

Observation on the reproductive capacity of wild major carp *Labeo dyocheilus* from Kumaun Himalaya, India

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Abstract

The study deals with the observation of reproductive capacity of major carp *Labeo dyocheilus* in spring fed Western Ram Ganga River from Kumaun Himalaya. The total reproductive capacity of the fish varied from a minimum 3,218 to a maximum 31,524 in the fish measuring to 8.5 Cm to 39.2Cm respectively. The reproductive capacity was highly dependent on the ovary weight and ovary length than any other body parameters.

Keywords: *Labeo dyocheilus* | Wild Fish |
Western Ram Ganga River | Kumaun Himalaya |

Introduction

Labeo dyocheilus is commonly known as Oonara in Kumaun region. It is a medium size major carp fish. It is a highly valued food fish in western Ram Ganga River, Uttarakhand. Of the five species recorded in Uttarakhand region, *L. dyocheilus* and can grow to about 39.2cm in the length and 860.55gm in weight. The information of the reproductive capacity is very important to estimate the potential of fish species for commercial farming. The reproductive capacity can be defined as the number of eggs laid by one female fish per hatching. Knowledge on the fecundity of a fish species is important for determining: (a) spawning potential and its success (Qasim 1973), (b) fluctuations in the egg production potential of individual stock related to life processes such as age and growth (Ludwig and Lange 1975), (c) effects of environmental factors (De Vlaming 1971) and (d) formulating the commercial management of fishery (Lagler 1956). Reddy (1979) also mentioned that the determination of breeding season is an essential part of biological investigations of fishes.

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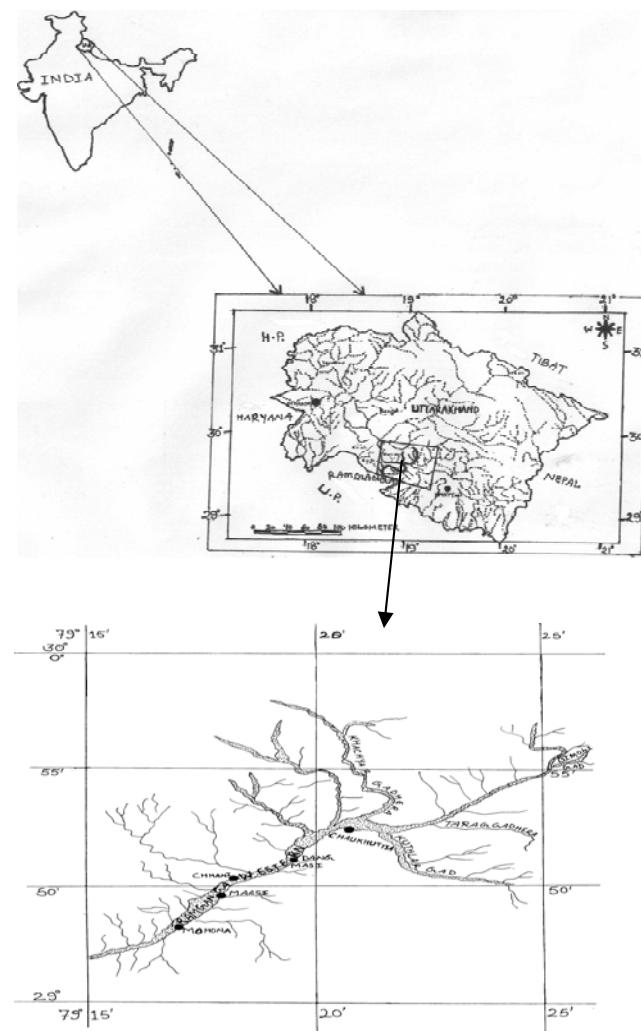
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(Agarwal et.al., 1988; Dobriyal et al., 2003; Bahuguna et al, 2007, 09, 10; Joshi et.al., 2010; Bahuguna and Kumar, 2011 etc.). Efficient growth and remarkable capacity for reproduction are the two main aspects of *Labeo dyocheilus* for fish culture. A detailed investigation on the reproductive capacity of this species was considered desirable to form a basis for studies aimed at increasing the production of fishes inhabiting the mountain-rivers, hill-streams, ponds, and reservoirs.

Materials and Methods

Sampling Sites

Fish sampling took place on three stations (Map.1).



The first sampling station, Chaukhutiya of the western Ram Ganga River, is located along a coarse, rocky zone with swift water current. The second sampling station, Maasi of the western Ram Ganga River is located in the rocky zone. Mohana is the third sampling station on the semi-plain zones having swift water current. Monthly samples of *Labeo dyocheilus* were collected with the help of local fisherman during the months of November 2008 to October 2011.

Laboratory Studies

A total of 46 female fishes were collected. The total length (TL) of each specimen was measured to the nearest 0.1cm, while weight was measured to the nearest 0.1gm. After morphometric measurements, the fishes were preserved in 8% formalin for further study. The total length and weight of each fish was recorded in fresh condition. However, the other parameters were measured within a fortnight of collection. Samples of 100 mg each from the middle, anterior and posterior part of the ovary were taken and numbers of ova of each sample were counted with the help of binocular microscope.

Reproductive Capacity estimation

Reproductive capacity (fecundity) was calculated by the formula $RC = S * OW / 100$, where RC = Reproductive capacity, S = Average number of eggs obtained from the three different samples of 100 mg. each, OW = Total weight of the ovary. Total weights with ovary (TW to the nearest 0.001gm) were taken using a digital electronic balance.

Analysis of Data

The relationship between reproductive capacity and other body parameters were obtained by the least square test, used as $Y = a + bx$, where

Y = (Reproductive Capacity, dependent variable), x = Body parameters (independent variables), a = Slope and b = Intercept.

Observations

The summarized data on the reproductive capacity of *Labeo dyocheilus* from western Ram Ganga River are presented in the table 1. Like most of the hill-stream fishes, it is also a monsoon breeder and breeds during the last week of June to August. It attained its maximum length of about 39.2cm. Various relationships between reproductive capacity and body parameters (Fish length, fish weight, ovary length and ovary weight) were calculated. These relationships were expressed with the help of regression analysis.

Fish length and Reproductive capacity: The maximum reproductive capacity was recorded 31,524 from a fish measuring 39.2 cm in total length while, minimum fecundity 3,218 was observed in the fish having the total length of 8.5cm. The obtain regression equation for this relationship was: $RC = -4645.6974 + 781.3562 FL$, $r = 0.9718$ (Fig.1).

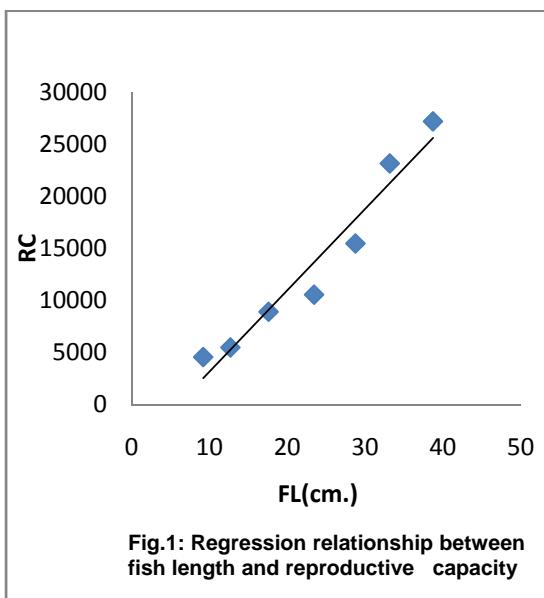


Fig.1: Regression relationship between fish length and reproductive capacity

Fish weight and Reproductive capacity: Reproductive capacity was found to hold a

straight line relationship with the fish weight. The minimum and maximum reproductive capacity was noted 3,218 and 31,524, when the fish weight was 120.13gm and 860.55gm respectively. The statistical equation for this relationship is as follows: $RC = -1819.1713 + 37.5840 FW$, $r = 0.9785$ (Fig.2).

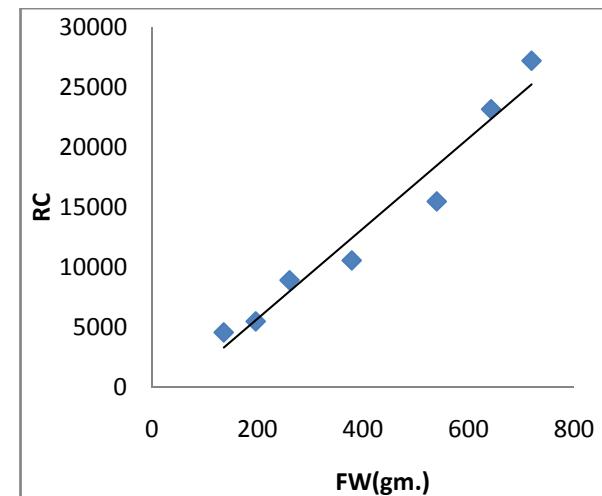


Fig.2: Regression relationship between fish weight and reproductive capacity

Ovary length and Reproductive capacity: The total reproductive capacity ranged from 3,218 to 31,524 in the fish of ovary length measuring from 3.5cm to 15.9cm. The regression equation obtained for this study was: $RC = 9506.8842 + 2743.5286 OL$, $r = 0.9815$ (Fig.3).

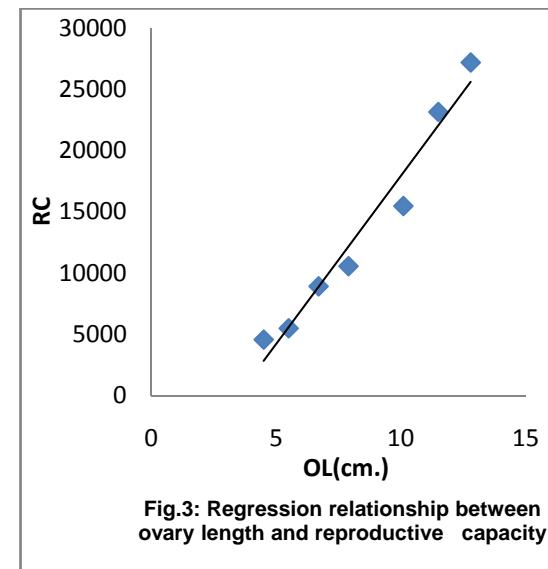
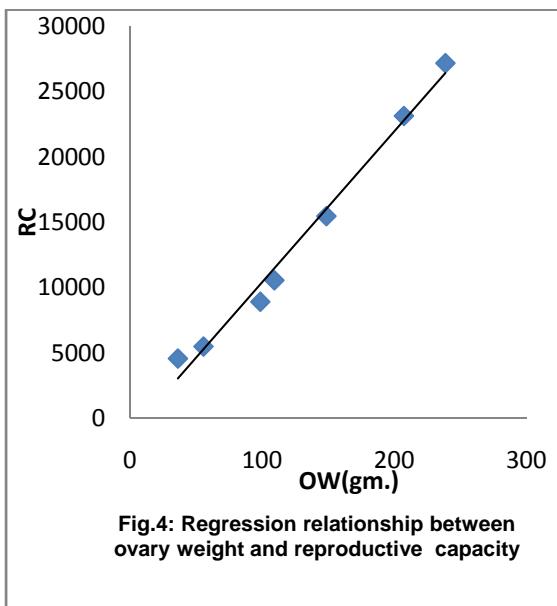


Fig.3: Regression relationship between ovary length and reproductive capacity

Ovary weight and Reproductive capacity: The minimum weight of the ovary was recorded 25.80gm, while the maximum was 260.83gm. The egg laying capacity of fish was ranged from 3,218 to 31,524 respectively. The regression data of this relationship was: $RC = -720.3901 + 110.6017 OW$, $r = 0.9899$ (Fig.4). The equation showed that it was the closest relationship among all other body parameters studied here.



Discussion

Labeo dyocheilus, an edible fish species from Kumaun region for local folk, has good reproductive capacity considering its body size. It is definitely conducive if developed as a pond culture or reservoir fisheries. The hill stream fishes show a great variation in their reproductive capacity. It mostly depends on the habitat ecology of the fish. The first sampling site is Chaukhutiya which is the upper part of the river. The small and medium size groups (5.1cm-30.0cm) of fishes from this site may be due to the low temperature of water and lack of food material. The second and third sampling site are Maasi and Mohana, which is the lower part of the river and the medium and larger size groups (15.1cm-40.0cm) of fishes from this site may be due to proper availability of food and high temperature of the river water. The change in the fecundity estimation could be due to different environmental conditions in which the two populations live. The fecundity also varied with the seasons, climatic conditions, environmental habitat, nutritional status and genetic potential (Bromage et al. 1992).

| Size Groups (cm) | Fish Length (cm.) | Fish Weight (gm) | Ovary Length (cm) | Ovary Weight (gm) | Reproductive Capacity |
|------------------|-------------------------------|-------------------------------------|------------------------------|-------------------------------------|------------------------------------|
| 05.1-10.0 | 8.5-9.8 9.2 ± 0.4 | 120.13-151.45 136.21 ± 12.15 | 3.5-5.8 4.5 ± 0.8 | 25.80-45.12 36.15 ± 7.20 | 3,218-5,423* 4563 ± 1035 |
| 10.1-15.0 | 11.2-14.4 12.70 ± 0.90 | 160.35-220.67 196.82 ± 20.77 | 4.2-7.7 5.5 ± 1.8 | 35.71-75.93 55.54 ± 17.12 | 4,643-6,457 $5,487 \pm 952$ |
| 15.1-20.0 | 15.7-19.1 17.60 ± 1.10 | 208.65-347.47 260.98 ± 37.75 | 5.4-8.2 6.7 ± 1.1 | 77.19-109.41 98.50 ± 12.7 | 6,839-10,399 $8,911 \pm 1208$ |
| 21.0-25.0 | 22.3-24.7 23.45 ± 0.75 | 295.66-482.24 378.84 ± 40.10 | 6.9-9.9 7.9 ± 1.4 | 89.12-142.74 109.20 ± 22.5 | 7,868-13,976 $10,557 \pm 2101$ |
| 25.1-30.0 | 27.5-30.0 28.76 ± 1.10 | 380.59-654.93 539.87 ± 70.78 | 8.9-12.5 10.1 ± 1.9 | 98.3-187.21 148.54 ± 40.71 | 8,984-19,835 $15,471 \pm 4008$ |
| 30.1-35.0 | 31.3-34.8 33.17 ± 1.31 | 510.59-740.33 642.78 ± 45.15 | 10.7-13.7 11.5 ± 1.5 | 180.18-220.86 207.18 ± 19.89 | 17,541-25,897 $23,145 \pm 2033$ |
| 35.1-40.0 | 37.0-39.2 38.72 ± 1.40 | 638.62-860.55 719.50 ± 60.19 | 11.6-15.9 12.8 ± 1.75 | 197.27-260.83 238.61 ± 22.15 | 19,973-31,524 $27,186 \pm 4177$ |

Table1: Summarized data on the reproductive capacity of *Labeo dyocheilus* (McClelland)

Several factors may be responsible for the difference in fish size from the two sampling sites (Bahuguna and Kumar, 2011). In *Labeo dyocheilus* the reproductive capacity is observed from 3,218 to 31,524 and increases with an increase in all the body parameters. The straight-line relationship has been calculated between the fish length and reproductive capacity, fish weight and reproductive capacity, ovary length and reproductive capacity, ovary weight and reproductive capacity. The reproductive capacity was more dependent on ovary weight ($r= 0.9899$) and ovary length ($r=0.9815$), than the fish body weight ($r=0.9785$) and fish body length (0.9718). Bhatnagar (1964) observed a range of breeding potential from 67,288 to 3,10,934 for *Labeo dero* in the fish measuring 33 to 50 cm. 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.

Jyoti and Malhotra (1972) reported the fecundity of *Schizothorax niger* from Kashmir valley as 8100 to 13940 in the fish ranging 12.3 to 36.5 cm. Gaigher et.al, (1975) reported that *Labeo umbratus* showed a curvilinear relationship between length and fecundity with the average fecundity increasing from 11 000 in fishes with a length of 20 cm to 48,000 to fishes with a length of 32 cm in the Tyume river, Eastern Cape. Raina (1977) has reported the fecundity of *Schizothorax esocinus* to be 3,910 to 53,108 in the fish length group of 14.9 cm to 39.7 cm. Joshi and Khanna (1980) reported the fecundity range of 47,168 to 3,80,714 in *Labeo gonius*. Pathani (1981) found the fecundity of *Tor putitora* from 7076 to 18535 from Kumaun lakes. Sunder and Subla (1984) estimated the fecundity of *Schizothorax*

curvifrons and reported it to be in a range of 4,834 to 31,221 in the fish length 190 mm to 430 mm from River Jhelum, Kashmir.

Dhasmana (1990) reported fecundity of *Garra gotyla gotyla* from 1, 05,900 to 1, 94,349 in the fish measuring from 15.2 to 19.2 in river Alaknanda. Bhatt and Pathak (1992) advocated that the maximum fecundity of golden Mahseer was 1, 22,325 in Sarju river of Kumaun. According to Desai (2000) the fecundity of *Tor tor* from river Narmada was 7,000 to 1, 01,600 in the fish measuring 28 to 75cm. According to Dobriyal et. al (2003), the fecundity of *Crossochilus latius latius* had a range of 20,660 to 70,630 in the fish measuring 16.0 to 26.3 cm from river Mandakini of Garhwal, Uttarakhand. Bahuguna and Kumar (2011) reported that the total breeding capacity of *Pseudecheneis sulcatus* was recorded as 781 to 8314 in the fish ranging from 10.0cm to 23.9mm. It was observed that the breeding capacity was highly dependent on fish weight (0.9967) and ovary weight (0.9696) than any other body parameters.

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