

Molting characteristics are shaped by both internal energy allocation and external culture conditions. Juvenile mud crabs consume feed most actively during the first two weeks after ecdysis, and about half of total feed intake during a molt cycle can occur in the first third of that cycle when tissue growth is highest. Environmental factors also modify molt dynamics: in *S. paramamosain*, higher water calcium concentrations shortened molt intervals, accelerated carapace hardening, and increased weight gain during molting, showing that growth responses to feeding depend partly on whether the culture environment supports successful shell formation (Zhang et al., 2024).

2.2 Major nutritional requirements of mud crab

Protein is the dominant dietary requirement for mud crab growth because it supports tissue synthesis, molt-related recovery, and overall biomass gain. A recent review across cultured crab species indicates that crabs generally require about 35%-50% dietary protein and 5%-10% lipid, together with adequate essential amino acids, cholesterol, phospholipids, and long-chain polyunsaturated fatty acids (Esmacili et al., 2024). For juvenile *Scylla serrata*, graded feeding trials showed that the best growth performance and nutrient turnover occurred near 45% crude protein, with regression analysis estimating an optimum of about 46.9%-47.0% dietary protein for maximum growth and protein deposition.

Lipid quality is also critical because crustaceans depend on dietary sterols and essential fatty acids to support molting, development, and survival. Work on *S. serrata* larvae and megalopae emphasized that lipids provide energy as well as cholesterol, phospholipids, and fat-soluble vitamins, and suggested an optimum dietary cholesterol level of about 0.80% for megalopal development in semi-purified diets. Nutrient source additionally matters in practice: soy protein concentrate sustained good tissue growth and feed utilization in juvenile *S. serrata*, indicating that alternative protein ingredients can partially replace fishmeal when diets remain nutritionally balanced.

2.3 Evaluation indicators of growth performance

Growth performance in mud crab feeding studies is usually evaluated with a set of complementary biological and production indicators rather than with body weight alone. Common measures include absolute weight gain, specific growth rate, survival rate, molting percentage, feed conversion ratio, protein retention, and lipid retention, because these variables together reflect whether a diet improves both biomass production and feed-use efficiency. In nursery studies, daily weight gain and specific growth rate in weight are especially useful for distinguishing the effects of different feeds during early development from megalopa to crablet stages (Ly et al., 2024).

The choice of indicator is important because live weight can overestimate real growth during molt-related water uptake, whereas dry matter better reflects actual tissue deposition. Studies on juvenile *S. serrata* therefore recommend evaluating tissue growth on a dry-weight basis, since body water changes markedly across the molt cycle and can obscure nutritional effects on somatic growth. Feed-based indices are equally informative: in purple mud crab instars, commercial formulated feed produced higher survival, greater weight gain, higher specific growth rate, more frequent molting, and lower feed conversion ratio than minced fish, illustrating how multiple indicators together provide a clearer assessment of feeding regime performance (Thien et al., 2022). In summary, mud crab growth performance is best interpreted through the interaction of molting biology, nutrient requirements, and measurement method. For studies comparing feeding regimes, the most reliable evaluation framework combines growth, survival, molting, and feed-utilization indicators while recognizing that true growth is inseparable from the crab's molt cycle.

3 Main Feeding Modes Used in Mud Crab Aquaculture

3.1 Scheduled and quantitative feeding mode

Scheduled and quantitative feeding mode refers to the provision of feed at fixed times and in predetermined amounts relative to crab body weight. In mud crab fattening, this regime is widely used because it standardizes nutrient delivery and simplifies feed management across culture units. Several studies applied fixed feeding rates of 5%-7% body weight per day, usually divided into one or two meals, and reported acceptable growth, feed conversion, and survival under these controlled conditions (Gabito and Baltar, 2023). For example, feeding mud crabs twice daily at 7% body weight supported 100% survival and favorable growth responses when African land snail was used as