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Inside ...

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Why Shrimp Seed Quality Matters More Than Ever?

Aqua International organised its 43rd edition Aquaculture Expo 2026 at Balasore, Odisha with the theme 'Tap the Potential to take Aquaculture in Odisha state to the next level of development'.

Global shrimp production continues to grow, with major producers such as Ecuador, India, China, Vietnam and Indonesia expanding output to meet rising demand. Consistency in survival, adaptability and feed efficiency now rank alongside growth as core performance indicators. As a result, shrimp breeding and hatchery systems are evolving toward integrated, science-based approaches that link genetics, hatchery technology and performance data across the production chain.

Dear Readers,

The February 2026 issue of Aqua International is in your hands. In the news section, you may find news about....

Aqua International organised 43rd edition Aquaculture Expo 2026 at Balasore, Odisha, an Exhibition, Panel Discussion and Experts - Farmers Interaction meet on aquaculture sector with the theme 'Tap the Potential to take Aquaculture in Odisha state to the next level of development'. Besides local MLA Manas Kumar Dutta, MPEDA's Odisha region incharge, Seafood Exporters Association of India Odisha region President, Aquatic Feed Dealers Association (AFDA) Odisha region Vice President, AFDA EC Member, West Bengal Fisheries Department AFO and an Young Entrepreneur took part in the deliberations and shared their views and suggestions for the development of this sector in the state.

Corel Lifecare and The Aqua Consortium signed Strategic Long-Term R&D Pact to Revolutionize Disease Management in Aquaculture. Corel Lifecare recently featured on Shark Tank India, announced the signing of a long-term Research and Development agreement with The Aqua Consortium, Switzerland. This strategic alliance aims to co-develop and deploy novel, farmer-first solutions addressing some of the most persistent biological challenges in the global aquaculture sector. The partnership brings together Corel Lifecare's expertise in bio formulations and rapid product development with The Aqua Consortium's deep technical capabilities and strategic industry oversight. The collaboration will focus heavily on creating safe, sustainable and effective treatments for parasitic infestations and critical shrimp culture bottlenecks. Targeting the 'Silent Killers' in fish farming, a primary focus of this R&D track is the development of next-generation management strategies for Copepod infestations, which currently cause significant economic losses globally due to mortality, reduced growth rates, and secondary infections.

Yellanki Ravi Kumar, Managing Director of Vaisakhi Bio-Marine Pvt Ltd, recommended 'One shrimp industry, two species' at an occasion in West Bengal. He gave a very informative and thought-provoking audio visual presentation on the idea 'One shrimp industry, two species' which can be put into reality by shrimp farmers in West Bengal from the near future. Beginning with a concept on Indian shrimp industry, Ravi Kumar mentioned that India has produced 1.1 million tonnes of shrimp in 2025, and, as till October 2025, India has exported 6,58,000 tonnes of shrimp whereas the figure was about 6,00,000 tonnes in entire 2024. But even then, he said that we (shrimp farmers) have to make some change if we want to make money.

The National Workshop titled 'Freshwater Aquaculture Technology Dissemination in India – Charting the Way Ahead' was organized by ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar in association with National Fisheries Development Board, Hyderabad at CIFA, Bhubaneswar in both physical mode and online mode on 20 January 2026. Dr M. L. Jat, Secretary, Department of Agricultural Research and Education and Director General, ICAR, New Delhi said that 'Its positive energy that matters', and spoke about

Contd on next page

NRS GROUP

Our Mission

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

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

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

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

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

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discussion and formulation of a roadmap in context of the title of Workshop, building legacy and leadership, expressed compliments to Dr J. K. Jena, DDG (Fisheries), ICAR; Dr R. Singh, DDG (Agriculture Extension), ICAR (for bringing India's 11 Agricultural Technology Application Research Institutes together in the Workshop) and Dr P. K. Sahoo, Director, ICAR-CIFA for continuing the leadership. He acknowledged and appreciated the good work carried out at CIFA, our engagement with the institute; taking learnings from the Prime Minister; plan and aspirations for Vikshit Bharat 2047 taking into account the complexities of challenges. Everyone must be brought together, togetherness is more important than money. Doubling of aquaculture outputs have been done over past 10 years, we have to further double it and develop with all capacity and the science we got.

K.N.C. Agro Limited, a shrimp processing plant is a well-recognized shrimp processing plant located in Purba Medinipur district of West Bengal, involved in frozen shrimp export since 2014. Mir Tabarak Ali, one of the Directors said that Vannamei processing unit meant for export in West Bengal under private sector, having EU approval number. Mission of this processing unit is supply of safe and hygienic seafood to the world maintaining the environment, sustainability and better livelihood of shrimp farmers. It is a 4-Star BAP (Best Aquaculture Practices) certified and BRC (British Retail Consortium Global Standards) Grade-A certified seafood company.

In the Articles section, **Multiple Breeding in Finishes: Breaking Seasonal Barriers for Higher Yields**, authored by J.Magimai John Jose and S.Selvaraj, said that Multiple breeding in cultured finfishes represents a significant advancement that facilitates repeated spawning cycles beyond the natural season, resulting in increased seed production and enhanced aquaculture efficiency. By employing advanced broodstock management, hormonal induction, and environmental control, farmers can surmount seasonal limitations and satisfy the rising demand for fish seed. This article examines the methodologies, advantages, and challenges associated with multiple breeding, emphasizing its importance in achieving sustainable and profitable aquaculture. Case studies involving Indian major carps and other commercial species illustrate its effectiveness and practical implementation. Multiple breeding in finfishes is transforming aquaculture by allowing year-round reproduction, thereby overcoming traditional seasonal barriers. By utilizing techniques such as photoperiod manipulation, hormone treatments, genetic selection, and optimized nutrition, farmers can stimulate species like Tilapia and Salmon to spawn multiple times each year, increasing fry production by as much as 50%. This article investigates the underlying science, advantages, and practical applications of multiple breeding, while addressing challenges such as egg quality and fish welfare. Backed by research, it underscores how these innovations boost yields, promote sustainability, and respond to global seafood demand, presenting a promising avenue for feeding a growing population.

Another article titled, **"Building Resilient Shrimp Seed: How Genetics and Hatchery Systems Drive Postlarvae Quality",** authored by Natthinee Munkongwongsiri and Craig L. Browdy discussed that, Why Shrimp Seed Quality Matters More Than Ever Global shrimp production continues to grow, with major producers such as Ecuador, India, China, Vietnam and Indonesia expanding output to meet rising demand. At the same time, shrimp farming is becoming increasingly complex. Disease pressure, environmental variability, tightening biosecurity requirements and rising feed costs are placing greater emphasis on consistency and risk management rather than maximum growth alone. In Asia in particular, shrimp are farmed across highly diverse salinity ranges, pond systems and management styles. Recent data from across Asia indicates a significant percentage of ponds are being flushed, or harvested early because of slow growth, mortality and or disease. The financial toll from lost crops is substantial, compromising farm viability. Under these conditions, the quality of shrimp seed specifically the robustness and resilience of postlarvae (PLs) has become a critical determinant of farm performance. Consistency in survival, adaptability and feed efficiency now rank alongside growth as core performance indicators. As a result, shrimp breeding and hatchery systems are evolving toward integrated, science-based approaches that link genetics, hatchery technology and performance data across the production chain.

Another article titled, **Culture Systems, Economic Viability and Livelihood Potential of cultivable Seaweed Kappaphycus sp. along the Tamil Nadu Coast,** authored by M. Subashini, M. Porkodi and S.Felix, said that Kappaphycus sp. cultivation along the Tamil Nadu coast emerges as a promising component of sustainable coastal aquaculture with strong economic, social and entrepreneurial relevance. The article highlights the suitability of established culture systems, favourable coastal conditions, and assured market demand that make Kappaphycus farming economically viable. Beyond primary production, significant scope exists for startups and micro-enterprises in value-added products such as carrageenan, seaweed-based foods, nutraceuticals, cosmetics, and biofertilizers, as well as in service-oriented ventures and digital solutions. The sector holds particular potential for women-led enterprises, livelihood diversification, and inclusive coastal development. With appropriate institutional support, market linkages, and policy backing, Kappaphycus cultivation can substantially contribute to the blue economy and the development of a resilient coastal rural economy. Introduction Marine macroalgae, commonly referred to as seaweeds, form an important renewable bioresource with extensive applications in food, pharmaceuticals, cosmetics, agriculture, and industrial sectors. In recent years, seaweed farming has been promoted in India as a climate resilient and sustainable coastal livelihood activity. Kappaphycus sp., a red seaweed belonging to the family Solieriaceae, is widely cultivated for the production of kappa-carrageenan, a hydrocolloid used as a gelling and stabilizing agent. The favorable hydrographic conditions prevailing along the Tamil Nadu coast, combined with institutional support and market linkages, have facilitated the expansion of Kappaphycus farming in selected coastal districts

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

M.A.Nazeer
Editor & Publisher
Aqua International

CIFA organises National Workshop on 'Freshwater Aquaculture Technology Dissemination in India – Charting the Way Ahead

Bhubaneswar: The National Workshop titled 'Freshwater Aquaculture Technology Dissemination in India – Charting the Way Ahead' was organized by ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar in association with National Fisheries Development Board, Hyderabad at CIFA, Bhubaneswar in both physical mode and online mode on 20 January 2026. In the inaugural session, Dr M. L. Jat, Secretary, Department of Agricultural Research and Education and Director General, ICAR, New Delhi gave a very influential speech. Dr Jat begun by saying 'It's the positive energy that matters', spoke about discussion and formulation of a roadmap in context of the title of Workshop, building legacy and leadership, expressed compliments to Dr J. K. Jena, DDG (Fisheries), ICAR; Dr R. Singh, DDG (Agriculture Extension), ICAR (for bringing India's 11 Agricultural Technology Application Research Institutes ATARIs together in this Workshop) and Dr P. K. Sahoo, Director, ICAR-CIFA for continuing the leadership. He acknowledged and appreciated the good work carried out at CIFA, our engagement with the institute; taking learnings from the Prime Minister; plan and aspirations for Vikshit Bharat 2047 taking into account the complexities of challenges. Everyone must be brought together, togetherness is more important than money. Doubling of aquaculture outputs have been done over past 10 years, we have to further double it and develop with all capacity and the science we got.

Dr Jat mentioned about togetherness that is important, linking science to the society, we have to do good for the people connected directly to society, which matters most. In Vikshit Bharat 2047, contribution of fisheries and aquaculture is very important, demand side assessment is important, i.e., requirement at ground level and we have to bring it back to research. Our expectations are growing, we are looking at contributions from KVKs. We need to have clear strategy, a five-year action plan. In this Workshop, we have to develop a focused, accountable, actionable action plan for the benefit of KVK personnel. Working in isolation in silos is not going to help us. For farmers' prosperity, shared vision and collective action is important. Dr Jat further mentioned that for giving effect to Government of India strategies, bringing synergies and convergence in work should be given highest priority. We have to work together, come out of our comfort zones, we have to change. We need and have to talk about business unusual, have to focus on what are expectations of country's farmers (the people we serve). Dr Jat spoke about success and satisfaction, which comes when people whom we serve grows. We must all grow together, and we have to think in this direction. In context of resource competition, we can translate competition into synergy if we work together. In 'perceived competition', he discussed about maize production going for ethanol production and for fish and livestock feed. Competition should not exist; there is no existence of competition if we see from a bigger picture. Target should be there, things should be taken in positive attitude and spirit.

Speaking about purpose of our life, Dr Jat mentioned that we should feel happy that we are contributing in some way or other. God has given us an opportunity to serve to farmers. We must not make someone fool. Lost time does not come again, we shouldn't lose a second. We will be able to sleep well if we make someone happy. In terms of freshwater aquaculture, there has been a huge growth in farm ponds over time in Odisha, we should make use of those ponds. Fish should be there in every pond, which will be a new dimension. In most of farm ponds in Rajasthan and Telangana, there are no fishes. When fishes are there, water can be used for both irrigation and fish farming & harvest, it will bring additional income to farmers. Fishes should be there in water conservation ponds, new opportunities can be explored. We have to look for opportunities, what kind of opportunities lies where in terms of integrating fisheries with other sector. Dr Jat said that shrimp farming in saline water in north-western Indian states is giving more production and profit than rice production and other agricultural crops – it is transformative. We need to explore what kind of aquaculture goes where, prepare roadmap in that manner.

Dr Jat spoke about requirement of 7-10 days' capacity building and capacity development programme, hands-on practical. Practice makes us perfect, and we should not be preachers but practitioners. While giving advice, we have to understand the compulsions of farmers, their livelihood. Integrating social science with agriculture and aquaculture is important, good use of it – also behavioural science. Fishery SMSs in KVKs need refresher courses, need continuous capacity development, new thought processes. Dr Jat also spoke about significant contribution of agriculture for human health and nutritional aspects, not only about food and livelihood; nutritional aspects of fishes. Integrated farming system links agriculture to health. We have to give stronger focus on bringing back local food system, conserving our legacy, biodiversity, heritage. Each KVK should have repository of biodiversity of that district. If we are focused on what we have to do

to transform the system, our country will have no dearth of money. We have to show our value, what we have done. We are contributing tremendously on growth of agriculture and aquaculture, we take pride in what we achieved. India is the highest producer of rice, and that has come from science, the policy, the hard work and accomplishments of farmers. Communication is important, strategies on communication policies have been recently launched at ICAR. There is a 'gender'-related institute CIWA at Bhubaneswar under ICAR. We have to develop women-friendly technologies, innovations on automization in fish harvesting are very important, which are significant milestones. We should not lag behind in new science like AI. Data policy has been launched, data science developed. We have to put our data together. We need to have robust analytical tools and systems. But we should not lose our natural intelligence. Connection and inter-operability between different Tools, Softwares and Apps are important.

Monitoring of outcomes is important, making use of media. Monitoring, Evaluation, Learning and Impact Assessment Unit developed at ICAR. We have to do all things properly within time – it is not a burden, but a necessity. Dr Jat in the end believed that this Workshop will set a new precedence, new roadmap, new way of doing business, a complete roadmap on activities of different institutes (KVKs, ATARIs, ICAR Research institutes and others).

Dr J. K. Jena, DDG (Fisheries), ICAR, New Delhi in his address briefly described the genesis and glorious past of FARTC and ICAR-CIFA. He mentioned that expectations from all levels have increased in fisheries and aquaculture over the years, now everybody realized the importance of this sector. Technologies like induced breeding of fish, carp polyculture, genetic improvement, species diversification have revolutionized freshwater aquaculture in India. Considering fish feed development and feed requirement of different cultivable fishes, different sets of feed required for larvae, advanced fry and broodfishes of each fish species. Fish pond soil and water health is important for fish growth and survival. Dr Jena informed that out of 19.5 million tonnes of country's fish production every year, about 13.5 million tonnes is contributed by freshwater aquaculture. But we have quite a few challenges when we envisage for the target of 40 million tonnes of fish production by the year 2047 under Vikshit Bharat 2047 (freshwater aquaculture has to contribute about 25 million tonnes) – we have global climate change, fish and shrimp diseases. It is a concern that whether good quality water will be available for aquaculture in future, as poultry sector also requires water. We have to look into how to utilize non-conventional materials. In this Workshop, we can sensitize ATARI Directors and Fishery SMSs about some aquaculture technologies which have been developed over the years. More knowledge about it have to reach to SMSs; further will reach to fish farmers. Training is required for SMSs on unique aquaculture (inland and marine) technologies.

Dr Jena spoke about importance of Biofloc system and RAS, cage farming in reservoirs, pen farming in wetlands, how to utilize newly-created Amrit Sarovars. In depth discussion will be done in this Workshop among CIFA scientists, other fishery research institutes, research conducted, ATARI and KVK officers. Animal scientists in KVKs may also be given training and demonstration. Dr Jena spoke about farming system models and ended by saying that a pond having fishes along with farming system should exist in all KVKs.

Mr Sagar Mehra, Joint Secretary (Inland Fisheries), Ministry of Fisheries, Animal Husbandry and Dairying, GoI in his online speech mentioned that freshwater aquaculture in India is important in terms of rural employment, fish production, nutritional security. We have to focus upon technology uptake with scale, measurable outcomes, convergence. Aquaculture production has doubled in last ten years, thanks to scientific innovations. More than 140 lakh tonnes of fish produced from freshwater aquaculture annually. We have to close the gap between research outcome and field-level adoption, small and marginal farmers face barriers when they lack awareness about new technology, technological complexities, limited access to good quality fish seed and feed, lack of finance. With proper funding mechanism, Fisheries Department has been trying to catalyze adoption and infusion of technologies among farmers. Under PMMSY, fish farmers have been supported with infrastructure building, strengthening quality seed production system, and others. In order to reach out to stakeholders, trainings and capacity building programmes are organized. Recently this Department created 34nos of fisheries production and processing clusters in India, where validated ICAR technologies can be demonstrated to farmers and fishermen on field conditions, market linkages and better coordination of input support.

From Government supported clusters, farmers will be able to get demonstration ready package of practice and complete advice in terms of pond preparation, quality seed, proper stocking density, fish feeding, water quality and fish health management. Public investment will translate into visible outcomes, adoption will be faster. Practical convergence and pragmatic roadmap will come out from this Workshop. High impact freshwater aquaculture technologies should be identified suitable to different geographical zones and ready for scaling. Hand holding support will be provided to farmers. We should plan for cluster based demonstration for each package of practice with help of ATARIs, KVKs. We will be able to reach out to farmers with packages of practices and demonstrations. Linking the demonstration units to PMMSY, NFDB funded scheme components is important, so that training, input support delivered

in integrated manner. In context of aquaculture intensification and disease incidences, implementation of NASPARD (National Surveillance Programme for Aquatic Animal Diseases) is important; KVK scientists will play important role in coordination for NASPARD, for downloading fish disease App.

Dr Mehra believes that along with strengthening convergence between ICAR, Ministry of Fisheries, NFDB, all validated ICAR technologies available will reach to farmers through cluster approach, benefits will reach to stakeholders with quantifiable impacts. KVK and ATARI scientists may give feedback on field constraints faced by farmers, actionable suggestions that can be implemented – it will be helpful in preparing the pragmatic implementable roadmap in consistent with on-ground realities. Dr Mehra ensured that during PMMSY Phase-II, all necessary support will be available in next 5 years for uptake of aquaculture production technologies.

Dr Rajbir Singh, DDG (Agricultural Extension), ICAR in his remarks appreciated the pond aquaculture technologies developed and demonstrated by ICAR-CIFA scientists. He mentioned that from the time of our independence, we have achieved 7 fold increase in rice production; whereas, presently our aquaculture production is about 20 million tonnes which was nil during 1947. In last one decade we have doubled the fish production in our country, a sea change in aquaculture – nation is proud of this emerging sector. Average aquaculture productivity has now increased to 4.77 tonnes per hectare area. A plan of action will be prepared in this Workshop. Dr Singh mentioned that in context of demonstration part by KVK scientists, we need to have a living laboratory of aquaculture in KVK campus. SMSs in Fisheries must clearly know everything about pond management in fish culture, source of seed, feeding mechanism, etc. He praised that CIFA scientists have newly developed mechanical harvesting of fish. According to Dr Singh, training and capacity building is a process, a full-fledged programme where confidence of trainees can be developed. They will be able to understand all things in details, consensus will come. It should be well designed with all components of confidence building; trainees will have questions built up in mind which can be cleared.

Failed in beginning before gaining success:
Dr Singh spoke about a fish farmer in Haryana namely Sultan Singh, a Padma Shri awardee. He struggled and failed in the beginning before gaining success, money and fame, got training. He gained knowledge, knowledge in marketing and developed a pathway himself that led him to great success. Many such progressive and illustrious farmers are in our country, who are 'Professors of practicing aquaculture'. We need their help in capacity building programmes. Exposure visit of farmers will be useful for building roadmap and pathway, they will be able to understand actions. Community of practitioners will grow in aquaculture sector. Convergence mode of working is important, roadmap should be accountable. Dr Singh ended by saying that we need to have close associate with works of KVK, NFDB, ATARIs, research institutes and others – what we can do and how best we can perform.

Dr B. K. Behera, Chief Executive, NFDB in his address discussed about the programmes conducted by NFDB, fund released to different ATARI, that released to different states for exposure visits, for SCSP and TSP programmes and farmers those will be benefitted. Dr Behera mentioned that proper framework should be developed about course content of trainings in KVKs imparted to trainee farmers, impact assessment of the trainings, how much trainees have been benefitted. He spoke about PMMKSY under which National Fisheries Digital Platform has been developed, proposals can be sent online for fund requirement for trainings. Trainings on induced fish breeding, feed technology, fish health management are organized; some modern areas can be covered like genome editing, pearl farming, value addition – funding can be done by NFDB for Training of Trainers. Fund is given by NFDB for innovative research projects, to KVKs for technology demonstration like Biofloc system, RAS. NFDB brood bank and multiplication facility developed within CIFA campus for genetically improved freshwater fishes, brood bank facilities can be developed in other states and places also after taking developed brood fishes from CIFA.

In the very beginning of this programme, Dr P. K. Sahoo, Director, ICAR-CIFA extended warm welcome and cordially greeted all invited guests and dignitaries individually. In the end of the inaugural session, Dr H. K. De, Principal Scientist, ICAR-CIFA proposed the Vote of thanks.

Four Technical Sessions
After the conclusion of inaugural session, there were four technical sessions on: Scalable freshwater aquaculture technologies of ICAR-CIFA for increasing fish production in India, ATARI Zonal level Presentations by Respective Directors on status of technology dissemination (zonewise), Discussion on PMMSY schemes for freshwater aquaculture development, Technology demonstrations and capacity building initiatives of NFDB. In an effort to learn and gain knowledge, News communicator Subrato Ghosh participated in the inaugural session entirely with keen interest in online mode in Zoom platform following the link provided by the institute and heard the speech of dignitaries. Directly by hearing and taking running notes, this News has been prepared. Previously he worked in this prestigious institute as SRF in the Project titled 'Economic and Livelihood Development of SC/ST Population through Dissemination of Freshwater Aquaculture Technologies' - a title quite similar to the title of this present National Workshop.

Uni-President

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7 days before stocking	800 g - 1,000 g	1,200 - 1,500 g	1,200 - 1,500 g
Day of stocking	300 g - 500 g	800 g - 1,000 g	800 g - 1,000 g
Every 7 - 10 days after stocking	300 g - 500 g	800 g - 1,000 g	3 - 5 days / use 1,000g - 2,000g

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

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Y. Ravi Kumar speaks on 'One shrimp industry, two species'

The 'One industry, two species' concept enables a pathway for safe shrimp farming, diseases like EHP and risks can be managed. Yellanki ended by saying that if the future of shrimp farmers is stable, then entire aquaculture sector is going to get benefitted. Both farm ponds and farmers will be free of 'stress'. In the same infrastructure, one time P. monodon farming can be done, and next time L. vannamei.

Kolkata: Mr Yellanki Ravi Kumar, Managing Director, Vaisakhi Bio-Marine Pvt Ltd, recommended 'One shrimp industry, two species' at an occasion in West Bengal. He gave a very informative and thought-provoking audio visual presentation on the idea 'One shrimp industry, two species' which can be put into reality by shrimp farmers in West Bengal from the near future. Beginning with a concept on Indian shrimp industry, Ravi Kumar mentioned that India has produced 1.1 million tonnes of shrimp in 2025, and, as till October 2025, India has exported 6,58,000 tonnes of shrimp whereas the figure was about 6,00,000 tonnes in entire 2024. But even then, he said that we (shrimp farmers) have to make some change if we want to make money. Ravi Kumar is one of the leading shrimp hatchery operators in India and an eminent shrimp farming expert. The Bengal Aquaculture Expo 2026 was organized at Contai.

But even then, he said that we (shrimp farmers) have to make some change if we want to make money (profit). During the years 2015 and 2016, Litopenaeus vannamei farmers had made money, but now, we

Y. Ravi Kumar

are producing more but we are making less money. We have to take L. vannamei to bigger size at harvest. Even in Andhra Pradesh, farmers are making more crops but not able to produce 30 counts (30 nos weighing 1 kg) L. vannamei. We are producing more in volume now, but not getting expected profit. We are not able to take it to bigger sizes. If we continue to do only L. vannamei, we will not be able to get enough profit, he stated.

We have to continue with farming of both the species Penaeus monodon and L. vannamei – 'one industry, two species'. We are going on now with only one species L. vannamei, and, in high stocking densities, we will end up in encountering problems. In recent years, EHP (Enterocytozoon hepatopenaei infection) is not allowing L. vannamei to grow, it is getting weak, and attack of pathogenic Vibrio sp follows. In summer, slow growth of L. vannamei is evident due to EHP, and subsequently Vibriosis (secondary infection) is causing farmers to incur losses, shrimp survivability rate comes down fast. During summer, Vibrio load in L. vannamei ponds exists on the higher side. Farmers are getting shrimps of different sizes which is unexpected, and FCR is rising. EHP is killing the shrimp crop economics and farmers are suffering.

Yellanki mentioned that in order to mitigate the risk, make a balance and bring stability in shrimp farming, we have to farm both the species. Crop rotation reduces the risk. Before introduction of L. vannamei, in India, the highest productivity of P. monodon was in West Bengal and Contai was that notable P. monodon farming region, best in India. P. monodon or 'Bagda chingri' used to be the 'Banglar Bag' (Bengal tiger) in early years. But we faced failures, mainly due to infected P. monodon broodstock collected from natural water bodies, infection passed on to offsprings and then to farm ponds. Now SPF (Specific Pathogen Free) P. monodon is available, it suits our environment very much, including West Bengal. Now we can do P. monodon farming, do both the species. P. monodon has better EHP tolerance as validated in field conditions. Some farmers in Gujarat are getting good crop of P. monodon and subsequently good crop of L. vannamei also. Farming condition has improved. Shrimp import markets in Asian countries have better demand for P. monodon. With tariffs imposed, now we cannot depend on shrimp (L. vannamei) markets in USA alone. Asian import markets account for 50% to 60% out of the total in the world, bigger than USA and European Union markets put together. In days to come, world import markets are going to shift towards Asia, as population here is growing, per capita consumption of shrimp is going to increase, economies are growing. From market perspective, P. monodon is going to help shrimp farmers and the industry. EHP in tandem with Vibrio definitely will have ill impact upon L. vannamei but it is not going to be the same case with P. monodon. The latter is not getting impacted by EHP.

Ravikumar emphasized on importance of crop rotation between farming of L. vannamei and P. monodon. Already in Gujarat (and in south coastal Andhra Pradesh), farmers have switched over, doing both species and getting very good harvest. Shrimp culture in

coastal Andhra Pradesh has revived, P. monodon is now done. In West Bengal, a crop of L. vannamei can be done after doing one crop of P. monodon and the production of both will be good. Pond bottom sediment will remain in good condition, disease cycle can be broken. The best domestic market for shrimp in India is in West Bengal. We can go for the sale of harvested L. vannamei in local markets. During summer months, nutrients in feed, not assimilated in L. vannamei body, comes out fast from the body via gut, it causes loading of ammonia in pond bottom. In P. monodon, nutrients in feed get fully assimilated in body. L. vannamei has very less tolerance for nitrite and ammonia levels in pond. Experimentally P. monodon farming can be started in, may be in two ponds out of ten in a farm in this current year, and next year onwards switching over to P. monodon may be done in a greater extent. Shrimp farmers should go for P. monodon farming in summer months, WSSV doesn't occur in high temperature conditions.

Yellanki adviced fish and shrimp farmers that there should be no compromise for full-proof biosecurity measures for P. monodon farming, even if SPF seeds are stocked. Biosecurity is a must. Stocking at low density gives bigger sizes at harvest in P. monodon. Sometimes large-scale farmers have to incur catastrophic loss in L. vannamei farming (very slow growth, less survivability) but it is not the case (risk) in P. monodon. Here farmers will get bigger size, good biomass, no stress, more stable and assured returns. P. monodon has tolerance for low dissolved oxygen content in pond water, but it is not the case with L. vannamei. Probiotics and health care products are required in lesser extent in P. monodon farming than L. vannamei. In all shrimp farming countries in Asia, India is ideal to go for bigger sizes in farmed P. monodon – farmers in West Bengal may target for 20 counts, or even 15 counts P. monodon. We can have enlarged market opportunity.

The 'One industry, two species' concept enables a pathway for safe shrimp farming, diseases like EHP and risks can be managed. Yellanki ended by saying that if the future of shrimp farmers is stable, then entire aquaculture sector is going to get benefitted. Both farm ponds and farmers will be free of 'stress'. In the same infrastructure, one time P. monodon farming can be done, and next time L. vannamei.

The other invited resource person was Ramraj Damodarswamy, Past President, Society of Aquaculture Professionals.

Subrato Ghosh made an audio-visual presentation on 'Common diseases of cultivable freshwater fishes in fish farms in West Bengal and their preventive measures'.

Qper India Pvt. Ltd. Launches Innovative Shrimp Health Product "GROBUST" at Aquaculture Expo 2025, Surat

Surat, Gujarat | 12 December 2025

Qper India Pvt. Ltd., is innovative researched base animal feed supplements manufacturer, proudly launched its latest innovative shrimp health product **GROBUST** at the **Aquaculture Expo 2025** held at **Sarsana Convention Centre, Surat, Gujarat**.

The product was officially unveiled by

- **Mr Ravi Yellanki, All India hatchery association, President**
- **Mr Suresh Patel, Gujarat Aqua Association, President**
- **Mr Pradeep Navik, GAFDA, President**
- **Dr Azad Dubey, Fortune Aquaculture**
- **Mr Samir Patel, Qper India Pvt Ltd**

in the presence of aquaculture farmers, industry experts, and stakeholders from across the country.

GROBUST is a scientifically developed, next-generation solution designed to **increase energy levels in shrimps and prevent gut-related diseases**. The product has undergone **extensive research and field trials for over two years** on both **Vannamei (Litopenaeus vannamei)** and **Black Tiger (Penaeus monodon)** shrimps under varied farming conditions.

Trial results have demonstrated significant performance improvements, including:

- **10–15% increase in Average Body Weight (ABW)**
- **Around 10% improvement in survival rate**
- **Approximately 5% improvement in Feed Conversion Ratio (FCR)**

Speaking at the launch event, **Mr. Nisarg Patel, Director of Qper India Pvt. Ltd.**, officially announced the **commercial availability of GROBUST for both domestic and international markets**, reaffirming the company's commitment to delivering research-backed, sustainable, and farmer-centric aquaculture solutions.

With the launch of GROBUST, Qper India Pvt. Ltd. aims to support shrimp farmers in achieving **better growth performance, improved gut health, and higher farm profitability**, while promoting sustainable aquaculture practices.

Corel Lifecare and The Aqua Consortium Sign Strategic Long-Term R&D Pact to Revolutionize Disease Management in Aquaculture

Navi Mumbai, India – 22nd January, 2026 – Corel Lifecare, a leading aquaculture innovation company recently featured on Shark Tank India, today announced the signing of a long-term Research and Development agreement with **The Aqua Consortium, Switzerland.** This strategic alliance aims to co-develop and deploy novel, farmer-first solutions addressing some of the most persistent biological challenges in the global aquaculture sector.

The partnership brings together Corel Lifecare's expertise in bio-formulations and rapid product development with The Aqua Consortium's deep technical capabilities and strategic industry oversight. The collaboration will focus heavily on creating safe, sustainable, and effective treatments for parasitic infestations and critical shrimp culture bottlenecks.

Targeting the "Silent Killers" in Fish Farming A primary focus of this R&D track is the development of next-generation management strategies for Copepod infestations, which currently cause significant economic losses globally due to mortality, reduced growth rates, and secondary infections.

The joint initiative will target two specific parasitic threats:

- ***Argulus* (Fish Lice) in Indian Major Carps:** Addressing the widespread infestation in freshwater farms—particularly affecting Rohu and Catla—to prevent ulcerative damage and improve marketability for farmers.
- ***Caligus* (Sea Lice) in Salmon:** Developing specialized solutions for the high-value Salmon industry, where sea lice remain the single largest pathogen challenge affecting welfare and profitability.

Expanding the Scope to Shrimp Culture In addition to finfish solutions, the agreement encompasses a robust development pipeline for the shrimp sector, addressing the needs of key stakeholders across the value chain.

"Our collaboration with The Aqua Consortium allows us to expand our impact beyond general farm management into highly specialized problem-solving," said **Abhijeet Naohate, Founder of Corel Lifecare.** "We are not just looking at fish; we are aggressively targeting pain points in shrimp culture. This includes developing advanced formulations for **shrimp hatcheries** to ensure higher larval survival rates, as well as biosecurity and growth-optimizing solutions for **grow-out farmers** battling complex disease pressures."

Global Expertise, Local Impact The partnership leverages The Aqua Consortium's global network to validate and scale Corel's indigenous innovations.

"We identified a critical need for solutions that are both scientifically rigorous and practically applicable for the diverse conditions of modern aquaculture," said **Ra'anan Ariav, CEO of The Aqua Consortium.** "Corel Lifecare has demonstrated an impressive agility in identifying farmer pain points. By combining our strategic R&D methodologies with their on-ground execution, we are positioned to deliver breakthrough interventions for the copepod crisis and shrimp sector challenges that the industry has long waited for."

A Commitment to "Lab-to-Land" Innovation By pooling resources, Corel Lifecare and The Aqua Consortium aim to accelerate the timeline from laboratory prototype to commercial application. The partnership underscores a shared commitment to the "Blue Revolution," ensuring that aquaculture remains a sustainable and profitable source of protein for the world.

About Corel Lifecare Corel Lifecare is a Mumbai-based aquaculture innovation company dedicated to designing problem-solving products for the aquaculture industry. With a focus on sustainable healthcare and yield optimization, the company recently gained national recognition on Shark Tank India Season 5 for its farmer-centric approach and rapid growth.

About The Aqua Consortium The Aqua Consortium is a premier strategic and technical organization serving the aquaculture industry. Known for its work in technology optimization and research dissemination, the Consortium partners with industry leaders to solve complex biological and operational challenges in aquatic food production.

Learn and explore new things towards advancement of Aquaculture:

Manas Kumar Dutta, MLA, Balasore advices aquaculture farmers and stakeholders

Aqua International organizes its 43rd Edition Aquaculture Expo at Balasore, Odisha

Manas Kumar Dutta, MLA, Balasore, inaugurated Aquaculture Expo 2026 while Sangram Das, M.A. Nazeer, Dilip Sahoo, Parasuram Behra and Mohan accompany the Chief Guest.

Balasore: The 43rd Edition Aquaculture Expo 2026 was held at NOCCI Business Park, Bampada, Balasore, Odisha on 27 and 28 January 2026. An Exhibition, Panel Discussion and Experts – Farmers Interaction Meet on aquaculture sector was organized to update knowledge on fish and shrimp farming and for better business opportunities.

M.A. Nazeer

On the first day in the inaugural session, Mr M. A. Nazeer, Chief Executive, Aquaculture Expo in his welcome address mentioned that Balasore is the shrimp farming capital of Odisha, and we will be able to gain more information and knowledge through exchange of ideas for betterment of the sector. Farmers, educational institutes, companies, suppliers of different commercial aquaculture products, processors and exhibitors have assembled here to participate in fruitful discussion. He said that Aqua International so far organized 42 exhibitions on aquaculture since 1994. Now shrimp farmers are struggling to do better as very high duty has been imposed upon shrimp price by USA, one of the main importing countries of farmed shrimp. Disease and low productivity are also a concern. But we will overcome all obstacles and rise, he stated.

Sangram K. Das, President, Seafood Exporters Association of India - Odisha Region, Aquatic Feed Dealers Association,, Odisha requested MLA Balasore Constituency to look into the improvement of export of shrimp from Balasore as ten shrimp export houses are located here. He gave his valuable opinion on analysis of shrimp samples

Sangram K. Das

Parasuram Behra

Dilip Sahoo

Archiman Lahiri

Manas Kumar Dutta

Chief Guest MLA and other dignitaries during lightning of lamp to mark inauguration of the Expo

for export, that both EIA and MPEDA are doing very good work. For the benefit of shrimp farmers who need power connection and supply in shrimp farms, Sangram Das mentioned that TATA Power may please withdraw its unilateral reclassification of electricity tariff, which has been enhanced. Government officials may please look into it.

Parasuram Behra, Executive Committee Member, Aquatic Feed Dealers Association mentioned that in comparison to previous years, success has been obtained in shrimp farming and production at Balasore in this current financial year, good crops harvested and no damage done in shrimp aquaculture. More awareness is needed among farmers on how to improve further on the existing situation and how to advance steadily. Shrimp farming is a measure of the economy of Balasore and entire Odisha particularly in the five coastal districts. It brings socio-economic development. Fishing in coastal seawaters in Odisha is done by professional fishermen and marine fishes caught, but more income and profit is obtained from shrimp aquaculture. Shrimp farmers should gain more information on the new aquaculture products (feed, medicine, etc.) marketed by reputed companies, which will help in increasing shrimp production.

Dilip Sahoo, Treasurer, Aquatic Feed Dealers Association said that laboratories are needed in Odisha to test water and raw material quality. Odisha shrimp farmers should get the facility and opportunity for testing their pond water and soil samples, whether any toxic effect of certain chemicals are there in water or not. Farmers may be given more subsidy in Government schemes, testing centres (lab) should be established at Bhubaneswar and Balasore. Farmers should know which protein content in shrimp feed is better, 35% or 40%. Test is also required for presence of residues of banned antibiotics in shrimp, and such lab should be established as early as possible for the benefit of farmers.

Archiman Lahiri, Deputy Director, MPEDA Regional Division, Odisha, mentioned that there has been remarkable 47% growth of shrimp farming in Odisha in the last decade. Also 19% growth in value of exports has been achieved in Odisha. This year 26% growth has been achieved in Odisha marine export. Odisha is the producer of sweetest shrimp, high-valued and the first criteria of export. MPEDA has established lab in Odisha for the test of banned antibiotics and quality control lab also established. For soil and water test and for PCR test, MPEDA will establish lab in Balasore. We are now fighting with the tariff burden and tariff war, but still we are exporting shrimp. We will target new export markets in 2026. MPEDA is giving training on preparation of value-added shrimp products, foreign delegates are awared on this aspect. Lahiri believed that best quality shrimp will be produced by Balasore farmers in days to come and offered to the world markets.

Manas Kumar Dutta, MLA, Balasore Constituency, Odisha and the Chief Guest of the Expo mentioned that we have to learn and explore new things towards advancement of aquaculture farming and the sector. Odisha has very good shrimp farming sector. Out of 11 lakh tonnes of fish production per year in the country, in Odisha, Balasore is the only district to have reached the 1 lakh tonnes production mark, and, out of it, 75000 tonnes is shrimp production. Balasore is the best marine district in India, and achieved awards from MPEDA. Aquaculture contributes in developing economy, and Balasore shrimp farming has great contribution – this district is at the centre of advancement. Problems of farmers will be addressed, more attention and importance will be given to this sector. More and more farmers should participate in such Aquaculture Expo, should know the usefulness of different aquaculture products. Commercialization of

A View of participants during inauguration of the Expo.

Panel Discussion held on prospects of aquaculture in Odisha

Sampath Das (Alok); Subrato Gosh, Archiman Lahiri; Jayant and Dinesh Chandra Ray during Panel Discussion on 27 January 2026 at Balasore, Odisha.

electricity should not be done, farmers should get some advantage. Datta ended by saying that the efforts of Balasore shrimp farmers will bear fruits, a huge improvement and heightened state of success will be made in 2026. Everyone participating in this Expo will be benefitted from the discussions and the exhibition.

Moderator and Panelists in Panel Discussion

In the afternoon, the Panel Discussion session and Experts – Farmers Interaction Meet was organized in the Auditorium hall. Among the total five panelists, Archiman Lahiri, Deputy Director, MPEDA Regional Division, Odisha; Subrato Ghosh, AFO, Department of Fisheries, West Bengal; Jayant, Director, Vaisakhi Marine Resources Pvt Ltd; Dinesh Chandra Ray, Shrimp Farmer, Oceanic Food; Sampath Das (Alok), Director, Hari Marine Pvt Ltd, were present. M. A. Nazeer moderated the Panel Discussion, which was organized on the theme 'Means to heighten status of aquaculture and aquaculture production in Odisha'. Quite a few very pertinent aspects were raised and discussions were made on these aspects, like quality of shrimp seed in Odisha, shrimp feed, shrimp pond management procedures, new technologies, hatchery shrimp seed production in Odisha, prevalence of shrimp and fish diseases, estimation of pond water and soil parameters and its importance, shrimp processing plants in Odisha, status of shrimp production in Odisha, biosecurity measures, problems faced by young shrimp farmers, issues about antibiotics use, laboratory facilities, and others. Progressive farmers, company technicians, learned participants from the audience expressed their viewpoints, participated actively in the lively discussion and agreed with the remarks made by Panelists. It continued for nearly two hours till 5.30 pm.

Aqua International presented mementos to the exhibitors as a gesture of appreciation for their participation in the Expo


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A view of Aquaculture Expo 2026 held at Balasore, Odisha on January 27 & 28

CPF India team at 6:00 PM in their booth in Aquaculture Expo 2026 held at Balasore, Odisha on 28 January 2026. CPF team head told Aqua International that they stayed till last minute of the Expo at 6:00 PM as they wanted to meet farmers till the end of the event.

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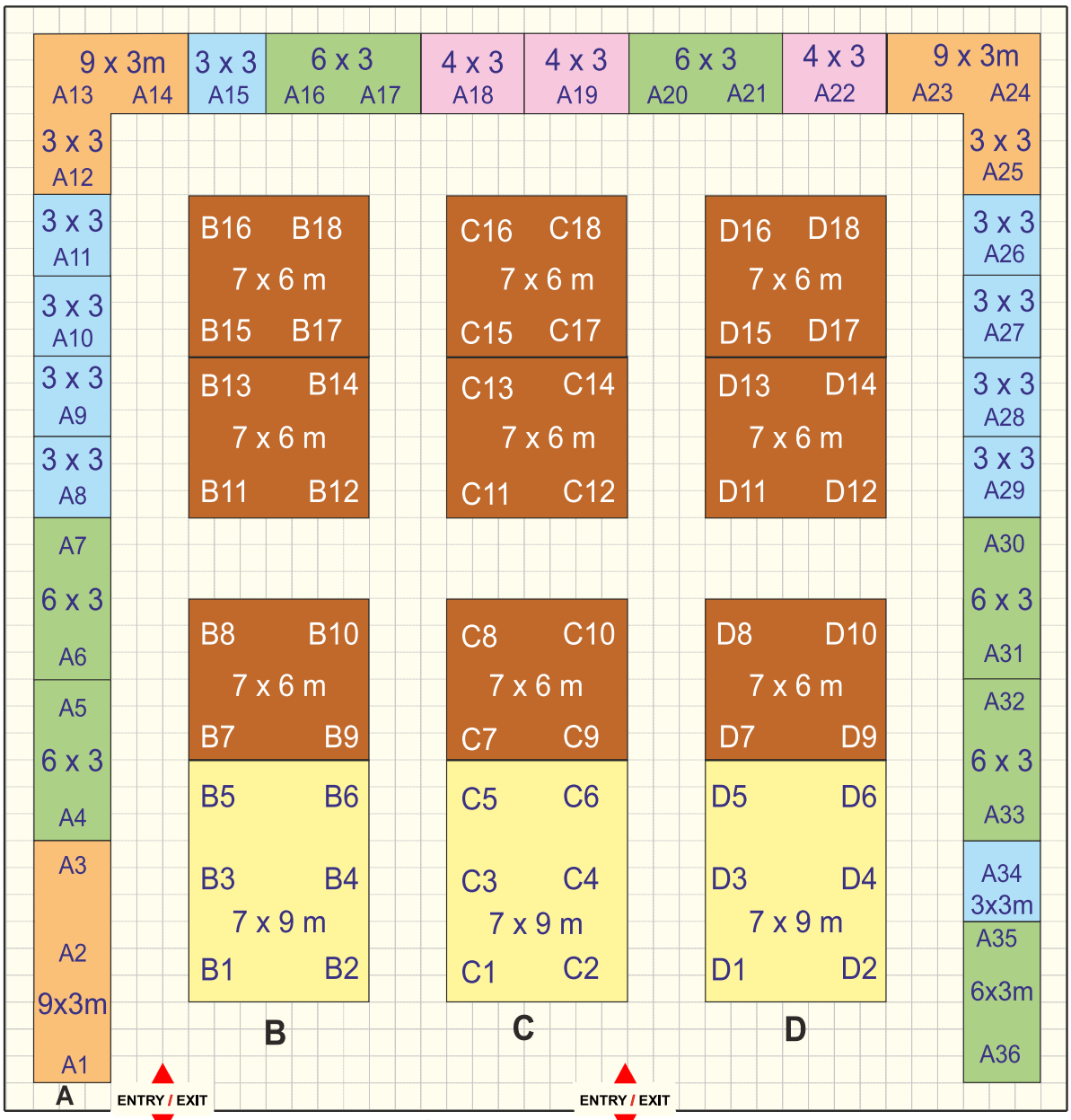

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Multiple Breeding in Finfishes: Breaking Seasonal Barriers for Higher Yields

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Abstract:
Multiple breeding in cultured finfishes represents a significant advancement that facilitates repeated spawning cycles beyond the natural season, resulting in increased seed production and enhanced aquaculture efficiency. By employing advanced broodstock management, hormonal induction, and environmental control, farmers can surmount seasonal limitations and satisfy the rising demand for fish seed. This article examines the methodologies, advantages, and challenges associated with multiple breeding, emphasizing its importance in achieving sustainable and profitable aquaculture. Case studies involving Indian major carps and other commercial species illustrate its effectiveness and practical implementation. Multiple breeding in finfishes is transforming aquaculture by allowing year-round reproduction, thereby overcoming traditional seasonal barriers. By utilizing techniques such as photoperiod manipulation, hormone treatments, genetic selection, and optimized nutrition, farmers can stimulate species like tilapia and salmon to spawn multiple times each year, increasing fry production by as much as 50%. This article investigates the underlying science, advantages, and practical applications of multiple breeding, while addressing challenges such as egg quality and fish welfare. Backed by research, it underscores how these innovations boost yields, promote sustainability, and respond to global seafood demand, presenting a promising avenue for feeding a growing population.






Introduction:

Aquaculture has transformed fish production; however, conventional breeding practices frequently constrain seed availability to particular seasons, mainly during the monsoon period. Various breeding strategies for finfishes have been developed as a remedy, facilitating several spawning cycles within a single year. This methodology not only guarantees a reliable supply of fish seed but also improves productivity in aquaculture enterprises. Envision a scenario in which fish farms can generate a larger quantity of fish at an accelerated rate throughout the year, contributing to the nutrition of millions while alleviating the pressure on wild fish stocks. This is not merely an aspiration for the future it is currently occurring through the implementation of multiple breeding in finfishes, a transformative approach within aquaculture. By adjusting environmental signals and employing advanced scientific techniques, aquaculture practitioners are overcoming seasonal limitations to enhance output and provide a consistent supply of seafood. Let us explore the mechanics of this process, its significance, and the latest scientific findings regarding its potential.

Multiple Breeding:

Multiple breeding entails encouraging fish to reproduce multiple times during a single breeding cycle. This is accomplished through an integration

of broodstock management, alteration of environmental conditions, and hormonal stimulation. Species such as Indian major carps (for instance, rohu, catla, and mrigal) have been effectively bred multiple times from March to September, leading to a substantial increase in seed production. Fish, akin to various animal species, usually reproduce during particular seasons influenced by triggers such as water temperature, length of daylight, or availability of food. For instance, Atlantic salmon generally spawn in the cooler seasons, whereas tropical species such as tilapia may reproduce when rainfall indicates plentiful food supplies. These natural rhythms restrict the frequency of fish reproduction, linking aquaculture output to seasonal patterns. Multiple breeding, alternatively known as out-of-season breeding or induced spawning, utilizes scientific methods to deceive fish into reproducing several times within a year, irrespective of seasonal changes. By adjusting variables such as light, temperature, or hormone levels, scientists and aquaculture practitioners can stimulate fish to spawn as needed. This practice results in an increased number of eggs, a higher quantity of fry (larval fish), and ultimately, enhanced production for aquaculture enterprises. A single female tilapia can lay as many as 1,500 eggs per spawning event, and through the implementation of multiple breeding techniques, certain farms can achieve 3 to 4 spawning cycles each year, in contrast to the 1 to 2 cycles observed in natural settings.

Techniques and Practices:

1. Broodstock Management:

Healthy, mature broodfish aged 2-3 years should be utilized. A diet rich in protein (30% protein, 6% fat) should be provided to enhance gonadal development. Regular water exchange (30-40% each month) is necessary to sustain optimal conditions. Selective breeding improves strains of fish that are more likely to spawn frequently or better respond to induced spawning techniques. For example, initiatives such as FISHBOOST in Europe have created carp and seabass varieties with elevated reproductive success. Selective breeding has enhanced disease resistance and spawning frequency in gilthead seabream by 10–15%, making them particularly suitable for year-round production.

2. Hormonal Induction:

Gonadotropin-releasing hormone analogs (e. g. , Ovaprim), dopamine antagonists, and human chorionic gonadotropin (HCG) are employed. Intraperitoneal injections are preferable to minimize stress and assure effective hormone distribution. At times, natural processes require stimulation. Hormones such as GnRH (gonadotropin-releasing hormone) or carp pituitary extract can initiate egg and sperm production. These hormones are administered with care to ensure healthy spawning without causing harm to the fish. Inducing spawning in carp with hormones can increase egg production by 50% per cycle, with fry survival rates reaching 80% under the right conditions.

3. Photoperiod Manipulation:

Fish typically utilize the length of the day to regulate their breeding cycles. By employing artificial lighting to replicate extended or shortened days, aquaculturists can deceive fish into perceiving it as the spawning season. For example, lengthening daylight hours may stimulate premature spawning in salmon, while reducing them can incite tropical species such as carp. A study conducted in 1999 demonstrated that altering photoperiods in Atlantic salmon led to a 20–30% increase in egg production beyond their natural spawning period.

4. Tweaking Temperature:

Water temperature serves as another critical indicator. By adjusting the temperature in tanks, aquaculturists can establish optimal spawning conditions. For instance, tilapia thrive at temperatures between 25–30°C, so maintaining warmer water throughout the year can lead to multiple spawning events. In Southeast Asia, tilapia farms utilize solar-heated ponds to keep the water warm, allowing for up to four breeding cycles annually.

Species-Specific Insights:

- **Indian Major Carps:** It can able to reproduce several times from March to September. The quantity of offspring produced rises with each following cycle of reproduction, reaching its highest point during the monsoon period.
- **Yellow Catfish (*Pelteobagrus fulvidraco*):** Research suggests that a feeding rate of 1% of body weight with a diet containing 46% protein improves reproductive success over several spawning events.
- **Golden Mahseer:** The ICAR-DCFR has established processes for captive maturation and various breeding methods for this at-risk species, enabling continuous seed generation throughout the year.
- **Tilapia in Philippines:** Through the use of hormonal induction and temperature regulation, farmers have enhanced tilapia production by 40%, with certain farms successfully achieving three spawning cycles each year. As a result, tilapia has become a primary source of protein for millions.
- **Salmon in Norway:** The manipulation of photoperiod has enabled salmon aquaculture to double the frequency of spawning cycles, resulting in a 30% increase in production and a diminished dependence on wild fish populations.

Considerations and Challenges:

- **Broodstock Health:** Frequent spawning may induce stress in broodfish; appropriate care and recuperation methods are necessary.
- **Water Quality Management**: Ensuring optimal water conditions is essential for effective breeding cycles.
- **Hormone Use:** Accurate dosing and application are critical to prevent adverse effects on the health of the fish.

- **Training:** Aquaculturists need sufficient training to successfully apply various breeding strategies.

Benefits of Multiple Breeding:

- **Extended Seed Availability:** Guarantees a continuous provision of fish seed throughout the entire year, lessening reliance on seasonal reproduction.
- **Increased Productivity:** The capability to achieve as many as four breeding cycles annually, considerably enhancing seed output.
- **Resource Efficiency:** Diminishes the necessity for maintaining extensive broodstock populations, thereby maximizing space and resources.
- **Economic Gains:** A reliable seed supply addresses market needs, boosting profitability for aquaculture enterprises.
- **More Fish, Faster:** Additional breeding cycles result in a higher volume of fish produced in shorter periods, optimizing farm yields.
- **Saving Wild Fish:** Enhanced yields from aquaculture reduce the necessity to deplete wild fish populations, thereby safeguarding marine ecosystems.
- **Feeding the World:** Continuous production assures a regular influx of cost-effective, protein-rich seafood.
- **Boosting Livelihoods:** Farmers benefit financially from consistent fish sales, bolstering coastal and rural economies.
- **Research Nugget:** A 2021 investigation concerning gilthead seabream discovered that extending photoperiods with artificial lighting raised spawning rates by 50%, effectively doubling the output of juvenile fish.

Conclusion:

Multiple breeding in finfishes constitutes a notable improvement in aquaculture, providing solutions to seasonal constraints and fostering seed production. By implementing these methodologies, aquaculturists can attain greater outputs, consistently satisfy market requirements, and promote sustainable aquaculture practices. Advanced DNA sequencing techniques, such as RAD sequencing, facilitate the identification of genes regulating spawning frequency, which allows for more informed selective breeding. Intelligent hatcheries that utilize AI-driven light and temperature control systems could enhance the efficiency and scalability of multiple breeding. As climate change modifies oceanic temperatures, multiple breeding may assist farmers in adapting by cultivating fish species that thrive under new environmental conditions. For example, selective breeding is being applied to alter the growth profiles of species such as cobia to align with warmer aquatic environments.

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Culture Systems, Economic Viability and Livelihood Potential of cultivable seaweed Kappaphycus sp. along the Tamil Nadu Coast

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Abstract:
Kappaphycus sp. cultivation along the Tamil Nadu coast emerges as a promising component of sustainable coastal aquaculture with strong economic, social, and entrepreneurial relevance. The article highlights the suitability of established culture systems, favourable coastal conditions, and assured market demand that make Kappaphycus farming economically viable. Beyond primary production, significant scope exists for startups and micro-enterprises in value-added products such as carrageenan, seaweed-based foods, nutraceuticals, cosmetics, and biofertilizers, as well as in service-oriented ventures and digital solutions. The sector holds particular potential for women-led enterprises, livelihood diversification, and inclusive coastal development. With appropriate institutional support, market linkages, and policy backing, Kappaphycus cultivation can substantially contribute to the blue economy and the development of a resilient coastal rural economy.

Introduction

Marine macroalgae, commonly referred to as seaweeds, form an important renewable bioresource with extensive applications in food, pharmaceuticals, cosmetics, agriculture, and industrial sectors. In recent years, seaweed farming has been promoted in India as a climate-resilient and sustainable coastal livelihood activity. Kappaphycus sp., a red seaweed belonging to the family Solieriaceae, is widely cultivated for the production of kappa-carrageenan, a hydrocolloid used as a gelling and stabilizing agent. The favorable hydrographic conditions prevailing along the Tamil Nadu coast, combined with institutional support and market linkages, have facilitated the expansion of Kappaphycus farming in selected coastal districts.

Potential Areas for Kappaphycus Culture along the Tamil Nadu Coast

The Tamil Nadu coastline, extending over 1,000 km, encompasses diverse coastal ecosystems suitable for seaweed farming. The Palk Bay region around Rameswaram provides sheltered shallow waters with low wave energy, making it highly suitable for rope-based culture systems. The Kanyakumari coast, influenced by nutrient-rich waters from three major seas, supports robust growth of Kappaphycus sp. Nagapattinam offers extensive intertidal flats and protected nearshore zones favorable for fixed and semi-floating culture systems. Thoothukudi, with its sheltered embayment and proximity to industrial infrastructure, supports both production and post-harvest handling activities. These regions together offer considerable scope for expansion of seaweed farming through site-specific culture practices.

Harvesting of farmed seawed (Kappaphycus) in Rameshwaram coast

Biological Characteristics of Kappaphycus sp.

Kappaphycus sp. is characterized by rapid vegetative growth, high carrageenan yield, and tolerance to a wide range of environmental conditions. The species thrives in salinity levels between 25 and 35 ppt and optimal temperatures ranging from 25 to 32°C. Propagation is entirely vegetative, using healthy thallus fragments as planting material. The absence of a sexual reproduction phase simplifies seed production and ensures uniformity in culture operations, making it suitable for adoption by coastal communities with minimal technical inputs.

Culture Systems and Methods

Several culture systems have been developed and standardized for Kappaphycus sp., depending on water depth, wave action, and substrate type. Among these, the long-line method is the most widely adopted along the Tamil Nadu coast. In this system, polyethylene ropes seeded

Seaweed Farming & Demonstration at Rameshwaram Coast

with Kappaphycus fragments are suspended horizontally between anchors with the support of floats. This method allows better water circulation and higher biomass production.

The monoline or single-rope method is commonly practiced in shallow coastal waters. It involves stretching a single rope between fixed supports and tying seaweed fragments at regular intervals. The fixed pole or stake method, using bamboo or wooden stakes driven into the seabed, is suitable for intertidal zones with minimal wave action. Although this method is low-cost, it is limited by site-specific constraints. Raft culture systems have been experimentally tested in sheltered waters and lagoons, offering scope for higher stocking density and mechanized handling.

Seeding and Culture Practices

Seeding material is prepared by selecting healthy, disease-free Kappaphycus fronds and cutting them into 10–15 cm long fragments. These fragments are tied onto culture ropes at intervals of 10–15 cm using soft nylon twine. Proper spacing is essential to prevent overcrowding and self-shading. Culture operations are typically initiated during post-monsoon and fair-weather seasons to avoid damage from rough seas and high turbidity.

Regular maintenance involves removal of epiphytes, monitoring for grazing organisms, and checking the integrity of ropes and floats. Harvesting is usually carried out after 45–60 days of culture, depending on growth rates and environmental conditions. Partial harvesting is often practiced to allow regeneration from the remaining biomass, enabling multiple harvest cycles from the same planting material.

Marketing and Buy-Back Arrangements

Marketing of Kappaphycus sp. in Tamil Nadu is largely facilitated through organized buy-back arrangements with processing companies and aggregators. These arrangements often involve pre-agreed prices, assured procurement, and, in some cases, supply of culture inputs such as ropes and floats. Farmers typically sell dried or semi-dried seaweed, with price determination based on moisture content, cleanliness, and quality.

Collective marketing through self-help groups (SHGs), cooperatives, or farmer producer organizations (FPOs) has proven effective in improving bargaining power and reducing transaction costs. Such institutional mechanisms also facilitate access to credit, training, and market information, thereby strengthening the overall value chain

Economic Viability

Kappaphycus farming is considered economically viable due to its low capital investment and short crop cycle. Initial costs are primarily associated with the procurement of ropes, floats, anchors, and planting material. Operational costs include labor for seeding, maintenance, harvesting, and transport. Returns are realized within two months of planting, and multiple crops can be harvested annually under favorable conditions.

Economic Viability of Kappaphycus sp. Culture along the Tamil Nadu Coast

Table 1. Fixed Cost for Kappaphycus sp. Culture (Per Unit: 1 acre long-line system)

S.No	Particulars	Quantity	Unit Cost	Total Cost	Life span years
1.	HDPE/polypropylene Culture ropes	1 set	25,000	25,000	3
2.	Floats (Plastic/thermocol)	100 nos	80	8,000	3
3.	Anchors/ Sinkers	10 nos	500	5,000	5
4.	Bamboo poles/ pegs	Lump Sum	---	4,000	1
5.	Knots, twine, accesories	Lump Sum	---	3,000	1
6.	Initial planting material (seed stock)	500(kg)	20/kg	10,000	---
Total Fixed cost		55,000			

Table 2. Variable / Operational Cost per Crop Cycle (45–60 days)

S.No	Particulars	Cost
	Labour for seeding and tying	6,000
2.	Maintenance &weeding	4,000
3.	Harvesting labour	5,000
4.	drying, cleaning and packing	3,000
5.	Transport to collection centre	2,000
6.	Miscellaneous & contingencies	2,000
Total viable Cost per cycle	22,000	

Table 3. Production and Returns per Crop Cycle

Parameter	Quality/ value
Culture duration	45-60 days
Wet biomass harvested	8-10 tonnes
Average wet to dry ratio	8:1
Dry seaweed yield	~1,000-1,250 kg
Average farm- gate price(dry)	Rs. 30-40 per kg
Gross income per cycle	Rs. 35,000-50,000

Table 4. Profitability Analysis per crop cycle

Particulars	Amount
Gross income (average)	42,500
Variable cost	22,000
Net operating profit per cycle	20,500

Table 5. Annual Economic Performance (6 crop cycle/ Year)

Particulars	Amount(Rs)
Gross annual income	2,55,000
Total Variable cost(6 Cycle)	1,32,000
Annual depreciation (fixed cost)	15,000
Net annual profit	1,08,000

Table 6. Benefit-Cost (B:C) Ratio

Particulars	Value
Total annual cost (Fixed + Variable)	Rs. 1,47,000
Total annual return	Rs. 2,55,000
Benefit- Cost Ratio	1:1.73

Interpretation

The economic analysis clearly indicates that kappaphycus sp. Farming is a financially viable coastal aquaculture activity with a Benefit-Cost ratio well above unity. The low capacity requirement, short crop cycle, amd assured buy-back arrangements contribute to early break-even, often within the first year of operation. When adopted through SHGs of women-led group, shared infrastructure further improves profitability.

Economic analyses from field experiences indicate that small-scale farmers can achieve break-even within one or two production cycles. However, profitability is influenced by environmental factors, market price fluctuations, and farm management practices. Risk mitigation through crop insurance, diversification, and collective operations is therefore essential.

Adoption by Rural Coastal Women

Seaweed farming has emerged as a gender-inclusive livelihood option, particularly suitable for rural coastal women. The activity is non-mechanized, flexible, and compatible with household responsibilities. Women actively participate in seeding, tying, drying, grading, and packaging operations. Formation of women-led SHGs has facilitated skill development, income generation, and social empowerment.

Participation in seaweed farming has contributed to income diversification, reduced dependency on capture fisheries, and enhanced resilience of coastal households to climate-induced livelihood shocks. Targeted training and institutional support can further strengthen women's participation across the seaweed value chain.

Scope for Startups and Entrepreneurship

Beyond primary production, Kappaphycus sp. offers significant scope for startup ventures and micro-enterprises. Opportunities exist in value addition, such as production of dried seaweed products, semi-refined carrageenan, seaweed-based food items, nutraceuticals, cosmetics, and biofertilizers. Service-oriented startups providing culture materials, technical consultancy, and training services can also play a key role in sectoral growth.

Integration of digital tools for site mapping, production planning, and

market linkage can enhance efficiency and transparency. With policy support and access to finance, seaweed-based startups have the potential to contribute to the blue economy and coastal rural development.

Conclusion

Kappaphycus sp. cultivation along the Tamil Nadu coast represents a sustainable and economically viable aquaculture activity with strong livelihood and entrepreneurial potential. Appropriate culture systems, assured market linkages, and collective institutional frameworks are critical for long-term success. The promotion of Kappaphycus farming, particularly among rural coastal women, can contribute significantly to income generation, social empowerment, and the development of a resilient coastal economy.

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A brief account on shrimp processing plant

at K.N.C. Agro Limited, Purba Medinipur, West Bengal

Subrato Ghosh, Kolkata, West Bengal

Highlight points

On 14/09/2024, I heard in a Presentation at the International Conference at Science City, Kolkata that India is a major farmed shrimp producing nation with seafood exports of Rs 60523.89 crores (as in 2023-2024). Frozen shrimp export was 7.16 lakh tonnes, which contributed to more than 66% (Rs 40013 crore) of the total export earnings to seafood export basket. K.N.C. Agro Limited is a well-recognized shrimp processing plant located in Purba Medinipur district of West Bengal, involved in frozen shrimp export since 2014. Sri Mir Tabarak Ali, one of the Directors of K.N.C. Agro Limited; Sri K. R. P. Rao, Plant Manager and Sri Anirban Das, Sr. Technician entertained me and other participants during our two-times visit here recently, guided and allowed us to enter into main shrimp processing (production) facility, gave an overview of scientific processes carried out here in context of processing and preservation of farmed *L. vannamei*.

Introduction

Established and operation started in the year 2014, K.N.C. Agro Limited is a renowned brackishwater shrimp *Penaeus monodon* and *Litopenaeus vannamei* processing unit (meant for export) in West Bengal under private sector, having EU approval number. Its location is at Vill. Uttar Sitala, P.O. Pichhaboni, PS Ramnagar under Ramnagar-2 CD Block, Dist. Purba Medinipur. Its building construction started in the year 2012. Mission of this processing unit is supply of safe and hygienic seafood to the world maintaining the environment, sustainability and better livelihood of shrimp farmers. It is a 4-Star BAP (Best Aquaculture Practices) certified and BRC (British Retail Consortium Global Standards) Grade-A certified seafood company. It is approved by BRC, FSMS (Food Safety Management System) registered, complying with ISO Code of Conduct for seafood production. K.N.C. Agro Limited is also certified by FDA (Food and Drug Administration), USA.

K.N.C. Agro Limited possesses 243 hectares of owned shrimp farm at Mondarmoni region in coastal Purba Medinipur. Complying with HACCP principles, here, economically-important shrimps are processed with high degree of freshness. Considering other infrastructure, this plant has seven contact freezers (for block frozen material), four raw IQF

(Individual Quick Frozen) machines and one Cooking Line, well-equipped in house Laboratory. Presence of even minimum traces of pathogenic and non-pathogenic microorganisms like *Vibrio* sp, *Salmonella* sp, *Pseudomonas* sp, *Escherichia coli*, *Staphylococcus aureus*, total and faecal coliform bacteria (if any) (total aerobic plate count in CFU, MPN coliforms) is thoroughly checked both in the raw material and final frozen product. All specialized machineries used here are imported. Product type at K.N.C. Agro Limited, both 'raw' and 'cooked' separately, includes: 'Head-on Shell-on'; 'Headless Shell-on'; 'Headless Shell-on Easy-peel'; 'Peeled, deveined Tail-on'; 'Peeled, deveined Tail-off'; 'Peeled and deveined'; 'Peeled undeveined'; 'Skewer'; 'Butterfly'.

Besides the above-mentioned two species of farmed shrimps, other varieties of shrimps processed here include Sea white shrimp *Fenneropenaeus indicus*, Sea pink shrimp *Metapenaeus monoceros*, Sea brown shrimp *Metapenaeus affinis*, Sea bamboo flower shrimp *Penaeus semisulcatus* – which are wild-caught. The processing plant was founded and led by Sri Mir Mamrej Ali (presently Managing Director of K.N.C. Agro Ltd.); has a fleet of insulated and reefer trucks for transport of raw material and finished product. Sri Mir Tabarak Ali, Sri Mir Tabrej Ali and another two persons are presently the Directors of this well-equipped shrimp processing plant namely K.N.C. Agro Limited. The cold storage works here at -18°C, temperature is maintained.

All steps of processing activities from receiving of adult shrimps from its own farm ponds, handling to production of final marketable products, ready for export to global markets, are done at this ultra-modern processing plant complying to strict hygienic principles (including personal hygiene) and adhering to food safety and quality standards. Both quality and shelf life of shrimps are increased in the process, value-added and prepared for consumption. These shrimps as food item in processed form are much popular around the world. As a part of 15-days In-Service Training Programme of the newly-appointed Fishery Extension Officers (FEOs under Directorate of Fisheries, West Bengal) organized at Government Fish Technological Station, Junput, Purba Medinipur, that begun on 15/09/2025 (1st Batch) and 24/11/2025 (2nd Batch), the first and second Batch of participants visited K.N.C. Agro Limited on 22/09/2025 and 30/11/2025 respectively as a part of their training schedule. I had an opportunity to be in the team of FEOs as learners on both occasions.

Receiving section at K.N.C. Agro Limited

L. vannamei harvested from farm ponds of K.N.C. Agro Industry Limited can arrive at this processing plant on ice in less than 30 mins time; that ensures the highest degree of freshness and excellent quality of the product. Raw material is brought to this shrimp processing plant in refrigerated form from farm, temperature in main processing zone is maintained below 4°C. All shrimp food handlers are well-versed with and adopt proper sanitation measures strictly while at work. Outsiders have to wear face mask, white apron coat, gum boot and head gear before entering the main processing zone K.N.C. Agro Limited, all items provided by the senior supervising staff on-duty. From the corridor, first they have to walk through a 6-8 inch height small squarish reservoir containing 2ppm and 20ppm chlorinated water (general wash water) and enter into main premises.

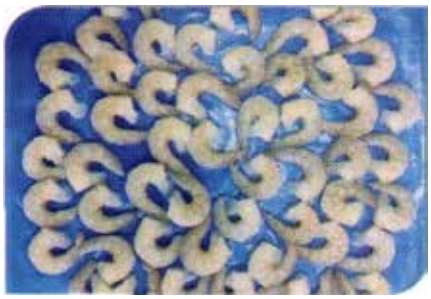
In the pre-processing area, deheading of shrimps is done. Bruished ones are sorted and discarded. Shrimps with intact body are sorted in the size grading machine 'Smart sorter and grader'. Segregated shrimps are passed through conveyor belt;

the IQF ones are brought to -40°C temperature in 20-40mins. From the conveyorized raw material (adult good quality shrimps) receiving section or the pre-processing section at K.N.C. Agro Limited, following are the activities performed in succession: sorting, deheading, peeling, grading, value addition, treatment with sodium polyphosphate (chemical soaking; that increases shelf life of shrimps, longevity 2 years), IQ Freezing at -40°C (shrimps washed in cold water and then hardened), partial cooking, glazing, packing, cold storage, shipment schedule. Shelf life of such shrimps is 2 years at -40°C.

Receiving section is also known by name Purchase section. Shrimps (*L. vannamei* 20-25gm and other species) loaded in blue rectangular carats (crates) in trucks are supplied to this processing plant from farm ponds and from sea water (wild caught ones). Workers wash their hands in 20ppm chlorinated water. Strict hygiene and sanitation are maintained at every step. Initially, shrimp samples received in bulk are washed with 5-20ppm chlorinated water having 1-2°C temperature (no use of normal water) – this is pre-washing or first wash. Raw materials are weighed, conveyor belts are used. Washing is done automatically, grading done in Laser Grading section of this plant {where 100kg raw shrimps are graded in every 1 hour; 26-30nos may weigh 1 pound (453gm) or 21-24nos may weigh 1 pound, or other, done according to importer's (consumer's) preference}. Size-graded shrimps are filled in carats automatically. Control panel with signals is used here. Cleaning, washing, storing, icing and re-washing of shrimps (in exchanged chilled 20ppm chlorinated water) are done in succession, then head-on materials are passed on to pre-processing section in conveyor belts. At this processing plant, the raw product is fully chilled, temperature is brought down from 8°C to -4°C and then iced, to kill all kinds of cold-resistant harmful bacteria.

Pre-processing and processing sections

In pre-processing section, materials



are first washed with 50-100ppm chlorinated water. Deheading is done manually on belt system, and 35-40% of the unwanted dirt materials are eliminated from shrimp body. It is followed by grading (shrimps segregated gradewise), washing and grading again. Shells teared off from body of shrimps individually. It is followed by weighing and washing. There are conveyor belts under control working at 90°C temperature in cooking area for producing processed and cooked shrimps. Chilled water and glazed water are used for freezing. There are freezer and cooker in cooking section area. Cooked shrimps are taken out from cooker and placed in chilled water, taken for freezing in chilled water, then hardened. 'Head (cephalothorax) and shell removed' shrimps are cooked by steam, either on a conveyor belt or by placing the shrimp in steel trays.

From pre-processing centre, shrimp material goes for value addition and further steps of operation. Activities concerning 'Peeled (peeling)' and 'deveined (deveining)' are included in value addition. In the processing section, controlled cooking is done; material includes 'Peeled, deveined and Tail-on IQF' shrimps. After cooking is completed, grading and weighing are done, then soaking done in chemicals, *i.e.*, food-grade sodium tri-polyphosphate, food-grade sodium citrate and non-phosphate (bicarbonate) solutions for 1-2 hours. Use of these chemicals depends on the importing country. After soaking, grading is done manually where broken and defect ones are rejected, the 'only intact meat' ones are taken for further processing.

Net weight of each of the block frozen *L. vannamei* at this processing plant is 1.8kg (1.8-2.0kg product per plate + chilled chlorinated water, placed in freezer). Shrimps are arranged in trays and filled with little water in plate freezing at this plant and frozen at -40°C for 2 hours. In plate freezer, cooling temperature down upto –40°C from 0°C is attained within an hour; thereafter complete freezing occurs in 3 hours. Completely iced product comes out from plate freezer, washed again with chlorinated water at 1°C and then it goes to packing section. Unglazed IQF shrimps (frozen at -38°C) are passed through glaze water chamber and then glazed (10% to 40%) for 10mins to prevent dehydration. A thin coating of a layer of ice is given to IQF shrimp which will not break, these are

frost-covered shrimps. Double glazer is used, as per preference of buyers in USA and UK. The IQF shrimps appear like small rocks, ready for final packing. IQF Freezer at K.N.C. Agro Ltd produces uniform quality IQF frozen shrimps with desirable colour, taste and appearance. It takes total 2.0-2.5 hours for the materials received at receiving section, processed and passed on to packing section. Combining IQF and block freezer, total freezing capacity of this shrimp processing plant is as high as 120 tonnes per day. Nearly 90% of exports of marine products (shrimps, marine finfishes) from West Bengal are in frozen form.

Packing section

The 'Peeled, deveined and Tail-on IQF' shrimp product is Wallmart brand, having net weight 21-25 pound per pack. Final packing is done in poly-propylene containers, then it goes to metal detector machine, then storing at -18°C (product temperature). Final frozen product are weighed and packed in master cartons. Loading on trucks for transportation is done as per schedule, processed shrimps exported to USA and other countries. Hazard detection (if any) and treatment done accordingly. There are different grade products: 40 count per pound (block frozen), 20 count per pound (frozen), 30 count per pound (IQF). Towards the end of operation, there are metal detectors for checking IQF shrimps after packing in pouches. In 30mins, frozen cooked shrimps are packed in poly-pouches, passed through metal detector; packed products are loaded in refrigerated containers.

There are refrigerated containers for loading. Temporary storage is done in chilled rooms when packed products are in excess. In addition to that mentioned earlier, frozen shrimp products include 'Shell-on Tail-on with proper shape', 'No shell Tail-on', 'Tail-on' or 'Tail-off'. Proper labeling, weight of final product, shelf life and Company Code number are mentioned in packets. There is Loading and Dispatch section in this plant. From here, sealed master cartons containing sealed packets (each containing 960gm shrimp product or other specific weights) maintained at -18°C becomes ready for shipping from Haldia dock and other place. The -18°C store room (many master cartons kept in order, total 8000 tonne capacity) at K.N.C. Agro Limited is a highly-iced frozen room and filled with snow. Quality assurance and quality control checking are routinewise done at different stages of operation; this Department had started at K.N.C. Agro Limited in 1987.

End note

The most efficient technology is used at K.N.C. Agro Limited, aiming to increase quantity of production and export of value-added seafood products. K.N.C. Agro Limited participated in 23rd India International Seafood Show at Kolkata, West Bengal from February 15-17, 2023; also in the World Food India at New Delhi during September 19-22, 2024. K.N.C. Agro Limited participated in the India Pavilion of Seafood Expo Global and Seafood Processing Global at Barcelona, Spain during April 25-27, 2023. KNC Agro Limited stall got the 'Best Stall' award in Exporter Category in 23rd India International Seafood Show. In March 2014, it commenced shrimp processing at its own facility. Revenue of K.N.C. Agro Ltd has improved consistently, aided by increase in international demand for shrimps and higher cultivation of *L. vannamei* in the domestic market. Skilled personnel at K.N.C. Agro Limited have helped us and Sri Anirban Das, Sr. Technician, K.N.C. Agro Ltd patiently explained all major activities and features at this shrimp processing plant in detail to us. The dedication, experience and wealth of knowledge of entire team at K.N.C. Agro Ltd. both at farm and factory have contributed to delivery and export of world-class and highest quality frozen shrimp products to world markets – with a commitment to the best quality.

Building Resilient Shrimp Seed:
How Genetics and Hatchery Systems Drive Postlarvae Quality

Natthinee Munkongwongsiri and Craig L. Browdy

Natthinee

Craig

Introduction: Why Shrimp Seed Quality Matters More Than Ever

Global shrimp production continues to grow, with major producers such as Ecuador, India, China, Vietnam and Indonesia expanding output to meet rising demand. At the same time, shrimp farming is becoming increasingly complex. Disease pressure, environmental variability, tightening biosecurity requirements and rising feed costs are placing greater emphasis on consistency and risk management rather than maximum growth alone.

In Asia in particular, shrimp are farmed across highly diverse salinity ranges, pond systems and management styles. Recent data from across Asia indicates a significant percentage of ponds are being flushed, or harvested early because of slow growth, mortality and or disease. The financial toll from lost crops is substantial, compromising farm viability. Under these conditions, the quality of shrimp seed—specifically the robustness and resilience of postlarvae (PLs)—has become a critical determinant of farm

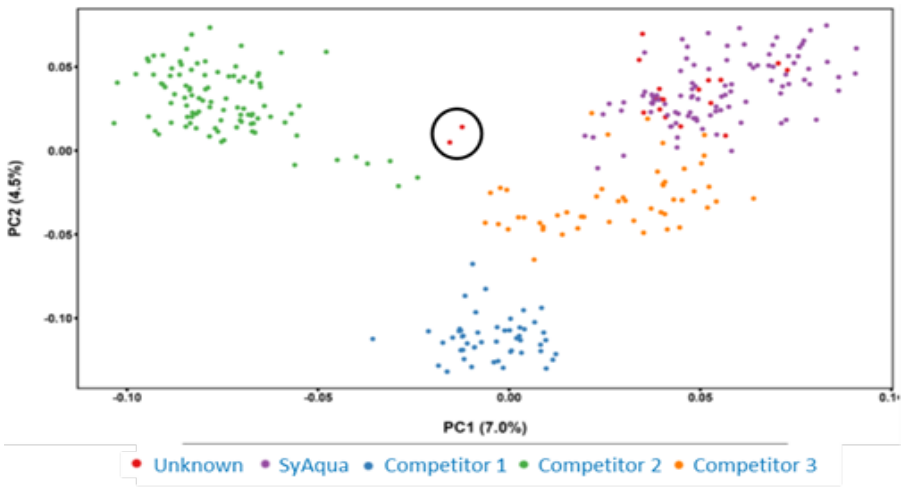


Figure 1: Genomic analysis enables reliable statistically powerful differentiation of SyAqua from non-SyAqua or hybrid stocks.

performance. Consistancy in survival, adaptability and feed efficiency now rank alongside growth as core performance indicators.

As a result, shrimp breeding and hatchery systems are evolving toward integrated, science-based approaches that link genetics, hatchery technology and performance data across the production chain.

Genetics with Purpose: Building Resilient Shrimp Seed

In modern shrimp farming, genetics defines far more than growth rate. As farming environments become more variable and production risks increase, breeding objectives must focus on producing shrimp seed that performs consistently under commercial conditions.

Earlier breeding approaches often prioritized rapid growth, assuming this alone would drive farm success. Experience has shown that single-trait selection frequently leads to trade-offs, particularly reduced robustness and lower tolerance to stress or disease. Shrimp that perform well under ideal conditions may struggle when exposed to fluctuating salinity, water quality challenges or pathogen pressure.

To overcome this, advanced breeding programs now apply balanced genetic strategies that improve multiple traits simultaneously. High genetic diversity provides the foundation for long-term improvement, while quantitative genetics and genomic selection increase accuracy and rate of genetic improvement, for combinations of complex traits. Index-based selection allows growth, survival, robustness and disease tolerance to be improved together, rather than in isolation.

"Balanced breeding programs, such as those implemented within SyAqua's genetic development framework, apply index-based and genomic selection to improve growth, robustness and disease tolerance simultaneously, reflecting the shift toward resilience-driven breeding objectives."

From Genetic Design to Commercial Farm Performance

Balanced breeding strategies must ultimately prove their value under commercial farming conditions. In Asia, shrimp are cultured across highly variable environments, particularly in terms of salinity, water quality and disease pressure. Genetic programs designed for resilience must therefore deliver consistent performance not only in optimal conditions, but also under real-world stress.

Breeding programs that deliberately select and test shrimp across contrasting salinity environments have demonstrated that strong performance can be maintained across low-, medium- and high-salinity systems. Rather than producing environment-specific lines, balanced genetic strategies allow a single genetic line to perform reliably across diverse farming conditions.

Disease pressure represents an additional and often more disruptive source of production risk. While different genetic stocks may show similar growth and feed conversion under non-challenged conditions, clear differences emerge when disease is present. Controlled challenge testing has shown that genetically tolerant stocks maintain significantly higher survival, better growth and improved feed efficiency under diseases. This tolerance has been demonstrated for viruses as well as bacterial and fungal pathogens such as acute hepatopancreatic necrosis disease (AHPND) and Enterocytozoon hepatopenaei (EHP).

Commercial farm data confirm the practical value of these traits. Across ponds facing variable environmental and health challenges, balanced genetic lines show more stable growth, efficient feed conversion and consistent yields. Performance trends remain similar across environments rather than diverging sharply, reducing uncertainty for farmers and feed producers.

"These trends are supported by multi-country commercial production records generated through structured benchmarking programs, including datasets developed within SyAqua's commercial farming network."

Genetic Integrity and Traceability

As breeding programs become more sophisticated, maintaining genetic integrity and traceability throughout the production chain becomes increasingly important. Unintentional hybridization, genetic drift or misidentification of stocks can compromise performance outcomes and reduce confidence in production results.

This issue is particularly relevant for farmers sourcing postlarvae from hatcheries that manage multiple genetic stocks. Without reliable verification, it can be difficult to link on-farm performance—such as survival, growth or feed conversion—to a specific genetic line. This uncertainty complicates management decisions, feed evaluation and comparisons between production cycles.

Genomic tools now allow reliable verification of genetic identity using small sample sizes collected at the farm level. Proper sampling protocols and secure data handling ensure confidentiality while providing statistically robust differentiation between genetic lines. This enables farmers to confirm that the seed stocked in ponds matches the intended genetic source.

Hatchery Systems That Unlock Genetic Potential

Genetic improvement alone does not guarantee performance. The expression of genetic potential depends heavily on hatchery systems and management practices. Poor hatchery execution can mask genetic advantages, resulting in variable PL quality and inconsistent farm performance.

Key hatchery elements that support high-quality PL production include:

- Strong biosecurity and water treatment systems
- Effective bioremediation and water quality management
- High-quality fresh and formulated feeds
- Feeding strategies aligned with larval developmental needs

Larval feeds are critically important, from healthy algae, to clean enriched Artemia with little or no vibrio contamination, and high quality manufactured larval feeds. Hatcheries have many choices in larval feeds from low-cost flakes to the most advanced highly digestible and nutritionally balanced microencapsulated particles. In a well-run hatchery, the highest feed quality improves profitability with higher survivals, while contributing to better PL quality. Feed management is particularly critical. Overfeeding does not improve larval performance and often leads to deteriorating water quality and compromised health. Successful hatcheries rely on frequent observation of survival, gut fullness and larval condition, adjusting feeding rates accordingly rather than following fixed feeding plans.

Measuring and Assuring Postlarvae Quality

PL quality cannot be assumed—it must be measured. Comprehensive PL quality assessment programs typically include:

- Morphological assessments for size consistency, deformities, fouling and tissue damage
- Evaluation of physiological indicators such as lipid reserves
- Stress tests and stocking accuracy checks
- Pathogen screening using molecular and microbiological tools
- Continuous monitoring of key water quality parameters

Coupled with new AI based tools for measuring and quantifying PL, these assessments provide hatcheries and farmers with greater confidence in the quantity and quality of seed entering grow-out systems. Assuring that the pond is stocked with the right number of PL is critical for proper pond management. Even small improvements in PL quality can translate into significant gains in survival, growth and feed conversion efficiency at the farm level.

Conclusions: Investing in Seed Quality Pays Dividends

Shrimp farming success increasingly depends on the integration of genetics, hatchery technology and data-driven decision-making. Advances in genomic selection, combined with balanced breeding strategies and modern hatchery systems, enable the production of postlarvae that are not only fast-growing but also robust, disease-tolerant and efficient users of feed.

For the industry, the message is clear: investing in high-quality shrimp seed delivers returns that far outweigh the initial cost. As farming environments become more challenging, resilient PLs will form the foundation of sustainable and profitable shrimp production worldwide.

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