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Egg Incubation and Early Larval Development of the Flameback Angelfish and Fertilization

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Introduction

Environmental condition is a significant factor that directly affects the growth, metabolism and productivity of marine algae. This study examined the influences of diluted seawater on the growth, antioxidation capacity and accumulation of bioactive compounds of the marine macroalga, Sargassum muticum. Compared to the natural seawater (30 ppt, parts per thousand) control, the specific growth rate was clearly elevated at diluted seawater with 15 and 20 ppt during the initial 3 days, and was not statistically different at diluted seawater from 15 to 30 ppt at 15 days, while it decreased significantly at a low seawater concentration of 10 ppt. Chlorophyll a, carotenoids and total protein content fluctuated slightly under the different seawater solutions, suggesting that the algal cells underwent metabolic regulation during the period of adaptation to culture media changes. Changes in seawater concentration altered antioxidant enzyme activity, for instance, total superoxide dismutase, catalase and peroxidase, especially at low seawater solutions with 10 and 15 ppt. The malondialdehyde content also increased substantially, indicating that oxidative damage occurred in diluted seawater below 15 ppt. Moreover, the alginate content increased with decreasing seawater concentration, the alginate productivity was significantly increased by 22.32%–54.79% in all dilutions at 3 days and this promotion continued only at 15 and 20 ppt salinities after 7 days. The fucoxanthin content reduced significantly in the 10 and 15 ppt dilutions at 15 days, however, its productivity increased slightly at 10 and 15 ppt salinities in the first 3 days. The phlorotannin content increased slightly in the seawater dilutions with 20 ppt at 3 and 7 days, meanwhile, its productivity was significantly elevated during the initial 3 days at all seawater dilutions and the highest value was found at 20 ppt treatment. These results provide valuable data for the development and management of the aquaculture of S. muticum.

The flameback angelfish (Centropyge aurantonotus) is a stunning and highly prized species in the world of marine aquariums. Breeding and rearing these captivating creatures require a deep understanding of their reproductive biology, including the processes of egg incubation and early larval development. This article delves into the intricacies of flameback angelfish egg incubation and the critical stages of their early larval development, providing insights into the challenges and strategies involved in successfully breeding and rearing these beautiful marine organisms.

Spawning and Fertilization

The flameback angelfish exhibits external fertilization, where spawning occurs as the male and female release their eggs and sperm simultaneously. The fertilization process takes place in the water column, resulting in the formation of fertilized eggs. These eggs are buoyant and float freely until the male collects them for incubation.

Within the male's buccal cavity, the eggs undergo embryonic development. The fertilized eggs develop into embryos, which undergo a series of intricate cellular divisions. As development progresses, the embryos acquire distinct morphological features, including eyes, a spinal cord, and a digestive system. Oxygen exchange occurs through the thin egg membrane, ensuring the embryos receive the necessary oxygen for development.

After an incubation period ranging from 7 to 10 days, the eggs hatch, releasing the larvae into the water column. The flameback angelfish larvae, with their transparent bodies, embark on a crucial journey towards their adult form. At this stage, their diet consists of small planktonic organisms, which provide the essential nutrients for growth and development.

Flameback angelfish larvae undergo a metamorphosis process, where they transform into miniature versions of the adult fish. During this stage, proper feeding is crucial for their survival and growth. Providing suitable live food options such as copepods, rotifers, and enriched Artemia nauplii helps ensure the larvae receive the necessary nutrition. As they continue to grow, the flameback angelfish larvae gradually develop their vibrant colors and distinctive patterns, eventually resembling their adult counterparts.

Hatching and Larval Stage

The egg incubation and early larval development of the flameback angelfish are remarkable processes that highlight the species' unique reproductive strategy and the dedication of the male in ensuring the survival of their offspring. Successful breeding and rearing of flameback angelfish require meticulous attention to water quality, proper nutrition, and suitable live food options for the larvae.

By understanding the intricacies of egg incubation and the stages of early larval development, aquarists and breeders can embark on the rewarding journey of cultivating these beautiful marine creatures. Through careful care and attention to their specific needs, flameback angelfish can thrive, bringing joy and vibrant beauty to aquariums around the world.

During the last decade, indiscriminate antibiotic use has increased with intensive aquaculture practice for disease management leading to the emergence. Hence, there is a need to devise sustainable feed additives with nutraceutical value. Marine macroalgae containing natural polysaccharides have drawn attention because of their significant bioactivities. Sulphated polysaccharide is a polysaccharide containing sulphate group in sugar unit, characterized as a potential bioactive component in fish feed. These are non-digestible feed constituents and facilitate the host in multiple ways by rousing the growth and immune responses and developing a defence against harmful microorganisms and physical stressors. In aquaculture practice, marine macroalgae-derived sulphated polysaccharides are considered prebiotic substances that regulate host organisms' growth and health status. This study overviews marine macroalgae-derived sulphated polysaccharides' sources, structure, and modes of action in aquatic animals. Furthermore, the present review underscores the potential applications of marine macroalgae-derived sulphated polysaccharides in aquaculture to improve the knowledge for additional headway in this field of research. Although the effects of sulphated polysaccharides in aquatic animals have been investigated, further exploration of the mechanisms of sulphated polysaccharides on the health status of aquatic animals is required, which may open a new window during sustainable disease and growth management in the aquaculture industry.

The objective of this work was to evaluate the use of recirculation and settling chamber in synbiotic multi-trophic culture of Crassostrea sp. with Litopenaeus vannamei. Four treatments were tested: MONO (shrimp monoculture); integrated multi-trophic aquaculture (IMTA) (shrimp and oysters in the same tank); IMTA-R (shrimp and oysters in adjacent tanks with recirculation) and IMTA-RS (shrimp and oysters in adjacent tanks with recirculation using settling chamber).