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Preliminary success on hormone induced captive breeding of goldspot mullet, *Liza parsia* (Ham.)

M.J. Alam*, M. Begum, H.K. Pal, M.A. Islam and Abdullah-Al Mamun
Bangladesh Fisheries Research Institute, Brackishwater Station
Paikgacha, Khulna, Bangladesh
*Corresponding author

Abstract
An attempt was made to breed goldspot mullet, *Liza parsia* in captivity through hormone induction. The fish started spawning 35~36 hours after a single dose of 2ml ovaprim per kg body weight. Hatching of fertilized eggs completed within 42~48 hours after spawning. The mean hatching rate (%) was 71.33±12 corresponding to the fertilization rate (%) of 64±12. The larvae started its first external feeding on the third day and attained a length 2.5±0.25 mm. The salinity of both breeding and rearing cisterns was 20‰ and temperature was maintained at 22~23^{0}C.

Key words: *Liza parsia*, hormone induced captive breeding.

Introduction

The fish *Liza parsia* (Ham.), under the family Mugillidae commonly known as goldspot mullet, is a catadromous fish and widely distributed in the coastal waters of tropical and sub-tropical regions extending from 42^{0}N to 42^{0}S (Talwar and Jhingran 2001, Nash and Shehadeh 1980). The fish *Liza parsia* is commonly available in shallow coastal waters, estuary and mangrove swamps of Bangladesh. The adults and juveniles are hardy, euryhaline and eurythermal. It is one of the most favorite, tasty and commercially important fish in Bangladesh as well as Southeast Asia, India and many parts of central and South America. The popularity of these species in aquaculture is due to high quality of its flesh, its extreme tolerance for a wide range of temperature and salinity, which is important for culture in intertidal ponds (Nlewadim and Deekae 1997).

A few works have been done on the biology of mullet, with brief accounts on fecundity, GSI, reproductive characteristics and spawning (Hsu *et al* 2007, Rheman *et al* 2002, Ergene 2000 and Cherif *et al* 2007) and only one study has been reported on artificial breeding of closely related species *L. subviridis* (Das, 1992). Ergene (2000) reported that the peak reproduction period of *L. ramada* lies in November through December. The mullet is a winter breeder and the suitable breeding temperature is 20~23^{0}C (Hsu *et al* 2007, Huang and Su 1986, 1989, Kuo 1986, Shyu and Lee 1986).

As no attempt has so far been made in artificial breeding and fry production of *L. Parsia* and considering the fishery and aquaculture importance of the species, Bangladesh Fisheries Research Institute has been conducting research on its breeding and mass seed production in captive condition. This communication reports on the success of the hormone induced captive breeding and fry production of *L. parsia* for the first time in Bangladesh.

Materials and methods

The study was done in between October to December 2008 at the Brackishwater Station of the Bangladesh Fisheries Research Institute (BFRI), Paikgacha, Khulna.

Fish and experimental vessel

Live gravid females and ripe males, on the basis of their morphological criteria, of *L. parsia* were collected from a local shrimp farm. The gravid female has swollen belly with round and reddish genital papillae. The ripe male secrets milky white milt on gentle pressure in its anal region. The female broods were of 22~25 cm in total length and 142~174g in weight while the males were of 16~20 cm and 70~90g. The fishes were kept in a circular concrete cistern (2 m dia x 1 m depth), filled with filtered pond water of 7‰ salinity, which were gradually increased up to 20‰ by adding 150‰ brine in 72 hrs. Pelleted feed was given in a tray and cleaned up time to time. Fishes, with a female:male sex ratio of 1:2, were kept in a similar cistern containing 20‰ water after hormone injection. A continuous current flow was maintained (16 m/min) for 34 hrs and then stopped for creating calm situation for pairing of the fishes. There were no water shower but aeration was provided with portable electric aerator. Water temperature of the breeding cistern was maintained between 22~23^{0}C using electric thermostat.

Hormone dose and injection

A synthetic gonadotropin releasing hormone analogue (SGnRH) commercially known as "Ovaprim" (Syndel Lab. Ltd., Vancouver, Canada) was used in this study. After 72 hrs of acclimatization, fishes of both the sexes were injected hormone at a dose of 2ml kg^{-1} body weight. In case of both male and female, a single dose of hormone was injected in deep muscle at the base of the dorsal fin.

Spawning, fertilization and larval rearing

Spawning behaviour of injected fishes was closely observed visually. After 12 hours since the first spawning, all fishes were removed from the spawning cistern. The eggs were floating and drifting in nature. To determine the ovulation success, spent fishes were stripped and the females from which no egg to come out were considered fully ovulated. In case of any egg to come out, the spent females were dissected and eggs retaining in the abdomen were counted. The numbers of unreleased eggs were used to

calculate the number of egg released, taking into account the relative fecundity of 867, 949 and 644 eggs/g body weight of the species in the months of October, November and December, respectively (Rheman *et al.*, 2002). The information also demarcated that December is the peak breeding season of the goldspot mullet. A random 100-egg samples were studied under a trinocular microscope and classified as fertilized and unfertilized. The fertilization rate was calculated as the number of fertilized eggs divided by the total sampled number (n=100) of eggs. Hatching percentage was estimated by random volumetric sampling and counting of the newly hatched larvae. Meanwhile the newly hatched larvae were transferred to three circular fiber glass tanks having identical salinity and temperature. When about 80% of the hatchlings were observed with their absorbed yolk sac, feeding was started with boiled and screened hen's egg yolk for two days. Subsequently newly hatched *Artemia* was given for rest of rearing period (20 days).

Results and discussion

The spawning activity appeared to continue first after 36 hours post injection. This period is reported 34-35 hours for *M. parsia* (Radhakrishnan *et al*, 1976), 48-52 hours for *L. subviridis* (Das 1992), 40-50 hours for *M. cephalas* (Liao 1975). The fishes started pairing just before they spawned, males were observed more active during the time of mating. The first release of a small number of eggs stimulated the male to release spermatozoa. The female then responded with a jerk and release huge eggs, while spawning males stayed besides females close to the tail and fertilized releasing eggs as soon as those scattered. The spawning rates (%) were 65±8, 54±12 and 42±6 for October, November and December trials respectively. The fertilization rates (%) were 72±11, 64±9 and 56±16 in aforesaid three consecutive months (Table 1).

Table 1. Spawning, fertilization and hatching data in hormone induced breeding trials of *L. parsia*

Months	Size of brood (g)	Latency period (hr)	Spawning rate (%)	Fertilization rate (%)	Incubation period (hr)	Hatching rate* (%)
October 2008	♀ 96±13 ♂ 64±8	35	65±8	72±11	44±2	82±12
November 2008	♀ 134±11 ♂ 72±7	36	54±12	64±9	45±3	76±8
December 2008	♀ 165±8 ♂ 80±10	35	42±6	56±16	44±3	56±16

*Hatching rate was calculated on the basis of considering fertilized eggs as base unit (100%).

In the present trial, the eggs took 42~48 hours after spawning to hatch out. Das (1992) reported that the incubation period of *L. subviridis* is 32~36 hours at 22~25^{0}C and 38~42 hours at 20~21.5^{0}C of temperatures. The hatching duration of *L. parsia* was a bit wide, as every pair of brood did not laid eggs at a time but the time span was very close for all the three trials. The hatching rates (%) were 82±12, 76±8 and 56±16 for

October, November and December trials respectively. The hatching rates were calculated on the basis of considering fertilized eggs as base unit (100%). Similar observation was reported by Das (1992) having a hatching rate 62.5% for *L. subviridis* that were artificially bred on winter but the count was based on total laid eggs.

The time required to develop larvae from first cleavage to hatch out takes 44 hours, where myomers were differentiated after 40 hours of development. The day-old blackish larvae showed peculiar jerking/crippling movements. Development of mouth cavity was started at the 3rd day and the yolk sac and the oil globules were reduced and larvae started first feeding. A 12-day old fry looks like a complete fish with every fins, well developed gills, darker in color and observed to swim in school. The salient features of such day-wise development of different larval stages of *L. parsia* under captive breeding conditions are described in Table 2 and shown in Figs. 1-9.

Table 2. Salient features of larval development and behaviour of *L. parsia*

Age (day)	Total length (mm)	Description of development and behaviour
0	1.25	Newly hatched larvae had large yolk sac and oil globule; larvae were slightly curled; eye, mouth and anus were closed; notochord curved along yolk sac.
1	1.5	Yolk sac tended to reduce; jerking/crippling movement; mouth and anus still closed; digestive tube not well developed.
2	2.0	Formation of organ was in progress; pigmentation on eye and body; mouth was under development; crippling movement.
3 to 4	2.25 to 2.75	Development of mouth cavity was started; yolk sac and oil globule reduced; larvae started to take feed; dorsal and pectoral fins appeared; well developed mouth; gill development appeared.
5 to 7	2.75 to 2.8	Digestive tube was well developed; fin rays appeared; mouth opened; well developed eye; normal movement; formation of stomach, intestine, gall bladder; reduction of oil globule continued.
8 to 9	3.25 to 3.50	Complete disappearance of oil globule, Formation of gill filaments. It was the flexing point growth curved the growth started to be accelerated.
10 to 13	3.75 to 4.15	Fin fold moved backward; gill filaments well developed; body surface become dark in color; larvae swam in school.
14 to 15	4.25 to 4.75	Fry swimming in school; body surface getting darker.
22	4.80 to 5.5	Fry have every similarity of its parents, showed phototaxis during day time, swimming during night; eyes were very clear.

The physicochemical parameters of the water in the breeding cistern were measured periodically following standard methods (APHA 1995) and the mean values are given in Table 3. The salinity of water used in the present study was a bit lower (20%), but values

of other parameters were close to those have been reported by Das (1992) for *L. subviridis*.

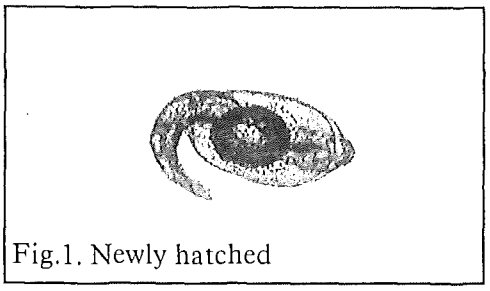

Fig.1. Newly hatched

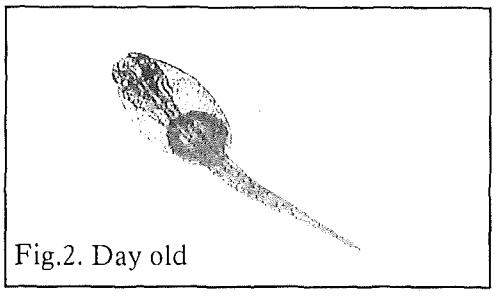

Fig.2. Day old

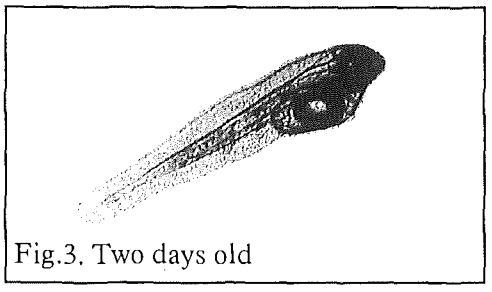

Fig.3. Two days old

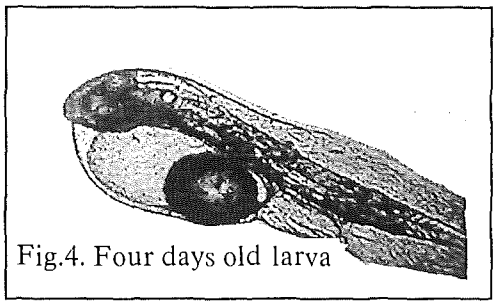

Fig.4. Four days old larva

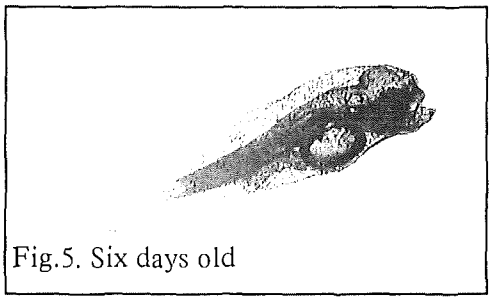

Fig.5. Six days old

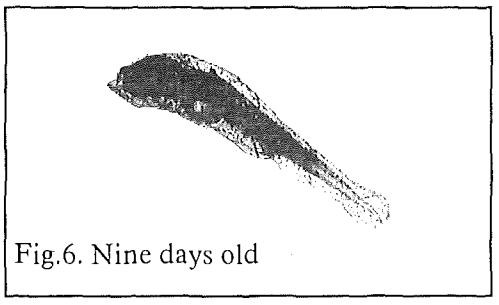

Fig.6. Nine days old

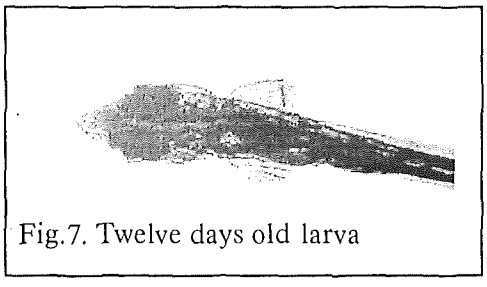

Fig.7. Twelve days old larva

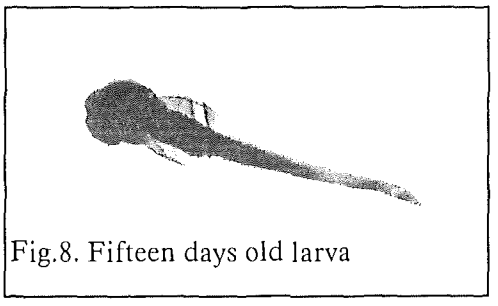

Fig.8. Fifteen days old larva

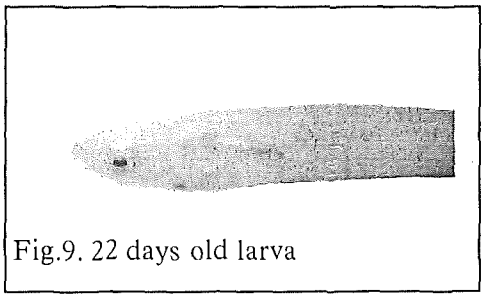

Fig.9. 22 days old larva

Figs. 1-9. Different development stages of *L. parsia* larvae at different days under captive breeding conditions.

Table 3. Values of different water quality parameters of breeding and rearing cisterns of *L. parsia*

Water quality parameters	Mean values ± SE	
	Breeding cistern	Rearing cistern
Water salinity (‰)	20±1	20±1
Water temperature (^{0}C)	22.5±0.5	22.5±0.5
pH	8.0±0.4	7.8±0.3
Dissolved oxygen (mg/l)	9.0±1.2	8.5±0.8
Alkalinity (mg/l)	146±6.0	138±8.0

Conclusions

The results of this article reveal that hormone induced breeding of *L. parsia* in captive condition is possible and would open a new era in the country for aquaculture and conservation of this commercially important brackishwater species. Further research are required for brood management, improvement and/or perfection of captive breeding technique, larval food and rearing, and mass seed production.

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