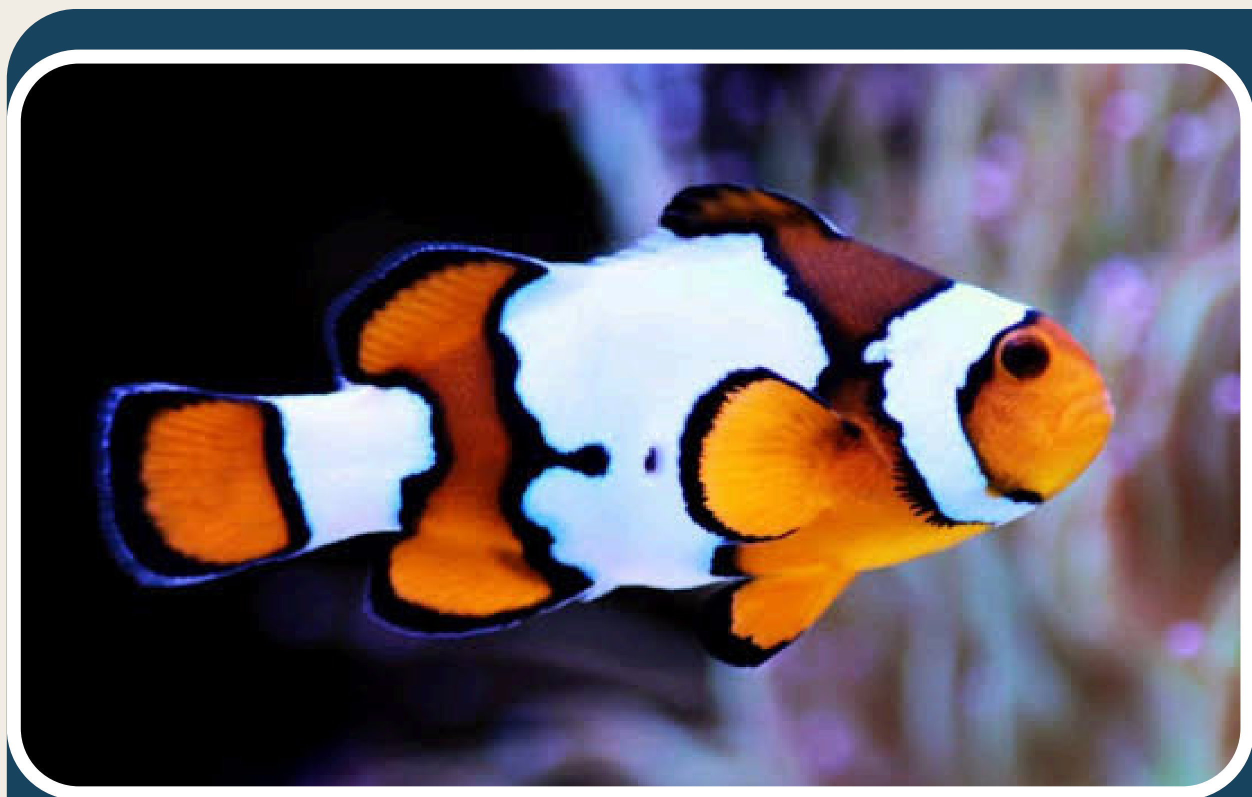
FISHTech Report

"To Explore Technologies in Fisheries and Aquaculture Sector"



20
26
JULY

MANAGE Fisheries Innovation and Startup Hub (MANAGE - FISHub)

(A National Fisheries Incubation Centre Supported by the Ministry of Fisheries, Animal Husbandry and Dairying, Govt. of India)

National Institute of Agricultural Extension Management (MANAGE)

(An Autonomous Organization of Ministry of Agriculture and Farmers Welfare, Govt. of India)

Rajendranagar, Hyderabad – 500 030, Telangana, India

https://www.manage.gov.in/managefishub/

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MANAGE-FISHub

MANAGE – Fisheries Innovation and Startup Hub (MANAGE-FISHub) is a national-level incubation and innovation hub hosted at the National Institute of Agricultural Extension Management (MANAGE). It was established at MANAGE in 2025 with the support of the Department of Fisheries (DoF), Ministry of Fisheries, Animal Husbandry and Dairying (MoFAHD), Government of India, to transform the fisheries and aquaculture sector through innovative technology, entrepreneurship, and ecosystem development.

Vision

The Vision of MANAGE-FISHub is to foster sustainable innovation and entrepreneurship in the fisheries and aquaculture sector by nurturing startups, accelerating technology adoption, and promoting inclusive growth across the value chain.

Collaboration Partner

ICAR–Central Marine Fisheries Research Institute (ICAR–CMFRI)

The ICAR–Central Marine Fisheries Research Institute (ICAR–CMFRI) played a central role by collaborating with MANAGE-FISHub for the FISHTech Webinar Series.

Established on 3 February 1947, the ICAR–Central Marine Fisheries Research Institute (ICAR–CMFRI), headquartered in Kochi, Kerala, is one of the world's leading tropical marine fisheries research institutes under the Indian Council of Agricultural Research (ICAR). Renowned for its excellence in marine fisheries, mariculture, biotechnology, and coastal ecosystem research, ICAR-CMFRI develops innovative technologies, scientific knowledge, and skilled human resources to promote the sustainable growth and resilience of India's marine fisheries and aquaculture sector.

FISHTech Webinar

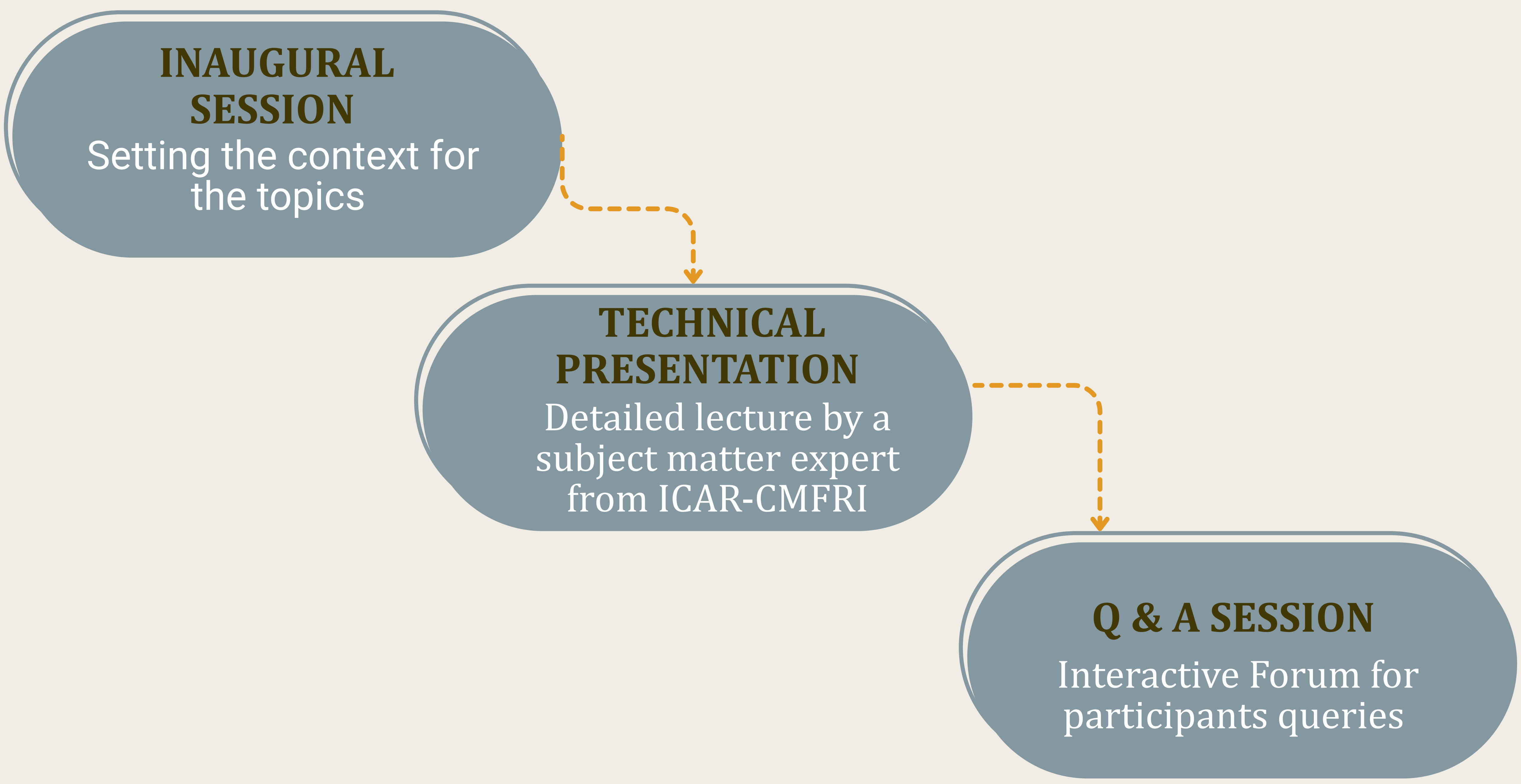
FISHTech Webinar series is a flagship online knowledge-sharing initiative of MANAGE–FISHub, designed to showcase innovative technologies developed by fisheries research institutions, ICAR institutes, State Fisheries Universities, and other academic and R&D organizations across India. The series aims to bridge the gap between technology developers and end users by creating a structured national platform for technology dissemination.

Objective of the Webinar

- To disseminate knowledge on emerging fisheries technology developed by fisheries institutes.
- To facilitate technology awareness among budding aquapreneurs, innovators, rural youth, students and fisheries professionals.
- To showcase commercialization pathways and startup opportunities linked with institution-developed fisheries technology
- To strengthen capacity building through expert-led sessions.
- To facilitate interaction among scientists, startups, aspiring aquapreneurs and students, thereby fostering collaborative learning and innovation ecosystems.

Program Schedule

The MANAGE-FISHub Webinar Series was organized as a structured 15-day intensive program, with each day dedicated to covered cutting-edge technologies and emerging trends within the fisheries sector.



Promotional Activities

The outreach focused on both institutional and public digital platforms

Regular updates and speaker profiles shared across social media handles

Short coming soon posters were used to redirect the participants

A key collaborating partner, **CMFRI** promoted the series through their internal WhatsApp Group

Information brochures and daily session links were shared through all WhatsApp groups

Formal invitation and program posters were sent to various fisheries colleges, KVKs and participants of MANAGE-FISHub Program

Personalized emails were sent to the MANAGE-FISHub participants

Regularly reminder Email were sent to registered participants 12 hours and one hour before each live session

1

Black Soldier Fly Larvae

Day - 1

JUL

20-07-2026

Biovalorisation of Organic Wastes into High-value Aquafeed Ingredients and Organic Compost using Black Soldier Fly Larvae (Hermetia illucens)

Dr. Sanal Ebeneezar
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Dr. Sanal Ebeneezar delivered a comprehensive and insightful presentation on Black Soldier Fly Larvae, highlighting its significance as a sustainable solution for aquaculture feed production and organic waste management.

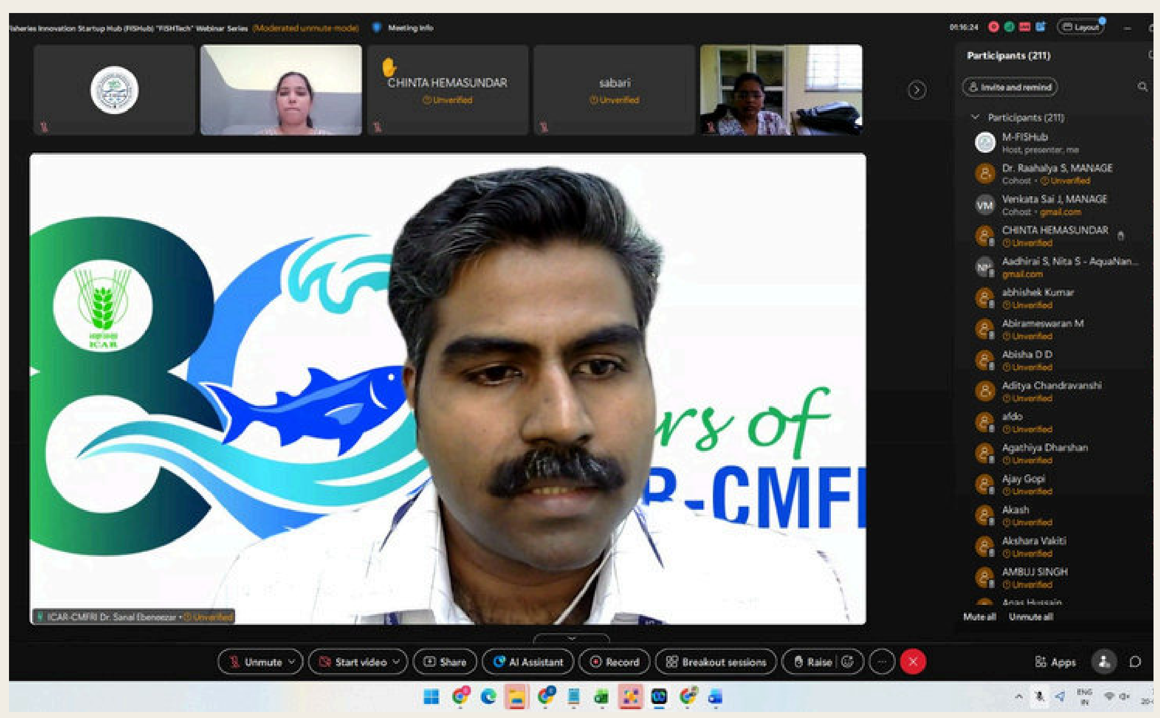
Modern aquaculture faces a significant challenge in balancing sustainable growth with the rising costs and environmental impact of conventional fish meal. An innovative circular-economy approach was developed by ICAR–CMFRI that uses Black Soldier Fly (*Hermetia illucens*) larvae to transform organic waste into high-value aquafeed ingredients and nutrient-rich organic compost. This technology not only addresses waste management concerns but also provides a nutritious, cost-effective and sustainable protein source for the aquaculture industry.

Need for Black Soldier Fly Larvae Technology

The speaker explained that fish meal has long been regarded as the benchmark protein source for aquaculture feeds due to its excellent nutritional quality. However, increasing prices, limited availability, and dependence on wild fish stocks have made it necessary to identify sustainable alternatives. Black Soldier Fly Larvae provide a promising solution by efficiently converting biodegradable organic waste into protein-rich biomass suitable for aquaculture and livestock feeds.

The speaker explained the biology and production process of the Black Soldier Fly (*Hermetia illucens*), highlighting its rapid growth, efficient waste conversion capacity and safe, non-pest nature. Successful production requires controlled environmental conditions, including optimum temperature, humidity, adequate light and proper ventilation.

The harvested larvae are processed into dried larvae, protein meal, and oil suitable for aquaculture, poultry, livestock and pet feed industries, while the residual frass serves as an organic fertilizer. The speaker also emphasized the environmental benefits of reducing landfill waste, lowering greenhouse gas emissions, and decreasing dependence on fish meal derived from wild marine fisheries.

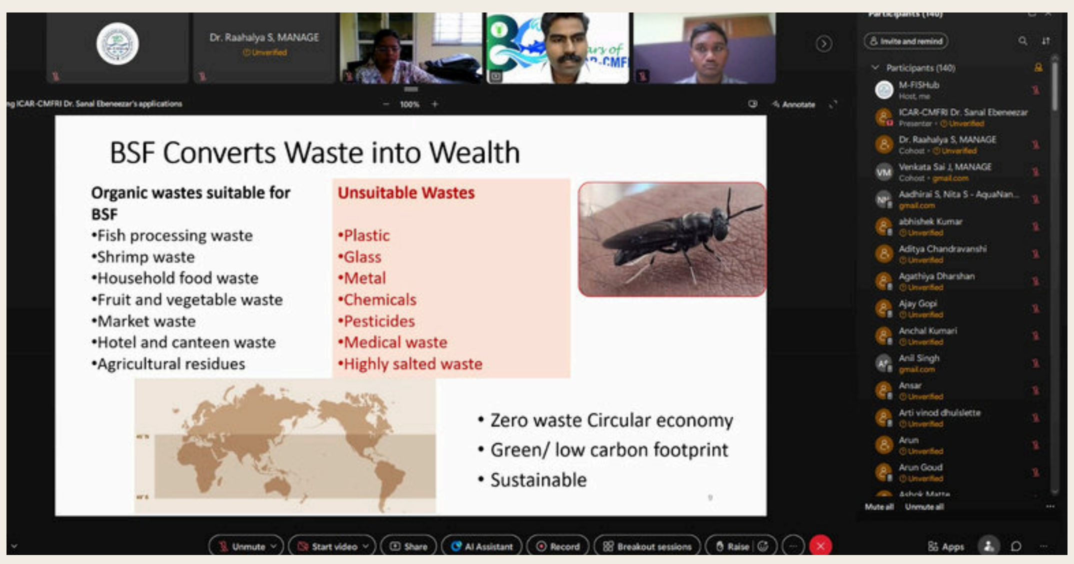


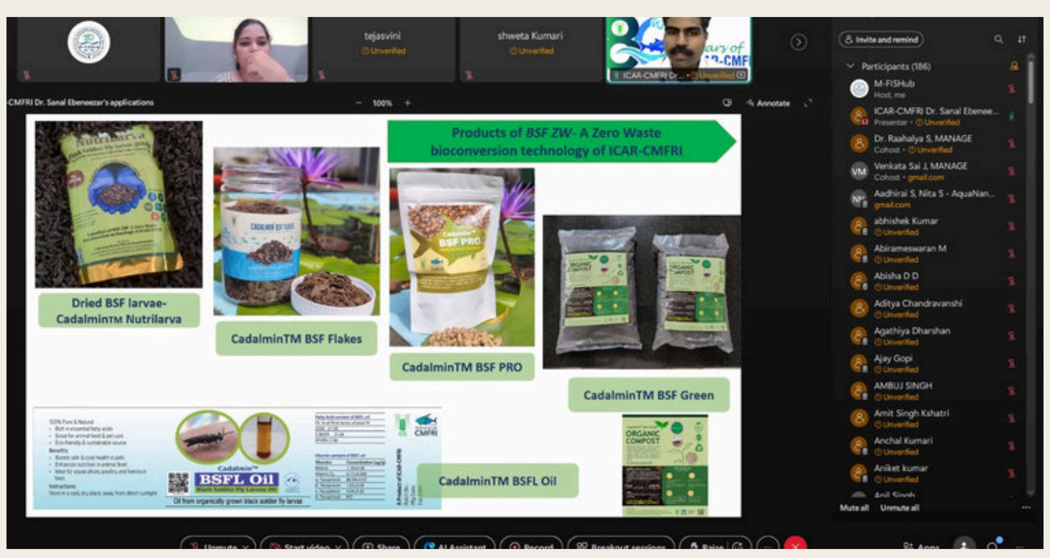
Production Technology

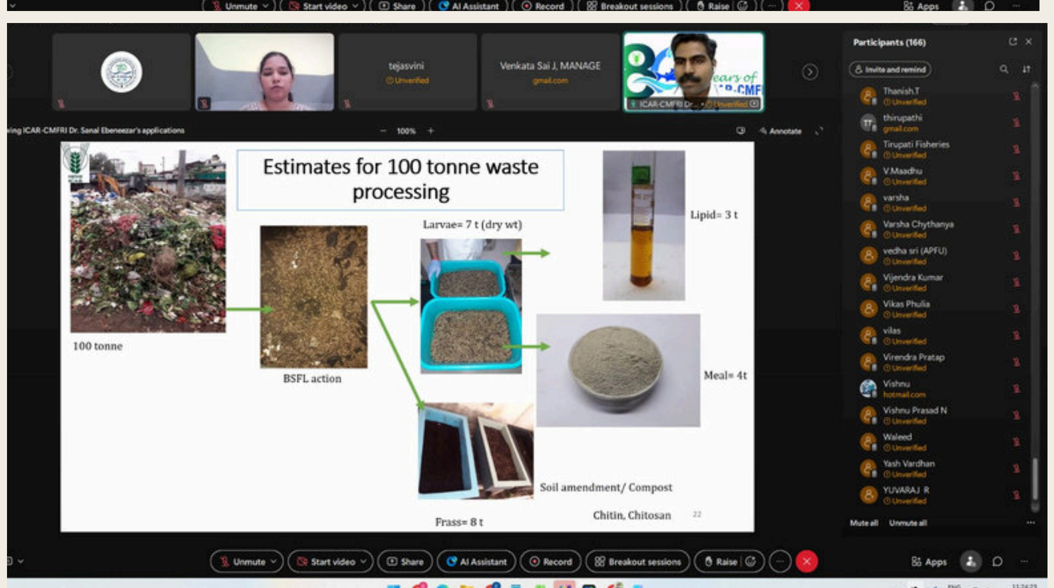
He elaborated on the complete BSFL production technology, beginning with the collection and pre-processing of organic waste, followed by larval rearing under controlled environmental conditions of 28–30°C temperature, 60–80% relative humidity, adequate ventilation and sufficient light for successful breeding. The harvested larvae are subsequently processed into dried larvae, protein-rich insect meal, and BSFL oil, while the residual by-product (frass) is converted into a high-quality organic compost. He emphasized that the protein meal possesses excellent nutritional value and can be effectively utilized in aquaculture, poultry, livestock, ornamental fish and pet feed industries.

Dr. Ebeneezar further highlighted the environmental and economic benefits of the technology, explaining that it significantly reduces landfill waste, lowers greenhouse gas emissions and minimizes dependence on fish meal derived from wild fisheries. He noted that BSFL production offers multiple revenue streams with an estimated return on investment of 2–2.5 years and that ICAR-CMFRI supports commercialization through technology licensing and startup assistance. Concluding his presentation, he emphasized the need for continued research on substrate standardization, automation and AI-based monitoring systems to enhance large-scale production and establish BSFL technology as a cornerstone of sustainable aquaculture and waste valorization.

In conclusion, Dr. Sanal Ebeneezar emphasized that Black Soldier Fly Larvae (BSFL) technology offers a sustainable and economically viable solution for converting organic waste into high-value aquafeed ingredients and organic compost. By transforming biodegradable waste into nutrient-rich protein, oil, and organic fertilizer, the technology addresses critical challenges related to feed security, waste management, and environmental sustainability while promoting a circular bioeconomy. He concluded that with scientific production practices, technology transfer and wider commercialization through ICAR-CMFRI, BSFL technology has immense potential to support sustainable aquaculture, create entrepreneurial opportunities and contribute to climate-resilient and resource-efficient food production systems.







Q & A Session

Q1. What is the procedure for transitioning fish from conventional feed to BSFL-based feed?
Ans: The acceptance of BSFL-based feed varies among fish species. Species such as tilapia, channa, and several ornamental fishes readily accept Black Soldier Fly larvae, whereas others, including Asian sea bass, may require gradual adaptation. He recommended introducing BSFL-based feed from the fingerling stage to ensure successful feed transition and better acceptance.

Q2. Is there a risk of contaminants being transferred through BSFL?
Ans: The speaker emphasized that the safety of BSFL products largely depends on the quality of the organic substrate used. If the waste contains heavy metals, antibiotic residues, pesticides, or other contaminants, these may accumulate in the larvae and subsequently enter the food chain. Therefore, only clean and safe organic waste should be used for BSFL production.

Q3. How safe is BSFL technology with respect to pathogen transmission?
Ans: Dr. Ebeneezar explained that Black Soldier Fly larvae possess a strong innate immune system and exhibit natural antimicrobial activity. Studies have demonstrated that the larvae significantly reduce the pathogenic load in organic waste during bioconversion, making the technology environmentally safe and suitable for producing high-quality feed ingredients.

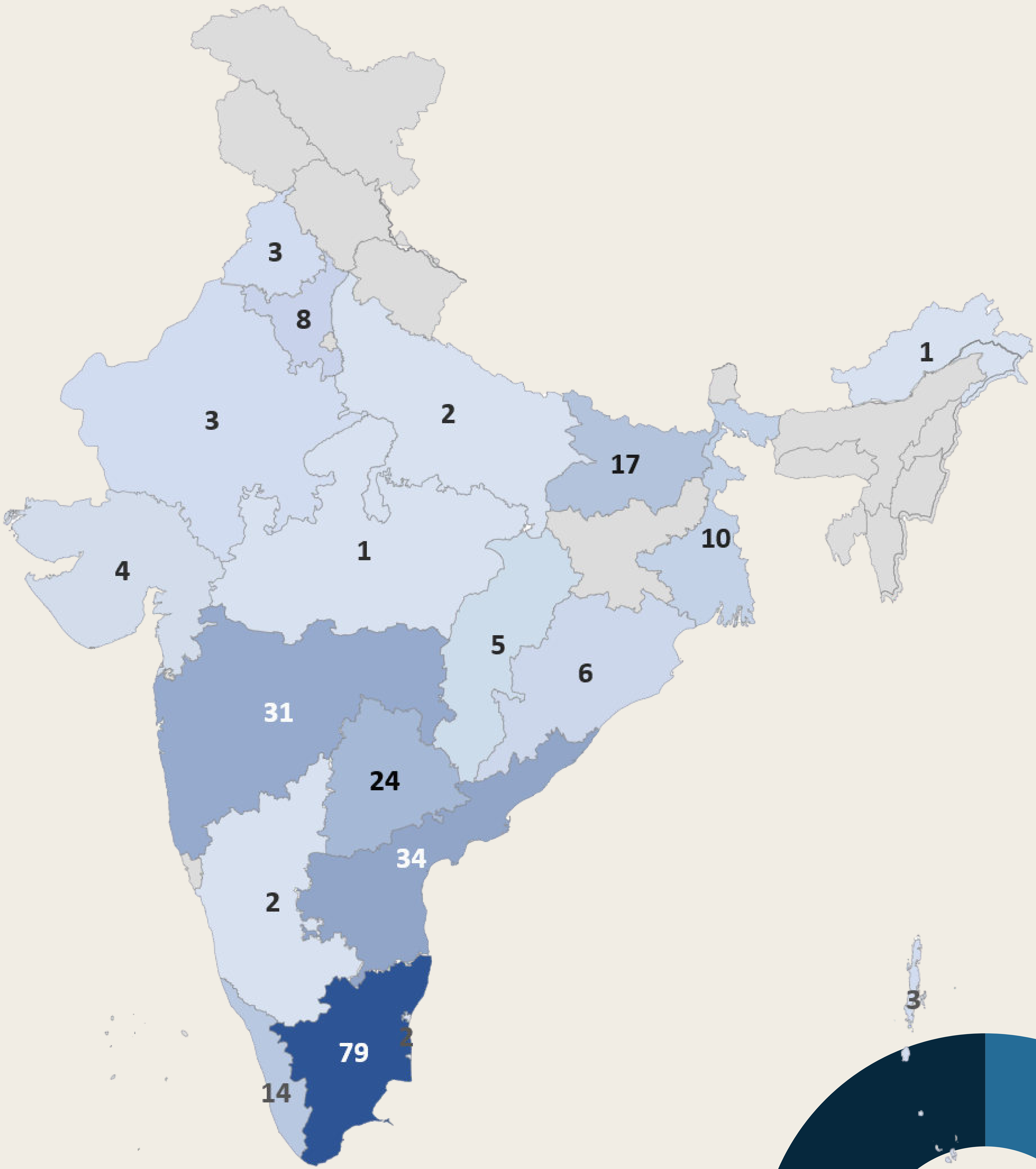
Q4. How economically viable is BSFL technology, and what is the licensing cost?
Ans: The speaker noted that although initial investment is required for establishing breeding and rearing facilities, the technology is economically attractive due to reduced feed costs and multiple value-added products. He informed participants that ICAR-CMFRI licenses the technology to Indian startups for ₹1 lakh plus 18% GST, covering production units with a waste processing capacity of up to 20 tonnes per day, with an applicable royalty on commercial production. The expected return on investment is approximately 2–2.5 years.

Q5. What quality parameters should be evaluated while purchasing BSFL products?
Ans: Dr. Ebeneezar advised that buyers should assess the protein, lipid, amino acid profile, microbiological quality, heavy metal content, and chitin level of BSFL products before procurement. Ensuring consistent nutritional quality and low contamination levels is essential for producing safe and effective aquafeeds.

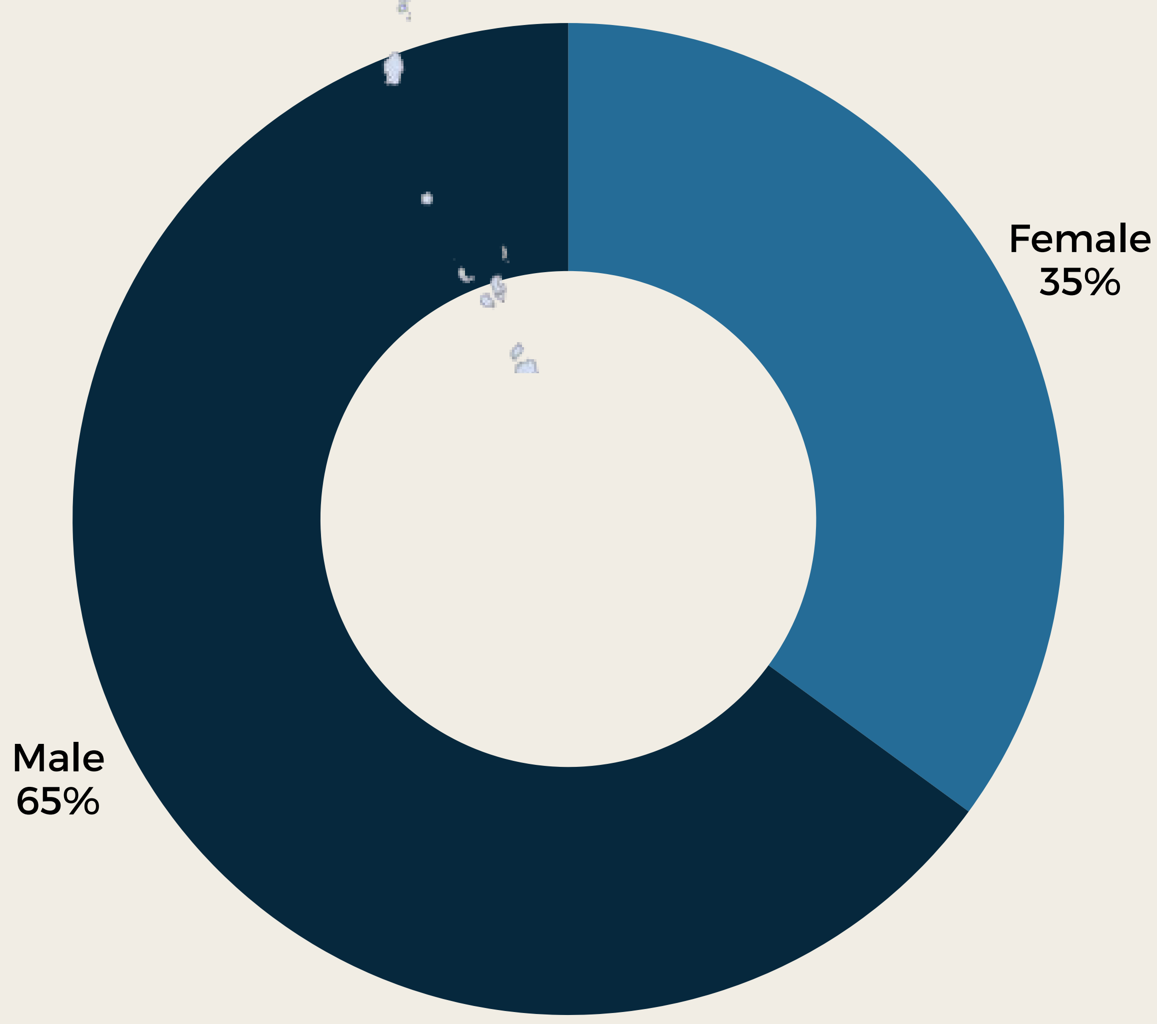
Q6. How can the high lipid and chitin content of BSFL be managed?
Ans: The speaker explained that the high oil content can be reduced through mechanical defatting using a screw press, resulting in a protein-rich meal with approximately 10–15% lipid content. To improve digestibility, particularly in herbivorous fish, he suggested harvesting larvae before the prepupal stage when chitin levels are lower or supplementing feeds with chitinase enzymes to enhance chitin digestion.

Q7. Does BSFL-based feed affect fish flesh quality?
Ans: Dr. Ebeneezar reported that feeding trials conducted by ICAR-CMFRI on species such as silver pompano and catfish showed no significant differences in flesh quality, texture, or taste compared to fish fed conventional fish meal-based diets, confirming the suitability of BSFL meal as an alternative protein source.

Participants Overview



Total Registrations: 502
Attended Participants - 254
(Male - 165; Female-89)



YouTube Video Link: https://www.youtube.com/live/hcYK0c-V76U?si=xte_CG9TjQ5xcAXf

2

Giant Trevally

JUL
21-07-2026

Breeding and Seed Production of Giant Trevally (Caranx ignobilis)

Mr. Ambarish P. Gop
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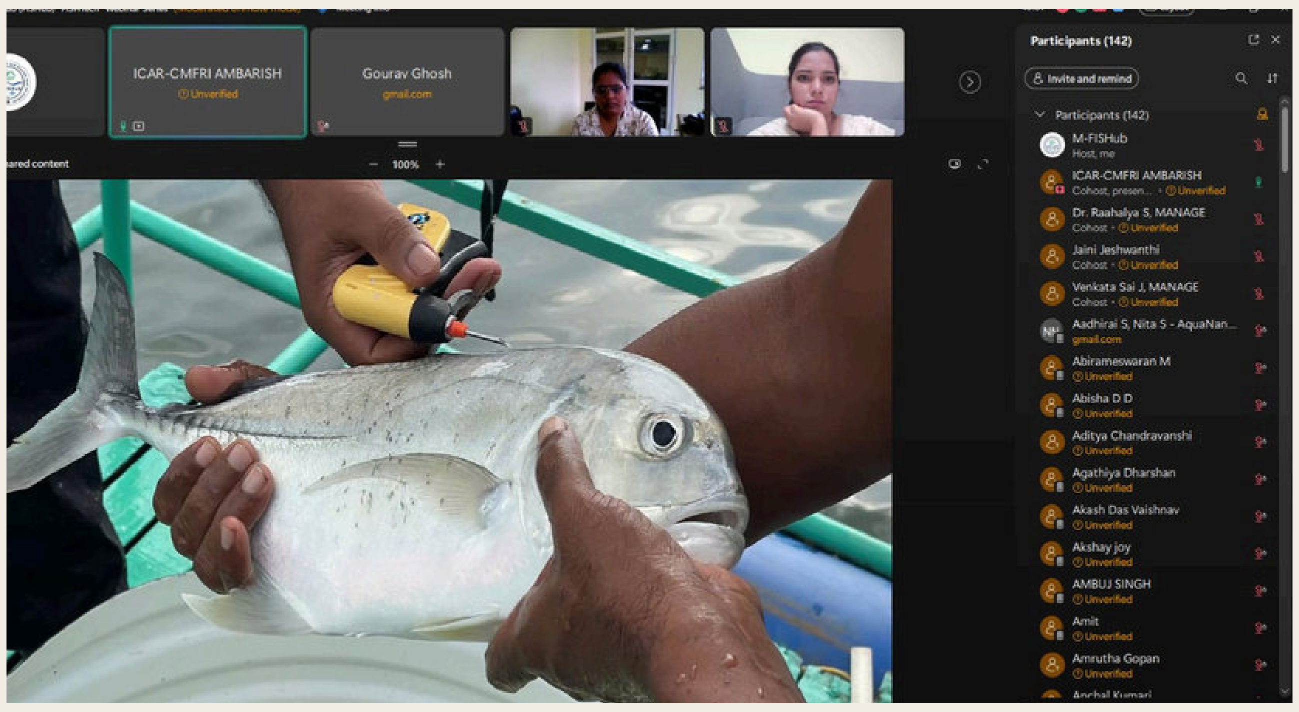
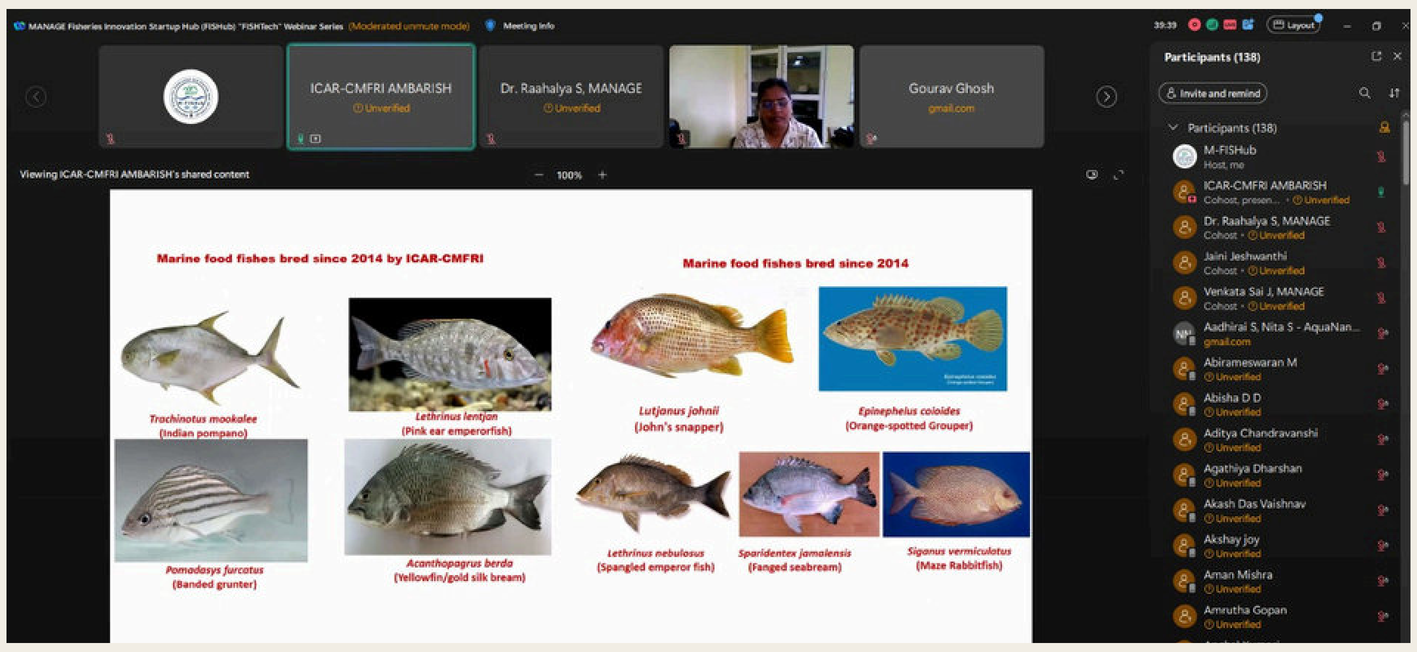
The speaker highlighted the growing importance of mariculture as a sustainable approach to meeting the increasing demand for fish while reducing pressure on declining wild fish stocks. With capture fisheries reaching their maximum sustainable limits due to over-exploitation, mariculture has emerged as a viable alternative for ensuring future seafood production.

The speaker explained the importance of broodstock management in successful seed production. Healthy broodstock are collected from the wild using soft-mesh dip nets to minimize stress and prevent damage to the protective slime layer. The fish are then subjected to quarantine procedures, including freshwater treatment to eliminate external parasites, before being transferred to broodstock holding tanks. Proper nutrition, water quality management, and minimal handling are essential to maintain broodstock health and reproductive performance.

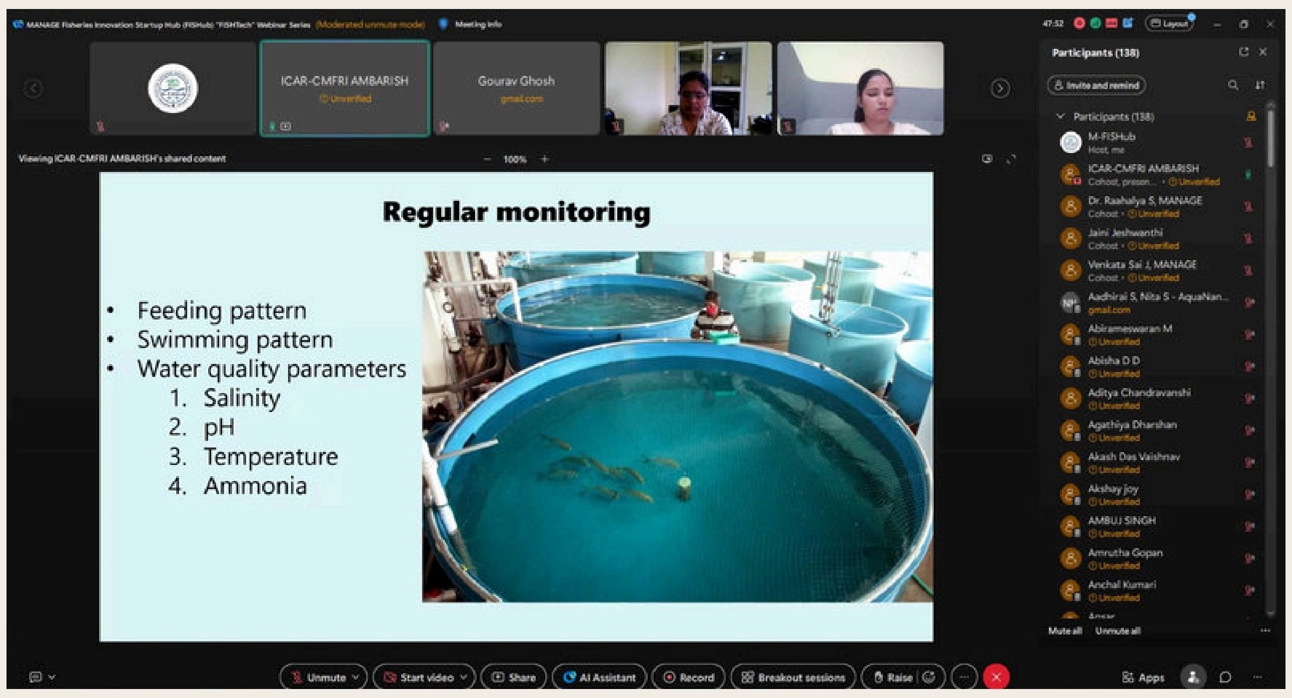
Since Giant Trevally does not exhibit external sexual dimorphism, the speaker described the use of Passive Integrated Transponder (PIT) tags for individual identification and maintaining breeding records. Broodstock maturity is monitored regularly through cannulation, a non-destructive technique used to collect egg samples and assess gonadal development. Once the egg diameter reaches approximately 350 µm or above, brood fish are considered suitable for hormonal induction using Gonadotropin-Releasing Hormone analogue (GnRHa) to initiate spawning under captive conditions.

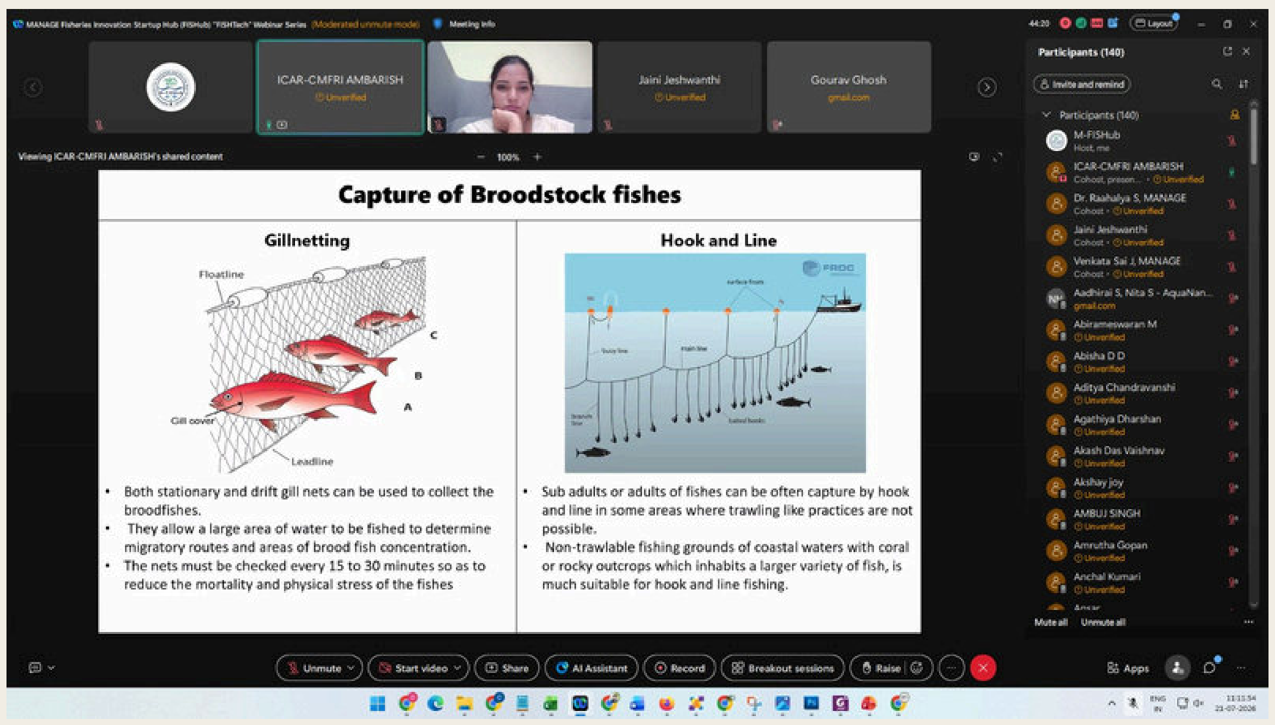




Describing the larval rearing protocol, the speaker emphasized that newly hatched larvae initially depend on yolk sac reserves before transitioning to external feeding. Due to their extremely small mouth size, early larvae require live feeds such as copepods (*Parvocalanus*) and rotifers (*Brachionus*), which provide essential nutrients for growth and survival. As the larvae develop, they are gradually weaned onto artificial micro-pellet feeds, followed by transfer to nursery systems where stocking density, feeding management, and water quality are carefully maintained to maximize survival.

In conclusion, the speaker highlighted that ICAR-CMFRI has successfully standardized Giant Trevally seed production and larval rearing technologies, demonstrating their effectiveness in farmer-led marine cage farming systems. The institute is actively transferring these technologies to state fisheries departments, hatcheries, and private entrepreneurs to enhance the availability of quality marine fish seed. The speaker emphasized that the adoption of this technology will promote sustainable mariculture, diversify aquaculture production, strengthen marine fish farming enterprises, and contribute to livelihood generation and seafood security in India.





Q & A Session

Q1. Is complete domestication of Giant Trevally broodstock possible?
Ans: Although complete domestication is technically possible, ICAR-CMFRI currently prefers collecting broodstock from the wild to maintain better genetic quality and avoid deterioration in subsequent generations.

Q2. How long should broodstock be maintained and what evaluations are carried out?
Ans: Broodstock are generally maintained for about two years until they attain reproductive maturity. During this period, regular assessment of reproductive development and breeding performance is conducted to determine their suitability for spawning.

Q3. What are the major challenges during hatchery operations?
Ans: The speaker highlighted that sudden temperature fluctuations, particularly during rainfall, adversely affect egg quality and larval survival. Maintaining stable environmental conditions is therefore essential for successful seed production.

Q4. What is the current status of commercial hatchery development in India?
Ans: The speaker informed that ICAR-CMFRI is actively transferring Giant Trevally breeding technology to private hatcheries and state fisheries departments, with commercial adoption progressing steadily across the country.

Q5. Have any major disease outbreaks been observed during breeding?
Ans: No major disease outbreaks have been reported. As a preventive health management practice, broodstock are given a freshwater dip before stocking to eliminate external parasites and improve overall fish health.

Q6. What are the major challenges in larval feeding and breeding?
Ans: The speaker explained that the major challenge is providing suitable live feed during the early larval stages because Giant Trevally larvae possess a very small mouth opening. A combination of copepods and rotifers is recommended to improve larval survival. For induced breeding, GnRHa/LHRH analogue is successfully used for hormonal induction.

Q7. Is hormonal implantation or hand stripping practiced for breeding?
Ans: The speaker clarified that hormonal implantation is not recommended as it may reduce broodstock lifespan due to repeated spawning. Similarly, hand stripping is avoided because it can cause injury and mortality. Instead, cannulation is employed to monitor gonadal maturity before hormone administration.

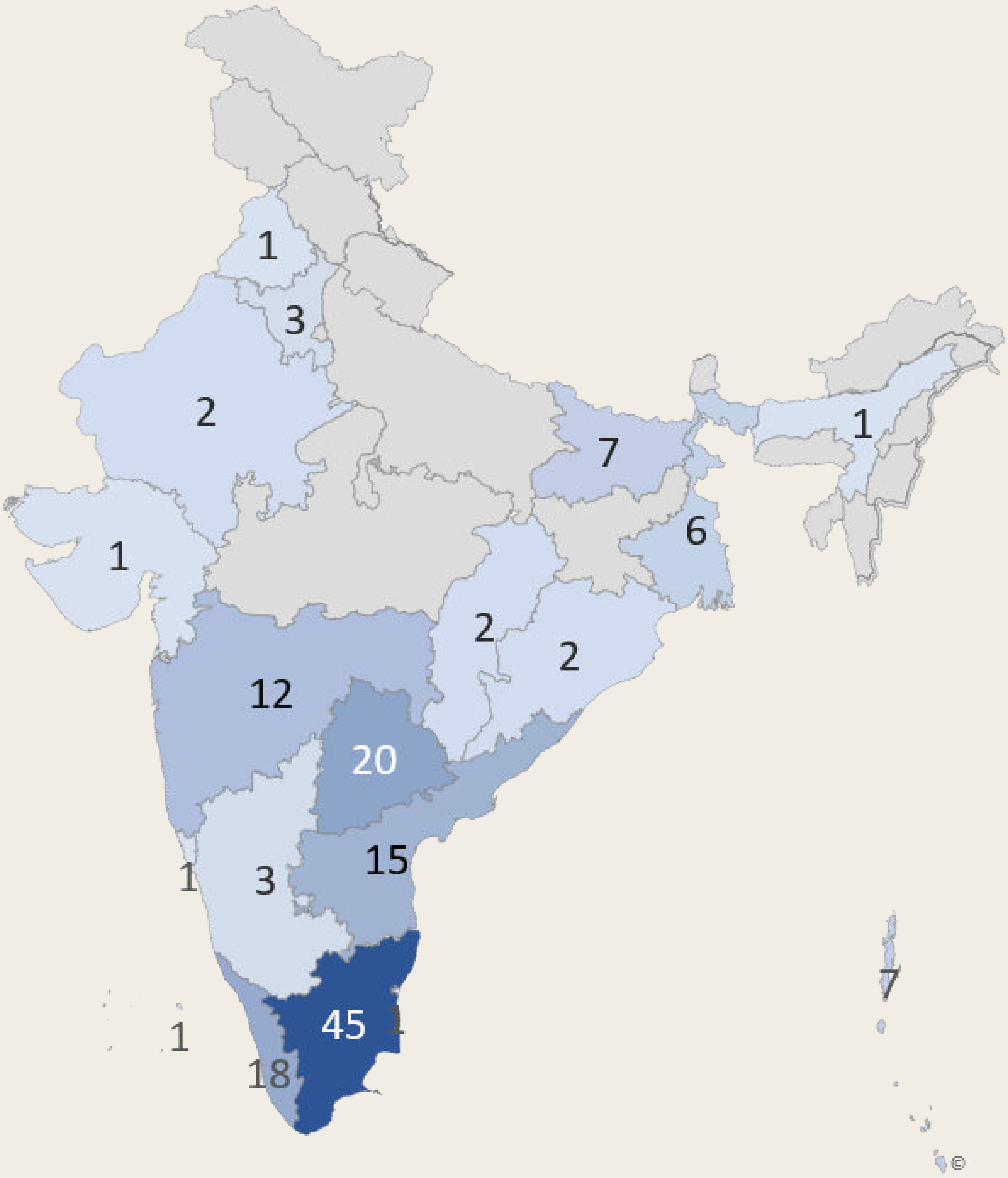
Q8. How many breeding cycles can a brood fish undergo?
Ans: According to the speaker, healthy brooders can be used for multiple breeding cycles, and some broodstock maintained at ICAR-CMFRI have remained productive for over eight years under proper management.

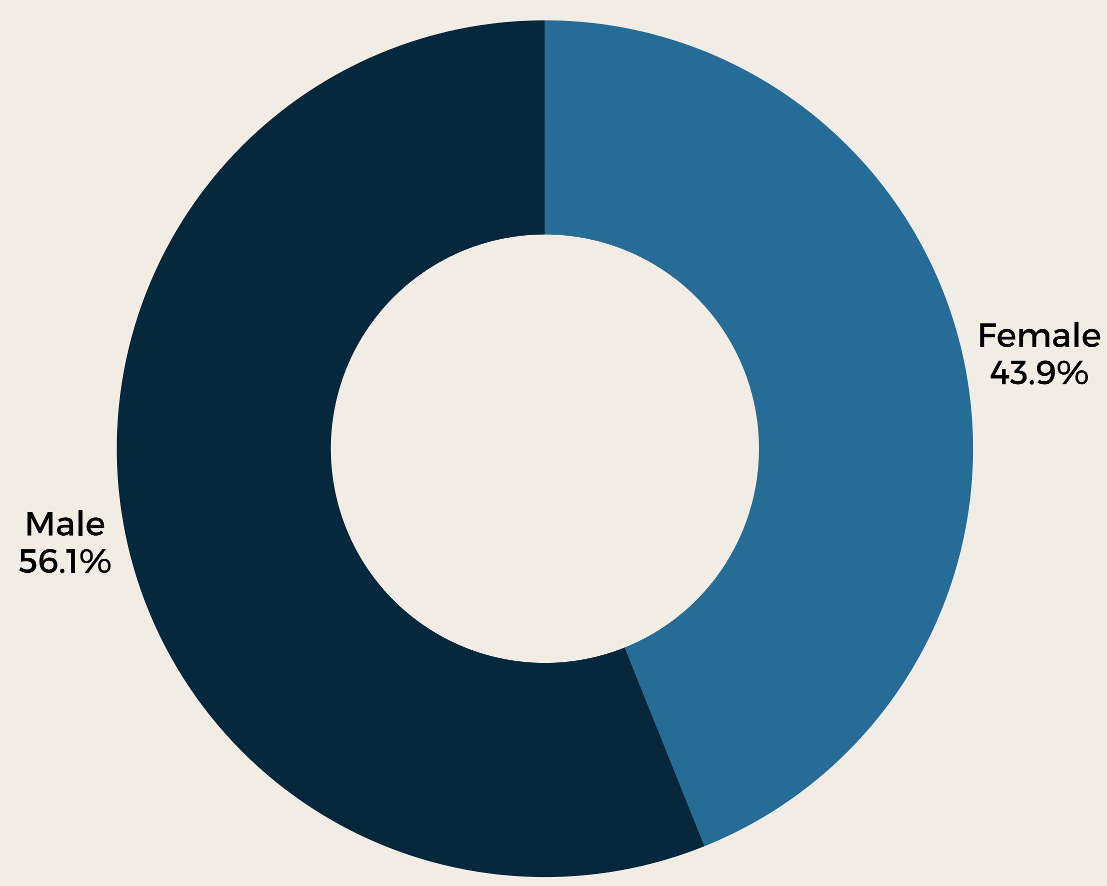
Q9. What precautions are taken during broodstock capture and transportation?
Ans: The speaker noted that broodstock experience considerable stress during capture and transport. To minimize stress and mortality, high dissolved oxygen levels are maintained throughout transportation, and fish are handled carefully using soft-mesh nets.

Q10. What are the recommended egg diameter, fecundity, and larval stocking density?
Ans: The speaker stated that brooders are considered ready for hormone induction when the egg diameter reaches 350–400 µm. Giant Trevally produce approximately 80,000 eggs per kilogram of body weight. For larval rearing, a stocking density of 2 larvae per litre is recommended, along with live feed densities of 5–8 rotifers/ml and 5 copepods/ml to achieve better survival.

Q11. What future research areas and production recommendations were suggested?
Ans: The speaker emphasized the need to develop specialized larval feeds, as suitable commercial diets are currently unavailable in India. He also recommended cage culture over pond culture for better growth performance and encouraged researchers and students to focus on improving larval nutrition and seed production technologies to support commercial mariculture.

Participants Overview





Total Registrations - 488
Attended Participants - 148
(Male - 83; Female-65)

YouTube Video Link: https://www.youtube.com/live/ioTGm8hB1V4?si=G2WvVq5EvtPJnmP8

3

Marine Copepods

Day - 3

JUL

22-07-2026

Mass Production of Marine Copepods

Dr. B. Santhosh
Principal Scientist & Head
ICAR–CMFRI
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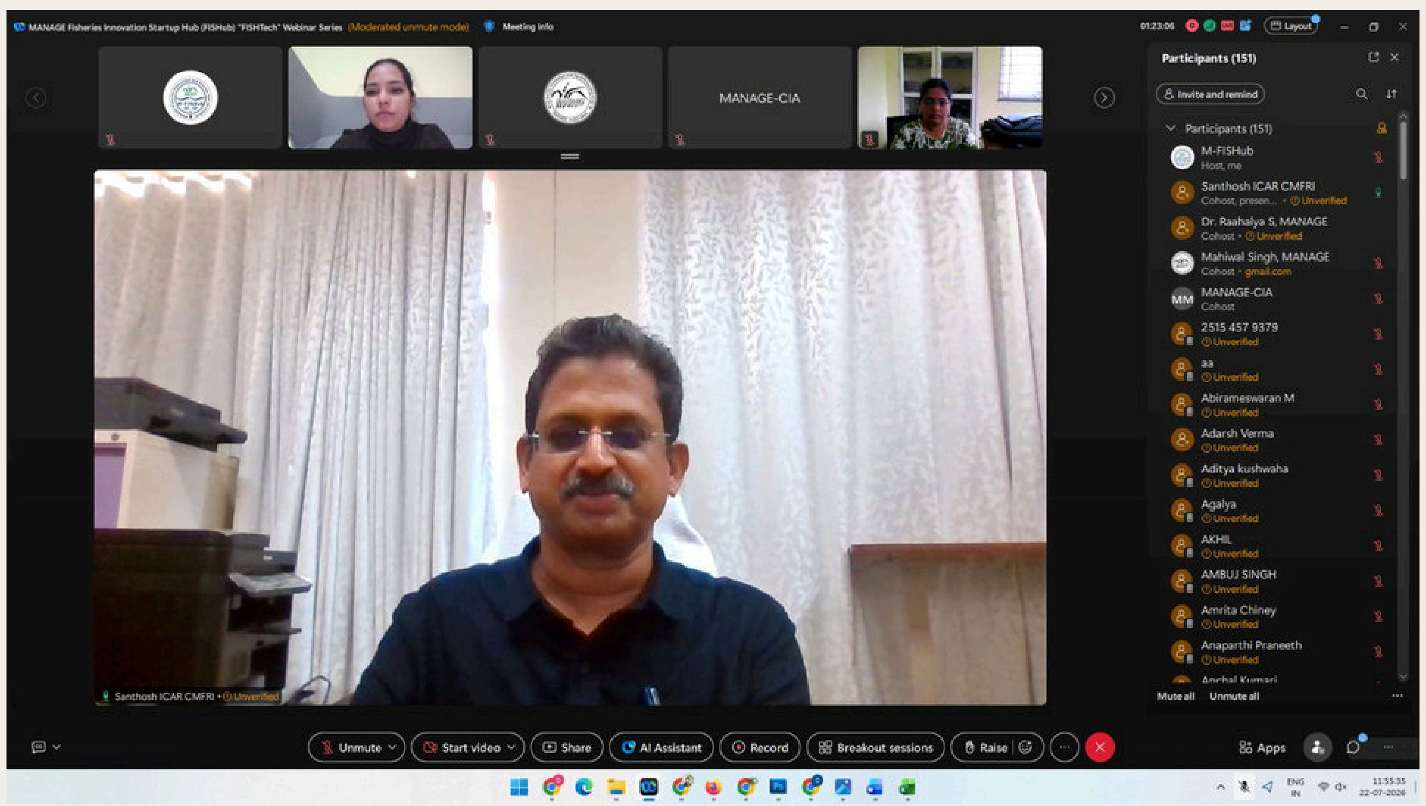
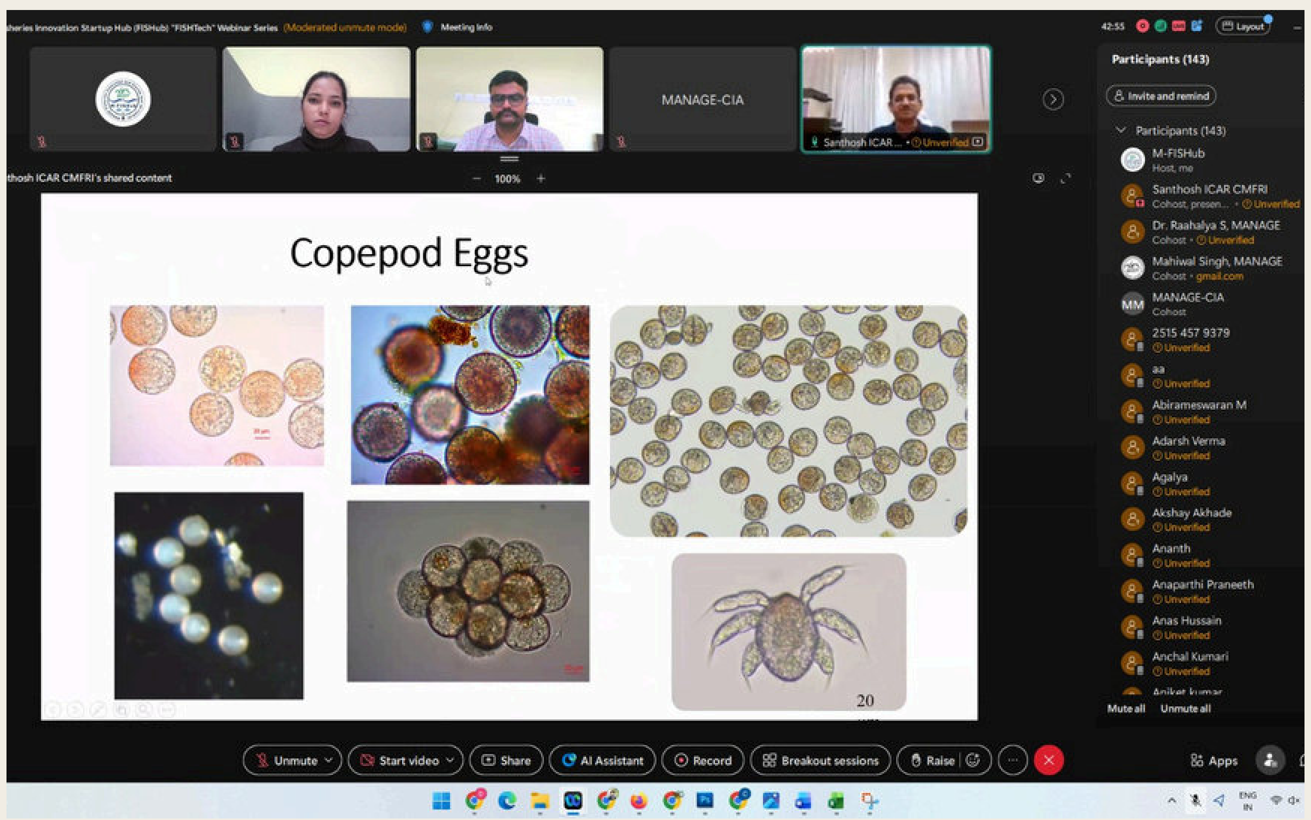
Dr. Santosh, delivered a comprehensive presentation on the mass production of marine copepods, highlighting their critical role as a live feed in marine fish hatcheries. He explained that copepods are indispensable during the early larval stages of many high-value marine fishes, including groupers, snappers, pompano, and ornamental species.

Due to their small size, superior nutritional composition, and high digestibility, copepods provide an ideal first feed for marine fish larvae with underdeveloped digestive systems and limited yolk reserves, thereby significantly improving larval survival and growth.

The speaker emphasized the nutritional superiority of copepods over conventional live feeds such as rotifers and Artemia. Copepods are naturally rich in essential fatty acids, particularly EPA (Eicosapentaenoic Acid) and DHA (Docosahexaenoic Acid), along with high-quality proteins and essential amino acids required for healthy larval development. Their small nauplii stages, ranging from 20–100 µm, make them particularly suitable for species with very small mouth openings, ensuring better feed acceptance, faster growth, improved pigmentation, and higher survival rates during the critical early life stages.

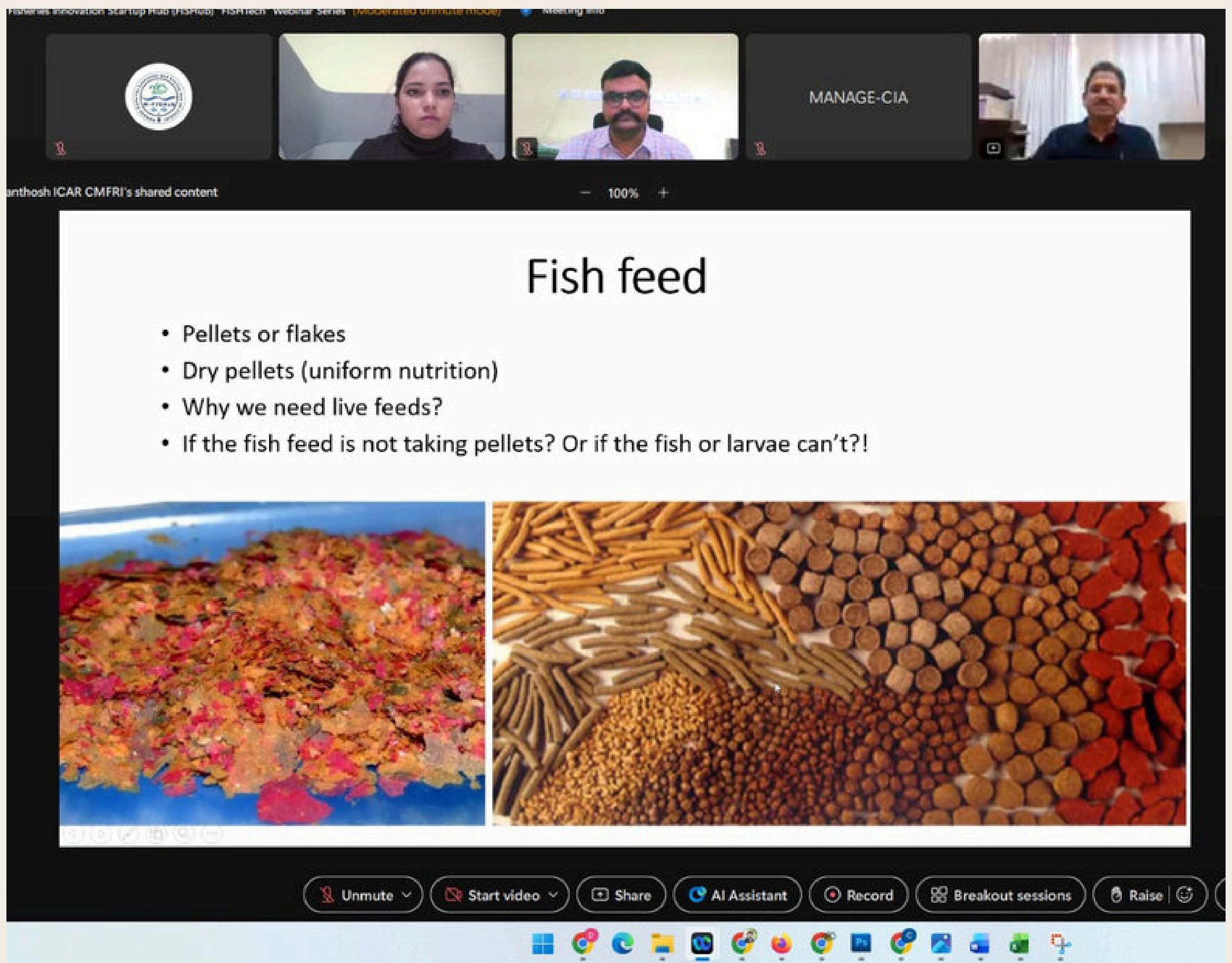
Dr. Santosh highlighted that ICAR-CMFRI has successfully standardized the mass production of 14 marine copepod species, representing one of the largest live collections maintained globally. He described the biological diversity of copepods, including egg-scattering and egg-carrying species, and explained that maintaining healthy cultures requires careful management of microalgal feed, water quality, and stocking density. Proper algae management is essential, as overfeeding can lead to deterioration of water quality and contamination by undesirable microorganisms such as ciliates.

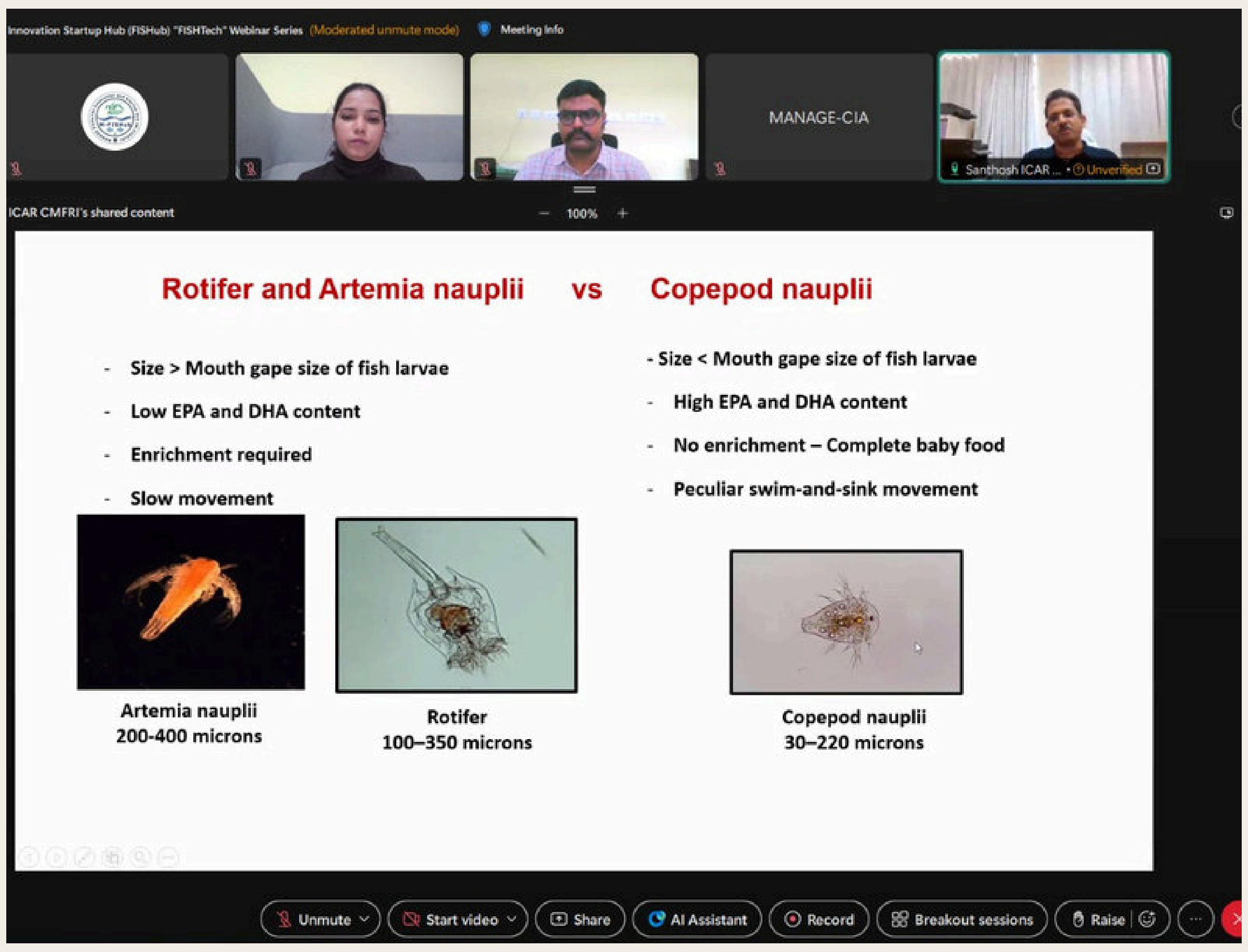


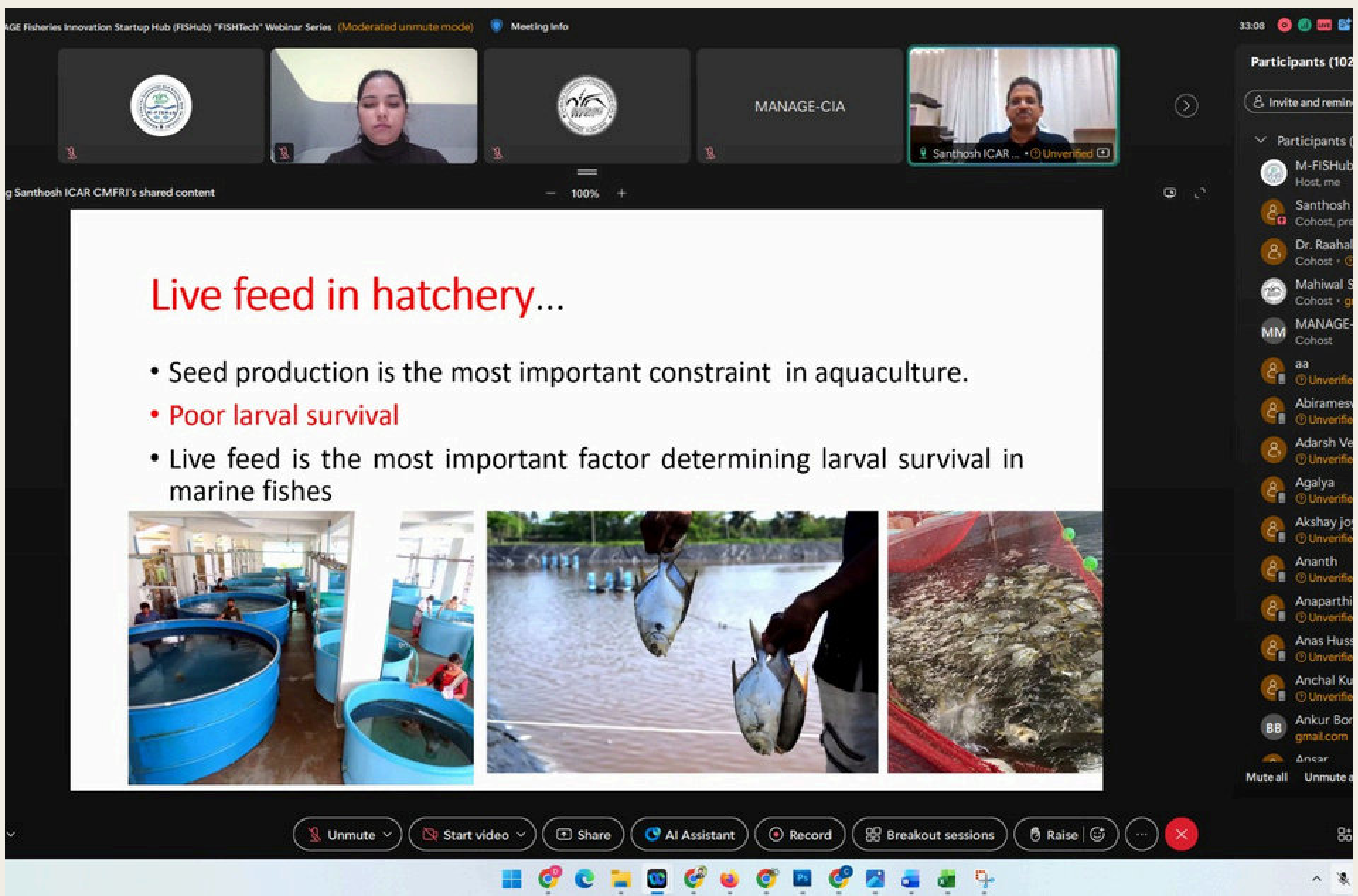


The speaker discussed the standardized production technology adopted by ICAR-CMFRI for large-scale copepod culture. He recommended the use of indoor high-density polyethylene (HDPE) tanks with light-colored interiors to facilitate culture management. Environmental parameters such as temperature (25–28°C) and salinity (30–35 ppt) should be maintained within optimum ranges for maximum productivity. Continuous culture systems were identified as the most efficient production method, allowing daily harvesting of nauplii and ensuring a continuous supply of live feed for marine hatcheries throughout the production cycle.

Dr. Santosh further emphasized the economic significance of copepod production in supporting India's expanding marine aquaculture sector. Dependence on imported Artemia cysts can substantially increase hatchery operating costs, whereas locally produced copepods provide a sustainable and cost-effective alternative with superior nutritional quality. The technology has immense potential for commercial hatcheries producing marine finfish and ornamental fishes, while ongoing research at ICAR-CMFRI focuses on cryopreservation techniques, resting egg production, and further optimization of mass culture protocols for commercial-scale adoption.







Q & A Session

Q1. What artificial feeds are recommended for copepod culture?

Ans: Dr. B. Santosh explained that there is no standard artificial feed recommended for copepod culture. Microalgae, particularly Chlorella and other suitable algal species, remain the primary feed source. Although a very small quantity of powdered fish pellet feed may occasionally be used for harpacticoid copepods, it is generally discouraged because overfeeding can lead to contamination, poor water quality, and culture crashes.

Q2. What career opportunities are available in the field of copepod production and fisheries enterprise management?

Ans: The speaker highlighted that significant career opportunities exist in the fish processing and seafood export industries, as well as in marine hatchery management, ornamental fish production, and live feed enterprises. He noted that establishing commercial hatcheries and ornamental fish units requires adequate infrastructure, technical expertise, and investment but offers excellent entrepreneurial potential.

Q3. How can environmental fluctuations be managed in copepod culture systems?

Ans: Dr. Santosh emphasized the importance of maintaining stable environmental conditions to prevent culture crashes. He recommended storing and conditioning artificial seawater before use and adopting Recirculating Aquaculture Systems (RAS) to reduce frequent water exchange and maintain stable salinity, temperature, and overall water quality.

Q4. What are the current research priorities in copepod culture?

Ans: The speaker explained that current research focuses on developing intensive mass production protocols, inducing resting egg production for long-term storage, improving culture management practices, and utilizing copepods as model organisms in toxicological, nutritional, and biochemical research.

Q5. Is cryopreservation of copepods commercially feasible?

Ans: Dr. Santosh stated that although cryopreservation techniques have shown promising results under experimental conditions, they are still in the developmental stage and require further research before becoming commercially viable for hatchery operations.

Q6. Does temperature influence the nutritional quality of copepods?

Ans: Yes. The speaker explained that lower culture temperatures generally enhance the Highly Unsaturated Fatty Acid (HUFA) content of copepods. He also noted that the nutritional quality depends greatly on the species of microalgae provided as feed, with algae such as *Isochrysis galbana* contributing significantly to improved fatty acid profiles.

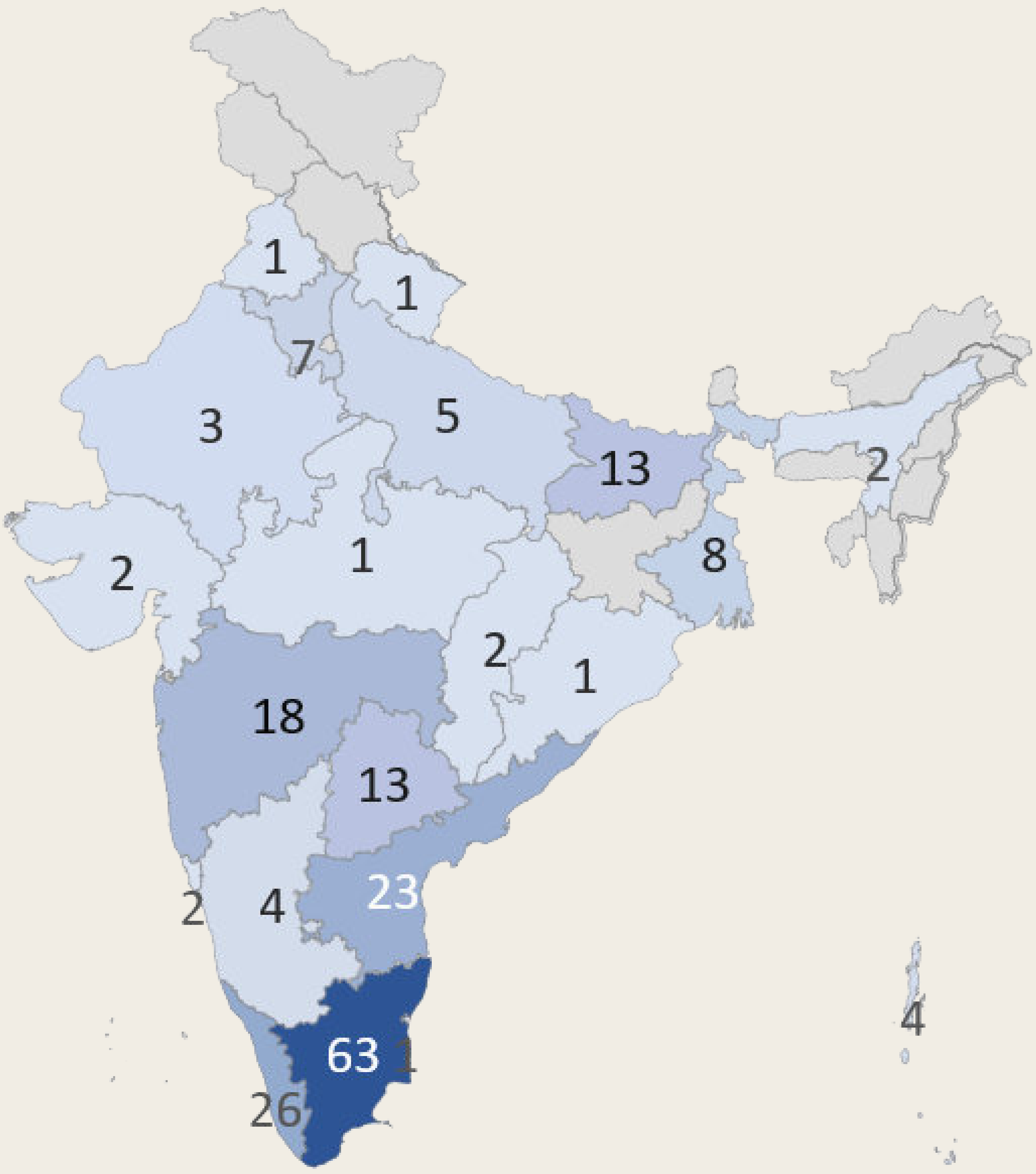
Q7. How can cannibalism be minimized in continuous copepod culture?

Ans: The speaker recommended selecting non-predatory copepod species such as *Paracalanus*, maintaining appropriate stocking densities through regular harvesting, and continuously monitoring larval-to-adult population ratios to reduce cannibalism and improve culture stability.

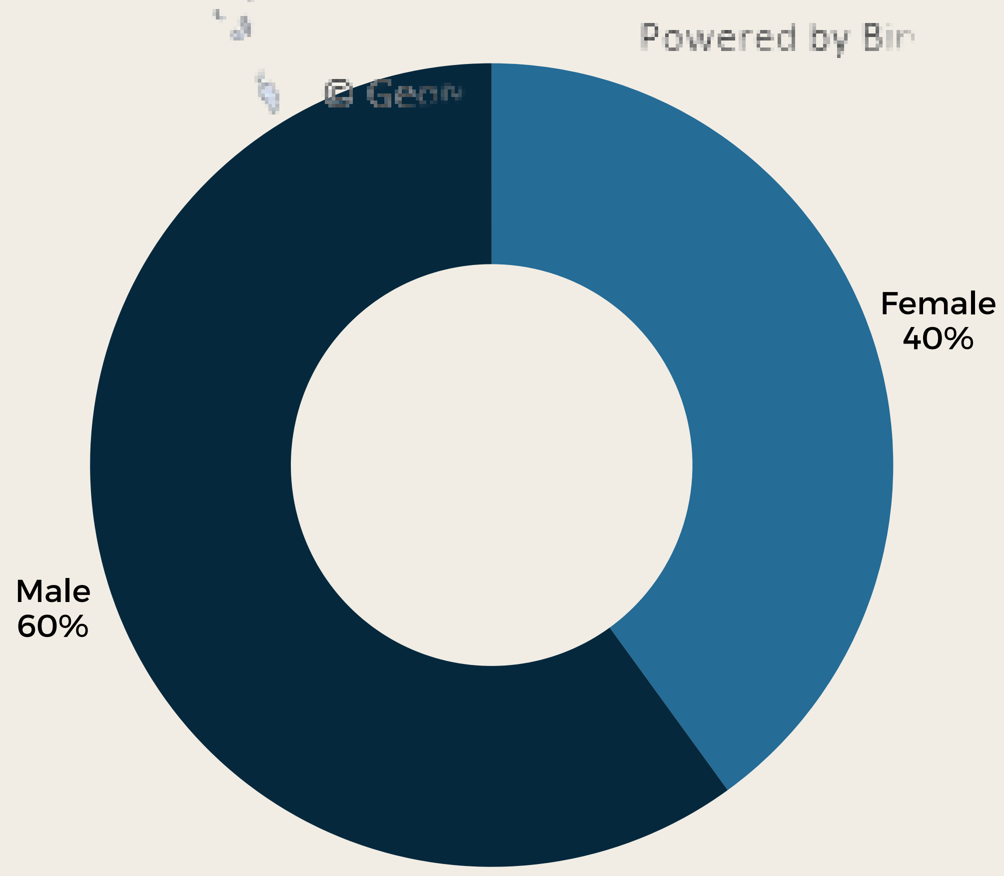
Q8. What is the typical hatching rate of calanoid copepods?

Answer: Dr. Santosh informed participants that calanoid copepods exhibit an exceptionally high hatching success, with hatching rates generally ranging between 98% and 100% under optimum culture conditions, making them highly suitable for large-scale hatchery applications.

Participants Overview



Total Registrations-499
Attended Participants - 200
(Male - 120; Female-80)



YouTube Video Link: https://www.youtube.com/live/EnRNc202vco?si=pHFJQmgADP6KvT37

4

Designer Clownfishes

Day - 4

JUL

23-07-2026

Production of Designer Clownfishes through Captive Breeding

Dr. Anikuttan K. K.
Senior Scientist
ICAR–CMFRI
Regional Centre, Mandapam
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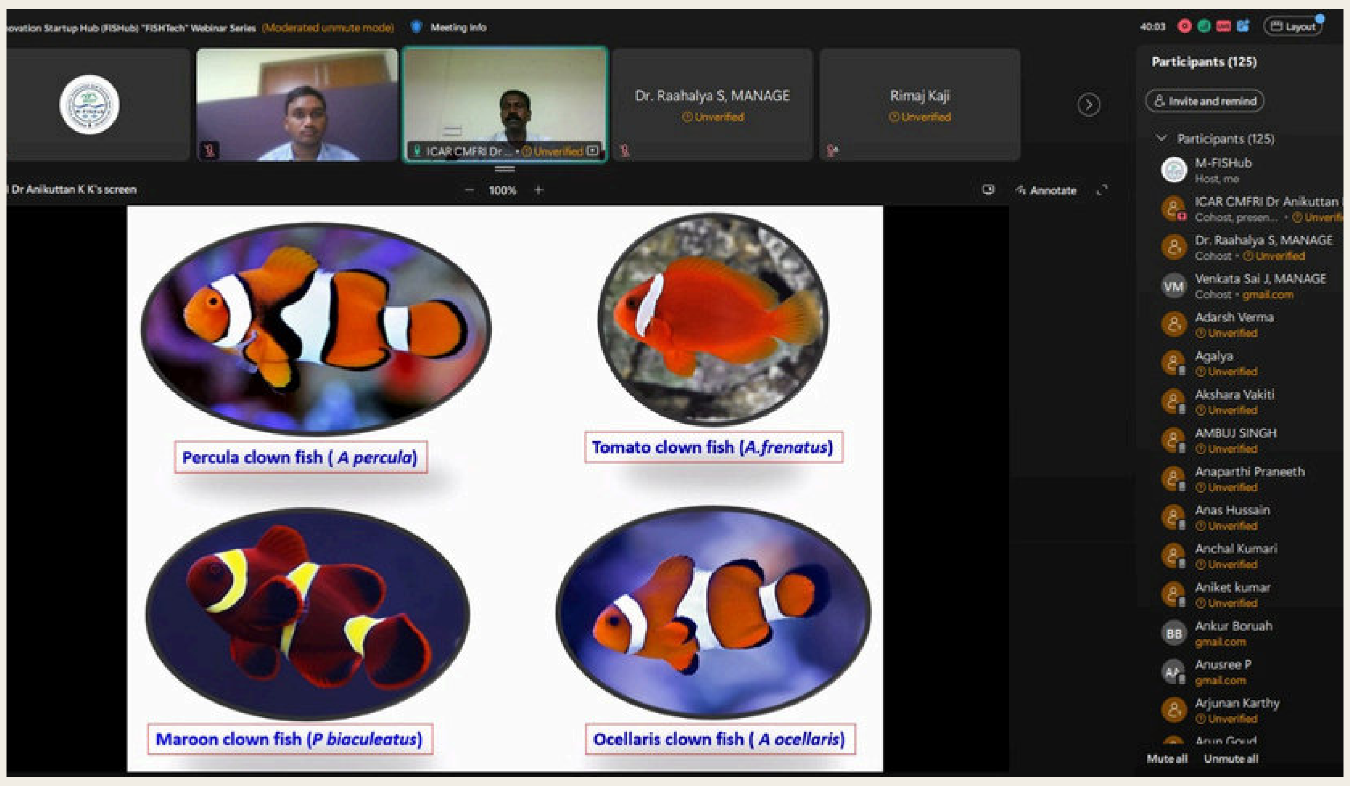
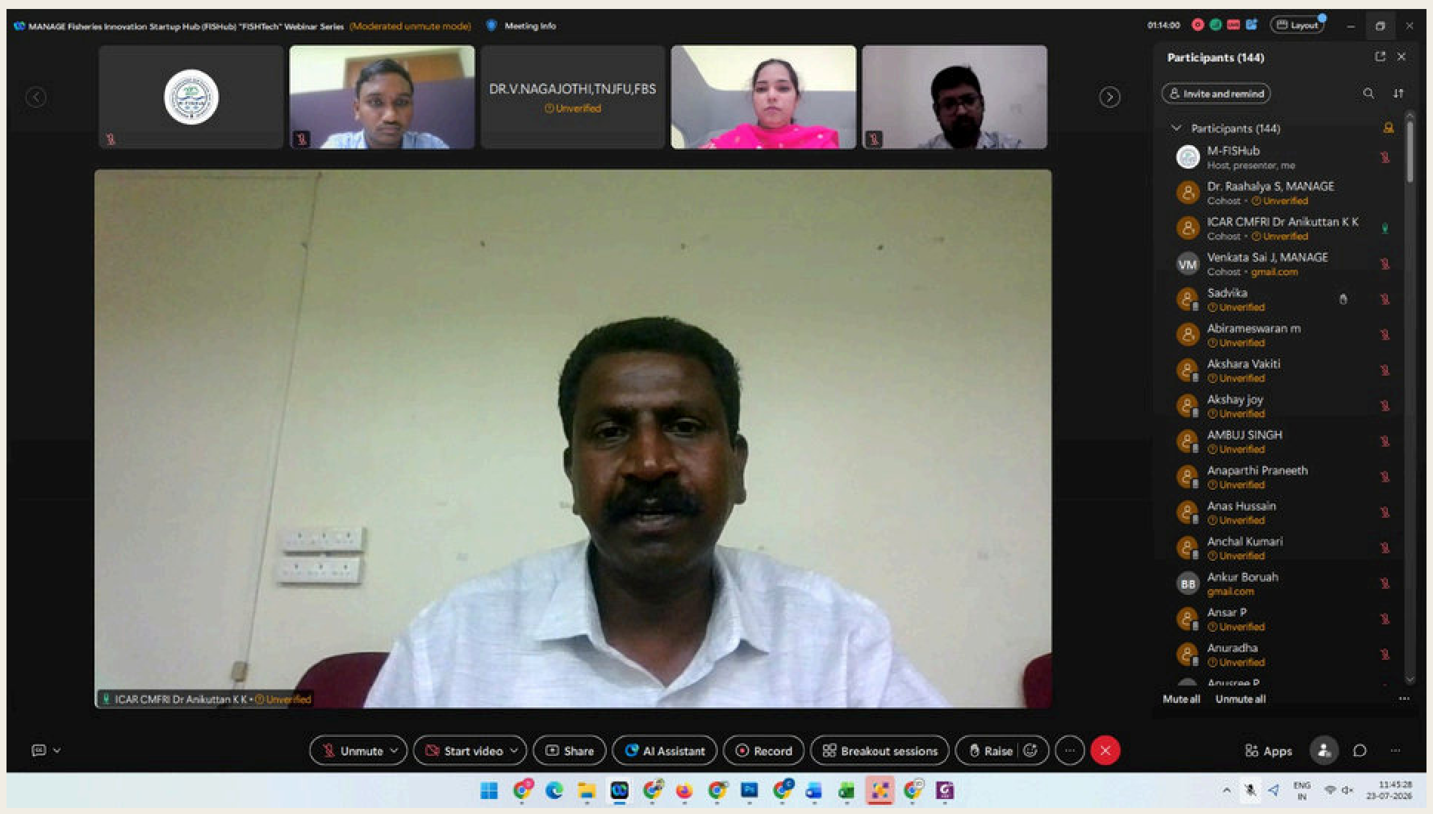
Dr. Anikuttan highlighted the potential of captive breeding for producing designer Clownfishes, focusing on selective breeding, quality seed production, colour and pattern development, and sustainable ornamental fish culture to meet growing market demand.

Dr. Anikuttan provided an overview of the marine ornamental fish trade, highlighting its status as a low-volume, high-value sector with major markets in Europe, the USA and Japan. He explained that the trade continues to depend predominantly on wild-caught fishes, particularly from coral reef ecosystems, which raises concerns regarding habitat damage and long-term sustainability. He emphasized captive breeding as a sustainable alternative to reduce pressure on wild populations and highlighted the need for a gradual transition from capture to culture. Hatchery-produced ornamental fishes, being acclimatized to captive conditions, are also more suitable for home aquariums.

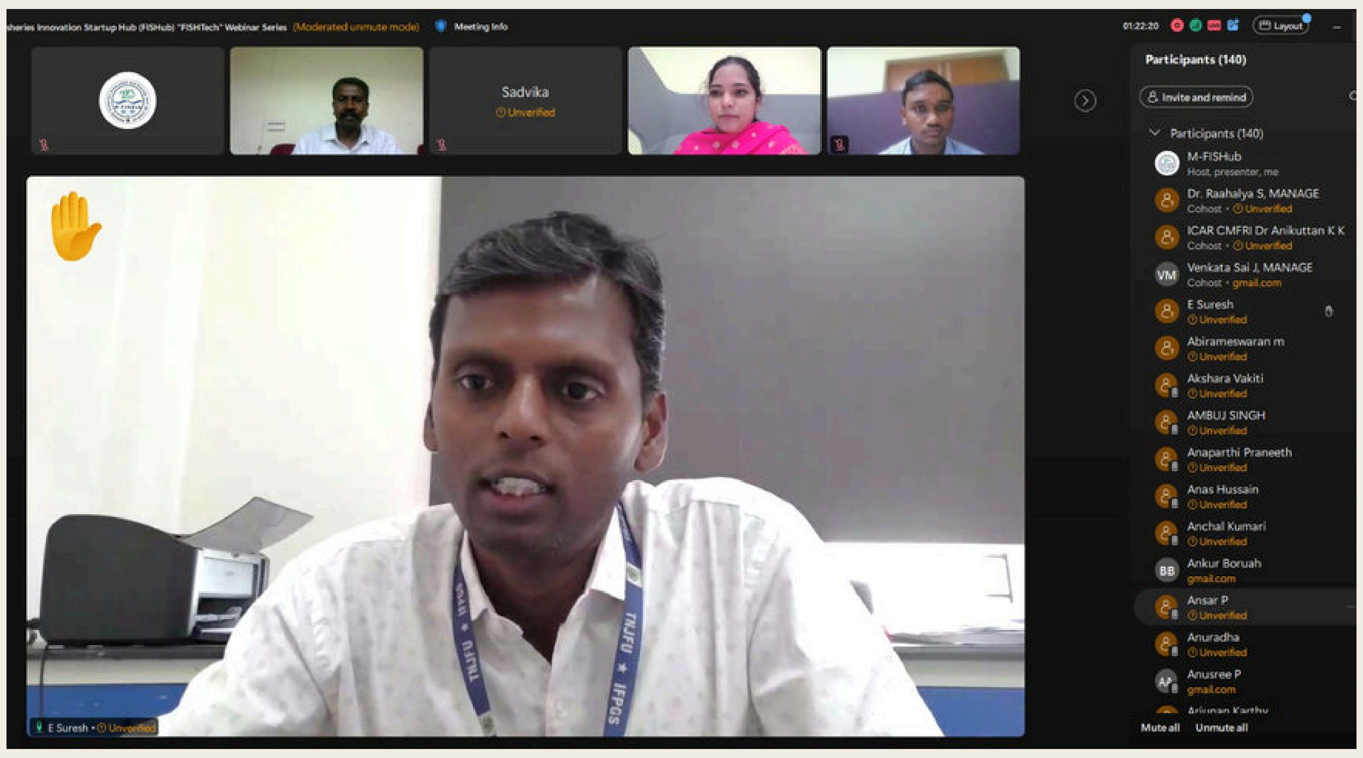
Focusing on designer clownfishes, the speaker discussed their increasing popularity due to their distinctive colour and pattern variations and their high market value. He explained that varieties such as Picasso and Platinum are marketed under different trade names based on their unique colour patterns. He also highlighted the scientific efforts undertaken at CMFRI to establish the taxonomic identity of designer clownfishes using morphometric, meristic and molecular approaches. The studies indicated their close similarity to *Amphiprion percula*, contributing to better scientific understanding of these commercially important varieties.

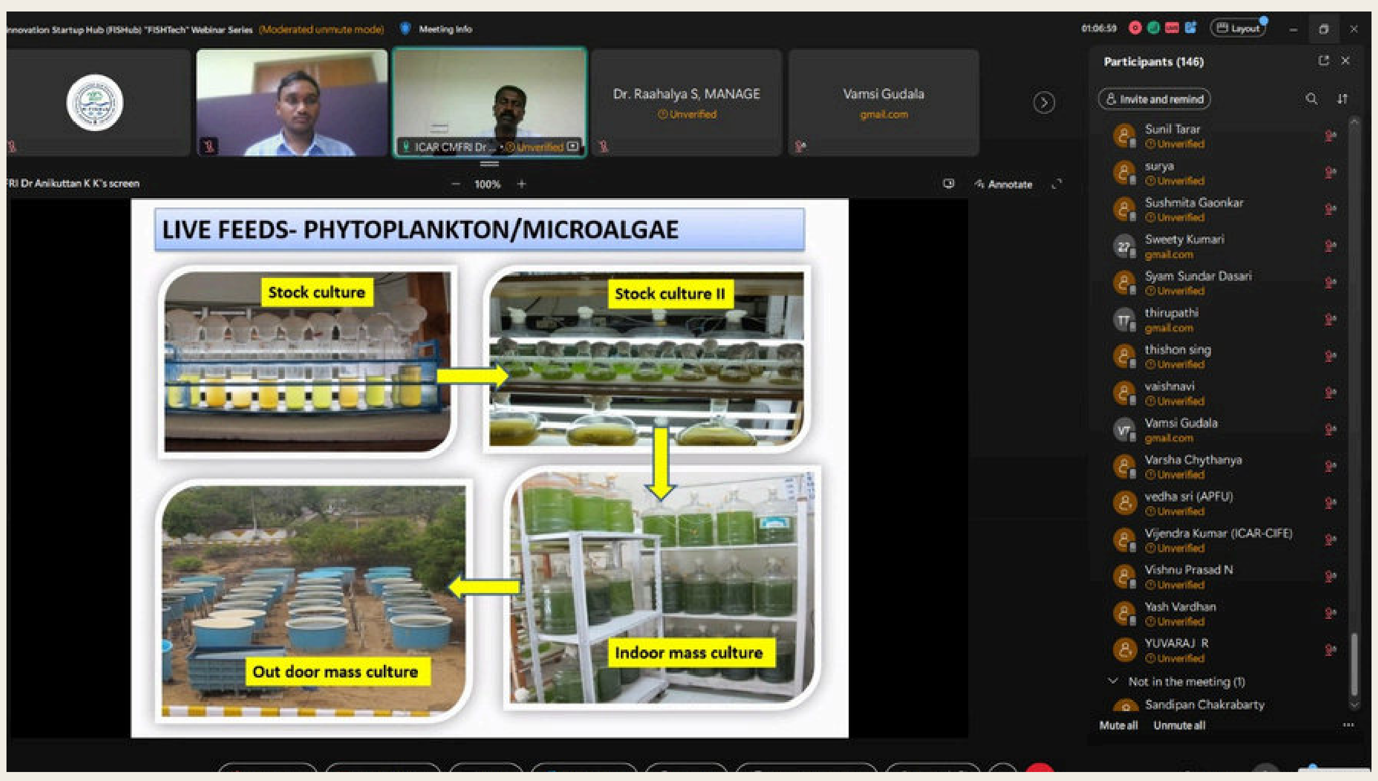




The speaker explained the major stages involved in captive production, including broodstock development, compatible pair formation, spawning, egg incubation, hatching and larval rearing. He emphasized that successful breeding depends on healthy broodstock, appropriate nutrition, good water quality, natural day–night light conditions and suitable temperature management. Clownfishes exhibit protandrous hermaphroditism, with the larger individual developing as the female. Establishing compatible pairs can be challenging and may require considerable time. During spawning, eggs are deposited on an artificial substrate such as ceramic tiles and are subsequently fertilized by the male. The eggs generally hatch after about 7–8 days, with parental care, particularly egg-fanning and cleaning, playing an important role in successful development.

Considerable emphasis was placed on larval rearing and live-feed management, which are critical for hatchery success. Newly hatched larvae require appropriately sized live feeds, beginning with rotifers and subsequently progressing to Artemia, along with microalgae. The speaker stressed that feed size, nutritional value, mass-production feasibility and suitability to local conditions are important criteria when selecting live feeds. He also explained the importance of maintaining dedicated live-feed culture facilities for continuous hatchery production. A distinctive feature of designer clownfish production highlighted during the session was the variation in progeny colour and pattern. Unlike conventional clownfish varieties, breeding designer clownfishes can produce offspring with different morphotypes, which become distinguishable only after several months of rearing.





Dr. Anikuttan concluded by emphasizing that the development of captive-breeding technologies for high-value ornamental fishes such as designer clownfishes can support sustainable marine ornamental aquaculture, reduce dependence on wild collection, and create opportunities for value addition and entrepreneurship.

Q & A Session

Q1. What startup opportunities and government support are available for BBA/MBA Fisheries Enterprises Management students interested in establishing fisheries enterprises?

Ans: Dr. Anikuttan explained that ICAR-CMFRI and other ICAR institutes generally serve as technology partners, while developmental and financial assistance schemes are mainly implemented through the National Fisheries Development Board (NFDB), Hyderabad. He highlighted that students interested in establishing fisheries enterprises can approach ICAR-CMFRI for technical guidance and support, while financial assistance can be explored through the relevant government development schemes.

Q2. Is technical assistance available for BBA/MBA students interested in starting fisheries enterprises?

Ans: The speaker assured that students from Fisheries Enterprises Management programmes can approach the institute for technical assistance and guidance related to establishing fisheries enterprises. He stated that the institute is willing to extend necessary technical support to interested students and entrepreneurs.

Q3. What type of pellet feed is recommended for ornamental fish, and does it contain colour enhancers?

Ans: Dr. Anikuttan explained that CMFRI has developed a patented formulated pellet feed called WA for marine ornamental fishes. The feed contains colour-enhancing components as part of its formulated ingredients and is commercially available through CMFRI.

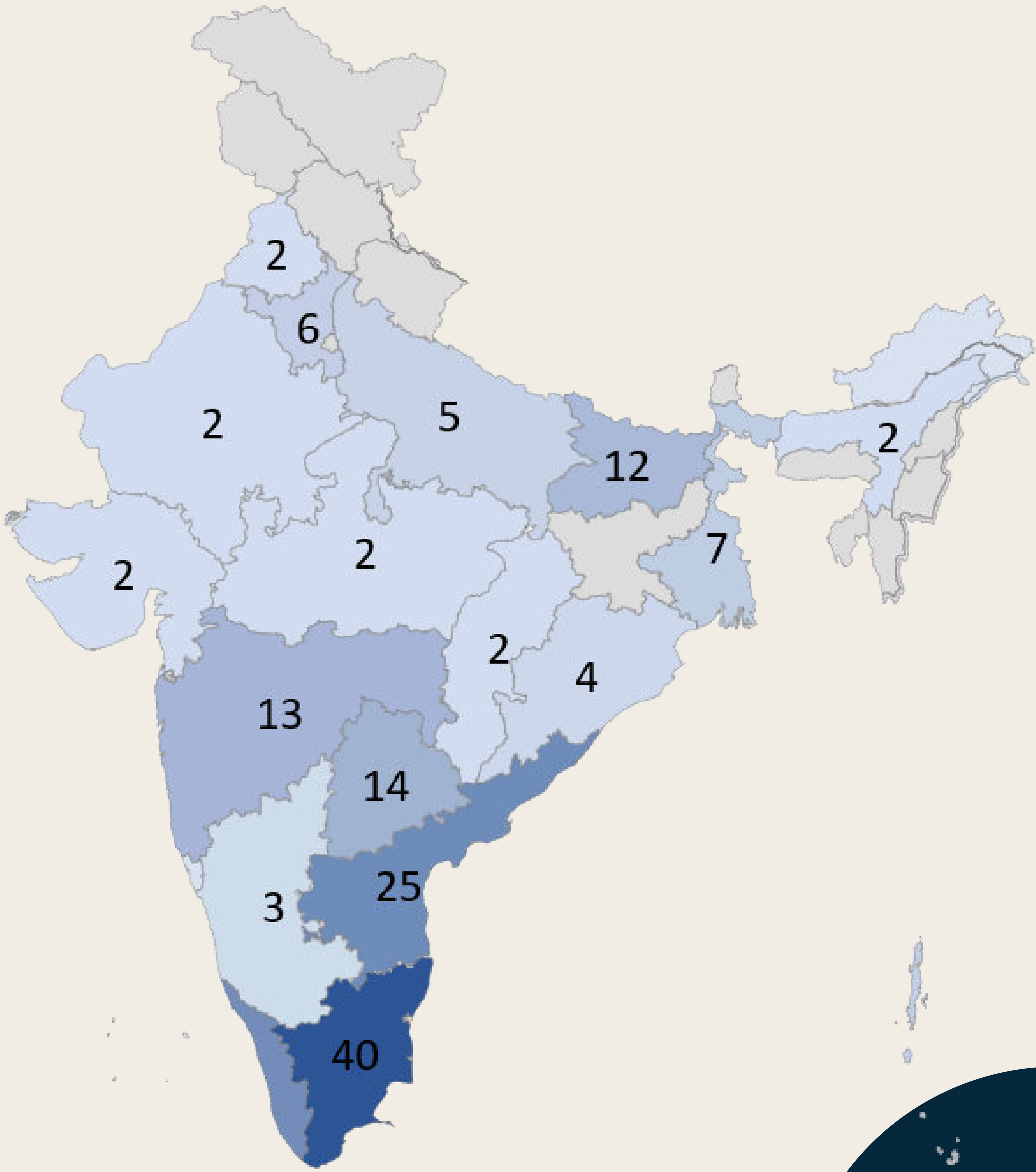
Q4. Which microalgae are recommended for feeding larvae?

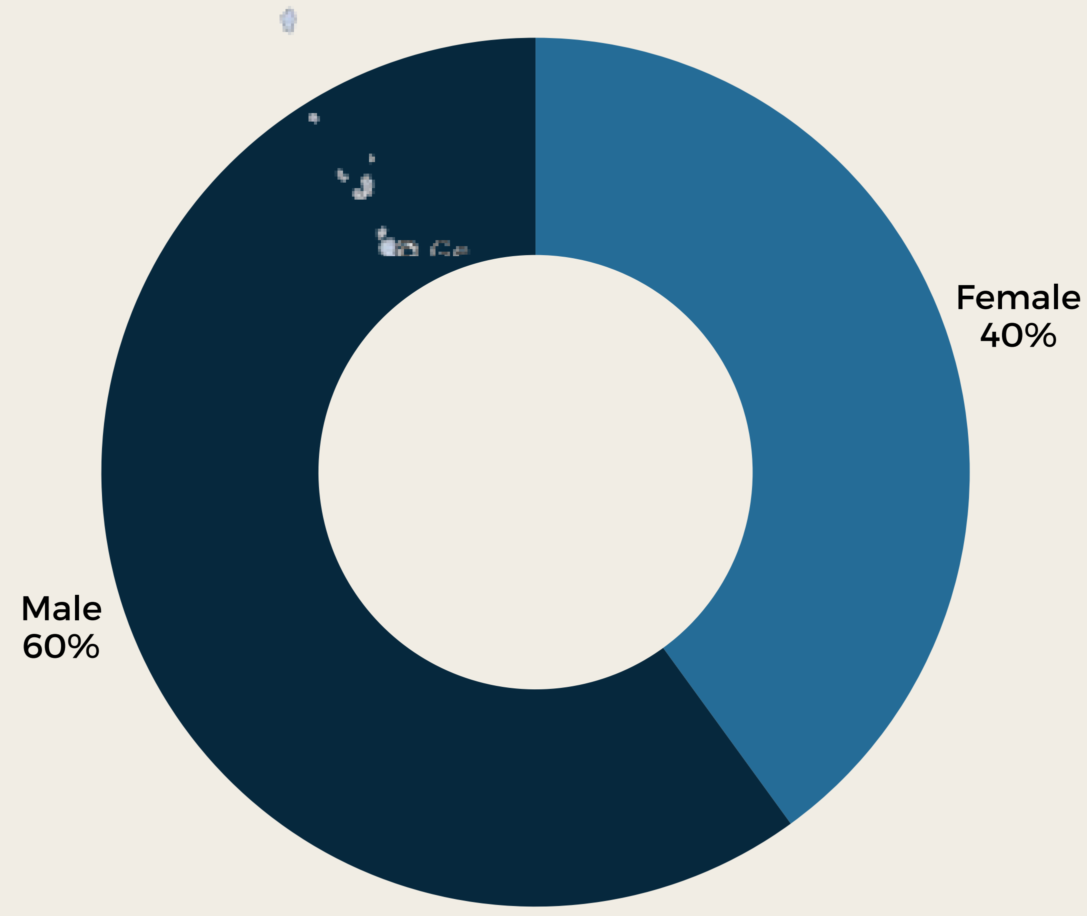
Ans: The speaker recommended microalgae such as *Nannochloropsis oculata*, *Nannochloropsis salina* and *Isochrysis galbana* for larval rearing. He highlighted their importance as sources of essential fatty acids such as EPA and DHA, which support larval development. The microalgae are also consumed by rotifers and subsequently transferred to the fish larvae through the live-feed chain.

Q5. How is artificial seawater prepared for ornamental fish culture?

Ans: The speaker explained that commercially available artificial sea salt can be used instead of ordinary salt because artificial sea salt contains the required components of seawater. The required quantity varies according to the product, and the manufacturer's instructions specify the amount to be dissolved per litre of water. He noted that the target salinity for the system is around 30 ppt and that artificial sea salt is commercially available from suppliers.

Participants Overview





Total Registrations-496
Attended Participants - 175
(Male - 105; Female-70)

YouTube Video Link: https://www.youtube.com/watch?v=IE_d3MKoDcg&list=PL4G41x3BKm6lUBmHoLiRlGoB_5Efxiaep&index=12&t=3s

5

Crassostrea madrasensis

JUL

24-07-2026

Hatchery Production of Cultchless Spat of Crassostrea madrasensis through Hormone-induced Settlement

Dr. M. K. Anil
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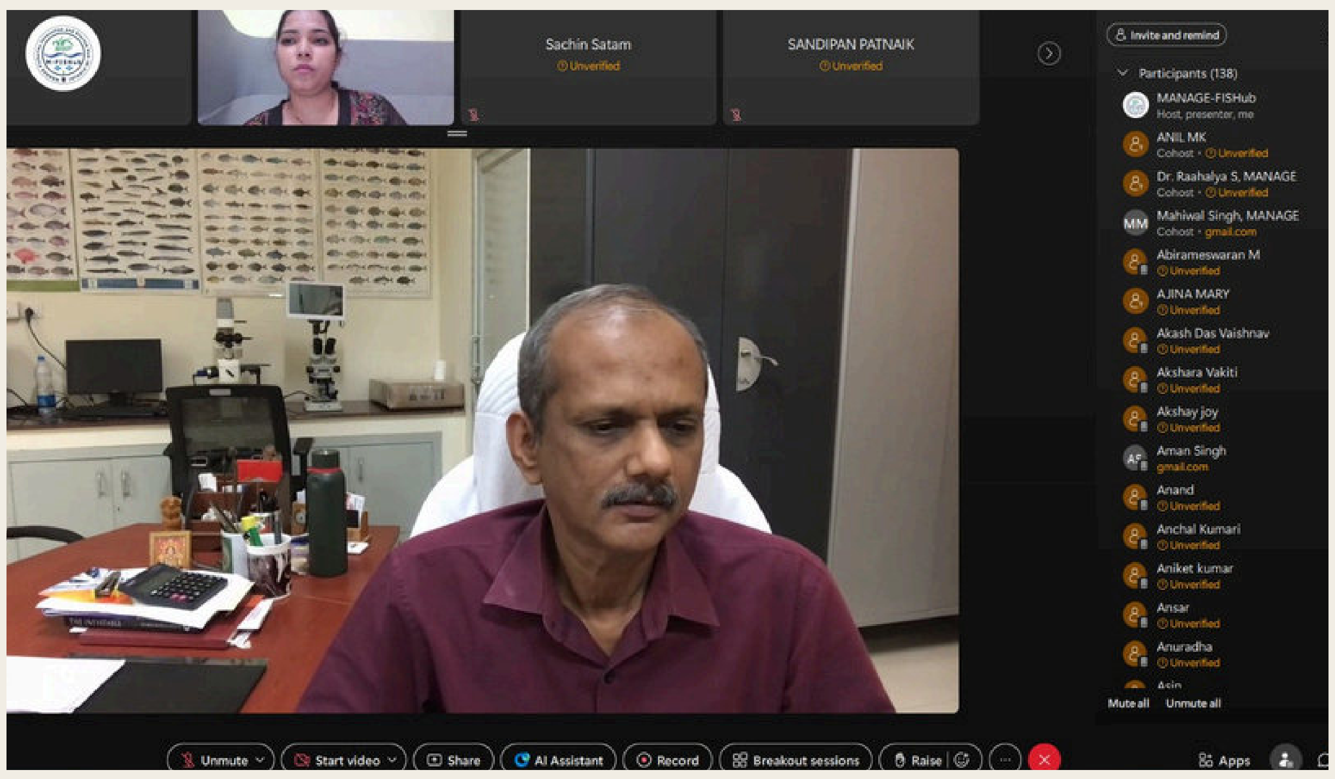
Regional Centre, Vizhinjam
mkanil65@gmail.com

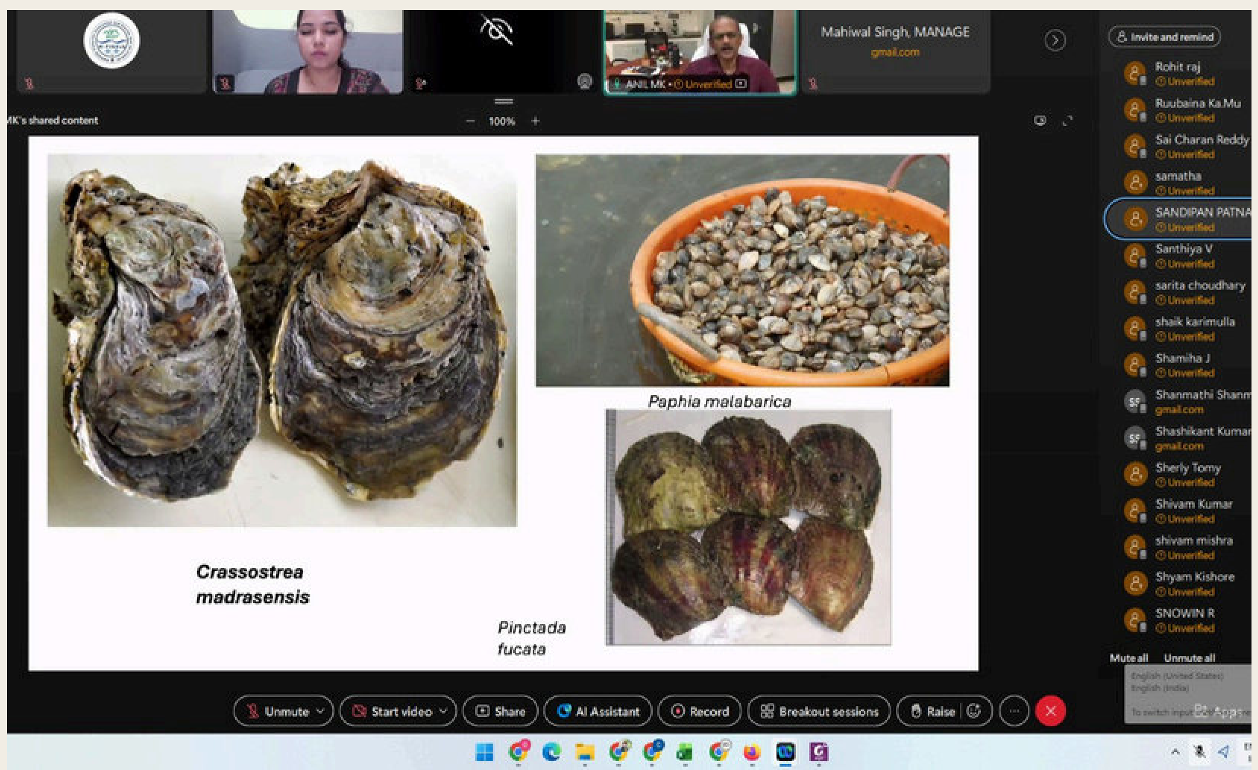
Dr. Anil explained the hatchery-based production and nursery rearing of oysters, with emphasis on developing reliable systems for producing oyster seed and supporting their subsequent culture.

Dr. Anil explained that oyster farming in India traditionally depends largely on natural or wild spat, which attach themselves to oyster shells suspended in backwaters. He discussed different methods of oyster farming, including floating long-line systems, cages and floating baskets. Floating baskets can be periodically lifted, rinsed and returned to the water to maintain suitable culture conditions. The speaker explained the life cycle and larval development of oysters, beginning with fertilization followed by embryonic development, the morula stage, D-shaped larva, umbo stage, eyed larva and finally the competent larval stage or spat.

A major focus of the session was the production of cultchless or single oyster spat. Normally, competent oyster larvae permanently attach to the tank or another substrate, making them difficult to remove and manage. To overcome this limitation, the competent larvae are treated with epinephrine/adrenaline, which inhibits permanent attachment and enables the production of individual cultchless spat. The session also discussed spawning and larval rearing techniques, including natural spawning, thermal shock and stripping methods. Stripping allows greater control over the selection of male and female broodstock and is particularly useful for genetic and triploid production studies. Static, flow-through and recirculating systems can be used depending on stocking density.

The speaker further explained nursery and farming systems, including cages, trays, longlines, rafts, trestles, floating baskets and other suspended culture methods.



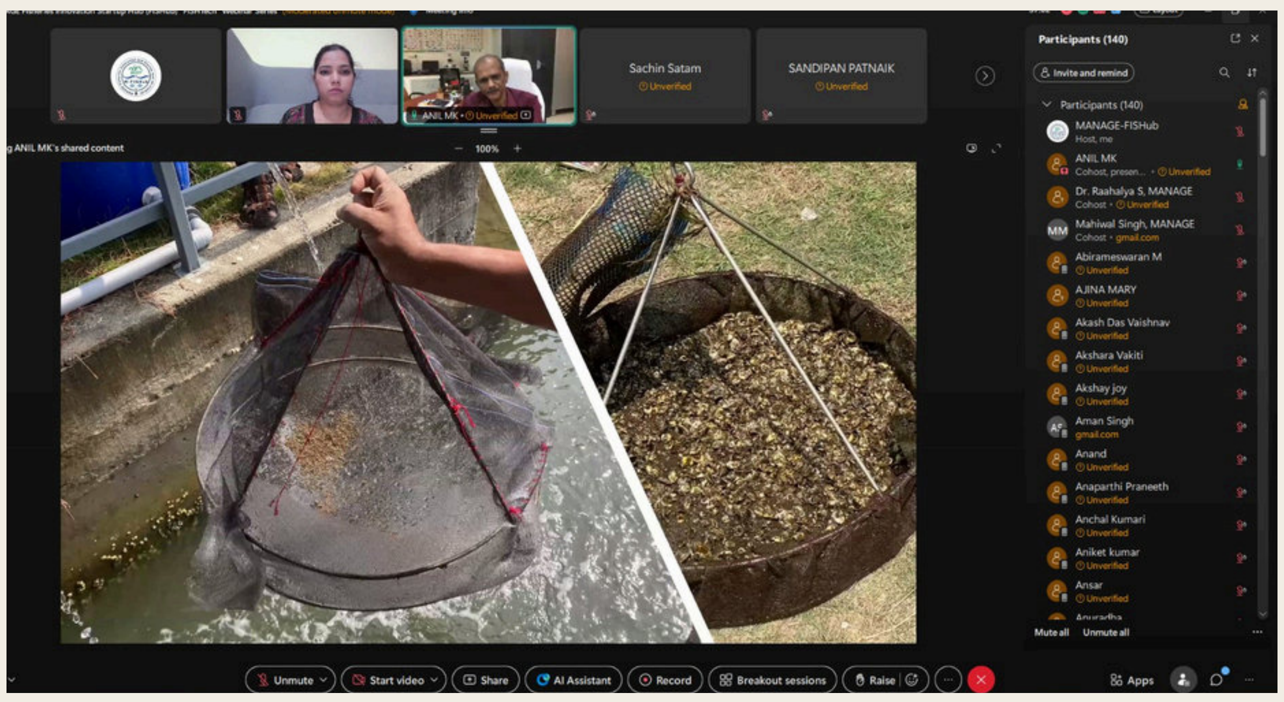


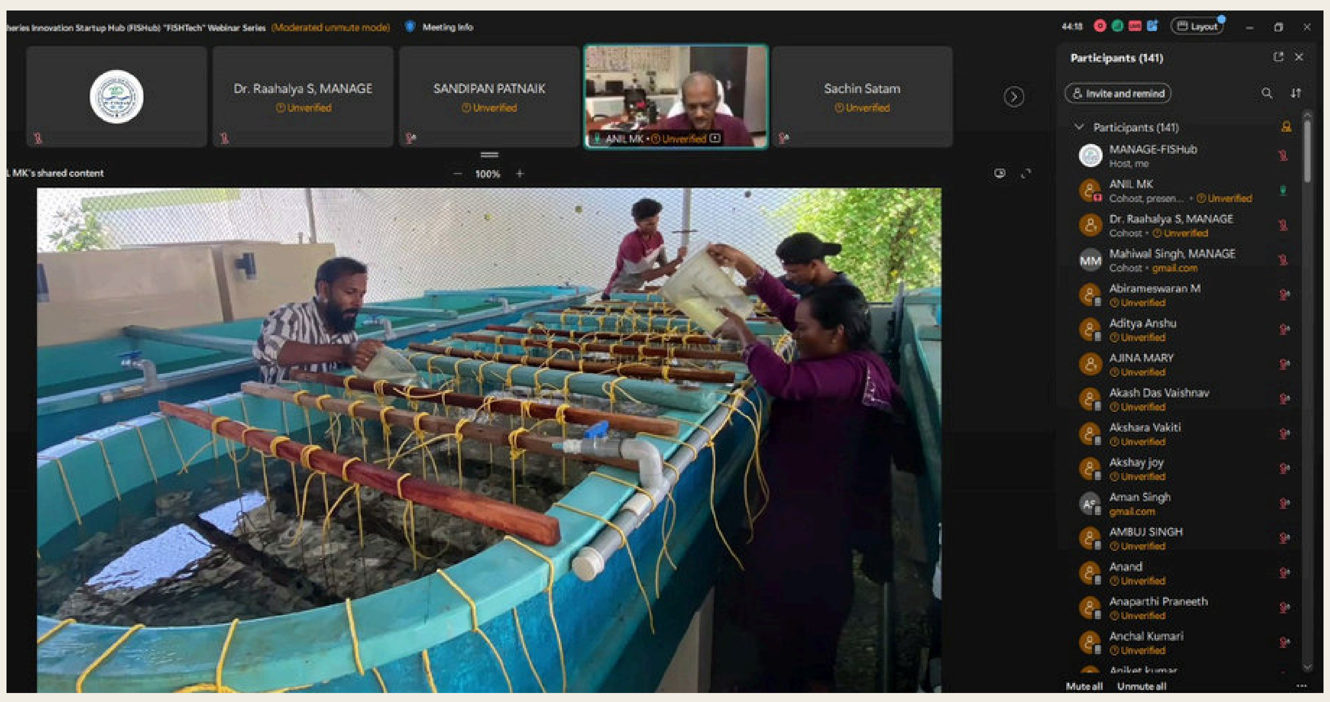
Cultchless spat can be grown into marketable oysters with better control over shape and quality, while attached spat can also be produced by allowing competent larvae to settle on prepared oyster shells.

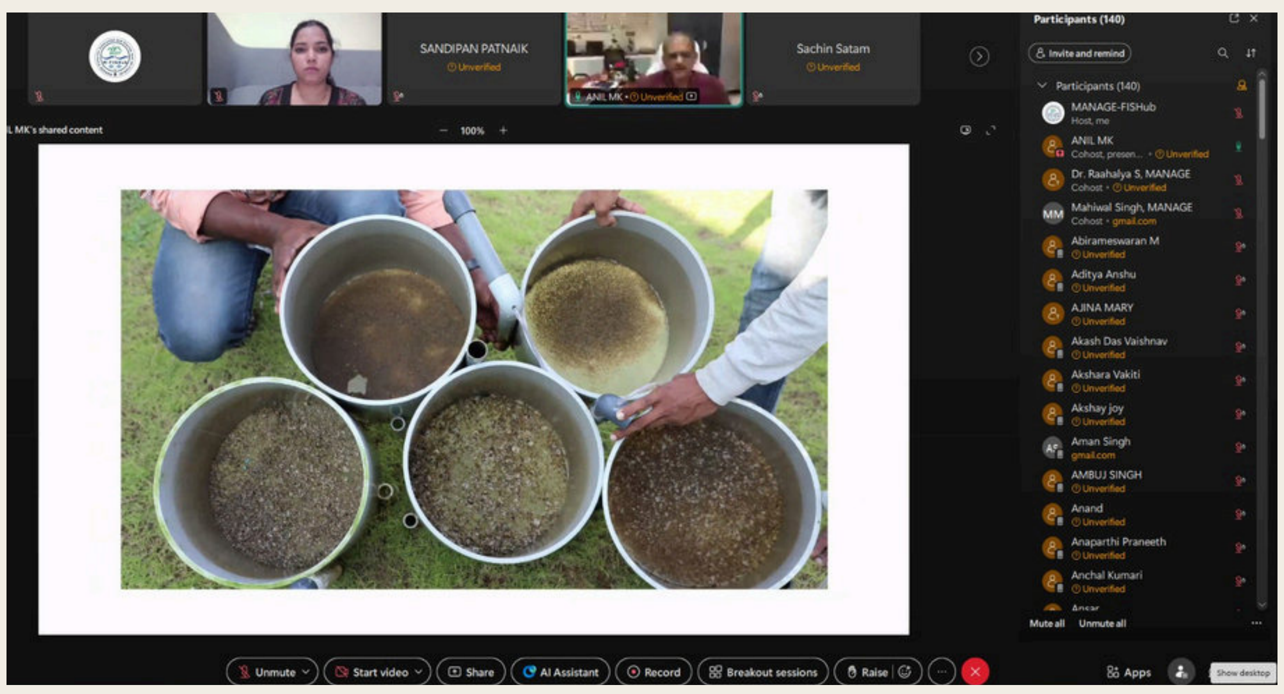
Green and brown mussel seeds are produced, transferred to nursery systems for further growth and subsequently supplied to farmers and other locations. The speaker also discussed the development and standardization of mussel farming technologies, including culture using ropes, rafts and long-line systems.

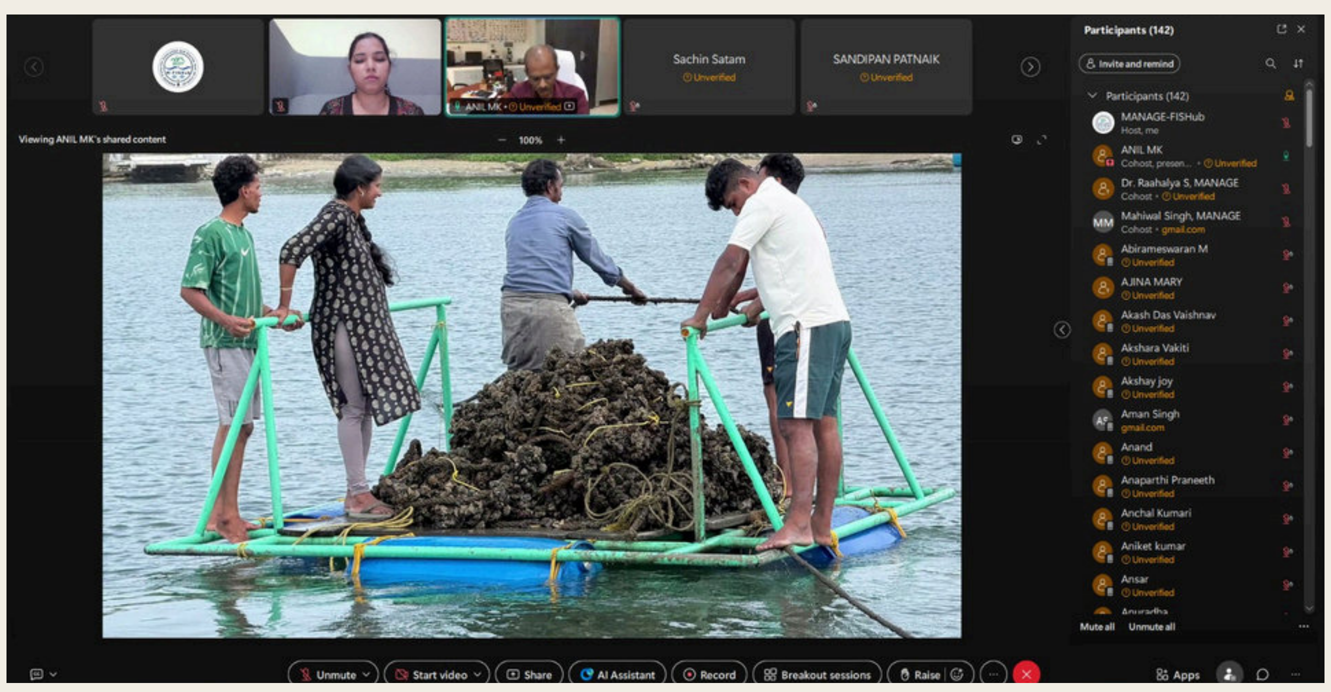
Particular emphasis was placed on the development of long-line farming systems for marine bivalves. The project involved the development of large floats, anchoring and mooring systems adapted to local conditions. The system was tested in the sea and successfully withstood the monsoon season, providing confidence regarding its suitability for future expansion to other farming areas. The experience demonstrated the importance of developing locally appropriate culture systems and adapting technologies used in other countries to Indian conditions.

Dr. Anil also highlighted the hatchery's capacity to produce large quantities of bivalve spat, including clam seed. The hatchery produced millions of clam spat, which were subsequently released into natural fishing areas to support the rejuvenation of clam fisheries. Similarly, oyster juveniles can be produced through hatchery techniques such as stripping and natural spawning and subsequently transferred for nursery rearing and grow-out. Overall, the session emphasized the potential of hatchery-based bivalve seed production, nursery systems and improved farming technologies to support oyster and other shellfish aquaculture, strengthen seed availability for farmers, rejuvenate natural fisheries and promote sustainable bivalve production.









Q & A Session

Q1. Can treatment tanks with limited depth be used for oyster culture?

Ans: Dr. Anil explained that treatment tanks with a depth of around 1.5–2 metres can be used, provided they maintain continuous water availability. However, the usable culture area may be relatively limited depending on the tank dimensions.

Q2. What problems or losses can occur after hormone-induced settlement?

Ans: The speaker explained that once the spat successfully settles and begins growing, major problems are generally not observed. However, settlement may occasionally fail if the larvae are not at the appropriate maturation or developmental stage. Mortality can also occur under unfavourable conditions, but normally good settlement rates can be achieved with proper management.

Q3. Where can oyster seeds be purchased for farming?

Ans: Dr. Anil stated that oyster seed can be obtained from their hatchery, which he identified as the only hatchery in India currently producing this type of spat. Production is seasonal, with oyster seed production generally beginning around August–September, after which seed can be supplied to farmers.

Q4. What is the feeding rate and proportion of microalgae required during the larval stages?

Ans: The speaker referred participants to the published protocols for specific cell concentrations and feeding rates rather than providing a fixed value during the session. He explained that, with experience, the feeding requirement can also be assessed through daily observation of larval condition and feeding activity under a microscope. The presence of greenish microalgal content inside the transparent larvae can indicate active feeding.

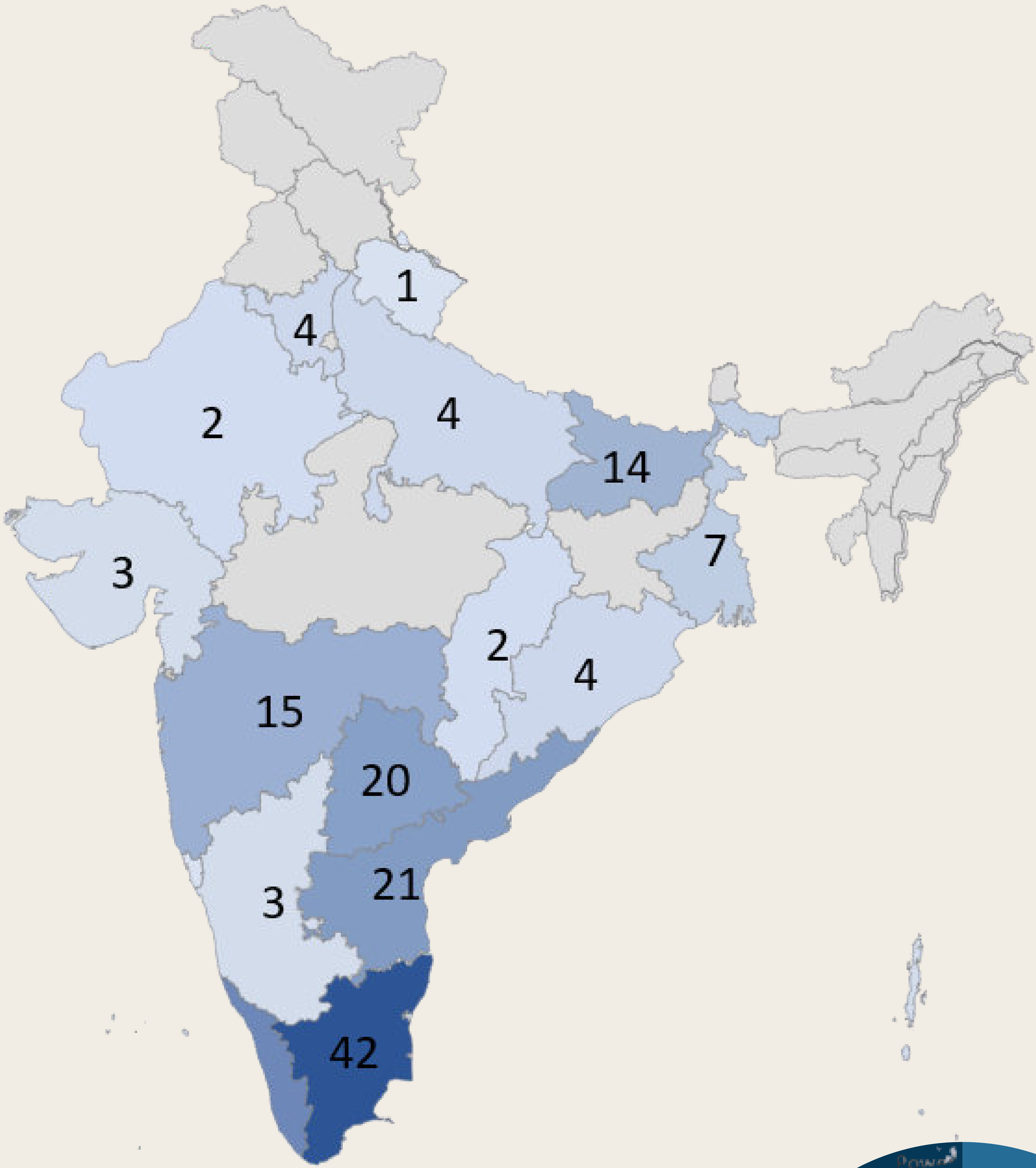
Q5. What are the major health problems encountered during oyster larval rearing, and how can they be controlled?

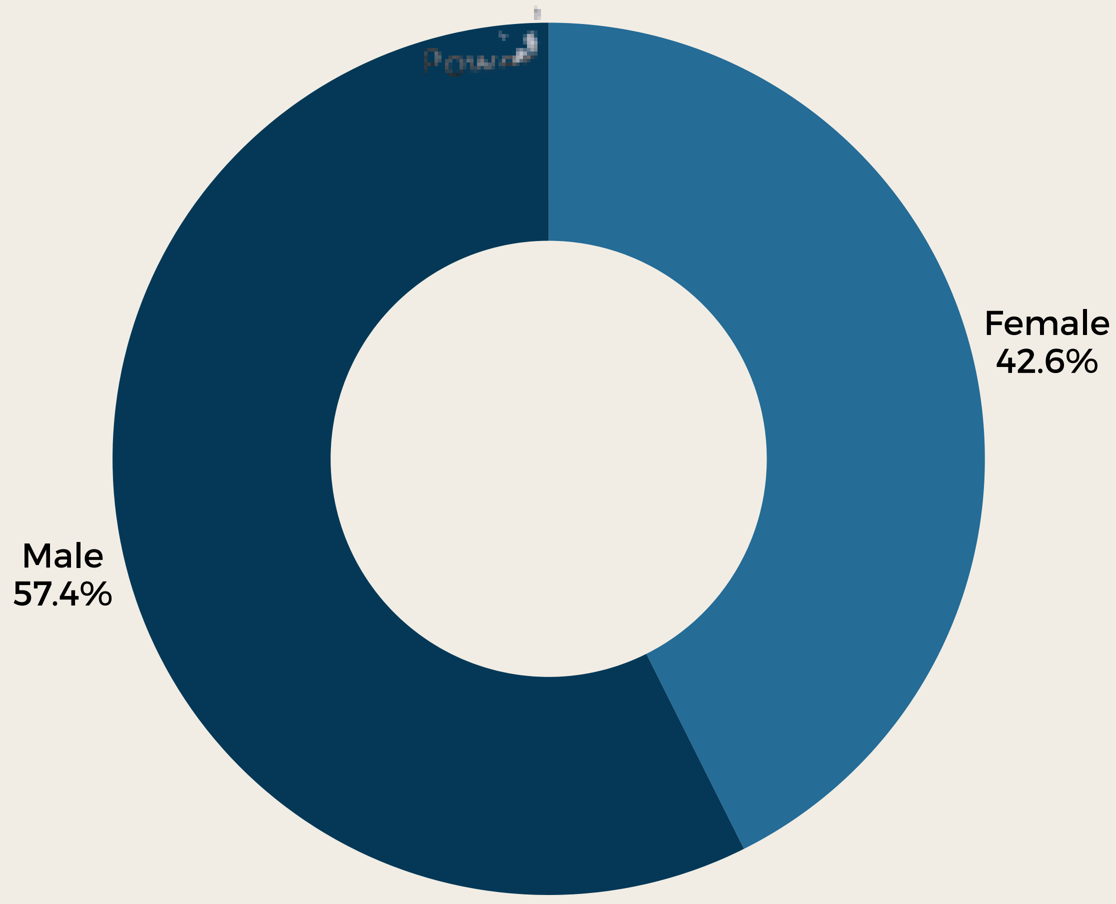
Ans: Dr. Anil highlighted that oyster larvae are highly sensitive to water-quality deterioration, contaminated feed and other management problems, which can result in sudden mortality. Bacterial infections may occasionally occur. Although antibiotics may have been used earlier, their use is currently restricted; therefore, probiotics, good water quality and proper hatchery management are preferred. He emphasized the importance of filtering incoming water and recommended appropriate filtration, including UV treatment where required, to reduce the risk of disease-causing organisms entering the culture system.

Q6. Can oysters or mussels be integrated into reservoirs, streams or other aquaculture systems to improve water quality?

Ans: The speaker explained that oysters and mussels can potentially be incorporated into such systems because they function as filter feeders, producing both bivalves and improved water quality. However, their use may also generate faecal or filtered organic matter that settles in the system, requiring appropriate management and balance.

Participants Overview





Total Registrations-493
Attended Participants - 176
(Male - 101; Female-75)

YouTube Video Link: https://www.youtube.com/watch?v=woxUQWeBGxA&list=PL4G41x3BKm6lUBmHoLiRlGoB_5Efxiaep&index=11&t=2s

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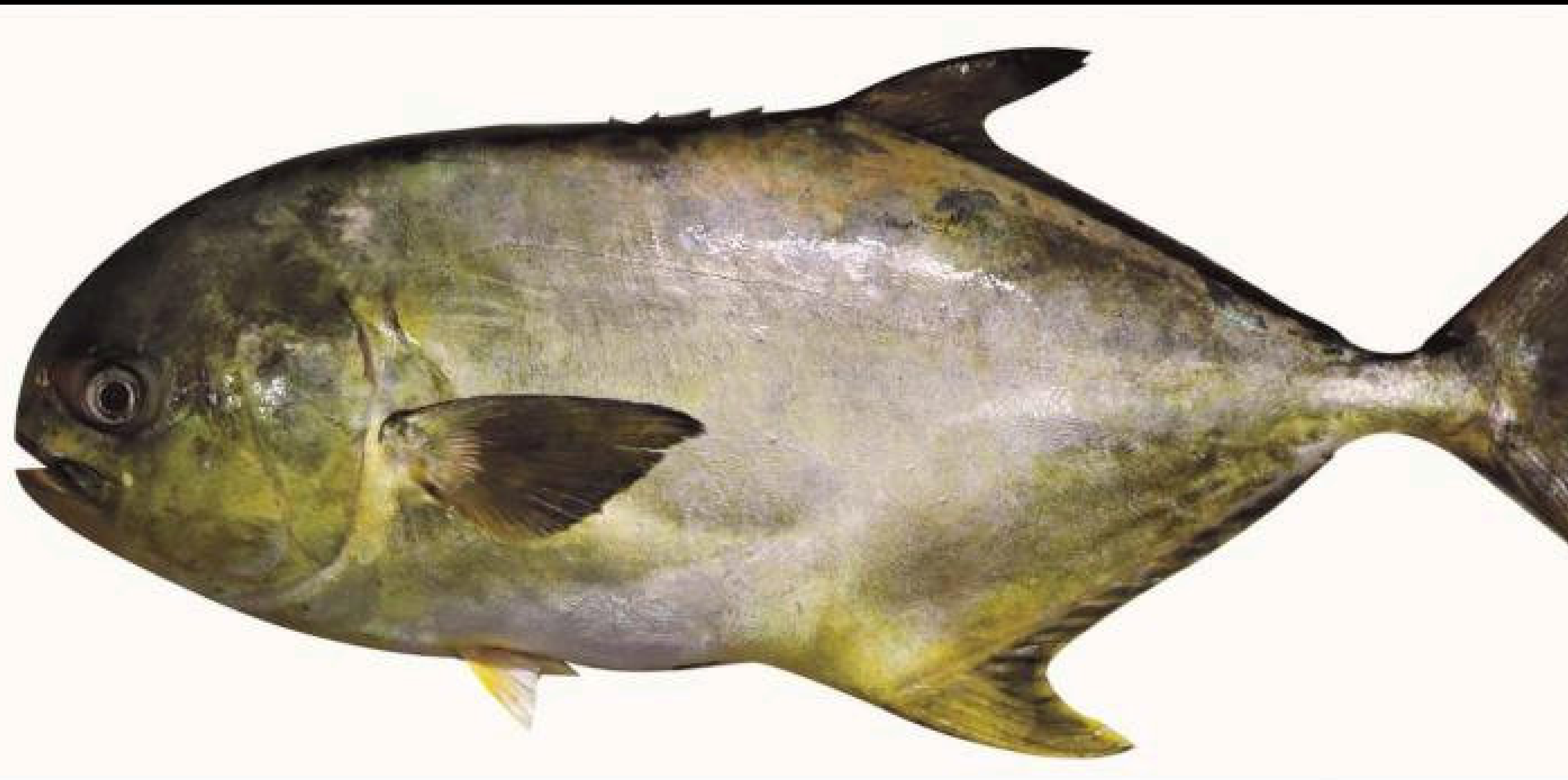

Indian Pompano

JUL
27-07-2026

Coastal Pond & Sea Cage Farming of Indian Pompano

Dr. Sekar Megarajan
Senior Scientist
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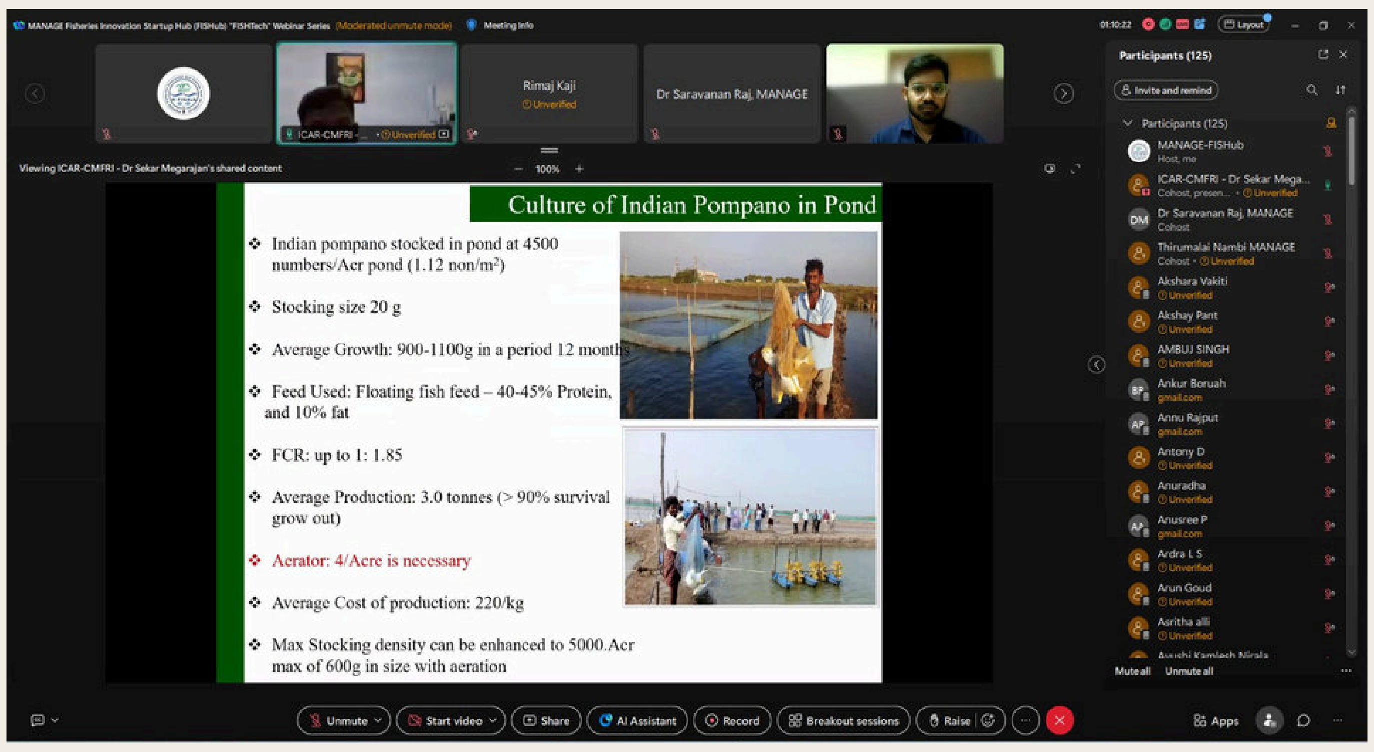
Dr. Sekar Megarajan highlighted the potential of Indian pompano farming in coastal ponds and sea cages, focusing on appropriate farm management practices, market potential and the opportunities for farmers to diversify their aquaculture enterprises.

He emphasized that Indian pompano can adapt to different culture environments, including both pond-based and cage-based systems, and that established production technologies and packages of practices are now available to support its commercial farming.

The speaker emphasized the importance of proper farm management, particularly aeration, feeding and water-quality management. He recommended maintaining adequate aeration, with around 2–3 paddle-wheel aerators per unit as a minimum requirement, along with proper feeding management and the creation of designated feeding zones. For coastal pond farming, he highlighted the importance of regular water exchange, recommending approximately 25 per cent water exchange per month. He explained that although zero-water-exchange systems may be practiced in some shorter-duration aquaculture systems, Indian pompano farming involves a longer culture period of around one year, making periodic water exchange important for maintaining suitable culture conditions.

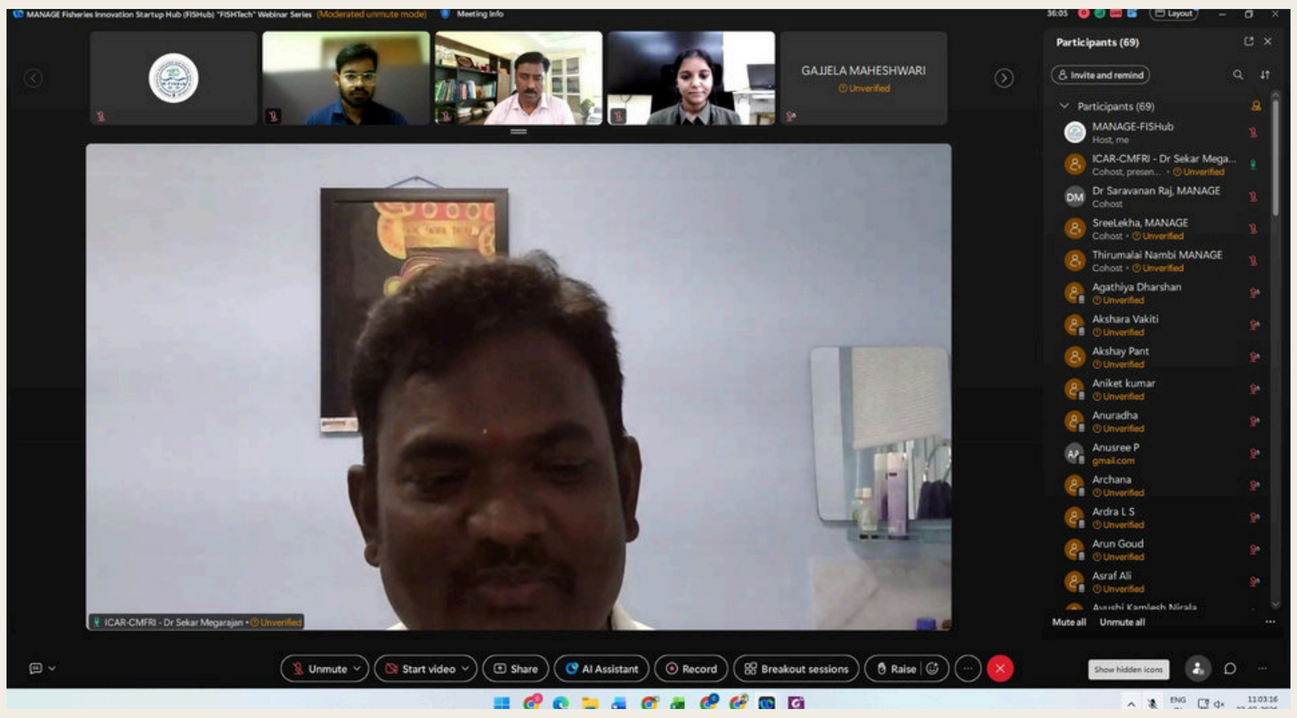
Dr. Sekar also discussed the market potential of Indian pompano, emphasizing its premium market value and growing consumer demand. The fish is being promoted as **"Golden Pompano"** and can command prices of up to approximately ₹600 per kg in the market. He highlighted that the fish has good meat quality, taste and consumer appeal, along with an attractive appearance characterized by a white body with slight yellowish tinges, which contributes to its market preference.

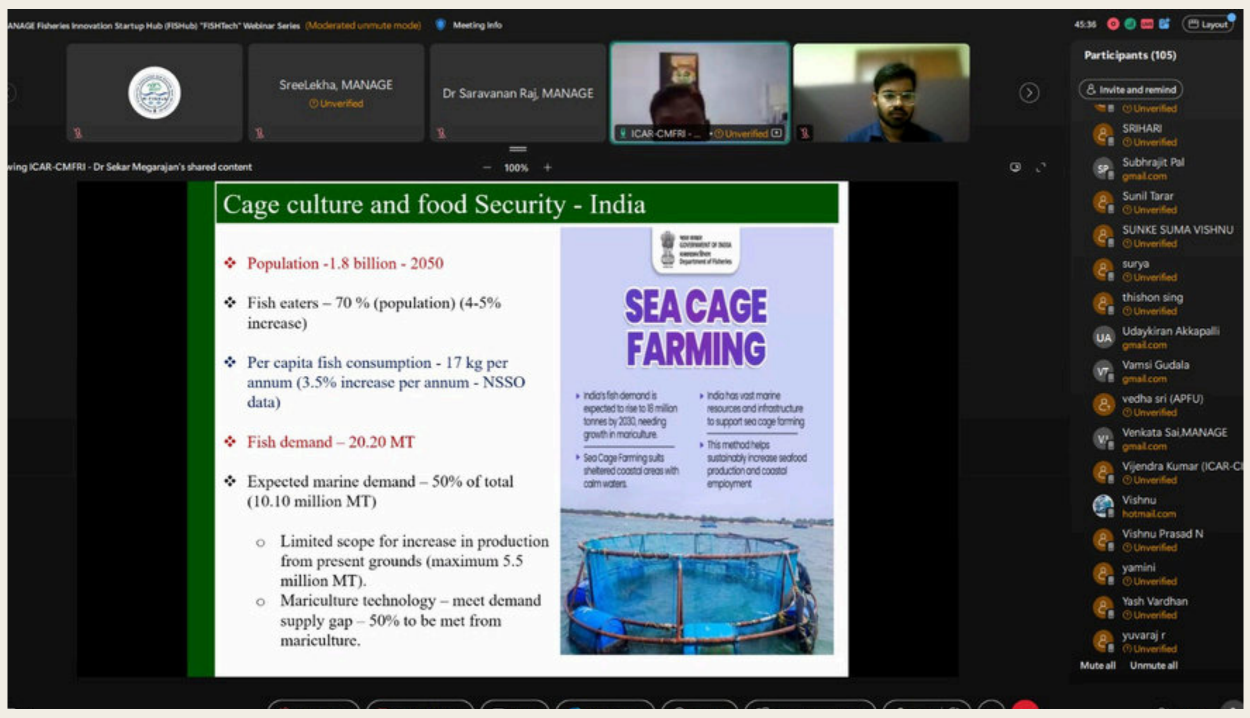


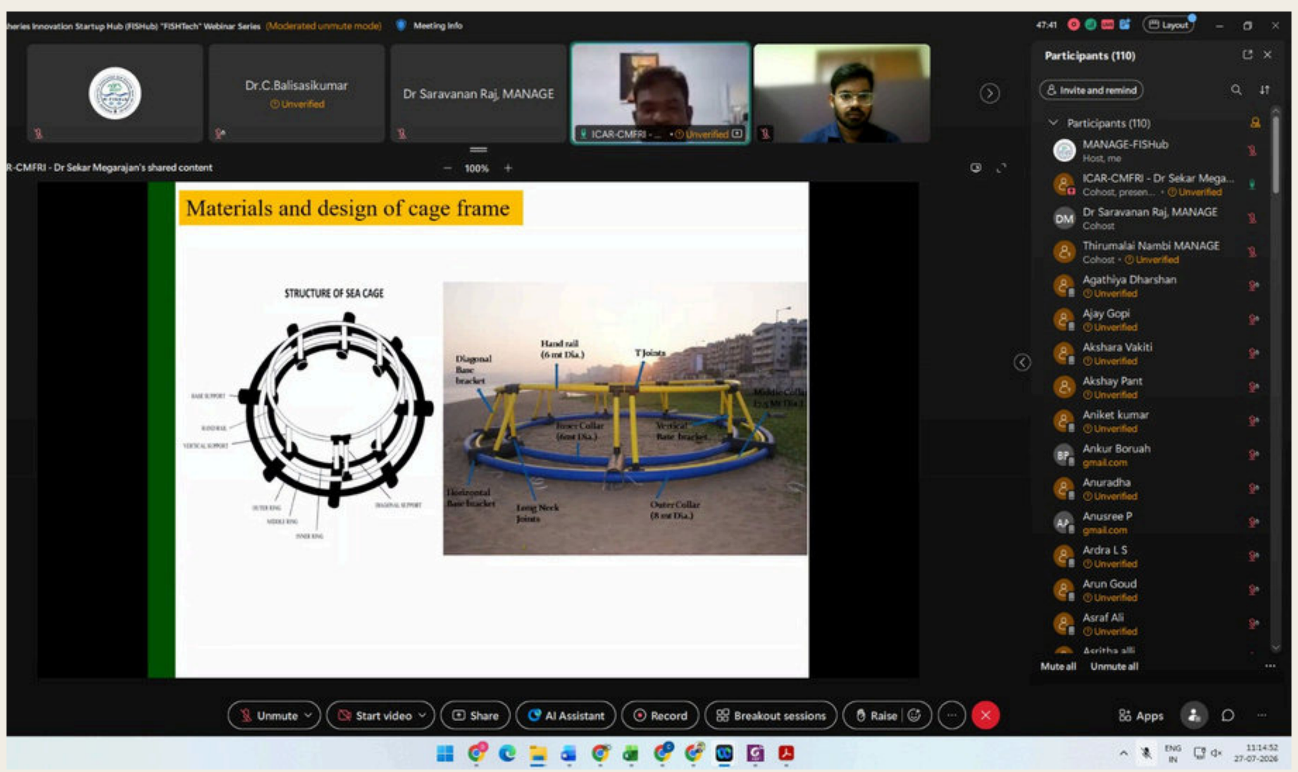
He also noted that Indian pompano has a supply-deficit market, as it is relatively rare in wild catches, creating an opportunity for farmers to meet demand through aquaculture production.

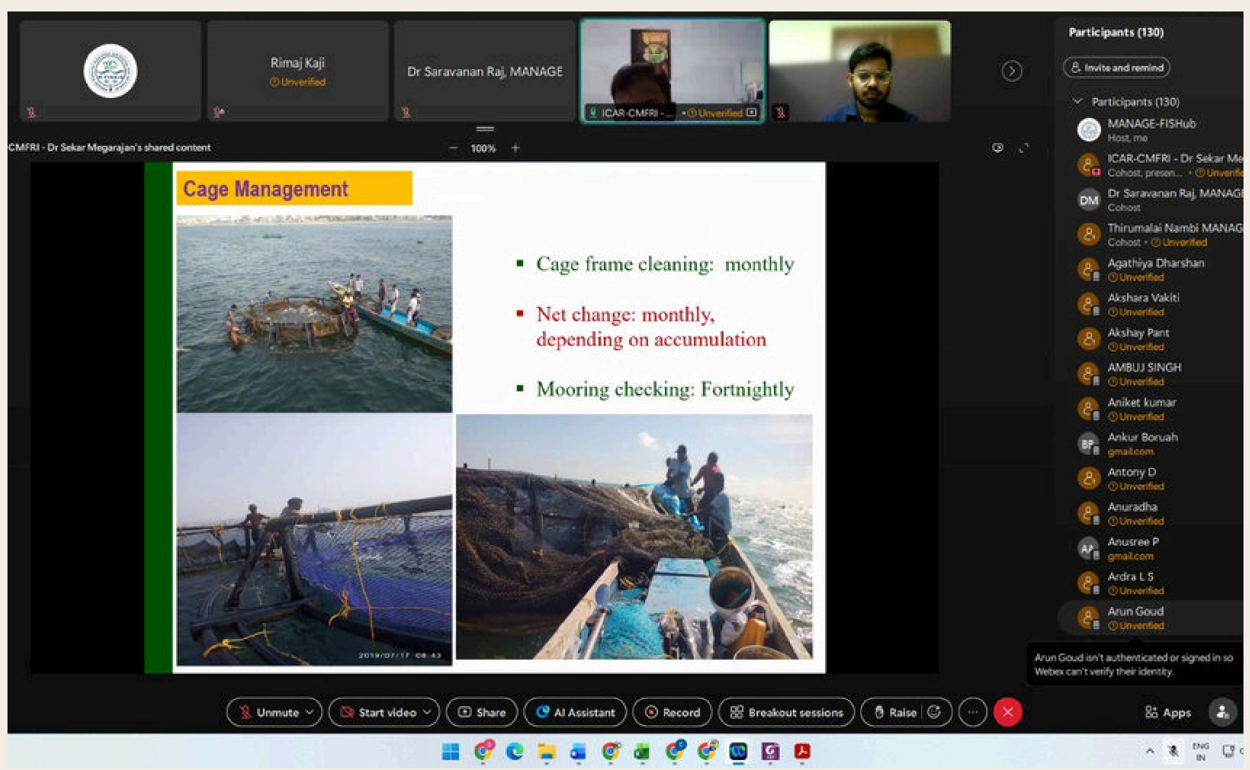
The speaker further highlighted Indian pompano farming as a potential crop diversification and rotation strategy, particularly for farmers engaged in shrimp farming. Since shrimp farming can face recurring disease-related pressures, incorporating Indian pompano as an alternative crop can help break disease cycles and reduce the risk of major losses associated with continuous monoculture. He emphasized that farmers can select either pond-based or sea-cage farming depending on their local environmental conditions and available resources.

Dr. Sekar concluded by highlighting the role of institutional and technological support in promoting Indian pompano farming. The development of technologies for seed production and farming practices, along with established packages of practices, provides farmers with greater confidence to undertake the culture of Indian pompano. Overall, the session emphasized Indian pompano as a high-value, consumer-preferred and commercially promising species, offering opportunities for coastal aquaculture diversification through both pond and sea-cage farming.









Q & A Session

Q1. Can freshwater dip treatment be used to control parasitic infestation in Indian pompano?

Ans: Dr. Sekar explained that freshwater dip treatment can be used when the number of fish is relatively small, particularly in broodstock or smaller cage populations. Individual fish can be removed from the cage, given a freshwater dip, and returned to the cage, with the salinity change helping to control the parasites. However, this approach is not practical for large grow-out cages containing a high number of fish.

Q2. What treatment approach is recommended for parasite infestation in large grow-out cages?

Ans: The speaker explained that for larger numbers of fish, an appropriate therapeutic treatment should be used rather than freshwater dipping individual fish. He noted that parasite infestation can take around 35 days to reach its peak, so farmers should plan treatment according to the expected harvest period. He also observed that major infestations are commonly seen when fish reach approximately 250–350 g, making this an important stage for monitoring and management. The treatment discussed has a 7-day withdrawal period.

Q3. Are internship or training opportunities available at ICAR-CMFRI for undergraduate students in fish breeding?

Ans: Dr. Sekar clarified that ICAR-CMFRI does not currently offer a one-year internship programme. However, students can undertake short-term project work of around one month, and training may also be considered when it forms part of a university course curriculum, such as a three-month academic training requirement.

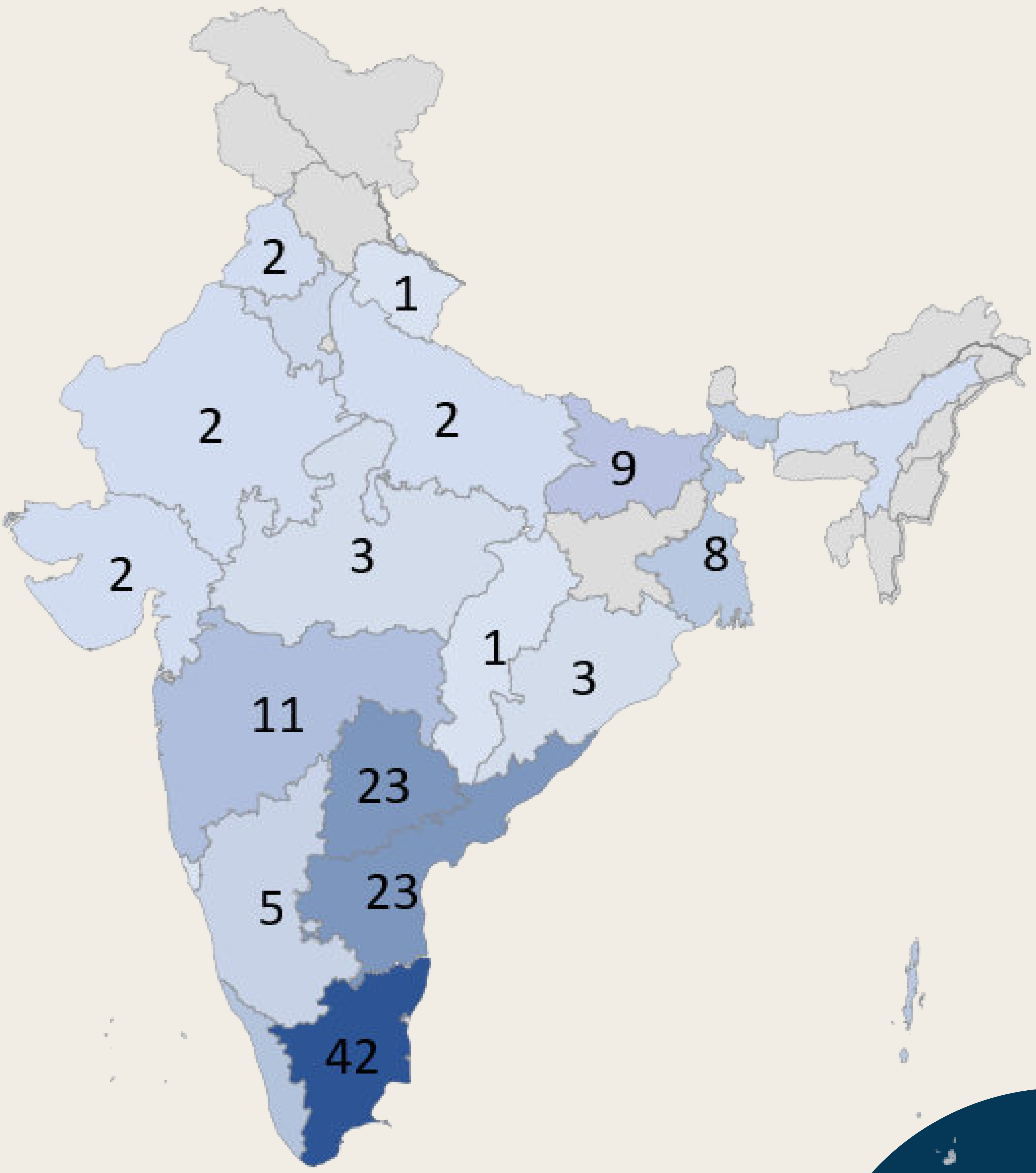
Q4. Are there commercial hatcheries producing Indian pompano seed apart from ICAR-CMFRI?

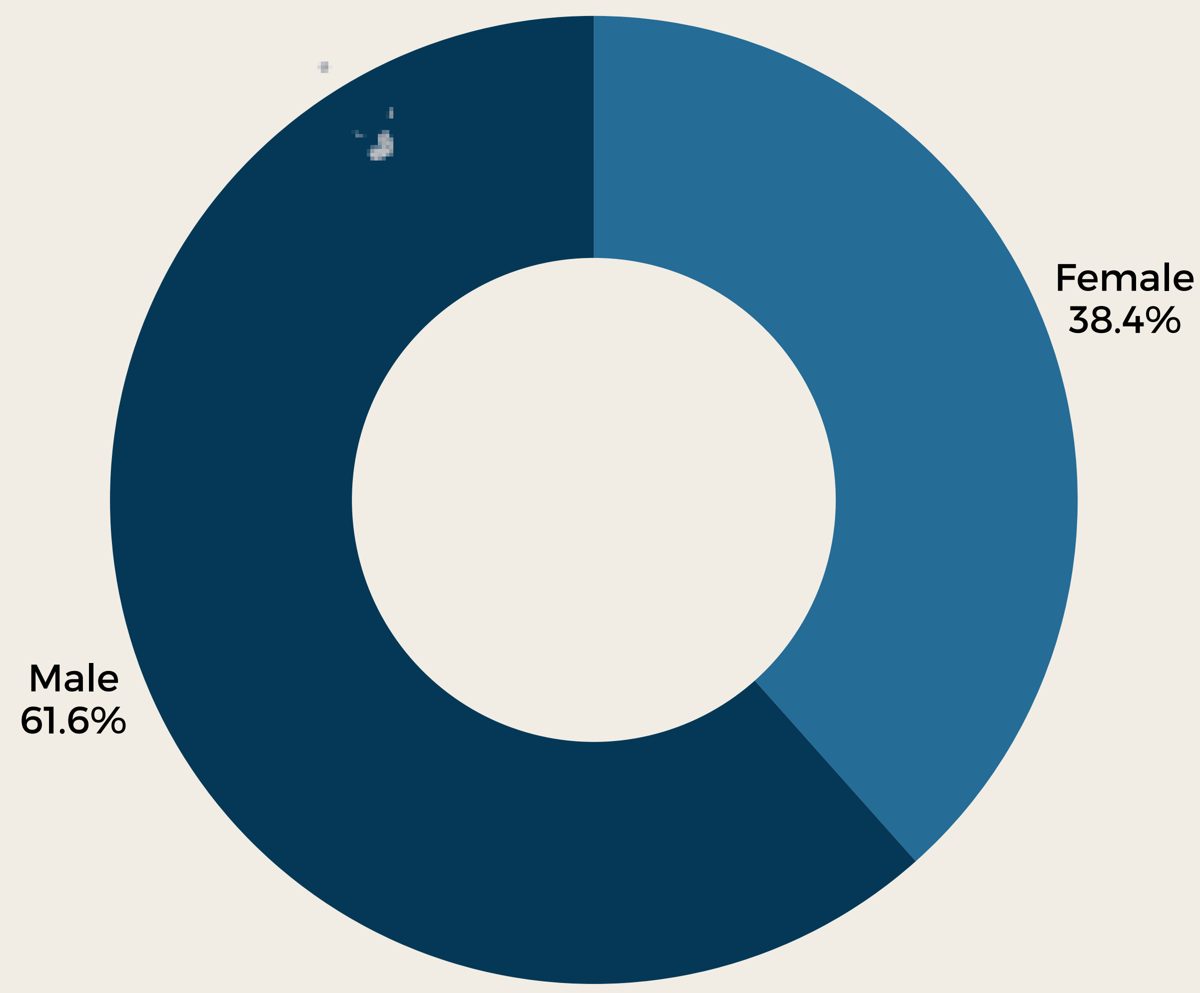
Ans: The speaker explained that the Indian pompano seed-production technology has been transferred to three hatcheries in Andhra Pradesh, including established groups involved in shrimp seed production. ICAR-CMFRI continues to provide handholding and technical support. Since seed production at the research institute is limited, approximately one lakh seeds per year are produced and supplied to around 20 farmers, with farming being undertaken in both coastal cages and ponds.

Q5. Does site suitability for cage farming vary among different fish species?

Ans: Dr. Sekar explained that the basic principles of site selection for cage farming are generally common across species, but species-specific environmental requirements, particularly salinity tolerance, must be considered. For example, Indian pompano can be cultured at comparatively lower salinities, whereas species such as cobia require higher salinity conditions. Therefore, the selected site must have salinity within the tolerance range of the target species.

Participants Overview





Total Registrations-520
Attended Participants - 164
(Male - 101; Female-63)

YouTube Video Link: https://www.youtube.com/watch?v=6zimpqpadbg&list=PL4G41x3BKm6lUBmHoLiRlGoB_5Efxiaep&index=10&t=122s

7

Black Seabream

Day - 7

28-07-2026

Standardized Protocol for Breeding and Seed Production of Black Seabream (Acanthopagrus berda)

Dr. Suresh Babu P. P.
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Dr. Suresh Babu highlighted the standardized captive breeding and seed production protocol for Black Seabream (*Acanthopagrus berda*), focusing on larval feeding, nursery rearing and juvenile management.

Dr. Suresh Babu explained that *A. berda* is a commercially important seabream with considerable potential for aquaculture in India. The species is euryhaline, occurring in marine, brackishwater and low-salinity habitats, including estuaries, mangroves and coastal lagoons. It is known for its good flesh quality, consumer preference and high market value. The species exhibits protandric hermaphroditism, with smaller individuals predominantly functioning as males and larger individuals as females. Sexual conversion generally occurs around 22–24.5 cm. The breeding season under Indian conditions extends from August to February, with peak spawning reported during November to January.

The speaker emphasized the importance of collecting broodstock with a wide size range to ensure the availability of both functional males and females. Broodstock can be collected from coastal and estuarine waters using cast nets, hook and line, gill nets and shore seines. The fish are maintained in cages and provided with nutritionally rich pellet feed, supplemented with vitamin-mineral premixes, cod liver oil and natural maturation feeds such as squid, oysters and crabs. For induced spawning, GnRH-based hormones such as Ovaprim or Ovotide are administered intramuscularly. The initial dose is followed by a second dose for females after six hours. The brooders are then maintained in 2-ton FRP tanks with seawater and aeration.

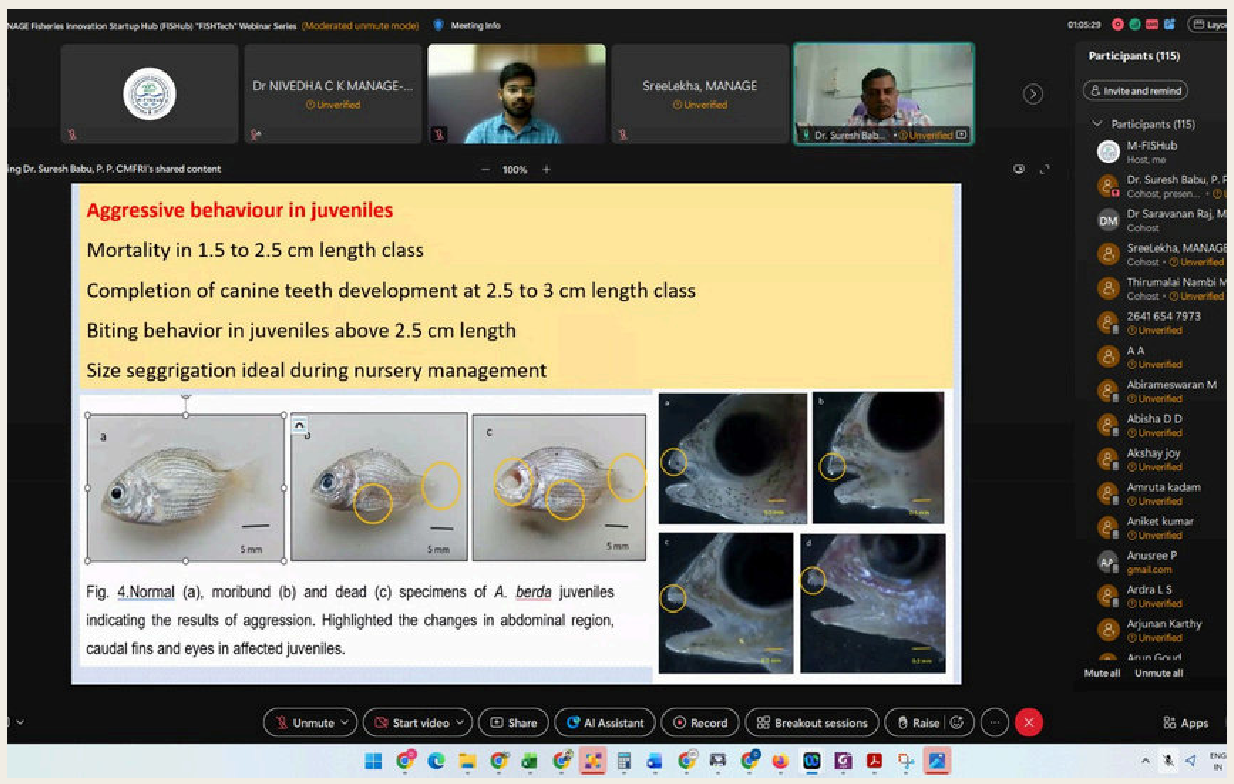
Dr. Suresh Babu identified three major critical periods during larval and juvenile rearing. The first is around the 2–3 DPH stage, when inadequate feed availability can result in mass larval mortality. The second critical phase is the weaning period, when larvae are shifted from live Artemia to artificial feed, as some larvae may not readily adapt to the formulated diet. The third challenge occurs during the advanced juvenile stage, when aggressive behaviour and cannibalism may develop.

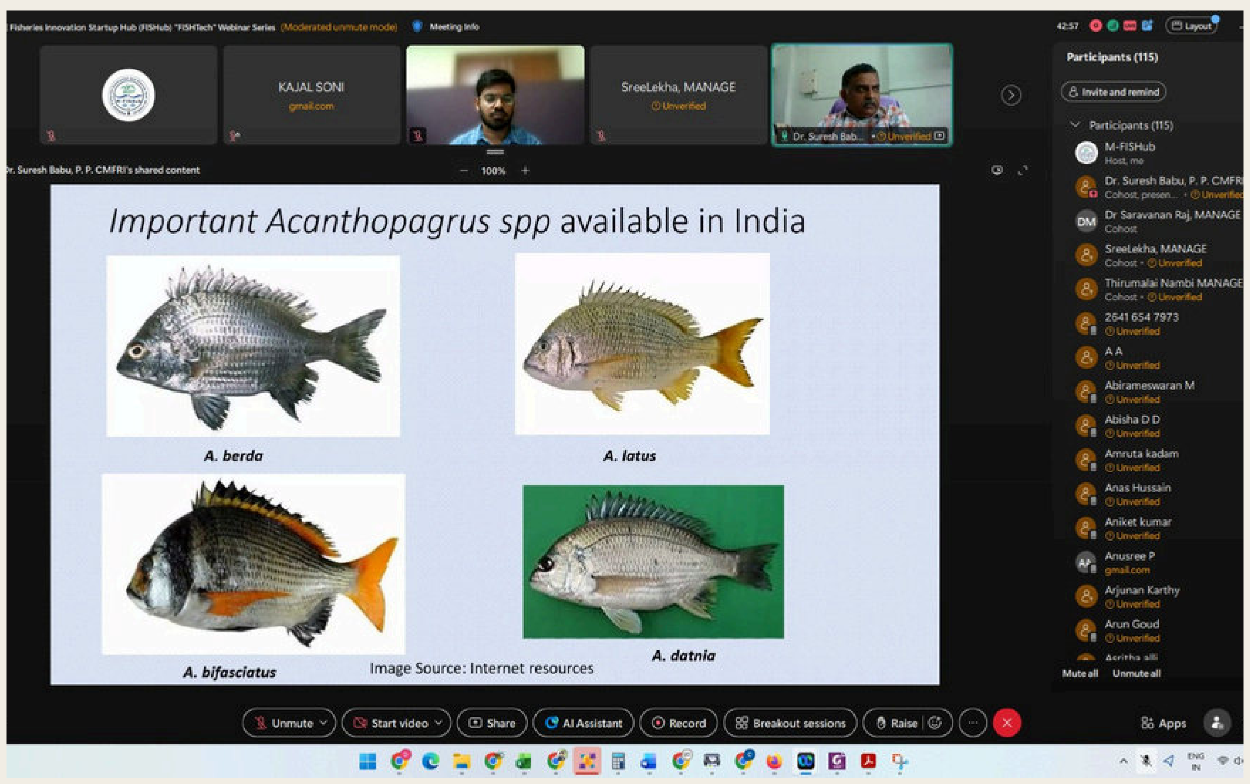
For nursery rearing, the standardized practice involves stocking approximately 500 juveniles/m^3 in a clear-water system, with around 30 ppt salinity providing suitable conditions for survival and growth.

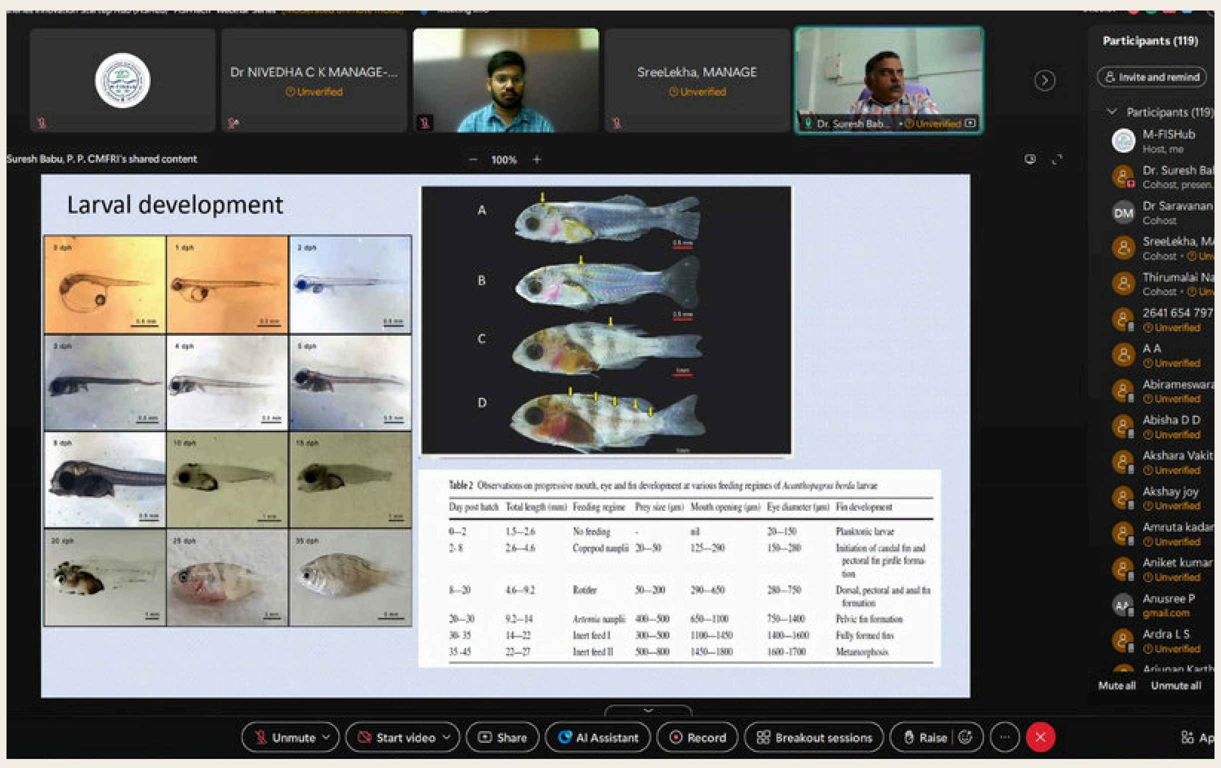
A formulated feed containing approximately 38–42% crude protein can be used for nursery-reared juveniles. The juveniles are recommended for transfer to grow-out ponds once they attain approximately 3–4 g in size.

A major management concern highlighted was the size-dependent aggressive behaviour of Black Seabream. Mortality can occur when juveniles reach approximately 2.5–3 cm, coinciding with the development of canine-like teeth, which enables larger juveniles to attack and nibble smaller individuals. To minimize mortality, the speaker recommended grading and removing larger "shooters" above approximately 2.75 cm. Similar size segregation should be followed during transportation, with juveniles above and below 2.5 cm packed separately to reduce aggression and associated losses.

The speaker also discussed important parasitic health problems, particularly *Amyloodinium* infestation and gill flukes. These can be managed through freshwater dips or permitted aquaculture treatments, depending on the situation. He concluded by highlighting that the captive breeding and seed-production protocol for *Acanthopagrus berda* has been successfully standardized at ICAR-CMFRI, with the technology supported by ICAR certification and scientific publications. The development of this protocol provides an important foundation for reliable seed production and the expansion of Black Seabream aquaculture.







Q & A Session

Q1. How many viable spawning batches can one broodstock produce during a spawning cycle?

Ans: Dr. Suresh Babu explained that following hormone-induced spawning, a broodstock can produce a maximum of around 2–3 batches of eggs in one spawning cycle. The first spawning may occur approximately 48 hours after induction, followed by subsequent spawning on the following day. Since Black Seabream is a multiple spawner with repeated batch spawning, the same broodstock can potentially be reused for another induction after about a month, depending on its recovery and broodstock management.

Q2. What are the major parasitic problems encountered in Black Seabream cage culture?

Ans: The speaker identified *Amyloodinium* infestation and gill flukes (*Dactylogyrus*) as the major parasites encountered during broodstock development and cage culture. Amyloodinium infections were observed particularly during the winter season. Infected broodstock can be removed from the group and treated individually through appropriate freshwater dips or permitted treatments.

Q3. What is the culture period and economic cost for producing market-sized Black Seabream?

Ans: Dr. Suresh Babu explained that the species has moderate growth, but it can fetch a good price even at smaller sizes of around 200–300 g. With proper feeding, this size may be achieved in approximately 8–10 months. However, the detailed economics and commercial farming package are yet to be fully standardized, as current work has primarily focused on seed production.

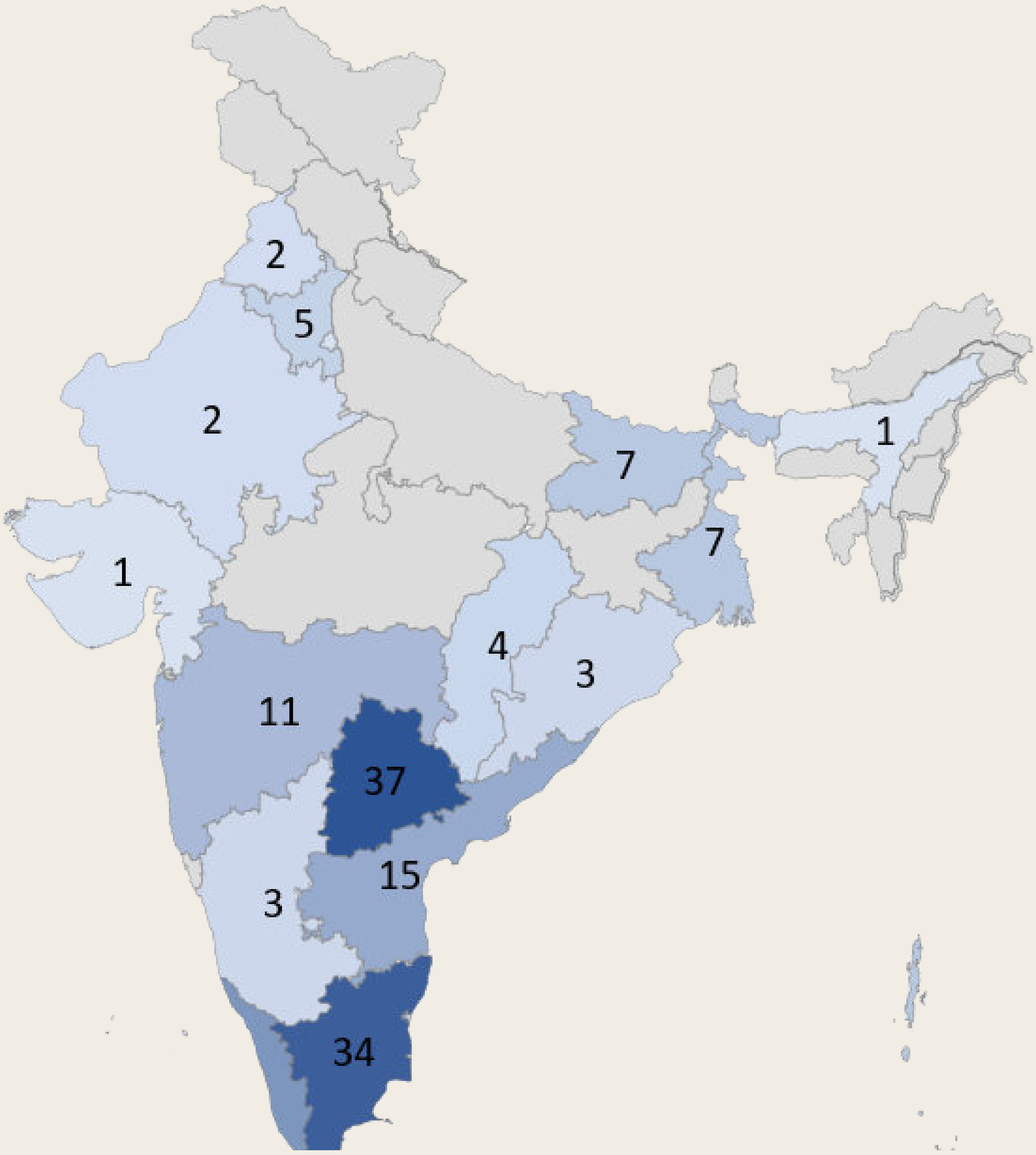
Q4. How can Amyloodinium infestation be identified and managed?

Ans: The speaker explained that Amyloodinium is a common parasite along the Indian coast. In broodstock, infected fish can be separated and treated individually, making management comparatively easier. For seed, freshwater baths of around 10 minutes, controlled reduction of salinity, or appropriate treatments such as formalin dips may be considered. The speaker also mentioned that certain anti-parasitic treatments have shown good results. He noted that Black Seabream is relatively hardy and mortality may not be very high even when infestation occurs.

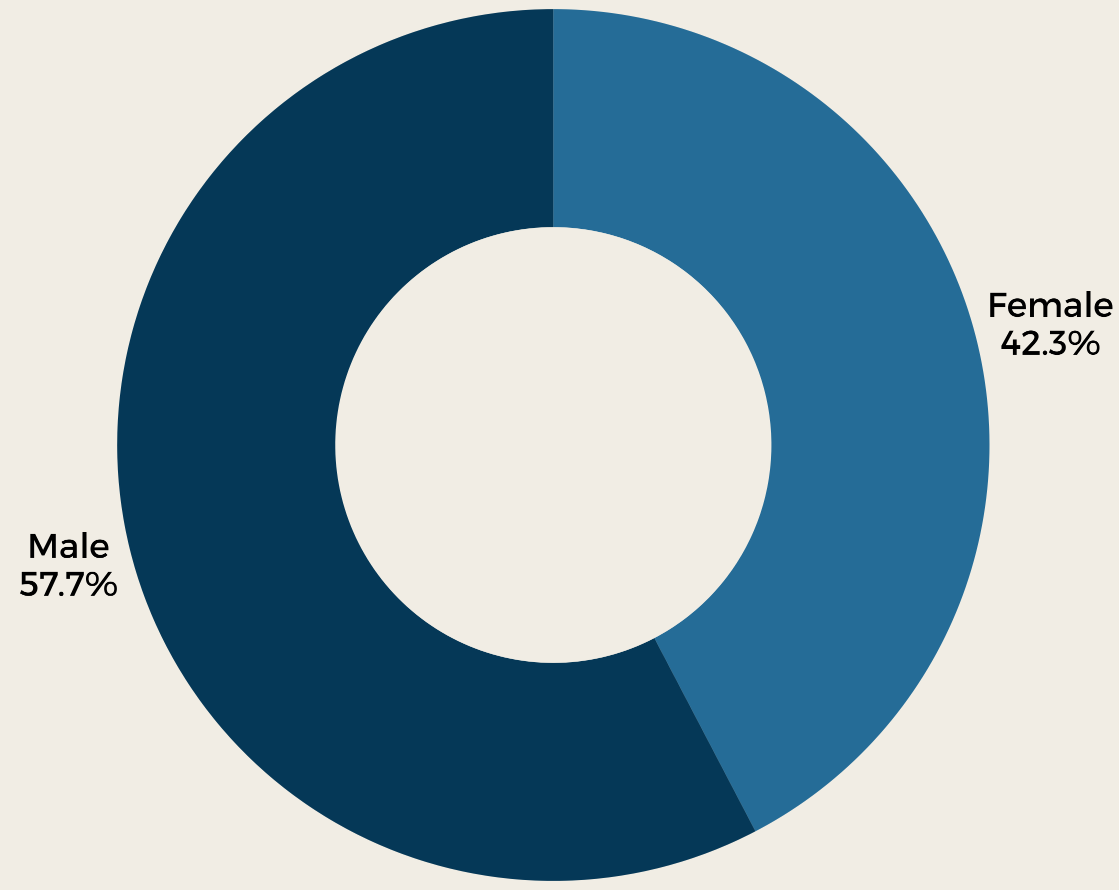
Q5. What is the ideal salinity for optimum growth of Black Seabream?

Ans: Dr. Suresh Babu explained that Black Seabream is a euryhaline species and can be cultured under both marine and estuarine conditions. Based on observations, 20–25 ppt salinity was indicated as favourable for better growth. The species can also survive and grow in marine conditions. Further research is planned to standardize its farming and compare growth and economics under estuarine and marine conditions, as well as pond and cage systems.

Participants Overview



Total Registrations-515
Attended Participants - 163
(Male - 94; Female-69)



YouTube Video Link: https://www.youtube.com/watch?v=C-tPv2BN-k0&list=PL4G41x3BKm6lUBmHoLiRlGoB_5Efxiaep&index=9&t=196s

8

John's Snapper

Day - 8

JUL

29-07-2026

John's Snapper (Lutjanus johnii) Seed Production Technology

Dr. Ritesh Ranjan
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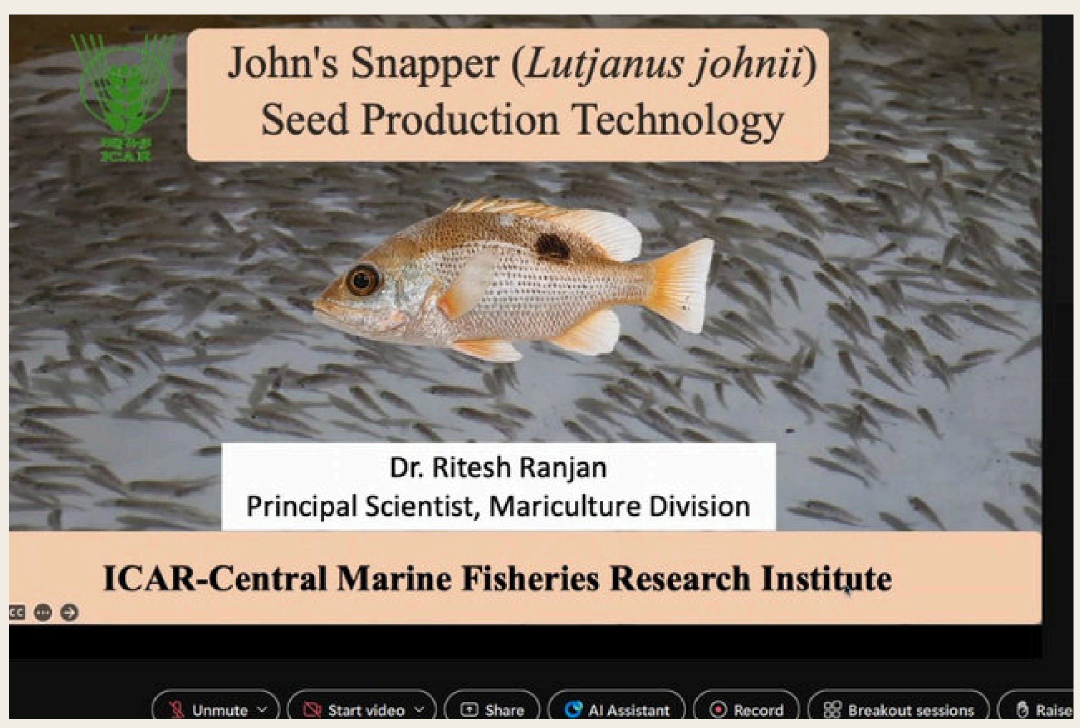
Dr. Ritesh Ranjan presented the standardized technology for hatchery-based seed production of John's Snapper (*Lutjanus johnii*), highlighting its potential as a high-value species for aquaculture and mariculture.

The speaker emphasized the species' desirable characteristics, including good flesh quality, delicate flavour, rapid growth and strong domestic as well as export market potential. With declining wild catches of this demersal reef-associated species, the development of captive breeding and reliable seed production technology is important for supporting its sustainable culture. He explained the broodstock development and management protocol, beginning with the collection of healthy brooders from the wild. Since the species is demersal, wild-caught brooders can experience barotrauma during rapid movement from deeper water to the surface. Proper handling and transportation are therefore essential. After collection, brooders are quarantined and treated to control external parasites before being transferred to the broodstock system. Dr. Ranjan emphasized the importance of identifying the sex and monitoring gonadal development, with PIT tagging used for individual identification and tracking of broodstock development.

For broodstock maturation, the speaker highlighted the advantages of a Recirculating Aquaculture System (RAS) over conventional flow-through or cage-based systems, particularly for maintaining stable water quality and protecting broodstock during rough weather. Large tanks of more than 100 tonnes, with high water recirculation, were found suitable for broodstock conditioning and spawning. The system incorporates filtration components such as slow sand filters, protein skimmers and biological filters, along with an egg-collection chamber designed to collect the naturally buoyant pelagic eggs.

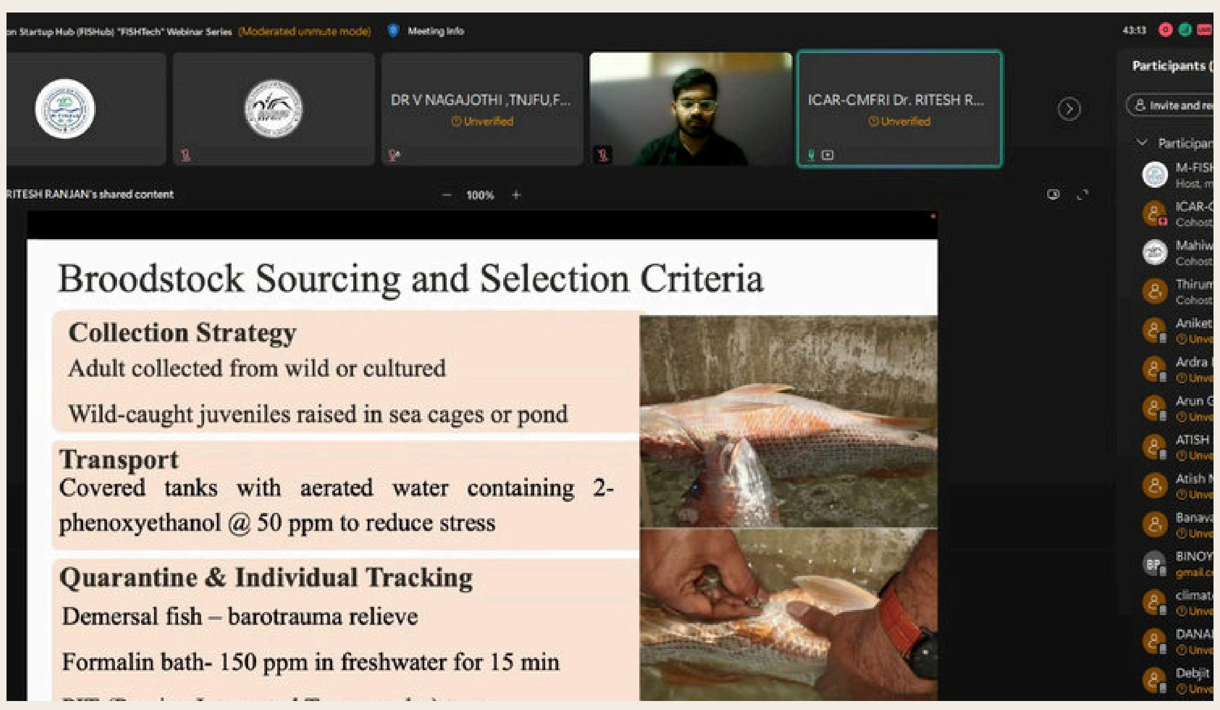
The speaker further explained the egg incubation and larval rearing protocol. Collected eggs are disinfected using iodophor and only batches showing good fertilization are selected for larval rearing. Fertilization rates of around 85–90% and hatching rates above 90% were reported.

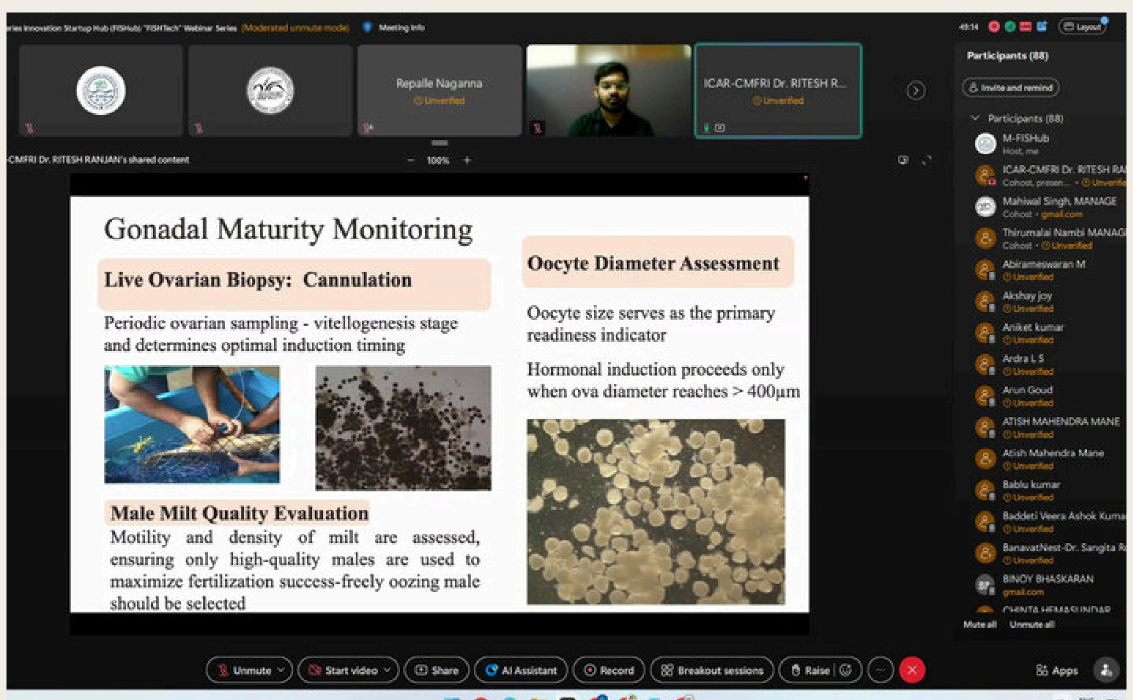


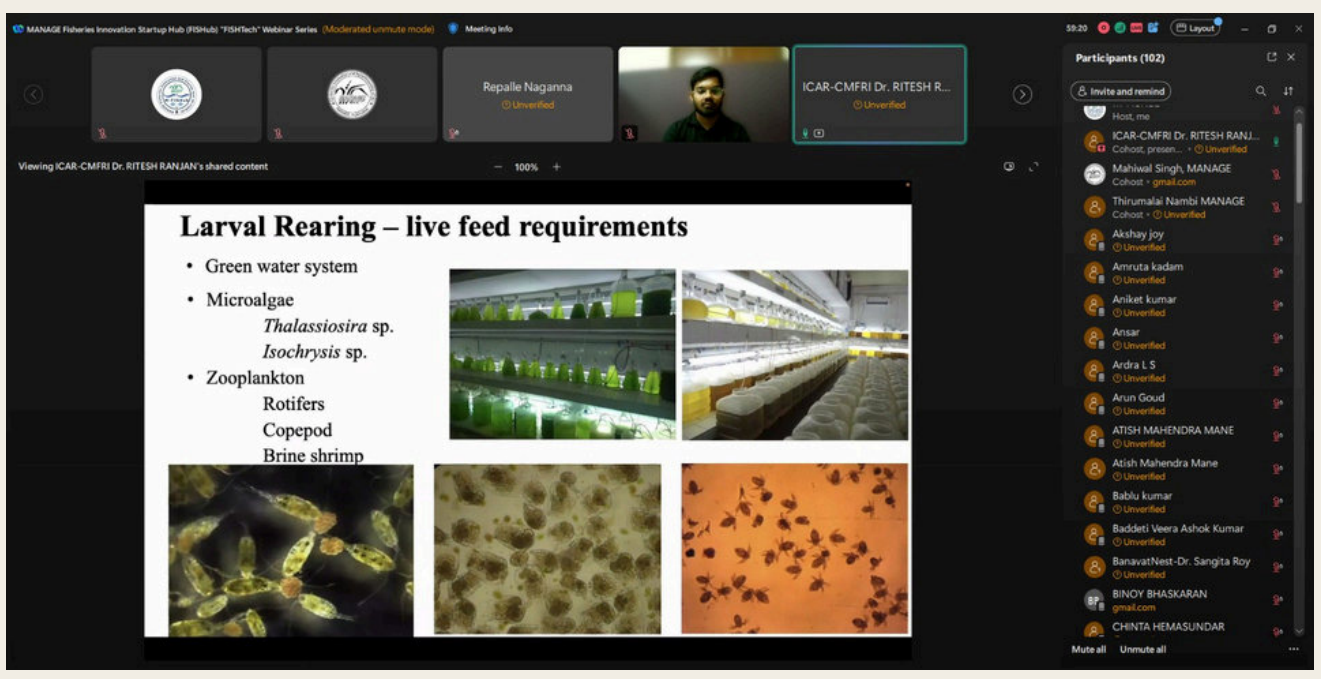
Dr. Ranjan emphasized that water-quality management is equally critical during larval rearing. Initial culture is maintained with minimal disturbance, followed by gradual siphoning and water exchange as the larvae develop. Temperature, dissolved oxygen, salinity and other water-quality parameters must be carefully monitored. The speaker also highlighted the importance of maintaining good hatchery hygiene, disinfecting tanks and equipment, quarantining broodstock and using properly filtered and disinfected water. Probiotics may also be incorporated as part of the larval and nursery management strategy.

The nursery phase requires particular attention because John's Snapper is highly cannibalistic and differences in size can result in significant mortality. Regular grading, preferably at approximately 15-day intervals during the initial nursery period, helps maintain uniform size and reduces cannibalism. Lower salinity of around 8–10 ppt was recommended for nursery rearing to reduce the risk of Amyloodinium infection. Feed protein levels can initially be around 52% and gradually reduced to approximately 45% as the juveniles grow.

The speaker concluded by highlighting the major challenges in seed production, including stunted growth, deformities, poor weaning, oxygen depletion, Amyloodinium infection and cannibalism. Stunted growth may be associated with inadequate nutrition, particularly insufficient lipid and DHA/EPA levels, while excessive temperature or sudden salinity changes can increase deformities. Proper feeding frequency, grading, aeration and water-quality management are therefore essential. Overall, the standardized seed-production protocol provides a strong foundation for the commercial hatchery production and future expansion of John's Snapper aquaculture, while continued refinement of nursery and grow-out practices can further improve its commercial viability.







Q & A Session

Q1. Which stage has a higher risk of disease and nutrient deficiency during larval rearing?

Ans: Dr. Ritesh Ranjan explained that nutrient deficiency is particularly critical during 5–20 days post-hatch (DPH), making this an important phase for larval management. Disease-related risks become more important when larvae are shifted from treated water to normal untreated water during nursery rearing, around 30–35 days, and appropriate salinity management is required to minimize Amyloodinium problems.

Q2. What is the optimal stocking density for John's Snapper larvae and broodstock?

Ans: The speaker recommended a stocking density of approximately 10 larvae per litre during larval rearing and around 1 kg of broodstock per cubic metre for broodstock management.

Q3. Can John's Snapper be domesticated for the development of SPF generations?

Ans: Dr. Ranjan explained that SPF generation development is currently being pursued at CMFRI for Indian pompano, rather than John's Snapper. However, future selective breeding and domestication programmes for John's Snapper are being considered. He noted that CMFRI already has second-generation captive broodstock of John's Snapper, although expansion of such programmes would require adequate tank and infrastructure facilities.

Q4. Has the seed production technology been transferred to farmers or private hatcheries?

Ans: The speaker clarified that the technology for John's Snapper has not yet been transferred to farmers or commercial hatcheries. However, CMFRI has already transferred technologies for Indian pompano to several hatcheries, while discussions are also underway for other species. He stated that CMFRI is willing to share John's Snapper technology with entrepreneurs and hatcheries interested in adopting it.

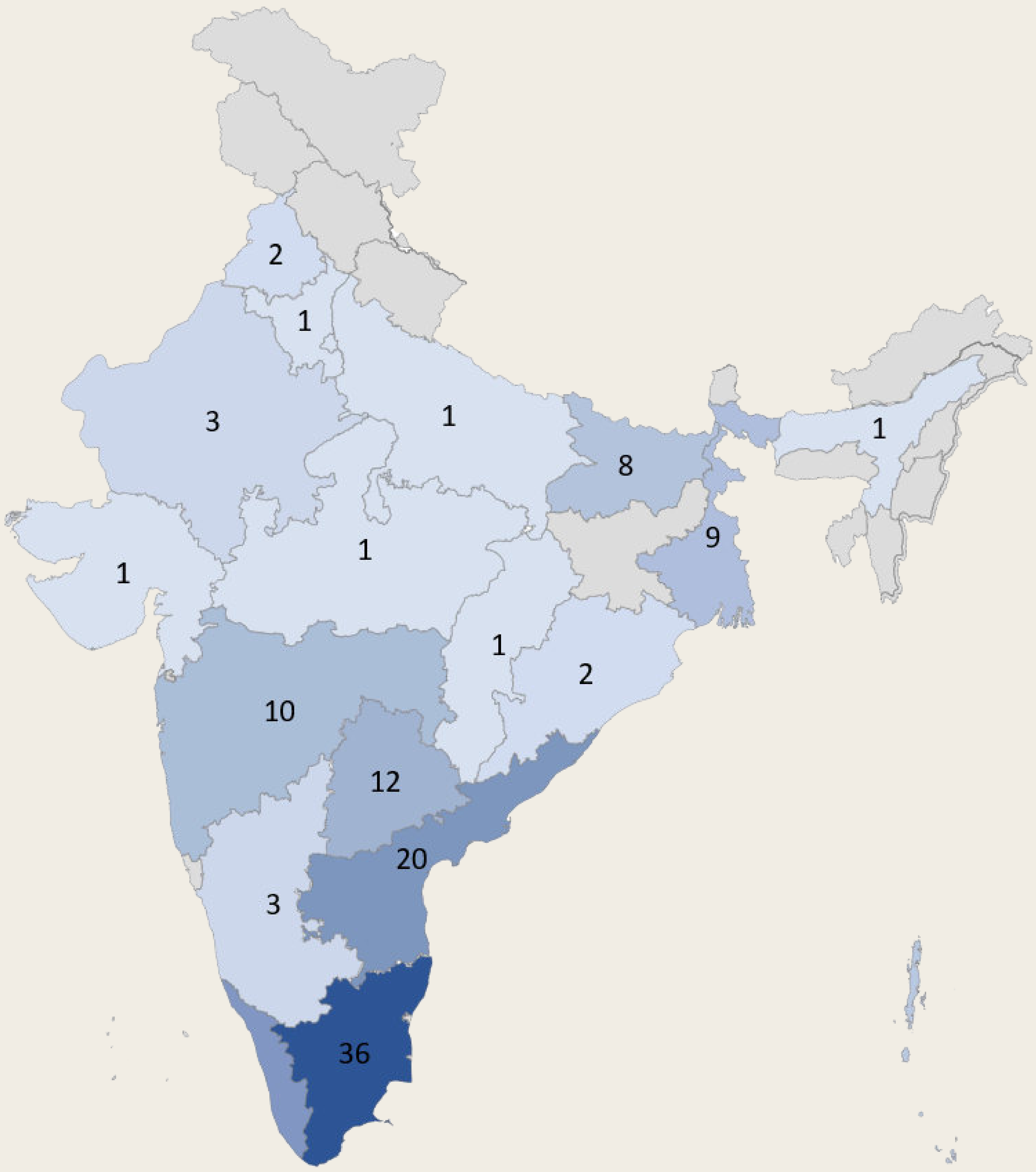
Q5. What is the survival rate from hatching to the larval stage, and can live feed be completely replaced with nutrient-rich nano feeds?

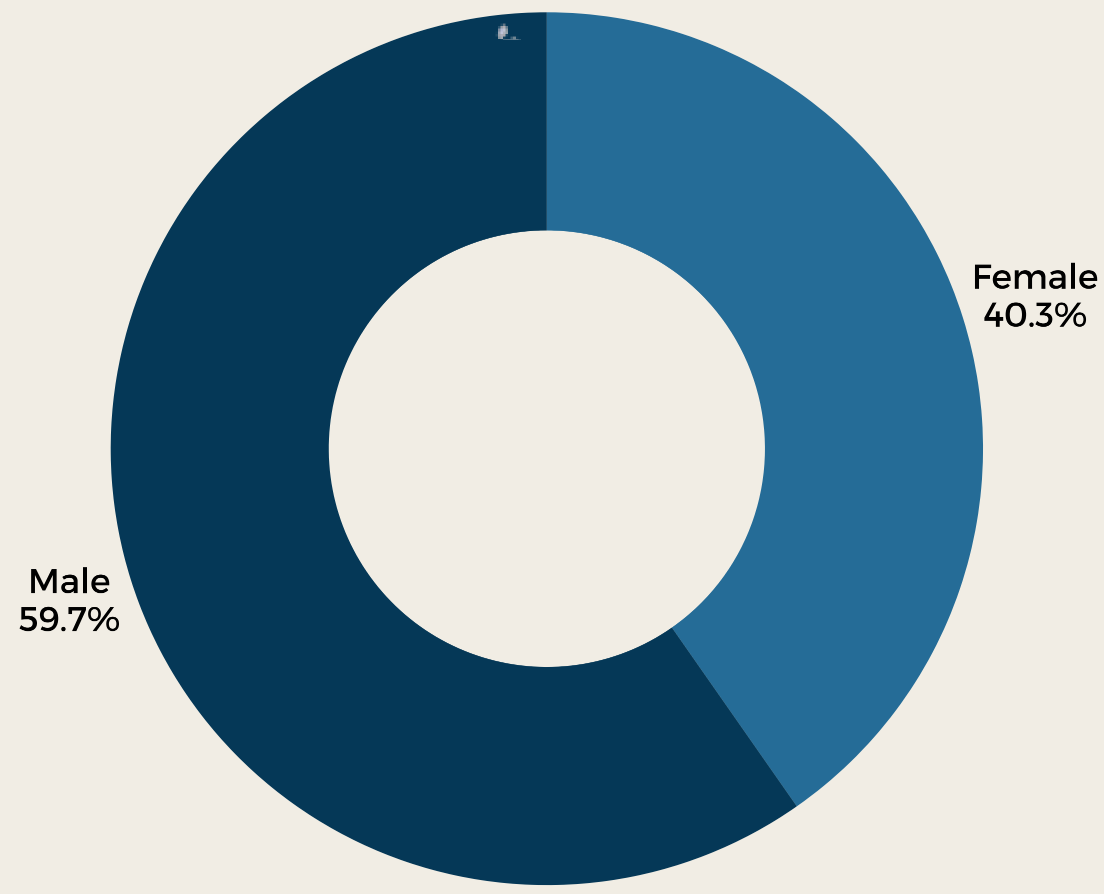
Ans: Dr. Ranjan reported a survival rate of approximately 16–18% from hatching through larval rearing. He emphasized that live feed cannot be completely replaced during the initial stages because the larvae have a very small mouth and initially exhibit sucking-type feeding behaviour. Live feed is therefore essential during the early larval phase. As larvae grow, microencapsulated feeds of around 100–200 µm and other advanced feeds can gradually be incorporated.

Q6. Why is resistance less likely to develop against LHRHa compared with hCG?

Ans: The speaker explained that LHRHa is a smaller peptide and does not readily stimulate the immune system to produce antibodies against it. In contrast, hCG is a larger peptide that can activate an immune response and lead to antibody production, potentially reducing its effectiveness after repeated use.

Participants Overview





Total Registrations-504
Attended Participants -139
(Male - 83; Female-56)

YouTube Video Link: https://www.youtube.com/watch?v=JeXNToxVEls&list=PL4G41x3BKm6lUBmHoLiRlGoB_5Efxiaep&index=8&t=527s

9

Black-bar Chromis

JUL
30-07-2026

Breeding and Seed Production Technology for Black-bar Chromis (Chromis retrofasciata)

Mr. Ambarish P. Gop
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Mr. Ambarish P. Gop presented the breeding and seed production technology of Black-bar Chromis, highlighting its potential as a marine ornamental fish and the importance of captive breeding for developing a sustainable ornamental fisheries sector.

Mr. Ambarish emphasized that hatchery production can reduce dependence on wild collection, minimize pressure on coral reef ecosystems and provide a reliable supply of aquarium fishes. The speaker explained the importance of broodstock management and captive maturation for successful breeding. Black-bar Chromis is a small marine ornamental fish with distinct territorial behaviour. Providing suitable shelters, such as small perforated pots, helps the fish establish territories and facilitates pair formation. Potential breeding pairs can be identified based on their behaviour and swimming patterns and subsequently transferred to dedicated breeding tanks. The speaker noted that Black-bar Chromis is a strictly marine species, requiring approximately 33–35 ppt salinity during broodstock maintenance and breeding.

The session covered the spawning and egg-management process in detail. Once a compatible pair is established, eggs are deposited on the surface or inside the shelter provided in the tank. The eggs are carefully collected from the substrate and transferred for larval rearing. In Black-bar Chromis, the eggs generally hatch after approximately four days or more than 90 hours of incubation. The speaker highlighted the importance of accurately recording spawning and incubation periods and monitoring egg development to improve hatchery management.

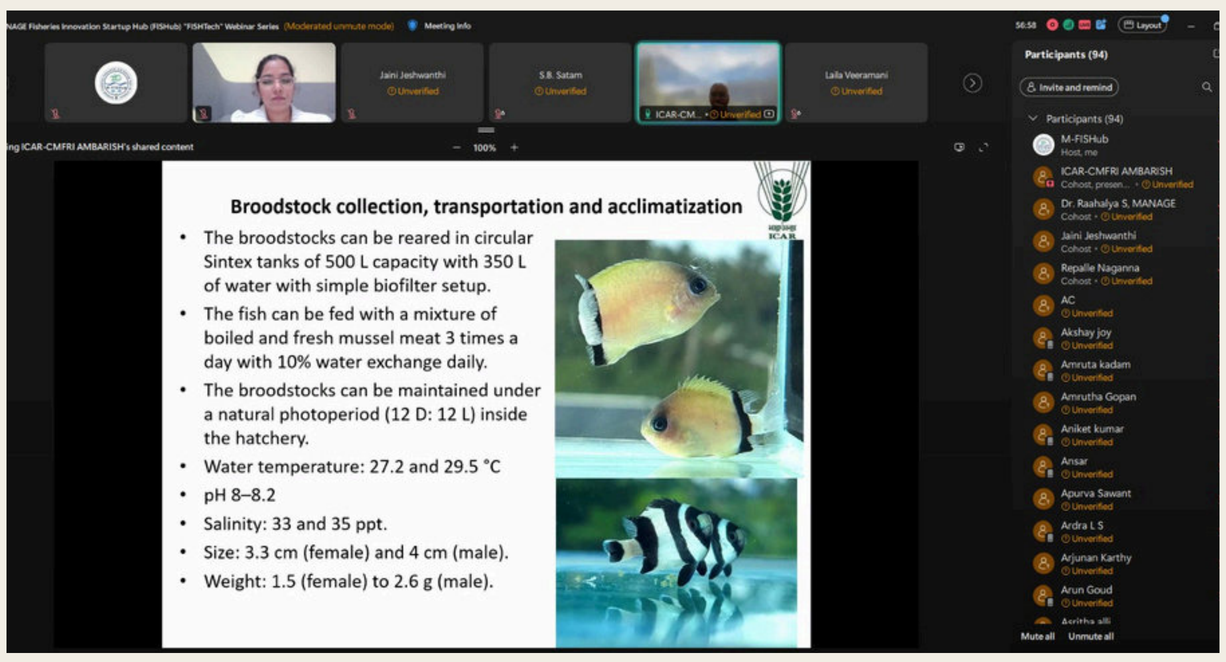
A major focus of the presentation was live-feed management during larval rearing, which was identified as one of the most critical stages of marine ornamental fish seed production. While rotifers are commonly used in marine hatcheries, the very small mouth size of Black-bar Chromis larvae makes them unsuitable for feeding exclusively on rotifers.

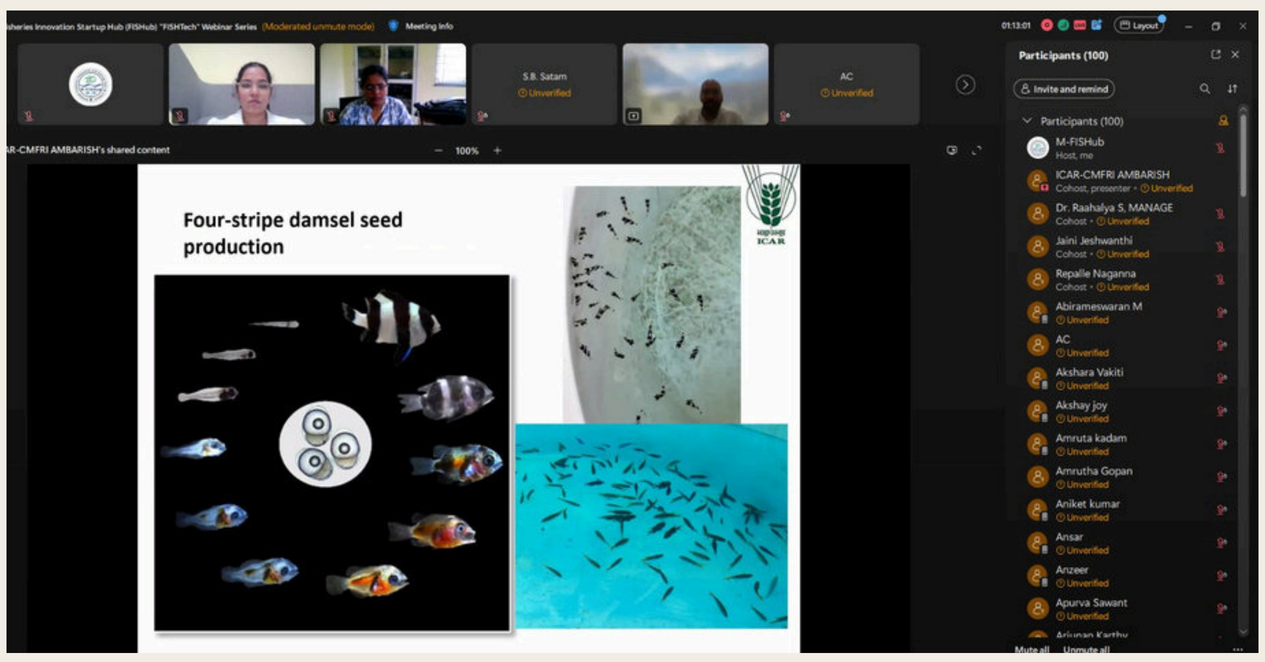
The speaker further emphasized that larval rearing requires careful water-quality and feeding management. Gentle aeration should be maintained, while water exchange is avoided during the initial period and gradually introduced as the larvae develop. Particular attention is required during the 4–7 DPH stage, when swim bladder inflation occurs.

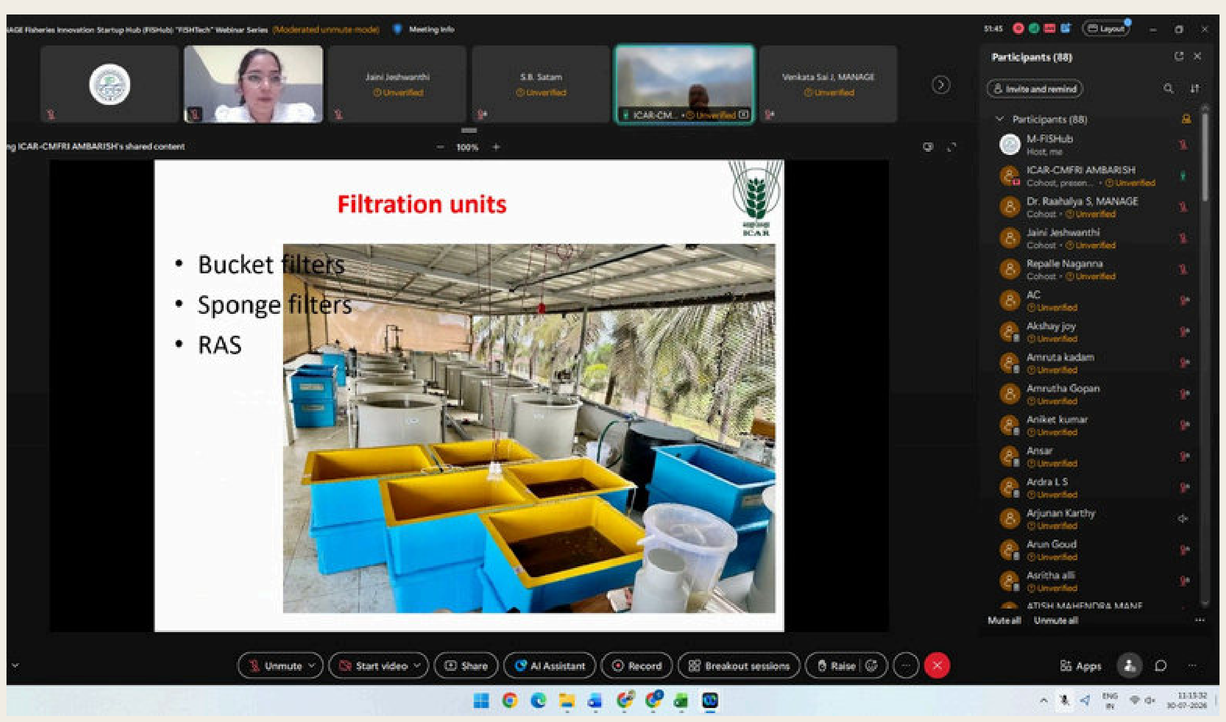
Another important challenge discussed was weaning from live feed to artificial feed. Poor acceptance of artificial feed can result in low survival and increased production costs if live feed has to be continued for a longer period. The speaker recommended introducing artificial feed gradually from around 16 DPH, combining it with live feed so that the larvae progressively adapt to the formulated diet. Appropriate feed size and nutritional quality are essential for successful weaning.

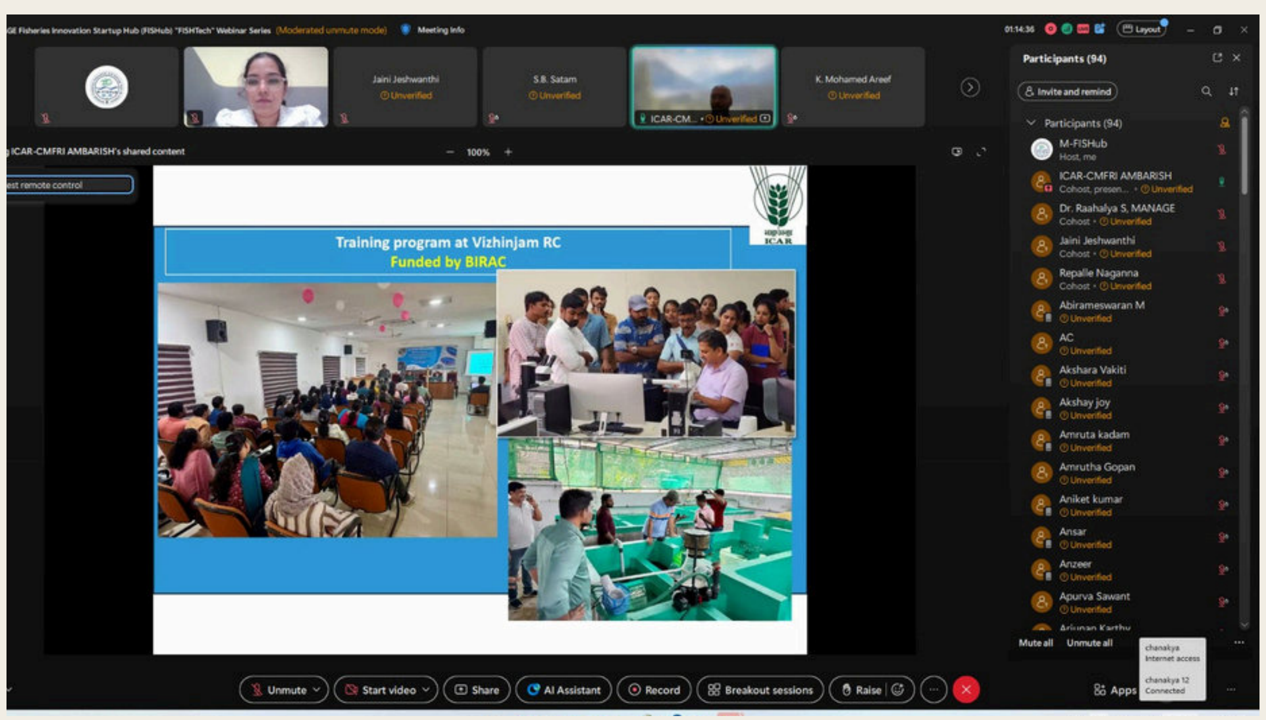
The session also addressed cannibalism, grading and disease management during nursery rearing. Variation in size, often caused by inadequate feeding, can promote cannibalistic behaviour; therefore, sufficient feeding and regular grading are important for maintaining uniform-sized juveniles. Freshwater treatment may be used at an appropriate stage, particularly after around 25–26 DPH, while maintaining good water quality and preventing contamination. The speaker also stressed the importance of maintaining hygiene, quarantine, optimum stocking density and appropriate filtration to reduce disease risks.

Overall, Mr. Ambarish highlighted that successful Black-bar Chromis seed production depends on appropriate broodstock conditioning, territorial pair formation, controlled spawning, specialized live-feed management, careful larval rearing and effective nursery practices. He also emphasized diversification of marine ornamental species in commercial hatcheries, which can improve profitability while reducing dependence on wild reef populations. Training and hands-on programmes can further support the transfer of marine ornamental fish breeding technologies to entrepreneurs, students, researchers and fisheries professionals.









Q & A Session

Q1. What are the steps involved in domestication of wild-collected Black-bar Chromis broodstock?

Ans: Mr. Ambarish explained that wild-collected fish should first undergo at least two weeks of quarantine in an isolated facility, where feeding behaviour, wounds, deformities and external parasites are monitored. Freshwater dips may be used cautiously for parasite removal, considering that the species is stenohaline. After quarantine, the fish should be conditioned for approximately 6–9 months with suitable feeds such as mussels, squids and formulated pellets. Once pair formation is observed, compatible pairs can be transferred to broodstock tanks.

Q2. What live feeds are recommended during different stages of larval rearing?

Ans: The speaker recommended copepods from the first day after hatching, followed by rotifers from around the 4th–5th day. A combination of copepods and rotifers can be provided during the initial 10 days. After approximately 10 days, Artemia can be introduced as the larvae develop a larger mouth capable of consuming it.

Q3. How can optimum water quality be maintained in marine ornamental fish larval culture?

Ans: For larger hatchery operations with multiple tanks, a Recirculating Aquaculture System (RAS) can be used. The speaker explained that mechanical, biological and chemical/UV filtration can be incorporated. Protein skimmers help remove suspended and organic matter, while biological filters containing MBBR media and beneficial bacteria help convert toxic ammonia into less harmful nitrogenous compounds. UV filtration can also be used for water treatment.

Q4. What is the fecundity of Black-bar Chromis?

Ans: Mr. Gop stated that Black-bar Chromis has comparatively low fecundity, generally producing around 200–300 eggs per spawning, and usually less than 500 eggs. In comparison, some other damselfish species may produce several thousand eggs per spawning.

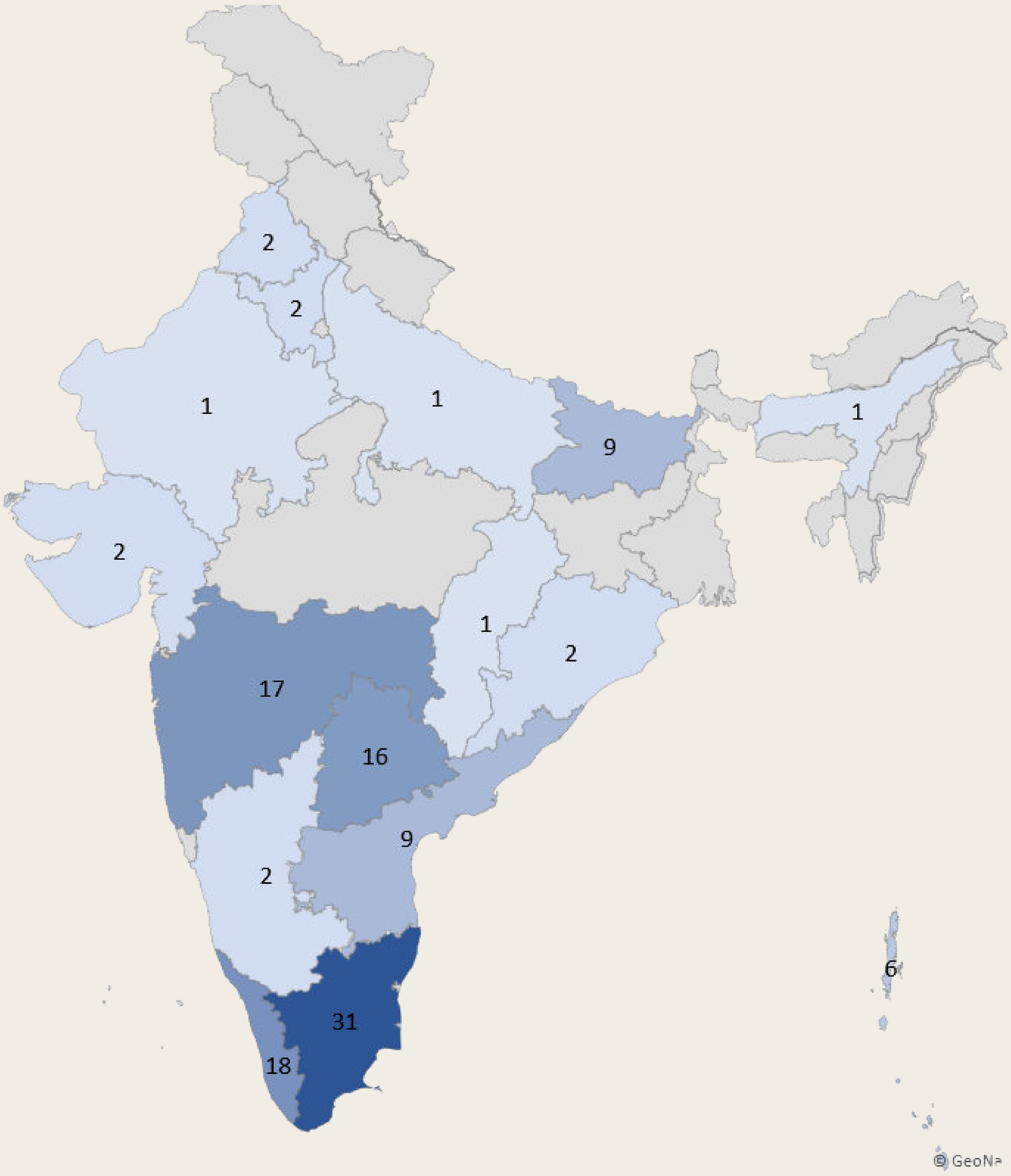
Q5. What is the stocking density for Black-bar Chromis broodstock and larvae?

Ans: For broodstock conditioning, approximately one pair (one male and one female) can be maintained in a 500-litre tank containing about 400 litres of seawater. For larval rearing, approximately one egg per litre was recommended; therefore, a 750-litre tank can accommodate around 750 eggs when filled to the appropriate water volume.

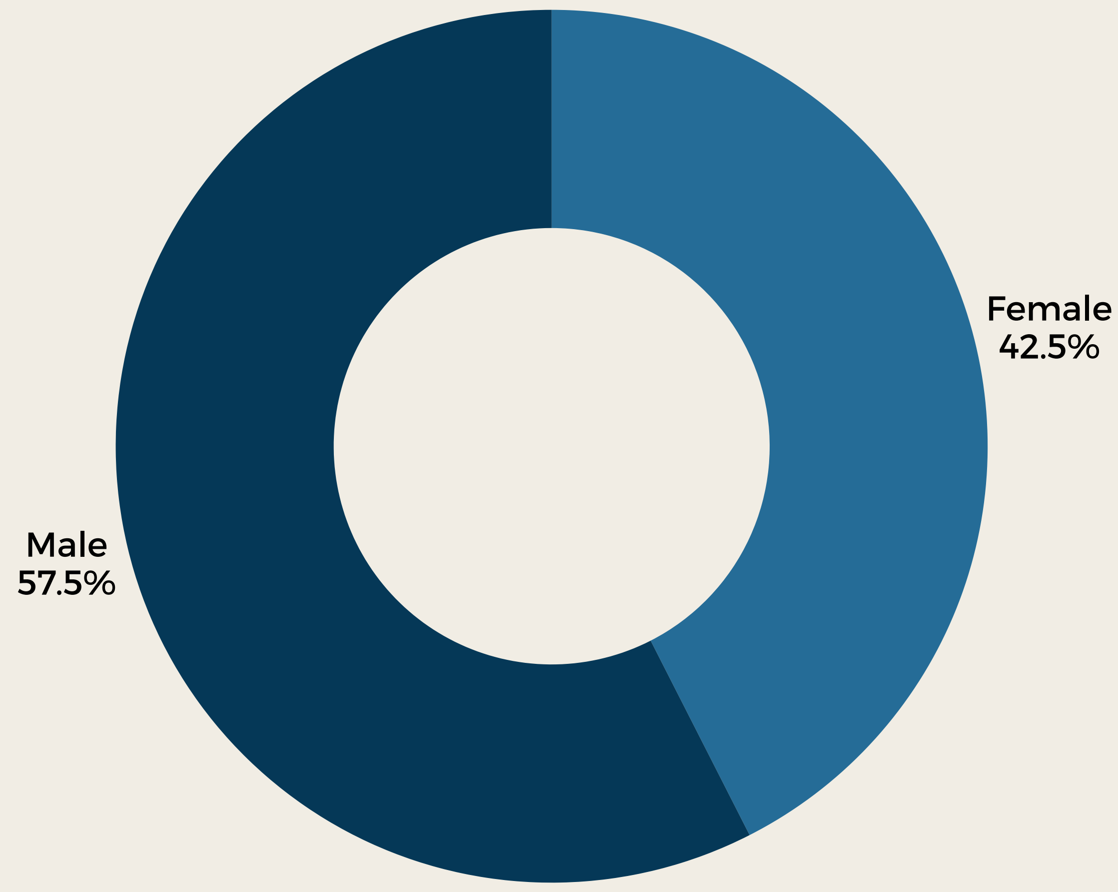
Q6. Are there specific challenges in induced breeding of marine ornamental fishes?

Ans: The speaker explained that induced breeding technology for marine ornamental fishes is still not well established, with limited information and protocols available internationally. Research is ongoing to develop and standardize induced breeding techniques for ornamental species.

Participants Overview



Total Registrations-507
Attended Participants -120
(Male - 69; Female-51)



YouTube Video Link: https://www.youtube.com/watch?v=aoqwnI2FLic&list=PL4G41x3BKm6lUBmHoLiRlGoB_5Efxiaep&index=7&t=129s

10

Vermiculated Spinefoot

Day - 10

JUL

31-07-2026

Technology for Seed Production of Vermiculated Spinefoot (Siganus vermiculatus)

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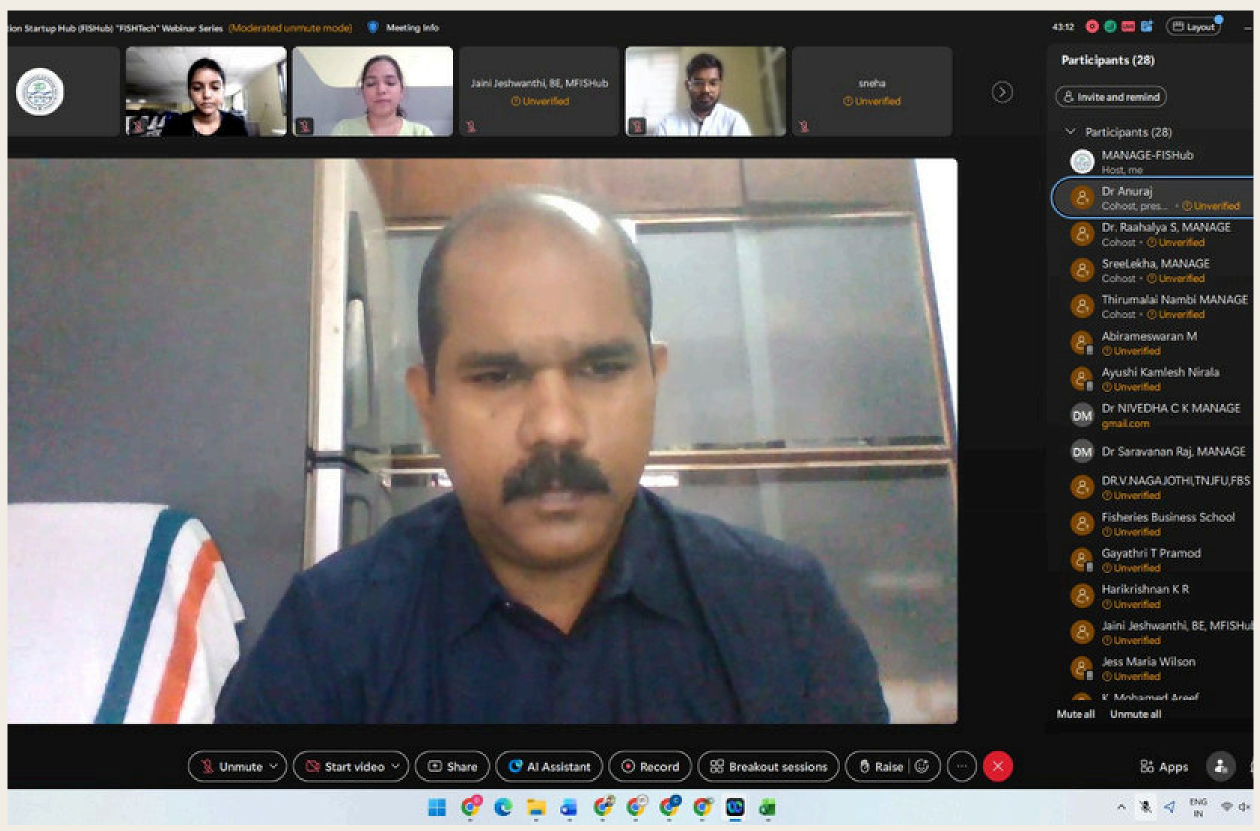
Dr. Anuraj focused on the importance of marine aquaculture, the culture potential of rabbitfishes, and the hatchery protocols developed for the production of quality seed of vermiculated spinefoot.

The speaker highlighted that aquaculture is increasingly contributing to global fish production, while the relative contribution of capture fisheries is declining. He emphasized that the availability of quality seed is a fundamental requirement for the expansion and sustainability of marine aquaculture.

The presentation then focused on rabbitfish (family Siganidae), which are primarily herbivorous and are widely distributed across the Indo-Pacific region. Among the different species, *Siganus vermiculatus*, commonly known as the vermiculated spinefoot or maze rabbitfish, was highlighted as a promising candidate for Indian mariculture. The species possesses several desirable characteristics, including fast growth, tolerance to a wide range of salinity, temperature and pH, low dietary protein requirements, and good consumer acceptance. It can be cultured in ponds, tanks and cages, either as a monoculture or in polyculture systems.

A major portion of the session dealt with the hatchery-based seed production protocol of *S. vermiculatus*. The speaker explained the different components required in a marine hatchery, including water intake and treatment systems, broodstock facilities, spawning and incubation units, larval rearing facilities, live-feed production units, nursery facilities and supporting infrastructure.

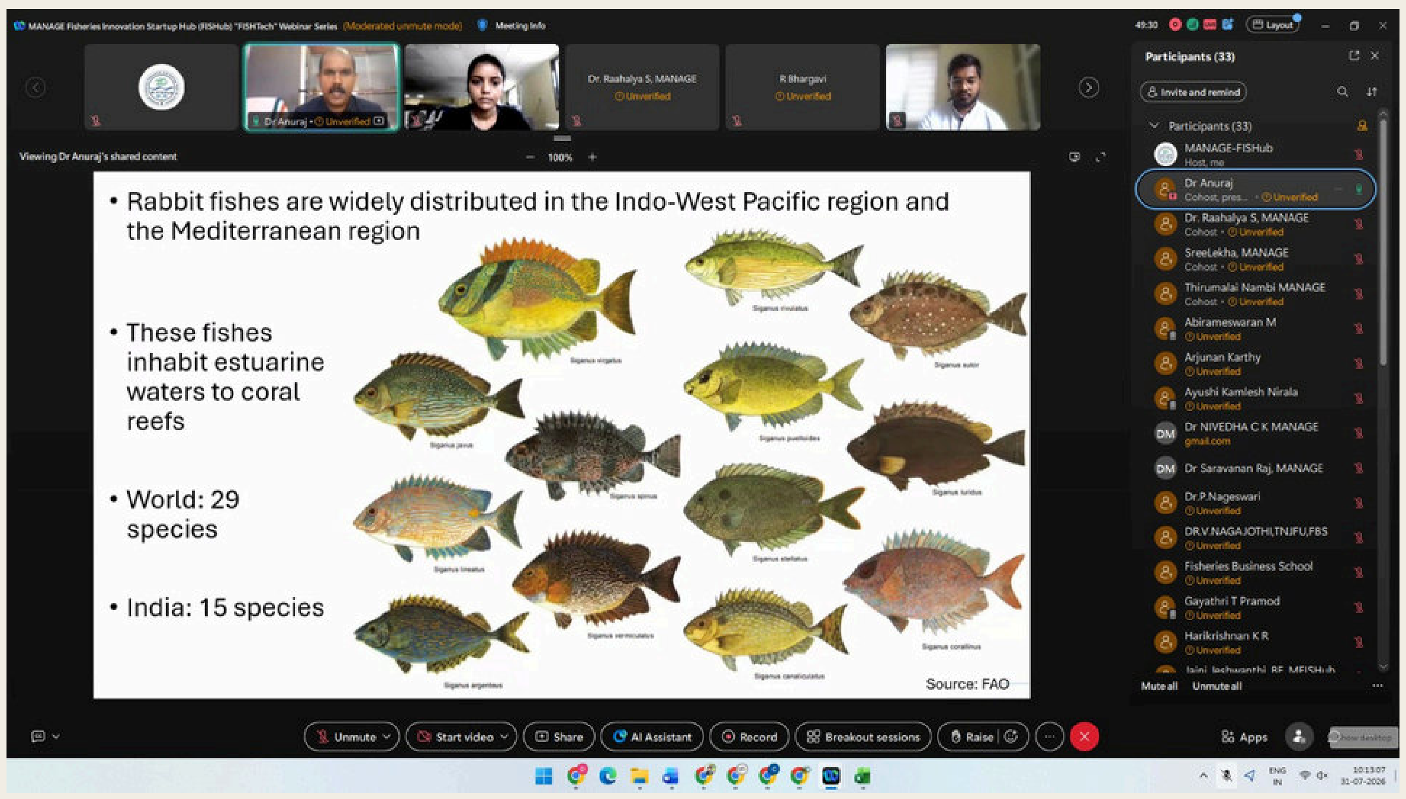
Particular emphasis was placed on maintaining a continuous supply of good-quality seawater and freshwater, effective filtration and disinfection, and proper effluent management. The broodstock development and induced breeding procedures were discussed in detail. Wild broodfish can be collected using suitable fishing methods and subsequently reared in cages or recirculating aquaculture systems.

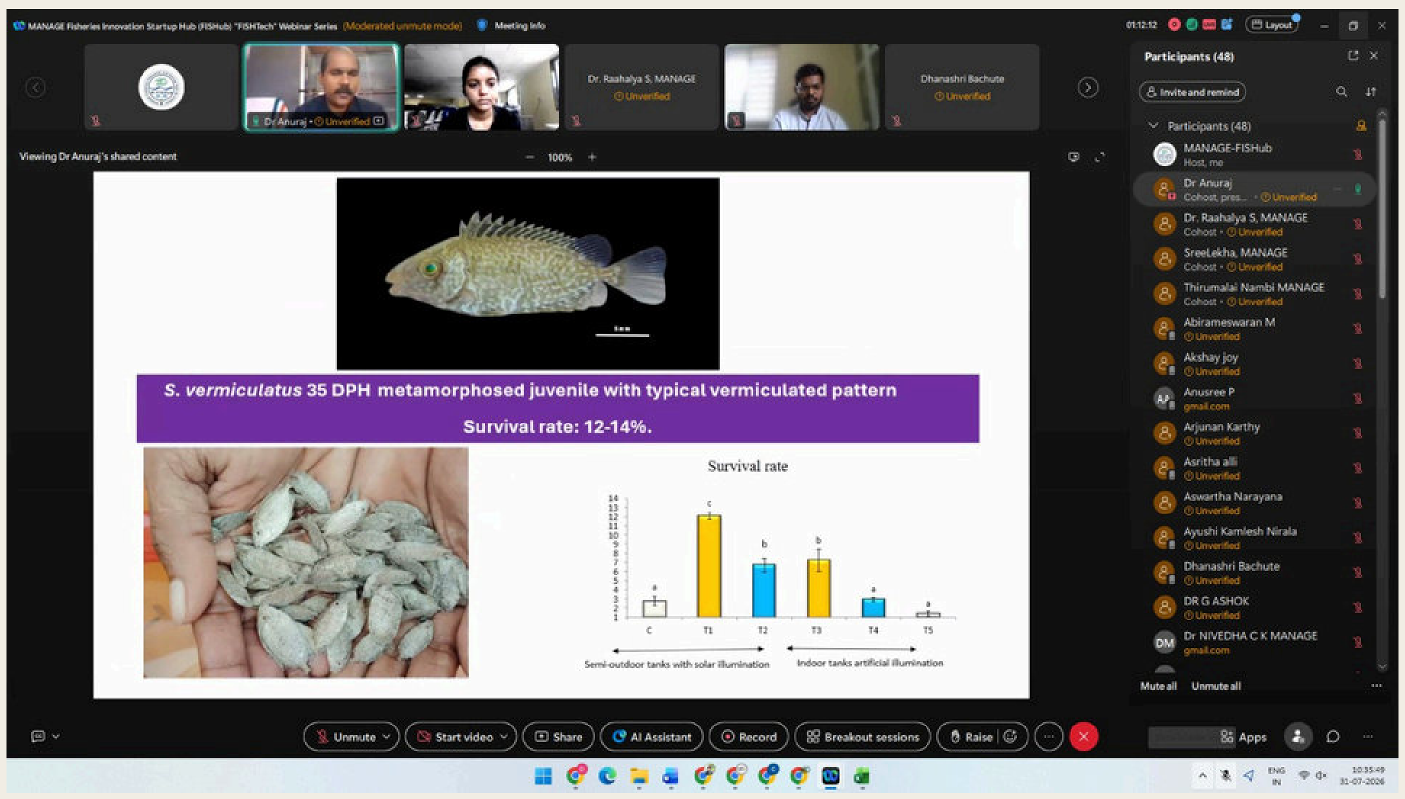


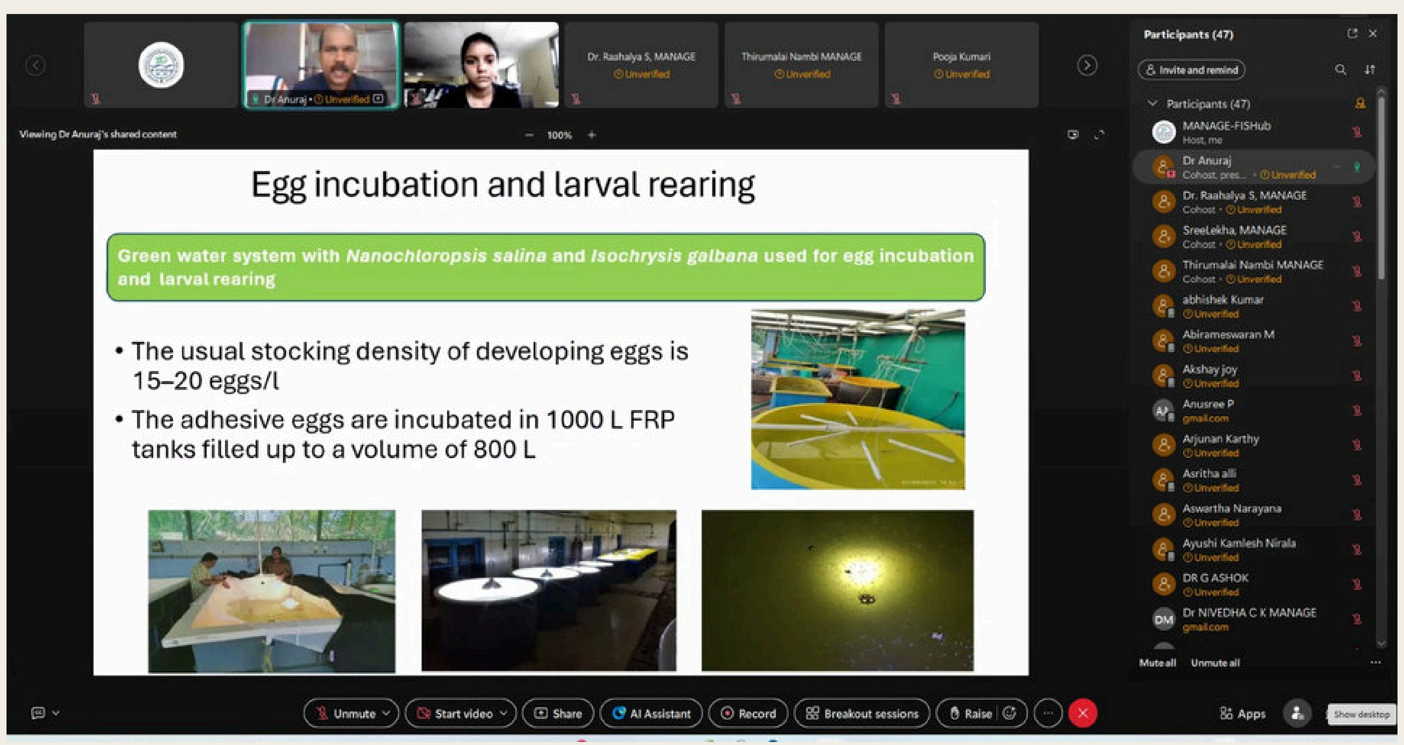
Appropriate maturation diets, supplemented with squid meat and nutritional enrichments, are provided to develop broodstock. Mature females can be identified through cannulation and microscopic examination of oocytes, while males can be selected based on milt quality.For induced spawning, hormones such as human chorionic gonadotropin (HCG) and luteinizing hormone-releasing hormone analogue (LHRHa) are administered at appropriate doses.
The speaker explained that *S. vermiculatus* exhibits a lunar spawning pattern and can be induced to spawn throughout the year under hatchery conditions.

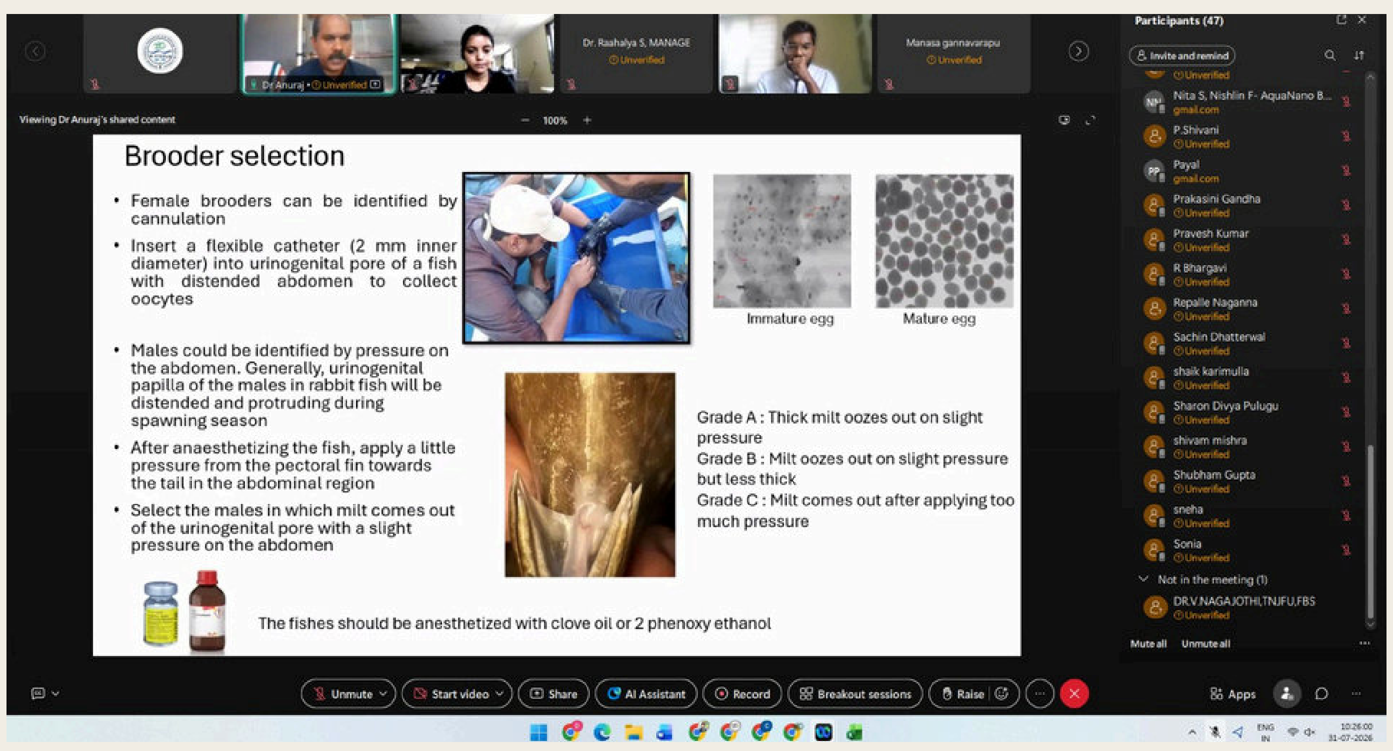
The session further covered egg incubation, larval rearing, live-feed management and nursery rearing. Since the species produces demersal adhesive eggs, tiles are used as suitable substrates for egg collection and incubation. Fertilized eggs exhibit high fertilization and hatching rates under suitable hatchery conditions. During the early larval stages, particular attention is required to live-feed size because of the small mouth gap of the larvae. Proper water exchange, bottom siphoning and feeding management are essential for reducing larval mortality. The developed protocol resulted in survival of approximately 12–14 per cent during larval rearing, while nursery rearing in tanks and cages achieved considerably higher survival rates.

The speaker concluded that the species, owing to its favourable biological traits, low feed requirements, culture adaptability, and market potential, offers promising opportunities for fish farmers, hatchery operators and aquapreneurs. The technology developed for broodstock management, induced breeding, larval rearing and nursery production provides a foundation for the wider adoption and commercial production of vermiculated spinefoot in India.









Q & A Session

Q1. What is the breeding season of *Siganus vermiculatus*?

Ans. The speaker explained that year-round breeding is possible under proper hatchery management, although spawning is closely associated with the lunar cycle, particularly around the full moon and first-quarter phase.

Q2. Can *Siganus vermiculatus* be reared in inland saline water?

Ans. The speaker explained that the species has potential for culture in inland saline waters, with better growth observed under relatively lower-salinity conditions, although further trials may be required.

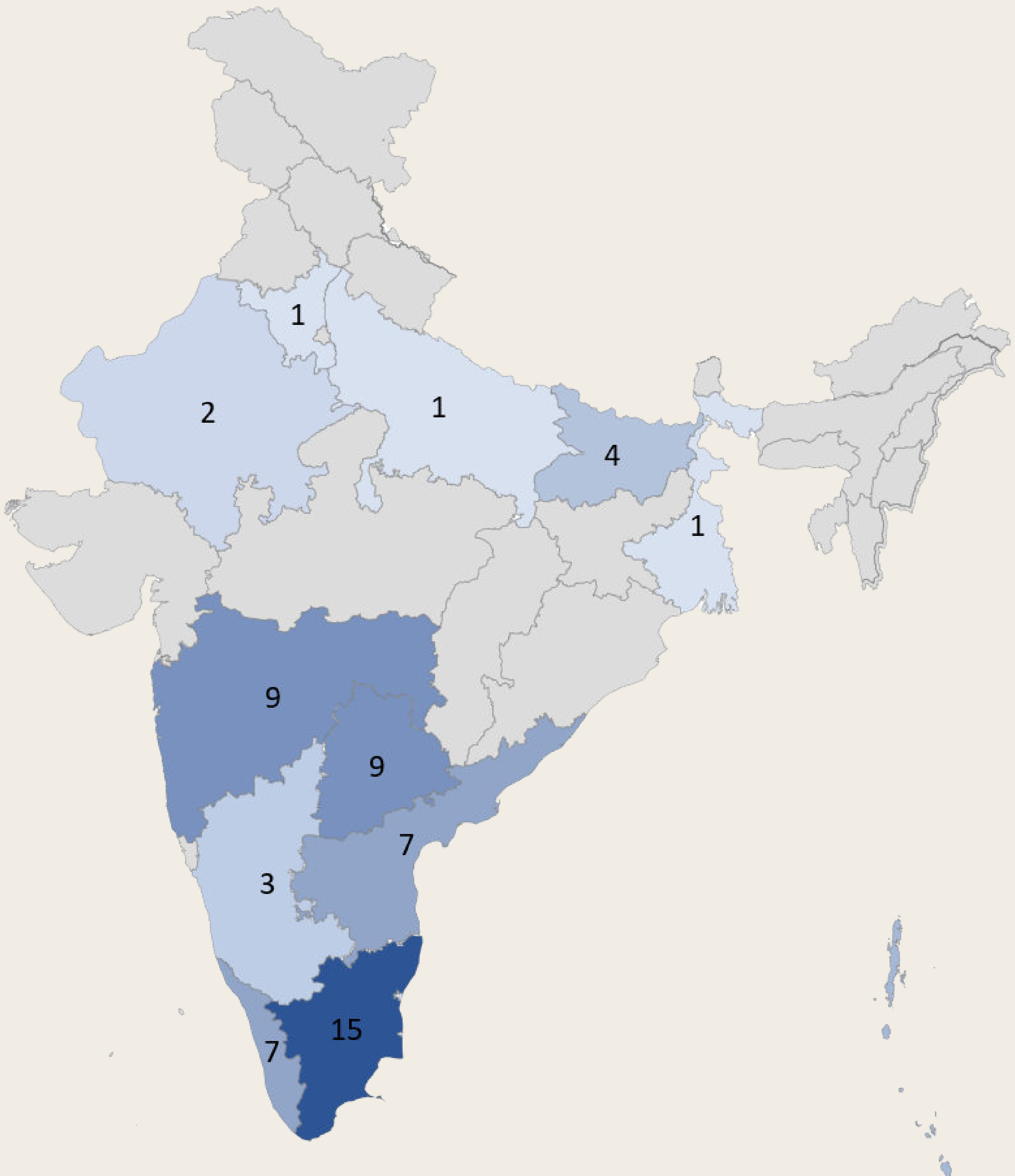
Q3. Have any trials been conducted in Maharashtra?

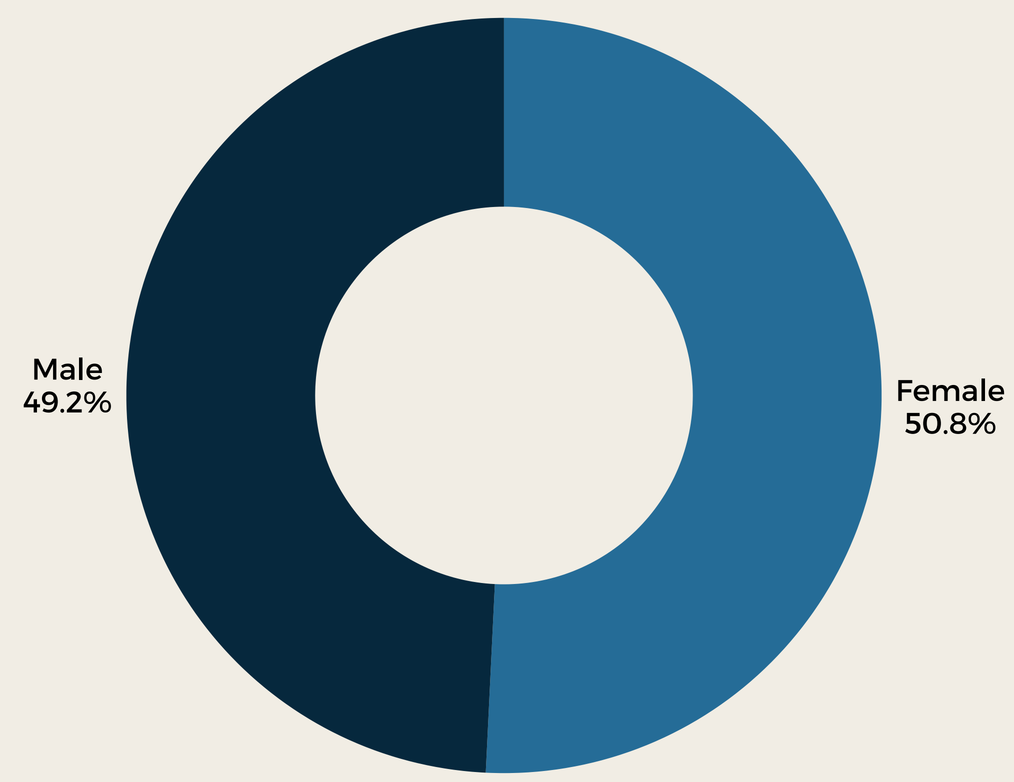
Ans. The speaker explained that trials had been conducted in Sindhudurg in collaboration with the Mangrove Foundation, with the initial broodstock sourced from the Ratnagiri coastal region under the All India Network Project on Mariculture.

Q4. What is the economic importance of *Siganus vermiculatus*?

Ans. The speaker explained that the fish fetches approximately ₹350–500 per kg at the farm-gate level in India and has considerable market demand in the Gulf and Southeast Asian countries, where it can command higher prices.

Participants Overview





Total Registrations-496
Attended Participants -65
(Male - 32; Female-33)

YouTube Video Link: https://www.youtube.com/watch?v=tC35VFvgSAY&list=PL4G41x3BKm6lUBmHoLiRlGoB_5Efxiaep&index=6&t=2s

11

Microalgae

Day - 11

AUG
03-08-2026

Microalgae culture Technology

Dr. Shoji Joseph
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shojicmfri@gmail.com

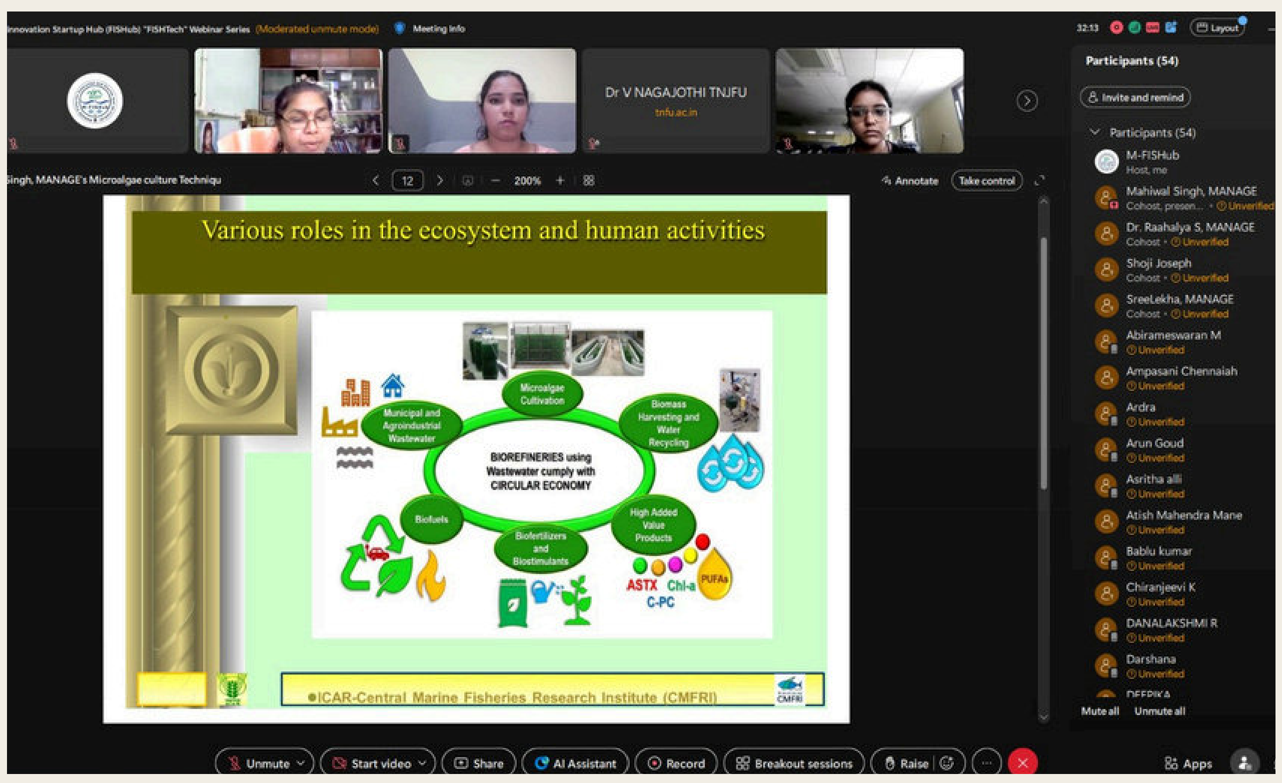
Dr. Shoji Joseph, delivered an informative session provided participants with practical insights into microalgae, particularly phytoplankton, and their significance in aquaculture and other emerging applications.

The speaker began the session by introducing microalgae and phytoplankton, explaining their diversity in terms of shape, size, and structure. She discussed how marine microalgae are predominantly unicellular organisms and serve as primary producers in aquatic ecosystems, forming the base of the marine food chain. She also highlighted their nutritional richness, particularly their protein content and diverse bioactive compounds, which makes them valuable as “single-cell proteins” and as potential sources of various value-added products.

Dr. Shoji Joseph further explained the importance and applications of microalgae in human nutrition, aquaculture, biofuel production, bioremediation, biofertilizers, and other industries. She discussed their ability to utilize carbon dioxide through photosynthesis and highlighted their potential role in carbon capture and environmental management. She also explained that microalgae can be cultivated using wastewaters and can serve as a relatively inexpensive source of protein and other valuable products.

A major part of the session focused on the role of microalgae in aquaculture. The speaker explained that microalgae are widely used as live feeds for bivalve molluscs, gastropods, echinoderms, crustaceans, and finfish larvae. She discussed how microalgae are also used as feed for zooplanktonic live feeds, which subsequently serve as food for fish and shrimp larvae.

The speaker then discussed the selection criteria for suitable microalgae for aquaculture, emphasizing nutritional value, non-toxicity, appropriate cell size, high production rate, reliability, and sustainability. She also discussed the nutritional importance of microalgae as sources of fatty acids, vitamins, minerals, pigments, and other bioactive compounds.

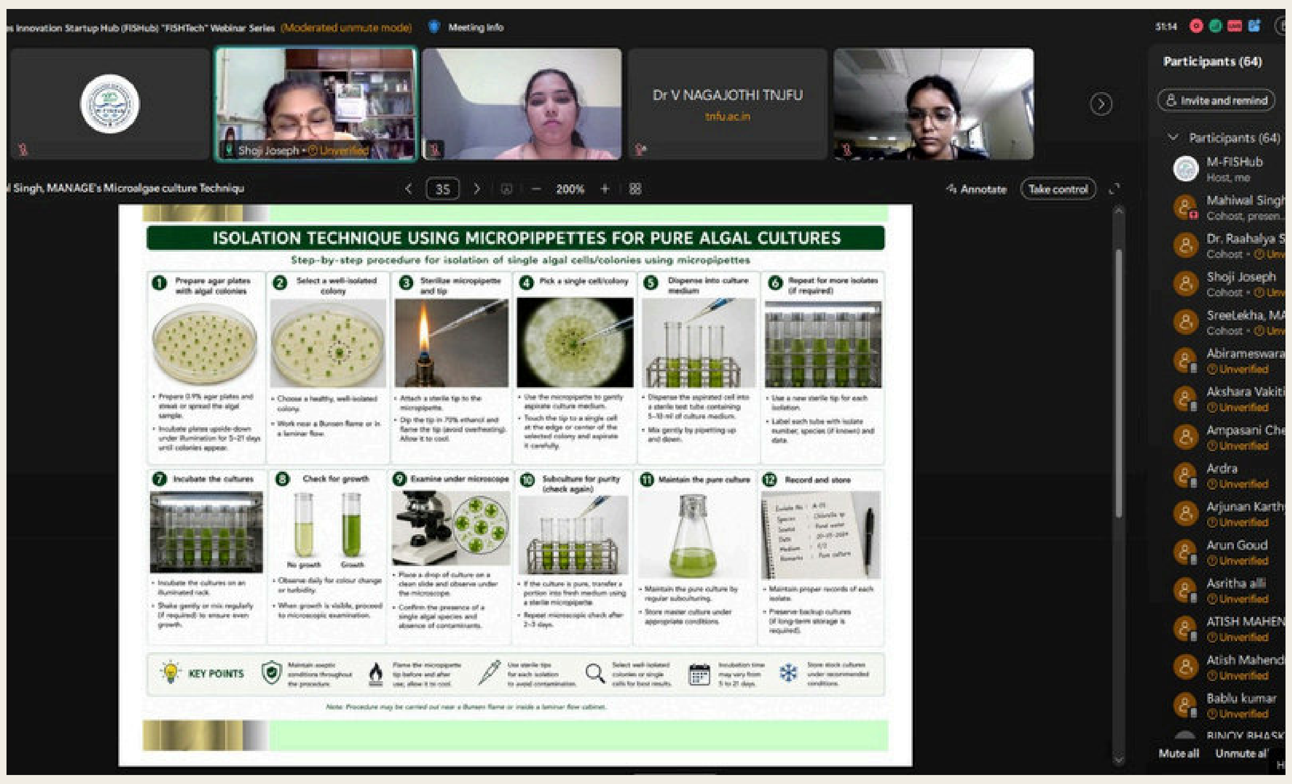


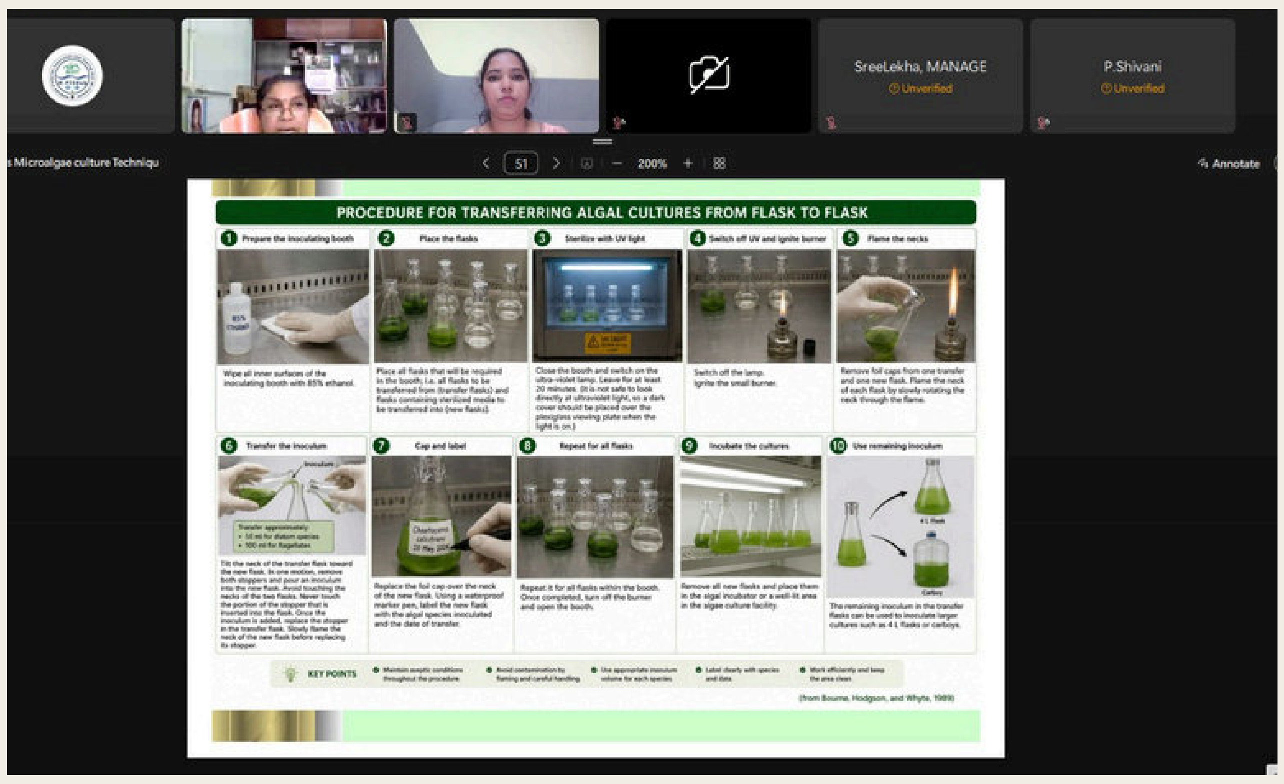
Moving towards the practical aspects, Dr. Shoji Joseph explained various microalgal isolation and purification techniques, including micropipette isolation, centrifugation or washing, phototactic isolation, agar plating, and serial dilution. She emphasized the importance of maintaining strict aseptic conditions throughout the isolation and culture process to prevent contamination.

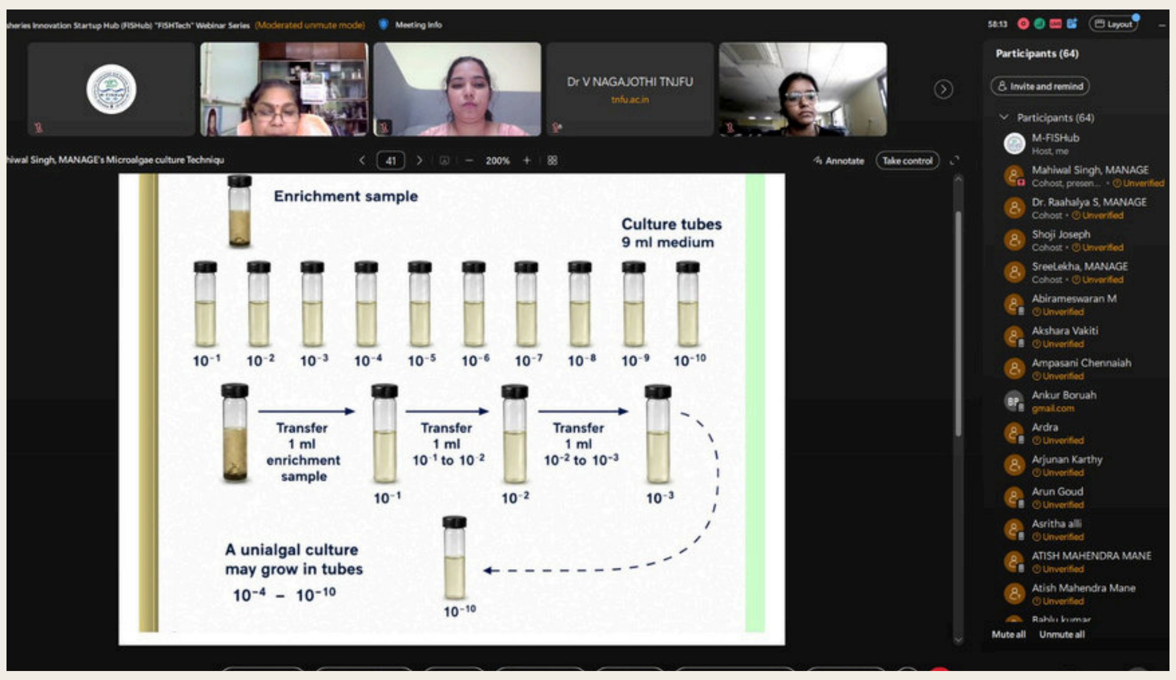
The speaker also explained the culture conditions required for successful microalgal production, including temperature, salinity, light intensity, photoperiod, pH, and nutrient availability. She discussed the use of enriched culture media, particularly F/2 medium, and explained the importance of maintaining appropriate environmental conditions according to the requirements of individual algal species.

Towards the conclusion, she explained the estimation of algal density using a haemocytometer, emphasizing the importance of determining cell concentration accurately for hatchery feeding and culture management. She also discussed the gradual scale-up of microalgal cultures, from small stock cultures and test tubes to conical flasks, larger vessels, and outdoor mass-culture systems.

The session provided participants with a comprehensive understanding of microalgae culture technology, its practical applications in aquaculture, culture and maintenance techniques, nutritional significance, and opportunities for large-scale production. The practical orientation of the session made it particularly useful for students, researchers, hatchery professionals, entrepreneurs, and other stakeholders interested in aquaculture and microalgal biotechnology.







Q & A Session

Q1. What are the alternative low-cost equipment or methods for farmers who cannot afford equipment such as a laminar flow cabinet, centrifuge, or refrigerator?

Ans: The speaker explained that expensive equipment is not always necessary for microalgal isolation. Farmers and entrepreneurs can use relatively simple methods such as agar plating and serial dilution, which can be carried out in their own laboratories with basic facilities. Agar plates can be prepared locally, and isolation can be performed through serial dilution techniques. The speaker emphasized that the more specialized equipment is required only on rare occasions.

Q2. Could you explain about Spirulina? Are laboratory-prepared Chlorella and Spirulina edible? Where can these cultures be obtained?

Ans: The speaker explained that Spirulina and Chlorella are used for edible purposes. She mentioned that the cultures maintained by CMFRI are available, and the institute maintains 22 species of microalgae. She also stated that the products are available from the institute for relevant purposes.

Q3. What are the major commercial applications of microalgae?

Ans: The speaker explained that one of the major commercial applications of microalgae is their use in aquaculture hatcheries, particularly for feeding shrimp larvae and fish hatchery organisms, as well as for culturing and enriching zooplankton. She further mentioned that microalgae are also produced on a mass scale for applications such as tablets, capsules, biodiesel, and bio-oil production.

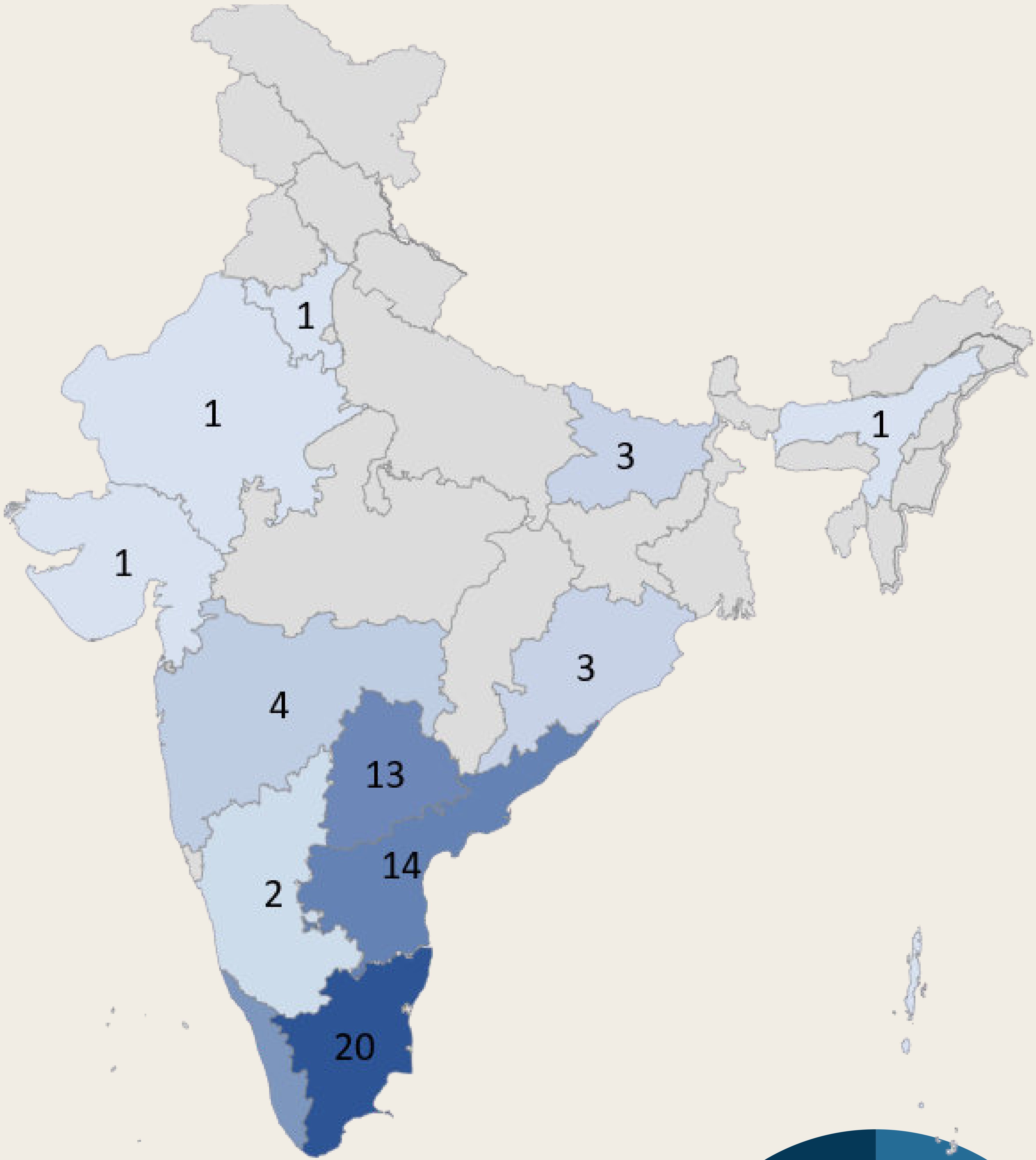
Q4. Where can culture media for microalgae be obtained? Are there any low-cost technologies or complete kits available for entrepreneurs?

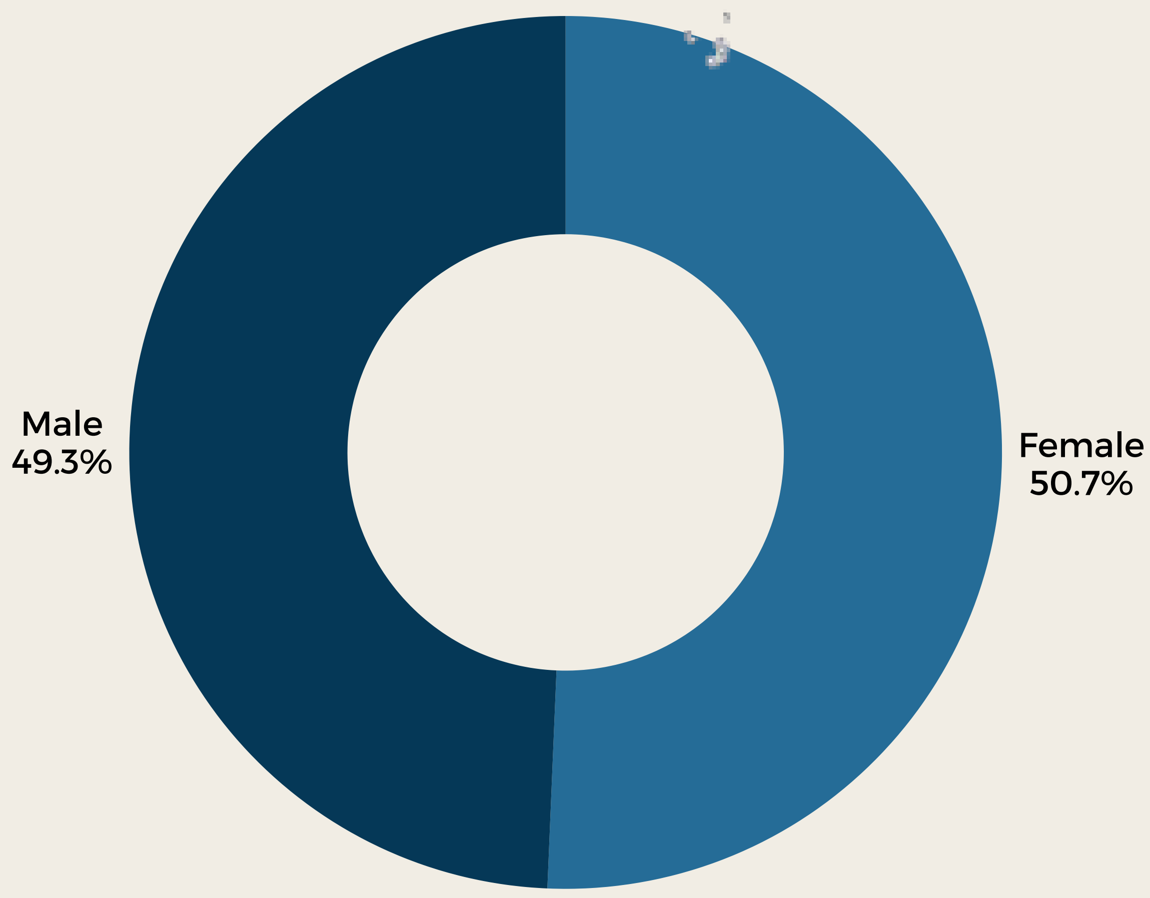
Ans: The speaker explained that microalgal culture media are commercially available, although the specialized media used for stock cultures may not be very inexpensive because they require minerals, vitamins, and other nutrients. For mass culture, comparatively simpler and cheaper media can be prepared using agricultural-grade chemicals such as urea and phosphate sources. She mentioned that CMFRI provides training on media preparation and algal culture techniques, although the institute primarily supplies algal cultures rather than ready-made media.

Q5. What is the role and objective of CMFRI in microalgal technology in India?

Ans: The speaker explained that microalgal research at CMFRI is primarily driven by the requirements of fisheries and aquaculture. Microalgae are required as feed for fish, bivalves, shrimp, and zooplankton. Therefore, CMFRI has isolated and maintained different microalgal species as stock cultures and uses them both for research and, importantly, for feeding organisms in hatchery systems.

Participants Overview





Total Registrations-540
Attended Participants - 75
(Male -37 ; Female-38)

YouTube Video Link: https://www.youtube.com/watch?v=DTSZ9FFr7Cs&list=PL4G41x3BKm6lUBmHoLiRlGoB_5Efxiaep&index=5&t=171s

12

Indian Pompano

Day - 12

AUG
04-08-2026

Nursery Rearing of Indian Pompano (Trachinotus mookalee) in Recirculating Aquaculture System (RAS)

Dr. Ritesh Ranjan
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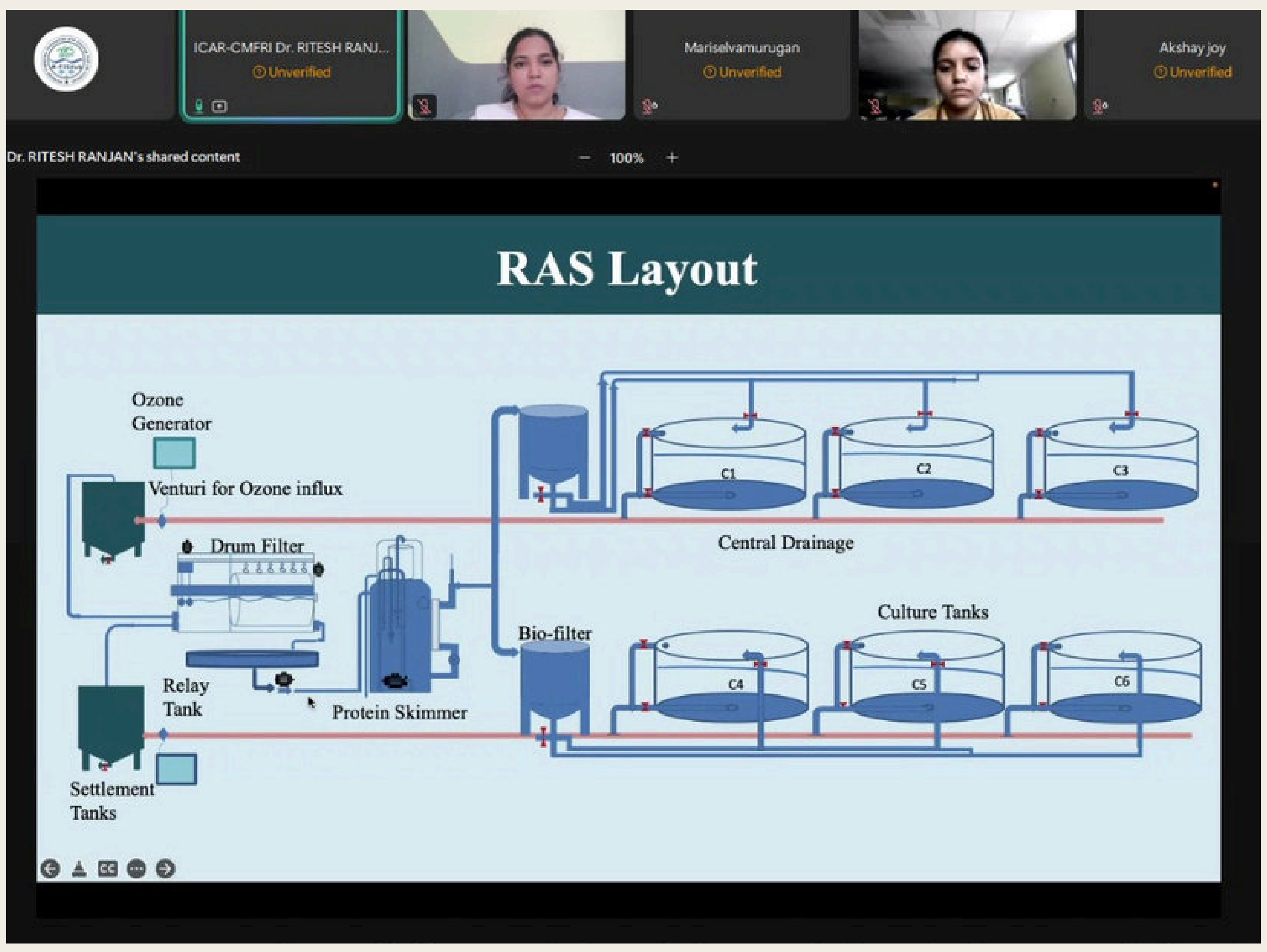
Dr. Ritesh Ranjan delivered an informative session that provided participants with detailed insights into the importance of Indian pompano, the functioning of RAS, nursery management practices, water quality management, feeding, grading, disease prevention, and the economic feasibility of the system.

The speaker began by explaining why Indian pompano was selected for nursery rearing in RAS. He highlighted that Indian pompano can accept artificial feed from the juvenile stage, can adapt to a wide range of salinities, grows rapidly, and has good market demand. He also explained that the species can be cultured in different systems, including cages, ponds, raceways, RAS, and biofloc systems. Therefore, developing a reliable and quality seed production and nursery rearing protocol is important for the expansion of Indian pompano culture.

Dr. Ranjan then discussed the importance of RAS for nursery rearing. He explained that conventional nursery systems require larger areas because of their lower stocking densities, whereas RAS allows higher stocking densities while maintaining good water quality. He highlighted that RAS can provide better growth, survival, seed quality, feed efficiency, and reduced water consumption compared with conventional and flow-through systems. He explained that RAS is essentially a closed-loop system, in which water is continuously treated, reconditioned, and pumped back into the culture tanks, creating a controlled environment for fish growth.

Dr. Ranjan further explained the major components of the RAS. The system consisted of six five-tonne culture tanks connected to filtration and water-treatment components. The system included a settlement tank, drum filter, protein skimmer, UV sterilization, biological filter, oxygen enrichment, and ozone treatment.



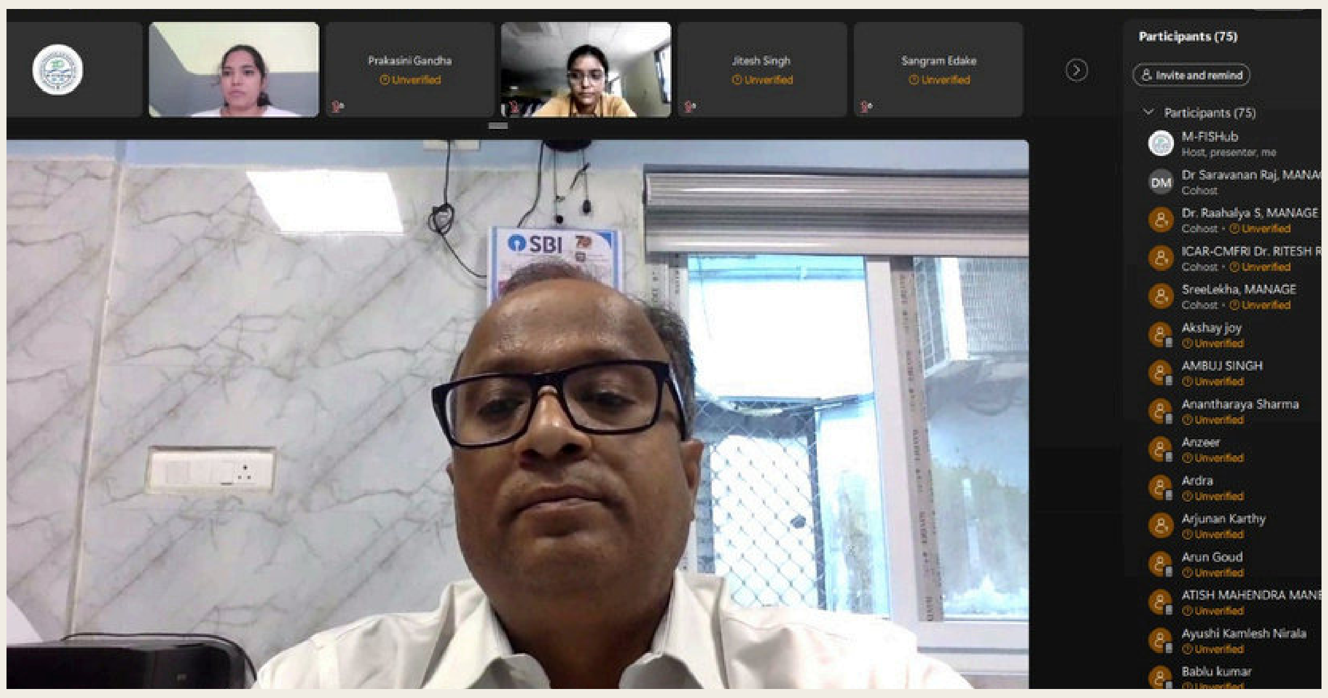
Challenges associated with RAS technology

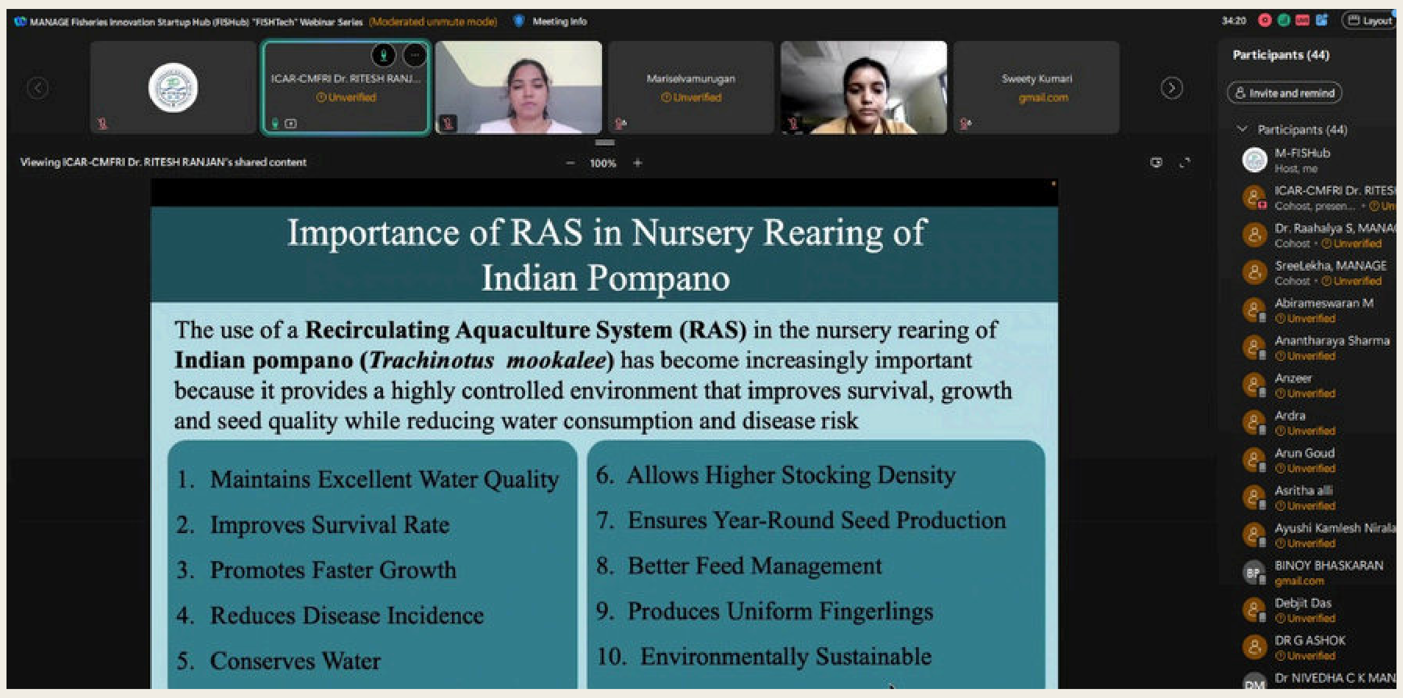
- High capital cost
- High eneregy consumption
- Requirement of skilled man power

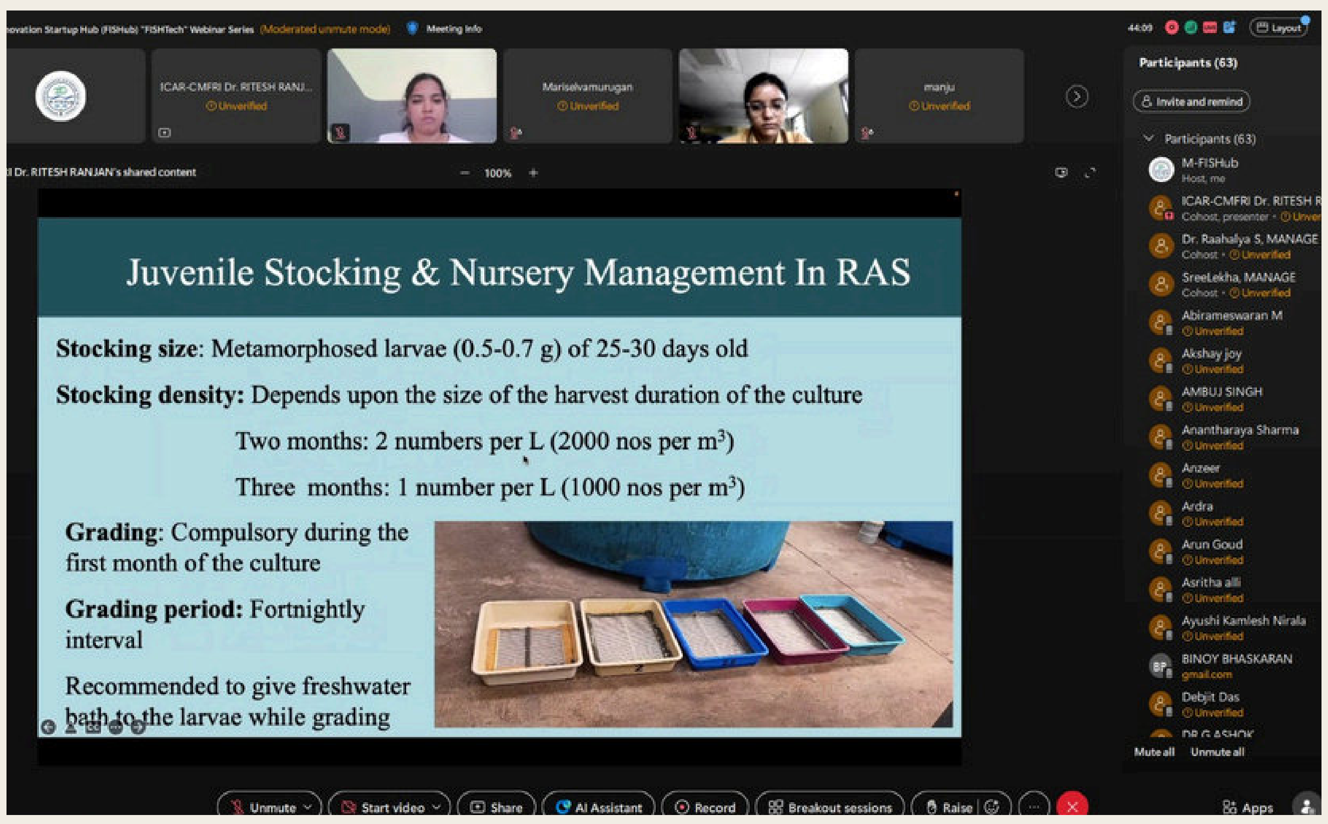
The speaker then discussed the standardized stocking density and production protocol. He explained that the system had a total capacity of 30 cubic metres and could accommodate approximately 30,000 to 60,000 fingerlings, depending on the intended culture period. He highlighted that the system achieved more than 90% survival, an FCR of approximately 1.36, and a biomass holding capacity exceeding 24–25 kg per cubic metre under the standardized protocol. A major focus of the session was on stocking, grading, and feed management. Dr. Ranjan explained that similarly sized fish should be stocked together because Indian pompano is cannibalistic.

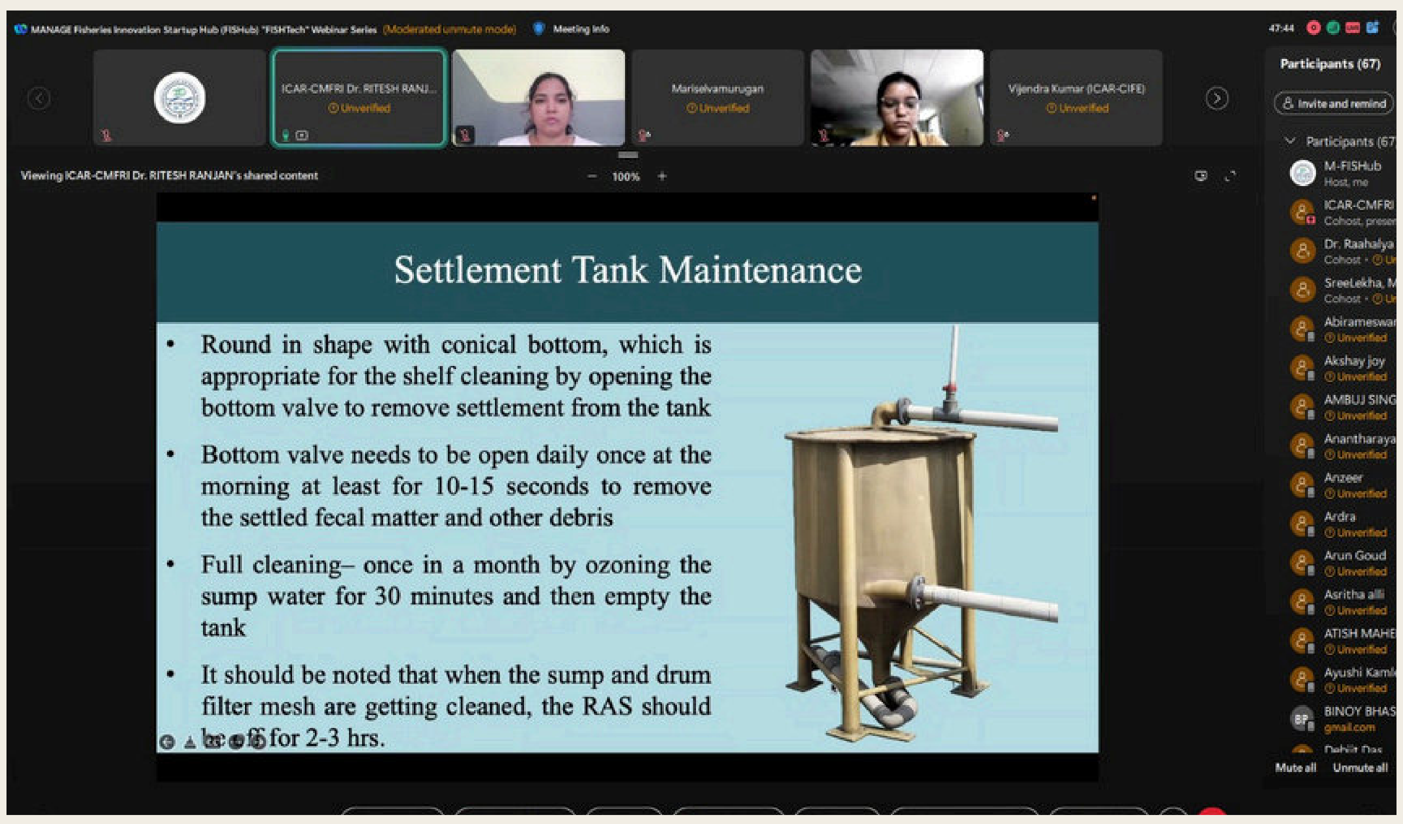
Dr. Ranjan further emphasized the importance of light management, ozone treatment, biosecurity, and disease prevention. He explained that Indian pompano is sensitive to sudden changes in light and may exhibit jumping behaviour when exposed to abrupt light stimuli. Therefore, gradual dimming and brightening of lights, tank covering, and adequate freeboard were recommended. He also explained that ozone can improve water clarity, help remove organic matter, and reduce microbial loads, but must be carefully controlled because excessive ozone can be harmful to fish.

The session concluded with an overview of the investment, production costs, returns, and economic feasibility of the RAS nursery system. He highlighted that the system demonstrated favourable economic indicators, including a benefit-cost ratio of approximately 1:1.12, a payback period of less than one and a half years, and a return on investment of about 75.88% under the conditions presented.









Q & A Session

Q1. Is a protein skimmer necessary for every aquarium?

Ans: The speaker explained that the requirement depends mainly on the stocking density and type of system. Protein skimmers are particularly important in marine systems with higher salinity and high fish stocking densities, such as public aquariums, because high-protein feeds generate considerable organic waste. However, for a small household aquarium of around 100 litres containing only a few fish, a protein skimmer may not be necessary, and a sponge filter may be sufficient.

Q2. Can nursery rearing of Indian pompano be carried out in biofloc systems instead of RAS?

Ans: The speaker explained that nursery rearing can also be carried out in biofloc systems, but the stocking density achievable may not be as high as that achieved in the RAS system. The RAS system discussed during the webinar could achieve approximately 24–25 kg biomass per cubic metre, whereas similar stocking levels may not be achievable in biofloc systems.

Q3. What type of feed is recommended for Indian pompano larvae during nursery rearing?

Ans:The speaker explained that feed size should be gradually increased according to fish growth, ranging approximately from 0.3 mm to 1.8 mm, while the protein content may be reduced from around 52% to 40% as the fish grow. He emphasized that better-quality feed results in better growth and performance.

Q4. Why does dissolved oxygen decrease after feeding?

Ans: The speaker explained that feeding increases the activity and metabolic requirements of the fish. During active feeding and digestion, fish require more oxygen, resulting in a temporary reduction in dissolved oxygen levels in the culture tank. Therefore, DO should be monitored carefully, particularly after feeding.

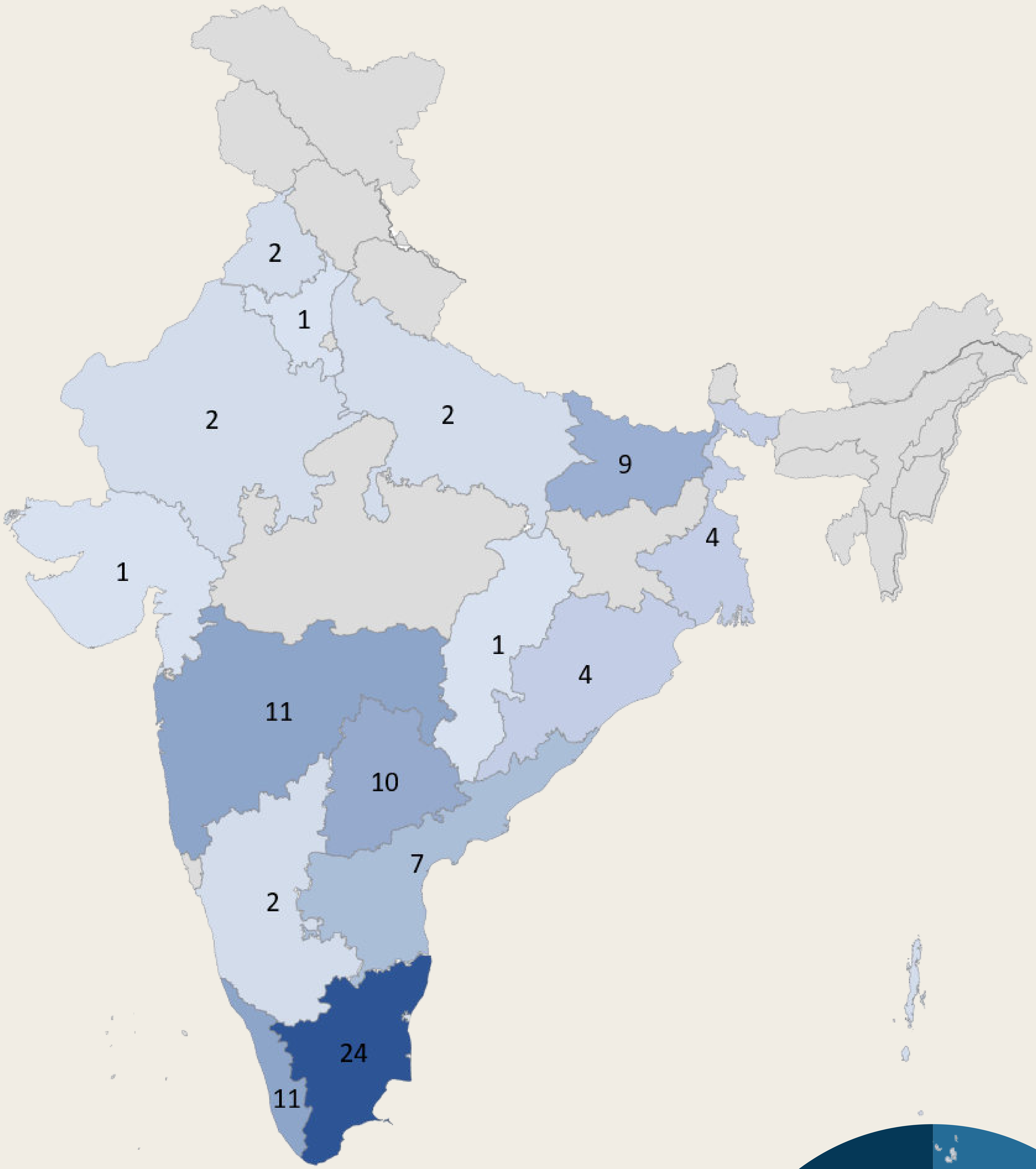
Q5. How can the lipid requirement of broodstock and nursery fish be determined?

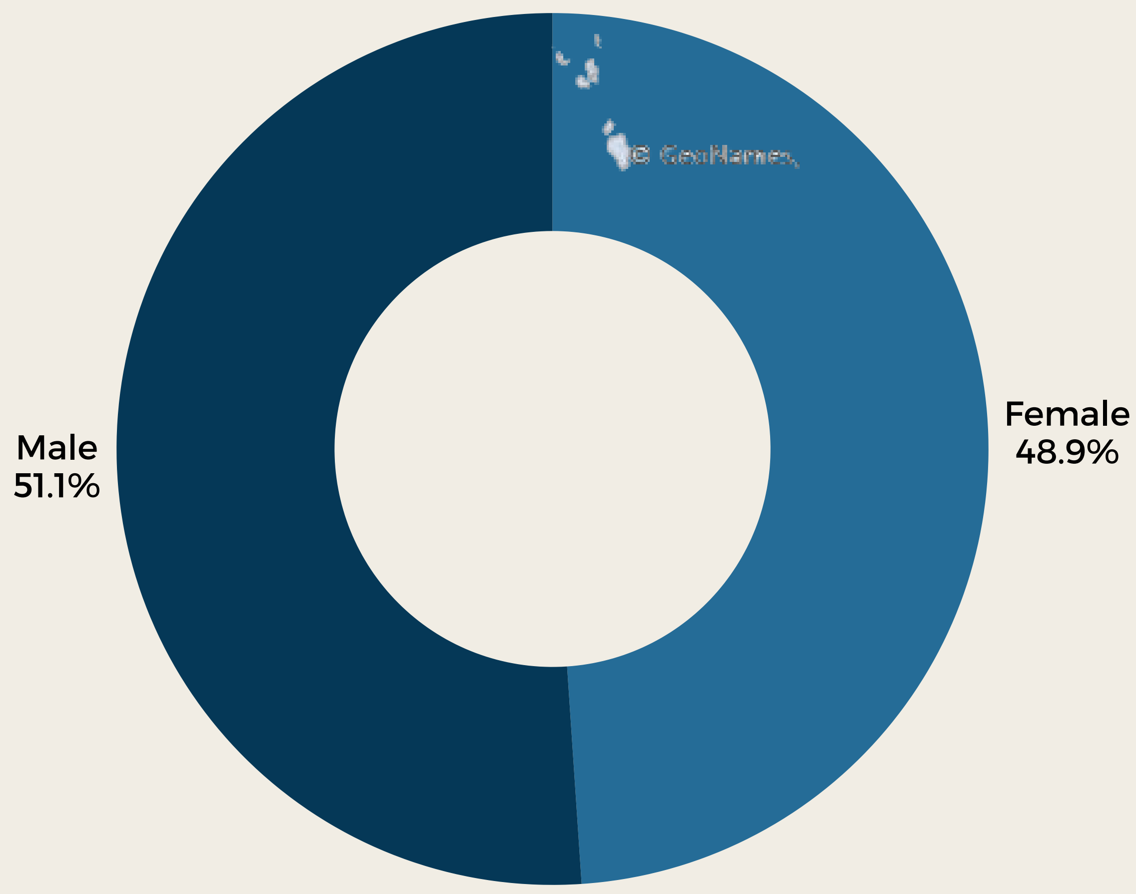
Ans: The speaker explained that lipid requirements need to be determined through experimental trials involving different levels and combinations of dietary oils. For broodstock, lipid levels can be evaluated by examining factors such as gonad development, body condition, and egg and larval performance. He shared an example where reducing oil supplementation affected larval survival despite successful spawning. For nursery fish, feeding response and growth can be compared under different dietary lipid levels to identify the most suitable formulation.

Q6. What material is used for the drum-filter mesh?

Ans: The speaker recommended using SS 316 mesh for the drum filter. The mesh may need to be replaced periodically, approximately every two to three months, depending on its condition.

Participants Overview





Total Registrations-527
Attended Participants -94
(Male -48 ; Female-46)

YouTube Video Link: https://www.youtube.com/watch?v=_nPjAv7MVm0&list=PL4G41x3BKm6lUBmHoLiRlGoB_5Efxiaep&index=4&t=168s

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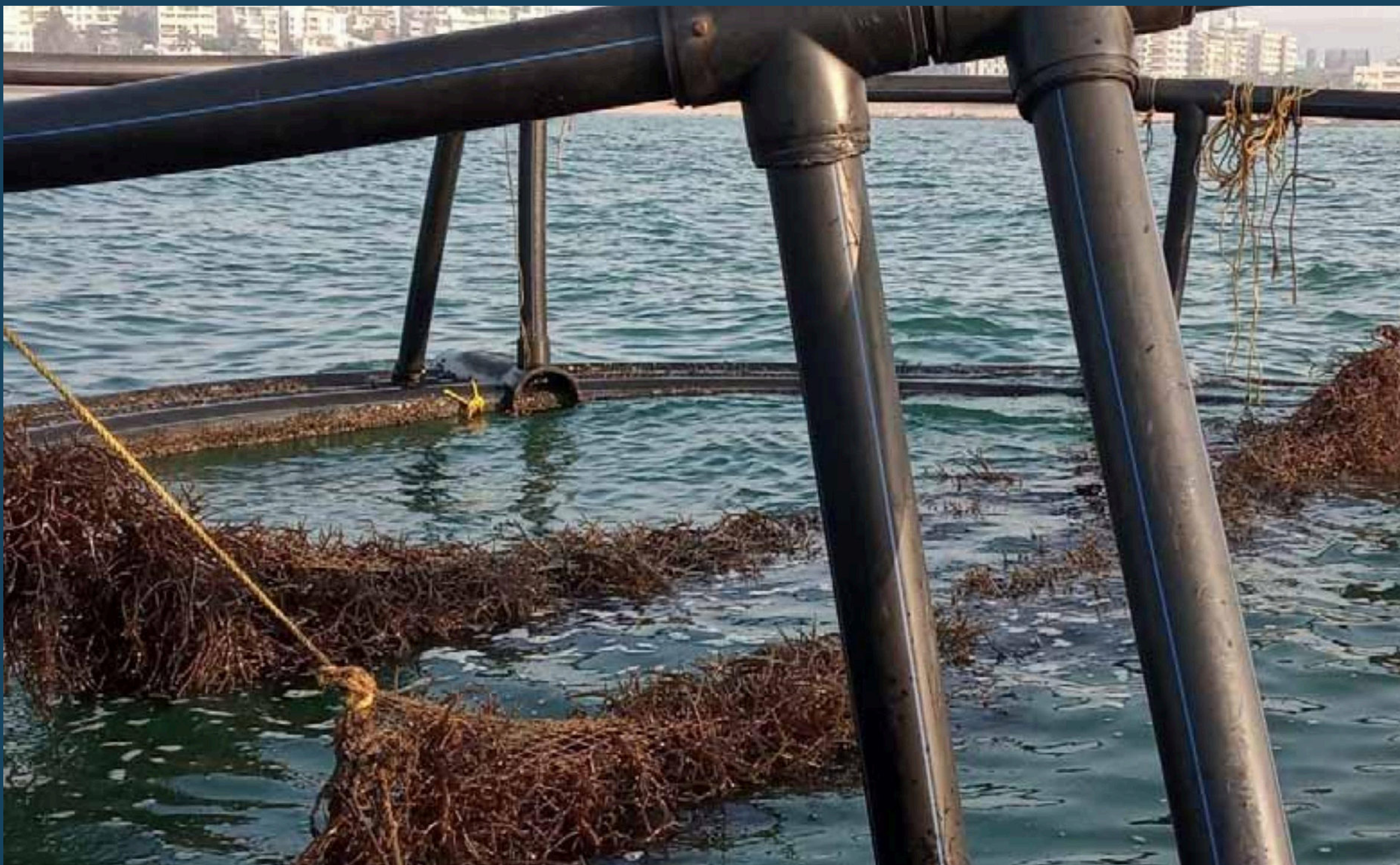

Seaweed Farming

Day - 13

AUG
05-08-2026

Tube-Net Based Seaweed Farming on HDPE Floating Rafts for Rough Coastal Waters

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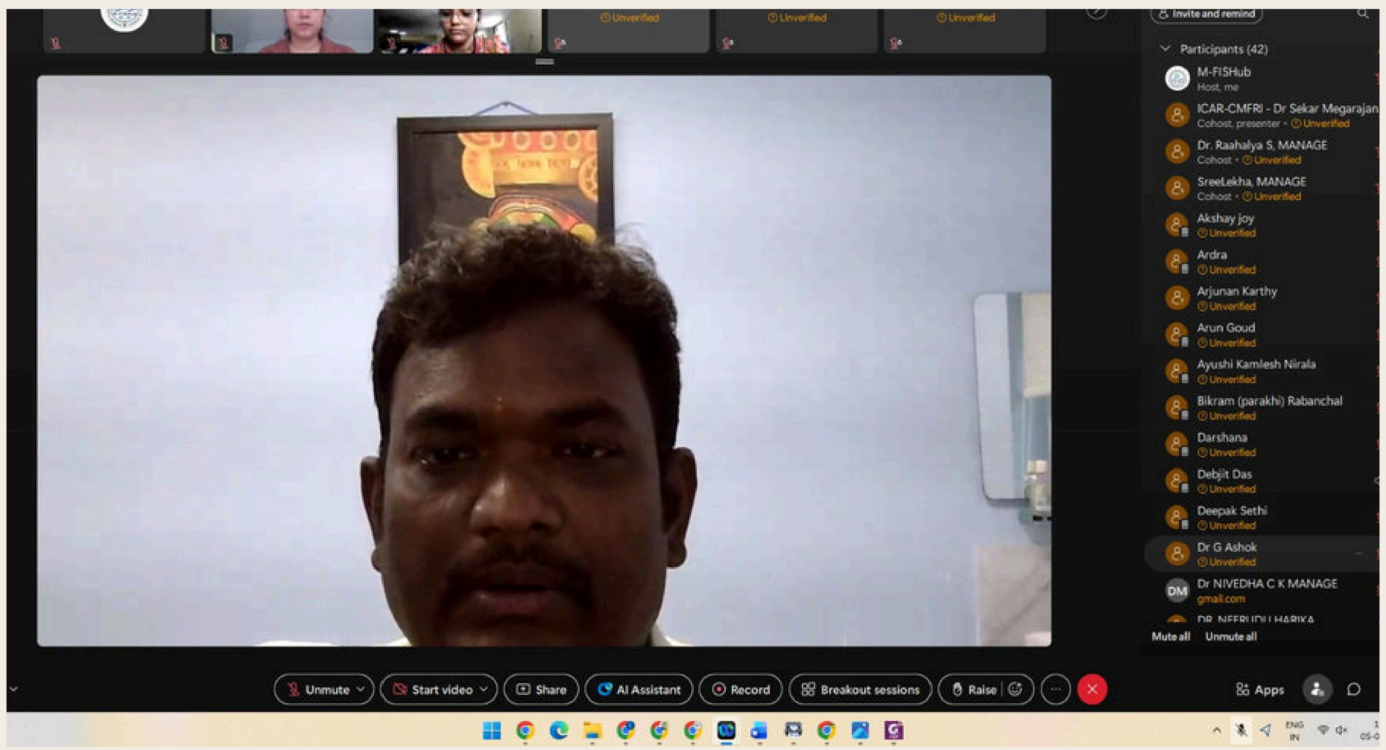
The session by Dr. Sekar Megarajan focused on the need for developing seaweed farming technologies suitable for exposed and rough coastal waters, where conventional farming systems are largely unsuitable.

The speaker began by highlighting the importance and commercial potential of seaweed. Seaweeds are nutrient-rich marine plants containing vitamins, minerals, amino acids and other essential nutrients, with applications in human nutrition, animal nutrition, healthcare, pharmaceuticals, agriculture, cosmetics, food industries and biotechnology. He also discussed important seaweed-derived products such as agar, carrageenan and alginate, emphasizing the growing demand and the scope for expanding seaweed production in India. The speaker explained that although India possesses a large coastline and several areas suitable for seaweed farming, commercial cultivation remains concentrated mainly in shallow and protected waters. Existing methods are not well suited to exposed areas with high wave action and greater water depths. This limitation motivated the development of the HDPE floating raft integrated with a tube-net system, particularly for rough coastal and nearshore waters.

A major highlight of the session was the explanation of the HDPE floating raft system. The raft is constructed using high-density polyethylene (HDPE) pipes in a square structure of approximately 3 × 3 m. Tube nets are attached to the raft to protect the seaweed during the early growth stage from damage caused by turbulence and strong wave action. The tube-net system is prepared using readily available net material and ropes, making it relatively simple and reusable. A strong mooring system with suitable anchors and chains is used to stabilize the raft in deeper waters.

Dr. Megarajan explained that the technology was evaluated under rough coastal conditions and higher water depths, unlike conventional systems generally used in shallow waters. The HDPE structure provides greater durability and flexibility under dynamic sea conditions.

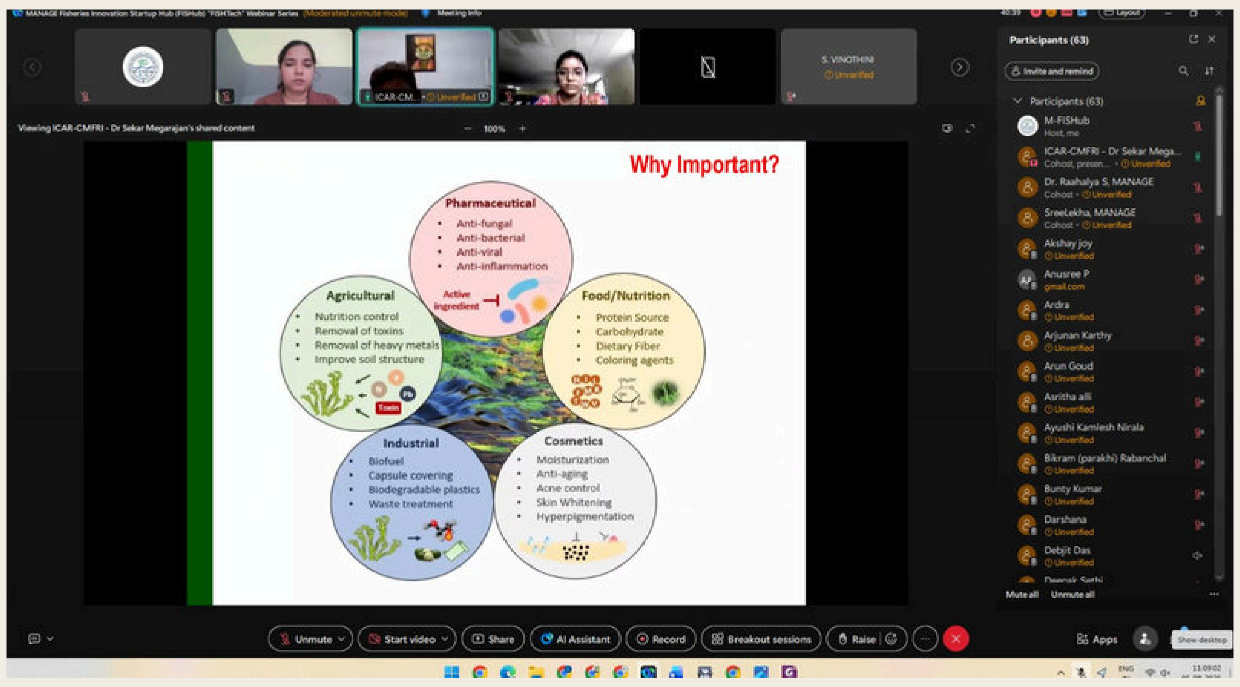


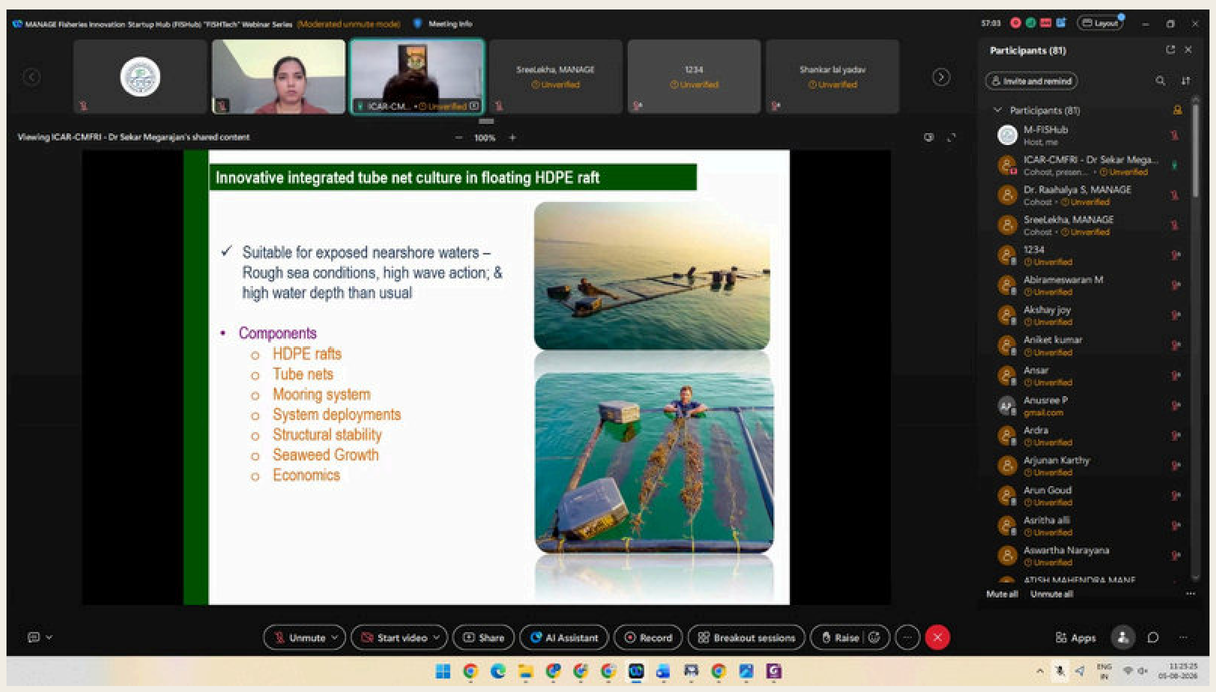
Proper deployment, mooring, periodic inspection, removal of fouling organisms, checking of ropes and maintenance of the raft were emphasized as essential for maintaining structural stability and preventing system failure.

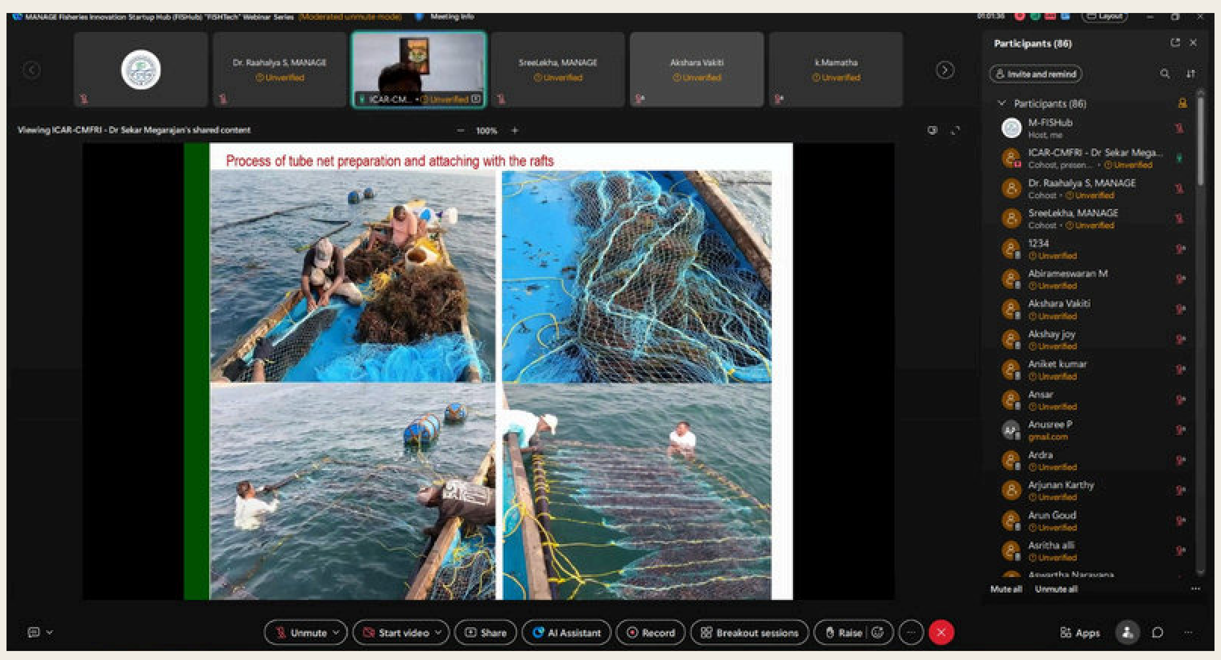
The session also highlighted the growth performance and economic potential of the technology. The seaweed demonstrated an average daily growth rate of approximately 4–4.5%, with a culture cycle of around 45 days under the demonstrated conditions. The speaker discussed the potential production and income from a larger raft-based farming unit, indicating the scope for generating livelihood opportunities through seaweed farming in suitable coastal areas.

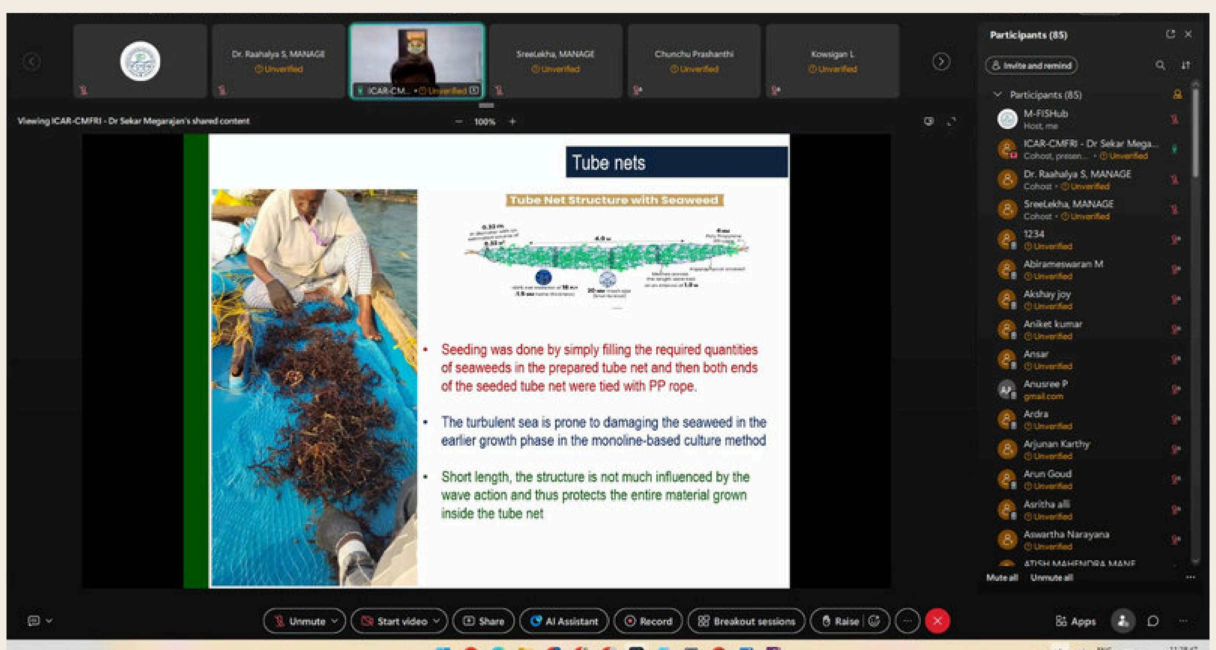
Dr. Megarajan further discussed the commercialization and dissemination of the technology, including its potential for community-based farming and participation of coastal communities and fisher groups. He highlighted the importance of government support, credit, insurance, market linkages, quality planting material, value addition and policy support for expanding seaweed cultivation.

The session concluded with a discussion on the challenges and future strategies for seaweed farming. Key challenges include the relatively high investment and operational costs of HDPE raft systems, dependence on boats for deployment and maintenance, limited awareness among coastal communities, low returns compared with some competing aquaculture activities, inadequate market linkages and the need for quality seed material. The speaker emphasized that value addition, improved market development, genetic improvement of suitable seaweed varieties, insurance and institutional support can strengthen the sector.









Q & A Session

Q1. Has the seaweed cultivated in Andhra Pradesh been profiled for its suitability for human consumption?

Ans: The speaker explained that detailed profiling for edible use has not yet been carried out. However, a firm from Hyderabad had approached the institute with an interest in using seaweed as an edible ingredient. Five different seaweed species, including green and red seaweeds, were provided to the firm for testing different combinations and assessing their suitability and consumer acceptance. Based on the feedback, suitable species may be further explored for edible applications.

Q2. Has CMFRI developed tissue culture technology for seaweeds?

Ans: The speaker stated that work on tissue culture of seaweeds has been initiated, with related work also being undertaken by other institutions. However, the technology has not yet been commercially established.

Q3. Has CMFRI developed technology for cultivating seaweed under controlled conditions in hatcheries?

Ans: The speaker explained that seaweed cultivation has been attempted in tanks, including FRP tanks. However, he emphasized that the technology should ultimately provide economic returns. Cultivating seaweed in small tanks or ponds may not always be economically viable because of the investment required. Since large marine areas are naturally available and underutilized, the focus is on developing technologies that can effectively utilize these available areas for commercial seaweed farming.

Q4. Are all seaweeds edible for human consumption?

Ans: The speaker clarified that not all seaweed species are intended for human consumption. He had presented specific edible seaweed species during the webinar and indicated that only selected species have potential for food applications.

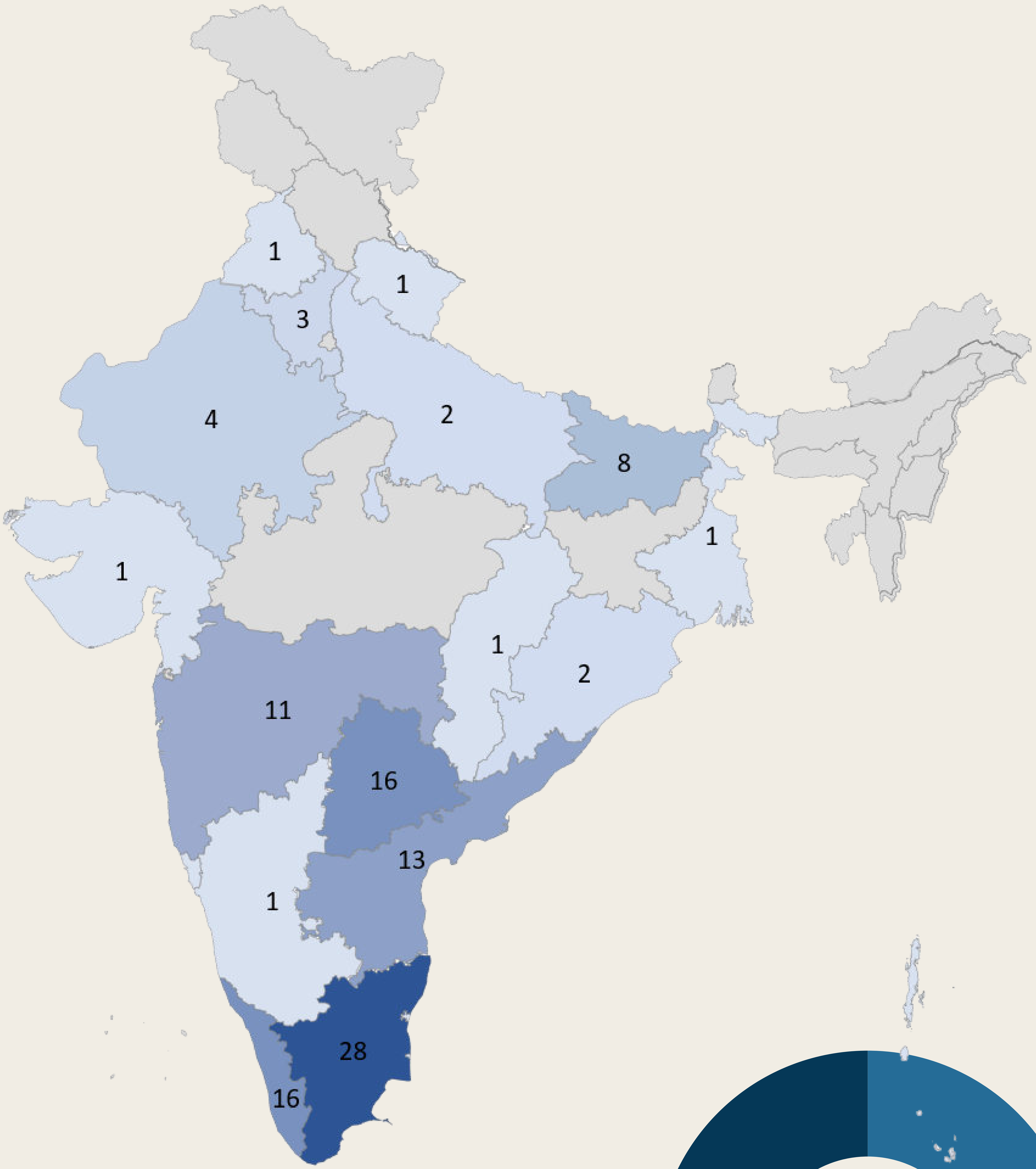
Q5. Can seaweed be cultured using artificial seawater? Is there any difference in growth compared with natural seawater?

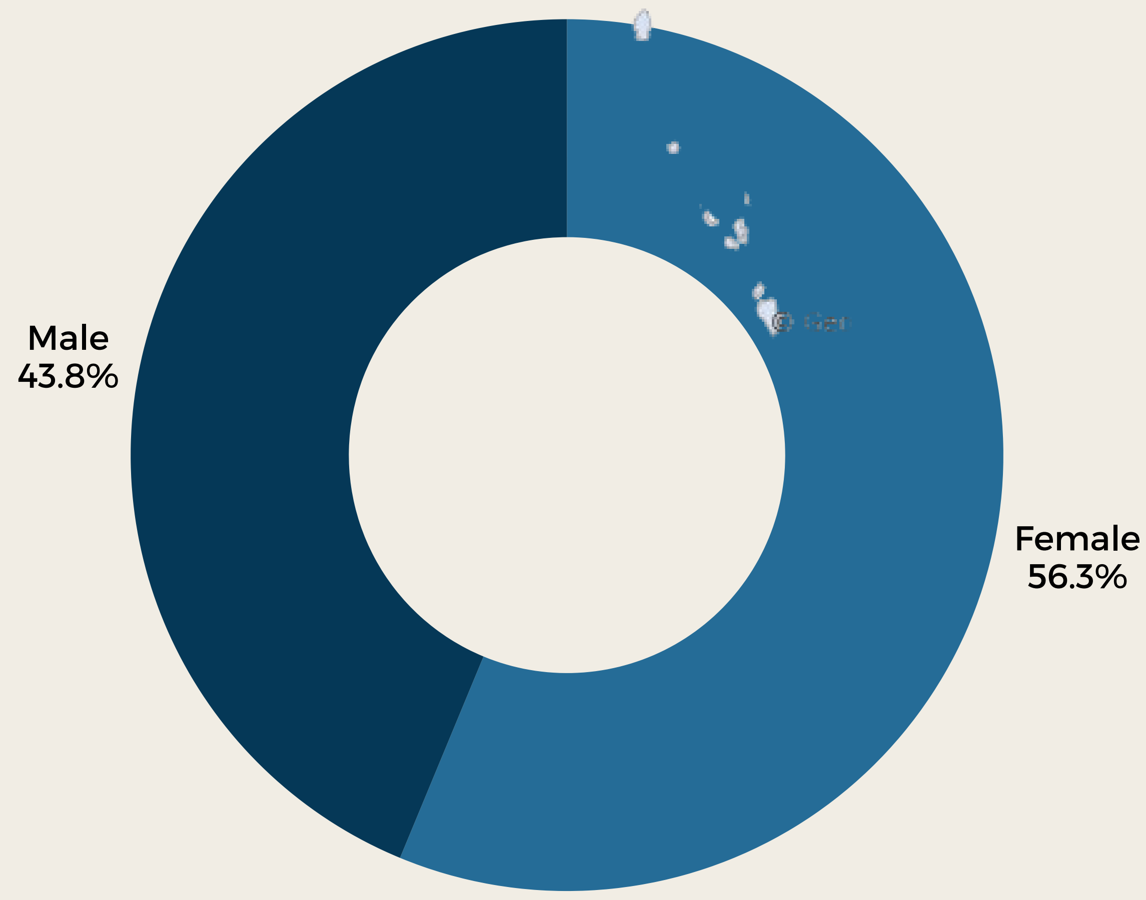
Ans: The speaker stated that seaweed can be cultured using artificial seawater, but this approach is mainly suitable for experimental or laboratory purposes. For commercial-scale farming, the use of artificial seawater is not advisable, primarily because of the requirement and cost associated with preparing the medium. Therefore, natural seawater is more appropriate for commercial cultivation.

Q6. Why is brown seaweed extract commonly used in commercial applications?

Ans: The speaker explained that brown seaweeds are commercially cultured and widely utilized, which has contributed to their greater use in commercial seaweed-based products. However, he also indicated that other seaweed groups may have potential for different applications and can be explored further.

Participants Overview





Total Registrations-532
Attended Participants - 112
(Male -49 ; Female-63)

YouTube Video Link: https://www.youtube.com/watch?v=SwrAbl4wk6M&list=PL4G41x3BKm6lUBmHoLiRlGoB_5Efxiaep&index=3&t=160s

14

Integrated Multi Trophic Aquaculture

Day - 14

AUG
06-08-2026

Integrated Multi Trophic Aquaculture (IMTA)

Dr. Johnson B
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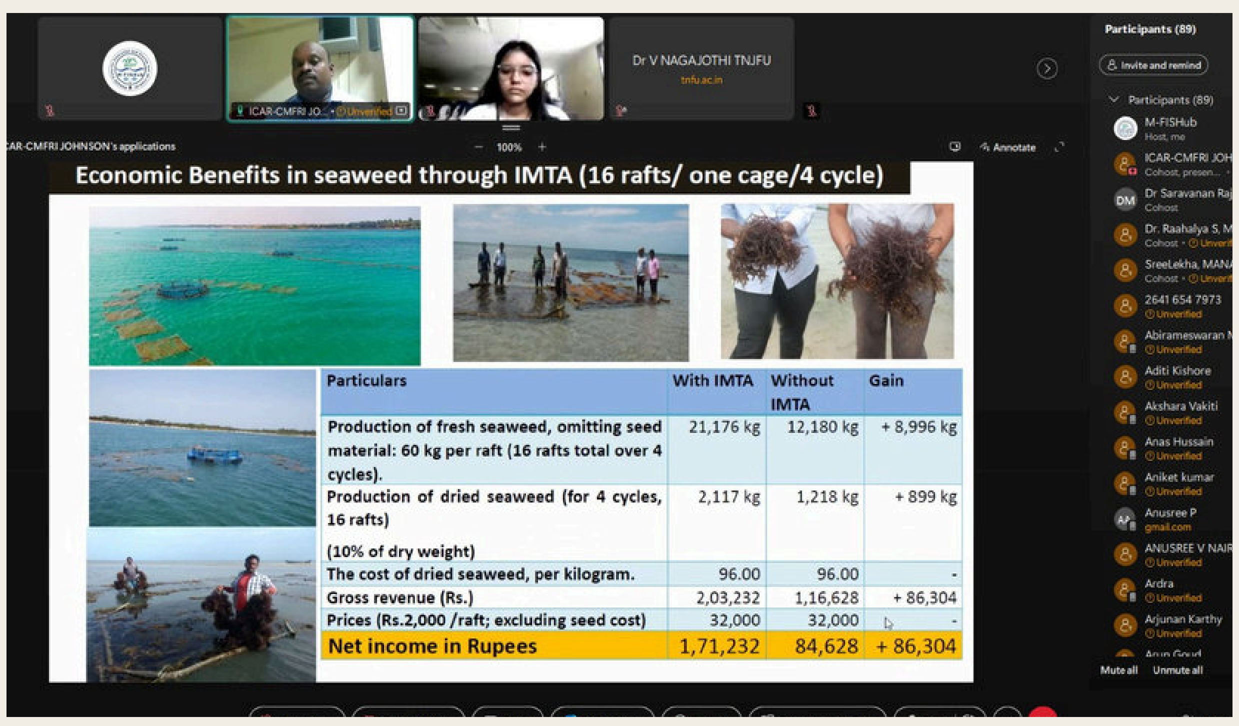
Dr. Johnson delivered a session focused on the emerging and sustainable aquaculture approach of Integrated Multi-Trophic Aquaculture (IMTA), providing an overview of IMTA as a sustainable production system that recycles nutrients within the aquaculture environment

Dr. Johnson highlighted the growing importance of aquaculture and mariculture in meeting the increasing demand for food and nutritional security, particularly in the context of shrinking agricultural land and rising demand for animal protein. He emphasized that India's extensive coastline offers significant potential for sustainable marine food production.

The speaker explained the three major components of IMTA: fed species, such as finfish, shrimp and lobster; extractive species, including shellfish such as mussels, oysters and clams; and seaweeds, which absorb dissolved inorganic nutrients. Uneaten feed and fish excreta are utilized by shellfish and seaweeds, thereby promoting nutrient recycling, improving water quality and reducing environmental pollution.

The speaker elaborated on the environmental, economic and social benefits of IMTA, including reduced nutrient pollution, improved water quality, enhanced biodiversity, diversified production, additional income generation, employment opportunities and improved coastal livelihoods.

The distinction between polyculture and IMTA was also explained, highlighting that IMTA specifically integrates species occupying different trophic levels to utilize and recycle waste nutrients.

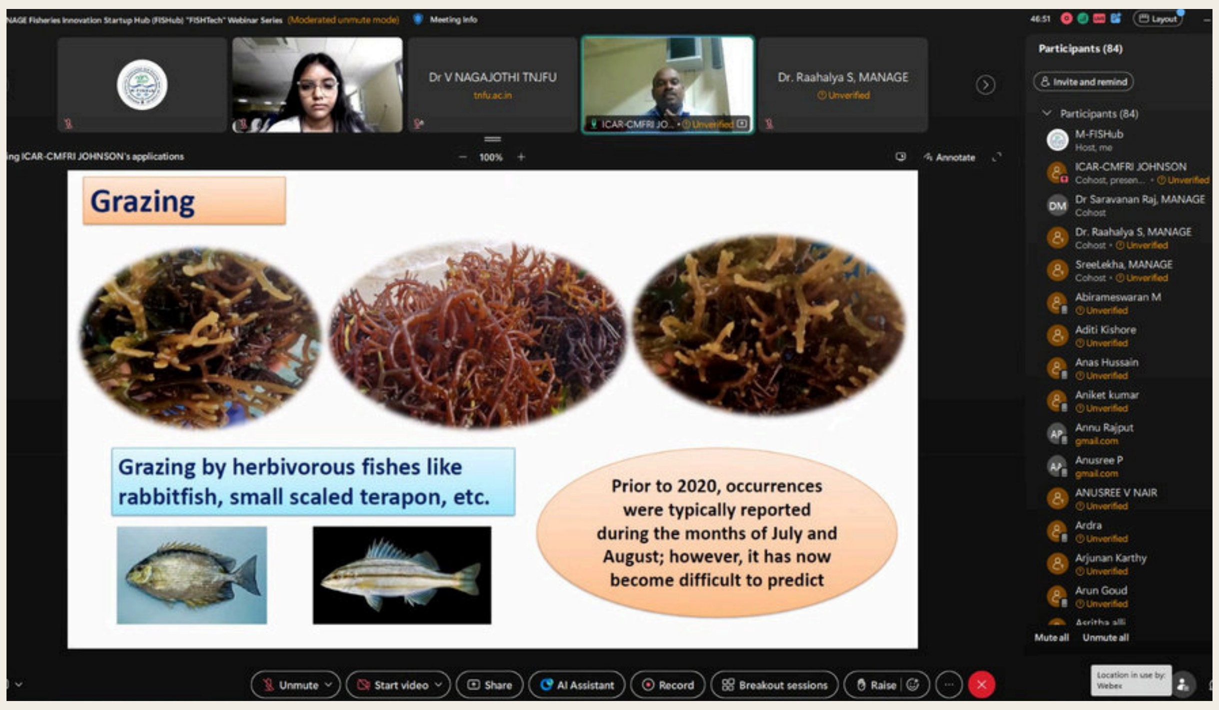


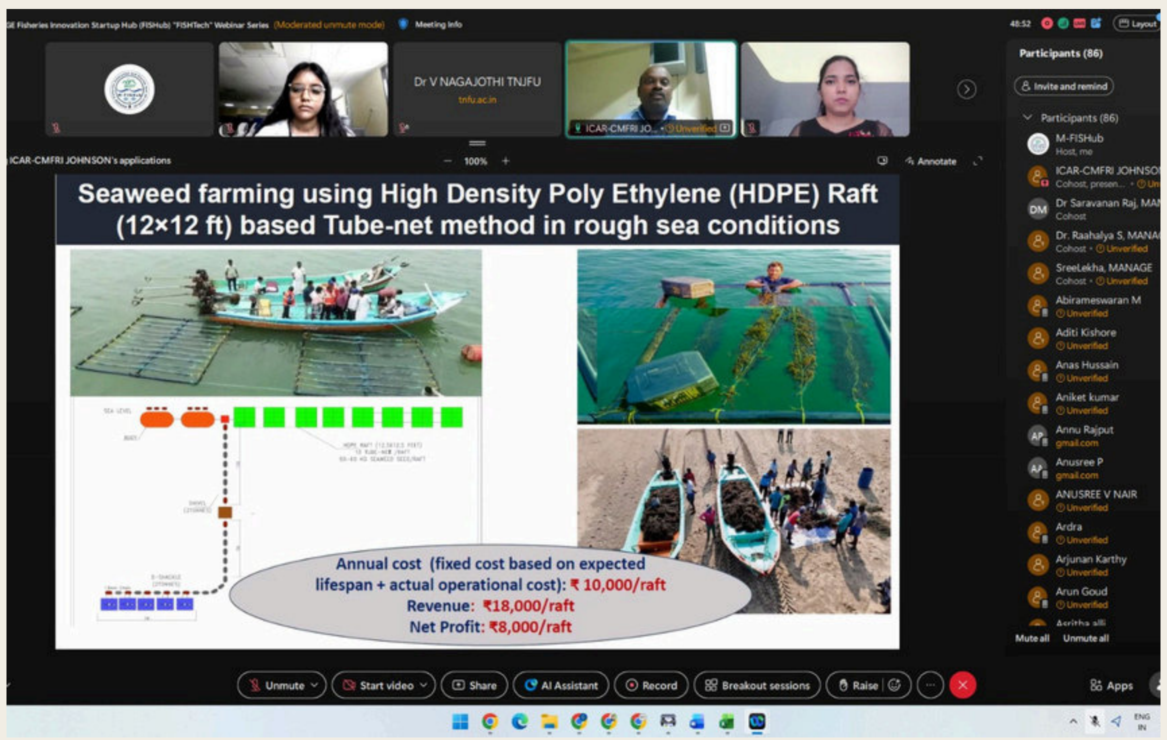
The session covered the major components of marine IMTA, including cage farming of high-value finfish, mussel culture and seaweed farming. Examples of species and culture systems were discussed, along with different seaweed cultivation methods such as raft, monoline and tube-net systems. The speaker also highlighted challenges in seaweed farming, including disease, epiphytism and grazing, and discussed management and biological approaches to minimize production losses.

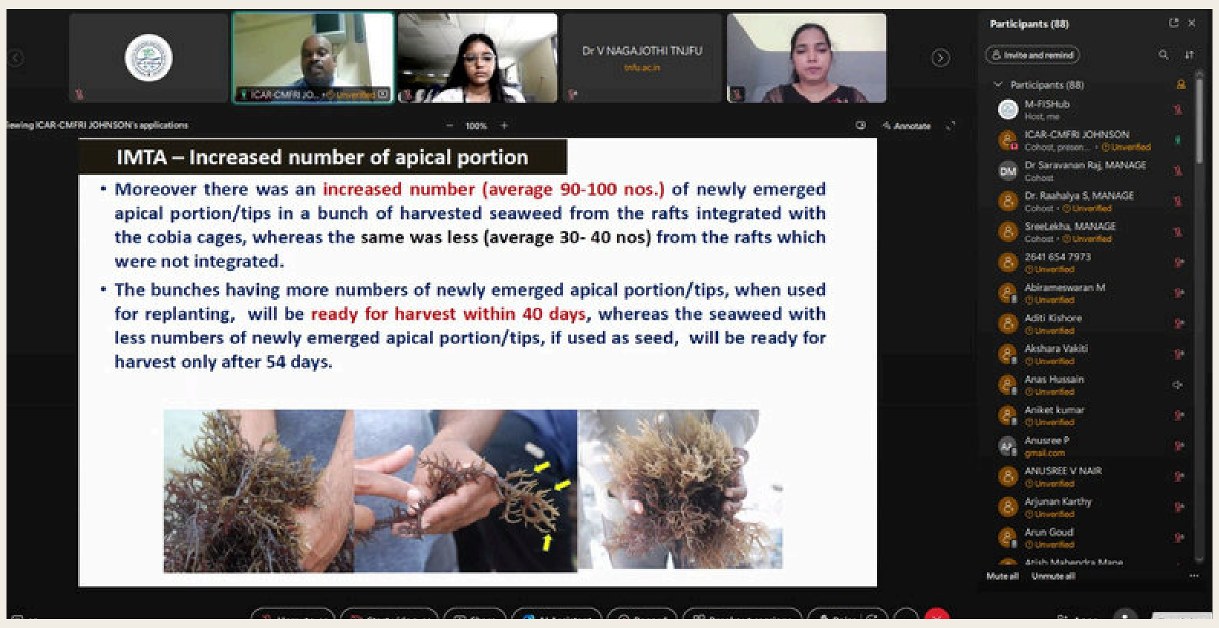
Several national and international case studies were presented from countries such as Canada and China, demonstrating the potential of integrating finfish, shellfish and seaweed for improved environmental sustainability and diversified revenue. Indian trials involving the integration of fish cages with seaweed and mussel culture in different coastal regions were also discussed. The results demonstrated improvements in production, additional income, nutrient removal and carbon sequestration under integrated systems.

The speaker also outlined the major challenges affecting IMTA adoption, including high initial investment, technical complexity, disease management, regulatory limitations, inadequate awareness and the absence of a comprehensive mariculture policy framework. He emphasized the need for government support, farmer training, awareness programmes and enabling policies to promote wider adoption.

Looking ahead, the session highlighted opportunities for smart and AI-based aquaculture, automated water-quality monitoring and climate-resilient aquaculture technologies. The speaker concluded that IMTA can effectively combine aquaculture productivity with environmental responsibility, social acceptability and economic viability, offering a promising pathway towards sustainable and low-waste aquaculture in India.







Q & A Session

Q1. How can IMTA be established in freshwater ponds, and which species can be used?

Ans: The speaker explained that freshwater or brackish-water IMTA can integrate fish or shrimp with suitable salinity-tolerant seaweed species such as *Gracilaria spp*. The seaweed can be cultured using ropes, poles or tube-based systems to absorb nutrients released from the culture system. Herbivorous fish should be avoided.

Q2. What are the criteria for selecting species for IMTA, and can diseases spread between integrated species?

Ans: Species should be selected based on seed availability, environmental compatibility and their ability to utilize different nutrient resources. Fish, shellfish and seaweed can be combined appropriately. The speaker noted that disease risks are comparatively lower in seaweed and shellfish; if disease occurs in fish, early detection and harvesting can help prevent its spread.

Q3. Has IMTA been tested with shrimp farming?

Ans: Trials integrating shrimp with seaweed are being conducted in different regions, including Nagapattinam and Andhra Pradesh. However, the technology is still at the trial stage and requires further refinement, particularly to manage fluctuations in salinity caused by rainfall and high evaporation in open ponds.

Q4. What suitable IMTA combinations can be adopted along the Kerala coast?

Ans: The speaker suggested combinations such as silver pompano, Indian pompano or grouper with seaweed. *Kappaphycus* can be considered under suitable salinity conditions, while Gracilaria can be used in brackish-water areas. Mussels can also be integrated where suitable.

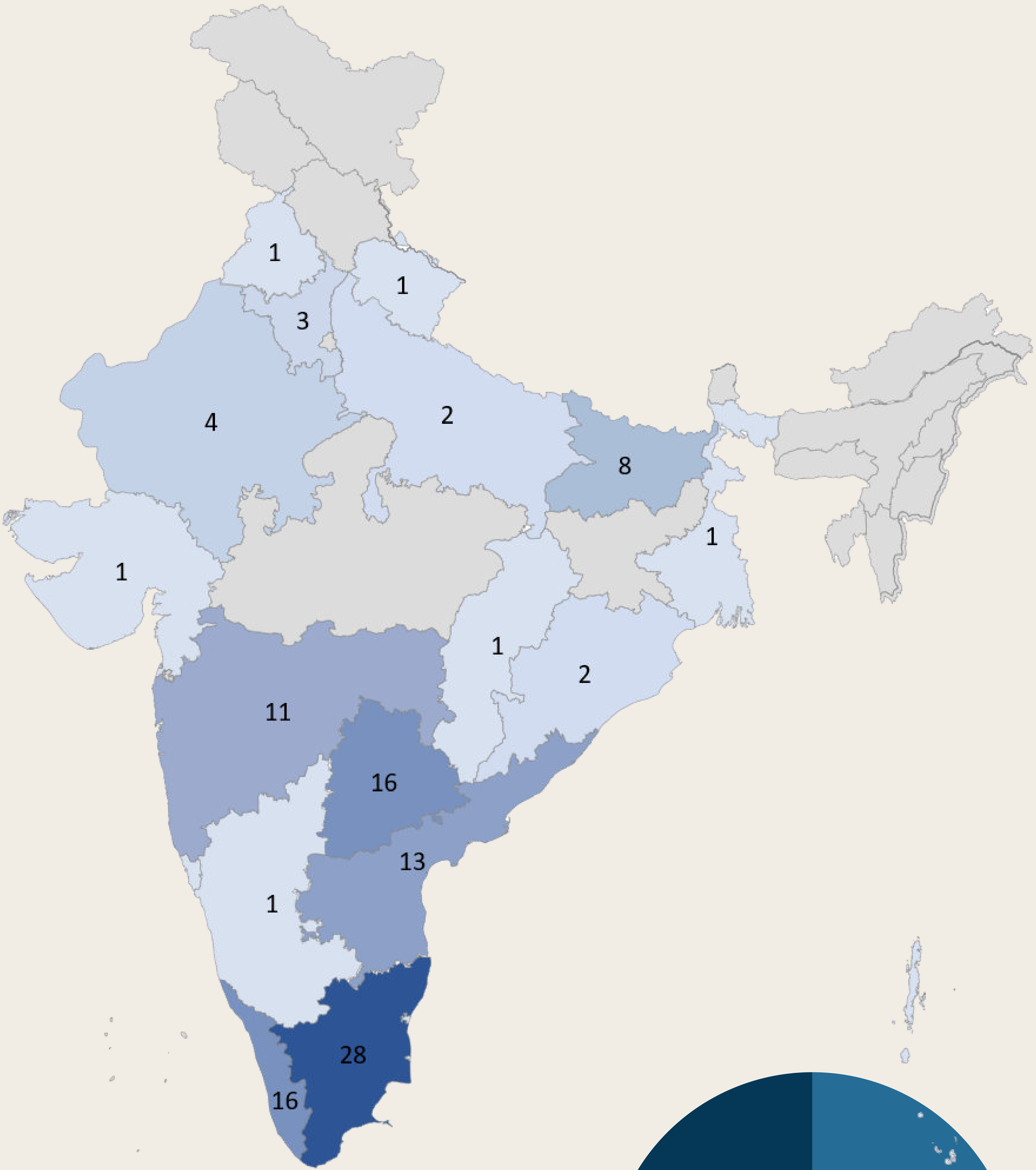
Q5. Why has seaweed farming not expanded as expected among coastal farmers?

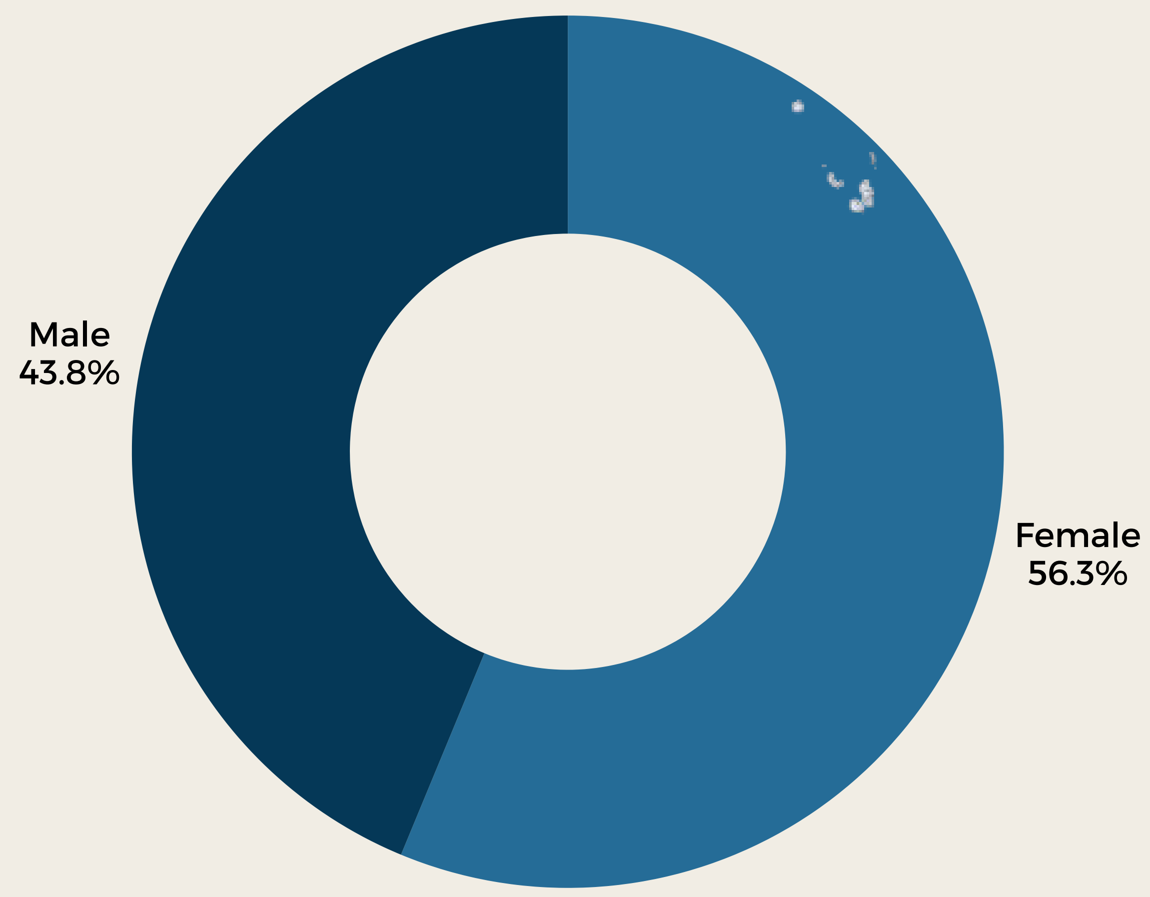
Ans: The major challenge is the availability and demarcation of suitable coastal areas, as the sea is a common property resource. Farmer motivation and access to farming space are also important. Seed availability is comparatively less of a constraint, with institutions maintaining seed banks and provisions for regulated import of seed material.

Q6. Are there regulations for IMTA?

Ans: The speaker explained that different countries have their own regulatory frameworks for IMTA. In India, appropriate regulations regarding site allocation, cage density, licensing and coastal resource use need to be further developed as IMTA expands.

Participants Overview





Total Registrations-555
Attended Participants -112
(Male - 49; Female-63)

YouTube Video Link: https://www.youtube.com/watch?v=lmI2Ugaa4dM&list=PL4G41x3BKm6lUBmHoLiRlGoB_5Efxiaep&index=2&t=2068s

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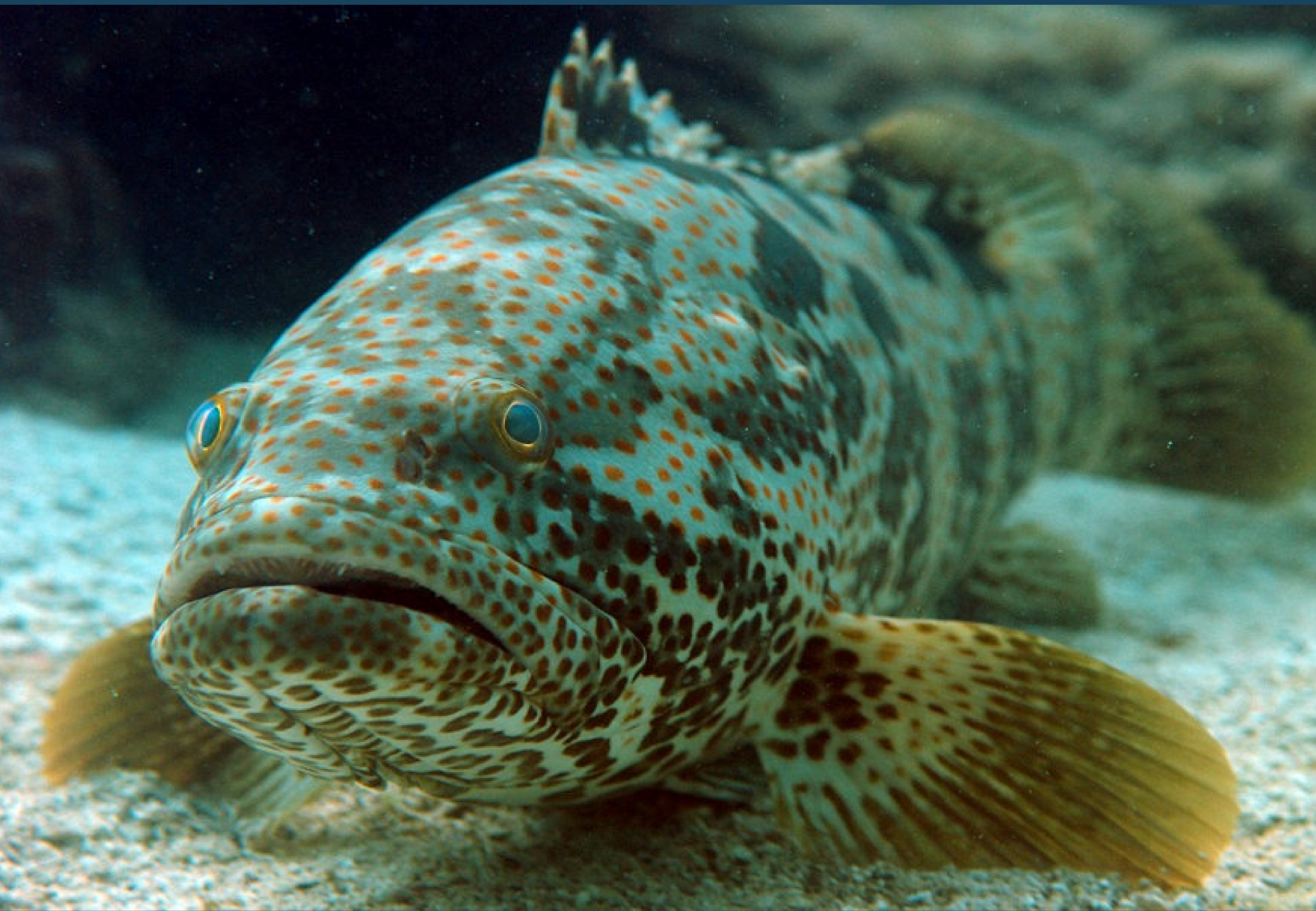

Orange-spotted Grouper

AUG
07-08-2026

Technology on Orange-spotted Grouper Farming in Marine Cages

Dr. Sekar Megarajan
Senior Scientist
ICAR–CMFRI
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Dr. Sekar delivered an insightful session on technology on Orange-spotted Grouper Farming. The session began with an overview of the growing contribution of aquaculture and mariculture to global fish production, highlighting the increasing importance of marine finfish farming to meet rising seafood demand.

Dr. Sekar introduced orange-spotted grouper as an emerging high-value marine finfish species with considerable potential for coastal and cage aquaculture. The species' biological characteristics, tropical nature, market demand and export potential were discussed. A major focus of the session was the step-by-step technology for cage farming of orange-spotted grouper, covering cage-site selection, cage structure, nursery rearing, grow-out culture, cage management, fish health, harvesting, marketing and economics. For cage-site selection, emphasis was placed on suitable water temperature, adequate depth, continuous water movement, good water quality, avoidance of polluted areas and accessibility to the farming site.

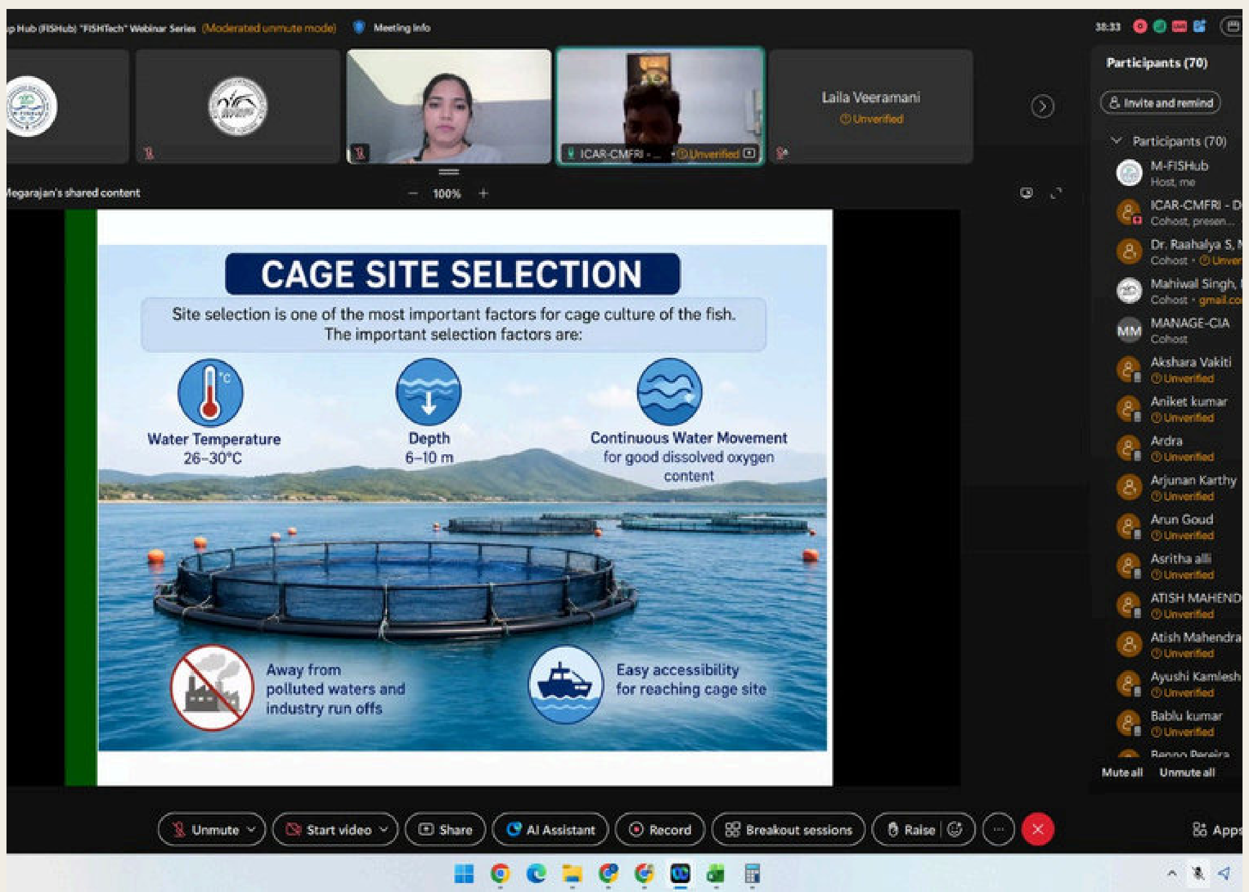
The speaker explained the importance of nursery rearing as an intermediate stage between hatchery production and grow-out farming. Juveniles are reared to an appropriate stocking size of around 20–25 g before transfer to cages, allowing them to acclimatize to prevailing farming conditions.

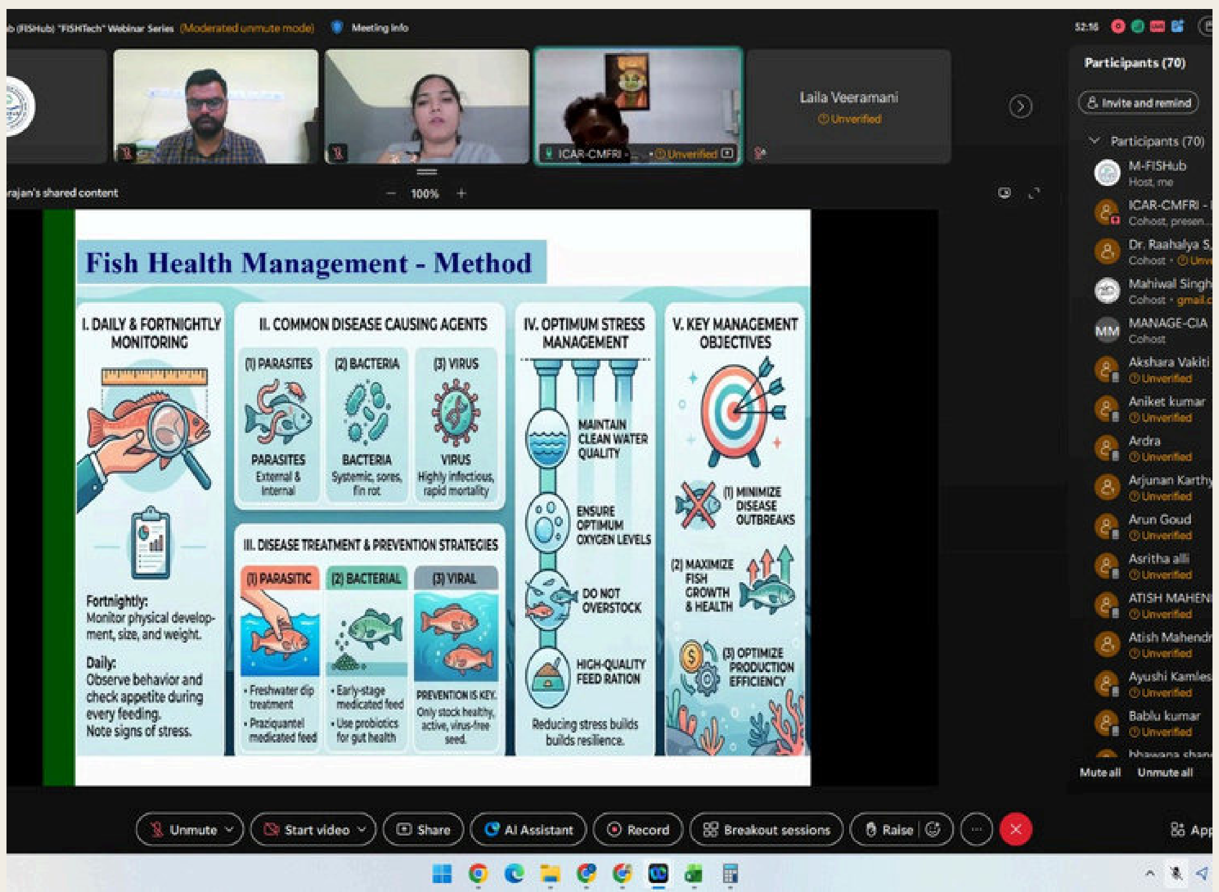
Feed management during nursery and grow-out stages was also highlighted, particularly the requirement for high-protein feed for this highly carnivorous species. The session further detailed stocking density, cage depth, feed management and periodic growth monitoring during grow-out culture.

Stocking at approximately 20–25 fish per cubic metre was discussed, with shallower net depths recommended during the initial stage and deeper cages as fish grow. The use of suitable pellet feeds, supplemented with chopped low-value fish where appropriate, was highlighted for improving growth and reducing size variation and cannibalism.

Dr. Sekar also emphasized regular cage management, including periodic net exchange to maintain water flow and prevent fouling, along with adherence to standardized best management practices. The session highlighted the strong market potential of grouper, particularly in Asian markets, driven by premium prices, growing consumer demand and export opportunities.

The session concluded with a discussion on key challenges, including limited availability of quality seed, the need for greater farmer awareness and adoption of standardized practices, and the importance of strengthening the grouper farming value chain. The webinar provided participants with practical insights into the production technology, management requirements, market opportunities and future prospects of orange-spotted grouper farming in marine cages.





Q & A Session

Q1. Does discoloration in orange-spotted grouper occur after harvest or during cage rearing?

Ans: Discoloration can occur during the rearing stage itself, particularly in cage culture. It is generally not observed in pond culture, possibly due to differences in natural/live feed availability and the higher stocking density used in cages.

Q2. Can discoloration be addressed through feed supplementation?

Ans: Researchers are exploring different feed formulations, including plant-based carotenoid sources, to improve coloration. Post-harvest handling can also help; chilling the harvested fish for about an hour can gradually reduce the discoloration.

Q3. Does discoloration affect the flesh quality of the fish?

Ans: No. The discoloration primarily affects the external appearance and does not significantly affect flesh quality. Nutritional profiling has shown that the meat quality remains good.

Q4. Is orange-spotted grouper being cultured only in Visakhapatnam?

Ans: No. Trials have been conducted in other coastal regions, including Andhra Pradesh and Tamil Nadu, with research and private-sector efforts also undertaken in different locations.

Q5. Is orange-spotted grouper suitable for inland saline aquaculture?

Ans: The species has shown potential at salinities of around 15 ppt, but inland saline culture in regions such as Punjab and Haryana has not yet been extensively tested. Further research is needed to assess its potential under such conditions.

Q6. What is the present status of seed availability?

Ans: Seed production has been undertaken at CMFRI and its regional centres, but commercial-scale seed availability is currently limited, partly because of relatively low farmer demand.

Q7. What is the suitable culture period and market size for orange-spotted grouper?

Ans: In some Southeast Asian markets, fish are harvested at around 600–800 g within 6–8 months. For live or chilled markets requiring larger fish of around 1–1.2 kg or more, the culture period may extend beyond one year. The longer culture duration can be a constraint for farmers seeking shorter-duration crops.

Q8. Can orange-spotted grouper be integrated with seaweed or shellfish culture?

Ans: Yes, integration with seaweed, oysters, or mussels can be practiced. However, such integration is mainly expected to provide additional production and value from the culture system rather than directly improving the grouper's growth or resolving coloration issues.

Q9. Is there a significant growth difference between pond and cage culture?

Ans: No major difference in growth period was observed between pond and cage culture under the conditions discussed during the session.

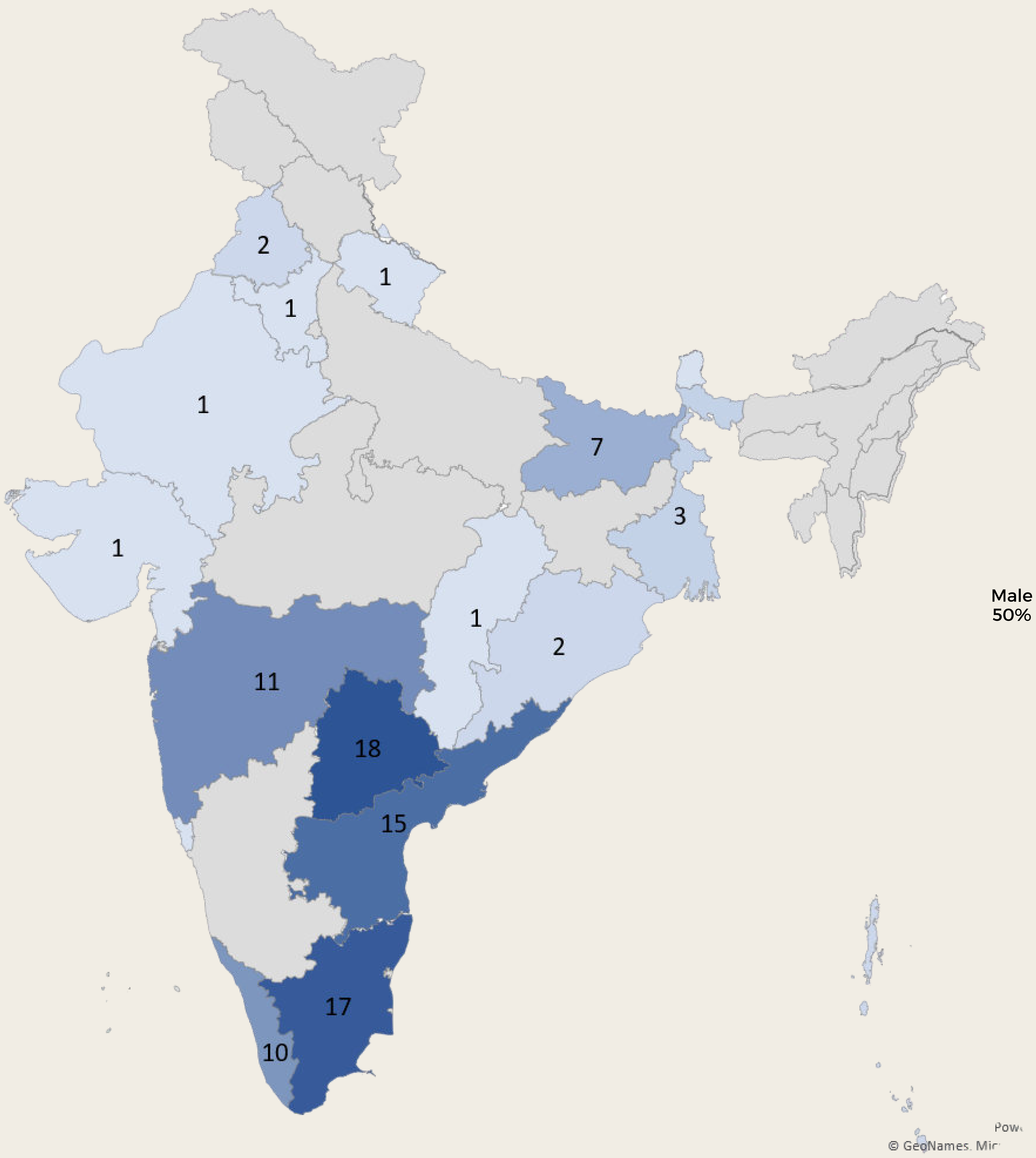
Q10. What survival rate can be expected in orange-spotted grouper culture?

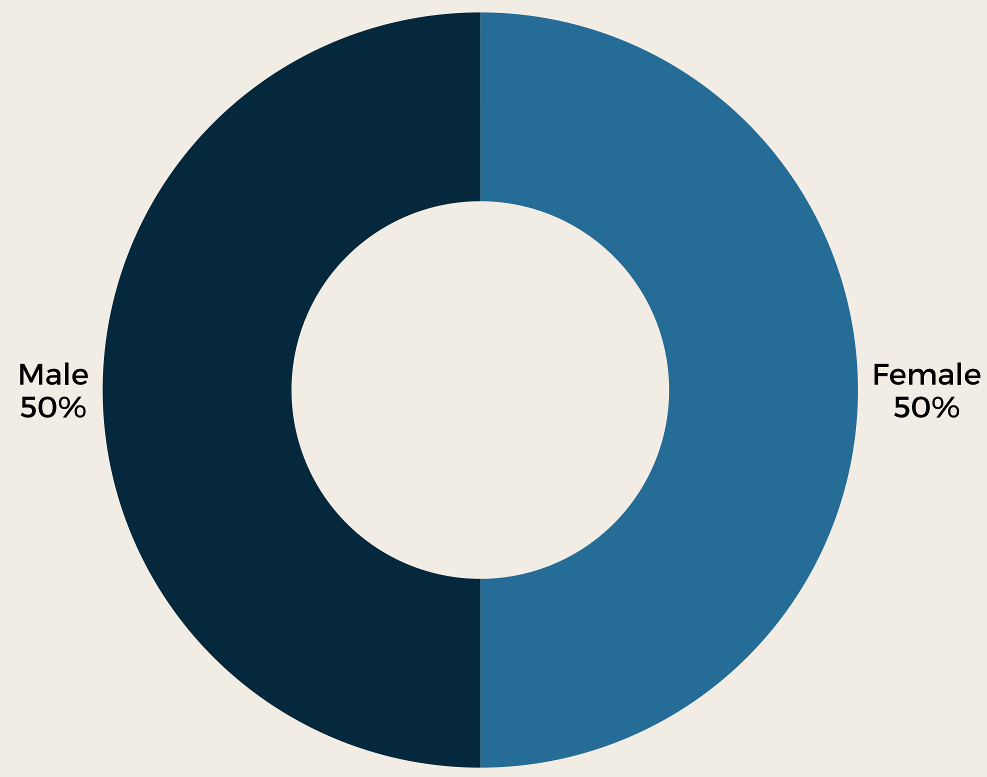
Ans: With proper nursery management, survival can exceed 95%. During grow-out culture, survival of around 82–85% has been observed, although it can be improved with proper management.

Q11. What dissolved oxygen (DO) level should be maintained for orange-spotted grouper?

Ans: As a practical guideline, DO should preferably be maintained above 4 mg/L. Although the fish can tolerate levels down to around 2 mg/L, prolonged exposure to such low DO can cause stress and imbalance. Proper water exchange and oxygen management are therefore essential.

Participants Overview





Total Registrations-508
Attended Participants - 94
(Male - 47; Female-47)

YouTube Video Link: https://www.youtube.com/watch?v=y0fwMEalmcg&list=PL4G41x3BKm6lUBmHoLiRlGoB_5Efxiaep&index=1&t=2605s

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