Innovative Approaches in Aquaculture Research (VOLUME-1)

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About the Book

This book is a comprehensive compilation of recent research and field-based studies in the domain of freshwater aquaculture and fish reproductive biology, with special emphasis on innovative breeding techniques, sustainable fish farming models, and conservation of indigenous fish biodiversity. It brings together a series of practical investigations and scientific analyses conducted in the central Indian region, particularly around Bhopal, Madhya Pradesh.

The chapters in this volume cover key aspects such as:

- Induced breeding of commercially and nutritionally important fishes including ornamental species like *Oranda Goldfish*, and indigenous species like *Clarias batrachus* and *Heteropneustes fossilis* using hormonal agents such as Ovafish, Ovatide, and Gonopro-FH.
- Practical demonstrations of mini portable hatchery systems, offering scalable and low-cost solutions for rural fish seed production.
- Polyculture systems integrating Small Indigenous Fish Species (SIFS) with Indian Major Carps, aimed at enhancing pond productivity and promoting dietary diversity in rural households.
- Experimental studies on the effect of environmental manipulations like greenlight exposure on the growth of Indian Major Carps, introducing low-cost innovations for increasing yield.
- Morphological and reproductive studies of small indigenous fishes and catfish species, essential for understanding reproductive cycles, gonadal maturation, and species conservation.
- Wetland and riverine ecosystem assessments around Bhopal, documenting current biodiversity status, ecological threats, and conservation priorities.

The book is designed to serve a wide readership including fisheries students, hatchery technicians, extension officers, policy planners, and small-scale farmers. It not only contributes to the academic understanding of fish breeding and ecosystem dynamics but also provides practical insights into field-level technologies and strategies for sustainable aquaculture and biodiversity conservation.

By linking laboratory research to on-ground implementation, this book represents a significant step toward technology transfer and livelihood enhancement in the fisheries sector, especially for the rural communities engaged in aquaculture.

Preface

The present volume is a compendium of scientific research and practical advancements in the field of aquaculture, with a special focus on induced breeding, reproductive biology, sustainable polyculture systems, and aquatic biodiversity conservation. With the growing demand for fish protein and the urgent need for biodiversity preservation, this book aims to bridge the gap between research innovation and grassroots implementation, especially in the context of small-scale and rural aquaculture practices.

This book begins with a series of studies on induced breeding techniques involving economically and ecologically significant fish species such as *Oranda Goldfish (Carassius auratus)*, *Clarias batrachus*, and *Heteropneustes fossilis*. These chapters provide valuable insights into the application of hormonal agents like Ovafish, Ovatide, and Gonopro-FH in both conventional and mini portable hatchery systems, demonstrating scalable models for fish seed production. Particular emphasis has been laid on embryonic development and hatchery management techniques tailored for field-level extension and farmer adoption.

The volume also delves into innovative polyculture practices, specifically integrating small indigenous fish species **(*Systomus sarana, Pethia ticto, Rasbora daniconius*)** with Indian Major Carps. These species hold potential not only for enhancing biodiversity in aquaculture ponds but also for addressing nutritional security in rural communities through micronutrient-rich fish production. Further chapters explore the influence of environmental factors, such as the application of greenlight for growth enhancement in carp culture. This emerging area of research opens new directions in light-based aquaculture technology for boosting productivity.

Adding to the biological understanding, the book features a morphological and reproductive analysis of gonadal structures in small indigenous fishes and indigenous catfish species, contributing significantly to species identification, brood stock management, and conservation breeding programs.

Lastly, this book underscores the ecological context by assessing the current status of wetlands and riverine biodiversity in and around Bhopal district, Madhya Pradesh. These findings provide a vital reference for environmental monitoring, aquatic resource management, and community-based conservation efforts.

This compilation is the result of collaborative efforts by researchers, students, and extension professionals. It is intended for use by students, researchers, policymakers, and fish farmers alike, offering both scientific rigor and practical relevance. We hope this volume serves as a valuable resource to strengthen sustainable aquaculture and biodiversity conservation in India and beyond.