EXPLORING THE UNEXPLORED: MESOPELAGIC FISH SURVEY ALONG KARNATAKA COAST-ROLE OF KARNATAKA STATE FIP

Introduction

Yashaswi Fish Meal and Oil Company, established in 2008 in Udupi, has emerged as a key player in the fish meal and fish oil industry. With a commitment to quality, innovation, and sustainability, Yashaswi has pioneered responsible fishing practices to ensure the long-term conservation of marine resources. As a part of its Small pelagic Purse seine fisheries Improvement Program for the Karnataka State, the company has taken a significant step in sustainable fisheries by partnering with the Central Marine Fisheries Research Institute (CMFRI) for the initiative **"EXPLORING THE UNEXPLORED: MESOPELAGIC FISH SURVEY ALONG THE KARNATAKA COAST."**

Objective of the Initiative

The primary goal of this initiative is to explore mesopelagic fish species as an alternative resource for fish meal and oil production. By focusing on mesopelagic fish, The Karnataka State FIP aims to reduce pressure on traditional fish stocks and promote sustainable fishing practices that align with global conservation efforts. This project seeks to:

- Identify and assess mesopelagic fish resources along the Karnataka coast.
- Develop sustainable methods for harvesting and processing mesopelagic fish.
- Establish a scientific understanding of mesopelagic species through research collaborations with CMFRI and CIFT.

Progress and Key Developments

The project officially gained momentum after the **National Workshop held on 24-05-2024**, where Yashaswi, in association with CMFRI and Fishermen Association leaders, conducted multiple follow-up meetings. These discussions culminated in the **4th Follow-up Meeting on 18-12-2024** at Yashaswi's office, where a significant breakthrough was achieved.

Collaboration with the Fishing Community

During the meeting, Yashaswi introduced **Mr. Arun Kumar**, owner of the fishing vessel **"Bharadwaja,"** who agreed to undertake expedition trials. Mr. Arun brought his entire fishing crew to meet CMFRI officials. A dedicated training session was conducted for the crew to familiarize them with the objectives and methodologies of the mesopelagic fish survey.

Financial Commitment by Yashaswi

Mr. Arun provided an overview of the total project cost for the expedition trips, and Yashaswi agreed to fully fund the initiative, covering all expenses related to the trial expeditions.

Expedition Details and Initial Findings

First Expedition Attempt

- The fishing vessel **"Bharadwaja"** embarked on its first expedition trip on **18-12-2024**.
- However, due to technical issues, the vessel returned to the landing center after only one trawl.
- Despite the setback, the team managed to collect some samples of mesopelagic fish species, which were later analyzed by CMFRI.

Successful Second Expedition

- After rectifying the technical issues, the vessel **set out again on 19-12-2024 and returned on 21-12-2024**.
- The expedition was successful, yielding approximately **2000 kgs of mesopelagic fish with 10-12 different species**.
- The collected samples were sent to **Central Institute for Fisheries Technology (CIFT) and CMFRI** for further scientific analysis and classification.
- The remaining quantity was utilized for fish meal production, marking a significant step towards commercial utilization of mesopelagic fish resources.

PROJECTING THE WORK ON MESOPELAGIC FISH SURVEY AT CMFRI FOUNDATION DAY

The Karnataka State FIP participated in CMFRI Foundation Day and showcased its work on **"EXPLORING THE UNEXPLORED: MESOPELAGIC FISH SURVEY ALONG THE KARNATAKA COAST**" by setting up a dedicated stall, attracting significant interest from the scientific community and industry stakeholders.

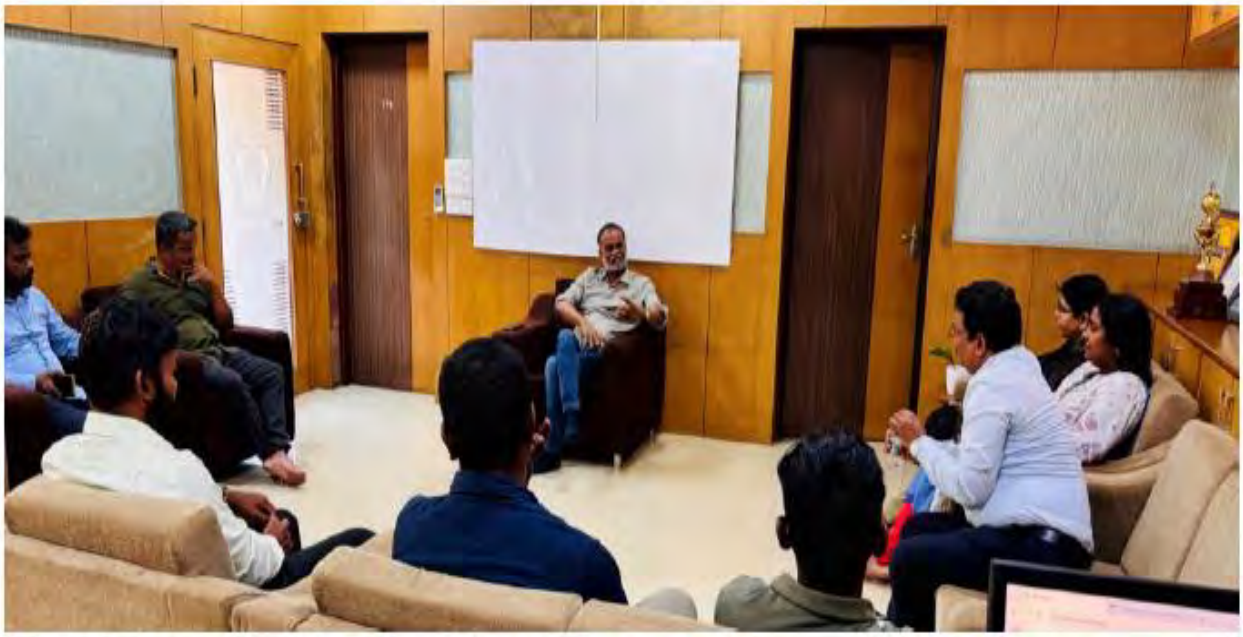
Future Prospects

With the initial success of the expeditions, **Karnataka State FIP and CMFRI plan to continue further exploratory trips** to gather more data and refine harvesting techniques. The fishing vessel **"Bharadwaja"** is gearing up for subsequent expeditions, aiming to enhance the knowledge base on mesopelagic fisheries and their potential in sustainable fish meal and oil production.

Conclusion

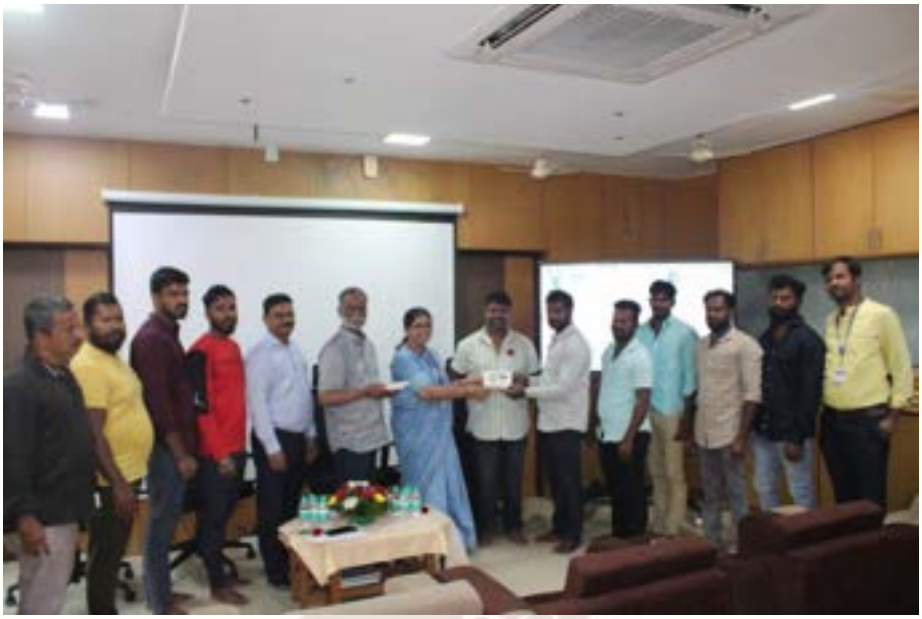
Small Pelagic Purse Seine Fisheries Improvement Program for Karnataka State has demonstrated its commitment to sustainable fisheries through this pioneering initiative. By exploring mesopelagic fish species, the KSFIP is not only **reducing dependency on traditional fish stocks** but also **paving the way for innovative and environmentally responsible fishing practices**. With continued research and collaboration, this project holds immense potential to revolutionize the fish meal and oil industry while safeguarding marine ecosystems.

First Follow-up meeting Held at Office of CMFRI-Mangalore, along with Dr. Gopalakrishnan, CMFRI officials, Fishermen leaders and Members of Karnataka State FIP



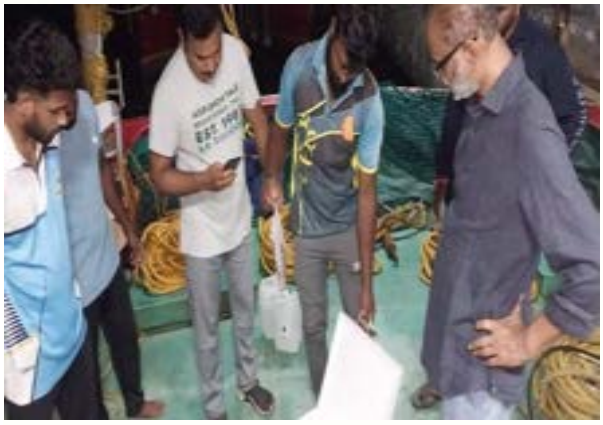
2nd Follow-up meeting held at office of Yashaswi, where the owner and captain of fishing vessel "Bharadwaja" present along with CMFRI officials and members of Karnataka State FIP

3RD Follo-up meeting is held at Office of CMFR-Mangalore, where Fishermen experts, owner of fishing vessel "Bharadwaja" and members of Karnataka State FIP were interacted with CMFRI officials



4th Follow-up meeting and training for the crews of fishing vessel “Bharadwaja” was done at the Office of Yashaswi.

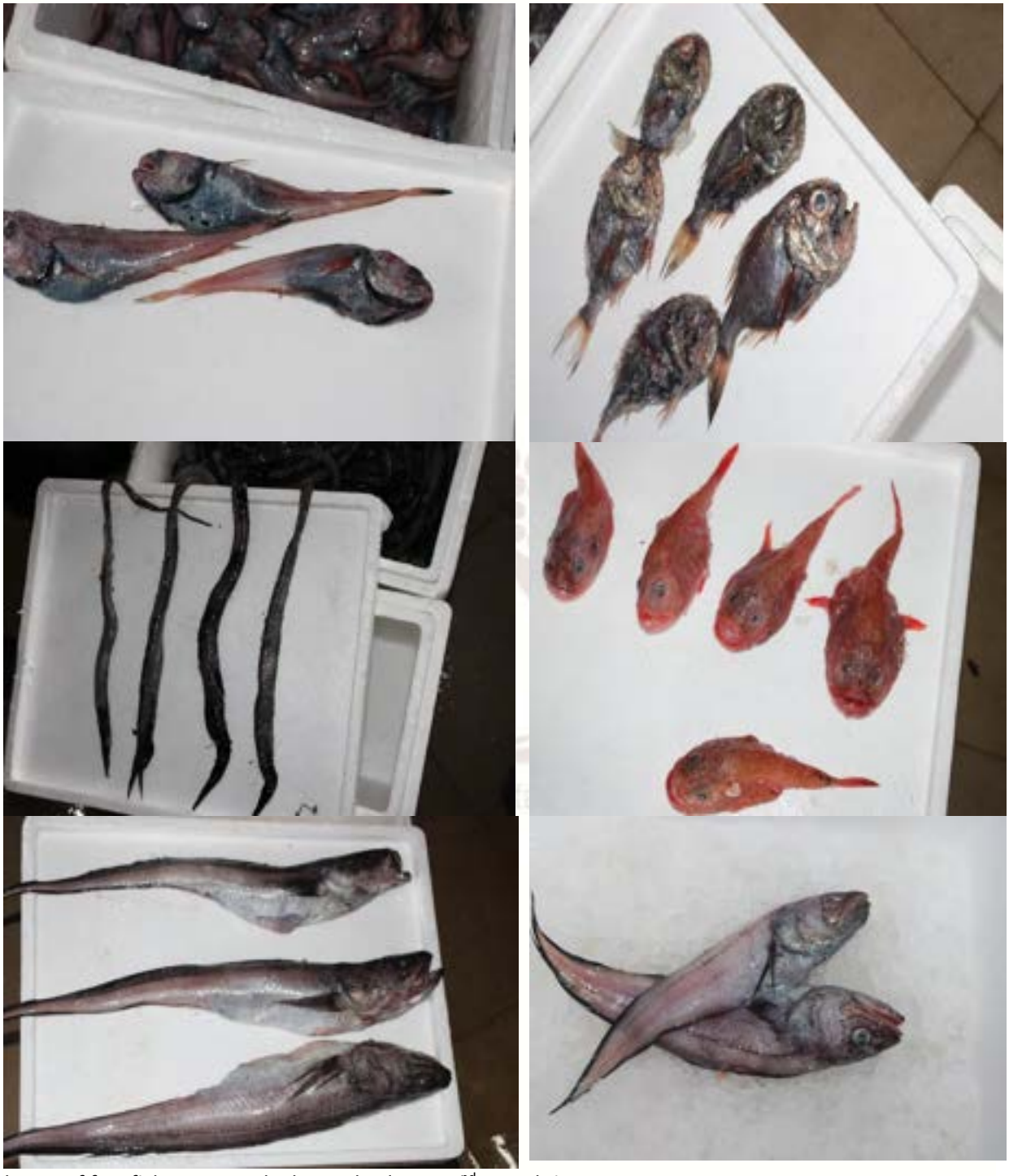
The fishing vessel “Bharadwaja” is ready for the 1st expedition trip




The fishing vessel “Bharadwaja” after 1st expedition trip. Karnatak State FIP members are inspecting the mesopelagic fish species.




The mesopelagic fish species were brought to the factory of Yashaswi, were CMFRI officials are inspecting the fish species.



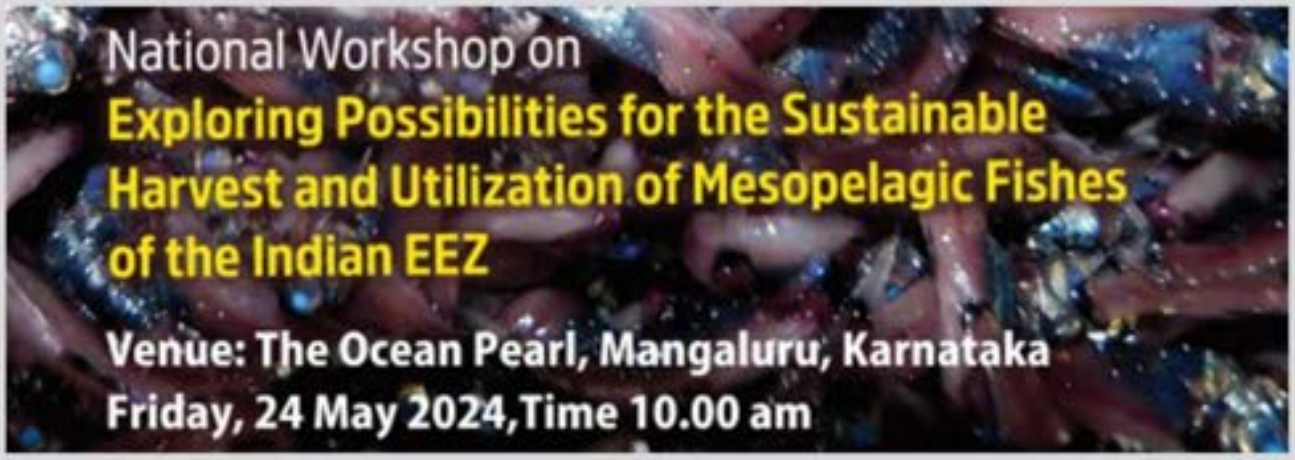
Photos of few fish species which caught during 2nd expedition trip

CMFRI Booklet Series No: 41/2024

Proceedings of the National Workshop on Exploring the Possibilities for Harvest and Utilization of Mesopelagic Fishes in the Indian EEZ

●●●

2024



Indian Council of Agricultural Research
Central Marine Fisheries Research Institute
PB No 1603, Ernakulam North P.O, Kochi , Kerala-682018

Proceedings of the National Workshop on Exploring the Possibilities for Harvest and Utilization of Mesopelagic Fishes in the Indian EEZ

Date: 24 May 2024

Organized by: ICAR-CMFRI Mangalore Regional Centre, Mangaluru, Karnataka

Collaborator: Yashaswi Fish Meal and Oil Plant, Udupi

Sujitha Thomas, Rajesh K.M., Akhilesh K.V., Sunil Kumar Ail, Bindu Sulochanan, Divya Viswambharan, Shoba Joe Kizhakudan, Remesan, M.P, Shubhadeep Ghosh, B. Meenakumari, A. Gopalakrishnan

Proceedings of the National Workshop on Exploring the Possibilities for Harvest and Utilization of Mesopelagic Fishes in the Indian EEZ

CMFRI Booklet Series No.41/2024

Citation: Sujitha Thomas, Rajesh K.M., Akhilesh K.V., Sunil Kumar Ail, Bindu Sulochanan, Divya Viswambharan, Shoba Joe Kizhakudan, Remesan, M.P, Shubhadeep Ghosh, B. Meenakumari, A. Gopalakrishnan. 2024. Proceedings of the National Workshop on Exploring the Possibilities for Harvest and Utilization of Mesopelagic Fishes in the Indian EEZ. CMFRI Booklet Series No.41/2024, ICAR-CMFRI, Kochi, Kerala, India. 20p.

Table of Contents

I. Introduction

The National Workshop on Exploring the Possibilities for Harvest and Utilization of Mesopelagic Fishes in the Indian EEZ was conducted by the ICAR-Central Marine Fisheries Research Institute (CMFRI) Mangalore Regional Centre on 24 May 2024, in collaboration with Yashaswi Fish Meal and Oil Plant. The workshop was held at The Ocean Pearl in Mangaluru and attracted around 100 participants, including fishers from Mangalore and Malpe, owners and operators of fish meal plants, processing units, feed mill plants, exporters, officials from the Department of Fisheries, researchers from CMFRI, CIFT, colleges, and various association leaders of fishers, exporters, and fish meal plants.

With coastal waters becoming increasingly overexploited, there is a pressing need to explore additional marine areas and species. The oceanic mesopelagic zone, which lies between 200-1000 meters below sea level, is home to several small fish species that play critical roles in ecosystem dynamics. These mesopelagic fishes are globally the most abundant vertebrates, with their communities often dominated by myctophids, commonly known as lanternfish. Although these fishes are abundant, the presence of wax esters in their livers makes them unsuitable for direct human consumption. However, their high lipid content presents an opportunity for their use in the fish meal industry.

The potential harvesting of mesopelagic fishes, including myctophids, and their sustainable utilization offer promising prospects for new food sources and economic development. This workshop served as a platform to bring together government officials, researchers, and industry representatives to discuss and explore the possibilities for achieving the following objectives:

Objectives

- To estimate the Accurate Potential Yield of Mesopelagic Fishes in the Indian EEZ:
    - Understanding the potential yield is essential for determining the viability of harvesting mesopelagic fishes on a large scale.
- To identify and Map Aggregation Sites of Mesopelagic Fishes in the Indian EEZ:
    - Mapping these aggregation sites is crucial for planning sustainable harvesting operations.
- To develop Suitable Harvest Methods and Assess the Economics of Fishing Operations:
    - Identifying efficient and sustainable harvesting methods is vital for ensuring the economic feasibility of mesopelagic fishing.
- To develop Suitable Post-Harvest Processing Protocols:
    - Creating effective processing protocols is necessary to ensure the optimal utilization of mesopelagic fishes in the fish meal industry.
- To explore the Potential Use of Mesopelagic Fishes in the Fish Meal Industry and Assess the Economics of These Operations
    - Evaluating the economic potential of utilizing mesopelagic fishes in the fish meal industry can open new avenues for industry growth.

- To assess the Utilization Potential of By-Products from Mesopelagic Resources:
    - Investigating the potential uses of by-products from mesopelagic fishes can enhance the overall value derived from these resources.

Given the increasing emphasis on deep-sea resource exploitation to boost fish production in the country, this workshop was both timely and crucial. The event facilitated valuable discussions and collaborations among various stakeholders, paving the way for future research and development in the sustainable harvest and utilization of mesopelagic fishes.

II. Inaugural Session

The programme was held at The Ocean Pearl in Mangaluru on 24th May 2024. Registration of participants commenced at 9:00 AM. Around 100 stakeholders from various sectors of the fisheries industry attended, including officials from the Department of Fisheries and MPEDA, researchers from CIFT and CMFRI, exporters, and fish feed and fishmeal owners from Gujarat, Maharashtra, Karnataka, Goa, Tamil Nadu, and Andhra Pradesh, as well as fishers and representatives from boat owners' associations. The event began with the ICAR and CMFRI theme song. Dr Sujitha Thomas, Head of the Mangalore Regional Centre, welcomed the gathering and emphasized the importance of the programme. She noted that the focus on deep-sea resource exploitation is both timely and crucial for boosting fish production in the country.

This was followed by an overview of the workshop by Dr A Gopalakrishnan Director of ICAR-CMFRI. He expressed great pleasure in welcoming all attendees and highlighted the significance of the workshop as a milestone in the ongoing efforts to understand and sustainably utilize mesopelagic resources. The Director provided a brief account of the genesis of the workshop, referencing CMFRI's Vision 2050 document and insights gained from the Potential Yield Estimate eport of 2018. These documents highlighted the potential and challenges associated with mesopelagic resources, particularly in relation to their use in fishmeal production. Research indicates that mesopelagic resources in the world's oceans amount to an estimated 11,000-15,000 million metric tonnes, with approximately 365 million metric tonnes in the Indian Ocean. Despite their abundance, commercial exploitation has been minimal due to challenges such as the high costs of deep-sea fishing and the biological properties of these species. He acknowledged significant contributions from CIFT and other esteemed researchers, including Dr E.M. Abdusammad, Principal Scientist , CMFRI, Dr Manju Sebastine, Assistant Professor,Fathima Matha College Kollam and Shri Jose Fernandez, Technical Officer, Export Inspection Council. Their studies have highlighted the untapped potential of mesopelagics, particularly myctophids, which are mostly bioluminescent and found at depths between 200-1000 meters. International examples of commercial harvesting in Oman and South Africa, alongside India's mid-water and krill trawling efforts by CIFT, were noted.

Dr A Gopalakrishan said that a pivotal discussion with Mr A. J. Tharakan from Amalgam Food Pvt. Ltd. led to a proposal for sustainable fishing and the utilization of these resources in fishmeal plants. Support from Mr Udayakumar Salian (Yashaswi Fishmeal and Oil Plant), facilitated by Dr Pratibha Rohit, resulted in a Memorandum of Understanding (MoU) with CMFRI on the Fishery Improvement Project (FIP) for selected marine species along the Karnataka and Goa coast. This collaboration underscores the need for continued partnership and research. In conclusion, the Director emphasized the significance of the workshop in exploring the possibilities for the sustainable harvest and utilization of mesopelagic fishes. He further emphasized that the participation and insights of all attendees were deemed invaluable as CMFRI embarks on this significant initiative. He concluded by looking forward to a productive and enlightening workshop. The Director's remarks underscored the importance of continued research, partnership, and innovation in this field

This was followed by the formal inauguration of the programme by lighting of the lamp by Dr B. Meenakumari, Former Chairperson National Biodiversity Board and Former DDG (Fisheries), ICAR. In her inaugural address, she emphasized the need for effective harvesting techniques to sustainably utilize the untapped potential of mesopelagic resources.

Dr Meenakumari highlighted the critical need to develop and refine harvesting techniques that would efficiently target mesopelagic species without compromising their sustainability. She also stressed the importance of understanding the economic viability of mesopelagic fishing operations, which includes evaluating the costs associated with deep-sea fishing, the potential market value of mesopelagic species, and the overall economic impact on the fishing industry. Further, she emphasized the necessity of developing appropriate post-harvest protocols to ensure the quality and maximize the utility of mesopelagic fishes, covering methods for processing, storage, and transportation. Additionally, she pointed out the significance of effectively utilizing by-products from mesopelagic fishes to enhance the overall value derived from these resources, thereby minimizing waste and increasing economic returns.

Dr Meenakumari's address set the stage for the workshop by underscoring the importance of sustainable practices and innovative approaches in harnessing the potential of mesopelagic resources. Her insights provided a valuable framework for the discussions and deliberations that followed during the workshop, serving as an inspiring call to action for researchers, industry stakeholders, and policymakers to collaborate in developing sustainable strategies for mesopelagic fisheries.

Following the inaugural address, the Guest of Honour, Ms Neetu Kumari Prasad, Joint Secretary to the Department of Fisheries, Government of India, addressed the workshop participants online. Ms Neetu Kumari Prasad pledged the government's support for entrepreneurial initiatives aimed at the sustainable utilization of mesopelagic resources." She said that there are options to develop mechanisms for utilizing these fishes through government schemes. Offshore resources are poorly explored. We should plan to move fishing beyond territorial waters and utilize

the untapped resources within the EEZ," she stated. Ms Neetu Kumari Prasad's address emphasized the importance of exploring offshore resources and moving fishing activities beyond territorial waters to harness the potential of mesopelagic resources within the Exclusive Economic Zone (EEZ).

Following Ms Prasad's address, Dr Shubhadeep Ghosh, ADG (Marine Fisheries), ICAR, emphasized the need for effective harvest and post-harvest measures. He highlighted the importance of dedicated and concerted efforts with the industry to resolve the pressing issues facing the sustainable utilization of mesopelagic resources. Dr Ghosh's remarks underscored the critical role of collaboration between research institutions and the fishing industry in addressing these challenges.

Dr Dinesh Kallar, Director of Fisheries, appreciated the initiative by ICAR-CMFRI for conducting the workshop. He emphasized the importance of creating more awareness and skill development among fishers to exploit underutilized resources. Dr Kallar's address highlighted the need for programs and training to empower fishers with the knowledge and skills necessary for sustainable fishing practices.

The inaugural session concluded with Vote of Thanks by Dr Rajesh K.M., Principal Scientist at the Mangalore Regional Centre. Dr Rajesh expressed gratitude to all participants, speakers, and organizers for their contributions to the successful commencement of the workshop.

III. Technical Session

The event's technical session included expert presentations on myctophid resources and their utilization, followed by in-depth discussions. Distinguished Panelists:

Dr B. Meenakumari, Former Chairperson of the National Biodiversity Board and Former DDG (Fisheries), ICAR, New Delhi.

Dr Pravin P., Former ADG (Marine Fisheries), ICAR, New Delhi.

Dr Prathibha Rohit, Principal Scientist and Former Scientist-in-Charge, Karwar RS, ICAR-CMFRI.

The session commenced at 11:30 AM coordinated by Dr Rajesh K.M., who highlighted the significance of the session. He emphasized the importance of mesopelagic fishes in the context of future global fish production and outlined the session's objectives.

Session I:
Topic: Unveiling the potential: Mesopelagic resources in Indian EEZ
Dr Shoba Joe Kizhakudan, Head Finfish Fisheries Division, ICAR- CMFRI

Dr Shoba Joe Kizhakudan, Head of the Finfish Fisheries Division at ICAR-CMFRI, delivered a talk on "Potential of Myctophid Resources in the Indian EEZ." She introduced the mesopelagic ecosystems, focusing on myctophids, which comprise 250 species across 33 genera. Dr Kizhakudan discussed fisheries activities in the Gulf of Oman, the Indian Ocean, the California Current, and the Northeast Atlantic, highlighting the distribution and ecological significance of myctophids in the global catch. She emphasized that with India's marine fisheries sector seeking to diversify into untapped areas of the EEZ, it is an opportune moment to explore the harvest and utilization potential of these resources with scientific rationale and sustainability goals. The presentation also covered various studies and estimates of mesopelagic resources worldwide, underscoring India's unexplored resource potential. Dr Kizhakudan outlined the economic prospects, challenges in harvest and post-harvest processes, and the bycatch contribution of these mesopelagic fishes, noting their potential applications in fishmeal, poultry, and cosmetics. She concluded with a recommendation for the sustainable harvest and utilization of these unexplored mesopelagic resources.

Session II : Myctophid Fishery in Arabian Sea

Dr Manju Sebastine, Asst. Professor Dept of Zoology, Fatima Mata College Kollam

Dr Manju Sebastine, Assistant Professor, in the Department of Zoology at Fatima Mata College, Kollam, presented her research on "Myctophid Fishery in the Arabian Sea," based on studies conducted between 2009 and 2011. She began with an introduction to the deep scattering layer and provided detailed information on myctophids, including their physical characteristics, photophores, taxonomical traits, and migratory patterns. Dr Sebastine showcased a captivating video of live specimens from her sampling, engaging the audience. Her presentation covered the taxonomy, distribution, biology, and reproductive stages of myctophid resources, particularly Benthosoma pterotum, highlighting their crucial role in energy transfer between surface and deeper ocean waters. She reviewed global research on the potential of mesopelagic resources, their fisheries, and utilization efforts, sharing her personal experience of consuming myctophids and discussing the nutritional value of wax esters and oils present in them. Dr Sebastine noted the significant presence of mesopelagic fishes in the bycatch fisheries of Kerala, especially in Cochin and Kollam. She provided extensive information on the reproductive biology, diet, and proximate composition of the myctophid species Diaphus watasei. Concluding her presentation, she emphasized that myctophids are rich in omega-3 fatty acids and a good protein source, with potential for future value-added products, industrial uses, and cosmetic research.

Session III: Myctophid harvest and utilization

Dr M.P. Remesan, Head & Principal Scientist, Fishing Technology Division.

Dr M.P. Remesan, Head of the Fishing Technology Division at ICAR-CIFT, delivered a talk on "Myctophid Harvest and Utilization." His talk was based on his previous work on mesopelagic fishes and began with an introduction to the resource potential of Myctophids. He discussed harvest technology, focusing on midwater trawling, and

presented fishing trials conducted in India by vessels such as Sagar Sampada and Matsyakumari-2. Dr Remesan highlighted several constraints and suggestions for harvesting Myctophids, including optimal vessel speed and night fishing techniques. He elaborated on the utilization of myctophids, showcasing products like myctophid fish meal (Myctomeal), myctophid oil (Myctoil), fish protein hydrolysate, battered and breaded products, myctophid silage, and fried fish from Diaphus watasei. He also discussed the development of various fishing gears suitable for Myctophid harvest, emphasizing midwater trawls with large vertical and horizontal mouth openings and minimal net visibility. The cruise trials off Lakshadweep and Kollam were presented to stakeholders, demonstrating practical applications. Dr Remesan concluded his presentation by stressing the importance of developing a value chain, improving harvest technology, and ensuring the sustainable utilization of mesopelagic resources.

IV. Discussion

The discussion session aimed to address various aspects and concerns related to the harvesting and utilization of mesopelagic resources. Key stakeholders, including industry representatives, researchers, and policymakers, participated in an engaging dialogue to explore the potential and challenges of this emerging fishery sector. Topics covered included sustainable harvesting practices, economic viability, market demand, regulatory frameworks, and future government initiatives. This session provided a platform for stakeholders to voice their concerns, share insights, and collaboratively seek solutions to ensure the responsible and profitable exploitation of mesopelagic resources.

Shri Chethan Bengre, a member of the Trawl Boat Association, expressed concerns regarding the fuel requirements and economics of fishing mesopelagic resources, given the travel time and prevailing market rates. He also raised questions about whether exploiting these resources might impact the food availability for other prominent fishery resources in the region. The discussion focused on key topics, including the sustainable harvesting of mesopelagic resources, market demand for this new fishery, the costs and benefits of mesopelagic fishing, the minimum legal size of myctophids, alternative uses of mesopelagic resources, and current and future government schemes on deep-sea fishing. Participants actively engaged in the discussions, and panelists provided clear answers and suggestions to each query. Several stakeholders highlighted the challenges of deep-sea ventures for exploiting these resources, with many expressing concerns about the market prices at landing centers. Additionally, some pointed out policy issues, noting that only vessels with state registration can exploit resources within 12 nautical miles, while deep-sea harvesting requires permissions from the central government. Other factors such as fuel, safety, skilled crew, and operational costs were also significant concerns.

V. Conclusion and Recommendations

The program provided a comprehensive exploration of the potential and challenges associated with mesopelagic fisheries. Dr Shoba Joe Kizhakudan, Dr Manju Sebastine, and Dr M.P. Remesan presented detailed insights into the biological, ecological, and technological aspects of Myctophid resources within the Indian EEZ. They highlighted the significant untapped potential of these resources, underscoring the importance of scientific rationale and sustainability in their exploitation. The discussions further illuminated key concerns from stakeholders, including economic viability, fuel requirements, market demand, and regulatory issues. Shri Chethan Bengre and other participants raised important points about the practicalities and policy implications of deep-sea fishing, emphasizing the need for supportive government schemes and infrastructure. The session concluded with a clear consensus on the necessity for a balanced approach that includes the development of appropriate harvest technologies, value chain creation, and sustainable utilization practices. The active engagement and diverse perspectives of all participants laid a strong foundation for future initiatives aimed at responsibly harnessing the potential of mesopelagic resources in India.

Recommendations of the Workshop

1. Develop suitable gears for targeted fishing of mesopelagic resources: ICAR-CIFT to focus on designing and standardizing nets specifically for the sustainable harvest of mesopelagic resources.
2. Mapping and taxonomy studies: ICAR-CMFRI to intensify efforts on the mapping and taxonomic studies of mesopelagic fishes along the Indian coast.
3. Comprehensive Mesopelagic Program: ICAR-CMFRI, in collaboration with ICAR-CIFT to draft a proposal for a dedicated mesopelagic program, including both harvest and post-harvest technologies, to be supported by the Department of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying, New Delhi through a suitable funding program.
4. Stakeholder engagement and industrial utilization: Promote the active participation of fishermen in harvesting mesopelagic resources and encourage an industrial approach for alternative utilization, such as fishmeal and other value-added products.
5. Funded Collaborative Projects: Initiate funded projects through collaborations among institutions like ICAR-CIFT, ICAR-CMFRI, and others, under the Ministry of Earth Sciences or the Department of Fisheries, to further research and develop the harvest and utilization of mesopelagic resources.

VI. Acknowledgements

We extend our heartfelt gratitude to all who contributed to the success of the workshop and the preparation of these proceedings. At the outset we deeply appreciate and thank Ms. Neethu Kumari Prasad, IAS, Joint Secretary, Dept of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying, Govt of India, for attending the workshop online and providing her support and encouragement.

We would like to thank Dr George Ninan, Director of CIFT, for his unwavering support in ensuring the success of this workshop. We are immensely grateful to Mr Udaya Kumar Salian of Yeshaswi Fish Meal and Oil Plant for his crucial role in the successful conduct of the program. His contributions were invaluable.

Our sincere thanks go to Dr Pravin Putran, ADG (Marine Fisheries) (Retd.) ICAR, and Dr Prathibha Rohit, Principal Scientist and former Scientist-in-Charge Karwar Research Station (Retd.), ICAR-CMFRI, for sharing their expertise and participating as panelists. Their involvement ensured smooth and insightful discussions.

We appreciate the support provided by the staff of ICAR-CMFRI Mangalore Regional Centre, and scientists from various centres of CMFRI, whose efforts were vital in organizing the program. We also acknowledge the PME Cell ICAR-CMFRI for indispensable support.

A special mention goes to the key stakeholders of this workshop, including seafood exporters, fish meal plant owners, fish feed plant owners, and fishers from Mangalore and Malpe. Their participation and input were crucial to the workshop's success.

We extend our gratitude to the press and media for their coverage and support, and Media Cell, ICAR-CMFRI which played a significant role in promoting the workshop and its objectives.

Lastly, we thank Ocean Pearl Mangalore for providing the venue and making the necessary arrangements, which significantly contributed to the seamless execution of the event.

VII. Appendices

About the Workshop

- The ICAR-Central Marine Fisheries Research Institute (CMFRI) is a premier research institute under the Indian Council of Agricultural Research (ICAR), dedicated to marine fisheries research and development. Established in 1947, CMFRI plays a pivotal role in advancing scientific knowledge, sustainable management, and utilization of marine resources in India.
- The institute conducts research on various aspects of marine biology, aquaculture, oceanography, and marine ecosystem conservation, contributing significantly to the enhancement of fisheries and aquaculture sectors.

  CMFRI's research outcomes and expertise are instrumental in shaping policies and practices for the responsible utilization and conservation of India's rich marine biodiversity in the Indian EEZ.
- The oceanic mesopelagic zone occurs 200-1000 m below sea level, and is home to several small fishes that play key roles in the ecosystem dynamics. These are globally the most abundant vertebrates; their communities are often dominated in terms of number and biomass by Myctophids, commonly referred to as lanternfish. (Order: Myctophiformes; Family: Myctophidae).
- Myctophids are named for their bioluminescent abilities, which they use for communication, camouflage, and attracting prey. Typically small in size, they range from a few centimeters to around 30 centimeters in length. They often form large aggregations of mesopelagic fish layers in the mesopelagic zone of oceans worldwide.
- Mesopelagic resources play a crucial role in the marine food web, serving as prey for larger fish, squids, and marine mammals.
- The presence of wax esters in their livers render them unfit for human consumption. However, they are high in lipid and protein content and may possibly find use in the fish meal industry, if harvested.
- Harvesting of mesopelagic fishes, including myctophids and their sustainable utilization present opportunities for new food sources and economic development, particularly in the context of increasing global demand for marine protein. The Potential Yield Estimate of both conventional and non-conventional marine fishes in the Indian EEZ is 7.1 MMT/year which includes 1.6 MMT of mesopelagic resources, indicating the vast possibilities of harvesting them.
- A one-day **National Workshop on Exploring Possibilities for the Sustainable Harvest and Utilization of Mesopelagic Fishes of the Indian EEZ** will be conducted by ICAR-CMFRI, Mangalore Regional Centre at Ocean Pearl, Mangaluru. The workshop is scheduled to be held on 24 May 2024 and will seek to create an awareness of the possibility of exploiting these resources sustainably for the fishmeal industry and the use of the waxy ester derived from them in the cosmetic industry.rl, Mangaluru. The workshop is scheduled to be held on 24 May 2024 and will seek to create an awareness of the possibility of exploiting these resources sustainably for the fishmeal industry and the use of the waxy ester derived from them in the cosmetic industry.

Objectives of the Workshop

The workshop will serve as a platform to bring together Government officials, researchers, and representatives from fish meal industry and seafood export industry to discuss possibilities to achieve the following objectives

- Estimate the accurate Potential Yield Estimate of mesopelagic fishes in the Indian EEZ.
- Identify and map aggregation sites of mesopelagic fishes in the Indian EEZ.
- Develop suitable harvest methods and assess economics of fishing operations.
- Develop suitable post-harvest processing protocols, explore potential use of mesopelagic fishes in fish meal industry and assess economics of these operations.
- Assess the utilization potential of by-products from the mesopelagic resources.

Who will participate

The workshop aims to benefit fishers, owners and operators of fishmeal plants, processing units and feed mill plants. Officials from ICAR-CIFT; Department of Fisheries, Govt of India; Karnataka Department of Fisheries; MPEDA; CMLRE; representatives from SEAI and Yashaswi Fish Meal & Oil Company will also participate.

Patrons:
Dr A Gopalakrishnan, Director, ICAR-CMFRI, Kochi
Mr Udaya Kumar Salian, Yashaswi Fish Meal & Oil Company, Udupi

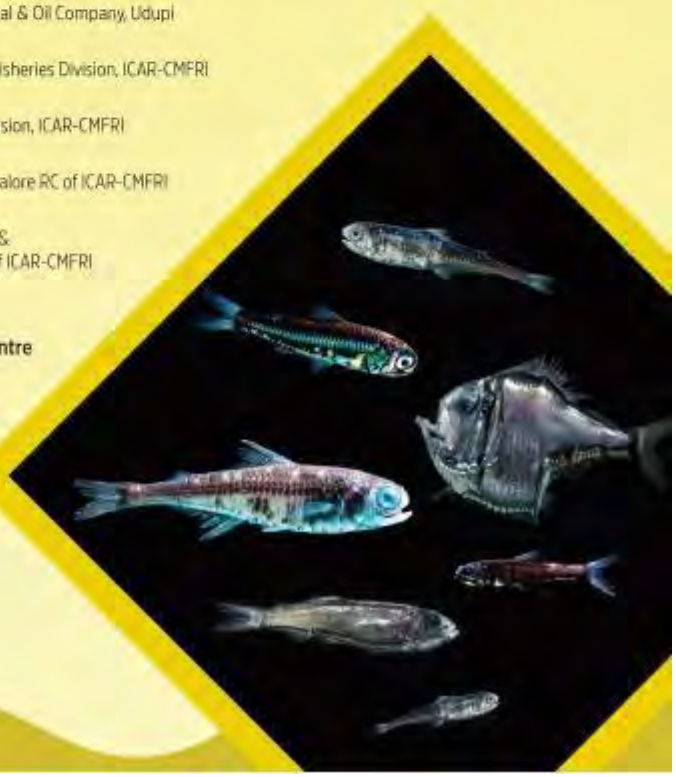
Organising Secretary:
Dr Shoba Joe Kizhakudan, Head, Finfish Fisheries Division, ICAR-CMFRI

Joint Organising Secretary:
Dr E M Abdussamad, Finfish Fisheries Division, ICAR-CMFRI

Coordinators:
Dr Sujitha Thomas & Dr Rajesh K M, Mangalore RC of ICAR-CMFRI

Co-coordinators:
Dr Sunil Kumar All, Dr Bindu Sulochanan &
Dr Divya Viswambharan, Mangalore RC of ICAR-CMFRI

Hosted by:
ICAR-CMFRI, Mangalore Regional Centre
in collaboration with
Yashaswi Fish Meal & Oil Company



CMFRI

Yashaswi

PROGRAM

24.05.2024 10AM

9.00-10.00 am	Registration
10.00-10.10 am	Welcome Dr Sujitha Thomas, Head & Principal Scientist, Mangalore Regional Centre ICAR-CMFRI
10.15-10.25 am	Overview of the Workshop Dr A. Gopalakrishnan, Director, ICAR-CMFRI
10.25-10.30 am	Lighting of Inaugral lamp
10.30-10.40 am	Inaugural Address Dr B. Meenakumari, Former Chairperson National Biodiversity Board and former Deputy Director General (Fisheries), ICAR
10.40-10.55 am	Address by Guest of Honour Ms Neetu Kumari Prasad, IAS, Joint Secretary (MF), Department of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying, Government of India Address by Dr Shubhadeep Ghosh, Assistant Director General (Marine Fisheries) ICAR, Delhi. Address by Shri Dinesh Kallar, Director, Dept of Fisheries, Govt of Karnataka
10.55-11.00 am	Vote of Thanks Dr Rajesh K.M, Principal Scientist, Mangalore Regional Centre ICAR-CMFRI
11.00 am-1.30 pm	Technical session Presentations on the Myctophid resources and their utilization by experts followed by discussions
1.30-1.35 pm	National Anthem

NATIONAL WORKSHOP ON EXPLORING POSSIBILITIES FOR THE SUSTAINABLE HARVEST AND UTILISATION OF MESOPELAGIC FISHES OF THE INDIAN EEZ

ICAR-CENTRAL MARINE FISHERIES RESEARCH INSTITUTE MANGALORE REGIONAL CENTRE
&
YESHWASI FISH MEAL AND OIL COMPANY

TECHNICAL SESSION

11.00-11.30

Unveiling the potential: Mesopelagic resources in the Indian EEZ
Dr. Shoba Joe Kizhakudan, Head Finfish Fisheries Division, ICAR-CMFRI

11.30-12.00

Myctophid fishery in Arabian Sea
Dr Manju Sebastine, Asst. professor Dept of zoology, Fatima Mata College, Kollam

12.00-12.30
Myctophid Harvest and Utilization
Dr. M.P. Remesan
Head & Principal Scientist, Fishing Technology Division

DISCUSSION AND CONCLUSION: 12.30-13.30

PANELIST

Dr. B MeenaKumari, Former Chairperson, National Biodiversity Board & DDG (Marine Fisheries) (former) ICAR New Delhi

Dr Pravin P. ADG (former) Marine Fisheries (ICAR, NewDelhi)

Dr. Prathibha Rohit, Principal Scientist & Head (Retd) Karwar RS ICAR-CMFRI

Glimpses of the workshop