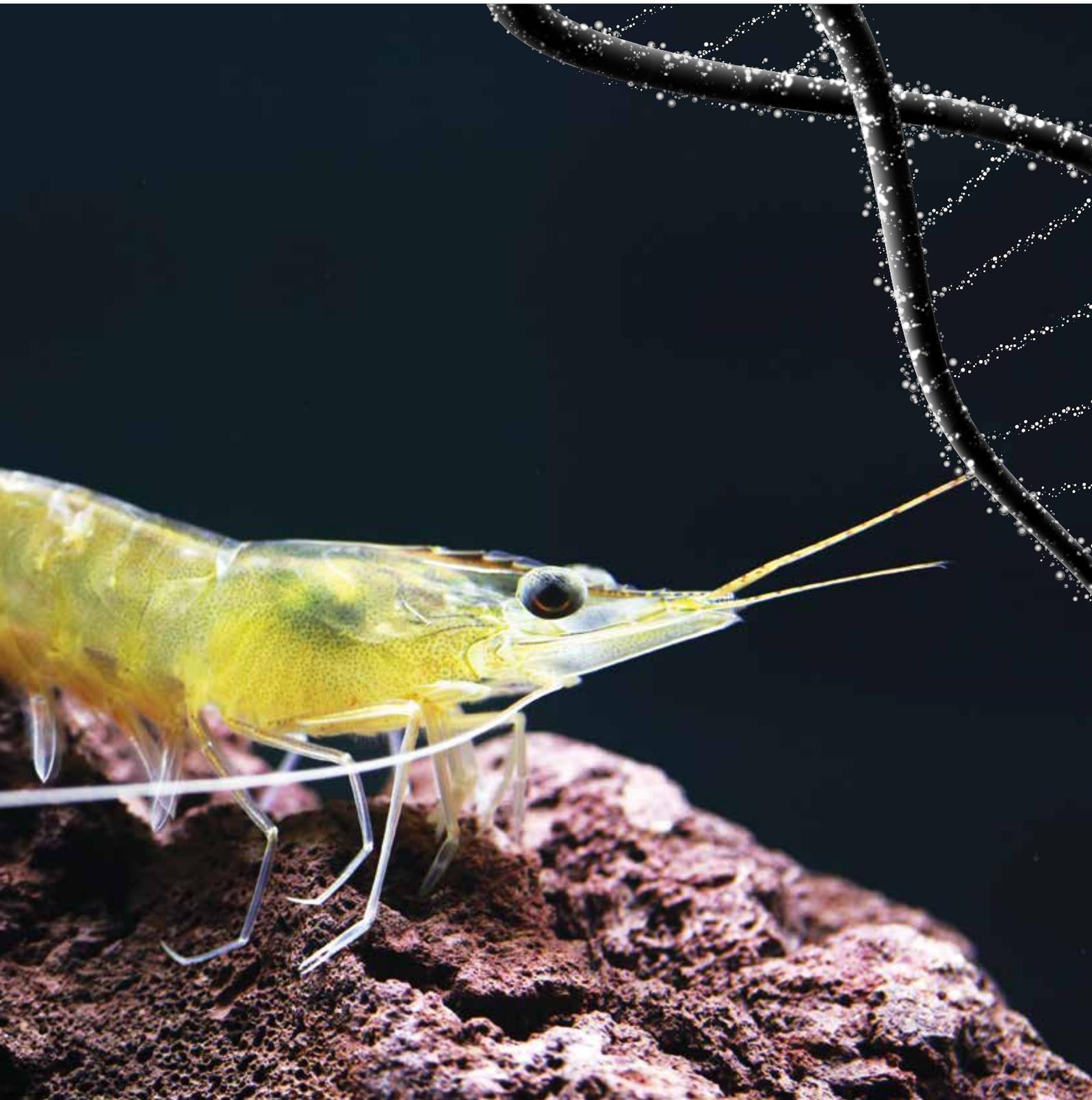


CIBANEWS



भाकृअनुप - केन्द्रीय खारा जलजीव पालन अनुसंधान संस्थान
ICAR-CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTURE
ISO 9001-2015



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Front cover :
Indian white shrimp,
Penaeus indicus

Published by

Dr. K.K. Vijayan
Director, ICAR-CIBA
Chennai - 28.

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Director's Desk



The second brackishwater aquafarmers' conclave (BAFAC-2020) conducted during 19-20 February 2020 at Surat, Gujarat, with a congregation of over 2000 participants, was a great success. As a non-customary, sixteen innovative farmers from different parts of the country got an opportunity to present their innovations and experiences at the conference.

The world is witnessing the pandemic coronavirus disease (COVID-19) and associated lockdowns causing significant severance around the world, shaping global demand, and altering the supply patterns of many industries, including fisheries and aquaculture sector. State and the central government brought aquaculture under essential activity easing the restrictions for the movement of inputs and people, negotiated with exporters for a minimum procurement price and domestic sale of produce. ICAR-CIBA, with its capacity, took several measures to assist the farmers and other stakeholders of the sector during this challenging time. We conducted an online survey to understand the damage that happened and the anticipated impacts of lockdown

on the entire value chains of the brackishwater aquaculture sector. Based on the survey, we prepared several advisories for various stakeholders. We suggested the measures to the Central and State Governments to tide over the impacts of this pandemic situation on this dynamic food production sector.

As a step ahead in this similar line, we conducted a conference titled 'Brackishwater aquaculture scenario in India with a focus on shrimp farming during COVID-19: challenges and way forward' on 3rd June 2020 on a digital platform. The conference deliberated the discussions on strategies to overcome the issues in sector with expert panellists representing policy makers, farmers, researchers, hatchery operators and seafood processors.

ICAR-CIBA, Chennai, and its regional centres at Kakdwip (West Bengal) and Navsari (Gujarat) established functional connectivity with the farmers and the local administration in the respective region to ensure the free movement of farm inputs and their produce to the market. Farmed fishes and shrimps from our institute ponds were sold to locals nearby our centers at a reasonable price to meet their nutritional needs during these difficult times.

In spite of the challenging situation, we were able to progress well in our R&D activities. To name a few, rearing of grey mullet fry successfully to juveniles, novel transcriptome assembly of Indian white shrimp, *Penaeus indicus*, CRISPR/Cas9 mediated genome editing for growth in *E. suratensis*, a vaccine against viral nervous necrosis of Asian seabass, etc.

We continue to work for the sector during these lockdown times through all the possible modes with at most precautions adhering to the guidelines set by MoHFW, Govt of India. We are also in the learning process of the advantages of connecting online with partnering institutions, stakeholders, and the ability to reach out to more people in an effective way.

I take this opportunity to thank all the stakeholders for their continued support and expect the same in the coming days. I am pleased to bring the CIBANEWS for the first half of 2020, which carries our achievements, events, and outcomes, particularly in relevance to this ongoing COVID 19 situation.

K.K.VIJAYAN
Director

Production of fingerlings in captivity: A step closer to seed production of grey mullet on a mass scale

Grey mullet, *Mugil cephalus* is a highly valued food fish and an important component of polyculture in traditional and contemporary farming systems. Wild grey mullet seeds are being utilised for stocking in the ponds and availability of these seeds is inconsistent and sharply declining, affecting grey mullet aquaculture adversely. After the initial success in captive reproduction of grey mullet achieved in 1960's by Taiwan, concerted efforts were put globally for achieving hatchery-based fry production at Hawaii, Egypt, Abu-Dhabi and Israel. However, consequent to the narrow annual reproductive period

coupled with multiple reproductive dysfunctions of grey mullet in captivity, commercial hatchery based seed production of the species still remains a challenge. Further, there is a need for fine-tuning of breeding protocols based on the local stocks. This year, CIBA achieved success in captive breeding and rearing of grey mullet young ones up to fingerlings, inching closer towards the mass scale production of grey mullet in captivity. Grey mullet female (body weight, 800 g; average oocyte size, 530 μ m) was stocked with two milting males after giving hormonal treatment for spawning induction. Natural spawning

was recorded 14 h after resolving dose administration. Fertilised floating eggs were transferred directly into larval rearing tanks. Newly hatched larvae (TL, 2.4 mm) were observed after 28 h at 29°C. Larvae were reared using phytoplankton *Nanochloropsis oculata*, live feed rotifer, *Brachionus plicatilis*, *Artemia* nauplii and inert larval feed. After 20 dph, 2000 numbers of metamorphosed larvae (TL, 3.57 \pm 0.53 mm) were obtained. Fry attained a size of average body weight, 6.4 \pm 0.75 g, TL, 79.57 \pm 0.75 mm after 80 days and 110 fingerlings were further reared in captivity.



12th day old larvae of *Mugil cephalus*

Captively bred hilsa, *Tenualosa ilisha* reared in ponds showed signs of maturation

The development of captive broodstock is the prerequisite for breeding and propagation of any fish for farming or stock enhancement in nature through ranching. CIBA achieved a success last year in the breeding and seed production of hilsa through dry stripping of the wild caught brooders. The young ones obtained were reared up to fingerlings and were stocked in well-prepared brackishwater broodstock ponds as well as recirculatory aquaculture systems (RAS) and reared for 90 days. These fishes (length: 4.32 ± 0.73 cm, weight: 0.69 ± 0.55 g) were stocked @ 2 numbers / m^2 in earthen ponds (two ponds each of $1200 m^2$ area) in June 2019. Water quality parameters (pH: 7.8-8.5, temperature: $16-28^\circ C$, salinity: 7-8 ppt, DO: 5-6 ppm and total ammonia-N: 0.04-0.07 ppm) were monitored regularly in the pond and RAS. Fishes were fed with supplementary pellet feed developed by CIBA @ 10% of biomass daily. Drag



Sub-adults of hilsa reared in ponds

netting was carried out at monthly intervals to accustom the sub-adults

to withstand the handling stress and remove unwanted weed fishes. After one year of rearing (June 2019 to June 2020), fingerlings attained comparatively larger size (length: 16-18 cm, weight: 45-60 g) in pond system than RAS (length: 15-18 cm and weight: 42-50 g). Hilsa of 15 months old, under both pond and RAS conditions, showed the appearance of gonad, indicating the chances of maturation in captivity. This is a positive development towards the large scale production of hilsa broodstock and breeding in captivity.



Sub-adult of domesticated F1 stock of hilsa showing primitive gonad

Novel transcriptome assembly of Indian white shrimp, *Penaeus indicus*

Coordinated research efforts through functional studies and genetic improvement program are very important to use *Penaeus indicus* as an additional and alternate species of choice to farmers. Access to full-length transcript sequences is a mandatory resource for researchers to derive valuable results from functional studies. Therefore, for the first time, we have generated a transcriptome assembly for *P. indicus* to support the efforts of developing another shrimp species for aquaculture diversification and associated genetic improvement programs. We have used the latest

Pacific Biosciences (Pacbio) Isoform Sequencing (Iso-Seq) approach on Sequel II instrument using 8M single molecule realtime (SMRT) sequencing cell and circular consensus sequence (CCS) technology to assemble transcriptome for *P. indicus*. This is the first report of a comprehensive transcriptome generated from different tissues and larval stage of *P. indicus* with 238.98 Gb of sequence data from gills, hepatopancreas, muscle, and pooled post-larvae. In the absence of a genome for *P. indicus*, the full-length transcriptome generated in this study would be a

valuable resource for conducting functional studies involving desired economic traits. The transcriptome assembly has great value in annotation of *P. indicus* genome and to improve genome annotations for other related shrimp. The isoform-level full-length transcript resource aids researchers to derive meaningful results in functional studies. Finally, the transcript assembly would have potential to support the efforts of species diversification in introduction and propagation of the *P. indicus* as a sustainable culture species.

Transcriptome assembly of *P. indicus*.

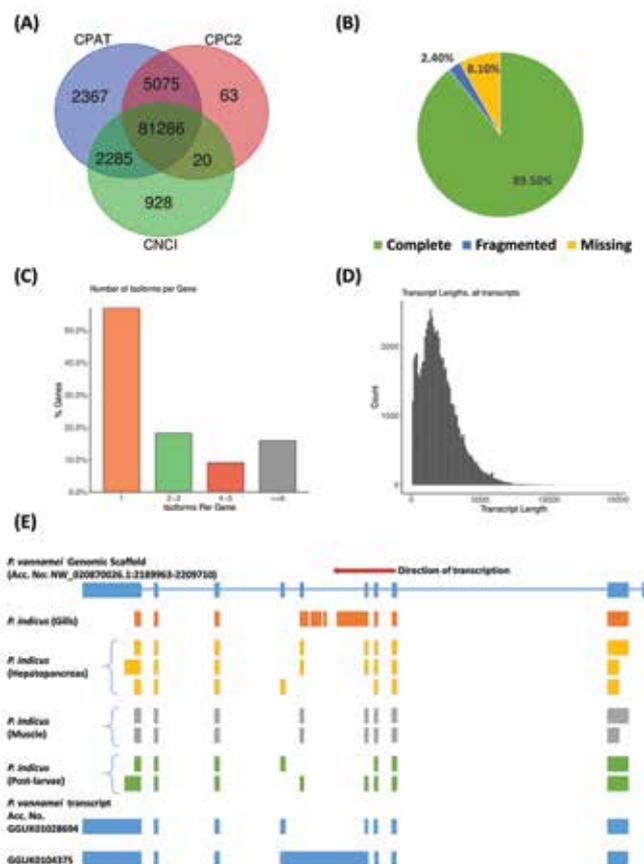
A. The number of coding transcripts identified through analysis of high-quality transcripts (n = 99,458) in CPAT, CNCI and CPC2 tools. A high-quality transcript identified as 'coding' by atleast one of these 3 tools, is finally classified as 'coding'.

B. Benchmarking the assembled transcripts against BUSCO orthologs for completeness.

C. The isoform diversity for transcripts in *P. indicus* obtained through squanti tool.

D. Transcripts length distribution in *P. indicus* transcriptome.

E. Tissue-specific isoforms of choline phosphotransferase gene in *P. indicus* mapped against the full gene of *P. vannamei*.

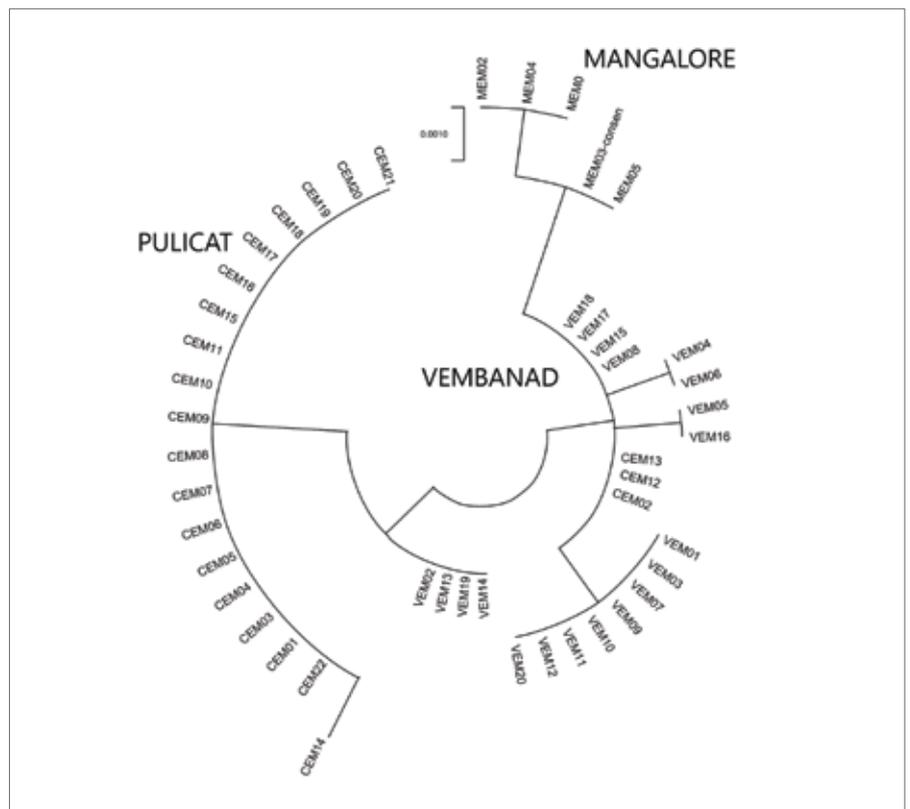


Population genetic structure of orange chromide (*Etroplus maculatus*) in South-Indian waters

The genetic diversity is the outcome of the evolutionary processes adapted by the species with respect to the spatial and temporal environmental changes since its origin. Hence, the studies on species diversity are of paramount importance to the conservation programs. The genetic diversity of orange chromide *Etroplus maculatus*, a brackishwater ornamental fish was studied from its ranges of natural occurrence in southern India, i.e. Pulicat lake, Vembanad lake and estuarine systems in Mangalore using mitochondrial DNA.

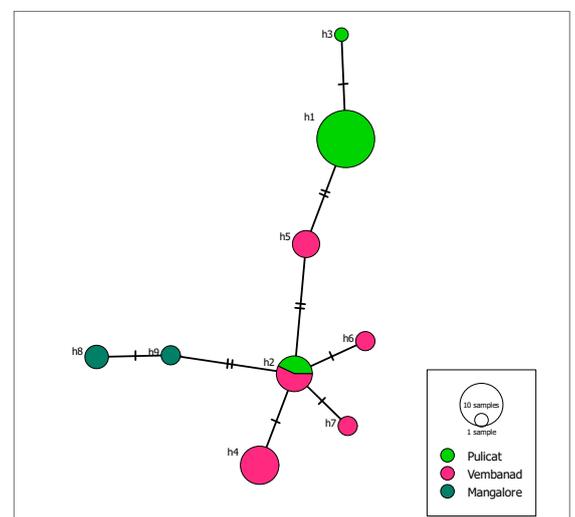
The samples exhibited ten variable polymorphic sites wherein no singleton site was observed and all were parsimony informative sites. The total haplotypes were nine. The nucleotide and haplotype diversity were 0.00376 and 0.802, respectively. Vembanad Lake stocks showed more diversity (six with the diversity of 0.78) compared to Pulicat Lake (three with the diversity of 0.33) and Mangalore (two with the diversity of 0.6). The AMOVA revealed a variation of 45% between the populations and 55% within the population, which indicates that the variation among individuals in the populations contributed more to the total genetic variation than the variation between populations. Non-significant Tajima's D (0.94) and multimodal mismatch distribution plot revealed no changes in population size during the recent past and the population was stable under equilibrium.

The phylogenetic tree and haplotype

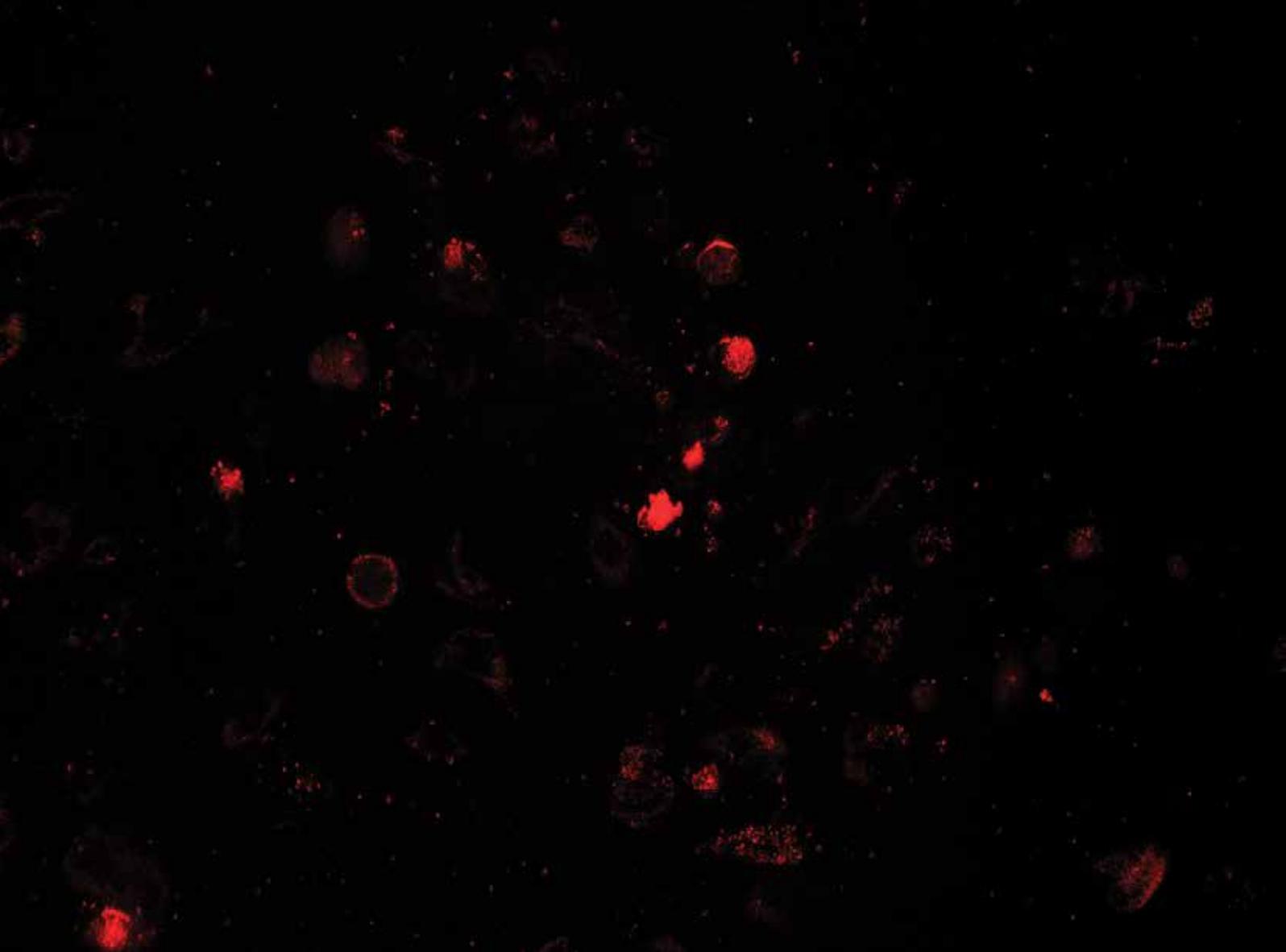


Phylogenetic tree on orange chromide populations (CEM-Pulicat; VEM-Vembanad; MEM-Mangalore)

network revealed three separate clades for three populations. The genetic differentiation study ($F_{ST}=0.45$) imparted significant ($P<0.0001$) difference between the stocks. The observed significant genetic differences indicate the biodiversity of the species and will be beneficial to develop stock specific strains and lines while attempting genetic improvement programs.



Haplotype network for orange chromide populations



Red fluorescence emission due to integration of RNP complex in treatment

CRISPR/Cas9 mediated gene editing for growth improvement

CRISPR/Cas9 is a newly emerging genetic editing tool to manipulate the genes in plants, humans, and animals by introducing double-stranded breaks in the targeted gene with cas9 nuclease and an appropriate guide RNA. This technology has been tested and found useful for genetic improvement in a wide range of species. *Etroplus suratensis* (pearlspot) is one of the potential candidate brackishwater aquaculture species with good market demand. However, the slow growth of the fish hinders

its wide acceptability for commercial aquaculture. In order to tackle this, myostatin gene, a muscle suppressor gene, has selected for permanent knock out using the CRISPR/Cas9 method to prominently increases muscle mass in pearlspot. The myostatin gene has been cloned and characterized and designed guide RNAs. The efficiency of guide RNAs was evaluated by transfecting a Ribonucleoprotein complex (RNP) of guide RNA (tagged with fluorescent dye ATTO 550), Cas9 protein, into

the primary cell culture of brain cells (passage No. 20). Successful integration of the RNP complex in the cell nucleus was evident by the emission of red fluorescence. Myostatin gene was amplified using gene-specific primers resulted in a lack of amplification of targeted fragment. The tested guide RNA is efficient for disrupting the targeted gene, and it also shows the feasibility of CRISPR/Cas9 technology for targeted mutations in pearlspot.

CIBA develops an indigenous vaccine against viral nervous necrosis (VNN) infecting Asian seabass

Viral nervous necrosis (VNN) is an acute viral disease affecting more than 120 species of marine, brackishwater and freshwater fish causing up to 100% mortality in seabass larvae. The causative agent of the virus is nervous necrosis virus (NNV) belonging to the genus *Betanodavirus* and family Nodaviridae. The clinical signs of the disease include dark discolouration of the affected fish, abnormal swimming with whirling movements and belly-up swimming due to inflammation of the swim bladder. The virus causes acute mortality in larval and early juvenile stages while adult fish are asymptomatic. Infected adult fish becomes carrier of the virus. The disease is transmitted horizontally through infected fish and water and vertically through egg and milt from the infected carrier broodstock to the progeny. Use of disease free brooders and vaccination of broodstock is the practical way to prevent the vertical



Intraperitoneal administration of VNN vaccine to Asian

transmission of the virus. ICAR-CIBA has developed a vaccine against VNN.

The capsid protein gene of NNV was cloned into prokaryotic expression vector and the recombinant protein was expressed in *Escherichia coli*. The recombinant protein was purified using Ni²⁺ affinity chromatography columns. The purified protein was emulsified with adjuvants and administered to Asian seabass broodstock by intraperitoneal

injection. An inactivated vaccine was also prepared by propagating NNV in SSN-1 cells, inactivating the virus using BEI and emulsifying with an adjuvant. The vaccine was administered intraperitoneally to seabass broodstock. Two boosters were administered to both the recombinant protein vaccinated and the inactivated virus vaccinated groups at two months interval. An indirect ELISA was developed using monoclonal antibodies against Asian seabass IgM developed in-house. Anti-NNV serum antibodies were assessed using the indirect ELISA. The recombinant protein vaccinated group gave a better immune response to the vaccine. The maternal antibodies in the larvae hatched from the unvaccinated and vaccinated groups were assessed by ELISA. The larvae hatched from the vaccinated groups had higher maternal antibody compared to larvae from unvaccinated brooders. Hence this vaccine can be used to immunize broodstock and fingerlings to prevent disease outbreaks and vertical transmission of the virus.



Blood collection from vaccinated brooder seabass

Domestication of Indian white shrimp, *Penaeus indicus*

The current exclusive reliance of shrimp industry on exotic *Penaeus vannamei* is severely constrained by emerging diseases and declining production performance. In this context, Indian white shrimp, *P. indicus* is found to be better alternative for the development of specific pathogen free stock for shrimp culture in India. The most important criteria for domestication and selective breeding of any species are complete control of reproduction under captivity. As an initial phase of the large scale domestication and genetic improvement program of native *P. indicus*, domesticated lines (G1 and G2) of this species were developed. In order to develop G1 lines, hatchery reared PL produced by wild brooders were reared in grow out ponds at low density 1 PL/m². Shrimps attained 30-45 g with 100% impregnation in female broodstock within 10 to 11 months. Nearly 60% of the impregnated females showed advanced gonad development from advanced second stage to third stage of ovary development. Mated females were unilaterally eyestalk ablated, and more than 70% animals reached final stage of maturation and 40% of animals spawned successfully. Induced maturation revealed average fecundity of 50,000 to 90,000 egg per spawning

with 50-70% and above hatchability, whereas reproductive ablated animals administered with 17 β -Estradiol responded with a fecundity of 75,000 and above with 80% hatchability. Although onset of gonad development started within 105 days of culture with nearly 46% of the population, the advanced gonad development was only found when animals attained 150 to 160 days of culture at 28 to 30 ppt salinity. Further with the reduction in salinity below 25 ppt, all the animals absorbed the gonad indicating salinity is a crucial factor for the gonad development. Studies on growth and reproductive performance

of these lines indicated that G2 lines grew faster than G1 lines, and within 135 days of culture (including 45 days of nursery), 80% of animals attained impregnation corroborating the hypothesis that issues of reproduction becomes less problematic during the course of domestication. Reproductive performance of domesticated line is slightly lower than wild broodstock, and it is mainly due to the large body weight of wild caught animals. The study reveals the possibility of closing the life cycle of domesticated *P. indicus* within a period of 6-8 months.



Matured ovary of G2 line female of *Penaeus indicus*

Production of pond reared fingerlings of hilsa, *Tenualosa ilisha* and its distribution to farmers for grow-out culture



Distribution of nursery reared hilsa fingerlings to farmers of Sundarbans

Hilsa, *Tenualosa ilisha* is an important commercial fish of the Indo-Pacific region, especially Bangladesh, India and Myanmar. Nursery rearing is an important step to produce fingerlings for development of aquaculture of this species. With this background, wild mature migratory fish were bred through dry-stripping and nursery rearing methodology in earthen pond system was developed. Oozing male (270 ± 5.0 g) and female (780 ± 15 g) fish during its spawning migration (February to April) were captured from Hooghly River at Godakhali, and bred through dry stripping on-board. Fertilized eggs were brought to KRC hatchery and incubated in glass jars, and after hatching, five-day post hatch larvae (after yolk sac utilization) were stocked in well prepared freshwater nursery ponds (100 m^2) @ 500 number/ m^2 larvae. During nursery rearing, larvae were fed with hilsa larval feed developed by CIBA. After 90 days of rearing, fish attained the size of 0.6-1.2 g (45-73 mm). Average survival of hilsa in nursery pond was 3-5% only. The nursery reared fingerlings were distributed to two farmers in Sundarbans to demonstrate hilsa culture.

Hepatopancreatic microsporidiosis invades inland saline shrimp farms

Shrimp hepatopancreatic microsporidiosis, caused by EHP has been widely reported in shrimp farming countries globally and often associated with reduced feed consumption, growth retardation and white faeces syndrome (WFS). CIBA's disease surveillance in the inland

states of Haryana, Punjab and Rajasthan revealed widespread occurrence of hepatopancreatic microsporidiosis caused by *Enterocytozoon hepatopenaei* (EHP). Transmission of this



scourge in the shrimp farms in the inland areas strongly suggests seed borne transmission. These shrimp farms source their seed from the vannamei hatcheries located on the south east coast of India. Generally, the shrimp farmers presume that the seed sourced from SPF hatcheries are always healthy and do not get affected by disease, and hence have done away with the practice of seed testing. CIBA has been repeatedly urging shrimp farmers to test seeds and periodically monitor the crops using sensitive diagnostic tests, which is one of the important means of biosecurity to avoid occurrence of diseases and ensure successful shrimp crop.



Pre-pupae of black soldier fly

Black soldier fly (BSF) meal as novel feed ingredient

Use of BSF meal in aqua feeds is an emerging concept, where bio-waste is converted in to useful biomass efficiently, which in turn result in clean environment and effective utilization of biomass. The nutrient composition of BSF meal (20-25 days old) revealed that it had 40-45% crude protein and

23-27% crude lipid content. In order to explore the nutritional potency of BSF meal as an alternative to fish meal, eight-week feeding trial was conducted in *P. vannamei*. There was no problem in feed intake, growth and survival when the BSF meal was included at 0, 5, 10 and 15% in the diet of vannamei.

The results revealed that BSF meal can be used as a sustainable alternative to fish meal and it can be included up to 15% in the diet of white shrimp, *P. vannamei* without any deleterious effect.

Demonstration of potential of CIBA-Plankton^{Plus} supplementation on reduction of feed requirement in shrimp culture



Potential of Plankton^{plus} (PPlus) on reduction of feed requirement was demonstrated in farmer's ponds at Haripur, Namkhana (West Bengal) under SCSP. Three ponds with three different treatments, i.e., control (100% feed without PPlus), T1 (90% feed & supplemented with PPlus) and T2 (80% feed & supplemented with PPlus) were

used for demonstration. Plankton^{plus} was used at 30 ppm and shrimps were stocked @ 60 pcs/m². After 120 days of culture, highest productivity of 11.45 t/ha was achieved when Plankton^{plus} was supplemented and feed was reduced by 20% compared to 9.83 t/ha in control. Demonstration clearly showed that Plankton^{plus} could save 20% feed and enhance the productivity to the tune of 1.62 t/ha.



Brackishwater aquaculture based Integrated Farming System for improving the livelihood status of coastal families -A success story

A batch of coastal families in Kundrakadu hamlet of Kovalam village, Chengalpattu district (Tamil Nadu) were engaged in clam collection in the Kovalam backwaters as a livelihood activity along with fishing. However, aftermath of the Indian Ocean Tsunami occurred during December 2004 the clam resources dwindled drastically in the backwaters which had adversely affected their livelihoods. Since they have the skill

sets of collecting clams and fish in coastal waters they approached ICAR-CIBA for guidance and facilitation for an alternative livelihood. CIBA in convergence with Chennai Petroleum Corporation Limited (CPCL) implemented a project under Corporate Social Responsibility (CSR) of CPCL of Madras Refineries Limited (MRL). The project team organised them as a group (10 members) to take up a brackishwater aquaculture

activity and trained them to establish a customised homestead Recirculatory Aquaculture System (RAS) for pearl spot fish (*Etroplus suratensis*) larval rearing. In addition to that poultry rearing, mushroom production and kitchen garden units were also established as an integrated set up to provide adequate employment and income to the group members.



Hilsa (*Tenualosa ilisha*)



Tenualosa ilisha commonly known as hilsa or Indian shad or hilsa shad is a member of the family Clupeidae, which consists of several other preferred food fish species like sardines, herrings, pilchards and menhadens. The fish is a highly sought-after delicacy for the people of West Bengal and Odisha owing to its taste and flavor, wherein it is a part of the culture, nostalgia and heritage of the region and its people. Hilsa is one of the delicacies of Bengalis and Odias worldwide, associated with culture and emotions, with high demand and market price for 500 g and above in the range of ₹ 700 to 1500/kg. The global capture fisheries production of Hilsa shad is around 4.15 lakh tonnes of which India accounts for a meager 25,000 tonnes, insufficient to meet the demand. Bangladesh accounts for 93 % of the world's Hilsa production which exported to Indian and worldwide are met through export. The species is anadromous in nature as it grows

Kingdom - Animalia
Phylum - Chordata
Order - Clupeiformes
Family - Clupeidae
Genus - *Tenualosa*
Species - *T. ilisha*

and matures in the sea and migrates into the rivers for spawning. Hilsa is found well-distributed in the Ganga-Brahmaputra-Meghna drainage systems of India and Bangladesh.

In India, hilsa was originally distributed all over the Indian east and west coast, parts of the Gulf coast. However, at present artisanal and small scale mechanised fishing of the species is restricted to the riverine systems of Ganga and Narmada, and it's associated estuarine and near coastal regions. It is also found in rivers and estuaries of Pakistan, Myanmar and in the Persian Gulf. Hilsa is a euryhaline fish which can live in marine, fresh and brackishwater occupying the pelagic-

neritic region, and can grow up to 60 cm in length 3 kg in weight. It has no dorsal spines but 18-21 dorsal soft rays and anal soft rays. The belly has 30 to 33 scutes. There is a distinct median notch in the upper jaw. The fish shows a dark blotch behind the gill opening, followed by a series of small spots along the flank in juveniles. Colour of the live fish is silver shot with gold and purple. The species filter feeds on plankton and by grubbing muddy bottoms. The fish schools in coastal waters and ascends up the rivers (anadromous) for around 50-100 km to spawn during the southwest monsoons (June to September) and also from January to April. April is the most fertile month for the breeding of Hilsa.

With a view to conserve and develop aquaculture of this species, ICAR-CIBA has developed the technology and package of practices for seed production in captivity and farming, respectively.

Distinguished visitors

Shri. Radha Mohan Singh, Honourable Former Union Minister of Agriculture & Farmers Welfare and the Member of Parliament and Chairperson, Parliamentary Standing Committee on Railways visited ICAR-CIBA



Shri. Radha Mohan Singh, former Union Minister of Agriculture & Farmers Welfare and Member of Parliament and Chairperson, Parliamentary Standing Committee on Railways, visited ICAR-CIBA on 6th January 2020 and interacted with the scientists. He appreciated the efforts of CIBA in providing technology support to the brackishwater aquaculture

sector and working with farmers on partnership mode. He opined that integration of crops with livestock and fisheries is the best farming system model for our farmers, and allied sectors like horticulture, animal husbandry, and fisheries offer promising scope for the future agricultural development and the ICAR institutes need to engage with

Krishi Vigyan Kendras (KVK) to transfer their technologies to the farming community. Dr. K.K. Vijayan, Director, CIBA explained the current research programmes of the institute and conveyed gratefulness to him for visiting the institute despite his other pre-occupations.

ICAR-CIBA organized the 2nd National Brackishwater Aquaculture Farmers Conclave, BAFAC-2020 at Surat, Gujarat during 19-20 February, 2020

The west coast of India possesses abundant brackishwater resources, although the region accounts for only 9% of the total production and a huge volume of resources still remain unutilized, and deserves special attention. Formulating a road map for *Sustainable Brackishwater Aquaculture Development for the west coast of India* with implementable policy interventions, strategies ensuring supply of quality inputs, capacity enhancement, diagnostic laboratories support and location specific production systems is of great importance. In this context, ICAR-CIBA in collaboration with Society of Coastal Aquaculture and Fisheries (SCAFi) and Navsari Agricultural University (NAU), Gujarat successfully conducted the 2nd Brackishwater Aquaculture Farmers Conclave-2020



Presidential address by Dr. Joykrushna Jena, DDG (Fisheries), ICAR

(BAFAC-2020), the first of its kind in the west coast during 19-20 Feb, 2020 at Surat international convention and

exhibition centre (SIECC), Gujarat. About 900 brackishwater farmers representing all the coastal states of India and few inland states like Haryana, Punjab and Rajasthan attended the program. On the opening day, farmers from other states were taken for a field visit to shrimp grow-out facilities, high-tech nurseries, and modern processing plants at Olpad, Surat. On the second day, technical sessions with scientist and farmer presentations and knowledge sharing in national language were held at SIECC, Surat. Shri. Anup Kumar, IAS, Secretary, Fisheries, Animal Husbandry and Agricultural Marketing, Govt. of Maharashtra inaugurated the BAFAC 2020. Dr. Joykrushna Jena, Deputy Director General (Fisheries), ICAR, New Delhi presided over the inaugural



Inaugural address by Shri. Anup Kumar, IAS, Secretary, Fisheries, Govt. of Maharashtra

session. Dr. S.R. Chaudhary, Vice-Chancellor, NAU, Navsari, Shri. N.F. Patel, Deputy Director, Department of Fisheries, Govt. of Gujarat Shri. Ketanbhai Desai, President of South Gujarat Chamber of Commerce and Industry, Shri. Pradeep Navik, former president of the Surat Aquaculture Farmers Association (SAFA), Dr. M. Manoj Sharma, President, Gujarat Aqua Feed Dealers Association (GAFDA) and Shri. Rahul Sunil Bhagwagar, President, SAFA, offered their felicitations for the conduct of BAFAC 2020 at Gujarat and assured their full support and partnership for the research programs of CIBA in the future. Dr. K.K. Vijayan, Director, ICAR-CIBA and President, SCAFi & Convener, BAFAC-2020 in his welcome address articulated the significance and purpose of the farmers' conclave. He presented an overview of the development of



Section of farmers attended the BAFAC-2020

brackishwater aquaculture sector with special reference to the shrimp farming and the way forward for sustainability. During the technical session, sixteen aquafarmers presented their experiences and

success stories on various aspects related to brackishwater aquaculture. An interactive session on the farmer presentations was conducted with stakeholders, scientists and the Govt. representatives in the fisheries sector.



Distribution of Soil health card, during ICAR-CIBA Farmers Conclave, BAFAC-2020 Surat, Gujarat

ICAR-CIBA conducted an online-survey to understand how the COVID-19 lockdown has impacted the aquaculture activities and the potentially 'high risk' groups due to the pandemic restrictions

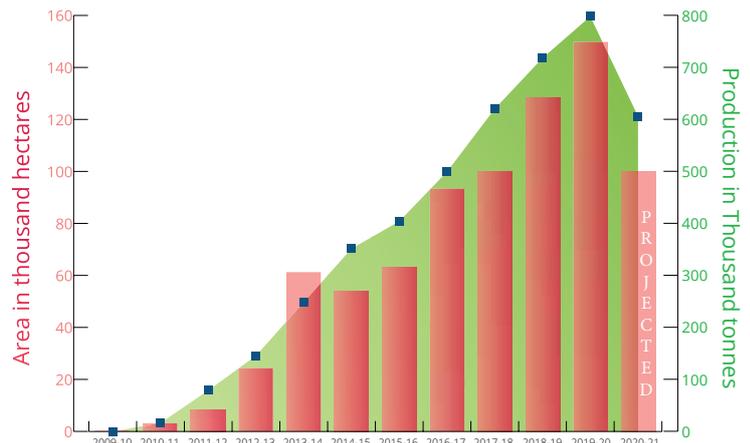
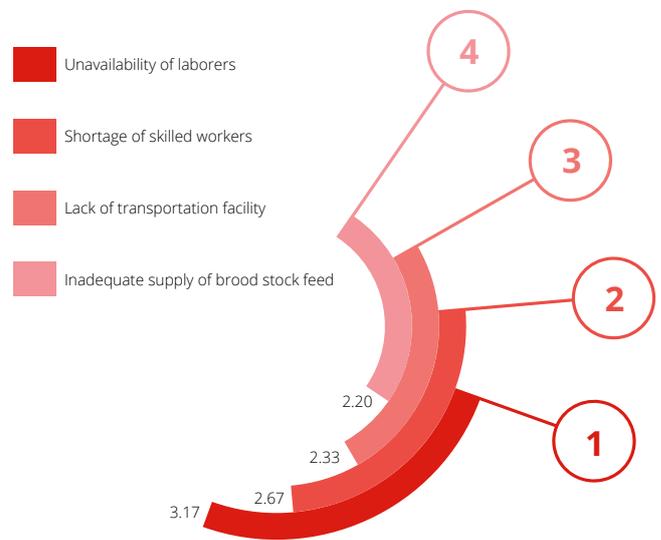
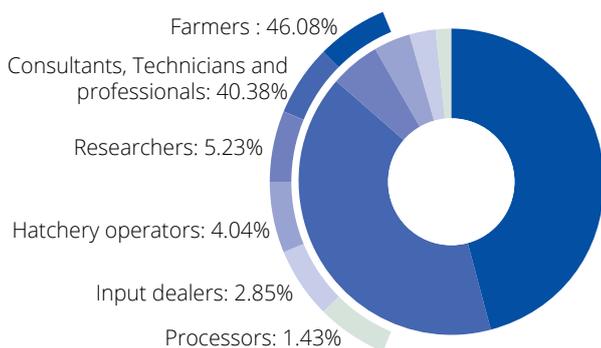
ICAR-CIBA conducted an online survey during April, 2020 to study the impact of COVID-19 and its trickling effect on shrimp farming sector of our country. A digital questionnaire with 44 questions related to seed supply, inputs supply, farming, marketing, and social issues was posted through our institute android App ('Vanami Shrimpapp') and other digital platforms. A random sample of 433 stakeholders, including farmers, hatchery operators, input dealers, processors, aqua-professionals, and academicians, responded to the survey and expressed their opinion. The responses received were processed component-wise to evaluate the impact of COVID-19 on this dynamic agribusiness sector.

More than 90% of the hatchery operators participated in the survey were apprehensive about the import of vannamei brood stock and sourcing of polychaete worms for the brood stock. The majority (78%) of the respondents reported a 30-40% drop in the sale of seed and the constraints in the availability of labour, technical staff, and transportation. Constraints in sourcing seed, increased feed cost by ₹ 6-7/kg, and restricted access for farming requirements due to COVID-19 lockdown caused a 40% reduction in farming area in the current season. It would increase the cost of production

by 15-20%, thereby a 40% reduction in profits. The results of the survey indicated that COVID-19 related disruptions adversely affected the shrimp aquaculture sector in terms of reduction of farmed area and shrimp production by 40%, seafood export performance, to the tune of 30% or more loss, in the current year. The loss of employment for the workers has gone up to 30-40% during the season. Based on the estimates available, probable economic loss to the shrimp aquaculture sector for the current year (2020-2021) is estimated to be around ₹ 10,000 crores. However, considering the continuous lockdown, the total impact may further change due to the non-availability of farm inputs.

The study indicated that the COVID-19 lockdown adversely affected the shrimp farming sector due to restrictions in SPF broodstock importing, seed production, the supply of farm inputs, reduction in farming area, processing and marketing of shrimps. Further,

restrictions in labourers' local movement and migrants' return to their native place negatively affected the sector and livelihoods. The approximate estimate indicates that the sector would incur an economic loss of about ₹ 10,000 crores. Therefore, the Central and State governments need to support the sector with a relief package and implement measures to mend the supply chain to sustain shrimp aquaculture, which earns foreign exchange of ₹ 35,000 crores per annum to our country. (For detailed report, give the link here to website)





Phone in Programme- An e-Extension strategy for the benefit of the aqua farming community during lockdown period

ICAR-Central Institute of Brackishwater Aquaculture (CIBA) in collaboration with the M.S. Swaminathan Research Foundation (MSSRF) Sirkazhi, Fish for All Centre, Poompuhar, Nagapattinam district (Tamil Nadu) made an e-initiative extension strategy viz., “Phone in programme” (PiP) to assist the shrimp/ fish farmers/fisher folk by providing technological backstopping with regard to various aspects of aquaculture during the lockdown period. The sample size was 40. About 40 fish farmers/fisher folk from four villages of Nagapattinam district, Tamil Nadu participated and raised queries on

the subject of “Seabass Culture and its Farm Management Practices” with the help of conference call with ICAR-CIBA experts on fish culture, feeds and feed management, health management and extension aspects. Major area of the program outlined the current level of knowledge of the fish farmers and sharing the scientific management practices of Asian seabass culture. With regard to their need on technical information, about 43 percent of the queries were addressed to culture aspects, of Asian seabass (*Lates calcarifer*), 35 percent on feed technology, feed and feed management and Feed

Conversation Ratio, 13 percent on health management and disease aspects and 10 percent on input supply, institutional support and related extension aspects like marketing, training, seabass fry procurement and financial assistance of State Department of Fisheries. The study also analysed the reaction of the fish farmers/fisher folk towards the programme and how it served as a source of information to them. About 80 percent of the participants expressed that the programme was informative and useful.

Helping hand to farmers during COVID-19 lockdown



Providing Asian seabass seed and feed to the farmers during COVID-19 pandemic period at MES of CIBA.

this crisis, Kakdwip Research Centre of CIBA provided Sundarbans to sustain the aquaculture practices in Sunderbans. In addition to this, CIBA recently made an advisory to prepare homemade formulated feed to maintain aquarium fishes at home during the lockdown. The COVID-19 pandemics also affected the socio-economic status of the people in the Sunderban area. Considering the importance of fish as an essential commodity among Sunderban people, KRC of CIBA facilitated the sale of farm-reared fish and shrimp produced to the needy and jobless villagers of Kakdwip at a reasonable price. Navsari Gujrat Research Centre of CIBA sold milkfish to the approved vendors & local villagers as a source of protein in COVID-19 pandemic.

COVID-19 lockdown severely affected the brackishwater aquaculture sector due to the interrupted supply of farm inputs. Realizing this unforeseen situation, ICAR-CIBA reached out to the farmers through teleservices, and social media to extend the support during COVID-19. Understanding the current scenario, Institute supplied seed and feed to the needy people. A total of 2500 seabass fry in the size of 2.0 to 3 cm size were supplied to fisherfolk from Muttukadu village as livelihood option. The seeds were stocked in the hapa for fingerling production. Seebass^{plus} feed produced at the pilot-scale feed mill located at Muttukkadu

experimental station was supplied to small and medium farmers. The aquaculture practices in Sunderban area were severely affected due to the lack of farm inputs such as seeds, feeds, aqua medicines etc. During



Sale of milkfish to the vendors at Navsari, Gujarat.

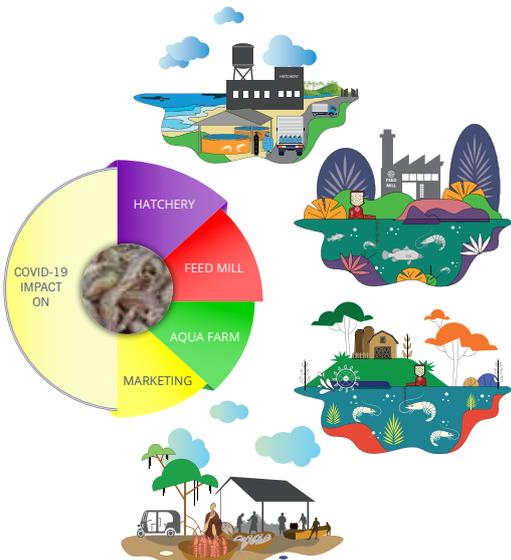


Farmer receiving Poly^{plus} pellet feed and sale of farm reared fish at KRC of CIBA.

COVID-19 Advisories



ADVISORY ON COVID-19 LOCKDOWN:
BEST PRACTICES FOR BRACKISHWATER AQUACULTURE SECTOR
WITH SPECIAL FOCUS ON SHRIMP



Impact of Corona Virus Disease (COVID-19) related lockdown on
Shrimp aquaculture sector In India:
Issues and way forward



ICAR-CIBA, Chennai: 02.05.2020



HOMEMADE FORMULATED FEED
for aquarium keeping using household ingredients for use in
COVID-19 lockdown period



Kolorfish^{plus}
a popular brand of ornamental fish feed from ICAR-CIBA



ICAR-CENTRAL INSTITUTE OF BRACKISHWATER AQUACULTURE

**A GUIDE DOCUMENT ON
OFFICE WORK IN
COVID-19 TIMES**



Preventive measures to contain the spread of COVID-19

Awareness posters

Self-care programmes



Online classes / webinar to graduate and post graduate students

Sl. No.	Name	Designation & Division	Topics	Participant college (s)
1	Dr. M. Kailasam	Principal Scientist & SIC, FCD	Nursery rearing of Asian seabass <i>Lates calcarifer</i> for fingerling production	Colleges of Fisheries, CAU, Tiripura; TNJFU, Nagapattinam; WBUAFS, Kolkata and College of Fisheries, Srinagar; College of Fisheries, Veraval
2	Dr. Debasis De	Principal Scientist, NGBD	Fish waste to wealth and its use in aquaculture	WBUAFS, Kolkata.
3	Dr. M. Makesh	Principal Scientist, FCD	Vaccines for Aquaculture	College of Fisheries, Veraval; WBUAFS, Kolkata.
4	Dr. Sanjoy Das	Principal Scientist, AAHED	Aquatic animal health in Aquaculture	WBUAFS, Kolkata.
5	Dr. Prem Kumar	Senior Scientist, FCD	Commercially important finfishes for coastal aquaculture	College of Fisheries, Bihar Animal Sciences University, Bihar.
6	Dr. Krishna Sukumaran	Senior Scientist, FCD	Modular system for pearlspot seed production	College of Fisheries, Lembucherra, West Tripura; TNJFU, Nagapattinam; WBUAFS, Kolkata.
7	Dr. R. Ananda Raja	Scientist, AAHED	Microbial and parasitic diseases of fish and shellfish	TNJFU, Nagapattinam.
8	Dr. Aritra Bera	Scientist, FCD	Milkfish farming and polyculture	CAU, Tripura; TNJFU, Nagapattinam; WBUAFS, Kolkata; College of Fisheries, Mangalore; SKUAST, College of Fisheries, Veraval; KUFOS and College of Fisheries Pantnagar.
9	Mr. J. Ashok Kumar	Scientist, NGBD	Artificial intelligence applications in aquaculture	College of Fisheries, Veraval; WBUAFS, Kolkata.
10	Dr. M. Muralidhar	Principal Scientist, AAHED	Environmental issues in aquaculture	Dr. M.G.R. Fisheries College & Research Institute, Tamil Nadu, TNJFU.
12	Mr. T. Sathish Kumar	Scientist, AAHED	Emerging diseases in shrimp aquaculture - Current scenario	Dr. M.G.R. Fisheries College & Research Institute, Tamil Nadu, TNJFU.
13	Dr. M. Kumaran	Principal Scientist, SSD	Impact of COVID-19 on shrimp aquaculture	National webinar on 'Fisheries Supply Chain Dynamics during COVID-19' organized by the College of Fisheries, Tripura, and Central Agricultural University. June 8-13, 2020.

Technology transfers, product releases and knowledge partnerships

ICAR-CIBA and A.R. Hatchery, Pvt. Ltd., Marakkanam, Tamil Nadu signed MoU for the Knowledge partnership for the production of indigenous shrimp seed for sustainable farming

ICAR-CIBA, Chennai and Mr. Suresh Nayak, A.R. Hatchery Pvt. Ltd., Panichimedu, Marakkanam, Tamil Nadu, signed for the Knowledge partnership for the production of indigenous penaeid shrimps (Indian white shrimp, kuruma shrimp) seed production on 18th January 2020. In the introductory remarks, Dr. K.K. Vijayan, Director, CIBA mentioned that the partnership program would trigger the farming of indigenous shrimps, a step forward in the sustainable shrimp farming in the country. This model is useful in



leveraging diverse expertise between government research institutes and industries to address the current issues in brackishwater shrimp aquaculture. Mr. Suresh Naik, the MOU partner, expressed appreciation

for the initiatives of CIBA in forging a partnership with private players, and expressed confidence in bringing positives, which would benefit the shrimp farming sector.

ICAR-CIBA and Nature Environment and Wildlife Society (NEWS), Kolkata signed MoU for the knowledge partnership for brackishwater aquaculture technology demonstration and training in the Sundarban

Dr. K.K. Vijayan, Director, ICAR-CIBA, Mr. Milon Sinha, Director, Nature Environment and Wildlife Society (NEWS), an NGO based in Kolkata, signed a MoU for the knowledge partnership for brackishwater aquaculture technology demonstration and training on 31st January 2020 at KRC of ICAR-CIBA, Kakdwip. Dr. Debasis De, Officer-in-Charge, KRC



in his introductory remarks briefed about the necessity of this partnership programme for development and demonstration of brackishwater aquaculture based livelihoods in the Sundarban. Mr. Milon Sinha

highlighted the NEWS activities that include conservational livelihoods related to mangrove for Sundarban farmers and the creation of alternative livelihoods through various foreign-funded projects. He also appreciated

the initiatives of CIBA for partnering with private bodies, and expressed his confidence in bringing positive outcome for the benefit of Sundarban farmers.

Water Fin Pvt. Ltd. Andhra Pradesh signs MoU with ICAR-Central Institute of Brackishwater Aquaculture for acquiring seabass seed production technology



Dr. K.K. Vijayan, Director, ICAR-CIBA, and Mr. B. Ravi Prakash, Executive Director, Water Fin Pvt. Ltd, Andhra Pradesh signed the MoU for technology transfer of seabass (*Lates calcarifer*) seed production. This MoU covers the development of land-based seabass broodstock, technical demonstration of maturation and spawning, fertilized egg transportation & incubation, and technical assistance for larval rearing up to fry stage. On this occasion, Dr. K.K. Vijayan emphasized the importance of species diversification and farming

of finfish species, like seabass, in the development of brackishwater aquaculture sector. He stated that this seed production facility would meet immediate seed demand not only for the small and medium scale of aqua farmers of Andhra Pradesh but also in other parts of the country. Mr. B. Ravi Prakash, Executive Director, Water Fin Pvt. Ltd., added that though their primary business is in logistics, they forecast a lot of opportunities for seabass aquaculture business in India in which production and supply of seed will have more business prospects.

Therefore, this long-awaited alliance with CIBA comes at the right time, and Water Fin Pvt. Ltd. is happy to associate with ICAR-CIBA.

Events

First digital conference

ICAR-CIBA and SCAFi conducted a Digital Conference on “Brackishwater Aquaculture Scenario in India with a focus on shrimp farming during COVID-19: Challenges and Way Forward”

ICAR-CIBA conducted the first digital conference on ‘Brackishwater Aquaculture Scenario in India with a focus on shrimp farming during COVID-19: Challenges and Way Forward’ on 3rd June, 2020. The highlight of the conference was the issues faced by the brackishwater aquaculture amidst COVID-19 and suggest probable measures to tackle the negative impacts. Expert panellists consisted of Dr. Jujjavarapu Balaji, IAS, Joint Secretary (Marine Fisheries) representing the Ministry of Fisheries, Government of India, Dr. Pravin Puthra, ADG (Marine Fisheries), ICAR, Dr. M. Karthikeyan, Director, Marine Product Export Development Authority (MPEDA), Dr. Arul Victor Suresh, President, Society of Aquaculture Professionals (SAP), Mr. Madusoothan Reddy, Secretary, All India Shrimp Hatcheries Association (AISHA),



Mr. Elias Sait, Secretary-General, Seafood Exporters Association of India (SEAI), and representatives of Coastal Aquaculture Authority (CAA), National Fisheries Development Board (NFDB), Fisheries Departments of Tamil Nadu and Andhra Pradesh. Experts from CIBA presented and discussed on seed production, feed, aquatic animal health, water quality, institutional support and

the importance of reaching farmers through digital communication during the current scenario. About 1800 participants representing shrimp industry viz., shrimp farmers, aqua professionals, researchers, inputs dealers, processors, marketers, state department officials, academicians and students participated in the on-line conference.

ICAR-CIBA celebrated the Annual Day cum Family get-together

ICAR-CIBA celebrated the Annual Day-2020 and Family get-together on 29th February 2020 at Headquarters, Chennai. Ms. Leena Nair, IAS, Administrative Member Tamil Nadu Real Estate Appellate Tribunal & Former Chair Person, Marine Products Export Development Authority, Kochi graced the occasion as the Chief Guest. Mr. Peer Bhasha, Inspector of Police, Patinappakkam, also joined the event. About 400 CIBA-family members, including retired alumni



joined the get-together event. Ms. Leena Nair addressed the gathering and interacted with the employees of CIBA and appreciated the efforts and achievements of CIBA. In her address, she remembered her stint as Chair Person, MPEDA and highlighted the role of CIBA in the progress of Indian aquaculture sector and wished for more such success in future. Dr. K.K. Vijayan, Director of the institute and President of the Recreation Club, addressed the gathering and emphasized the importance of the informal meeting of the CIBA-fraternity for better opportunity for interaction, feeling of belonging and ownership for the Institute. Newly joined employees were introduced to the gathering. To encourage the staff, the institute employees were awarded for their best performance in the form of Institute Awards for the year 2019-20



Annual day cum Family get together



in designated categories. In the cultural event, Flowers Comedy Utsavam Team performed karaoke, mono acting, mimicry interlaced by the traditional

dance performance by artistes from Kuchipudi Academy.



ICAR-CIBA Celebrated World Women's Day-2020 with Fisher Women at Kovalam village, Chennai

ICAR-CIBA celebrated World Women's Day on 8th March 2020 at Kovalam Village in the Chengalpattu district of Tamil Nadu. The theme of World Women's Day-2020 was ushering in a "Gender Equal World." Shri. S. Janakiraman, Trustee of Shri Venkatraman Memorial Trust,

Kovalam was the chief guest and he highlighted the development activities of fisherwomen in his village and requested CIBA to take part in initiating aquaculture activities for improving the socio-economic status of fisher families. About 150 womenfolk interested in aquaculture activities

from nearby villages participated in the event. The fisherwomen sensitized about the opportunities available in brackishwater aquaculture like ornamental and finfishes larval rearing and, the concept of 'fish waste to wealth'. Success stories were presented by Dr. Krishna Sukumaran,



Senior Scientist, CIBA, Shri. Kennit Raj, the fisherfolk of Pattinapakkam and Smt. Chitra, Irula Tribal from Karathittu village. Dr. D. Deboral Vimala, Principal

Scientist, and coordinator of the event explained about the ICAR's flagship programmes, 'My Village My Pride' (*Mera Gaon Mera Gaurav-MGMG*)

and 'Tribal Sub-Plan' (TSP) for the empowerment of women through skill development for their livelihood support.

ICAR-CIBA celebrated World Environment Day on digital platform



World Environment Day was celebrated on 5th June 2020 by ICAR-CIBA using a digital platform. The theme for World Environment

Day 2020 is biodiversity- a call to combat the loss of natural resources due to several anthropogenic activities and natural calamities. Dr.

C. Suvarna, IFS, Commissioner of Fisheries, Govt. of Telangana was the chief guest, elaborated on the richness of Indian biodiversity and the impact of anthropogenic activity such as industrial and domestic waste disposal on the pollution of natural resources, water, and soil. Further, she emphasized the undesired effects of exotic species and destructive impact on natural resources, stressing the need for a better understanding of the species to be introduced. Dr. K.K. Vijayan, the Director, ICAR-CIBA in his presidential address opined necessity of maintaining a balance between food production activities and sustainable use of natural resources. This would be possible only by the collaboration of various agencies involved in ecosystem services to develop a win-win situation.

ICAR-CIBA celebrated 'World Oceans Day' and distributed hatchery produced brackishwater ornamental fish silver moony (Monos), *Monodactylus argenteus* to the ornamental traders

The World Ocean Day was celebrated on 8th June 2020 at the institute. Emphasizing the importance of world ocean day, Dr. K.K. Vijayan, Director, ICAR-CIBA pointed out the adverse effects of over exploitation of ornamental fishes from wild and the need of breeding and hatchery technology to sustain the ornamental fish industry of our country. He also highlighted the importance of partnership programmes between industry and the government research institutions to promote this potential sector. On this occasion, ICAR-CIBA handed over about 500 numbers of the hatchery-produced



seed of silver moony to Mr. Dennis, AQUASTAR, ornamental traders from Kolathur, Chennai. This would set a sustainable model for the ornamental fish breeding and trade

in the country. During this event, Dr. K.K. Vijayan released the Technology Series on "Silver moony, *Monodactylus argenteus* breeding and seed production.

25th Research Advisory Committee (RAC) meeting of ICAR-CIBA conducted

ICAR-CIBA for the first time, conducted the RAC meeting through a digital platform (Microsoft Teams) considering the COVID 19 lockdown. The RAC team of CIBA comprising Prof. (Dr) B. Madhusoodana Kurup, Ex-Vice Chancellor, KUFOS as Chairman, Dr.

M. Vijayakumaran, Ex-Head, NIOT, Dr. Santhana Krishnan, CEO, Maritech, Dr. Lalit C. Garg, Ex-Scientist, NII, Dr. A.K. Pal, Ex-Joint Director, ICAR-CIFE, Dr. Pravin Puthra, ADG (M. Fy.), ICAR as Members, Dr. K.K. Vijayan, Director, ICAR-CIBA as Ex-officio Member and

Dr. S.K. Otta, Principal Scientist, ICAR-CIBA as Member Secretary joined the meeting. All Scientific staff of CIBA also joined the virtual meeting.

Dr. K.K. Vijayan, the Director, welcomed the Chairman and Members of



the newly constituted RAC and the scientists. In his presentation, he highlighted the vision, mission, mandates, significant research achievements of CIBA under different thematic areas of brackishwater aquaculture, during the past year. In the opening remarks, the Chairman appreciated the research activities, technology dissemination, training

programmes, and outreach activities of CIBA. Members of the RAC appreciated the proactiveness and enthusiasm to work on basic and applied research areas required in the sector and also for the beneficial advisories issued by CIBA, from time to time. They also mentioned that the commercialisation of technologies and, adoption of technologies and products by farmers

clearly shows the success of CIBA as a national research institution and the visibility has improved to a greater extent among the farming community in the last five years. Several suggestions and valuable recommendations were made for fine-tuning the future research areas.

National training programme on 'Aquaculture Nutrition and Feed Biotechnology'

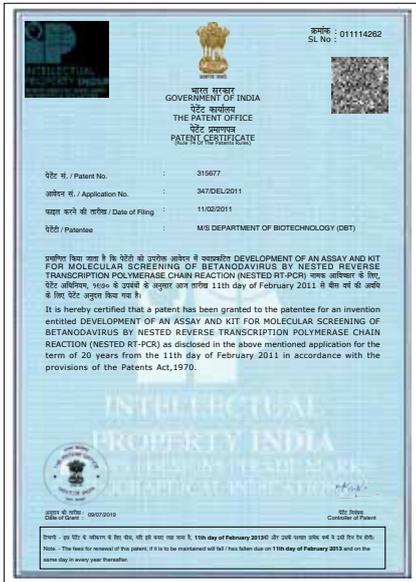


CAR-CIBA, Chennai conducted a national hands-on training on "Aquaculture Nutrition and Feed Technology" from 27th February to 7th March 2020. The specialized programme offered skill development in indigenous aqua feed processing, feed biotechnology, and feed management for sustainable brackishwater aquaculture. Twenty participants attended the training

program, including farm managers, feed mill technicians, academicians, students, and entrepreneurs interested in starting aquaculture from different states. Importance of functional feeds in aquaculture, broodstock feed, larval feed preparation were covered in the lecture series. Practical sessions included proximate analysis of fatty acids, amino acids, and minerals using

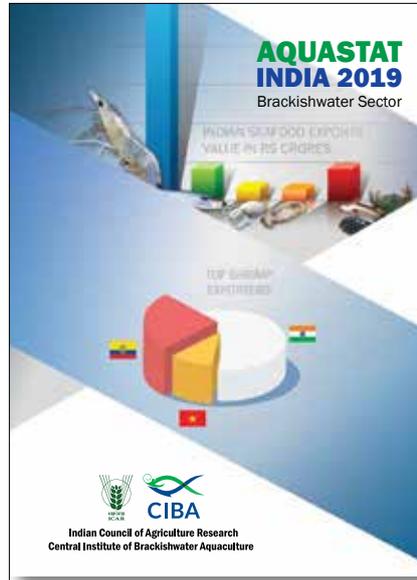
modern analytical instruments. Dr. K.K. Vijayan, Director, interacted with the trainees and explained the need for Public-Private Partnership (PPP) for sustainable development of the sector. Dr. S.V. Alavandi, Director In-charge, ICAR-CIBA, addressed trainees and distributed the certificates on valedictory function.

Patents and Publications



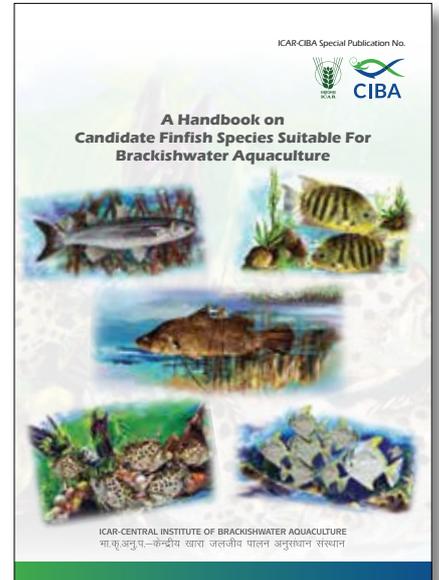
Patent

ICAR-CIBA obtained patent for the *Development of an assay and kit for molecular screening of betanodavirus by nested reverse transcription polymerase chain reaction (Nested RT-PCR)* Patent No. 315677 vide application No. 347/DEL/2011 under a DBT funded project implemented during 2007-2011.



Book Released

Geetha, R., Ravisankar, T., Sairam, C.V. Kumaraguru vasagam, K.P., Vinoth, S., Vijayan, K.K. 2019. AQUASTAT INDIA 2019, Central Institute of Brackishwater Aquaculture, Chennai, 219 p.



A Handbook on Candidate Finfish Species Suitable for Brackishwater Aquaculture was released on the occasion of Brackishwater Aquaculture Farmers conclave (BAFAC) conducted during 19-20th February 2020 at Surat, Gujarat.

Personnel

SUPERANNUATION



Shri E. Manoharan

Designation
Skilled Support Staff

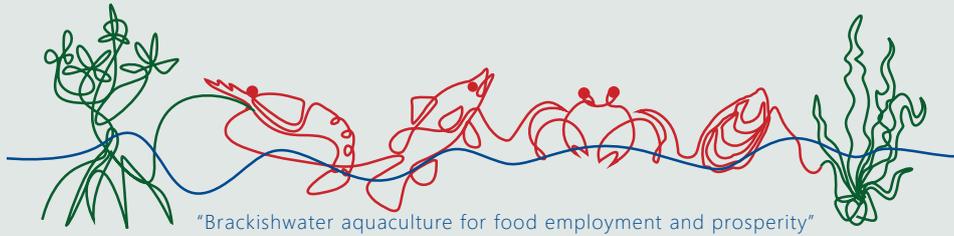
Date
31.05.2020



Shri K. Paranthaman

Designation
Senior Technical Assistant

Date
30.06.2020



ICAR-Central Institute of Brackishwater Aquaculture

75, Santhome High Road, M.R.C. Nagar, Chennai - 600 028

Phone: 044-24610565, 24618817, 24616948, Telefax: 044-24613818, 24610311

Email: director@ciba.res.in, Website: www.ciba.res.in

