

RESEARCH ARTICLE

BIOTECHNOLOGY

MANAGEMENT OF *OMPOK PABO* BROODERS - A PRE REQUISITE STRATEGY FOR CAPTIVE BREEDING**D. SARMA*¹, J. DAS¹ AND A. DUTTA²**¹Department of Zoology, Goalpara College: Goalpara-783 101, Assam (India)²Department of Zoology, Gauhati University: Guwahati-781 014, Assam (India)**D. SARMA**

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ABSTRACT

Present investigation deals with management of *Ompok pabo* brooders up-to maturity for the period of December/2007 to November/2010. Brood fishes of the sizes 12 to 16 cm in total length and 22.19gm to 25.20gm were collected, released and cultured in the polyculture pond with proper management. Essential water quality parameters were monitored regularly and corrected during the period of study. Brooders were fed with earth worm, formulated food, live & trash small fishes, formulated pellet of mixed silk worm pupae and rice polish in appropriate rate and ratio. Maturity was attained at the age of about one year in the stocking pond after rearing for six months. Fully matured brood fishes were measured 21.0 cm to 23.7 cm in total length and 65.0 gm to 75.0 gm in weight. Sexual dimorphism of Males and females could be fully distinguishable from the month of May onwards.

KEYWORDS

Management, Brooders, *Ompok pabo*, Breeding, Maturity,

INTRODUCTION

Successful breeding of any fish species requires quality brood stock which can produce high quality seeds. In this regard, management of brood stock plays an important role in obtaining successful results in induced breeding. Chakrabarti *et al.* (2009)¹ assumed that scaling up of farming requires a consistent supply of good quality seed, necessitating captive breeding; careful brood stock management and larval rearing. According to Sahoo *et al.* (2010)², availability of quality seed is one of the pre requisites for successful culture of any species. On the other hand, to avoid loss of genetic diversity and inbreeding depression problems in hatchery population, proper brood stock management strategies and effective breeding plans for commercially important fish species need to be designed and implemented.³ Therefore, to ensure high fry survival and reproductive success there is need to improve the sperm and egg quality through improved brood stock nutrition.⁴

The quality of sperm is highly variable and depends on various external factors such as feeding regime, the quality of the feed and then rearing temperature of the fish.⁵ Maturity condition of the brood fish is also a key factor for breeding success. It can be examined by observing the sexual dimorphism, which is mostly prominent in the breeding seasons. The genital pore, the size of the head, the shape of the body, abdomen of the fishes and the body coloration of both the sexes are examined for finding a practical way of discerning the sex.⁶

The reproduction, growth, and development of the fish are carried out in the water.⁷ Therefore, there should be a better water quality to ensure the fish to grow and develop which is very important for fish. Water to fish does not merely serve as a solvent for life, but an indispensable habitat for fish; its degree of excellence is the

most determining factor for the propagation of desirable aquatic organisms. Fish pond management however includes all management practices applied to fish ponds in order to increase the yield per unit area of pond *i.e.* the water quality, fertilization of ponds, feeding, stocking, stock manipulation etc. Present study deals with all the above parameters for the successful preparation of the brooders of *Ompok pabo* for captive breeding program.

MATERIALS AND METHODS

Study area

The investigation was carried out for three successive years from December/2007 to November/2010. The study area is located in the Goalpara College campus, Goalpara, Assam, India. It lies between the latitude 26° 10' 11" N and longitude 90° 37' 37" E. The area of the pond is 120 m² with an average depth of 1.9-2.5 m. Goalpara district is situated on the south bank of river Brahmaputra. The geographical location of the district is between latitude 25° 50' to 26° 20' N and longitude 90° 10' to 91° 05' E. The climate in the district is moderate during the winter and in summer it is hot. The maximum temperature is 32° C during July and August and the minimum temperature dips down to 14°C in the month of January. Relative humidity (RH %) during summer is 91.2% in day time and 75.2% in night and in winter months it is 51.1% at day and 35.5% at night.⁷

Pre stocking management of pond

The pond was pretreated with KMnO₄ @ 5% concentration before 7 days of releasing of the brooders. It was cleaned mechanically to remove unwanted weeds and vegetation. Water of the pond was disinfected with Bleaching

powder @ 2 mg l⁻¹ to eradicate insects and predators. Bamboo barricade was given throughout the pond to prevent the entry of foreign animals. Tree branches of the bank of the pond were also cut down for easy penetration of sun light to the pond water. Two trenches were dug out for maintaining desired water level of the pond during rainy seasons.

Collection & release of brooders

Brooders of pabo (130 nos) were collected from Goronga beel near Pobitara Wildlife Sanctuary of Morigaon district, Assam in December, 2007. Collection was done with the help of fishers. The size of the species was 12 to 16 cm in total length and weight was 22.19gm to 25.20gm. They were transported to the pond in well oxygenated packets. Collected brooders were kept in quarantine tank for 5 hours for acclimatization and released in the pond after treating with 5% KMnO₄.

Post stocking management of pond

Physico chemical parameter analysis of pond water was done twice in a month. Correction measures were also taken as far as possible followed after Saha (1996)⁸; Boyd (1998)⁹. Water quality assessment was performed adopting the method of Trivedi and Goel (1986)¹⁰; APHA (1989)¹¹. For analysis of all parameters, climate of Goalpara district may be divided into four seasons *i.e.* premonsoon, monsoon, retreating monsoon and winter.¹² Brooders were reared and managed followed after Hussain (1997)¹³. Nutritional requirements of fry and larval rearing were performed followed after the method of Tesch (1971)¹⁴; Booth and Alquezar (2002)¹⁵. Monthly fishing was done to check the fish growth as well as maturity condition. In each time of fishing, 10 fishes were sampled and total Length (TL) of the fish was measured using meter scale calibrated in centimeters. Fish weight was measured after blot drying with a piece of clean hand towel. Weighing was done with a tabletop weighing balance to the nearest gram.

RESULTS

Management of water quality

Seasonal fluctuation of water quality parameters were observed during the investigation period in the three annual cycles with little exception (Fig 1. A-H). The water temperature of the pond was observed between the ranges of 20.5^oC to 31.0^oC. In the first and third annual cycle seasonal water temperature was observed quite normal. But, in the year 2008-09 it was maximum (29.1^oC) in pre—monsoon and minimum (26.63^oC) in the retreating monsoon season. In all the three annual cycles, pH values of pond water were estimated between 7.9 and 8.5. Lowest mean pH value was observed in winter and highest in Pre monsoon. Present studies indicate that the water of the experimental pond was in the alkaline side during the investigation period. DO value was observed between the range of 6.8 mg l⁻¹ and 14.09 mg l⁻¹ maximum being observed in retreating monsoon and minimum in winter. All the three annual cycles experienced same trend of mean DO values in the four seasons. Free CO₂ ranges between 0.22 mg l⁻¹ and 8.8 mg l⁻¹ of which maximum was observed in winter and minimum in monsoon seasons. It has been observed that the mean FCO₂ values in all the seasons of three annual cycles were having same trend of fluctuation. Alkalinity Values were found between the ranges of 55 mg l⁻¹ and 137 mg l⁻¹, the highest being in monsoon and the lowest in retreating monsoon seasons. Total acidity values estimated between the ranges of 0.66 mg l⁻¹ and 11.0 mg l⁻¹ of which highest was being recorded in retreating monsoon and lowest was being observed in the monsoon seasons. During the investigation periods, the hardness values of the pond water fluctuate between the ranges of 34 mg l⁻¹ and 94 mg l⁻¹ month wise. It was observed maximum in winter and minimum in the

retreating monsoon seasons. Chloride value was estimated between the range of 3.47 mg l⁻¹

and 16.33 mg l⁻¹ of which lowest being in ___monsoon and highest being in winter

seasons.

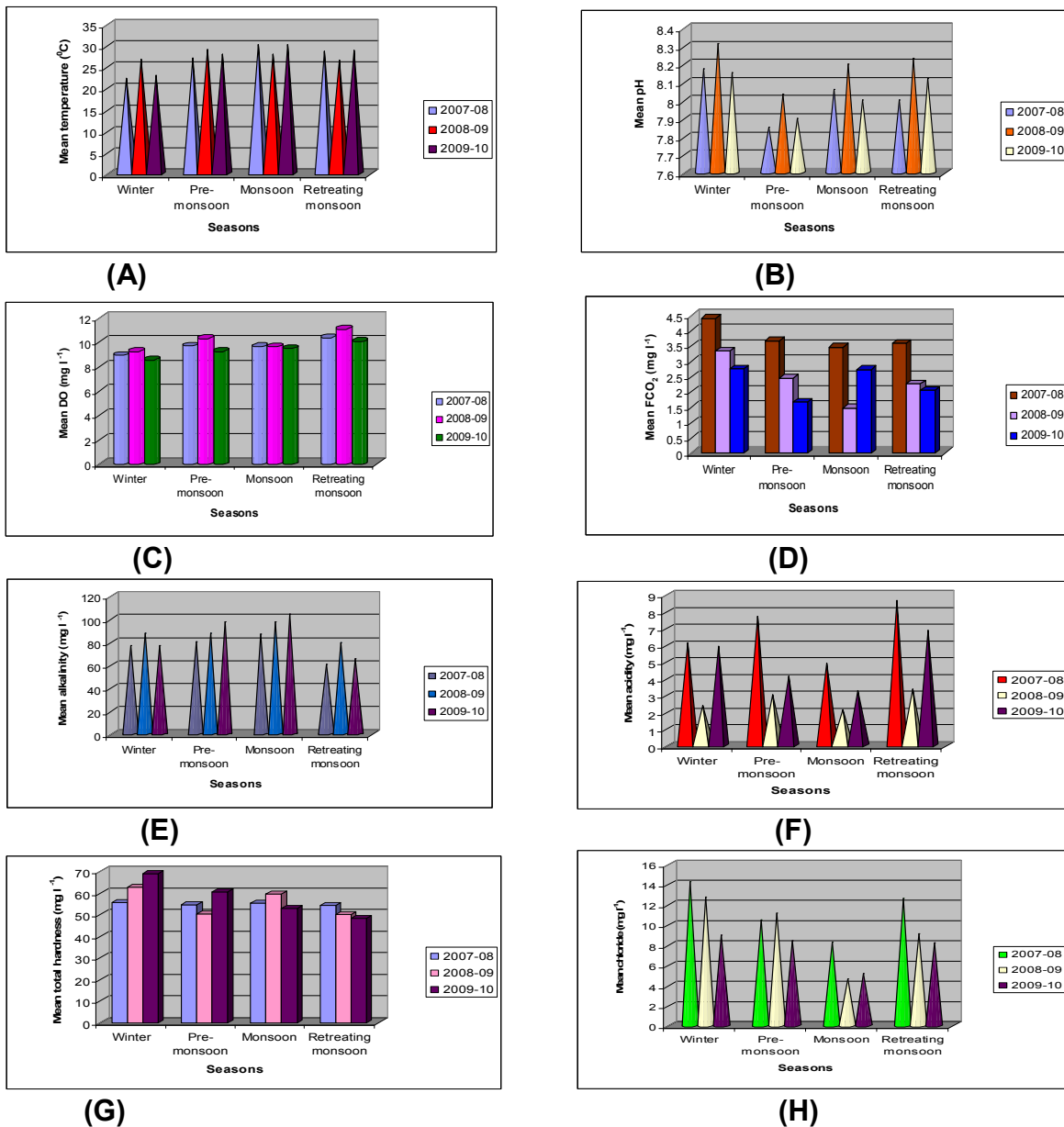


Figure 1.
Mean water analysis of pond water in three annual cycles.
(A) Temperature (B) pH (C) Dissolve Oxygen (DO) (D) Free CO₂ (E) Alkalinity (F) Acidity (G) Hardness and (H) Chloride.

Feeding to brood fish

It has been observed that *Ompok pabo* is carnivorous in nature, which mostly feeds on small fishes, aquatic insects, insect larvae, earthworms etc. Among all the diets, live food

i.e. earthworm is very favorite for this species. The ingredients and composition of food items were as follows:

- 1) Chopped earth worm @ 25 to 30 gm/kg body weight.

- 2) Formulated food (rice bran 55%, mustard oil cake 30%, molasses 10% and dry fish powder 5%) @ 45 to 50gm/kg body weight.
- 3) Live as well as trash small fishes *i.e.* *Puntius* sp., *Rasbora* sp. etc. were supplied @200gm/kg body weight.
- 4) Formulated pellet of mixed silk worm pupae and rice polish @ 100 to 150 gm/kg body weight.

found distinguishable as the belly of the female gets enlarged while the male developed slightly rough pectoral fin. Maturity of Pabo brood fish was attained at the age of about one year in the stocking pond after rearing for six months. Maturity of gonads initiated from the first week of May to last part of August. Fully matured brood fishes were measured 21.0 cm to 23.7 cm in total length and 65.0 gm to 75.0 gm in weight. Breeding efficiency was found from the month of late May to July at the favorable climatic condition. But it may extend up to the month of August depending upon the onset of monsoon.

Maturity of the brooders

Till the month of February, sex was not easily distinguishable. In the month of March it was

Table 1.
Brood fish culture and observed maturity condition

Month	Length attain (cm)	Weight attain (gm)	Maturity condition	
			Male	Female
Jan	13-17.6	22.9-27.0	Not distinguished.	Not distinguished.
Feb	16.3-18.6	26.7-32.0	Not distinguished.	Not distinguished.
Mar	17.2-20.4	39.5-62.5	Pectoral fin slightly rough.	Enlargement of belly slightly.
Apr	19.1-21.3	60.0-65.7	Slightly serrated pectoral fin.	Enlargement of belly continued.
May	20.5-22.0	63.5-68.5	Rough pectoral fin	Swollen abdomen with reddish anus.
Jun	21.0-23.7	65.0-75.0	Freely oozing milt while slight pressure on the abdomen.	Bulging abdomen demarcated as two lobes.

Sexual dimorphism

Sexual dimorphism could be fully distinguishable from the month of May. Pectoral fins of male become rough and serrated, the genital papilla pointed and narrow with freely oozing milt while applying slight pressure on the abdomen. In case of female, the pectoral fin was smooth and genital papilla was found swollen and reddish in color. The abdomen was soft and bulging in appearance. Maturity of female can also be determined by observing the demarcation line of two lobe of the ovary. This line will be very prominent in the high maturity stage. The size of the female is generally broader and bigger comparing to the male.

DISCUSSION

Physico chemical parameters play a significant role in the maintenance of a healthy aquatic environment and production of natural food organisms.¹⁶ The ranges of water temperature (20.5°C to 31°C) recorded from the experimental ponds were within the suitable range for the culture of fishes.¹⁷ Similar finding was also recorded by Rahman *et al.* (2008)¹⁸ during the production of *Ompok pabda* in nursery pond.

The pH was observed neither strong nor alkaline supported by the finding of Pahwa & Melhotra (1996)¹⁹. Fish survive and grow best in waters with a pH between 6 and 9. If pH

readings are recorded beyond this range, fish growth is reduced.²⁰ Thus, the pond water was mostly suitable for fish culture. Similar observation was also reported by Rahman & Rahman (2003)²¹ and Ali *et al.* (2005)²².

Normally, dissolved oxygen level is low in ponds stocked with a high density of fish compared to ponds where stocking density is low.²³ However, the DO level was within the acceptable range for fish culture.^{24, 25} Maximum values of DO in the retreating monsoon might be due to inflow of oxygen rich water following the monsoon showers.

At higher concentrations, CO₂ causes fish to lose equilibrium, become disoriented and possibly die. Maximum FCO₂ concentration observed in the winter is due to decomposition of organic matters by the microbes to release free CO₂. According to Boyd (1998)⁹, the desirable limit of CO₂ is from 1 to 10 mg l⁻¹. In the present study also the values are recorded within this limit.

The level of alkalinity in the present study indicate that the productivity of the ponds was medium to high.^{25, 26} The high values of alkalinity are indicative of eutrophic growth in the water body.²⁷ Abdo (2005)²⁸ revealed that high bicarbonate alkalinity values of pond indicate their high productivity and consequently favorable contribution for fish production.

Water normally gets acid reaction due to the organic acid resulted from high content of humus. Acidity of pond water is also related to the concentration of free carbon dioxide. The present study also reveals the same trend except in the retreating monsoon seasons.

Total hardness refers to the concentration of calcium and magnesium in the water. Hard waters are generally more productive than soft waters.²⁹ Present findings shows maximum hardness in winter may be because of higher concentration of magnesium.²⁸ The total hardness of the pond water during investigation period was soft to moderately hard.

Chloride is one of the major inorganic anions in water and waste water.³⁰ According to Boyd (1998), pond water having chloride values from 1 mg l⁻¹ to 100 mg l⁻¹ is desirable for pond

aquaculture. In the present study, highest chloride concentration in the winter might be due to the eutrophication of the pond water.

The quality and quantity of feed as well as feeding regime are important for spawning as well egg quality.³¹ In the present study, the brood fishes were fed with earth worm, formulated food, live & trash small fish, formulated pellet of mixed silk worm pupae and rice polish. Mukherjee *et al.* (2002)³² was also used mustered oil cake and rice bran in the ratio of 1:1 for the *Ompok pabo* brood fish. However, in the present study, the main food item used was the earth worm as it contains all the essential amino acids required in fish feed.³³

Maturity of *Ompok pabo* was observed after rearing for six months which indicates that a speedy growth might be due to the supply of highly proteinous food items to the brood fishes. Maximum breeding efficiency in the months from late May to July observed is due to suitable temperature as well as monsoon rain which made the climate favorable for breeding. Similar observations were also reported by Mukherjee *et al.* (2002)³² in case of *Ompok pabo*. Chakrabarty *et al.* (2009)¹ also reported same results in case of *Ompok pabda* rearing for induced breeding operation.

Sexual dimorphism of *Ompok pabo* distinguished in the breeding season (from the month of May) indicates that they are ripe and ready for spawning. In *Ompok pabda*, females can be distinguished by a rounder, fuller abdomen, reddish vent colour and rounded genital papilla, while males have an elongated and pointed genital papilla.¹ According to Mahapatra (2004)³⁴, a fully mature female *Clarius batrachus* looks a bit heavier as its abdomen is distended with eggs. Present findings also agree with the above sexual characters.

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