea*. The number of fin rays is as follows: dorsal, 8; pectoral, 8; ventral, 7; anal, 7 and caudal, 16.

#### *Scale*

Very small, imbricate, scales on head in patches could be found below and behind eyes and upper part of the operculum. On the ventral side of the head the scales extend anteriorly beyond the isthmus; 25-30 rows of scales are present between the back of the body and base of the anal fin. Colour and lateral line variable in life and age.

#### *Total length (TL)*

The TL of *L. guntea* ranged from 52 mm to 96 mm with a mean value of  $74 \pm 15$  mm.

#### *Standard length (SL)*

The SL of *L. guntea* ranged from 46 mm and 78 mm with a mean of  $61 \pm 13$  mm (n = 600).

#### *Total length (TL) and standard length (SL) relationship*

The relationship between the TL and SL for males, females and combined males and females is shown in Table 1.

**Table 1.** Relationship between the total length (TL) and standard length (SL) of *L. guntea* males, females and both males and females combined. The values of constant a, b and correlation coefficient r, are given.

Ratio of abscissa and ordinate	Sex	a value	b value	r value
TL/SL	Male	-1.47	0.844	0.998
	Female	-4.14	0.880	0.999
	Combined	-4.02	0.880	0.999

#### *Total weight (TW)*

The total weight of *L. guntea* ranged from 0.8 g to 8.0 g with a mean total weight of  $3.9 \pm 2.2$  (n = 600).

#### *Length-weight relationship*

Based on a total of 600 specimens of *L. guntea* examined in the present study, the total length and total weight ranged from 52 to 96 mm and 0.8 to 8.0 g, respectively. The mean TL was  $72 \pm 13$  in males,  $74 \pm 14$  in females and  $74 \pm 15$  mm in male and females combined while mean TW was  $3.3 \pm 1.8$  g in males,  $3.9 \pm 2.2$  g in females and  $3.9 \pm 2.2$  g in males females

combined. The length-weight relationship showed a curvilinear curve (Table 2) with a Log TW =  $-5.16 + 3.05 \text{ Log TL}$ .

**Table 2.** Length-weight relationship of *L. guntea* in males, females and both males and females combined. The values of constant, a, n and r are given below.

No. of observation.	Sex	a value	n value	r value
201	Male	0.00000213	3.32	0.985
324	Female	0.00000321	3.23	0.977
525	Combined	0.00000686	3.27	0.978

#### *Condition factor (K)*

In the males K values range from 0.83 to 0.97 with a mean value of  $0.82 \pm 0.23$ . In case of females the K values range from 0.83 to 0.87 with a mean of  $0.87 \pm 0.12$  and in male and females combined the K values range from 0.82 to 0.90 with a mean of  $0.86 \pm 0.32$ .

#### *Reproductive periodicity*

##### *Percentage of gravid females*

A total of 95 gravid females from July 1994 to June 1995, revealed that the ovigerous females of *L. guntea* do not occur throughout the year. No gravid females were found in the month of November to January. Maximum percentage of gravid females were found in the month of June and July (86 and 85 respectively; Table 3).

**Table 3.** Monthly percentage of gravid females of *L. guntea*.

Months and Year	No. of gravid females	No. of mature females	% of gravid females
1994			
July	22	26	85
August	7	32	22
September	3	29	10
October	2	26	8
November	NO*	25	NO*
December	NO*	30	NO*
1995			
January	NO*	25	NO*
February	2	28	7
March	4	31	13
April	13	22	59
May	22	29	76
June	18	21	86

\* NO, not observed.

#### *Gonado-Somatic Index (GSI)*

Out of 89 (females) observations on GSI of *L. guntea*, the maximum and minimum values were found to be 12.49 (June) and 7.77 (February), respectively. The mean GSI was ranged from 7.77 to 12.49. The highest values of GSI were observed in the months from April to July (Table 4).

**Table 4.** Monthly GSI, GLI and ova diameter of *L. guntea*.

Months	No. of Spec.	GSI			GLI			Ova diameter(mm)		
		Mini	Maxi	Mean	Mini	Maxi	Mean	Mini	Maxi	Mean
Jul.	10	8.70	24.13	12.45	32.22	44.94	37.34	0.31	0.66	0.42
Aug.	5	7.69	14.00	10.88	20.21	24.22	22.69	0.23	0.29	0.24
Sep.	3	7.90	13.00	09.50	21.00	25.00	20.00	0.23	0.30	0.25
Oct.	2	6.90	12.10	08.60	22.40	23.90	19.10	0.21	0.31	0.24
Nov.	3	6.75	11.80	09.73	21.80	24.30	18.29	0.21	0.29	0.23
Dec.	4	7.25	10.86	08.60	22.00	23.10	19.30	0.20	0.30	0.22
Jan.	3	5.36	10.50	09.41	19.90	21.40	20.10	0.19	0.29	0.21
Feb.	4	2.27	11.43	07.77	20.51	24.29	21.87	0.15	0.32	0.21
Mar.	5	7.31	14.00	10.14	18.99	22.22	21.51	0.22	0.29	0.25
Apr.	14	7.95	17.86	11.72	34.57	45.07	36.77	0.41	0.50	0.43
May	20	7.02	16.28	11.55	35.21	47.14	36.92	0.44	0.51	0.47
Jun.	16	8.89	15.73	12.49	31.46	44.44	36.58	0.43	0.50	0.45

#### *Gonadal Length Index (GLI)*

Based on 89 females examined for GLI from July 1994 to June 1995, the minimum and maximum values occurred in the months of March (21.51) and July (37.34), respectively with the peak from April to July (Table 4).

#### *Diameter of ova*

The maximum ova diameter was found in the month from April to July (Table 4).

#### *Colouration of gonad*

In *L. guntea* the immature ova are white in colour while the ripe ova are pale yellow to yellow in colour. With the start of maturation the colour of the ovary change from white through pale yellow and finally to yellow. In April to August most of the females have yellow ovary, indicating that the ovary is ripe. From the above investigation it may be concluded that from April to July is the breeding season of *L. guntea*.

## DISCUSSION

The relationship between the TL and the SL showed linear regression with the following values of correlation coefficient,  $r$ , 0.998, 0.999, 0.999 in males, females and both males and females combined respectively. Length-weight relationship showed curvilinear regression lines in males, females and also combined sexes and it was observed that *L. guntea* is not isometric in all cases. It is reported that (Doha, 1970), in isometric form the fish cannot change their specific gravity during all life. In all case of *L. guntea* the value of 'n' is higher than 3 (Table 2). It varies due to the fact that the weight is affected by the time or season, stomach contents, spawning condition *etc.* Condition factors and relative condition factor showed fluctuations in both sexes. The fluctuations may be due to the spawning and rebuilding of the reproductive systems of the fish. The values of the factors also vary to some extent with the seasonal changes in appetite and general condition (Doha, 1970). From the above investigation, the percentage of gravid females against time, GSI, GLI, ova diameter and colouration of gonad showed the highest value from April to July. The reproductive periodicity in fishes is influenced

by several environmental factors together with the endocrine activities. Light and temperature are important factors to controlling the maturation of gonads in fishes (Khanna, 1978; Nikolskii, 1963). There are 17 methods to determine the reproductive cycle (Hossain, 1989; Hossain *et al.*, 1989; Hossain *et al.*, 1992). Among this 17 method we used 5 methods to determine the reproductive periodicity of *L. guntea*. Seasonal changes in the ovaries of teleosts have been studied histologically as well as by measuring ova diameter and gonado-somatic index (Khanna, 1978). Parween *et al.* (1993) have studied the breeding periodicity of *Esomus danricus* by using above mentioned 5 methods which is enough to determine the reproductive periodicity of freshwater fish species. Many workers have studied the reproductive periodicity of fishes by using different methods among the 17 (Hossain *et al.*, 1989; Stephenson, 1934).

From the above study it may be concluded that April to July is the breeding season of *L. guntea*.

### ACKNOWLEDGEMENTS

The authors are grateful to Professor A. S. Bhuiyan, Dr. S. K. Paul and Dr. Selina Parween for their kind cooperation during this work. The authors are also thankful to the Chairman, Department of Zoology, Rajshahi University, Bangladesh, for providing the research facilities during this study. We are especially indebted to Mr. Toni Ruchimat and Mr. Danilo Largo for their fruitful criticism for preparing the manuscript.

### REFERENCES

- BHUIYAN, A. L. 1964. Fishes of Dacca. 1st edn. The Asiatic Society of Pakistan. Dacca. Publ. no. 13 148 pp.
- DOHA, S. 1970. Length-weight relationship and the condition in the male and female shrimp, *Palaemon malcolmsonii* (palaemonidae: Decapoda, Crustacea). *Pakistan J. Zool.* 2(2), 95-106.
- DOHA, S. 1974. Investigation into the biology of the gobi, *Glossogobius giurus* (Ham. Buch) (Perciformes: Gobiidae) *Bangladesh J. Zool.* 2(2), 95-106.
- HOSSAIN, M. A. 1989. On the methods of determining the reproductive cycle in fisheries species. Proceedings of the 76th Ind. Sci. Congr. Ass. Madurai. 1-4.
- HOSSAIN, M. A., A. TALEB and M. H. RAHMAN 1989. Reproduction and reproductive periodicity of *Notopterus notopterus* (pall) (Notopteridae: Clupeiformes). *Bangladesh J. Aquacul.* 11(2), 57-64.
- HOSSAIN, M. A., M. H. RAHMAN and S. PARWEEN 1991. Notes on the length-weight relationship of *Lepidocephalus guntea*. *Bangladesh J. Zool.* 19(1), 145-146.
- HOSSAIN, M. A., A. TALEB and M. H. RAHMAN 1992. Reproduction and fecundity of *Ompok pabda*. *Bangladesh J. Sci. Res.* 10(1), 49-52.
- ISLAM, S. and M. A. HOSSAIN 1984. On the fecundity of chela, *Oxygaster baccila* (Ham.) (Cypriniformes: Cyprinidae) from the river Padma. *Univ. J. Zool. Rajshahi Univ.* 3, 45-48.
- KARIM, M. A. and M. A. HOSSAIN 1972. Studies on the biology of *Mastacembelus pancalus* (Spiney eel. Ham.) in artificial ponds part-II. Sexual maturity and fecundity. *Bangladesh J. Biol. Agric. Sci.* 1 (2), 15-18.
- KHANNA, S. S. 1978. An introduction of fishes. Jhon wiley and sons Ltd. New York. 251 pp.
- LECREN, E. D. 1951. The length-weight relationship and seasonal cycle in gonad weight and condition in the *Perca fluviatilis*. *J. Anim. Ecol.* 20, 201-319.
- MANN, R. H. K. 1971. The populations, growth and production of fish in four small streams in southern England. *J. Anim. Ecol.* 40, 155-190.
- NIKOLSKII, G. V. 1963. The Ecology of Fishes. Academic Press, London. 352 pp.
- PARWEEN, S., N. BEGUM, M. H. RAHMAN and M. A. HOSSAIN 1993. On the breeding periodicity of *Esomus danricus* (Hamilton). *Univ. J. Zool. Rajshahi Univ.* 12, 31-34.

- RAHMAN, A. K. A. 1989. Fresh water fishes of Bangladesh. Published by Zoological Society of Bangladesh. 364 pp.
- SHAFI, M. and G. MUSTAFA 1976. Observation of some aspects of the biology of climbing perch, *Anabas testudineus* (Bloch). *Bangladesh J. Zool.* 4(1), 21-28.
- STEPHENSON, A. 1934. The breeding of reef animals part 2, invertibrates other than corals. Great Barries Reef Expd. 1928-1929. *Sci. Reports.* 3, 25 pp.

(Accepted 30. August. 1997)