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Editorial

Advancements In Aquaculture Ecology Research.

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Abstract

It is dedicated to the advancement of aquaculture science, with an emphasis on sustainable fish farming, aquatic health, nutrition, genetics, and ecological management. This magazine enables researchers, industry experts, and policymakers to communicate innovative methods and scientific findings that improve aquaculture productivity while maintaining ecological balance. Topics covered include water quality management, disease control, breeding strategies, feed formulation, and the effects of climate change on aquatic systems. The journal's goal is to promote multidisciplinary research and contribute to global food security and responsible aquaculture industry development.

Keywords : *Aquaculture, Ecology, aquatic organisms.*

INTRODUCTION

This Special Issue covers recent research on the ecology of commercial aquatic organisms, aquaculture systems, interactions with the environment, microbial community structure and function, and environmental management principles in aquaculture ecosystems. We compiled ten interesting papers on developments in aquaculture ecological research. The authors are all from China, the world's largest aquaculture producer, accounting for almost 60% of total production.

Aquaculture is a rapidly expanding human activity that produces high-quality food but may bring environmental risks. Sargassum-caused golden tide outbreaks have received significant attention. Song et al. investigated the interactions between farmed Gracilariopsis lemaneiformis and floating Sargassum horneri [1]. The study's findings could help prevent golden tide outbreaks through mariculture management. Wang et al. used depth-averaged two-dimensional shallow water equations and three-dimensional incompressible Reynolds-averaged Navier-Stokes equations to assess the effect of floating raft aquaculture on the hydrodynamic environment of an open sea area in Liaoning Province, China [2]. This study serves as a valuable resource for future research on open-sea aquaculture.

Research has focused on developing bioremediation solutions to mitigate environmental impacts of aquaculture and promote its sustainability. Li et al. identified suitable seaweed species for bioremediation of aquaculture effluent [3]. The study found that the seaweeds Neoporphyra haitanensis and N.dentata are effective and environmentally benign remedial tools.

Bio-floc technology, developed in the past decade, is an environmentally beneficial option for aquaculture. Carbon sources are used in biofloc systems to boost the carbon-to-nitrogen ratio (C/N) and encourage the growth of heterotrophic bacteria [4,5]. Molasses, a water-soluble carbon source, requires regular application, leading to increased management efforts. Two papers [4,5] focused on the production environment in biofloc systems. The publications examined how Bacillus pumilus BP-171 and various carbon sources, including PHBV and molasses, affected water quality, bacterial community, and Litopenaeus vannamei production in culture systems. Both papers found that introducing carbon sources or probiotics can impact water quality and the microbial community.

Three papers [6-8] examined how environmental factors such as temperature, carbonate alkalinity, and protein levels in compound feeds affect commercial aquatic species such as ridgetail white prawn (Exopalaemon carinicauda), juvenile mud crab (Scylla paramamosain), and Chinese mitten crabs (Eriocheir sinensis). Yu et al. examined the protein requirements of young Chinese mitten crabs in a rice-crab co-culture system, providing valuable insights for optimizing

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feeding strategies [6].

Liu et al. studied the ideal temperature range for young mud crabs based on growth, molting, energy consumption, antioxidant capability, and stress response [7]. The study's findings can inform crab management in aquaculture and help build recirculating systems for the species. China has around 46 million hectares of saline-alkaline water, which the government has urged to be reclaimed for fishponds [8]. Saline-alkaline water contains high carbonate alkalinity and pH, limiting aquatic species growth. Zhang et al. studied the impact of long-term high carbonate alkalinity stress on ovarian development in E. carinicauda, identifying the genes and pathways involved [8].

Daphniopsis tibetana is a crucial food source for marine fish and shrimp during their nursery stage. Zhao et al. studied the biology of D. tibetana in three Tibetan lakes and the genetic differences between wild-type and seawater-domesticated D. tibetana. Their findings are crucial for large-scale cultivation of D. tibetana (9).

In China, we have investigated many polyculture applications, including marine and freshwater. Understanding the biological processes behind different polyculture models is crucial. Yuan et al. conducted a thorough evaluation of ecology studies on three integrated rice field aquaculture models in China: rice-fish, rice-crab, and rice-crayfish co-culture systems (10). Integrated rice field aquaculture is a major freshwater aquaculture system. This publication provides a systematic assessment of ecology research in integrated aquaculture systems, including theories, biological studies, models, and eco-engineering methodologies.

Although aquaculture has attained high and consistent yields in recent decades, it faces long-term concerns such as pollution and resource use. Aquaculture ecology aims to establish an ecological foundation for long-term aquaculture development.

The Special Issue on "Advances in Aquaculture Ecology Research" is now closed, however research on aquaculture ecology continues to progress swiftly.

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