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The Effect of Pituitary Extract and Gonopro –FHon GSI And Fecundity of *Catlacatla*

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ABSTRACT

In the present study during the period December 2012 to November 2014 applying the appropriate doses of the hormones Gonopro-FH and pituitary extract was studied on the Fish weight (g) Ovary weight (g)GSI (%)and Fecundity (in Lakhs) at Fish breeding center at Manalfish farm, Orathanadu, Thanjavur Dist. Tamil Nadu, India. The fecundity, the Gonopro-FH hormone treated fish was significantly higher than the pituitary extract and control fishes were minimum. During the spawning period, the maximum fecundity was observed with the synthetic Gonopro-FH hormone injected fish. Synthetic Gonopro-FH hormone were produced higher number of eggs in injected catla fish, as compared with pituitary extract injected and control fish. The values were different significantly ($P < 0.05$) in ovulation in different groups.

KEY WORDS:Gonopro-FH, Fecundity, spawning, *Catla*, GSI

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I. INTRODUCTION

Catlacatla is a species of choice for the study of the temporal organization of reproduction under natural and experimental conditions for understanding environmental. Fecundity means the indicator of the reproductive capability of a fish. The estimation of fecundity and its relationship with the body measurements give an idea about the egg laying capacity of the fish. The highest fecundity indicates that the spawning peak of the fish. The size of the fish at maturity is yet another parameter which is essential to identify the reproductive strategy of a fish. It designates the maturity of the male and female and is used to ascertain the breeding season of the fishes^{1,2}. The effects of ovaprim and ovatide (both at 0.5 mg/kg female and 0.25 mg/kg male) in carp breeding and also reported the effectiveness of ovaprim over ovatide for the breeding of *Gebelioncatla*³. Ovatide resulted in higher fecundity and fertilization rate in *Labeorohita* and *Cirrhinusmrigala* as compared to ovaprim.

In fish culture various hormonal substances (Ovaprim, carp pituitary, human chorionic gonadotropin, frog pituitary extracts, etc.) have been used to induce breeding in fish with varying magnitudes of success^{4, 5}. The effectiveness of ovaprim on induced spawning of silver carp (*Hypophthalmichthysmolitrix*) by a single intramuscular injection⁶. The fecundity of an individual female also varies according to many factors including age, size, types of species, food availability and season. Many works had been done on the fecundity of different fishes^{7,8}. The success of induced breeding operation depends upon proper selection of brood fish particularly female .

Environmental and hormonal manipulation of ovulation in the fish have become of practical importance in the fish farming industry for two main reasons; to solve the problem of spawning asynchrony which necessitates frequent broodstock handling. The present study has been designed to investigate the reproductive performance of pure breed *Catlacatla* when induced with synthetic Gonopro-FH hormone and pituitary extract.

II. MATERIALS AND METHODS

The research work is conducted at Manal fish farm, Orathanadu, Thanjavur Dist. Tamil Nadu, India, during the month of December 2012 to November 2014. The farm is well designed and constructed a new method of Chinese hatchery, Peripheral dyke feeder canal, and drainage canal, etc. The female and the male *Catlacatla* were injected with Gonopro-FH intramuscularly in a single dose (0.2 ml/kg). The male was alone injected with pituitary extract in a single dose of 0.2 to 0.4 ml/kg but the female was given with double administration of pituitary extract i.e, the first

dose was 0.2 to 0.4ml/kg and the second dose was 0.6 to 0.8 ml/kg. The sex ratios of two males and one female (2:1) were used.

a. Selection of Broods

The healthy and disease free brooders of 2 years old were selected for every trail. Broods were selected on the basis of the secondary sexual characters. Brooders fishes were identified and selected for the experiment on the basis of the following secondary sexual characteristics. Secondary sexual characteristics were evident⁹.

b. Pituitary gland extract

The pituitary gland secretes the gonadotropins i.e., Follicle Stimulating Hormone (FSH), and Luteinising Hormone (LH) each hormones secreted throughout the year, however proportionally correlated with the cycle of endocrine gonadal maturity. Follicle Stimulating Hormone (FSH) causes growth and maturation of ovarian follicles in female and spermatogenesis in the testes of the male. Luteinising Hormone (LH) cause Luteinisation in female and promote the production of testosterone in males. These hormones don't seem to be species-specific; but, there's nice variability in its effectiveness in numerous species.

c. Collection of pituitary gland

Proper selection of the donor fish is essential for success of induced breeding and pituitary collected from fully ripe gravid fish. Glands from immature or spent fish do not give satisfactory results. The glands usually collected from freshly sacrificed fish but ice-preserved specimens also used. However, May to July months, most suitable time in India for collection of pituitary glands of major carps. After collection glands immediately put in absolute alcohol for defatting and dehydration process, after 24 h glands washed with absolute alcohol and kept again in fresh absolute alcohol and to store in refrigerator.

d. Preparation of pituitary extract

Extract of the gland prepared just before injection. Gland weighed and homogenized in distilled water or 0.3% saline. Final volume should be 0.2ml/kg body weight of the fish. Centrifuged the suspension and supernatant used for injection.

e. Methods of injection

The selected brooders were kept in breeding pool for acclimatization. They were made to fast for 4-6 h before injection to release faecal matter outside the body and easy to spawn. Brooders one by one netted out in hand net. They were placed on a cloth and carefully injected

avoiding wriggling movement. Required amount of hormone was withdrawn from the bottle by keeping the needle. Then the intramuscular injection was given at the base of caudal fin. Injected brooders were released in breeding pool. After injection fishes give interval of 4 to 6 h the response to behavioral changes, ovulation and spawning etc. For the hatching of eggs hatching pool was used which is circular cemented tank.

f. Injection of pituitary extract

Male fish was given with single administration of pituitary extract about 0.2 to 0.4 ml/kg. Female fish was given with double doses of pituitary extract i.e., first dose of 0.2 to 0.4ml/kg, and second dose of 0.6 to 0.8 ml/kg were injected.

g. Injection of Gonopro-FH

The male were injected with about 0.2 to 0.3 ml/kg, while the female were injected Gonopro-FH at a rate 0.5 to 0.6 ml/kg.

h. Fecundity of *Catlacatla*

The fishes were dissected out, and ovaries were separated carefully; also the wetness was dried with blotting paper. Ovaries were weighed and measured one by one. The dry ovaries were preserved with 5% formalin solution for 24 hours¹⁰. This allowed to separating eggs from walls of ovary simply. One gram portion of the ovary from every lobe was weighed on Electronic Scale. The egg samples were placed in a petri dish separately and added some amount of distilled water to each Petri dish. The total number of eggs in each sample were counted carefully and noted for further calculations. The absolute fecundity was calculated¹¹.

$$F = n G/g$$

F = fecundity

N = mean numbers of eggs in all sample

G = weight of ovary

G = weight of sample.

The numbers of eggs/kg body weight of the fish (relative fecundity) and number of egg per fish (absolute fecundity) was also calculated by using simple algebraic formula.

III. RESULTS AND DISCUSSION

In the present study from December 2012 to November 2014. The results of this experiment carried out on Indian major carp *Catlacaltat* treated with Gonopro-FH hormone and

Pituitary extract has been presented in table 1 and 2. In this present studies maximum response were found in Gonopro-FH hormone due to the year 2012-2013 while compared with other treatment. The average number of Fish weight were 1583 ± 125.83 , average number of ovary weight were 330.34 ± 64.51 average number of GSI was 20.73 ± 2.48 and the average number of Fecundity were 1.94 ± 0.21 of catla fish noticed in spawning period however, Gonopro-fh injected fishes more effective performance while compared with pituitary extract fish and also control. In the 2013-2014, the average number of Fish weight were 1537.33 ± 127.52 , average number of Ovary weight were 316.63 ± 60.46 average number of GSI was 20.47 ± 2.28 and the average number of Fecundity were 1.834 ± 0.22 of catla fish. However, all parameters found high in spawning seasons in Gonopro-FH treated fish as compared with pituitary extract treated fish. In induced breeding technique (hypophysation) gave the power to mass production of quality seed in a controlled environment. Induced breeding technique reducing the natural seed collection. Therefore, induced breeding is a method of fish breeding in confined water. Stimulated either by gonadotropin from the pituitary gland and synthetic hormone administration such as Gonopro-FH. The artificial propagation of the indigenous *Tor* species of Malaysia. *Tor tambroides* and *Tor duronensis* was successful done in using hormone free and with ovaprim (0.05ml/kg/bd.wt.) being the most successful hormone treatment for both the species¹². During the present study, it has been established that the fish obtain sexual maturity in confined water as well as is possible to induce to breed with hormonal intervention. It has been observed in *C. catla* could breed only once a year under captivity from May to August. This was due to the delay in the maturation of gonad in female brooders under captivity in comparison to maturation of male. The availability of lower number of mature female also contributes to the problem. The fish seed was the critical and basic input for successful fish culture operations. However, the major problem in the fish culture was the non-availability of quality fish seed^{13,14,15} and it is said that the timely seed supply was one of the major constraint. Pituitary extract was used for the successful spawning of *Labeogonius* under the climatic condition of mid-altitude of Meghalaya¹⁶. Successful induced breeding of *Tor putitora* was done by intramuscular administration of the synthetic hormone, ovaprim with single dose (0.20ml/kg/body weight)¹⁷. However, the species has been reported to breed in natural habitats in the South Regions of India during May-June and August-September¹⁸. The results of the present study showed high influence on the absolute fecundity when single intramuscular injection of the synthetic hormone Gonopro-FH and pituitary extract administration. Experimental fish performed much better than the control fish. A peak value of fecundity was observed from the fish injected with Gonopro-FH followed by pituitary extract during the spawning period.

Table 1. The seasonal variation of GSI and fecundity of female Catla (Dec-2012 to Nov-2013)

Season	Control				Pituitary Extract				Gonopro-FH			
	Fish weight (g)	Ovary weight (g)	GSI (%)	Fecundity (in Lakh)	Fish weight (g)	Ovary weight (g)	GSI (%)	Fecundity (in Lakh)	Fish weight (g)	Ovary weight (g)	GSI (%)	Fecundity (in Lakh)
Preparatory	999.9 ±44.06	52.83 ±2.148	5.27 ±2.04	0.324 ±0.01	1161.33 ±10.72	96.86 ±34.79	8.22 ±2.39	0.635 ±0.03	1298.67 ±50.65	128.33 ±37.3	9.81 ±2.51	0.932 ±0.04
Pre spawning	1166.6 ±112.02	117.91 ±47.25	9.6 ±2.70	0.802 ±0.2	1412.66 ±93.00	191.53 ±39.46	13.47 ±1.89	1.325 ±0.05	1540 ±98.49	264.43 ±54.72	17.07 ±2.53	1.895 ±0.02
Spawning	1340 ±60.82	172.97 ±24.99	12.87 ±1.33	0.938 ±0.15	1507.33 ±137.26	259.95 ±59.26	17.95 ±2.48	1.40 ±0.01	1583 ±125.83	330.34 ±64.51	20.73 ±2.48	1.94 ±0.21
Post spawning	986 ±52.46	39.44 ±16.26	4.03 ±1.52	0.199 ±0.01	1172 ±163.00	81.35 ±36.21	6.73 ±2.31	0.319 ±0.01	1273.33 ±165.02	111.04 ±58.9	8.44 ±3.55	0.453 ±0.02

Values: mean ± SD.

A minimum fecundity value was observed in the control fish at preparatory period. Statistical analysis indicated that, there was significant difference ($P < 0.05$) in the ovary weight and fecundity in the Gonopro-FH hormone when compare to the pituitary extract and control. Hence, the present study conducted on the Gonopro-FH, it was indicated that this hormone had no adverse effect on brood fish. Similar results have been published many authors on fecundity and successful induction of spawning of carp by Ovaprim in Pakistan on different species *L.rohita* and *C.mirigalaby*^{19,20}.

Table 2. The seasonal variation of GSI and fecundity of female Catla (Dec-2013 to Nov-2014)

Season	Control			Pituitary Extract			Gonopro-FH					
	Fish weight (g)	Ovary weight (g)	GSI (%)	Fecundity (in Lakhs)	Fish weight (g)	Ovary weight (g)	GSI (%)	Fecundity (in Lakhs)	Fish weight (g)	Ovary weight (g)	GSI (%)	Fecundity (in Lakhs)
Preparatory	955.33 ± 133.24	50.08 ± 22.12	5.18 ± 2.17	0.294 ± 0.01	1076.67 ± 98.14	90.4 ± 3.26	8.31 ± 2.52	0.578 ± 0.03	1206.6 ± 83.27	116.87 ± 36.09	9.63 ± 2.42	0.812 ± 0.45
Pre spawning	1120 ± 78.10	109.48 ± 39.57	9.79 ± 0.81	0.763 ± 0.01	1358 ± 71.36	182.46 ± 33.3	13.66 ± 1.80	1.290 ± 0.06	1482.67 ± 80.16	253.14 ± 50.39	16.92 ± 2.63	1.772 ± 0.07
Spawning	13	168.28	12	0.90 ± 0.1	1468.	25	17	1.360	1537	31	20	1.834

ning	0 3 ± 7 2 .3 4	±26. 94	. 8 6 ± 1 .3 9	49	67 ± 14 3.1 9	2. 2 9 ± 5 2. 9 3	. 0 4 ± 2 .0 4	± 0.0 1	.3 3 ± 12 7. 52	6 .4 6 3 ± 6 0 .4 6	. 4 7 ± 2 .2 8	±0.2 2
Post spaw ning	7 0 ± 9 5 .4 9	33.1 7± 15.7 9	3 .7 1 ± 1 .4 9	0.15 9± 0.10	10 43. 33 ± 15 5.0 2	6 9. 6 7 ± 3 4. 6 3	6 .4 5 ± 2 .4 9	0.2 70 ± 0.0 1	11 88 .6 7 ± 18 7. 15	1 0 1 .2 8 ± 5 8 .2 7	8 .1 6 ± 3 .5 5	0.40 3± 0.02

Values: mean ± SD.

IV.CONCLUSION

From the observations and conclusions of this research, it is clear that the Gonopro-FH have been found suitable for successful induced breeding of experimental Indian carps *Catlacatla*. In conclusion, it suggested that more emphasis should be given to develop the technique of induced breeding of fish and popularize it all over the country. It is a fact that the first and foremost prerequisite for successful intensive fish cultivation and development of Inland Fisheries is an assured that the supply of pure quality of fish seed to meet the demand of fish seed in India.

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