Textbook of Aquariculture

By
B. Ahilan
N. Felix
Associate Professors
Department of Aquaculture
&
R. Santhanam
Ex-Dean
Fisheries College & Research Institute,
Tamilnadu Veterinary and Animal Sciences University,
Thoothkudi - 628 008, T.N.

2008
DAYA PUBLISHING HOUSE
Delhi - 110 035
Technical advances in the commercial ornamental fish production have taken place in the last two decades. Suitable technologies for the mass production of egg laying and live bearing ornamental fishes have also been developed. Due to these advancements, the world ornamental fish industry has grown considerably. More and more entrepreneurs have developed interest in this venture.

The world turnover in this industry has exceeded more than 5 billion US$. However, India’s contribution to the international export market is less. Though our fertile aquatic habitats harbour a variety of ornamental fishes, their collection, farming and trade have not been intensified sofar.

There is no comprehensive publication on tropical ornamental fishes for use as text book by students, standard reference by researchers and as a guide to entrepreneurs.
To fulfill this long felt gap, the present publication entitled “Textbook of Aquariculture” is being published. I strongly hope that this publication would be of immense help for the students, farmers and entrepreneurs dealing with ornamental fishes.

I congratulate the authors for their timely work.

Dr. V.K. Venkataramani, Ph.D.
Dean
Fisheries College and Research Institute
Thoothukudi
Preface

A number of publications on aquarium keeping are available from many countries. But in India, where ornamental fish culture is now being popularized, publications on Aquariculture with reference to our agro-climatic conditions are lacking. In order to fill up this long-felt gap, the present work has been taken up.

A wide range of aspects of freshwater ornamental fish culture such as, construction of aquarium tanks, maintenance of aquarium, important ornamental fishes and their breeding, ornamental aquatic plants, preparation of feed and feeding management and water quality and disease management have been dealt with. It is hoped that this contribution presented in an easy-to-read style with a number of photographs would be of great use to all students who have fisheries in their curriculum and also as a standard guide for the researchers and entrepreneurs.
We are highly indebted to Dr. V.K.Venkataramani, Dean, Fisheries College and Research Institute for his Foreword. We gratefully acknowledge Dr. J.D.Jameson, Director of Research and Extension (Fisheries) and Dr. N.V. Sujath Kumar, Associate Professor for their kind help in the preparation of this publication. We extend our thanks to Mr.Cherrmaraj for his secretarial assistance.

B. Ahilan, N. Felix & R. Santhanam
# Contents

*Foreword*  \(v\)

*Preface*  \(vii\)

1. Ornamental Fish Culture: An Introduction  \(1\)

2. Design and Construction of Ornamental Fish Tank  \(7\)

3. Accessories Used for Aquariculture Unit  \(14\)

4. Setting Up of an Aquarium  \(27\)

5. Commercially Important Ornamental Fishes  \(33\)

6. Breeding of Live-bearers  \(50\)

7. Breeding of Egg-layers  \(55\)

8. Ornamental Aquatic Plants  \(76\)

9. Feed and Feeding Management in Ornamental Fish Culture  \(95\)
10. Water Quality Management 122
11. Ornamental Fish Diseases 127
12. Transportation of Ornamental Fishes 139
13. Economics of Ornamental Fish Culture 146

Subject Index 155
Chapter 1
Ornamental Fish Culture: An Introduction

Among the various farming practices, aquaculture is practically promising and productive both in the freshwater and saltwater systems. Several groups of aquatic organisms such as finfishes, crustaceans, molluscs and seaweeds exist in the country with great potentials. Ornamental fishes are one such group of organisms, abundantly distributed in the freshwater and brackishwater systems and also in seas of India.

Ornamental fishes are colourful, beautiful and attractive. Hence they are called “Living jewels”. They are maintained in home aquarium and in garden pools for the hobby and enjoying their beauty. Ornamental fish keeping has been serving as a viable recreation, especially for hobbyists from time immemorial. The ancient Romans were
the first to keep ornamental fishes as pets at homes. The art of rearing the beautiful fishes by colour, design and shape spread rapidly throughout the world. With the growing interest on the fanciful varieties of brightly coloured organisms, ornamental fish culture developed as a tremendous business.

Aquarium fish can fetch about 100 times more price than the food fish and marine ornamentals are about ten times costlier than their freshwater counterparts (Bassleer, 1994; Gomes, 1996). The economics and profitability of an ornamental fish-exporting unit works out to be highly lucrative provided the activity is taken up on scientific lines with appropriate marketing strategies. The activity is possible not only on large scale but also on small scale. It provides good opportunity even to small entrepreneurs to enter into the field.

Technical advance in this field has taken place in the past 40 years. Recently suitable technologies for the mass production of the egg-laying and live-bearing fishes have been developed. For proper water quality maintenance, flow-through systems have also been developed. Due to these, the world ornamental fish industry has really grown steadily over the years.

As far as India is concerned, rapid development in ornamental fish farming would be a boon to the national economy. Establishment of ornamental fish farms including hatcheries have now been made by some selected business houses to diversify their activities. This trend should continue and more ornamental fish farms should be set up in selective areas. This approach would help to identify diversified ornamental fishes of our natural environments
and multiply them suitably so that India would be able to compete internationally in this trade.

**Export Potential of Ornamental Fishes in International Markets**

There has been considerable growth and diversification in the international trade of ornamental fishes, which are valued at about 5 billion US$. The major traders include USA, Europe, Japan, Australia, Singapore, Indonesia, Philippines and Sri Lanka. The markets for ornamental fishes consist of 99 per cent home hobbyists and 1 per cent public aquarium and Research Institutions.

The estimated annual wholesale value of world trade in ornamental fish is estimated to be more than US$1 billion. At the retail level, about 1.5 billion fish with a value of US$6 billion are traded annually. The entire industry, including accessories, is estimated to be worth about US$14 billion. Some 30–35 species dominate in the US markets and 30 species account for about 60 per cent of imports. The lower valued fish are generally in greater demand than the higher valued species.

According to statistics, 50 per cent of the suppliers are located in Asian countries with estimated 80 per cent pond raised freshwater fish, 15 per cent marine wild caught fish and 5 per cent fresh and brackishwater wild caught fish. Singapore, Thailand, Hong Kong, Japan and Malaysia are the major suppliers of freshwater fishes while Indonesia, Philippines and Sri Lanka are the major suppliers of wild caught marine fish.

India is really fortunate to utilize the natural marine ornamental fishery resources along her coast, particularly