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Assessment of Fecundity and Its Relation with Body Parameters of Common Carp, [*Cyprinus carpio* (var.) *communis*] in Dal Lake, Kashmir

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ABSTRACT

Background: Fecundity is an important parameter in fisheries that predicts the reproductive capability of fish stock. Information on the fecundity of Common carp is helpful in estimating the amount of offspring produced in spawning season, which is essential for the stock assessment of the species. Assessment of the fecundity of a fish is essential for evaluating the commercial potentialities of its stock, life history, practical culture and actual management of the fishery. Common carp is a commercially important fish which has the potential to meet the demand of food in the country. Scanty of data is available on fecundity parameter of common carp in Kashmir waters. Therefore, this research work aims to estimate the fecundity of Common carp collected from the Dal lake of Kashmir.

Methods: The present study aims to estimate the fecundity of Common carp, [*Cyprinus carpio* var. *communis*] existing in Dal Lake, Kashmir. The 30 fish samples were collected once every month from the month of January 2018 to December 2018. Fishes were brought to Fisheries Resource Management (FRM), Faculty of Fisheries, SKUAST-K Laboratory for the estimation of total length, weight of fishes and weight of ovaries. Gravimetric and actual counting method was used for the estimation of fecundity.

Result: It was observed that the number of eggs varied from 16650 (for a fish with total length 180mm and total weight 120 g) to 129000 (for a fish with total length 430 mm and total weight 1300 g. The mean absolute fecundity was recorded as 68864.07 ± 6563.59 for a fish with a mean total length of 301.43 ± 13.93 mm and mean total weight of 435.1± 66.51 g. The relative fecundity ranged from 99.2-240.8 and the mean relative fecundity was 185.96. Significant positive correlation was found between fish weight and absolute fecundity. ($r= 0.907$, $p<0.01$), fish length and absolute fecundity ($r= 0.976$, $p<0.01$), Ovary weight and absolute fecundity ($r= 0.998$, $p<0.01$). Relative fecundity showed a significant negative correlation with weight, length and absolute fecundity ($r= -0.747$, $p<0.01$; $r= -0.419$, $p<0.05$ and $r= -0.460$, $p<0.05$ respectively.

Key words: Absolute fecundity, Ovary, Relative fecundity.

INTRODUCTION

Fecundity, *i.e.*, reproductive potential is an important biological parameter that plays a significant role in evaluating the commercial potentials of fish stocks (Gomez-Marquez, 2003). Assessment of fecundity is important for successful fisheries management including practical aquaculture relies to understand the recovery ability of fish populations (Lagler, 1956; Nikolskii, 1969; Tracey *et al*., 2007). The potential of egg output can be estimated by the fecundity and its relation to female size (Chondar, 1977) and the potential number of offspring in a season and reproductive capacity of fish stocks (Qasim and Qayyum, 1963). Alikunhi (1966) stated fecundity of the Common carp in the tropics has early maturity and year-round breeding; under temperate conditions there is a specific annual breeding cycle, during which the fish may spawn once or under exceptionally good conditions, twice or thrice, while in the tropics a mature carp may spawn five or six times in the course of a year under optimum conditions and the absolute fecundity increases with each spawning. As a result, the number of eggs produced per fish per year is significantly higher in the tropics.

Fish species exhibit wide variations in fecundity, even among individuals of the same species, size and range (Bagenal, 1957), which may be due to differential feeding success within the members of population prior to spawning (Bagenal, 1978) and probably due to release of the eggs in batches. Variation in fecundity may also be due to the existence of different age classes (Saliu *et al*., 2007). Fecundity of fishes also varies across species, and within the same species because of differences in age, body length and gonadal weight (Lagler, 1956). The ovaries of two fish

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with same body weight contain different number of eggs. This variable fecundity may also be associated with genetic diversity indicating that different strains mature and spawn at various body weight and size in its geographical range and is influenced by ecological factors. Lone and Hussain (2009) reported water temperature, photoperiod and rainfall appear to affect growth and development of ovary. Studies related to reproduction of many species have indicated that the reproductive cycle of fishes is closely associated to the environmental changes, particularly temperature, day length and food supply influencing gonadal development initiation and fecundity. Determination of the reproductive pattern is an essential component in managing and improving fishery biology of any species (Iram *et al*. 2018; Bhat *et al*. 2010). Conservation and survival of any fish species depends more importantly on its reproductive potential. Reproduction has key components of fecundity and gonadosomatic index, which are very vital demographic characteristics essential for understanding the life history of a species (Shafat *et al*. 2016).

Linear relationship between fecundity and fish length; fish weight, ovary length and ovary weight have been reported in different freshwater fish species by various workers (Singh and Srivastava, 1982; Sharaf *et al*. 1997; Somdutt and Kumar, 2004; Joshi, 2008; Bhat *et al*. 2003 and Bahuguna and Khatri 2009).

MATERIALS AND METHODS

Female brooders were captured from the Dal Lake during the spawning season. 30 gravid females were studied for estimation of fecundity. Fishes were brought to Fisheries Resource Management (FRM), Faculty of Fisheries, SKUAST-K Laboratory for the estimation of total length, weight of fishes and weight of ovaries were measured. Gravimetric and actual counting method was used for the estimation of fecundity.

For the estimation of fecundity, fishes were sacrificed and both the ovaries were taken out carefully. The moisture was thoroughly wiped out from the ovaries with a blotting paper. The length and weight of ovaries was noted down with complete care. The collected ovaries were placed in 10% formaldehyde for at least 24 hours to bring hardness of eggs, so as to make easy and accurate calculation of sticky eggs. This was followed by drying of eggs on blotting paper for 1-2 hours, three subsamples of one gram each from anterior, middle and posterior region were weighed and then eggs were counted carefully by gravimetric method. The mean numbers of eggs were multiplied by gonad parts of ovary weighed on a sensitive mono-pan weighing balance and the total number of eggs per gonad was obtained, *i.e* fecundity of fish.

The absolute fecundity and relative fecundity was calculated as per the formula given by (Bagenal, 1978):

$$\text{Absolute fecundity} = \frac{\text{No. of ova in the subsample} \times \text{total ovary weight}}{\text{Weight of subsample}}$$

$$\text{Relative fecundity} = \frac{\text{Absolute fecundity}}{\text{Weight of fish}}$$

RESULTS AND DISCUSSION

The range, mean value, and standard error of body weight, body length, ovary weight and fecundity are given in the Table 1. The absolute fecundity during the present study ranged from 16650 to 129000**,** which is in conformity with the findings of Shafi *et al.* (2012) who reported the fecundity of [*Cyprinus carpio* (var.*) communis*] from 3173 to 629320. The observed fecundity was lower than the ranges of 75645 to 356743 and 36955 to 318584 for *C.C* var. *communis* reported by Abera *et al.* (2015) and Hailu (2013) respectively. The fecundity reported by these workers was slightly higher than the present study. Total fecundity of *Cyprinus carpio* (Bankok strain) inhabiting tropical waters has been reported to have fairly high due to its early maturity and year round breeding behaviour. The relative fecundity during the present study ranged from 99.2 to 240.8, which is in conformity with the findings of Shafi *et al.* (2012) who reported the relative fecundity of Scale carp in the range of 21 to 223 with a mean value of 91.17.

Relationship among body weight, body length, ovary weight, absolute fecundity and relative fecundity (Table 2). A direct proportional increase in the fecundity with the increase in fish weight has been reported by Dobriyal (1988) and Lehman (1953). During the present study an increase in the number of ova was found with the increase in body weight. Absolute fecundity of [*Cyprinus carpio* (var.*) communis*] had a strong correlation with ovary weight than body weight and Total length. These results are in conformity with the results obtained by Khan *et al.* (1992) for *Mystus tengra* and Nabi *et al.* (2007) for *Glossogobius giuris.*

According to Smith (1947), the fecundity has been more related to the fish weight than to the length in *Salvelinus fontinalis.* Same has been reported for *Liza parsia* by Rheman *et al.* (2002). However, the 'r' value in the correlation between fecundity and total weight was higher than that of fecundity and total length, suggesting that total weight is a

Table 1: Statistical estimates of reproductive biology of female [*Cyprinus carpio* (var.*) communis*].

Parameters	Range	Mean	Standard error
Weight	120-1300	435.1	66.61
Length	180-430	301.43	13.93
Ovary weight	15-86	48.96	4.15
Absolute fecundity	16650-129000	68864.07	6563.59
Relative fecundity	99.2-240.8	185.96	8.34

Table 2: Pearson correlation between fish body weight, body length, ovary weight, absolute fecundity and relative fecundity in Common carp.

Parameter	Weight	Length	Ovary weight	Absolute fecundity	Relative fecundity
Weight	1	.878**	.888**	.907**	-.747**
Length		1	.981**	.976**	-.419*
Ovary weight			1	.998**	-.419*
Absolute fecundity				1	-.460*
Relative fecundity					1

**correlation is significant at 0.01 level (2 –tailed).

* correlation is significant at 0.01 level (2 –tailed).

better predictor of fecundity in the present study than total length. Similar finding have been reported by Ikomi and Odum (1998) in *Chrysichthys auratus*. Varghese (1961) has found a reduction in the rate of egg production with the increase in ovary weight in *Coilia ramcarati*. But in present study a corresponding increase in the number of eggs with the increase in the weight of ovary has been found, as in *Tilapia nilotica* (Soliman *et al.* 1986), *Labeo gonius* (Joshi and Khanna, 1980).

CONCLUSION

Fecundity is of great importance in aquaculture because it influences recruitment into fisheries. The present study conclude that the fecundity of Common carp was related to the body parameters of fish. The study found the strong correlation of fecundity with ovary weight followed by body weight and body length indicating that the bigger the size of fish higher will be the fecundity and vice versa.

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