English Monthly from Hyderabad, India

Aqua International

Estd. 1993

Health • Nutrition • Technology • Management

December 2025

Annual Subscription: ₹800 Foreign USD 100

Inside ...

Aqua International

English Monthly Magazine
(Established in May 1993)

Volume 33 Number 8 December 2025

Editor & Publisher
M. A. Nazeer

Editorial & Business Office:
AQUA INTERNATIONAL
NRS Publications,
BG-4, Venkataramana Apartments,
11-4-634, A.C.Guards,
Hyderabad - 500 004, India.
Tel: 040 - 2330 3989, 96666 89554
E-mail: info@aquainternational.in
Website: www.aquainternational.com

Annual Subscription
India : Rs. 800
Foreign Countries : US $ 100
or its equivalent.

Aqua International will be sent to the subscribers in India by Book Post and to the foreign subscribers by AirMail.

Edited, printed, published and owned by M. A. Nazeer and published from BG-4, Venkataramana Apts., 11-4-634, A.C.Guards, Hyderabad - 500 004, India. Printed at Srinivasa Lithographics.
Registered with Registrar of Newspapers for India with Regn. No. 52899/93. Postal Regn. No. L II/ RNP/HD/1068/2021-2023.

NRS PUBLICATIONS
www.aquainternational.in

CONTENTS

ADVERTISERS' INDEX

Subscriptions for Aqua International, English monthly, should be sent to:
The Circulation Department, Aqua International, BG-4, Venkataramana Apartments, 11-4-634, A.C.Guards, Near Income Tax Towers, Hyderabad - 500 004, India. Email: info@aquainternational.in

FAMSUN

Integrated Solution Provider

Vacuum coater

Exceptional design & Flexible operation

Vacuum coater for the application of oil or fat, pigments, flavors, functional improver, vitamins, etc. onto pellets after drying and/or cooling. Aquafeed and pet food in particular.

FAMSUN Co., Ltd.

Add: No.1 Huasheng Road, Yangzhou, Jiangsu, China 225127
T:+86-514-87848880
E-mail:mypublic@famsungroup.com
www.famsungroup.com

India Office

Add: No 401 , Dega Towers , Raj Bhavan Road , Somajiguda , Hyderebad , Telangana - 500082
T: +62-21-30027458; 30027459
Contact: Arun Kumar K
E-mail : arunkumar@famsungroup.com
Mob: +91 9901916554

Contact: Shelby
E-mail: lxb@famsungroup.com
Mob: +91 9100436652

WA 2025 India held at Hyderabad reinforces India's growing leadership in Global Aquaculture

Nature of work of newly appointed Fishery Extension Officers in West Bengal, an attempt has been made to present the basic nature of work of Fishery Extension Officers at Block level in West Bengal, how FEOs can help in improving the lives and livelihood of fish farmers, and valuable words of inspiration recently extended towards FEOs by higher authorities in Fisheries Department, Government of West Bengal in a Training Programme - Role of FFDA in promoting freshwater aquaculture: An evaluation.

Dear Readers,

The December 2025 issue of Aqua International is in your hands. In the news section, you may find news about....

World Aquaculture India 2025 organised by the World Aquaculture Society – Asian Pacific Chapter with the support from the Government of Telangana together with the National Organizing Committee, by the Indian Council of Agricultural Research, the National Fisheries Development Board (NFDB), with strong support from P.V. Narsimha Rao Telangana Veterinary University, the Society of Aquaculture Professionals, Marine Product Export Development Authority concluded successfully at the Novotel Hyderabad Convention Centre, reinforcing India's growing leadership in global aquaculture. This year's World Aquaculture India event brought together over 3,600 participants from 63 countries, including 90 students. The international trade show featured 110 booths highlighting innovations, technologies, and services from leading companies in India and abroad. Scientific activities included 438 abstracts, 298 oral presentations, 76 posters, and 45 technical sessions, reflecting the sector's growing research and development momentum. The conference opened on November 11 with the Lighting of the Lamp and welcome remarks. The ceremony was graced by key leaders from WAS-APC, ICAR, PVNRTVU, the Government of Telangana, NFDB, MPEDA and other distinguished officials.

Mr Suresh J Patel, President, Gujarat Aquaculture Association said that we need "One Nation, One Power policy" to help aquaculture farmers in Gujarat, and all over India. Suresh Patel is putting efforts in representing the government at state and central level with the issues related to aquaculture development in Gujarat state. Some of the representations he made are published in this issue of Aqua International. GAA President requested the government The electricity tariff in Gujarat state is Rs 9.25 per unit, whereas Andhra Pradesh government is charging Rs 1.50 per unit. GAA President requested that the electricity tariff in Gujarat state should be brought down to Rs 2 to 3 per unit. The cost of production of Shrimps in Gujarat state is Rs 50 higher than in Andhra Pradesh due to power tariff and other aspects. The government should remove import duty on raw materials of feed manufacturing, and also withdraw GST and Taxes on aquaculture inputs. Gujarat has 376,000 hectares of brackishwater area, the second largest area next to West Bengal, and 90,000 hectors of land is very much suitable for aquaculture, but only 10,000 hectares land is in use for aquaculture. If the land is brought into use for aquaculture, aquaculture sector can grow a lot in the state, the GAA President appealed. Government is not supporting this industry and there is no allotment of land and there is no renewal of land on lease due to CRZ issue, which has to be solved soon in order to ensure growth of this sector in Gujarat state.

NIFPHATT's innovations in Seaweed Processing and Product Development, Dr Shine Kumar C.S, Director, the National Institute of Fisheries Post Harvest Technology and Training (NIFPHATT), under the Department of Fisheries, Government of India, has pioneered the development of innovative seaweed-based value added food products that integrate marine and agricultural resources for enhanced nutrition and sustainability. Utilizing Gracilaria edulis sourced from Lakshadweep, NIFPHATT has introduced unique products such as Seaweed–Pineapple Jam, Seaweed Sorbet, Seaweed–Tomato Ketchup, Seaweed–Soya Cutlet, and Seaweed Wafers. These innovations highlight seaweed's functional properties as a natural

Contd on next page

NRS GROUP

Our Mission

Aqua International will strive to be the reliable source of information to aquaculture industry in India.

AI will give its opinion and suggest the industry what is needed in the interest of the stakeholders of the industry.

AI will strive to be The Forum to the Stakeholders of the industry for development and self-regulation.

AI will recognize the efforts and contribution of individuals, institutions and organizations for the development of aquaculture industry in the country through annual Awards presentation.

AI will strive to maintain quality and standards at all times.

TALK TO US

SEND AN EMAIL:
info@aquainternational.in
Please do not send attachment.

FOLLOW US:
facebook.com/aquainternational.nrs
twitter.com/nrspublications

Send a letter: *Letters to the Editor must include writer's full name, address and personal telephone and mobile numbers. Letters may be edited for the purposes of clarity and space. Letters should be addressed to the Editor:*

AQUA INTERNATIONAL, BG-4, Venkataramana Apartments, 11-4-634, A.C.Guards, Near Income Tax Towers, Masab Tank, Hyderabad - 500 004, T.S, India.
Tel: +91 040 - 2330 3989, 96666 89554. Website: www.aquainternational.in

gelling and stabilizing agent while promoting its nutritional and therapeutic potential. The initiative not only diversifies food applications and reduces dependence on synthetic additives but also supports India's blue–green economy by fostering sustainable livelihoods and empowering coastal communities through seaweed cultivation. The National Institute of Fisheries Post Harvest Technology and Training (NIFPHATT), originally established as the Indo Norwegian Project (INP), has been at the forefront of advancing India's fisheries sector since its inception.

Sandhya Marines, one of India's leading seafood producers, has been certified by DNV to the ASC Feed Standard for its feed production facility in Andhra Pradesh. The certification, formally awarded at World Aquaculture India 2025, makes Sandhya Marines the first shrimp feed miller in India to achieve this milestone. Sandhya Marines' customer base includes more than 25 customers in over 10 countries, and its products – primarily frozen shrimp – are sold to retail chains, stores, restaurants, and food service distributors across North America, Europe, and Asia. The ASC Feed Standard provides a comprehensive framework for responsible aquafeed production, setting stringent requirements in key areas including social and labour rights, health and safety, environmental stewardship, and responsible sourcing of raw materials. Sandhya Marines' certification was granted following a thorough independent audit conducted by DNV, verifying compliance with the standard's strict requirements. The certification demonstrates Sandhya Marines' commitment to producing feed in an environmentally, socially, and ethically responsible way – building trust, promoting long-term sustainability, and creating value for customers, employees, and the wider community. "We are proud to be the first shrimp feed miller in India to obtain ASC certification. The DNV certification mark is respected worldwide for its association with safety, quality, and sustainability," says K. Arun Kumar, Whole Time Director, Sandhya Marines.

Dr Manoj Mohanlal Sharma, Promoter of Mayank Aquaculture Pvt Ltd, Surat, Gujarat has been appointed as the Member in the newly reconstituted Governing Body of National Fisheries Development Board, Govt. of India. We appreciate NFDB for appointing the qualified and knowledgeable expert shrimp farmer in the country Dr Manoj M. Sharma. We are sure that Dr Manoj Sharma will give his ideas and expertise to NFDB for the development of aquaculture sector in the country. Dr Manoj M. Sharma is an expert in shrimp farming, known for his pioneering work in Gujarat, India. With over three decades of experience, Dr Manoj Sharma has promoted sustainable shrimp farming practices, generating employment to many people.

In the Articles section, "**Pubertal Molting as a Bottleneck in Crustacean Growth and Reproductive Cycles**", authored by J. Magimai John Jose and S. Selvaraj, says Pubertal molting refers to the transition between the growth and sexual maturity of the shrimp, crabs, and lobsters, i.e., the passage to reproduction. There is also an energy trade-off since molting and reproduction are energy competitors and in low resource situations, growth and fecundity are both negatively affected. Molting and reproduction are controlled by hormones, including hormones that prevent molting, molt-inhibiting hormone (MIH), and ecdysteroids, which can stop the cycles. It is a weak period when crustaceans are soft-shelled and weak and extremely susceptible to stress or death. Temperature, light cycles, and tides are environmental factors that affect pubertal molting, posing problems in hatcheries. Molting hormones and disrupt the reproductive abilities of stalls due to endocrine effects of pollutants and poor water quality. Some solutions are listed: better broodstock feeding, environmental manipulation (temperature, light), substitution of invasive hormonal manipulations with safer ones and breeding selection on the predictability of molt. In the future, it is suggested to work with molecular tools, biomarkers, and genetic enhancements to predict and control pubertal molts. Pubertal molting is a biological milestone, as well as a management issue in crustacean aquaculture that has a significant impact on profitability. In most of the crustaceans, pubertal molting is a critical physiological event which connects growth development to reproductive maturity.

Another article titled, "**Biocolorants in Aquaculture: The Science and Application of Carotenoids**, authored by Subashini.M, Raswin Geoffery.G.K, S.Felix, India's diverse freshwater and marine ecosystems harbor over 400 indigenous ornamental fish species, many of which possess high export potential. Major production hubs are concentrated in West Bengal, Kerala, Tamil Nadu, Odisha and the Northeastern states, where both small-scale farmers and women self-help groups actively participate in breeding and rearing operations. Since most fishes cannot synthesize pigments such as carotenoids on their own, their color intensity largely depends on dietary supplementation. Hence, the inclusion of natural biocolorants particularly carotenoids has gained increasing importance in ornamental aquaculture, not only for enhancing beauty but also for improving overall fish health and stress resistance. Coloration plays a pivotal role in determining the aesthetic appeal and commercial value of ornamental fishes.

Another article titled, "**Nature of work of newly appointed Fishery Extension Officers in West Bengal**" authored by Subrato Ghosh, discussed that, an attempt has been made to present the basic nature of work of Fishery Extension Officers at Block level in West Bengal, how FEOs can help in improving the lives and livelihood of fish farmers, and valuable words of inspiration recently extended towards FEOs by higher authorities in Fisheries Department, Government of West Bengal in a Training Programme. 'Role of FFDA in promoting freshwater aquaculture: an evaluation', authored by Dr H. K. De, Dr G. S. Saha, Mrs N. Panda, published in Compendium of ICAR Sponsored Short Course on New Initiatives in Aquaculture Extension, organised at ICAR-CIFA, Bhubaneswar during November 2007, we come to know that Fishery Extension Officers posted at Community Development (CD) Block level are the key functionaries of the State Department of Fisheries. He / she is the first contact point for any services related to fisheries and aquaculture to fish farmers. They are responsible to inform about the schemes, educate farmers in scientific carp culture, and provide technical backstopping. Similarly at the office of Freshwater Fish Farmers Development Agency (FFDA) too, FEOs have a great role. He scrutinizes application, visits the site and recommends the case accordingly. During implementation of the scheme, FEO has to ensure that the farmer adheres to principles of scientific aquaculture, both freshwater and brackishwater.

Readers are invited to send their views and comments on the news, special feature and articles published in the magazine which would be published under "Readers Column". Time to time, we shall try to update you on various aspects of Aquaculture sector. Keep reading the magazine Aqua International regularly and update yourself. Wish you all fruitful results in your efforts.

M.A.Nazeer
Editor & Publisher
Aqua International

NIFPHATT's innovations in Seaweed Processing and Product Development

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. Corresponding author Email: shinesiva@nifphatt.gov.in

Launching of New Range by Prof. S. P. Singh Baghel, Union Minister of State for Fisheries, Animal Husbandry and Dairying at the prestigious World Food India Exhibition 2025 held in New Delhi on 25 September 2025

Abstract

The National Institute of Fisheries Post Harvest Technology and Training (NIFPHATT), under the Department of Fisheries, Government of India, has pioneered the development of innovative seaweed-based value-added food products that integrate marine and agricultural resources for enhanced nutrition and sustainability. Utilizing *Gracilaria edulis* sourced from Lakshadweep, NIFPHATT has introduced unique products such as Seaweed–Pineapple Jam, Seaweed Sorbet, Seaweed–Tomato Ketchup, Seaweed–Soya Cutlet, and Seaweed Wafers. These innovations highlight seaweed's functional properties as a natural gelling and stabilizing agent while promoting its nutritional and therapeutic potential. The initiative not only diversifies food applications and reduces dependence on synthetic additives but also supports India's blue–green economy by fostering sustainable livelihoods and empowering coastal communities through seaweed cultivation.

Keywords

Seaweed, Gracilaria edulis, value-added products, Blue–green economy

NIFPHATT's Seaweed Innovations and Their Impact on the Blue–Green Economy

The National Institute of Fisheries Post Harvest Technology and Training (NIFPHATT), originally established as the *Indo-Norwegian Project (INP)*, has been at the forefront of advancing India's fisheries sector since its inception. The Institute's current mission is to address emerging challenges and harness new opportunities in the field through continuous up gradation and dissemination of post-harvest technologies, human resource development, gender and rural empowerment initiatives, and consultancy services for fisheries infrastructure development.

Through its multifaceted roles in skill enhancement, technological innovation, and community-oriented programmes—especially those focusing on fishermen's welfare and rehabilitation—NIFPHATT serves as an active partner in national fisheries growth and export development. Staying true to its core mandate, the Institute remains deeply committed to promoting excellence and capacity building in fisheries post-harvest technology.

Building upon its enduring legacy of innovation and technological advancement, the **National Institute of Fisheries Post Harvest Technology and Training (NIFPHATT)** — the pioneering Central Government fisheries institute based in Kochi — has recently unveiled a groundbreaking range of value-added food products poised to revolutionize India's bakery, confectionery, and fruit processing industries. The newly introduced line showcases the vibrant Seaweed–Pineapple Jam and the dairy-free Seaweed Sorbet as its flagship innovations, accompanied by other creative formulations such as Seaweed–Tomato Ketchup, Seaweed–Soya Cutlet, Seaweed Wafer, and Seaweed Cracker. Through this initiative, the Institute reaffirms its commitment to sustainable food technology, value addition, and the diversification of post-harvest applications within the fisheries and allied sectors.

This innovative product line was officially launched by **Prof. S. P. Singh Baghel**, Union Minister of State for Fisheries, Animal Husbandry and Dairying, and **Dr. Abhilaksh Likhi**, Secretary, Department of Fisheries, at the **prestigious World Food India Exhibition 2025** held in New Delhi on **25 September 2025**. Developed using *Gracilaria edulis*, a red seaweed sustainably harvested from the pristine waters of **Lakshadweep**, these products embody a seamless fusion of taste, tradition, and cutting-edge food science. Through this initiative, NIFPHATT reaffirms its pioneering role in advancing sustainable innovations and value addition within India's fisheries and allied food

processing sectors, while promoting the integration of marine resources into mainstream food applications.

For centuries, sea vegetables have served as a dietary cornerstone across many Asian cultures, often associated with health, vitality, and longevity. Seaweed, in particular, is recognized as a functional superfood, abundant in unique bioactive compounds, proteins, and dietary fibres that are seldom present in terrestrial plants. Its nutritional and therapeutic potential is remarkable—seaweeds are an unparalleled source of iodine, essential for optimal thyroid function, and possess calcium levels up to ten times higher than milk, along with iron concentrations exceeding those found in red meat. Furthermore, they are rich in essential minerals such as magnesium and zinc, and contain significant quantities of prebiotic fibres that promote digestive health, regulate cholesterol levels, and enhance immune resilience. The presence of potent antioxidants contributes to cellular protection and anti-inflammatory effects, while their content of beneficial omega-3 fatty acids supports cardiovascular well-being, all within a low-fat nutritional profile.

NIFPHATT's initiative, however, extends well beyond culinary innovation, holding profound implications for both societal welfare and the national economy. This programme aligns with the Government of India's strategic vision under the Pradhan Mantri Matsya Sampada Yojana (PMMSY) and NITI Aayog's Strategy for the Development of the Seaweed Value Chain, emphasizing sustainable resource utilization and inclusive growth.

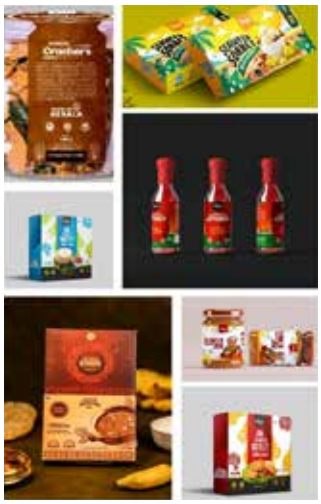
Through its pioneering work in seaweed-based food product development, NIFPHATT is poised to strengthen and complement several key industries. The natural gelling, emulsifying, and stabilizing properties of seaweeds offer sustainable and cost-effective alternatives to conventional additives, thereby unlocking new avenues for the bakery, confectionery, and fruit processing sectors. Innovations such as the Seaweed–Pineapple Jam exemplify how seaweed can enhance value-added fruit preserves, while the Seaweed Sorbet demonstrates its application in achieving superior texture and sensory quality in frozen desserts. Collectively, these advancements enable industries to diversify their product portfolios and meet the rising consumer demand for nutritious, natural, and eco-friendly foods.

Moreover, this innovation represents a transformative shift for India's coastal communities—from traditional, often unpredictable fishing practices to sustainable seaweed cultivation. By providing a stable, year-round source of income, seaweed farming mitigates the socio-economic risks associated with seasonal fishing cycles and climate variability. This transition is particularly empowering for women and marginalized groups, creating equitable livelihood opportunities and promoting community resilience.

These innovations also exemplify how agriculture and fisheries can effectively converge to build a synergistic blue–green economy. Products such as Seaweed–Pineapple Jam and Seaweed–Tomato Ketchup establish new, high-value markets for agricultural produce while ensuring consistent demand for cultivated seaweed. This integrative approach not only minimizes post-harvest losses but also strengthens both the agricultural and coastal economies, fostering a sustainable and inclusive model of growth.

Innovative Seaweed-Based Value-Added Food Products Developed by NIFPHATT

NIFPHATT has successfully developed an innovative range of seaweed-based value-added food products that integrate marine and agricultural resources to enhance nutrition, sustainability, and market potential. The Seaweed–Pineapple Jam combines the sweetness of pineapple with the gelling and nutritional properties of *Gracilaria edulis*, creating a functional preserve rich in antioxidants and dietary fibre. The Seaweed–Tomato Ketchup elevates a common condiment by merging tomato's lycopene and vitamin C content with seaweed's minerals and bioactive compounds, resulting in superior texture, shelf life, and nutritional value. The



New range of seaweed based products from NIFPHATT

Seaweed–Soya Cutlet offers a high-protein, mineral-rich, and ready-to-cook snack blending soya and seaweed for balanced nutrition and consumer convenience. Traditional Indian snacks have been reimagined through the Seaweed Cracker, which enriches the familiar flavour and crunch with seaweed-derived calcium, iron, and fibre, and the Seaweed Wafer, which combines fish mince and seaweed extract to produce a light, omega-3-enriched marine snack. The Seaweed Kheer transforms a classic Indian dessert into a ready-to-eat, nutrient-fortified formulation that provides essential minerals and dietary fibres without compromising traditional taste. Finally, the dairy-free and vegan Seaweed Sorbet harmonizes tropical pineapple with seaweed extract to create a smooth, antioxidant-rich frozen dessert. Collectively, these products exemplify NIFPHATT's pioneering role in mainstreaming seaweed into culturally familiar foods, advancing functional nutrition, and promoting sustainable livelihoods for coastal and agricultural communities.

Uni-President

AQUACULTURE PROBIOTICS EXPERT

Nu Ri
NET 200 g **BSL**

Probiotics for water treatment

1. WATER QUALITY CONDITIONING

Best choice of *Bacillus* spp. that rapidly decompose uneaten feed, feces and other organic substances in pond water, keeps water quality optimal

2. HIGH ACTIVITY OF SPORES

No cultivation is needed. Easily adapt to the changes of surroundings and grow fast in freshwater or seawater culture farming, even under low oxygen environment

3. DECREASE AMMONIA CONTENT

Prevent the accumulation of toxic substances such as NH_3, NO_2, etc.

4. IMPROVE WATER COLOR

Improve water color regulate the algae and bacteria balance in water, turning your pond from green to clear

5. ESTABLISH BALANCED POND BACTERIA SYSTEM

Compete nutrition with vibrio and inhibit them to grow. Provide nutrition for probiotics in the pond, to establish a well-balanced farming system.

6. INCREASE AQUACULTURE PRODUCTION

Good quality of water prevents fish/prawn infections, making high profit of production

* COMPOSITION:

Bacillus spp. > 1x 10^{11} cfu/kg	15%
(Bacillus subtilis, Bacillus amyloliquefaciens, Bacillus licheniformis)	
Carrier (rice bran, corn gluten)	75%
Moisture	10%

* STORAGE:

Keep at dry, well-ventilated condition. Avoid direct sunlight exposure and use as soon as possible once opened for best quality.

* DIRECTION OF USE:

No cultivation is needed. Apply Nuri BSL with water-soluble bag near to the working water wheel or pour into the pond evenly. Recommend apply Uni-Light PSB together with Nuri-BSL on sunny day to achieve a clear pond more efficiently.

UNI-LIGHT PSB Funtion:

- Decompose pond bottom
- Inhibit the growth of *Vibrio* spp.
- Purification of water quality

BSL Dosage:

/10,000 m² Quantity	10 - 30 pl/m² tiger prawn or < 80 pl/m² Vannamei	For >30 pl/m² tiger prawn or > 80 pl/m² Vannamei	For > 150 pl/m² Vannamei
7 days before stocking	800 g - 1,000 g	1,200 - 1,500 g	1,200 - 1,500 g
Day of stocking	300 g - 500 g	800 g - 1,000 g	800 g - 1,000 g
Every 7 - 10 days after stocking	300 g - 500 g	800 g - 1,000 g	3 - 5 days / use 1,000g - 2,000g

****Dosages can be adjusted according to the water conditions and practices.*

UNI-PRESIDENT VIETNAM CO., LTD

No. 16-18-20, DT 743 Road, Song Than II Ind Zone, Di An Ward, Di An City, Binh Duong Province, Vietnam.

aquafeed@upvn.com.vn
www.uni-president.com.vn

DNV certifies Sandhya Marines under the ASC Feed Standard

[Novotel Hyderabad Convention Centre, India | 12 November 2025] Sandhya Marines, one of India's leading seafood producers, has been certified by DNV to the ASC Feed Standard for its feed production facility in Andhra Pradesh. The certification, formally awarded at World Aquaculture India 2025, makes Sandhya Marines the first shrimp feed miller in India to achieve this milestone.

From left – Jibandip Mandal, F&B, India, DNV, Balamurugan Sambasivam, Area Manager, India and Middle east, DNV, K. Arun Kumar, Whole-time Director, Sandhya Marines Limited, Madan Mohan Meegada, CEO, Feed Division, Sandya Marines Limited, Puspendra Prasad Roy, Seafood Manager, India, DNV.

Sandhya Marines' customer base includes more than 25 customers in over 10 countries, and its products – primarily frozen shrimp – are sold to retail chains, stores, restaurants, and food service distributors across North America, Europe, and Asia.

The ASC Feed Standard provides a comprehensive framework for responsible aquafeed production, setting stringent requirements in key areas including social and labour rights, health and safety, environmental stewardship, and responsible sourcing of raw materials.

Sandhya Marines' certification was granted following a thorough independent audit conducted by DNV, verifying compliance with the standard's strict requirements. The certification demonstrates Sandhya Marines' commitment to producing feed in an environmentally, socially, and ethically responsible way – building trust, promoting long-term sustainability, and creating value for customers, employees, and the wider community.

"We are proud to be the first shrimp feed miller in India to obtain ASC certification. The DNV certification mark is respected worldwide for its association with safety, quality, and sustainability," says K. Arun Kumar, Whole-Time Director, Sandhya Marines.

"Producing feed responsibly is crucial to us, as it ensures transparency and traceability across our supply chain and supports the reduction of our environmental footprint. The certification process has strengthened our systems for responsible sourcing and allows us to show our commitment to global sustainability standards," adds K. Arun Kumar.

"The ASC Feed certification reinforces Sandhya Marines' commitment to being a responsible aquaculture producer, enhancing customer confidence, expanding market opportunities and demonstrating sustainable practices. As the first ASC-certified shrimp feed miller in India, Sandhya Marines sets an example within the industry and reinforces the growing importance of transparent and ethical feed production in the region," says Balamurugan Sambasivam, Area Manager, India and Middle east, DNV.

About Sandhya Marines

For over three decades Sandhya Marines Ltd. has been delivering premium, value-added frozen seafood to the world. From the aquaculture-rich coast of Andhra Pradesh, Sandhya Marines craft a wide range of ready-to-cook and ready-to-eat shrimp products, trusted by retail chains, restaurants and distributors in multiple regions worldwide. With unwavering focus on quality, innovation and sustainability, they proudly serve our global partners – building long lasting relationships and shaping the future of seafood excellence. From their feed division, they care about safe and sustainable farming, so every bag of Sandhya Feeds is eco-friendly, antibiotic-free and free from banned chemicals. Their Premium Vannamei and Monodon feeds are scientifically formulated to deliver fast growth, better survival and higher profits ensuring easy digestion and excellent FCR.

About DNV

DNV is one of the world's leading certification bodies. Through management system certification and training services, DNV help companies manage risks, assure compliance and build trust in its systems, people and value chains across all types of industries, including food & beverage, automotive and aerospace and ICT. Whether tackling quality, environmental, safety, security or other challenges, DNV combines technical, industry and risk management expertise to help companies build confidence, continuity, and resilience. Driven by its purpose, to safeguard life, property, and the environment, DNV helps customers tackle the global transformations facing them and demands for operations aligned to sound ESG principles. That is why DNV is a trusted voice for many of the world's most successful and forward-thinking companies.

West Bengal Fisheries Department's initiative towards economic development of SC and ST villagers

Subrato Ghosh, News communicator with an ST Adivasi

In last 30-35 years, production of economically-important freshwater foodfishes *via* improved grow-out fish culture methods in earthen village ponds in West Bengal have contributed towards continuous supply of affordable and nutritious animal protein-rich food. It meets consumer and domestic market demand of big-sized fishes, create sustainable livelihood, economic prosperity and increased income in villages. In fish culture vocation, household consumption of major part (rest sold in market) of grown-up Indian major carps, *Labeo bata* (sub-adult to adult fishes) in homestead owned ponds helps the disadvantaged and underprivileged group of small-scale agriculture-dependent SC and ST people in remote villages to fight back and reduce the extent of malnutrition-related health disorders amongst them, it provide food and nutritional security. This 'family nutrition' concept combats 'hidden hunger'. With financial & technical support of Fisheries Department, Govt of West Bengal, rural SC and ST youths are motivated to take up fish culture practices in owned pond and that taken on lease as sustainable remunerative avenue of self-employment, utilizing untapped village water bodies.

During 2006-2009, News communicator Subrato Ghosh worked in DBT, Govt of India funded Project on 'Economic and Livelihood Development of SC and ST Population through Freshwater Aquaculture Technologies' at tribal-dominated villages in Kendrapada and Keonjhar districts, Odisha; demonstrated techniques of seed production of economically-important fishes Rohu, Catla, Mrigal, Bata by induced breeding method in portable FRP hatchery, seed rearing from spawn to fry and fry to fingerling stage in seasonal ponds, composite fish culture in perennial ponds, culture of giant freshwater prawn in clean backyard ponds, integrated fish culture in association with poultry birds and horticulture to Project beneficiaries. Concerned farmer-friendly packages of practices have been standardized and refined by scientists and experts. Technologies developed in academic and research institutions in fish culture, *i.e.*, research knowledge are being translated and transmitted to rural areas towards livelihood development, societal benefit, betterment of rural socio-economic condition, made applicable by fish farmers and others concerned - a step towards transforming rural poverty to prosperity.

During first four years (January 2013 - June 2017) of Government service in the Department, News communicator had close association with members of two ST-dominated Fish Production Groups (FPGs) in Dakshin Dinajpur district; which were accepted as beneficiaries under Social Fishery scheme of the Department – fish fingerlings, feed and lime were provided for fish ponds under possession of FPGs. West Bengal State

Release of fish fingerlings in SC beneficiary's pond

Government-Assisted Schemes namely 'Economic Upliftment of Tribal People through operation of Pisciculture' and 'Dwelling Houses for Tribal People (Poor Tribal Fishermen)' have been implemented in different districts. Fish culture schemes with supply of inputs & accessories to water bodies of marginalized tribal people (individual beneficiary and Fish Production Groups; owned and taken on lease) are taken up for their socio-economic upliftment. Infrastructural works, renovation of water bodies and training on fish culture to interested tribal people have been executed by the Department.

Since financial year 2024-2025, two schemes namely 'Composite fish culture of Rohu, Catla, Mrigal with supply of accessories (fish fingerlings, lime, floating

ST fish farmer beneficiaries with fish feed input

News communicator with ST fish farmers

pelleted fish feed) under Tribal Sub Plan (TSP)' and 'Air-breathing fish culture with Singi with supply of fish seed under TSP', amongst other schemes, are taken up the Department exclusively for tribal fish farmers with the vision "ST community development through pisciculture and allied activities". These are economically viable, well-suited to remote village conditions in the State where resource-poor, small-scale ST fish farmers live. FPGs have been formed at Gram Panchayat level involving SC and ST fish farmers (men and women separately) in villages throughout the state; pisciculture inputs given to them as beneficiaries. Small indigenous naturally-occurring freshwater fishes *Puntius sarana*, air-breathing catfishes, *Mystus vittatus*, *Amblypharyngodon mola* are the 'Poor man's protein source' and 'Rich food for poor people',

their culture methods in small ponds have been developed which SC and ST fish farmers can adopt.

Training programmes on different aspects of freshwater and brackishwater fish culture are organized by the Department where a considerable number of SC and ST farmers participate. In addition to detailed lecture sessions, they are demonstrated how to test important physico-chemical parameters of fish pond water and soil for proper fish growth, to prepare farm-made formulated supplementary fish feed. Course materials (Training booklets) and information pamphlets given to participating trainees for wider extension of scientific fish culture, they get more information and inspiration. In order to accelerate tribal development through fisheries and aquaculture interventions with focused government support, since

Lime provided to SC fish farmer beneficiaries

House under construction of ST fisherman beneficiary

2024-2025, the Dharti Aaba Janjatiya Gram Utkarsh Abhiyan (DA-JGUA) scheme has been implemented by the Department, targeting ST Groups as beneficiaries in selected tribal villages. More advantage has been given to SC and ST fish farmer beneficiaries in comparison to beneficiaries under General Category in terms of subsidy amount (Government assistance component) in total Project cost in various schemes under Pradhan Mantri Matsya Sampada Yojona in last four financial years, funded by both Central and State Government in different districts of the State.

The 'precious' indigenous

ST beneficiaries with fish fingerlings input

practice of small-scale freshwater fishing by SC and ST villagers, employing traditional knowledge-based fish catching devices is worth mentioning. Fishing devices and traps, varying in shape-size and mode of operation, are home-made and used in shallow wetlands, inundated river banks, water-logged paddy fields and other still freshwater bodies during monsoon and post-monsoon months. This low-cost but effective technology and practice targets small-sized, naturally-occurring freshwater fishes and shellfishes. Those caught are got back live without any damage - are mainly meant for household consumption, aiding in rural family nutrition. They know the food values and health benefits of eating wild-caught swampy freshwater eel *Monopterus cuchia* and murrel *Channa striatus*, meat of freshwater bivalve, apple snail and *Bellamya bengalensis* (which people in cities and sub-urban areas do not normally prefer to eat). They prepare unique pickles using small *Puntius* sp, other minnows, small prawns and riverine shrimps. Cooked rice and/or boiled broken rice at homes are allowed to remain overnight in water in Hundi, slightly sour aroma arises on next day, small cone-shaped dumplings obtained from nearby ST households added to soaked feed as feed attractant, and fed to growing major carps in homestead ponds within 24 hours. Protein deficiency can be met if rural SC and ST youths adopt scientific fish culture in increasing extent. Many trained rural youths are coming up to achieve this objective, with new thoughts and concepts.

Courtesy: Subrato Ghosh

World Aquaculture 2025 India held

At Hyderabad Reinforcing India's Growing leadership in Global Aquaculture

World Aquaculture India 2025 Concludes with Strong Global Participation in Hyderabad

Hyderabad, India — November 14, 2025 — World Aquaculture India 2025 (WAI 2025), organized by the World Aquaculture Society – Asian Pacific Chapter (WAS-APC) with the support from the Government of Telangana together with the National Organizing Committee, by the Indian Council of Agricultural Research (ICAR), the National Fisheries Development Board (NFDB), with strong support from P.V. Narsimha Rao Telangana Veterinary University, the Society of Aquaculture Professionals (SAP), Marine Product Export Development (MPEDA)— concluded successfully at the Novotel Hyderabad Convention Centre, reinforcing India's growing leadership in global aquaculture. This year's World Aquaculture India event brought together over 3,600 participants from 63 countries, including 90 students. The international trade show featured 110 booths highlighting innovations, technologies, and services from leading companies in India and abroad. Scientific activities included 438 abstracts, 298 oral presentations, 76 posters, and 45 technical sessions, reflecting the sector's growing research and development momentum. The conference opened on November 11 with the Lighting of the Lamp and welcome remarks. The ceremony was graced by key leaders from WAS-APC, ICAR, PVNRTVU, the Government of Telangana, NFDB, and MPEDA, and other distinguished officials. World Aquaculture 2025, India was held in Hyderabad on 10-13 November 2025

A view of inaugural session of World Aquaculture 2025 India

Keynote presentations included:

- **Dr Modadugu Vijay Gupta,** World Food Prize Laureate (2005), on "Indian Aquaculture: Meeting Food and Livelihood Security"
- **Dr Manuel Barange,** Assistant Director General, FAO, on "Trends and Projections in Global and Regional Aquaculture: A Blue Transformation"

WAS Awards and WAS-APC Student Awards were also presented, recognizing excellence in aquaculture research.

Over the three-day event, WAI 2025 delivered comprehensive sessions covering feed and nutrition, genetics, disease management, sustainability, market trends, and digital innovation. A special farmer-focused session, organized by the NFDB, brought together farmers from across India, while additional sessions were conducted by MPEDA. The exhibition halls offered a dynamic space for networking, technology demonstrations, and partnership development. Special thanks to the program chair and session chairs for their support in organizing and leading the sessions.

WAI 2025 was a tremendous success,

WAS Receives Global Technical Recognition from FAO for its Role and Leadership on Sustainable Aquatic Food Systems

On October 15, 2025, the World Aquaculture Society (WAS) was honored with a prestigious award from the Food and Agriculture Organization (FAO) for its significant role in sustainable aquatic food systems. The award was presented by FAO Director-General Dr Qu Dongyu during a ceremony held at FAO Headquarters in Rome, Italy. This event marked FAO's first-ever Global Technical Recognition Ceremony, which took place as part of the organization's 80th anniversary celebrations and the World Food Forum 2025.

During the ceremony, special recognition was given to several FAO partners for their technical leadership, collaboration, innovation, and best practices in transforming sustainable agrifood systems. These contributions were highlighted across six key areas: (1) Sustainable livestock transformation, One Health, animal health, and Reference Centres; (2) South-South and Triangular Cooperation; (3) Land, soil, and water resource management for resilient agriculture and food security; (4) Sustainable aquatic food systems; (5) Sustainable Forest production and protection; and (6) Sustainable plant production and protection.

Receiving this honorary accolade underscores the importance of the WAS as a pivotal vehicle and instrument for the development of sustainable aquaculture globally. It reaffirms WAS's role as a global leader in fostering enhanced international communications, collaborations, education, and information exchange on aquaculture. This has been important to FAO's programme of work on aquaculture for several decades, since the 1970s.

The award was accepted by Mr Blessing Mapfumo, Executive Officer of the World Aquaculture Society, African Chapter, on behalf of Dr Antonio Garza D Yta, the WAS-FAO Global Liaison person.

Dr Manoj Sharma appointed as the Member of NFDB Governing Body

Dr Manoj Mohanlal Sharma

Hyderabad: Dr Manoj Mohanlal Sharma, Promoter of Mayank Aquaculture Pvt Ltd, Surat, Gujarat has been appointed as the Member in the newly reconstituted Governing Body of National Fisheries Development Board, Govt. of India. We appreciate NFDB for appointing the qualified and knowledgeable expert shrimp farmer in the country Dr Manoj M. Sharma. We are sure that Dr Manoj Sharma will give his ideas and expertise to NFDB for the development of aquaculture sector in the country.

Dr Manoj M. Sharma is a renowned expert in shrimp farming, known for his pioneering work in Gujarat, India. He's the founder of Mayank Aquaculture Private Limited. With over three decades of experience, Dr Sharma has promoted sustainable shrimp farming practices, generating employment to many people.

Contd. from page 22

highlighting India's leadership in aquaculture innovation and sustainability. The knowledge exchange and collaboration during the event will significantly strengthen aquaculture development across the Asia-Pacific region. We extend our sincere thanks to all participants for their active involvement. We hope this event has enriched everyone with valuable insights, new technologies, and innovative ideas. We remain committed to continuing this momentum and delivering future events that support learning, innovation, and progress for all.

WAS-APC expressed gratitude to its Premier Sponsors — **Aker Qrill Company, Avanti, Blue Aqua, Devee Group, INVE Aquaculture, DSM, Syaqua, and Zeigler** — whose support was instrumental in delivering an outstanding international event.

Special appreciation was extended to all **media partners** whose coverage and outreach expanded the global visibility of WAI 2025 and amplified the sector's collective voice.

Looking Ahead to World Aquaculture 2026

With the success of WAI 2025, preparations are already underway for **World Aquaculture 2026 (WA2026)**, scheduled to take place in **Singapore**. The event will continue the mission of advancing global aquaculture through science, innovation, policy dialogue, and industry collaboration.

ISF Group gains reputation for prompt payment to customers

Shahenshah Hussain Moinuddin Khan, Managing Director, ISF Seafoods Pvt Ltd and Partner, SHK Fisheries under ISF Group has announced his plans to start export of shrimps and to establish shrimp processing plant with 50 tonnes per shift capacity by 2027. ISF Group is supplying 7,000 tonnes of shrimp feed and 100 million Tiger and Vannamei seed in Gujarat state, and lifting 5,000 tonnes of shrimp raw material from farmers.

Shahenshah Khan, Managing Director, ISF Seafoods Pvt Ltd

Shahensha Khan with the then Union Minister of State for Rural Development Faggan Singh Kulaste, the seven times election winning Member of Parliament (2019 to 2024).

Surat: Mr Shahenshah Hussain Moinuddin Khan, Managing Director, ISF Seafoods Pvt Ltd and Partner, SHK Fisheries under ISF Group has announced his plans to start export of shrimps and to establish shrimp processing plant with 50 tonnes per shift capacity. The processing plant which is under construction at Mumbai will start its operations in 2027.

ISF Group is supplying 7,000 tonnes of shrimp feed and 100 million Tiger and Vannamei seed in Gujarat state, and lifting 5,000 tonnes of shrimp raw material from farmers. The company is also supplying inputs for health and nutrition for shrimp farming in the state. The group has achieved an annual turnover of Rs 150 crores.

ISF Group was started in 1991 and is providing different kinds of products and services to aquaculture farmers mainly in Gujarat state, and then purchasing shrimp raw material from Haryana, Punjab, Rajasthan and Andhra Pradesh, and gives the raw material to the processing plants in Gujarat and Mumbai.

Mr Shahensha and his group of companies have reputation for prompt payment and services in aquaculture community. In future he would like to put efforts to develop domestic consumption of shrimps.

Olpad Aqua delivering end-to-end shrimp farming and processing solutions

From left: Hasan Malek, Imtyaz Khan, Arefin Malek and Farhan Malek, Partners of Olpad Aqua Pvt Ltd, Olpad, Gujarat.

Olpad, Surat: Olpad Aqua Pvt Ltd is engaged in the business of shrimp processing and aquaculture solutions, catering to both domestic and international markets. We operate across the entire aquaculture value chain from pond preparation to shrimp processing and export - providing high-quality products and services that ensure sustainable and efficient shrimp farming, said Mr Arefin Malek, Executive Director, Olpad Aqua Pvt Ltd.

Arefin Malek said that their integrated business model encompasses:

Shrimp Processing: Procurement, cleaning, grading, freezing, and packaging of shrimps for export and domestic sale, ensuring compliance with international food safety and quality standards.

Aquaculture Inputs: Supply of pond preparation materials, probiotics, feed supplements, disinfectants, and water treatment chemicals to enhance shrimp health and yield.

Equipment and Infrastructure Support: Distribution of aerators, water testing kits, and other essential aquaculture machinery and accessories to shrimp farmers, enabling efficient pond management and sustainable farming practices.

With a focus on quality, innovation, and farmer-centric solutions, our Company has established a growing presence in India's aquaculture ecosystem. Our product portfolio, technical expertise, and strategic relationships with farmers and processors provide a competitive edge in delivering end-to-end shrimp farming and processing solutions, he stated.

Olpad Aqua has four partners Mr Hasan Malek, Mr Imtyaz Khan, Mr Arefin Malek and Mr Farhan Malek who are all brothers.

We need 'One Nation, One Power policy' to help aqua farmers in Gujarat, all over India

Suresh J Patel, President, Gujrat Aquaculture Association, appeals state and central governments. Electricity Tariff in Gujarat state is at Rs 9.25 per unit, whereas its Rs 1.50 in Andhra Pradesh.

Suresh J Patel, President, Gujarat Aquaculture Association

Navsari: Mr Suresh J Patel, President, Gujarat Aquaculture Association (GAA), is putting efforts in representing the government at state and central level the issues related to aquaculture development in Gujarat state. Aqua International Editor M.A. Nazeer visited his office at Navsari on 7 November 2025 and found lot of correspondence Suresh Patel doing with the government. Some of the representations he made are published in this issue of Aqua International.

Electricity Tariff in Gujarat state at Rs 9.25 per unit

Suresh Patel requested the government to have "One Nation, One Power policy" in Gujarat and all over the country for aquaculture farming, then only farmers will be able to reduce cost of production. The electricity tariff in Gujarat state is Rs 9.25 per unit, whereas Andhra Pradesh government is charging Rs 1.50 per unit. The electricity tariff in Gujarat state should be brought down to Rs 2 to 3 per unit. The cost of production of Shrimps in Gujarat state is Rs 50 higher than in Andhra Pradesh due to power tariff and other aspects, he stated.

The government should remove import duty on raw materials of feed manufacturing, and also withdraw GST and Taxes on aquaculture inputs, the GAA President appealed.

Gujarat has 376,000 hectors of brackishwater area, the second largest area next to West Bengal, and 90,000 hectors of land is very much suitable for aquaculture, but only 10,000 hectors land is in use for aquaculture. If the land is brought into use for aquaculture, aquaculture sector can grow a lot in the state, he stated.

Suresh J Patel said, farmers are not aware of what our Association is doing for the benefit and well being of aquaculture sector and the farmers. Government is not supporting this industry and there is no allotment of land and there is no renewal of land on lease due to CRZ issue, which has to be solved soon in order to ensure growth of this sector in the state.

Initially in 1991 the land lease was Rs 100 per hector, then became Rs 500 per hector in 2007, and now made Rs 5,000 per hector per year. We request the government to look into this matter and renew the land lease at Rs 1,000 per hector instead of Rs 5,000, so that the farmers can have better livelihood, the GAA President requested.

Office bearers and Key Persons of GAA:

1. Suresh J Patel.
2. Narendra Tandel.
3. Anil L Patel.
4. Prahlad H Patel.
5. Dr Manoj Sharma.
6. Dattu Bhai Tandel.
7. Manhar C Tandel.
8. Pradip Navik.
9. Heetal Patel.
10. Jignesh U Contractor.
11. Saji Chacko.
12. Chandrakant Patel.
13. Purshotham D Patel.
14. Vindo D Patel.
15. Prakash Kumar R. Tandel.

To

Shri Rajiv Ranjan Singh Ji
Honorable Cabinet Minister
Ministry of Fisheries, Animal Husbandry and Dairying
Government of India, New Delhi

Date: 01.02.2025

Subject: Request for Removal of Import Duty on Shrimp and Fish Feed

Respected Sir,

On behalf of shrimp farmers in Gujrat and nationwide, I thank the government for its support to the aquaculture sector. However, we now request the complete removal of the import duty on shrimp and fish feed (HS Code: 23099031) in the upcoming budget to protect farmers interests.

Impact of 2021 Duty Hike

In 2021, the increase in import duty from 5 % to 15 % led to a 20 % rise in feed prices, significantly burdening farmers. Another hike would make shrimp farming unsustainable and negatively impact exports, as farmers would struggle to maintain profitability.

Role of Imported Feed

Although imported feed constitutes only 1 % of India's total feed market, it is vital for competitive pricing. Without it, domestic manufacturers could raise prices, which would further strain farmers already facing 15-20 % higher feed costs than international competitors.

Risk of a 30 % Duty Increase

There are concerns that some domestic feed producers are lobbying for a30 % duty, which would eliminate imports and allow them to increase prices. Since feed accounts for 50-55 % of farming costs, this would harm farmers and hurt india's shrimp exports, risking the livelihoods of many.

Global Competitiveness

With over 90 % of india's shrimp exported, keeping feed costs competitive is essential for maintaining our market share, especially against like Ecuador and Vietnam. Rising feed prices could make Indian shrimp less competitive globally.

Economic benefits of Duty Removal

The duty's revenue is minimal, while removing it would reduce feed costs, increase shrimp production, and boost exports, benefiting the economy and aquaculture sector.

Monopolistic Practices

Domestic feed manufacturers are large corporations, not small enterprises, and their lobbying for higher duties threatens to monopolize the market and raise prices. Removing the import duty would protect farmers from exploitation.

We trust your leadership in supporting the shrimp farming community and urge the removal of the import duty to safeguard farmers interests and india's shrimp export sector.

Thank You,

Suresh Patel, President,
Gujrat Aquaculture Association,
Navsari, Gujarat.

To, Date: 08.10.2024

George Kurian Sir,
Hon'ble Minister of state for Fisheries,
Animal Husbandry and Dairying,
Delhi.

Subject: regarding giving relief to the prawns farming fisheries farmers regarding filing C A. in Hon. High Court against the order of the Hon. Gujrat High Court in Sp. C A. No. 3533 / 2022, Dt: 12.02.2022.

Serial:

1. Letter of Government of India Agricultural secretariat, New Delhi No. 31035-849-89 AKY (3) Dt: 10.05.199
2. Letter of government of Gujrat Agriculture government and village department No. CHEKDIVI-291 illegible Dt : 06 June 1984 sent to Chairman Vidyut Gujrat Board Vadodara
3. Vidhyut Sulk Kshmaharta Gandhinagar letter no. D/SCHN/ PGVCL/2019 28880 Dt: 13.12.19
4. Surat aqua culture farms association's letter dt: 14/6/18 making submission to collector Surat for electricity relief
5. Submissions made by Gujrat Aqua Culture Association to Hon. Minister Pratapchandra Sarangi, Government of India on dt : 18/1/20
6. Submissions made by Gujrat Aqua Culture Association to Chief Secretary Gujrat Government, Gandhinagar, Dt 11/2/20
7. Submissions made by Gujrat Aqua Culture Association to fisheries commissioner on dt: 11.02.22
8. Submissions made by Gujrat Aqua Culture Association to Hon. Minister Zavaharbhai Chavda, tourism and fisheries Gandhinagar dated 18.07.21
9. Submissions made by Gujrat Aqua Culture Association Hon. Minister Mukeshbhai Patel Agricultural Department Gandhinagar, Dt : 11.01.22
10. Recommendation letter by Honorable minister of state agriculture, energy and petrochemicals Gujrat State Gandhinagar no. Mantri/185/225/22, Dt: 11.01.22 to Hon. Minister of state fisheries department, Gandhinagar
11. Submissions made by Gujrat Aqua Culture Association to Hon. Chief Minister, Gujrat State Gandhinagar, Dt: 22.02.22
12. Submissions made by Gujrat Aqua Culture Association to Hon. Pradesh Adhyaksh C.R. Patel, D.
13. Order under petition Sp. C.A. 3533/2022 with S.C.A. No. 13743/21 filed by zeal aqua Ltd, against state government Dt: 22.04.22
14. Submissions made by Gujrat Aqua culture association to chief secretary Gujrat state Gandhinagar Dt: 31.05.22
15. Letter sent by specially authorized officer on duty of Hon. Chief Minister, Chief Minister's office, Gandhinagar to Agra Sachiv, Energy and petrochemicals department and commissioner Fisheries Gandhinagar
16. C.A. filed in matter Sp C.A. Nop. 13743/21 in Hon. High Court by Gujrat Aqua culture association
17. Submissions made by Gujrat Aqua culture association to chairman MPEDA, KOCHI, Dt : 04.10.22
18. Submissions made by Gujrat Aqua culture association to Hon. Minister shri Parsottam Rupala Saheb, Union Cabinet Minister fisheries, Government of India, Dt: 05.10.22
19. Letter from Deputy director fisheries (aqua) Gandhinagar to applicant association regarding proposals given to government and matter is under process at government level
20. Submissions made by Gujrat Aqua culture association to Hon. Minister Jitubhai Chaudhary, Minister of state fisheries and kalpsar Gujrat state Gandhinagar
21. Submissions made by Gujrat Aqua culture association through letter dt: 30.01.22 to Dr Sanjikumar Billiyanji, Minister of State for Fisheries, Govt of India.

Honorable,

With due respect and jay bharat, this is to inform regarding the subject mentioned above that, in entire India, under the leadership of honorable prime minister saheb, Atmanirbhar bharat and pradhanmantri matsya yojna is running. Wherin, prawns farming fisheries is also included. And on one such farm, 30 to 35 persons are getting employment directly or indirectly accordingly, districted situated on 1600 K.M. sea

Coast of Gujrat viz. from south Gujrat side Valsad, Navsari, Surat, Bharuch and districts of Saurashtra coast and in these districts plenty numbers of coast area and number of fisheries farms are situated. On each farm, in lakhs of numbers of people are getting employment. In comparison with other employments in state, because of prawns farming labour, worker and holder of prawn farm owners are passing their life with capability and in good manner and receiving good returns, Plenary of numbers of labour workers can get sufficient

employment opportunity. But because of confusions because of burning issues with the fishers and fisheries holders, who are engaged in business for 10-12 years, have to avail electrical powers for technical machineries at sea coast for prawn farming. Said charge of electrical power is very high comparing to other states. Because of that production cost is very high, because of that fisheries farmers have to suffer financially for production. This is to say that because of high electricity rates, financial problems arises. Because of that constant confusions are created. In prawns farming, if because of deceases spread during production process, because of electricity burden, suffers crores of rupees as loss. With this burden of seeds etc also are there. As prawn farming is done at sea coasts, it becomes impossible to bear expenses due to natural calamity viz. storm, speedy air, heavy rain, expensive pipe line to bring clean water from long distance. Its liability directly imposes on fisheries farmers. Among many confusions have to pay electricity power charge to electricity company compulsorily, because of its high rates, no steps are initiated towards appropriate compensation. And for years associaton is making submissions for relief in electricity rates to farmers.

Agricultural ministry of Government of India has issued instructions to fisheries department of all states on dt: 10.05.1994 to do necessary proceedings. And under which, upsachiv krushi, Sahkar and Gramya Vibhag of Gujrar state through letter dt: 06.06.1994, has instructed to chairman Gujrat Vidyut board Vadodara to do appropriate proceedings in reference to letter of Government of India Agricultural mantralaya, Dt: 10.05.94. Association has no knowledge about proceedings regarding the same. Under Gujrat Electricity Rate Act 1958, various amendments issued by Vidyut Sulk Kshmaharta Gandhinagar and discussions / talks took place between oct.2019 to dec.2019 regarding electricity rates, the proceedings were published. Issue No. 2 of that proceeding regarding waver of electricity tax, it is not clear it is for which business. Further issue no. 4 (b) of proceeding, it is clarify that prawns farming business is not included in industrial unit. Then whether to include prawn farming with farming business or not ? is not clarified. And our time to time submissions were made. But we have not received any specific instruction or relief till date. We the farmers associated with prawns farming have to pay electricity at high rates constantly in comparison with other states. Because of that the return received by farmers of prawn farming is negligible. State wise rate of volt of electricity line being collected by states are as under.

Sr.	State	Electricity line	Volt	Rupee
1	Gujrat	L.T.M.D	100	9.00
2	Orissa	L.T.M.D	100	2.50
3	Andhra Pradesh	L.T.M.D	100	2.50
4	Tamilnadu	L.T.M.D	100	2.50

And position of Electricity connection demand charge and energy being collected in Gujrat from 2015-16 to 2019 is as under

Sr.	State	Valid from	Type of line	Demand Charge	Energy Charge
1	Gujrat	2019	HT	150	7.8
			LT		8.57
1-502	Orissa	2019	LT agriculture activities	0	1-60
			HT agriculture activities	30	1-50
3	Andhra Pradesh	2019	LT III	21	2.00
			MT-1 C	21	2.00
4	Maha-rashtra	2015-16	LT-IV	20	2.10
			HT-IV	30	3.32
5	Tamil-nadu	23.05 .2016	LT-IV Prawns farming	0	Fully subsi-dized

Thus looking to the above details, in comparison with other states of India, electricity rate in Gujrat is very high. And for that association has made submissions in last 4-5 years to state government / centre government referred in above No. 4,5,6,7 ,8,9,11,12,14,16,17,18,20,21. And have met personally numerous time to concern department secretary and Hon. Ministers. Fisheries farmer filed Sp.C.A No. 3533 / 2022 with Sp. C.A No. 13743 / 2021 to avail relief in electricity rates and order was given to opponent state authority to take decision within three months from date of order i.e., 12.04.22, as per rules. But association has filed separate petitioner "C.A" in honorable High Court for review for not to collect electric charge more than Rs.2.10. To give the voice to our submissions for giving relief in electricity rates we have made various and many times the requests. Still we have not be given any relief till date or consolations are also not given. Because, if relief is given for prawns farming farmers can get very good returns and state government also can get more revenues. As Gujrat sea coast is 1600 K.M. long and wherein 85340.91 hector land is enough for fish and prawns farming, only 8000 hector land is allotted at present for prawns farming by the state government to the fisheries farmers accordingly 45,00,000 ton prawns are being produced in Gujrat state against it, electricity rate is Rs.9/- for production of 45,00,000 ton prawns, Rs.135 crore electricity is consumed. If honorable government gives relief in electricity to the prawns farming farmers, then it is true that government will have burden but 45,00,000 ton prawns are being exported and out of that government is earning revenue of 3000 crore.

Therefore if state government gives serious look prawns production then appropriate return can be availed and prawn producing farmers can get relief in comparison of other states. And state prawns production in state can be increased. And because of that, there are bright circumstances for government to get more and more revenue. Under this circumstances in other states, fisheries farmers are getting electricity at very low rate and in comparison to it, the rate in Gujrat is high and this is a request to give immediate relief In electricity rates in comparison to other state.

Date: 22.12.2023

Gujrat Aquaculture Association
D-28, First Floor, Udhyog Nagar,
Vijalpore, Navsari 396450.

Gujrat Electricity Regulatory Commission,
6th Floor, Gift One,
Road 5C, Zone 5, Gift City,
Gandhinagar – 382 355,
Gujrat, India.
Phone: 91 - 79 - 2360 2000
Fax: 91 – 79 – 2360 2054 / 2360 2055
Email: gerc@gercin.org

Subject: Petition No. 2261 of 2023 – Notification of Hearing.

Dear Sir,

I trust this letter finds you well. I am writing on behalf of the Gujrat Aquaculture Association to bring to your attention a matter related to Petition No. 2261 of 2023.

We have received the communication indicating that the Honourable Commission has scheduled a hearing for the aforementioned petition today, i.e., on 22.12.2023, after 11 am. Regrettably, due to the delayed receipt of this notification, we were unable to appear for the scheduled hearing.

Additionally, our technical representative is unavailable from January 14,2024, until January 25, 2024. In light of these circumstances, we kindly request your consideration in rescheduling the hearing to a mutually convenient date. We would appreciate receiving advance notice to ensure our participation.

In adherence to your directive, we will duly serve copies of the petition to the respondents, namely:

The Secretary, Agriculture Khedut Kalyan and Co-operative Department, Government of Gujrat, Block No.5, First Floor, New Sachivalaya, Gandhinagar, Gujrat. T: 079 - 2325 0802, Email: secagri@gujarat.gov.in

The Secretary, Energy & Petrochemicals Department, Government of Gujrat, Block No. 5, 5th Floor, Sachivalaya, Gandhinagar, Fax: (079) 2325 0797, Telephone No.: 2325 0771 / 72 / 73, Email Id: secepd@gujarat.gov.in

The Managing Director, Dakshin Gujrat Vij Company Limited, Registered & Corporate Office, "Urja Sadan", Nana Varachha Road, Kapodara, Surat - 395 006, Phone no.: 0261 250 6299, Fax No.: 0261 257 2636 / 257 4251, E-mail: gvcl@gebmail.com

We sincerely appreciate your understanding of these unavoidable circumstances and kindly request your assistance in facilitating a rescheduled hearing.

Thank you for your attention to this matter, and we look forward to your prompt reply.

Yours Sincerely,

For Gujrat Aquaculture Association
President's Full Name – Sureshbhai Jogibhai Patel

Date: 28.08.2025

To
The Secretary,
Fisheries Department,
Government of India
Krishi Bhawan, Dr Rajendra Prasad Rd,
Opposite Rail Bhawan, Rajpath Area,
Central Secretariat, New Delhi.

Subject: Request to Remove GST and Taxes on Aquaculture Inputs

Dear Sir / Madam

I am writing to respectfully request that the Government of India consider removing Goods and Services Tax (GST) and other taxes on all aquaculture inputs. The recent tariffs imposed by the USA on Indian shrimp have significantly impacted our industry, making it extremely challenging for aqua farmers to survive.

The additional burden of GST and taxes on essential aquaculture inputs is further exacerbating the situation. Removing these taxes would help reduce production costs, increase profitability, and make Indian aquaculture products more competitive in the global market.

I urge you to consider the long-term benefits of supporting our aqua farmers and the industry as a whole. Your prompt attention to this matter would be greatly appreciated.

Thank You for your time and consideration

Sincerely

The Gujrat Aquaculture Association
President
Suresh Patel
President
Gujrat Aquaculture Association

Date: 31.01.2023

To
Dr Sanjeev Kumar Balyan Ji,
Minister of State for Fisheries,
Animal husbandry & Dairying,
Government of India.

Subject: Subsidized Power for Aquaculture in Gujrat. Representation in pursuance of Common Order dated 12.04.2022 passed by the Hon'ble High Court of Gujrat in SCA No.3533 of 2022 & 13743 of 2021.

Dear Sir,

Gujrat as a coastal state is endowed with a long coastline of over 1600 km with about 85.340.91 hectares of saline affected land suitable for fish and shrimp farming. At the moment just about 8000 hectares land is allotted and developed for shrimp farming.

Gujrat produces close to 50.000 MT of shrimp/prawns annually generating export revenue over Rs 2250 crore. This activity generates employment to the rural population. The employment generated by this activity is close to 1 lakh persons directly or indirectly. India as a country produces about 7,70,000 MT of shrimp generating an export revenue of about Rs 50000 crore. At present Andhra Pradesh leads in shrimp production in the country with an annual production of about 6,25,000 MT. Gujrat has huge potential to produce shrimps as we have utilized just about 7 % of the available land.

Government of India has recognized fish/shrimp farming as an allied activity of Agriculture for the supply of water and electricity at concessional rates vide their communication to the secretaries in charge of fisheries of all the states on 10.05.1994. Many states like Andhra Pradesh, Maharashtra, Karnataka, Orissa, Tamil Nadu, Kerala, etc has recognized this and implemented this directive and is supplying electricity for fish/ shrimp farming at subsidized rates. Therefore, it is important to note that right from the beginning the policy of the central Government is to give benefit in electricity duty charges for prawn farming. The said communication Dated 10.05.1994 therefore clearly mentioned that:

"Electricity and water should be made available to fish farmers at concessional rates by the State Government as is done for agriculture".

Therefore, it is crystal clear and evident that the policy of the Central Government of charging electricity charges same as that of agriculture sector, when it comes to prawn farming. The Central Government has therefore all the State Governments furtherance of the same, Maharashtra Electricity Regulatory Commission in their order dated 26.06.2015 ruled that aquaculture, sericulture and cattle breeding farms shall be considered under the Metered Agriculture Others category for which the tariff is lower.

Andhra Pradesh also supplies power to Aquaculture in both LT and HT categories at almost half the price of that supplied to industries. Kerala also supplies power to aquaculture, prawn farms, fish farms etc at subsidized rates and categorized the tariff under LT VB-Agriculture and HT – III B – Agriculture. Orissa also has categorized aquaculture under Allied agricultural activities and supplies power at lower rates. Tamilnadu also supplies power to fish/prawn culture units and it is fully subsidized.

However, the electricity duty charges from the members of our association are at the rate of Rs 7.80/- per kilo Watt which is unreasonably excessive and it is operating very harshly on the members of the Association. Therefore, too it is becoming impossible for them to compete with the other states in cost of production as well as other factors.

A comparison of power tariff for aquaculture / fish / shrimp / orawn farming prevailing at various States is given below:

Name of State	Date / Year Valid From	Category	Demand Charge (Rs / KVA / Month)	Energy Charges (Rs / KWH)
Gujrat	2019	HT	150	7.80
		LT		8.97
Orissa	2019	LT : Allied Agriculture Activities	0	1.6
		HT : Allied Agriculture Activities	30	1.50
Andhra Pradesh	2019	LT -	21	2.00
		HT-I (C)	21	2.00
Maha-rashtra	2015-16	LT-IV	20	2.10
		HT-V	30	3.32
Tamil Nadu	23.05 .2016	LT-IV Prawn Farming		Fully subsidized

A bare look at the table would show that the electricity duty charge in the State of Gujrat is much more than the other States. In Gujrat it is being charged at Rs 8.97/- per KW for low tension and Rs 7.80 per KW for high tension while for the State of Orissa it is at the rate of Rs 1.60/- and Rs 1.50/- respectively. In the state of Andhra Pradesh, it is at the rate of Rs 2.00 for both low tension and high tension. In Maharashtra it is at the rate of Rs 2/- per KW and Rs 2.20 per KW for low and high tension respectively. In Tamil Nadu, it is fully subsidized and for prawn farming activity no electricity duty is charged. Thus, it is only in the state of Gujrat that such high rates are being charged and therefore putting the members of our association at a disadvantage.

On 28.07.2005 the Commissioner of Fisheries had written a letter to the Deputy Secretary, Fisheries Department, State Government clearly pointing out that since Gujrat has a very big coast line and because of the salty water, the lands situated near that is being not utilized for any other prpose than fisheries and that 1.95 lakh hectares land can be used as being

utilized for agriculture / prawn farming. It was further pointed that order of Central Government should be given effect to and further pointing out that as far as electricity charges are concerned, they should be on the basis of agriculture and not commercial or industrial use. It was also pointed out that electricity is very important in prawn farming and it should be declared as agriculture use and maximum foreign exchange could be earned since it is a exported oriented business.

Furthermore, a letter was also written on 14.06.2018 by our association to the Collector, Surat for giving benefit of concession in electricity duty to the prawn farmers. Apart from that, a letter is also written by our Association to the Commissioner of Fisheries on 11.02.2020 informing about electricity charges and clearly pointing out and reiterating that the electricity charges in the State of Gujarat are exorbitant in comparison with other states. It was also stated that the high electricity tariff paid by the prawn farmers in Gujarat has put them at a disadvantage as it results in the escalation of cost of production in comparison to the shrimp farmers of other states. The prawn farmers of Gujrat already at a cost disadvantage due to the additional freight cost burden on the purchase of major inputs like seeds, feed etc as majority of the hatcheries and feed mills are located in Andhra Pradesh and Tamil Nadu.

On 28.09.2020, a letter is written by the Deputy Secretary, Fisheries Department to recommended for reduction in the electricity charges to the Agriculture department of the Government of Gujrat and Agriculture and Co operation Department of the State Government that needful should be done very urgently, it is pertinent to note that on 28.09.2020, though a clear recommendation was made, the State Government quite contrary to the interest of citizens of Gujrat State is sitting tight on that and not reducing the electricity charges. On 18.07.2021, our Association has also written a letter to the Agriculture Ministry to reduce electricity charges.

That thereafter our Association was left with no other alternative but to approach the Hon'ble High Court of Gujrat. The Hon'ble High Court of Gujrat thereafter passed a common Order dated 12.04.2022 below a SCA No.3533 of 2022 & 13743 of 2021 directing the State Authority to decide the representations dated 11.02.20201 & 18.07.2021 within a period of three month. The Present representation is also being made in pursuant of the same order so as to assist the State Authority.

At the end, Aquaculture, like agriculture is prone to natural calamities like drought, flood, disease outbreaks etc. Prawn farming in Gujrat is mostly carried out by members from the fishermen community, who are finding aquaculture as an alternate subsistence means as the returns from capture fisheries is declining year by year. Coastal aquaculture in Gujrat generates excellent opportunity for rural employment and development.

We therefore request you to kindly intervene with the concerned authorities to review the tariff and provide us with a lower tariff in the same lines as that of other states.

Thanking You

President
The Gujrat Aquaculture Association

Date: 31.05.2022

To

The Principal Secretary,
Gandhinagar,
Gujrat.

Subject: Subsidized Power for Aquaculture in Gujrat. Representation in pursuance of Common Order dated 12.04.2022 passed by the Hon'ble High Court of Gujarat in SCA No.3533 of 2022 & 13743 of 2021.

Dear Sir,

Gujaratas a coastal state is endowed with a long castline of over 1600 km with about 85,340.91 hectares of saline affected land suitable for fish and shrimp farming. At the moment just about 8000 hectares land is allotted and developed for shrimp farming.

Gujaratproduces close to 50,000 MT of shrimp / prawns annually generating export revenue over Rs 2250 crore. This activity generates employment to the rural population. The employment generated by this activity is close to 1 lakh persons directly or indirectly. India as a country produces about 7,70,000 MT of shrimp generating an export revenue of about Rs 50000 crore. At present Andhra Pradesh leads in shrimp production in the country with an annual production of about 6,25,000 MT. Gujarat has huge potential to produce shrimps as we have utilized just about 7% of the available land.

Government of India has recognized fish/shrimp farming as an allied activity of Agriculture for the supply of water and electricity at concessional rates vide their communication to the secretaries in charge of fisheries of all the states on 10.05.1994. Many states like Andhra Pradesh, Maharashtra, Karnataka, Orissa, Tamil Nadu, Kerala, etc has recognized this and implemented this directive and is supplying electricity for fish / shrimp farming at subsidized rates. Therefore, it is important to note that right from the beginning the policy of the central Government is to give benefit in electricity duty charges for prawn farming. The said communication Dated 10.05.22 therefore clearly mentioned that:

"Electricity and water should be made available to fish farmers at concessional rates by the State Government as is done for agriculture".

Therefore it is crystal clear and evident that the policy of the Cental Government of charging electricity charges same as that of agriculture sector, when it comes to prawn farming. The Central Government has therefore informed all the State Governments including the State of Gujarat to give effect of the said Order dated 10.05.1994.

In furtherance of the same, Maharashtra Electricity Regulatory Commission in their order dated 26.06.2015 ruled that aquaculture, sericulture and cattle breeding farms shall be considered under the Metered Agriculture Others category for which the tariff is lower. Andhra Pradesh also supplies power to Aquaculture in both LT and HT categories at almost half the price of that supplied to industries. Kerala also supplies power to aquaculture, prawn farms, fish farms etc at subsidized rates and categorized the tariff under LT VB-Agricultural activities and

supplies power at lower rates. Tamil -Nadu also supplies power to fish/prawn culture units and it is fully subsidized.

However, the electricity duty charges from the members of our association are at the rate of Rs 7.80/- per kilo Watt which is unreasonably excessive and it is operating very harshly on the members of the Association. Therefore, too it is becoming impossible for them to compete with the other states in cost of production as well as other factors.

A comparison of power tariff for aquaculture/fish/shrimp/prawn farming prevailing at various States is given below:

Name of State	Date / Year Valid from	Category Description	Demand Charge (Rs / KVA / Month	Energy Charges (Rs / KWH)
Gujarat	2019	HT	150	7.80
		LT		8.97
Orissa	2019	LT : Allied Agriculture Activities	0	1.60
		HT : Allied Agriculture Activities	30	1.50
Andhra Pradesh	2019	LT-III	21	2.00
		HT-I (C)	21	2.00
Maha-rashtra	2015-16	LT-IV	20	2.10
		HT-V	30	3.32
Tamil Nadu	23.05 .2016	LT-IV Prawn Farming		Fully subsi-dized

A bare look at the table would show that the electricity duty charge in the State of Gujarat is much more than the other States. In Gujarat it is being charged at Rs 8.97/- per KW for low tension and Rs 7.80 per KW for high tension while for the State of Orissa it is at the rate of Rs 1.60/- and Rs 1.50/- respectively. In the state of Andhra Pradesh, it is at the rate of Rs 2.00 for both low tension and high tension. In Maharashtra it is at the rate of Rs 2/- per KW and Rs 2.20 KW for low and high tension respectively. In Tamil Nadu, it is fully subsidized and for prawn farming activity no electricity duty is charged. Thus it is only in the state of Gujarat that such high rates are being charged and therefore putting the members of our association at a disadvantage.

On 28.07.2005 the Commissioner of Fisheries had written a letter to the Deputy Secretary, Fisheries Department, State Government clearly pointing out that since Gujarat has a very big coast line and because of the salty water, the lands situated near that is being not utilized for any other purpose than fisheries and that 1.95 lakh hectares land can be used as being utilized for agriculture / prawn farming. It was further pointed that order of Central Government should be given effect to and further pointed out that as far as electricity charges are concerned, they should be on the basis of agriculture and not commercial or industrial use. It was also pointed out that electricity is very important in prawn farming and it should be declared as agriculture use and maximum foreign exchange could be earned since it is a exported oriented business.

Furthermore, a letter was also written on 14.06.2018 by our association to the Collector, Surat for giving benefit of concession in electricity duty to the prawn farmers. Apart from that, a letter is also written by our Association to the Commissioner of Fisheries on 11.02.2020 informing about electricity charges and clearly pointing out and reiterating that the electricity charges in the State of Gujarat are exorbitant in comparison with other states. It was also stated that the high electricity tariff paid by the prawn farmers in Gujarat has put them at a disadvantage as it results in the escalation of cost of production in comparison to the shrimp farmers of other states. The prawn farmers of Gujarat are already at a cost disadvantage due to the additional freight cost burden on the purchase of major inputs like seeds, feed etc as majority of the hatcheries and feed mills are located in Andhra Pradesh and Tamil Nadu.

On 28.09.2020, a letter is written by the Deputy secretary, Fisheries Department to the President of our Association clearly pointing out that the Director of Fisheries has already recommended for reduction in the electricity charges to the Agriculture department of the Government of Gujarat and Agriculture and Cooperation Department of the State Government that needful should be done very urgently. It is pertinent to note that on 28.09.2020m though a clear recommendation was made, the State Government quite contrary to the interest of citizens of Gujarat State is sitting tight on that and not reducing the electricity charges. On 18.07.2021, our Association has also written a letter to the Agriculture Ministry to reduce electricity charges.

That thereafter our Association was left with no other alternative but to approach the Hon'ble High Court of Gujrat. The Hon'ble High Court of Gujarat thereafter passed a common Order dated 12.04.2022 below SCA No.3533 of 2022 & 13743 of 2021 directing the State Authority to decide the representations dated 11.02.2022 & 18.07.2021 within a period of three month. The Present representation is also being made in pursuant of the same order so as to assist the State Authority.

At the end, Aquaculture, like agriculture is prone to natural calamities like drought, flood, disease outbreaks etc. Prawn farming in Gujarat is mostly carried out by members from the fishermen community, who are finding aquaculture as an alternate subsistence means as the returns from capture fisheries is declining year by year. Coastal aquaculture in Gujarat generates excellent opportunity for rural employment and development.

We therefore request you to kindly intervene with the concerned authorities to review the tariff and provide us with a lower tariff in the same lines as that of other states.

Thanking You,

President
Gujarat Aquaculture Association

C.C. To,

(1). Office of the Commissioner of Fisheries,
Block No.10,3rd Floor,
Dr Jivraj Mehta Bhavan,
Gandhinagar.

(2). The Secretary, Fisheries Department,
New Sachivalaya, Gandhinagar.

(3). The Collector, Navsari,
Office of the Collector,
Navsari.kv

Pubertal Molting as a Bottleneck in Crustacean Growth and Reproductive Cycles

J. Magimai John Jose[1]* and **S.Selvaraj[2]**
[1]**UG Scholar,** TNJFU, Dr MGR Fisheries College and Research Institute, Ponneri Campus
[2]**Department of Aquaculture,** TNJFU, Dr MGR Fisheries College and Research Institute, Ponneri Campus
Corresponding Author E-mail: magimaimadha003@gmail.com

Abstract:
In most of the crustaceans, pubertal molting is a critical physiological event which connects growth development to reproductive maturity. Due to the high metabolic cost of molting and its strong regulation by neuroendocrine systems, the pubertal molt can often be the bottleneck to aquaculture: it may allow animals to delay breeding, increase mortality, or have inadequate reproductive success when environmental, nutritional, or husbandry factors are unfavorable. The following article is a review of the biology and endocrinology of pubertal molting, reasons why it is a bottleneck in production systems, management strategies adopted to control pubertal molting in hatcheries and farms, gaps in research, and future research directions. This article unpacks why pubertal molting is a bottleneck in growth and reproduction cycles and how aquaculture practitioners and researchers can address it.

HIGHLIGHTS:

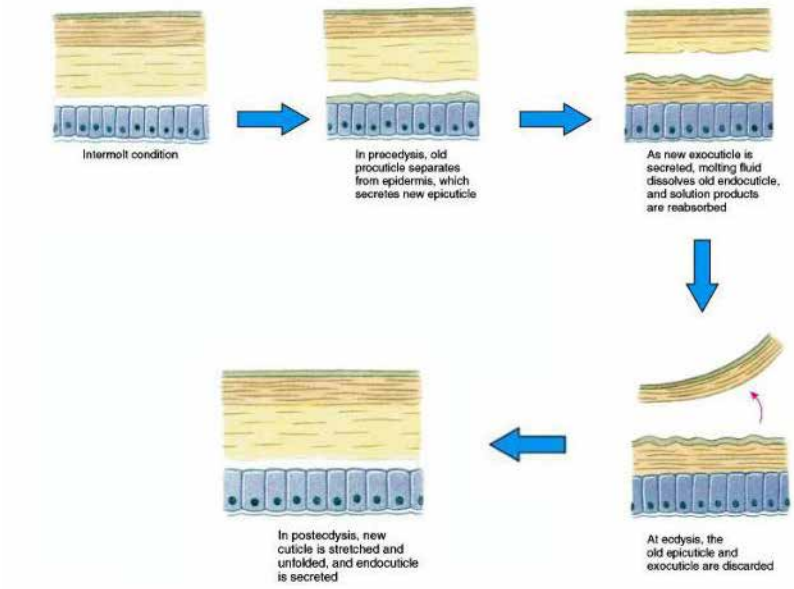
- Pubertal molting refers to the transition between the growth and sexual maturity of the shrimp, crabs, and lobsters, i.e., the passage to reproduction.
- There is also an energy trade-off since molting and reproduction are energy competitors and in low resource situations, growth and fecundity are both negatively affected.
- Molting and reproduction are controlled by hormones, including hormones that prevent molting, molt-inhibiting hormone (MIH), and ecdysteroids, which can stop the cycles.
- It is a weak period when crustaceans are soft-shelled and weak and extremely susceptible to stress or death.
- Temperature, light cycles, and tides are environmental factors that affect pubertal molting, posing problems in hatcheries.
- Molting hormones and disrupt the reproductive abilities of stalls due to endocrine effects of pollutants and poor water quality.
- Some solutions are listed: better broodstock feeding, environmental manipulation (temperature, light), substitution of invasive hormonal manipulations with safer ones and breeding selection on the predictability of molt.
- In the future, it is suggested to work with molecular tools, biomarkers, and genetic enhancements to predict and control pubertal molts.
- Pubertal molting is a biological milestone, as well as a management issue in crustacean aquaculture that has a significant impact on profitability.

Introduction:

Crustaceans such as economically important species such as mud crabs, shrimps and lobsters have a hard shell limiting uninterrupted development. Ecdysis (molting) in crustaceans, is the process of periodically shedding the old exoskeleton and developing a new one. In contrast to vertebrates, crustaceans develop in phases, and a molt happens after each growth phase (Mykles, 2021). It triggers sexual maturity, facilitates mating, and it is closely associated with the first ovarian developmental cycle in females. Nonetheless, this molt is a physiological bottleneck: its complexity, energy requirements and susceptibility to external and internal disruptions often limit the growth and reproductive achievement in aquaculture and the wild. One particularly significant and most important molt is the pubertal (or pubertal/prereproductive) molt which, in most cases, occurs before sexual maturation and initial reproduction in decapods (Raviv & Sagi, 2008). The inability to molt at the appropriate time or the expenses of this molt can constrain throughput, diminish the availability of broodstock and raise the risk of production in cultured species (shrimp, crabs, lobsters).

Molt cycle in crustaceans:

The molt cycle follows stages of inter-molt (growth and energy storage), pre-molt (proecdysis) (apolysis and new cuticle formation), ecdysis (shedding) and post-molt (postecdysis) (cuticle hardening and mineralization). Crustaceans that are young develop after repeat molting which is after every few weeks. With approach to sexual maturity, molting occurs less often and is more complicated. The last or almost the last molt before



maturity is the pubertal molt that causes significant anatomical and physiological changes, particularly in the reproductive system (Li et al., 2021). A neuroendocrine axis controls crustacean molting. The key players are:

- **Y-organs (YOs)** are glands that are associated with each other in pairs and produce ecdysteroids (molting hormones) to stimulate the occurrence of pre-molt and ecdysis.
- **X-organ sinus gland complex** (in the eyestalk) releases molt inhibiting hormone (MIH) and other neuropeptides which inhibit YO activity.
- **Ecdysteroids** (e.g., 20-hydroxyecdysone) bind to their target tissues and promote cuticle resorption and new cuticle formation (Techa & Chung, 2015).

Pubertal molting is the molt that results in either sexual maturation, gonadal maturation, or morphological maturation in relation to reproductive readiness (Raviv et al., 2008).

Role of Pubertal Molt in Growth and Reproduction:

The maturation of crustacean reproduction depends on pubertal molt. The mating behaviour of most species occurs only after the females have undergone the pubertal molt; their exoskeleton is soft thus allowing the copulation and further development of the ovaries (Nurcahyono et al., 2024). In mud crabs (Scylla spp.), pubertal molt is a sign of the juvenile-adult transition that triggers the reproductive axis and preconditions the beginning of the reproductive lifespan of a female (Asmat-Ullah et al., 2025). Nevertheless, at this stage, the metabolic needs are high because the animal not only needs to grow, but also to renew the exoskeleton and to develop its gonads.

Mechanisms Regulating Pubertal Molt:

Pubertal molting is strictly controlled by physiological and endocrine processes. The ecdysteroid molting hormones produced in the Y-organ control the process mainly. The molt-inhibiting hormone (MIH) synthesized by the X-organ/sinu gland complex of the eyestalk controls their own activity (Mykles, 2021). The drop of the MIH signal initiates a burst of ecdysteroid release that results in the cascade of events in the cells leading to molting. These neuroendocrine axes are combined with environmental signals like photoperiod, tidal cycles, temperature and nutrition (Devaraj and Natarajan, 2006). In the process of pubertal molting, a rise in ecdysteroid concentration triggers the production and breakdown of the exoskeleton, the atrophy of some muscles, and the growth of gonads (Yuan et al., 2022). But during this transition, there is always a conflict between the signals of growth and reproduction, and this brings about physiological trade-offs (Zmora et al., 2009).

Why pubertal molting is a bottleneck?

- **Increased energy requirements and metabolic restructuring:** The melting process is highly expensive. Animals release glycogen and lipid reserves, create new cuticular proteins and chitin, and reorganize tissues (Agha et al., 2018). Perturbal molt is frequently associated with initiation of energetically active reproductive activities (vitellogenesis, gametogenesis). Restricted or skewed energy resources can thus retard or diminish advantageous molting and also incapacitate reproductive expenditure - imposing a life cycle bottleneck (Li et al., 2021).
- **Neuroendocrine linkage of molt and reproduction:** Hormone cross-talk between molting and reproduction is close. As an example, ecdysteroids not only mediate cuticle molting but also reproductive maturation, MIH, and other neuropeptides mitigate YO activity and consequently the time of cuticle molting in relation to reproductive competence (Mykles, 2021). When this endocrine balance (stress, pollutants, nutrient deficits) is disrupted, the molt and reproductive cycles can be out of phase with each other -- leading to missed or delayed pubertal molts.
- **Greater vulnerability in pre-molt and post-molt:** The physiological vulnerability of premolt and right after molt stages is associated with an increased vulnerability to predation and sensitivity to environmental factors (salinity, oxygen) and transiently lower immunosuppression (molting-associated immunosuppression) (Zhang et al., 2021). Deaths or sub-optimal condition, which occurs near pubertal molt diminish the

number of animals that can be used in breeding and are therefore limiting.

- **Seasonality of the environment and external stimulus:** The pubertal molting of many crustaceans is induced by environmental signals (photoperiod, temperature, lunar/tidal cycles). Poorly matched cues or inappropriate seasonal conditions could slow down pubertal molt or decrease broodstock synchrony in farms, making it difficult to manage broodstock and schedule production (Naylor et al., 2013). Bottlenecks are caused by failure to predict or model these cues.
- **Anthropogenic stressors and disruption of endocrine:** Molting/reproduction may be blocked by chemical pollutant (pesticides, endocrine-disrupting compounds)

and poor water quality, which may disrupt MIH/ecdysteroid signaling. This interference does not only impact the physiology of individuals, but at a population level, it leads to reproductive failure in hatcheries.

Evidence from aquaculture species:

- **Mud crabs (Scylla spp.):** First mating and ovary maturation in female mud crabs are determined by pubertal molting. Research demonstrates that there are prominent changes in energy metabolites and lipid stores at pubertal molt showing high metabolic price and significance in reproduction (Li et al., 2021). Malnutrition or stress in this period lessens the success of spawning and quality of larvae.
- **Penaeid shrimp (Penaeus spp.):** Penaeids The timing of the onset of reproductive maturity may be linked to particular molting levels; broodstock conditioning may necessitate a close attention to diet and photoperiod which ensures timely pubertal molt and high fecundity. Reproduction is induced through endocrine manipulations and eyestalk ablation (which is still controversial), in the case of MIH-related inhibition (Raviv & Sagi, 2008).
- **Lobsters and other decapods:** In a few species, the intermolt between pubertal and pre-pubertal molts is prolonged, and farmers have difficulty in coordinating hatchery production molts. Wild populations may have a seasonal lock on the pubertal molt, making culture attempts difficult.

Management strategies to reduce the pubertal molt bottleneck:

- **Nutrition & condition management:** High-quality diets High-quality diets are effective in energetic requirements of premolt and vitellogenesis, including essential fatty acids (EPA/DHA), protein and micronutrients. It has been demonstrated that dietary lipids, (e.g., krill oil), are capable of enhancing molting and postmolt development in swimming crabs (Frontiers, 2022). Pretreatment with proper feeds and vitamins will decrease the number of failed molts and enhance fertility.
- **Environmental manipulation:** Pubertal molting in hatcheries can be synchronized or accelerated by using temperature, photoperiod and salinity regimes. Time to first spawning can be decreased by controlled environmental conditioning which mimics seasonal cues.Tidal and lunar signals are more difficult to model, but can be estimated using light regimes and water exchanges.
- **Endocrine and reproductive technologies:** Hormonal treatments and broodstock treatments (using dopamine agonists, ecdysteroid analogs or MIH modulators of the pathways) are the topics of ongoing research. It is better to use methods which are harmless to manipulate endocrine signals without any harmful practice (e.g., eyestalk ablation). Recent discoveries of new molecules that regulate YO imply targets to use in benign interventions (Shyamal et al., 2018).
- **Biosecurity, husbandry and stress management:** Limit the manipulation of delicate premolt periods. Have good quality water and do not overcrowd to inhibit molt due to stress. Quarantine and disease control: infections around molting windows result in a disproportionate deaths.
- **Genetic and selective breeding methods:** Breeding to more rapidly intermolt lines, to be more tolerant of environmental variability, or predictable pubertal molting may alleviate bottlenecks. Genomic or transcriptomic signature based marker-assisted selection of YO activity or pubertal readiness is hopeful but in its infancy.

Practical considerations for hatcheries:

- **Measure hemolymph metabolites and ecdysteroid levels where available:** an increase in ecdysteroid titers reflects an activation of YO and a molt (Techa & Chung, 2015).
- Staging and marking broodstock to synchronize spawning.

- Intrinsic avoidance of invasive and destructive stimuli like eyestalk ablation in presence of alternatives; embrace proper dieting and environmental conditioning.
- Plan hatchery will schedule to work planned delays around pubertal molt in order to keep back-up broodstock to prevent disruption of production.

Research Directions and Beyond:

- **Mechanistic gaps:** In most cultured species, molecular insights into the mechanism of action of YO regulation and interaction with reproductive hormones still require further clarification, although major hormones (MIH, ecdysteroids) have already been identified (Shyamal et al., 2018).
- **Energy budgeting and metabolomics:** Further comparative information on their energy reserves, mitochondrial activity, and metabolomics in the molt in pubertal conditions is required to implement specific nutritional interventions (Li et al., 2021).
- **Non-invasive biomarkers:** Devise simple, field-readable (hemolymph metabolites, miRNAs) biomarkers of pubertal molt readiness and reproductive condition to assist in the hatchery decision-making process.
- **Endocrinology of the environment:** The current study of sub-lethal impacts of pollutants and endocrine disturbance of molting/reproductive axes in commercial hatcheries is essential to sustainable production.

Conclusion:

In crustaceans, pubertal molting is at the junction of growth and reproduction. It is a key component to a healthy and productive aquaculture cycle, and the high energy requirements, endocrine complexity, and susceptibility to environmental stressors result in a common bottleneck. A balanced diet, wise environmental conditioning, non-invasive monitoring, and prudent application of the new hormonal or genetic aids are the most effective way to narrow this bottleneck. The sustained fundamental and applied studies particularly on YO regulation, metabolomics, and innocuous endocrine interventions will be rewarded with sustainable crustacean aquaculture. Pubertal molting is a natural, yet very strong, bottleneck in growth and reproduction of crustaceans. It has complex regulatory networks and an energy demand that renders it a highly dangerous period of time in terms of mortality and reproductive failure. The combination of integrative research, nutritional approaches and conservation of the environment is essential in the sustainable crustacean aquaculture and conservation biology.

References:

Li, W.-F., et al. (2021). Vital carbohydrate and lipid metabolites in serum during pubertal molting of the swimming crab. Metabolites, 11(10), 651. https://doi.org/10.3390/metabo11100651

Mykles, D. L. (2021). Signaling pathways that regulate the crustacean molting gland. Frontiers in Endocrinology, 12, 674711. https://doi.org/10.3389/fendo.2021.674711

Nakatsuji, T., & Ishida, K. (2009). Crustacean molt-inhibiting hormone: structure, function and regulation. Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology, 153(1), S63–S64. (Review). https://doi.org/10.1016/j.cbpa.2008.11.012

Shyamal, S., et al. (2018). Transcriptomic analysis of crustacean molting gland (Y-organ). Scientific Reports, 8, 25368. https://doi.org/10.1038/s41598-018-25368-x

Techa, S., & Chung, J. S. (2015). Ecdysteroids regulate the levels of molt-inhibiting hormone in crustaceans. General and Comparative Endocrinology, 216, 114–121. https://doi.org/10.1016/j.ygcen.2015.07.007

Frontiers in Marine Science. (2022). New insight into the molting and growth in crustaceans. Frontiers in Marine Science (special issue/research article). https://doi.org/10.3389/fmars.2022.914590

Biocolorants in Aquaculture:
The Science and Application of Carotenoids

Subashini.M, Raswin Geoffery.G.K, S.Felix
St. Devasahayam Institute of Fisheries Science and Technology, Ammanattantheri, Kanniyakumari – 629 193

Introduction

Coloration plays a pivotal role in determining the aesthetic appeal and commercial value of ornamental fishes. In the competitive ornamental fish trade, vibrant and stable coloration is often the first criterion influencing consumer choice and market price. Buyers associate bright, natural colors with good health, vitality, and superior quality, making pigmentation a key factor in marketing success. Since most fishes cannot synthesize pigments such as carotenoids on their own, their color intensity largely depends on dietary supplementation. Hence, the inclusion of natural biocolorants particularly carotenoids has gained increasing importance in ornamental aquaculture, not only for enhancing beauty but also for improving overall fish health and stress resistance.

Ornamental Aquaculture Trade in India

The ornamental aquaculture sector in India has emerged as a promising component of the blue economy, contributing significantly to livelihood generation, rural entrepreneurship, and foreign exchange earnings. India's diverse freshwater and marine ecosystems harbor over 400 indigenous ornamental fish species, many of which possess high export potential. Major production hubs are concentrated in West Bengal, Kerala, Tamil Nadu, Odisha, and the Northeastern states, where both small-scale farmers and women self-help groups actively participate in breeding and rearing operations.

The domestic market for ornamental fishes has expanded rapidly due to the growing popularity of aquariums and home décor trends, while exports are primarily directed to countries in Southeast Asia, Europe, and North America. However, the trade is constrained by challenges such as inadequate infrastructure, limited access to quality broodstock, inconsistent supply chains, and gaps in quarantine and certification systems.

Highlights of the article:

India's diverse freshwater and marine ecosystems harbor over 400 indigenous ornamental fish species, many of which possess high export potential. Major production hubs are concentrated in West Bengal, Kerala, Tamil Nadu, Odisha, and the Northeastern states, where both small-scale farmers and women self-help groups actively participate in breeding and rearing operations. Since most fishes cannot synthesize pigments such as carotenoids on their own, their color intensity largely depends on dietary supplementation. Hence, the inclusion of natural biocolorants particularly carotenoids has gained increasing importance in ornamental aquaculture, not only for enhancing beauty but also for improving overall fish health and stress resistance.

Recent government initiatives under the Pradhan Mantri Matsya Sampada Yojana (PMMSY) and state-level aquaculture missions aim to strengthen hatchery networks, promote indigenous species, and establish ornamental fish clusters for organized trade. With proper policy support, technological interventions, and sustainable management of native biodiversity, India holds vast potential to emerge as a global hub for ornamental aquaculture production and trade.

What are Carotenoids?

Carotenoids are naturally occurring pigments belonging to a large family of isoprenoid compounds responsible for the yellow, orange, and red hues seen in many plants, algae, and aquatic organisms. Chemically, they are lipid-soluble pigments composed of long chains of conjugated double bonds, which give them their characteristic coloration and antioxidant properties. Carotenoids are broadly classified into two main groups viz carotenes and xanthophylls.

Carotenes (such as β-carotene and lycopene) are purely hydrocarbons containing only carbon and hydrogen atoms, while xanthophylls (such as lutein, zeaxanthin, astaxanthin, and canthaxanthin) are oxygenated derivatives that often occur in higher abundance in aquatic species.

In nature, carotenoids are synthesized primarily by photosynthetic organisms such as microalgae, cyanobacteria, and higher plants. These pigments enter aquatic food webs through primary producers and are accumulated by zooplankton, crustaceans, and ultimately by fish and other higher trophic levels. Important aquatic sources include microalgae like *Haematococcuspluvialis* (rich in astaxanthin), *Dunaliella salina* (β-carotene), and cyanobacteria such as Spirulina (zeaxanthin). Terrestrial sources, including marigold petals, red peppers, and carrots, also serve as rich reservoirs of carotenoids and are increasingly used in aquafeeds. Thus, carotenoids serve as essential biocolorants that link plant and algal productivity with fish coloration and health in ornamental aquaculture.

Carotenoid Biosynthesis and Deposition in Fish:

Fish, like most animals, are Incapable of synthesizing carotenoids de novo, meaning they must obtain these pigments through their diet. While some species possess limited enzymatic capability to modify dietary carotenoids—for example, converting β-carotene into astaxanthin or lutein into tunaxanthin—the basic carbon skeleton of carotenoids can only be produced by photosynthetic organisms such as algae, cyanobacteria, and plants. Once ingested, carotenoids are absorbed in the intestinal tract along with dietary lipids, facilitated by bile salts and incorporated into lipoprotein complexes. These lipoproteins transport the pigments through the bloodstream to various tissues, where they are deposited in skin, scales, muscles, and fins. The intensity and hue of coloration depend on factors such as the type and concentration of carotenoids, fish species, metabolism, and environmental conditions.
In ornamental fishes, specialized pigment cells called chromatophores, particularly xanthophores (yellow) anderythrophores (red), play a central role in storing and displaying these pigments, ultimately determining the vivid coloration that enhances their visual appeal and market value.

Significance of Carotenoids in Ornamental Aquaculture

Carotenoids play a multifaceted role in ornamental aquaculture, contributing not only to the enhancement of body coloration but also to the overall health and vitality of fish. As natural pigments, they intensify red, orange, and yellow hues in the skin and fins, thereby improving the aesthetic appeal and marketability of ornamental species such as goldfish, koi, and guppies. Beyond their visual function, carotenoids act as potent antioxidants, protecting fish cells from oxidative stress caused by reactive oxygen species generated during metabolism or environmental stress. They also exhibit immune-modulatory properties, enhancing disease resistance by stimulating the production of antibodies and immune cells. Furthermore, carotenoids are known to influence reproductive performance by improving gonadal development, fertility, and larval survival, while their role in maintaining membrane integrity and cellular function supports optimal growth and feed efficiency. Thus, carotenoids serve as essential dietary components that link visual quality with physiological well-being in ornamental fish culture.

Dietary Sources of Carotenoids

In ornamental aquaculture, carotenoids are primarily supplemented through natural and synthetic sources to enhance pigmentation and promote fish health. Among natural sources, microalgae such as *Haematococcus pluvialis* (rich in astaxanthin) and *Dunaliella salina* (β-carotene) are widely recognized for their high pigment content and bioavailability.

Cyanobacteria like *Spirulina platensis* provide zeaxanthin and other accessory pigments that contribute to brilliant coloration and improved immunity.

Yeasts such as *Phaffiarhodozyma*, along with crustacean shell waste containing residual astaxanthin, also serve as valuable, eco-friendly pigment sources. Terrestrial plants like marigold petals, red bell peppers, and carrotsare additionally incorporated in ornamental fish diets to supply lutein, capsanthin, and β-carotene. Although synthetic carotenoids such as canthaxanthin and astaxanthin are commercially available and allow precise dosing, they are often expensive and may pose environmental or health concerns due to low biodegradability. Consequently, there is growing emphasis on natural, sustainable carotenoid sources that align with the principles of eco-friendly and cost-effective ornamental aquaculture.

Applications in Ornamental Fish Feeding

The effective use of carotenoids in ornamental fish feeding requires careful consideration of dosage, formulation, and bioavailability to achieve optimal pigmentation without adverse effects. Typically, carotenoids are incorporated into feeds at concentrations ranging from 30 to 150 mg/kg, depending on the fish species, pigment type, and desired color intensity. Since carotenoids are lipid-soluble, inclusion alongside dietary fats enhances their absorption and deposition in chromatophores. Encapsulation and micro-coating techniques are increasingly used to protect these sensitive pigments from oxidation during feed processing

and storage. Research on species such as guppy (*Poeciliareticulata*, goldfish (*Carassiusauratus*), koi carp (*Cyprinuscarpio*), and discus (*Symphysodon* spp.) has demonstrated that diets enriched with natural carotenoid sources like Spirulina, Haematococcus, and marigold extracts significantly improve coloration, brightness, and overall vitality. Such formulations not only boost visual appeal but also support immune function and stress tolerance, reinforcing carotenoid supplementation as a key strategy in sustainable ornamental fish culture.

Challenges and Research Advances

Despite their importance, the effective use of carotenoids in ornamental aquaculture faces challenges related to bioavailability and stability. Carotenoids are prone to oxidation, degradation by heat, light, and oxygen, and their absorption can be limited by feed composition or species-specific metabolic factors. To overcome these limitations, recent research has focused on encapsulation and nano-formulation technologies, which protect carotenoids from environmental and digestive degradation while enhancing their uptake and targeted deposition in tissues. Microencapsulation, liposomal delivery, and nanoemulsion techniques have shown promise in improving pigment stability, color intensity, and even the health-promoting effects of carotenoids. These advances are paving the way for more efficient, sustainable, and cost-effective strategies to maximize the benefits of carotenoids in ornamental fish production.

Plant pigments called carotenoids, or polyphenols, give many fruits and vegetables their distinct colors—orange, yellow, or red—and have a number of advantageous qualities, including antioxidants (which squelches free radicals), light harvesting (which squelches excessive light), and photosynthesis (Demmig-Adams and Adams, 2002). Carrots, papaya, pumpkin, watermelon, sweet potato, yam, tomato, bell peppers, capsicum, paprika, kale, mango, kiwi, spinach, broccoli, cantaloupe, avocado, and orange are among the common foods that are rich in carotenoids (Saini et al., 2015; Fernandez-Garcia et al., 2016; Thurnham, 2007). Algae such as Dunaliella, Chlorella, Haematococcus, Murillopsis, Chlamydomonas, and Spirulina spp. are additional sources. (Guedes et al., 2011), fungi/yeast including Phytomyces blakesleanus, Blakeslea trispora, Neurospora crassa (Mata-Gomez et al., 2014; Pegklidou et al., 2008) and bacteria such as Halophilic, Myco/myxobacterium, Paracoccus, and Streptomyces spp. (Schweiggert and Carle, 2016) are also sources of carotenoids.

Sustainability and Future Prospects

The future of carotenoid use in ornamental aquaculture increasingly emphasizes sustainable and eco-friendly sources. Agricultural and agro-industrial byproducts, such as marigold petals, tomato skins, and shrimp shell waste, offer cost-effective and renewable carotenoid supplies while reducing environmental waste. In addition, biotechnological production using microalgae (*Haematococcus, Dunaliella*) and carotenoid-producing yeasts (*Phaffia rhodozyma*) provides a controlled, high-yield, and environmentally friendly alternative to synthetic pigments. These approaches not only ensure a consistent supply of high-quality carotenoids but also align ornamental aquaculture with green and sustainable practices, supporting both economic and ecological goals.

Conclusion

Carotenoids are inevitable to the success of ornamental aquaculture, influencing coloration, health, growth, and reproductive performance. Integrating advances in carotenoid research with innovative feed formulations and selective breeding strategies can optimize pigment deposition, enhance fish vitality, and increase market value. By focusing on sustainable natural sources, bioavailability improvement, and eco-friendly production methods, ornamental fish culture can achieve both aesthetic excellence and environmental responsibility, ensuring long-term profitability and industry growth in India to improve the domestic and export market potential of ornamental fishes.

References:

Demmig-Adams, Barbara, and William W. Adams III. "Antioxidants in photosynthesis and human nutrition." *Science* 298.5601 (2002): 2149-2153.

Fernández-García, Elisabet, Irene Carvajal-Lérida, and Antonio Pérez-Gálvez. "Carotenoids exclusively synthesized in red pepper (capsanthin and damage." *Photochemical & Photobiological Sciences* 15.9 (2016): 1204-1211

Guedes, Ana Catarina, Helena M. Amaro, and Francisco Xavier Malcata. "Microalgae as sources of carotenoids." *Marine drugs* 9.4 (2011): 625-644.

Mata-Gómez, Luis Carlos, et al. "Biotechnological production of carotenoids by yeasts: an overview." *Microbial cell factories* 13.1 (2014): 12.

Pegklidou, Kiriaki, FaniMantzouridou, and Maria Z. Tsimidou. "Lycopene production using Blakesleatrispora in the presence of 2-methyl imidazole: yield, selectivity, and safety aspects." *Journal of agricultural and food chemistry* 56.12 (2008): 4482-4490.

Saini, Jitendra Kumar, Reetu Saini, and Lakshmi Tewari. "Lignocellulosic agriculture wastes as biomass feedstocks for second-generation bioethanol production: concepts and recent developments." *3 Biotech* 5.4 (2015): 337-353.

Schweiggert, Ralf Martin, and Reinhold Carle. "Carotenoid production by bacteria, microalgae, and fungi." *Carotenoids: nutrition, analysis and technology* (2016): 217-240.

Thurnham, David I. "Macular zeaxanthins and lutein–a review of dietary sources and bioavailability and some relationships with macular pigment optical density and age-related macular disease." *Nutrition research reviews* 20.2 (2007): 163-179.

Nature of work of newly-appointed Fishery Extension Officers in West Bengal

Subrato Ghosh, Kolkata, West Bengal; Email: subratoffa@gmail.com

Highlight points

In this article, an attempt has been made to present the basic nature of work of Fishery Extension Officers at Block level in West Bengal, how FEOs can help in improving the lives and livelihood of fish farmers, and valuable words of inspiration recently extended towards FEOs by higher authorities in Fisheries Department, Government of West Bengal in a Training Programme.

Introduction

From the article titled 'Role of FFDA in promoting freshwater aquaculture: an evaluation', authored by Dr H. K. De, Dr G. S. Saha, Smt. N. Panda, published in Compendium of ICAR Sponsored Short Course on New Initiatives in Aquaculture Extension (Pg. 56-66), organized at ICAR-CIFA, Bhubaneswar during November 2007, we come to know that Fishery Extension Officers (FEOs) posted at Community Development (CD) Block level are the key functionaries of the State Department of Fisheries. He/she is the first contact point for any services related to fisheries and aquaculture to fish farmers. They are responsible to inform about the schemes, educate farmers in scientific carp culture, and provide technical backstopping. Similarly at the office of Freshwater Fish Farmers Development Agency (FFDA) too, FEOs have a great role. He scrutinizes application, visits the site and recommends the case accordingly. During implementation of the scheme, FEO has to ensure that the farmer adheres to principles of scientific aquaculture, both freshwater and brackishwater.

In this Compendium, Dr Radheyshyam has mentioned in his article 'Changing perspectives of rural aquaculture' (Pg. 12-22) that District-level fisheries extension network for promoting rural aquaculture starts with Assistant Director of Fisheries (ADFs) and District Fishery Officer (DFOs), working for monitoring and coordinating the extension technical programme and giving feedback to the Directorate of Fisheries. Both are also responsible for overall fisheries and aquaculture development of the district, whereas the FEOs are responsible at the CD Block level. FEOs are basically field level extension workers working at the Block and Gram Panchayat level. Dr U. Bhaumik has mentioned in his article 'Role of Transfer of Technology in ushering Blue Revolution in West Bengal', in Matsya Samachar Workshop issue, Vol. 1 No. 9 (Pg. 29-32) that all FEOs should be encouraged to undertake more field work in order to improve his/her competence since they are the workers having direct contact with fish farmers. Role of extension agents is not only information transfer, but also facilitation of learning and building overall capacity of fish farmers.

Dr K. Kumar, Dr De, Dr Saha, Dr U. L. Mohanty have opined in their article 'Taking aquaculture to millions – some impediments', published in that Compendium (Pg. 67-69) that FEO may be given one time grant of Rs 10000/- for strengthening the laboratory on pond soil and water quality testing, Secchi disc, zooplankton estimation, and for purchase of equipment. There should be continuous flow of information in the form of extension literature as a means of educating the fish farmers about new/improved practices, emerging problems and the ways to tackle them.

FEO – an important service position

Back in the year 1986, Former Minister of Fisheries, West Bengal Sri K. Nanda had stated that Department of Fisheries, Government of West Bengal (GoWB) is not content with activities for augmenting fish production alone. It is particularly careful about the upliftment of poor and marginal fishermen and fish farmers in remote villages. At the State-level Training Centre under Freshwater Fisheries Research and Training Centre, located at Kulia, Kalyani under the Department, FEOs of the Department will be given in-service training so as to acquaint themselves with the advancement made in piscicultural practices. Sri S. S. Chattopadhyay, Former Secretary to the GoWB, Department of Fisheries had mentioned in his article 'Fisheries and rural development' that indirectly scientific pisciculture in inland water areas has expanded the employment opportunities and augmented the income of not only the fish pond owners but also of the poor fishermen who work in them. With proper extension, adequate training and guidance, a poor fish farmer can significantly improve his economic condition by adopting scientific pisciculture practices.

The Revised Job Chart for the officers of West Bengal Junior Fisheries Service Grade-II (Fishery Extension

Officer/Assistant Fishery Officer/ Assistant Research Officer/Fishery Supervisor/Assay Assistant) has been brought out in details by the then Director of Fisheries, West Bengal Sri D. K. Ghoshal, IAS as a Memorandum of the Directorate of Fisheries, GoWB (Memo No. Estt-94/100 dated 17/02/1998). It has come to effect from that date. The Sections include: Duties and responsibilities of WBJFS Grade-II officers when they are posted at the Block Development Office as FEO (1.1-1.13); Duties and responsibilities of WBJFS Grade-II officers when they are deputed to FFDA (2.1-2.10); Duties and responsibilities of WBJFS Grade-II officers when they are posted in the district Headquarters as AFO/ FEO under ADFs (3.1-3.6); Duties and responsibilities of WBJFS Grade-II officers when they are posted as CEO of any Primary Fishermen Cooperative Society (PFCS) (4.1-4.11).

This Job Chart was first published as Memorandum (bearing Memo No. Estt-2247, dated 28/11/1991) in the MeenBarta Special Issue on Fishery Training and Cooperation, January 1992 issue, brought out by the then Director of Fisheries, West Bengal Sri S. Das WBCS (Exe.). In his article 'An approach to create competent extension services and training network' published in this Issue, he mentioned '….I will also provoke and inspire those who want to participate in our extensive campaign for multiplication of the amount of production of table fish in West Bengal and to exceed the demand of the local market'. Drawing attention of extension officers, he mentioned that 'If we go to people with a package of new schemes and subsidies, it does not receive adequate welcome. Instead of propagating new schemes, the starting point of discussion should be analyzing the existing shortcoming of their adopted system of aquaculture. This is called problem identification. If we fail to identify the deficiency of what they are doing now, we will neither be able to make them willing or listen, or motivate them for adoption of something new and we will not be able to even prescribe the exact medicine to sure the existing problem'. An FEO can be posted at, or later on transferred to any CD Block in any district within West Bengal. In the interest of public service, they are liable to be transferred to any place of posting as per existing policy/ practice.

Recent recruitment and appointment of FEOs; speech of the Director

Even after 33 years, in September 2025, higher authorities in Department of Fisheries, West Bengal have spoken in the same tune while addressing the newly-recruited and appointed FEOs. In June 2025, 73 persons (candidates) have been recommended by the West Bengal Public Service Commission for recruitment for permanent posts of FEO and afore-mentioned posts in same grade in the West Bengal Junior Fisheries Service Grade – II under Department of Fisheries, GoWB. Following this, a 15-day In-service Training Programme for 45nos (first batch; out of total 73nos) of newly-appointed FEOs under Directorate of Fisheries, GoWB was organized at Government Fish Technological Station, Junput, Dist. Purba Medinipur during 15/09/2025 to 25/09/2025 and 08/10/2025 to 11/10/2025. On the day of inauguration, the Director of Fisheries Sri S. Mohanty, IAS encouraged the participating FEOs, saying that they are the representative and 'face' of Fisheries Department; that experience gained in fishery and aquaculture should be put into effect in field conditions. Service should be provided to poor people in villages, FEOs have to engage themselves and care for the people's betterment. Not only fishery activities, FEOs may have to do some kind of administrative work also. He believed that this training will be a lifelong memorable experience for all.

Karmadhyaksha's words of inspiration

The Karmadhyaksha, Matsya o Prani Sampad Bikash Sthayee Samity, Purba Medinipur Zilla Parishad Sri T. K. Jana stated that all participants are very much competent for this position. FEOs have to get involved into, and present the different developmental and welfare schemes of the Department to common people in towns and villages of West Bengal. We can reach out to such people if we become affectionate towards them and in our attitude, working with everyone, building up cordial relation with them. FEOs should have clear idea of open field conditions of different Mouza (villages) under the Block in which he/she will be posted and will have to work with skill and expertise, route to residence(s) and culture ponds of progressive fish farmers; have to identify good farmers in his/her Block; the number, dimension and total area of water bodies fit for pisciculture. They will have to first upgrade himself/ herself with knowledge of improved aquaculture practices and then share it, also experiences, with fish farmers.

District Magistrate's motivational and guiding speech

The District Magistrate, Purba Medinipur Sri P. Maji, WBCS (Exe.) mentioned that we should have specific aim(s) in our service. We must not lose our knowledge, talent, good academics while in service. FEOs need to build up 'sense of ownership' of the common rural people of his/ her Block, should be workaholic - even beyond the normal 10am to 5pm working hours at office. They should get an idea about the relation between good education and on-field conditions, ensure income of beginners in commercial pisciculture and farmers old in age, give hands-on demonstration; so that those people will get a well-secured path to move ahead in life successfully. FEOs have to guide them for better fish production, ensure it, inform them about market channels in fishery and aquaculture sector in his Block and neighbouring areas. They need to work hard, extend love and care towards fish farmers, identify their needs, build up unity so that those people will remember the sincere service and humanity of FEO for entire life.

Sabhadhipati speaks

Sri U. Barik, Sabhadhipati, Purba Medinipur Zilla Parishad encouraged

the FEOs saying that it had been the right expression of appropriate and worthy intelligence and understanding on the part of every FEO so that they have achieved this position. They have established themselves by dint of their talent and good education. But more talent and skill are required in days to come in service life – FEOs have to work together with farmers, elected people's representatives, other Government officers at higher and same rank, with integrity, honesty, concentration and steadfastness. Ultimately Fisheries Department will be benefitted from good service of FEOs. More and more numbers of fish farmers and fishermen in Block should be helped, standing by their side at times of need, and raising their standard of living. Many expectations remain with FEOs, fish farmers should get a new direction to prosper. Different cultivable species of economically-important foodfishes have different level of importance (in terms of nutritional and livelihood security) and acceptance in different regions in West Bengal; their scientific methods of farming are also different. We have to accept fish farmers and fishermen as someone of our own. Department will steadily grow and attain new heights, keeping hand-in-hand with FEOs.

ACS Madam's thought provoking address

The Additional Chief Secretary to the GoWB, Smt. Roshni Sen IAS, emphasized on working with excitement, impetus and enthusiasm; getting oneself (as FEO) enriched after having conversation with elderly farmers, leaving a distinct 'impression' before leaving (retiring from) service. We have to do something exceptional and everlasting, so that people will remember for long. We all have to work for overall development of fishery and aquaculture in the state. FEOs should not prevent the action and expression of their knowledge; instead, they need to think about what new things can be done, bringing some perceivable 'change' in society, putting their ideas into effect. FEOs may have to get temporarily involved in some other Government works (not related to fishery and aquaculture) as assigned to him/her by concerned Block Development Officer at some point of time; but our main aim and focus will be on proper and timely implementation of developmental schemes of Fisheries Department at Block and Gram Panchayat level to the best possible extent.

We have to utilize the untapped pond resource of different kind (perennial or seasonal, small or big, clean or semi-clean), unutilized water bodies for fish culture in modified extensive scientific methods. Input support may be given to owners of the water bodies from Government; local villagers may be engaged and employed. Training on fish culture should be imparted to more numbers of people in sub-urban and rural areas with an aim to increase farmed fish production. Trainees should be encouraged and acquainted about new Government schemes and aquaculture technologies, making them aware, get those people associated with the schemes. Message of the Department should reach to more numbers of people *via* FEOs, disseminate new (innovative) ideas and concepts, packages of practice. Scientific fish farming should be extended and initiated in newer areas of the Block. We should bring species and system diversification in fish culture in farmers' field, encourage farmers to produce big-sized major carps for which good quality fish seed and fish feed are needed. Shelf life of harvested fishes can be increased by adopting suitable processing techniques (post-harvest technology) as much as possible. Along with freshwater aquaculture, we have to improve brackishwater aquaculture and marine fishery sectors also. We have to draw attention to the fact and ensure that farmers get good quality fish feed and fish seed. Inputs like Aluminium Hundi, cast net should reach to those fishermen and members of PFCSs who are really in need of it.

Our job (work) is both that of a facilitator to villagers in general, as that of a regulator. FEOs have to help bonafide applicants in his/her Block to get the identity of fisherman as 'Fisherman Registration Card' at an early date, and to get loan sanctioned from Bank (as working capital/initial investment) for fish farming with facility of interest subvention, which is an advantage for beneficiaries under MJCC scheme of Fisheries Department. Timely renovation, embankment strengthening, desilting and deweeding of large freshwater bodies (beels and wetlands) lying under the possession of different PFCSs in different districts is important. Smt. Sen gave an overview of Organizational Structure of Fisheries Department and vivid description of different schemes. Utilizing the knowledge of FEOs, in a systematic manner, fish production will increase in West Bengal and there lies enormous scope of development. In turn, Fisheries Department will get enriched and prosper, and so too, the Government of West Bengal.

Hon'ble MoS's words of inspiration to FEOs

Sri B. Roy Chowdhury, Hon'ble Minister of State (Independent Charge), Dept of Fisheries, GoWB opined that FEOs should not only give importance to monthly salary and income from his service position, but to make use of their lives and knowledge in true sense - that will give them happiness, have to understand the importance of one's life. When we will grow older and have accomplished a desired aim, we will feel that our lives have been successful. FEOs have to learn, know and understand all applied aspects of fish farming. In West Bengal, scope of Government service is lessening as days progress, no new openings in Government Departments; so, without sitting idle and jobless, self-employment generation for educated and less-educated youths in rural areas *via* fish farming is a very good option and very much possible. Fish farming, if done with proper care, can fetch an income of Rs 10,000-12,000 per month to the farmer from a middle- to big-sized fish pond.

FECPI

SOLUTION FOR SUSTAINABLE

AQUA CULTURE....

Our Products are Registered with CAA as Antibiotic-free Aquaculture Inputs

Manufactured & Marketed by

FECPI India Pvt. Ltd.

Regd. off : Sy No. 94/1A1, Ground Floor
Vanagaram-Ambattur Road, (Next To Apollo Hospital),
Ayanambakkam, Chennai - 600095
Cusstomer Care : +91 99449 88192, +91 44 495 23456
Email : info@fecpi.in Visit us at : www.fecpi.in

Visit us at : **www.fecpi.in**

Fish is the source of most easily-digestible animal protein and less expensive, fish farming activity has to be increased and sustained for nutritional and livelihood security. Farmers will be able to understand the methodologies involved, which are quite easy. FEOs must make a survey, inquire and know the total number of ponds (waist-height depth and above) existing in his/her Block jurisdiction. If fish farming has not been initiated till now in considerable number of ponds, then what may be the reason. Fish farming has to be initiated in derelict, small-sized, semi-clean, aquatic weed infested open freshwater bodies after proper renovation and management.
No pond or 'Doba' should be left unused. Macrophyte (water hyacinth) choked and silted large freshwater bodies (wetlands) old in age have to be identified, pre-stocking pond management measures have to be adopted therein as quickly as possible. A small portion of the extent of dense aquatic weeds should not be cleared off, and deepened ditch-like areas (pools) can be created manually in peripheral regions (with increase in water depth) where fishes can take shelter during summer months.

FEOs should try their level best, give the best of their efforts, know how to deal with the setbacks and overcome the obstacles encountered by rural fish farmers. Now healthy major carps are transported in live state from Moyna Block in Purba Medinipur to certain parts of Jharkhand, Odisha, which is an achievement for us. Amount of table fish, *i.e.*, Indian major carps imported from other states has reduced nowadays, which is desired. Each district in West Bengal has to be self-reliant in fish production every year, supply should exceed the demand. We have to increase the quantum of fish export from West Bengal to other states, and, if possible, outside India and overseas. FEOs should broaden their areas of discussion, keep themselves in touch frequently with elderly progressive fish farmers of his Block time to time. Slowly FEOs will be able to learn how to work in field and acquire the skill (anything which is not known or less known to them). Among the fish farmers as visitors at FEO's chamber at Block office, FEOs have to identify those genuine farmers who have not received any kind of benefit from Fisheries Department in recent past. Sri Roy Chowdhury conveyed his good wishes to all FEOs so that they can proceed forward in service life successfully.

End note

About five years back, Sri Debashis Basu, one of the very knowledgeable Departmental officers (now retired from position of DFO) inspired me by saying that we have to stand beside fish farmers, know their needs and constraints and help accordingly – which is very satisfying for any FEO. Dr S. Das, Additional Director of Fisheries (Technical), West Bengal was another speaker in that 15/09/2025 inauguration programme, who emphasized on increasing our acceptability as FEO amongst fish farmers of our Block, and applying and utilizing our knowledge gained from academics to enhance fish production in farmers' ponds, with regards to the Lab to Land programme. Smt. S. Das, Secretary in Fisheries Department in her talk mentioned that more and more water bodies should be brought under the aegis of pisciculture, knowledge acquired should be put into use for common people. Human values like dedication and humanity, good attitude towards farmers, endeavour and perseverance have been spoken about by almost all the dignitaries. 'If we think and work, accuracy level will increase'. Being kind whenever possible, doing it from heart; doing job with utmost honesty and integrity, farmers will recognize that you have value.

Padma Shri Dr. M. Vijay Gupta, World Food Prize Laureate (2005) had inspired me on 07/03/2018 with his heartening words: I am glad you are keeping in touch with fish farmers and breeders. That is the way to go if we wish to contribute to increased fish production and improve livelihoods of farmers. For me that gave lot of happiness than publishing a paper - "a smile on farmer's face is worth million dollars". When Bharat Ratna Late Dr A. P. J. Abdul Kalam, Former President of India was asked: How do you feel your work is helping society? Dr Kalam replied 'Whenever I give something, I feel happy. Whatever, you have better knowledge, sometimes you may have better economy, kind words you can have - so if you use and make somebody's life happy, that you are giving and his/her life is happy, that is the best thing a human being can think of'. Indeed, extension service in fisheries provides information and support to fishermen and fish farming communities, with the aim of improving their well-being.

Professional Feed Machinery Manufacturer

Hengrun SWFL Series Vertical Pulverizer

Vertical shaft with no-screen grinding, Bearing no maintenance. The production is uniform and the fineness is adjustable (Range from 40~200 mesh.)

Hengrun HRYTZ Series Vacuum Sprayer

Totally enclosed spraying space, Precision & Efficient spraying proportion widely ranged from 2%~30%.

THE SKY LINE

Considering only the growth rate gives you a wrong image: survival is as much a key to success.

The Blue Genetics Sky Line delivers a consistent growth rate with an over 90% survival rate at the final harvest in extensive tests we have done in India.

	Blue Genetics Sky Line	Other brands
Stocking Density	25-30 units per sq m	35-40 units per sq m
DOC	110 days	110 days
Final count	40 units per kg / 25 g	40 units per kg / 25 g
Survival rate	90%	60%
Final Density	23 to 27 units per sq m	21 to 24 units per sq m
Final weight per sq m	0.65 kg	0.55 kg
Final Weight per Hectare	6.5 tons	5.5 tons

THE CUSTOMER'S VIEWPOINT

Extensive customer tests by Indian farmers indicate that the Sky Line's growth is very competitive while delivering an exceptional survival rate, resulting in higher profits:

Farmers can stock at a lower density while obtaining better result than other brands:

- Lower density stocking means less PL cost (lower upfront investment).
- Lower density stocking means less food cost (lower maintenance cost).
- Lower density stocking means less animal stress during growth improving health conditions (better health conditions).

Conclusion : Less expenses, more tons per hectare, better profitability.

BLUE GENETICS
Caring for life

Please contact:
Raghuram Yeluru
91 95423 34345
raghuram.yeluru@blue-genetics.com

GROUPE GRIMAUD
Caring for Life