

stocking density jointly determine productivity and economic performance, with natural trash fish at around 15% of body weight often producing strong growth and feed efficiency during fattening. Feed is also economically critical because it represents a major share of operating costs, especially when high-protein ingredients are required, and this burden tends to increase as culture systems become more intensive. Empirical studies confirm that feed type matters: in juvenile and grow-out phases, some natural feeds such as trash fish or African land snail have produced better weight gain, feed conversion, and profitability than several alternatives (Andal et al., 2025). Formulated feeds also show promise under nursery conditions. In purple mud crab instars, commercial formulated feed outperformed minced fish in survival, growth, and feed conversion, suggesting that nutritionally balanced artificial diets can support more efficient early-stage culture. Likewise, in megalopa-to-crablet nursing of *S. paramamosain*, feed choice altered growth performance even when survival remained high across treatments, with Lansy pellets and frozen *Artemia* supporting better daily weight gain than pureed shrimp meat or NRD pellets. Beyond feed type, dose and schedule also influence outcomes. Different raw-fish feeding doses significantly affected absolute weight gain and specific growth rate in fattening *S. serrata*, with the best performance reported at the highest dose tested, while fresh-feed trials in single-room systems found that chicken intestine produced the best combination of growth, molting, and feed conversion among the tested diets. By contrast, not every feeding adjustment yields a strong biological response: in a recirculating aquaculture system, changing trash-fish feeding frequency from once to three times daily did not significantly affect growth or survival, although once-daily feeding produced the best observed performance (Mayzuri et al., 2025). These results show that feeding management is not a single-variable issue, but a composite of feed source, nutritional composition, ration size, and feeding frequency that interacts with production stage and culture system.

Against this background, research on different feeding modes is significant because the mud crab industry still lacks universally reliable, cost-effective, and species- or stage-specific feeding strategies. Although live foods such as rotifers and *Artemia* remain standard in hatchery production, they are expensive, nutritionally inconsistent, and insufficient for fully reliable mass seed production, which has motivated efforts to develop microbound and other formulated larval diets. Experimental work indicates that mud crab larvae and megalopae can respond differently to feeding modes across developmental stages: co-feeding microbound diet with *Artemia* improved zoea III survival and development relative to total replacement, whereas megalopae were able to ingest and develop on formulated particles with moderate survival depending on ingredient composition. Other studies similarly show that artificial feed supplementation is not always advantageous at every stage; for example, enriched *Artemia* alone remained sufficient for some larval stages of *S. tranquebarica*, while additional fresh or artificial feeds were more relevant closer to crablet production. In grow-out and fattening systems, the evidence also remains mixed rather than definitive. Some studies identify clear advantages for specific natural feeds such as trash fish, African land snail, or chicken intestine; others report that changing carbohydrate-to-lipid ratios in isoprotein artificial diets does not significantly alter molting, growth, or feed efficiency, despite slight performance trends among treatments. This variation suggests that optimal feeding regimes likely depend on crab species, life stage, rearing environment, stocking conditions, and economic context rather than on a single universal feed formula. Therefore, the present study on the effects of different feeding regimes on mud crab growth performance is important for clarifying which feeding modes most effectively improve growth under culture conditions while maintaining practical relevance for farmers. Its objective is to compare alternative feeding regimes in terms of growth performance and, where applicable, associated production indicators such as survival and feed efficiency, so as to provide evidence that can support more efficient, economical, and sustainable mud crab farming.

2 Growth Characteristics and Nutritional Requirements of Mud Crab

2.1 Growth and molting characteristics of mud crab

Mud crab growth is discontinuous because size increase occurs mainly through molting rather than by steady external enlargement. In juvenile *Scylla serrata*, fresh weight rises abruptly at ecdysis because of rapid water uptake, then increases more moderately during postmolt shell mineralization and tissue deposition, before becoming relatively stable during intermolt (Nguyen et al., 2022). This means that apparent body growth reflects both true tissue accretion and temporary changes in body water, so the molting cycle must be considered when evaluating the effect of feeding regimes on growth performance.