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ICAR - CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTURE
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Modern Reflections
Chennai

ICAR-CIBA - a nodal R&D agency working in brackishwater aquaculture for the past three decades with a vision of environmentally sustainable, economically viable and socially acceptable seafood production. Technology backstopping and interventions by the institute is benefiting the sector to the tune of Rs 10,000 crore annually.

Front cover : Hatchery produced milk fish fry

Back cover : CIBA trained farmer Shri. A Baburaj receiving Pandit Deen Dayal Upadhyay Antodaya Krishi Puraskar- 2016" by ICAR from Honb. Union agriculture minister.

An entrepreneur cheerfully holding a bag of hatchery produced milkfish seeds during the event of seed release

HAVING MULTI-TROPHIC ASSEMBLAGE OF CANDIDATE SPECIES AND DIVERSIFIED REARING SYSTEMS ARE KEY DRIVERS TO BRING SUSTAINABLE BRACKISHWATER AQUACULTURE

FROM THE DIRECTOR'S DESK

In brackishwater aquaculture footprint of fish production on potable water is negligible. Furthermore, the pressure on fish farming due to climate change and decreasing freshwater resources, much of the expansion in aquaculture is expected to occur in brackishwater and marine environments. Brackishwater environments are rich in biodiversity and productive ecosystems than the open marine waters, which are generally challenging for maneuver, therefore brackishwater resources are perceived as ideal for scaling up of aquaculture production in future.

Currently, brackishwater sector in the country is centered on farming of single species, exotic vannamei shrimp, which accounts for the 90% of the farmed shrimp production. ICAR-CIBA realize the risk of complete dependence on single species. CIBA being a nodal research institute in brackishwater aquaculture, it continues to stress upon the diversification of brackishwater aquaculture with different candidate species of shellfish and finfish. This will enable us to judiciously and responsibly use the nations brackishwater resources.

In this direction, CIBA has made commendable progress in developing technologies for seed, feed and husbandry of diversified food fishes such as seabass, cobia, milkfish, pearlspot, long whiskers catfish, mud crab and 5 native species of shrimp. In this context, we are proud in declaring the breakthrough achieved in captive breeding of milkfish in our finfish hatchery at Muttukadu in June 2015 for the first time in this country. CIBA scientists continue to work on species such as grey mullet and red snapper to have a comprehensive multitrophic species assemblage to judiciously and responsibly utilise feed and food resources in the dynamic brackishwater sector. CIBA also perfected the technology on breeding of brackishwater ornamental such as chromides, scat, mono angel and crescent perch opening up a new brackishwater ornamental portfolio.

We also focus on alternative aquaculture systems such as integrated multi-trophic aquaculture systems (IMTA), family farming, polyculture and organic farming. Further, we have taken sincere efforts to bridge the relationship between the stakeholders and farmers, and the results are visible in the form of partnership agreement (MOUs) on a public-private partnership (PPP) mode. Also, CIBA has developed close working relationship between the state government and other government agencies working for the development of brackishwater aquaculture in the country by sharing the strength and weaknesses, which provided a new synergy.

The year 2015-16 is behind us, and when look back, this has been an eventful year for CIBA, with significant success stories, useful and meaningful research outcomes, achievements and events. I take this opportunity to thank all the stakeholders for the continued support, and CIBA feel pleased to bring the 2nd special issue of the CIBANEWS which carries the significant achievements, events, and outcomes of CIBA in 2015 and 2016.

Dr. K.K. Vijayan
Director

Milkfish broodstock maintained in 100 t capacity broodstock tank at CIBA

Breakthrough in breeding of captive-reared milkfish *(Chanos chanos)*

Milkfish *(Chanos chanos)* is a fast growing, big size brackishwater food fish ideal for farming in coastal waters. Being a herbivore, milkfish can grow rapidly in natural water bodies by feeding on benthic algae, lab-lab, phytoplankton and detritus matter. They also very well accept low protein pellet feed under culture conditions and grow to the marketable size of 500 g in six months. Farmed milkfish fingerlings are preferred as live bait for tuna fishing using a long line. In India, milkfish farming is still depending on the wild resources for seeds, which is of poor quality and supply is unreliable. Visualizing the significance of milkfish and need for the diversification of species ICAR-CIBA has initiated the milkfish breeding program at its Muttukkadu Experimental Station (MES) a few years back and did a focused research on broodstock development and induced breeding protocols in land based rearing systems.

As a result of constant efforts by ICAR-CIBA, for the first time in this country, artificial breeding of milkfish under captive conditions was achieved on 8th June 2015. A total of 80, 000 eggs of 1.23 mm mean size were obtained and fertilization rate achieved was 18.8%. After 22 hours post fertilization, eggs hatched into transparent larvae of 3.4 mm mean length and the hatching rate was 41%. As a milestone in the history of Indian aquaculture, 3000 milkfish fry of 3.2 cm size were produced and handed over to the farmers for further rearing. Successively, a total of seven spawning were observed with average egg production of 111232 eggs/spawning. Total larvae produced are 307699 with 75.1 % fertilization rate and 71.2 % hatching rate. The mean total length of the newly hatched larvae was 3.4 mm. Continuous production and larval rearing are being conducted, with the further fine tuning of the seed production protocols. On successful rearing, the milkfish larvae reached to the early fry stage (15mm) on 20 day post hatch (dph). Milkfish seed produced in the hatchery were distributed to the farmers from different maritime states across the country.

Indian consumer surveys indicate high fish consumption in West Bengal and Odisha as most of the people consume fish on day to day basis and there is a good demand for milkfish. These states also have traditional polyculture of many fish species which includes milkfish also. Also, milkfish can be cultured in coastal waters, estuaries and brackishwater water bodies such as Chlika lake in Odisha, Pulicat lake in Tamil Nadu/Andhra Pradesh, Bheries in West Bengal, backwater in Kerala, Goa and Karnataka. Milkfish being similar in look and spiny nature as hilsa, it can have a ready market with a selling price of Rs.150/Kg in Kerala, West Bengal, Odisha and other North Eastern states of India and can be recognized as Decan Hilsa in the domestic market. Milkfish hatchery technology will be useful for setting up hatcheries in these states. The institute has transferred milkfish hatchery technology to M/s Aditya fish hatcheries, Andhra Pradesh.

Embryonic development of milkfish

Milkfish fry ready for nursery rearing

Adult Mystus gulio

Captive breeding of *Mystus gulio*: Yet another brackishwater fish for region specific markets

Mystus gulio is a commercially important brackishwater catfish locally known as "Nuna Tengra", which is an important small indigenous fish species (SIS) of the Sundarban delta, West Bengal. In natural water bodies, they feed on organic matter and small crustaceans. Availability of this fish from natural water bodies has been reduced due to overexploitation and environmental degradation. This resulted in high market demand and price for this fish, and eventually stirred interest for farming. Mystus cat fish attains a maximum size of 30 cm (250 g) in a year in the optimum salinity range of 5-12 ppt. It is preferred for farming because of its hardy nature, taste, nutritional value and high market demand.

In this backdrop, Kakdwip Research Centre of CIBA has developed a comprehensive technology comprising of captive breeding, larval rearing and grow-out culture of this fish in brackishwater systems. Though rearing of this fish is easy as other omnivorous fish species, but breeding and seed production is more critical and challenging.

During the month of April (before onset of spawning season), pre-mature brood-stocks of *M. gulio* were collected from brackishwater bodies, and acclimatized to hatchery condition (5-20 ppt salinity) with provision of maturity diet. Selected matured female (>150 g) and male (>50 g) distinguished by external morphological characteristics are induced with hormones for spawning. Single intramuscular injection of gonadotropin or LHRHa to female and half the dose to male resulted in good spawning. Fertilized eggs are demersal and sticky, and demand provision of substrate in the form of nylon net fibre for their attachment. It is a low fecund fish and total fecundity ranges from 25000 to 150000 eggs depending on size of female. Hatching takes place post 16-18 h of fertilization.

The newly hatched larvae start feeding from 2 days post hatching (dph) before the yolk sac gets completely absorbed at 3 dph. In larval rearing tank, larvae are fed initially with green algae and egg custard from 2 dph, then with Artemia nauplii and egg custard from 3 dph, Artemia nauplii alone from 5 dph, Artemia nauplii and crumbled feed from 8 dph and exclusively with crumbled feed from 15 dph. In 30-35 dph, fry attained 48-50 mm size and cost of production was calculated as Rs. 30 per 100 fry.

Harvested M. gulio

Farmers Speak

Thiru. J. Sivagnanam

I am Thiru. J. Sivagnanam, an aqua farmer hailing from Kattur Village, Tiruvallur district, Tamil Nadu. Ours is a typical south Indian joint family dependent on agriculture as a source of income from an extent of four acres of land. As the groundwater was slightly saline, a single crop of paddy per annum during the northeast monsoon season was the prime crop in our farm land which depends on the village tank nearby for irrigation. Though we got enough paddy for our family consumption, we did not get any further income from agriculture. I realized that the income from agriculture wouldn't be sufficient to afford my kids' education, and I was desperately looking for an alternative. During 2000-2004, CIBA had a project on 'Institute Village Linkage Programme (IVLP) for Technology Assessment and Refinement' in my village and I had the opportunity to interact with CIBA scientists and other progressive aqua farmers. This paved the way for my entry into aquaculture. Initially, I started farming of Indian major carps in one pond and shifted then to giant freshwater prawn (*Macrobraccium rosenbergii)* and subsequently to low saline Pacific white shrimp (*Penaeus vannamei*) farming in 2011 with the guidance and training of CIBA. Since then I continue farming vannamei shrimp successfully in an innovative way. I am doing on-farm nursery, where PL 10 aged seed is reared @ 500/m^2 for 25-30 days to a size of 2.5 to 3 g before shifting to the main grow-out pond. Juveniles are reared for another 60 days before harvest, where shrimps reach a size of 18-20 g average. Altogether in 90 days, I could able to complete one crop, and easily I could get three crops in a year. Onsite nursery rearing is cost-effective as seed can be procured in the lean period, survival and growth of shrimps are very good, and culture duration is shortened. Since water is a scarce resource in our area, I practice water recycling by pumping 30-40% nutrients rich pond water into another pond while harvesting one pond and top up with ground water. In this process, once in three years only, I dry my ponds. Recycling of pond water for the subsequent crop ensure quality rearing medium for the shrimp, reduce the input and energy (aeration) costs considerably and prevented the eutrophication of natural water bodies. I have been mostly successful in aquaculture and further, I have motivated and brought at least 200 new farmers into aquaculture with about 1000 ha of area and about 10000 tonnes of shrimp every year. We all used to approach CIBA for testing of water, soil, seed and shrimp and their services are very good. ICAR-CIBA motivated me with the "Farmer-Innovator" award in 2014 and upon nomination by CIBA I have received "Innovative Farmer Award - 2015" from the Indian Agricultural Research Institute, New Delhi.

With all my experience, I must say that quality seed is the foremost important and the farmers should be aware of seed selection protocols. Similarly optimizing the stocking density preferably lesser than the carrying capacity of the pond is the key factor for successful farming. Similarly, collective seed procurement through the farmers' association/group in a tie-up with reputed hatcheries is a strategy to source quality seed and this approach proved to be a win-win situation for both. By adopting simple farm level strategies and technological advancements in modern aquaculture, every farmer can achieve our government vision of doubling the farmer income by 2022.

Thiru J. Sivagnanam receiving award for his contribution in aquaculture

Integrated Multi-trophic Aquaculture (IMTA):

Multi-trophic integration for optimum utilization of resources

Integrated multi-trophic aquaculture, IMTA, is the farming of species from different trophic levels with complementary ecosystem function in proximity. In this farming practice, un- eaten feed, nutrients, wastes and energy of one species or crop are recaptured and utilized as fertilizer, feed and energy for other co-culture species or crops. When diet introduced to a fed species (fish or shrimp), it will be partially egested as feces or fully excreted as soluble nutrient, and that could be captured by co-cultured species (organic extractive: bivalves; inorganic extractive: seaweed). Thus, the efficiency of whole system would be improved. A distant prototype of IMTA existed in many Asian countries as a polyculture of different species, often species from same trophic level. The importance of IMTA as a management option for sustainable ecosystem functions along with economic benefits has been recognized recently.

The origin of the IMTA can be traced back to the origin of aquaculture. In 2100 BC, You Hou Bin demonstrated the integration of fish with aquatic plants and vegetable production in China. In modern day aquaculture, the interest in IMTA is reinitiated by John Ryther in 1970, and he called it as integrated waste recycling marine polyculture system. During the last four decades this system has refined further, and received international acceptance. The philosophy behind IMTA is "The solution to nutrification is not dilution, but extraction and conversion through diversification". IMTA system is extremely flexible; it may either be a land-based system or open-

water system. The success of IMTA system largely depends on the appropriateness of the species chosen. The species chosen should be based on ecological function, and more importantly the economic potential of the species. Thus IM TA goes beyond environmental sustainability, it provides economic diversification, reduces the economic risk, and further increases the accessibility of aquaculture sector itself. Only few countries, such as Canada, Chile, Ireland, South Africa, UK, USA, have established IMTA at near commercial level or commercial level. However, most countries have recognized the potential of IMTA for the long-term sustainability of aquaculture.

Initiation by CIBA: The institute has undertaken on-station and on-farm trials to demonstrate and popularize IMTA. In on farm trials, the existing pond based shrimp farms in Sindhudurg District (Maharashtra, India) are modified for the IMTA demonstrations. Different combinations of fed species (*Chanos chanos, Etroplus suratensis, Mugil cephalus, Penaeus indicus*) and an extractive crop (*Crassostrea madrasensis*) were reared and compared the growth and production with monoculture system. The productivity of IMTA system was higher (3250 kg/ha) than control (2000 kg/ha). Further, income and benefit-cost ratio was found to be higher in IMTA pens. In on station trial, a 150-day experiment was conducted in brackishwater ponds at KRC of CIBA. *Mugil cephalus, Liza parsia, Penaeus monodon*, estuarine oyster (*Crassostrea cuttackensis*) and seaweed (*Enteromorpha* spp) were reared. The growth and production of IMTA pond is compared with control polyculture pond without oyster and seaweeds. A significantly higher production of 1707 kg/ha (Mullets- 926 and shrimp- 781 kg/ha) with better water quality was obtained in IMTA system compared to that of control ponds (1434 kg/ha; mullets- 772 and shrimp- 662 kg/ha). This preliminary trial indicates the potential of IMTA in brackishwater, and further experiments will be conducted for refining the species combination and assessing economic viability of the IMTA model.

Challenges of modern aquaculture remain to be resolved yet, and some are daunting. At this context IMTA will be a major concept to build a sustainable brackishwater aquaculture.

The species chosen should be based on ecological function, and more importantly the economic potential of the species

IMTA - Model

National Surveillance of Aquatic Animal Diseases

Under National surveillance programme of aquatic animal diseases (NSPAAD), aquatic animal diseases of brackish water aquaculture system in three districts of Andhra Pradesh (Nellore, Guntur, Krishna) and three districts in Tamil Nadu (Nagapatinam, Cuddalore and Villupuram) were monitored by ICAR-CIBA. During 2015-16, active disease surveillance was carried out in 120 shrimp farms covering coastal states such as, Andhra Pradesh, Tamil Nadu, Gujarat and West Bengal. White spot disease (WSD) remained the major cause of mortalities with 17% of the farms suffering mortalities. Additionally, a new microsporidian parasite, *Enterocytozoon hepatopenaei* (EHP) emerged as a new challenge to Indian shrimp farming. EHP was detected in 43.39% of the farms in the maritime states, particularly Andhra Pradesh (AP) and Tamil Nadu (TN). Infectious hypodermal and haematopoietic necrosis (IHHN) was prevalent in 5% of the farms, and monodon baculovirus (MBV) in 13.3% of the farms. None of the other trans-boundary diseases such as YHV, IMNV and TSV were detected during the period.

Hands on training given to fisheries officials

Hepatopancreatic microsporidiosis in farmed shrimp

Hepatopancreatic microsporidiasis, an emerging disease, caused by a microsporidian parasite *Enterocytozoon hepatopeanei* has been widely reported in shrimp farming countries. During the surveillance in the states of Andhra Pradesh and Tamil Nadu, twenty three farms were observed with EHP. Of the farms affected with EHP, 34.7% of the cases were associated with stunted growth, 39.1% with white feces syndrome, and 26 % with white spot disease. Post-larvae of *P. vannamei* screened from a few hatcheries were found to be negative for EHP. *In situ* hybridisation using EHP-specific DIG-labelled probe showed positive signals

Impact of disease outbreak in a shrimp farm

in infected hepatopancreatic tissue. Although EHP could be detected from slow-growing as well as WFS- affected animals, the present study could not conclusively elucidated the association of EHP with these clinical signs through experimental infection trials.

Stunted growth, white faeces syndrome and running mortality syndrome cause considerable morbidity

Disease syndromes such as white faeces syndrome (WFS), stunted growth, running mortality syndrome (RMS) or chronic mortality syndrome (CMS), white muscle syndrome (WMS) and loose shell syndrome (LSS) have become a serious cause concern in vannamei farms. These syndromes together cause considerable morbidity. These syndromes have been primarily attributed to poor farm management. During 2016, stunted growth /growth retardation was recorded in as high as 31% of the farms, CMS in 20%, WFS in 21% of the farms and white muscle syndrome in 12% of the farms investigated. Five per cent of the 120 farms investigated were affected with IHHNV during April 2015 to March 2016 and majority of them were associated with growth retardation of farmed shrimp. Increased occurrence of this pathogen despite use of SPF stocks would require further investigation. These syndromes were also found to have co-infections with other pathogens. Out of the 29 farms affected with WFS, seven farm samples had WSSV infection, four with MBV and nine had EHP. *Vibrio parahemolyticus* was found predominant in three farms, *V. proteolyticus* in seven, *V. alginolyticus* in two of WFS affected farms. Out of 28 farms affected with CMS, 18 farms had WSSV infection, six farms had MBV and one farm had IHHNV infection. WMS affected shrimp were also tested for *Penaeus Vannamei* noda virus and infectious myonecrosis virus (IMNV), however, all the samples tested were negative. Five WMS farm samples had EHP infection. *V. parahemolyticus, V. proteolyticus, V. alginolyticus*, *V. coralliilyticus* were found to be predominant in the WMS affected shrimp. In histological sections, coagulative necrosis and hemocytic infiltration was observed in the hepatopancreas of affected shrimp but no viral inclusions were observed.

Tiger shrimp affected by slow growth syndrome showing size variation

Shrimp farming in the era of changing climate

Climate Change (CC) in the form of unpredicted variations in climatic parameters and occurrence of extreme climatic events is being experienced and expected to impact brackishwater aquaculture due to its location along the coast and delicate nature of farming. Vulnerability to climate change is the susceptibility of shrimp farming operations to climate disturbances determined by its exposure, sensitivity and the farmers' capacity to adjust to climate-induced perturbations. Vulnerability = *f* (exposure, sensitivity & adaptive capacity).

In order to calculate the vulnerability of shrimp aquaculture to CC, an innovative methodology was developed to measure exposure and sensitivity of farms and adaptive capacity of aqua farmers. Exposure was operationalised as experiencing a particular climate change event or phenomena by the farmer and the frequency of its occurrence. Sensitivity was operationalised as the consequences (positive and negative on a five-point rating scale) of a climate change event or phenomena on aqua farming in terms of economic gain/loss. Adaptations refer to planned (with the help of the government) and autonomous (individuals themselves). Each adaptation measure score was calculated by multiplying its score with salvage value (measured on a 0 to 5 scale). Adaptive capacity was ascertained through 21 indicators. Subsequently, the scores of exposure, sensitivity and adaptive capacity were normalized to render it as a dimensionless measure and the vulnerability was calculated. *Vulnerability = 1/3 (Exposure + Sensitivity + (1-Adaptive capacity)*. Vulnerability levels were categorized on a scale of 0-5 as very low (0 – 1.0), low (1.1-2.0), moderate (2.1-3.0), high (3.1- 4.0) and very high (4.1- 5.0).

The approach to evaluate the impact of CC on shrimp farming, assessment of its vulnerability and development of district wise resilience plan inclusive of a tripartite process viz., (i) Participatory focus group discussion (FGD) with farmers, (ii) In-depth farmers survey and (iii) Stakeholder workshop at district level involving all the development departments to validate and map the planned adaptive and mitigation measures. The findings from one district in each coastal state of the country, wherein aquaculture is a dominant farming system showed that extreme climatic events like heavy rain, flood and cyclone are rated as high risky due to their extremely negative to disastrous impacts on the aquaculture production systems. The extreme events were perceived to be high risk and

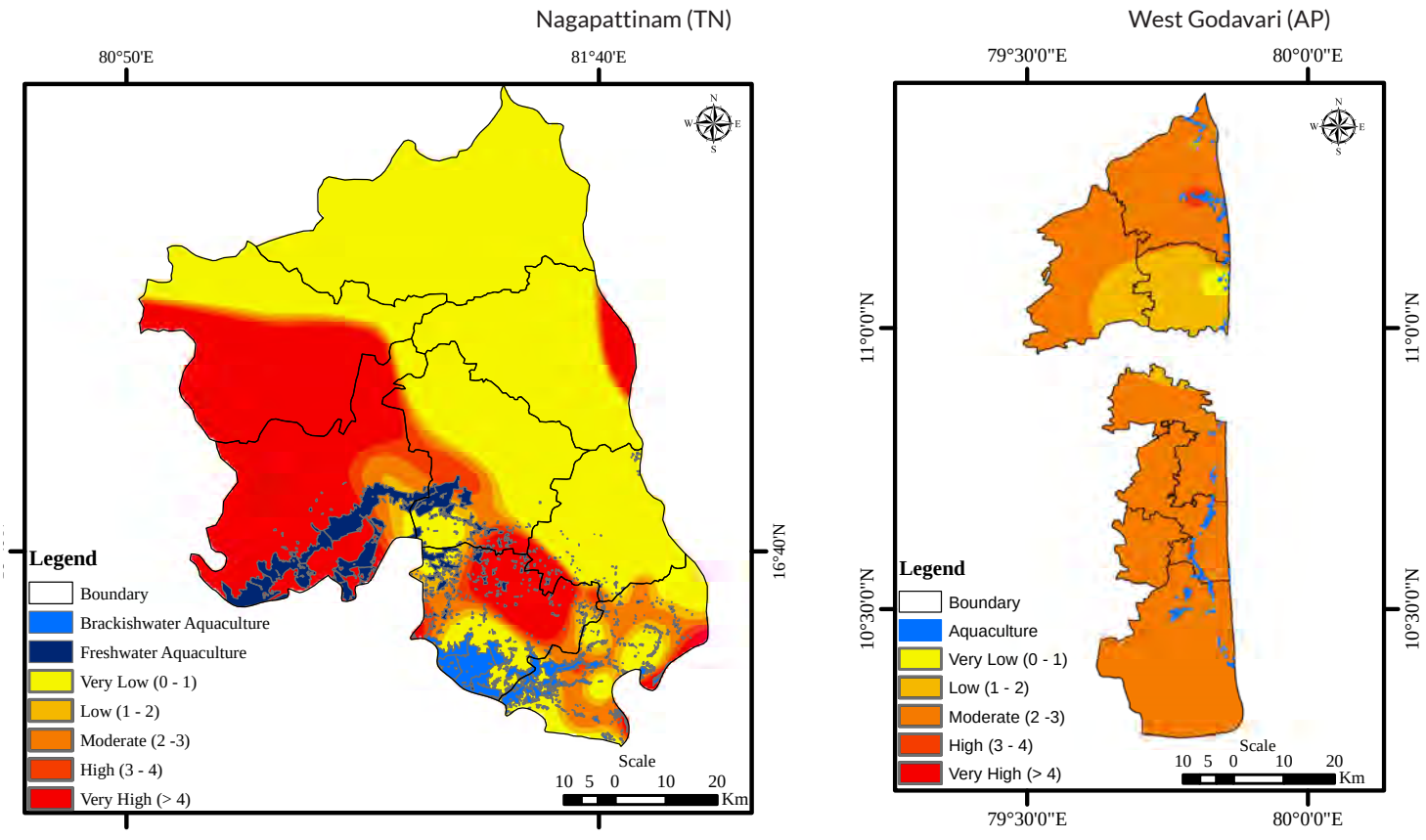
Inundation of shrimp farms during Chennai flood, 2015

disastrous as they are extremely negative to shrimp aquaculture with 50 to 100% economic loss and loss of livelihood. The prolonged and unusually high and low temperature for a relatively longer period affected the physiology of the species and it spent its full energy in maintaining the metabolic rates led to severe stress. Seasonal changes like late onset and early withdrawal of monsoon seasons, an extension of summer/winter seasons beyond their stipulated period are reported as the second highest risk as the seasonal variations hinder in planning and continuing the crop. Further, an extension of cold seasons beyond the period facilitates the manifestation of disease pathogens and similarly hampering the breeding and seed production of candidate species.

Brackishwater shrimp aquaculture is moderately vulnerable to CC events and the east coast was more vulnerable than the west coast. The majority of the aquaculture farms in Tamil Nadu (66%), Andhra Pradesh (66%), Odisha (51%) and West Bengal (57%) were felt moderately vulnerable. Similarly, in the west coast around half of the farms of Kerala (39%), Karnataka (48%), Goa (43%), Maharashtra (55%) and Gujarat (16%) were assessed to be moderately

vulnerable to climate change. In Gujarat about 63% of farmers showed very low vulnerability because of commercial shrimp aquaculture per se was relatively nascent, the farms were constructed scientifically and the farmers ably adopted better management practices. Maps of aquaculture vulnerability to CC and predictions of sea level rise (SLR) on inundation of coastal resources were prepared, which are useful to policy makers. A climate resilient plan and mechanism to pre-emptively minimize the climate change impacts was prepared for Nagapatinam District, Tamil Nadu and suggested appropriate adaptation strategies to lessen the impacts, vulnerability and enhance the adaptive capacity of the aquaculture farmers. Planned adaptive measures like government support, institutional credit, insurance and incorporating brackishwater aquaculture as an agriculture productions system while providing relief during the occurrence of extreme events would certainly minimize the risk levels and vulnerability of brackishwater aquaculture and enhance the resilience of the system vis-à-vis climate change induced impacts.

> **"The majority of the aquaculture farms in Tamil Nadu (66%), Andhra Pradesh (66%), Odisha (51%) and West Bengal (57%) were felt moderately vulnerable. Similarly, in the west coast around half of the farms of Kerala (39%), Karnataka (48%), Goa (43%), Maharastra (55%) and Gujarat (16%) were assessed to be moderately vulnerable to climate change."**



Vulnerability of shrimp aquaculture to climate change

Indigenous cost effective vannamei shrimp feed: Vannami*Plus*

Farmed shrimp constitute about 70% of annual seafood exports from India. Formulated feed is a major recurring cost, which often ranges from 50 to 60 % of the total cost of production and directly determines the profitability. The major share of Indian shrimp feed business is catered by the multinational corporate companies or their joint ventures, where an upward trend in price has been noticed during the last few years. The size of the Indian shrimp feed industry is 6.25 lakh tons worth of Rs 4600 crores in the year 2016. Increasing shrimp feed price is a major challenge facing Indian shrimp farming. ICAR-CIBA's focussed research on nutrient requirements, scientific feed formulation, database on price and seasonality of locally available ingredients led to a cost-effective shrimp feed using indigenous feed processing technology. This feed has been branded as Vannami*Plus*, and has been widely tested in farmers' pond in Andhra Pradesh, Kerala and Gujarat states. While the cost of the commercial feed available to the farmer is about Rs. 82 to 88 per kg, the cost of Vannami*Plus* was only Rs. 50 to 55 per kg. Vannami*Plus* has good attractability, palatability and performed on par with the top commercial brands in terms of growth, survival, and feed utilization, as revealed by the farmers. We demonstrated that, while feed cost to produce 1 kg of shrimp can be restricted to Rs. 91 to 98 by using Vannami*Plus*, it can go up to Rs.140 with commercial feeds. The feed showed impressive performance and the farmers could reduce the cost of production of shrimp from Rs.230- 240 per kg to 170-180 per kg. Thus it is playing a crucial role in improving the profitability of small and medium shrimp farmers.

This feed technology has been transferred to M/S Sai Aquafeeds, Bapatla, Andhra Pradesh. The feed produced by M/S Sai aqua feed can cater to the farming area of 300 hectares and would benefit about 100 shrimp farmers. ICAR-CIBA has entered into MoUs with 6 stakeholders in Andhra Pradesh, Gujarat, Kerala, West Bengal and Orissa to assist in setting up feed mill to produce shrimp feeds using Vannami*Plus* technology.

Vannami*Plus* would be cost-effective and able to be an import substitute to bring down the cost of production and increase the profitability of Indian shrimp farmers. Though it appears that the coverage of Vannami*Plus* technology in the sector is a small portion in meeting the feed demand, it is serving as a benchmark for pricing as well as to compare the performance of the other commercial feeds evolving in the sector. The trickle-down effect is expected to benefit the Indian shrimp farmers around 1500 Cr/annum by saving the cost of production @10%. This type of small and medium scale feed mill has to be replicated across the country for the benefit of shrimp farming sector.

FEATURES OF THE VANNAMI*Plus* FEED TECHNOLOGY:

- Scientifically formulated quality feed for vannamei (35% Protein & 6% Fat)
- Feed cost of ₹ 50-55 / kg
- Increase the profit margin for farmers by 15-20%.
- Tested and evaluated extensively in farmer's pond
- FCR of 1.2-1.4
- Better feed utilization offers good soil and water quality
- Customizable technology for small, medium and large scale operations
- Suitable for corporate entrepreneurs, farmer clusters, and co-operative societies
- Capital investment for the feed production unit is

  ₹ 50 to 150 lakhs based on the infrastructure and production target.

Pilot scale feed mill at Muttukadu

Industry opinion

Shrimp production grew multifold in India after the introduction of specific pathogen free Vannamei in 2009, making India become the second largest shrimp producer in the world today. Government agencies like CIBA and MPEDA played a crucial role along with Coastal Aquaculture Authority (CAA) in the creation of Aquatic Quarantine Facilities and framing farming guidelines to bring discipline in the farming of an exotic species of shrimp in India. Expansion of existing hatcheries and farms, seafood processors, and the establishment of additional hatcheries, farms and processing plants brought Indian Shrimp Aquaculture to the limelight.

It is expected that India shall produce around 50 billion vannamei shrimp PLs in 2017 which will result in producing more than 500,000 MT shrimp this year. Consistency in farm gate price for shrimps of all sizes will help the shrimp farmers to increase the crops per year as the size at harvest remains below 20 g. With the enterprising nature of Indian farmers and expansion of shrimp farming areas alongside, it is not too far for us to reach the number one position in shrimp production.

Though the situation in India looks rosy, we are not immune to diseases. Reports from the disease surveillance in brackishwater aquaculture by CIBA, NBFGR and other institutes have indicated the emergence of EHP and new viral disease outbreaks are major concerns at present. Productivity levels are declining and loss of production due to diseases has increased in the recent years. Lack of biosecurity and high density farming practices made them susceptible to new diseases. Stocking densities in grow out need to be based on the carrying capacity of the ponds and quality of source water.

Food safety and traceability are gaining importance and we need to ensure the quality of produce to have smooth and safe exports. Most of the Asian countries compromised their responsibility when the farm productions went high. Indian Aquaculture fraternity should learn lessons from those countries that failed miserably in the last three to four years and bring discipline to the industry. Let us go on to become the best producer of cultured shrimps in the world

It is imperative that the industry need to revisit the farming and hatchery practices to make the industry more sustainable and successful. Commitment at all levels is the need of the hour. Responsible aquaculture practices alone can make the industry to grow further and sustain after reaching greater heights. The guidelines of CAA should be strictly adhered in better management of farms and hatcheries to ensure the assured results. Considering the larger interests of the country, all stakeholders have their accountability and a definite role to play for a better future. Let us adopt new farming technologies to produce healthy shrimps for us as well as for the rest of the world.

Reports from the disease surveillance in brackishwater aquaculture have indicated emergence of EHP and new viral

Mr. S.Chandrasekar
President
Society of Aquaculture Professionals, Chennai, India.

EVENTS

NEW LOGO OF CIBA, LAUNCHED

ICAR-CIBA being an important R&D institution under ICAR, Government of India, in the development of brackishwater aquaculture in the country, it is essential to have better visibility and identity of CIBA in the sector. In the present light of brackishwater aquaculture in the country, a new logo for CIBA was conceived and designed. Shri. Muthukaruppan, Former President, Society for the Aquaculture Professionals, released the new logo on 20th June 2015, and congratulated CIBA for its new brand building efforts. He also expressed his happiness, in the initiatives of CIBA and its efforts in bringing the brackishwater aquaculture industry closer with the institute activities, and promised the full support of the industry in this direction.

SOIL AND WATER HEALTH CARD DISTRIBUTION TO AQUACULTURE FARMERS

Long term sustainability in aquaculture depends on the maintenance of soil health and water quality. A workshop on 'Soil and Water Health Card Distribution" was organised at Mahabalipuram, near Chennai on 19th December, 2015, and the cards were distributed to the farmers on the occasion of Celebration of International Year of Soils- 2015 and the cards were distributed a group of 44 shrimp farmers from the state of Tamilnadu based on the analysis of their respective soil and water samples they brought. This was the first initiative of such a kind in the country in fisheries sector in tune with the similar scheme for agricultural farmers with a target of distributing, 14 crore soil health cards over a span of next 3 years as announced by the Hon'ble Prime Minister of India.

ICAR-CIBA CELEBRATED ITS 29th FOUNDATION DAY

Since its establishment in the year 1987, CIBA continues to play a crucial role in brackishwater aquaculture research and development in the country. ICAR-CIBA celebrated its 29th foundation day on April 22nd, 2016, at the Muttukadu Experimental Station. by creating awareness among school students regarding the environmentally safe, socially acceptable and economically sustainable brackishwater aquaculture. A total of 539 students and 33 teachers from different schools such as Kendriya Vidyalaya, CLRI, Adyar; Pon Vidyashram, Injambakkam; Sri Sankara Senior Secondary School, Adyar; GT Aloha Vidya Mandir, Injambakkam; Bala Vidya Mandir, Adayar and St. Joseph's Higher Secondary School, Kovalam attended the event and visited the facilities at MES , CIBA.

NATIONAL LEVEL STAKEHOLDER CONSULTATION ON "DEVELOPMENT OF SUSTAINABLE BRACKISHWATER AQUACULTURE IN AN ECONOMICALLY VIABLE, ENVIRONMENT FRIENDLY AND SOCIALLY ACCEPTABLE MODE"

A national level stakeholder consultation was conducted on the theme 'Development of sustainable brackishwater aquaculture in an economically viable, environmentally friendly and socially acceptable mode' on 26th April, 2016 to ascertain the field level issues in brackishwater aquaculture across the coastal states. Forty stakeholders including aqua farmers and officials from all the coastal states participated in the meeting. Dr. Ajith Sinha Patil, President of the Maharashtra Aqua Farmers Association, Mumbai inaugurated the consultation. The participants were taken for a visit to Muttukadu Experimental Station of CIBA and had exposure on the infrastructure facilities of the institute.

NATIONAL CONSULTATION ON EARLY MORTALITY SYNDROME (EMS) OR ACUTE HEPATOPANCREATIC NECROSIS DISEASE (AHPND) OF CULTURED SHRIMPS

A National consultation on Acute Hepatopancreatic Necrosis Disease (AHPND) also known as Early Mortality Syndrome (EMS) was held on 16th June 2016 at CIBA, Chennai. Stakeholders including shrimp hatchery operators, farmers, input providers, aquaculture professionals, academicians, and scientists participated in the deliberation. The workshop was conducted to review the present status of AHPND in other countries, its impact on the shrimp aquaculture and to develop a National Action Plan to prevent the possible introduction of the bacterial pathogen causing EMS which can affect India's EMS free status. Better management practices and proactive and responsible culture practices to control the emergence of diseases such as AHPND were highlighted during the meeting.

NATIONAL FISH FARMERS DAY CELEBRATED ON 10th JULY 2016

"National Fish Farmers Day" was celebrated on 10th July 2016 at Vennangupattu, a coastal village in Kanchipuram district of Tamil Nadu in the presence of around 100 fish farmers and fisher youth. As part of the celebration, the Asian seabass (*Lates calcarifer)* fish seeds produced in CIBA hatchery were distributed to the Dr.A.P.J.Abdul Kalam fish producers group in the village for nursery rearing in the open waters and brackishwater cage farming. An interaction session on 'Prospects of undertaking cage culture of brackishwater fin fishes in open waters' was organized during the occasion.

NATIONAL WORKSHOP ON ANTIBIOTIC RESIDUE ISSUE IN SHRIMP AQUACULTURE

National workshop on 'Antibiotic Residue Issue in Shrimp Aquaculture' was organized on 18th August 2016 to create awareness and to sensitize the farmers and stakeholders on the issue of antibiotic residues and rejection of export consignments by the overseas buyers. Representatives of all niche areas in shrimp farming viz. farmers, NFDB, PFFI, SEAI, SAP, hatchery operators, consultants and private entrepreneurs took part in the workshop. Dr. B. K. Das, Director, CIFRI, Barrackpore, inaugurated the workshop. Dr. V. V. Sugunan, Senior consultant from NFDB, Hyderabad, Dr. Utpal Sar, Executive Director, NFDB, Hyderabad, Mr. Elias Sait, Secretary General, Seafood Export Association of India, Mr. V. Balasubramanian, Prawn Farmers Federation of India gave presentations on this issue.

AQUACULTURE HEALTH CAMP IN NAGAPATTINAM DISTRICT OF TAMIL NADU

ICAR-CIBA organized a first of its kind "On-farm Aquaculture Health Camp" at Chinnathumbur village in Nagapattinam district, Tamilnadu on 19th August, 2016 under the aegis of "National Surveillance Programme for Aquatic Animal Diseases (NSPAAD)". CIBA provided on-farm testing service for white spot disease (WSD) and *Enterocytozoon hepatopenaei* (EHP) using PCR-DNA test free of cost. Similarly, soil and water samples from shrimp farms were collected, analyzed and reports along with advisories on the pond soil condition and water quality parameters were also distributed to the farmers during the camp. For creating awareness on disease management, extension hand-outs prepared in vernacular languages were distributed to the shrimp farmers on the management of diseases, soil and water quality management and rational use of aquaculture inputs. Scientists held active interactions with farmers from the region to educate them on the better management practices in shrimp farming and understand the field level issues.

NATIONAL WORKSHOP ON BIOFLOC BASED AQUAFARMING TECHNOLOGY

National workshop-cum-training program was conducted during September 15-17, 2016 to disseminate the knowledge on Biofloc based brackishwater aquaculture technology to farmers, researchers and other stakeholders from various parts of India. Twenty four trainees from eight states of India participated in this training workshop. Biofloc being a rich source of quality protein with essential amino acids, minerals, vitamins and fatty acids, enhances the growth and its natural probiotic effect help in a better health status of cultured shrimp. In an effort to create awareness among the farmers about the prospects and challenges of biofloc based farming systems, a brain-storming interactive session was convened on 17th September 2016 as part of the workshop.

ATTRACTING AND RETAINING YOUTH IN AGRICULTURE (ARYA) PROGRAMME

A three-day training program on "Science and Agricultural careers after School Education" was organized by ICAR-Central Institute of Brackishwater Aquaculture during 26th -28th September, 2016 for plus one students comprising of Biotechnology and Biology from Sri Sankara Senior Secondary School, Adyar, Chennai.

TRAINING WORKSHOP – CUM – AQUACULTURE HEALTH CAMP ON CLIMATE CHANGE IMPACTS AND ADAPTATION MEASURES IN BRACKISHWATER AQUACULTURE'

ICAR-CIBA organized training workshop – cum – Aquaculture Health Camp on Climate Change Impacts and Adaptation Measures in Brackishwater Aquaculture at Ramanathapuram, Tamil Nadu on 28th September, 2016 under the support of "National Innovations in Climate Resilient Agriculture (NICRA). Shrimp farmers in the region were provided with on-farm testing service during the workshop. Water, soil and animal samples were collected from 40 farmers in Ramanathapuram District and were analyzed for important water and soil quality parameters and white spot disease (WSD) and Enterocytozoon hepatopenaei (EHP) using PCR-DNA test at free of cost. About 85 farmers from the region participated in the Workshop. Pamphlets in vernacular language on soil and water quality management for shrimp culture, application of minerals in shrimp culture, soil redox potential an indicator of pond bottom condition, water probiotics, management of diseases such as WSD, EHP, acute hepatopancreatic necrosis disease (AHPND) were distributed to the farmers for creating awareness. The portable instruments used for the on-farm testing were displayed during the meeting, to provide first-hand information to farmers on the testing and diagnostic process and interpretations.

AGRICULTURAL EDUCATION DAY

ICAR-CIBA conducted 'Agricultural Education Day' on 3rd December 2016 to create awareness to the school students of Chennai on the importance of agriculture and vitality of agriculture education. A total of 66 students along with 5 teachers from Kendriya Vidyalaya, Island grounds, Kendriya Vidyalaya, CLRI, Adyar and GTA Vidhya Mandir, Neelankarai participated in the programme. Dr.V.M. Sankaran, Professor and Head, Department of Agronomy, Madras Veterinary College, Chennai was the Chief guest. He gave an exposure to the students on agricultural, horticultural, veterinary and fishery education avenues and career options that have good scope for employment. An interactive session followed the program during which the queries raised by the students were clarified.

Technology Transfer and Knowledge Partnership Through MoUs'

1. MoU signing event in IIT Madras, Chennai, for Collaborative research programmes for 3 years

2. Mou signed with Shri. Nissar, MA., Azhivelikkakath house, Pazhangad PO, Edavanakadu PO, Ernakulam- 682502 for breeding and nursery rearing of Grey Mullet in west coast (Pallipuram, Ernakulam)

3. Group photo in Mou signing event with Mr.Koduru Manoj Kumar Reddy Westland Marines Pvt Ltd. No:25-02-2084, Gowthami Nagar 4th street, Nellore-524004, Andhra Pradesh, for technology transfer on shrimp feed processing.

4. MoU signed with Mr. A. Baburaj, from Ambadi House, Kadalundi, Cheriyathiruthi, Kozhikode-673302, for technical support and partnership farming for adoption of pearlspot seed production and nursery rearing models

5. MoU were excahnged in a official event with M/S Hatsun Agro Product Ltd, Domaine, 1/20-A, Rajiv Gandhi Salai (OMR), Karapakkam-600097, for the collaborative project on development of biodynamic preparation for application in shrimp aquaculture.

S. No	Name of the technology	Contracting party with address	Time period (years)
6	For technical support and partnership farming for development of farming models suitable for brackishwater	Shri.M.K.Abdulla, Padanna P.O, Kasaragod	2 years
7	For technical support and partnership farming for adoption of pearlspot seed production and nursery rearing models	Mr. Bijoy.K.B, from Kaithakkat House, P.O.Edavilangu, Pin-680 671	2 years
8	For collaboration on development of brackishwater aquaculture	Shri.S.Suresh Babu, and his associates from Lakshmipuram, Kadayiruppu P.O, Ernakulam Dist., Kerala-682311	2 years
9	For consultancy on evaluation of natural product for its antiviral activity	Revelations Biotech Pvt. Ltd. Plot No: 69, Vittal Rao Nagar, Madhapur, Hyderabad-500081	2 years
10	For culture demonstration of Indian white shrimp (*Penaeus indicus*)	Mr.Anjan Dandapat, Dandapat Aquatics, P/o-Sahada, Via-Irda, Basta, Balsaore, Odisha	6 months
11	For culture demonstration of Indian white shrimp (*Penaeus indicus*)	Mr.Sudhakaran, Nandana Aqua farm, Cheravettil House, Narayanamangalam, Po-Pollut, Kerala	6 months
12	For culture demonstration of Indian white shrimp (*Penaeus indicus*)	Ms.Shyamala Subramanian, Ms.Marine wonders, No.30/109B, Baskar colony, 3rd street, Virugambakkam, Chennai-600 092 Site address: Radhanagar village, Sirkali Taluk, Nagapatinam Dt, Tamilnadu.	6 months

CIBA IN NEWS MEDIA

THE HINDU

THE HINDU • SATURDAY, JULY 11, 2015

Scientists have achieved success in breeding milkfish in captivity after 10 years of research, whose spinoffs are goods news for farmers and fish eaters

BREAKTHROUGH IN AQUACULTURE

F. Kolappan

For the first time in the country, efforts to breed the Chennai-based Central Institute of Brackishwater Aquaculture (CIBA) has succeeded in breeding in captivity milkfish (Chanos Chanos), known as Pal Kendai in Tamil, met with success by the Chennai-based Central Institute of Brackishwater Aquaculture (CIBA) at its Experimental Research Station in Muttukadu.

"It is a major breakthrough in the history of aquaculture in the country. It has taken almost 10 years to achieve it. This fish is the best candidate for sustainable farming and it cohabits with shrimps and mullets," said. K.K. Vijayan, director of the CIBA.

A team led by principal scientist M. Kailasam achieved the breakthrough by implanting hormones in the fish. "Instead of injecting hormones, we have implanted hormones and it would be released in a sustainable manner," Mr Vijayan explained.

Mr. Kailasam said broodstocks at the CIBA were eight years old and a matured fish weighing one kilogram would lay one million eggs. "While it is difficult to breed the fish in captivity, it will continue to breed after the first instance.

THIS FISH IS THE BEST CANDIDATE FOR SUSTAINABLE FARMING AND IT COHABITS WITH SHRIMPS AND MULLETS—K.K. VIJAYAN, CIBA DIRECTOR

CATCH OF THE DAY

- Called vegetarian fish, milkfish can survive in all types of waters
- Suitable for polyculture as it can live with shrimp and mullet and it is highly disease-resistant
- It can reach a weight of 500 kg in six months. However, it is a fish with a lot of bones

The production cost is between Rs 80 to 90 kg and its market value is Rs 150

It has a great scope for export as it can be used as a bait in tuna lining (Longline fishing for Tuna)

The survival of juveniles is also good as they do not indulge in cannibalism like Sea Bass," he said.

Though the fish lives in backwaters, it migrates to the sea for breeding, as suitable saline conditions are vital for the process. Normally, the seeds of milkfish are collected from wild and in the last year alone Andhra Pradesh produced 1,000 tonnes of milkfish. But in the wild it would be available only three months in a year.

The advantage with milkfish is that being a vegetarian (herbivore) it requires only low protein feed and it substantially reduces the production cost. But the one thorny issue is that the fish has a lot of bones. Countries like Taiwan and Indonesia, known for mass production of [illegible] removing the bones.

"It is like the Hilsa, popular in Bengal. As Tamil Nadu is witnessing migration of workers from the North-East and Hilsa-eating States, milkfish farming is commercially viable," Mr. Vijayan said.

M. Sakthivel, president of the Aquaculture Foundation of India, said milkfish was an answer to malnutrition in the country. "The government should come forward to rear the fish in all ponds and tanks in every panchayat in the country. It can fulfil the need for protein requirement at a very cheap rate," he said.

Former Principal Scientist of CIBA, A.R. Thirunavukkarasu said as milkfish could be [illegible]

தினமணி

11 ஜூலை, 2015

பால் கெண்டை மீன் உற்பத்தியை அதிகரிக்க செயற்கை முறையில் இன விருத்தி

DECCAN Chronicle

THE LARGEST CIRCULATED ENGLISH DAILY IN SOUTH INDIA

CHENNAI, SATURDAY 11 JULY 2015

Milkfish experiment a success

DC CORRESPONDENT
CHENNAI, JULY 10

In a major breakthrough in the field of fisheries, the Central institute of Brackish-water Aquaculture (CIBA) becomes the first in the country to artificially breed and produce the seeds of milkfish, a breed that is compatible to brackish-water, sea-water and fresh-water. The CIBA research team developed the first breed of milkfish during the second week of June.

"Locally known as 'Pasi Kendai', the fish has vegetarian feeding habits and consumes low protein formulated feed and grows up to 500 -600 gram in size in a span of six months", said K.K Vijayan, Director of CIBA and a member of the research team who was instrumental in this achievement. He added this is a first step in proving fish that can be produced in a hatchery at a very affordable cost.

For CIBA, functioning under the Indian Council of Agricultural Research (ICAR), the achievement is come after eight years were the male and female adult milkfish were reared in cement tanks for eight years under captive condition.

The fish was bred by induced breeding methods through hormonal manipulation, administering a standardised dose of a permitted hormone called Luteinizing Hormone-Releasing Hormone (LHRH), a reproductive hormone at regular intervals. The fertilised eggs obtained were hatched and reared to fingerling stage that are further suitable for nursery rearing and farming at the experimental research station at Muttukadu near Chennai.

The first set of milkfish was handed over to three farmers namely M.A Sukumaran, Ashok Kumar and Ravi Ganesh from Kerala, Tamil Nadu and Andhra Pradesh respectively, as a symbolic gesture at a function held at the CIBA center on Friday.

"Even though I have been growing a lot of varieties of fish at my facility in Kodungallur, this breed will be the most feasible one as the cost of growing the milkfish is very less and moreover more people prefer this fish," exulted M.A Sukumaran, an aqua-farmer from Kerala.

Earlier in December 2014, CIBA also signed a Memorandum of Understanding with Aditya Fish Hatcheries, a private fish hatchery based in Andhra Pradesh, for sharing expertise for breeding milkfish in captivity, so as to close the life cycle.

"Presently when the cost of marine fish is anywhere between ₹250 and ₹490 a kilogram, the milkfish with vegetarian feeding habits could be produced at ₹80 a kilogram and will cost a maximum of ₹150 a kilo in the domestic markets," said M.Sakthivel, President, Aquaculture Foundation of India.

M.A Sukumaran, an aqua-farmer from Kerala receiving the first set of milkfish breed from K.K Vijayan, Director of CIBA. —DC

আনন্দবাজার পত্রিকা

পুকুরের নোনা জলে বাড়ছে ইলিশের চারা

TAMIL NADU

THE NEW SUNDAY EXPRESS
CHENNAI 3 APRIL 2016

DESI SHRIMP FARMS GET MADE IN INDIA FEED

RESEARCHERS IN CHENNAI HAVE DEVELOPED INDIGENOUSLY FORMULATED FEED; HITHERTO A FEW FOREIGN FIRMS HAD MONOPOLY IN THIS FIELD

By Krishna Chaitanya

Chennai: Complimenting the [illegible] vision of the Prime Minister [illegible] Modi, researchers [illegible] at Central Institute [illegible] Brackishwater Aquaculture (CIBA) have developed indigenously formulated [illegible] for the multi-billion shrimp industry, [illegible] dominated by [illegible] companies. [illegible] as Vannamei [illegible] feed [illegible] effective, while [illegible] output levels of [illegible] brands.

[illegible] is attracted [illegible] farmers and [illegible] from different [illegible] States like [illegible] and Kerala. [illegible] scale feed [illegible] built in several [illegible] will be available [illegible] month to [illegible] demand.

Dr K.K Vi[illegible] says that in [illegible] shrimp aquaculture industry, the feed constitutes 60 percent of cost of production. In the last five years, the cost of shrimp-feed has more than doubled. The current market price is ₹88 per kg, while the actual input cost is under ₹50. Companies thus enjoy large margins. Firms offer high commissions along with fixed sops to dealers including lavish foreign trips to secure their market dominance.

"Now, through Vannamei Plus, we want to cut the cost of production by at least 20 percent. To produce one kilo of the commercial feed, it costs ₹140 per kilogram. With Vannamei Plus, the cost is reduced to ₹91 per kilo.

There is huge scope for small and marginal farmers to enter the market using the low cost Vannamei Plus," the director said and added that the institute is in talks with NFDB to [illegible]

PARASITE ATTACK FEAR LOOMS

- The Indian shrimp industry has witnessed phenomenal growth in the past four years
- However, all aquaculture States are on alert following the emergence of a new microsporidian parasite called Enterocytozoon hepatopenaei (EHP), reported to be associated with retarded growth
- Network of Aquaculture Centres in Asia-Pacific (NACA) has pointed to urgent need for export management in the Asian region through an advisory issued to the Indian farmers jointly by the CIBA and the CAA
- The Marine Products Export Development Agency states that export production has grown from 17 lakh metric tonnes to 3.5 lakh metric tonnes in 2014-15. This production is likely to go down due to the disease
- All major aquaculture [illegible] and Gujarat have been placed [illegible] surveillance

NEW TESTING CENTRE AT MUTTUKADU

CIBA experimental station, Muttukadu on the East Coast Road will shortly have a sophisticated testing centre (will also be a referral lab) at a cost of ₹1.5 crore for the benefit of hundreds of aquaculture farmers.

Shrimp farmers can have their feed or seed samples tested for a nominal fee to ensure better harvests

NEW REGULATI[illegible]S

- With increasing [illegible] Aquaculture As[illegible] ture and Farm [illegible] norms and de[illegible] inputs, which [illegible]
- Aqua farmers [illegible] permitted to u[illegible] their facilities
- Dr P Ravichan[illegible] said a public noti[illegible] is the first time such [illegible] This will fix standards [illegible] like larval and farm feed [illegible] fectants, other chemicals [illegible] immune-stimulants etc.

[illegible] from over food safety, Coastal [illegible] rity (CAA), Ministry of Agricul[illegible] Welfare, is introducing stringent [illegible] ed to register all the aquaculture [illegible] free of antibiotics of concern

[illegible] and hatchery operators will be [illegible] only the registered inputs in [illegible]

[illegible] Member Secretary of CAA, [illegible] is already been issued and this [illegible] regulation is being introduced. [illegible] all coastal aquaculture inputs [illegible] additives, chemical disinfectants, drugs, fertilizers, probiotics, [illegible]

farmers for setting up feed mills using CIBA technology. Karuna Raju, a farmer from Baptla in Guntur of Andhra, has invested ₹1.5 crore to build a feed mill using CIBA technology to produce Vannamei Plus for his 50 hectares of shrimp farm.

Dr K.Ambasankar, principal scientist and in-charge [illegible] nutrition [illegible] needs to become more mainstream with small and medium scale feed mills that need to be set-up [illegible] across the country.

INDIAN MA[illegible]E EXPORTS

Item	[illegible]-14	2014-15
Frozen Shrimp	3,01,4[illegible] tonnes	3,57,505 tonnes
Value in crore	₹19,36[illegible]	₹22,468.12
MARKET WISE		
SOUTH EAST AS[illegible]	[illegible]nnes	4,09,931 tonnes
[illegible]	₹8,047	₹8,621
CHENNAI PORT		
	55,282 tonnes	48671 tonnes
Value in Crore	₹2,710	₹2,458

Source: Marine Products Export Development Authority

Indigenous shrimp feed to help farmers save 20% cost

U.Tejonmayam@timesgroup.com

While shrimps need about 34-36% protein and 6% lipid, their varying levels in the feed were decided based on laboratory studies conducted at CIBA

Chennai: An indigenously and scientifically formulated feed for shrimps made from locally available ingredients is likely to become an alternative option for small scale shrimp farmers in the country, who shell out more to buy other commercial feed.

Scientists at ICAR-Central Institute of Brackishwater Aquaculture have developed 'Vannamei Plus', a feed for vannamei shrimp species that forms a major chunk of the shrimp exports in India. Through this, CIBA is also promoting small scale feed mills, where small farmers in that area can source it. This, scientists said, would result in reducing the cost of shrimp production by 20%.

Four entrepreneurs from Andhra Pradesh, Kerala and Gujarat have already begun commercial production with CIBA's technology. The feed will be available in the market from August.

In 2014-2015, India exported more than 3.57 lakh metric tonnes worth USD 3,709.76million. About 90% of vannamei produced in India is exported while rest is sold in the domestic market particularly in Kerala.

Principal scientist K Ambasankar said that they have used a combination of marine protein sources like fish meal, plant protein sources like soya, gingelly oil cake, ground nut cake, corn gluten, and alternative carbohydrate sources available in that area as per the requirement.

While shrimps need about 34-36% protein and 6% lipid, their varying levels in the feed were decided based on laboratory studies conducted at CIBA.

"The nutritional content varies with different shrimp species. We have already developed such indigenous feed for our indigenous species," the scientist said.

There are close to eight big feed mills in the country each producing about 30,000 to one lakh tonnes of feed annually. There are also about 25 small feed manufacturers in India who make feed with whatever ingredients available, but the formulation is not scientifically validated.

Though similar ingredients are used in the feed currently available in the market, CIBA scientists have suggested alternative protein sources of marine and plant origin. The feed underwent various levels of trials from labs to farmer's ponds.

To make the feed, scientists have also custom designed the feed mill machineries apart from helping manufacturers to set up quality control lab. The machine can produce about one to three tonnes an hour. With the indigenous feed, scientists said, that a farming cluster of about 500 hectares can be taken care by establishing a feed mill with a capacity of 1-2tonne per hour.

Deccan Chronicle 17 June 2016

Beware of EMS, scientists tell Indian shrimp farmers

NISHA PONTHATHIL I DC
CHENNAI, JUNE 16

The Central Institute of Brackishwater Aquaculture (CIBA), under the Indian Council of Agricultural Research (ICAR), has begun a nationwide awareness drive against the dreaded Early Mortality Syndrome (EMS) that started destroying stocks in best shrimp producing countries like China, Thailand and Vietnam.

Though the disease has not yet affected shrimp farming in the country, CIBA has started making farmers and stakeholders involved in the sector aware of the need of better management practices and quality shrimp culture methods.

The campaign also involves promotion of EMS-free shrimp seeds. Talking on the sidelines of a national consultation on EMS here on Thursday, CIBA director K K Vijayan told *DC* that better vigilance and monitoring can protect Indian shrimp farmers from the threat.

Cultured shrimps grown by aquaculture farmers in states like Andhra Pradesh, Tamil Nadu, Odisha and Karnataka contribute about 77 per cent of the shrimp being exported from India. Because of the prevalence of EMS in China, Thailand and Vietnam, Indian farmers are getting better demands.

The meeting in Chennai discussed mainly about the need to evolve a national action plan to have preventive strategies which could help India stay afloat.

India has reconfirmed the non-presence of EMS. Sophisticated quarantine mechanisms should be used to prevent the entry of infected shrimps. Targeted surveillance should also be put in place", he said.

THE HINDU

» TODAY'S PAPER » NATIONAL

Kolkata, October 27, 2016

Farmed hilsa: Bengal may get its delicacy round the year

Scientists are rearing the fish in brackish water ponds in an experimental project to meet future domestic demand

Sourav Das

KOLKATA: Research by a Central government institute, under the Indian Council of Agricultural Research, may provide a "long-term solution" to address the shortage of Bengal's favourite fish 'ilish', or hilsa.

Scientists at the Central Institute of Brackishwater Aquaculture (CIBA) in South 24 Parganas claim that they can now keep the fish "alive" for a longer period. The hilsa diet so soon it is taken out of the brackish water where it spawns and spoils faster than other fish.

Between June and November, about 30,000 metric tonnes of Hilsa was netted in Bengal. But it fell "well short" of the demand, said Fish Importers Association secretary Syed Aman Maqsood.

CIBA scientists say that hilsa can now be reared in ponds and that this would address the supply problem.

Speaking to *The Hindu*, Debasis De, principal investigator of the project at Kakdwip Research Centre (KRC), an unit of CIBA, said that prior to the breakthrough, hilsa did not survive in the pond even for a day.

"Now the small fishes in the brackish water pond (low salinity water found at river estuaries) at KRC survived more than a year and attained a level of sexual maturity to the point where egg development in females and sperm development in males can be noticed," Mr De said.

"This makes the captive breeding of hilsa an achievable target in the near future," said CIBA director K.K. Vijayan.

At this point, the institute is "rearing" the fish but not breeding, the scientists explained.

At the initial stage of the project, which started in January 2014, young fish were collected from local rivers and were released into the brackish water pond. Around 800 fish were released into the pond after they were put through an acclimatisation process to adjust to the lower salinity of the brackish water.

Young hilsa, weighing 1.37 gram with a length of about 35 mm used for the stocking, attained weight of 310-325 gram in 31 months, "with an estimated survival of 25-30 per cent," stated a CIBA release.

"In a bid to wean them off their natural diet of small crustacean and algae, they were fed with frozen crustacean and algae. Then their diet was gradually shifted to an artificial diet comprising soyabean, fish oil and several vitamins," Mr De said.

Hilsa reared in a brackish water pond. — SOURAV DAS, ARRANGEMENT

বিবি

খবর ৩৬৫ দিন

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আজ কাগজে মোট ১৬ পাতার ■ মন জগতের সঙ্গে ৮ পাতার বিবি

৬ সোমবার ২৩ ডিসেম্বর ২০১৪ পৌষ ৩৬৫ দিন

সফল গবেষণা, কাকদ্বীপের মিল্কফিশ চাষে ব্যাপক সাফল্য

আনন্দবাজার পত্রিকা

কলকাতা ১০ পৌষ ১৪২০ রবিবার ২৫ ডিসেম্বর ২০১৬ শহর সংস্করণ ৬ টাকা

আজ কাগজে ৩০ পাতা, ৩ পাতা জেলার খবর-সহ

আনন্দবাজার পত্রিকা রবিবার ২৫ ডিসেম্বর ২০১৬

উত্তর ও দক্ষিণ ২৪ পরগনা ১৫

কাকদ্বীপের বাজারে 'দাক্ষিণাত্যের ইলিশ'

শান্তনু মজুমদার ● কাকদ্বীপ

দাক্ষিণাত্যের ইলিশ। নিজস্ব চিত্র।

কাকদ্বীপে 'দাক্ষিণাত্যের ইলিশ'! কাকদ্বীপের 'কেন্দ্রীয় নোনা জলজীব পালন ও অনুসন্ধান সংস্থা'র (সিবা) পরামর্শ মতো পরীক্ষামূলক ভাবে পুকুরে 'মিল্ক ফিশ' চাষ করেছিলেন দক্ষিণ গোসিংপুরের মৎস্যচাষীদের কাছে 'ডেকান হিলশা' বা 'দাক্ষিণাত্যের ইলিশ' হিসেবেই পরিচিত। শনিবার সেই মাছই কাকদ্বীপের পাইকারি বাজারে ১৫০ টাকা বেশি দরে বিক্রি হল। 'সিবা'র বিজ্ঞানীদের দাবি, এই মাছ মৎস্যজীবীদের নতি ফিরিয়ে করার ক্ষমতা রাখে। সেই কারণে 'পাইলট প্রকল্প' হিসেবে এই পুকুরে মাছ চাষ করা হয়েছে। মাছ নিয়ে নানা গবেষণা করে চলেছেন 'সিবা'র বিজ্ঞানীরা।

মিল্ক ফিশ প্রকল্পের আধিকারিক তথা মৎস্যবিজ্ঞানী গৌতাম বিশ্বাস জানান, মিল্কফিশ মূলত ফিলিপিন্সের মাছ। এ দেশের দক্ষিণ আফ্রিকার মেদো। সেখান থেকে মাছ এনে এখানকার পুকুরে চাষ করা হয়েছে। চারা তৈরানোর পর প্রায় ২ ইঞ্চি বড় করে তোলা হয়েছে ওই পুকুরেই। এতে প্রায় ৪০ দিন সময় লাগে। গৌরাঙ্গবাবুর দাবি, 'পুষ্টি ২৪ পরগনার নোনা জলের ক্ষেত্রফলটিতে এই মাছ নিঃসন্দেহে লাভজনক হতে পারে।' বিজ্ঞানীরা জানাচ্ছেন, তামিলনাড়ু, অন্ধ্র, কেরলের সমুদ্র উপকূলে মিল্ক পাওয়ার পর একটু বড় হলেই বছরের নির্দিষ্ট সময়ে ইলিশের মতোই মিল্ক ফিশ মোহনা থেকে উজানে রওনা হয়। ইলিশের মতো উজানে পাড়ি না দিলেও নদী থেকে উর্ধ্ব পথ পাড়ি না দিলেও এই মাছ প্রায় ১০ কিলোমিটার পর্যন্ত উজানে আসে। ৫০০ গ্রাম পর্যন্ত বড় হতে পারে এই মাছ। মিঠে জলের দিকে আসে বলে এই মাছ মিষ্টি আঁশের হয় এবং একটু ছোট হয়। আঁশ এবং কাঁটাযুক্ত এই মাছের খাদ্যগুণও অনেকটাই বলে দাবি বিজ্ঞানীদের।

মৎস্যজীবী আশিসবাবু বছর দশেক মাছ চাষ করছেন। তিনি বলেন, "সিবা থেকে চারা নিয়েছিলাম। বড় করেছি। কেজিপ্রতি প্রায় ৭০ টাকা বড় হয়েছে। পাইকারি বাজারে ১৫০ টাকা কিলো দরে বিক্রি হয়েছে।" আশিসবাবুর অভিজ্ঞতা বলছে, নোনাজলে সবচেয়ে পরিমাণ কমবেশি হলে তা সহ্যের সহ্য করে নিতে পারে এই প্রজাতির মাছ। সেই কারণে প্রাকৃতিক পরিবেশে এই মাছের বেঁচে থাকার হারও বেশি। বাজারে বিক্রি করার আগে শক্তিশালী ইলিশের দুটি পর ব্রাশ করে পাড়া প্রতিবেশীদের খাইয়েছিলেন আশিসবাবু। তাঁর দাবি, "ইলিশের মতো না হলেও মাছ বেশ সুস্বাদু।"

Human Resource Development

TRAINING PROGRAMS/WORKSHOPS

Trainees and KRC staff members of disease management training at KRC of CIBA during, 31 August – 5 September 2015

HEADQUARTERS

Sl. No.	Training Programme	Duration	No. of participants
1.	Generation and Analysis of Truss Morphometric Data for Aquaculture species	18-19 May 2015	16
2.	Fish Hatchery operation	1-7 July 2015	3
3.	Integrated Fish/Shrimp - Crab Culture	20-30 July 2015	16
4.	Training in Brackishwater aquaculture imparted to two Scientists from Sultanate of Oman	10-18 August, 2015 at CIBA, Chennai	2
5.	Brackishwater fish seed production	22-31 August 2015	5
6.	Genetics and Biotechnology: Tools and their Application in Aquaculture	14-19 December 2015	4
7.	Soil and water Health cards distribution to brackishwater aqua farmers	19th December, 2015	140
8.	Hands on training on Feed analysis and quality control	5-8 January 2016	1
9.	Advanced training in aquaculture nutrition and feed processing	20-29 January 2016	4
10.	Hands-on Training on Water and Soil analysis	1-5 February 2016	1
11.	Hands-on training programme on Nursery rearing of seabass for the village youth	2-5 March, 2016	15

KAKDWIP RESEARCH CENTRE

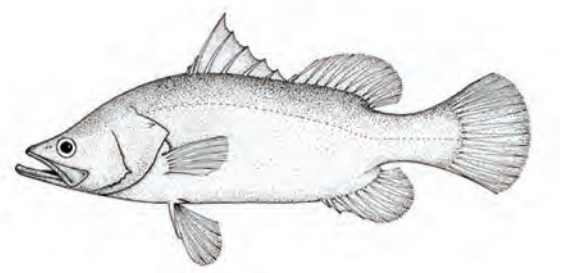
1	Training on Sustainable Brackishwater Aquaculture Practices	21-25 July, 2015	10
2.	Field Experience Training of M.F.Sc. (Aquaculture) students from ICAR-CIFE, Mumbai	30 August–5 September 2015	2
3.	Training on Diagnosis, prevention and control of brackishwater finfish and shellfish diseases	31 August-5 September, 2015	7
4.	Training on Scientific shrimp (*L. vannamei*) farming	5-9 October, 2015	8
5.	On-farm Training of B.F.Sc. 4th year students from Faculty of Fishery Sciences, WBUAFS, Kolkata	24–30 November 2015	30

Ph.D Degrees Awarded

Sl. No.	Name of the Candidate	Title	Date of award of Ph.D.
1	Sh. K.Sivakumar	Efficacy of marine algae against Quorum sensing bioluminescence causing *Vibrio harveyi*	25.5.2015
2	Ms. J. Kiruthika	Identification and characterization of differentially expressed genes in response to salinity stress in shrimp *Penaeus monodon*	26.5.2015
3	Shri J. Shanmugakarthik	Identification of single nucleotide polymorphisms and expression profiling of immune-related genes in white spot disease challenged *Penaeus monodon*	8.7.2015
4	Shri D. Ramesh Kumar	Development of antiviral gene therapy for Monodon Baculovirus (MBV) using dsRNA and polyelectrolyte nanocapsule delivery system in *Penaeus monodon* (Fabricius, 1798) post larvae	9.9.2015
5	Shri R. Rajendran	Effect of fibrolytic enzymes in improving the nutrient utilization of alternate carbohydrate sources in the diet of tiger shrimp, *Penaeus monodon* (Fabricius, 1794)"	23.9.2015
6	Shri S. Venu	Studies on the efficacy of viral vaccine against Nodavirus on the rearing of Asian Seabass, *Lates calcarifer* (Bloch, 1790)	28.9.2015
7	Ms. M. Madhavi	Studies on the reproductive biology of spotted scat, *Scatophagus argus* (Linnaeus, 1776)	4.11.2015

Participants of the Hands-on training programme on "Aquatic Animal Health Management in Brackishwater Aquaculture", 30th November 2015

Know your species



Asian seabass *(Lates calcarifer)*

Asian seabass popularly known as Barramundi is a high value, fast growing food fish distributed in Indo-west pacific region. In India, it is called Bhetki in West Bengal, Kalanji in Kerala, Koduva in Tamil Nadu and Pandu Kappu in Andhra Pradesh. Asian seabass can thrive and grow in any salinity from 0 to 36 ppt (euryhaline) and temperatures in between 28˚C and 32˚C. Seabass is a carnivore and an opportunistic predatory fish. In natural habitat they feed on crustaceans, insects and fishes etc. **Seabass is suitable fish for farming in ponds as well as in cages using formulated feed.** While its standard table size is 500 g to 3 kg, it can grow to a size of 2 m long and weigh over 60 kg.

It is a protandrous hermaphrodite fish. Male fishes are observed at the age of 2 – 3 years. After 3 years, almost all fishes change their sex to female. In nature, spawning occurs in the months of October – February in sea. It is a highly fecund species. A female of 1.2 m can spawn 30 – 40 million eggs in an active spawning season. Eggs float to near shore regions and estuaries where they hatch later. Fry of seabass preys on zooplankton initially and later feeds on microcrustaceans. In hatchery rearing environment they exhibit sibling cannibalism behavior during 15 – 45 dph (days post hatch). Reduction of cannibalism can be achieved by regular grading of shooters.

Thailand was the first country which developed controlled spawning and brood stock maintenance facility during 1973-78, after which culture of Asian seabass rapidly took over in other South East Asian countries. Traditionally in India, culture of seabass was going on in bheries along the Hooghly-Matlah estuarine system in West Bengal and in the coastal ponds in Odisha for past several years. In 1983, worldwide aquaculture production of Asian seabass was 2730 tonnes which increased to 71,581 tonnes in 2014 (Source: FAO).

In India, ICAR-CIBA made a breakthrough in induced breeding of Asian seabass in the year 1997, and perfected the year round breeding of seabass under captive condition. Complete technology package on seabass farming which includes seed, feed and rearing of Asian seabass in diversified rearing models is ready for dissemination to farmers. To educate the farmer community about this technology, routine trainings are being organized by ICAR-CIBA on need-based.

Harvested Seabass

Taxonomic position

Phylum	-	**Chordata**
Class	-	**Pisces**
Sub-class	-	**Teleostomi**
Order	-	**Perciformes**
Family	-	**Latidae**
Genus	-	**Lates**
Species	-	***Lates calcarifer* (Bloch)**

Swachh Bharat Abhiyan (Clean India Mission)

Swachhta Abhiyan Campaign at coastal village Thonirevu

Under Swachh Bharat Abhiyan (Clean India Mission), a number of cleanining campaigns were organised. The unserviceable materials from the laboratories in the Institute were e-auctioned as per the norms. Areas within the institute including pathways were cleaned up to use the place for practicing sports events.

Swachhta Abhiyan Campaign at coastal village Karikattukuppam

TV Talks

Dr. K.K. Vijayan, Director, CIBA, was interviewed in a daily breakfast program, "Virundhinar Pakkam" by SUN TV on Brackishwater Aquaculture and on significance of fish for nutritional security, on 30th March, 2015.

Dr. M. Kailasam, Principal Scientist and SIC, Fish Culture Division was interviewed in a daily breakfast program, "Virundhinar Pakkam" by SUN TV on Brackishwater Finfish Culture on 30th September, 2015.

Dr. V.S. Chandrasekaran and Dr.R.Saraswathy, Principal Scientists jointly delivered a talk on "Brackishwater Aquaculture and Environment" in Doordarshan's "Pothigai" Channel on 17th July, 2015.

Awards and recognitions

- Dr. Debasis De, Principal Scientist was selected for the Endeavour Research Fellowship 2015 of Govt. of Australia and undergone a Post-Doctoral Research programme on "Supplementation of probiotics and prebiotics in diets for greenlip abalone (*Haliotis laevigata*) for improving survival in response to high water temperature" during 7 April – 6 October 2015 at South Australian Research and Development Institute (SARDI), Aquatic Sciences Centre, 2 Hamra Ave West Beach, SA 5024.
- Dr. Gouranga Biswas, Scientist was conferred with Dr. C.V. Kulkarni Best Young Scientist Award for 2014-15 by ICAR-CIFE, Mumbai on 31st August 2015.

Dr. Trilochan Mohapatra took charge as Director-General, ICAR

Dr. Trilochan Mohapatra

Renowned agriculture scientist Dr. Trilochan Mohapatra took over the charge of Secretary, Department of Agricultural Research and Education & Director-General, ICAR on 22 February 2016. Earlier, Dr. Mohapatra was the Director-cum-Vice Chancellor of the prestigious ICAR-Indian Agricultural Research Institute (IARI), New Delhi. Prior to this, he served as the Director of ICAR-National Rice Research Institute (formerly CRRI), Cuttack.

He is a scientist of global repute in the field of molecular genetics and genomics, Dr. Mohapatra authored over 145 research papers in leading national and international peer reviewed journals including "Nature" and numerous book chapters to his credit. His research accomplishments include development of the first high yielding Basmati rice variety resistant to bacterial leaf blight through molecular marker assisted selection, physical mapping and genome sequencing of rice and tomato. He is a fellow of the Indian National Science Academy (INSA), National Academy of Sciences, India (NASI) and the National Academy of Agricultural Sciences, (NAAS), New Delhi.

Dr. Trilochan Mohapatra has received several honours and prestigious awards viz., INSA young scientist award, Prof. LSS Kumar Memorial Award, NAAS-Tata Award, IARI BP Pal Award, DBT Bio-science Award and NASI-Reliance Industries Platinum Jubilee Award. Also got the recognition Award of the National Academy of Agricultural Sciences for the biennium 2013-14 for significant contributions in Plant Improvement and Lifetime Achievement Award of the Indian Genetics Congress in recognition of outstanding contribution in the field of Plant Genetics.

The Director and Staff of ICAR-CIBA wish him the very best in his present position and look forward to receive his valuable guidance and leadership in all the activities of ICAR-CIBA.

ICAR-IARI Innovative Farmers Award 2016

An Irular tribal woman brackishwater aquafarmer Smt. M. Usha, from Kulathumedu village, Pazhaverkadu (Pulicat), Ponneri, Tiruvallur district, Tamil Nadu nominated by ICAR- CIBA, Chennai received the award "IARI Innovative Farmers Award 2016. Shri. Radha Mohan Singh, Hon'ble Union Minister for Agriculture and Farmers Welfare presented the award in the presence of Dr. Sanjeev Kumar Balyan, Hon'ble Minister of State for Agriculture and Food Processing Industries, in the Krishi Unnati Mela 2016. Smt. Usha was trained on alternative livelihood using modern brackishwater aquaculture technologies such as mud crab farming, seabass nursery rearing in hapas and polyculture farming of crab and seabass by ICAR-CIBA under Tribal Sub Plan (TSP).

Publications

Journal articles

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Technical bulletins /manuals/ books

- Training manual on Sustainable Brackishwater Aquaculture Practices, CIBA Special Publication No. 81, 21-25 July 2015, KRC of CIBA, Kakdwip, 188 p.
- Training manual on Diagnosis, Prevention and Control of Brackishwater Finfish and Shellfish Diseases, CIBA Special Publication: TM Series No. 1, 31 August - 5 September 2015, KRC of CIBA, Kakdwip, 128 p.

Personnel

Superannuation of CIBA Staffs

Dr. P. Ravichandran,
Principal Scientiest
CIBA, Chennai
30.6.2015

Dr. M. Natarajan,
Principal Scientiest
CIBA, Chennai
31.07.2015

Smt. K. Nandhini,
JAO
CIBA, Chennai
31.08.2015

Shri. Nayan Tara Dalui,
SSS
KRC of CIBA, Kakdwip
30.09.2015

Shri. N. Harinathan,
SSS
CIBA, Chennai
31.10.2015

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