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ORIGINAL ARTICLE

On the Fecundity and Sex-ratio of *Labeo bata* (Hamilton) (Cypriniformes: Cyprinidae)

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Abstract

The fecundity and sex- ratio of 2200 *Labeo bata* (Hamilton) specimens were studied. The fecundity of 234 gravid females varied from 51,354(for a fish with total length of 127.3 mm and total body weight of 20.0 g) to 91,568(for a fish with total length of 256.6 mm and total body weight of 156.70g).The mean fecundity was recorded as 67,617.50±13,510.15 for the average length and weight of 192.98±41.06 mm and 87.79±49.07 g, respectively .The mean total length and weight of gonad was 67.62± 24.01 mm and 20.35±13.50 g, respectively .The relationship between fecundity (F.) and other parameters such as total length (TL), Standard length (SL), total weight(TW), gonadal length (GL), gonadal weight (GW) and gonadal depth (GD) were studied. [*Journal of Science Foundation, 2013;11(2):43-48*]

Key words: *L bata*, fecundity, sex-ratio

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Introduction

Labeo bata locally called Bhangan , Bhanga , Bata belongs to the family Cyprinidae of order Cypriniformes is a freshwater species in Bangladesh. This fish is also found in many countries, like India, Nepal, Burma and Punjab. It also contributes to valuable fishery economics in Japan and Australia (Nash and Shehadesh, 1980). Principal areas where it is available are the rivers, canals, haors, baors, beels, pond and ditchs in Bangladesh. It is ovious that the considerable percentage of all fishs 43% are small fish (SIS) and 13% are bigger food fish. SIS constitutes about 3-4% of total fish production of Bangladesh. *L. bata* is found to be suitable for cultivation with major carp and this species is preferred by the people as food fish. Knowledge about fecundity is essential for evaluating the commercial potentialities of its stock, life history, culture and management of the fishery (Laglar, 1956; Laglar et al., 1967; Doha and Hye 1970; Das, 1977; Ahmed et al., 1979). The study of fecundity is undertaken to determine the index of density dependent factor affecting the population size of a fishery (Simpson, 1951, Das, 1977). Several workers have made significant contribution to the fecundity of fishes in different countries of the world .Notable among them are Lahman, 1953, Yuen, 1955, Mac.Gregor, 1957, Rao, 1963, Gupta 1968, Islam and Tolbot 1968, Evans, 1969, Bhatnagar 1964. But only a few workers Doha and Hye, 1970; Dewan and Doha 1979; Shafi and Quddus, 1974; Kader and Talukder 1978; Afroze and Hossain, 1990; Islam and Hossain, 1990; Hossain *et al.*, 1992; Bhuiyan and Afroz, 1996 have studied the fecundity of some species of fishes in our country. But published information is not available on the fecundity of *L. bata* in Bangladesh.

Methodology

A total of 2200 specimens of *L bata* were collected at random from different place in Rajshahi during the period from February 2007 to January 2009.Of the collected samples 1263, were females (660

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non-gravid and 603 gravid) and 937 were males. 234 gravid females were studied for estimation of fecundity. The collected fish samples were brought to the fisheries research laboratory for further studies and analysis. In the laboratory total length of fishes were measured to the nearest mm by means of a measuring board and their weights were recorded to the nearest g by a electronic balance (A&D co. ltd. Korea). After opening the abdomen, gonads were taken out intake and moisture was thoroughly wiped out from ovaries by blotting paper and preserved in 70% alcohol solution. Gravimetric method was used for the estimation of the fecundity. The method was followed by many workers (Bhuiyan, 1987, Doha and Hye, 1970, Shafi and Quddus, 1974, Das, 1977, Afroz and Hossain, 1983, Nargis and Hossain, 1988, Bhuiyan and Islam, 1990, Islam and Hossain, 1990, Joadder *et al.*, 2007.

Table 1: The mean total length, standard length, total body weight, gonadal length, gonadal weight and estimation fecundity of *L bata* as obtained to the present study (Mean)

Size group (10 mm class intervals)	Total length(TL) in mm	Standard length(SL) in mm	Total weight (TW) in g	Gonadal length(GL) in mm	Gonadal weigth(GW) in g	Fecundity
120-130 (N=16)	127.3	105.8	20.0	21.1	1.06	51354
131-140 (N=17)	134.6	119.5	24.6	30.5	2.10	53863
141-150 (N=19)	147.7	128.3	28.5	38.7	3.80	55870
151-160 (N=18)	156.3	137.9	46.8	49.0	7.00	55920
161-170 (N=17)	167.0	156.5	65.5	57.9	11.50	57760
171-180 (N=20)	177.2	171.7	70.0	69.1	17.00	59546
181-190 (N=14)	187.5	183.8	78.9	76.5	19.40	59642
191-200 (N=22)	198.4	192.5	81.2	78.7	23.60	69090
201-210 (N=23)	207.7	201.2	92.7	81.0	25.00	71245
211-220 (N=15)	215.5	211.5	126.5	85.8	31.80	76342
221-230 (N=15)	223.8	218.1	135.8	86.0	33.40	77016
231-240 (N=17)	238.0	229.9	147.4	88.9	34.00	77675
241-250 (N=12)	249.1	234.5	154.5	90.5	36.80	90754
251-260 (N=9)	256.6	241.8	156.7	93.0	38.5	91568
Total	2701.7	2538	1229.1	946.7	284.96	947645
Mean ± SD	192.98 ±41.06	181.29±45. 54	87.79±49.07	67.62±24.01	20.35±13.50	67617.5±13 510.15

Results and Discussion

The fecundity is one of the important aspects of fish biology and population dynamics.

Table 2: Values of regression co-efficient (b), intercept (a) and co-efficient of correlation(r) in F/TL, F/SL, F/TW, F/GL, F/GW

Relation					
Ordinate	Abscissa	Value of 'a'	Value of 'b'	Value of 'r'	Significance of 'r' at 5% and 1% level
Fecundity (F)	Total length (TL)	-8546	308.19	0.965	Highly significant
Fecundity (F)	Standard Length (SL)	-17441	277.19	0.934	"
Fecundity (F)	Total weight (TW)	-44766	261.10	0.954	"
Fecundity (F)	Gonadal length (GL)	-35326	478.59	0.955	"
Fecundity (F)	Gonadal weight (GW)	-48484	943.52	0.948	"

*Highly significant (P<0.001)

A thorough knowledge on fecundity of a fish is essential for evaluating the commercial potentialities of its stock, life history, practical culture and actual management of the fishery (Lagler, 1956; Doha and Hye, 1970).

Table 3: Male and Female percentage and Sex-ratio of *L bata*

Months	Years	Total no. of specimens	No. of males	No. of females	Percentage of males	Percentage of females	Sex-ratio male : female	χ^2 values
Feb.	2007	100	48	52	48	52	1: 1.08	o.16
	2008	110	51	59	36.36	53.64	1 : 1.16	0.58
Mar.	2007	80	38	42	47.50	52.50	1 : 1.12	0.20
	2008	86	31	55	36.05	63.95	1 : 1.77	6.39**
Apr.	2007	112	40	72	35.71	64.29	1 : 1.80	7.14**
	2008	90	32	58	35.56	64.44	1 : 1.81	7.31**
May	2007	90	33	57	36.67	63.33	1 : 1.73	5.40*
	2008	116	44	72	37.93	62.07	1 : 1.64	5.25*
Jun.	2007	116	43	73	37.07	62.93	1 : 1.70	6.16**
	2008	118	46	72	38.98	61.02	1 : 1.57	4.62*
Jul.	2007	80	28	52	35.00	65.00	1 : 1.86	6.20**
	2008	120	54	66	45.00	55.00	1 : 1.22	1.20
Aug.	2007	70	30	40	42.86	57.14	1 : 1.33	1.42
	2008	80	36	44	45.00	55.00	1 : 1.22	0.80
Sep.	2007	80	32	48	40.00	60.00	1 : 1.50	1.20
	2008	90	38	52	42.22	57.78	1 : 1.37	2.17
Oct.	2007	90	40	50	44.44	55.56	1 : 1.25	1.11
	2008	62	30	32	48.39	51.61	1 : 1.07	0.06
Nov.	2007	110	60	50	54.55	45.45	1 : 0.83	0.90
	2008	70	42	28	60.00	40.00	1 : 0.67	1.80
Dec.	2007	60	26	34	43.33	56.67	1 : 1.31	1.06
	2008	80	35	45	43.75	56.25	1 : 1.29	1.25
Jan.	2008	100	42	58	42.00	58.00	1 : 1.38	2.56
	2009	90	38	52	42.22	57.78	1 : 1.37	2.17
Total		2200	937	1263	42.59	57.41	1 : 1.15	67.21***

*= P≤0.05; ** = P≤0.01 and *** = P≤0.001

Fecundity also determines the index of density dependent factor affecting the population size (Das, 1977). In fishery science, the fecundity is defined as the total number of ripe eggs produced by the female individual up to the next spawning. The number of eggs contained in the ovary of a fish is

termed the fecundity of an individual female varies according to many factors including her eggs, size, species, food availability, water temperature and season (Laglar, *et al.*, 1962). It was observed in the present study that the fecundity varied from 51,354(for a fish with total length of 127.3 mm and total body weight of 20.0 g) to 91,568(for a fish with total length of 256.6 mm and total body weight of 156.70 g) respectively. The mean fecundity was obtained to be 67,617.50±13,510.15 for the average length and weight of 192.98±41.06 mm and 87.79±49.07 g, respectively .The mean total length of gonad was 67.62± 24.01 mm against the mean total weight of gonad of 20.35±13.50 g (Table-1). During the experiment the number of eggs it was found to vary with the size ovaries .The number of eggs increased linearly with the increase of body length, body weight, gonadal length and gonadal weight (Table-1).

Table 4: Chi-square heterogeneity test of the observed sex ratios in *L. bata*

Source	Degree of freedom	Chi-square value	Tabulated value		
			5%	1%	0.1%
Total chi-square	24-1=23	67.21***	35.17	41.64	49.72
Overall chi-square	2-1=1	18.56***	3.84	6.64	10.82
Chi-square heterogeneity	23-1=22	48.65**	33.92	40.29	48.26

* = P≤0.05; ** = P≤0.01 and *** = P≤0.001

The mathematical relationship between the fecundity with other parameters such as total length, total weight, gonadal length and gonadal weight were calculated. The values of intercepts(a), regression co-efficient(b), co-efficient of correlation(r) were measured by least square method(Table-2). It was found that all these relationships were positively correlated. Simpson(1951) found that fecundity was related nearly to the cube of the length and was thus directly proportional to the fish weight. It was observed that out of 2200 specimens, 937 specimens were males and 1263 specimens were females. Male to female ratio was 1:1.15. However the males were found to be dominant during the month of November and the females in the month of June. It was evident from Table 3 that the females were predominant throughout the year. The Chi-square test shows that the male and female distribution in the natural population is significantly different at 5% level of probability(Table 4).

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