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Fecundity of the Chinese silver carp *Hypophthalmichthys molitrix* (Val.) from Gujartal Fish Farm, Jaunpur, UP

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Abstract. Data on the fecundity of *Hypophthalmichthys molitrix* was statistically computed and the relationships between fecundity and body measurements were found to be linear. The fecundity was more closely related to the body weight ($r = 0{\cdot}8439$, $F = 15{\cdot}37$ at 1% level of significance) than fish length ($r = 0{\cdot}704$, $F = 8{\cdot}953$ at 5% level of significance) and the ovary weight ($r = 0{\cdot}6794$, $F = 8{\cdot}3839$ at 5% level of significance).

Keywords. Fecundity; Chinese silver carp.

1. Introduction

The knowledge of fecundity and its relationship with the body measurements make it possible to estimate the number of eggs that are likely to be spawned by the fish. In fish culture, if the number of eggs likely to be obtained from the spawning stock is known, it is easier to make arrangement for their successful hatching. The silver carp, *Hypophthalmichthys molitrix* (Valenciennes) naturally occurs in the river system Yangtze, West river, Kwangsi, Kwangtung in south and central China and in the Amur basin in USSR. In India, the first ever consignment of 360 fingerlings of silver carp was brought from Japan in 1959 to the pond culture division of Central Inland Fisheries Research Institute, Cuttak, Orissa. In due course, they were bred successfully by hypophysation and their fry were distributed from Cuttack to various states of India (Jhingran 1982).

H. molitrix is a planktivorous or surface feeder fish which breeds during April–July in its natural habitat in China and in the month of June–July in the Tone river, Japan. At Gujartal Fish Farm this species is an important member of the composite fish culture. The present study will be of greater help in making the proper management for the successful hatching of eggs.

2. Materials and methods

Mature specimens of *H. molitrix* were selected and all the body measurements were recorded in fresh condition. The ovary of each fish was dissected and preserved in 5% formalin solution. The fecundity of fish was recorded by gravimetric count method and studied in relation to total length, body weight and the ovary weight of fish. For the total fecundity estimation, 3 random samples of 100 mg each were taken from the anterior, middle and posterior regions of each ovary of every specimen. The number of ova in each sample were computed under a binocular microscope and total number of eggs in each ovary were estimated by the following formula:

$$F = S \times OW/100,$$

where F is fecundity, S is average number of eggs obtained from 6 different samples of 100 mg each and OW is total weight of ovary. The relationship between fecundity and other body parameters were obtained by plotting the respective values as a scatter diagram and fitting the straight line equation:

$$Y = a + bX,$$

where Y is independent variable, i.e. fecundity; X is dependent variable, i.e. fish length, fish weight and ovary weight, a and b are the constants. The correlation coefficient, r, was calculated for each relationship. The analysis of variance (F) was made use for testing the linearity of regression.

3. Results

3.1 *Fecundity and fish length*

The relationship between fecundity and fish length is shown in figure 1. The number of ova varied from 1·14 lakh for a fish of 43·6 cm to 2·55 lakh in the fish measuring 49·5 cm. The largest specimen of 50·4 cm had a fecundity of 2·49 lakh. The relationship between fecundity and the total length was observed to be as:

$$F = -8{\cdot}1946 + 0{\cdot}21339\,L \qquad (r = 0{\cdot}70407),$$

where F is fecundity, L is fish length and r is correlation coefficient. The analysis of variance proved the linearity of regression (observed $F = 8{\cdot}9532$, significant at 5% level).

3.2 *Fecundity and fish weight*

The relationship between fecundity and the fish weight is expressed in figure 2. Egg production ranged from 1·14 lakh in a fish of 0·760 kg to 2·55 lakh in a fish of 1·350 kg. The mean values of the fecundity calculated per kg body weight ranged from 1·483 to 1·78 lakh. The fecundity-body weight relationship can be expressed as:

$$F = -0{\cdot}6529 + 2{\cdot}1884\,FW \qquad (r = 0{\cdot}843904),$$

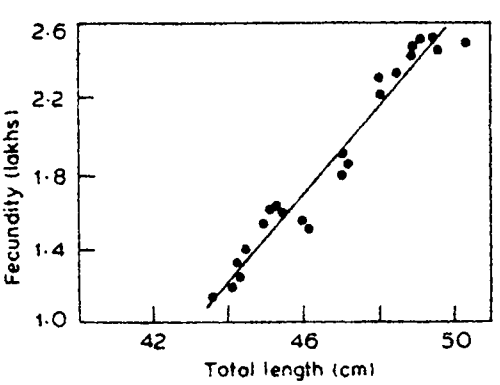

Figure 1. Relationship between fecundity and total length in *H. molitrix*

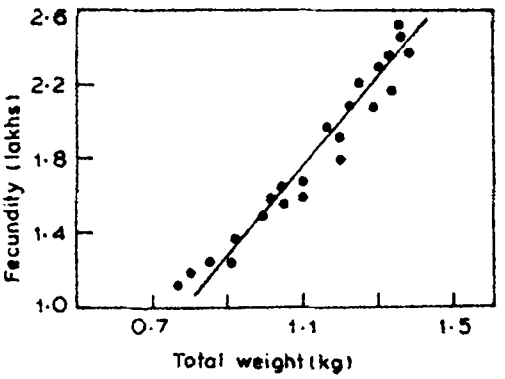

Figure 2. Relationship between fecundity and body weight in *H. molitrix*.

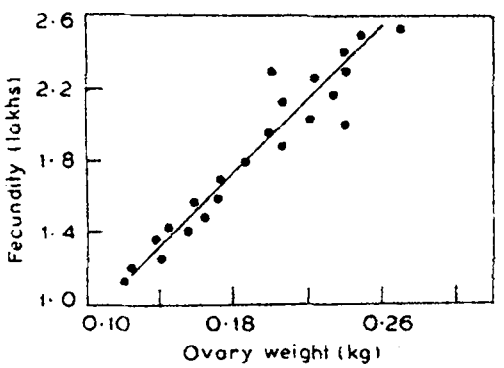

Figure 3. Relationship between fecundity and ovary weight in *H. molitrix*.

where FW is fish weight in kg. The analysis of variance proved the linearity of regression (observed $F = 15{\cdot}377$, significant at 1% level).

3.3 *Fecundity and ovary weight*

The relationship is expressed in figure 3. Egg production ranged from 1·14 lakh in an ovary of 120 g to 2·55 lakh in an ovary of 270 g. The fecundity-ovary weight relationship can be expressed as:

$$F = 0{\cdot}19352 + 8{\cdot}3839\ OW \qquad (r = 0{\cdot}679453).$$

The analysis of variance proved the linearity of regression (observed $F = 8{\cdot}3$, significant at 5% level).

4. Discussion

Fish selected for the fecundity studies were more than two years old as the yearlings were removed from the dragnet. It has been observed that even the yearlings were

quite mature and ready for hypophysation. The original stock of silver carp fingerlings brought from Japan in 1959 started maturing when they were only 20 months old and attained full maturity by the time they were two years old. During 1962, when silver carp were 3 years old, they were induced to breed in ponds for the first time in India through hypophysation. The progeny so obtained became mature in ponds when they were only 11 months old (Alikunhi 1965).

The fecundity of fish has been studied by Clark (1934), Khan (1945), Alikunhi (1956), Varghese (1973), Joshi and Khanna (1980), Singh *et al* (1982) and Dobriyal and Singh (1987). In *H. molitrix*, the fecundity ranged from 1·14 lakh in a fish measuring 436 mm in total length, 760 g body weight and 120 g ovary weight to 2·55 lakh in a fish measuring 495 mm in total length, 1·350 kg body weight and 270 g ovary weight. The relative fecundity (fecundity/kg body weight) calculated for *H. molitrix* ranged from 1·48 to 1·78 lakh. Alikunhi *et al* (1963) reported the fecundity of silver carp, weighing 3·18–8·51 kg, as 1·45–20·44 lakh. The number of eggs per gram body weight were 171 and per gram ovary weight 292. Wu and Chung (1964) stated that the fecundity of pond reared breeders of Chinese carp in Kwangtung province, China, is high (1 lakh eggs/kg body weight). However, Kuronuma (1968) stated that silver carp from Tone river, Japan, treated with pituitary injections ranged from 9·5–11 kg in weight and fecundity from 10·98–13·92 lakh.

In *H. molitrix*, the fecundity increases with an increase in all the body parameters. A straight line relationship has been observed between the fecundity and fish length, fish and ovary weight. Clark (1934) suggested that the fecundity of a fish increased in proportion to square of its length. However, Simpson (1951) concluded that the fecundity of Plaice was related to cube of its length. A straight line relationship between the fish weight and fecundity has been reported by several workers (Bagenal 1957; Sarojini 1957; Varghese 1973). However, a curvilinear relationship has been reported by Varghese (1976) in *Coilia ramcarati*.

The study shows that the fecundity and body weight relationship was more closely related ($r = 0{\cdot}8439$, $F = 15{\cdot}377$ at 1% level of significance) than the fish length ($r = 0{\cdot}704$, $F = 8{\cdot}953$ at 5% level of significance) and ovary weight ($r = 0{\cdot}6794$, $F = 8{\cdot}3$ at 5% level of significance). The study will be much helpful in making the scientific arrangements for the successful hatching of the spawned eggs after hypophysation.

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