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Studies on the fecundity (F), gonadosomatic index (GSI) of *Cyprinus carpio* (Common carp) due to administration of hormonal doses PGE, Ovaprim and Ovatide at FSPC, Aurangabad, Maharashtra, India

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Abstract
Fecundity (F) and Gonadosomatic index (GSI) of *Cyprinus carpio* (Common carp) at fish seed production center at Aurangabad was estimated for a period during June to September months (2013-2015). During the present study the fish samples was within the range of 30cm to 60cm in length and 400g to 750g in weight. Fecundity and its correlation with body weight of *Cyprinus carpio* upon administration of ovaprim, ovatide and pituitary gland extract, Average body wt ±SD and Average number of eggs ± SD, a±SD, b±SD, r, and Average relative fecundity±SD for both fecundity and gonadosomatic index were estimated. Fish body weight and weight of gonad gives the gonadosomatic index (G.S.I.). It is the ratio of fish gonad weight to body weight, it is particularly helpful in identifying days and seasons of spawning, as the ovaries of gravid females swiftly increase in size just prior to spawning. Gonadosomatic index of fish increases with maturation being maximum during peak period of maturity and abruptly declines after spawning. The development and growth of gonad simultaneously takes place in the fish and fish grows and the GSI is high. Present study ensured that the growth of fish, body weight and gonad development is correlated. Gonadosomatic index of fish is related to spawning and reproduction of fish. At maturity stage fish has maximum GSI value and after spawning GSI value declines. The GSI value also related to amount of food available to them in water and temperature of water also. So generally during the breeding season of such selected fish shows maximum GSI value and after spawning it is reduced. In this study we have carried out GSI of male and female fish simultaneously. When GSI of both sexes were we came to know that maximum values of GSI have occurred almost at the same time in both sexes and after spawning it is recorded that there was a great decrease in GSI values.

Keywords: *Cyprinus carpio*, fecundity, gonadosomatic index, fish seed production centre, pituitary gland extract, ovaprim and ovatide

1. Introduction

The *Cyprinus carpio* is an exotic fish and it has become extensively used at seed production centre in order to produce more spawn to supplement the deficiency of proteins towards lower section of the community. *C. carpio* (Common carp) constitute the exotic fishery. This fish is highly nutritious and it contains omega-3 poly unsaturated fatty acid that is needed for the development of brain and retina in infants. In the inland waters the natural seed propagation and production of Common carp is significantly high at the fish seed production centre and it fetches the high market value as spawn cultivated by the fish farmers. Knowledge on the fecundity of the fish is essential for evaluating the commercial potentialities, stock study, life history, particular culture and the management of fishery (Lagler *et al.*, 1956, Zin *et al*., 2011) [8, 15]. Fecundity is an important parameter in fishes for determining the reproductive potential of fish species (Zin *et al*., 2011) [15]. Fecundity along with other indices such as gonadosomatic index (GSI) is used to access the reproductive condition of a fish. Changes in the gonadosomatic index (GSI) helps to determine the reproductive season of the fish (Arruda *et al*., 1993) [3]. GSI value has been considered by many workers in different fishes for determining spawning season and spawning frequency (Islam *et al*. 2008. Ghaffari *et al.* 2011., [5, 4] Kingdom and Allison, 2008., Sadekarpawar and Parikh, 2013 and Jan *et al*, 2014) [7, 10, 6].

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The present investigation study would be helpful to produce the spawn in the breeding pool by far by the application of selected doses and it is important that to know the exact breeding season of the fish so that maximum number of sperms and eggs could be extracted from the brooder male and female fishes after offering the injection for both the fishes in order to produce spawn in large quantity in the breeding pool by this induced breeding technique. Thereafter shifted towards in a hatchery tank and after spawning is over the spent brooders are then kept in the stocking pond those would be used in the next year.

2. Material and Methods
Fish seed production centre is located within geographical coordinates of 19^0 28' 48.00"N and 75^0 22' 48.00"E. The study site was selected at fish seed production centre, Paithan. Department of Fisheries Government of Maharashtra helped a lot while carrying out the breeding techniques of *C. carpio* fishes. Collection and identification of *C. carpio* fishes from the stocking ponds. The present investigation study is relied on the experiment conducted upon administration of selected hormonal and synthetic doses over a period during June to September 2013-2015. Fishes were brought to the laboratory for the experiment purpose upon introduction of PGE and ovaprim and ovatide hormones from the breeding pool. All the fishes were collected from the breeding tanks located at the fish seed production centre. They were properly washed and dried in the blotting paper, cleaned and kept ready for dissection. Abdominal region was given cut by means of sharp scissor. The gonads was collected in intact and weighed. Thereafter ovary was then fixed in 5% formalin and the standard procedure for estimation of fecundity was used. Spread a section of the eggs on many slides, counted individually all eggs and multiplied by means of formula. Fully matured fishes were weighed along with the weight of gonads. For the study of Gonadosomatic Index (GSI), weight of gonads and body weight of fish of both male and female sexes of major such as *C. carpio* were assessed separately.

Gonadosomatic Index (GSI) was estimated with the help of the following formula given by (Valadykov, 1956; Hopkins, 1979) [12]: A live ripe and fully mature brooder female fish's specimens were collected from the source. The weight and total body length was recorded. It was dissected and finally the ripe ovaries were exposed and were taken out carefully in intact form. Weight of gonads was taken and finally GSI value of female specimen was calculated. The GSI was calculated to know the maturity in order to determine the breeding cycle of the fish.

$$GSI = \frac{W_1}{W_2} \times 100$$

Where, W_1 = Wet weight of gonad.
W_2 = Total wet weight of fish.

3. Results
In the present study the fecundity was found maximum almost 85% successful during breeding experiment were performed. Fishes are having mean total average length of 45cm and mean weight 750g. This suggests that large sized fishes contain more eggs as compared to small sized fishes. So egg production is related to the size of the fish. Similar results were shown by Vass *et al*, 1981 [13]. Total and relative fecundity of *Cyprinus carpio* upon administration of hormonal doses *viz*. PGE in combination with ovaprim and ovatide was estimated and following observations were recorded in the following table. The relative fecundity (Number of eggs in lakh / kg body weight) of *C. carpio* was highest (1.264 ± 0.222) from PGE followed by ovaprim (1.175 ± 0.301) and ovatide (1.126 ± 0.233). The gonadosomatic index of female of *C. carpio* from PGE, ovatide and ovaprim was 8.549 ± 1.291, 7.545 ± 1.809 and 6.735 ± 2.104 respectively. In case of male, it was 1.858 ± 0.518 and 1.835 ± 0.420 from PGE and ovaprim respectively, while in ovatide it was 1.792 ± 0.506 (Table 1).

Table 1: Fecundity and its correlation with body weight of *Cyprinus carpio* upon administration of ovaprim, ovatide and pituitary gland extract

Fish species	Hormonal doses	Average body wt ±SD	Average number of eggs ± SD	a±SD	b±SD	r	Average relative fecundity±SD
C. carpio	Ovaprim	5.700 ± 0.950	6.794 ± 2.398	-3.484 ± 4.554	1.803 ± 0.790	0.715	1.175 ± 0.301
	Ovatide	4.786 ± 1.913	5.711 ± 3.153	-1.981 ± 0.837	1.607 ± 0.164	0.975	1.126 ± 0.233
	PGE	6.186 ± 1.363	7.903 ± 2.064	-2.618 ± 3.097	1.701 ± 0.495	0.838	1.264 ± 0.222

Table 2: Gonadosomatic index and correlation of gonadal weight with body weight upon administration of hormonal doses at FSPC, Paithan

Fish species	Hormonal doses	Average body wt ±SD	Average gonad wt± SD	a±SE	b±SE	r*	Average GSI ±SD
C. carpio (Male)	Ovaprim	4.133 ± 1.689	0.075 ± 0.031	-0.011 ± 0.011	0.015 ± 0.002	0.830	1.835 ± 0.420
	Ovatide	3.429 ± 1.153	0.059 ± 0.019	-0.022 ± 0.012	0.010 ± 0.003	0.681	1.792 ± 0.506
	PGE	3.722 ± 1.445	0.065 ± 0.020	-0.035 ± 0.011	0.008 ± 0.003	0.588	1.858 ± 0.815
C. carpio (Female)	Ovaprim	5.700 ± 0.950	0.380 ± 0.117	0.234 ± 0.311	0.026 ± 0.054	0.208[NS]	6.735 ± 2.104
	Ovatide	4.786 ± 1.913	0.387 ± 0.224	-0.160 ± 0.057	0.114 ± 0.011	0.977	7.545 ± 1.809
	PGE	6.186 ± 1.017	0.533 ± 0.126	-0.143 ± 0.163	0.109 ± 0.026	0.882	8.549 ± 1.291

4. Discussion
Fecundity is nothing but the measurement of total number eggs laid by a female fish so estimation of ova is an important aspect. In the current fisheries science many adopted methods have applied in different way to estimate fecundity as suggested by Arnold *et al.,* 1997) [2]. A stepwise and complete development of gonad was observed at its peaks condition during June to September. After spawning by fish GSI decline

automatically. As GSI connote gonad development and maturity of fish increases with the maturation of the fish. In the present study GSI showed higher value during the breeding season from June to September.

In male *Cyprinus carpio* upon administration of ovaprim the average body weight in plus minus standard deviation was observed 4.133±1.689 and average gonad weight in plus minus SD was found to be 0.075±0.031 and r* value is

recorded 0.830, an overall average in GSI plus minus SD 1.835±0.420 was recorded. Due to applying ovatide hormonal dose average body weight 3.429±1.153 and average gonad weight in plus minus standard deviation is 0.059±0.019 and r* value is represented by 0.681 and average GSI value is estimated 1.792±0.506. By the application of pituitary gland extract average body weight in plus minus standard deviation is found 3.722±1.445 and average gonad weight is recorded 0.065±0.020 and r* value is recorded 0.588, an average GSI value is estimated 1.858±0.815.

In female *Cyprinus carpio* upon administration of ovaprim the average body weight in plus minus standard deviation was observed 5.700±0.950 and average gonad weight in plus minus SD was found to be 0.380 ± 0.117 and r* value is recorded 0.208 which becomes non-significant, an overall average in GSI plus minus SD 6.735 ± 2.104 was recorded. Due to applying ovatide hormonal dose average body weight 4.786 ± 1.913 and average gonad weight in plus minus standard deviation is 0.387 ± 0.224 and r* value is represented by 0.977 and average GSI value is estimated 7.545 ± 1.809. By the application of pituitary gland extract average body weight in plus minus standard deviation is found 6.186 ± 1.017 and average gonad weight is recorded 0.533 ± 0.126 and r* value is recorded 0.882, an average GSI value is estimated 8.549 ± 1.291.

Overall value represented higher in case of female *Cyprinus carpio* as compared to male *Cyprinus carpio* in the event of average body weight, average gonad weight, r* and an average GSI with plus minus standard deviation.

5. Conclusion
Fecundity along with gonadosomatic index (GSI) is used to assess the reproductive condition of the fish. GSI is a most vital parameter which provides significant information about the cyclic changes taking place during different seasons. The seasonal timing of reproduction and spawning time can easily be identified by the changes in the GSI, which determines reproductive season. Therefore, the study of these indices will not only provide useful information about the effect of season on the reproductive activity of the fish, but information about these parameters is also useful for rational exploitation of the fish. The present investigation the fecundity of C. carpio is almost high relying on skill and technical man power available at the FSPC. A highly significant correlation (P < 0.01) was observed between total number of eggs and body weight of *C. carpio*. The correlation between body weight and gonadal weight was also found significant for both male and female except for female of ovaprim dose given.

6. Acknowledgement

7. References
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