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Studies on Fecundity of a Hill Stream Loach *Noemacheilus montanus* (McClelland) in Relation to Total Length, Total Weight, Ovary Length and Ovary Weight

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Abstract

A total of forty mature specimens of *Noemacheilus montanus* collected from river Alaknanda and its tributaries ranging from 7.0 cm to 9.2 cm in length and from 2.31 g to 5.49 g in weight were used for the present study. The fecundity was calculated to be 500 to 1005. The relationships between fecundity and total length, total weight, ovary length and ovary weight were found to be linear. The coefficient of correlation 'r' for the above relationships was found to be 0.948, 0.906, 0.909 and 0.969 respectively.

***Key words*:** *Noemacheilus montanus*, Hill Stream Loach, Fecundity, Alaknanda river, Ovary length

Introduction

Noemacheilus is one of the important bottom dwelling fishes in the hill regions and more than nine species have been reported in Garhwal region (Badola and Singh, 1977; Singh *et al*., 1987; Uniyal *et al*., 2002). Among these *Noemacheilus montanus* is the most common accounting for 30% of the catchment of this fish in Garhwal Himalayas. The present study is made to determine the fecundity and its relation with various body parameters. Fecundity is defined as the total number of eggs present in ovary before spawning and is the indicator of auto recruitment of that species. Studies on fecundity and its relationships with various body parameters viz. total length, total weight, ovary length and ovary weight are useful in increasing the yield of fish species, stock management and assessment in any water body.

Considerable work has been done on the fecundity of the fishes in India as well as abroad by Clark (1934), Bagenal (1967), Sinha (1975), Chonder (1977), Joshi and Khanna (1980), Varghese (1980), Nautiyal (1985) and Somdutt and Kumar (2004). However, the knowledge on fecundity of this species is scanty. Hence the present study will be useful in understanding the relationship of fecundity with above mentioned body parameters and thus serve as a tool for better management of this resource.

Methodology

A total of forty mature female specimens of

Noemacheilus montanus were collected in the months of August and September, 2007 from the river Alaknanda and its tributaries of the Garhwal Himalayas. The total length and weight of each fish and ovary in fresh condition were noted down. The dissected ovary was preserved in 5% formalin solution for 24 hours. The fecundity of the fish was calculated using the gravimetric method (Simpson, 1959) as well as the volumetric method (Kandler and Pirwitz, 1957) and its relation with various body parameters viz. body length and body weight, ovary length and ovary weight was determined applying the method of least square i.e., y = a + bx, and in logarithmic form as log y = loga + blogx.

Results

During the present study, the total length of the specimens ranged from 7.0 cm to 9.2 cm and total weight ranged from 2.31 g to 5.49 g. The results are given below for each relationship separately.

***Relationship between fecundity* (*F*) *and total length* (*TL*)**

The relationship between fecundity and total length of fish is shown in the table 1. According to it the number of ova varied from 511 for a fish of length 7.0 cm to 1005 in the fish measuring 9.2 cm. The relationship between fecundity and the total length can be expressed as:

F = -1496.63 + 286.80 TL (r = 0.948)

Where, F = fecundity

TL = Total length in cm

The number of eggs contained was more or less directly proportional to the total length of the fish body. The regression equation is found to be linear (Figure 1). The correlation coefficient (r) is 0.948 which corresponds to a very strong positive correlation. It is highly significant.

***Relationship between fecundity* (*F*) *and total body weight* (*TW*)**

The relationship between fecundity and total body weight of fish is shown in table 1. The number of ova varied from 511 for a fish of weight 2.31 g to 1005 in the fish weighing 5.49 g. The relationship between fecundity and the total body weight can be expressed as: F = 74.98 + 204.97 TW (r = 0.906)

Where, F = fecundity

TW = Total weight of fish in grams

Fecundity increased as the body weight increased. The relationship between fecundity and the total body weight is found to be linear and highly significant with the correlation coefficient (r) equals to 0.906 (Figure 2).

***Relationship between fecundity* (*F*) *and total ovary length* (*OL*)**

The relationship between fecundity and ovary length of fish is shown in the table 1. The ovary length ranged from 3.2 cm to 4.2 cm in fish ranging from 7.0 to 9.2 cm in length. The number of ova varied from 511 in an ovary of length 3.2 cm to 1005 in the ovary of length 4.2 cm. The relationship between fecundity and the ovary length can be expressed as:

F = -1439.58 + 608.00 OL (r = 0.909)

Where, F = fecundity

OL = Length of ovary in cm

Table 1. Total body length, total body weight, ovary length, ovary weight, and fecundity of *Noemacheilus montanus*.

SN	Fish length (cm)	Fish weight (g)	Ovary length (cm)	Ovary weight (g)	Fecundity
1.	7.0	2.31	3.2	0.54	511
2.	7.1	2.45	3.2	0.61	519
3.	7.2	2.52	3.2	0.63	522
4.	7.4	2.81	3.4	0.82	582
5.	7.4	2.78	3.4	0.88	616
6.	7.5	2.92	3.4	0.98	665
7.	7.5	2.93	3.3	0.92	659
8.	7.5	3.11	3.5	0.98	710
9.	7.6	3.14	3.6	1.12	683
10.	7.6	3.08	3.6	1.02	674
11.	7.6	3.15	3.6	1.18	689
12.	7.7	3.13	3.6	1.09	670
13.	7.7	3.20	3.7	1.21	695
14.	7.7	3.18	3.6	1.07	679
15.	7.7	2.99	3.6	0.99	663
16.	7.8	3.15	3.6	1.06	682
17.	7.8	3.18	3.5	0.99	661
18.	7.8	3.18	3.7	1.23	733
19.	7.9	3.18	3.7	1.25	752
20.	7.9	3.22	3.7	1.29	770
21.	7.9	3.36	3.7	1.27	786
22.	8.0	3.41	3.7	1.36	920
23.	8.1	3.98	3.8	1.44	917
24.	8.1	3.81	3.8	1.40	895
25.	8.2	3.71	3.7	1.46	913
26.	8.2	3.48	3.8	1.46	946
27.	8.2	3.55	3.7	1.36	842
28.	8.3	3.62	3.7	1.38	879
29.	8.3	3.59	3.7	1.41	916
31.	8.3	3.71	3.8	1.39	899
32.	8.4	3.89	3.8	1.47	939
33.	8.4	4.08	3.9	1.54	923
34.	8.5	4.28	3.8	1.46	936

35.	8.5	4.17	3.9	1.49	953
36.	8.5	4.21	3.9	1.51	964
37.	8.6	4.45	3.9	1.61	988
38.	8.8	4.69	4.0	1.64	997
39.	8.8	4.62	4.0	1.59	987
40.	9.2	5.49	4.2	1.67	1005

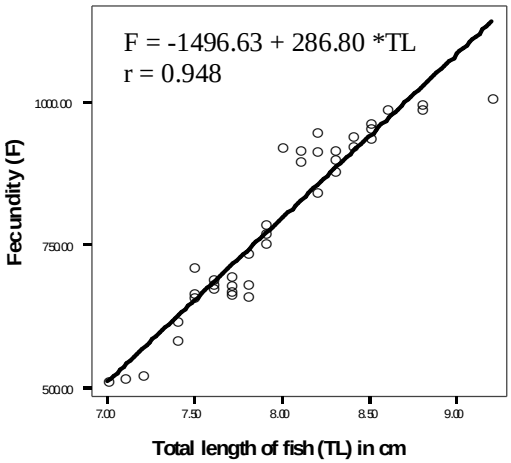

Figure 1. Relationship between total length and fecundity

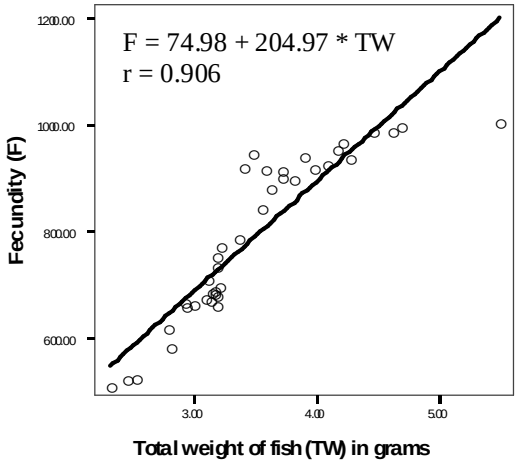

Figure 2. Relationship between total fish weight and fecundity

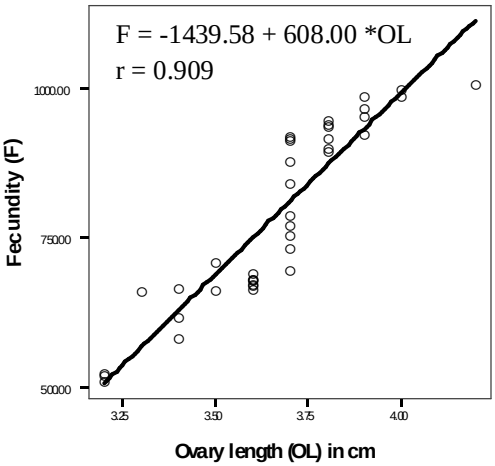

Figure 3. Relationship between ovary length and fecundity

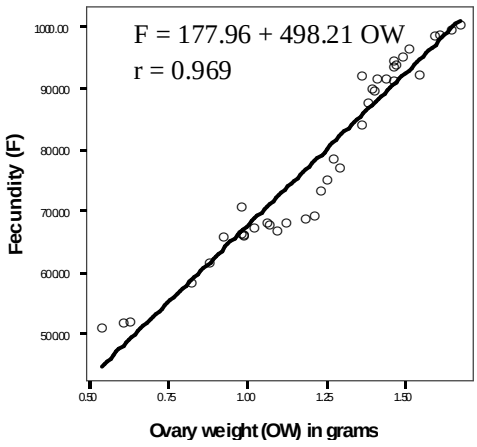

Figure 4. Relationship between ovary weight and fecundity

Fecundity increased with the ovary length. A significant linear relationship was observed between fecundity and the ovary length (Figure 3). The correlation coefficient (r) was calculated to be 0.909.

Relationship between fecundity (F) and total ovary weight (OW)

The relationship between fecundity and ovary weight of fish is shown in Table 1. The weight of ovary ranged from 0.54 to 1.67 g in fish weighing 2.31 to 5.49 g. Fecundity varied from 511 in an ovary of weight 0.54 g to 1005 in the ovary weighing 1.67 g. The relationship between fecundity and the ovary weight can be expressed as:

$F = 177.96 + 498.21\ OW\ (r = 0.969)$

Where, F = fecundity

OW = Weight of ovary in grams

Analysis of regression showed that there is a significant relationship between the numbers of eggs in the ovary i.e., fecundity and the weight of ovary (Figure 4). The number of eggs per female increased with increasing ovary weight. The correlation coefficient was found to be 0.969.

Discussion

Different relations have been found to exist between fecundity and the above body parameters by various workers. Chonder (1977), Singh *et al*. (1982), Singh and Srivastava (1982), Somdutt and Kumar (2004) and Joshi (2008) have observed linear relationship between fecundity and total length whereas Sinha (1975) found the relationship to be curvilinear in *P. sarana* from Loni reservoir.

A linear relationship between the fecundity and the fish weight has been reported by Gupta (1968), Sinha (1975), Hodgekiss and Man (1978), Singh *et al.* (1982), Somdutt and Kumar (2004). A curvilinear relationship has been reported by Yuen (1955) and Varghese (1980).

A linear relation between the fecundity and ovary weight has been reported by Bhatnagar (1964) of *Labeo dero* in Bhakra reservoir and Sinha (1972) of *Puntius sarana* in Bhadra reservoir.

The values of correlation coefficient 'r' in the present study indicate that among the above four parameters studied, closest correlation of fecundity was observed with the ovary weight i.e., OW (r = 0.969) followed by total body length i.e., TL (r = 0.948), ovary length i.e., OL (r = 0.909) and body weight i.e., TW (r = 0.906). Hence, it is concluded that the ovary weight is a better index of fecundity than the total length, total weight and ovary length.

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