

# Evolution of Fisheries and Aquaculture in India



**N.G.K. Pillai & Pradeep K. Katiha**

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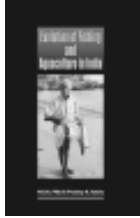
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**N.G.K. Pillai and Pradeep K. Katiha\***

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## FOREWORD


Fishing is one the oldest recorded sources of livelihood. In India, the fisheries sector contributes significantly towards strengthening household food and nutritional security, generation of gainful employment and income and manifold increment in fish export. These facts established fisheries sector as an important enterprises of Indian economy in general and agriculture sector in particular. During the last five decades, Indian fisheries had made tremendous progress, with the annual production increasing from 0.75 million tones of fish and shellfish in 1950 to 6.1 million tones in 2002, indicating over eightfold increase during the period. This is the outcome of research and development activities of various institutions, which developed and transferred improved fishing practices and aquaculture technologies to the fishers, fish farmers and entrepreneurs. Practically, it transformed this traditional sector of fifties to a developing multicore industry. It is field that inadequate documentation of fishery information coupled with the highly scattered nature of management options and possibilities relevant to each ecosystem/resource are the major handicap to (i) examine process of fisheries research and development; (ii) frame holistic approach for fishery planning and development; (iii) assess production potential of prospective technologies for different fishery waters; and (iv) provide comprehensive and consolidated information on aforementioned aspects for all user groups.

The book *Evolution of Fisheries and Aquaculture in India* is the outcome of "Aquaculture technologies and fishing practices in India, one of the components of ICAR-World Fish project *Strategies and options for increasing and sustaining fisheries and aquaculture production to benefit poor households in India*. It is a compilation of available information on aforementioned aspects. The book addresses aspects of evolution of fisheries research and development; aquatic resources and their production; catalogue and brief description of aquaculture and fishing practices and post-harvest technologies; economic, adoption, impact

assessment and prioritization of these technologies; pipeline technologies, suggestions, recommendations and action points for development of inland and marine fisheries sector in India.

This attempt on documentation and compilation of aquaculture technologies developed and refined over the years and fishing practices along with their process of development and future prospects is really a hard task and valuable contribution accomplished by Dr. N.G.K. Pillai and Dr. Pradeep K. Katiha. I congratulate the authors for their untiring efforts for preparation of this comprehensive publication. I am confident that publication of this nature will be of immense interest and help to the fishers, students, researchers, development workers, planners, policy makers and all those concerned with the development of fisheries. Further, this publication would facilitate evolution of suitable and relevant fisheries management programmes in the Indian perspective.

New Delhi - 12  
June 2004

  
(S. Ayyappan)

## PREFACE

Over the last four decades the aquatic systems of the globe have undergone a rapid transition. Worldwide per capita fish consumption nearly doubled from about 8 kg in the early 1950s to about 15.8 kg in 1999. Fish exports from developing countries have surpassed export of traditional crops and meat. In India fishing activities in the pre-independent days used to be carried out at a subsistence level, almost exclusively by the traditional fishermen. Today, this sector has attained the status of a capital-intensive industry, warranting close monitoring and management for sustained development. Presently the Indian fisheries sector accounts for an annual turnover of over Rs 220 billion, which is 1.40 percent of total GDP and 4.59 per cent of agricultural GDP. The ICLARM (WorldFish Center), Penang, Malaysia launched a project on “*Strategies and Options for Increasing and Sustaining Fisheries and Aquaculture Production to Benefit Poor Households in Asia*” with funding support from the Asian Development Bank (ADB-RETA 5945) in March 2001 for three years. The project has been implemented in collaboration with nine Asian developing countries namely Bangladesh, People’s Republic of China, India, Indonesia, Malaysia, Philippines, Srilanka, Thailand and Vietnam. The project aims at developing appropriate strategies and options for increasing and sustaining fisheries and aquaculture production, targetting the poor producers and consumers in Asia. In India, the project was jointly implemented by the NCAP New Delhi, CMFRI Cochin, CICFRI Barrackpore, IARI New Delhi, University of Agricultural Sciences, Bangalore and Gujarat Agricultural University, Janagarh. This publication is the outcome of Component One on Aquaculture Technologies and Fishing Practices in India based on the work done at CMFRI and CICFRI. The findings of the research project were presented and discussed in the National Workshop held at NCAP, New Delhi during January 29-30, 2004. The suggestions of the discussants have also been considered for this publication.

Technological advancements fuelled the growth of fisheries sector in India. Over eightfold increase in fish production during the last five and half decades was primarily due to transformation of traditional fishing practices into capital intensive industry through development and transfer of fisheries and aquaculture technologies. The available literature on the research and development process of Indian fisheries sector is scattered. Therefore, the accessibility for this information is laborious. The book ***Evolution of Fisheries and Aquaculture in India*** is an effort to

consolidate and comprehensively present fisheries research and development under the following major topics: i) evolution of fisheries research and development; ii) magnitude of fishery and aquaculture potential over space and their contribution in fish production over time; iii) advancements in fisheries and aquaculture technologies, their adoption and impact over time and space; iv) prioritisation, future prospects and potential production of different technologies, etc. The book is a revised version of the report on “Aquaculture technologies and fishing practices in India”, one of the components of ICAR-WorldFish project *Strategies and options for increasing and sustaining fisheries and aquaculture production to benefit poor households in India*

The publication is primarily based on information culled out from various literature on the subject, discussion with researchers and field surveys under the project. The gathered information is presented in a systematic manner to facilitate the readers interested in fisheries and aquaculture. Considering the vast difference in various aspects of inland and marine resources and making it user/reader friendly, the book is broadly divided into two sections, namely, inland and marine for most of the specific aspects. However, some chapters like introduction, profiles of stakeholders, adoption, impact assessment, prioritisation of technologies and recommendations are presented for inland and marine sectors together.

The introduction describes the role of fisheries sector in Indian economy and précis of evolution of fisheries research and development in India, covering institutions involved, development programmes, employment, investments and fish production over different Five Year Plans. The chapters 2-7 deal with Indian inland fisheries sector giving a brief account of evolution of aquaculture and fisheries research, aquatic ecosystems, resource-wise contribution in fish production, catalogue of aquaculture technologies and fishing practices, their description and pipeline technologies. On similar lines, chapters 8-13 are devoted for marine sector. In the remaining chapters marine and inland sectors are addressed together for profiles of stakeholders (Chapter 14); adoption, impact and constraints in implementation of aquaculture technologies and fishing practices (Chapter 15); prioritisation of these technologies and fishing practices (Chapter 16) and recommendations and action plans (Chapter 17). The references or literature cited are mentioned at the end.

We express our deep sense of gratitude to Dr. S. Ayyappan, DDG (Fy.), ICAR, New Delhi; Prof. (Dr.) Mohan Joseph Modayil, Director, CMFRI, Kochi; Dr. D. Nath, Director, CICFRI, Barrackpore; Dr. Mruthyunjaya, Director, NCAP, New Delhi for their encouragement and all logistic support for pursuing this study and publication of this book. We are grateful to



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June 2004

N. G. K. Pillai  
Pradeep K. Kathiha

## ACRONYMS

ADAK	Aquacultural Development Agency in Kerala
AFH	Artificial Fish Habitat
AICRP	All India Coordinated Research Project
APAARI	Asia-Pacific Association of Agricultural Research Institution
AP	Andhra Pradesh
ASC	Antarctic Study Centre
ATIC	Agricultural Technology Information Center
AVHRR	Advanced Very High Resolution Radiometer
BCD	Beach landing Craft Development
BFFDA	Brackishwater Fish Farmers Development Agency
BLC	Beach Landing Craft
BOBP	Bay of Bengal Programme
CCA	Copper-Chrome-Arsenic Compound
CFTRI	Central Food Technological Research Institute
CIBA	Central Institute of Brackishwater Aquaculture
CICEF	Central Institute of Coastal Engineering and Fisheries
CIFRI	Central Inland Fisheries Research Institute
CIFA	Central Institute of Freshwater Aquaculture
CIFACA	Carp Feed developed by CIFA
CIFAMA	Catfish Feed developed by CIFA
CIFAPRA	Prawn Feed developed by CIFA
CIFE	Central Institute of Fisheries Education
CIFNET	Central Institute of Fisheries Nautical & Engineering Training
CIFT	Central Institute Fisheries Technology
CMFRI	Central Marine Fisheries Research Institute
CMLRE	Centre for Marine Living Resources and Ecology
CPUE	Catch Per Unit Effort
CRZ	Coastal Regulation Zone
CSIR	Council of Scientific & Industrial Research
CSMCRI	Central Salt and Marine Chemical Research Institute
DANIDA	Danish International Development Agency
DARE	Department of Agricultural Research and Education
DBT	Department of Biotechnology
DFI	Direct Fuel Injection
DOD	Department of Ocean Development
DRDA	District Rural Development Agency
DST	Department of Science & Technology
DWRA	Development of Women and Children in Rural Areas
EEZ	Exclusive Economic Zone

FAD	Fish Aggregating Device
FAO	Food and Agriculture Organization
FFDA	Fish Farmers Development Agency
FPS	Flexible Plastic Strips
FRP	Fiberglass Reinforced Plastic
FSI	Fishery Survey of India
GDP	Gross Domestic Product
GIS	Geographical Information System
GOI	Government of India
GPS	Global Positioning System
HACCP	Hazard Analysis and Critical Control Points
HCG	Human Chorionic Gonadotrophin
HDPE	High Density Polyethylene
h.p.	Horse Power
HPS	Higher Purchase Scheme
HRD	Human Resource Development
HSD	High Speed Diesel
IARI	Indian Agricultural Research Institute
IBM	Inboard Motor
ICAR	Indian Council of Agricultural Research
ICLARM	International Centre for Living Aquatic Resource Management
ICZM	Integrated Coastal Zone Management Plan
IFP	Integrated Fisheries Project
IIOE	International Indian Ocean Expedition
IMC	Indian Major Carp
INCOIS	Indian National Centre for Ocean Information System
INP	Indo Norwegian Project
IPQC	In Process Quality Control
IVLP	Institution Village Linkage Programme
KVK	<i>Krisbi Vigyan Kendra</i>
LHRH	Leutinizing Hormone Releasing Hormone
LHRHA	Leutinizing Hormone Releasing Hormone Antagonist
MATSYAFED	Kerala State Cooperative Federation for Fisheries Development Limited
MEI	Morpho Edaphic Index
MFRA	Marine Fishing Regulation Act
M. F. Sc.	Master of Fishery Sciences
MOC	Mahua Oil Cake
MoE&F	Ministry of Environment & Forests
MPEDA	Marine Products Export Development Authority
NABARD	National Bank for Agriculture & Rural Development

NBFG	National Bureau of Fish Genetic Resources
NCAP	National Centre for Agricultural Economics and Policy Research
NCDC	National Co-operative Development Cooperation
NCUI	National Co-operative Union of India
NGO	Non-governmental Organization
NIO	National Institute of Oceanography
NIOT	National Institute of Ocean Technology
NOAA	National Oceanic Aeronautic Administration
NORAD	Norwegian Agency for Development and Co-operation
NRCCWF	National Research Center for Coldwater Fisheries
NRSA	National Remote Sensing Agency
OAL	Overall Length
OB	Outboard
OBC	Other Backward Caste
OBM	Outboard Motor
ODA	Overseas Development Agency
PCR	Polymerase Chain Reaction
PEN	Planters Energy Network
PFP	Pelagic Fisheries Project
PFZ	Potential Fishing Zone
PGE	Pituitary Gland Extract
PGPM	Postgraduate Programme in Mariculture
PL	Post Larva
RCC	Reinforced Cement Concrete
R&D	Research and Development
SAUs	State Agricultural Universities
SHGs	Self-Help Groups
SIDA	Swedish International Development Co-operation Agency
SIFFS	South Indian Federation of Fishermen Society
SSP	Single Super Phosphate
Spp	Species
TN	Tamil Nadu
TRYSEM	Training of Rural Youth in Self-Employment
TTC	Trainers' Training Center
TWR	Total Weighted Rank
UGC	University Grants Commission
UNDP	United Nations Development Programme
WFC	WorldFish Centre