SEAFOOD EXPO BHARAT 2026

www.seafoodexpobharat.com

एमपीईडीए
MPEDA



स्मरणिका
SOUVENIR

PLATINUM

GOLD

SPONSORS

Chennai Trade Centre, Nandambakkam, Chennai, India.

MARKSMEN AQUATIC PRODUCTS LLP

Sustainably Sourced, Naturally Nourishing!



Manufacturers of

Fish Meal & Fish Oil

6/84, Vadakku Karasseri,
Tuticorn - 648851,TamilNadu,India
marksmenaquatic.com

+91 81292 70000
+91 87547 44451
info@marksmenaquatic.com

HIRAVATI GROUP

www.hiravati.com

EXPORTING **PREMIUM SEAFOD** WORLDWIDE SINCE 1975



50+ YEAR LEGACY | **8** BUSINESS VERTICALS | **10+** GROUP COMPANIES | **3** ESTABLISHED BRANDS

Our Business Verticals

A diversified group across seafood processing, marine ingredients, and rope & net manufacturing, built on integrated operations and strong manufacturing capabilities.

Seafood Processing

• Surimi • Frozen Seafood
• Crab Meat • Surimi Analogue

Marine Ingredients

• Sterilised Fish Meal • Marine Collagen

Rope & Net Manufacturing

• Fishing and Wire Ropes • HDPE Nets & PP Ropes

For more information contact us at
Info@hiravati.com
Mo. +91 9537 137 137

HIRAVATI GROUP OF COMPANIES

- Amar Wire Ropes
- Amar Aquatic
- Amar Polyfills
- Amar Packaging
- Amar Sterillised Fish Meal
- Amar Food Products
- Vistar Amar Ltd.
- Ocean Protein Pvt. Ltd.
- Amarsagar Seafood Pvt. Ltd.
- Hiravati Marine Products Pvt. Ltd.

011- 20815386/87/88

eic@eicindia.gov.in

PARTNER IN CREATING INDIA'S EXPORT GROWTH

EIC

ISO 9001:2015 Organisation



The competitive worldwide export marketplace demands high quality assurance solution that effectively meet today's needs and address tomorrow's challenges. In an area that's characterized by fierce competition and continuing quality governance mechanisms. Export Inspection Council (EIC), as official certification body, stands out as the forerunner.

Set up as statutory body by the Government of India, EIC has radically transformed its activities from the regulatory domain of pre-shipment inspection to that of facilitator of exports trade. Its team comprises of dedicated, experienced and highly qualified technical personnel.

Today, EIC guarantees exporters a gateway to demanding markets and the importers that food and related products sourced from India are fit for consumption and adhere to stringent international quality standards.

From the last several decades since its inception, EIC has played a pivoted role to boost the country's exports through Quality Assurance and Certification Programmes. EIC operates through its field organizations, Export Inspection Agencies (EIAs) at Delhi, Kolkata, Mumbai, Chennai and Kochi, having a network of 24 Offices including Sub-Office(s) supported by ISO 17025 accredited Laboratories situated at Delhi, Chennai, Mumbai, Kolkata, Bhubaneswar, Visakhapatnam, Kochi and Bhimavaram, and four ISO 17043 accredited Proficiency Testing Providers at Kochi, Chennai, Kolkata and Mumbai. Having Facility for testing of Residues, Contaminants, Toxins, Physicochemical Parameters in various food commodities, Microbiological Parameters in food commodities, GMO, Viruses, Meat Authenticity, Basmati rice Authenticity and Honey Authenticity and Adulteration.

EXPORT INSPECTION COUNCIL (EIC)

(Ministry of Commerce and Industry, Govt. of India)

2nd Floor, B- Plate, Block-I Commercial Complex, East Kidwai Nagar, New Delhi - 110023

Contents

Messages

7
Chairman, MPEDA

9
President of India

11
Prime Minister of India

13
Minister of Commerce & Industry, Govt. of India

15
Minister of Fisheries, Animal Husbandry & Dairying, Govt. of India

17
Commerce Secretary, Department of Commerce, Minister of Commerce & Industry, Govt. of India

19
Secretary (Fy), Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Govt. of India

21
Director General of Foreign Trade

Articles

24
Seafood Expo Bharat 2025: A Landmark Beginning For India's Seafood Industry

30
Understanding Green Value Chains: Building A Sustainable Future For The Fisheries Sector

40
Mud Crab Farming In Andhra Pradesh: Present Status And Growth Potential

46
Sustainable Seafood Certification Scenario In India

52
Decent Work In The Aquaculture Sector: Global Best Practices And Pathways For India

60
Utilisation Of Seaweed Polysaccharides For Preparing Edible Films And Coatings

66
Women Climate Champions Driving Sustainable Crab Farming Under The ECRICC Project In Odisha

72
Post-Harvest Losses In The Fisheries Sector: Opportunities And Challenges For Processing And Entrepreneurship

80
Insights From Grouper Aquaculture Endeavours In The Andaman & Nicobar Islands

92
Status And Future Strategies Of Mud Crab Aquaculture

100
Equipping India For Sustainable Seafood Production: CMFRI Leading The Way

108
From Waste To Worth: Upcycling Fish And Shrimp Leftovers Into Industrial Biomaterials

114
Beyond The Frozen Block: A Life-Cycle Vision For Indian Seafood's Next Decade

SEAFOOD EXPO BHARAT 2026

MPEDA

Editorial Advisory Board

Mr. P. Jawahar IAS
Chairman, MPEDA

Dr. M. K. Ram Mohan
Director

Dr. T. R. Gibinkumar
Secretary

Mr. Anil Kumar P.
Joint Director (Marketing)

Dr. P. Jayagopal
Deputy Director (Aquaculture)

Mrs. Anju
Deputy Director (Marketing Services)

Editor
Mr. S. Asok Kumar
Deputy Director (Publicity & Market Promotion)

Printed and Published by
Dr. T. R. Gibinkumar
Secretary
On behalf of
The Marine Products Export Development Authority
(Ministry of Commerce & Industry, Govt. of India)
MPEDA House, Panampilly Avenue, Kochi
Kerala - 682 036,
Tel: +91 2311901
www.mpeda.gov.in
support@mpeda.gov.in

Published by
MPEDA House
Panampilly Avenue
Kochi, Kerala - 682 036

Printed at
Print Express
44/1469A, Asoka Road
Kaloor, Kochi, Kerala - 682 017

Chairman's Message



Dear Friends,

It gives me immense pleasure to welcome you to the second edition of Seafood Expo Bharat 2026, being held from 1–3 July 2026 at the Chennai Trade Centre. Following the remarkable success of the inaugural edition in 2025, Seafood Expo Bharat has established itself as a premier event for stakeholders across the seafood value chain to foster business partnerships, exchange knowledge, and showcase innovations driving the sector forward.

2025–26 was a landmark year for India's seafood industry, with marine products exports reaching close to two million MT valued at USD 8.46 billion despite global challenges. The United States and China remained the major export destinations, while frozen shrimp continued to lead exports, followed by frozen fish.

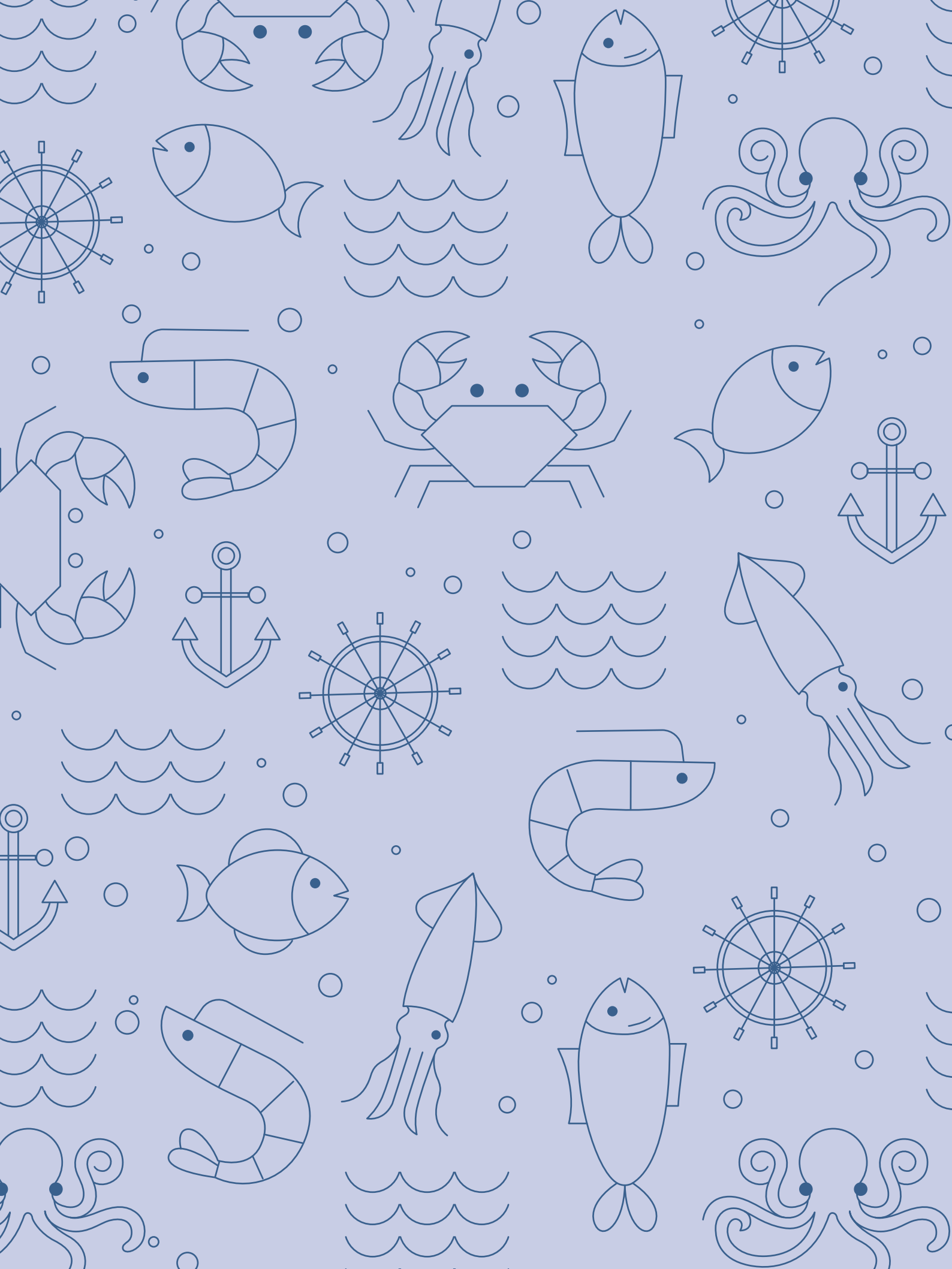
The inaugural Seafood Expo Bharat 2025 received an overwhelming industry response and provided an excellent forum for business interactions, technology showcases, and discussions on seafood trade, aquaculture, sustainability, value addition, and emerging market opportunities. Seafood tasting sessions further showcased the quality and diversity of Indian seafood products.

Building on the success of the Reverse Buyer Seller Meets organised during SEB 2025, we will continue to facilitate interactions between Indian exporters and international buyers, creating opportunities for trade expansion, market diversification, and long-term business partnerships. Over 60 buyers have confirmed their participation in SEB 2026.

Among the key highlights of the event was the National Skill Olympiad on Seafood Value Addition, organised to recognise and promote excellence in seafood processing and value addition. This year, the National Skill Olympiad will once again culminate with its grand finale during Seafood Expo Bharat. The competition provides an opportunity to recognise emerging talent in seafood value addition while strengthening India's capabilities in producing high-value seafood products for global markets. There are other attractions in store for the event.

As we gather for Seafood Expo Bharat 2026, I am confident that the event will further strengthen collaboration among industry stakeholders and open new avenues for growth and innovation. I encourage all participants to make the most of the opportunities for networking, learning, and business development that the expo offers.

Thank you.
P. Jawahar, IAS





राष्ट्रपति
भारत गणतंत्र
PRESIDENT
REPUBLIC OF INDIA

MESSAGE

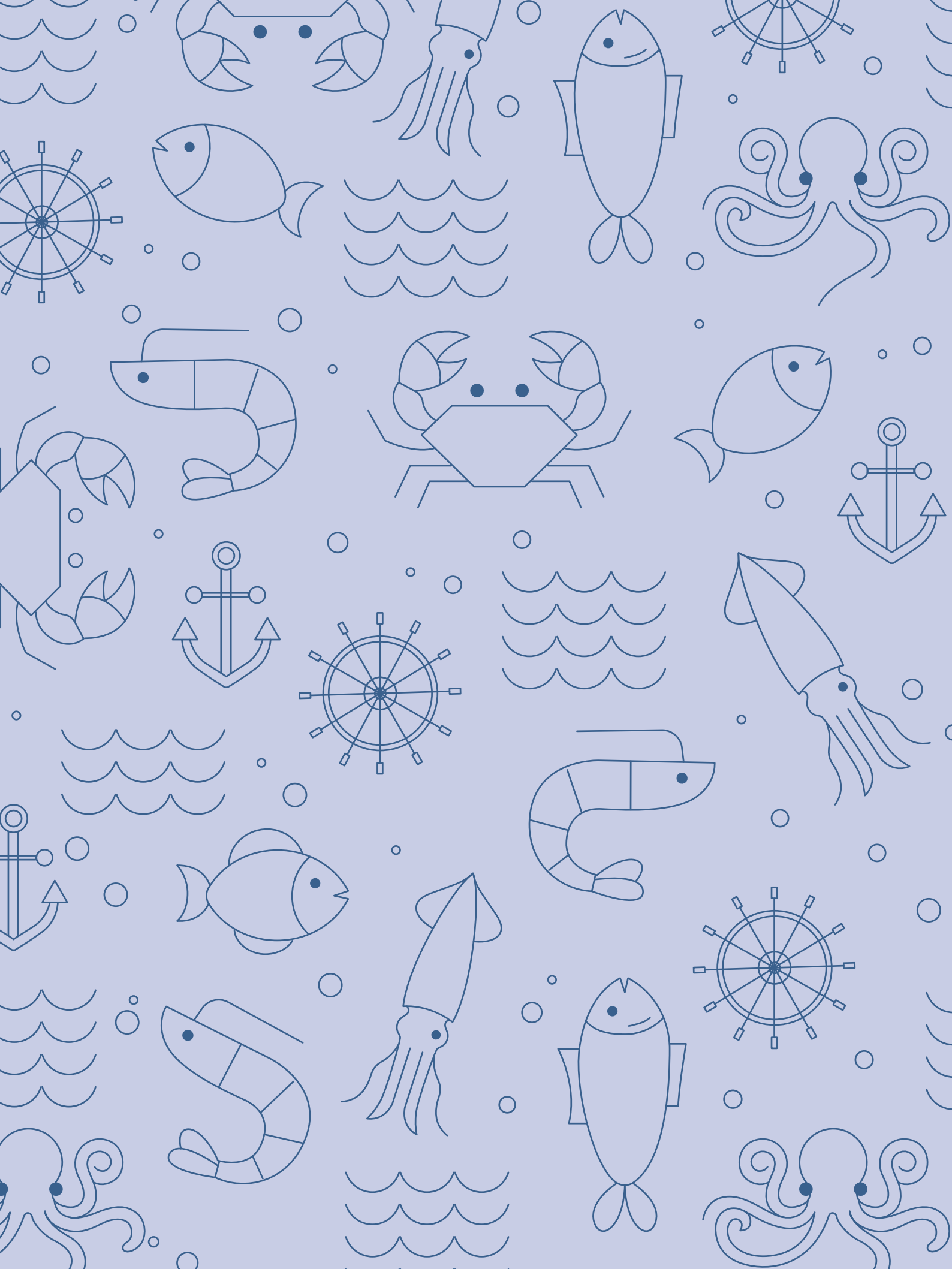
I am happy to know that the Marine Products Export Development Authority (MPEDA) is organising the second edition of Seafood Expo Bharat (SEB) 2026 at Chennai from 01 to 03 July 2026. A souvenir is being released to commemorate the occasion.

India's marine products sector plays an important role in the national economy through exports, employment generation and livelihood support. Seafood Expo Bharat 2026 offers a valuable platform to showcase India's marine diversity, advanced processing capabilities and commitment to development of the fisheries sector. I am confident that Seafood Expo Bharat 2026 will provide a dynamic platform for stakeholders to collaborate, showcase innovations and explore new opportunities.

I extend my greetings and felicitations to the organisers and participants and wish the Expo every success.

(Droupadi Murmu)

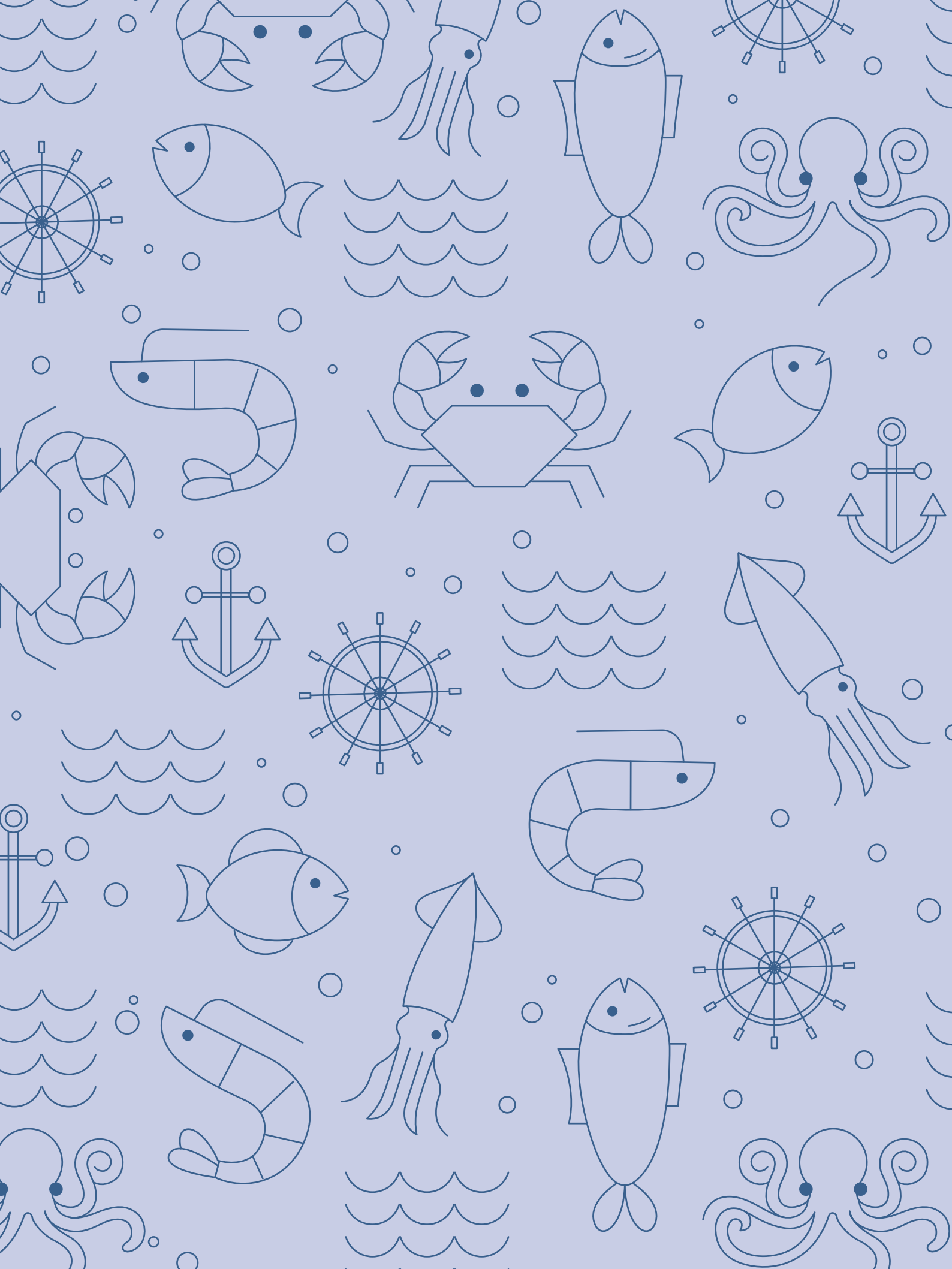
New Delhi
09 June 2026





Shri Narendra Modi

Hon'ble Prime Minister of India



पीयूष गोयल
PIYUSH GOYAL

सत्यमेव जयते

वाणिज्य एवं उद्योग मंत्री
भारत सरकार
MINISTER OF COMMERCE & INDUSTRY
GOVERNMENT OF INDIA



MESSAGE

I am delighted to learn that the Marine Products Export Development Authority (MPEDA) is organizing the 2nd edition of Seafood Expo Bharat (SEB) from 1st to 3rd July 2026 in Tamil Nadu. A souvenir is also being released on this occasion.

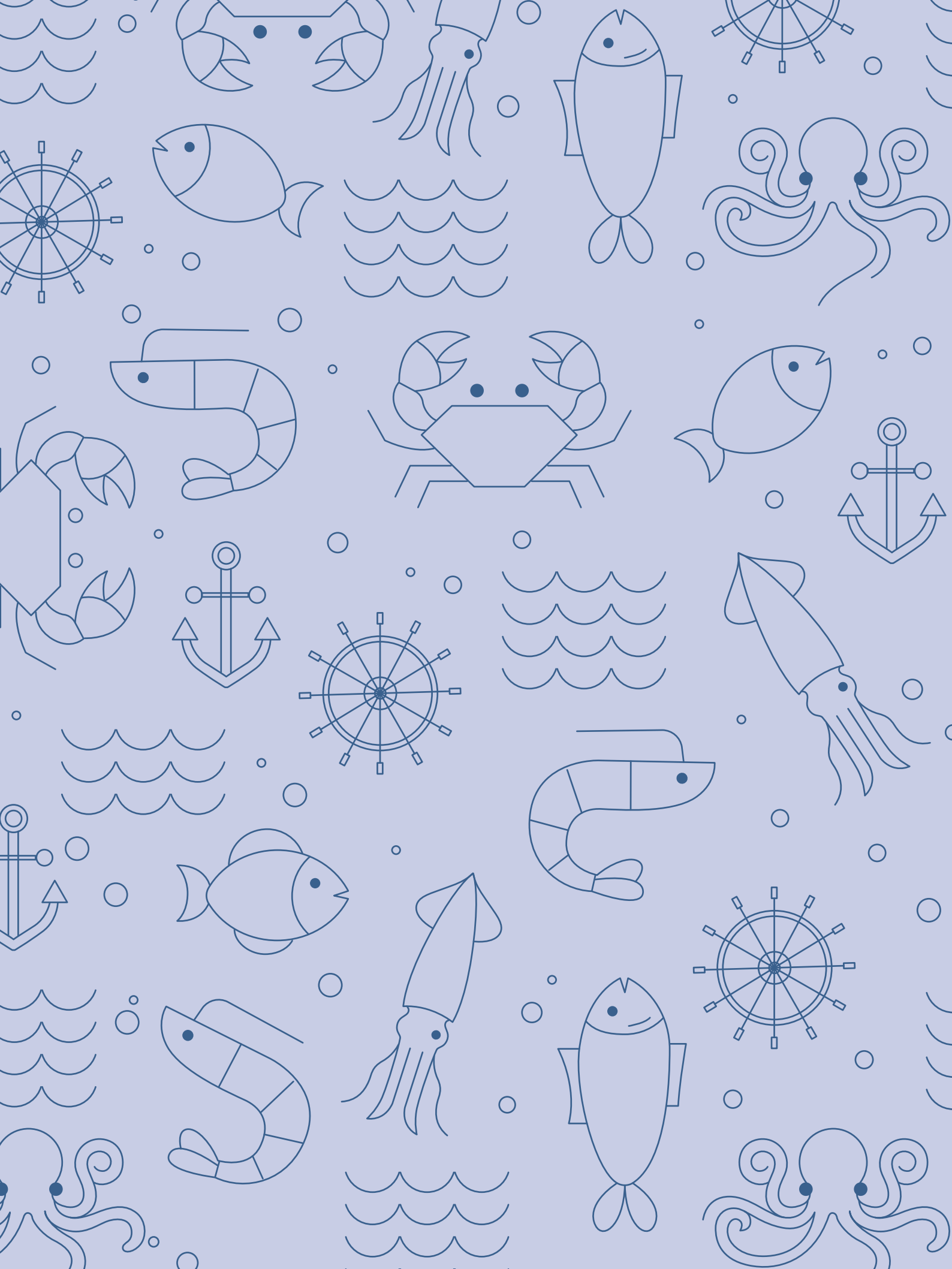
India has emerged as a global leader in seafood exports, recognized for its high-quality, safe and sustainably produced seafood. Over the years, the Government of India's focused initiatives, under the dynamic leadership of our Hon'ble Prime Minister Shri Narendra Modi ji, have played a pivotal role in strengthening the sector. These include the promotion of modern aquaculture practices, adoption of innovative processing and preservation technologies, expansion of cold-chain and logistics infrastructure, support for export-oriented policies and capacity-building programs for fishers and farmers. These measures have positioned India as a trusted supplier in international markets while also boosting rural livelihoods and employment opportunities.

The Seafood Expo Bharat provides an excellent platform to showcase India's capabilities in safe and sustainable seafood production. It will feature the latest innovations, advanced technologies and recent developments in the seafood industry, creating opportunities for learning, collaboration and growth. The event will bring together a diverse set of stakeholders, including exporters, importers, processors, suppliers of raw materials, policymakers and experts, facilitating meaningful exchanges, adoption of best practices and the forging of new partnerships that can drive the sector forward.

I congratulate MPEDA for its efforts in organizing this event and wish Seafood Expo Bharat great success.

Piyush Goyal

Ministry of Commerce & Industry, Vanijya Bhawan, Akbar Road, New Delhi-110001
Tel. No. : +91 11 23039110, 23039111, E-mail : cimoffice@nic.in



राजीव रंजन सिंह उर्फ ललन सिंह
RAJIV RANJAN SINGH ALIAS LALAN SINGH

सत्यमेव जयते

पंचायती राज मंत्री
और मत्स्यपालन, पशुपालन एवं डेयरी मंत्री
भारत सरकार
Minister of Panchayati Raj and
Minister of Fisheries, Animal Husbandry and Dairying
Government of India

DO. No.2791 MIN PR&FAHD/2026



MESSAGE

I am pleased to extend my warm greetings to all participants of the second Seafood Expo Bharat (SEB) 2026, organised by the Marine Products Export Development Authority (MPEDA) in Chennai from 1-3 July 2026.

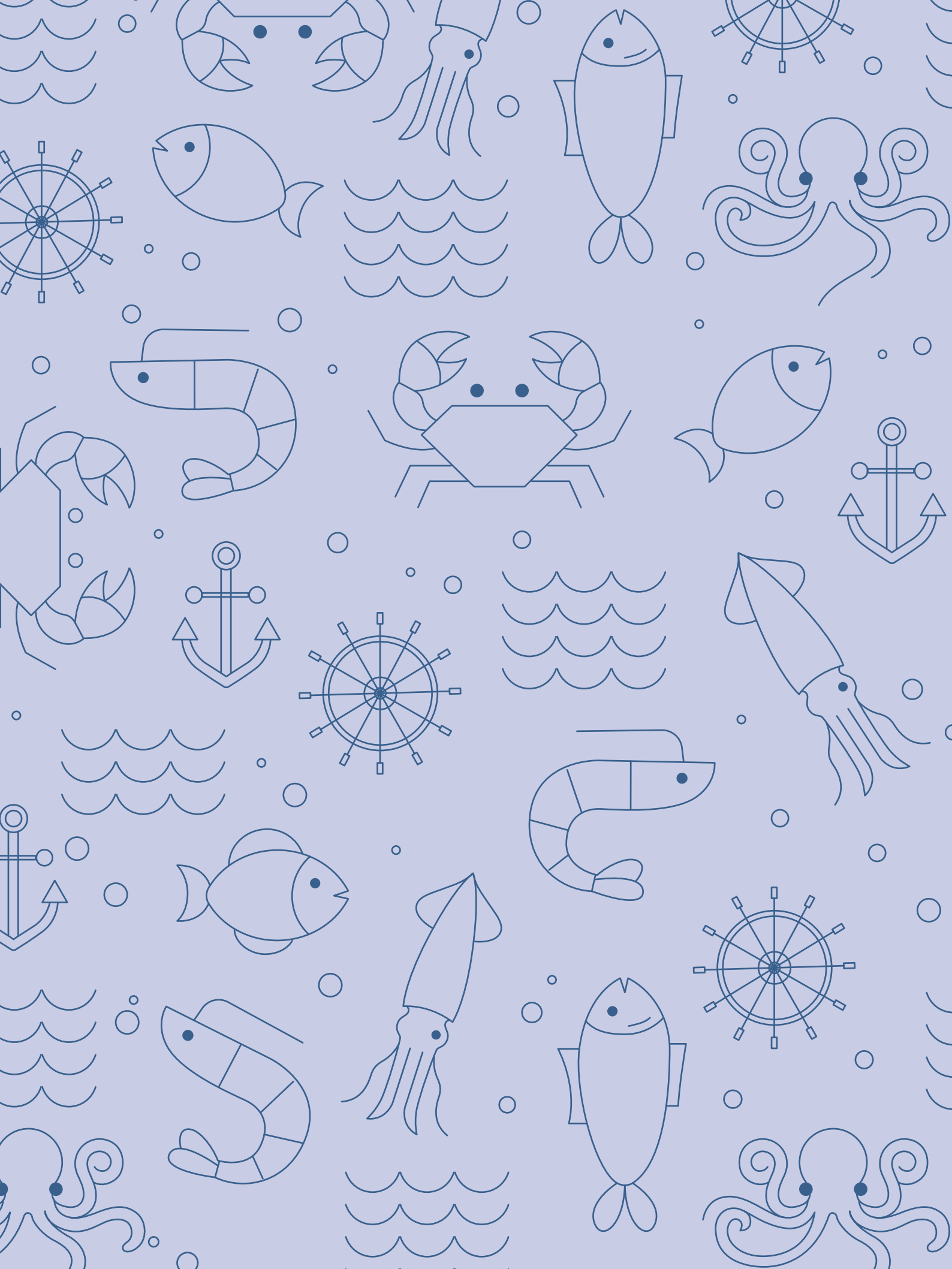
India's fisheries and aquaculture sector is a cornerstone of our rural economy, supporting the livelihoods of millions of fishers, fish farmers, and coastal communities. As one of the world's leading producers and exporters of seafood, India has the responsibility to advance global standards in quality, sustainability, and innovation.

SEB 2026 once again brings together all segments of our seafood ecosystem on one platform. Its significance extends beyond trade—it connects the efforts of our fishers and aquaculture farmers directly with global market opportunities, thereby strengthening their economic prospects. Building on the momentum of its inaugural edition, I am confident that SEB 2026 will set new benchmarks for a more resilient, competitive, and inclusive seafood sector.

I extend my heartfelt greetings to all stakeholders and participants and wish the Expo resounding success.

(Rajiv Ranjan Singh)

Room No. 234, B- Wing, Krishi Bhawan, Dr. Rajendra Prasad Road, New Delhi-110 001 (India)
Ph. +91 11-23380780/81/82 Fax: +91 11- 23380783 Resi. 011-23782781/82



राजेश अग्रवाल
RAJESH AGRAWAL

वाणिज्य सचिव
भारत सरकार
नई दिल्ली–110011
COMMERCE SECRETARY
GOVERNMENT OF INDIA
NEW DELHI-110011

सत्यमेव जयते



MESSAGE

I am delighted to extend my warm greetings on the occasion of the second edition of **Seafood Expo Bharat (SEB) 2026**, being organised by the Marine Products Export Development Authority (MPEDA) in Chennai from 1–3 July 2026. Building on the resounding success of its inaugural edition, SEB-MPEDA's flagship annual event-has firmly established itself as a premier platform for convening stakeholders from across the seafood value chain and for showcasing the strengths of India's seafood sector in global markets.

India's marine sector occupies a place of considerable significance in the country's export basket and serves as a vital source of livelihood for millions engaged in fisheries, aquaculture, processing, and allied activities. Despite a challenging global environment, marine exports have continued to demonstrate remarkable resilience, underpinned by sustained efforts to strengthen quality standards, sustainability, traceability, and regulatory compliance. These initiatives have enhanced India's standing as a trusted supplier of high-quality seafood worldwide, while contributing meaningfully to the prosperity of our coastal communities.

As India advances towards the vision of **Viksit Bharat @2047**, the seafood sector is poised to play an increasingly pivotal role in driving export-led growth, generating employment, and promoting sustainable development. I am confident that Seafood Expo Bharat 2026 will spur innovation, deepen trade partnerships, and open new avenues for collaboration and market access, further consolidating India's position as a leading player in the global seafood trade.

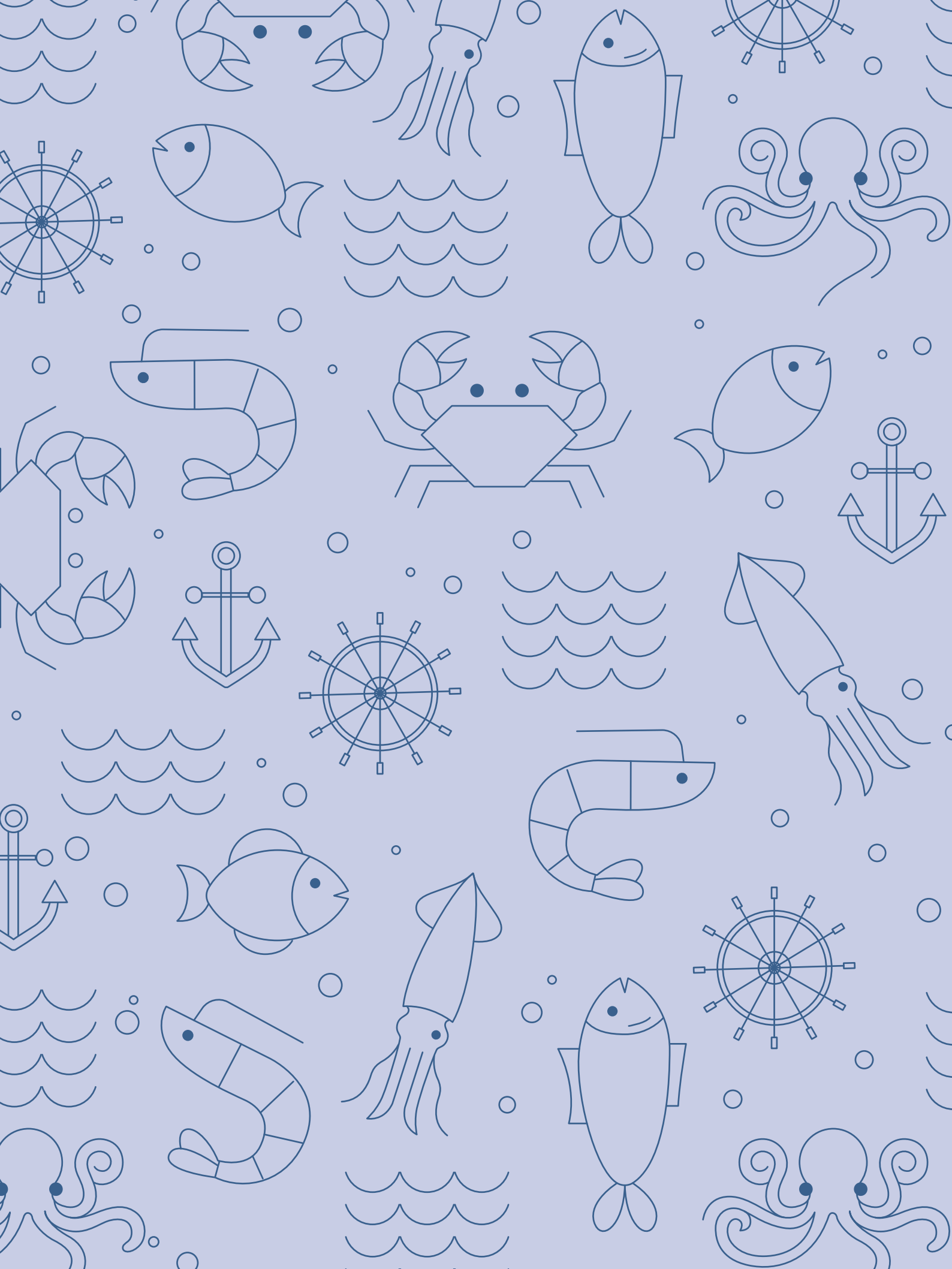
I extend my best wishes for the grand success of Seafood Expo Bharat 2026.

[Rajesh Agrawal]

Place: New Delhi

Date: 15.06.2026

Room No. 426, Vanijya Bhawan, Akbar Road, New Delhi-110 011, Tel.: 011-23039251-55 / E-mail : csoffice@nic.in
Website : www.commerce.gov.in



Dr. Abhilaksh Likhi, IAS
Secretary
डॉ. अभिलक्ष लिखी, भा.प्र.से.
सचिव

भारत सरकार
मत्स्यपालन, पशुपालन एवं डेयरी मंत्रालय
मत्स्यपालन विभाग
कृषि भवन, नई दिल्ली–110001
Government of India
Ministry of Fisheries,
Animal Husbandry & Dairying
Department of Fisheries
Krishi Bhawan, New Delhi-110001



MESSAGE

It is with great pleasure that I extend my greetings to all participants and stakeholders at the second Seafood Expo Bharat (SEB) 2026, organised by the Marine Products Export Development Authority (MPEDA) in Chennai from 1st to 3rd July 2026.

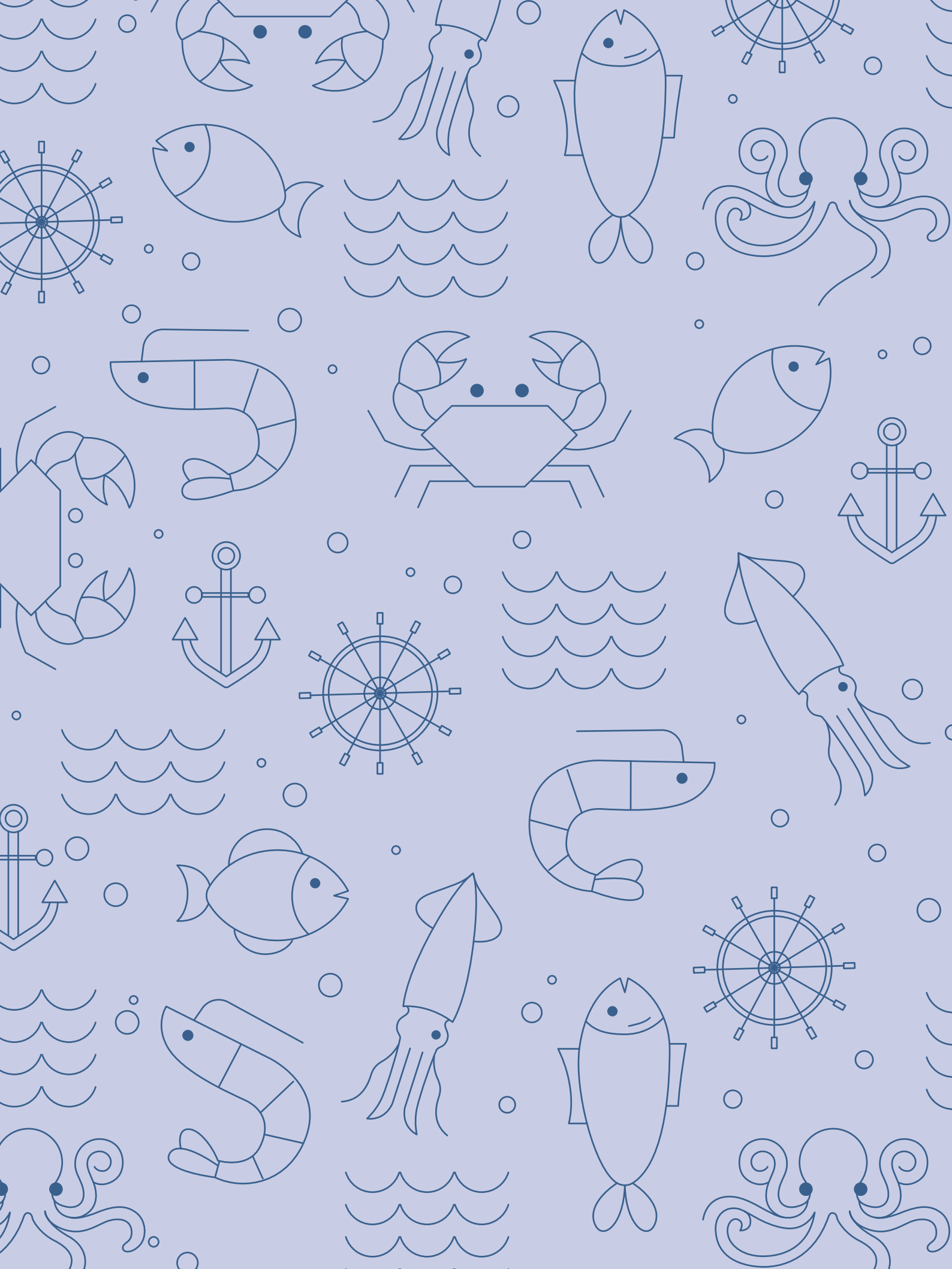
India's seafood sector stands at an exciting juncture. Our collective commitment to quality, sustainability, and value addition, which are the very principles that have guided SEB from its inception, continues to strengthen our competitive position in global markets. The Department of Fisheries remains firmly committed to creating an enabling policy environment that supports the growth, modernization, and sustainability of India's fisheries and aquaculture sector.

SEB 2026 once again brings together a distinguished gathering of experts, technologists, entrepreneurs, and policymakers, both national and international. I am confident that the dialogues and collaborations fostered at this Expo will yield actionable insights, drive adoption of emerging technologies, and help chart a robust roadmap for elevating India's seafood exports to new and greater heights.

I extend my best wishes to MPEDA, the organisers, and all participants for a fruitful and highly successful Expo.

(Dr. Abhilaksh Likhi)

Office: Room No. 220, Krishi Bhawan, New Delhi-110001 • दूरभाष / Phone: 23381994, 23070370
E-mail: secy-fisheries@nic.in



लव अग्रवाल, भा.प्र.से.
महानिदेशक
LAV AGARWAL, IAS
Director General



भारत सरकार
वाणिज्य एवम् उद्योग मंत्रालय
विदेश व्यापार महानिदेशालय
वाणिज्य भवन, नई दिल्ली-110011
Government of India
Ministry of Commerce & Industry
Directorate General of Foreign Trade
Vanijya Bhawan, New Delhi - 110011

MESSAGE

I am pleased to convey my greetings to all participants at the second Seafood Expo Bharat (SEB) 2026, organised by MPEDA in Chennai from 1st to 3rd July 2026.

Today's global seafood buyers expect more than quality; they expect transparency, traceability, and responsible sourcing, and India has been making real progress on all three fronts. With over 604 Indian establishments approved for the EU market, full regulatory alignment achieved on antimicrobial standards, and the Shrimp Regulatory Partnership Agreement currently being finalised with the United States, securing our shrimp access to the US market, India is increasingly being seen as a trustworthy and compliance-ready exporter.

Recent trade agreements with the UK and EFTA nations have widened our export reach considerably. For Indian companies, the priority now is to demonstrate the regulatory readiness and standards alignment that these new markets demand. SEB 2026 is the right platform to take stock of where we stand and to accelerate that preparedness.

My best wishes to MPEDA and all participants for a successful Expo.

(Lav Agarwal)

New Delhi
30th April, 2026



AL YAHYA EXPORTS

Frozen Seafood Processor and Exporter

www.alyahyaexports.com

We Have started the fisheries business in the year 1992 after years of experience in the year 2016 has begun to process frozen and fishery product and became an exporter with a company name AL YAHYA EXPORTS In a very short term company has growth and success in this field turning AL YAHYA EXPORTS into a successful venture.

Plot No. 59 & 60 G.I.D.C.
Veraval - 362269 Gujarat - India

alyahyaexports@gmail.com
www.alyahyaexports.com

Mr. Yunus Panja
FOUNDER - CEO
+ 91 92275 35509

Mr. Yahya Panja
MANAGING PARTNER
+91 92750 72350

Mr. Farhan Panja
MARKETING MANAGER
+ 91 81602 48007

भारत सरकार
GOVERNMENT OF INDIA

मत्स्यपालन विभाग
DEPARTMENT OF FISHERIES

NATIONAL FISHERIES DEVELOPMENT BOARD

NATIONAL FISHERIES DEVELOPMENT BOARD

About us:

- The National Fisheries Development Board (NFDB), an autonomous organization established on 10th July 2006, under the Ministry of Agriculture, Government of India, to increase fish production and productivity and to coordinate fishery development in the country.
- At present, functioning under the Department of Fisheries (DoF), Ministry of Fisheries, Animal Husbandry and Dairying (MoFAHD), Government of India. NFDB undertakes various developmental activities to enhance fish production, productivity, and post-harvest infrastructure in fisheries sector.



Our Mission:

- Development of the fisheries sector by enhancing fish production and productivity, ensuring nutritional security, and contributing to economic growth, employment, exports, and tourism.

Regional Centers :

- **Eastern Regional Centre, Bhubaneswar, Odisha:** Established in 2013 within the National Freshwater Fish Brood Bank (NFFBB), it serves as a technology dissemination center to disseminate knowledge on breeding techniques, quality seed, GIFS etc.
- **North-Eastern Regional Centre, Guwahati, Assam:** Set up in 2014, it promotes fisheries and aquaculture in the North-Eastern region through training, awareness, and technical support.
- **Integrated Coastal Aquaculture Facility, Mulapolam, Andhra Pradesh:** Developed in 2024 with nursery complexes, grow-out ponds, and a water management system for brackish water aquaculture.

Key Schemes/Projects implemented

Pradhan Mantri Matsya Sampada Yojana (PMMSY) 2020-21 to 2025-26:

A flagship scheme to bring about Blue Revolution through sustainable and responsible development of fisheries sector in India with an investment of Rs. 20,050 crores.

National Fisheries Digital Platform (NFDP):

transformative initiative under the ongoing PM-MKSSY scheme to lay the foundation through a comprehensive framework for data collection and analysis, to facilitate informed decision-making, need-based policy formulation, partnerships and collaborations.

Group Accident Insurance Scheme (GAIS):

Insurance coverage to fishers and other individuals involved in fishing-related activities in case of accidental death, permanent/partial disability, and hospitalization due to accidents.

Aquaculture Insurance under PM-MKSSY:

provides a one-time incentive for adopting insurance for aquaculture farms. The insurance is intended to protect against unforeseen losses, particularly for those engaged in newer forms of aquaculture, and includes systems such as cage culture, Circulatory Aquaculture System (RAS), bio-floc, and raceways.

Entrepreneur model under PMMSY:

promoting entrepreneurs, start-ups, and private entities by providing back-ended subsidy upto 30% of the project cost.

Fisheries and Aquaculture Infrastructure Development (2023-24 to 2025-26):

Facilitates creation of fisheries infrastructure facilities both in marine and inland fisheries sector.

- Provides interest subvention upto 3% of project cost with a maximum repayment period of 12 years including moratorium of 2 years on principal amount

Pradhan Mantri Matsya Kisan Samridhi Sah-Yojana (PM-MKSSY) 2023-24 to 2026-27:

A sub-scheme under the PMMSY to address structural weaknesses in the fisheries sector through targeted financial and technological interventions, facilitating institutional reforms and supporting the long-term transformation.

For further details:
National Fisheries Development Board
Toll Free No: 1800-425-1660
Open: Monday to Friday (10:00 AM - 6:00 PM)
Email: info.nfdb@nic.in

https://nfdb.gov.in/ nfdbindia nfdbindia nfdbindia

Pillar. No. 235, PVNR Express Highway, SVPNPA Post, Hyderabad - 500052

Seafood Expo Bharat 2025:
A landmark beginning for India's seafood industry

The inaugural edition of Seafood Expo Bharat (SEB) 2025, organised by the Marine Products Export Development Authority (MPEDA) under the Ministry of Commerce & Industry, Government of India, was held at the Chennai Trade Centre from 1–3 July 2025. Conceived as India's flagship seafood trade exhibition, the event showcased the country's strengths in seafood exports, aquaculture innovation, processing technologies, and value addition.

SEB 2025 brought together stakeholders from across the seafood value chain, including exporters, importers, processors, equipment manufacturers, aquaculture companies, cold chain providers, government institutions, and technical experts. The event served as a vibrant platform for business networking, collaboration, and knowledge exchange.

A key highlight was the Reverse Buyer Seller Meet (RBSM), which attracted 47 international buyers from 20 countries and facilitated over 800 structured B2B meetings with around 130 Indian exporters, strengthening trade relationships and enhancing the global visibility of Indian seafood products. The enthusiastic participation and positive feedback from buyers and exporters reflected the growing confidence in India's seafood industry.

The expo featured around 110 stalls from over 70 exhibitors showcasing advanced processing equipment, packaging innovations, aquaculture technologies, cold chain solutions, and value-added seafood products. Live seafood kitchen and tasting sessions, along with cooking demonstrations, highlighted the quality and versatility of Indian seafood.

Technical sessions brought together industry leaders, researchers, policymakers, and entrepreneurs to discuss global seafood trade trends, sustainable aquaculture, seaweed cultivation, food safety, traceability, climate resilience, and value addition. The event also hosted the grand finale of MPEDA's National Skill Olympiad on Seafood Value Addition, recognising excellence in seafood processing and product development and highlighting MPEDA's commitment to skill development within the seafood industry.

SEB 2025 concluded successfully with participation from over 2,700 delegates and more than 1,000 visitors, firmly establishing itself as a premier platform for the seafood industry. Building on this success, Seafood Expo Bharat 2026 returns with greater scale, wider international participation, expanded exhibition space, and enhanced business opportunities, further strengthening India's position as a global seafood powerhouse.

As the industry gathers once again at the Chennai Trade Centre from 1–3 July 2026, SEB 2026 promises to create new opportunities for trade, technology exchange, sustainability, and investment, charting a stronger future for Indian seafood on the global stage.




MPEDA
SEAFOOD EXPO BHARAT 2025
WELCOME TO SEAFOOD EXPO BHARAT 2025
nexgen
INDIA'S LARGEST SEAFOOD EXPO


04


12






MPEDA




SEAFOOD EXPO 16
INDIA'S LARGEST SEAFOOD





ARNAV FISH INTERNATIONAL

Arnav group of companies is led by Mr.Manoj Kumar Sonkar,Managing Director/ Proprietor of this flourishing business With 25 years of expertise in the fish and fisheries products, he had a humble start in 2009 when he founded Arnav Fish international and took it to the heights where today it stands due to his keen interest and vast knowledge in this business.

Located in the hub of aquaculture and Sea Corridor,i.e.; Andhra Pradesh, the company is engaged in processing and export of chilled fish to Domestic as well as International markets.

The Factory is approved by the Marine Products Export Development Authority of India and Export- Inspection Agency to International standards in terms of all working areas such as Labs, daily production maintaining quality etc.





ROHU FISH



CATLA FISH



TILAPIA FISH



ROOPCHAND



PANGASIUS

Corporate office Address :
#5-204,Ramalayam Street
Narayanapuram-534406
Unguturu(M)-534411
WestGodavari dist,Andhrapradesh,india

Company Address :
#2-32/1,singarajupalemroad
unguturu-534411,unguturu(M)
WestGodavari dist,Andhrapradesh,india.
,

Ph: +91 9848855699
+91 8106129908

email: arnavinternational@gmail.com

Website : www.arnavfishinternational.com

SMLH



Sri Mahalakshmi Hatcheries

Sai Balaji Hatcheries

Sri Varaha Mahalakshmi Hatcheries Pvt. Ltd.,

Rooted in Farmer Confidence.
Driven by Enduring Partnerships.

We sincerely thank our respected farmers for their continued faith and support throughout our journey of more than 30 Years.

Your trust has inspired us to consistently deliver excellence and stand beside you at every step. Our commitment remains unwavering in producting High-Quality.

L VANNAMEI post larvae and providing dependable support to the farming community with honesty, dedication, and care.

Advancing Together for a Better Tomorrow

Mangamaripeta Village, Bheemili Beach Road,
Visakhapatnam - 531 163

Cell : 9849622666



Ahmed Foods is a leading processor and exporter of premium frozen fish and seafood from India, recognized globally for quality, consistency, and reliability. Backed by more than 25 years of combined industry expertise, we have built a strong reputation in international seafood markets through our commitment to excellence and customer satisfaction. Established in 2011, Ahmed Foods has rapidly grown into a trusted global name in seafood processing and exports. We source raw material directly from vessel owners, ensuring strict quality control from catch collection to final processing at our modern facility.Our processing unit is certified by MPEDA / EIA and operates under internationally recognized food safety and quality systems including ISO 9001, ISO 22000, and HACCP. We are also inspected and certified by renowned agencies such as BIVAC, SGS, and COTECNA.

At Ahmed Foods, we believe in sustainable growth and responsible processing. Along with utilizing skilled human resources and natural resources efficiently, we strictly follow environmental policies and industry standards to maintain an eco-friendly and hygienic processing environment.

Ahmed Foods — Delivering Quality Seafood Worldwide.

Raju Malek
FOUNDER

Ismail Mansuri
FOUNDER

Ahmed Foods

Frozen Seafood Processor And Exporter

www.ahmedfoods.in

info@ahmedfoods.in ahmedfoods.in@gmail.com

Plot 1109/1110, G.I.D.C. Estate Veraval - 362269, Gujarat India.
+ 91 9904986063 Ismail Mansuri / + 91 9925221249 Raju Malek

Understanding Green value chains: Building a sustainable future for the fisheries sector

Devasena R., *School of Sustainable Studies, Xavier Institute of Management, Harirajpur, Puri, Odisha*
Dr. Ram Mohan M.K.*, *The Marine Products Export Development Authority, Kochi, Keralam*

Introduction

The growing concerns over climate change, environmental degradation, resource depletion, and biodiversity loss have prompted nations to adopt more sustainable models of economic growth. Green value chains have emerged as an effective approach by integrating environmental considerations throughout a product's life cycle, from raw material procurement to production, distribution, consumption, and disposal. These chains promote resource efficiency, waste minimisation, renewable energy use, and ethical sourcing, thereby supporting sustainable development while enhancing economic competitiveness. The fisheries and aquaculture sectors are particularly important in this context, as they provide vital nutrition and livelihoods for millions worldwide.

India, with approximately 8% of global fisheries production and 3.9% of seafood exports, has become a major player in this sector. However, this rapid growth also raises concerns regarding resource overexploitation, waste generation, carbon emissions, and long-term environmental sustainability. Responsible consumption and production, as outlined in the United Nations Sustainable Development Goal 12 (SDG 12), offer a pathway toward addressing these challenges. By embracing "green value chains", the fisheries sector can contribute to environmental conservation while ensuring long-term economic resilience and social well-being. This article aims to bring an outline on the steps that leads to make the value chain greener.

The concept of Green value chains

A value chain encompasses all activities involved in bringing a product from its initial conception to its final use. Traditionally, value chains have focused primarily on maximising efficiency and profitability. However, growing awareness of environmental challenges has led to the evolution of green value chains, which incorporate sustainability principles throughout the entire chain.

A green value chain recognises that businesses operate within and depend upon natural ecosystems. Consequently, every participant within the chain—including producers, suppliers, manufacturers, transporters, distributors, retailers, and consumers—shares responsibility for minimising environmental impacts.

The objectives of green value chains include reducing greenhouse gas emissions, improving energy efficiency, conserving natural resources, minimising waste generation, and promoting environmentally sound technologies. Equally important is the pursuit of social equity through fair labour practices, community engagement, and support for vulnerable populations.

The concept aligns closely with the Triple Bottom Line framework, which emphasises three interconnected dimensions of sustainability:

**Corresponding author email: director@mpeda.gov.in*

➤ **People** – ensuring social well-being, equity, and improved livelihoods.
➤ **Planet** – protecting ecosystems and reducing environmental degradation.
➤ **Profit** – maintaining economic viability and long-term business success.

By integrating these dimensions, green value chains seek to decouple economic growth from environmental harm.

India's fisheries sector: Opportunities and responsibilities

The fisheries sector in India contributes significantly to food security, employment generation, export earnings, and rural development. The expansion of aquaculture, particularly shrimp farming, has accelerated the country's emergence as a major seafood exporter. However, adoption of unsustainable practices and climate-related threats endanger aquatic ecosystems. Adopting green value chains can promote environmentally responsible fisheries while ensuring long-term economic and ecological sustainability.

Aligning fisheries with Sustainable Development Goal 12

Sustainable Development Goal 12 focuses on ensuring responsible consumption and production patterns. The goal recognises that economic progress cannot continue indefinitely under resource-intensive and wasteful production systems. Several objectives of SDG 12 are directly relevant to fisheries and aquaculture:

A. Reducing material footprints: Improving resource efficiency reduces the amount of energy, water, and raw materials required throughout production processes. Efficient



Cast net fishing in Chilika lake, Odisha



Demonstration of Turtle Excluder Devices (TED) by MPEDA -NETFISH



Sneakers made out of Salmon skin (product from Norway)

technologies and sustainable sourcing practices help lower environmental impacts.

B. Minimising loss and waste: Large quantities of seafood are lost during harvesting, processing, storage, and distribution. Improved cold chains, processing technologies, and consumer awareness initiatives can significantly reduce waste.

C. Environmentally sound waste management: The fisheries sector generates substantial quantities of organic waste and wastewater. Proper treatment and recycling systems prevent pollution while creating opportunities for value addition.

D. Promoting circular economy principles: Traditional linear economic models follow a "take-make-dispose" approach. In contrast, circular models prioritise reducing resource use, reusing materials, and recycling waste into valuable products.

These principles provide the foundation for integrating sustainability into fisheries value chains.

Responsible sourcing and resource sustainability

Resource sustainability and responsible sourcing are quite important in making the value chain greener. Regulations that support resource sustainability, and the associated ecosystem, including the closed seasons, catch quotas, gear regulations, protection of vulnerable species etc. support the segment with long term benefits. Habitat protection and coastal economy empowerment initiatives also contribute to the goals.

The fishery improvement programmes, "SHAPHARI" certification and other certifications in the aquaculture value chain, compliance of fisheries to the US Marine Mammal Protection Act, and initiatives in the implementation of the Turtle Excluder Device (TED) need to be considered as steps in the right direction that go along with the concept. Climate resilience programmes in various states related to livelihood aquaculture and rural, especially women empowerment align with SGD 1 and SDG 5.

Circular economy and waste valorisation in fisheries

One of the most promising aspects of green value chains is the transformation of waste into useful products. Rather than treating by-products as liabilities, circular economy approaches recognise their economic potential.

Seafood processing operations generate considerable quantities of shells, bones, viscera, scales, and other residues. These materials can be utilised to produce a variety of value-added products, including Chitin and chitosan for pharmaceutical and biomedical applications,



Seaweed farming

biofertilizers from fish waste and seaweed, animal feed ingredients, bioplastics, coatings and packaging materials, Nutraceuticals and dietary supplements etc. Fish skin is also used now widely to make products like bags, wallets, footwears etc. Few Indian entrepreneurs have been making wallets and small bags using Tilapia skin.

Marine plastic waste also presents opportunities for innovation. Discarded fishing nets and recovered plastics can be recycled into new products, reducing pollution while supporting resource efficiency. By embracing waste valorisation strategies, businesses can reduce disposal costs, generate additional revenue streams, and contribute to environmental conservation.



Solar powered auto feeder

Sustainable aquaculture practices

Aquaculture has become one of the fastest-growing food production sectors globally. However, sustainability considerations must guide its continued expansion.

➤ **Integrated farming systems:** Integrated aqua-agricultural systems combine fish farming with crop cultivation. Examples include rice-fish farming and other integrated systems, which enhance nutrient recycling and reduce dependence on synthetic inputs. However, such systems shall also ensure the safety of the food produced by using proper inputs and post-harvest handling.

Many of the aquaculture seed production systems use wild broodstock. Use of domesticated broodstock reduces dependence on wild stock, supporting the resource replenishment in the wild population. There are success stories to highlight





Use of solar panels atop building and on the roof of a fishing boat

such as Salmon, trout, Tilapia and shrimps like vannamei and Black Tiger.

➤ **Seaweed cultivation:** Seaweed farming represents an environmentally beneficial activity that contributes to carbon sequestration besides ensuring alternate livelihood for the coastal folk. Seaweeds absorb carbon dioxide during growth and require neither freshwater nor chemical fertilizers. Studies indicate that farmed *Kappaphycus alvarezii* can fix roughly 1.1–1.2 kg CO_2 per kg of dry biomass produced over a typical cultivation cycle.

➤ **Sustainable feed alternatives:** Traditional aquaculture feeds often rely heavily on fishmeal derived from wild fisheries. Alternative protein sources, including plant proteins, insect meals, algae, and microbial proteins, reduce pressure on marine ecosystems. Entrepreneurship in India is slowly catching up to augment the production of such alternate protein and nutrient sources.

➤ **Cage culture systems:** Cage farming utilises natural water bodies while minimising land requirements. The energy requirement on water exchange is saved and facilitate better utilisation of aquatic realms besides improved production efficiency.

➤ **Renewable energy adoption:** Solar-powered pumps, aerators, automatic feeders and monitoring systems reduce dependence on fossil fuels and lower operational emissions, and associated costs. AI integration into these components aids the smart aquaculture management minimising human interference, thereby improving biosecurity.

Collectively, these approaches strengthen the environmental performance of aquaculture while supporting productivity and profitability.

Green technologies in seafood processing and transportation

Technological innovation plays a vital role in advancing sustainable value chains in the seafood processing and marketing.

➤ **Energy-efficient refrigeration:** The adoption of carbon dioxide-based refrigeration systems than ammonia can improve energy efficiency while reducing environmental impacts associated with conventional refrigerants.

➤ **Advanced wastewater treatment:** Modern effluent treatment technologies enable reuse of 90% of the treated effluent and can be set up in a limited space, aiding recycling and space constraints.

➤ **Renewable energy systems:** Renewable energy installations provide long-term economic and environmental benefits by lowering electricity costs and reducing greenhouse gas emissions. Other alternate renewable energy

resources may also be tapped to reduce the dependence on fossil fuels. The heat removed while chilling or freezing shall be used for heating purpose elsewhere, rather than allowing it to get dissipated to the environment.

Green shipping and ports: Transportation contributes substantially to the seafood sector's carbon footprint. Sustainable port initiatives, renewable energy integration, and alternative fuels such as green hydrogen can support decarbonisation efforts.

Ports like V.O. Chidambaranar Port in Tuticorin, Tamil Nadu has brought in quite a number of initiatives to implement the "Green Port" guidelines. Cochin International Airport and the new Mangalore Port has achieved 100% solar power integration. The 'Harit Sagar' guidelines (2023) covering port decarbonisation by the Ministry of Ports maintains that all Ports shall achieve more than 20 percent reduction in energy consumption / ton of cargo by 2030. The guidelines propose a carbon credit scheme to reward ports meeting greenhouse gas (GHG) intensity targets (30% by 2030 and 70% by 2047). India's National Green Hydrogen Mission also stimulates green hydrogen hubs near industrial and port clusters.

Responsible consumption and consumer participation

Consumers play an increasingly influential role in shaping production practices through their purchasing decisions. Growing awareness regarding environmental and social issues has led many consumers to seek seafood products that are sustainably sourced and ethically produced. Certification programmes and eco-labels provide important information regarding production standards and traceability.

Responsible consumption practices also include supporting local and seasonal fisheries, reducing household food waste, verifying product labelling and origin and encouraging businesses committed to sustainability. Consumer advocacy creates market incentives that encourage producers and retailers to adopt greener practices.

Challenges to implementing Green value chains

➤ Despite their advantages, green value chains face several implementation challenges. The high initial costs associated with renewable energy systems, advanced treatment technologies, and automated equipment can discourage investment. Smaller enterprises often encounter difficulties accessing financial resources and technical expertise.

➤ Resistance to organisational change represents another obstacle. Businesses may hesitate to replace existing systems due to concerns about operational disruptions or uncertain economic returns. Most of the times, the premium price paid by an end user does not percolate to the producer level, discouraging him to lose interest in sustaining.

➤ Awareness gaps among producers, processors, and consumers can further limit adoption rates. In many cases, stakeholders may underestimate the long-term benefits associated with sustainability investments.

➤ Policy inconsistencies, inadequate infrastructure, and limited access to training programmes also hinder progress.

Addressing these barriers requires coordinated action involving governments, industries, academic institutions, financial organisations, and civil society.

Strategies for advancing Green value chains

Handholding by the Government, policy makers and the public is very critical in carrying forward to enhance the Green value chains. Governments may continue to support investments in research and development for innovation to facilitate the emergence of cost-effective green technologies. Support for startups engaged in waste-to-wealth

innovations can stimulate entrepreneurship and generate employment opportunities.

Capacity-building initiatives are equally important. Training programmes can enhance awareness regarding sustainable practices and equip stakeholders with the skills needed to implement them effectively. Collaboration across sectors should be strengthened to promote knowledge sharing and partnerships.

Finally, integrating sustainability considerations into educational curricula and public awareness campaigns can foster a culture of responsible consumption and environmental stewardship.

Conclusion

Green value chains represent a transformative approach to achieving sustainability within the fisheries sector. By integrating environmental considerations throughout production and consumption systems, they provide opportunities to reduce ecological impacts while enhancing economic performance and social well-being.

India's prominence in fisheries production and trade places it in a unique position to demonstrate how sustainability and economic growth can coexist. Protecting marine ecosystems, improving livelihoods, ensuring food security, and combating climate change require collective action from governments, businesses, communities, and consumers. Through circular economy initiatives, renewable energy adoption, technological innovation, responsible aquaculture practices, and informed consumer choices, the country can strengthen the resilience and competitiveness of its seafood industry.

The transition toward green value chains is not without challenges. Nevertheless, the long-term benefits far outweigh the initial costs. The future of the blue economy depends upon our willingness to embrace responsibility, innovation, and sustainability. By doing so, we can ensure that fisheries continue to nourish both people and the planet for generations to come.

"The future is circular. The horizon is blue. The responsibility is ours."

References

1. *Asche, F., Bellemare, M. F., Roheim, C., Smith, M. D., & Tveterås, S. (2015). Fair enough? Food security and the international trade of seafood. World Development, 67, 151–160.*
2. *Bush, S. R., Belton, B., Hall, D., Vandergeest, P., Murray, F. J., Ponte, S., et al. (2013). Certify sustainable aquaculture? Science, 341(6150), 1067–1068.*
3. *Food and Agriculture Organization (FAO). (2024). The State of World Fisheries and Aquaculture 2024: Blue Transformation in Action. Rome: FAO.*
4. *Harit Sagar: Green Port Guidelines (2023). Ministry of Ports, Shipping and Waterways, Government of India, New Delhi.*
5. *Marine Products Export Development Authority (MPEDA). (2025). Annual Report 2024–2025. Kochi: MPEDA, Ministry of Commerce and Industry, Government of India.*
6. *Marine Products Export Development Authority (MPEDA). (2025). Press release on export of marine products 2025–2026. Kochi: MPEDA, Ministry of Commerce and Industry, Government of India.*
7. *National Green Hydrogen Mission (2023). Ministry of New and Renewable Energy, Government of India, New Delhi.*
8. *Ram Mohan, M. K. (2026). Understanding Green Value Chains – Responsible Consumption & Production. Presentation delivered in the two-day workshop on "Leveraging Blue and Green Economy for a Resilient Future", Bhubaneswar on 29th January, 2026.*
9. *United Nations. (2015). Transforming Our World: The 2030 Agenda for Sustainable Development. New York: United Nations.*
10. *United Nations Environment Programme (UNEP). (2021). Towards a Circular Economy: Sustainable Consumption and Production in Practice. Nairobi.*



Marine Stewardship Council

SUSTAINABLE FISHING WITH THE MARINE STEWARDSHIP COUNCIL

The MSC is widely recognized for setting the world's most credible standards for sustainable fishing and seafood.

The **Marine Stewardship Council (MSC)** is a global nonprofit organization established to protect the last major food resource that is truly wild: seafood. The MSC works with fisheries, supermarkets, restaurants, and other supply chain companies to change the way the oceans are fished, address food fraud, and make it simple for consumers to purchase sustainable, traceable, wild seafood.

The **MSC Fisheries Standard** was developed and continues to be updated in collaboration with scientists, academics, and other international stakeholders. The program is voluntary and open to all wild-capture fisheries.

As agents of change, MSC certified sustainable fisheries are contributing to the long term health of the world's oceans. These fisheries ensure that fish are caught in a way that allows fish populations and the ecosystems on which they depend to remain healthy and productive.

Only seafood from fisheries that meet the MSC's strict standard for environmental sustainability can be sold with the blue **MSC ecolabel.** To ensure that MSC labeled seafood can be traced back to a certified sustainable fishery, MSC also sets a standard for **Chain of Custody (CoC)**.



msc.org | info@msc.org

Choose MSC to:

1. Support fishermen and local livelihoods
2. Promote assurance in the seafood supply chain
3. Combat food fraud, mislabelling and greenwashing
4. Ensure an ocean teeming with life so that future generations can enjoy seafood

MSC is also helping more fisheries move towards sustainability through our Improvement Program, Ocean Stewardship Fund and improvement tools.

Numerous fisheries in Kerala, Karnataka, Goa, Tamil Nadu and Orissa are on their journey towards MSC certification, including deep-sea shrimp, squid and octopus, blue swimming and mud crabs, lake clams, threadfin bream and others.

In 2014 the Ashtamudi Lake clam fishery became the first fishery in India to achieve MSC certification (withdrawn 2019). Thanks to renewed market demand, the fishery aims to re-enter the MSC program by 2027.

MSC Global Headquarters
Marine House, 1 Snow Hill, London, EC1A 2DH

MSC India Office
6th Floor, 'Ruby Plaza', TC 15/54(8),
Vellayambalam–Sasthamangalam Road,
Thiruvananthapuram, 695010, Kerala State, India

Contact: Dr Ranjit Suseelan: Head of MSC India
ranjit.suseelan@msc.org | +91 9846268609

M/s. Progress Frozen & Fish Sterilization

Merchant tie up with Mukka Proteins Limited

MPL Mukka PROTEINS LIMITED

Best Quality Fishmeal

Our Mission

- To Produce 100% Pure Fish Meal
- For Animal and Aquaculture
- Feed With The Finest Quality
- Processed Under The Most Hygienic Condition.

Address

Rev Survey No. 15/3, Jawar Naka,
Porbandar 360575, Gujarat

Contact us: +91 9825321475

FRESH CAUGHT

COMMITED TO FRESHNESS AND QUALITY

JOECONS
Marine Exports Pvt. Ltd.



SQUID
Loligo duvaucelii



CUTTLE FISH
Sepia pharaonis



INDIAN MACKEREL
Rastrelliger kanagurta



HORSE MACKEREL
Trachurus trachurus



VANNAMEI SHRIMP
Penaeus vannamei



BLACK TIGER SHRIMP
Penaeus monodon



MAHI MAHI
Coryphaena hippurus



RIBBON FISH
Lepturacanthus savala

A TRADITION OF QUALITY

Fresh from the ocean and processed to international standards, Joecons Marine Exports delivers premium seafood renowned for its quality, consistency, and freshness. Trusted by partners worldwide, we bring the best of the sea to global markets.

CERTIFICATION

BRCGS FSSC 22000 HACCP CE

CONNECT WITH US

MOBILE- +91 93073 04141 | +91 9930990980
EMAIL- GM@JOECONSMARINE.COM
INFO@JOECONSMARINE.COM
ADDRESS- PLOT NO. L-4 AND M-23, CUNCOLIM INDUSTRIAL ESTATE, CUNCOLIM, SALCETE-GOA 403 703

GLOBAL PRESENCE

Supplying premium seafood across global markets

THAILAND | MALAYSIA | INDONESIA
VIETNAM | KUWAIT | SPAIN | ITALY | JAPAN
OMAN | NETHERLANDS | UAE | UK | PORTUGAL
FRANCE | USA | GREECE | AFRICA

Mud crab farming in Andhra Pradesh: Present status and growth potential

Dr. P. Ram Mohan Rao, M.Sc., M.Phil., PhD*.
Dy. Director of Fisheries (Rtd)
Kakinada- Andhra Pradesh
98851-44557

Introduction

Mud crabs, especially the giant green mud crab (*Scylla serrata*), are rapidly emerging as one of the most profitable and resilient aquaculture enterprises in coastal India, particularly in Andhra Pradesh. With increasing domestic demand, premium export value, and the unique ability to withstand live transport, mud crabs offer farmers a lucrative, low-risk alternative to conventional shrimp culture.

Two farming models dominate the industry: the grow-out system, where juvenile crabs are reared for 3–5 months to market size, and the highly popular crab fattening system, which converts low-value soft-shell "water crabs" into premium hard-shell crabs within just 15–45 days, delivering quick returns on investment. Modern technologies such as Recirculating Aquaculture Systems (RAS), one-crab-one-box culture and vertical rack farming are further revolutionising production by preventing cannibalism, improving survival and maximising output from limited space.

Success in mud crab farming depends on maintaining excellent water quality and following precise feeding practices. Farmers should maintain dissolved oxygen above 5 mg/L, pH between 7.5 and 8.5, salinity between 15 and 25 ppt, and temperatures between 28°C and 33°C. As nocturnal predators, mud crabs feed most actively at night and require daily feeding at 5–10% of body weight using trash fish, molluscs, or formulated pellets. Feeding trays help monitor consumption and minimise waste. As demand continues to rise, the future of the industry lies in replacing dependence on wild seed with reliable hatchery-produced juveniles, ensuring a sustainable, biosecure and scalable supply chain.

Challenges

Despite its strong potential, mud crab farming faces several challenges. A major constraint is the dependence on wild seed, which reiterates the need for the establishment of mud crab hatcheries in the country.

Disease outbreaks like that by Mud Crab Reo-Virus (MCRV) affects some farming areas. Symptoms include weakness, poor feeding, discolouration, slow movement, and organ damage. Strong biosecurity, hatchery certification, disease surveillance, quarantine systems and compartment-based farming methods are necessary to reduce disease occurrence.

Cannibalism, especially during moulting, is a common biological problem in mud crab farming, and causes direct mortality and financial loss. Cannibalism can be prevented by providing shelters, grading by size, adequate feeding and individual box culture.

Feed sustainability is another concern. Dependence on trash fish increases pressure on

*Corresponding author email: rammohanraokkd@gmail.com

marine resources and may pollute pond water. Future growth of the industry requires affordable formulated feeds based on fishery by-products, plant proteins, insect meal, or other sustainable ingredients.

Marketing and trade also present challenges. Farmers often depend on middlemen who control prices. Live transport mortality, poor handling systems, high freight costs, seasonal price fluctuations and limited cold chain facilities reduce profitability.

Climate changes, viz., cyclones, floods, salinity changes, heat stress, and rising temperatures, can seriously affect crab health, production, and farmers' livelihoods.

Export opportunities

Mud crabs have excellent export potential due to their high market value, superior meat quality and ability to be transported alive. Demand is strongest in China, Hong Kong, Singapore, Japan, Malaysia and Thailand, where live hard-shell crabs fetch premium prices. Farmers can earn attractive returns through both grow-out and fattening systems, especially by producing large, healthy crabs for export markets. With expanding hatchery seed production, improved live transport systems and modern farming technologies, mud crab culture is emerging as a promising export-oriented aquaculture enterprise for coastal states such as Andhra Pradesh.

Andhra Pradesh – Future hub of mud crab farming

Among all Indian states, Andhra Pradesh has exceptional potential for commercial mud crab farming. The state is already India's leader in aquaculture, especially shrimp farming and possesses vast brackish water resources, hatcheries, feed mills, processing plants, export networks, cold storages and experienced farmers. This strong aquaculture sector provides an ideal platform for the rapid expansion of mud crab farming. In Andhra Pradesh, the major mud crab farming areas are located in the East Godavari, West Godavari, Krishna, Guntur districts.

At present, the area under mud crab culture in Andhra Pradesh is estimated at around 2,000 hectares, mostly under small-scale farming, seasonal fattening, and integrated systems with shrimp ponds. Estimated annual production from mud crab farming and fattening (excluding capture fisheries) is around 2,000 tonnes.

A major advantage for Andhra Pradesh is the availability of thousands of idle, seasonal or low-performing shrimp ponds that can be converted into profitable mud crab fattening, grow-out farming systems. This allows farmers to diversify income, reduce dependence on shrimp alone and utilise existing pond infrastructure with minor modifications. Mud crabs fetch premium prices ranging from Rs. 400 to Rs. 1,200 per kg depending on size, season and demand. India's mud crab export trade is estimated at around Rs. 850 crore, showing strong domestic and international demand.

Konaseema district in Andhra Pradesh has special potential because of its canals, creeks, estuaries, mangrove-linked ecosystems and underutilised ponds. Katrenikona Mandal already has fishermen families engaged in crab farming and fattening in near-shore sandy ponds that receive tidal seawater naturally. However, constraints such as poor seed supply, closure of sea mouths, lack of electricity and dependence on diesel pumps, weak feed technology and poorly organised marketing need to be addressed.

The future growth of mud crab farming in Andhra Pradesh can be accelerated through hatchery development, quality seed supply, farmer training, low-cost feed development, one-crab-one-box systems, cage culture, soft-shell crab farming, RAS technology, improved live transport systems, value-added processing, export branding, and SHG-based enterprises.

Mud crab farming cluster

Andhra Pradesh has developed a cluster-based mud crab farming/fattening model that integrates production, fattening, and export

activities. The Godavari Delta (Konaseema and Kakinada) serves as the main grow-out farming region, where hatchery-produced crablets are reared to premium market sizes. The Krishna to Bapatla region specialises in short-duration crab fattening, converting low-value soft-shell crabs into high-value marketable crabs within a few weeks. Nellore and Visakhapatnam function as key logistics and export hubs, providing grading, packing, live transport and export facilities for international markets. Together, these clusters establish an integrated value chain from seed production to export, positioning Andhra Pradesh as a premier hub for sustainable mud crab farming and live crab exports.

The Government of India is promoting a cluster-based development approach by identifying suitable regions for specific aquaculture activities, and mud crab farming deserves special priority under this strategy. In this regard, Dr. B.R. Ambedkar Konaseema District of Andhra Pradesh is highly suitable for development as a dedicated Mud Crab Farming Cluster because of its rich brackish water resources, mangrove ecosystems, tidal canals, estuaries, underutilised ponds, and favourable coastal climate. With support from the Government of India through MPEDA, NFDB, and the PMMSY framework, the cluster can promote the scientific farming of mud crabs (*Scylla spp.*) as a high-value, sustainable aquaculture enterprise. This model can provide an alternative livelihood for fishermen, small farmers, rural youth and SHG women, while reducing overdependence on shrimp farming. Key interventions include establishing hatcheries and nurseries for quality seed supply, training farmers in best management practices, adopting the aforementioned advanced technologies and infrastructure development. These initiatives can create rural employment, enhance farmer incomes, empower women, promote sustainable aquaculture and boost exports of premium mud crab products. Given its immense potential, there is an urgent need to declare Dr. B.R. Ambedkar Konaseema District as a dedicated Crab Export Hub.



Box farming of mud crab

Advantages of cluster-based mud crab farming

The cluster-based approach enhances the efficiency, profitability, and sustainability of mud crab farming in Andhra Pradesh by promoting integrated production, technology adoption and market linkages. The main advantages are:

- Better prices and market access through direct linkages with exporters and premium markets.
- Efficient value chain integration connecting hatcheries, nurseries, farms, fattening units and exporters. This will strengthen Andhra Pradesh's position in the international live mud crab trade.
- Cluster-based development facilitates the rapid dissemination and adoption of innovations such as recirculating aquaculture systems (RAS), soft-shell crab production, biosecure nursery management and other improved farming practices.
- Lower production costs through shared infrastructure, inputs and services.
- Enhanced export competitiveness through quality assurance, traceability, and consistent supply.

Conclusion

Mud crab farming can become a profitable and sustainable sector of the blue economy in Andhra Pradesh. Many shrimp farms in coastal areas are abandoned due to recurring diseases and converting them back to farmland is difficult. Using these ponds for mud crab farming is a practical solution. Mud crab culture can generate



Mud crab - scylla serrata



Crab farmers holding crabs



Harvested crabs

employment, exports, income and coastal development. Challenges such as disease, seed dependence, cannibalism, and marketing gaps can be addressed through technological and policy support. With its long coastline, estuaries, skilled farmers and seafood sector, Andhra Pradesh is well placed to lead this growth. Developing Konaseema as a Mud Crab Farming Cluster can make it a model hub for sustainable aquaculture, rural livelihoods, and export-led growth in the blue economy. The time is ripe now.

References

1. *Elina Apine, Prashanth Ramappa, Ramachandra Bhatta, Lucy M. Turner, Lynda D. Rodwell,2023. Challenges and opportunities in achieving sustainable mud crab aquaculture in tropical coastal regions, Ocean & Coastal Management, Volume 242,2023,106711, ISSN 0964-5691,https://doi.org/10.1016/j.ocecoaman.2023.106711. (https://www.sciencedirect.com/science/article/pii/S0964569123002363)*
2. *Lalramchhani Christina, Balasubramanian, C. P., Shyne Anand P.S., Ghoshal, T. K., Prem Kumar and Vijayan, K. K 2019. Mud crab farming: An alternative livelihood in the Indian Sundarban Volume 23 No. 3, July-September 2019 29*
3. *Murak, Waiho, K., Fazhan, H. et al.2026. Emerging challenges and sustainability pathways in global aquaculture of mud crab (genus Scylla). Aquacult Int 34, 105 (2026). https://doi.org/10.1007/s10499-026-02506-1*
4. *Nivas, Naveen S, Dinesh Kaippilly, Gopalakrishnan, Ayyaru, Sravani Savva, Anisha Shafni John, Saranya Dayalane, Keerthika Ganesan and Geeji MT, 2024. India's Mud Crab Industry: Challenges and Strategic Solutions. DECEMBER 2024, WORLD AQUACULTURE WWW.WAS.ORG 46-48*
5. *Russo, G. L., Langellotti, A. L., Torrieri, E., & Masi, P, 2024. Emerging technologies in seafood processing: An overview of innovations reshaping the aquatic food industry. Comprehensive Reviews in Food Science and Food Safety, 23, e13281. https://doi.org/10.1111/1541-4337.13281.*



SUN GROUP OF COMPANIES







SUN EXPORTS

PROCESSOR & EXPORTER OF SEAFOOD PRODUCTS
IF/BLOCKS/BLAST

EU APPROVAL NO. 1156

Plot No. 1313, G.I.D.C., Veraval - 362269. Gujarat (INDIA)
Email : sunexports1313@gamil.com

SUN MARINE EXPORTS

PROCESSOR & EXPORTER OF SEAFOOD PRODUCTS
BLANCHED/COOKED/IQF/BLOCKS/BLAST/ AQUACULTURE SHRIMPS ETC.

EU APPROVAL NO. 1290

Plot No. 1312, G.I.D.C., Veraval - 362269. Gujarat (INDIA)
Email : sunexports1313@gamil.com

SUN INTERNATIONAL

PROCESSOR & EXPORTER OF SEAFOOD PRODUCTS
BLANCHED/IQF/BLOCKS/BLAST/ AQUACULTURE SHRIMPS ETC.

EU APPROVAL NO. 2607

Plot No. 1403, G.I.D.C., Veraval - 362269. Gujarat (INDIA)
Email : sunexports1313@gamil.com

Sajid Patni +91 9227531803
Zahir Patni +91 9825195909
Huzzaifa Patni +91 8980786708
Ejaz Patni +91 9909145379

WINTER EXPORTS

Frozen Seafood · Bhimavaram, India

MPEDA REGISTERED EXPORTER

Marine Products Export Development Authority · **Govt. of India**

PREMIUM WHITELEG SHRIMP

Frozen *Vannamei* Shrimp, Export Grade

Farm-fresh **Penaeus vannamei** sourced from the brackish waters of coastal Andhra Pradesh, processed and individually quick-frozen to lock in freshness — delivered worldwide to the highest food-safety standards.



1000 T	100%	03	IQF
ANNUAL CAPACITY / YEAR	VANNAMEI WHITELEG	EXPORT REGIONS SERVED	& BLOCK FROZEN LINES

01 PRODUCT RANGE

HOSO	**Head-On, Shell-On**	Whole shrimp with head and shell intact — premium presentation grade.
HLSO	**Headless, Shell-On**	Head removed, shell retained — versatile foodservice favourite.
PD	**Peeled & Deveined · Tail-On / Tail-Off**	Fully peeled and deveined, ready-to-cook convenience format.
PUD	**Peeled, Undeveined**	Peeled with vein retained — ideal for value processing.
BLOCK / IQF	**Block Frozen & Individually Quick Frozen**	Both freezing methods available across all cuts and counts.

AVAILABLE COUNT SIZES (PER LB)

U/15 · 11/15 · 16/20 · 21/25 · 26/30 · 31/40 · 41/50 · 51/60 · 61/70 · 71/90 · 91/110 · 110/130

02 EXPORT MARKETS

- **VN** — **Vietnam** — Bulk & reprocessing trade
- **CN** — **China** — Retail & foodservice
- **ME** — **Middle East** — GCC distribution & HORECA

- **Traceable Sourcing** — Direct from registered coastal farms.
- **Cold-Chain Integrity** — –18°C maintained, farm to port.
- **Custom Glazing & Packing** — Buyer-specific specs & labels.
- **Reliable Volumes** — Consistent year-round supply.

03 OUR PRODUCT



CONTACT

Sajil V Saji +91 90303 23666

Sajeev Kumar +91 90303 28666

TRADE ENQUIRIES

Whiteleg Vannamei · Frozen

Worldwide shipping & documentation

WINTER EXPORTS

Bhimavaram, West Godavari

Andhra Pradesh, India

Sustainable seafood certification scenario in India

Dr. Mangesh M. Shirdhankar*, *Retired Professor & Head*
Dr. Vineetha Aravind, *MSC Certified Auditor*
Mr. Mangesh Gawde, *MPEDA*
Mr. Atul Sathe, *MPEDA*

India's seafood exports reached to the tune of ₹72,325.82 crore in the financial year 2025–26. India has set a target of exporting seafood worth ₹1,00,000 crore by the year 2030. At the same time, there is a growing demand from the export market for sustainable seafood. This puts India, an exporting country, in a position to go for sustainability certifications. India obtained Marine Stewardship Council (MSC) certification for the Ashtamudi short-neck clam in 2014, but the certification was suspended in 2020. The Marine Stewardship Council cites a delay in the audit schedule due to unforeseen circumstances as the reason for the fishery suspension. Currently, there are no certified fisheries in India. In the past few years, Indian seafood processors have come forward and undertaken Fishery Improvement Projects (FIPs) to obtain sustainable seafood certificates for many commercially important species. Yet the process is slow to progress as challenges are many. The certification process involves three principles: sustainable fish stocks, minimal environmental impact, and effective management. Successful certification requires the involvement of different stakeholders such as fishers, Government (Central Department of Fisheries, State Department of Fisheries, Marine Product Export Development Authority, Export Inspection Council), Industry (Seafood processor, entity in chain of custody in distribution of fish catch), NGOs (Sustainable Seafood Network of India, World Wide Fund for Nature), Fishery experts and Academia (research institutes, academic institutes/universities). The decision of the Department of Fisheries, Government of India, to develop the National Framework on Traceability in Fisheries and Aquaculture in 2025 is the first step towards a sustainable seafood certification process and is widely appreciated.

Dolphin Safe

Best Aquaculture Practices

Marine Stewardship Council

Responsible Fishing Scheme

Seafood Watch

Aquaculture Stewardship Council

Fig. 1: Sustainable seafood labels

*Corresponding author email: mangeshmshirdhankar@gmail.com

The world's seafood lovers prefer their seafood to come from sustainable sources. Now, let's understand what is meant by sustainable seafood. Sustainable seafood is fish or shellfish captured from nature or cultured through farming, which ensures an uninterrupted supply of species captured or cultured in the present and future period with minimum negative impact on the environment from where it was captured or cultured, as well as supporting the communities involved in the capture or culture of the species. Understanding this, the next question is how sustainability is ensured. Sustainability is ensured through ecolabelling certifications. They are formal recognitions awarded to fishing or farming and typically appear as logos or wordmarks on seafood packaging or labels. Organisations like the Marine Stewardship Council (MSC),

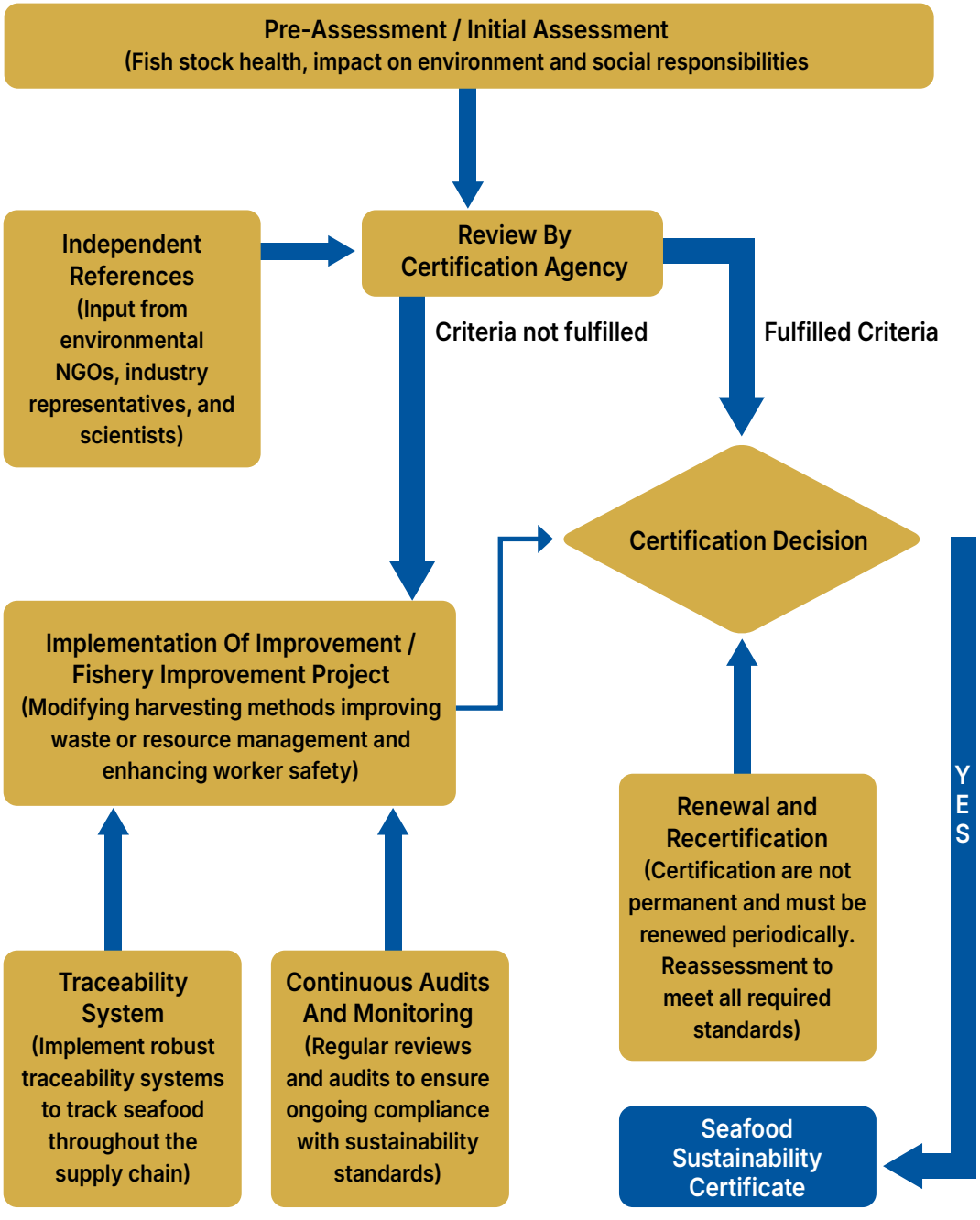


Fig. 2: Schematic diagram of the steps involved in seafood certification

Aquaculture Stewardship Council (ASC), Best Aquaculture Practices (BAP), National Oceanic and Atmospheric Administration (NOAA), SHAPHARI, and Monterey Bay's Seafood Watch Program are a few representative certificates issued to seafood for sustainability (Fig. 1).

Steps involved in the seafood certification procedure

Before acquiring a seafood sustainability certificate for any fishery or farm, the fishery or farm must follow many steps set by the government or a private certifying agency. The steps to be followed vary as per the procedures set by the certifying organisation (Fig. 2).

The sustainable seafood certification is a rigorous process that involves the following steps: Identification of the fishery, Pre-assessment, FIP Action Plan Development, FIP Launching, FIP Implementation, Improvement in Practice/Management, and Improvement in water. Pre-assessment of the fishery is followed by preparation of an action plan for the Fishery Improvement Project (FIP) and is to be uploaded on a website for third-party review and publication. For the successful completion of FIP and entry into full certification, many steps will be detailed in the FIP action plan. The fish stock status has to be assessed, and reference points for management have to be set by the research organisation. The impact of fisheries on the environment has to be measured, and ways to reduce the impact be devised. These have to be incorporated into a fishery-specific management plan (FMP) and same to be implemented, enforced and monitored on the ground by the state Department of Fisheries. Further, ReALCRaft data of the Unit of Assessment (UoA) from the State Department of Fisheries is required for traceability. In addition to this, social responsibility declarations from the government, exporters and fishers are required to ensure the rights of fishers. Thus, the process of sustainable seafood certification involves many stakeholders, and they must work hand in hand.

To obtain the sustainable seafood certification tasks such as initial & continuous evaluation of stock status, preparing harvest control rules and harvest strategy for the target species, reduction of bycatch and juveniles by improving selectivity, monitoring of discards of bycatch as well as impact of fishery on Endangered, Threatened, Protected (ETP), evaluation of impact of fishery on habitats & ETP benthos and ecosystem modelling are to be completed as per the FIP action plan. The seafood processors interested in obtaining sustainable seafood certification are dependent on the research and academic institutes in the country to undertake research on these aspects as per the FIP action plan. Implementation of these projects requires huge amounts of funds on project components such as human resources (Senior Research Fellow & Young Professional), sample procurement, travel, contingencies and institutional charges.

Issues faced by seafood processors/exporters in the procurement of certification

1. Availability of ReALCRaft data to the seafood processor: The ReALCRaft data is available on the National Portal of ReALCRaft and is the domain of the Department of Fisheries. This is required for traceability. The same needs to be made available easily to seafood exporters as and when required.

2. Social Responsibility certificate: The legal issues concerning crew members working on fishing vessels are not governed by the state's Labour Law or the state Department of Fisheries. The authority responsible for issuing Social Responsibility certificates is unclear.

3. 24×7 Fisher Assistance cell: Most of the maritime state Departments of Fisheries have not established a Fisher Assistance cell on a 24×7 basis, while the availability of a 24×7 Fisher Assistance cell for fishers is a basic requirement for certification organisations.

4. Availability of regular fish stock assessments and allied information: It is required to develop

a system for continuous assessment of fish stocks of species in India's export basket, and the same needs to be made available to seafood processors at reasonable charges.

5. Availability of Fisheries Management Plan: Fisheries Management Plan of all the maritime states for major gears and species, at least in the export basket, has to be prepared by research institutes and be suggested to the respective State Fisheries Departments.

6. Independent enforcement units in all the maritime states of India for effective management: Independent enforcement cells are not available in most of the maritime states of India for effective management of fish stocks and are required to be established as early as possible.

Fishery Improvement Project in India

Short-neck clam (*Paphia malabarica*) from the Ashtamudi estuary was the only MSC-certified stock in India. At present, MSC has suspended the certificate since 15.01.2020. Other than this, none of the fisheries in India are certified by the MSC. A total of nine FIP's are published on the Fishery Progress site to procure MSC sustainable seafood certification, of which two are inactive (Table 1).

Sl. No.	FIP Name	Status
1	India threadfin bream - trawl	Inactive
2	India unicorn leatherjacket filefish - trawl	Active
3	India Palk Bay flower shrimp - trawl	Inactive
4	India Kerala shrimp and cephalopods - trawl	Active
5	India Palk Bay blue swimming crab - gillnet	Active
6	India Kerala deep-sea shrimp - trawl	Active
7	India grouper - gillnet and trawl	Active
8	PROSPECTIVE India Karnataka State Small Pelagics Purse Seine	Active
9	India Karnataka squid - trawl	Active

Table 1: List of FIPs published on the Fishery Progress site

Way forward

Worldwide, almost 229 fisheries are MSC certified, 25 are in improvement programs, 44 are in assessment, and 24 are suspended. In India, none of the fisheries is certified; seven are in the assessment process, and one is suspended. Rising environmental concerns, regulatory enforcement, and shifting consumer preferences are driving the growth of sustainable seafood. Buyers now demand traceable, certified products with transparent supply chains. The Global Sustainable Seafood Market was valued at USD 13,120.62 million in 2018, reached USD 19,581.99 million in 2024, and is projected to hit USD 33,340.50 million by 2032, expanding at a 40% Compound Annual Growth Rate (CAGR), driven by certification-led sourcing and regulatory alignment. Modern consumers demand visibility into where and how seafood is sourced. Health-conscious buyers prioritise traceable products with clear environmental and social credentials. Eco-labels like MSC, ASC and Fair Trade provide recognisable assurance. Credence market surveys show a high willingness to pay more for certified, responsibly sourced seafood. Retailers respond by stocking verified products and promoting them through digital and physical campaigns. This transparency creates accountability across the supply chain. Market education campaigns continue to shift preferences toward sustainable options. It helps bridge knowledge gaps and builds loyalty. The Global Sustainable Seafood Market is increasingly shaped by this buyer-driven dynamic. Currently, India has no certified stock. In India, the initiative for certification is taken up by the processors for the fishery stock they are interested in. It is essential that all stakeholders in this industry come together and work hand in hand to obtain sustainability certification for the Indian Fishery stocks in the export basket. The Government of India also needs to encourage by providing single-window clearance for all activities involved in the certification process for fishery stocks.

Premium Seed.
Maximum Potential.

SRI MANJUNATHA HATCHERY
SMH
ESTD 2016



AVS RAJU
Managing Director

Advancing Aquaculture Through Innovation And Quality

BRANCHES

1
ULAVAPADU
Alagayapalem Village,
Ulavapadu, Prakasham DT,
Andhra Pradesh –
523292
7997997828

2
PONDICHERRY
Pudhunadu Kuppam,
Thirupattinam Village,
Chengalpattu DT, Tamil Nadu –
603305
7997883099

3
ETHAMUKKALA
Ethamukkala Village,
Kothapatnam, Prakasham DT,
Andhra Pradesh –
523280
7997994469

SRIMANJUNATHAHATCHERIES.COM

RELIABLE | RESPONSIBLE | RESILIENT

33 YEARS OF QUALITY SERVICE

SVR HATCHERIES

SRINIDHI BIOTECHNOLOGIES

SRINIDHI MARINE TECHNOLOGIES

SHRIMP SEED PRODUCTION CENTRES

BUILT ON FARMER TRUST

STRENGTHENED BY LONG-TERM RELATIONSHIPS

Our heartfelt thanks to our valued farmers
for placing your trust in us and allowing us
the privilege to serve you for over three decades.

We remain committed to producing the finest quality
L. Vannamei post larvae while supporting our farmers
with integrity, care, and consistency.

GROWING TOGETHER. ALWAYS.

MANAGING PARTNER
P. Veera Bhadra Kumar
+91 98494 44057

Addaripeta, Tuni,
Andhra Pradesh
533401

srinidhibiotech@gmail.com
srinidhimaritech@gmail.com
vannameisvrhatcheries@gmail.com

Decent work in the aquaculture sector: Global best practices and pathways for India

Mr. Elvis Beytullayev, *Senior Agri-Food Sector Specialist,*
Ms. Alessandra Scomazzon, *JPO, Rural Economy Sectors, Labour Governance and Sectoral Policies Department, ILO Geneva and*
Ms. Sudipta Bhadra*, *Senior Programme Officer, ILO Decent Work Team for South Asia and Country for India*

Aquaculture: A sector of increasing global significance

Aquaculture accounts for more than half of all fish consumed by humans globally. In recent years, the sector has grown rapidly, with Asia leading this expansion. Eleven of the world's 15 largest aquaculture producers are located in Asia, which accounts for 92% of global production. The sector provides direct employment to more than 22 million people worldwide, most of them in Asia. As an important source of indirect jobs across the supply chain, aquaculture-related activities are estimated to sustain some 56 million livelihoods.

Despite its growing contribution to economic development, employment, food security and nutrition, the sector continues to face significant decent work deficits alongside other important social and environmental challenges. Addressing these deficits is key to strengthening the industry's efficiency, inclusiveness, resilience and sustainability, and to harnessing its full potential for decent employment creation and economic growth. As the world's second largest aquaculture producer and exporter, India is a critical arena for translating the sector's potential into a source of productive employment and decent work.

International labour standards addressing conditions of work across the seafood supply chain

The ILO's body of international labour standards – Conventions, Protocols and Recommendations – constitutes the global normative framework for decent work. These standards apply across the full seafood supply chain, from hatchery and grow-out operations to processing, packaging and export. Their effective implementation is a legal obligation for ratifying States and, in view of the emerging due diligence legislation, an essential condition for access to many international markets. It is also an essential means of ensuring the well-being of the workers on whom the sector relies.

In many developing countries, the aquaculture supply chain is characterised by the prevalence of informality; low and insecure wages and incomes; poor working conditions; and a lack of social and labour protections, including limited access to fundamental rights to organise and bargain collectively and to be free from forced labour, child labour, and discrimination. For instance, a regional survey conducted by the ILO within the framework of the EU-funded Ship to Shore Rights South-East Asia programme revealed persistent gaps in working conditions among workers in the fishing and seafood processing sectors, most of whom are migrants, in several countries across Asia. This highlighted the need to ratify and effectively implement relevant international labour standards, especially those relating to recruitment and forced labour.

Occupational safety and health: Aquaculture workers are exposed to multiple Occupational Safety and Health (OSH) hazards with short- and long-term consequences. Underdeveloped OSH management

*Corresponding author email: bhadra@ilo.org

systems and weaker regulatory frameworks, particularly in the informal economy, exacerbate the challenge. While in recent years many aquaculture-producing countries in Asia have taken important steps to establish stronger legal frameworks on OSH, important gaps remain. None has ratified the Safety and Health in Agriculture Convention, 2001 (No. 184) or the Labour Inspection (Agriculture) Convention, 1969 (No. 129), which is one of the four ILO governance (priority) Conventions; and only a few have ratified instruments related to workers' compensation. In 2022, the International Labour Conference recognised the Occupational Safety and Health Convention, 1981 (No. 155) and the Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187) as fundamental Conventions, recognising workplace safety and health as a core labour right. The inclusion of safety and health within the framework of fundamental principles and rights at work means that it is no longer merely a policy option but an essential right to which every worker is entitled.

Non-discrimination and women's empowerment: Women constitute a significant proportion of the aquaculture workforce, especially in processing, but are underrepresented in higher-skilled positions. While the development of commercial aquaculture has contributed to closing labour force participation gaps, women continue to be disproportionately engaged in labour-intensive and low-paid jobs, which are often marked by discrimination, informal employment arrangements, and limited social and labour protection. This reflects persistent barriers to equal access to skills development, career progression and higher-value employment opportunities. The Equal Remuneration Convention, 1951 (No. 100), the Discrimination (Employment and Occupation) Convention, 1958 (No. 111) and the Violence and Harassment Convention, 2019 (No. 190) establish the normative foundation for equal treatment for women and men, including the principle of equal opportunity for employment, equal pay for work of equal value, and a world of work free from violence and harassment. Discrimination perpetuates inequalities, undermines social cohesion and wastes human talent, with detrimental effects on productivity and economic growth. Targeted policies and proactive measures are therefore needed to target groups of workers who may be particularly vulnerable to discrimination based on their race, colour, sex, religion, political opinion, national extraction or social origin.

Child labour and forced labour: Of the 138 million children in child labour worldwide, 83.4 million or 61% are in the wider agricultural sector, which includes aquaculture. In informal, small-scale operations, children may be found collecting fish fry and seeds; building, cleaning, or maintaining gear or facilities; feeding and harvesting fish; applying fertilisers; processing and packaging; loading and unloading fish for transport; shovelling ice; and guarding premises. Poverty, the absence of decent work opportunities for adults and inadequate access to education are the main causes. Sociocultural norms that normalise child labour exacerbate the challenge.

Given its labour-intensive nature, aquaculture production in many developing countries relies on low-cost labour, increasing the risks of labour standards violations. Over the past years, reports have highlighted concerns regarding working conditions in shrimp farms and processing facilities across several major aquaculture-producing countries, including risks of forced labour. Sustainably addressing these issues requires effective domestication and implementation of core ILO conventions, including the Forced Labour Convention, 1930 (No. 29) and its Protocol of 2014, as well as other relevant ILO standards, and robust due diligence across supply chains.

Freedom of association, social dialogue and collective bargaining: In addition to its status as a fundamental human right, freedom of association and collective bargaining is considered as an enabling right that enables individuals to access other civil, political, economic, and social rights. Yet in aquaculture, only a small number of workers are trade union members, and casual, temporary and migrant workers frequently face barriers to organising. Limited organisation and the absence of well-functioning sectoral social dialogue

mechanisms prevent workers from influencing the decisions that affect their working and living conditions. As is the case in many other countries, union density is relatively higher among skilled workers than among their low-skilled or unskilled counterparts in India. The Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87) and the Right to Organise and Collective Bargaining Convention, 1949 (No. 98) establish the normative basis for effective social dialogue across all sectors. Importantly, India ratified the Right of Association (Agriculture) Convention, 1921 (No. 11) and the Rural Workers' Organisations Convention, 1975 (No. 141), instruments addressing the subject in the wider agricultural sector, on 11 May 1923, the very day the former entered into force, and on 18 August 1977, several months before the latter entered into force.

Informality: In many countries, the aquaculture sector is characterised by the increasing casualisation of waged labour, outsourcing and the prevalence of informal, seasonal and temporary work arrangements. Workers engaged on a long-term casual basis often have limited or no entitlement to annual leave, notice of termination, or redundancy pay, and may be legally excluded from, or practically unable to access, social protection systems. Women are disproportionately represented in these precarious roles.

Global ILO policy frameworks on aquaculture

The ILO has developed a number of policy tools to support the promotion of decent work in the aquaculture and broader agri-food sector. These provide governments, employers and workers with practical frameworks for addressing the decent work challenges across the seafood value chain.

Policy Guidelines for the Promotion of Decent Work in the Agri-food Sector, adopted in May 2023, are the first reference tool and technical guidance document on employment and labour issues in the agri-food sector, encompassing the four pillars of the Decent Work Agenda, agreed internationally through tripartite negotiations. The document provides guidance in the form of actionable recommendations for those engaged in the design and implementation of employment and labour policies and measures in the agri-food sector.

Code of Practice on Safety and Health in Aquaculture covers general provisions related to OSH in aquaculture, including the OSH-related duties, rights and responsibilities of the sectoral actors, as well as guidance on OSH management systems and organisation; reporting, recording and notification of work-related injuries and diseases; personal protective equipment; welfare; and labour protection. It also provides technical guidance on such sector-specific OSH issues as chemicals, biological hazards, noise and vibration, and the safety of aquaculture installations and equipment. Indian experts were among the government and employer groups that participated in this meeting.

Policy guidance on the elimination of child labour in fisheries and aquaculture, developed jointly by ILO and the Food and Agriculture Organisation of the United Nations in 2025, offers a framework for governments, industry, employers' and workers' organisations, communities and international partners to translate international commitments into practical measures. The document highlights the need for integrated strategies that combine prevention, protection and sustainable alternatives.

From principles to practices: The ILO experience in Asia

The ILO's work in Asia illustrates how the principles enshrined in international labour standards can be translated into concrete action through policy reform, strengthened social dialogue, improved labour inspection, supply chain due diligence and workplace interventions across the seafood supply chain.

The Philippines: from research to action on decent work in aquaculture

In the Philippines, the world's 12th-largest aquaculture producer, with a sector worth US$3.9 billion and a 260,000-strong workforce, the ILO has been supporting national constituents to build more resilient, inclusive and sustainable aquaculture

supply chains. Delivered through the Japan-funded *Resilient, Inclusive and Sustainable Supply Chains* project, this work has focused on addressing human and labour rights risks and expanding decent work and responsible business conduct across shrimp and seaweed supply chains. Research conducted under the project revealed that the sectors faced high levels of informality, limited labour inspection, absence of trade unions, and lack of mechanisms for social dialogue or remedy. The research was leveraged to drive industry engagement and action, build stakeholder capacity through practical engagement, pioneer collaborative platforms for industry improvement, foster locally led improvement efforts, and shape policy advocacy for responsible business practices and decent work. A key milestone was the establishment of the first Industry Tripartite Council for aquaculture in the country's Region XII, which adopted a Strategic Plan of Action. A series of joint interdepartmental labour inspections was augmented by capacity-building on responsible business conduct. The first National Industry Dialogue for aquaculture aimed to build joint solutions to key industry challenges and strengthen the sector's credentials as a future hub for responsible and sustainable aquaculture. Enterprise-level interventions focused on skills, access to finance and employment creation.

Thailand: Increasing awareness and building private sector capacity for labour standards compliance in seafood processing

In Thailand – one of the world's largest seafood exporters – the ILO has been working with national constituents and development partners to reduce the risk of labour exploitation and strengthen access to justice and services. Implemented since 2016, the Ship to Shore project combines policy support, capacity building, and the delivery of information and services to ensure that labour protections are effectively translated into tangible improvements in workers' lives. *The Seafood Good Labour Practices (GLP) programme,* developed through the project in collaboration with the Thai Tuna Industry Association and the Thai Frozen Foods Association, seeks to enhance employers' awareness of Thai labour law and international labour standards and equip factories with management systems to support compliance. As a voluntary programme specific to export-oriented seafood processing, it aims to improve labour standards one factory at a time. Over the past five years, 88 factory visits have been conducted annually, reaching over 77,000 migrant and Thai workers employed by member companies. Implementation has yielded measurable results. Compulsory pregnancy testing during recruitment is no longer being observed. Employment contracts and company policies are being translated into migrant workers' languages, while migrant worker participation in worker welfare committees has increased notably. Civil society organisations have been integrated as partners in factory visits, strengthening independent oversight. The next phase aims to expand coverage to upstream segments, support the industry's capacity for self-regulation, improve grievance mechanisms, and increase transparency to build buyer confidence.

Sri Lanka: Building inclusive aquaculture livelihoods in the post-conflict Northern Province

Communities in Sri Lanka's Northern Province have long faced compounding barriers to decent livelihoods, with unemployment and poverty rates remaining above the national average. Limited access to formal finance, low financial literacy, and predatory microcredit schemes have left many farming and fishing families trapped in cycles of debt. The ILO has responded through two complementary projects: *LEED+ and PAVE (Promoting Advancement of Vulnerable Persons and Enterprises),* supported by the Governments of Australia and Norway, respectively. They demonstrated how value chain approaches and public-private partnerships can build inclusive aquaculture livelihoods and promote productive employment in post-conflict settings.

Under *LEED+,* the ILO intervened to generate employment in the sea cucumber sector, where wild harvesting had almost resulted in value chain collapse. By partnering with a private company and the National Aquaculture Development Authority to shift production to hatchery-born aquaculture – establishing three nurseries and 15 model farms – the ILO transformed an unsustainable extractive

practice into a stable source of decent jobs. The number of farmers employed in the sector grew from 32 in 2018 to 1,700 in 2022, with 345 jobs directly created between 2018 and 2023. A women-led nursery of 22 female farmers was supported, offering working arrangements compatible with caregiving responsibilities and opening a pathway into paid employment for women previously excluded from the sector.

The way forward for a sustainable aquaculture sector in India: Building from experience

Having experienced rapid expansion in aquaculture over the past decade, India has emerged as a leading global producer and exporter of shrimp, which has also brought greater attention to labour-related challenges and opportunities within the sector. The ILO has been supporting the Indian shrimp industry in addressing decent work challenges, paying particular attention to vulnerable groups of workers. With support from the Korea International Cooperation Agency, the ILO's Promoting Sustainable Enterprises in India (PSEI) project worked with government institutions, employers and workers' organisations to strengthen competitiveness and promote responsible business practices in shrimp farming and processing. The initiative adopted a systemic change approach, combining policy dialogue, institutional capacity building and enterprise-level interventions in key producing states. This included piloting district-level coordination mechanisms in Andhra Pradesh and Odisha. While training and mentoring sessions involving large Indian producers and Korean importers reached 95 enterprises by 2024, direct shop-floor interventions with 20 shrimp processing units resulted in notable productivity gains. Formal employment arrangements increased notably, with more than 220 workers transitioning from casual labour arrangements to fixed-term employment with written contracts. Over 1,250 workers were also linked to the Employees Social Insurance Scheme (ESIS) and other government schemes through formalisation measures and digital wage payments and were now also able to benefit from gender-sensitive workplace improvements. Exchanges with the Republic of Korea also provided 45 government officials and industry representatives with insights into good practices in food safety, value addition and processing technologies. Another key outcome of the programme has been the establishment of tripartite committees in Andhra Pradesh and Maharashtra, bringing together government, employers and workers to strengthen social dialogue and coordinated action on working conditions and competitiveness in the seafood sector. Similar mechanisms are being advanced in seven other shrimp- producing and exporting states through a process facilitated by the Marine Products Export Development Authority (MPEDA), in consultation with state governments and the ILO's technical support. The collaboration has also included training on international labour standards and the development of practical tools and monitoring mechanisms aligned with ILO standards and the new ILO Code of Practice on Safety and Health in Aquaculture.

Given the growing role of aquaculture in global food security, employment generation and trade, sustained efforts to address persistent decent work deficits will be essential to ensuring the sector's long-term growth and realising its full potential. Building a more resilient, inclusive and sustainable aquaculture sector will require a stronger focus on ensuring compliance with labour standards, improving working conditions and access to rights through social dialogue, investment in skills and enterprise development, while ensuring gender equality and social protection.

India, together with other leading aquaculture producers and exporters, is well-positioned to lead this transition. Priorities should include strengthening labour inspection and OSH systems in aquaculture and seafood processing, extending social and labour protection, promoting women's access to decent and better-paid jobs, and reinforcing mechanisms for social dialogue, collective bargaining and worker representation. Greater collaboration between government institutions, employers' and workers' organisations, buyers and international partners will also be critical to advancing responsible business conduct and ensuring that growth in aquaculture translates into decent work for all.

EXPLORING THE POTENTIALS OF THE DEEP SEA

UNITED MARINE PRODUCTS

Manufacturers & Exporters of Fish Meal, Fish Oil & All kinds of Marine Products

KARNATAKA
Door No. 1-1/20, Sea Road, Kotepura
Ullal, Mangalore, Karnataka - 575020, India

GOA
Plot No. L-28, Cuncolim Industrial Estate
Cuncolim, Salcete, Goa - 403703, India

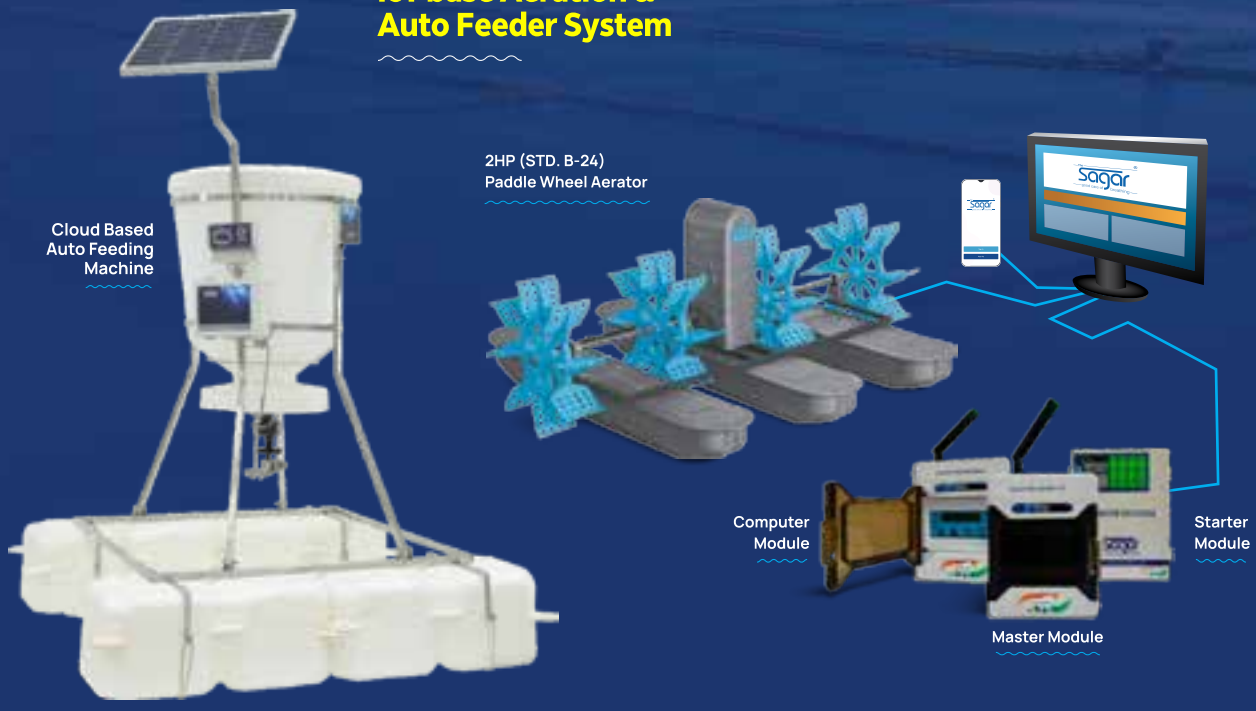
COMMUNICATION / OFFICE
IIIrd Floor "MAK PARK SQUARE" NH 66, Pumpwell, Mangalore - 575002.
Tel: 0824 4256665

E-mail: info@unitedmarineproducts.com | www.unitedmarineproducts.com

Revolutionizing Aquaculture with Smart Automation

The Sagar®
good care of breathing

IoT base Aeration & Auto Feeder System





30+ Countries Served

25+ Years Experience

Advanced Manufacturing Facility

SAGAR AQUACULTURE PVT. LTD.
Aerators & Aquaculture Equipments

Reg. Office
Plot No. 1, Survey No 1084, Ardoi-Kotda Sangani Road,
Village: ARDOI-360030 Ta.: Kotda Sangani,
Dist.: RAJKOT (Gujarat) INDIA

info@sagaraquaculture.com
www.sagaraquaculture.com
75748 52544
75748 52545

SHILPA
HATCHERIES LLP

SPF L VANNAAMEI SEED PRODUCTION CENTRE

SHILPA HATCHERIES LLP







- CAA Approved Hatcheries
- BAP Certified
- Own Maturation Facility
- Certified SPF Broodstock
- Certified SPF Seeds
- Antibiotic Free Seeds
- SHAPHARI Certified
- Qualified and Experienced Technical Team
- 10,000+ Farmers Network
- 300 Million+ Shrimp seeds Production
- 6000 Million+ Nauplii Production
- Over 100 Dedicated Employees
- Built on farmer trust strengthened by long-term relationships
- Work Together - Grow Together

SHILPA HATCHERIES LLP

CAA Approved Regn No. 56-3(385)/2022
Pentakota (V), Payakarao Peta Mandal,
Anakapalli District. A.P.
Shilpahatcheriesllp@gmail.com | www.shilpahatcheries.com

MANJA NAIK, MPSC
Managing Director
✆ 94944 87111



Utilisation of seaweed polysaccharides for preparing edible films and coatings

Sravani Kalluri*, *Department of Fish Processing Technology, Andhra Pradesh Fisheries University, Narsapur, 534275, Andhra Pradesh, India*
Panchakarla Sedyaaw, *Department of Fish Processing Technology. College of Fisheries, Ratnagiri,415629, Maharashtra, India*

Introduction

Seaweed can be used as extracts, polysaccharide-rich raw materials, or potentially active agents in FCMs (Food Coating Materials) (Ristivojevic *et al.,* 2021). Products made from seaweed can enhance the materials' functionality, sensory qualities, and sustainability. Seaweed is utilised in sachets, edible films, edible coatings, intelligent packaging, active packaging, and other utensils. Seaweeds are mixed with other polysaccharides, nanoparticles, essential oils, or plant extracts to enhance their barrier, mechanical, thermal, antioxidant, and antibacterial qualities in order to be utilised as effective FCMs (Khalil *et al.,* 2017). Alginate-sepiolite myrtle berries extract (Cheikh *et al.,* 2020), sodium alginate-cyclodextrin-carvacrol (Cheng *et al.,* 2019), agar-sodium alginate-SiO2 nanoparticle (Hou *et al.,* 2019), furcellaran-gelatin hydrolysate-rosemary extract (Jancikova *et al.,* 2019), and other seaweeds have been combined with other polymers to create active packages. Seaweeds have also been utilised as intelligent packaging solutions thanks to the addition of mulberry (Liu *et al.,* 2019), anthocyanin (Liu *et al.,* 2020), and the capacity to change colour at various pH sensitivities. Seaweed is used as edible films and coatings because of its non-toxic, non-lethal qualities and capacity to make films. Fig. 1 illustrates the process for creating these seaweed-based FCMs.

Coatings from seaweeds

Edible coatings are typically developed using proteins and/or polysaccharides. As shown in Seaweed polysaccharides like alginate and carrageenan have been extensively used in the creation of edible coatings (Table 1).

By adding phenolics, essential oils, nanomaterials, and other possible chemicals, the seaweed-based coating's functions can be improved. Colletotrichum gloeosporioides development in capsicum held at 10°C was effectively prevented by an alginate-based edible coating combined with 1% polyphenolic rich pomegranate peel extract, according to a study by Nair *et al.* (2018). Additionally, following coating, the capsicum's colour, hardness, weight, ascorbic content, and total chlorophyll were all preserved. Furthermore, the coated capsicum's shelf life was found to be 20 days based on sensory quality features, which

Seaweed Polysaccharide	Packaging Matrix	Properties of the Packaging Material	Reference
Alginate	Pomegranate peel extract	Inhibition against Colletotrichum gloeosporioides and improvement in shelf life of capsicum.	Nair *et al.,* (2018)
Kappa-carrageenan	Konjac glucomannan and camellia oil	Reduction in microbial count and improvement in shelf life of chicken meat by up to 10 days when stored at 4 °C.	Zhou *et al.,* (2018)

Table 1: Examples of seaweed polysaccharides in coatings and edible films

*Corresponding author email: shine7sravani@gmail.com

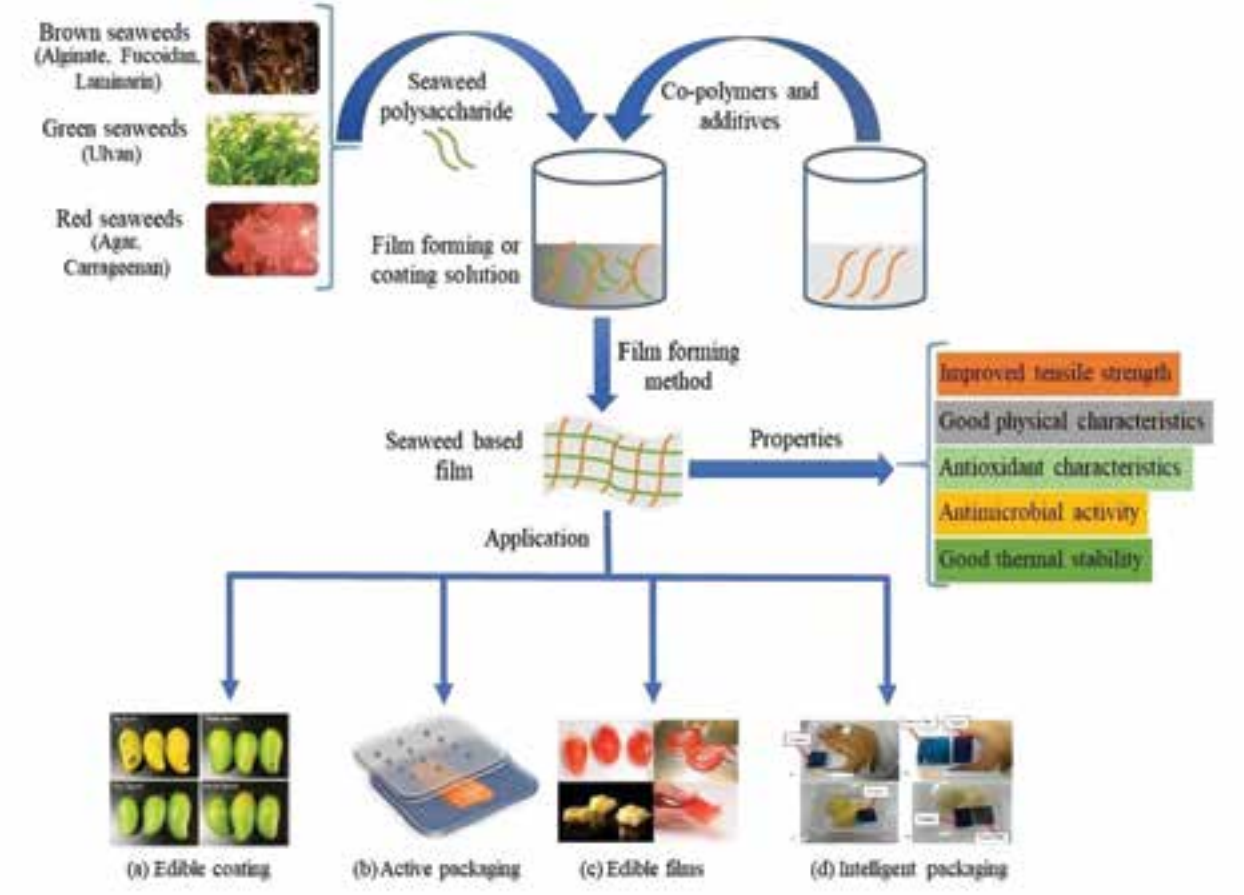


Fig. 1: The mechanism for developing seaweed-based food contact materials

was longer than the control samples' 12-day shelf life. In a different study, Zhou *et al.* (2021) created a coating material (KGM/KC-CO) to extend the shelf life of chicken meat using kappa-carrageenan (KC), konjac glucomannan (KGM), and camellia oil (CO). The KGM/KC-CO coated samples showed a significant decrease in microbial counts, total volatile nitrogen, thiobarbituric acid reactive material, pH, and weight loss. Additionally, when stored at 4°C, the addition of 3.5% CO to the KGM/KC-based coating extended the shelf life of chicken flesh by up to 10 days. Figure 1 shows the method of preparation of various Food Coating Materials.

Edible films from seaweed

Packaging materials composed of edible elements are known as edible films, and are known to improve food quality, freshness, and shelf life Additionally, edible films can be employed as delivery systems for the regulated release of nutrients, medications, food ingredients, and bioactive components. When creating edible films, high solubility is crucial since they must dissolve quickly. As demonstrated in Table 2, numerous researchers have created innovative edible films using seaweeds while adding additional biopolymers, bioactive agents with packaging-appropriate qualities, and enhanced bioactivity.

Packaging Matrix	Properties of the Packaging Material	Reference
k-carrageenan and Glycerol	➤ Alginate favoured film uniformity and transparency ➤ I-carrageenan effect the opacity of film	Paula *et al.*, (2015)
Sodium alginate and Lactococcus lactis	➤ Reduced gloss and transparency when incorporation of Lactococcus lactis ➤ Inhibition of S. aureus growth for 7 days	Ma *et al.*, (2019)

Table 2: Instances of seaweed polysaccharides in edible films

References

1. *Cheikh, D., Martin-Sampedro, R., Majdoub, H., & Darder, M. (2020). Alginate bionanocomposite films containing sepiolite modified with polyphenols from myrtle berries extract. International journal of biological macromolecules, 165, 2079-2088.*
2. *Cheng, M., Wang, J., Zhang, R., Kong, R., Lu, W., & Wang, X. (2019). Characterization and application of the microencapsulated carvacrol/ sodium alginate films as food packaging materials. International Journal of Biological Macromolecules, 141, 259-267.*
3. *Dou, L., Li, B., Zhang, K., Chu, X., & Hou, H. (2018). Physical properties and antioxidant activity of gelatin-sodium alginate edible films with tea polyphenols. International journal of biological macromolecules, 118, 1377-1383.*
4. *Garg, S., Hemrom, A., Syed, I., Sivapratha, S., Panigrahi, S. S., Dhumal, C. V., & Sarkar, P. (2019). Nanoedible coatings for dairy food matrices. In Nanotechnology Applications in Dairy Science (pp. 27-42). Apple Academic Press.*
5. *Hou, X., Xue, Z., Xia, Y., Qin, Y., Zhang, G., Liu, H., & Li, K. (2019). Effect of SiO2 nanoparticle on the physical and chemical properties of eco-friendly agar/sodium alginate nanocomposite film. International Journal of Biological Macromolecules, 125, 1289-1298.*
6. *Jancikova, S., Jamróz, E., Kulawik, P., Tkaczewska, J., & Dordevic, D. (2019). Furcellaran/gelatin hydrolysate/rosemary extract composite films as active and intelligent packaging materials. International Journal of Biological Macromolecules, 131, 19-28.*
7. *Khalil, H. A., Saurabh, C. K., Tye, Y. Y., Lai, T. K., Easa, A. M., Rosamah, E.,& Banerjee, A. (2017). Seaweed based sustainable films and composites for food and pharmaceutical applications: A review. Renewable and Sustainable Energy Reviews, 77, 353-362.*
8. *Liu, Y., Qin, Y., Bai, R., Zhang, X., Yuan, L., & Liu, J. (2019). Preparation of pH-sensitive and antioxidant packaging films based on κ-carrageenan and mulberry polyphenolic extract. International journal of biological macromolecules, 134, 993-1001.*
9. *Liu, L., Zhang, J., Shi, J., Huang, X., Zou, X., Zhang, D., & Li, Y. (2020). Preparation and comparison of two functional nanoparticle-based bilayers reinforced with a κ-carrageenan–anthocyanin complex. International Journal of Biological Macromolecules, 165, 758-766.*
10. *Ma, D., Jiang, Y., Ahmed, S., Qin, W., & Liu, Y. (2019). Physical and antimicrobial properties of edible films containing Lactococcus lactis. International Journal of Biological Macromolecules, 141, 378-386.*
11. *Mahcene, Z., Khelil, A., Hasni, S., Akman, P. K., Bozkurt, F., Birech, K.,& Tornuk, F. (2020). Development and characterization of sodium alginate based active edible films incorporated with essential oils of some medicinal plants. International Journal of Biological Macromolecules, 145, 124-132.*
12. *Mohamed, S. A., El-Sakhawy, M., & El-Sakhawy, M. A. M. (2020). Polysaccharides, protein and lipid-based natural edible films in food packaging: A review. Carbohydrate polymers, 238, 116178.*
13. *Nair, M. S., Saxena, A., & Kaur, C. (2018). Characterization and antifungal activity of pomegranate peel extract and its use in polysaccharide-based edible coatings to extend the shelf-life of capsicum (Capsicum annuum L.). Food and bioprocess technology, 11(7), 1317-1327.*
14. *Paula, G. A., Benevides, N. M., Cunha, A. P., de Oliveira, A. V., Pinto, A. M., Morais, J. P. S., & Azeredo, H. M. (2015). Development and characterization of edible films from mixtures of κ-carrageenan, ι-carrageenan, and alginate. Food hydrocolloids, 47, 140-145.*
15. *Ristivojević, P., Jovanović, V., Opsenica, D. M., Park, J., Rollinger, J. M., & Velicković, T. Ć. (2021). Rapid analytical approach for bioprofiling compounds with radical scavenging and antimicrobial activities from seaweeds. Food chemistry, 334, 127562.*
16. *Zhou, X., Zong, X., Zhang, M., Ge, Q., Qi, J., Liang, J., & Xiong, G. (2021). Effect of konjac glucomannan/carrageenan-based edible emulsion coatings with camellia oil on quality and shelf-life of chicken meat. International journal of biological macromolecules, 183, 331-339.*

www.aquaseafoods.in

AQUATECH
FEED & SEAFOODS PVT. LTD.

AQUATECH
FEED & SEAFOODS PVT. LTD.

WEST BENGAL, INDIA

Leading Exporter of Premium
Shrimp & Seafood Products



From Our Farms to Your Table



- 30+ Years of Excellence
- State-of-the-Art Infrastructure
- Hygienic & Safe Processing
- Advanced Freezing Technology
- Global Export Presence

OUR PREMIUM PRODUCTS


VANNAMEI HEAD ON (HLV)


VANNAMEI EASY PEEL (EZPL)


VANNAMEI PDTO / BUTTERFLY


VANNAMEI EZPL FROZEN


VANNAMEI PDTO / PVTO


FROZEN BLOCK


BLACK TIGER (BT) RANGE


COOKED (PD) RANGE


HACCP & BRC CERTIFIED PLANT


IN-HOUSE LABORATORY

- FSSAI APPROVED
- USFDA COMPLIANT
- HACCP CERTIFIED
- HALAL CERTIFIED
- BRCGS CERTIFIED
- BAP CERTIFIED

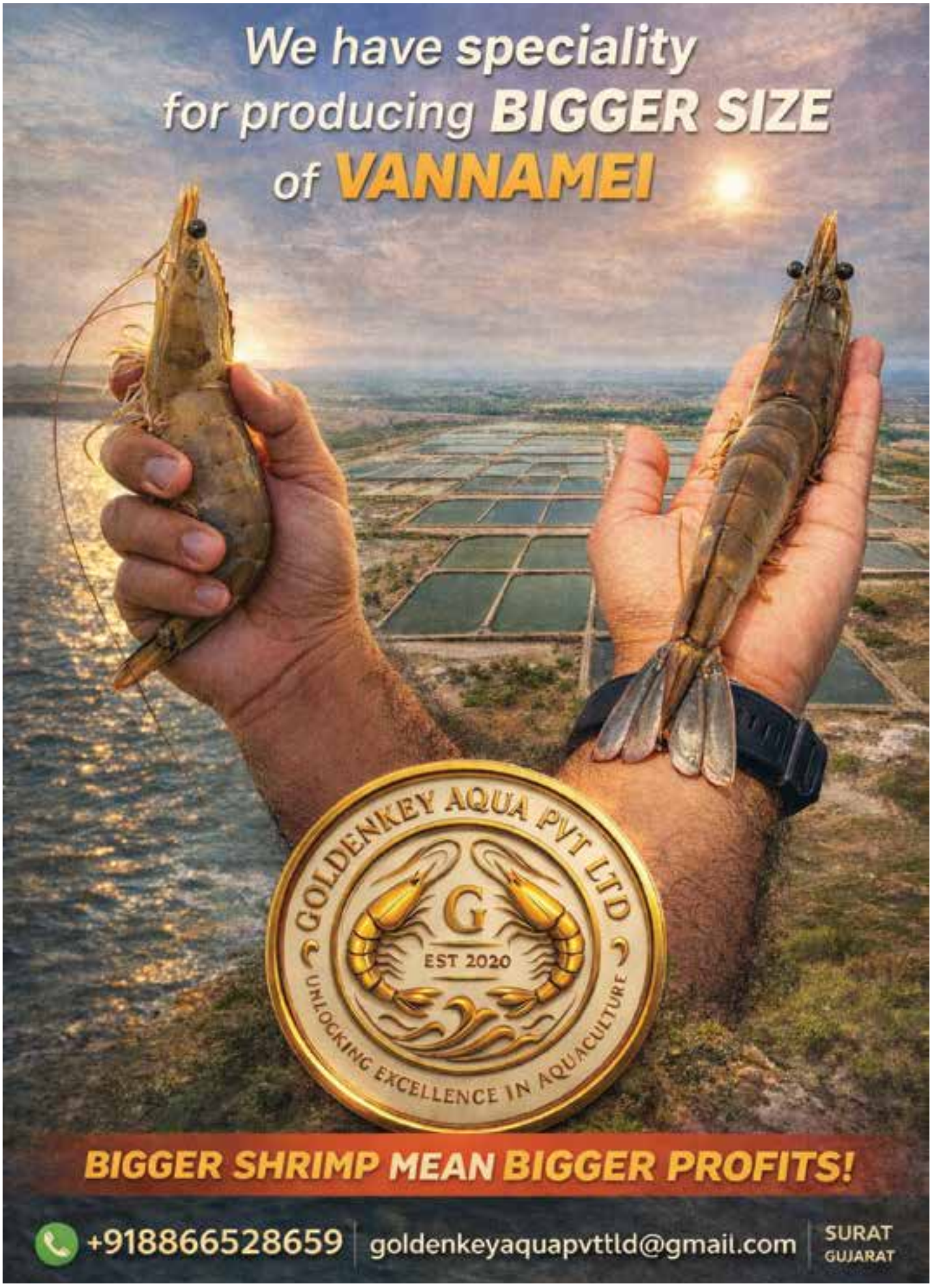
GLOBAL MARKETS: Japan, China, Vietnam, Indonesia, South Korea, Singapore, Hongkong, Malaysia, Taiwan, Mauritius, UAE, Qatar, Kuwait, Jordan, Dominican Republic, United Kingdom, USA, Belgium, Netherland, Poland, Germany, Spain, Italy and more.

AQUATECH FEED & SEAFOODS PRIVATE LIMITED

E-mail: aquatechfeed2019@gmail.com | Mob.: +91 9734771208

Factory:- Hanuman Complex, Vill - Islampur, Po - Islampur, Dist - Howrah, West Bengal - 711 401, INDIA.

Reg. Office :- 4, Fairlie Place, 5 Floor, Room No.:M-503C, Kolkata - 700 001, West Bengal, INDIA.


We have speciality
for producing BIGGER SIZE
of VANNAMEI
GOLDENKEY AQUA PVT LTD
G
EST 2020
UNLOCKING EXCELLENCE IN AQUACULTURE
BIGGER SHRIMP MEAN BIGGER PROFITS!
+918866528659
goldenkeyaquapvttld@gmail.com
SURAT
GUJARAT

Coastal Corporation Limited



Marikavalasa Village Paradesipalem Visakhapatnam Andhra Pradesh 531163, India

Processor & Exporter of

Packing of Fresh / Chilled Fish & Fishery Products (IQF/Block),
Freezing of Raw Skewered / Nobashi, Blanched / Cooked Fish &
Fishery Products (IQF) - Fisher (Histamine & Non-Histamine forming),
Shrimps (Aquaculture / Sea caught)

Reach us : 9848186666
Contact us : tvalsaraj@coastalcorp.co.in

Women climate champions driving sustainable crab farming under the ECRICC Project in Odisha

Mr. Dillip Mahapatra*, *Socio-Economic & Livelihoods Associate, State Project Management Unit (SPMU), Enhancing Climate Resilience of India's Coastal Communities (ECRICC), Bhubaneswar, Odisha-751012*

Odisha's 575-km-long coastline and rich network of estuaries, creeks, mangroves, and brackish-water ecosystems have traditionally supported thousands of families dependent on fisheries and aquaculture. However, climate change, saline intrusion, recurring cyclones, habitat degradation, and declining fish productivity have increasingly threatened the livelihoods of vulnerable coastal communities. In response to these challenges, the 'Enhancing Climate Resilience of India's Coastal Communities' (ECRICC) Project has emerged as a transformative initiative that combines ecosystem restoration with climate-adaptive livelihoods. Supported by the Green Climate Fund (GCF), the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India, the Forest, Environment and Climate Change Department, Government of Odisha, and UNDP, the project is being implemented across 7 vulnerable coastal landscapes covering 4 districts of Odisha.

Among the many climate-resilient livelihood interventions promoted under the ECRICC Project, sustainable crab farming has shown remarkable success in strengthening household income, reducing livelihood vulnerability, and empowering coastal communities. A key factor behind this success has been the active involvement of "Climate Champions" — local community facilitators, mostly women, who have played a crucial role in translating scientific aquaculture practices into simple, practical, and locally adaptable methods for community members.

Crab farming as a climate-adaptive livelihood

Crab farming offers communities more than an alternative source of income — it provides a pathway to restore the delicate balance between people and nature. By raising mud crabs (*Scylla serrata*) in scientifically managed ponds rather than relying entirely on wild-caught fisheries, coastal households can secure stable earnings while reducing pressure on marine resources. This contributes to the recovery of aquatic biodiversity and promotes healthier coastal ecosystems.

Under the ECRICC Project, scientific crab farming practices are being promoted in coastal villages through technical support from institutions such as the Rajiv Gandhi Centre for Aquaculture (RGCA), a society established under the Marine Products Export Development Authority (MPEDA), MoC&I, Govt. of India. MPEDA-RGCA has already supplied 1,16,000 Nos. of match-box size certified crablets to ECRICC Project in Odisha during 2023-24, 2024-25, and 61 crab farmers have already taken up science-based mud-crab farming in the State. Farmers are trained in pond preparation, stocking density and water quality management, feeding techniques and feed management, disease prevention, and harvesting practices. These interventions aim not only to improve productivity but also to ensure environmental

*Corresponding author email: dillip.mahapatra@undp.org









sustainability and climate resilience. A mud-crab hatchery (*Scylla serrata*) with a 1 million-crab instar production capacity is being implemented at BWTC, Paradip, Jagatsighpur district, Odisha, jointly funded by the ECRICC Project and the Directorate of Fisheries, F&ARD, Govt. of Odisha. ECRICC project has signed an MoU with RGCA for technical support to the ECRICC project for the establishment of a mud-crab hatchery and the Directorate of Fisheries, F&ARD, Govt. of Odisha, for the execution of the mud-crab hatchery project in Odisha. The crab-hatchery project in Paradip, Odisha, is expected to provide a sustainable supply of crablets to the farmers of Odisha and neighbouring coastal states.

The project focuses on engaging vulnerable households, women's Self-Help Groups (SHGs), and small-scale fishers, who often have limited livelihood opportunities during extreme weather events. By integrating crab farming with ecosystem restoration and community participation, the project demonstrates how climate adaptation can also generate economic opportunities.

The role of climate champions

One of the most innovative aspects of the

ECRICC Project has been the deployment of Women Climate Champions at the grassroots level. Across the project landscapes, village facilitators (Climate Champions) have been identified, engaged for the project and trained as local resource persons to promote climate-resilient practices and strengthen community participation. Notably, nearly 98 per cent of these Climate Champions are women.

In the context of crab farming, Climate Champions serve as the critical bridge between scientific institutions and rural communities. While technical experts provide scientific guidance and demonstrations, Climate Champions ensure that this knowledge reaches farmers in an understandable and practical form and that the recommended scientific and timely practices are adopted by crab farmers, which makes crab culture interventions successful under the project.

Many coastal households initially viewed scientific aquaculture practices as complicated or inaccessible. Climate Champions simplified these practices through regular field demonstrations, peer learning sessions, household visits, and community meetings. They explained technical concepts such as salinity management, feed conversion, water exchange, and disease monitoring in the local language and through practical examples.

Their role extended far beyond awareness generation. Climate Champions closely monitored farming activities, guided farmers during pond preparation, ensured timely stocking of crablets, and regularly visited farms to track growth and survival rates. By maintaining close contact with farming households, they were able to identify problems early and facilitate timely technical support.

Translating science into community practice

Scientific aquaculture practices often require continuous monitoring and disciplined management. For small-scale farmers unfamiliar with such systems, adopting these practices can be challenging. Climate Champions addressed this gap by transforming scientific recommendations into daily community practices.

For example, farmers were trained on maintaining optimum water quality and salinity levels, which are critical for healthy crab growth. Instead of relying solely on technical manuals, Climate Champions demonstrated simple field-level techniques for checking pond conditions, identifying signs of stress in crabs, and maintaining hygiene in culture systems.

Similarly, scientific feeding schedules and stocking densities were explained using locally understandable methods. Climate Champions encouraged farmers to maintain records of feed usage, crab growth, and mortality, helping them understand the economic benefits of scientific management.

Through continuous handholding support, farmers gradually developed confidence in adopting improved practices. This participatory approach significantly improved survival rates, productivity, and income generation while minimising environmental risks associated with unscientific aquaculture.

Women at the centre of climate resilience

The active participation of women as Climate Champions has been one of the most inspiring outcomes of the ECRICC Project. Traditionally, women in coastal communities were often confined to supportive roles in fisheries and aquaculture. Under ECRICC, however, women have emerged as leaders, trainers, and decision-makers.

Women Climate Champions have demonstrated exceptional commitment in mobilising SHGs, coordinating farmer groups, monitoring farming activities, and facilitating community discussions. Their close engagement with households has strengthened trust and improved the adoption of scientific practices.

In many villages, women Climate Champions

have become role models for climate-resilient livelihoods. They have helped communities understand that sustainable aquaculture is not only about income generation but also about long-term environmental sustainability and risk reduction.

Their involvement has also strengthened social inclusion and community ownership of project activities. Since women are deeply connected to household food security and financial management, their leadership has ensured that the benefits of crab farming are distributed more equitably within communities.

Monitoring and community support

Continuous monitoring has been essential for the success of crab farming interventions under the ECRICC Project. Climate Champions regularly visit ponds and cage culture sites to observe water quality, crab health, feed utilisation, and overall farm conditions.

This close monitoring system has enabled early identification of problems such as poor water exchange, disease symptoms, or feed-related issues. In many cases, timely intervention has helped farmers avoid losses and improve productivity.

Climate Champions also facilitate coordination between farmers, project teams, technical experts, and government departments. By maintaining regular communication and documentation, they ensure that scientific guidance reaches communities at the right time. The participatory monitoring process has strengthened accountability and encouraged farmers to follow scientific protocols more consistently. It has also created a culture of collective learning where farmers share experiences and solutions with one another.

Building climate-resilient coastal communities

The success of crab farming under the ECRICC Project highlights the importance of combining science, community participation, and local leadership for climate adaptation. Coastal communities facing increasing climate risks require livelihood systems that are economically viable, environmentally sustainable, and socially inclusive.

By promoting sustainable crab farming alongside ecosystem restoration efforts such as mangrove plantation and wetland conservation, the project is creating a holistic model of coastal resilience. Healthy mangroves and wetlands support fisheries productivity, protect coastlines from cyclones and storm surges, and improve ecological balance, all of which directly benefit aquaculture-based livelihoods.

Most importantly, the project demonstrates that local communities themselves can become powerful agents of climate action when equipped with scientific knowledge, institutional support, and leadership opportunities.

Conclusion

The ECRICC Project in Odisha stands as an inspiring example of how climate-resilient livelihoods can transform vulnerable coastal communities. Sustainable crab farming has not only improved income opportunities but also strengthened the adaptive capacity of households facing increasing climate uncertainties.

At the heart of this transformation are the Climate Champions, dedicated local leaders, predominantly women, who have successfully translated scientific aquaculture practices into community action. Through awareness generation, close monitoring, regular handholding support, and community mobilisation, they have ensured that climate-resilient crab farming becomes both practical and sustainable for rural households.

As Odisha continues to confront the challenges of climate change, the experiences from the ECRICC Project underline an important lesson: resilient communities are built not only through infrastructure or technology, but through empowered people who can connect science with grassroots action and lead change from within.

LNSK GREEN HOUSE AGRO PRODUCTS LLP

SAFE • SUSTAINABLE • SUPERIOR

QUALITY YOU TRUST, SEAFOOD YOU LOVE

From Our Farms to the World's Finest Tables



ESTABLISHED	EIA APPROVAL NO.	MPEDA REGN. NO.	WORKFORCE
2016	1872	AP1/MT/193/16	290+

NORTH RAJU PALEM VILLAGE,
KODAVALURU MANDAL,
SPSR NELLORE DIST-524366, ANDHRA PRADESH, INDIA

COMPANY OVERVIEW

LNSK Green House Agro Products LLP is a leading exporter of premium quality frozen shrimp and value added seafood products. Our state-of-the-art processing facility is equipped with advanced technology, skilled manpower and stringent quality control systems to deliver safe, hygienic and high-quality seafood to global markets.

OUR MARKETS



USA | EUROPE | ASIA | RUSSIA

1700+ Shipments Globally (Last 3 Years)

INFRASTRUCTURE & CAPACITY

Plate Freezing	IQF Freezing	Ice Plant	Cold Storage
16 TPD	22 TPD	40 TPD	770 MT

Chit Room	Insulated Vehicles	Water Tank Capacity
15 MT	10 Nos	3 Lakh Lts

- Ultraviolet Water Disinfection System
- Pressure Activated Carbon Filter for clear, filtered & odorless water
- Effluent Treatment Plant (ETP) with advanced technology ensuring treated effluent within prescribed standards
- Hygienic, sustainable & environment-friendly operations

PRODUCT PORTFOLIO

BLOCK FROZEN RAW SHRIMPS



Headless Black Tiger / Vannamei

PDTO, PD, PUD, PTO

Black Tiger, Vannamei

INDIVIDUALLY QUICK FROZEN (IQF) SHRIMPS



Headless Black Tiger / Vannamei

HLSO, EZ Peel

PDTO, PD, PUD, PTO

Black Tiger, Vannamei

OUR SUPPLY CHAIN

Shrimp Farms	Raw Material Collection	Processing Unit	Cold Storage	Logistics & Export
Local aquaculture farms (Vannamei)	Daily procurement & quick transportation	Sorting, grading, cleaning & value addition	Block Freezing, IQF Freezing 1000 MT Capacity	Reefer container transport to global markets

CERTIFICATIONS

EIA | HACCP COMPLIANCE | BRCGS CERTIFIED | BAP Best Aquaculture Practices | HALAL

FOOD SAFETY & QUALITY POLICY

We are committed to produce only fresh, safe, legal and consistent quality products as per the buyer's requirements and specifications. This is achieved by purchasing fresh raw material, careful product handling, maintaining faultless housekeeping and good hygiene practices as per Codex Alimentarius, BRC Issue 9, Regulatory Requirements and entire scope of BAP SPS 5.1 standards and its annexes.

THE ENTIRE OPERATIONS ARE HANDLED BY WELL QUALIFIED AND EXPERIENCED TEAM OF EMPLOYEES.

OUR STRENGTHS

Strong Quality Assurance	Regulatory Compliance	Experienced Workforce	Traceability System
Robust HACCP, GMP & hygiene practices	EIA, BRCGS, EU & international export requirements	Skilled & trained team with regular training	End-to-end traceability from farm to finished product

FINANCIALS (IN INR)

FY 2023-24	₹540 Cr
FY 2024-25	₹650 Cr
FY 2025-26	₹680 Cr

(Figures in INR)

FUTURE STRATEGY

Expand Markets | Improve Margins | Scale Operations

**SUSTAINING QUALITY,
DELIVERING TRUST,
FEEDING THE WORLD.**



+91 7893077664 | info@lnskgreenhouse.com | www.lnskgreenhouse.com | Nellore, Andhra Pradesh, India

BACTERIOPHAGE THERAPY TO DESTROY PATHOGENIC VIBRIOS

V PHAGES™ HATCHERY & **V PHAGES™** GROWOUT are a cocktail of Phages isolated from Natural environment. Hence they are safe on aquatic animals, people and ecosystems. This destroys the pathogenic bacteria which are even resistant to antibiotics and increases the efficacy of probiotics.

V PHAGES™ cocktail targets against most common pathogenic *Vibrio species* in Shrimp Hatchery & Farming

- ***Vibrio parahaemolyticus***
- ***Vibrio alginolyticus***
- ***Vibrio harveyi***
- ***Vibrio campbellii and other pathogenic Vibrio sp.***

100 % Natural | Pathogen specific approach | Very Fast action | Enhances Probiotic performance | Easy & Safe to use
Does not leave any residues



CAA Certified Antibiotic-free Product
CAA/OCT22/PRO/04169



CAA Certified Antibiotic-free Product
CAA/MAR2023/PRO/04631

BENEFITS

Broodstock:
Prevents entry of opportunistic pathogens and safeguards health of this high value asset.

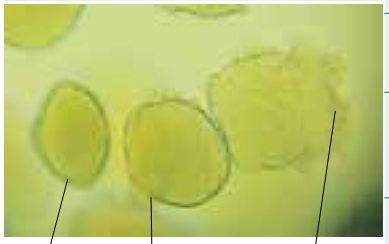
Artemia:
Reduces the *Vibrio sp.* load in Artemia tank.

Zoea & Mysis:
Helps in better conversion and survival.

Post Larvae:
Stagewise control of *Vibrio sp.* results in remarkable reduction of *Vibrio sp.* load in post larval tanks. This results in high health seeds.

Works as an Alternative to Antibiotics and complies with International Seafood export regulations.

Stages of *Vibrio sp.* colonies infected with Bacteriophages & Progressive Lysis observed on an Agar plate, under Stereo Microscope



Colony 1 in Stage 1: Intact Colony may be infected or yet to get infected.

Colony 2 in Stage 2: Phage infected Colony showing Partial lysis

Colony 3 in Stage 3: Phage infected Colony Completely lysed, cell contents with multiplied phages spreads out in search of their host.

BENEFITS

- Effective against Vibriosis, other Bacterial Infections and Running Mortality Syndrome (RMS).
- Effectively prevents Gut Infections and Improves feeding.
- Prevents sudden crop loss and extends Life of Pond during critical profit-making period.
- Enhances Probiotic performance.

Works as an Alternative to Antibiotics and complies with International Seafood export regulations.

Manufactured by :
SALEM MICROBES PRIVATE LIMITED
Registered Office: 21/10C, Bajanai Madam Street, Gugai, Salem - 636006, Tamilnadu, India.
Tel:+91-9787196447 / E.Mail: contact@salemmicrobes.com www.salemmicrobes.com

www.salemmicrobes.com

Post-harvest losses in the fisheries sector: Opportunities and challenges for processing and entrepreneurship

Dr. Shine Kumar C.S*, *Director,*
National Institute of Fisheries Post Harvest Technology and Training, Department of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying, Government of India

Introduction

The fisheries sector is one of the fastest-growing segments of the Indian economy, contributing significantly to food security, employment generation, nutritional security, and overall economic development. It supports millions of livelihoods, particularly in coastal and rural regions, and plays a crucial role in ensuring protein security for the population. Despite substantial growth in production from both marine and inland sources, the sector continues to face a persistent and critical challenge in the form of post-harvest losses. According to the Food and Agriculture Organization (FAO), nearly 30–35 percent of fish produced globally is lost after harvest due to inefficiencies in handling, preservation, processing, and marketing systems. This highlights the magnitude of the issue and indicates that a significant proportion of harvested fish fails to reach consumers in optimal condition.



Photo credit: MPEDA

*Corresponding author email: shinesiva@nifphatt.gov.in



Photo credit: MPEDA

Extent and nature of post-harvest losses in India

In the Indian context, quantitative estimates of post-harvest losses appear relatively lower—ranging from 4.86 percent in inland fisheries to 8.76 percent in marine fisheries—but these figures do not adequately capture qualitative losses, which substantially reduce market value. Quality deterioration due to improper handling, lack of icing, exposure to high temperatures, and delayed marketing often leads to price reduction and economic loss. Broader domestic assessments suggest that nearly 20–25 percent of fish production is adversely affected due to inadequate cold-chain infrastructure, inefficient handling practices, and fragmented domestic marketing systems. Thus, a major portion of fish is effectively lost either physically or economically, underscoring the urgency of addressing post-harvest inefficiencies through a systematic and integrated approach.

Infrastructure gaps at fishing vessels harbours and landing centres

The problem originates at the primary level of the value chain, particularly at fishing harbours and landing centres. In many regions, these facilities lack essential infrastructure such as potable water, ice availability, sanitation systems, and reliable energy supply. As a result, fish is often exposed to ambient environmental conditions for extended periods immediately after landing, leading to rapid spoilage or deterioration in quality. From a national perspective, modernisation of harbours and landing centres is therefore a fundamental requirement. The establishment of hygienic auction halls, covered sorting platforms, grading facilities, and immediate icing and chilling systems can significantly improve the quality of fish entering the supply chain and reduce initial losses. Such improvements form the foundation for an efficient post-harvest management system.

Need for integrated cold chain development

However, improvements at landing centres must be supported by a robust and integrated cold-chain system. Fish, being highly perishable in nature, requires continuous temperature-controlled handling from the point of harvest to final consumption. The absence of such systems remains one of the most significant constraints in the fisheries sector. National-level policy frameworks emphasise the development of cluster-based cold-chain networks connecting landing centres, aggregation points, processing units, and markets. This includes insulated storage at the vessel level, ice plants at landing centres, cold storage facilities at district and cluster levels, and refrigerated transport systems for distribution. Strengthening this cold-chain continuum is essential not only for reducing physical and quality losses but also for stabilising market prices, improving supply chain efficiency, and expanding access to distant markets.

Role of processing in loss reduction

Processing infrastructure represents another critical component in minimising post-harvest losses. Currently, fish processing in India is largely oriented towards export markets, with comparatively limited focus on domestic consumption. This imbalance results in surplus fish, particularly from inland aquaculture systems, being underutilised or sold at lower prices. Establishing decentralised processing systems is therefore essential. Mini processing units can be

developed by converting existing peeling sheds or by constructing new small-scale facilities in production clusters. These units can focus on domestic processing and marketing rather than export-oriented facilities in the initial stages.

Such units can undertake value addition activities, including chilling, freezing, drying, smoking, pickling, and preparation of ready-to-cook and ready-to-eat products. Also, facilities need to be created for descaling and evisceration, steak preparation and filleting, mincing to support the value addition activities. Over time, with improvements in quality and scale, these units can expand into more advanced processing systems. This decentralised model not only reduces losses but also enhances local employment and strengthens rural economies.

Institutional support: Cooperatives and FFPOs

Institutional involvement is crucial for enabling this transformation. Fisheries cooperatives and Fish Farmer Producer Organisations (FFPOs) can function as aggregation and processing hubs, facilitating collective action, improving bargaining power, and ensuring better market access. Strengthening cooperative development can significantly reduce post-harvest losses by enabling shared infrastructure and coordinated marketing.

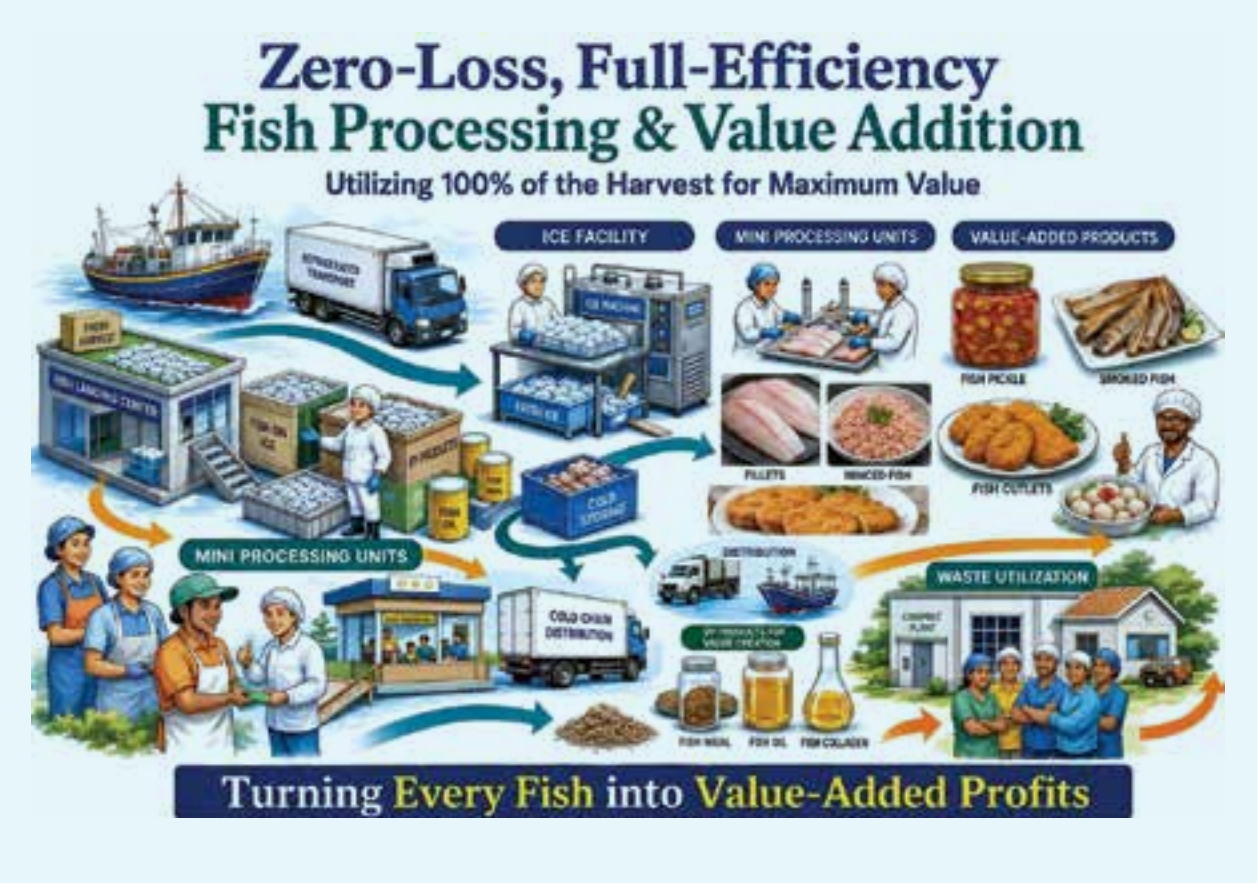
Organisations such as the National Bank for Agriculture and Rural Development (NABARD) and the National Cooperative Development Corporation (NCDC) play a vital role in supporting these structures through financial assistance, infrastructure financing, and cooperative development programmes. While institutional credit is primarily provided by commercial banks, regional rural banks, and cooperative banks, NABARD facilitates refinance and strengthens rural credit systems, and NCDC extends financial support mainly to cooperative institutions. These mechanisms enable access to credit-linked subsidies, interest subvention, working capital support, and capital investment assistance. Financial models such as the 25:10:65 structure—representing a typical pattern of 25% subsidy, 10% beneficiary contribution, and 65% institutional credit with interest subvention—help reduce the financial burden on beneficiaries and encourage participation from small-scale stakeholders.

However, a major constraint is the lack of awareness among cooperatives and producer groups regarding the convergence of these financial schemes from the central, state Government, NCDC, NABARD and public sector Banks. Many potential beneficiaries are unable to access these facilities due to procedural complexities and a lack of technical guidance. Therefore, capacity building, awareness programmes, and institutional handholding are essential to ensure effective utilisation of available schemes. Financial convergence of various schemes of the Government and Banks will support the growth of FFPOs and Cooperative societies in the Fisheries Sector, which is very much essential for the development of small-scale fishers and fish farmers in the country.

Government initiatives and policy support

The Government of India has introduced several initiatives aimed at reducing post-harvest losses and strengthening fisheries infrastructure. The Pradhan Mantri Matsya Sampada Yojana (PMMSY) is a flagship scheme that supports the development of fishing harbours, landing centres, cold-chain infrastructure, ice plants, processing units, and value addition facilities through subsidies and credit-linked assistance. The scheme also promotes entrepreneurship by supporting start-ups and small-scale enterprises in the fisheries sector.

Similarly, the PM Formalisation of Micro Food Processing Enterprises (PM-FME) Scheme, implemented by the Ministry of Food Processing Industries (MoFPI), aims to strengthen micro-processing units through credit-linked capital subsidy, branding and marketing support, and capacity-building interventions. The scheme primarily operates through institutional bank lending, wherein beneficiaries avail loans from



scheduled banks, supported by a 35% credit-linked subsidy.

Despite the availability of these schemes, their impact is often limited by inadequate awareness and weak last-mile delivery. Strengthening extension systems, improving coordination among institutions, and providing technical assistance at the grassroots level are essential for maximising the benefits of these initiatives.

Full utilization of fish resources and by-product development

An important strategy for reducing post-harvest losses is promoting the complete utilisation of fish resources. Inland aquaculture species such as tilapia, pangasius, murrels, trout and other farmed fishes offer significant potential for processing and value addition. Through systematic processing, these species can be transformed into fillets, surimi, ready-to-cook, and ready-to-eat products suitable for domestic markets.

In addition, by-products generated during processing—such as heads, bones, skin, and trimmings—can be utilised to produce fish meal, fish oil, collagen, gelatine, and other industrial products. The development of parallel by-product industries can enhance profitability while ensuring nearly 100 percent utilisation of fish resources. This approach significantly reduces waste and contributes to sustainability, besides ensuring the commercial viability of these species.

Role of NIFPHATT in capacity building and technology development

In this context, the National Institute of Fisheries Post-Harvest Technology and Training (NIFPHATT), a premier institution dedicated to post-harvest fisheries technology, contributes to the development of processing techniques, training programmes, quality standardisation, and product innovation. It serves as the sector's technical backbone by providing scientific

knowledge and practical training to stakeholders.

Strengthening such institutions and expanding their regional outreach can facilitate effective technology transfer to cooperatives, entrepreneurs, and small-scale processors, thereby bridging the gap between research and field-level implementation.

Processing losses and product development: Tilapia and Pangasius

Further insights into post-harvest loss and value addition can be drawn from yield studies conducted on species such as tilapia and pangasius. These studies indicate that a considerable proportion of raw fish weight is lost during primary processing when traditional methods are followed. However, with the adoption of scientific processing techniques and appropriate machinery, these apparent losses can be significantly reduced and converted into valuable by-products.

In the case of tilapia, a wide range of value-added products such as fillets, fish fingers, cutlets, and surimi-based products can be developed. These products not only enhance shelf life but also improve consumer acceptability and market value. Similarly, pangasius processing yields high-quality fillets, and generates by-products like fish oil, fish meal, etc. that can be utilised for industrial applications. These findings demonstrate that post-harvest loss should not be viewed merely as waste, but as an opportunity for value creation through efficient processing systems.

Entrepreneurship development and youth engagement

Entrepreneurship development is a critical dimension in addressing post-harvest losses in the fisheries sector. Youth engagement holds particular promise in fish processing, cold-chain logistics, value-added product development, and domestic marketing. Integrating educated youth into fisheries cooperatives and Fish Farmer Producer Organisations (FFPOs) can enhance operational efficiency through technical expertise and innovative business models, enabling them to manage mini processing units, ensure quality control, and develop branded products for domestic consumers. The growth of organised retail networks and e-commerce platforms further expands entrepreneurial opportunities, transforming fisheries into a dynamic, innovation-driven industry.

Challenges in processing and modernisation

Several challenges continue to hinder modernisation of the fisheries sector. Limited availability of advanced processing machinery — filleting machines, meat-bone separators, and automated systems — restricts efficiency and scalability. Heavy dependence on imported machinery, ingredients, and packaging materials undermines export competitiveness and domestic processing growth, making indigenisation of equipment and inputs a policy priority. Cold chain gaps, unreliable energy supply, and poor convergence among financial schemes further constrain small entrepreneurs. Coordinated policy interventions, infrastructure investment, and stronger institutional support are essential to overcome these barriers.

Conclusion

Post-harvest losses in the fisheries sector represent a critical yet addressable challenge. By focusing on infrastructure development, strengthening cooperative institutions, promoting processing and value addition, enhancing access to finance, indigenisation of machineries, equipment's and ingredients and fostering entrepreneurship, it is possible to significantly reduce losses and improve value realization. The transition from a production-oriented approach to a value-centric model will not only enhance fisher incomes but also ensure sustainable utilization of resources. Ultimately, achieving near-total utilization of fish production must become the central objective, transforming losses into opportunities and paving the way for a resilient, efficient, and inclusive fisheries sector in India.

SEA+ BRAND

J J SEAFOODS

E.U APPROVED UNIT

PROCESSOR AND EXPORTER OF
QUALITY FROZEN SEAFOOD PRODUCTS

BRCGS Food Safety CERTIFICATED

FDA REGISTERED

fssai





CONTACT FOR VALUE ADDED PRODUCTS OF
SEA CAUGHT SHRIMPS, SQUID AND CUTTLEFISH

BARA ROAD , MANGROL - 362225
DIST. JUNAGADH, GUJARAT
TEL. 02878 - 296055 MO.9879580342
E-MAIL- jjseafoods@gmail.com

HARIOM AQUACULTURE PVT LTD

We Deals in

1. Bleaching Powder (SBP)
2. Seeds (A) P. Monodon (Black Tiger)
   (B) L. Vannamei.
3. Shrimp Feed
4. All Types of Probiotics
5. All kind of Aquaculture input
6. Aerators
7. Purchase of Hanvest Material
8. Technical Services

Best Aquaculture Practices

Aquaculture Stewardship Council

'SHAPHARI'

HARIOM AQUACULTURE PVT LTD

4622 to 4627, Dhir Complex, Eru Char Rasta, Vijalpore, Navsari 396450.

Mobile No. +91 72111 89111 - E-mail ID : info@hariomaqua.in

WITH BEST COMPLIMENTS FROM

TASTY NiBBLES®

Relishing... to the last bite

HIC-ABF SPECIAL FOODS PVT.LTD.

www.tastynibbles.in

Insights from grouper aquaculture endeavours in the Andaman & Nicobar Islands

D. Thinesh Santhar*
Damodar P N
Vijayakumar S
Grouper Project, Rajiv Gandhi Centre for Aquaculture

Introduction

Groupers are predatory coral reef fishes that are widely distributed throughout the tropical and subtropical seas of the world, particularly in the Indo-Pacific region. They are an extremely diverse group of fish comprising 115 species across 22 genera in the subfamily Epinephelinae, one of five subfamilies of Serranidae (Baldwin and Johnson, 1993; Williams *et al.*, 2004). Aquaculture production of groupers continues to expand rapidly, at 10-77% per annum since 1999 (Rimmer *et al.* 2004). This expansion is fuelled by the consistent demand for a range of high-value species sold alive, with major markets in Hong Kong and China. Globally, fish have been a focus of research and development aimed at enhancing production through various aquaculture technologies. Groupers are generally grown in net cages, and some species are also grown in earthen ponds (Sugama *et al.* 2012).

Looking at the excellent potential for grouper aquaculture in Andaman and Nicobar Islands with over 43 species reported, pristine environment and stable water quality, Rajiv Gandhi Centre For Aquaculture initiated a grouper project during the year 2006 in A&N Islands. Tiger grouper (*Epinephelus fuscoguttatus*) was selected as the candidate species. The hatchery production of grouper seeds started in the year 2009. The fish has immense potential in the live trade market and is well accepted in the domestic market as well. Once logistics for the transport of Live Grouper are available in the area, Andaman is likely to become the hub of Grouper aquaculture in India and will become a major source of income for fishermen and small- and large-scale entrepreneurs in the area.

Objectives of the project

The main objectives were:

➤ To develop hatchery technology for high-value tiger grouper

➤ To develop technology for the grow–out culture of tiger grouper in floating net cages to marketable size through better management practices.

➤ To transfer technology standardised by MPEDA - RGCA to the local fishermen, entrepreneurs,



Fig. 1: Location of the Grouper Open sea cage farm, A&N Islands

*Corresponding author email: thinesh.rgca@mpeda.gov.in



Fig. 2: HDPE cage raft 3 m x 3 m dimension



Fig. 3: Tiger grouper – Epinephelus fuscoguttatus (Forsskal)

and self-help groups in association with the Department of Fisheries, A & N Islands.

Infrastructure development

Open sea cage farm

Four hundred square meters of sea area was taken on lease by RGCA near Rutland Islands, South Andaman (Lat: 11°29′ N and Long: 92°40′ E) from the Port Management Board, A & N Administration, based on an annual renewal agreement. The sea cage farm consists of 21 High-Density Polyethylene (HDPE) cage rafts with 3 m x 3 m dimensions for grouper broodstock management and to farm the hatchery-produced grouper fingerlings. The HDPE cage rafts are fabricated by the butt-welding method. Double-layered nylon knotless square net cage, measuring 3 m L x 3 m W x 3 m H, was used to avoid injury to the body surface of the broodstock. The nylon cages had inner netting with 16-ply/24 mm KK & outer netting with PE knotted, 1.5 mm/38 mm KK.

The facility has two FRP speed boats propelled with 40HP outboard motor, scuba diving equipment and accessories for skin diving to check net cages, anchors, etc. on a regular basis. Additionally, there are two wooden floating working platforms measuring 5 m in length and 5 m in width, which are used to store cage materials and provide prophylactic treatments to the grouper brooders and grow-out fishes, along with a wooden floating watchman shed to watch and ward the cage farm.

The candidate species: Tiger grouper

Tiger grouper, *Epinephelus fuscoguttatus*, is also known as flowery cod, Blotchy rock cod, and Brown marbled grouper. It is a protogynous hermaphrodite which inhabits shallow coral reefs and rocky bottoms to depths of 60m. Juveniles are often found in seagrass areas. Like other groupers, the tiger grouper is carnivorous, feeding on small fish and crustaceans. Tiger grouper appears pale yellowish-brown, with 5 vertical series of dark brown blotches that form irregular bars; head, body and fins covered with close-set small brown spots, those on the dark blotches much darker than the spots in between the blotches; a small diffuse black saddle spot on the rear half of the peduncle; 2 or 3 faint dark bars at the side of the jaws. It is one of the more common species in the live reef food fish trade centre in Southeast Asia.

Collection of tiger grouper broodstock from the wild

Tiger grouper broodstocks were collected with the help of local fishermen using hook and line gear in the region of South Andaman Island. The collected broodstocks were transported to the open-sea cage facility in a 200-L fibreglass tank filled with seawater, using a mechanised boat with 100% water exchange per hour. For quarantine, collected breeders were kept in separate cages and treated with 200 ppm formaldehyde for 1 hour to eliminate parasites before being stocked into the respective broodstock cages. Only healthy fish with a body weight of 4 – 9 kg, free from major injuries, were used for stocking. The broodstocks were fed a variety of feeds comprising mackerel, sardines, squid, and cuttlefish.



Fig. 4: Checking of net cages by diving



Fig. 5: Checking of anchors by SCUBA diving



Fig. 6: Jet washing of net cages

Maintenance of grouper broodstock in net cages

The cages were covered at the top with shade-cloth nets to prevent light from entering. The cage nets were periodically replaced with washed nets to minimise biofouling. The cages were regularly checked for any damage, to assess fish behaviour, and to check for the presence of parasites or epibionts. Freshwater bath treatments were provided once a month to reduce the parasite load on the fish. Water quality data, including temperature, pH, salinity, dissolved oxygen, nitrate, nitrite, and ammonia content, were recorded daily at 06: 00 AM at the sea cage site using standard methods. The anchor ropes were cleaned every fortnight to remove any attachment of macrophytes and barnacles.

Cannulation and tagging of Tiger grouper broodstocks

The maturity status of the brooders was determined by the biopsy method. The mature male fish oozes milt from the genital pores when the abdomen



Fig. 7: Checking the maturation status of the female



Fig. 8: Checking the maturation status of the male



Fig. 9: Tagging an RFID tag with a single-shot tag applicator



Fig. 10: RFID tag (Radio frequency identification device)



Fig. 11: Tag reading with an electronic tag reader

is gently pressed from the head down towards the tail (a process called stripping). Whereas the maturity of the female fish was determined by the cannulation method. The cannula was made of polyethylene with a 0.8 mm to 1.2 mm diameter. The length, weight, and sex of each fish were recorded, and the fish were tagged with an RFID tag (Radio Frequency Identification Device).

Spawning of tiger groupers in an open sea cage

Spawning of tiger grouper at the sea cage farm occurs naturally during the new moon phase. One week before the new moon day, the mature male and female brooders were released into a separate net cage in a sex ratio of 1:3 (male: female) for natural spawning. The female weighed 4.3 ± 0.61 kg and measured 70.5 ± 1.6 cm in length, and the male weighed 7.1 ± 0.84 kg and measured 150.2 ± 5.2 cm in length. The cages were provided with a 400 µm happa net to facilitate egg collection. Most spawning occurs late at night, and the fertilised



Fig. 12: Egg collection method in sea cage farm



Fig. 13: Collecting spawned eggs



Fig. 14: Tiger grouper eggs



Fig. 15: Eggs packed in oxygenated bags



Fig. 16: Transportation of eggs by boat

eggs float on the surface. The floating spawned eggs are collected and packed in oxygenated polyethylene bags. These packed eggs are then transported to the hatchery for further larval rearing. The spawning event continues for three to four days from the new moon day.

Hatchery production of tiger grouper

The tiger grouper eggs are transported from the sea cage farm to the hatchery and are stocked in a one-ton FRP tank to settle damaged eggs. The settled damaged/unfertilized eggs are siphoned from the bottom. The floating eggs were carefully removed and stocked in a 100-litre FRP tank to estimate the number of fertilized eggs. After estimation,



Fig. 17: Grouper hatchery facility



Fig. 18: Larval rearing tank



Fig. 19: Nursery rearing tank







Fig. 20: Live feed

the eggs were treated with 1 mg/L ozone for 60 seconds and stocked in Larval rearing tanks at a density of 10 eggs per litre. Hatching took place 18 – 20 hrs at 28-30°C, and after hatching, the tank bottom was siphoned out carefully to remove the unhatched eggs. On the third day, the larvae were fed with copepod nauplii along with enriched super small strain (SS-100-160 µm) rotifer for the first five days. Subsequently, small strain (S-150-200 µm) & large strain (L-200-360 µm) rotifers were fed to the larvae and thereafter, enriched Artemia supplemented with microencapsulated artificial feed was used for larviculture. The water exchange was given as per standard protocol. During larval rearing, DO, ammonia, nitrite, and pH were maintained at the desired levels.

The first successful production of Tiger Grouper (First Time in India) was achieved in September 2009 with a survival rate of 0.4%. Subsequently,



Fig. 21: Larval stages of tiger grouper

the survival rate increased to 1.35% when proper enrichment protocols for live food were followed using HUFA enrichment products. However, the highest survival of 5.5% was recorded in July 2012 by modification in SOP for larval rearing. Once larvae reached size 1-1.2 cm Total Length (TL) (fry stage), the fish were graded twice a week or whenever significant size variation was observed. The fry on attainment of 2.5 to 5 cm size were transferred to nursery tanks and were further reared to 10-15 cm Total Length (TL), which is the ideal size for stocking in floating net cages for grow – out farming to grow up to marketable size.

Grow–out culture of tiger grouper

The Grow–out culture of Tiger grouper was conducted in floating net cages with different mesh sizes. There are 14 HDPE cage rafts in place to culture tiger grouper fingerlings to marketable size. Initially, the 10 cm tiger grouper fingerlings were stocked in net cages with 3 m x 3 m x 3 m dimensions, nylon knotless inner netting (16-ply/16 mm KK & outer PE knotted (1.5 mm/ 38 mm KK) and covered with shading cloth. The stocking of fingerlings was done early in the morning. Initially, the stocking density was maintained @ 15 individuals/cubic meter based on the site conditions. Pellet feed was fed to the fish based on the biomass. Feeding was done both morning and evening until it attained a 300-gm size, and it was restricted to one feeding in the evening until it reached market size. The stocking density of the fish was adjusted based on the fish biomass and size. Periodic size grading was carried out to prevent stunted growth. A freshwater bath was administered while grading the fingerlings to reduce parasite attachment.



Tiger grouper juveniles



Tiger grouper fingerlings



200 gm size tiger grouper



500 gm size tiger grouper

The project has:

- Successfully developed technology for conditioning wild-caught tiger grouper broodstock in net cages.
- Standardised technology for hatchery seed production of Tiger grouper *Epinephelus fuscoguttatus.*
- Demonstration of cage farming of Tiger grouper from the hatchery produced fingerlings.
- Achieved an average of 62% of survival in farming of Tiger grouper in floating net cages and attained 5.5 % of survival for hatchery production of tiger grouper fries.
- Produced and sold 3.68 tons of tiger grouper marketable-size fish cultured from the net cages from the hatchery-produced fingerlings.
- Conducted a hands-on training programme in the sea cage farming of Tiger Grouper to SHGs and interested local entrepreneurs.

Significance of the project for A & N Islands

1. An abundant supply of grouper species in the market by aquaculture will ultimately reduce fishing pressure on high-value species like Humpback grouper, Tiger grouper, Coral trout, etc., and endangered grouper species like Giant grouper, Napoleon wrasse, etc., and hence contribute to the conservation of valuable natural resources in the Andaman & Nicobar Islands.

2. There is a good demand for live groupers in Southeast Asian countries. The proximity of the Andaman to Southeast Asian countries will enable farmers to produce live groupers to earn a good income. The availability of many grouper species in the Andaman will also provide greater flexibility in selecting species for culture based on their commercial value in the international live fish trade.







Fig. 22: Harvested market-sized Tiger grouper fish from the net cage

3. The expansion of hatchery and farming operations of groupers in the islands enhance livelihoods and employment. Collection of grouper broodstock and captive brood fish production create well-paid opportunities for both skilled and unskilled workers, while hatchery operations generate direct and indirect employment for local youth.

4. Cage rafts fabricated using locally available materials and local labour provide reliable income, while grouper hatchery and cage-farming technologies offer sustainable livelihood opportunities that can be readily adopted by communities in the Andaman & Nicobar Islands. This helps local economic development and technology adoption.

5. The hands-on training programmes imparted by the Grouper project have initiated farming activities in the A&N Islands.

6. Grouper farming will benefit the farmers immensely. Trained unemployed youth could also take up grouper farming as a self-employment opportunity with assistance from donor agencies. Grouper farming will spur the establishment of new marine finfish cage aquaculture operations in the region and may further cater to the needs of allied sectors such as net manufacturers, fish processors, fish traders, and feed manufacturers. Interested entrepreneurs from the Andaman could be trained to raise fingerlings from fertilised eggs and to engage in grouper aquaculture.

Way forward

The hatchery technology developed by MPEDA-RGCA for seed production of Tiger grouper can help in the establishment of a multi-species marine finfish hatchery in the Andaman Islands. The demonstration of an open-sea cage farm for rearing groupers can encourage more entrepreneurs to invest in farming activities, thereby enabling continuous production and supply and opening avenues for the live fish market. Once a continuous supply system for live groupers from mariculture is established, air connectivity can be facilitated to export marketing of groupers from the islands to the mainland and to international destinations.

References

1. *Baldwin, C.C., Johnson, D., Phylogeny of the Epinephelinae (Teleostei: Serranidae), Bull. Mar. Sci., 52 (1993) 240–283.*
2. *Battaglene, S.C., and Morehead, D.T., Tolerance of striped trumpeter Latris lineata embryos to ozonated seawater, Aquaculture Int., 14 (2006) 421–429.*

3. *Boglione, C., Marino, G., Giganti, M., Longobardi, A., De Marzi, P., and Cataudella, S., Skeletal anomalies in dusky grouper Epinephelus marginatus (Lowe 1834) juveniles reared with different methodologies and larval densities. Aquaculture, 291 (2009) 48–60.*
4. *Buchan, K.A.H., Martin-Robichaud, D.J., Benfey, T.J., MacKinnon, A.M. and Boston, L., The efficacy of ozonated seawater for surface disinfection of haddock (Melanogrammus aeglefinus) eggs against piscine nodavirus. Aquacult. Eng., 35 (2006) 102–107.*
5. *Davis, P.Z.R., The Current Status of the Live Reef Fish Trade for Food: A Review. Report compilation, 159 pp. Available at: http://www.c3.org.uk/Multimedia/Reports/Live%20Reef%20Fish%20Trade.pdf (2001).*
6. *FAO, FishStatJ, a Tool for Fishery Statistics Analysis. FAO Fisheries and Aquaculture Department, FIPS - Statistics and Information, Rome (2013).*
7. *Koven, W., Peduel, A., Gada, M., Nixon, O., Ucko, M., Taurine improves the performance of white grouper juveniles (Epinephelus aeneus) fed a reduced fish meal diet. Aquaculture, 460 (2016) 8–14.*
8. *Liao, I.C., Leano, E.M., The Aquaculture of Groupers. (Published by Asian Fisheries Society, World Aquaculture Society, the Fisheries Society of Taiwan and National Taiwan Ocean University) 2008, ISBN 978-986-01-4331-7.*
9. *Marianne, L., Ching, F.F., Shigeharu, S., Sexual maturation and gonad development in tiger grouper (Epinephelus fuscoguttatus) × giant grouper (E. lanceolatus) hybrid. J. Aquac. Res. Development, 5:2 (2013).*
10. *Nagano, N., Hozawa, A., Fujiki, W., Yamada, T., Miyaki, K., Sakakura, Y., Hagiwara, A., Skeletal development and deformities in cultured larval and juvenile seven-band grouper, Epinephelus septemfasciatus (Thunberg). Aquaculture Res., 38 (2007) 121–130.*
11. *Olanrewaju, A.N., Ajani, E.K., Kareem, O.K., Orisasona, O., Relationship between physico-chemical parameters and reproductive indices of Parachanna obscura (Gunther 1861) in Eleyele Reservoir, Ibadan, Nigeria. Eur. Exp. Biol., 7 (2017) 6–36.*
12. *Rajan, P.T., A Field Guide to Grouper and Snapper Fisheries of Andaman and Nicobar Islands. (Published by Director, Z.S.I.) 2001, ISBN: 81-85874-40-9.*
13. *Rimmer, M.A., McBride, S., and Williams, K.C., Advances in Grouper Aquaculture. ACIAR Monograph No. 110. [Australian Centre for International Agricultural Research: Canberra] (2004).*
14. *Sim, S.Y., Rimmer, M.A., Toledo, J.D., Sugama, K., Rumengan, I., Williams, K., Philips, M.J., A Guide to Small-Scale Marine Finfish Hatchery Technology. (Network of Aquaculture Centres in Asia-Pacific: Bangkok, Thailand) 2005.*
15. *Song, Y.B., Oh, S.R., Seo, J.P., Ji, B.G., Lim, B.S., Lee, Y.D., and Kim, H.B., Larval development and rearing of longtooth grouper Epinephelus bruneus in Jeju Island, Korea. J. World Aquacult. Soc., 36 (2005) 209–216.*
16. *Sugama, K., Rimmer, M.A., Ismi, S., Koesharyani, I., Suwirya, K., Giri, N.A., Alava, V.R., Hatchery Management of Tiger Grouper (Epinephelus fuscoguttatus): A Best-Practice Manual. ACIAR Monograph No. 149. (Australian Centre for International Agricultural Research: Canberra) 2012, pp. 66.*
17. *Thampi Samraj, Y.C., Jayagopal, P., Thinesh Santhar, D., Damodar, P.N., and Michael, A. Rimmer, Deformities in tiger grouper culture in India. Aquaculture Asia Pacific (2011) 7–2.*
18. *Williams, A., Begg, G., Pears, R., Garrett, R., Larson, H., Griffiths, S., Lloyd, J., Groupers. Key Species: A Description of Key Species Groups in the Northern Planning Area. (National Oceans Office, Hobart, Australia) 2004a, pp. 147–155.*
19. *Yashiro, R., Status of Grouper Breeding and Culture in Thailand. (Published by National Institute of Coastal Aquaculture, Thailand, Kaosan Road, Soi I, Muang, Songkhla 90000). Available at: http://library.enaca.org/Grouper/Research/Breeding/2000/0803.htm#_ftn1.*

penver

PRODUCTS LIMITED



Penver Products Limited is a diversified, vertically integrated company with over 25 years of experience across the seafood value chain.

CERTIFIED AND RESPONSIBLE PRODUCTION

asc · HACCP · BAP · IFS Food · BRC Food · amfori BSCI · FSSC 22000

FROM CATCH TO PLATE CONTROLLED AT EVERY STAGE

Feed Distribution · Farming · Processing

Export · Import · Distribution

taste matic



Carrying this legacy forward, Tastematic Foods Inc. brings high-quality, value-added seafood closer to customers, with a shared commitment to quality, innovation, sustainability and care.



penver PRODUCTS LIMITED · taste matic

penverproducts.com
info@penverproducts.com
+91 478 283 2200

HAMEED

MARINE PRIVATE LIMITED

Manufacturers and Exporters of Fishmeal and Fish Oil



FISH MEAL



FISH OIL



GMP+

SGS ISO 22000 : 2018

SGS

ISO ISO:9001-2015

ISO ISO:14001-2015

OFFICE:
27/1, RASAK ROAD,
EDALAKUDY,
KOTTAR, NAGERCOIL-629002
KANYAKUMARI DISTRICT.
INDIA.
Email: azif@hameedmarine.com
hameedonsite@gmail.com

FACTORY:
21/D, IRUKKANDURAI-627106,
RADHAPURAM TALUK
THIRUNELVELI DISTRICT,
INDIA.
Mob: 090808 24906, 094431 26047
Web: www.hameedmarine.com

JENEFA INDIA

Manufacturer & Exporter of Steam dried Fish Meal & Fish Oil





SCAN ME!

REGISTERED OFFICE
1/54B, Indira Colony, Vannarapettai,
Tirunelveli - 627 003, Tamilnadu, India.
Mob : 94431 50182
Email : venkatesh@jenefaindia.net

FACTORY ADDRESS
SF No-764/1, 2 & 3, Vadakku Karacheri Village - 628601.
Srivaikundam (TK), Thoothukudi (Dt),
Tamilnadu, India.
Email : jenefaindiafactory@gmail.com

www.jenefaindia.com

Status and future strategies of Mud crab aquaculture

Dr. D. Kannan*
Sr. Scientific Officer, MPEDA –RGCA Mud Crab Hatchery Project

Introduction

Mud crab aquaculture has emerged as one of the most promising sectors within coastal and brackish water aquaculture in India, particularly in mangrove-associated ecosystems. The high demand for live mud crabs in both domestic and international markets, along with their premium market price, has spurred interest in their culture across several coastal states, including Andhra Pradesh, West Bengal, Odisha, Tamil Nadu, Maharashtra, Kerala, and the Andaman & Nicobar Islands. Among the species cultured, *Scylla serrata* is highly prized for its rapid growth, large size, superior meat quality, and strong export potential, making it a lucrative option for farmers seeking higher returns in coastal aquaculture. Mud crabs are among the most economically important crustaceans in India, contributing significantly to both domestic consumption and export markets.

Despite this potential, the expansion of mud crab aquaculture faces significant challenges. Heavy reliance on wild seed collection, indiscriminate harvesting of juveniles and brooders, and the lack of hatchery and feed technologies have put immense pressure on natural populations. Unsustainable harvesting practices, such as collecting crabs regardless of size, reproductive status, or physiological condition, have led to declines in wild populations.

MPEDA – RGCA The Central Aquaculture Genetics, Pathology and Food Testing Laboratory (CAFPFTL) had confirmed that only two species, *Scylla serrata* and *Scylla olivacea*, are commonly found along the Indian coastline (Mandal *et al.*, 2014a; 2014b). Both species are highly sought after in international markets; however, S. serrata dominates aquaculture in India owing to its superior quality and higher market price.

Grow-out culture of mud crabs in earthen ponds

Mud crab (*Scylla* spp.) farming in India began in the early 1980s with low-density stocking of wild juveniles in polyculture systems alongside fish or shrimp, using cages, pens, and small ponds for 4–8 weeks. Over time, mud crab aquaculture has expanded in coastal states such as Andhra Pradesh, West Bengal, Tamil Nadu, Odisha, and Kerala, with *Scylla serrata* as the preferred species due to its rapid growth and minimal damage to pond infrastructure. In some brackish-water farms, particularly in Andhra Pradesh, crab instars are now stocked alongside Black tiger shrimp (*Penaeus monodon*) to maximise resource utilisation. Grow-out culture typically uses brackish-water earthen ponds in mangrove areas or abandoned shrimp ponds, with net enclosures to prevent crab escape and the intrusion of unwanted species. Nursery-reared crablets are preferred and generally reach marketable sizes of ≥500 g within 6–7 months, while an alternative strategy involves initial rearing of juveniles in small ponds before transfer to larger grow-out ponds.

Pen culture of juvenile crabs has also become increasingly common, using HDPE net pens (20 × 10 × 1.2 m) with 10 mm mesh for 4–5 months of growth. This method enables easier monitoring, selective harvesting, and size-based segregation,

*Corresponding author email: kannan.rgca@mpeda.gov.in



Nursery culture of mud crab



Pen culture of mud crab



Soft shell crab culture



Open pond crab culture

improving production efficiency. Additionally, transporting crablets with wet mangrove leaves helps reduce stress and mortality during handling and stocking. Together, these practices have significantly enhanced the productivity, sustainability, and economic viability of mud crab aquaculture in India.

Soft-shell crab production in India

Soft-shell crab farming is an emerging niche sector in India, practised mainly on an experimental scale using perforated plastic boxes in tide-fed ponds. Newly moulted crabs are harvested and processed for export to high-value markets such as Japan, the USA, the Republic of Korea, and Southeast Asia. MPEDA-RGCA has promoted this practice through training and demonstration trials, which have yielded encouraging results.

India is one of the leading exporters of live mud crabs globally. Major export destinations include China, Singapore, Malaysia, Taiwan, and the USA. Live crabs fetch premium prices, often exceeding Rs. 2,500 per kg for large-sized individuals, making mud crab aquaculture a highly lucrative enterprise.

Establishment of Mud crab hatchery by MPEDA – RGCA

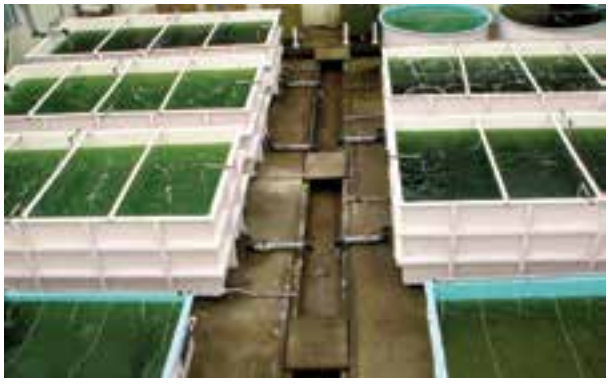
The Marine Products Export Development Authority (MPEDA), through the Rajiv Gandhi Centre for Aquaculture, established a pilot-scale mud crab hatchery in 2004 at Thoduvai, Nagapattinam District, Tamil Nadu. The hatchery initially adopted technology from SEAFDEC/AQD in the Philippines, which was subsequently refined and adapted to Indian environmental conditions. Based on the experiences during the pilot-scale operation, the pilot-scale mud crab hatchery facility was upgraded to a full-fledged hatchery and inaugurated in 2013. At present,



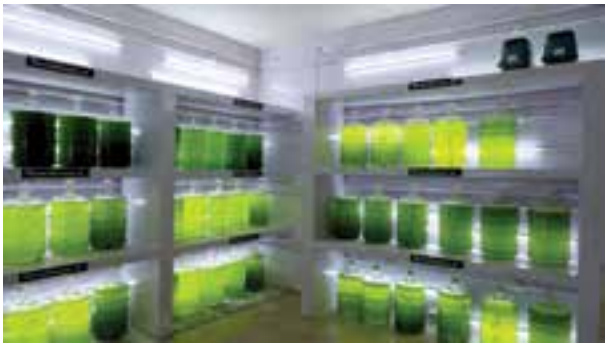
MPEDA –RGCA Mangrove Mud Crab Hatchery



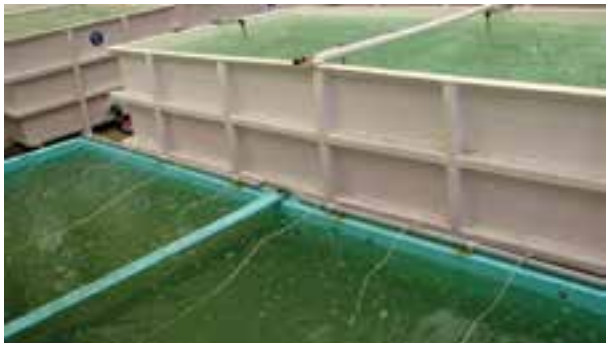
Larval rearing unit



Outdoor Microalgae culture



Indoor micro algae culture unit



Rotifer Mass culture

the MPEDA-RGCA mud crab hatchery has a production capacity of over 1.5 million disease-free seeds annually, significantly contributing to the crab aquaculture sector and also playing a pivotal role in the conservation of natural stocks.

Hatchery seed production of Mangrove Mud Crab

Healthy, hard-shelled female mud crabs weighing 500–800 g are collected from key coastal regions of Tamil Nadu, to serve as broodstock.



1. Wild broodstock collection



2. Transportation of wild-caught broodstock



3. Quarantine



4. Selection of broodstock



5. Berried crab



6. Hatching tanks



7. Newly hatched larvae



8. Larval rearing tanks



9. Crab instars



10. Packing of crab seeds



11. Culturing of crab seeds in the earthen ponds



12. Harvested live crabs from the pond for export

Upon arrival, crabs undergo quarantine, formalin treatment, and thorough health screening before being transferred to broodstock holding tanks. Ovigerous females are identified through routine monitoring and placed individually in spawning tanks to ensure controlled breeding. Newly hatched *S. serrata* zoeae are stocked at 70–80 per litre and fed rotifers (10–20 per mL) and Artemia nauplii (0.5–1 per mL). Water quality is maintained by replacing 30–50% of tank water every three days or as needed. Zoea 5 larvae are partially transferred to separate tanks, while the rest remain in the original tanks until reaching the crab instar stage. Larval development from



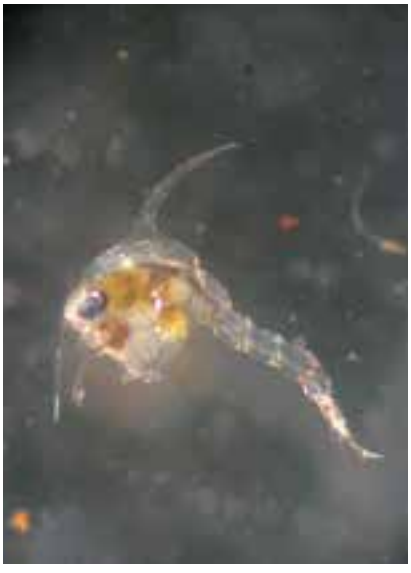
Wild-caught broodstock



Berried crab



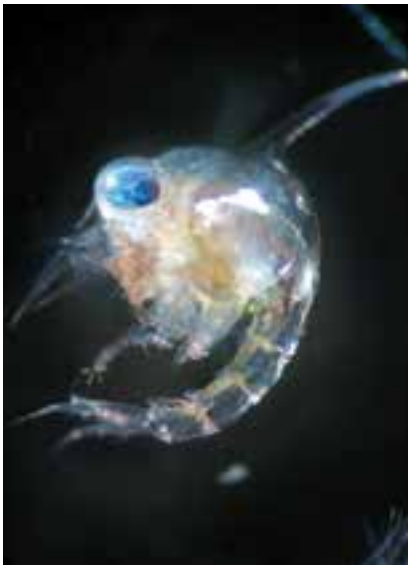
Zoea 1



Zoea 2



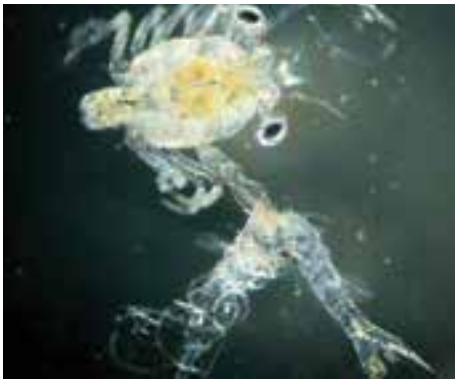
Zoea 3



Zoea 4



Zoea 5



Megalopae



Instar

zoea 1 to crab instar takes 28–30 days, with survival rates ranging from 7–10%.

Larval stages of Mud crab

Nursery Rearing of Crablets

Nursery rearing of crablets involves cultivating megalopae or early crab instars to the juvenile stage in brackish-water ponds or creek-based net cages with salinity levels of 15–35 ppt over 30–40 days. Artificial shelters such as PVC pipes, shade nets, and seaweeds (*Gracilaria* spp.) are provided to reduce cannibalism. Crab instars are stocked at approximately 30 individuals per square meter in 5 × 4 × 1 m net cages and fed natural foods supplemented with Artemia or finely chopped fish. Crablets reaching 1.5–4.5 cm carapace width are harvested for grow-out culture and transported in baskets or containers with moist materials to maintain humidity, supplying farmers and fisheries institutions across coastal states under RGCA–MPEDA programmes.

To date, the facility has produced a total of 13.74 million crab instars/crablets, which have been supplied to 1446 farmers and other stakeholders. Despite these achievements, there remains a significant shortfall in the supply of crab seeds relative to the demand from the aquaculture industry, highlighting the need for further scaling up of hatchery production.

The mud crab hatchery technology developed by the Rajiv Gandhi Centre for Aquaculture (RGCA) has been awarded a patent by the Controller General of Patents, Designs, and Trademarks, Government of India, valid from 2011 to 2030.

Conclusion

Sustainable mud crab aquaculture in India depends on ensuring a reliable supply of high-quality, disease-free seed and promoting organized farming practices. The MPEDA–RGCA hatchery technology has established a strong foundation for the development of the mud crab farming sector by producing and supplying quality crablets to farmers across the country. Through collaborations such as the UNDP–ECRIC project in Odisha, RGCA has supported Women Self-Help Groups and coastal farming communities by supplying 86,932 crablets and providing scientific and technical guidance for mud crab grow-out farming. These initiatives have contributed to livelihood enhancement, income generation, and capacity building among coastal and tribal communities, particularly women. Further expansion of hatchery infrastructure, nursery facilities, and biosecure farming practices will help meet the growing demand for crab seed while ensuring the long-term sustainability and commercial growth of the mud crab aquaculture industry in India.

References

1. *Mandal, A., Mathews, V.M., Sobha, P.S., Anjali, K.M., Gopalakrishnan, A., Ganesh, K., Arulraj, S., Pandiarajan, S., & Thampi Samraj, Y.C. 2014a. Molecular markers reveal only two mud crab species of the genus Scylla (Brachyura: Portunidae) in Indian coastal waters. Biochemical Genetics, 52: 338–354.*
2. *Mandal, A., Mathews, V.M., Anjali, K.M., Sobha P.S., & Thampi Samraj, Y.C. 2014b. Identification of Indian mangrove mud crab Genus Scylla spp. (Brachyura: Portunidae) using RAPD and PCR-RFLP markers. Journal of Shellfish Research, 33(2): 503–510.*
3. *Sathiyaraj, G., Babu, B., Mithun, R., Saravanan, M., Velmurugan, K., Ruban, L., Mandal, A., Kandan, S. & Prabhu, N.M. 2023. Reovirus occurrence in mud crab farming systems and wild-caught brooders located in the eastern coastal area of India. Aquaculture International, 31(2): 739–758.*
4. *Thampi Samraj, Y.C., Mandal, A., Ganesh, K., Arulraj, S., Pandiarajan, S. & Jaideep, K. 2013. Status of mud crab industry in India. In: E.T. Quinitio, F.D. Parado-Estepa, Y.C.*
5. *Thampi Samraj & A. Mandal. Eds.2013. Proceedings of the International Seminar-Workshop on Mud Crab Aquaculture and Fisheries Management. Kerala, India, RGCA-MPEDA, New Delhi, Government of India.*

ESSEX MARINE

SEAFOOD PROCESSOR & EXPORTER

"EXPORT HOUSE" (Govt. Of India Approved)
(Registered with MPEDA and approved by EIC)

16+ YEARS OF PREMIUM **SEAFOOD PRODUCTS**

BRCGS SMETA FSSC 22000



State-of-the-art
Cold Storage facility
UNDER THE BRAND OF
DE SENS COLDSTORE











- EXPORT-APPROVED PROCESSING PLANT
- QUALITY CONTROL LABORATORY
- HYDENIC PROCESSING FACILITY



ESSEX MARINE LTD

CALL US!
+91-33-2262-7929

EMAIL ADDRESS
essexmarineltd@gmail.com

Visit Website: www.essexmpl.com

19 Pollock Street, 7th Floor, Room No.7, Kolkata – 700001

EVEREST
SEAFOODS PVT. LTD.



Sourced Responsibly

Processed Hygienically

Delivered Globally.





EVEREST SEAFOODS PRIVATE LIMITED
Plot no 413&414 Part, Industrial Area
Baikampady, Mangalore-575011
email :- everestseafoodsmlr@gmail.com
phone:- +91 98454 28790, +91 98200 92113

Supplying Quality
Seafoods
to The World

quality is our promise the world is our market

Equipping India for sustainable seafood production: CMFRI leading the way

Charles Jeeva, Boby Ignatius *and* **Grinson George***
ICAR- Central Marine Fisheries Research Institute



During the course of over 78 years, the ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI), has emerged as a leading tropical marine fisheries research institute in the world. During the first half of the five decades of its existence, the CMFRI devoted its research attention towards the estimation of marine fish landings and effort, taxonomy of marine organisms and the bio-economic characteristics of the exploited stocks of finfish and shellfish. This research effort contributed significantly to India's marine fisheries development from a predominantly artisanal, sustenance fishery till the early sixties to that of a complex, multi-gear, multi-species fishery. It was CMFRI that helped India manage its critical resources that contributed raw material to the seafood sector. During the early nineteen seventies, the CMFRI realised that capture fisheries production alone would not be able to cater to the needs of our growing population and it became very clear that there was a need to supplement capture fisheries with production from coastal mariculture and sea farming. Subsequently, with the infrastructure and expertise built over half a century and looking towards the future needs of the nation, CMFRI began to undertake research in new areas such as marine finfish farming, biotechnology and biodiversity. Along with this, fisheries management plans for

*Corresponding author email: director.cmfri@icar.org.in

each maritime state were formulated. In the mariculture front, commercial bivalve farming became a popular women empowerment programme in the beginning of this century. The new knowledge and technologies developed in finfish farming have been transferred to end users and many cutting-edge technologies have been patented in marine biotechnology. The institute's multidisciplinary approach to research in marine capture and culture fisheries has won it recognition as a premier institute comparable to any well-established marine laboratory in the world.

Trends, challenges and pathways to sustainable growth

India occupies a prominent position in the global fisheries sector, contributing nearly eight percent to the world's total fish production (FAO, 2024 estimates), ranking among the top producers worldwide. Despite the rapid expansion of aquaculture, marine capture fisheries continue to serve as a cornerstone of the nation's economy, supporting the livelihoods of millions of coastal communities. A key role in monitoring marine fisheries is undertaken by ICAR-CMFRI, which has developed a robust and adaptive system for data collection and assessment. This system is built on a scientifically validated survey design that ensures reliability and consistency through trained, independent field personnel. The adoption of a two-stage stratified random sampling approach enables comprehensive coverage of landing centres, encompassing 1258 locations along the mainland coast and in the Andaman and Nicobar Islands. Through this structured framework detailed information on fishing operations is systematically recorded, providing valuable insights into the status and trends of marine resources.

Ensuring sustainable fishing and livelihood security of coastal communities

As the government's core knowledge partner for marine resources, CMFRI's role is to provide science-backed governance strategies. It helps the government by establishing scientifically informed reference points, such as maximum sustainable yield (MSY), that integrate complex biology, socioeconomics, and mathematical modelling. Sustainable harvest is the cornerstone of livelihood security. CMFRI fundamentally enables the government's sentinel duty by providing the 'big picture' of fish stock status, which directly guides regulatory decisions, such as seasonal closures and minimum legal size (MLS). It bolsters compliance through multi-stakeholder capacity development programmes, stakeholder consultations, and on-the-ground extension activities. Critically, CMFRI's mariculture technologies (e.g., open sea cage farming) are proving to be viable, alternative livelihood options that augment coastal incomes. Through specialised units like the Science and Technology Innovation Hub, Agricultural Technology Information Centre (ATIC), and Krishi Vigyan Kendras (KVKs), CMFRI provides customised, gender-sensitive support, acting as a catalyst for forming successful self-help groups (SHGs) and farmer producer organisations (FPOs).

Support for MSMEs, start-ups, and artisanal fishers access technology and improve their income

CMFRI's support for MSMEs, start-ups, and artisanal fishers is centred on democratising access to high-value, scalable technology to transform them from subsistence to an enterprise model. ICAR-CMFRI extends a wide range of interventions to MSMEs, and start-ups engaged in coastal aquaculture and other promising entrepreneurial activities. For small and artisanal fishers, CMFRI has developed and popularised low-cost, climate-resilient technologies like cage farming of high-value species such as sea bass, cobia and pompano, and scalable seaweed cultivation. These are direct, scientifically validated avenues for income diversification away from pressure on capture fisheries. The Institute has commercialised its technologies, such as seaweed- and mussel-based nutraceutical products, breeding and seed production protocols, feed manufacture



ICAR-CMFRI's participation in Seafood Expo Bharat (2025) and other seafood fairs showcasing its technological support for seafood export

technologies, black soldier fly-based waste valorisation technologies, etc., to budding start-ups, hatchery units and business houses. The Institute also plays a key role in forming new farmer-producer organisations/ fish farmer-producer organisations by acting as a producer organisation promoting institutions and in securing financial support from banking institutions, such as NABARD. The Institute also supports MSMEs and FPOs in establishing direct market linkages.

Key challenges faced by India's marine fishers today

The most profound challenge is the changing marine environment. Climate change manifested as rising sea surface temperatures, ocean acidification, and unpredictable weather is directly altering fish stock status and migration routes. This is compounded by the degradation of essential habitats like coral reefs and mangroves and chronic pollution from industrial waste and plastic. Frequent extreme weather events severely limit viable fishing days and increase operational risk. This vulnerability undermines the economic security of the majority, who are small-scale fishers. There is a marked reduction in profitability due to increasing operating expenses (e.g., fuel) and intense competition for dwindling resources. Insecure, fluctuating incomes lead to vicious debt cycles due to low access to formal credit and insurance coverage to contain risks. New global dynamics, such as the strict international norms for traceability and hygiene, currently a major bottleneck for exports, add further complexity and cost.

Beyond the milestone: Strategic resilience in Indian seafood exports

The latest figures from the Department of Commerce reveal a historic achievement for India's marine sector: exports have reached an all-time high of ₹72,325.82 crore ($8.28 billion) for FY 2025–26. With volumes touching 19.32 lakh

metric tonnes, the industry has demonstrated immense scale and operational strength. However, these record-breaking numbers exist alongside a complex trade environment. While we celebrate this growth, we must also address the "U.S. factor" and what it means for our long-term stability. India's seafood sector has proven its ability to scale. The challenge for the coming year is to ensure this scale is matched by strategic agility. By leaning into the diversification already evident in the FY 2025–26 data, we can transform our industry from one that reacts to global trade barriers into one that proactively defines its own global footprint. The record is a milestone, but the strategy is the map. Let us continue to navigate toward a more diversified and resilient future (courtesy: MPEDA).

Seafood sector eyes value addition, new markets amid rising US tariffs

Industry leaders and policy makers call for urgent market diversification, enhanced value addition, and technology-driven innovation to sustain the country's seafood trade. India's seafood export sector is facing a major setback following the recent US tariff. Exports to the US, India's largest seafood market, fell nearly six per cent in April-September 2025, while shipments to China, Vietnam, and Thailand surged, indicating a shift towards Asian markets. A robust technology-driven startup ecosystem in the fisheries sector is very much required, integrating the efforts of researchers, technologists, industry, and policymakers to drive innovation and value addition. Focusing on re-processing and producing high-value products to increase export revenue is the need of hour. India must move beyond exporting bulk raw seafood and tap into the potential for diversified value-added products, ranging from breaded squid rings and surimi products to a variety of ready-to-eat seafood fillets. India's current value-added seafood exports stand at USD 742 million, lagging behind competitors such as China, Thailand, Vietnam, Ecuador, and Indonesia. Exclusive aquaculture zones and fast-tracking Free Trade Agreements (FTAs) to regain competitiveness in global markets should be declared. The US has long been India's biggest market for shrimp exports, which constitute the bulk of the country's seafood trade. However, the new tariff regime, coupled with sustainability and traceability challenges, has disrupted trade flows and affected export earnings.

Market diversification, FTAs key to protecting the livelihoods of coastal farmers

Our immediate priority is to drive market diversification, fast-track FTAs, and move toward high-value products to safeguard the livelihoods of millions of coastal farmers and workers. The recent US tariffs on shrimp highlight a serious vulnerability in depending on a single product form (frozen bulk) and a single market. Shifting to a diversified, high-value product basket is now essential to de-risk exports and capture market share in fast-growing economies. There is a growing global demand for hygienic, fully traceable, and conveniently packaged seafood, particularly in major markets like the US, the European Union (EU), and Japan. By focusing on processing, India can better meet these stringent quality and traceability standards.

Mandatory fishmeal traceability amid rising demand

ICAR-CMFRI is pushing for a regulatory overhaul of the fishmeal sector, demanding end-to-end traceability to combat IUU fishing and unsustainable sourcing. A first-of-its-kind, CMFRI's pilot study on deep-sea mesopelagic species adds a rare scientific dimension to what is shaping up as a pivotal moment for India's aquaculture supply chain, found mesopelagic deep-sea species could be economically viable for fishmeal production, pending further validation. CMFRI has called for mandatory traceability in India's fishmeal and fish oil sector. End-to-end traceability from harvest to consumption is seen as critical to curbing IUU fishing and ensuring market credibility. CMFRI is committed to detailed stock assessments to guide future sectoral interventions. Global markets' growing emphasis on sustainability is

increasing pressure on Indian producers to align practices with international standards.

Mesopelagic resources as a promising alternative

There is huge potential for mesopelagic resources, deep-sea species found in midwater zones, as an underutilised and promising alternative raw material for fishmeal production. A pilot study led by CMFRI, described as the first of its kind in India, indicated these resources could be economically viable, though experts called for further scientific validation before large-scale adoption. Diversifying raw material sources is critical to reducing pressure on conventional fish stocks. that growth in the sector must be evidence-based. And CMFRI's push for mandatory traceability is a direct acknowledgement of that gap. The IUU fishing problem is not peripheral, it undermines stock assessments, distorts market prices, and erodes India's credibility in sustainability-conscious export markets. The mesopelagic pilot is scientifically intriguing, but the jump from a first-of-its-kind study to commercial-scale sourcing requires rigorous stock assessment that could take years. The more immediate challenge is whether the national traceability framework, which officials are urging industry to adopt, has the enforcement teeth to move beyond voluntary compliance.

India's performance in implementing the blue economy framework

India's implementation of the blue economy framework has shown significant early momentum, primarily through a strategic focus on port-led development and maritime logistics. This is crucial for trade and immediate economic growth. However, to truly realise its potential, especially for coastal communities, we need a more balanced portfolio. Marine fisheries, mariculture, and coastal tourism must be accorded a higher policy and investment priority, as they are the direct drivers of livelihood security. Furthermore, cutting-edge sectors like marine renewable energy and blue biotechnology are still requiring greater policy support and targeted investments.

CMFRI not only developed technologies but also created the required manpower from time to time in different forms. The Post Graduate Programme on Mariculture which defined India's growth in the fisheries sector by providing capable manpower and other HRD initiatives from CMFRI always helped us in providing qualified manpower to the sector. Today, we adequately embrace ourselves to the frontline research without destabilising our fundamental research capabilities for ensuring sustained fish production from the marine environment.



100 YEARS | BAFCO

BAWA FISH MEAL & OIL CO



QUALITY PROCESS ENSURING QUALITY:

APPROVED:

mail@bawafishmeal.com
bawafishmeal@gmail.com
riaz@bawafishmeal.com

Registered Office:
Bawa Fishmeal & Oil Co.,
4th Floor, Paradigm Plaza
AB Shetty Circle, Mangalore - 575001

www.bawafishmeal.com

Managing Director

DATLA SUBBA RAJU (BUCHIBABU)

MUMMIDIVARAM, MLA(WIP),
AP STATE HATCHERIES PRESIDENT (ASSHA)

DSR HATCHERIES

Quality Aquaculture Starts Here

CAA Registered

Regn.No-56-3(89)/2012

CAA Registered and SHAPHARI Certified Hatchery

About Us :

Leading Hatchery Specializing In High-quality Seed Production
With Strong Focus On Consistency, Survival Rate, And Healthy Growth.

OUR STRENGTHS

- High Quality & Disease-free Seed
- Advanced Hatchery Technology
- Strict Quality Control & Testing
- High Survival & Growth Rate
- Timely Delivery & Logistics Support

Konapapapeta, U. Kothapalli Mandal,
KAKINADA - 533 449, Kakinada Dist, Andhra Pradesh
dsrhatcheries@gmail.com
✆ 94407 22224, 98857 71502



BISMI GROUP OF COMPANIES

We guarantee the traceability through vertical Integration















"Through Our value based vertically integrated chain of
Shrimp Hatchery, Shrimp Feed & Fish meal manufacturing units
BISMI ensures protein enriched quality happy shrimp for the global populace"

R.O. : DEEN COMPLEX, O.S.M. NAGAR, MAYILADUTHURAI - 609001.
MAYILADUTHURAI DIST., TAMILNADU, INDIA .
Tel : 04364 - 229134 / 224619 / 224967
e.mail : bismiaqua@gmail.com www.bismigroups.in

From waste to worth: Upcycling fish and shrimp leftovers into industrial biomaterials

Nilesh Gandhi*
Director, Nizona Marine Products Pvt. Ltd., Mumbai

India's seafood processing sector generates millions of tonnes of by-products every year — fish scales, shrimp shells, skins, and bones — most of which are discarded or sold at minimal value as animal feed. Yet these same materials are the source of two high-value industrial biomaterials: hydrolysed collagen and chitosan. Both are natural polymers with proven commercial applications spanning water treatment, agriculture, healthcare, and sustainable packaging. The systemic failure to recover and valorise these by-products represents one of the largest untapped opportunities in India's blue economy. Addressing it requires not just individual enterprise, but a coordinated shift in how the sector treats processing waste — as a resource stream, not a disposal problem.

Here's the thing about India's seafood industry. We're a global powerhouse. We process millions of tonnes of fish and shrimp every year, shipping to markets across Asia, Europe, and the Americas. But for every tonne of fish that goes out the door as fillets or frozen product, a significant portion stays behind: scales, skin, bones, heads. For shrimp, the shells and heads can make up a large share of the animal's total weight. For decades, most of this material got dried, dumped, or sold cheaply as animal feed. It was treated as an afterthought. The cost of doing business.

That thinking is changing. And the opportunity it's unlocking is enormous.

The two materials at the centre of this shift are collagen and chitosan. Collagen comes mainly from fish skin and scales. Chitosan is extracted from the chitin in shrimp and crab shells. Both are natural polymers: biodegradable, non-toxic, and produced by nature in vast quantities. Industries around the world are discovering they can do things with these materials that, until recently, required synthetic chemicals. The question for India isn't whether there's a market. There clearly is. The question is whether we'll be the ones supplying it.

The fourth dimension of blue foods



Fig. 1: From raw material to industrial asset: Unrefined marine by-products (left) are bio-refined into high-purity chitosan and collagen powders (right) for global industrial distribution

We've always known blue foods (fish, shrimp, molluscs, algae) are good for the world. They feed billions of people. They support livelihoods for coastal communities. And compared to land-based livestock, they generate a fraction of the greenhouse gas emissions. Three strong reasons to grow the sector. Three well-understood pillars. But there's a fourth dimension emerging now.

*Corresponding author email: ng@nizona.co

It's about what happens to everything that's left over once the food has been harvested and processed. That question, which used to have a very boring answer, now has an exciting one.

Globally, aquaculture produces over 220 million tonnes of production each year. Of that, nearly 100 million tonnes of by-products (shells, scales, skins, bones) have traditionally been discarded or used in low-value applications. That's not a waste. That's a biological goldmine we've been ignoring. Through biorefining, these side streams become collagen and chitosan: materials that are finding real, urgent, commercial applications in water treatment, agriculture, manufacturing, healthcare, and environmental cleanup. India sits right at the centre of this. We just haven't fully acted on it yet.

The PFAS problem: Why shrimp shells are part of the answer

If you haven't heard of PFAS, you will soon. PFAS, short for per- and polyfluoroalkyl substances, are a class of synthetic chemicals that have been used for decades in food packaging, non-stick coatings, textiles, and firefighting foams. They're incredibly persistent. They don't break down in the environment. They don't break down in the human body either. That's why they're called "forever chemicals." And they're now showing up in drinking water, soil, and human bloodstreams around the world, including in India.

Regulators are cracking down. The US EPA and the European Union are both tightening restrictions on synthetic fluoropolymers, and industries that've relied on these chemicals for



Fig. 2: Chitosan-based hydrogels offer a powerful, bio-based solution for industrial wastewater treatment, capable of removing persistent "forever chemicals" like PFAS with remarkable efficiency

years are scrambling for alternatives. This is where chitosan comes in, and it does so in two distinct ways.

First, modified chitosan can be used to create PFAS-free coatings for food packaging and textiles. It delivers the water resistance and grease-barrier properties that manufacturers need, without the environmental persistence that makes PFAS so harmful. Second, and this is remarkable, chitosan-based hydrogels can remove PFAS from contaminated water, with research showing removal efficiencies above 98%. Think about that. The same shrimp shell that was discarded in a processing facility could end up cleaning water that industrial chemicals have spent decades contaminating.

This isn't just an environmental story. It's a market signal. Demand for PFAS-free solutions is growing fast, and the raw material to answer that demand is sitting in shrimp processing facilities across coastal India right now.

What these materials can actually do

Collagen and chitosan aren't one-trick materials. Their applications span a remarkable range of industries.

Fish-derived collagen is finding its way into nutraceuticals, cosmetics, wound care products, and biomedical applications. It's particularly well-suited for global markets because it carries no risk of bovine or porcine contamination, making it acceptable across a wide range of dietary and religious contexts. India's fish processing industry generates enormous quantities of scales and skins that are currently underused. Converting them into hydrolysed collagen peptides is a direct route into the booming global wellness and healthcare market.

Chitosan's range is still broader. In water treatment, it acts as a natural coagulant, binding suspended particles, heavy metals, and other contaminants to clean industrial wastewater without the toxicity of many conventional chemical treatments. In agriculture, it acts as a bio-stimulant, supporting plant immunity and soil health, thereby reducing the need for synthetic, fossil-fuel-derived fertilisers. In manufacturing, marine polymers are being developed as biodegradable alternatives to petroleum-based plastics, materials that perform well but break down naturally rather than persisting in the environment for centuries. And across healthcare, collagen and chitosan are turning up in wound dressings, haemostatic agents, drug delivery systems, and post-harvest food coatings that extend shelf life without chemical preservatives.

We don't need new inputs. We need to use what we already have.

Here's what makes this transition different from most "green" alternatives. It doesn't ask anyone to do more. It doesn't require new farmland, new water supplies, or new infrastructure investments to grow raw materials from scratch. Unlike corn-based bioplastics, which require additional land and energy to produce, marine biomaterials come from resources already flowing through our supply chains. The fish has already been caught. The shrimp has already been processed. The by-products are already there.

The transition to marine biomaterials does not ask India's seafood sector to take on something new. It asks the sector to stop discarding the second half of what it already creates. Every shrimp shell that becomes chitosan rather than landfill is value recovered from a system that has already paid the cost of generating it. Every fish scale that becomes collagen rather than fish meal is a step up the value chain, at no additional environmental cost. The question for processors, policymakers, and industry bodies alike is how to build the infrastructure — collection, processing, quality standards, and market linkages — that makes this recovery systematic rather than exceptional.

The people this could change

It's easy to talk about biomaterials as an industrial or environmental story. But it's also a human one. In many of India's coastal processing facilities,



Fig. 3: Strengthening coastal supply chains: Value addition in marine by-products provides formal, traceable employment and improved livelihoods for women workers in India's coastal communities

it's women who do much of the sorting, cleaning, and by-product preparation. It's unglamorous, low-visibility work. And for a long time, it's been poorly compensated, because the material being handled wasn't considered valuable.

That changes when by-products become the starting point of a formal biomaterial supply chain. The labour becomes traceable. The skills become recognised. The income improves. A well-executed transition to marine biomaterials isn't just good for the environment or the balance sheet. It strengthens the communities that have always been at the heart of India's seafood industry.

The conditions are right. The time is now.

The science behind collagen and chitosan isn't new. What's new is that everything else has caught up with it. Regulations are tightening. Export markets are demanding bio-based, traceable inputs. Industries are actively seeking alternatives to petrochemical-based synthetics. And bio-refining technology has improved to the point where consistent, commercial-scale production is genuinely achievable.

India's seafood sector has spent decades earning a global reputation for quality and reliability. Those are exactly the capabilities that'll matter in the marine biomaterials space. The infrastructure's there. The raw material is there. The expertise is there.

The fourth dimension of blue foods isn't on the horizon. It's already here, embedded in the scales and shells that India's seafood processing sector generates every single day. Realising this potential will require coordinated action: investment in bio-refining infrastructure, clear quality standards for marine biomaterials, stronger market linkages between processors and downstream industries, and policy support for by-product valorisation. The raw material advantage is in place. What the sector now needs is the systemic will to use it.

Whatever we produce, we must fully use.

PRECIOUS AQUA

FARMING WITH TIGER PRAWNS

PREMIUM QUALITY • SUSTAINABLE FARMING • HEALTHY SEAFOOD



From Our Ponds
TO YOUR PLATE

PREMIUM QUALITY
Carefully Farmed

SUSTAINABLE PRACTICES
Better for Nature

CLEAN WATER
HEALTHY PRAWNS
Safe & Nutritious

TRUSTED SEAFOOD
For a Better You



• QUALITY YOU CAN TRUST, FRESHNESS YOU CAN TASTE •

BISMI AQUATIC PRODUCTS

Manufacturer & Exporter of Marine Feed Ingredients

Bismi Aquatic Products is a leading manufacturer and exporter of high-quality marine-based feed ingredients. With a strong commitment to quality, sustainability, and international standards, we serve aquafeed and animal nutrition industries worldwide.

OUR PRODUCTS



Fish Meal



Fish Oil



Fish Soluble Paste

#50/1 PAANDUKKUDI ROAD, MACHUR VILLAGE, VATTANAM POST, THONDI -623 409. THIRUVADANAI TALUK RAMANATHAPURAM DIST, TAMILNADU, INDIA.

GSTIN 33AAJFB9021H1ZO

Email: info@bismiaquaticproducts.com

Website: www.bismiaquaticproducts.com

Beyond the frozen block: A life-cycle vision for Indian seafood's next decade

R. Harini, N. Venkatachalapathy* *and* **V. Palanimuthu**
National Institute of Food Technology, Entrepreneurship and Management, Thanjavur
Thanjavur, Tamil Nadu, India

The 8.46-billion-dollar question

In June 2026, the Marine Products Export Development Authority (MPEDA) announced a number that ought to have made every Indian proud. Despite a punishing 50% tariff imposed by the United States, India's seafood exports had climbed to an all-time high of ₹73,890.46 crore, about $ 8.46 billion. Volumes touched 19.72 lakh tonnes. New buyers in China, the European Union and Southeast Asia had stepped in just as old buyers in America stepped back. The sector had not merely survived; it had grown.

And yet, behind that headline lies a quieter story. More than two-thirds of those exports left Indian shores in one form: frozen shrimp, headless and shell-on, packed in cardboard cartons of two-kilogram blocks. By the time those same shrimps reach a supermarket in Tokyo, Berlin or New York, they have been transformed into battered, breaded, marinated, skewered and plated into ready meals. They sell for three, four, sometimes five times what India was paid for them. The value India creates in the pond is real. The value the world creates on the shelf is far greater. The question is no longer whether Indian seafood can grow. It is whether it can move up the value chain.

A walk down a foreign supermarket aisle

Stand in the chilled-food aisle of a large retailer in any wealthy country, and the future of seafood is already visible. There are panko-breaded shrimps in resealable pouches. The tempura prawns are ready in 10 minutes in the oven. Garlic-butter shrimp skewers, marinated overnight, vacuum-sealed for the grill. There are retort pouches of fish curry that need no refrigeration and cook in the time it takes to boil rice. There is sushi-grade tuna in single-portion packs, smoked salmon in ribbons, surimi crab sticks for cold salads, and fish-protein crisps for the gym crowd. There are squid rings dusted in seasoned flour, mussels pre-cooked in white wine, and octopus carpaccio in olive oil.

India's presence in these premium formats is still small, and that is where the next decade of growth lies. Globally, value-added seafood accounts for roughly 18 % of the total seafood market. India's share of that value-added basket has risen from 2.5% to 11% of its exports, worth about USD 742 million. MPEDA's own roadmap is candid: it aims to push that share to 20 percent by 2030, in part by building on the path already proven by Thailand, Vietnam and China, which moved from raw exports to finished food.

Why value must be built across the life cycle

Value addition is a discipline that runs throughout the entire life of the product, from the broodstock pond to the retail shelf, and India's seafood sector is steadily strengthening at every stage.

At the hatchery, specific-pathogen-free brood stock, antibiotic-free feeds, and sound polyculture choices are setting Indian shrimp up for premium markets from the very start. On the farm, growing discipline around stocking density, water quality, and disease management is strengthening residue compliance year on year, the same

*Corresponding author email: venkat@iifpt.edu.in

standard that EU and other premium buyers look for, opening the door to deeper, steadier market access. At harvest, the wider adoption of stress-free protocols and on-board chilling is preserving the firmness and colour that high-end retailers pay a premium for, carrying forward every gain made upstream.

Processing is where this value is shaped into form: battered, breaded, ready-to-eat and ready-to-cook formats built using surimi from low-value fish, retort pouches of regional curries, and marinated portions for Asian cuisines. Packaging carries that value forward. Modified atmosphere and active packaging extend shelf life by days; intelligent indicators confirm that the cold chain has remained unbroken; and sustainable packaging materials are becoming a strong selling point with European retailers rather than a hurdle to clear.

By-products complete the picture, and increasingly, they are where the real upside lies. Shrimp shells are converted into chitin and chitosan for use in cosmetics, biomedicine and water treatment. Fish skin becomes collagen and gelatine. Fish frames become high-protein hydrolysates. What was once waste is fast becoming a second product line, often more profitable than the first.

India is also moving early on the sustainability and traceability work that the world's top seafood markets now expect. The share of value-added products in India's export basket has risen from 2.5% to 11%, worth about USD 742 million, and MPEDA aims to push it toward 20% by 2030. The early work backing that target is already paying off. Life-cycle studies on Indian shrimp farms have found that the older, simpler earthen ponds actually produce 27.4 percent less carbon per tonne of shrimp than the newer plastic-lined ones, a finding that's now feeding straight into farm-level decisions. Certification has moved just as fast. BMR Seafood Group became India's first ASC-certified shrimp farm, and Penver Products and Suryamitra Exim followed soon after as the country's first and second four-star BAP groups, the highest rating the programme gives. Across India and its neighbouring exporters, more than 1,450 farms now hold ASC certificates between them, accounting for close to 14 % of all the farmed shrimp produced worldwide. As more global markets begin treating sustainability and traceability as the baseline, India's early head start gives it room to push further, not just into existing seafood markets, but into the broader shift the world is making toward value-added, sustainable food.

The world has already moved on to sustainable value addition

There is a deeper shift underway in the world's premium seafood markets, and India is well placed to ride it. Buyers in those markets no longer want value-added products alone; they want products they can trust to be sustainable, traceable, low in carbon and fairly produced. Large corporate retailers increasingly ask their seafood suppliers to account for their environmental and social footprint. Certifications such as ASC, BAP and MSC are fast becoming the basic standard a product is expected to meet before it ever reaches a shelf.

This shift plays to India's advantage. The countries that built their value-added seafood industries decades ago did so when sustainability was barely on the agenda, and many are now spending heavily to undo old habits and retrofit cleaner systems. India is building much of its modern processing capacity now, in real time, which means it can design for low water use, renewable energy, full traceability and zero-waste by-product recovery from the very first brick rather than bolting them on later. The EU-grade traceability system, the Japan-grade quality standard, and the clean-energy processing line can be the starting design, not an expensive upgrade. That is the real opportunity in front of the sector: not to catch up with the world's sustainable-seafood leaders, but to build the next benchmark and set the pace others follow.

This modern infrastructure is already a reality on the ground. Backed by the ₹20,050 crore PMMSY scheme, India's approved, active builds include 23,285 hectares of inland ponds, 52,058 reservoir

cages, 27,189 transport units, and 634 value-added enterprise units. This massive, clean-slate capacity is supported by a record ₹2,761.80 crore allocation in the 2026-27 budget, driving growth in the cold chain logistics sector, which is projected to reach US$ 52.96 billion by 2032.

What India already has going for it

The foundations are stronger than they are sometimes given credit for. India is the world's second-largest aquaculture producer and exports more than 1,500 seafood products to nearly 130 countries. Domestic fish production has risen from 141 lakh tonnes in 2019-20 to 197 lakh tonnes in 2024-25, an average annual growth rate of around 7%. The Pradhan Mantri Matsya Sampada Yojana has invested heavily in processing and cold-chain infrastructure. The recently signed India-UK Comprehensive Economic and Trade Agreement has eliminated tariffs of up to 21.5 percent on Indian shrimp, lobster, squid and value-added marine goods, giving Indian exporters duty-free access to one of the world's most premium seafood retail markets.

The road to ₹1 lakh crore by 2030

Reaching the ₹1 lakh crore export target by 2030 will require more than higher volumes. It will require higher values per kilogram, and that means a deliberate national push on four fronts: investment in value-added processing infrastructure designed to international standards; large-scale adoption of sustainability certifications and traceable supply chains; focused research and development on indigenous Indian product formats, Indian-style ready-to-eat seafood, regional curries in retort pouches, value-added preparations rooted in our own culinary heritage that no other country can imitate; and a steady widening of cold-chain and skilling capacity so that quality is preserved from the farm gate to the foreign shelf.

If these pieces fall into place, the supermarket aisle of 2030 looks different. A panko-breaded shrimp pack from Visakhapatnam sits beside a Goan fish curry retort pouch from Kochi. A jar of clean-label chitosan capsules carries a Mangalore postcode. Each product is traceable to its farm, certified for sustainability, and priced at the premium end of the world's plate. The frozen block, that humble two-kilogram carton that built the industry, does not disappear, but it is no longer the whole story. India will have moved beyond it. And the next billion dollars will not come from catching more. It will come from creating more.

References

1. *India Brand Equity Foundation. (2026). Marine Products Industry in India, Export Data and Growth. IBEF.*
2. *Marine Products Export Development Authority. (2026). Provisional Export Data, FY 2025-26. MPEDA, Kochi.*
3. *Ministry of Commerce and Industry. (2026, June 1). India's seafood exports reach record high of ₹73,890 crore in FY 2025–26: Frozen shrimp drives India's record seafood exports; US and China remain top markets. Press Information Bureau, Government of India. https://www.pib.gov.in/PressReleasePage.aspx?PRID=2267666&reg=3&lang=1*
4. *Ministry of Fisheries, Animal Husbandry & Dairying. (2026, January 12). Fish production has increased to 197.75 lakh tonnes in FY 2024-25 from 95.79 lakh tonnes fish production in FY 2013-14 increasing a significant 106%. Press Information Bureau, Government of India. https://www.pib.gov.in/PressReleasePage.aspx?PRID=2213532&reg=3&lang=1*
5. *Ministry of Fisheries, Animal Husbandry and Dairying. (2026). Annual Report on Fisheries Sector. Department of Fisheries, Government of India.*
6. *Press Information Bureau, Government of India. (2026, April 6). Advancing India's Fisheries Sector -Institutions, Investment, and Inclusion. Ministry of Fisheries, Animal Husbandry and Dairying, New Delhi. https://www.pib.gov.in/PressReleasePage.aspx?PRID=2249228*
7. *SeafoodSource. (2024). India sets USD 1.6 billion target for value-added seafood production by 2030.*

Blueline Group
Since 1968

Blueline
Foods (India) Pvt Ltd

Manufacturers & Exporters Of
FISH MEAL, FISH OIL, FISH SOLUBLE PASTE & OTHER MARINE PRODUCTS





★★★THREE STAR EXPORT HOUSE★★★

4th Floor, Suite No 406, Crystal Arc, Balmatta Road, Mangalore - 575 001, Karnataka, India
Ph: +91-824-2427744 / 2441466
Email: info@bluelinefoods.in

Karnataka State FIP
Small Pelagic Purse Seine Fisheries

BEST WISHES FROM

AKASH
FISHMEAL & FISH OIL PVT. LTD.

FISHMEAL

- High Protein
- Rich in Amino Acids
- Excellent Digestibility
- Ideal for Aquaculture, Poultry & Livestock

FISH OIL

- Rich Source of Omega-3
- Promotes Growth & Immunity
- Supports Health & Vitality

SOLUBLE PASTE

- High Protein & Energy
- Easy to Digest
- Ideal for Feed Manufacturing

PREMIUM QUALITY | NUTRITION RICH | SUSTAINABLE SOURCING | ADVANCED PROCESSING | TRUSTED PARTNER

NOURISHING AQUACULTURE. BUILDING A BETTER TOMORROW.

Sindhudurg Dist.
Vengurla, Maharastra.
Office: +91 9921300079
M: +91 7588567880
akash.fishmeal@yahoo.com
www.akashfishmeal.com

Best Wishes

For the

SEAFOOD EXPO BHARAT 2026

INDIAN FISHMEAL & FISHOIL EXPORTERS ASSOCIATION (R)

REGISTERED OFFICE

Door No: 3-31-2517/9, 1st Floor, Prakruthi Commercial Complex, Near C.V. Nayak Hall, Kadri Road, Mangalore, Karnataka, India - 575003

Email: ifafea@gmail.com Ph: +91-824-4266622

Best Wishes from

Mukka
PROTEINS LIMITED

MANUFACTURER & EXPORTER OF STEAM DRIED FISH MEAL & FISH OIL

COMMITTED TO THE MARINTRUST IMPROVER PROGRAMME (IP)

CORPORATE OFFICE

MUKKA CORPORATE HOUSE
1st Floor, 1st Cross, NG Road, Attavar, Mangalore - 575001
Ph : +91 824 4252889, Fax : +91 824 2426405

E : info@mukkaproteins.com | W : www.mukkaproteins.com

Karnataka State FIP
Small Pelagic Purse Seine Fisheries

BEST WISHES FROM

YASHASWI
FISH MEAL & OIL COMPANY

PRODUCERS OF

FISH MEAL | FISH OIL | MARINE INGREDIENTS | SURIMI PRODUCTS

• *India's Trusted Partner in Marine Nutrition and Global Excellence* •

Yashaswi Marine Ingredients | Yashaswi Marine Ingredients | Yashaswi Surimi Marine

www.yashaswifishmeal.com | yashfishmeal@yahoo.co.in

RAJ FISHMEAL AND OIL COMPANY

(AN ISO 9001:2015 CERTIFIED COMPANY)

GMP+



OUR PRODUCTS



FISHMEAL

- High Protein
- Quality Assured



FISH OIL

- Rich in Omega-3
- Purity Guaranteed

Best Wishes for the

SEAFOOD EXPO BHARAT 2026

ADDRESS

1-23 & Unit II 1-23B,
3RD CROSS,
MALPE-MADHWARAJ ROAD, MALPE,
UDUPI-DISTRICT, KARNATAKA, INDIA - 576 108.

CONTACT DETAILS

Phone : +91 9900490375 / +91 9448272980
Email : sales@rajfishmeal.com / office@rajfishmeal.com
Website : www.rajfishmeal.com

Scan to visit our website

QUALITY YOU CAN TRUST | NUTRITION YOU CAN RELY ON | PARTNERING IN YOUR GROWTH

Karnataka State FIP

Small Pelagic Purse Seine Fisheries

Janatha

Rising with Tide



FISH MEAL, FISH OIL, FISH SOLUBLE PASTE, FISH HYDROLYSATES

Our Certifications

IFFO

JANATHA FISH MEAL & OIL PRODUCTS

Manoor Fisheries Road, Kota, Udupi District, Karnataka, INDIA - 576 221
Tele: +91 820 2987005, E-mail: info@janathafishmeal.com, www.janathafishmeal.com

With Best Compliments from

Asvini fisheries

SEAFOOD EXPO BHARAT 2026

ICAR-CIFA:
Advancing India's Freshwater Aquaculture Revolution



The ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA), Bhubaneswar, is India's premier research institute dedicated to freshwater aquaculture. The institute traces its origin to the Pond Culture Division of the Central Inland Fisheries Research Institute established at Cuttack in 1949 and became an independent institute on 1 April 1987.

Located at **Kausalyaganga, Bhubaneswar,** ICAR-CIFA works under the Indian Council of Agricultural Research and contributes to science-led development of sustainable freshwater aquaculture in the country.

ICAR-CIFA undertakes basic, strategic and applied research on freshwater finfish and shellfish culture, species and system diversification, fish genetics, nutrition, health management, environment, extension, training and technology transfer.

The institute has regional research centres at **Bathinda, Bengaluru, Rahara** and **Vijayawada,** enabling location-specific aquaculture research and outreach across different agro-climatic regions.

VISION
To make Indian freshwater aquaculture globally competitive through eco-friendly and economically viable fish production systems for livelihood and nutritional security.

MISSION
To achieve excellence in research for developing sustainable and diversified freshwater aquaculture practices for enhanced productivity, quality, water-use efficiency and farm income.

MAJOR CONTRIBUTIONS

INNOVATIVE AQUACULTURE TECHNOLOGIES
Development and dissemination of improved aquaculture technologies for carp, catfish, freshwater prawn, murrel, anabas, tilapia and other priority freshwater species.

GENETIC IMPROVEMENT PROGRAMMES
Genetic improvement programmes for important fish and shellfish species, including improved carp and freshwater prawn lines such as Jayanti Rohu, CIFA Amrit Catla and CIFA-GI Scampi.

HEALTH & DISEASE-MANAGEMENT SOLUTIONS
Development of farmer-oriented health and disease-management solutions, including CIFAX, CIFA ArguVax-I, CIFA - L Check and CIFA M-Check for better aquatic animal health management.

SCIENTIFIC FEED & NUTRITION SOLUTIONS
Development of scientifically formulated feed and feed supplements such as CIFABROOD, carp nursery feed, carp grower feed and Zinc-Selenium Nanoplus for improved growth and broodstock performance.

DIGITAL & PRECISION AQUACULTURE
Promotion of precision and digital aquaculture through geospatial decision-support tools, mobile-based advisory systems, online training and farmer-friendly knowledge platforms.

FARMER OUTREACH & CAPACITY BUILDING
Farmer outreach through aquaculture field schools, KVK-Khurdha, training programmes, exposure visits, SCSP, TSP, NEH, Farmer FIRST and other national development initiatives.

HATCHERY & SEED PRODUCTION TECHNOLOGIES
Strengthening of hatchery, seed production and grow-out technologies through facilities for carp, catfish and freshwater prawn breeding, feed production, disease diagnosis, soil and water testing, and feed analysis.

NATIONAL AQUACULTURE DEVELOPMENT SUPPORT
Support to national aquaculture development through technology backstopping, capacity building, entrepreneurship promotion, women empowerment, student engagement and science-society linkage.

Grow Fish, Grow with Fish !!!

ICAR-CENTRAL INSTITUTE OF FRESHWATER AQUACULTURE
An ISO 9001:2015 Certified Institute
Kausalyaganga, Bhubaneswar-751 002, Odisha, India | www.cifa.nic.in

Genetic Improvement Programme (ICAR-CIFA)



Jayanti Rohu® (14th Gen.) • CIFA-Amrit Catla® (4th Gen.) • CIFA-GI Scampi® (16th Gen.)

Genetically improved fish and freshwater prawn strains — developed through long term selective breeding — delivering **faster growth, higher productivity, efficient resource utilization,** and **enhanced farmer incomes** across India's aquaculture sector.



50–60% Faster Growth

Jayanti Rohu® — 5.2 lakh tonnes of additional fish production annually across 18 states

30% Faster Growth

CIFA-Amrit Catla® — boosts farmer profits by ≥50%; cuts grow-out by ~2 months across 13 states





55% Faster Growth

CIFA-GI Scampi® — contributes ~2,550 tonnes of additional freshwater prawn production annually

₹8,470 Crore

Economic Impact

Combined economic value across all three improved genetic strains nationwide

Climate Adaptation

- Faster growth reduces culture duration and exposure to climatic uncertainity
- Higher productivity per unit area, water, and feed input
- National Nucleus Breeding Centres (NBCs) and NFFBB ensure genetic quality and sustainable dissemination

Technology Spread

Strain	States	Coverage
Jayanti Rohu®	18	1.30 lakh ha
CIFA-Amrit Catla®	13	0.67 lakh ha
CIFA-GI Scampi®	10	3,500 ha

Collective Impact: These climate-resilient genetic stocks are strengthening India's aquaculture systems, **securing farmer livelihoods,** and driving national fish production — commercialized through multiplier units for large-scale adoption.



BAP CERTIFIED

arya SEAFOODS always reliable

BRC FOOD CERTIFICATED

SMETA Sedex Members Ethical Trade Audit

HALAL INDIA

fssai

FOOD SAFETY H.A.C.C.P CERTIFIED

For Enquiries Contact :

Arya Sea Foods Privare Limited
9-14-10, 1st Floor, CBM Compound,
Visakhapatnam - 530 013.

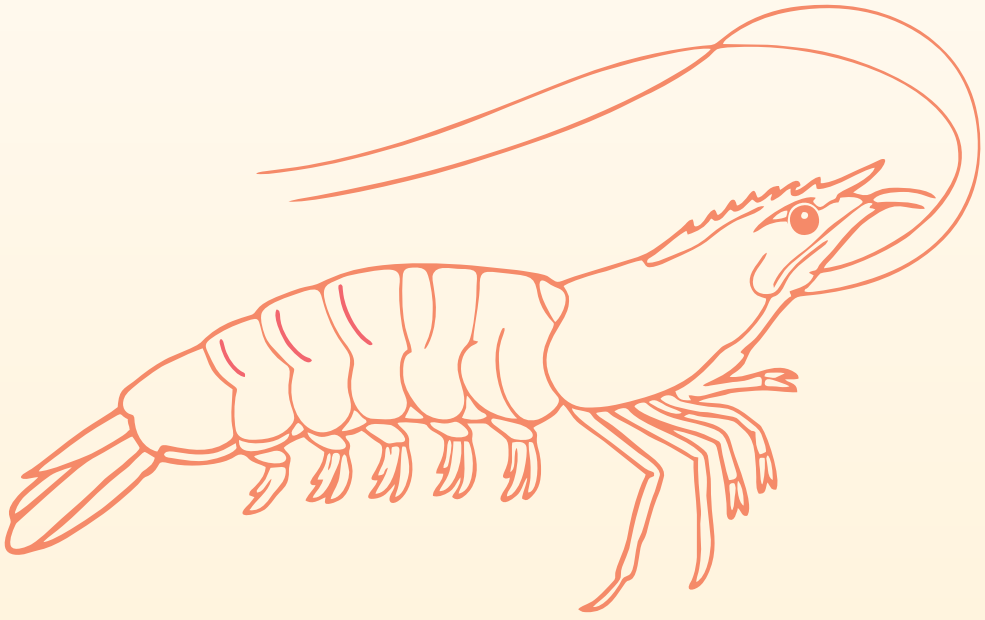
+91 98666 60443

sales@aryaseafoods.com
venkat@aryaseafoods.com

www.aryaseafoods.com

SANDHYA AQUA

AQUA X™



PREMIUM BLACK TIGER FEED

EXTRA GROWTH, EXTRA INCOME

NURTURE WITH NATURE'S BEST

BAP CERTIFIED CERT # M10169

HACCP SYSTEM APPROVED

CHE:FM 19

AN ISO 22000 & ISO 9001 CERTIFIED COMPANY

CAA Registration: CAA/SEP 2025/FAU/09150

APSADA License No.: AQNLBOKK085208

FRESH FROM THE WAVES

BRE

BHIMRAJ
EXPORTS PRIVATE LIMITED

PLANT EU APPROVAL NO.1370
MERCHANT PLANT - PADMASHREE EXPORT (1318)

PREMIUM SEAFOOD, PURELY DELIVERED

From Our Ocean to Your Table

- **FRESH FROZEN** FOR MAXIMUM QUALITY
- **HYGIENICALLY** PROCESSED
- **GLOBAL STANDARDS** TRUSTED WORLDWIDE
- **ON TIME** EVERY TIME



BRCGS · HACCP · Halal India · Government Recognized Star Export House · USFDA · fssai · ISO Quality Certification

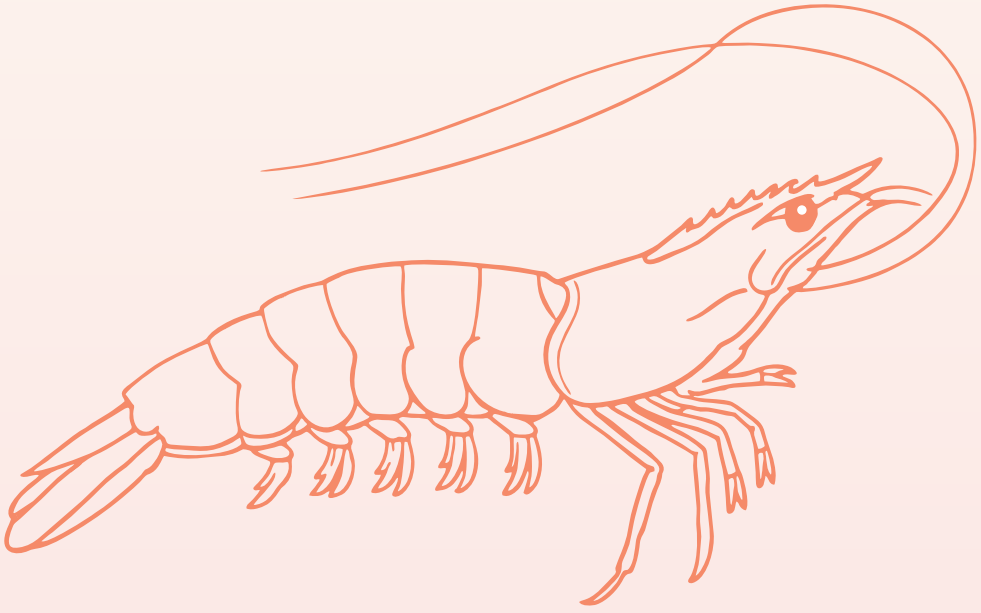
CONTACT US:
Rajalaxmi Pradhan
(Director)

Plot No. - 524/1671/1898, Patia Station Road, Patia, Bhubaneswar, Khordha, Odisha - 751024
+919937620464
rajalaxmi@bhimrajexports.com

www. bhimrajexports.com

SANDHYA AQUA

AQUA X™



PREMIUM VANNAMEI FEED

EXTRA GROWTH, EXTRA INCOME

NURTURE WITH NATURE'S BEST

BAP CERTIFIED CERT # M10169

HACCP SYSTEM APPROVED

CHE:FM 19

AN ISO 22000 & ISO 9001 CERTIFIED COMPANY
CAA Registration: CAA/APR 2024/OTHERS/06043
APSADA License No.: AQNLBOKK085208

Alashore
Marine Exports Pvt. Ltd.

ALASHORE
MARINE EXPORTS PVT. LTD.



PREMIUM QUALITY | FOOD SAFETY ASSURED | GLOBAL EXPORTS | TRUSTED PARTNER

OUR PRODUCTS



HEAD-ON SHELL-ON (HOSO)



HEADLESS SHELL-ON (HLSO)



PEELED & DEVEINED (PD)



PEELED DEVEINED TAIL-ON (PDTO)



EASY PEEL SHRIMP



IQF FROZEN SHRIMP



BLOCK FROZEN SHRIMP



VALUE ADDED SHRIMP PRODUCTS

All products are processed under strict international quality standards and customized according to buyer specifications.

WHY CHOOSE US?

INTEGRATED SUPPLY CHAIN
From hatchery and farming to processing and export, complete control ensures consistent quality.

GLOBAL QUALITY STANDARDS
Advanced processing facilities with stringent food safety and quality control systems.

RELIABLE EXPORT PARTNER
Serving food companies, retail chains, distributors, restaurants, and importers worldwide.

SUSTAINABLE AQUACULTURE
Committed to responsible farming practices and supporting local farming communities.

CUSTOMIZED SOLUTIONS
Tailored product specifications, packaging, and logistics support to meet customer requirements.

CONSISTENT SUPPLY
Strong farming network and processing capabilities ensure year-round availability.

Shipping World Wide .....



GLOBAL MARKETS

UNITED STATES | MIDDLE EAST | EUROPEAN UNION | INTERNATIONAL SEAFOOD MARKET

CONTACT US

Balasore, Odisha, India
+91 7978940218
alashoremarine@gmail.com
www.alashoremarine.com

ALASHORE MARINE EXPORTS PRIVATE LIMITED

fssai | HACCP | FDA | SMETA | Sedex

PREMIUM QUALITY FROZEN SHRIMP EXPORTER | SUSTAINABLE AQUACULTURE | GLOBAL SUPPLY PARTNER

HIGHLAND

AGRO FOOD

Where Possibilities Unfold

TYPES OF ITEMS

- VANNAMEI
- BLACK TIGER
- WILD CAUGHT SHRIMPS
- CEPHALOPODS
- MAHI/GROUPERS/OTHER FISH ITEMS



OUR STRENGTH IN NUMBERS

1000+	1600+	150 MT/Day	6000 MT	GLOBAL	SUSTAINABLE
Shrimp Farms Network	Workforce Strength	Processing Capacity	Cold Storage Facility	Export Presence	& Technology-Driven Operations

BRANDS OF HIGHLAND AGRO FOOD

CAMARON FEEDS
Advanced Aquaculture Nutrition Solutions

Highland Royal
The Signature of Trust & Excellence

EMPOWERING FARMERS. NOURISHING GLOBAL MARKETS. BUILDING SUSTAINABLE FUTURES.

CERTIFICATIONS

BAP | SMETA | IFS | fssai | FSSC 22000 | HALAL | HACCP | ASC | BRC GLOBAL STANDARDS

USA | EUROPE | MIDDLE EAST | ASIA

Highland Agro Food Pvt. Ltd.
Plot No. 347-353, Gadabhanga,
Khantapada, Balasore, Odisha – 756043, India
+91 70087 17359
www.highlandgroups.com
info@highlandgroups.com

PROUDLY INDIA • GLOBALLY TRUSTED

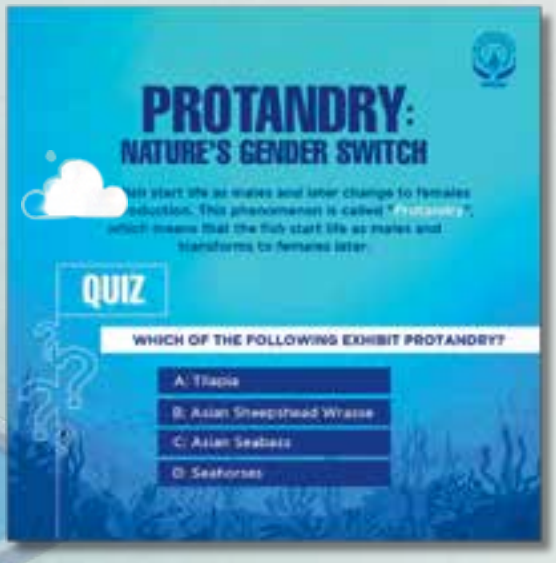
Aquaculture

Quiz time









RAJ FISHMEAL AND OIL COMPANY

BEST WISHES FOR THE SEAFOOD EXPO BHARAT 2026

RAJ FISHMEAL AND OIL COMPANY
(AN ISO 9001: 2015 CERTIFIED COMPANY)

RAJ FISHMEAL AND OIL COMPANY, UNIT II
(AN GMP + ASSURED COMPANY)

OUR PRODUCTS


Fishmeal



FishOil


FishSoluble

ADDRESS

1-23 & 1-23B, 3RD CROSS,
MALPE-MADHWARAJ ROAD, MALPE,
UDUPI-DISTRICT, KARNATAKA, INDIA- 576 108.

CONTACT DETAILS

Phone : +91-9900490375 / +91-9448272980
Email : sales@rajfishmeal.com / office@rajfishmeal.com
Website : www.rajfishmeal.com





SHANKHA DEEP EXPORTS PRIVATE LIMITED (UNIT-II)

CHANDIGORI, BADU, NORTH 24 PARGANAS, KOLKATA-700128, WEST BENGAL, INDIA

EU APPROVAL NO-1373

BAP-P11026, BRCGS, HACCP, SMETA, FDA, FSSAI

E-Mail: info@shankhadeepexports.com

SEA FOODS PRIVATE LIMITED

DAKSHIN BALARAMPUR , SHANKARPUR, BODHRA, RAMNAGAR, WEST BENGAL, INDIA

EU APPROVAL NO-498

BAP- P10652, BRCGS, HACCP, SMETA, ASC, FDA

G-Mail: info@seafoodsmail.com

JANA BROTHERS SEA FOOD LLP

JAGAIBASAN, P.O. : DIGHA, P.S. DIGHA MOHANA COASTAL, DIST. PURBA MEDINIPUR,PIN - 721428, WEST BENGAL, INDIA

EU APPROVAL NO-1345

HACCP, FDA, FSSAI

E-Mail: info@janabrothers.in

JANA GROUP OF COMPANIES

Contact with Us

MR.KAMDEV JANA
(Managing Director & Marketing Head)
Mobile & Whatsapp: +91-9800956710
E-Mail: soham.kj@rediffmail.com

MR.MAHADEV JANA
(Director)
Mobile: +91-9830330799

MR.KRISHNENDU JANA
(Director)
Mobile: +91-9635093818

MR.H.MUKHERJEE
(Manager)
Mobile: +91-9903043390/7063514120

MR.A.MUKHERJEE
(Manager)
Mobile: +91-9477118642