Farming of orange mud crab in the Indian Sundarbans: Opportunities and challenges

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Orange mud crab inside a fattening box.

Mud crab is an important candidate species for brackish-water aquaculture in India. The two commercially important species are *Scylla serrata* and *S. olivacea*. Of these, *S. serrata* (green mud crab) is preferred for aquaculture because it grows larger and commands a higher price. However, fattening of *S. olivacea* is becoming popular, as this species is abundant in West Bengal and Odisha. Recent developments, such as farming in HDPE boxes, have encouraged fattening of *S. olivacea* (orange mud crab) for the production of mature crabs that fetch a premium price.

Live mud crabs have a niche market in countries such as Singapore, China, Thailand and Japan. Small consignments are exported on demand from hubs including Chennai and Kolkata. Unlike other seafood commodities, crabs are exported live and priced by individual size. A live mud crab of more than 900 g can fetch ₹1,100 - 2,000 in export markets, depending on demand and season. In 2023 - 24, 4,746.58 tonnes of crabs (live, fresh or frozen) were exported to various countries, earning US$ 42.60 million (Department of Commerce, Government of India). The high unit value makes mud crab a sought-after species for brackish-water aquaculture. Nevertheless, several bottlenecks on the farming side: Uncertain seed availability, cannibalism during grow-out, nursery-rearing issues and difficulties in harvesting limit large-scale expansion. Even so, small-scale grow-out and mud crab fattening are being adopted by coastal fish-farming communities.

Mud crabs are crustaceans with a hard exoskeleton and mainly inhabit mangrove and estuarine brackish-water areas. As noted, the two major species are *S. serrata* and *S. olivacea*. Previously, *S. serrata* in Indian waters was misidentified as *S. tranquebarica*. Molecular taxonomy now supports the existence of two species in these fisheries: *S. serrata* and

Mud crab fattening boxes.

S. olivacea[1]. Both occur along much of the coast, but in the Sundarbans the main species supporting fishery and culture is *S. olivacea*.

Like other crustaceans, mud crabs undergo periodic shedding of the exoskeleton (moulting), a key process affecting growth and reproduction. In mud crabs, weight gain across a moult is substantial, often approaching 100% of pre-moult weight. For example, a 100 g crab may reach 180 - 230 g after moulting, depending on nutrition. This seems attractive for aquaculture, but a single moult may take a couple of months because the intermoult period is long. Moulting is more frequent early in life; as crabs grow larger, the time required for each moult increases sharply.

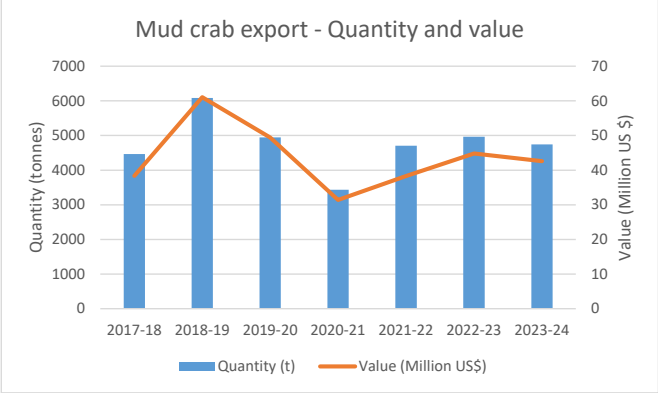
Status of mud crab culture in India

Grow-out culture

Except in the Sundarbans, mud crab aquaculture in India is mainly focused on *Scylla serrata*, which can grow to a larger size. In the wild, *S. serrata* can reach about 2.5 kg body weight, whereas *S. olivacea* typically attains around 600 - 700 g; in both species, males grow larger. Initially, *S. olivacea* was not considered aquaculture-friendly because of its smaller size, burrowing habit and more aggressive behaviour compared with *S. serrata*. However, innovative culture practices and demand for different product categories have given momentum to farming *S. olivacea*, which could be scaled up in future as a major culture activity. Even so, despite several ongoing culture practices, most production still comes from wild capture.

Farming mud crab in earthen ponds remains the major aquaculture activity in the country. Recommended stocking density is below 0.5/m². Because recovery at harvest is difficult, pond-based farming is still practised extensively. Although the two species share biology and habitat, their culture practices differ in important ways. At present, pond-based farming of *S. serrata* is carried out in Tamil Nadu, Andhra Pradesh, Kerala and Karnataka using wild-caught crablets and hatchery-produced crablets, driven by high market demand and larger size. Pond-based farming of *S. olivacea* is less popular; small-scale activities are undertaken along the coasts of West Bengal and Odisha, mainly in polyculture with other brackish-water fishes.

Unlike *S. serrata*, *S. olivacea* shows strong burrowing behaviour and often creates large holes in dykes, damaging structures. Where pond bottoms are muddy with silty clay, crab recovery is difficult, which reduces farmers' interest. Wild-caught crablets and rejected crabs procured from local traders are commonly used as seed for stocking. Trash fish from fish-landing centres is the main feed in these systems. Harvested crabs are usually sold in local markets, with larger individuals sent for export.



Ponds dried and prepared for fattening of orange mud crab

Mud crab fattening

Fattening of mud crabs is a major aquaculture activity and is popular with farmers because of the higher returns. It is a capture-based practice in which recently moulted, larger crabs are reared for a short period (about 30 - 35 days) to harden the shell. Newly moulted crabs have soft shells and lower meat content and are rejected during export grading. These crabs are therefore purchased at lower prices (₹300 - 400) and reared further to obtain a premium price once they harden. Rearing is done in individual HDPE boxes, as well as in pens and ponds. This approach is mainly used for *Scylla serrata* and is already practised across the coastal regions.

Fattening of *S. olivacea* differs from that of *S. serrata*. Recently moulted crabs are not used; instead, female crabs of 100 - 200 g are reared in HDPE boxes for 30 - 40 days to promote gonadal development. Shell-hardening is also practised in *S. olivacea* but only for larger crabs. Females with a gravid ovary showing a bright orange colour fetch a premium price in export markets and are in high demand in Taiwan, Thailand and China. Prices for fattened orange mud crabs can reach about ₹1,200 - 2,000 during peak export seasons, depending on grade. Unlike *S. serrata*, maturation in *S. olivacea* is faster; they mature at 90 - 100 mm carapace width and 90 - 150 g body weight. This is a key reason for the development of fattening in *S. olivacea*.

At present, fattening of orange mud crabs in individual boxes and ponds is a major culture activity in the Sundarbans because of the better returns. Production of gravid *S. olivacea* has grown with the introduction of HDPE boxes for individual stocking and monitoring. The boxes used are slightly smaller than those for *S. serrata*. HDPE boxes commonly range from 20 × 18 × 16 cm (L × W × H) to 30 × 21 × 22 cm. They are fixed to floating rafts made of PVC pipes and deployed in open waterbodies, brackish-water canals or ponds. For ease

Male orange mud crab.

of feeding, 20-40 boxes are loaded per raft. Approximately 20,000-30,000 boxes can be stocked per hectare, allowing for raft movement during feeding.

Stocking material comes from wild collections and is usually purchased from local traders at ₹300-400/kg. Immature crabs of 100-200 g body weight are mainly selected for fattening. During the fattening period, crabs are fed trash fish procured from the market at about 10% of body weight per day.

Fattening mud crab with the claws tied

Alongside box fattening of orange mud crabs, farmers in the Sundarbans also practise a distinctive method of fattening crabs in open ponds with the claws tied, which is gaining popularity. Crabs of 80 - 150 g are stocked into small earthen ponds of about 400 - 500 m². Approximately 80 - 100 kg of crabs are stocked per pond, with the chelipeds (claws) tied as for transport. Tying the claws reduces fighting and cannibalism. Feeding is not hindered because trash fish is chopped before feeding. Daily feed is about 5 - 6 kg of trash fish, and water is exchanged using source water from nearby creeks.

Farmers report that crabs fatten within 12 - 18 days with this method. The activity is seasonal, mainly from August to January when prices are higher. Crabs for stocking are purchased at ₹200-350/kg and sold during peak export seasons at ₹1,000 - 1,200/kg. The method is favoured because it requires less labour and investment, though reported survival fluctuates between 50% and 90%.

Marketing of mud crab

The marketing chain typically starts with the fisher or farmer who collects or cultures the crabs, and local traders or aggregators act as intermediaries. Crabs taken from the wild or from fattening units are usually delivered to a nearby trader for aggregation, because export hubs are distant and daily volumes are small. Initial grading is carried out by the trader according to size and export categories. Grading codes for orange mud crab differ from those for *Scylla serrata*. For *S. olivacea*, males and females are graded separately because mature females form an important category, which is not usually the case for green mud crab.

The ovary of mud crabs is H-shaped; when fully mature it occupies most of the space inside the carapace. Maturity can be assessed by shining a strong light through the underside of the carapace to observe shadows on the dorsal side. Gravid crabs are graded using this technique; empty crabs are returned for further fattening or sold locally. Although traders may use different codes, basic categories and sizes are similar. Female crabs with full ovaries are commonly classified as F1 (≥ 180 g), F2 (≥ 150 g) and F3 (≥ 100 g), fetching about ₹1,200 - 1,300, ₹800 - 900 and ₹700 - 800, respectively (Table 1). During grading, traders also check for physical damage, loss of appendages and reproductive status. Grading is done carefully because crabs are exported live and must arrive intact. Fishers are paid according to export rates, less a trader's margin, and aggregated crabs are shipped to the nearest export hub for onward transport.

S. olivacea female after rearing in the box based fattening system.

Grading the mud crab for gonadal development. Above: Immature crab. Below: Fattened fully gravid crab.

Scope and challenges in mud crab aquaculture

Mud crab aquaculture has strong potential for scale-up within the brackish-water sector, especially for fattening crabs in HDPE boxes. Housing crabs individually helps address cannibalism, and ponds used for other fish can be utilised

Earthen ponds of Namkhana, West Bengal for pond-based fattening of S. olivacea practiced with tied claws.

for rearing. Demand for crabs is likely to grow, and strategic steps can help capture this potential. New techniques - such as soft-shell crab production and vertical farming - are also emerging.

Despite industry interest in box-based farming, many farmers report technical constraints to scaling. Box-based fattening of orange mud crab is currently declining, with some farmers reducing operations for several reasons. Mortality and low survival during fattening, often linked to disease, are major concerns. A key factor is reliance on wild-collected stock, for which health status cannot be properly assessed. In addition, the quality of juvenile crabs sourced from local traders can be poor due to handling during grading and prolonged holding in sheds before transport to farms.

Prices are not fixed and fluctuate with international markets. Because crabs are kept individually, feeding is labour-intensive, pushing production costs higher and squeezing margins in the off-season. Farmers also struggle to obtain fair prices from local traders due to the number of intermediaries in the marketing chain. Nevertheless, advances in crablet production and the development of formulated feeds could address many of these issues.

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