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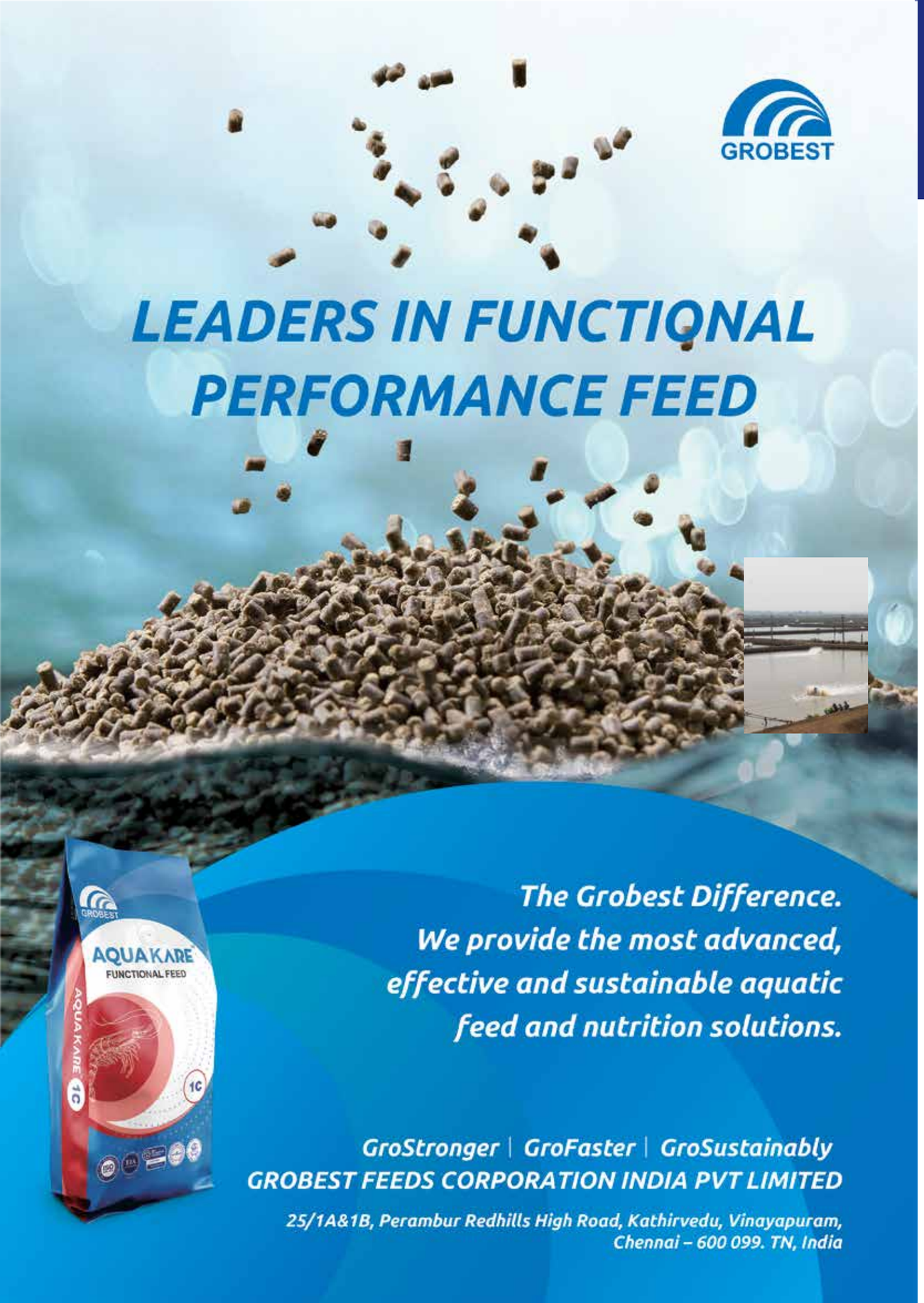

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Markets- key for sustainable aquaculture

Aquaculture is seen as a sunrise sector in India with the potential to not only strengthen livelihood and create employment opportunities but also earn crucial foreign exchanges for the country.

Until up to the Covid pandemic, the sector continued to maintain a sustained growth rate, being the second largest fish producing nation in the world with the volume touching 14.16 million metric tonnes during 2019-20. The major export market continued to remain the USA, China, the European nations, Japan, South East nations.

But the pandemic caused a mild shock in the sector, bringing down the export numbers as worried overseas customers cut their consumption level and cancellation orders piled up.

The downtrend, however, remained short-lived and towards the beginning of 2021, the sector saw a surge in shipment led by robust demand from the US market and record production of Vannamei shrimp. The introduction of pathogen-free Black Tiger shrimp broodstock gave the added push to the export volume. The country exported 12.89 LMT of fisheries products at USD 6.68 billion during 2019-20, largely mitigating the adverse impact of the Covid-19 pandemic.

The Commerce Ministry now in its latest statement on Friday projected the export of marine products to touch USD 8 billion during the fiscal year. The unveiling of the projection target reflects a healthy turnaround of seafood export.

Significantly, more than 90 per cent of seafood shipments are exported to major destinations like the US and China with 42 per cent and 25 per cent respectively. We need to explore new markets. Today, 74 per cent of India's export is shrimp. The share of value-added products is low at 7 per cent. Thus, there is a huge scope to increase value-added exports.

Apart from the export market, there is a huge scope to develop the domestic market. Many start-ups, online wholesale vendors and suppliers have come up during last five-seven years, streamlining the supply chain management in the domestic market. During the pandemic period, they have delivered products at the doorstep. It is prudent to ensure the farmers are also getting good farm gate price. It will help both farmers as well as consumers.

The blue revolution initiatives and public investment will certainly increase the production in the coming years. Thus, we have to give more focus on developing market infrastructure and new technologies for the sustainable development of the sector.

Bharath Bhathan

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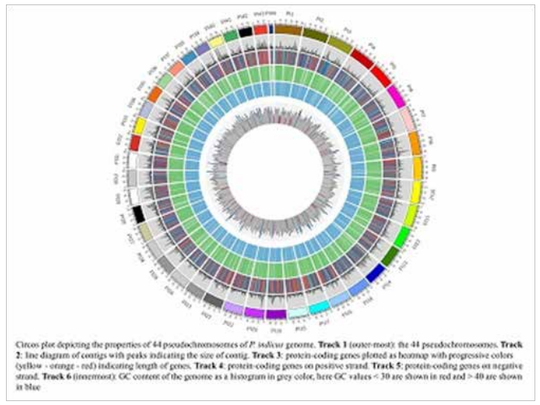
ICAR-CIBA unveils whole genome of Indian white shrimp



Circos plot depicting the properties of 44 pseudochromosomes of *P. indicus* genome. **Track 1** (outer-most): the 44 pseudochromosomes. **Track 2**: line diagram of contigs with peaks indicating the size of contig. **Track 3**: protein-coding genes plotted as heatmap with progressive colors (yellow - orange - red) indicating length of genes. **Track 4**: protein-coding genes on positive strand. **Track 5**: protein-coding genes on negative strand. **Track 6** (innermost): GC content of the genome as a histogram in grey color, here GC values < 30 are shown in red and > 40 are shown in blue

The Scientists of the ICAR-Central Institute of Brackishwater Aquaculture, Chennai have sequenced and assembled the whole genome of Indian White Shrimp (Penaeusindicus) on their own. This is a significant achievement for the country in decoding the whole genome of the native species of shrimp, one of the world's most important seafood commodities, said an ICAR statement.

Globally, the shrimp farming is an important contributor of seafood, provides nutritional security, supports employment opportunities and exports shrimp commodities of high value to many countries. The Indian Shrimp Industry contributes about 11 per cent share of the global production (759,906 Tonnes valued at USD 4 Billion in 2020) amongst the shrimp producing countries.

The Scientists' team involved in shrimp genome assembly included Dr. M.S. Shekhar, Dr.Vinaya Kumar Katneni, Dr. Ashok Kumar Jangam and Dr. K.K. Vijayan.

The shrimp genome sequencing project was financially supported by the ICAR-Consortium Research Platform on Genomics and coordinated by Dr. Joy Krushna Jena, Deputy Director General (Fisheries Science), ICAR.

The Shrimp Genome contains 28,720 protein-coding genes. The decoded shrimp genome has applications to genetic improvement programmes, stock management and ecology and evolutionary studies in species of commercial significance.

To reduce the dependency on exotic species, the Indian native shrimp, P. indicus which has tolerance to a wide range of salinity and wide geographical distribution, can be developed as a potential species of culture for India.

The future genetic improvement programmes with focus on P. indicus would benefit aquaculture with increased productivity and sustainability across Asia and the other geographical locations where this shrimp species is predominantly found. The whole genome sequence of shrimp is an invaluable genomic resource to aquaculture science researchers & shrimp breeders and would serve as a reference genome for future genetic improvement programmes for developing the shrimps with desired economically important traits.

Union fisheries secretary visits ICAR-CIBA

Union Fisheries, Animal Husbandry & Dairying Secretary J.N. Swain visited the ICAR-Central Institute of Brackishwater Aquaculture, Chennai on December 28 and interacted with the scientists of ICAR-CIBA at the Coastal Aquaculture Authority.

He urged the Institute for focusing on the research work to include seaweeds in shrimp and fish feeds for enabling the seaweed farmers get a continuous market demand and enjoy remunerative prices.

ICAR-CIFRI organised campaign on climate smart inland fisheries

The ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata organized the Campaign on 'Climate-Smart Inland Fisheries in Coastal Wetland, West Bengal' at the Coastal Wetlands of the Sundarbans.

The Campaign aimed at sensitizing the fishers and creating awareness on the climate-smart fisheries management in the changing climate scenario. The registered participants comprised of 70 Scheduled Caste Fishers including 20 women.

Dr.Uttam Kumar Sarkar, Principal Investigator, NICRA &HoD, Reservoir and Wetland Fisheries Division, ICAR-CIFRI, Barrackpore highlighted the various issues and innovative adaptation strategies

MoS Jal Shakti stressed on reservoir development in Odisha

The Department of Fisheries, Government of Odisha and the fishers should join hands with the ICAR-CIFRI, Barrackpore for the holistic development of the Reservoirs in Odisha, said Union Minister of State for Jal Shakti and Tribal Affairs Bishweswar Tudu, He said this during the inauguration of the ICAR-CIFRI Pen Culture Demonstration-cum-Reservoir Fisheries Enhancement Programme at Balidiha, Mayurbhanj District, Odisha on December 11.

The Minister stressed on disseminating the benefits of the Reservoir Fisheries Development programme to the local community.

Subrata Dash, District Fisheries Officer, Mayurbhanj District, Odisha underlined the various Schemes being run by the State Government for fisheries development.

Dr. K.P. Jithendran, Director, ICAR-CIBA, Chennai shared with the Secretary the progress of the ongoing projects undertaken by the Institute. The disease surveillance programme and the importance of Jump Start Programme on Genetic Improvement of Indian Shrimp (Penaeusindicus) to facilitate shrimp farmers with indigenously produced quality shrimp seed for supporting the Indian Shrimp Culture was also underlined by Dr.Jithendran.

for managing the fisheries of the coastal wetland. The need for conservation was also stressed by Dr. Sarkar.

Tapan Sardar, Gram Pradhan, Bermajur - 1, North 24 Parganas, appreciated the Institute's initiative for the development of the Scheduled Caste Community through the climate-smart fisheries.

Earlier, welcoming the dignitaries, Dr. B.K. Das, Director, ICAR-CIFRI, Barrackpore briefed about the activities being carried out by the Institute in Odisha. He also urged the fishers of Balidiha Dam to work together in a participatory mode for the success of the Reservoir Fisheries Enhancement Programme. About 250 Fishermen participated in the programme.

Centre issues advisory to fishermen on the perils of crossing international maritime limits, says Rupala

The Ministry of Fisheries, Animal Husbandry and Dairying issues advisory to coastal States and Union Territories from time to time to sensitize the fishermen on the implications of crossing the International Maritime Boundary Line (IMBL) and on the importance of not to cross IMBL.

Besides, Indian Navy and Indian Coast Guard (ICG) regularly conduct Community Interaction Programmes (CIPs) for the fishermen in the coastal villages wherein they are sensitised about IMBL among other safety and security measures, Minister of Fisheries, Animal Husbandry & Dairying Parshottam Rupala said in the Rajya Sabha in a written reply during the concluded Winter Session of Parliament.

ICG ships and aircraft, during regular patrol close to IMBL undertake shepherding of Indian fishing boats into Indian waters, he added.

Co-ordinated patrols with neighboring countries are also undertaken in order to sensitize the fishermen to avoid crossing IMBL. ICG also sensitizes Fisheries Departments of Coastal States/UTs and fisheries associations about the perils of fishing near/across IMBL, he said.

The Pradhan Mantri Matsya Sampada Yojana (PMMSY) provides support to traditional fishermen/ fishermen groups, to acquire deep sea fishing vessels and automatic information system/communication devises and support for training and capacity building to avoid crossing IMBL

In addition, PMMSY also supports fitment of communication and/or tracking devices, and GPS on board fishing boats in order to help the fishermen to avoid straying across IMBL, he said.

Union Fisheries Secretary bats for expanding cold water fisheries base

Union Fisheries Secretary Jatindra Nath Swain has emphasised on the need to expand cold water fisheries and aquaculture as it is an attractive and viable livelihood security option specially for the youths and women of the Himalayan and North eastern States.

Speaking at a webinar on "Coldwater Fisheries: Untapped Resource" on December 22, the Secretary underlined on a robust infrastructure, potential market and cost effective transport system to ensure good returns to the farmers and fishermen of remote cold water regions. He also encouraged the scientists and entrepreneurs to motivate farmers and develop innovative ways for increasing profits, decreasing input cost, species diversification and increasing the production and productivity of cold water species.

The webinar was attended by over 100 participants including officials of Department of Fisheries and fisheries officials of different States, faculties from State agriculture, veterinary and fisheries universities, entrepreneurs, scientists, farmers, hatchery owners, students and stakeholders from aquaculture industry across the country.

Sagar Mehra, Joint Secretary (Inland Fisheries) highlighted the critical role of coldwater fisheries in enhancing fish production in the Himalayan States and ensuring food security and employment generation.

Mehra said that Kisan Credit Card (KCC) scheme provides assistance to the beneficiaries of coldwater regions to meet short term credit requirements and apart from this, is promoting coldwater fisheries by scientific methods, innovations and infusion of modern technologies by providing financial assistance under various schemes which can benefit the natives of coldwater regions.

Dr. J. Balaji Joint Secretary (Marine Fisheries) said coldwater fisheries resources can bring surreal growth in the fisheries sector and the Department of Fisheries, has been keen to bring significant difference in the current production status of coldwater fisheries.

Norway contributes US $ 5 million for aquaculture development in Sub-Saharan Africa

As more people spiral into hunger and poverty due to pandemic restrictions, climate change and conflicts, the Norwegian Agency of Development Cooperation (NORAD) has committed NOK 45 million (US$5 million) to increase the incomes and build the resilience of small aquaculture farmers in Kenya, Mozambique and Tanzania, the International Fund for Agricultural Fund (IFAD) announced today.

"This generous contribution of Norway underscores its credentials as a global leader in sustainable fisheries management and is further proof of the country's relentless determination to free the world from hunger and poverty," said Gilbert F. Houngbo, President of IFAD. "The sustainable development of the aquaculture sector holds significant potential to address malnutrition and poverty worldwide. Norway's support will help thousands of small aquaculture farmers build better lives for their families and produce the healthy foods their communities need."

The contribution from NORAD will finance the Advancing Resilient and Nutrition-sensitive Smallholder Aquaculture (ARNSA) Project implemented by IFAD and its government partners. With the aim to support approximately 3,000 smallholders and make increased quantity and quality fish products available to at least 100,000 people, the project will pilot and scale-up climate resilient and nutrition-focused aquaculture technologies and approaches. It will, in particular, improve access to quality and affordable farm inputs such as seeds and feed, and to market opportunities especially for women and youth through innovation and value creation. It will also strengthen farmers' technical skills and extension services and address post-harvest losses.

The project will focus mainly on inland aquaculture, except in Tanzania where attention will be given also to seaweed value chains. The support from NORAD contributes to IFAD's increasing attention to aquaculture in Sub-Sahara Africa, which now includes related investments in Tanzania, Kenya, Mozambique, Angola, Eritrea, Ethiopia, Nigeria and Ghana.

Today, small-scale aquaculture farmers provide over 80 percent of the global acquaculture production. Worldwide roughly 20 million people engage in full or part-time aquaculture, many of whom struggle to maintain reasonable livelihoods. With a growing demand for fish products, in particular from Africa and Asia, the sector holds a strong potential for growth, better incomes for the producers and employment opportunities especially for women.

In addition, as a source of high-quality macro and micronutrients, fish and aquatic foods are irreplaceable in combating malnutrition and alleviating nutritional deficiencies. Globally, 22% of children below the age of five (149 million) are stunted (too short for their age) and 30% of girls and women aged 15-49 years (571 million) suffer from anemia.

As one of the world's leading fishing and aquaculture nations, Norway has made the establishment of secure and sustainable fisheries and ecosystems in partner countries a priority through its Fish for Development programme. It aims to provide a coordinated and effective response to increasing food demand, rising poverty and the urgency to achieve multiple Sustainable Development Goals by 2030.

Revival of giant freshwater prawn farming in India

Bindu R. Pillai and D. Panda

Introduction:

Giant freshwater prawn, Macrobrachium rosenbergii widely known as 'scampi' in trade circles, is an indigenous freshwater prawn species of India inhabiting rivers, canals, estuaries and coastal waters. It is one of the most important cultivable species in freshwater systems due to its high price, large size, faster growth, good taste and high export demand. It can be cultured alone (monoculture) or with compatible fish species like catla, rohu and exotic carps like silver carp and grass carp(polyculture).

Scampi farming picked up in early nineties when the tiger shrimp farming collapsed due to white spot virus diseases. Its farmed production has shown phenomenal increase from mid-nineties, increasing from less than 500t in 1997 to more than 42,000 t in 2005. Aquaculture production of scampi was concentrated in Nellore district of Andhra Pradesh in late nineties and early 2000, nearly 80% of the production was coming from Nellore alone. However, the production has declined substantially since 2006. The major reason for the decline in production was the reduction in economic viability and decline in the profit margin. Another major problem faced by farmers was the lack of quality seeds for stocking. Farmers had to depend on seed of unknown quality, which lead to slow growth and poor survival thereby decreasing production. In 2009, government of India permitted introduction of exotic shrimp Penaeus vannamei. The high production potential of vannamei (>6 t/ha) and its highly remunerative prices and market demand attracted the scampi farmers and more and more farmers opted for vannamei farming in AP drastically reducing the area under scampi culture and production.

Present status of scampi farming in India

The total production of farmed scampi in 2020-21 was 8,303 tonnes (Table 1),which is nearly 80% less than the highest production of 42,800 t reported in 2005. Now, the major scampi farming states are in West Bengal, Gujarat, Maharashtra and Odisha. The production reported from Maharashtra and Gujarat are from reservoir and village ponds. West Bengal continue to be the top scampi producer in India followed. Most of the production now comes from village ponds and reservoirs or small-scale polyculture practiced by marginal and small farmers in these states.

Table 1: State-wise Estimated Production of Scampi (2011 – 2021) (in tonnes)

Sl. No.	State	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
1	W. Bengal	2906	174	2744	3449	3780	2421	5024	2784	3307	3373
2	Orissa	513	54	454	598	1504	769	1619	1118	1235	1074
3	Andhra Pradesh	475	6	21	688	1207	14	167	329	1580	335
4	Tamil Nadu	285	-	59	25	86	144	90	111	38	41
5	Kerala	52	-	151	185	263	29	-	0	1	0.22
6	Karnataka	-	60	3	0	0	-	-	0	20	0
7	Maharashtra	38	3332	84	1835	2002	-	-	1350	1469	1497
8	Gujarat	-		-	1210	1310	-	-	1530	1890	1982
	Total	**4231**	**3626**	**3516**	**7990**	**10152**	**3377**	**6900**	**7222**	**9540**	**8303**

(Source: MPEDA)

In West Bengal the scampi production is going on mainly in two districts viz., East Medinipur and North 24 Parganas. Tentulia in Bilbally area of North 24 Parganas is the major hub of scampi farming in WB. Bilbally is a low-lying area of more than 20,000 ha fed by River Sonai. In this area nearly 600 ha is presently under scampi culture. Polyculture of scampi and Indian major carps (IMC) is practiced in thisarea. Nearly 5000 small farmers are involved in scampi farming in the area. Culture is based on wild seed as the farmers are not happy with the quality of hatchery seed. Seed are collected from nearby rivers during April. The farmers stock 20,000 to 30,000 post larvae (10 mm size) per acre in April and culture continues up to March next year. Larger fish seed (yearling of 150-200g) are also stocked at very low density of 500 nos./acre. Due to the absence of scampi feed in the market the farmers use vannamei feed at Rs.100/kg. Harvest starts from October onwards and continues till March. In six months (October) the harvest size is 40 to 50g and by end of 8th month it would be 80g. There is a dedicated market for scampi in Tentulia where every day from October till March scampi is sold by local farmers by auctioning. The rate they receive for 30g is Rs.400/kg and for 80 to 100g they receive Rs. 500/kg (2017 price). Farmers reported a net revenue ranging from Rs.2.0 to 4.0 lakhs/acre. They get a production of 900 to 1000kg/per acre. Farmers experience some diseases like black gill, rostral deformity, antennae cut.

In Odisha, polyculture of scampi is practiced by small scale carp farmers mainly in coastal districts of Balasore, Kendrapara, Bhadrak, Jagatsinghpur, Puri and Khordha. In addition, farming is also practiced in non-coastal districts on a small scale. There are around four backyard type hatcheries producing 1-2 million seed per annum, one medium scale hatchery with a production capacity of 30 million in Balasore and one experimental hatchery in ICAR-CIFA catering to the local seed demand. Many farmers still depend on wild seeds. Besides these, an innovative and low-cost technique of seed production of scampi in small brackish water ponds is going on in West Bengal and Odisha since last few years. This is practiced mostly in East Medinipur district in West Bengal and Balasore district in Odisha. This is seasonal operation and practiced during February to June when the salinity is high in the brackish water canals. The seed obtained through this method are larger in size compared to the hatchery seed and are healthy as they are produced in the pond itself and therefore has good demand.

The normal production of scampi from polyculture ranges from

200 to 400kg/ha and the usual farm gate price is Rs.350/kg for 50 g size (20 count). The price may go up to Rs.600/kg in non-coastal states due to the high demand. The scampi seed is now selling at Rs.1/pc. There is a good demand of scampi seed in Odisha at present and good scope for expansion.

In addition to the above states, Telangana, Madhya Pradesh and Chhattisgarh also produces scampi, however there is no data on production available.

Current Market demand and price

Scampi has good demand in the domestic as well as export market and the price usually vary depending on the size. Larger sized prawns (>100g) fetches higher price compared to smaller size prawns (<30g). The rate for 50g prawn (Head on) ranges from Rs.300 to Rs.350/- in most parts of the country. The price may go up to Rs.600/kg during festive seasons. For export market the exporters require assured minimum supply of 40 tonnes to load one container so farm clusters are essential to promote export market.

Potential states for the Scampi farming

India has vast freshwater resources, including 2.38 million ha of ponds and tanks, 0.798 million ha of bheels and oxbow lakes that can be made use for freshwater prawn culture. Besides, some of the 1.44 million ha of available brackish water area in the country can also be made available for freshwater prawn culture. With little concerted efforts, freshwater prawn can be easily incorporated into the existing carp-based aquaculture system, as prawns are compatible with the major carps. Potentially all the earthen ponds and tanks available in states, in southern (Kerala, Tamil Nadu, Karnataka, Telangana,), eastern (Odisha, AP, WB), western (Maharashtra, Gujarat, Rajasthan) parts of the country as well as inland states (Bihar, Jharkhand, Chhattisgarh, UP), can be used for scampi farming. Only upland areas like Himachal Pradesh, Uttarakhand, Jammu and Kashmir are not suitable for scampi farming due to low ambient water temperature.

Fish species compatible with Scampi culture system

Scampi is a bottom dwelling species and mainly feeds on small animals like worms, crustaceans, bottom detritus and plant materials available on the pond bottom. In polyculture system, surface feeders and column feeders like rohu, catla, silver carp and minor carps are recommended. The bottom feeders like mrigal and common carps and carnivorous fish species should be avoided in scampi polyculture system. Carp and scampi polyculture system is the most widely practiced system in the country.

Scampi being an indigenous species has several advantages as a cultured species. It is readily available in most of the major river systems in the country, has very good domestic and international market demand and fetches good price. Besides these technology for breeding and seed production is available. It can be cultured along with carps and can be integrated with rice cultivation and could be cultured in low saline coastal sites also. Considering the immense potential of scampi farming in increasing aquaculture production as well as income of farmers, it is essential to work towards reviving the culture of scampi. Few measures suggested for revival of scampi farming in India is given below.

Measures for revival of scampi farming

a) Dissemination of genetically improved fast-growing breed of scampi -'CIFA-GI ScampiTM

Developing a fast-growing strain of scampi through selective breeding is one way to revive scampi farming. Towards this goal ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA) in collaboration with the WorldFish, (an international research organization headquartered in Malaysia) has started a systematic selective breeding programme for improving the growth rate of M. rosenbergii in 2007. A base population with wide genetic base to start selective breeding was formed using populations of scampi from three geographically distant locations in India (Gujarat, Kerala and Odisha). After the completion of the collaborative project in 2013, ICAR-CIFA continued the selective breeding as an in-house project and sofar produced 13 generationsof selectively bred M. rosenbergii. The grow-out performance of the new improved breed was evaluated in farmers' ponds in Odisha and AP. The average daily growth of improved breed recorded in the farmers pond was 0.28g compared to 0.17gof the farmers stock. The new improved breed of Scampi is registered as 'CIFA-GI ScampiTM in 2020.

Dissemination of the improved breed to the scampi farmers through multiplier scampi hatcheries is one way to revive the scampi farming. For this scampi hatchery operators need to sign an MOU with ICAR-CIFA and

register as a multiplier unit and get the seeds from latest generations of selectively bred scampi which can be raised to broodstock for seed production in hatcheries.

In 2021, Government of India has sanctioned a Central Sector Scheme titled 'Scaling up of Genetic Improvement Programme of Freshwater Prawn Macrobrachium rosenbergii (Scampi)' to ICAR-CIFA under the Prime Minister Matsya Sampada Yojana (PMMSY) to strengthen and scale up the ongoing selective breeding program of scampi. In October 2021, ICAR-CIFA has selected three scampi hatcheries in Andhra Pradesh (ASR hatchery, Nellore; BKMN AQUA, Nellore and MSR Aqua Pvt. Ltd, West Godavari) as multiplier units of 'CIFA-GI Scampi' and signed MOU.

ICAR-CIFA is also supplying improved scampi seed to the National Freshwater Fish Brood Bank (NFFBB) established by NFDB at Kausalyaganga in Bhubaneswar for broodstock raising. NFFBB is now supplying improved broodstock of scampi to interested scampi hatchery operators. It is expected that the above selected multiplier units will be able to spread the improved scampi breed and help the farmers in achieving higher production.

b) Promotion of polyculture

Aggressive promotion of poly-culture of scampi with Indian major carps (IMC) is crucial in reviving the scampi farming as we have nearly 0.80 million hectares of area under carp culture and scampi can be easily incorporated in this as the bottom feeder. If we can incorporate scampi as a bottom component in 10% of the present area under carp culture then we can expect to have an additional production of 32,000 MT. In India larger size scampi (>50g) is preferred as it fetches good price and polyculture yields large size prawns. Farmers can get additional income with minimum efforts. However, for this we need to have sufficient supply of good quality seed of scampi. Currently, as almost all scampi hatcheries have been either closed or shifted to marine shrimp seed production, therefore, more concerted efforts are needed to bring the hatchery operators back to scampi seed production. Government may consider giving some incentives to the hatchery owners to take up scampi seed production. Multi-

species hatcheries or backyard hatcheries need to be promoted.

c) Development of dedicated nurseries for the supply of larger size juveniles

For stocking in polyculture ponds 40-60 days old juvenile prawns are preferred. Juvenile prawns (>2g) are hardy compared to delicate post larvae (0.02g) and can withstand environmental fluctuations and therefore farmers get good survival during culture. Therefore, juvenile stocking is essential to get good survival and yield from polyculture. State government agencies may consider demarcating nursery ponds for raising large size prawn juveniles for supplying to polyculture ponds. Juveniles can be sold to farmers at much higher price than PL. As survival during 40 to 60 days nurseries can be 80% or more, nursery growers can earn good profit if continuous supply of PL is ensured.

d) Establishment of dedicated brood bank for scampi

During the peak production period of scampi during early 2000, majority of the scampi hatchery owners were sourcing broodstock either from wild or from grow-out ponds which led to the deterioration of the seed quality over time resulting in poor growth and survival during grow-out. This reduction in productivity is one of the reasons cited by many farmers for exiting scampi farming. Establishment of a dedicated broodbank near to a commercial hatchery would assure the supply of good quality brooders to the hatchery. However, a tie up with one or two existing hatcheries prior to the establishment of broodbank is essential. ICAR-CIFA had established the first broodbank for scampi in Nellore in a five ha water spread area in collaboration with College of Fisheries, Muthukur, Nellore in 2012. However, the closure of many scampi hatcheries in the vicinity of the brood bank affected its functioning as there were no takers for the broodstock raised by the brood bank.

e) Cluster approach

In India more than 90% of freshwater prawn farmers belong to small or marginal category with operational holdings of less than two hectare per individual. Each of the farmer's production system is independent and the culture operations are not in sync with that of neighbouring farmers. Most of them practice traditional methods for operating their farms and do not have access to scientific farming techniques. Promotion of cluster farming has resulted in substantial benefit to shrimp farmers as demonstrated by MPEDA in AP. The same cluster approach would be beneficial to scampi farmers also.

Cluster refers to interdependent aquaculture ponds often situated in a specified geographical locality and in close proximity to each other where all members of the cluster have the same production system, culture the same candidate species and share resources or infrastructure (water pumps/water source/ drainage canal). The primary advantage of cluster approach is that it enables participating farmers to organize the schedule of farm operations, quality seed procurement, simultaneous stocking, water exchange and harvesting regimes contributing to substantial reduction in cost of production. The unity gives them bargaining power to deal with the local government departments to get subsidy or other assistance. The members are able to reduce the production cost through efficient use of resources, avoiding unwanted chemicals and antibacterial agents, and sharing of expenses for culture operation.

Fisheries departments of state governments can play a major role in forming clusters for scampi farming. Clusters should be linked with scampi hatcheries for the assured supply of quality seed and also with a feed supplier. Marketing channels also need to be developed to prevent low price due to higher production. Online marketing need to be developed to increase the domestic consumption.

Conclusions

In order to put scampi back into its deserved prominent position in the aquaculture sector in India, concerted efforts from all stakeholders are essential starting from policy makers to research organizations, developmental agencies, hatchery operators and scampi farmers. Earlier attempts to revive the sector were fragmented and was not supported by strong policy. Now, the new fisheries ministry has given a lot of importance to scampi farming. The state department and prospective entrepreneurs need to make use of the provisions under PMMSY to develop scampi farming in their respective states.

(The authors are Principal Scientists working at CAR-CIFA, Bhubaneswar.)

‘We look at the whole seafood business from customer’s perspective’: Highland MD

Highland Group, an emerging player in the seafood business, has carved out its own space for itself by exporting over 60 million USD of shrimp in the year 2021-22. Pratik Jena, MD, Highland Group talks to AQUA POST about the company’s remarkable journey in the last two years and future growth strategy.

Q.Can you share with us the journey of Highland and its performance during the Covid period?

Ans: “Highland” has been in the seafood business for the last two years. We are happy that we have made a mark in this segment in a very short period. We have a blend of young and experienced professionals in our team. The abled guidance of our Chairman has helped us to complete the whole plant during the Covid 19 pandemic period and start international operation. We have been able to convert the Covid-19 challenges to our advantage. Despite the travel restrictions, we have been able to support shrimp farmers in Odisha and ensured safety measures for our staff and workers. Notwithstanding the challenges, we have exported to Japan, China, Middle East & Vietnam. We will be entering into USA and EU markets shortly.We have been able to exportof shrimp in the last 9 months of current financial year 2021-22. “Highland” is now a Two Star Rated Export House being recognised by Govt. of India.

Q. What are the initial challenges you faced as a start-up in this segment?

Ans: We have gone through the same set of challenges every entrepreneur faces at the initial phase. First of all, establishing a state-of-the-art infrastructure for seafood processing is capital intensive. We have 40 insulated vehicles of various capacities and reefer containers. Our Cold stores are integrated with our processing plant. We ensure there is no gap in the cold chain right from the farm to the processing plant and processing plant to port for shipment. Large capacity installation with modern facilities has been our USP. Secondly, this Industry is heavily manpower intensive, with every shrimp going

through multiple hands of food handlers right from the harvesting of shrimp to its chill transport to factories, its beheading and value addition to headless, tail on and tail off forms, product freezing in IQF / plate freezers and its labelling and packaging till it enters cold storage. Training of semiskilled and skilled labour needs a huge amount of time and effort to produce a safe product as per international standards meant for human consumption. Thirdly, the major challenge is sales and marketing to various countries. Direct sales to distributors in these countries are the other issue. Restrictions to the biggest market such as the USA in the form of anti-dumping duties (ADD) with 10.17 per cent is a major hurdle. With margins hovering at 5-7 per cent, paying this ADD does not offer a level playing field for those with new factories entering this shrimp export sector. Incentives given by the Ministry of Food Processing to establish the factory, to a certain extent mitigates the problems. Exports to China have hit a roadblock since June 2021 with reports of Covid seen on frozen food packaging material.

Q. What is your experience with the seafood business till now? How do you plan to establish your brand?

Ans: We lookat the whole scenario from a customer's perspective, such as obtaining farm-fresh produce, safe, nutritious, and wholesome with no additives. Timely shipments irrespective of fluctuating market prices have given us repeat orders with major customers. Yes, the market is changing rapidly with the ongoing expansion of the industry in India. However, we have the advantage of having an ultra-modern facility with advanced technologies. It is very crucial to comprehend the patterns of the market movements to strategize better. Our efficient strategy in procurement and sales gives us a head start in planning and an edge over the competitors. We also plan to participate in all exhibitions and trade fairs to establish our brand and products.

Q. How do you foresee the processed seafoodmarket in India?

Ans: India at present is the largest exporter of shrimp globally with nearly 23 per cent of the global shrimp trade volume. In the 2021-22 financial year, India will produce anywhere between 750,000 mt to 800,000 mt of Lvannameiand Pmonodon shrimps.

Major producing states are Andhra Pradesh with over 450,000 mt, West Bengal with around 90,000 mt, Orissa with 60,000 mtand Gujarat with 35,000 mt.The average production of shrimps per Ha in the country varies from 4 mt / Ha to 7.5 mt / Ha depending on the number of crops per year and stocking densities. Black Tiger production in the country will be 8,000 to 12,000 mt/ annum andis likely to be doubled in 2022-23.

The interesting part is that states,thousands of km away from

the coastline, such as Punjab, Haryana, Bihar and UP are getting into shrimp production. What we need to develop is the domestic sales of processed and frozen shrimp. Besides, retail chains such as Reliance, D mart, Spenser's etc need to be more aggressive in the seafood sector.It is encouraging to see several start-ups in the domestic market.

Q. What are the major expectations of customers?

Ans: Today customer is supreme. We acknowledge this fact. Our team learns to deliver a product tailor-made to customers' specifications, including its packaging and labelling. The Quality Assurance team painstakingly lists out the product characteristics, additives, freezing, packaging, labelling, microbial sampling, traceability, chemical and antibiotic testing protocols along with online production quality control checks. Shrimps are produced exactly as per customers' demand and then stored in the cold store at -18 C before it is released for shipment.

Close integration between sales and marketing, farm procurement, production, quality assurance, logistics departments is necessary to ensure the shrimp is handled with minimal time-temperature abuse from farm to fork to retain its freshness. 'Highland' offers farm-fresh head, headless, peeled tail on and tail off shrimps in block or IQF [Individually quick frozen] forms as desired by the customer.

Q. How do you ensure the quality of the produce? Do you educate farmers about the best aquaculture practices?

Ans: We assist the farmers with high-quality feeds, technical assistance in scientific farming at sustainable stocking densities. After harvest, the produce is procured by "Highland" for processing and exports, thus ensuring traceability of the product. Also, our quality team collects periodical samples of farmed shrimp for various bacteriological and antibiotic residues to ensure that pollutants / banned chemicals residues are not present in shrimp. Our product conforms to EU / USFDA standards.

Q. What is your future growth plan?

Ans: We plan to enter the USA market this year. We would like to consolidate the volumes and penetrate HORECA segment in North America. We will be catering to the EUand Russian markets in 2023.We plan to have our second processing facility ready by 2023 with the ability to produce specialised items like breaded shrimp, breaded fish fingers etc. This will enable us to cater to the domestic retail segment in a big way and export the product also.

Best management practices for freshwater aquaculture

Debtanu Barman, Amit Bera & Dr Swagat Ghosh

Scientific developments of the last 50 years have led to a much-improved understanding of the functioning of aquatic ecosystems, and the global awareness of the need to manage them sustainably. Twenty-five years after the adoption of the Code of Conduct for Responsible Fisheries, the importance of utilizing fisheries and aquaculture resources responsibly is now widely recognized and prioritized.

Global fish production is estimated to have reached about 179 million tonnes in 2018, with a total first sale value estimated at USD 401 billion, of which 82 million tonnes, valued at USD 250 billion, came from aquaculture production. Of these, 156 million tonnes were used for human consumption, equivalent to an estimated annual supply of 20.5 kg per capita. The remaining 22 million tonnes were destined for non-food uses, mainly to produce fishmeal and fish oil. Aquaculture accounted for 46 per cent of the total production and 52 per cent of fish for human consumption.

Current fish culturists utilize both open and close frameworks to raise fish. Open frameworks, for example, the raceways (utilized in incubation centres of both finfish and shellfish and eel, trout culture) are described by a fast turnover of water. Shut frameworks are ordinary in lake culture of carps, catfishes, tilapia, ocean bass, prawn, and shrimp among others. Shut aquaculture frameworks don't have a fast turnover of water; however, don't have a high surface to volume proportion encouraging the trade of gases, supplements, vitality, and so forth with the environmental factors. Such the shut framework, increased, high-thickness aquaculture shapes the premise of concern.

The aquaculture sector has potential to boost the Indian economy and meet the nutritional requirements of the country. Protein requirements are increasing in India with the growth of population. The aquaculture completely depends on the water quality. Water quality assumes a critical job in fish farming.

Physical variables impacting the water quality in fish culture:

Type of soil & its quality

The kind of soil and its arrangement at a site is of critical significance. It has a direct bearing on the profitability of the pond. By and large, a site where common vegetation is noticeable can be thought of, will have great soil for fish ponds.

Water Depth

Depth of a water body assumes a significant job in aquaculture since profundity prerequisite shifts from life form to a creature under culture. For carp culture, the water profundity ought to be somewhere in the range of 1.5 and 2 m profundity. The nursery pond of the water profundity ought to be kept up somewhere in the range of 0.6m and 0.8m

Turbidity

Water turbidity implies the measure of suspended material, which interferes with the light passageway in the water area. In prawn lakes, water turbidity can result from planktonic living things or suspended earth particles. Turbidity controls light penetration, thus compelling photosynthesis in the base layer. Higher turbidity can cause temperature and DO partition in the lake.

Temperature

Temperature is an enormous water quality variable since it will affect fish handling and managing rates impact biota breath (oxygen use) rates, influence the dissolvability of oxygen. Temperature is helpfully assessed by the thermometer. 28°-32°C temperature is the perfect temperature for fish development. Less than 20°C is sabbed lethal and above 35°C is lethal for fish.

Chemical variables impacting the water quality in Fish culture:

pH

In science, pH is a scale used to decide how acidic or central a water-set up game plan is concerning the size of 0 to 14 with 7 being customary. PH level depends upon CO2 centre in fish lakes, in the day time that the model is assembled. In the daytime the plants in the water clear carbon dioxide for photosynthesis, the pH will increase. Around night time, the pH will reduce as carbon dioxide totals. Most fish species do well inside the pH extent of 6.5 to 9.5. Relentless pH levels underneath 6.5 may decrease fish engendering and are connected with fish fail miserably offs that periodically occur in the pre-spring.

Salinity

Saltiness addresses the total gathering of separated inorganic particles, or salts, in water. It accepts a basic activity in the improvement of culture living creatures through osmoregulation of body minerals from that of the enveloping water. For better continuance and improvement perfect extent of saltiness should be kept up in the lake water. In

case saltiness is unreasonably high, fish, and shrimp will start to lose water to the earth. Phenomenal changes of saltiness may similarly modify the phytoplankton fauna and their people densities and lead to the shakiness of the organic framework. Cutting down the saltiness by more than 5 ppt, at each period of water exchange, he recommended.

Dissolve Oxygen

Dissolve Oxygen (DO) is one of the most critical parameters in aquaculture. Keeping up extraordinary degrees of DO in the water is key for productive creation since oxygen (O2) influences feed confirmation, affliction restriction, and processing. A blemished level is outstandingly upsetting for fish. It is subsequently basic to keep the DO at perfect degrees or above 4.0 ppm. When dealing with the fish, oxygen demand is higher on account of extended essentialness use. To stand up to this higher oxygen demand, a couple of measures can be taken. Various wellsprings of oxygen than photosynthesis is scattering or moving from air to water. Wave movement or mechanical air course is convincing this oxygen scattering. Paddle wheel aerators accomplish this by breaking water into little dots and extending contact of water surface with air. Attractions mechanical assembly aerators ask air into the water through an undertaking and a propeller. Another reason behind airflow is the course of circled air through water through the pond.

Electrical Conductivity

The least salt substance is enchanting to help fish with keeping up their osmotic correspondence. The upper range changes with fish species. Seawater has a conductivity of around 50,000 to 60,000 siemens/cm. Electrical conductivity (EC) in addition can be utilized to give a bothersome check of the all-out entire of split up solids (TDS) in water. Routinely, the TDS respect in mg/l is about the bit of the EC (mSiemens/cm). Conductivity should change small during shipment to the investigation place.

Total Alkalinity

Estimations of the centralization of bases (ordinarily carbonate and bicarbonate) in the water known as All out alkalinity (TA) that give buffering limit. The units are milligrams per liter (mg/l) as calcium carbonate. TA underneath 20 mg/l limits essential efficiency in water, and lakes with such water profit by lime.

Chemical Oxygen demand

The Chemical Oxygen Demand (COD) of water addresses the proportion of oxygen required to oxidize all characteristic issues both biodegradable and non-biodegradable by a strong compound oxidant. This implies both sewage and mechanical pollution. The ideal estimation of COD should be under 50ppm asa player for water culture.

Pond Management

Phytoplankton assumes a critical job in balancing out the entire pond biological system and in limiting the vacillations of water quality. A reasonable phytoplankton populace enhances the framework with oxygen through photosynthesis during sunshine hours and brings down the degrees of CO2, NH3, NO2 and H2S A solid phytoplankton sprout can diminish poisonous substances since phytoplankton can expend NH4 and tie up substantial metals. It can forestall the improvement of filamentous green growth since phytoplankton can square light from arriving at the base. A solid blossom likewise gives legitimate turbidity, what's more, thusly settles shrimp and diminishes human flesh consumption. It diminishes temperature misfortune in winter and balances out the water temperature.

Pond Bottom Management

For farms receiving cutting edge innovation, it is vital that the lake base ought to be dried and circulated air through to dispose of harmful gases. Numerous ponds in low-lying zones can't be depleted and dried. To beat this, Aqua farmers apply to squander digesters to the lakes. The digesters are innocuous microscopic organisms (probiotics) and compounds that devour natural issues on the pond base. After the utilization of digesters, farmers apply a disinfectant, either natural silver or natural iodine. Copper sulfate isn't utilized as a disinfectant these days as it isn't biodegradable and gathers in the lake up to levels that are harmful to aqua life. Natural silver is exceptionally compelling against microbes and infections and its harmfulness to sea-going life is extremely low. Natural silver is applied at the pace of 18 litres (4 gallons) per hectare after bringing down the water profundity to 12 inches. Seven days after the application, this disinfectant breaks down, so there is no compelling reason to flush the pond. Natural silver likewise forestalls the improvement of green growth that develops on shells. Natural iodine, can fix gill or shell maladies, eliminate microbes on contact and has low poisonousness. Its impact can be seen within 24 hours and the lake base can be sterilized without discharging the lake. The recommended measurement is 5 ppm to 10 ppm. It effectively goes on for a few days contrasted with around seven days on account of natural silver.

The authors are associated with the Aqua Doctor Solutions & Aqua Clinic Kolkata, SMS (Fisheries), SasyaShyamalaKrishiVigyan Kendra(SSKVK), Ramkrishna Mission Vivekananda Educational &Research Institute (RKMVERI), West Bengal respectively.)

Zero waste aqua system promises biosecurity, enhanced output

By Megha S Vinod & Mohammed Meharoof

Introduction

The aquaculture sector has a long history, but it has gained prominence in recent decades because of population pressures on food security, as well as an increased understanding of the vital nutrient contributions that fish and related entities can make to human health and wellbeing. Aquaculture practices are the ones that could ensure human sustenance by generating profits in both domestic and international markets, not only by selling and marketing fish species, but also by providing opportunities to establish other allied industries such as processing plants, feed mills, and so on. Apart, raw materials produced by the aquaculture sector are used in a variety of commercial and beneficial businesses today, such as the pharmaceutical and cosmetics industries. As a result, it is apparent that the industry plays a significant role in the country's economy, food security and livelihood.

The sector today has come a long way ahead surpassing the traditional practices and being more intensive and technology-driven. So far, so good, but in an era of global warming, climate change, and scarcity in production factors, strategic management and sustainable resource exploitation, particularly in aquaculture, is inevitable.

Traditional systems, which encourage extensive culture with little supervision, have been contaminating and damaging the environment for years. It lacks sufficient biosecurity and discharges wastewater without

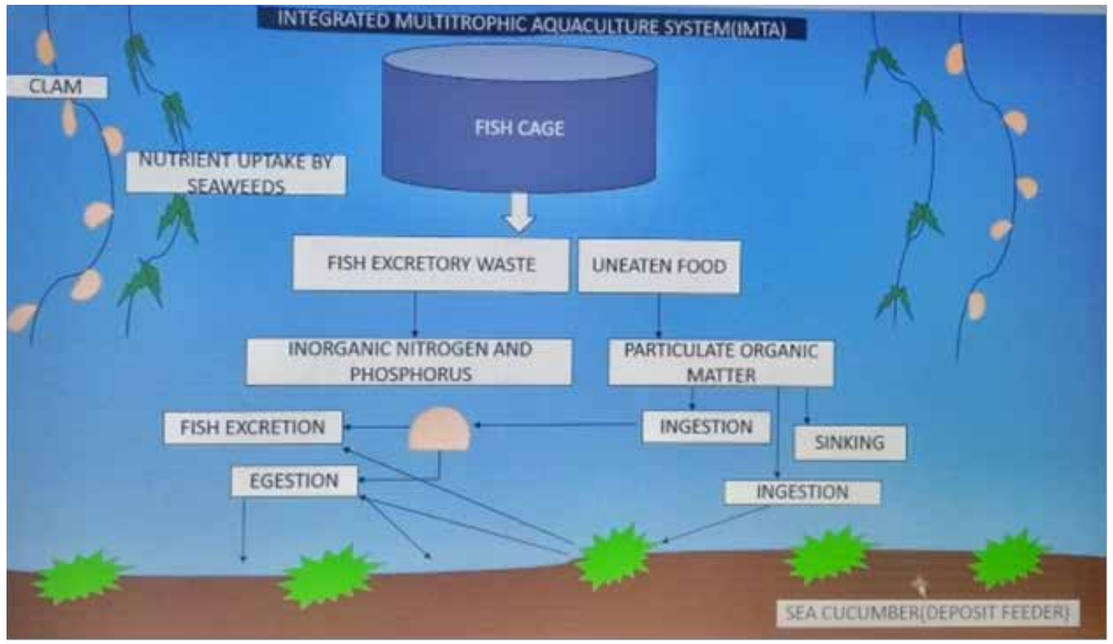
scientific treatment, resulting in deterioration of the surrounding soil and water quality as well as spread of diseases. The method also requires a large amount of water, which could lead to a shortage of water for human needs. Hence a skip over traditional systems was essential.

The zero-waste aquaculture systems are an alternative that decreases environmental effects due to nutrient-rich water discharge, increases biosecurity and secures higher output with less water exchange, higher aeration, and mixing rates. This article discusses different forms of efficient cultural practices over traditional systems.

Integrated Multi-Trophic Aquaculture (IMTA)

Integrated multi-trophic aquaculture (IMTA) is based on the concept of utilizing unutilized organic and inorganic nutrients resulting from feeding in intensive aquaculture systems of various trophic levels in an ecosystem. It is a combination of aquaculture (fish/shrimp) with organic and inorganic extractive culture species like shellfishes, seaweeds etc. to create balanced systems for environmental remediation, economic stability, and social acceptability.

The system in itself has the bio-augmenter, the bio-filter and the bio-mitigator precluding the need for expensive additions to the system. By transforming by-products and uneaten feed from fed organisms into extractable products, the method improves economic and environmental sustainability while minimizing eutrophication. This sort of polyculture varies from others in that it cultivates diverse types of organisms that thrive in water bodies at different trophic levels to obtain a high yield through a synergistic effect with minimal environmental impact. There is a plant component, mostly the seaweeds which act as bio-filter, filtering out the nutrients for self-consumption as well as making it available to others for consumption. Thus, the system offers species diversification- its income and assurance, nutrient cycling and considers the waste as a form of energy and not as a burden. Besides, it offers disease control by self-regulating the ecosystem as well as protecting its component seaweed's antibacterial properties. This system forms a nutrient extractive aquaculture practice and thus avoids to a maximum extent the negative externalities caused by the aquaculture practice itself. The system also rules out the disadvantages of prominent culture practices of the era and avoids the chance of water quality degradation by the unspent feed and added fertilisers to the system by culturing species at the bottom which could translate them into useful and utilisable nutrient components as required by the other components of IMTA. It is also recognised as an effective



strategy against climate change and provides scope for rural empowerment just by taking benefit of the locally available resources.

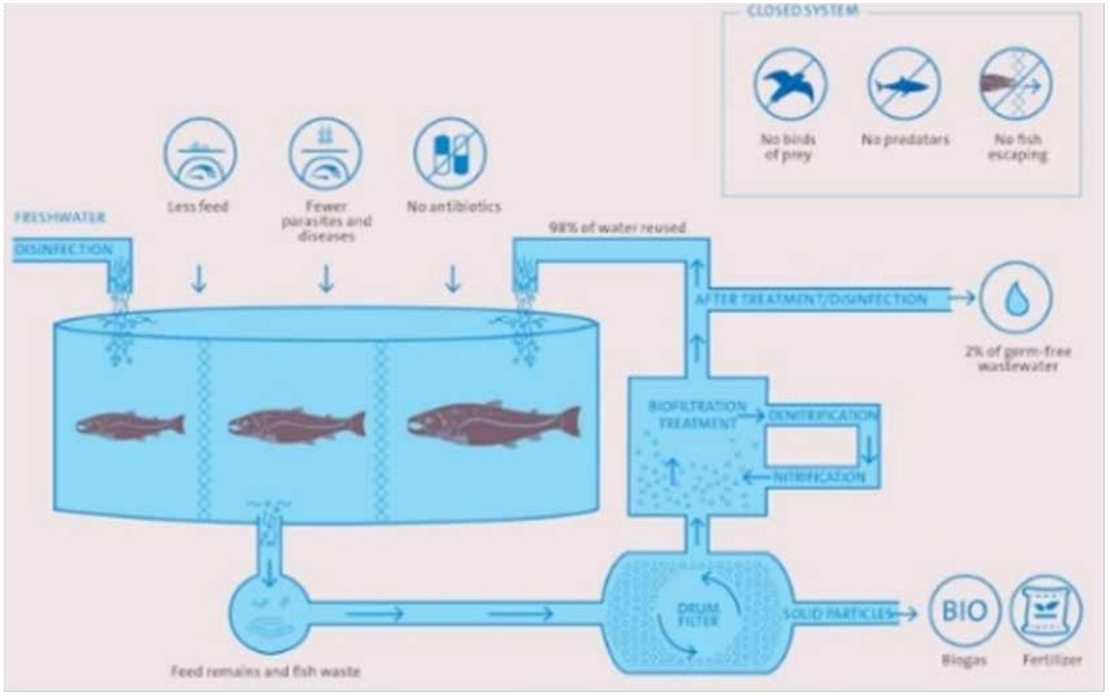
The practice has created milestones in our country at various places and one of the recent successes is its adoption in Kerala by CMFRI which yielded a huge volume of green mussels, seaweed, and fin fish, thus paving way for millions to follow with confidence. According to experts at CMFRI, a good harvest with a better growth rate showed that IMTA is economically feasible in the state.

The practice is flexible enough to be done across different kinds of water bodies. IMTA raise the assimilative capacity of the farm as well as provide farmers with better income via more growth and production as well as because of its provision for species diversification. Some of its disadvantages include lower productivity compared to monocultures, public perception issues, limited species culture possible and food safety concerns due to the involvement of bacterial species in a closed system of culture.

Recirculatory Aquaculture System (RAS)

As the name implies, the process entails the recirculation of water inside the system and the related filtration using mechanical and biological filtering methods for the growth of various fish species in the same, without the water being discharged. This is one of the best examples of the method that uses minimal inputs, such as land or water, and produces maximum output with nearly no environmental impact. According to NFDB figures, the system can produce 60 MT per year using only 1/8th hectare of land and 1/6th of the water required by traditional methods. It filters, recycles, and reuses water in a regulated environment, and the high stocking density it holds results in a tremendous output. Only enough additional water is added to compensate for evaporation, splash out, and waste flushing, with daily replacements of not more than 10% of the total water. The technology can be used indoors or outdoors, providing flexibility in the culture practice with better biosecurity thus preventing diseased conditions. The method can be practised in different geo-climatic zones and provides an opportunity to culture almost all species even in extreme conditions of weather.

Farmers benefit from RAS because they can get a larger yield with less land and water, and they can vary their scale of culture techniques to fit their financial situation. According to NFDB, the states like Assam, Bihar, Chhattisgarh, Haryana, Madhya Pradesh, Maharashtra,



Odisha, Punjab, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, and West Bengal are having great potential for RAS as a promising aquaculture activity. Also under the Blue Revolution schemes, the government has put forward schemes to set up the RAS with higher subsidies. The only disadvantage it possesses is its higher capital investment and intensive technical monitoring comparably and also its requirement for continuous nutrient supply.

The system has a simple and basic design consisting of fish tanks, mechanical filter, biofilter, trickling filter, oxygen enrichment unit and UV disinfector and these together work towards the basic operating principle where the water from fish tanks move through the mechanical filter; water being stripped of carbon dioxide before getting aerated and is further returned to the tanks. Tanks used can be of any shape, but the preferably circular or oval tank is used, with diffusers for a sufficient supply of Oxygen. Since the system requires a continuous water supply, water pumps form an integral part of which centrifugal is the most used one.The biofilter forms the most important part of RAS whose media is made up of materials like plastic sheets, beads, lava rock, gravel or sand grains and possess a high surface area for bacterial growth, pores for water movement, is clog-resistant and are rendered easy to clean. Also, the temperature should be between 10-35°C and the pH should be between 7-8 for the biofilter to effectively function. A sump or clarifier tank, shaped "V", even forms a part of the biofilter as it is used to collect and sediment all the solid waste which could otherwise block the biofilter and use up the oxygen. Nitrosomonas and Nitrobacter are employed in nitrification whereas Pseudomonas is employed in denitrification and sodium bicarbonate and calcium bicarbonate as buffers are used in maintaining pH balance. Since recycled water turns out to be warmer than natural, the system isn't suitable for cold water species and thus species like African catfish, barramundi, carps, perch, tilapia, pangasius, white fish, Atlantic cod, bluefin tuna, rainbow trout, sturgeon, seabass etc. is preferred.The major components of the RAS observed at Neyyar Dam, Kerala includedthe main culture holding tank whose water is recirculated with a filter- both mechanical and biological. The biological being a sideway placed plant bed which absorb the nutrients from the water and filter it of its ammonia content and a 3rd tank which had Azolla in it, grown as a feed for the species being culture i.e.,Tilapia in the main tank. The system is fully indoor. Azolla is being utilised as it has a good nutritional profile and can be grown easily as well as had been documented as a major supplementary food to

species like Tilapia for its growth. However,at different places, there are different models of RAS being constructed according to the place, geography, climate, and other feasibility factors.

The Shrimp RAS

This RAS system stocks only SPF shrimp PL's at a density of 120-200 m^2 and during the production cycle there is no water exchange except to make up the water loss to evaporation, seepage, and solid discharge. It maintains an active heterotrophic bacterial community by controlling the amount of organic load and C:N ratio. The sludge produced in the culture process is removed by concentrating it at the centre of the tank, further draining and eventually directing it to the solid settling pond for treatment and ultimate disposal. Being an indoor approach, the process has a firm control over the various operating parameters like temperature and other water quality parameters. The fact that maximum shrimp growth occurs at a temperature of 30°C and there exists no such outdoor site that can maintain such a temperature year-round, the ability to control the water temperature to an optimum on a year-round basis is a distinctive advantage.The absence of expensive wastewater treatment, handling equipment, high capital and operational cost is an added benefit.Covered rearing space also permits a control of the light spectrum and day length, thus improving the efficiency of the culture.Since a high level of aeration is used, the need for supplemental heating is reduced. The enclosed raceway minimizes vectors causing disease transfer and exist null chance for animal escapement due to nil input and output to the surrounding environment.The inorganic nitrogen build-up is controlled by manipulating the C:N ratio in such a way as to promote the growth of heterotrophic bacteria. As a result, the ammonia -nitrogen is removed from the system through assimilation into microbial biomass. In addition, this can be an important source of feed protein for the shrimp too, thus reducing cost of production. The system recycles ammonia, nitrite and nitrate using microorganism consortia and reduces water usage significantly and their level can be maintained using addition of heterotrophic bacteria, nitrifying bacteria, and

microalgae regularly.The microbe consortium even contributes to shrimp nutrition and growth, competitively excluding harmful opportunistic pathogen, thereby improving health and immune competence of shrimp.Here more stringent environment regulation and more control over water quality parameters can be maintained. Reduced operating cost by reducing labour through feed automation and reduced number of production units through increased density per unit is it's another valuable advantage. A high survival rate and average body weight in comparison to the traditional practice and an improved and stable physico-chemical and biological parameters are also observed which prevents infections like WSSV. In case of degradation of water and sediment quality leading to diseases, biore mediation technique with the application of gut probiotics can ensure sustainability. Bioaugmentor like detrodigest and gut probiotic preparation named Enterotrophotic can be used for the same. These were validated in different seasons and stocking densities and have proved effective with good responses from the farmers amidst WSSV outbreaks in the region. The system is effortless as it can be operated with a minimum of 2 people.

BioflocTechnology (BFT)

In aquaculture, around 60-75% of the operating cost are incurred from fish feed and hence it forms the most critical factor in the achievement of profit for the farmer. BFT, an eco-friendly model, employs minimal feed by recycling and reusing nutrients in the culture media and ensures minimum water exchange. The system has a microbial aggregation combined with other particulate organic matter, phytoplankton which provides protein-richfood resources to the cultured species as well as help in the treatment of cultured water ensuring minimal environmental damages. Here the various biofloc particles are maintained in suspension by supplementing with aeration and mixing of water and these particles act as an additional food source thus attaining favourable FCR. Biofloc being an aggregation of beneficial organisms promote the probiotic effect and improves the organism's digesting ability. The system maintains a high C:N ratio by adding carbohydrates and allows the proliferation of single-cellmicrobes. These microbes in turn work to maintain the nutrient level and cycles nutrients in situ, thereby reducing the additional cost of feed as well as filter and cleaning the water medium. The system however has an intense requirement for aeration as it has as its component the microbial population which also consumes oxygen in addition to the cultured

species, hence projecting a chance for oxygen deficiency.

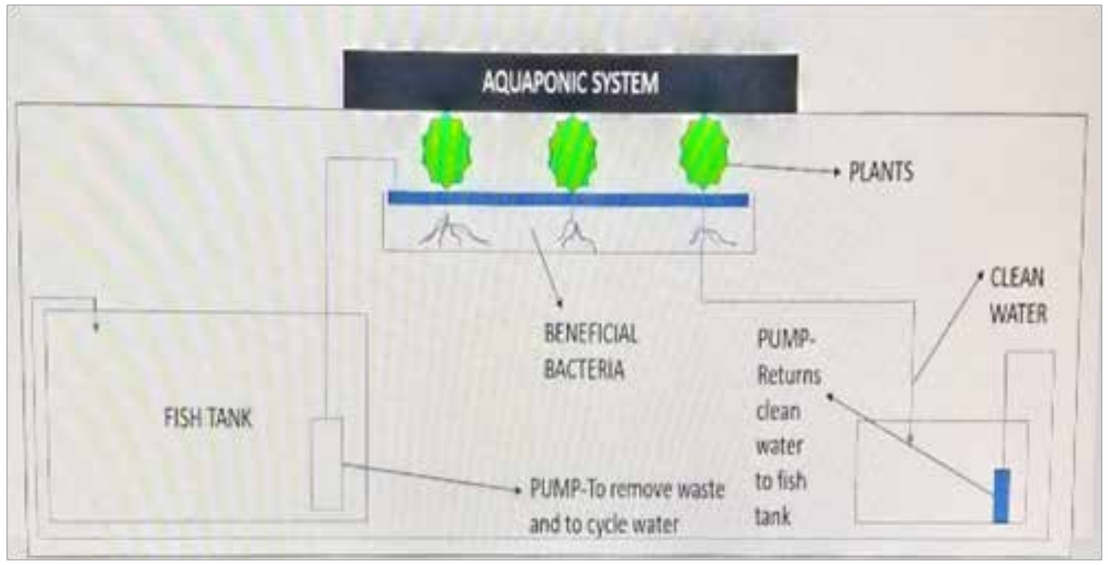
The steps involved in biofloc setup are as follows:

1. Tank or pond setup- preferably a lined pond, concrete pond, or indoor tanks
2. Aeration – preferably paddlewheel aerator
3. Pre-seeding beneficial microbes
4. Species selection and determination of stocking densities-
    - Species selected being wholly or partially filter feeders like freshwater prawn, Singhi, Magur, Pangasius and Tilapia
    - Avoid species that dislike murky waters with high solid content like the IMC's as they can't perform well in such conditions
5. Balancing carbon
    - It is recommended to maintain carbohydrates in the system to ensure heterotrophic bacteria growth and therefore to maintain water quality
    - The Carbohydrate source used must have a C;N ratio above 10
6. Biofloc growth
    - The growth of flocs must be monitored using a cone-shaped beaker or Imhoff cone by collecting water samples up to a depth of 15cm to 25cm, preferably in the late morning
7. Monitoring and control of water quality parameters and stock
8. Harvest and further clean-up of the pond system for next batch of culture

There are even several upcoming projects that club together the RAS and BFT to ensure better production in terms of both quantity and quality.This again forms an important closed aquaculture model and the fact that it reuses water rules out several issues like pollution, pathogen introduction and escapement of exotic species.The system could however leave the species affected with various diseases if the level of solids in the culture system cannot be managed properly. Also, the discrete microbial dynamics associated is not yet fully understood, hence posing the threat for unknown disorders and issues.

Aquaponics

Aquaponics, yet another close-loopself-contained system, successfully incorporates the technology of hydroponics and RAS to sustainably produce both fish and plant stock. The method involved goes like, the waste materials released by the fishes is converted into usable forms by the bacterial consortium which in turn is utilised by the plants for its growth. Plants and fish species have a symbiotic interaction in which the plant aids in the filtering of waste from the medium used for fish growth. As a result, both partners gain in growth and development while having no negative impact on the environment. Furthermore, all of the waste produced by the system can be collected and sold as fertiliser. As a result, this



technique is the finest option for getting fresh, chemical-free fish and vegetables throughout the year, and it also has the added benefit of requiring little land, allowing it to be embraced and practised even in urban settings. Aquaponics produces different species of plants and fish species depending upon the scale of its operation like kale, tomato, lettuce, tilapia etc. The increasing demand for organic vegetables and fish species suggest that farmers will never have to suffer loss in adopting aquaponics as their means of cultural practice. The fact that the produce is grown without any artificial feed or fertiliser increases its market demand especially among the privileged categories of the society and star-rated hotels, thus offering an opportunity for fetching double the normal market price. And that's why and how Cherai, a village in Kerala has become the first aquaponics village in just 2 years, since 2016. The system being costly, having the requirement for uninterrupted power need, requiring professional skills and the limited species available for culture, is however slowing the pace of its adoption among the rural fraternity.

Way Forward

Sticking to tradition doesn't always take you a long way, changes are inevitable for the food and nutritional security along with the sustainability of resources. The discussed methods are all self-sophisticated in their way and don't harm the environment in any way nor do they pose threat to the humans consuming the produce.Drained water from ponds and tanks often contains relatively high concentrations of nitrogen and phosphorous, limiting nutrients that induce algae growth, which may cause severe eutrophication and further anaerobic conditions in natural water bodies. This condition may further contribute to broader issues like global warming and climate change. Hence adoption and integration of these methods into practice will improve the production and productivity, thereby securing the nutritional profile of the country and its biosphere. The government understands the importance of the blue economy in offering various credit and subsidy schemes at all levels to encourage people to uptake such zero impact aquacultural practices. The schemes under Pradhan Mantri MatsyaSampada Yojana (PMMSY) is promoting all these practices and the farmers can take advantage of this to change their traditional fish culture systems. The fisheries departments, fisheries institutes and related research organisations in the country are offering training as part of the extension and outreach in the modern fishing systems which can be made use of by the farmers. Thus,the adoption of modern environmental friendly fish culture practices can bring a blue revolution in the sector.

(The authors are from Dr. Rajendra Prasad Central Agricultural University, Bihar and from ICAR-Central Institute of Fisheries Education, Mumbai)

ICAR-CIFRI on road to usher second blue revolution

B. K. Das

ICAR-Central Inland Fisheries Research Institute, Barrack pore, Kolkata, West Bengal is a premier research Institute of the pre-independence era in India. It was set up on March 17, 1947, catering to basic, strategic and applied research in fisheries, training, extension and developmental in inland open waters aiming at sustainable fisheries enhancement, ecological, and human resource management in a more pragmatic way.

The institute has developed a number of epoch-making technology since its inception such as induced breeding, air-breathing fish culture, composite fish culture, protocols for small and large reservoir fisheries management, integrated wetland fisheries enhancement, enclosure (Cage & pen) culture& feed formulation,riverine biodiversity conservation and ranching, Fish for human health, conservation of Hilsa, vulnerability assessment,

It is the first Institute toinitiate, perform and disseminate knowledge on induced breeding, composite fish culture and among others, air-breathing fish culture.

climate-smart fisheries, evaluating pollutants in inland waters, E-flow in Indian rivers, GIS in resource delineation, bio- and nano-technology for aquatic health management, big data in inland fisheries and formulation of training modules.

It is also addressing Sustainable Development Goals (SDGs) towards humanity and national development (1) End poverty, (2) Zero hunger, (5) Gender equity & women empowerment, (8) Economic growth (12) Sustainable consumption & production, (13) Climate change & (15) Biodiversity are being made

It has set national priorities to

achieve healthy and resilient inland open waters with abundant fish stocks providing sustainable economic returns for and by the commons,are governed by a common inland open water policy integrated at local, national and international levels.

Major initiatives and achievements:

It is the first Institute to initiate,perform and disseminate knowledge on induced breeding, composite fish culture, air-breathing fish culture, enclosure culture, Tilapia Lake virus, micro plastics in inland waters, scientific river ranching, arsenic in inland waters and mitigation, hilsa conservation protocol and tagging, reservoir and wetland fisheries management, SIFs and malnutrition prevention, E-flow protocol, assessing pollutants in inland waters.

Research highlights in the last five years:

Riverine Ecology & Fisheries by studying of ecology & biodiversity of major Indian rivers (Cauvery, Mahanadi, Tapti, Siang, Chaliar).

Reservoir Fisheries management for sustainable fisheries enhancement in major reservoirs of India with guidelines.

National Mission for Protein Supplement (NMPS), DAHD&F, GoI,Enclosure Culture& CIFRI: NMPS, has popularised the cage culture of CIFRI for table fish production in 15 States diverting Rs 100 crores targeting livelihood & nutritional security across India. Impacts are high fish production (70 kg/m3/8 months) from the cage of Pangas in Jharkhand reservoirs. About 30,000 cages spread over 22 states are in operation, producing more than 65,000 ton of fish with the employment of eight lakh man days per year.

Fisheries Socio-Economics through Institutional arrangements vis-à-vis sustainable inland open water fisheries.

Aquatic Pollution Monitoring, Ecosystem & Fish Health Management: i) Pollution bio markers developed for different types of stress ii) Genetic diversity studied for important fishes iii) Disease control of fishes in open water fish culture iv) Molecular characterization of salt stress tolerant bacteria

Resource Assessment &Database Creation: devising digital methods of fisheries resource assessment;data-driven model-based assessment for sustainable inland fisheries; Refining sampling methodology for fish catch estimation;Forecasting

The institute was set up on March 17, 1947.

models developed for sustainable fisheries in Narmada estuary & Chilika; stratified sampling design for Hilsa catch;Assessing impact of barge induced hydrodynamic disturbances on tiny phytoplankton in National Water Way 1 of river Ganga, India; Database creation

Climate Change & Climate Smart Fisheries Through NICRA: Institute is working on impacts of climate change, its impact on ecology, fisheries, heatwave studies, climate-resilient fisheries, adaptation techniques, carbon sequestration potential of wetlands, development of the novel approach in modelling reproductive & ecological vulnerability in riverine systems and impacts of extreme climatic events on fisheries in Chilika lagoon and backwaters of peninsular India.

PMMSY & Inland Fisheries: Aiming at doubling farmers income by 2022, Govt. of India has launched Pradhan Mantri Masya Sampada Yojona, allocating Rs 20,050 crores for integrated, sustainable & inclusive development of fisheries in India. Of this, Rs 600 crores bhaseen marked for cage culture development where Institute is prioritizing to achieve it.

Policy Formulation, Management Guidelines & Recommendations: i)National guidelines for cage culture ii) Conservation and management action plans for Chilika lagoon iii) Decision support tool using geo-spatial technology for reservoir stocking enhancement program iv) National Action Plan for Hilsa & West Bengal Hilsa fishery management guidelines v) Coal transportation guidelines in National Waterways No. 1 vi) Development of Roadmaps for inland open water fisheries of 13 states and vii) Strategic plan for inland fisheries development under PMMSY

E-flow requirements for major rivers were undertaken by the Institute to sustain ecosystem functions.

National Mission for Clean Ganga (NMCG) & CIFRI: During 2017-20, in-depth study of ecology & biodiversity of river Ganga under NMCG in 20 sampling sites of 2525 km was made; 190 fish species (182 native & 8 exotics) identified;2 crore spawn was produced with wild IMCs germplasm; conducted 51 river ranching programmes in Ganga, releasing > 45 lakhs of Ganga bred IMCs fingerlings from Prayagraj to Barrackpore. Mahseer stock will be ranched in upstream;conducted 53 mass awareness programmes;4390 nos of fishers were sensitized in 4 states viz., Uttarakhand, Uttar Pradesh, Bihar & WB; published 15 research papers, 15 book chapters/articles, 5 books, 10 folders & 2 manuals; 9 exhibitions were conducted displaying activities of NMCG with 2 workshops.

Was conferred the Sardar Patel Outstanding Research Institute Award-2020.

Reservoir fisheries enhancement: Through CIFRI technology on reservoir stocking, the yield has increased substantially to 34, 98 and 190 kg/ha/y in large, medium and small reservoirs, respectively with fish yield of 125 kg/ha/y been achieved through CBF in reservoirs of Chhattisgarh, MP, Jharkhand, Karnataka & TN; yield of 58 small reservoirs of Odisha has increased by 158% through CBF.

Increment in fish yield through technological intervention & PMMSY targets

Standardization of optimum stocking density for wetland fisheries enhancement: ICAR-CIFRI has recommended stocking with fingerlings of IMC > 100 mm @ 1500-2000/ha in wetlands of Bihar, West Bengal, Assam, Uttar Pradesh.

Co-management and integrated wetland development in Bihar: CBF management in 5 mauns of Motihari resulted in doubling of fish yield (kg/ha/y)from 180 to 675 in Kararia , 190 to 320 in Sirsa; 70 to 140 in Rulhi, 60 to 120 in Majharia & 14 to 70 in Kothiya maun with employment generations from 58 to 153 mandays/y. This has addressed the 'ARYA'-Attracting & Retaining Rural Youth in Agriculture in a befitting manner.

Culture of Small Indigenous Fish species (SIFS) in derelict waters of Sundarbans were initiated empowering rural tribes for sustainable fisheries by culturing SIFS for livelihood security in West Bengal. Group of 20 families earned Rs. 40,000-50,000/- in six months.

Management of Hilsa fisheries through special initiatives been taken by the Institute to conserve hilsa.

Re-establishing Hilsa fisheries in Ganga through NMCG: CIFRI has recently (2020-21) initiated to re-establish Hilsa fisheries in river Ganga through different initiatives.

Environmental hazardous pollutants in inland waters: River pollution induced by heavy metals and pesticides in Ganga, Gomti, Mahanadi, Kathjodi, Godavari, Krishna, Cauvery were evaluated. Pollution in water phase at a very low level with heavy metals (Zn, Cu, Cd, Pd, Cr, Mn) in few stretches was noticed while free from those elements in other stretches.

Threats from exotic fish species in inland open waters were assessed and documented 15 exotic fishes with an abundance index of 0.2 to 65 per cent.

Patents & Commercialization of CIFRI Technologies:

The Institute has developed, propagated, and commercialized a number of technologies. Two technologies obtained design registrations, CIFRI GI Cage & Tissue Embedding Machine, five got trademarks - Cage Grow, CIFRI GI Cage, CIFRI Pen HDPE, Argcure and CIFLIN, the first four commercialized. CIFLIN - formalin detection kit in fish & One -Step PCR based TiLV kitis under commercialization. The Institute is an ISO 9001: 2015 certified providing world-class service standards.

Employment opportunities through CBF in reservoirs & wetlands from 30 to 150 man-days/fisher household/ ywas made and 90man-days/pen been generated by pen culture. Canal fisheries in Sundarbans, WB provided nutritional security & livelihood to 1200 tribal fishers.

Development of farmers' friendly Apps and documentaries: i) Android App for Fish Disease (Fish Disease Advisory) ii) Andriod App for NutriFishIn (NutriFishApp) iii)Android App for Pension Database (Cifri PensionApp)iv) Android Application on CRT (Catch Recording Tool) v) e-Matsya (e-DAS) vi) 20 nos of customized farmers' friendly documentaries in Youtube vii) e-Atlases of water bodies above 0.5ha of 19 States.

It has developed farmer friendly apps and documentaries

Development of road maps for fisheries development was made for WB, Odisha, Jharkhand, Bihar, NE States (8), Telangana, Andaman &Nicobar Islands for ushering in Second Blue Revolution.

Initiatives for SCSP programs since 2018; demonstration of ornamental fish culture to 205 beneficiaries in Odisha, WB and Jharkhand providing training, technical support, fish tank, fish seed, fish feed and other accessories. Pen culture in 4 wetlands &12 reservoirs in Odisha, 13 Wetlands in WB&17

reservoirs in Jharkhand providing trainings, seeds and feed for pen culture to >5000 beneficiaries.

Collaboration of CIFRIwithIUCN, GIZ Germany, NFDB, FAO, Worldfish, University of Manitoba, Canada, University of Aberdeen, UK, BOBLME, WWF, NOFIMA, RMIT University, Australia, Agriculture & Forestry University, Nepal, BAU, Mymensingh, Bangladesh, Carleton University, Canada, Ghent University, Belgium, Tribhuwan University, Nepal, University of Ottawa, Canada, University of Waterloo, Canada, Wageningen University, Netherlands, CDA, NWA, IWAI, NHPC, CWC, SSNNL, Gujarat, NYKS, M/s Das & Kumars, Varanasi, M/s M. R. Aquatech, Bhubaneswar, M/S. Glaucas Agro-Chemicals, Kolkata, Coal Ash Institute of India, Kolkata, PRADAN, New Delhi, Kalpasar Department, Govt of Gujarat.

Resource generation through research grants from other agencies like 21 external funded projects; received Rs 2431.68 lakhs in 2015-16 to 2019-20; Rs. 1051.32 lakhs from 22 consultancy projects; sponsored training programmes Rs. 221.98 lakhs from different States;commercialization of 4 technologies viz, 'CIFRI GI CAGE', 'CIFRI PEN HDPE', 'CIFRI CAGEGROW' & 'Argcure' earned Rs. 6.5, 7.0, 6.0, & 10 lakhs respectively as one time grant apart from royalties from sales.DoF, Odisha has signed an MOU with CIFRI for installation of two CIFRI technologies, 110 nos CIFRI GI Cage and 100 ha CIFRI Pen HDPE in reservoirs of Odisha with Rs1.13 and Rs2.0 Crores.

Empowering fisherwomen through trainings, awareness for uplifting socio-economic status & livelihood in estuaries and through SCSP programs being made regularly

Research publications: Institute published (2016-2021) 1.5 research papers per Scientist/y (av. 1 paper/scientist in journals of NAAS rating > 6) and the average NAAS Score/Scientist/ y was 7.23.

Honours, Awards,

Recognition:

Sardar Patel Outstanding Research Institute Award-2020 in larger category Institutes of ICAR was bagged by Institute; Dr B. K. Das, Director adjudged with Rafi Ahmed Kidwai Award;ICAR Best Annual Report Award 2018-19 in "Large Institute" category;First "Cashless ICAR Institute Award" in 2016; First Prize of Ganesh Shankar Vidyarthi Hindi Krishi Patrika Purashkar 2017 for Neelanjali by ICAR.Dr V.G. Jhingran, Ex-Director, received Padma Shri Award in 1977. GoI released a special postage stamp of 5 Paise denomination in 1979 as a token of recognition of the pioneering work of CIFRI. Dr B. K. Das, Director was awarded Fellow of NAAS in 2019.

COVID-19 Guidelines by ICAR-CIFRI published for the stakeholders in fishing activities -rivers, estuaries, reservoirs & wetlands in 7 regional languages, English & Hindi, acclaimed by FAO, Rome who recommended these advisories to be included as Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries under the Asia-Regional initiatives for the benefit of fisheries sector across the globe.

The HR of Institute: Mammoth activities of CIFRI are being managed through a very dedicated team of only 201 nos. staff including 84 scientists,52 technicals. Even, CIFRI's presence is felt in the furthest corner of HP to 'Serlui B' reservoir, Mizoram., CIFRI is the Nodal Pension Authorising Unit of 13 ICAR Institutes.

Strong Leadership behind CIFRI's achievements: Need-based and timely support extended by Dr Trilochan Mohapatra, Secretary, DARE and DG, ICAR coupled with untiring guidance by Dr J. K. Jena, DDG (Fy. Sc), ICAR, New Delhi with relentless effort in meticulously performing all the mandated activities of the Institute by Dr B. K. Das, Director, ICAR-CIFRI has made the Institute in its present shape endeavouring towards doubling farmers' income by2022.

Mera Gaon Mera Gaurav (MGMG) Program and CIFRIa Flagship program of ICAR with an objective to propagate scientific know-how to the farmers/fishers by the Scientists of ICAR Institutes in their surrounding areas for uplifting livelihood to the farmers and in this program, 50 villages were covered with 56 Scientists covering 700 beneficiaries since 2015 by CIFRI.

Reaching to unreached by imparting knowledge support and capacity building to the ultimate beneficiaries through a handful of technologies has been meticulously being performed by the Institute.

(The author is the Director, ICAR-CIFRI, Barrackpore,West Bengal.)

ICAR-CIFT, Cochin invites applications for the temporary post of Young Professionals-I

ONLINE INTERVIEW

Applications are invited through online from the eligible candidates for the temporary post of Young Professional-I (YP-I) (01 No.) (on contractual basis) to work in NRL at QAM Division of CIFT, Cochin. The duration of the contract is for 01 year, extendable up to 03 years (max.).

I. Young Professional-I :

Emoluments : Rs.25,000/- per month (Consolidated)

Essential Qualification : MSc.Marine Chemistry/MSc.Hydrochemistry from a recognized university in India or abroad.

Experience : Minimum 2 years' experience in operation of GC-MS/MS and ICP-MS.

Desirable : Knowledge on statistical evaluation of data.

Age limit : Candidates should be above 21 years and maximum of 45 years as on date of interview. Age relaxation as per rules.

Terms & Conditions:

1. The application should be submitted in MS Word format (please refer Annexure I) by email to <qamdiv@gmail.com>.
2. The last date for submission of application is 25thJanuary 2022(25.01.2022).
3. Age relaxation of 3 years for OBC candidates and 5 years for SC/ST candidates is permissible.
4. Candidate should possess 1st class or 60% marks or equivalent overall GPA
5. Date and time for the online interview will be intimated to the shortlisted candidates in due course.
6. The recruitment will be held in strict compliance with the ICAR O.M. dated 04.12.2020.
7. The selected candidate will be recruited on contract basis under ICAR norms. The post is purely temporary.
8. The selected Young Professional is entitled for 08 days CL and 02 days RH in a calendar year on pro rata basis as per the ICAR OM dated 04.12.2020.
9. The candidate attending the interview should ensure that they fulfill all the eligibility conditions. No correspondence will be entertained from the candidates for selection/test/appointment
10. Candidates already employed should submit "No Objection Certificate" from the present employer while attending online interview.
11. Concealing of facts or Canvassing in any form will render the candidate disqualified for the post.

ICAR-CIFT invites applications for the interview for the post of senior research fellow

Applications are invited from the eligible candidates for temporary posts of Senior Research Fellow (02 No.) (on contractual basis) for the project "Marine fishery in Kerala: A Study on Evolution of Policy, Cost and Earnings of Fishing Units and Income of Fisher Households". The post is purely on contractual basis for the period mentioned or co-terminus with project. The duration of the contract is for about three years (till October, 2024).

II. Senior Research Fellow :

Fellowship : Rs.28,000/- per month (Consolidated) + 16%HRA

Essential Qualification : Master's Degree in Fisheries Economics, Agricultural Economics, Development Economics, Economics, Agricultural extension and Agricultural Statistics with 4 years/ 5 years of Bachelor's Degree.

Candidates having Post-Graduate Degree in Economics / statistics with 3 years of Bachelor's degree and 2 years Master's degree should have NET qualifications and 2 years of research experience.

Desirable Qualification : Research experience, field related research work, publications, writing skills, statistical analysis using software like STATA / SPSS/R.

Nature of work : Assisting in research activities, data collection and coordination and Data analysis, report writing.

Age : Maximum 35 years for men and 40 years for women as on date of interview. Age relaxation of 3 years for OBC candidates and 5 years for SC/ST candidates is permissible.

Recruitments are in accordance with ICAR OM No. Ag Edn. 6/27/2014-HRD dated 30.07.2019 except for fellowship.

Terms & Conditions:

1. The application should be in PDFformat (please refer Annexure I) by email to <ciftfishecon@gmail.com>
2. The last date for submission of application is 22th January 2022 (22.01.2022).
3. Date and time for interview will be intimated to the shortlisted candidates in due course. In view of the COVID crisis, mixed interview method (either online/ in-person) will be conducted, depending on the situation. The date and time of the interview and the mode of interview will be intimated to the shortlisted candidates.
4. The selected candidate will be recruited purely on contract basis under ICAR norms. The post is purely temporary. The office reserves the right to terminate the services of the appointee at any time if not found satisfactory.
5. The candidate attending the interview should ensure that they fulfill all the eligibility conditions. No correspondence will be entertained from the candidates for selection/test/appointment.

6. Canvassing in any form will render the candidate disqualified for the post.
7. The decision of Director, CIFT will be final and binding in all aspects regarding the selection to the post.

WALK-IN-INTERVIEW

Post Name: Junior Research Fellow/ Senior Research Fellow at CIFE, Mumbai

No. of Post: 1 (one)

Project: "Distribution of pathogenic micoraerophilic Arcobacter sp. in seafood and development of a rapid method for its detection"

Duration: Till 07th October, 2024

Date and venue of interview: 31st January 2022(Time:11:00 am) at CIFE, Off Yari Road, Panch Marg, Versova, Andheri (W), Mumbai - 400 061

WALK-IN-INTERVIEW

Post Name: Young Professional - II at CIFE, Mumbai

No. of Post: 1 (one)

Project:"NETWORK PROJECT ON ASSESSMENT OF AMR IN MICRO – ORGANISMS ASSOCIATED WITH FISHERIES AND AQUACULTURE IN INDIA"

Duration: Three Years or closure of the project (whichever is earlier)

Date and venue of interview: 18th January 2022(Time:11:30 am) at CIFE, Off Yari Road, Panch Marg, Versova, Andheri (W), Mumbai - 400 061

WALK-IN-INTERVIEW

Post Name: Junior Research Fellow (JRF)

No. of Post: 1 (one)

Project:"Development of Nursery Based System for Pacific White Shrimp, Litopenaeus vannamei, using ground inland saline water, and assessment of physiological and immunological parameters in single phase and two phase farming system"

Duration: 16.05.2022 (completion of the project)

Date and venue of interview: 12.01.2022(Time:10.00 am) at ICAR – Central Institute of Fisheries Education, Rohtak centre, Lahli, Rohtak, Haryana – 124 411

WALK-IN-INTERVIEW

Post Name: Young Professional-II (Legal) at CIFE, Mumbai

No. of Post: 1 (one)

Duration: 1 Year

Date and venue of interview: 3rd January 2022(Time:02:30 pm) at CIFE, Off Yari Road, Panch Marg,

IARI invites applications for the post of technicians

Organization: Indian Agricultural Research Institute

Applications invited on behalf of Indian Council of Agricultural Research (ICAR) and its institutes.

Post: Technicians

Vacancies: 641

Category classification: UR 286, OBC 133, EWS 61, SC 93, ST 68.

Age limit: 18-30 years

Educational Qualifications: Matriculation or equivalent

Pay scale: Rs 21,700 (Basic + allowances)

Application fee:

Rs 1000 for UR/OBC/EWS category candidates

Rs 300 for Women/SC/ST/Ex-servicemen/PwBD category candidates

Important dates:

#Online submission begins: December 18, 2021

#Last date for receipt of online application January 10, 2022

#Date of online exam: Between January 25 to February 5, 2022

#Test format: Objective type questions

Top agricultural universities 2020

If you are a student of Science and wish to pursue a career in agriculture but picking the right university is a bothersome job, you might consider the latest ranking (2020) of the top agriculture institutes in India to make an informed decision. The rankings have been published by Indian Council of Agricultural Research (ICAR).

The rankings have been carried out by the education division of ICAR with an objective of instilling a competitive environment to improve quality and visibility.

The ranking process is expected to help the universities to self-assess themselves on the quality and enhance their abilities. It also tends to improve healthy competition among universities.

The parameters on which the rankings have been carried out are teaching resources and outcome, faculty profile, students' performance, research productivity, research impact, research excellence, extension activities, outreach programmes, revenue generation, peer recognition of the faculty, students and staff,

The Rankings –2020:

1. ICAR- National Dairy Research Institute – Karnal
2. ICAR – Indian Agricultural Research Institute, New Delhi
3. ICAR – Indian Veterinary Research Institute, Izatnagar
4. GB Pant University of Agriculture & Technology, Pantnagar
5. Punjab Agricultural University, Ludhiana
6. University of Agricultural Sciences, Bangalore
7. ICAR- Central Institute of Fisheries Education, Mumbai
8. Tamil Nadu Agricultural University, Coimbatore
9. Chaudhary Charan Singh, Haryana Agricultural University
10. Sher-e-Kashmir University of Agricultural Sciences and Technology, Kashmir
11. Acharya NG Ranga Agricultural University, Guntur
12. Tamil Nadu Veterinary & Animal Sciences University, Chennai
13. Central Agricultural University, Imphal
14. Ch. Sarwan Kumar Krishi Vishwavidhyalay, Palampur
15. Maharana Pratap University of Agriculture & Technology, Udaipur
16. Indira Gandhi Krishi Vishwavidyalaya, Raipur
17. University of Agricultural Sciences, Dharwad
18. GuruAngad Dev Veterinary Animal Sciences University, Ludhiana
19. Orissa University of Agricultural and Technology, Bhubaneshwar
20. Anand Agriculture University, Anand

ICAR-DIRECTORATE OF COLDWATER FISHERIES RESEARCH
(Indian Council of Agricultural Research)

Introduction

The Directorate of Coldwater Fisheries Research (ICAR-DCFR), erstwhile NRCCWF (National Research Centre on Coldwater Fisheries), was established on 24th September, 1987. The directorate is a national facility to strengthen fishery research in coldwater sector encompassing the Himalayan and peninsular parts of the country. The research programmes undertaken by the Directorate are designed with major thrust on conservation and management of open water fisheries and development of hill aquaculture. The directorate has well equipped state of art laboratory facilities for research in diverse areas. During the last three decades, the ICAR-DCFR has achieved commendable success in the area of coldwater fisheries research and disseminated need based technologies to different stakeholders. It has significantly contributed towards the enhancement of fish production, species and system diversification, health management of fishes, genetic characterization of important species, conservation of endangered fish species as well as human resource development through training and skill development. The directorate has strong national and international linkages with SAUs, universities, NGOs, Govt. departments, farmers and other stakeholders. The ICAR-DCFR is on its glorious path of virtually actualizing its vision by imparting boon of quality research in sustainable coldwater fisheries production, management and conservation.

Mandate

- Basic, strategic and applied research in coldwater fisheries and aquaculture
- Act as a repository of information on the hill fisheries resources
- Human Resource Development through training, education and extension

Mission

To become a national facility of excellence for assessing and managing coldwater fishery resources, develop technologies and models of hill aquaculture and provide critical inputs in formulating strategies for sustainable growth and development of the sector.

Achievements

- GIS based aquatic resource mapping for planning, sustainable utilization and development of fisheries and aquaculture in Indian Himalayan regions.
- Technology developed for captive breeding of endangered golden mahseer, *Tor putitora* for its mass scale seed production.
- Developed flow through hatchery for golden mahseer, *Tor putitora* & rainbow trout, *Oncorhynchus mykiss* for seed production and rearing.
- For species diversification in aquaculture, developed breeding technologies for different food and ornamental fishes.
- Developed cost-effective starter feed for initial feeding of rainbow trout (*Oncorhynchus mykiss*) fry providing higher survival and better FCR values.
- Established and demonstrated Re-circulatory Aquaculture System (RAS) as a climate resilient technology for intensive rainbow trout culture under controlled condition.
- Developed multi-tier model for integrated fish farming using polytanks in mid hill region.
- Fish Disease surveillance for coldwater aquaculture and fish health management.
- Genetic characterization of important coldwater fish species for studying population structure and conservation priorities.
- Supported hill states of the country in developing coldwater fisheries and aquaculture.
- Training and skill development of state govt. officers, faculties, students, research scholars, farmers & NGOs,

Directorate of Coldwater Fisheries Research, Bhimtal – 263 136, Nainital, Uttarakhand, India
☎: 05942-247279/247280, Fax: 05942-247693, email: director.dcfr@icar.gov.in, dcfrin@gmail.com Website: www.dcfr.res.in

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