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Fecundity in fish *Puntius sophore* and relationship of fecundity with fish length, fish weight and ovary weight from Jammu water bodies J and K (India).

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Abstract

Fecundity of gravid female fish *Puntius sophore* was estimated during the period from July to September. The estimated fecundity ranged of 1560 to 2314 eggs with a mean total length of 5.5 cm and body weight of 5.47 gm. The relative fecundity ranged from 390.85 to 480.18 per fish and absolute fecundity from 6106.73 to 6942.35 eggs. Mature ovaries of *Puntius sophore* occupied maximum space in abdomen during breeding season. Various relationships between fecundity and body parameters (Fish length, fish weight and ovarian weight) were worked out and it was observed that absolute fecundity is highly correlated (r^2= 0.809) with ovarian weight but poorly correlated (r^2= 0.047) with total length and moderately correlated (r^2=0.216) with body weight. Thus it appears that fecundity was more dependent on ovarian weight than body related parameters. During present investigations a straight line relationship has been obtained between relative fecundity, absolute fecundity with body parameters (Fish length, fish weight and ovarian weight) of fish *Puntius sophore.*

Keywords: *Puntius sophore,* fecundity, ovaries, relative fecundity, absolute fecundity.

INTRODUCTION

The 'fecundity' of a fish is defined as the number of eggs that are likely to be laid during a spawning season (Bagenal 1957). The reproductive potential, i.e., fecundity is an important biological parameter that plays a significant role in evaluating the commercial potentials of fish stocks (Gómez-Márquez 2003). Successful fisheries management including practical aquaculture relies on having an accurate assessment of fecundity to understand the recovery ability of fish populations (Lagler 1956; Nikolskii 1969; Tracey et al. 2007). The fecundity and its relation to female size make it possible to estimate the potential of egg output (Chondar 1977) and the potential number of offspring in a season and reproductive capacity of fish stocks (Qasim & Qayyum 1963).

Descriptions of reproductive stratigies and the assessment of fecundity are fundamental topics in the study of biology and population dynamics of fish species (Hunter *et.al.*, 1992). Studies on reproduction including the assessment of size at amturity, fecundity, duration of reproductive season, daily spawning behaviour and spawning behaviour and spawning fraction, permit the quantification of the reproductive capacity of individual fish. This information in combination with estimates of egg production enable estimation of spawning stock biomass (Saville, 1964; Parker, 1980; Lasker, 1985). Even within a stock, fecundity is known to vary annualy , undergo long-term changes (Horwood *et.al.*, 1986; Rijnsdorp 1991; Kjesbu *et.al.*, 1998) and has been shown to be proportional to fish size (and hence, age) and condition. Larger fish produce more eggs, both in absolute and in relative terms to body mass. For a given size, female in better condition exhibit higher fecundity (Kjesbo *et. al.,* 1991). Fish size and condition are thus key parameters to properly assess fecundity at the population level.

The aim of this review is to provide a protocol to estimate the fecundity and its relation to body parameters of minor carp *Puntius sophore* from field samples.

MATERIAL AND METHODOLOGY

Collection area:

Fishes were collected from their natural habitat from a stream at Gho-Manhasan located at a distance of 20km north west of Jammu city (32˚ 67' Lat N; 70˚ 79' Long E).

Fish *Puntius sophore* were collected from their natural habitat from a stream at Gho-Manhasan and these were acclimatised in plastic troughs at room temperature. They were fed on live feed and formulated feed, every alternate day dead fish were removed. Fecundity in fish was estimated by using the gravimeteric method (Hunter *et al.* 1992). For each ovary, 0.1g of each sample was taken seperately from the anterior, posterior and middle region of each lobe. The eggs were counted from 0.1g of each sample and mean number of eggs was calculated and then multiplied by total ovarian weight which gives the absolute fecundity.

Absolute individual fecundity was calculated by using following formula of:
F = OW × S/ ws
F = Fecundity,
OW = Weight of ovary,
S = No. of ova in the sub sample,
ws = Weight of sub sample.

The oocytes were seperated by keeping fully mature gravid ovaries into Gilson's solution, as modified by Simpson (1951). Total length, body weight and ovarian weight of fish were estimated to establish a mathematical relationship with fecundity (Beganal and Braum, 1978) as :
$Y= a.X^b$
Where,
Y = Fecundity (dependent variable),
X˚ = Body parameters (independentable variables)
a and b are constant.
The regression equation :
Y = a+ bX,
where, Y = Fecundity,
X = total length (TL),
a = value of intercepts, b = regression coefficient and correlation of coefficient (r) were calculated by least square method.

RESULTS AND DISCUSSIONS

Fecundity in *Puntius sophore* : (**Table 1and 2) (Fig. 1 – 9).**

Fecundity is generally defined as the egg laying capacity of a fish. Fecundity is the measure of reproductive capacity of a species and is studied to determine the productivity dynamics of a species concerned. It is studied both in relative as well as absolute context.

Relative fecundity is the number of eggs per unit body weight and the total (absolute) fecundity is the total number of eggs that are likely to be spawned in one spawning season.

Important contributions to the study of fecundity in relation to other parameters of body have been made by Jyoti and Malhotra (1972); Desai (1973); Joshi and Khanna (1980); Pathani (1981); Thakare and Bapart (1981); Singh *et al.* (1985); Sundra and Subba (1984); Bisht (1985); Dobriyal and Singh (1987, 1989, 1993); Rautela (1999); Dobriyal *et al.* (2000); Uniyal (2003); Singh (2004); Hina (2010) and Vohra (2011).

During the course of present investigations, fecundity of *Puntius sophore* has been observed to vary from 1560 to 2314 eggs with a mean total length of 5.5 cm and body weight of 5.47 gm (Table 1). The relative fecundity ranged from 390.85 to 480.18 per fish and the absolute fecundity from 6106.73 to 6942.35 eggs. Mature

ovaries of *Puntius sophore* occupied maximum space in abdominal cavity during breeding season (Figure 9). Various relationships between fecundity and body parameters (fish length, fish weight and ovary weight) have been presented in table 1 and 2. These relationships have been calculated with the help of regression analysis.

Relationship between fecundity and fish length, fish weight and ovary weight :
In the present study, the absolute fecundity of the individual fish varied from 6106.73±15.52 to 6927.35±15.52 with a mean body weight of 4.31±1.04gms to 5.18±0.02gm, mean total length of 4.7±1.09cm to 5.7±1.03cm and mean ovary weight of 0.078±0.004gm to 0.21±0.002gm.

The mean fecundity of fish varied from 2041.66±53.08 to 2314±28.51 in the fish measuring 4.31±1.04 to 5.24±0.02gm of average body weight, 4.7±1.09 to 6.3±0.02cm average total length and 0.078±0.004 to 0.36±0.008gm average ovary weight of fish as shown in Table 1 and 2 & Figure 4-8.

The relative fecundity of the individual fish varied from 475.17±15.52 to 444.59 in the fish measuring 4.31±1.04 to 5.24±0.02gm body weight , 4.7±1.09 to 6.3±0.02cm average total length and 0.078±0.004 to 0.36±0.008gm ovary weight of fish as shown in table 2.

The regression equation obtained for the relationship of absolute fecundity with body weight, total length and ovary weight was :
$y = 329.9x + 4787BW$, ($r^2 = 0.216$).
$y = 56.29x + 6108TL$, ($r^2 = 0.047$).
$y = 8984x + 1526OW$, ($r^2 = 0.809$).
where y = fecundity, BW = body weight, TL = Total length, OW = Ovary weight and "r" = correlation of coefficient.

It has been observed that absolute fecundity is highly correlated ($r^2 = 0.809$) with ovarian weight , but poorly with total length ($r^2 = 0.047$) and moderately with body weight ($r^2 = 0.216$) (Figure 5 and 7) . Thus, it appears that fecundity was more dependent on ovarian weight than body related parameters (body weight and total length). During present investigations a straight line relationship has been obtained between relative fecundity, absolute fecundity with body parameters (total fish length, body weight and ovary weight) of fish as shown in figure 1-8.

Similar relationships have also been reported earlier by Desai (1973) in *Tor tor,* Dobriyal and Singh (1987) in *Barilius bendelensis,* Rautela (1999) in *Glyptothorax telchitta,* Thapliyal (2002) in *Pseudecheneis sulcatus* and Hema *et al.* (2012) in *Puntius sophore.*

These relations are somewhat in disagreement with those of Rehman *et al.* (2002) and Bhuiyan *et al.* (2006) in *Liza parsia* and *Puntius gonionotus* respectively.

Various workers like Jyoti (1972), Joshi and Khanna, (1980), Singh *et al.* (1985), Parween *et al.* (2000), Alp *et al.* (2003); Singh (2009) and Hina (2010) reported similar straightline relationships between these parameters while conducting study on different fish species. However Varghese (1980) has reported a curvilinear relationship of fecundity with fish weight.

Table 1. Relationship of fecundity with length and weight of P*untius sophore*

Total length (cm) Size Group	**Body Weight (gms)**	**Average Fecundity**
4-4.5	4.34±0.07	2084.66±13.51
4.6-5.0	4.31±0.03	2041.66±53.08
5.1-5.5	5.2±0.05	2089.33±14.65
5.6-6.0	5.18±0.04	2303±15.52
6.1-6.5	5.24±0.09	2314±28.51
6.6-7.0	5.23±0.02	2119±49.56
7.1-7.5	5.26±0.02	2094.33±51.81
7.6-8.0	5.47±0.04	2138.33±13.32

Table 2. Absolute and relative fecundity and weight and length of *Puntius sophore.*

Mean length	**Mean fish weight**	**Mean ovary weight**	**Fecundity**	**Absolute fecundity**	**Relative fecundity**
4.3	4.34	0.41	2084.66±13.51	6260.36±13.51	480.18±15.52
4.7	4.31	0.96	2041.66±53.08	6106.73±15.52	475.17±15.52
5.3	5.2	0.70	2089.33±14.65	6267±14.65	401.73±15.52
5.7	5.18	1.20	2303±15.52	6927.35±15.52	444.59±15.52
6.3	5.24	0.81	2314±28.51	6942±15.52	441.6±15.52
6.7	5.23	0.78	2119±49.56	6357±15.52	405.16±15.52
7.3	5.26	0.72	2094.33±51.81	6290.14±15.52	398.19±15.52
7.7	5.47	0.74	2138.33±13.32	6422.22±15.52	390.85±15.52

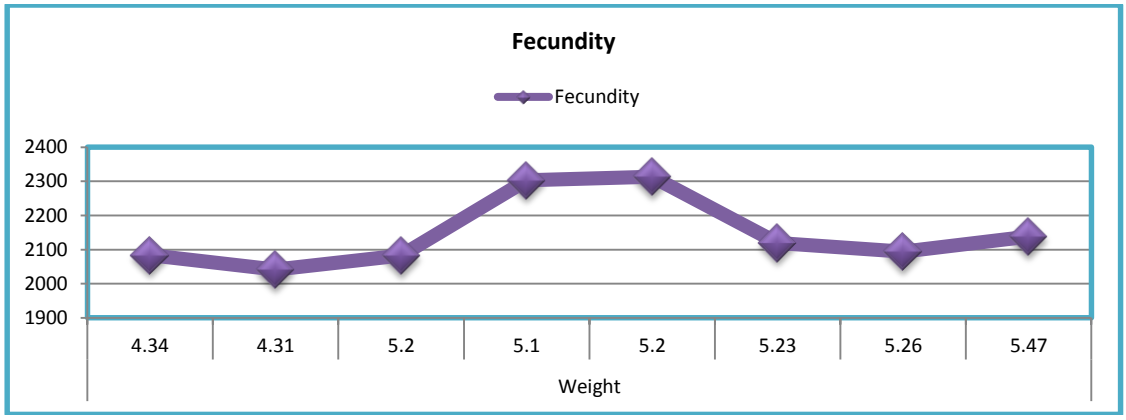

Figure 1. Relationship of fecundity with fish body weight of *Puntius sophore.*

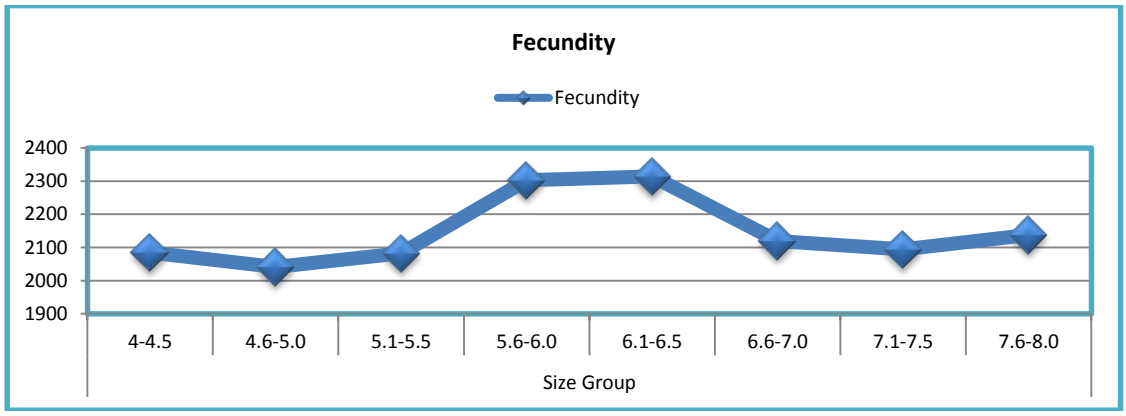

Figure 2. Relationship of fecundity with fish length of *Puntius sophore.*\

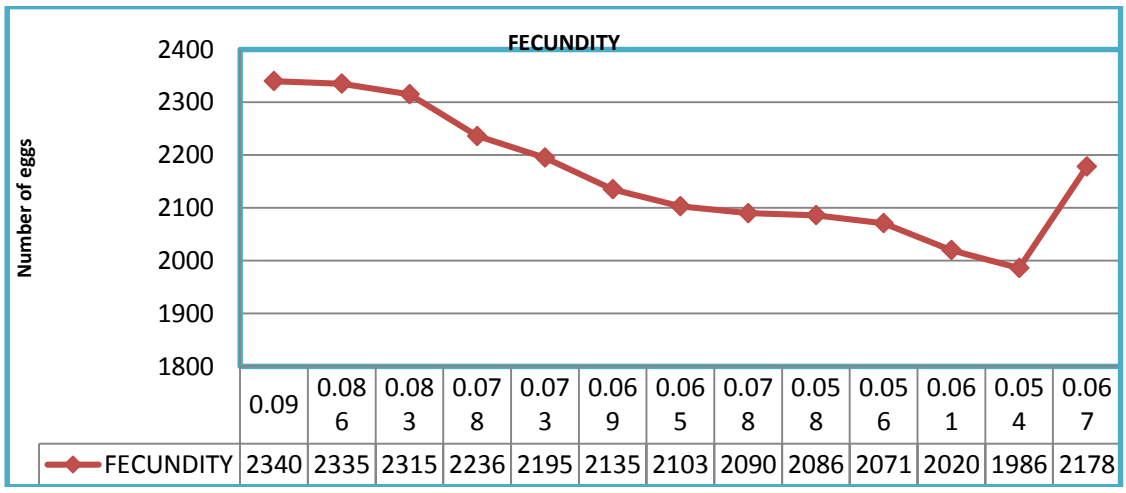

Figure 3. Relationship of fecundity with ovary weight of *Puntius sophore.*

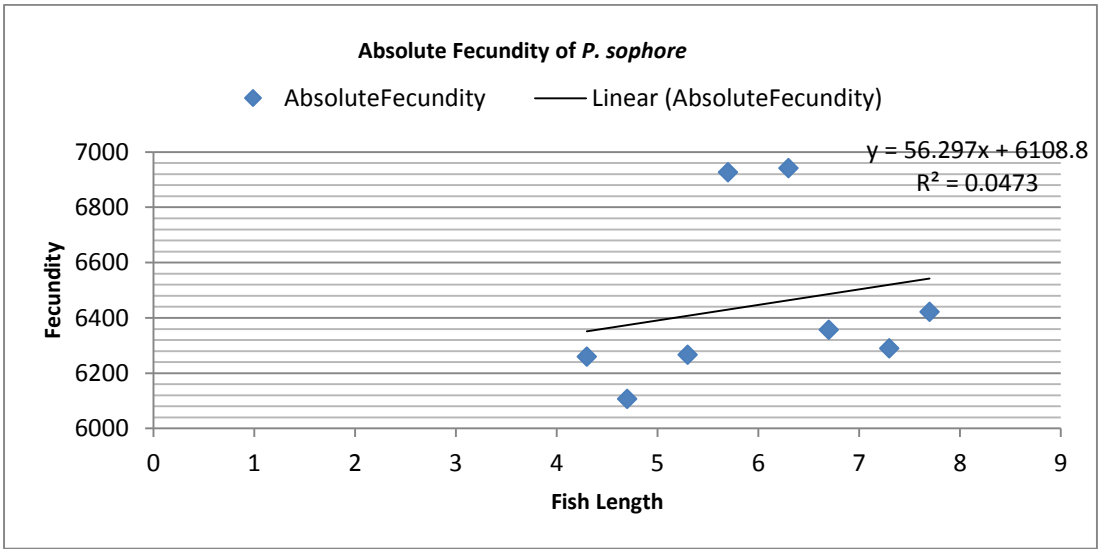

Figure 4. Absolute Fecundity fish length relationship in *Puntius sophore.*

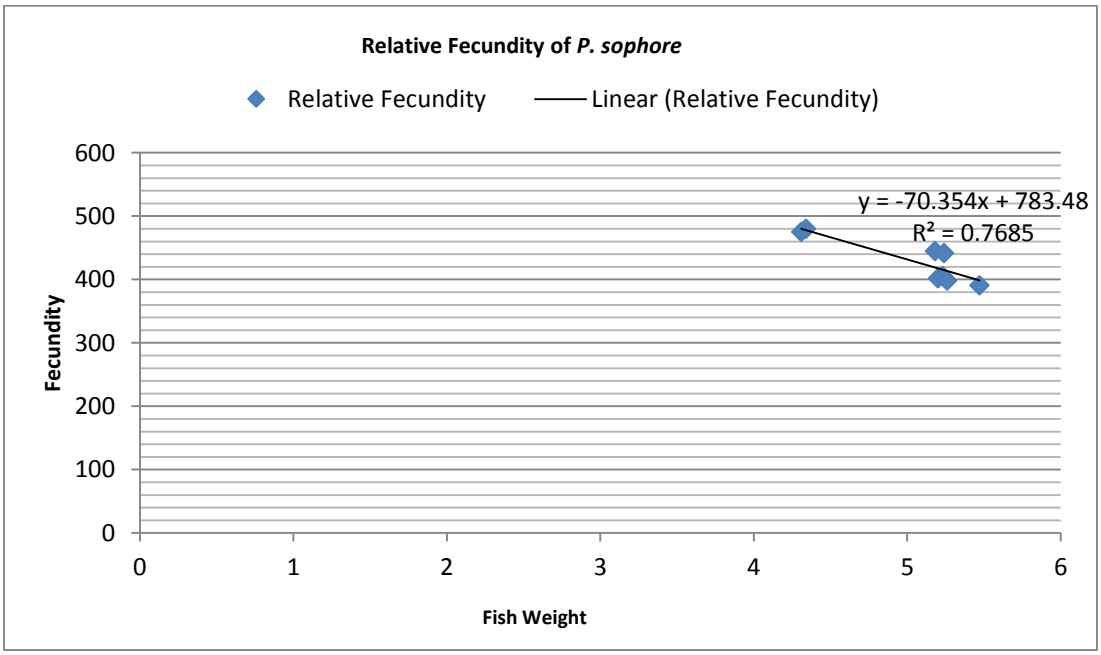

Figure 5. Relative Fecundity fish weight relationship in *Puntius sophore.*

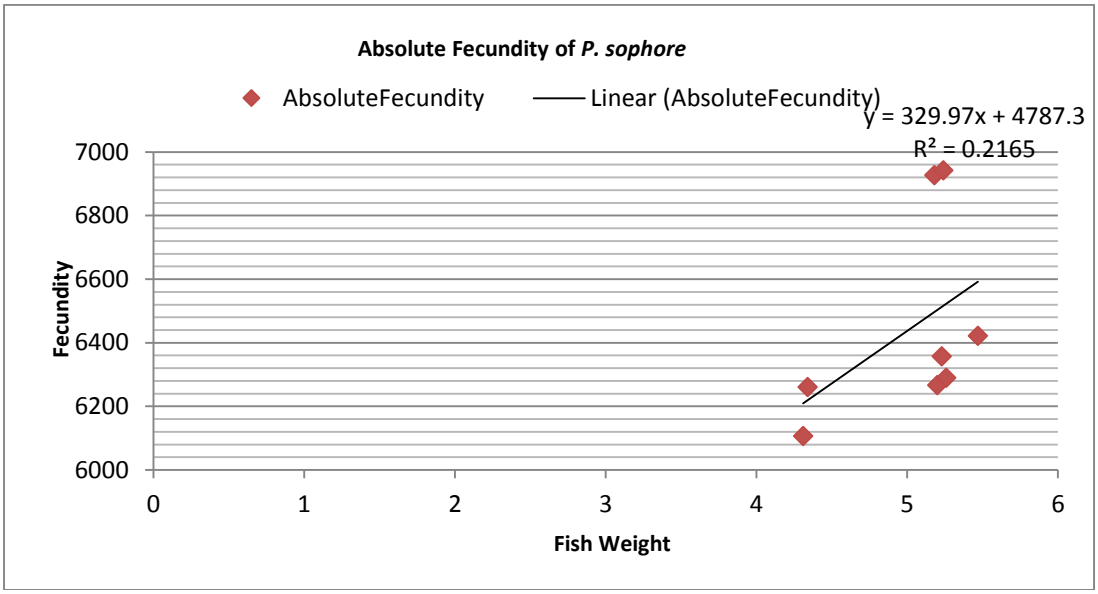

Figure 6. Absolute Fecundity fish weight relationship in *Puntius sophore.*

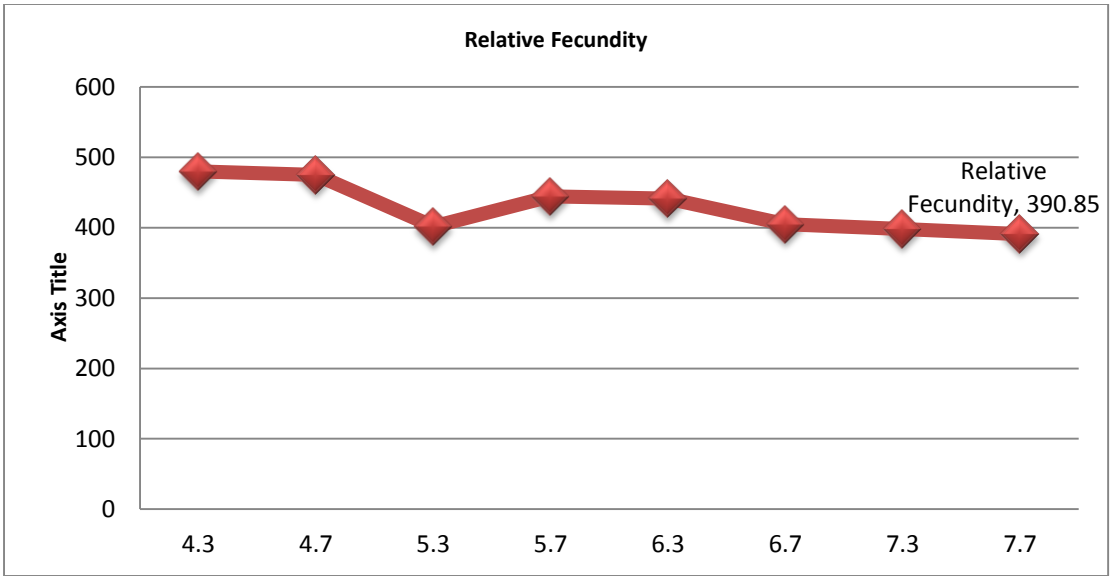

Figure 7. Relative fecundity and total length relationship of *Puntius sophore.*

Figure 8. Photograph of *Puntius sophore* showing mature ovaries studded with mature ovas in the body cavity during spawning season. Ovas are visible to naked eyes.

M O = Mature ovum
O V = Ovaries

Figure 9. Photograph of *Puntius sophore* showing mature ovaries studded with ovas occupying 2/3rd of the body cavity. Ovas are visible to naked eyes.

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