Journal of Fisheries
Volume 14 Issue 1 April 2026
Peer Reviewed | Open Access

eISSN 2311-3111
pISSN 2311-729X

DOI: https://doi.org/10.17017/j.fish.1124

Original Article

Feasibility of cage culture of Asian seabass in coastal rivers of Bangladesh

Ashim Kumar Ghosh[1,2] • Bipul Kumar Dey[3] • Rahat Bin Shahid[1,4] • Saikat Bain[1] • Babu Kumar Roy[1] • Md. Golam Sarower[1]

[1] *Fisheries and Marine Resource Technology Discipline, Khulna University, Khulna 9208, Bangladesh*
[2] *Department of Fisheries, Ministry of Fisheries and Livestock, Ramna, Dhaka 1000, Bangladesh*
[3] *Independent Researcher, Haarweg 249, Wageningen 6709 RS, Gelderland, The Netherlands*
[4] *School of Science, Engineering and Environment, University of Salford, Manchester M5 4WT, UK*

Correspondence
Md. Golam Sarower; Fisheries and Marine Resource Technology Discipline, Khulna University, Khulna 9208, Bangladesh
sarower@yahoo.com

Manuscript history
Received 30 October 2025 | Accepted 22 December 2025 | Published online 2 January 2026

Citation
Ghosh AK, Dey BK, Shahid RB, Bain S, Roy BK, Sarower MG (2026) Feasibility of cage culture of Asian seabass in coastal rivers of Bangladesh. Journal of Fisheries 14(1): 141208. DOI: 10.17017/j.fish.1124

Abstract
Despite its aquaculture potential, Asian seabass (*Lates calcarifer*) has not yet been adopted for cage culture in Bangladesh. This pilot study aimed to assess the feasibility of cage culture of this species in coastal rivers of Bangladesh. A total of six cages (18 m^3 each) were installed in a coastal river and each was stocked with 50 fish (7.70 ± 0.18 g). Three feeding treatments were applied: 100% live feed (live and/or trashed juvenile tilapia) (T_1); 50% live feed with 50% formulated feed (T_2); and 100% formulated feed (T_3). The experimental fish were reared for 12 weeks and fed at 8% of their body weight during the initial 3 weeks and at 6% during the later weeks. Fish refused formulated feed. Survival in T_3 (64%) was significantly lower compared to that in T_1 (88%) or T_2 (82%) but did not differ between T_1 and T_2. Mean specific growth rates (SGR) were 1.66, 1.12, and 0.90 % d^{-1}; daily growth rates (DGR) were 2.20, 0.74, and 0.44 g, and weight gain (WG) values were 182.50, 61.10, and 36.50 g in T_1, T_2, and T_3, respectively. SGR values significantly differed among the treatments. DGR and WG values in T_1 were significantly higher than that in T_2 or T_3 but did not differ between T_2 and T_3. Results indicate that cage culture of Asian seabass in Bangladesh requires live and/or trash fish as feed, or else advances in domestication and artificial feed development.

Keywords: coastal rivers; *Lates calcarifer*; cage culture; stocking density; growth; feed; Bangladesh

1 | INTRODUCTION

Asian seabass (*Lates calcarifer*), also known as barramundi, is a euryhaline carnivorous fish predominantly inhabits coastal areas in the Indo-Pacific region (Ilham *et al*. 2016). This species is an important food fish in numerous countries due to its outstanding taste and nutritional value (Pervin *et al*. 2013; Vij *et al*. 2014; Yenmak *et al*. 2018). Global production of this species reached 154,281 tonnes in 2022, with a 735% increase in the production since 2000 (FAO 2025), underscoring its high economic value. The rapid expansion in the production of Asian seabass is due to, at least partially, its ability to reproduce in captivity, its tolerance of water quality extremes (Tiensongrusmee *et al*. 1989; Singh 2000; Chudasama *et al*. 2023), and its suitability for culture in earthen ponds as well as cage systems across freshwater, brackish water, and marine environments (Kungvankij *et al*. 1986; Rimmer and Russell 1998; Anil *et al.* 2010).

Brackish waterbodies are predominantly used for pond-based aquaculture, while these waterways also continue to support capture fisheries, reflecting their dual role in aquatic food production (Mitra and Sikder 2023). Proper utilisation of brackish water resources (e.g. coastal rivers) in modern aquaculture practices, such as cage culture, can enhance aquaculture production and reduce pressure on freshwater resources utilized by multiple users, including fish farmers (Ignatius 2016). Additionally, carnivorous behavior of Asian seabass is considered a constraint in polyculture with other fish species in many cases; therefore, this species is a good candidate for cage culture. Reports have revealed that location-specific cage systems can profitably grow fish, securing the livelihood of coastal fishers by employing open brackish waters with the ideal depth and water quality (Krishna *et al*. 2014; Manju Lekshmi 2015; Aswathy and Joseph 2019). Therefore, cage culture is preferable to pond aquaculture of Asian seabass (Boonyaratpalin and Williams 2002).

Cage culture of Asian seabass had been started long ago in several countries, and as of 2022, this fish was commercially produced in 18 countries (Dunstan 1959; Singh 2000; Carbone *et al*. 2025). Despite having high demand of Asian seabass and extensive coastal waterbodies, cage culture of Asian seabass is not under practice in Bangladesh. Establishing cage culture of this species in Bangladesh requires country-specific information, presently unavailable. Therefore, the current study aimed to assess the feasibility of cage culture of Asian seabass in coastal rivers of Bangladesh. This work provides the first documentation of Asian seabass cultivation in coastal rivers in Bangladesh and offers valuable insights to initiate cage culture practices in floating cages in coastal rivers of Bangladesh and other Asian countries.

2 | METHODOLOGY

2.1 Location of the study

A part of the Sholmari River (at 22.7417°N 89.5167°E) located in Batiaghata Upazila under Khulna district, Bangladesh was selected for cage setup (Figure 1). Tidal water flow of the river reaches up to 1.0 m s^{-1} during the monsoon and 0.5 m s^{-1} in the pre- or post-monsoon periods (WARPO 2019). Regardless of seasons, pH values of the river water typically fall within 7.5–7.9. Dissolved oxygen fluctuates from 3.8–6.3 mg L^{-1} in the pre-monsoon to 5.2–6.9 mg L^{-1} during the monsoon, declining to 1.7–4.7 mg L^{-1} post-monsoon. Salinity decreases from 19.3–23.5 to 0.02–0.92, and subsequently 0.04–0.52 across the same periods (Islam *et al*. 2016). Although annual temperature data for the Sholmari River are unavailable, measurements from the nearby Bhadra River suggest seasonal temperatures of approximately 32°C (pre-monsoon), 29°C (monsoon), and 22°C (post-monsoon) (Ara *et al*. 2017). These previously recorded data supported the culture of Asian seabass in the river, and the current cage culture study was carried out for 12 weeks during the monsoon (7 July to 29 September 2022). At high tide, the water column reached a depth of 12 m, while at low tide, it was 10 m. The dynamic width of the experimental river ranged between 18.9 and 36.6 m under tidal influence. The river had a sandy-mud bottom.

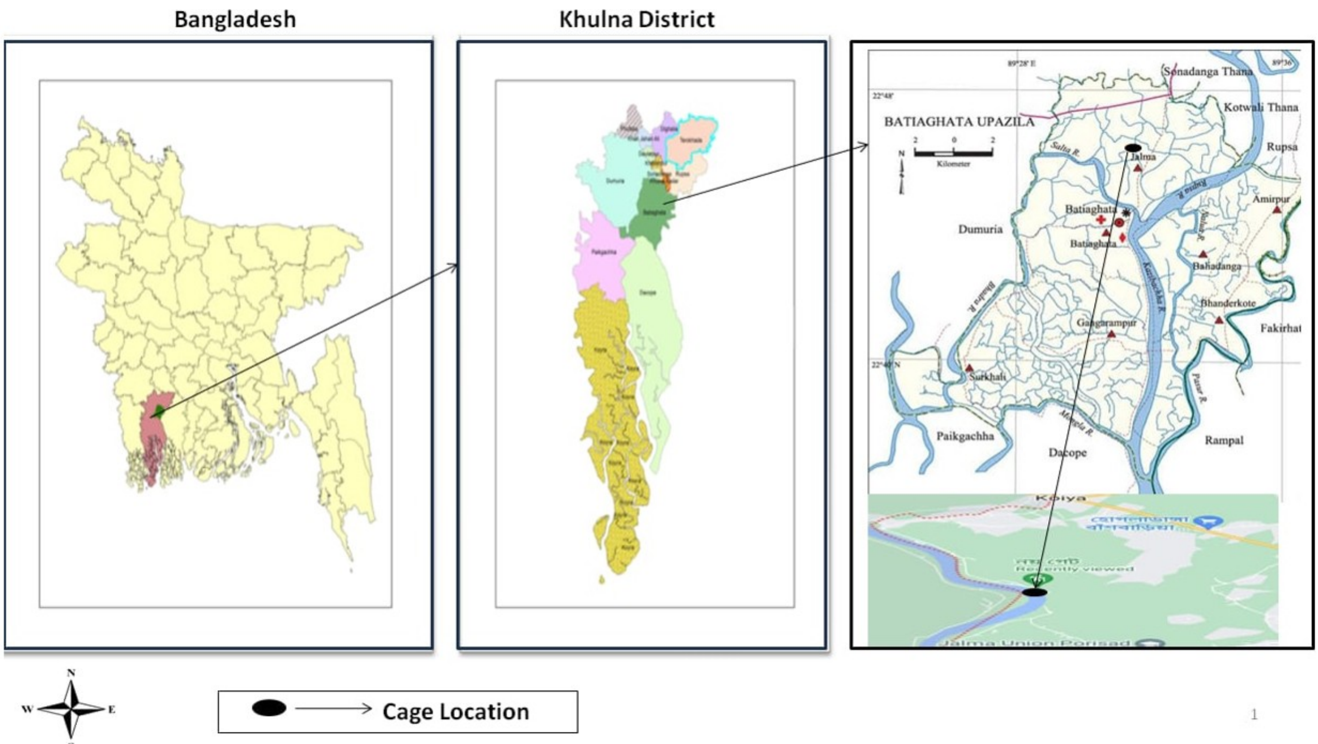

FIGURE 1 Location of the experimental cages in the Sholmari River, Batiaghata Upazila, Khulna district, Bangladesh.

2.2 Cage construction and installation

A total of six cages each of 18 m^3 (3 m × 3 m × 2 m, length × width × height) were constructed with bamboo split. The entire frame was wrapped with a nylon net of 1.0 cm mesh size. To prevent feed pellets from drifting out of the cages, the water level inside each cage was fitted with a 30 cm wide, 1 mm mesh net border along the waterline. Empty 250-L air-filled plastic drums were used as flotation devices to provide buoyancy for the cage structure. Each cage was tied and hanged with bamboo poles. The top of each cage was covered with a nylon net (mesh size 2.5 cm) to prevent fish from escaping and from predation by birds. To enable the cages to float with changes in water level, the entire structure was loosely fastened to a bamboo raft and secured on both sides with nylon-rope anchors (Figure 2). The submerged volume of each cage was 15 m^3 (3 m × 3 m × 1.67 m). Six cages were randomly assigned to three feeding treatments with two replicate cages per treatment.

FIGURE 2 Cage setup for experimental Asian seabass culture in the Sholmari River, Batiaghata Upazila, Khulna district, Bangladesh.

2.3 Fish collection and stocking

A total of 1,500 Asian seabass (4.8–5.8 cm; 2–3 g $fish^{-1}$) were collected from the Pasur River in Mongla Upazila of Bagerhat district, Bangladesh, and were immediately transported to the experimental site. Fish were collected from nature because the hatchery-produced Asian seabass are not available in Bangladesh. The collected fish were conditioned for transport in aluminum pots containing river water and no supplemental feeding. Two earthen ponds, each of 15 m length, 10 m width, and 1.5 m depth, nearby the experimental site were used for nursing the fish for 25 days. Fish were initially acclimatized to the nursing environment by gradually adding pond water to the aluminum pots before releasing the fish into the ponds. Stocking density was 750 fish $pond^{-1}$, representing approximately 3 fish m^{-3}. Fish were provided with a formulated floating feed 4 times daily for 23 days to adapt them to the formulated feed (a high-protein pelleted feed, Table 1); however, the fish refused the formulated feed. A limitation of this adaptation process was that this preliminary study provided fish only with pellets and did not evaluate co-feeding strategies (e.g. mixed trash fish and pellets). To prevent cannibalism, an intermediate size-grading after two weeks of stocking was conducted. Following 25 days of nursing, fish were harvested and a total of 300 uniform-sized fish (7.7 g and 7.5 – 7.8 cm) were equally distributed to the six cages (50 $cage^{-1}$; dynamic volume 15 m^3 per cage), represents a stocking density of approximately 3 fish m^{-3}. In cage culture, the ideal stocking density and carrying capacity vary depending on the species, fish size, cage size, water exchange rate or flow, and duration of the rearing period (Philipose *et al*. 2013). Initial weight of each fish was recorded with the help of an electronic balance (CT 1200-S, OHAUS, USA). Six cages were randomly assigned to three feeding treatments: 100% live feed (mixture of live and trashed juvenile tilapia) (T_1), 50% live feed plus 50% formulated feed (T_2), and 100% formulated feed (T_3), with two replicate cages per treatment. The nutritional composition of the formulated feed and live feed is given in Table 1. In T_1 and T_2, fish were fed at 8% during the initial 3 weeks, and later at 6% of their body weight. The fish were fed twice a day, 50% of the daily ration in the morning (0800 h) and another 50% in the afternoon (1600 h). Intake of the formulated feed was determined by collecting all the remaining pellets in the cages after one hour of each feeding and then by weighing the pellets. Feed allocation for each cage was adjusted based on triweekly samplings and daily mortality. A diver examined the cages every ten days interval. Water quality parameters, i.e., dissolved oxygen, pH, salinity, and temperature were monitored twice daily (0900 h and 1630 h) using portable devices.

TABLE 1 Mean values (n = 2) of proximate composition of juvenile tilapia and formulated feed those were fed to the experimental Asian seabass.

Composition	Juvenile tilapia	Formulated feed
Moisture (% as-is)	77.8	10.4
Crude protein (% DM)	66.1	49.7
Crude fat (% DM)	20.1	16.3
Crude ash (% DM)	13.7	11.4
Carbohydrate (% DM)	–	22.7
Gross energy (kJ g^{-1} DM)	22.6	18.7

DM = dry matter

2.4 Proximate composition analysis of feeds

Proximate composition of the live feed and the formulated feed were determined according to the general principle of Association of Official Analytical Chemists, USA (AOAC 2005) with a little modification in some cases. For dry matter analysis, the samples were dried at 105°C for 24 h following an extra 4 h afterwards to confirm a constant dry weight. Crude ash was determined through incineration at 550°C for 8 h. Crude protein was assessed based on analyzed nitrogen: crude protein = Kjeldahl-N × 6.25. Crude fat was determined by Soxhlet method using methanol-chloroform (1:2, V/V) extraction. A bomb calorimeter was used to assess gross energy content of the feed samples.

2.5 Fish sampling and growth study

Periodical sampling of fish was carried out on week 3, 6, 9, and 12 throughout the experimental period to ascertain health status and growth. On each sampling, 5 representative fish per cage were sampled and their individual weight was recorded using an electronic balance (OHAUS, Model CT 1200-S, USA). After weighing, the sampled fish were released back into their respective cages. All the fish were harvested at the end of the experiment. Growth parameters, i.e., specific growth rate (SGR), daily growth rate (DGR), and weight gain (WG) were estimated at each sampling and final harvesting as per the formulas used by Salama and Al-Harbi (2007):

SGR (% d^{-1}) = [(ln final mean body weight – ln initial mean body weight) / Number of days] × 100

DGR (g d^{-1}) = [(Final mean body weight – Initial mean body weight) / Number of days)]

WG (g) = Final body weight – Initial body weight

Cumulative mortality (%) = (Number of dead fish at a certain point / Initial number of live fish) × 100

Survival (%) = (Number of fish harvested at a certain point / Initial number of fish) × 100

2.6 Data analysis

Statistical analysis of SGR, DGR, WG, and cumulative mortality were performed by one-way ANOVA, where the mean values were compared by Tukey's New Multiple Range Test at 5% level of significance (Gomez and Gomez 1984). The statistical software SPSS (version 22.0) was used for all the analysis.

3 | RESULTS

3.1 Water quality parameters

Irrespective of tidal condition of the river, the recorded water temperature, salinity, dissolved oxygen, and pH ranged between 23.0–29.6°C, 4.0–19.0 ppt, 4.0–8.0 mg L^{-1}, and 6.9–9.7, respectively. The periodic and overall mean values are given in Table 2. Although some fluctuations in values, particularly salinity, were observed between periods, the values did not change sharply within a day between high and low tide.

TABLE 2 Water quality parameters of the Sholmari River, presented as triweekly means (n = 18) and overall mean (n = 72) with their standard deviations on tidal condition throughout the 12-week experimental period between July and September 2022.

Parameters	Tide	Week 0–3	Week 4–6	Week 7–9	Week 10–12	Overall
Temperature (°C)	High	25.4 ± 2.0	28.4 ± 1.2	27.2 ± 1.0	25.9 ± 1.0	26.7 ± 1.8
	Low	24.4 ± 2.2	27.9 ± 0.7	27.6 ± 0.7	25.4 ± 0.5	26.3 ± 1.9
Salinity (ppt)	High	13.4 ± 2.3	10.1 ± 1.5	5.4 ± 1.6	10.8 ± 2.3	9.9 ± 3.5
	Low	11.3 ± 2.5	8.1 ± 1.6	5.4 ± 1.5	7.9 ± 0.6	8.2 ± 2.7
pH	High	7.4 ± 0.7	7.7 ± 0.1	7.1 ± 0.2	7.5 ± 0.3	7.4 ± 0.5
	Low	8.1 ± 0.5	7.9 ± 0.2	7.9 ± 0.2	7.9 ± 0.1	7.9 ± 0.3
Dissolved oxygen	High	4.7 ± 0.3	6.5 ± 0.4	5.8 ± 0.3	4.4 ± 0.4	5.4 ± 0.9
(mg L^{-1})	Low	5.2 ± 0.5	7.3 ± 0.8	6.4 ± 0.5	5.0 ± 0.4	6.0 ± 1.1

3.2 Feed acceptance and growth of fish

Fish in T_2 and T_3 refused the formulated feed. This refusal was ascertained by comparing the given amount and the leftover of feed after one hour of each feeding. Fish were sampled on week 3, 6, 9, and 12 to measure growth. All the treatments showed the highest SGR values on week 3 when compared to the later sampling moments. Irrespective of sampling moments, SGR values varied significantly ($p < 0.05$) between treatments (Figure 3). Final SGR values after 12 weeks were 1.66, 1.12, and 0.90 % d^{-1} in T_1, T_2, and T_3, respectively.

DGR values differed significantly among the treatments ($p < 0.05$) at week 3 or 9. On week 6 or 12, DGR value in T_1 was significantly higher ($p < 0.05$) compared to T_2 or T_3, but the values did not vary between T_2 and T_3 (Figure 4). Final DGR values were 2.20, 0.74, and 0.44 g d^{-1} in T_1, T_2, and T_3, respectively.

WG values in T_1 at each sampling moment were significantly higher ($p < 0.05$) compared to their respective T_2 or T_3 (Figure 5). Despite perceptible differences, no statistical differences in WG were observed between T_2 and T_3 ($p > 0.05$) at week 6 or 12 (Figure 5). However, the values at week 3 or 9 differed significantly between T_2 and T_3 ($p < 0.05$). From week 9 to week 12, WG value in T_1 sharply increased when compared to T_2 or T_3 (Figure 5). Final WG values were 182.50, 61.10, and 36.50 g in T_1, T_2, and T_3, respectively.

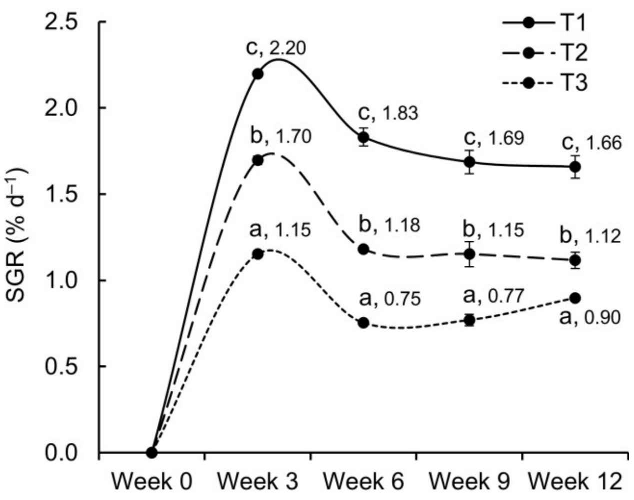

FIGURE 3 Specific growth rate (SGR) of experimental Asian seabass on each sampling moment (week). Values lacking a common letter at each sampling moment are significantly different ($p < 0.05$). Error bars represent the standard deviation of the mean (n = 2). T_1 = 100% live feed (live and/or trashed juvenile tilapia); T_2 = 50% live feed plus 50% formulated feed; T_3 = 100% formulated feed.

3.3 Mortality and survival

Mortality at week 3 or 6 did not differ among the treatments. At week 9, mortality in T_2 did not differ from T_1 or T_3, but the mortality in T_3 was higher compared to T_2 ($p < 0.05$; Figure 6). Final mortality (week 12) in T_1 (12%) was significantly lower compared to T_3 (36%) ($p < 0.05$); however, the mortality did not differ between T_1 and T_2 (Figure 6). Overall survival rates were 64, 82, and 88% in T_1, T_2, and T_3, respectively.

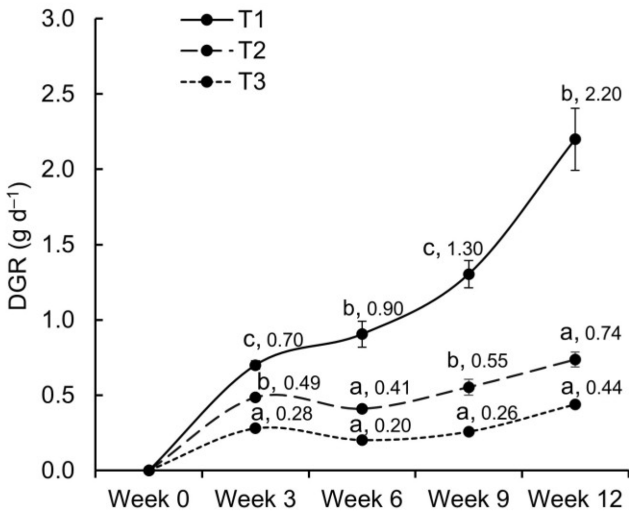

FIGURE 4 Daily growth rate (DGR) of experimental Asian seabass on each sampling moment (week). Values lacking a common letter at each sampling moment are significantly different ($p < 0.05$). Error bars represent the standard deviation of the mean (n = 2). T_1 = 100% live feed (live and/or trashed juvenile tilapia); T_2 = 50% live feed plus 50% formulated feed; T_3 = 100% formulated feed.

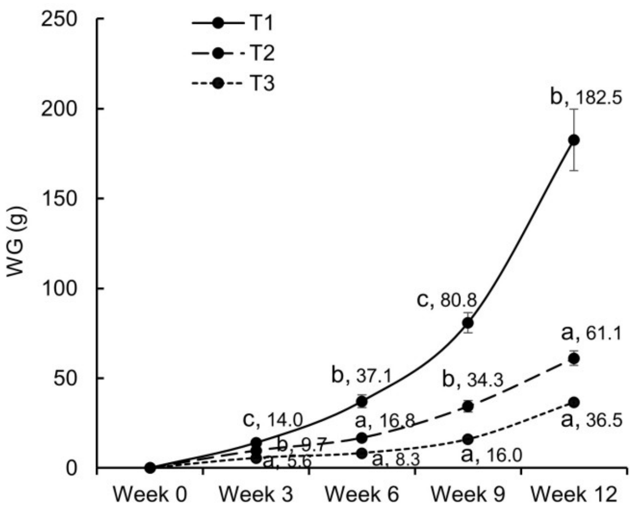

FIGURE 5 Weight gain (WG) of experimental Asian seabass on each sampling moment (week). Values lacking a common letter at each sampling moment are significantly different ($p < 0.05$). Error bars represent the standard deviation of the mean (n = 2). T_1 = 100% live feed (live and/or trashed juvenile tilapia); T_2 = 50% live feed plus 50% formulated feed; T_3 = 100% formulated feed.

4 | DISCUSSION

This study aimed to assess the feasibility of cage culture of Asian seabass (*Lates calcarifer*) in coastal rivers of Bangladesh. The feasibility was assessed in relation with the suitability of aquatic environment for cage culture, feed preference, growth performance, and survival of fish.

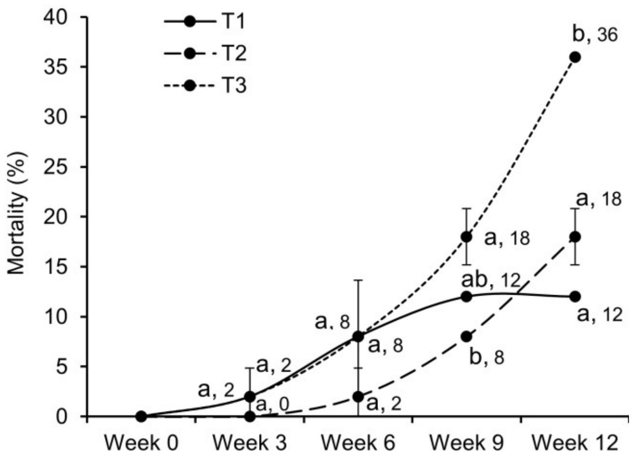

FIGURE 6 Cumulative mortality of experimental Asian seabass over 12 weeks. Values lacking a common letter at each sampling moment (week) are significantly different ($p < 0.05$). Error bars represent the standard deviation of the mean ($n = 2$). T_1 = 100% live feed (live and/or trashed juvenile tilapia); T_2 = 50% live feed plus 50% formulated feed; T_3 = 100% formulated feed.

4.1 Water quality and environmental suitability

Water quality directly influences the general health status of fish (Al Zahrani *et al*. 2013), which is related to their growth. Poor water quality reduces feed consumption, increases feed conversion ratio, and diminishes the survival of fish (Santos *et al*. 2010). Asian seabass has an extremely wide thermal (15–40°C) tolerance, with optimal growth at 22–35°C (Tucker *et al*. 2002; Anil *et al*. 2010). In the current study, the measured water quality parameters including temperature were within the suitable range for Asian seabass (Kungvankij *et al*. 1986; Tucker *et al*. 2002; Anil *et al*. 2010). Therefore, water quality parameters were not identified as a critical factor influencing fish performance in this study. These findings indicate that the water environment in the studied Sholmari River, and likely other coastal rivers of Bangladesh, is suitable for Asian seabass cage culture.

4.2 Growth performance under different feeds

Growth parameters SGR, DGR, and WG were measured in the present study. Regardless of feeding treatments, the highest SGR values on first sampling in this study are attributable, at least in part, to the higher feeding rate during the initial weeks, considering the faster growth during early stages (Sangeeta *et al*. 2018). Although the fish groups received the same amount of feeds with similar dietary energy contents, final SGR was nearly doubled in T_1 compared to T_3. This difference in SGR between treatments is likely due to the refusal of the formulated feed. Although studies conducted outside Bangladesh reported satisfactory responses of Asian seabass to formulated feeds (e.g. Anil *et al*. 2010), the native strain of Asian seabass used in the present study did not adapt to the formulated feed. However, feeding strategies such as gradual weaning, where mixed feeds of trash fish and formulated feeds are provided with a progressively declining ratio of trash fish over a certain period, may help fish adapt to formulated feeds. The highest SGR value (1.66 % d^{-1}) recorded after 12 weeks in the present study is much lower compared to that recorded by Hassan *et al*. (2021) in Asian seabass (4.13 and 3.78 % d^{-1}) after a 10 week trial. This inconsistency in results between studies might be attributed to differences in fish strain and age, feed type, feed digestibility, cage size, stocking density, culture period, and environmental conditions. However, the SGR values in the present study showed similarity with that in other carnivorous and omnivorous fish species such as striped snakehead (*Channa striata*; 1.49 % d^{-1}; Sangeeta *et al*. 2018), European catfish (*Silurus glanis*; 1.40–2.66 % d^{-1}; Köprücü *et al*. 2024), Pangas catfish (*Pangasius pangasius*; 1.84 % d^{-1}; Debnath *et al*. 2005), and Nile tilapia (*Oreochromis niloticus*; 2.14 % d^{-1}; Dey *et al*. 2020). This suggests that Asian seabass has potential for cage culture; however, this preliminary study did not aim for a cost-benefit analysis, which remains to be addressed in future research.

In contrast to SGR, similarity in final DGR values between T_2 and T_3 indicates that SGR may not always reflect DGR, and statistical patterns between them are not necessarily consistent. Once the fish in T_3 completely refused feed, the similarity in final DGR values between T_2 and T_3 was likely attributable to the high mortality in T_3. It is likely that in T_3, live fish consumed dead individuals, which contributed to growth and thus influenced DGR. Moreover, the abundance of natural food may also have contributed to this outcome. The highest final DGR in T_1 over 12 weeks (2.20 g) is similar to that (2.22 g) recorded in the study of Philipose *et al*. (2013) on Asian seabass cultured in sea cages. This suggests that the wild strain of Asian seabass in Bangladesh shows potential for cage culture under the present conditions.

A previous 10-week pre-growout culture of juvenile Asian seabass showed a final WG of 112.07 g (Krishna *et al*. 2014), which was lower than the highest value observed in T_1 (182.50 g) but higher than the second-highest value (61.10 g) in T_3 of the present study. In another study, a 9-week culture of Asian seabass fingerlings achieved a WG of 167.81 g (Hassan *et al*. 2022), closely aligning with the highest value recorded in the present study. This inconsistency in findings between studies may occur due to multiple reasons as discussed earlier. However, consistent with SGR and DGR, WG values also indicates the potential for cage culture of Asian seabass in the studied systems in Bangladesh. However, the promising WG values in T_1 suggest reliance on live or trash fish as feed, highlighting concerns about availability and cost.

4.3 Survival, cannibalism, and stocking density

Survival rates of Asian seabass in the present study (64–88%) fall in the survival range of 65–100%, as recorded in several previous studies conducted in cages (e.g. Catacutan and Coloso 1997; Kailasam *et al*. 2001; Kumaran *et al*. 2021). Several factors such as quality of fish, feed type (nutrition), and environmental factors like pollution may influence the mortality of Asian seabass in cages, making differences in survival among studies. Cannibalism, a genetic and behavioral characteristic of Asian seabass, which causes mortality influenced by size variation and environmental factors such as food availability, pollutants, shelters availability, water transparency, light, and feeding frequency. Under controlled conditions, seabass compete with one another for food and space, which gradually causes size differences and consequently stimulates the cannibalistic behavior in bigger individuals (Khan *et al*. 2021). In the present study, the observed cannibalistic behavior was relatively low, most likely due to the low stocking density (3 fish m^{-3}) and the stocking of apparently uniform-sized fish. Aligning with several previous studies mentioned above, survival of Asian seabass in this study indicates the potential for cage culture of Asian seabass in the studied systems in Bangladesh. Although T_2 showed more than 80% survival, comparable to T_1, growth performance should also be considered when focusing on profitability.

4.4 Implications for cage culture development in Bangladesh

This pilot and short-term investigation provides an initial dataset to support further research on Asian seabass culture in Bangladesh. The local strain used in this study did not accept formulated feed, indicating a major constraint for commercial cage culture due to continued reliance on live feed and its associated cost and availability. Future work should evaluate co-feeding protocols and other strategies to facilitate adaptation to formulated feeds. As the present study did not include a cost-benefit assessment, it provides no basis for inferring commercial profitability. Nonetheless, the cage construction materials and overall setup appeared relatively inexpensive, suggesting potential economic viability. However, long-term trials with more replicates per treatment are required for a robust financial evaluation, as this preliminary study included only two replicates per treatment. Additional research is needed to optimize stocking density and improve production per unit area. Also, development of artificial breeding techniques of Asian seabass in Bangladesh would help reduce pressure on wild populations and support sustainable aquaculture expansion.

5 | CONCLUSIONS

Cage culture of Asian seabass in coastal rivers remains at an early stage of development in Bangladesh. Aquatic environmental conditions for cage culture, growth performance, and survival of fish recorded in this preliminary study demonstrate the feasibility of rearing Asian seabass in floating net cages in coastal rivers of Bangladesh. Nevertheless, the economic feasibility of this technique has yet to be established. Until the strain is domesticated and suitable pelleted feeds are developed, farmers attempting seabass cage culture in coastal rivers of Bangladesh should plan for reliable access to live and / or trash fish and maintain relatively low stocking densities.

ACKNOWLEDGEMENTS

The study has been conducted by the funding of the Project Implementation Unit of Bangladesh Agricultural Research Council (BARC) under National Agricultural Technology Program-Phase II Project (NATP-II) of World Bank (Grant number: NATP-2/PIU-BARC-44/2017-7169; Dated: 23.07.2019). AK Ghosh appreciates NATP-II Project and BARC for providing his PhD fellowship. The authors are grateful to Md. Mahmud Hasan, the owner of Mahmud Aquaculture, Batiaghata, Khulna for supporting research work in his cages.

CONFLICT OF INTEREST

The author declares no conflict of interest.

AUTHORS' CONTRIBUTION

AK Ghosh: conceptualization, methodology, data curation, formal analysis, investigation, visualization, writing–original draft preparation, review and editing, validation. BK Dey: investigation, data curation, formal analysis, visualization, writing–original draft preparation, review and editing, revision. RB Shahid: data curation, visualization. S Bain: data curation. BK Roy: data curation. MG Sarower: conceptualization, methodology, funding acquisition, project administration, resources, supervision, writing–review and editing, validation. All authors read and approved the final manuscript.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on a reasonable request from the corresponding author.

REFERENCES

Al Zahrani AW, Mohamed AH, Serrano Jr AE, Traifalgar RFM (2013) Effects of feeding rate and frequency on growth and feed utilization efficiency in the camouflage grouper (*Epinephelus polyphekadion*) fingerlings fed a commercial diet. European Journal of Experimental Biology 3(1): 596–601.

Anil MK, Santhosh B, Jasmine S, Saleela KN, George RM, …

Rao GS (2010) Growth performance of the seabass *Lates calcarifer* (Blotch) in sea cage at Vizhinjam Bay along the south-west coast of India. Indian Journal of Fisheries 57(4): 65–69.

AOAC (2005) Official methods of analysis of the association of official analytical chemists international, 16th ed. Association of Official Analytical Chemists, Rockville, USA.

Ara MH, Uddin MN, Sarkar SC, Kumar U (2017) Seasonal variation of temperature dependent physico-chemical parameters of a coastal River Bhadra, Bangladesh. Journal of Tropical Biology and Conservation 14: 69–81.

Aswathy N, Joseph I (2019) Economic feasibility and resource use efficiency of coastal cage fish farming in Kerala. Economic Affairs 64(1): 151–155.

Boonyaratpalin M, Williams K (2002) Asian sea bass, *Lates calcarifer*. In: Webster CD, Lim C (Eds) Nutrient requirements and feeding of finfish for aquaculture. CABI Publishing, Wallingford, UK.

Carbone V, Shinn A, Crieloue H, van Amerongen A, Giri INA, … Debono S (2025) Adapting Mediterranean aquaculture larval feeding strategies for tropical species: a case study of barramundi. In: World Aquaculture–The Magazine of the World Aquaculture Society 56(1): 31.

Catacutan MR, Coloso RM (1997) Growth of juvenile Asian seabass, *Lates calcarifer*, fed varying carbohydrate and lipid levels. Aquaculture 149(1–2): 137–144.

Chudasama RV, Patel PH, Bhola GK, Zala NA, Devaliya JD (2023) A short review of Asian seabass (*Lates calcarifer*) cultivation. Indian Journal of Pure and Applied Biosciences 11(3): 17–35.

Debnath D, Pal AK, Sahu NP, Jain KK, Yengkokpam S, Mukherjee SC (2005) Effect of dietary microbial phytase supplementation on growth and nutrient digestibility of *Pangasius pangasius* (Hamilton) fingerlings. Aquaculture Research 36(2): 180–187.

Dey BK, Hossain MMM, Alam ME (2020) Effect of black cumin seed oil on growth, innate immunity and resistance against *Pseudomonas fluorescens* infection in Nile tilapia *Oreochromis niloticus*. Aquaculture International 28(4): 1485–1499.

Dunstan DJ (1959) The barramundi *Lates calcarifer* (Bloch) in Queensland waters. Technical Paper (CSIRO, Division of Fisheries and Oceanography, Australia) 5: 22.

FAO (2025) FishStatJ–software for fishery and aquaculture statistical time series. Food and Agriculture Organization of the United Nations, Rome, Italy.

Gomez KA, Gomez AA (1984) Statistical procedures for agricultural research. John Wiley & Sons, New York, USA.

Hassan HU, Ali QM, Ahmad N, Masood Z, Hossain MY, … Kamal M (2021) Assessment of growth characteristics, the survival rate and body composition of Asian seabass *Lates calcarifer* (Bloch, 1790) under different feeding rates in closed aquaculture system. Saudi Journal of Biological Sciences 28(2): 1324–1330.

Hassan HU, Ali QM, Siddique MAM, Hasan MR, Hossain MY (2022) Effects of dietary protein levels on growth, nutritional utilization, carcass composition and survival of Asian seabass *Lates calcarifer* (Bloch, 1790) fingerlings rearing in net cages. Thalassas: An International Journal of Marine Sciences 38(1): 21–27.

Ignatius B (2016) Equipping fisherwomen youth for the future. In: Manual of ICAR-Central marine Fisheries Research Institute, Cochin, India. pp. 175–178.

Ilham I, Siddik MAB, Fotedar R (2016) Effects of organic selenium supplementation on growth, accumulation, haematology and histopathology of juvenile barramundi (*Lates calcarifer*) fed high soybean meal diets. Biological Trace Element Research 174: 436–447.

Islam MM, Azad AK, Ara MH, Rahman M, Hassan N, … Rabeya I (2016) Environmental study on a coastal river of Bangladesh with reference to irrigation water quality assessment: a case study on Shailmari River, Khulna. Journal of Geoscience and Environment Protection 4(10): 41–64.

Kailasam M, Chandra PK, Muralidhar M, Thirunavukkarasu AR, Abraham M (2001) Survival and growth of seabass, *Lates calcarifer* (Bloch) fry reared at different stocking densities. In: Perspectives in Mariculture, Marine Biological Association of India, Kochi, India. pp. 311–320.

Khan MSK, Salin KR, Yakupitiyage A, Siddique MAM (2021) Effect of stocking densities on the growth performance, cannibalism and survival of Asian seabass *Lates calcarifer* (Bloch, 1790) fry in different nursery rearing system. Aquaculture Research 52(11): 5332–5339.

Köprücü K, Yonar SM, Köprücü S, Yonar ME (2024) Effect of different stocking densities on growth, oxidative stress, antioxidant enzymes, and hematological and immunological values of European catfish (*Silurus glanis* L., 1758). Aquaculture International 32(3): 2957–2973.

Krishna S, Thirunavukkarasu AR, Kailasam M, Prem K, Subburaj R, Thiagarajan G (2014) Pre-growout culture of Asian seabass (*Lates calcarifer*) (Bloch) in low volume cage in brackishwater Ashtamudi lake under participatory mode with traditional fishermen. Journal of Aquatic Biology and Fisheries 2: 272–276.

Kumaran M, Vasagam KPK, Kailasam M, Subburaj R, Anand PR, … Vijayan KK (2021) Three-tier cage aquaculture of Asian seabass (*Lates calcarifer*) fish in the coastal brackishwaters–A techno-economic appraisal. Aquaculture 543: 737025.

Kungvankij P, Tiro Jr LB, Pudadera Jr BJ, Potestas IO (1986) Biology and culture of sea bass (*Lates calcarifer*). In: Aquaculture extension manual, No. 11, Network of Aquaculture Centres in Asia-Pacific, Bangkok, Thailand.

Manju Lekshmi N (2015) Coastal aquaculture a potential livelihood opportunity for Goa with special reference to mussel culture (pp. 89–90). In: Souvenir-silver jubilee publication, ICAR-Research complex for Goa, Goa, India.

Mitra R, Sikder V (2023) Impact of brackish water aquaculture and mangrove degradation on global carbon balance: a review. The Holistic Approach to Environment 13(2): 76–82.

Pervin T, Yeasmin S, Islam R, Rahman A, Sattar A (2013) Studies on nutritional composition and characterization of lipids of *Lates calcarifer* (Bhetki). Bangladesh Journal of Scientific and Industrial Research 47(4): 393–400.

Philipose KK, Sharma SRK, Loka J, Sadhu N, Divu D, Dube P (2013) Culture of Asian seabass (*Lates calcarifer*, Bloch) in open sea floating net cages off Karwar, South India. Indian Journal of Fisheries 60(1): 67–70.

Rimmer MA, Russell DJ (1998) Aspects of the biology and culture of *Lates calcarifer*. In: De Silava SS (Ed) Tropical Mariculture. Academic Press, Cambridge, USA. pp. 449–476.

Salama AJ, Al-Harbi MA (2007) Response of the Asian seabass *Lates calcarifer* fingerlings to different feeding rates and feeding frequencies reared in hyper saline condition. Marine Sciences 18(1): 1–18.

Sangeeta K, Tiwari VK, Rani AMB, Rajesh K, Satya P (2018) Effect of feeding rate on growth, survival and cannibalism in striped snakehead *Channa striata* (Bloch, 1793) fingerlings. Journal of Experimental Zoology India 21(1): 205–210.

Santos GA, Schrama JW, Mamauag REP, Rombout JHWM, Verreth JAJ (2010) Chronic stress impairs performance, energy metabolism and welfare indicators in European seabass (*Dicentrarchus labrax)*: the combined effects of fish crowding and water quality deterioration. Aquaculture 299(1–4): 73–80.

Singh RK (2000) Growth, survival and production of *Lates calcarifer* in a seasonal rain-fed coastal pond of the Konkan region. Journal of Aquaculture 8: 55–60.

Tiensongrusmee B, Chantarasri S, Budileksono S, Yuwono SK, Santoso H (1989) Propagation of seabass, *Lates calcarifer* in captivity. (accessed on 24 November 2025).

Tucker Jr, Russel DJ, Rimmer MA (2002) Barramundi culture: a success story for aquaculture in Asia and Australia. World Aquaculture 33(3): 53–59.

Vij S, Purushothaman K, Gopikrishna G, Lau D, Saju JM, … Orbán L (2014) Barcoding of Asian seabass across its geographic range provides evidence for its bifurcation into two distinct species. Frontiers in Marine Science 1: 1–30.

Water Resources Planning Organization (WARPO) (2019) Research on the morphological processes under climate changes, sea level rise and anthropogenic intervention in the coastal zone. Ministry of Water Resources, Government of the People's Republic of Bangladesh. pp. 1–77.

Yenmak S, Joerakate W, Poompuang S (2018) Prediction of fillet yield in hatchery populations of Asian seabass, *Lates calcarifer* (Bloch, 1790) using body weight and measurements. International Aquatic Research 10(3): 253–261.

ORCID

AK Ghosh https://orcid.org/0009-0008-2387-7477
BK Dey https://orcid.org/0000-0002-0804-525X
RB Shahid https://orcid.org/0009-0006-9270-5690
S Bain https://orcid.org/0009-0000-8363-2684
BK Roy https://orcid.org/0009-0007-2771-8302
MG Sarower https://orcid.org/0000-0001-6488-9839