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BROOD STOCK MANAGEMENT AND INDUCED BREEDING OF THAI PANGUS (*Pangasius hypophthalmus*) PRACTICED IN THE HATCHERIES OF JESSORE REGION, BANGLADESH

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Abstract

The study was conducted on brood stock management and induced breeding of Thai Pangus in a hatchery of Jessore region. Brood fishes were reared in the brood rearing pond by providing artificial diet for good health and full maturation. The water quality parameters; temperature, p^H, dissolved oxygen and transparency were recorded from 25-30^{0}c, 7-8.5, 4.5-7.1 ppm and 23- 31 cm in the brood rearing ponds respectively. The experiment was conducted on the induced breeding of *Pangasius hypophthalmus* in a hatchery by using pituitary gland (PG) hormone. The present study consisted of three treatments (T_I, T_2 and T_3) with three replications of each. The eggs and sperms were obtained just by stripping and then fertilization was done by artificial insemination. Nine pairs of male and five pairs of female were selected for induced breeding and the average body wt. of the female and male were 4.47±0.55 kg and 3.65±0.44 kg respectively. To observe the effective dose for induced breeding, the females were injected at the rate of 8 (T_I), 10 (T_2) and 12 (T_3) mg PG/kg body wt. and correspondingly the males were administered a dose of 1 mg PG/kg body wt. in all treatments. The male and female ratio was maintained as 2:1 for each treatment. The fertilization rate, hatching rate, deformity rate and survival rate were determined. The fertilized eggs were hatched within 22-24 hours respectively. The water temperature was recorded between 27 to 28.5^{0}C during the experiment period. Among the three treatments T_3showed the best result in terms of fertilization rate (87%), hatching rate (82%), deformity of larvae (6%) and survival rate (80%). The present findings can be used in induced breeding of *P. hypophthalmus* for the development of hatchery propagation. The overall breeding performances of *P. hypophthalmus* were found to be satisfactory for the commercial production of this fish in Bangladesh.

Key words: *Pangasius hypophthalmus*, Broodstock management, Induced breeding, Fertilization rate, Hatching rate, Survival rate, Hatchery, Jessore, Bangladesh**.**

Introduction

Fish and fisheries products are the second important foreign exchange earners for Bangladesh, play an important role in Bangladesh both from economic and nutritional point of view and contributes about 4.37% to GDP, 23.37% GDP in the Agricultural sector and more than 12% to the foreign exchange earning of the nutrition (DoF, 2014).Furthermore, 63% of animal protein in the daily diet of Bangladeshi people is fish based and majority of the Bangladeshis consider fish and fish products as prime delicacy which is more preferred to other sources of protein (DoF,2014).At least 55 species of catfishes belonging to 35 genera have been recorded in Bangladesh (Rahman, 2005). Total catfish production in inland water is 85,869 metric ton (DoF, 2014). There are 130 government hatcheries and rests are private hatcheries most of which are present in Jessore, Comilla and Mymensingh districts. In Bangladesh both public and private hatchery produced around 423986kg hatchling (DoF, 2014).

The cat fish species mainly inhabits ponds, ditches, swamps and marshes but sometimes occurs in muddy rivers (Froese and Pauly, 2012).Due to its high market value, fast growth, tolerance to high stocking densities, ability to survive in oxygen-low waters (Dehadrai *et al.*, 1985), and its low fat, high proteinand

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iron content (Alok, *et al*., 1993),medicinal value (Froese and Pauly, 2012),catfishes is an ideal fish species for aquaculture (Vijaya kumar *et al*., 1998;Haniffa and Sridhar, 2002). Broodstock or broodfish is a group of mature individuals used in aquaculture for breeding purposes. Brood stock management can improve seed quality and number through enhanced gonadal development and spawning. In Bangladesh, successful induced spawning was first done by (Ali, 1967) in carps through hypophysation having been standardized (Haque, 1975; Islam and Chowdhury, 1976; Ahmed, 1983 and Alam, 1983).The origin of *Pangasius hypophthalmus* was from the Mekong River of Vietnam to Chao Phraya River of Thailand and distributed to other countries such as Malaysia, Indonesia and China (Robert and Vidmayanon, 1991). This specie is widely cultured in Asian countries such as Bangladesh, Vietnam, Malaysia, Indonesia, Laos, Cambodia and China (Roberts and Vidthayanon, 1991; Rohul Amin *et al*., 2005; Chheng*et al*., 2004; Ali *et al*., 2005). Pangus Commercially production has increased recently because of its acceptance in the market, fast growth and omnivorous feeding habits (Chheng *et al*., 2004; Ali *et al*., 2005; Rohul Amin *et al*., 2005). Cultivated production in the region is considerable and Vietnam is the largest Pangus producing country in the region (Phan *et al*., 2009). In 2007, Vietnam's total production of catfish was 1,200,000 tons, of which 95-97% was Pangas (Phuong and Oanh, 2010). Pangus (*P. hypophthalmus*) is the best due to its easy farming system, suitable weather condition and high market demand (Phuong and Oanh, 2010).On 8 May 1993, *Pangasius hypophthalmus* was first induced to breed in Bangladesh at Riverine Station, BFRI, Chandpur. It is an omnivorous fish and breeds in rivers. Currently, most hatchery operators are producing fry of *P. hypophthalmus* and producing table fish intensively. *P. hypophthalmus* can reach up to 15 kg but mature for the first time at 3 kg. The main objective of present research work was to know about the brood stock management of Pangus in a hatchery, determine the optimum dose of Pituitary Gland (PG) for induced breeding of *P. hypophthalmus;* and determination of the fertilization, hatching, deformity and survival rate of *P. hypophthalmus.*

Materials and Methods

Study Site

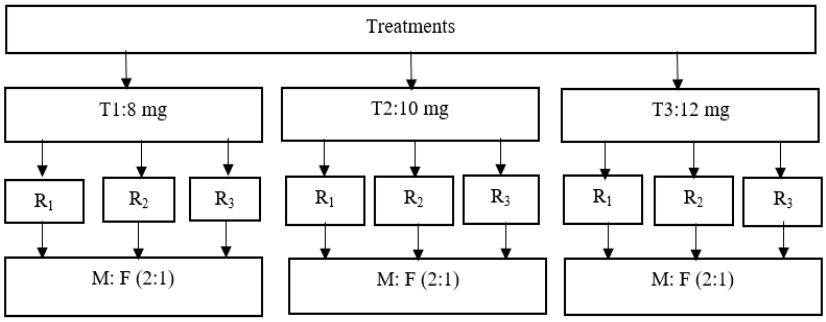
The research work was conducted at the finfish hatchery, Chanchra, Jessoresaadr, Jessore. The experiment was performed during January to May 2015.

Data Collection

Primary data were collected by the direct interviews of the hatchery owner and the hatchery farmers with a set of interview schedule designed for this study each respondent was given a brief introduction about the nature and purpose of the study during the interview. The existing data related to this study were collected from Freshwater Substation, Bangladesh Fisheries Research Institute (BFRI), Jessore; Department of Fisheries (DoF), World Fish Center (WFC) and other Government and Non-government organization, different books, project reports, maps, other thesis paper, journals and websites.

Fig. 1: Map showing the study site

Research Design



Induced breeding method

Brood fish Selection Criteria

Broods were selected on the basis of the criteria mentioned in Table 1.

Table 1. Criteria followed to select mature breeders of *P. hypophthalmus*

Female	***Male***
Good looking and healthy.	Good looking and healthy.
Body robust and pigmented	Brood slender, more translucent and less pigmented.
Abdomen bulging, elastic and soft.	Abdomen normal; not bulky like female.
Anus is pink color during breeding season.	Anus is pinkish color.

Conditioning of brood fishes

In the present study, the brood fishes were transferred to the rectangular tanks for conditioning for 6-7 hours respectively. During conditioning, the male and female were kept separately, prior to administration of the inducing agents. Continuous water flow by shower was given in the conditioning tank to ensure proper aeration. No feed was provided during the period of conditioning.

Breeding plan

For induced breeding of *P. hypophthalmus* male and female broods were collected from the brood rearing ponds of hatchery at 2**:**1 ratio of male and female. In the experiment, three doses of PG extract 8, 10, 12 mg/kg body wt. for female fish were considered as treatments T_1, $T_2$and T_3 respectively and corresponding single doses of PG 1 mg/kg body weight for male fish were used with three treatments of each. For each treatment 2 male and 1 female were used. So, 27 brood fishes were injected for induced breeding that composed of 9 females and 18 males.

Age and Weight of brood fishes

Minimum age, weight and length of brood fishes of the experiments are shown in table 2.

Table 2. Age, weight and length of brood fishes under different treatments

Treatments	***Sex***	***Age (years)***	***Length(cm) Mean ± Sd***	***Weight(kg) Mean ± Sd***
T_1	Female	3	39.5±1.32	4.25±0.25
	Male	3	36.62±1.02	3.10±0.13
T_2	Female	4	41.16±1.89	4.25±0.75
	Male	4	37.95±1.55	3.91±0.66
T_3	Female	4	42.91±0.14	5.26±0.27
	Male	4	39.75±1.11	4.07±0.11

Preparation of PG dose

At first, the pituitary glands were gently removed from the acetone by a small needle and dried by using the normal paper for 2-3 minutes and then counted by naked eye where each PG was 2 mg.The freshly prepared supernatant of hormone was then taken slowly in a 3 ml hypodermic syringe for injection.

Injecting system of hormone

The injection was done very carefully with a 3 ml syringe and PG was then injected near the muscle of the tail region (Fig. 2). The amount of PG extract for each fish was determined before according to the body weight of the broods. The PG extract injection of female fish was administered with two doses at interval of 7 hours. A male was injected with a single dose of PG at before of second dose of female.

Fig. 2: Hormone injection of brood fishes

Doses of PG for male and female brood

The prepared dose of PG extract for male and female were shown in table 3. Dose of PG was administered to the female and male broods at 11pm.

Table 3. Doses of PG for male and female broods of *P. hypophthalmus* under different treatments

Sex	T_1		T_2		T_3	
	1^{st} dose (mg/kg)	2^{nd} dose (mg/kg)	1^{st} dose (mg/kg)	2^{nd} dose (mg/kg)	1^{st} dose (mg/kg)	2^{nd} dose (mg/kg)
Male	1	-	1	-	1	-
Female	2	8	2	10	2	12

Stripping of fishes

In the study period, the hatchery owners collected egg and sperm from brood fishes by stripping method. They locally used this method year after year and getting good result. In a hatchery protocol, after 6 hours of second dose, at 6.00 am stripping was started. The eggs and sperms were collected from the ovulated females and males by stripping to the abdomen of fishes with gentle hand (Fig. 3 and Fig. 4). The eggs were collected into Tin plate. Then it mixed with eggs with a soft feather for 1minuites and added fresh water into fertilized eggs. The swollen eggs were transferred into hatching jarsT_1, T_2 and T_3 respectively for incubating. The ovulation period of fishes under different treatments are shown in table 4.

Table 4. Ovulation period of fishes under different doses

Treatments	*Ovulation period(hrs)*
T_1	8:30-9:0
T_2	7:50
T_3	7

Fig. 3: Collection of egg from broods and Collection of sperm from broods.

Determination of Fertilization Rate

The fertilization rate was determined by following formula:

$$\text{Fertilization rate (\%)} = \frac{\text{No. of fertilized eggs}}{\text{Total no of eggs (Fertilized + unfertilized)}} \times 100$$

Determination of Hatching Rate

The hatching rate was determined by following formula:

$$\text{Hatching rate (\%)} = \frac{\text{No. of hatching}}{\text{Total no of eggs}} \times 100$$

Percentage of Abnormal Larvae

The abnormality rate was determined by the following formula:

$$\text{Percentage of abnormal larvae (\%)} = \frac{\text{No. of abnormal larvae}}{\text{Number of hatched eggs}} \times 100$$

Determination of Survival Rate

The survival rate was determined by following formula:

Survival rate (%) = $\frac{\text{No. of hatchlings of survivors}}{\text{Total no. of eggs}} \times 100$

Data Processing and Analysis

The collected primary data were coded, categorized, tabulated and analyzed scientifically. The qualitative data were transferred into quantitative data by appropriate scoring techniques.All the collected data were analyzed through different software by using computer. Statistical and different type's graphs were done by MS Excel 2007; Adobe Photoshop 8 was used to arrange the picture. These data were verified to eliminate all possible errors and inconsistencies. Tabular technique was applied for the analysis of data by using simple statistical tools like averages, mean, standard deviation and percentages. Finally the results found in the experiment were subjected to statistical analysis, ANOVA, (one way) that showed the significance ($P<0.05$) level of differences between the treatments. This statistical analysis was performed with the aid of the computer software SPSS programme version 16.

Results

Brood stock Management

Application Rate of Fertilizer in Brood Rearing Ponds

The brood ponds should be free from weeds and predators and should be enriched with manures and fertilizers. In the study site, they used urea, TSP and organic manure such as cowdung, mustard oil cake in their brood rearing ponds for growing natural feeds. (Figure 4).

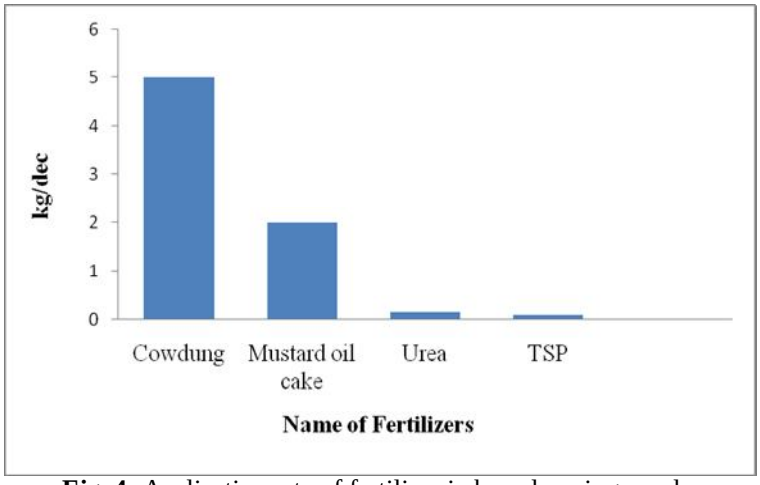


Fig. 4: Application rate of fertilizer in brood rearing ponds.

Sources of Feed for Brood Fishes

In the present study, it was mentioned that the hatchery owners followed several criteria to buy the brood fishes feed. During the management process, they used two types of feed such as formulated and market feed (Fig. 5). But in maximum time they used market feed such Mega feeds as their brood fishes feed. The hatchery owners are used pellet feed in their brood stock pond for the standard quality of feed. Most of the feeds were collected from market and the rest are formulated. They used formulated feeds two days and market feeds five days per week in a brood stock pond (table 5). But they can't maintained protein level of formulated feed in their brood rearing ponds.

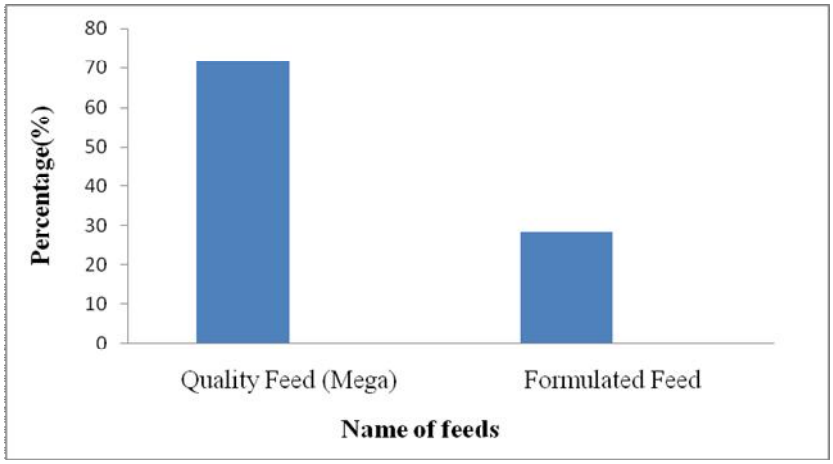


Fig. 5: Sources of feed for brood fishes.

Application Rate of Food and Feeding

In the present study, the brood fishes feed were formulated from Fish meal, Rice polish, Mustard oil cake, Maize meal, Soyabean meal, ata and vitamin premix. The brood fishes were reared for four months with feeding at two times a day according to the body weight of fishes. It was observed that the farmers feed Pangus as 2-2.5% body weight of fish in their brood rearing ponds. The percentage of different food ingredients of formulated feed are shown in table 5.

Table 5. Application rate of formulated feed in brood stock pond

Food ingredients	***Feeding rate (%)***
Fish meal	10%
Rice polish	30%
Maize meal	20%
Soyabean meal	15%
Mustard oil cake	20%
Ata	4%
Vitamin	1%

Proximate Composition of Feed Ingredients

The food nutrients are important for brood fish growth and maturation. It is the most crucial part for the management of brood fishes. Special dieting was maintained in early breeding season and continued up to the completion of breeding cycle. In the study period, it was recorded that the proximate composition of market feed (Mega feed) used in the brood stock ponds are Crude protein, lipid, Ash and Moisture (Table 6).

Table 6. Proximate composition of feed ingredients(Quality feed) in brood stock pond

Food ingredients nutrients	***Percentage (%)***
Crude protein	29.35
Lipid	8.68
Ash	12.76
Moisture	13.16

Water Quality Parameters of Brood stock Pond

Water quality parameter is the most important factor for brood fishes health, growth, survival and reproduction of fishes. The optimum level of DO is required for fish culture and reproduction. p^H(Hydrogen ion concentration) indicates acidity- alkalinity condition of a water body. It is called productivity index of water body. In brood ponds suitable temperature, DO, p^H and transparency are needed for survival and reproduction of fishes. During the experimental period temperature, DO, pH and transparency of water were recorded between (25- 30)^{0}C, (4.5-7.1) ppm, (7-8.5) and (23-31) cm respectively (Figure 6).

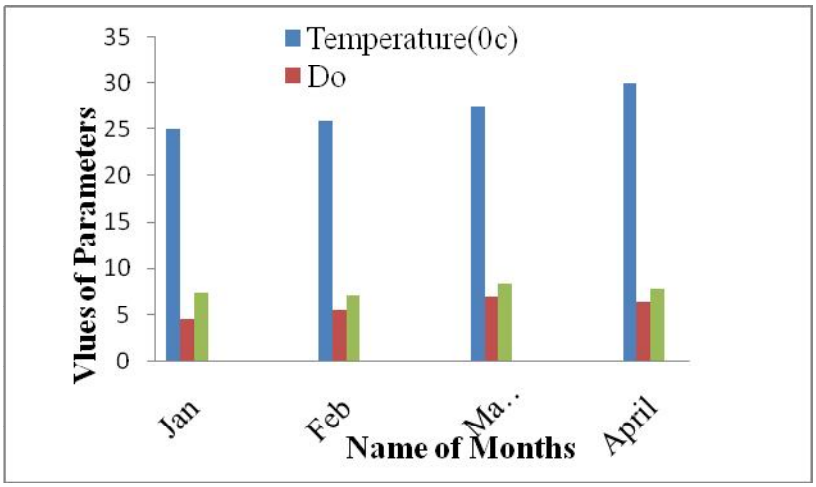


Fig. 6: The variation of water quality parameters in different months

Dose optimization with PG hormone

Dose optimizations with PG hormone for ovulation of female *P. hypophthalmus* were performed with different doses of pituitary gland extract. Three different doses viz., 8, 10 and 12 mg PG /kg body weight

of fish were applied whereas each dose was consists of one treatment e.g. T_1, T_2 and T_3 respectively (table 7 and Figure 7 and Figure 8). Corresponding data representing the effects of PG doses on fertilization rate, hatching rate, deformity and survival rate of *P. hypophthalmus* are shown in Table 7.

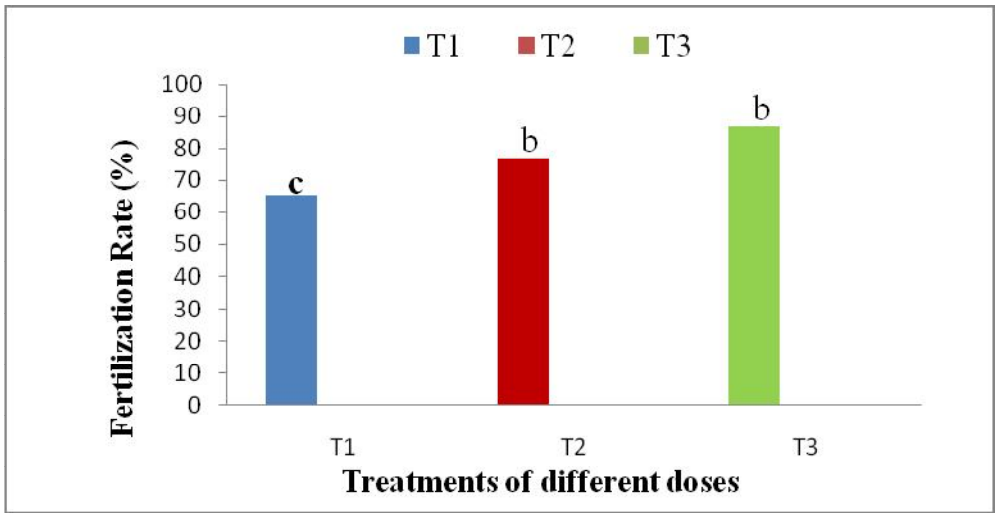


Fig. 7: Comparison of fertilization rate (%) of *P. hypophthalmus* during induced breeding with different doses of PG

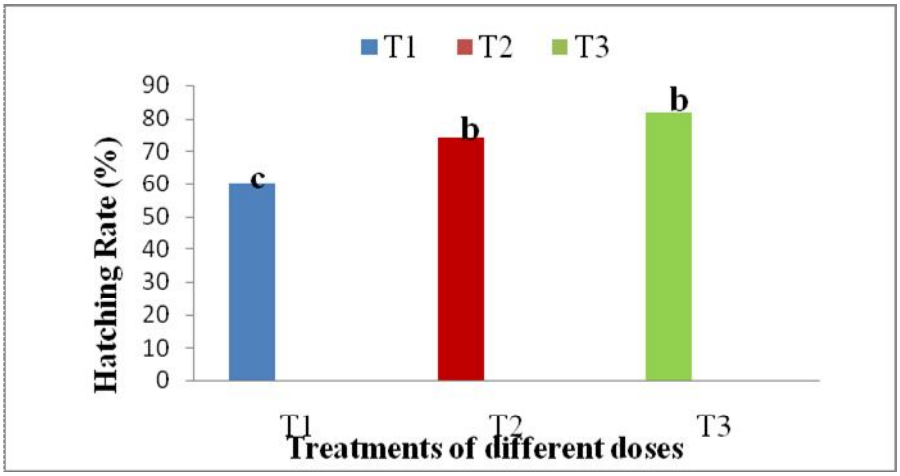


Fig. 8: Comparison of hatching rate (%) of *P. hypophthalmus* during induced breeding with different doses of PG

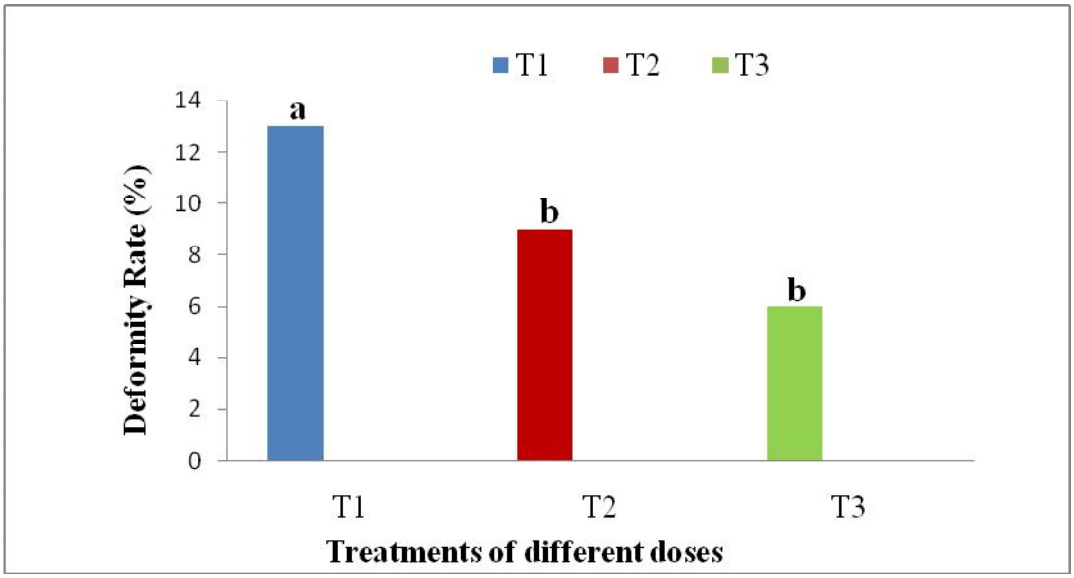


Fig. 9: Comparison of deformity rate (%) of *P. hypophthalmus* during induced breeding with different doses of PG

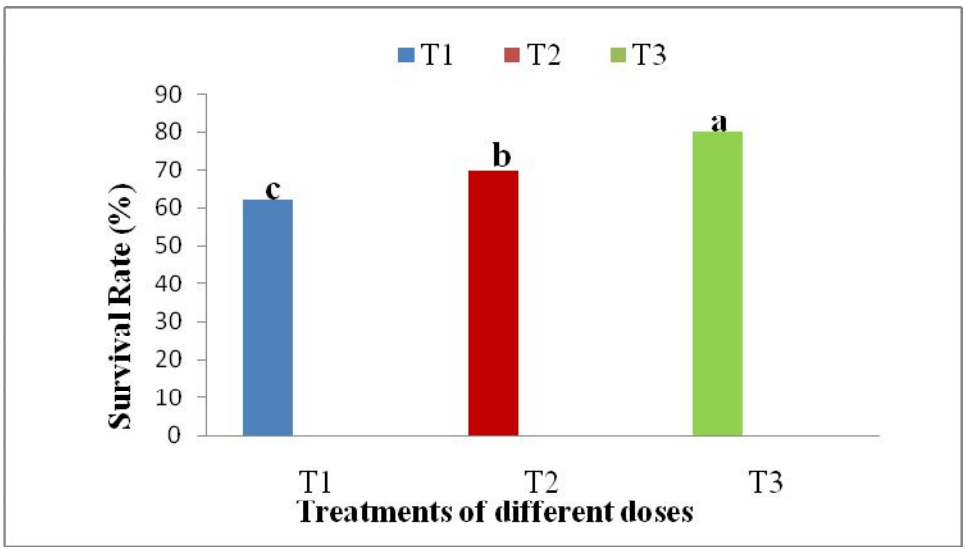


Fig. 10: Comparison of survival rate (%) of *P. hypophthalmus* during induced breeding with different doses of PG

Table 7. Performances of different doses of male and female on induced breeding of *P. hypophthalmus* under different treatments

Treatments	*Fertilization rate (%)* *Mean ± SD*	*Hatching rate (%)* *Mean ± SD*	*Deformed larvae (%)* *Mean ± SD*	*Survival rate (%)* *Mean ± SD*
T_1	65±5.00	60±5.29	13±3.00	62±2.64
T_2	77±3.60	74±2.00	9±2.64	70±2.00
T_3	87±4.00	82±2.00	6±1.73	80±3.00

Fertilization Rate of *P. hypophthalmus*

From the experiment, the fertilization rate were recorded 65, 77 and 87 % in treatments T_1, T_2 and T_3 respectively (Table 7 and Figure7). The highest fertilization rate (87%) was recorded in T_3 whereas the lowest fertilization rate (65%) was found in T_1.The results from the ANOVA test indicated that there was a significant difference among three doses of PG treatment T_3 was significantly (p<0.05) higher than that of treatments T_1 and T_2**.**

Hatching Performance of *P. hypophthalmus*

The hatching rate was found 60, 74 and 82 % in treatments T_1, T_2 and T_3 respectively (Table 7 and Figure8). The highest hatching rate was recorded 82% in T_3 and the lowest hatching rate was recorded 60% in treatment T_1. The result from the ANOVA test indicated that there was a significant difference among three doses of PG. It was found that hatching rate in T_3 was significantly (p<0.05) higher than that of T_1 and T_2.

Percentage of Deformed Larvae

The abnormality rate of larvae was found 13, 9 and 6 % in treatments T_1, T_2 and T_3 respectively (Table 7 and Figure 9). The highest abnormality rate was recorded 13% in T_1 and the lowest abnormality rate was recorded 6% in treatment T_3. The result from the ANOVA test indicated that there was a significant difference among three doses of PG. It was found that abnormality rate in T_1 was significantly (p<0.05) higher than that of T_2 and T_3.

Survival Rate of *P. hypophthalmus*

The hatching rate was found 62, 70 and 80 % in treatments T_1, T_2 and T_3 respectively (Table 7 and Figure10). The highest hatching rate was recorded 80% in T_3 and the lowest hatching rate was recorded 62% in treatment T_1. The results revealed that there was a significant difference among three doses of PG and a significantly (p<0.05) higher survival rate was observed in treatment T_3 compared to the other two treatments $T_1$and T_2 respectively.

Water Quality Parameters of Hatching Jars

In the present experiment, the water quality parameters such as DO, p^H and temperature were recorded under different treatments of hatching jars ranged between (4.1-4.4) ppm, (6.9-7.2) and (27-28.5) 0c respectively.

Discussion

Brood stock management is a major factor for breeding trials of any fish species. Khan and Mukhopadhay (1975) pointed that the success of induced breeding depends largely on the availability and proper selection of brood fishes, which was suggestive of our findings.

It was found that brood stock is properly managed in the brood rearing pond until the breeding (Robert *et al*. 1982). In the present study, stocking density are generally done in the hatcheries ponds are 25- 30 kg/decimal which is more or less similar to the recommendation of DoF (2004).

In the present study, hatchery owners used urea, TSP, MOP and organic manure such as cowdung, mustard oil cake in their brood rearing ponds for growing natural feeds. Cowdung was used at a rate of 5 kg/dec, Mustard oil cake 2kg/dec and Urea was used at a rate of 150 gm/decimal which is similar with the recommendation of DoF (2004).

In the present study, the hatchery owners used quality feeds as their brood ponds. The the hatchery owners supplied formulated and market feed at a rate of 28.57 % and 71.42% in their brood rearing ponds. This data is more or less similar to Kuddus (2011) who mentioned that the feed of catfishes were collected from the market 80% and formulated feed(home made) 20% in the hatcheries.

It was mentioned that the hatchery owners in the Jessore region used fish meal (10)%, Rice polish (30)%, Maize meal (20)%, Mustard oil cake(20)%, Soyabean meal (15)%,Ata (4)% and vitamin premixes 1%, supplementary diet in the hatcheries catfishes brood stock pond. It was recorded that the proximate composition of Mega feed used in the catfishes brood stock pond, crude protein (29.35)%, lipid (8.68)%, ash (12.76)%, moisture (13.16)% and vitamin 1%. This data was similar to Hoque, (1990).

In the present study temperature was varied from January to April at (25-30) 0c during the study period. Hossain (1989) recorded that in Bangladesh most of the catfishes breed from June to August when temperature remained from 28 to 340c. Temperature ranging from 26.5 to 350C is reported to be appropriate for spawning of major carps (Ibrahim et al. 1968).

In the present study, dissolved oxygen concentration in water varied from January to April is (4.5-7.1) ppm which is more or similar to Ali et al. (2008). Most water bodies have pH within the range of 6 to 8.5. The slightly alkaline pH is most suitable for fish culture. Acidic pH of water reduces of the growth rate, metabolic rate and other physiological activities of fishes (Swingle, 1967). In the study period, the range of pH varied from (7-8.5) from January to April. The findings of the study were more or less similar to the findings of Bhuyan (1970).The transparency is a gross measure of pond productivity. Boyd (1990) recommended that the transparency ranged from 15 to 49 cm is appropriate for fish culture. The transparency variation in different months ranged from (23-31) cm during the study, which was similar to findings of Rahman (1999) and Uddin (2002).

In the study period, the hatchery owners generally breed carp fishes and catfishes but they are mostly dependent on carp breeding. Rahadujjaman (2011) who mentioned that there are 60 fish hatcheries in Jessore region and maximum of which was carp hatcheries.

Edwards et al. (2000) emphasized the importance of freshwater fish seed quality in Asia and suggested criteria for selecting good quality brood for aquaculture.

In the present study, it was observed that the hatchery owners conditioning broods in the hatcheries rectangular tanks. The brood fishes were transferred to the conditioning tanks for 6-7 hours respectively. During conditioning, the male and female were kept separately, prior to administration of the inducing agents. Continuous water flow by shower was given in the conditioning tank to ensure proper aeration (Kuddus, 2011).

After conditioning of brood fishes, the weight of each fishes were taken for the preparation of PG dose. It was observed that, the broods of Pangus were generally minimum age of 4 years and weight of male and female were minimum 3 and 5 kg of each fish. This value is more or less similar to Santigoet al. (2004) who mentioned that the cat fish brood of Pangus were generally minimum age of 2 years and weight were gained female 2-2.5 kg and male 2 kg.

In the present study, the injection were administrated into the muscular basal of tail region of the fishesThe injection was done very carefully with a 3 ml syringe. The needle was inserted at about 450 angles to the body surface (Haniffa and Sridhar, 2002).

The male fishes were found to be responding by a single dose of 1 mg PG /kg body weight. Rahman (2001) was able to breed Ompokpabda in hapa by administration of a single PG dose of 14 and 16 mg/kg body weight for female and 12 mg/kg body weight for the males.

In the present experiment, the females were injected at the rate of 8 (T_1), 10 (T_2) and 12 (T_3) mg PG/kg body wt. On the other hand, the males were administrated a dose of 1 mg PG/kg body wt. for all

treatments. This findings is more or less similar to Islam (2002) who reported that the doses of PG were ranged between 1-2, 30-35, 30-35 and 8-10 mg PG/kg of body weight of male of Pangus, Shing, Magur and Pabda.

In the present study, the average fertilization rate of Pangus was 87% (T3) for dose of 2-12 mg PG/kg and the lowest rate was found 65% (T^1). Islam (2002) have observed that induced breeding experiments among 4 doses of PG showed the best result in the form of fertilization rate (87.89%).

Present findings of fertilization rate coincide with the result of Akhteruzzamanet al. (1993), who recorded a fertilization rate of Pangus 75% at the dose of 3-10 mg PG/kg body weight for females and 1 mg PG/kg of body weight for male in hapa, among which doses of 2-10 mg PG/kg fish gave the best results.

It was observed that the average hatching rate of Pangus was 82% (T_3) during the present study. Rahman (2001) found that, the hatching rate of Pangus was 72% in hapa by administration of a single PG dose of 2 and 10 mg PG/kg fish to the female and 1-2 mg PG/kg fish to the male. Sultana (2011) reported that the average hatching rate of Pangus 80% when treated with PG doses of 2-12 mg/kg body weight of fish.

The average percentage of hatching obtained in $T_3$was significantly different to the T_1 and T_2 at 5% significance level. Islam (2002) have observed that induced breeding experiments among 4 doses of PG showed the best result in the form of hatching rate (76.21%) .

It was observed that the average deformity rate of Pangus was 13% (T_1) during the present study. This findings is similar to the findings of Ohta*et al.* (1996) who showed that the higher percentage of abnormal larvae ranging from 8%–12% was also observed when the females were injected 4000 and 5000 IU kg–1, and stripped at 20–23 h and 14–23 h post-injection respectively. The high fraction of abnormal larvae at these combinations may have originated from fertilization of over-ripped eggs in this catfish *Pangasianodonhypophthalmus*(Legendre *et al.* 2000).

It was also found that the highest deformity rate obtained in $T_1$was also significantly different to the other treatments T_2 and T_3at 5% significance level.

In the present experiment, it was observed that the average survival rate of Pangus was 80% (T3) during the study period. The highest survival rate of Pangus, Shing, Magur and Pabda were 70%, 66%, 68% and 66% in June and lowest rate was 60%, 58%, 54%, 56% in August 2014(Rahman, 2001).

It was also found that the best survival rate obtained in T3was also significantly different to the other treatments T1 and T2 at 5% significance level.

Physico-chemical condition of water such as temperature, dissolved oxygen and pH of water in hatching jars under different treatments of P. hypophthalmusranged between (27-28.5)0C, (4.1-4.4)ppm and (6.9-7.2) respectively. Temperature ranging from 26.5 to 340C is reported to be appropriate for spawning of catfishes (Ibrahim et al. 1968).

It is very difficult to identify the reason for such differing results. From the above discussion it can be said that, the fertilization, hatching, deformity and the survival rate of larvae differs mainly due to the hormone dose as well as quality of brood, seasonal variation, incubation density, water flow during incubation, quality of hatchery water, aeration system of hatching jar, handling procedure of the broods, and the source of PG. But upon all consideration PG of 2-12.0 mg for per kg body weight for female and 1 mg/kg body weight for male may be recommended for induced breeding of P. hypophthalmusin a hatchery.

Conclusion

The hatcheries of Jessore district, management of brood stock was satisfactory. The hatchery workers were very much careful in hatchery operation so the quality of hatchery produced spawn and fry was good. They maintained proper age and growth rate of hatchery produced spawn and fry was satisfactory. The study was conducted to obtain the dose optimization of pituitary gland for induced breeding of *P. hypophthalmus* and to determine the fertilization, hatching, deformity and survival rate of *P. hypohthalmus*.

The present study consisted of three treatments with three replications was designed to optimize the suitable dose of PG hormone for the best performance. Nine pairs of male and five pairs of female were selected as a ratio of 2:1 from the ponds and different doses of PG were administrated to examine its effect. To observe the effective dose for induced breeding, the females were injected at the rate of 8 (T_1), 10 (T2) and 12 (T3) mg PG/kg body wt. On the other hand the males were administrated a dose of 1 mg PG/kg body wt. for each treatments. Then the eggs and sperm were collected by stripping and fertilization was done. Fertilization and hatching rates were determined. Then the survival rate was determined after three days of hatching. At 27to 290C water temperature the best result in terms of

fertilization (87%), hatching (82%), deformity (6%) and survival (80 %) rates were found among the three treatments. The highest percentage of fertilization, hatching and survival rate obtained in the present experiment may be considered as satisfactory and the highest deformity was found in treatment T_1. However; there is scope for further improvement in the process. The present findings can be used in induced breeding of *P. hypophthalmus* in hatcheries.

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