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Evaluation of growth and production performance of hatchery produced silver pompano *Trachinotus blochii* (Lacépède, 1801) fingerlings under brackishwater pond farming in India

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ABSTRACT

Growth, survival and production performance of hatchery produced silver pompano, *Trachinotus blochii*, (Lacépède, 1801) fingerlings were evaluated in a brackishwater pond in Anthervedi, East Godavari District, Andhra Pradesh, India. A total of 3,400 fingerlings of silver pompano (30.59 ± 0.24 mm mean length and 2.00 ± 0.04 g mean weight) were stocked in a one acre pond (0.4047 ha) with salinity of 8 ± 1.2 ppt. The salinity gradually increased to 24 ± 1.8 $\%_0$ during the farming period due to high saline intake water. Fishes were fed with extruded floating pellet feed containing 50 to 30% crude protein and 10 to 6% crude fat. After 240 days of culture, 1,305 kg of silver pompano were harvested. The survival rate was 91.32%. Mean length of the harvested fishes was 296.88 ± 6.27 mm and mean body weight 464.65 ±10.25 g. The absolute and specific growth rate obtained were 1.93 g day^{-1} and 2.27% per day respectively with an FCR of 1:1.83. The results revealed that farming of *T. blochii* in brackishwater pond is technically feasible.

Keywords: Brackishwater farming, Growth, Silver pompano, *Trachinotus blochii*

Introduction

Among the many high value marine tropical finfish that could be farmed in India, the silver pompano, *Trachinotus blochii* is an important candidate, mainly due to its fast growth and high market demand (Gopakumar *et al*., 2012). The silver pompano occurs only sporadically in the commercial fishery, and its availability is rather scarce. It is a much sought after species and its demand can be met only through aquaculture production. The aquaculture of pompano has been successfully established in many Asia-Pacific countries like Taiwan and Indonesia. Farming can be successfully carried out in ponds, tanks and floating sea cages. The species is pelagic, very active and is able to acclimatise and grow well even at a low salinity of about 8‰ (Gopakumar *et al*., 2012). Further, it is suitable for farming in the vast low saline waters of our country, besides its potential for sea cage farming. In the international market, the dockside price of Florida pompano averaged to $ 8 kg^{-1} and in India, the current price of pompano is about ₹ 200/- per kg at the fish landing centers and around ₹300/- per kg in the retail markets.

The Central Marine Fisheries Research Institute (CMFRI) initiated research on captive broodstock development and seed production of silver pompano from 2008 and the first successful induced breeding and larval production was achieved in 2011 (Gopakumar *et al*., 2012). Subsequently, five more successful breeding and seed production trials were carried out. following which, demonstration of farming in brackishwater pond was initiated by the CMFRI to popularise the suitability of the species among farmers. This paper discusses the first demonstration farming of hatchery produced silver pompano fingerlings, undertaken by CMFRI, in a brackishwater pond at Anthervedi Village, East Godavari District, Andhra Pradesh, India.

Materials and methods

Pond preparation

A brackishwater shrimp culture pond of 1.0 acre area (0.4047 ha) owned by a farmer in Anthervedi was used for the present farming trial. The pond was dried till cracks appeared on the surface. The top layer of the soil containing waste accumulated from the previous crop of shrimp culture was removed. Ploughing was done to till the soil below 30 cm. Feeding areas, corners and side trenches in the pond were properly tilled and dried to avoid formation of black soil. About 400 kg lime was applied to increase the soil pH from 5.8 to 7.5. Water filling was carried out by covering the opening of the inlet pipe with 2 layers of fine mesh nets (100 µ) to avoid introduction

of other fishes and predators. A week before stocking, the pond was fertilized with organic and inorganic fertilizers to stimulate plankton growth.

Source of seed

Hatchery raised fingerlings of silver pompano (Fig. 1) (average length 30.59 ± 0.24 mm**;** average weight 2.0 ± 0.04 g) produced in the marine fish hatchery complex of Central Marine Fisheries Research Institute (CMFRI), Mandapam Regional Centre, Tamil Nadu, were used for the farming trial.

Stocking and nursery rearing

The pompano fingerlings were packed in polythene bags containing 7 l of water and 10 l of oxygen, and

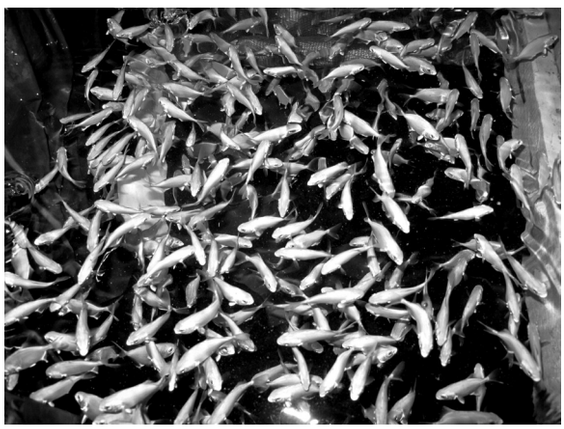

Fig. 1. Pompano fingerlings used in the farming trial

transported from the Mandapam Regional Centre of CMFRI to the farming site. Before packing, the salinity in the culture tank water was reduced gradually from 32‰ to 12‰ over a period of 24 h. Temperature of the packing water was brought down from 29 to 22°C to reduce the basic metabolic rate and transportation stress to the fingerlings. The fingerlings were starved for 12 h prior to packing and were packed at a density of 30 fingerlings per bag. After transportation for 30 h, the fingerlings were acclimatised at the farm site to a salinity of 8‰, and were stocked in hapas (2m x 2m x 2m) installed in the pond, at a density of 200 fingerlings per hapa (Fig. 2). The initial mesh size of the hapa was 4 mm and it was changed to 8 mm after 30 days. After 60 days of stocking or when the fishes attained 30 g size they were released into the pond. The stocking density was 0.84 m^{-3}. The grow-out farming experiment was conducted for 240 days from August 2011 to April 2012.

Feeds and feeding management

During the nursery phase, the fingerlings were weaned to floating pellet feed of 1 mm size. Extruded floating pellet feed was used during the entire trial to

Fig. 2. Nursery rearing of pompano fingerlings in hapa

avoid feed wastage and spoilage of pond bottom. Extruded floating pellet feed (Rudhra Techno Feeds, Bhimavaram, Andhra Pradesh) was used at various stages of farming (Table 1). During the hapa rearing phase, feeding was done 4 times a day (06.00 hrs, 12.00 hrs, 16.00 hrs and 20.00 hrs) and in pond culture phase it was 3 times a day (06.00 hrs, 12.00 hrs and 18.00 hrs.). The total feed requirement was calculated according to the biomass of fishes in the pond and it was further divided and fed 3 to 4 times per day. The details of feed and feeding schedule are listed in Table 1.

Periodic sampling was carried out every 15 days. and about 50 fishes were caught with cast net to assess growth and to monitor health status of fish. Whenever size variation among the fishes was noticed during the sampling, smaller size pellet feeds were mixed along with the regular feed to meet the feed requirements of the smaller fishes.

Water quality management

A minimum water level of 120 cm was maintained in the pond to reduce risk of benthic algal growth. When the colour of pond water was clear, a mixture of organic fertilizer (urea, 10-30 kg ha^{-1}) and inorganic fertilizer (super phosphate, 1-3 kg ha^{-1}) was applied to obtain algal growth. The water depth in the shallowest part of the pond was at least 100 cm. Water quality parameters like optimal algal growth and dissolved oxygen content were maintained by exchanging 10% of the water once a week for the initial period of three months; 20% per week after 3 months and 30% per week after 6 months. If water colour was too dark, the quantum of water exchange was proportionately increased. To maintain water pH within an optimum range of 7.5-8.5, agriculture lime was applied once in 30 days and when the pH dropped below 7.0, lime was applied @ of 50 kg per time. Dissolved oxygen (DO) level was maintained above 5 ppm at all times. Two paddle wheel aerators (2 HP capacity) were placed in the

Table 1. Feed and feeding frequencies of silver pompano *T. blochii* during the farming trial

Weight of the fish (g)	Pellet feed size (mm)	Crude protein* (%)	Crude fat* (%)	Feeding rate (% biomass per day)	No. of feeding per day
< 1	0.8 - 1.0	50	10	20	4
1 – 10	1.0 - 1.5	40	8	10	4
10 – 100	1.8	35	8	5	3
100 – 250	3.5	35	6	4	3
250 – 500	4.5	30	6	3	3

*Other ingredients of feed includes: Crude Fibre: 2.5-5.0% max; Crude Ash: 15.0% max; Calcium: 2.0% min; Phosphorus: 1.5% min; Moisture: 5.0 - 8.0% max; Mineral and Vitamin Premix

pond to create minor water current and to maintain the DO level. Aeration was given during late evening to early morning period (between 23.00 hrs and 05.00 hrs), once the fishes attained 200 g size and above. At the time of stocking, the salinity was 8‰ in the pond and gradually increased to 24‰ within 4 months period due to high saline intake water in the Godavari River.

Estimation of growth parameters

Regular sampling of fishes was carried out at every fortnight to assess the growth of the fishes in terms of length and weight and the growth parameters *viz.,* absolute growth rate, relative growth rate, specific growth rate, and feed conversion ratio (FCR) (Table 2) were estimated based on Moreira *et al.* (2005) and Benetti *et al.* (2010).

Results and discussion

Growth performance

During the 240 days culture period, the fishes had grown from 30.59 ± 0.24 mm to 296.88 ± 6.27 mm with weight increasefrom 2.00 ±0.04 g to 464.65 ± 10.25 g. Survival of pompano during the culture period was 91.32%. The absolute growth rate, relative growth rate and specific growth rate obtained were 1.93 g day^{-1}, 0.96 (231.32%) and 2.27% day^{-1} respectively. Growth in terms of length and weight during the different days of culture are given in Table 3. The length-weight relationship of harvested pompano is depicted in Fig. 3.

Production

A total of 1,305 kg of silver pompano was harvested (Fig. 4). About 80% of the harvested fishes were in the length range of 251 to 350 mm where as 13% of the fishes were in the length range of 326 to 400 mm size. About 76% of the harvested fishes were in the weight range of 386 to 490 g and 20% were in the weight range of 491 to 595 g. The FCR obtained was 1:1.83.

Table 2. Growth parameters of silver pompano

Growth parameter	Formula
Absolute growth rate (g day^{-1})	AGR = $(W_2\text{-}W_1) / (t_2\text{-}t_1)$
Relative growth (%)	RG = $(W_2\text{-}W_1) / W_1$ x 100
Relative growth rate	RGR = $(W_2\text{-}W_1) / W_1 (t_2\text{-}t_1)$
Specific growth rate (% per day)	SGR= (ln W_2- ln W_1) / $(t_2\text{-}t_1)$ x 100
Feed conversion ratio (FCR)	FCR = fi / ib

W_1 = Initial wet weight of fish at stocking, W_2 = Final wet weight of fish, t_1 = Age at stocking, t_2 = Age at end of growout period, fi = Total feed intake, ib = Total fish biomass

Table 3. Growth of pompano in terms of length and weight during the farming experiment (mean ± SE)

Days of culture (DOC)	Growth (mm)	Weight (g)
1	30.59 ± 0.24	2.00 ± 0.04
15	49.84 ± 0.36	9.05 ± 0.08
30	73.42 ± 0.53	15.08 ± 0.16
45	85.02 ± 0.80	22.59 ± 0.23
60	102.88 ± 1.91	34.60 ± 0.41
75	137.78 ± 1.81	54.72 ± 1.62
90	158.39 ± 2.42	72.54 ± 1.95
105	168.80 ±1.73	80.02 ± 2.67
120	182.30 ± 2.03	101.82 ± 3.11
135	186.02 ± 2.82	138.78 ± 4.49
150	203.71 ± 3.73	172.39 ± 4.55
165	224.17 ± 3.16	220.05 ± 3.54
180	226.51 ± 2.90	258.31 ± 5.76
195	248.13 ± 3.21	303.72 ± 4.49
210	273.07 ± 3.62	375.32 ± 8.07
225	288.36 ± 5.19	416.60 ± 7.72
240	296.88 ± 6.27	464.65 ± 10.25

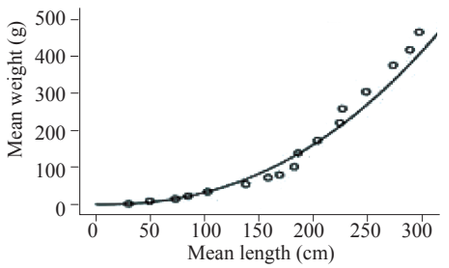

Fig. 3. Length-weight relationship in silver pompano grown in brackishwater pond

The present farming trial conducted in brackishwater pond in Antharvedi is the first grow-out culture experiment of *T. blochii* in India. Results indicated that this species is suitable for farming in ponds, readily accepts pellet feed and tolerates varying salinities between 8‰ to 24‰, in conformity with Kalidas *et al.* (2012) and has reasonable growth rate. A similar type of salinity tolerance and growth was reported by Groat (2002) in the Florida pompano *Trachinotus carolinus* reared in closed recirculation systems. The FCR of 1:1.83 obtained in the present farming experiment was reasonable and is almost close

Fig. 4. Harvested silver pompano

to that reported by Manomatitis and Cremer (2007) in *T. carolinus* (1.84). Lan *et al.* (2007), Mc Master *et al*. (2006) and Cremer and Jian (1999) reported FCR values ranging from 2.51 to 2.59, 3.0 and 2.13 to 2.23, respectively from various farming systems. Chavez *et al*. (2011) obtained an FCR of 1.84 in *T. blochii* reared in cages, which is closer to the FCR value in the present study. Extruded floating pellet feeds having 50-30% crude protein and 10-6% crude fat was used in the present farming experiment, whereas Chavez *et al*. (2011) used 46-44% crude protein and 10-6% crude fat. This indicates that *T. blochii* can be grown with feed containing low level of crude protein and crude fat without affecting growth rate in terms of length and weight, in order to reduce production cost.

Chavez et *al*. (2011), Manomatitis and Cremer (2007) and Lan *et al.* (2007) observed similar survival rates in *T. blochii* grown in cages as obtained in the present study. Lower survival rate was reported by Cremer and Jian (1999) for *Trachinotus ovatus* in cages (72%) and Mc Master *et al*. (2006) in ponds (42%). The high survival rate in the present experiment can be attributed to its ability to adapt to different salinities. Mc Master *et al*. (2003) and Chavez *et al*. (2011) also noted that throughout the experimental trial, the silver pompano proved to be a hardy fish and exhibited tolerance to a wide range of environmental conditions.

The growth rate of silver pompano is higher when compared to many other farmed fish (Chavez *et al*., 2011). The average total grow-out time from post-hatchery fry to 0.5 kg market ready fish is about 8 months. The market demand for the fish is also comparatively high. Results of the present study indicate that commercialisation of silver pompano farming can be a lucrative option for augmenting seafood production. In the context of serious outbreaks of viral diseases in the brackishwater shrimp farming scenario in India, diversification of farming practices with silver pompano appears to promote sustainability in vast areas of brackishwater ponds available in the country (about 0.20 million ha). However, further studies are needed to optimise the stocking density, feeding strategies and farm management practices.

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