

Book Title (ID 2024\_13)

## Aquatic Horizons: Advancing Ecology in Aquaculture

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### ABOUT THE BOOK

Aquatic Horizons: Advancing Ecology in Aquaculture delves into the intricate relationships within aquatic ecosystems and their vital role in the sustainability of modern aquaculture. This comprehensive book explores key themes such as Integrated Multi-Trophic Aquaculture (IMTA), pond ecology, cage aquaculture and Recirculating Aquaculture Systems (RAS), emphasizing the ecological interactions and processes that underpin these systems. By integrating theoretical insights with practical applications, the book provides a holistic view of how sustainable aquaculture can harmonize with natural ecosystems to promote resilience, productivity and environmental health. The primary objective is to equip researchers, practitioners, and students with the knowledge and tools necessary for implementing ecologically sound practices in aquaculture, thereby balancing economic viability with environmental stewardship. Readers will benefit from a deep understanding of aquatic ecosystems, innovative technologies, and sustainable practices designed to minimize ecological footprints and enhance resource efficiency. Aquatic Horizons offers a balanced perspective on the future of aquaculture, highlighting emerging trends, research and real-world case studies that demonstrate the integration of ecological principles with aquaculture practices. By bridging the gap between ecology and aquaculture, this book serves as an essential resource for fostering a sustainable future in aquatic farming.

### CHAPTERS OUTLINES BUT NOT LIMITED TO:

#### Theme 1: Understanding the Principles and Significance of Aquaculture Ecology

**Chapter 1:** Foundations of Aquaculture Ecology: A Historical and Ecological Perspective

**Chapter 2:** Role of Ecology in Shaping Sustainable Aquaculture: Insights and Innovations

**Chapter 3:** Core Ecological Principles Underpinning Modern Aquaculture Practices

#### Theme 2: Structure and Function of Aquatic Ecosystems

**Chapter 1:** Energy Dynamics and Nutrient Cycling in Aquatic Ecosystems: An Ecological Overview

**Chapter 2:** Keystone Species and Their Crucial Roles in Aquatic Ecosystems

**Chapter 3:** Interconnections Between Marine and Freshwater Ecosystems: Ecological Implications

#### Theme 3: Factors Influencing Productivity

**Chapter 1:** Maximizing Biological Productivity in Aquaculture Systems: Strategies and Techniques

**Chapter 2:** Primary Producers in Aquaculture: Roles and Management

**Chapter 3:** Optimizing Water Quality for Enhanced Aquaculture Productivity

#### Theme 4: Positive and Negative Ecological Interactions

**Chapter 1:** Ecological Synergy in Aquaculture: Harnessing Positive Interactions

**Chapter 2:** Risks and Management of Invasive Species in Aquaculture

**Chapter 3:** Sustainable Management of Aquatic Invasive Species: Challenges and Solutions

#### Theme 5: Factors Influencing Growth Rates

**Chapter 1:** Genetic and Environmental Determinants of Aquaculture Growth Rates

**Chapter 2:** Nutritional Innovations for Enhanced Feed Efficiency in Aquaculture

**Chapter 3:** Optimizing Environmental Conditions for Sustainable Aquaculture Growth

#### Theme 6: Impact of Temperature, Salinity and pH Variations

**Chapter 1:** Physiological Responses to Environmental Stressors in Aquaculture

**Chapter 2:** Long-Term Climate Variability and Its Effects on Aquaculture

**Chapter 3:** Adaptive Management Strategies for Environmental Resilience in Aquaculture

## **Theme 7: Role of Microorganisms and Plants in Water Purification**

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**Chapter 2:** Phytoremediation in Aquaculture: Techniques and Benefits

**Chapter 3:** Integrating Aquatic Plants for Comprehensive Water Quality Management

## **Theme 8: Sediment Accumulation and Its Impact on Pond Ecology**

**Chapter 1:** Eutrophication and Hypoxia: Managing Sediment Accumulation in Aquaculture

**Chapter 2:** Innovative Sediment Management Techniques for Sustainable Aquaculture

**Chapter 3:** Cutting-Edge Technologies for Sediment Remediation in Aquaculture Ponds

## **Theme 9: Concepts and Benefits of Integrated Multi-Trophic Aquaculture (IMTA)**

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**Chapter 2:** Economic and Environmental Benefits of IMTA Systems

**Chapter 3:** Designing and Optimizing Efficient IMTA Systems: Innovations and Insights

## **Theme 10: Overview of Land-Based Systems**

**Chapter 1:** Land-Based Aquaculture: Closed Recirculating Systems (RAS) and Beyond

**Chapter 2:** Advances in Integrating Aquaponics and Hydroponics for Sustainable Aquaculture

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## **Theme 11: Challenges and Solutions for Aquaculture in Saline Environments**

**Chapter 1:** Navigating Saline Environments: Aquaculture Challenges and Innovations

**Chapter 2:** Saline-Tolerant Species: Opportunities and Management Strategies

**Chapter 3:** Successful Case Studies of Aquaculture in Salt-Affected Areas

## **Theme 12: Benefits and Challenges of Cage Aquaculture**

**Chapter 1:** Cage Aquaculture: Environmental Impact and Management

**Chapter 2:** Innovations in Cage Design and Sustainable Materials

**Chapter 3:** Best Practices for Cage Aquaculture Maintenance and Management

## **Theme 13: Best Practices for Ensuring Animal Health and Welfare**

**Chapter 1:** Health Monitoring and Diagnostic Tools for Aquatic Animals

**Chapter 2:** Prophylactic and Therapeutic Treatments in Aquaculture

**Chapter 3:** Welfare Standards and Ethical Considerations in Aquaculture

## **Theme 14: Impact of Climate Change on Aquaculture Practices**

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**Chapter 2:** Predictive Modeling for Climate Impact Assessment in Aquaculture

**Chapter 3:** Policy and Governance for Climate Adaptation in Aquaculture

## **Theme 15: Principles of Sustainable Aquaculture**

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## **Theme 16: Essential Biological and Environmental Principles**

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**Chapter 3:** Ecological Niche and Habitat Preferences in Aquaculture Management

## **Theme 17: Criteria for Species Selection**

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## **Theme 18: Comparative Analysis of Open and Closed Systems**

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**Chapter 2:** Technological Innovations in Aquaculture System Design

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## **Theme 19: Design and Operation of RAS**

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## **Theme 25: Role of Genetic Technologies in Sustainable Aquaculture**

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**Chapter 3:** Ethical Considerations and Regulatory Frameworks for Genetic Technologies

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**Chapter 2:** Conservation Strategies for Wild Populations in Aquaculture

**Chapter 3:** Enhancing Biodiversity Through Sustainable Habitat Management

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**Chapter 2:** Financial Incentives and Subsidies for Sustainable Aquaculture

**Chapter 3:** Market Trends and Trade Opportunities in Aquaculture

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