Indian J. Fish., 69(2): 139-143, 2022
DOI: 10.21077/ijf.2022.69.2.110174-18

Note

Investigations on the performance of snubnose pompano *Trachinotus blochii* (Lacepede,1801) in a lowcost recirculating aquaculture system

P. P. SURESH BABU[1], A. ANURAJ[1], JAYASREE LOKA[2], K. RAGHU RAMUDU[1], K. SRINIVASA RAO[1], PRAVEEN NARAYAN DUBE[1], N. G. VAIDYA[1], S. M. SONALI[1] AND IMELDA JOSEPH[3]
[1]Karwar Research station of ICAR-Central Marine Fisheries Research Institute, Bithkol, Karwar - 581 302, Karnataka, India
[2]Visakhapatnam Regional Centre of ICAR-Central Marine Fisheries Research Institute, Visakhapatnam - 530 003 Andhra Pradesh, India
[3]ICAR-Central Marine Fisheries Research Institute, Kochi - 682 018, Kerala, India
e-mail: sbabukkd@rediffmail.com

ABSTRACT

Farming of snubnose pompano *Trachinotus blochii* (Lacepede,1801) in a low cost recirculating aquaculture system (RAS) was attempted by stocking fingerlings (5.3±0.02 g) at 33 fish m^{-3} and fed on a commercial pellet feed (45% protein). After 210 days, a specific growth of 1.68% per day was observed with final average weight of 180.78±4.54 g and a production of 29.28 kg (4.88 kg m^{-3}) with 81% survival. The fish exhibited a condition factor of 1.61 with an allometric growth (b = 2.94). The data can be used as baseline for upscaling farming of the species in commercial RAS systems.

Keywords: FCR, Fish growth, Mariculture, Water quality

Snubnose pompano *Trachinotus blochii* (Lacepede,1801) is one of the ideal candidates for marine and low saline aquaculture. Availability of standardised hatchery production technology (Abdul Nazar *et al*., 2012) and farming protocols (Jayakumar *et al*., 2014) make the species a potential candidate for various farming systems. Farming practices of this species in different aquaculture systems such as monoculture in ponds (Jayakumar *et al*., 2014) and cages (Kalidas *et al*., 2020), as an intercrop in shrimp ponds (Damodaran *et al*., 2019) have been reported recently. The species is also reported as a good candidate for stunted fingerling production in marine conditions (Anikuttan *et al*., 2021).

Environmental calamities and rapid climate change events have increased the adoption of land based marine aquaculture systems for enhancing fish production. Recirculatory aquaculture system (RAS) is one of the most advanced farming systems adopted for marine finfish farming globally. RAS for several marine finfishes such as Florida pompano (Weirich *et al*., 2009), orange spotted grouper and Indian pompano (Ranjan *et al*., 2019) has been attempted globally. In India, monsoon season is considered as lean period for marine aquaculture practices due to adverse conditions such as torrential rain and cyclonic weather. Shifting of marine farming practices indoor is one of the ideal options to continue fish production during the monsoon season. A preliminary attempt to understand the suitability to adopt snubnose pompano as a candidate species for RAS is attempted here in a low cost indigenous mini-RAS system.

Snubnose pompano (*T. blochii)* fingerlings (<3 g size) produced at the Marine finfish hatchery of Mandapam Regional Station of ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI), Mandapam, Tamil Nadu, India were used for the experiment. Nursery rearing of the fingerlings and the RAS farming were carried out at the Marine hatchery complex of Karwar Research Station of ICAR-CMFRI, Karwar, Karnataka, India. Snubnose pompano fingerlings (5.3±0.02 g size) were stocked at 33 fish m^{-3} in the RAS system. Schematic diagram of the RAS system with the direction of water flow is given in Fig. 1. The low cost RAS system consists of a fibre reinforced plastic (FRP) tank having 10,000 l capacity filled with 6000 l chlorinated seawater (chlorinated with 10 ppm liquid chlorine and dechlorinated with rigorous aeration for three days). Water was recirculated through a protein skimmer (100 l with flow rate capacity approximately 40-50 l min^{-1}) followed by an indigenous biological filter. The biological filter was set up in a 300 l FRP tank with two chambers. The inner chamber was filled with synthetic fibre mat and outer chamber with 500 numbers of bio-balls for bio-remediation. The top synthetic fibre mat acted as a mechanical filter for removing suspended solids which was washed on alternate days. The biological filter was initially inoculated once with 50 ml of commercial probiotic (CP Aquaculture India, Pvt. Ltd.). The flow rate in the unit

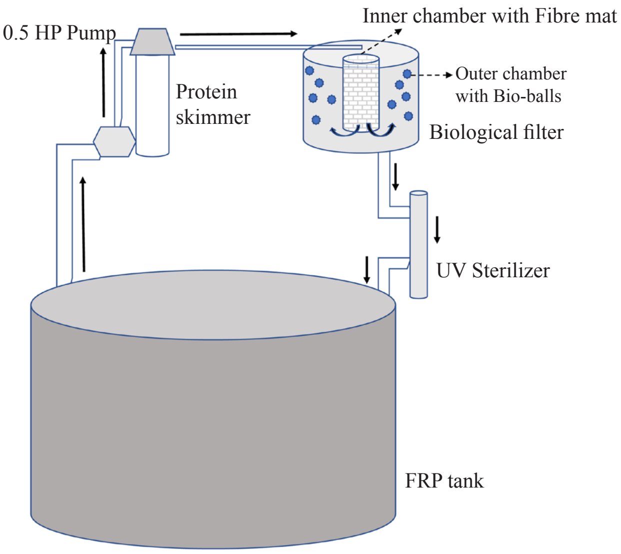

Fig. 1. Schematic diagram of the low cost RAS system with water flow direction (solid arrows)

was maintained at 25 l min^{-1}, since water was retained in the biological filter for a short duration. Continuous aeration was provided from an air compressor. Evaporation loss in the system was replenished by adding dechlorinated water (10% of total volume) once in a fortnight.

Water quality parameters such as dissolved oxygen, pH, temperature, salinity and NH_3-N and nitrite concentration were monitored at weekly intervals following standard procedures (APHA, 1981). The fishes were reared for 210 days and fed a diet of commercial pellet feed (Nutrila, Growel India Pvt. Ltd; 45% crude protein; 10% crude fat; 2.5% crude fibre; 11% moisture, 0.8 to 1.2 mm size) at 10% of body weight per day initially and gradually reduced to 6%. For growth evaluation, 20% of the stock was sampled to record the length and weight of individual fishes once a month. Total length of the fish from tip of snout to tip of the caudal fin was measured using a 1 m wooden scale with an accuracy of 1 mm. Total weight of fish was measured using an electronic weighing balance with an accuracy of 0.001 g. Specific growth rate was calculated according to De Silva and Anderson (1995).

$$\text{Specific growth rate (\%)} = \frac{\ln\text{(Final weight)} - \ln\text{(Initial weight)}}{\text{Days of culture}} \times 100$$

where 'ln' is the natural logarithmic value

Condition factor was determined according to Gomiero and Braga (2005);

$$K = \frac{W \times 100}{L^3}$$

where, K = condition factor; W = Weight of the fish (g); L = Total length of the fish (cm).

Feed conversion ratio (FCR) was calculated at the end of the experimental farming using the following formula:

$$\text{Feed conversion rate} = \frac{\text{Feed given (dry weight)}}{\text{Body weight gain (wet weight)}}$$

The number of fishes in each tank was counted and the survival rate (%) was calculated using the formula:

$$\text{Survival (\%)} = \frac{\text{Total number of fish present}}{\text{Total number of fish stocked}} \times 100$$

For evaluating the size variation in the harvested fishes, coefficient of variation (CV) was calculated as the ratio of standard deviation to the mean.

Water quality parameters recorded during the study period (Fig. 2) were maintained in the ideal range for the growth of the species. Damodaran *et al*. (2019) reported similar values for the parameters in pond based farming of snubnose pompano even though NH_3-N was slightly higher in the present work. In RAS system the total ammonia nitrogen will be higher than that in pond culture system. Pfeiffer and Riche (2011) reported a higher (0.46 ppm) total ammonia nitrogen from the RAS system used for Florida pompano.

Growth parameters (Fig. 3 and 4) and final harvest details (Table 1) of the fishes indicated the suitability of farming this species in RAS. The fishes gained an average weight of 175 g (final weight 180.78±4.54 g) from an initial stocking size of 5.3±0.02 g with an SGR per day of 1.68% in 210 days. The final survival of the fishes was 81% yielding a total production of 29.28 kg. The growth,

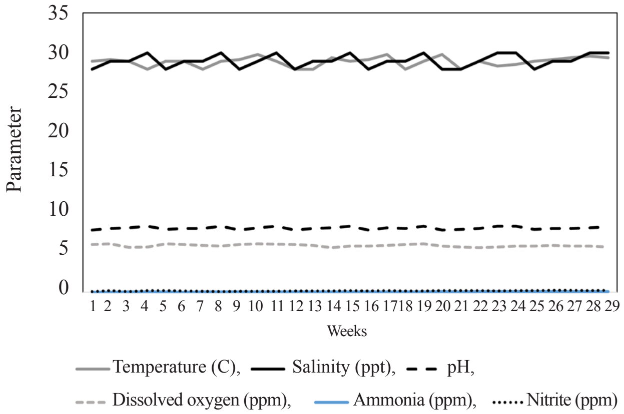

Fig. 2. Water quality parameters recorded during the farming of snubnose pompano in RAS system

Table 1. Harvest details of snubnose pompano reared in RAS system

Parameter	Value (Mean±SD)
Initial average weight	5.3±0.02 g
Final average weight	180.78±4.54 g
Weight gain (day^{-1})	0.835 g
Specific growth rate (SGR) (day^{-1})	1.68%
FCR	2.8
Survival	81%
Initial biomass	1.06 kg
Total biomass harvested	29.28 kg
Condition factor	1.61
Coefficient of variation (Length)	0.06
Coefficient of variation (Weight)	0.18

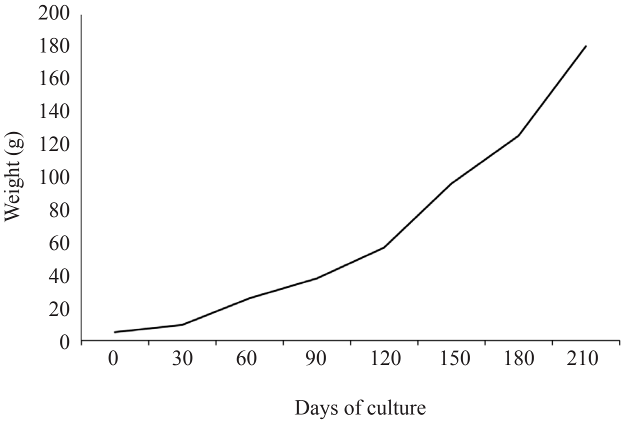

Fig. 3. Weight increment in snubnose pompano reared in RAS system

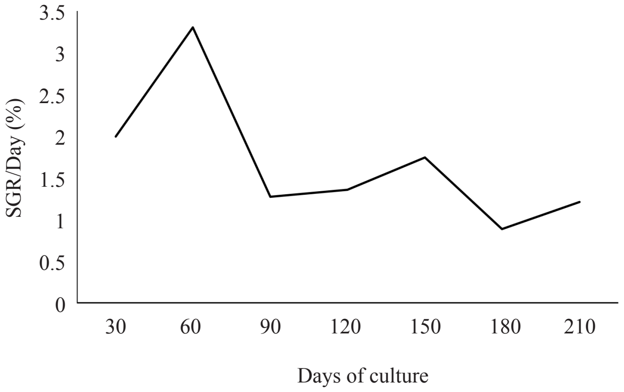

Fig. 4. Specific growth rate of snubnose pompano reared in RAS system

survival and production of snubnose pompano obtained was comparatively lower than from other studies in marine cages (Chavez *et al*., 2011; Kalidas *et al*., 2020) and pond farming (Jayakumar *et al*., 2014; Damodaran *et al*., 2019) mainly due to the lower initial stocking size (5.3 g) and stocking density adopted in the present work. More over the conditions provided in different farming systems were not directly comparable. The present study also emphasised on the importance of enhancing the stocking size of the fishes in the RAS system in order to get better production. Weirich *et al*. (2009) adopted a higher stocking size in RAS for Florida pompano to attain marketable size. From Fig. 3 it is clear that there was stagnated growth in the fishes during the initial farming period (up to 90 days and approximately 40 g size) after which the growth rate had picked up considerably. Damodaran *et al*. (2019) also used bigger fishes (above 40 g) for rearing snubnose pompano in pond conditions for intercropping with shrimp.

Specific growth rate (Fig. 4) showed a declining trend in the RAS system also similar to the pond farming system of Damodaran *et al*. (2019). The SGR per day (1.68%) was lower than that reported from pond based farming of snubnose pompano (Jayakumar *et al*., 2014; Damodaran *et al*., 2019) may be due to the lower initial stocking size adopted in the present work. Damodaran *et al*. (2019) reported a faster growth in *T. blochii* when the initial stocking size was higher.

FCR in the present study was 2.8 which was higher than reported by Damodaran *et al*. (2019) and Jayakumar *et al*. (2014) in snubnose pompano farming in ponds. But McMaster *et al*. (2006)) reported similar FCR values for farmed pompano *Trachinotus carolinus* in ponds. Condition factor, the indicator of wellbeing of the fishes in a given ecosystem (Gomiero and Braga, 2005) was above one (1.61) indicating that the fishes have grown in good condition. Damodaran *et al*. (2019) also highlighted similar condition factor for snubnose pompano grown in pond condition. The fishes exhibited a near isometric growth (Fig. 5) in the recirculatory aquaculture system. Chavez *et al*. (2011) also reported a similar growth pattern in *T. blochii* grown in marine cages. But Damodaran *et al*. (2019) observed a hypoallometric growth in snubnose pompano grown in pond conditions. Thus, condition factor and growth pattern of snubnose pompano in the present work indicates that the fish can be well adopted to the RAS farming system.

Size variation in the harvested fishes is an important parameter for fish farming (Yu and Ueng, 2007; Costa-Bomfim *et al*., 2014). The harvested fishes showed more variation in body weight (coefficient of variation 0.18) than length (0.06). These results suggest the need for size grading and uniform feeding of the fishes prior to stocking in order to reduce size variation in RAS farming.

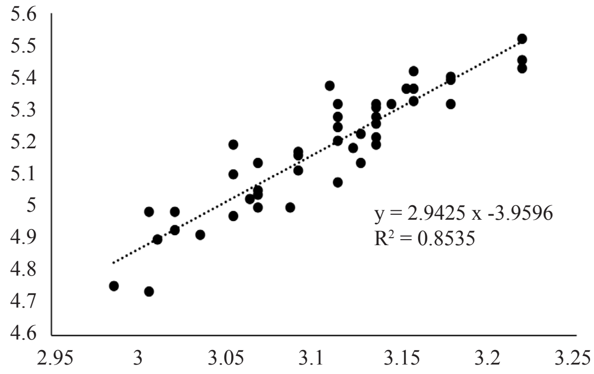

Fig. 5. Length-weight relationship of snubnose pompano reared in RAS system

Results obtained in the present trial indicated that snubnose pompano can be cultured in RAS system that can be upscaled for commercial production. It is advisable to stock bigger fishes (above 40 g) for rearing in RAS in order to achieve marketable size in short duration similar to other reports for snubnose pompano (Damodaran *et al*., 2019). Uniform initial size for stocking and uniform feed availability for all fishes are ideal for reducing size variation in the harvested fishes.

Acknowledgements

The authors are grateful to the Director, ICAR-CMFRI, Kochi, for support and encouragement provided for carrying out the research work.

References

Abdul Nazar, A. K., Jayakumar, R., Tamilmani, G., Sakthivel, M., Sirajudeen, S., Balamurugan, V., Jayasingh, M. and Gopakumar, G. 2012. Larviculture and seed production of the silver pompano, *Trachinotus blochii* (Lacepede, 1801) for the first time in India. *Indian J. Fish.,* 59(3): 83-87.

Anikuttan, K. K., Jayakumar, R., Suresh Babu, P. P., Abdul Nazar, A. K., Tamilmani, G., Sakthivel, M., Ramesh Kumar, P., Sankar, M., Krishnaveni, N., Thomas, T., Rao, G. H., Anuraj, A., Boby, I. and Imelda, J. 2021. Assessment of compensatory growth in stunted fingerlings of snubnose pompano, *Trachinotus blochii* (Lacepede, 1801), in marine conditions. *Aquac. Res*., 52: 403-409. https://doi.org/10.1111/are.14879

APHA 1981. *Standard methods of the examination of water*, 15th edn. American Public Health Association, Washington DC, USA, 1193 pp.

Chavez, H. M., Fang A. L. and Carandang, A. A. 2011. Effect of stocking density on growth performance, survival and production of silver pompano, *Trachinotus blochii* (Lacepede, 1801) in marine floating cages. *Asian Fish. Sci.,* 24: 321-330. https://. DOI: 10.1111/are.14858.

Costa-Bomfim C. N., Pessoa, W. V. N., Oliveira, R. L. M., Farias, J. L., Domingues, E. C., Hamilton, S. and Cavalli R. O. 2014. The effect of feeding frequency on growth performance of juvenile cobia, *Rachycentron canadum* (Linnaeus, 1766). *J. Appl. Ichthyol.*, 30: 135-139. https://doi.10.1111/jai.12339.

Damodaran, D., Mojjada, S. K., Vase, V. K., Sukhdhane, K., Abdul Azeez, P. and Kumar, R. 2019. Intercropping of marine finfish in shrimp ponds: A maiden feasibility study. *PLoS ONE,* 14(5): e0216648. https://doi.org/10.1371/journal.pone.0216648.

De Silva, S. S. and Anderson, T. A. 1995. *Fish nutrition in aquaculture*. Chapman and Hall Aquaculture Series, London, UK, 319 pp.

Gomiero, L .M. and Braga, F. M. S. 2005. The condition factor of fishes from two river basins in Sao Paulo State, south-east of Brazil. *Acta Scientiarum,* 27: 73-78. http://dx.doi.org/10.4025/actascibiolsci.v27i1.1368.

Jayakumar, R., Abdul Nazar A, K., Tamilmani, G., Sakthivel M., Kalidas C., Ramesh Kumar, P., Hanumanta Rao, G. and Gopakumar, G. 2014. Evaluation of growth and production performance of hatchery produced silver pompano *Trachinotus blochii* (Lacepede 1801) fingerlings under brackishwater pond farming in India. *Indian J. Fish.,* 61(3): 58-62.

Kalidas, C., Ramesh Kumar, P., Linga Prabu, D., Tamilmani, G., Anbarasu, M., Rajendran, P. and Thiagu, R. 2020. Optimising stocking density for grow-out culture of silver pompano *Trachinotus blochii* (Lacepede, 1801) in marine floating cages. *J. Appl. Aquac.,* 34(1): 223-233. https://doi.org/10.1080/10454438.2020.1829245.

McMaster, M. F., Kloth, T. C., Coburn, J. F. and Stolpe, N. E. 2006. Florida pompano *Trachinotus carolinus* is an alternative species for low salinity shrimp pond farming. In: *Aquaculture America 2006.* Mariculture Technologies International lnc. 14 February 2006, Las Vegas, USA, http//www.mariculturetechnology. com/ MlTlPompano2006.

Pfeiffer, T. J. and Riche, M. A. 2011. Evaluation of a low-head recirculating aquaculture system used for rearing Florida pompano to market size. *J. World Aquac. Soc.,* 42: 198-207. https://doi.org/10.1111/j.1749-7345.2011.00456.x.

Ranjan, R., Megarajan, S., Xavier, B., Raju, S. S., Ghosh, S. and Gopalakrishnan, A. 2019. Design and performance of recirculating aquaculture system for marine finfish broodstock development. *Aquac. Eng.,* 85: 90-97. https://doi.org/10.1016/j.aquaeng.2019.03.002.

Weirich, R., Wills, P. S., Baptiste, R. M., Woodward, P. N. and Riche, M. A. 2009. Production characteristics and body composition of Florida pompano reared to market size at two different densities in low-salinity recirculating aquaculture systems. *N. Am. J. Aquac.,* 71: 165-173. https://doi.org/10.1577/A08-016.1.

Yu, S. and Ueng, P. 2007. Impact of water temperature on growth in cobia *Rachycentron canadum*, cultured in cages. *Israel. J. Aquac. Bamidgeh*, 59(1): 47-51.

Date of Receipt : 04.02.2021
Date of Acceptance : 11.04.2022