Breeder Management and Induced breeding of Sea bass, *Lates calcarifer* (Bloch,1790) in Myeik Archipelago

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Abstract

The study was conducted from September 2018 to February 2019 for the management of breeders in Sarr kyun (Latitude 12° 33′ 1.98″ N, Longitude 98° 28′ 40.33″ E) and induced breeding of sea bass in Yemyitkyi (Latitude 12° 33′ 27.0″ N, Longitude 98° 19′ 34.13″ E), Myeik Area. Breeders were obtained from the United K.M.K Company. The breeders were reared for two months before injection to be healthy fish. The male and female spawners were selected and injected hormone which was calculated to males and females, and their body weight. Induced breeding of study species was studied. The effects of weather and water parameters of the study area were collected.

Keywords: Breeder management, induced, Sea bass, *Lates calcarifer*, spawners

Introduction

Lates calcarifer, known as sea bass in Asia and barramundi in Australia, is a euryhaline member of the family Centropomidae. It inhabits freshwater, brackish and marine habitats including streams, lakes, estuaries and coastal waters. Larvae recruit into estuarine nursery swamps where they remain for several months before they move into the freshwater which have tidal influenced coastal rivers and creeks. Juvenile sea bass remain in freshwater habitats until they are three-four years of age when they reach sexual maturity as males, and then move downstream during the breeding season to participate in spawning.

Sea bass spawn naturally in captivity (Toledo et al. 1991). Alternatively, they can be induced to spawn by hormonal or environmental manipulations (Kungvankij 1987, Garcia 1989a, b). Ruangpanit (1987) noted that *L. calcarifer* spawn all year round, with peak activity from April to September. Thailand is the most advanced country in the production of sea bass seed from spawners collected from the wild and induced to breed since 1973. Techniques for the culture of barramundi were developed in Thailand in the early 1970s (Wongsomnuk and Manevonk 1973) and considerable progress in aquaculture techniques for the species has been achieved since that time.

The growth of barramundi was investigated by tagging and scale reading in northern Australia (Davis and Kirkwood 1984), by scale reading in the sexually precocious population of the northeast Gulf of Carpentaria (Davis 1984a). In present study, sea bass are cultured in cage and tested by tagging with biomark during the study period. The purpose of the study;

- to assess the breeder management for pre-spawning of sea bass
- to conduct the induced breeding of sea bass from culture.

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Materials and Methods

Study period and study sites

The study was carried out within six months from September 2018 to February 2019. The investigation on *Lates calcarifer* was conducted at Sarr-kyun located in (12° 33′ 1.98″ N, 98° 28′ 40.33″ E), and Yemyitkyi village (12° 33′ 27.0″ N, 98° 19′ 34.13″ E) in Myeik Township, Taninthayi Region (Figure 1).

Figure 1 The map of study sites (Source: Google map)

Materials

1. Hand net for carrying breeder
2. Live breeder container
3. Refractometer
4. Thermometer
5. pH test kit
6. Ammonium test kit
7. Aeration stones
8. Heater rods
9. Egg collection cup
10. Biomark

Selection of mature brooder

They were selected as broodstock size– female 3 kg up, male < 4 kg (between 2yr and 7yr). After stocking sea bass broodstock in the pre-spawning tank for two months, female fish were examined and selected for spawning on the basis of a sample of oocytes removed from the ovary by cannulation. The cannula was gently inserted through the genital opening for a distance of 6-8 cm. The oocyte sample was examined under a microscope for size and shape. The females were induced oocyte which was greater than 400 µm in diameter, and spherical in shape.

Males were selected when white and creamy milt oozes out from the genital opening upon gentle stripping of the belly. Sex ratio in the pre-spawning tank was kept at two males per female.

Food and feeding the selected broodstock

The breeders are fed twice daily with fresh fish and squid 1-2 time a week. Moreover, vitamin A, B, C, and E were supplemented once daily alternately (by putting inside fresh fish). It is fed twice daily with pellet diet for old breeding stock.

Process of hormone injection

The breeders were marked tagging by biomark to calculate the dose for injection. Ten females and five males of broodstock were injected with single dose. Suprefact and Dextrose ratio of (1:2) for female and ratio of (1:1) for male were injected. The hormone was injected intramuscularly on area between the lateral line, above the base of the pectoral, and dorsal fin using a 1 ml disposable syringe and a hypodermic needle . All instruments for the operation were cleaned to avoid bacterial infection. According to the spawning behavior of species, the breeders were injected at 11:00 in the morning. And then, released injected-fishes back into spawning tank. Begin releasing mucus before spawning (after 30:30 hr of injection). Spawning occurred at 32:30 hours after injection.

Collection and incubation of eggs

The fertilized eggs were collected by using water overflow method. The overflowing water carries the eggs into the egg collector made of a fine netting (200 μ). The eggs were rinsed in seawater two to three times before placing in the incubation tanks. The number of fertilized eggs were estimated by using sampling method; density of egg, estimate egg number per litre for egg counting. The fertilized eggs were stock into hatching tanks that is concrete tanks by using incubate equipments. The optimum water quality is monitored with five parameters. The eggs density is 1000,000 in one tank. The tanks were given gently aeration to prevent the eggs from settle at the bottom. Eggs began hatching after spawning at about 12-15 hours at 23 - 32 °C. Dead eggs which settled at the bottom were removed by siphoning. The newly-hatched larvae were carefully collected the following morning by scooping them with a beaker and immediately transferred to larval rearing tanks.

Data analysis

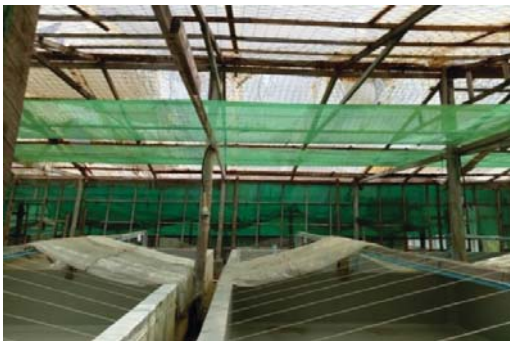
Sampling and Calculation the total egg

$$\text{Total eggs} = \frac{\text{No. of eggs in sampling} \times \text{total volume (ml)}}{\text{sampling volume (ml)}}$$

$$\%\ \text{hatchability} = \frac{\text{Total eggs - unfertilized eggs}}{\text{Total eggs}} \times 100\ \%$$

A. Spawning tank and eggs collecting tank

B. Hatching tanks



C. Larvae Reary Tanks

Plate 1 Hatchery equipments

Suprefact hormone

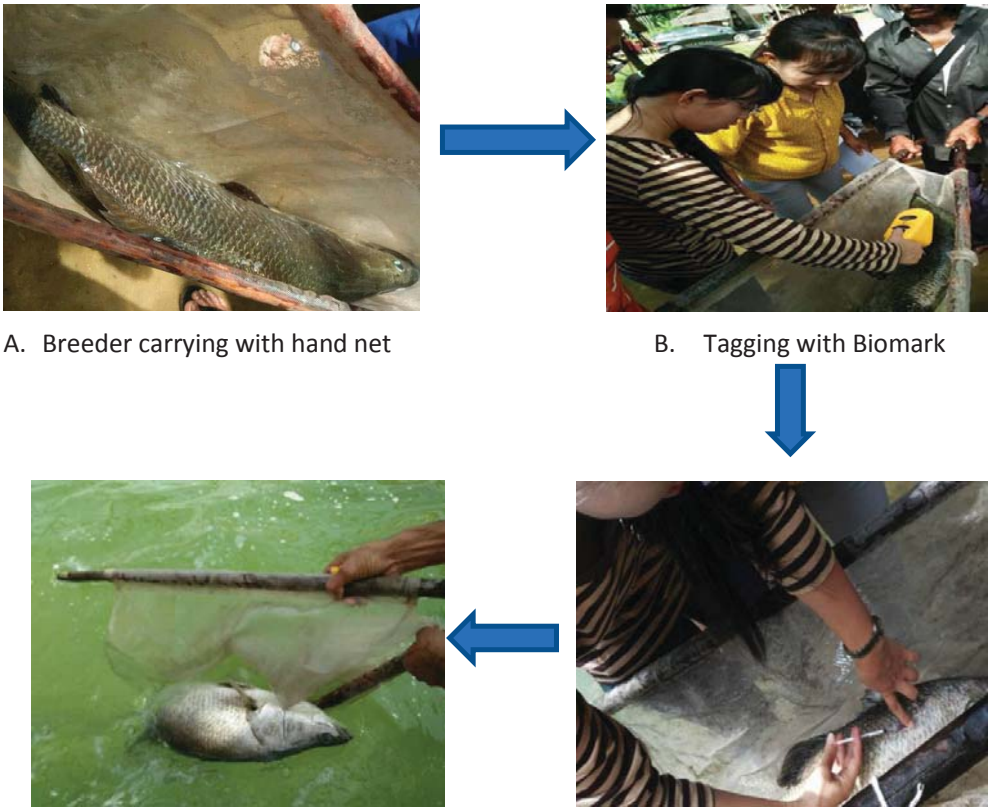
Dextrose sugar (5%)

Povidone-Iodine Solution for injury

Hypodermic needle

Disposable syringe

Plate 2 Hormone drugs for induce breeding of Sea bass



A. Breeder carrying with hand net

B. Tagging with Biomark

C. Injection of hormone

D. Injected fish releasing to spawning tank

Plate 3 Steps of inducing hormone

Results

Scientific Classification

The systematic positions of *Lates calcarifer* are as follows:

Kingdom - Animalia
Phylum - Chordata
Class - Actinopterygii
Order - Perciformes
Family - Latidae
Genus - *Lates*
Species - *L.calcarifer* (Bloch, 1790)
Common name - Barramundi / Sea bass
Local name - Kakadit (Kathabaung)

Table 1 Measuring and tagging to Sea bass for injection (Female)

No.	Date	Tag Number	Length (cm)	Weight (kg)	Dose	Induced Time (pm)
1	31/10/18	02018978*	70	5.5	5 cc	11:01
2	31/10/18	Wild stock	62.5	3.5	4 cc	11:13
3	31/10/18	Wild stock	62.5	4	4.5 cc	11:18
4	31/10/18	Wild stock	65	4.5	5 cc	11:21
5	31/10/18	Wild stock	67.5	3.5	4 cc	11:24
6	31/10/18	Wild stock	62.5	4	4.5 cc	11:25
7	31/10/18	Wild stock	75	6	6.5 cc	11:27
8	31/10/18	01811216*	75	6	5.5 cc	11:28
9	31/10/18	Wild stock	77.5	7	7.5 cc	11:30
10	31/10/18	02048854*	70	7	6.5 cc	11:34

* = Have been injected in previous time

Table 2 Measuring and tagging to Sea bass for injection (Male)

No.	Date	Tag Number	Length (cm)	Weight (kg)	Dose	Induced Time (pm)
1	31/10/18	Wild stock	67.5	3	3.5cc	11:02
2	31/10/18	Wild stock	60	2.8	3cc	11:04
3	31/10/18	Wild stock	60	2.9	3cc	11:08
4	31/10/18	Wild stock	65	3	3.5cc	11:10
5	31/10/18	01934984*	55	3.5	3cc	11:11

* = Have been injected in previous time

Table 3 Fertilized and hatching rate in egg collection

Date/ Time	No. of eggs	No. of yolkfish	Hatching rate (%) in each egg collection
1/11/18 8:00 pm	5,000,000	3500,000	70
2/11/18 2:00 am	3,000,000	2,750,000	91.7
2/11/18 5:30 am	2,000,000	1,750,000	87.5
2/11/18 1:00 pm	3,000,000	2,500,000	83.3
2/11/18 5:00 pm	2,000,000	1,500,000	75
Total average	15,000,000	12,000,000	80

Table 4 Ranges of water quality for the spawning and hatching tanks

Parameters	Range of value (standard) by FAO	Range of value (experiment)
Water temperature	26 – 32 °C	23 - 32 °C
Salinity	10 – 30 ppt	29 - 32 ppt
pH	7.5 – 8.5	6.8 – 8
Dissolved oxygen	4 – 9 mg/ l	6 – 9 mg / l
Ammonia(NH3)	Less than 1 ppm	0 – 0.3 ppm

Discussion

Sea bass is farmed with high production in Southeast Asia, generally from small coastal cage farms and large-scale sea bass farms in Australia. In Myanmar, sea bass are successful in induced breeding and also cultured in cage for its commercial value. Adult sea bass (3 – 5 kg) migrated towards the mouth of the river from inland water into the sea where the salinity ranges between 30 – 32 ppt for gonadal maturation and subsequent spawning (Grace Mathew, 1985). Sources of adult sea bass spawners could be collected from wild-caught adults and from cages or ponds about 2 – 6 years old species averaging in weight from 2 – 8 kg (Ramon Y.Tangon,2016).

In present study, 2 – 7 kg breeders were selected for induced breeding and optimum salinity range is between 28 – 32 ppt, the previous study is in agreement with previous authors Grace Mathew, 1985 and Ramon Y. Tangon, 2016). Captive broodstock of sea bass were also successfully induced to spawn naturally using environmental stimulation (Kungvankij 1981).

Good broodstock management and proper nutrition are essential for full maturity to ensure sustainable supply of quality eggs and fry for stock enhancement (Reyes, 2014). In present study, breeders were well fed and cared for two months before the induced breeding, the present study is in agreement with Reyes, 2014 .

Conclusion

The sea bass breeders were stocked for two months at Sarr-kyun before injection and the breeders were injected at Yemyintkyi village in Myeik Township, Taninthayi region during September 2018 to February 2019. The fertilized and hatching rates in each egg collection were observed with estimate counting method. The fertilized rate was highest in the first laying time and the hatching rate was highest in the early morning. The fertilized and hatching rates of larvae increased considerably as a result of improved feeding strategies of the breeders and in the improvement of the nutritional quality of live feeding and fully controlled rearing conditions. The findings will benefit the production of sea bass fry, and provide baseline information for further studies.

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