Sindh Univ. Res. Jour. (Sci. Ser.) Vol: 40 (1) 49-54 (2008)

Sindh Univ. Res. Jour.

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Some Aspects of Breeding Biology of Dahi, *Labeo Calbasu* (Hamilton) From Keenjhar Lake (District Thatta), Sindh, Pakistan

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(Received 24th Feb. 2008 and Revised 16th Mar. 2008)

Abstract:

Some aspects of breeding biology of Dahi, *Labeo calbasu* (Hamilton) from Keenjhar Lake (District Thatta), Sindh were studied in terms of sex dimorphism, gonadosomatic index (GSI), ova diameter and fecundity during (March 2006 to February 2007). The values of both ova diameter and GSI showed one peak during June 1.30 and 18.60 and 1.66 in female and male respectively. It indicated that the fish *L. calbasu* breeds once in a year in the month of June. The estimation of fecundity was based upon 15 mature fishes ranged from 33.0 to 48.2 cm and 485g to 1475g in total length and weight respectively. The number of ova per gram of body weight was 262.5 eggs and the number of ova per gram ovary weight was 1564.4 eggs. The fecundity data were plotted against their respective length, weight and gonad weight. The fecundity-gonad weight relationships showed better relationship as compared to fecundity-total length and fecundity-body weight relationship.

Keywords: GSI, Ova diameter, Fecundity, *Labeo calbasu*, Keenjhar Lake.

1. Introduction:

An understanding of the reproductive cycle in nature is an essential prerequisite for the artificial breeding and development of improved techniques for the culture of the particular species (Barua *et al.*, 1986). *Labeo calbasu* (Dahi) is a delicious and widely accepted fish in India, Pakistan, Bangladesh and Myanmar but unfortunately very little progress has been made to culture it economically in the said countries, although it can thrive in any type of freshwater habitat and can survive well in extremely oxygen depleted conditions (Azadi and Kuddus 1995).

No published information is reported on the subject from Pakistan except one report on length-weight relationship and relative condition factor of *L. calbasu* from Keenjhar Lake (Mastoi *et al.*, 2005) is available. Very few reports on information related to its biology are published such as Rao and Rao (1972) reported biology of *L. calbasu* from River Godawari India, Pathak and Jhingran (1977) published information on maturity and fecundity of *L. calbasu* from Madhya Pradesh India, Vinci and Shugunan (1981) studied biology of *L. calbasu* from Nagarjunasagar reservoir, India. Ever increasing demand for fish has made quite a few entrepreneurs think deeply to utilize the tremendous potential of this species for culture in freshwaters but the serious shortage of basic information on the biology of this species jeopardizes all their attempts. In view of the above, the present investigations are aimed to study gonadal development based on gonadosomatic index, ova diameter and fecundity of *L. calbasu* from Keenjhar Lake district Thatta, Sindh.

2. Materials and methods:

10 fish samples belonging to each sexes were collected from the catch of the fishermen of Keenjhar Lake, district Thatta, Sindh, once in a month during the study period from (March 2006 to February 2007). The collected fishes

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were preserved in 10% formalin and transferred to the laboratory in a polythene bag. Experimental fish were immediately sexed, measured and weighed on an electronic balance. At the same time the gonads were dissected out, weighed and transferred to vials containing 5% formalin for subsequent studies. From each ovary, diameter of about 100 ova was measured by using graticule under the dissecting microscope. The gonadosomatic index (GSI) was calculated by the formula:

$$GSI = \frac{\text{Gonad Weight}}{\text{Body weight}} \times 100$$

For fecundity estimation gravimetric method was applied as described by Shafi *et al.*, (1978), Dewan and Doha (1979) and Blay (1981). In the present study 15 mature fishes ranged from 33.0 to 48.2 cm and 485g to 1475g in total length and weight respectively, were sampled from (March to June 2006). Samples taken from the anterior, middle and posterior region of both ovaries were weighed separately and the number of ova present within each sample was counted, fecundity was estimated on the basis of total weight of ovaries. The fecundity of the fish was obtained by using formula:

F= N X Gonad weight/sample weight, where F= fecundity and N= the number of egg in the sample. The relationship between various parameters *viz.* fecundity-total length, fecundity body weight and fecundity gonad weight were determined using linear regression (least square estimation).

Results:

Sex dimorphism

The fish *L. calbasu* is dioecious but there are no secondary sex characters. The sex of *L. calbasu* could not be recognized easily out side the spawning season except by dissection. During the breeding season the male became active and dark in color while female became more pot-belled and bright in color. A slight press on the belly of ripe fish brought the whitish milt from males and eggs from females.

4. *Ova diameter*

The data on ova diameter of *L. calbasu* from Keenjhar Lake is presented in **Table 1**. During the period of twelve months (March 2006 to February 2007) diameter of ova as found in the ovaries of *L. calbasu* was recorded. The diameter of ova ranged from 0.10 mm to 1.30 mm during (March 2006 to February 2007). All the ova (100) were measured and found to be spherical and uniform in diameter, this indicated that the eggs were released in a single batch during the peak period of spawning (April to June). **Table 1** indicated that there were no ova present during the months of July to October. Thus the eggs shed in a season developed simultaneously. No evidence was found to show that the resting oocytes in mature females would reach maturity during the current spawning season.

Table 1. Month wise changes in ova diameter and gonadosomatic index of a carp *Labeo calbasu* (Hamilton) from Keenjhar Lake Distt: Thatta.

S. No.	Months	No.of Males	%GSI Male	No.of Female	%GSI Female	Ova diameter (mm)
1	March	07	0.60	04	2.37	0.44
2	April	05	0.70	05	4.80	0.60
3	May	06	1.37	05	11.13	1.0
4	June	04	1.66	05	18.60	1.30
5	July	05	0.13	05	0.30	0.00
6	August	04	0.20	05	0.80	0.00
7	September	05	0.25	05	0.90	0.00
8	October	05	0.30	05	0.99	0.00
9	November	04	0.38	04	1.05	0.10
10	December	05	0.42	05	1.25	0.15
11	January	05	0.50	06	1.45	0.25
12	February	06	0.55	06	1.80	0.30

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Table 2. Data on total length, body weight, gonad weight and fecundity of *Labeo calbasu* (Hamilton) from Keenjhar Lake Distt: Thatta.

S.No.	Length of fish (mm)	Weight of fish (g)	Gonad weight (g)	Fecundity in Thousands
1	362	540	51.8	84958
2	410	970	171.80	321265
3	330	485	24.26	25441
4	395	880	209.70	345017
5	337	530	114.21	186372
6	458	1350	285.84	471613
7	452	1500	224.86	365566
8	480	1400	157.40	280203
9	420	1100	89.15	157478
10	472	1475	380.40	471754
11	410	940	27.30	33319
12	440	1280	178.50	280198
13	482	1580	393.0	573332
14	415	1190	225.0	277631
15	415	1000	188.70	384046

5. *Gonadosomatic Index (GSI)*

Gonadosomatic Index (GSI) ranged from 0.13 to 1.66 in male and 0.30 to 18.60 in female and also showed one peak in June (Fig.1). During the present study the higher values of GSI were observed from April to June, it ranges from 0.70 to1.66 and from 2.37 to 18. 60 in male and female respectively. After extrusion of ripe gonads, the gonads were suddenly reduced in size and weight. **Fig. 1** shows that there were no gonads from July to October as indicated by the decline of GSI after spawning to minimum indices during July 0.13 and 0.30 respectively. Therefore, it was observed that the fish spawned once in a year with one spawning peak highest in the month of June as indicated by the values of both ova diameter (1.30 mm in June) and gonadosomatic index (1.66 and 18.60) respectively.

Fig. 1. Changes of Gonadosomatic Index (GSI) in males and females of *Labeo calbasu* (Hamilton) from Keenjhar Lake district Thatta, Sindh, Pakistan.



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Fecundity:

The estimate of fecundity in the present study was based on 15 specimens of mature females of *L. calbasu* sampled during March to June 2006. These individuals ranged in size from 33.0 to 48.2cm and 485 g to 1475g in total length and weight respectively. The estimation of ova, in the present study ranged from 25441 to 573332 eggs. The maximum fecundity was from a fish with a total length of 48.2cm and 1580g in weight and the minimum from a fish with a total length of 33.0cm and 485g in weight **(Table 2)**. The number of ova present in per gram of body weight was 262.5 eggs and the number of ova per gram of ovary weight was 1564.4 eggs. It was also noticed during the present investigations that the fecundity increases with the increase in gonad weight of the fish. The equations of regression co-efficient between total length (TL), body weight (BW) and gonad weight (GW) versus fecundity (F) are given below. All these relationships have been shown graphically in **Figs. 2, 3 and 4.** The values of correlation coefficient (r =) has been calculated and presented below.

Fig. 2. Linear relationship between the log-transformed XX and the log- transformed YY of *Labeo calbasu* (Hamilton) from Keenjhar Lake District Thatta, Sindh, Pakistan.

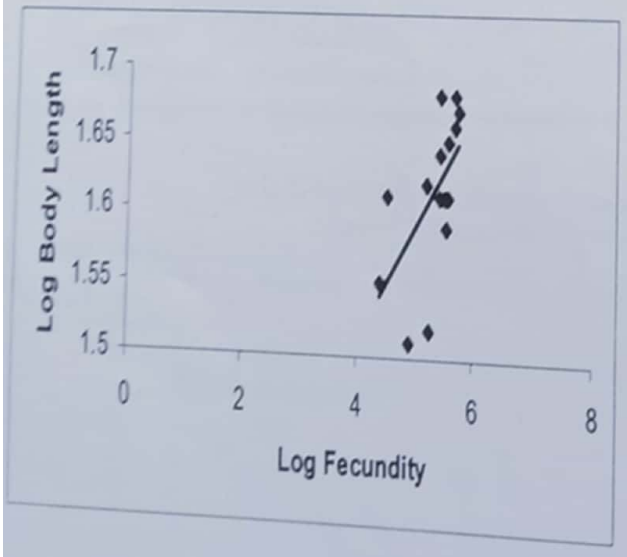


Fig. 3. Linear relationship between the log-transformed XX and the log- transformed YY of *Labeo calbasu* (Hamilton) from Keenjhar Lake District Thatta, Sindh, Pakistan.

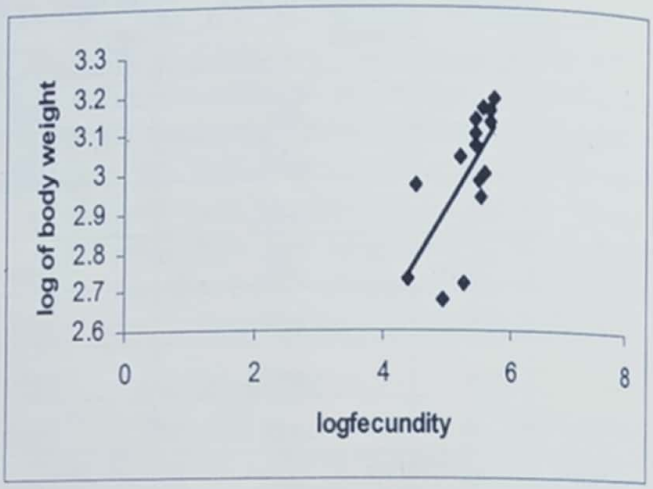
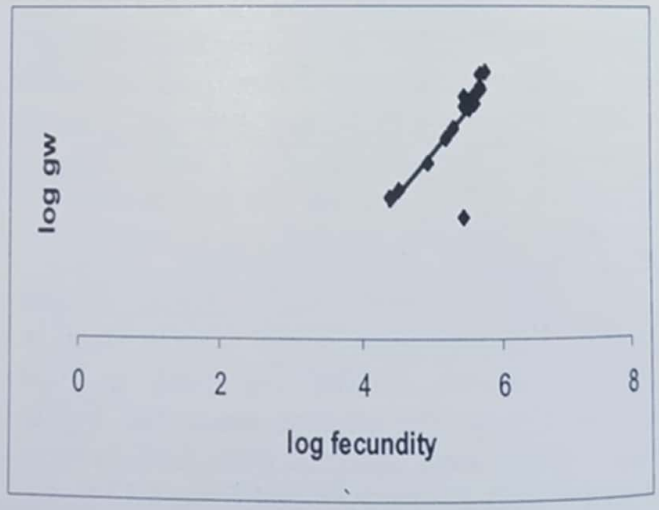


Fig. 4. Linear relationship between the log-transformed XX and the log- transformed YY of *Labeo calbasu* (Hamilton) from Keenjhar Lake District Thatta, Sindh, Pakistan.



LogF = -17.90 + 14.38X logL Fecundity-total length relationship (r= 0.90)

LogF= -5.80 + 3.70 Xlog BW Fecundity-Body weight relationship (r = 0.88)

LogF= 3.87+ 4.43Xlog GW Fecundity-Gonad weight relationship (r = 0.95)

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As may be noted from Figs. **2,3 and 4** and values of correlation coefficient of the above parameters, fecundity-gonad weight was more dependable than the fecundity-total length and fecundity-body relationship. The "t" test was applied and found highly significant ($P < 0.01$) level, this indicated that the fecundity bears a strong relationship with gonad weight in this fish.

6 Discussion:

Some aspects of the reproductive biology of Dahi, *Labeo calbasu* (Hamilton) from Keenjhar Lake, district Thatta, Sindh were described for twelve months from (March 2006 to February 2007). It was observed that there were no secondary sex characters in *L. calbasu* and females became more pot-bellied during the spawning season. Bera (1984) observed milt and egg on applying slight pressure on the belly of *Prototractes maraena* male and female respectively. Narejo *et al.*, (1998) and Narejo *et al.*, (2002) reported similar observations, no secondary sex characters in *Tenualosa ilisha* and in *Mastacembelus armatus* respectively. The maximum size of mature eggs found during the present investigations was 1.30mm. The eggs were spherical and uniform in diameter. Various authors in different fish species like Vinci and Shugunan (1981) in *Labeo calbasu*, Nabi and Hossain (1996) in *Macrognathus. aculeatus*. Narejo *et al.*, (1998) in *Tenualosa ilisha*,, Narejo *et al.*, (2002) in *Mastacembelus armatus*, Narejo *et al* (2003) in *M. cuchia* and Lashari *et al.*, (2007) in *C. reba* also reported similar findings. The GSI during the present investigations shows one peak in summer and the mean GSI 1.66 and 18.60 in male and female respectively, during the months from April to June. It was inferred that all the mature ova were release during the breeding season. Rao and Rao (1972) Vinci and Shugunan (1981) reported single spawning season from April to June and all the mature ova were released during breeding season in *L. calbasu* from River Godawari and Nagarjunasagar reservoir India respectively. The results of the present study agreed with the above findings. During the present observations it was noted that fecundity increases with the increase in gonad weight of the fish. The results of the present study are very similar to those obtained by Rao and Rao (1972), Vinci and Sugunan (1981) in *L. calbasu*, Faruq *et al.*, (1996) in *Clarias batrachus*, Kabir *et al.*, (1998) in *Gudusia chapra*. In the present investigations the fecundity data was plotted against total length, body weight and gonad weight. It was observed that the fecundity-gonad weight gives a strong relationship as compared to fecundity-total length and fecundity-body weight relationship. Many authors like Danwattana and Nakorn (1985) in *C. stariata*, Azadi and Siddique (1986) in *H. fossilis*, Azadi *et al.*, (1987) in *M. vittatus*, Das *et al.*, (1989) in *H. fossilis*, Faruq *et al.*, (1996) in *C. batrachus*, Kabir *et al.*, (1998) in *G. chapra* reported similar observations. In the present study the same linear relationship was observed between the variables.

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