Open sea cage culture of cobia: a catalyst for the blue economy along Indian coasts

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The escalating global demand for fish protein necessitates the expansion of aquaculture from land to sea, facilitated by floating sea cages. In this study, the National Institute of Ocean Technology (NIOT), Chennai, Tamil nadu conducted a pilot-scale culture of hatchery-reared cobia seeds (*Rachycentron canadum*) in HDPE collar floating cages (9 m diameter with a cultivable volume of 320 m^3). These cages were strategically deployed at Olaikuda (Gulf of Mannar, Tamil Nadu) and Thuplipalem (Andhra Pradesh), representing semi-protected (SP) and open sea (OS) environments respectively. The evaluation focused on growth performance, with cobia seeds stocked in cages at an initial biomass of 150 g/m^3 (SP) and 154 g/m^3 (OS), featuring an initial average weight of 32.49 ± 1.77 g and a total length of 15.6 ± 0.91 cm during stocking. In SP site, cobia exhibited significant growth, reaching an average weight of 3830 g in 270 days, with a specific growth rate (SGR) of 1.76% with a survival rate of 77%. In contrast, despite the longer culture period of 322 days at the OS site, lower average weight of 2550 g with an SGR of 1.35% with survival rate 62% at SP. Physicochemical and biological parameters at both sites remained within optimal ranges. Notably, the OS site experienced higher wave heights (ranging from 0.56 to 2.28 m); potentially impacting feeding patterns, high energy expenditure due to the exposed weather conditions resulted into reduced growth rate compared to the sheltered bay. This study aims to elucidate the comparative suitability of environmental settings and its economic feasibility for open sea cage farming.

Keywords: Blue economy, cobia, growth rate, mariculture, sea cages, wave height.

Introduction

advantageous tropical climate, a long coastline stretching 8118 km, 12 nautical miles of territorial waters, and approximately 4 million marine fishermen residing in 3432 fishing villages across 66 coastal districts in 9 coastal states and 4 union territories. The country also features 6 major and 40 minor fishing harbours along with 1537 marine fish landing centres[2].

Despite the high protein content in fish, global fish production remains around 140 million tonnes (mt), which is relatively lower than the world's cereal production of 2686 mt (ref. 3). India's total fish production was reported to be 14.73 million metric tonnes (MMT) for the year 2020–21, with capture fishery contributing 3.48 MMT and culture fishery contributing approximately 11.25 MMT (Indian Fisheries Annual Report 2021–22). As capture fisheries have reached their maximum sustainable level, there is a pressing need to expand culture fishery, specifically through open sea-cage farming, as land-based aquaculture production often leads to multiple conflicts. Open sea-cage farming offers stable water quality and comparatively fewer conflicts in the offshore environment. Furthermore, land-based culture typically produces an average of 0.5 kg/m^3 (5000 kg/ha), while open sea-cage farming allows up to 100 kg/m^3 production through intensified culture operations, such as those involving *Hippoglossus hippoglossus*[4]. Offshore cage farming facilitates high-density seed stocking compared to land-based culture, employing simpler operations and harvesting methods with multi-trophic level usage[1].

Cobia (*Rachycentron canadum*) stands out as one of the essential candidates, demonstrating superior growth rate combined with consistent demand in both domestic and international markets[5–7]. Various environmental settings, particularly wave height, influence the growth of