Environment Conservation Journal 8 (1-2) 37-43, 2007
(ISSN 0972-3099)

Fecundity and sex ratio in *puntius conchonius* (pisces cyprinidae) from Garhwal Himalaya

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Abstract

The paper deals with the analysis of reproductive capacity of *Puntius conchonius* (Ham.-Buch.), an important ornamental fish inhabiting the river Mandal in Garhwal Himalaya. Study is based on 73 mature female specimens in a length ranging from 53 to 79 mm were collected from river Mandal. The absolute fecundity ranged from 523.0 ± 100.3 (fish length 54.2 ± 1.1 mm, fish weight 2782.5 ± 84.6 mg, ovary length 17.5 ± 1.2 mm and ovary weight 250.1 ± 12.7 mg) to 1366± 282 (fish length 77.4±1.4 mm, fish weight 8408 ± 861 mg, ovary length 26.2 ± 2.2 mm and ovary weight 584.7 ± 112.7 mg). Four linear relationships were observed between fecundity and different body parameters calculated by the method of least squares. Sex ratio of fish in nature was also studied monthly, which varied from 1:1 (April) to 1:1.8 (July) with an annual average 1:1.17 (male: female, X^2 = 0.013 which is insignificant) .Overall it was found very close to the natural one.

Introduction

The knowledge of fecundity, its mathematical relationship, with the body parameters and sex-ratio is considered very useful in fishery science 'as it provides prior information regarding number of eggs that are likely to be received for hatching process and further management of nursery etc. Sex- ratio is an indication of abundance of any sex at a particular time or whether the population is in natural ratio or not.

Significant contribution to the estimation of reproductive capacity of hill-stream fish have been made by Joshi and Khanna (1980), Pathani (1981), Nautiyal (1984), Nautiyal and Lal (1985), Dobriyal (1986,88, 2005), Dobriyal and Singh (1987,89,93), Agrawal, *et al.* (1988), Dobriyal, *et. al* (2000, 2003), Negi (1998), Rautela (1999), Thapliyal (2002) and Uniyal (2003). Present communication deals with the fecundity of an important ornamental fish *P. conchonius* (Ham.-Buch) from river Mandal of Garhwal Himalaya.

Material and Methods

The fish for present study were sampled during the years 2003-05 from river Mandal of Garhwal Himalaya, which flows close to the border of Garhwal and Kumaun region. After recording the morphometric data of the fish, it was preserved in 5 % formalin and brought to the laboratory for further analysis. Measurements of ovary were made just before the estimation of fecundity. Gravimetric method was used for fecundity count and its relationships were traced by the method of least squares. Sex ratio was noted for entire period of study and its significance was tested by Chi square test.

Observations

The information regarding reproductive capacity and body parameters is presented in Table 1. The fish were in a range of 52 to 79 mm length and 2620 to 9403 mg in body weight. The minimum fecundity was calculated for a fish measuring 52 mm and weighing 2620 mg whereas the maximum fecundity was 1727 in the fish measuring 79 mm and weighing 9403 mg. The relationships of fecundity with different independent

body parameters were observed straight and presented in Figs 1 to 4. The equations obtained were as follows:

1.	F	=	- 737.892	+	27.0161	FL	(r = 0.4053)
2.	F	=	307.701	+	00.1309	FW	(r = 0.5334)
3.	F	=	- 279.155	+	60.8235	OL	(r = 0.4958)
4.	F	=	116.619	+	2.3303	OW	(r = 0.8163)

Where F = fecundity, FL = fish length, FW = fish weight, OL = ovary length, OW = ovary weight and r = coefficient of correlation.

The sex ratio and its significance test is presented in Table 2. It shows that the population was normal round the year as the *Chi*-square was always insignificant at the level of 5 % significance.

Discussion

Puntius conchonius (Ham.-Buch), an ornamental fish has good fecundity considering its body size. It is definitely conducive if developed as an aquarium fish. The hill-stream fishes show a great variation in their reproductive capacity. It mostly depends on the habitat ecology of the fish. *Schizothorax* species forms the major fishery in Garhwal hillstreams. It has two major species in Garhwal region, the *richardsonii* and the *plageostomus*. The fecundity of *S. plageostomus* has been reported in a range from 3474 to 13016 in the fish ranging from 30.1 to 55 cm and ovary weight from 132 to 19.7g by Agrawal, *et al.* (1988). The biology of *Schizothorax richardsonii* (Gray) was studied by Misra (1982) who reported its fecundity 3832 to 10.351 in the fish range.of 35- 53 cm. Mahseer is another important fishery of Garhwal region, which is next to the *schizothoracids* in its productivity magnitude. Nautiyal and Lal (1985) reported the fecundity range of *Tor putitora* from 26,998 to 98,583 in the fish weighing from 3.5 to 23 Kg. Dobriyal (2005) have reported low fecundity of *Tor putitora.* (5600-31438 in the fish measuring 50-78 cm and ovary weighing from 21.6 to 136.8 g) from Song river.

Tor chilinoides (McClelland) is a very important game and food fish for the rural folk in Garhwal Himalaya. Its fecundity has been reported as 1265- 9284 in the fish measuring 11-24 cm and ovary weighing 1- 15.6 g from the spring-fed river Western Nayar (Uniyal, 2003). *Garra* and *Crossocheilus* species are next in the queue of important fishery of the region. Dhasmana (1990) reported high fecundity of *Garra gotyla gotyla* (Gray) from 1.05,900 to 1,94349 in the fish measuring from 15.2 to 19.2 em. in river Alaknanda. Rautela (1999) reported low fecundity (4930-55553) for Glama from Khoh stream. The fecundity of *Crossocheilus latius latius* (Ham.) was reported 20,660- 79630 from river Mandakini in the fish measuring 16.0-26.3 cm by Dobriyal *et al.* (2003).

Glyptothorax and Pseudecheneis are the two important catfish genera inhabiting the Garhwal hillstreams. The fecundity of *G. pectinopterus* was reported as 1600- 8050 (Dobriyal and Singh, 1989) in the fish measuring 12 to 16 cm and ovary weighing from 1.15 to 9.17g. The fecundity of *Pseudecheneis sulcatus* was reported from river Alaknanda in a range of 1299 to 6435 (Thapliyal, 2002) in the fish measuring 12.2 to 20 cm and ovary weighing from 0.72 to 2.42 g. The size of ova was 1.7 mm. *Barilius* and *Noemacheilus* are two most common genera available in all the small stream and brooks in Garhwal region. The fecundity of *B. bendelisis* was reported from 900- 5048 in the fish measuring 7.5- 11.5 cm and ovary weighing from 700

mg to 2.42g (Dobriyal and Singh, 1987). *Noemacheilus botia* (Ham.) was studied by Singh (2004) in the Khoh stream who reported its fecundity from 447- 1631 in the fish measuring just 51 to 80 mm.

Four linear relationships were observed for *P. conchonius* in the present study, which had a low correlation coefficient value. The fecundity was observed to be more dependent on ovary weight than any other body parameter. It is evident that the ecological conditions of streams play vital role in the development, maturation and fecundity of fish. The fecundity of coldwater fishes is generally low due to lower temperature range and less availability of food in nature. The fecundity of *C. latius latius* and *G. gotyla gotyla* is generally higher in relation to other species because these two species have been designated as eurythermal species, which can bear a wide temperature range. Our observations support the views of Nikolski (1961) who stated that the food consumed by fish determines not only the fecundity but also the quality of sexual product.

The sex ratio analysis has been considered of immense importance in the fisheries investigations. It was observed that the sex ratio was quite natural one in *P. conchonius.*

Acknowledgements

Authors sincerely acknowledge Prof. J.P. Bhatt, Head of Zoology Department, H. N. B. Garhwal University Srinagar Garhwal for constant encouragement.

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Table 1 Data on the reproductive capity of *Puntius conchonius* (Ham Buch).

S.No	Size Group	Fish Length	Fish Weight	Ovary Length	Ovary Weight	Fecundity
1	46 - 55	52 - 55*	2620 - 2920	16 - 19	230 - 272	360 - 635
		54.25 ± 1.16	2782.5 ± 84.64	17.5 ± 1.19	250.12 ± 12.71	523.75 ± 103.61
2	56 - 65	57 - 65	3100 - 5907	17 - 23	324 - 550	540 - 1560
		61.18 ± 2.48	4513.54 ± 915.52	19.73 ± 1.55	379.45 ± 149.69	1155.50 ± 379.84
3	66 - 75	66 - 75	4800 - 8110	19 - 28	205 - 621	390 - 1723
		70.35 ± 2.37	6687.97 ± 860.58	23.77 ± 2.60	432.07 ± 139.63	1243.02 ± 404.89
4	76 - 85	76 - 79	7400 - 9403	24 - 29	463 - 751	1018 - 1727
		77.43 ± 1.40	8404.85 ± 816.62	26.25 ± 2.25	584.75 ± 112.70	1366.00 ± 282.99

Min - Max*

Average ± SD

Table 2 : Sex ratio in *Puntius conchonius* (Ham-Buch) during July 2003 to June 2005 from Mandal river.

Month	No. of Specimen	Male	Female	% of male	% of female	Sex ratio		Chi square (X^2)	Remarks
						Male	Female		
Jul	42	15	27	37.714	64.285	1.00	1.80	0.228	NS
Aug	28	12	16	42.875	57.142	1.00	1.33	0.046	NS
Sep	28	12	16	42.875	57.142	1.00	1.33	0.046	NS
Oct	43	21	22	48.837	51.162	1.00	1.05	0.001	NS
Nov	31	16	15	51.612	48.387	1.07	1.00	0.002	NS
Dec	34	15	19	44.117	55.882	1.00	1.26	0.029	NS
Jan	39	19	20	48.717	51.282	1.00	1.05	0.001	NS
Feb	28	15	13	53.571	46.428	1.15	1.00	0.010	NS
Mar	29	16	13	55.172	44.827	1.23	1.00	0.237	NS
Apr	48	24	24	50.000	50.000	1.00	1.00	0.000	NS
May	46	20	26	43.478	56.521	1.00	1.30	0.039	NS
Jun	39	15	24	38.461	61.538	1.00	1.60	0.138	NS
Total	435	200	235	45.597	54.022	1.00	1.17	0.013	NS

NS = Non Significant ($X^2_{0.1} = 2.705$)

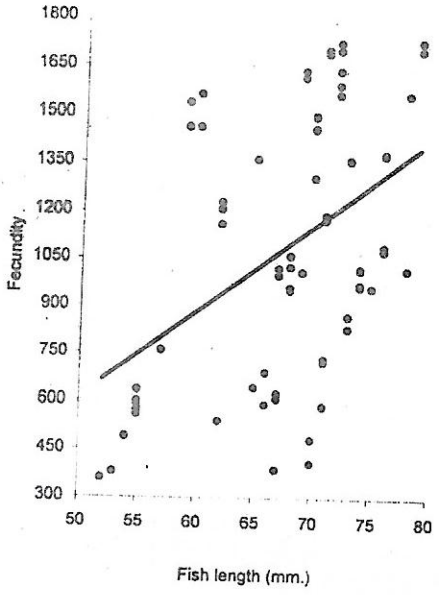

Fig:1 Regression between fecundity and fish length of *P. conchonius*

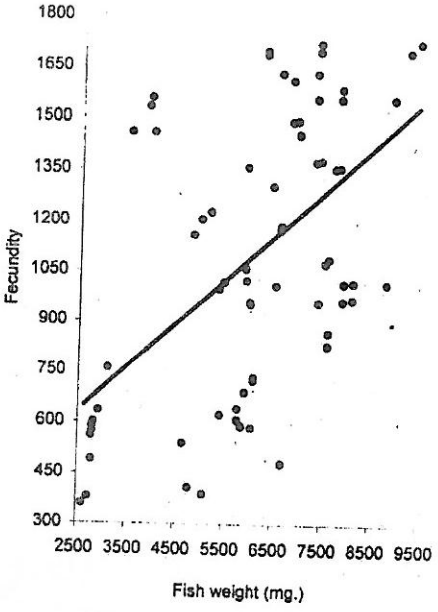

Fig:2 Regression between fecundity and fish weight of *P. conchonius*

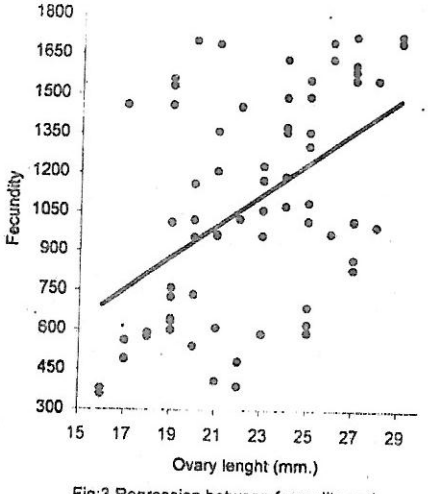

Fig:3 Regression between fecundity and ovary length of *P. conchonius*

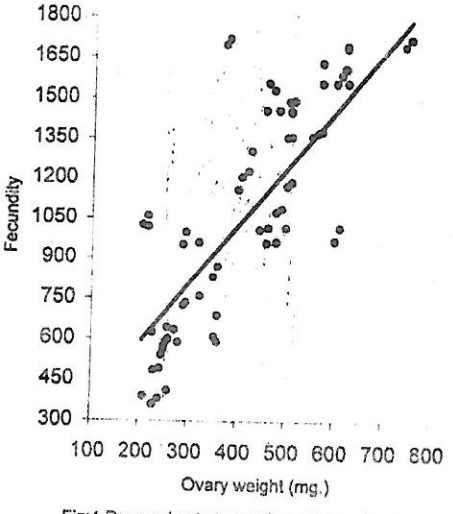

Fig:4 Regression between fecundity and ovary weight of *P. conchonius*