

# ARTISANAL FISHERIES:

CONTRIBUTIONS OF ICAR-CIFT  
*a photo narrative*



ICAR- CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY  
Matsyapuri, Willingdon Island, Cochin, Kerala 682029





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*Published by:*  
**Director**



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## Foreword

Fisheries and aquaculture are crucial to health, wellness and food security. Artisanal fisheries involve fishing households (as opposed to commercial companies), using relatively small amount of capital and energy, relatively small fishing vessels (if any), making short fishing trips, close to shore, mainly for local consumption. Artisanal fisheries can be subsistence or commercial fisheries, providing for local consumption or export and sometimes referred to as small-scale fisheries. Small-scale fishers produce 40% of the global fisheries catch. While marine catch amounts to 68% of small-scale fisheries output, 32% comes from inland waters. According to the Food and Agricultural Organization estimates, 40 million people are directly engaged in small-scale fishing globally, mostly in low and middle-income countries, and another 20 million are directly involved in small-scale aquaculture, with hundreds of million more engaged indirectly. Artisanal fisheries support at least partially to the livelihood of 492 million people. The United Nations General Assembly has declared the year 2022, the International Year of Artisanal Fisheries and Aquaculture IYAFA 2022 mainly for presenting the potential and diversity of small-scale artisanal fisheries and aquaculture and point out the benefits which can be gained from facilitating partnerships and co-operation with fishers, fish farmers, and fish workers and as well in achieving the United Nations (UN) Sustainable Development Goals (SDGs). For the past six decades, the ICAR-Central Institute of Fisheries Technology has conducted research and development on resource conservation and efficient harvesting systems for the inland, aquaculture, and marine sectors of the country. Numerous technologies have been developed by the institute for the improvement of India's artisanal fishing sector. The book "Artisanal Fisheries: Contributions of ICAR-CIFT a photo narrative" is a compilation of fishing technological interventions by ICAR-CIFT for the development of the country's artisanal sector.

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**Dr. Leela Edwin**  
Director (Act.), ICAR-CIFT

# Preface

Though contributing significantly to the livelihood, the artisanal fisheries sector in India has often lagged, in terms of input of technologies that can help reduce the drudgery, increase efficiency and at the same time retain the inherent characteristics of the sector, which is low energy-low impact method of fish capture. ICAR-CIFT has been working in the field of fishing technology and has contributed immensely to the artisanal sector of the country. This manual is a compilation of the interventions made by the institute in realising the goal of upliftment of the artisanal fisheries of the country and will help as a ready reckoner to understand the achievements related to fishing craft and gear of the artisanal sector in the country.

**Dr. M.P. Remesan**  
Head (Act.), Fishing Technology Division

Preface

# Rubber wood for fishing boat construction

Rubberwood comes as a by-product from rubber plantations. Utilizing rubberwood would have several advantages, including the efficient utilization of by-product, increased revenue for rubber planters, and reduced reliance on natural wood resources. Based on research conducted at ICAR-CIFT, a technique for the efficient use of rubberwood in marine applications was developed, involving chemical preservative treatment of the wood, followed by fibre reinforced plastic (FRP) coating. The new method can lower small boat construction costs by 35-40%.



# Use of coconut wood for fishing boat construction

Though coconut wood has high strength and other properties suitable for canoe construction, use of this wood was limited due to issues related to its weight and amenability to traditional carpentry. Studies carried out at ICAR-CIFT helped in developing a technology for effective utilization of coconut wood for canoe construction. The standardised parameters for preservation helped to enhance the physical and mechanical properties of the coconut wood, which could now be used for construction of canoe for fishing. The reduction in cost, when compared to traditional wood-made canoes is estimated to be around 30%.



## Preservative treatment of wood for fishing vessel

Wooden fishing vessels degrade rapidly when exposed to seawater which contain organisms that decompose wood. Fishermen employ indigenous preservatives such as cashew nutshell liquid, fish oil, etc., for protection. However, these are rarely effective, resulting in significant financial losses. ICAR-CIFT has created a highly effective chemical wood preservatives by fortifying creosote with arsenic or copper, and with addition of creoscore. The approach could lower the cost of treating wood.





# ICAR-CIFT FRP Pedal boat

Even though they contribute significantly to artisanal fisheries, most of the vessels used in India's reservoirs are of a primitive design that is either unsafe or inefficient for fishing operations, as fishing is typically performed by a single fisher, who must simultaneously control the boat and deploy the gear. ICAR-CIFT has built a FRP pedal boat that is appropriate for fishing in reservoirs and addresses the issue of navigating the boat while simultaneously deploying the gear.



# Solar powered boat

Though not comparable to the scale of emissions from commercial fisheries, artisanal and small-scale fisheries in India, also contribute to emissions due to fuel use. Taking this into account, ICAR-CIFT has developed a solar powered fishing boat of 8.0 m LOA, with high stability and large deck space for fishing operations and use of features like navigational lights, which are all powered by solar energy. Though initial investment is higher compared to traditional boats, these are highly safe and have very low maintenance cost.





# Aluminium boats

Fishing boats used in the artisanal sector of India, have many disadvantages with respect to space utilization, safety features and also with issues related to deterioration and frequent repairs to the vessels. In this context, ICAR-CIFT suggested Aluminium as an alternative material for boat construction. The boat features two seats for fishers and a buoyancy chamber in the forward end for safety. Other advantages of this canoe include being light weight, strong and tough, corrosion-resistant with reduced maintenance costs.



# FRP coracles for fishing



Coracle, a saucer shaped country craft, often made of split bamboo frames and covered with plastic sheets are the major fishing craft used in the reservoirs. Though they are of simple design and are inexpensive, safety and frequent maintenance is a problem. FRP coracles which are safe, cheaper, and durable, and which follow scientific designs for reservoir fishing were developed by ICAR-CIFT as an alternative to the traditional coracles and are widely adopted in reservoir fisheries.

# Fishing boats for Andaman and Lakshadweep Islands

ICAR-CIFT has played a major role in modernizing the traditional fishing boats used both in the Andaman and Lakshadweep Islands. The major involvement was the introduction of scientifically designed small-scale fishing vessels in both the Islands. ICAR-CIFT had introduced seven different designs of fishing vessels suitable for the Islands, which were subsequently adopted by the Department of Fisheries and the fishers in the respective Islands.





# Database on gillnet fishing systems

Among the different gears used in the artisanal fisheries, gillnets are the most important and a multitude of design variations in gillnets are observed. Documentation of these fishing systems is essential for improvements in efficiency, cost effectiveness and for management. ICAR-CIFT has been documenting the changes in the design and operational parameters of gillnets, both in the marine and the inland sectors by purposive surveys in different waters bodies and these studies serve as a baseline document for developing policy guidelines and advisories in various states of the country.



# Upgradation, design modification and optimisation of gillnets for reservoirs

Gillnets form a major gear used in the reservoir fisheries, which is predominantly artisanal. ICAR-CIFT has conducted extensive research to improve the design and operational parameters, to make gillnet efficient for Indian reservoirs. Optimization in the mesh sizes, hanging ratio, introduction of suitable materials with specific characteristics like thickness, colour etc. were carried out in the initial phases, followed by optimization in the mesh sizes for different species, for the sustainable harvest of major resources targeted by gillnets in reservoirs. In addition to recommended mesh sizes, optimum fishing heights were also recommended for different reservoirs. The interventions by ICAR-CIFT in the gillnets sector have significantly helped the fishers in improving their livelihoods.



# Optimisation of gillnets for commercially important species in the marine sector

Based on selectivity studies, ICAR-CIFT has recommended optimum mesh sizes for many commercially important marine fish species including Indian oil sardine, Indian mackerel, pomfrets, chinese herring, seer fishes and shrimp. The recommended mesh sizes are now adopted by different maritime states of India in their respective Marine Fishing Regulation acts. This has helped in ensuring sustainable gillnet fishing with reduced juvenile incidence and enhanced income for fishers.





## Optimisation of colour for gillnets

The colour of webbing of gillnets is found to significantly affect the catch rate and the species profile. In addition to the visual acuity of the species, many extraneous factors determine the catchability. Systematic studies by ICAR-CIFT on the effect of different coloured webbing showed species specificity and accordingly specific colour was recommended for major commercial species. The idea of specific colour was well received by fishers and has become especially useful for capture of hilsa and pomfrets along different parts of the country.





## Ring Seines

ICAR-CIFT developed and introduced a mini purse seine, popularly known as ring seine as an efficient alternative gear for operation from the boat seine craft thanguvallam in the artisanal sector during 1982-83. Along with CIFT's introduction and popularisation of ring seines in Cochin, other developments were initiated by fishermen contributing to wide acceptance of ring seines in the small-scale sector. Ring seines are now widely spread over the Indian coast from Andhra Pradesh in east coast to Goa in the west coast and is one of the major fishing gears operated for the harvest of small pelagics.



# Upgradation, design modifications and optimisation of ring seines

ICAR-CIFT has extensively studied the evolution, growth, economic and social implications of the ring seine fishery in India. Studies were conducted on the incidence of juveniles and changes in the catch per unit of effort in the various systems of ring seines used in coastal states. Research pertaining to energy analysis in ring seine operations were an additional major component. The ICAR-CIFT also developed a prototype ring seine with a high sinking rate, more efficiency, and a longer lifespan based on in-situ research with new generation synthetic webbing. These investigations on catch rates revealed an excess of capacity in this sector, and ICAR-CIFT has emphasised the importance of implementing management approaches to resolve problems in this sector.



# Beach seines

ICAR-CIFT had conducted extensive studies to document the different types of beach seines operated along the east and west coasts of India. The details on design of different types seines in the area along with energy use were documented, which would significantly help in analysis of different fishing methods with regard to energy use. Technical modifications to reduce the incidence of juveniles in the beach seines were recommended.



## Stake net / Bag nets



Stake nets and bagnets are widely used in the small-scale sector of the country and is often considered as low energy capture mechanism. However, the use of smaller mesh size in the codend has significantly increased the capture of juveniles in these systems. ICAR-CIFT has conducted extensive work related to documentation of these systems and design modifications to reduce energy use and juvenile incidence in stake nets and bagnets used in the estuarine and marine conditions. Optimized design for Dol nets, square mesh window BRD for hilsa bagnets were developed. ICAR-CIFT has also recommended optimum mesh size to be used in the codends for the major species caught in stake nets. Adoption of these technologies will significantly improve the species and size selectivity, coupled with high catch quality and savings in energy.



# Chinese Dipnets

With over 4500 nets being operated in Kerala in the five coastal districts of Trichur, Ernakulam, Kottayam, Alleppey and Quilon, dip nets contribute significantly to the artisanal fisheries and is considered a low energy and sustainable fishing method. However, owing to many factors the catches from the systems have reduced significantly. ICAR-CIFT has documented the different classes of nets used and the recent innovations in this sector by fishers, including the practise of catch and release. CIFT has recommended installing cages in the vicinity of the dipnets to ensure the growth of fishes and other organisms that are released back after capture, which has ensured better income for the fishers.



# Pots and Traps

Various indigenous pots and traps are operational in the inland waters of the country. Traditional traps made of natural materials have intrinsic limitations such as a short life span, bulkiness, and inability to be stacked, among others. Comparative studies demonstrate that indigenous traps are less effective than modern, species-specific traps. ICAR-CIFT has contributed significantly to the documentation and development of different species-specific traps designs. Lobster traps, collapsible fish traps, ring traps, are some of the trap designs developed and popularized in addition to studies on optimizing the size and the best angle of the funnel to maximize captures in traps.



# Hook and Lines

The hook and line fishery contributes about two percent of the total marine fish landings in India and is a major gear used in the traditional sector as well. The works carried out by ICAR-CIFT has been instrumental in the use of species-specific baits for different target species. Surface long lines and vertical lines used in the country were the outcome of the technical support extended by the institute to different organizations. Development of artificial lures and determining the optimum thickness of twines for longline operations are other outcomes of research carried out by ICAR-CIFT.





## Advice on safety measures for artisanal fishing vessels

The number of fishing accidents and fatalities has increased, and in many instances the issue of safety at sea is not appropriately addressed. ICAR-CIFT has advised safety precautions for all types of fishing vessels, including small-scale fishing units, in recognition of the significance of this component. In addition to a watertight flashlight, reflective tapes, and hand flares, the institute recommended a buoyancy chamber and a chine rail for small vessels, to improve safety which is now adopted as standard by state governments.



# Introduction of acoustic pingers to reduce marine mammal interaction

Dolphins often depredate on the catches in ring seines by biting off the gear, which causes significant losses to the fishers, both in terms of damage to the fishing gear and lost fishing days. To overcome these concerns, ICAR-CIFT introduced acoustic pingers, which generate sound at specified wavelengths to deter dolphins interacting with the fishing gear. The introduction of pingers has drastically reduced interactions with dolphins in this sector.



# Studies related to abandoned, lost or otherwise discarded fishing gear in the artisanal fisheries sector

Abandoned, lost and otherwise discarded fishing gear (ALDFG) is now became a problem of severe concern as it adversely affects the ecosystem. ICAR-CIFT had undertaken assessment of ALDFG along with the collaboration of FAO to estimate, in qualitative and quantitative terms, the fish loss and gear loss from selected gillnet and trammel net fisheries in India. The study documented a loss of 24.8 percent of the total weight of gear used in this sector. The institute has suggested several technical, and policy interventions for effective management.



# Aquaculture

Fish cage culture is currently regarded as an important method for increasing the productivity of inland waters. In cage culture, however, fouling and the associated reduction in water exchange is a common issue. The biocide created by ICAR-CIFT to reduce fouling has proven to be particularly successful in decreasing the fouling issue, which is quite rampant in this sector. It is anticipated that the use of this technology will reduce cleaning and maintenance expenditures for cages by approximately 25 percent. In addition to fouling control, proper netting materials for cage construction, optimal mesh size, etc. were also recommended by the institute.









*This compilation is a dedication to the artisanal fishers of India, who through their perseverance and fortitude have contributed immensely to the growth of the Indian fisheries sector. We gratefully acknowledge the efforts of all the scientists and staff of the Fishing Technology Division of ICAR-CIFT whose work is reflected in this compilation*



INTERNATIONAL YEAR OF  
**ARTISANAL FISHERIES  
AND AQUACULTURE**  
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