भाकृ अनुप
ICAR

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ICAR-CENTRAL INSTITUTE OF FRESHWATER AQUACULTURE
(An ISO 9001 : 2015 Certified Institute)

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CONTENTS

Director's Desk	01
Research Highlights	02
Success Story	06
Important Events	06
Extension Activities / Technology Transfer	10
Other Extension Activities	13
Tribal Sub-plan (TSP/STC)	13
SCSP	14
Important Visitors	17
Awards	17
Superannuation	17

DIRECTOR'S DESK

Warm Greetings to all readers and best wishes for a very productive and fruitful New Year 2020!

The year 2020 has started with a lot of promise but the rapid spread of the global pandemic COVID-19 since 30 January when the first case of COVID-19 was reported in India, has caused unprecedented misery to people in all walks of life including those in aquaculture sector. In spite of this, ICAR-CIFA had made a good progress in research and development. Some of our research highlights during the period include development of grow-out technology of murrels (*Channa striata and C. marulius*) in earthen ponds with a production level of 4.5 to 5 tonnes/ha, development of a larval diet for *Ompok bimaculatus*, cloning and characterization of antibacterial activities of recombinant proteins of rohu antioxidant genes and isolation and characterization of a heterotrophic ammonia oxidising bacteria from aquatic environment. A breakthrough was achieved in breeding and seed production of

Indian Major Carps using CIFABROOD™ (a carp broodstock diet developed by ICAR-CIFA) during December-January in Tamil Nadu.

The important event we organized during this period was the third edition of the 'International Symposium on Genomics in Aquaculture (ISGA-III)' during 21-23 January 2020, which provided a platform for the exchange of new information among researchers and students in this very important area of research. A review Workshop on Perception and Implications of IMC breeding during North East Monsoon in Tamil Nadu by using CIFABROOD™, was organized by the institute in collaboration with the state fisheries department of Tamil Nadu on 6 March 2020. We also observed International Women's Day 2020 during 8-9 March 2020 and the Constitution Day on 29 January 2020.

Four of our technologies viz., CIFA-Carp Starter, CIFA-Carp Grower, Nanoplus@CIFA and Fish Hydrolysate were commercialized with the support of AgIn, New Delhi during the period under report. The technology license agreements for the four technologies were handed over to M/s. Agarwal Trading Corporation, Raipur, Chhattisgarh and the agreement for fish hydrolysate was handed over to M/s Smart Farming, Odisha on 3 March 2020.

We have organized nine technology transfer training programmes, 48 exposure visits and three field days involving 273, 1438, 91 participants, respectively during the period. The livelihood development programmes for the tribal farmers were continued during the period under report and several training and workshops were organized in Gajapati, Nabarangpur and Koraput districts in Odisha as well as in West Singhbhum district in Jharkhand. Similarly, livelihood development programmes for the Scheduled Caste farmers were continued under the SCSP programme, in the adopted districts of West Bengal, Punjab, Tamil Nadu, Andhra Pradesh and Odisha. The beneficiaries in all these areas were provided with training on scientific fish farming and also supplied with inputs for aquaculture operations.

Overall our progress in research and development was good and we hope to continue our good work in the future also in the new normal caused by the pandemic coronavirus disease (COVID-19).

(B.R.Pillai)
DIRECTOR

RESEARCH HIGHLIGHTS

Grow out culture of murrels

To develop package of practices for grow-out culture of murrels, the *Channa striata* and *C. marulius* (1:1) were stocked @ 4,000 fingerlings/acre in earthen ponds (0.04 ha). Fishes were fed with formulated feed initially @ 5% of their body weight and gradually reduced it to 2% as the culture progressed. Periodical liming and water quality testing were done to keep the water quality in optimal range. After 10 months of culture, a production level of 4.5-5.0 tonnes/ha with a final size of 500-800 g and the average survival of 60-65% was achieved. Total harvest was made by dewatering of the cultured fish ponds.

Haul of striped murrel, *Channa striata*

Rearing of *Mystus cavasius* from fry to fingerling

Rearing of *M. cavasius* fry to fingerling was undertaken at a stocking density of 20/m^2 in four 16 m^2 tanks. The growth and survival rate ranged from 0.50 -1.63 g and 60-76%, respectively during 30 days of rearing.

Growth of tilapia, *Oreochromis niloticus* under different stocking density

Oreochromis niloticus fingerlings (avg. length 38 mm and avg. weight 11 g) were stocked at 30, 40 and 50 Nos/m^3 in circular cement tanks to assess the growth at different stocking densities and feeding frequencies. The fishes were fed with a commercial floating diet having 25% CP (1 mm size) @ 5 % body weight daily in four feeding frequencies *i.e.*, one time, two-times, three times and four times a day. After two months the growth was assessed and the highest growth was observed at 30/m^3 stocking with three- and four-times feeding frequency, i.e., 90.5 g and 91.5 g, respectively. However, when fed one and two times daily at 30 Nos/m3, the average weight gain was 56 g and 80 g, respectively. The growth of tilapia stocked at 40 Nos/m^3 and 50 Nos/m^3 fed with once a day were 54 g and 51 g, with two times feeding it was 77 g and 74 g, respectively which was found to be significantly lower ($P<0.05$) than the fish fed 3 and 4 times per day.

Development of larval diet of *Ompok bimaculatus*

Thirty-day old *O. bimaculatus* larvae (0.44±0.20 g) were stocked at 70 Nos./tank in glass aquaria (25 L) in triplicates and fed with experimental diets for 50 days. The basal diet (control) was prepared using fish meal, soybean meal, groundnut oil cake, wheat flour, vegetable oil, vitamins and mineral mixture (having 40% protein) served as (Feed 1). Four test feeds were prepared using protein supplements, viz., blood meal, chicken viscera, egg albumin and mussel meat, and were added @ 10 % with the formulated basal feed (Control) before feeding, which served as Feed 2, Feed 3, Feed 4 and Feed 5, respectively. The fish grew to 4.81±0.07, 4.65±0.06, 5.36±0.05; 5.85±0.06 and 5.46±0.04 (g), respectively for test Feeds 1-4. Net weight gain was significantly ($P<0.05$) higher in Feed 4 (control feed along with 10% egg albumin) and survivability was significantly higher in case of Feed 2, that didn't differ significantly from the Feed 4.

Amylase and lipase activities were significantly higher in groups of Feed 3 and Feed 4, respectively, as compared to the other groups. Feed 4 exhibited the highest pepsin activity (4.35±0.12 U); however, alkaline proteases activities (Trypsin, Chymotrypsin) were reduced in groups of Feed 4 and Feed 5. Significantly lower aspartare aminotransferase (AST) and alanine amniotransferase (ALT) activities in the liver were recorded in group of Feed 4 and Feed 5, respectively.

Considering growth performance and survivability of the juveniles from the experiment, a formulated feed having 40% crude protein with 10% of egg albumin is suggested as a better feeding strategy to make the *O. bimaculatus* juvenile adaptive to the formulated diets.

Effect of nutrient supplementation on planktonic quality and quantity and growth and survival of peninsular carp *Hypselobarbus pulchellus* in fry to fingerling rearing

An experiment was conducted to evaluate the effect of nutrient supplementation in culture system on planktonic quality and quantity *vis-a-vis* growth and survival of the peninsular carp *Hypselobarbus pulchellus* during fry to fingerling rearing. *H. pulchellus* fry were stocked at 3 lakh/ha after 12 days of initial manuring and reared for 90 days in outdoor, 1000 L circular, soil-based ring cisterns for evaluating the effect of nutrient supplementation on planktonic quality and quantity and fish growth and survival. Nutrients in the soil base provided to each cistern were analysed prior to manuring. All the cisterns were manured with cow dung, urea and SSP at fortnightly intervals at recommended dose (CIFA, 2009). Water soluble forms of Mg (100 mg), Mn (100 mg), Zn (100 mg) and Si (0.2 ml) were applied to tanks once in 10 days. Tanks which did not receive any supplementary nutrient served as Control. No supplementary feed was given to any of the treatments. Fish growth, water quality and planktonic quality (species composition) and quantity were analysed at monthly intervals.

Growth data at the end of culture period revealed that final weight of fingerlings was the highest ($P<0.05$) in Si treatment followed by Mg (Fig. 1). No difference was observed between Control, Mn and Zn treatments. No difference ($P>0.05$) in length and survival was recorded among the different treatments (Fig. 1). Qualitative estimation of plankton revealed that, the population of diatoms (Bacillariophyceae and Coscinodiscophyceae), rotifers and plankton belonging to Chlorophyceae, Euglenophyceae and Trebouxiophyceae were higher in tanks supplemented with Si followed by Mg treated cisterns with plankton

belonging to Trebouxiophyceae. Euglenophyceae were higher in tanks supplemented with Mn, Mg and Si. The highest density of Cyanophyceae plankton was recorded in Zn treatment. The density of Crustaceans was higher in Control and Mn treatment.

The study revealed that addition of Si and Mg can help in improving the specific classes of beneficial live food, ultimately resulting in higher growth in the seed rearing of the peninsular carp *H. pulchellus*.

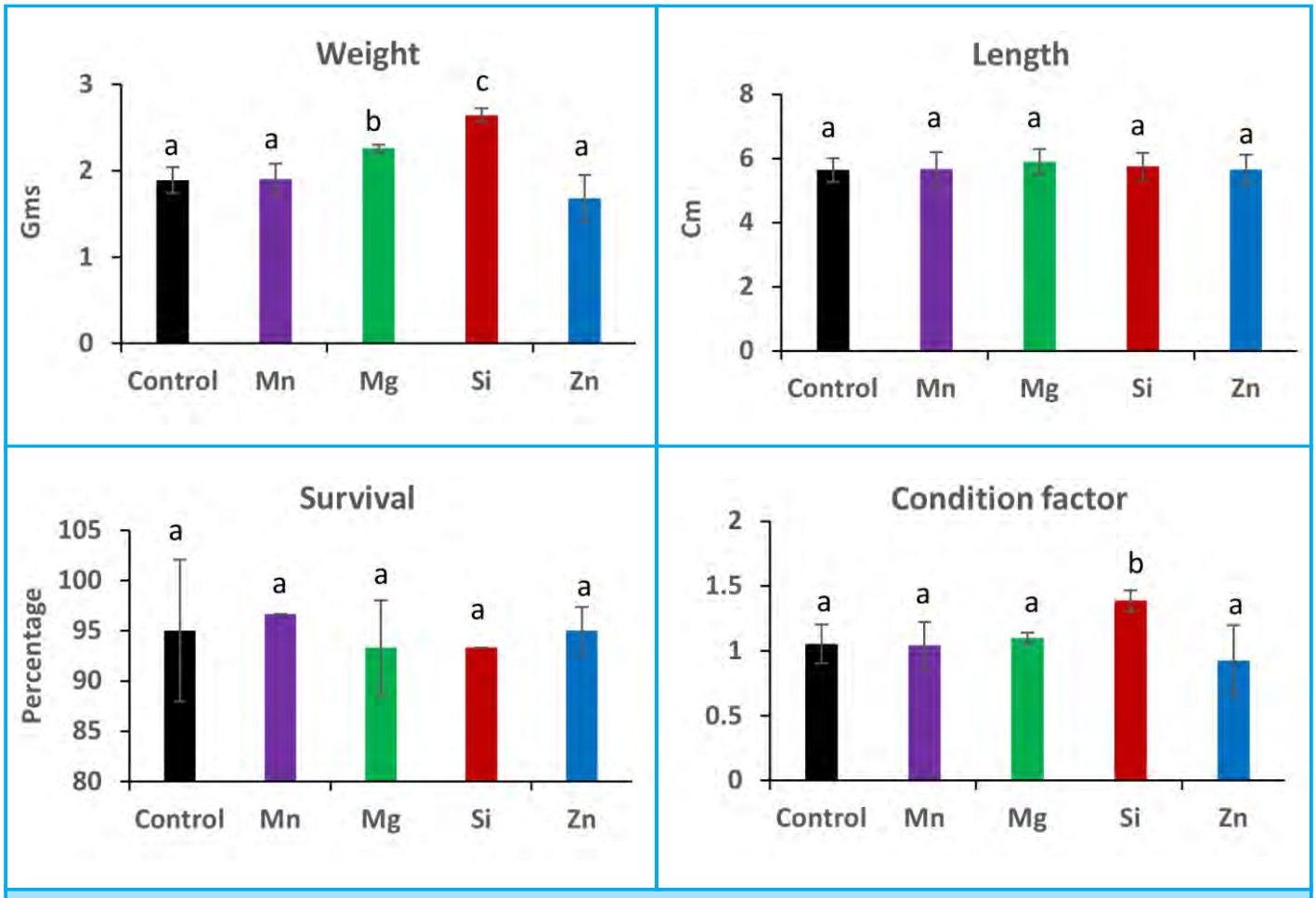
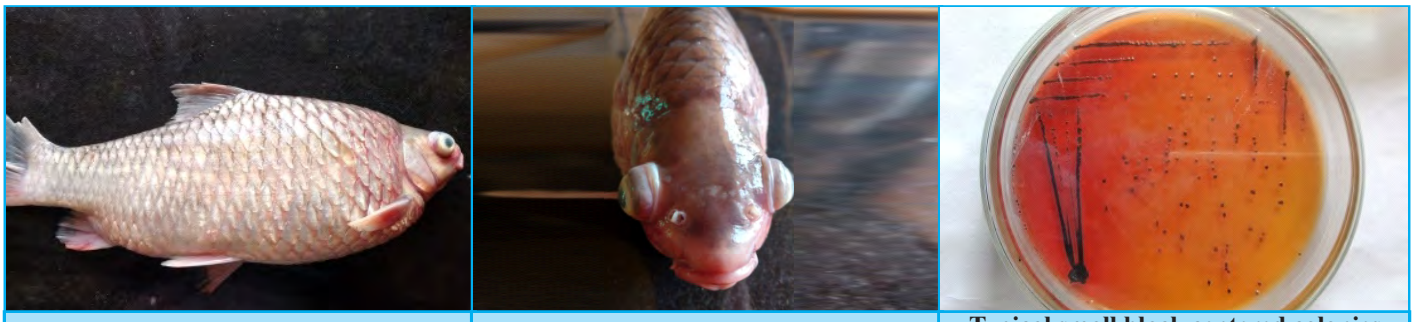


Fig.1. Growth and survival of *H. pulchellus* fingerlings at harvest. Different alphabets above error bars in the same graph indicate significant difference ($p<0.05$) between the treatments.

Infection in cultured *Hypselobarbus pulchellus*

H. pulchellus under culture were observed to have symptoms /clinical signs of abdominal distension, severe hemorrhages all over the body, exophthalmia with accumulation of serosanguinous fluid in peritoneal cavity and internal hemorrhages, which are typical of *Edwardsiella septicemia*. From the affected fish, black centered colonies resembling *Edwardsiella tarda* were isolated on SS agar plates. The black centered colonies appeared small, round in shape. Efforts are on to confirm the species by PCR.



***H. pulchellus* with abdominal distension** | ***H. pulchellus* with exophthalmia** | **Typical small black centered colonies on SS agar plates**

Cloning and characterization of antibacterial activities of recombinant proteins of rohu antioxidant genes

The full-length CDs of the four major antioxidant genes *i.e.*, Catalase, Glutathione peroxidise, Glutathione S-transferase, CuZn superoxide dismutase were amplified, cloned and sequenced. Recombinant proteins i.e., GPX, GST and CuZnSOD of *L. rohita* were expressed in *E. coli* BL21 (DE3) cells following induction with 1mM of IPTG at 37 °C for 6 h. In a soluble fraction of lysate, the expected band of proteins were detected and purified by using an anti-His antibody. The antimicrobial activities of r*Lr*GPX, r*Lr*GST, r*Lr*CuZnSOD were checked by minimum inhibitory concentration in gram-negative (*A. hydrophila*) and gram-positive (*Staphylococcus aureus*) bacteria, and the activities were observed in 200 µg/ml concentration for all the recombinant proteins.

Isolation and characterization of a heterotrophic ammonia oxidising bacteria from aquatic environment

A new species of *Pseudomonas* was isolated and identified from aquatic environment and further confirmatory identification by 16S rRNA has revealed that isolated bacteria belongs to *Pseudomonas aeruginosa*. The sequence analysis using NCBI blast showed 99 % identity with *P. aeruginosa*. The isolated bacteria are capable of heterotrophic nitrification and aerobic denitrification and have good ability to remove ammonia and nitrate without nitrite formation in the media.

Socio-economic status of fish farmers and farming practices in Andhra Pradesh

A study was conducted to assess the socio-economic status of fish farmers, their farming practices and impact of exotic fish species farming on sustainability of carp culture in the Krishna and West Godavari districts of Andhra Pradesh. A total of 103 farmers participated in the survey of which majority of the fish farmers (70.87%) were middle aged (30 to 60 years) group and mostly a category of small family (62%) followed by 22.33% and 07% farmers are young age and older age groups, respectively. It was observed that while majority of farmers (52.62%) involved in fish production were matriculate, the 10% and 33% were having primary and graduates and/or above levels of education, respectively. Majority of fish farmers (44.66%) had medium land holdings which were between the range of 5-10 ha followed by 41.74% of respondents having large land holdings. The average fish production of more than 5 tonnes/ha/year was obtained. This might be because of the better managerial interventions and adoption of scientific fish farming by the farmers. It was noticed that medium and larger ponds increased the possibility of effective management, more productivity and higher farm income. Majority of fish farmers are practicing carp culture (68%), followed by pangas (18%), pacu (6%) and others (8%). The polyculture of carps (58.25%) was most dominated in Andhra Pradesh followed by pacu and pangas. The intensification of fish was observed higher in case of pangas culture (15000 /acre), followed by pacu (6500/acre) and carps (2000/ acre). Due to higher growth rate and level of productivity, monoculture of striped catfish (*Pangasionodon hypophthalmus*) has been adopted as the second most important culture system in the state, whereas, pacu/roopchand (*Piaractus brachypomus*) farming could establish in low productive areas. Mash feeds are used widely in carp culture. De-oiled rice bran is used as the principal feed ingredient, followed by groundnut cake and cotton seed cake. Commercial pelleted floating feeds were used in the exotic species culture systems. Bacterial infections and different parasitic infestations lead to the predominant diseases in farming that had a significant impact on the yield and productivity of exotic fish and carp culture. It was noticed that a positive correlation observed among the different fish production systems. Cobb Douglas production model was applied to correlate different production systems. It was noticed that carp culture was highly correlated ($R^2 = 0.98$) and dominant with higher co-efficient value (0.63) which is significantly ($p<0.05$) different than exotic fish species culture systems.

Incidence of Disease in Fish culture in Andhra Pradesh

Primary and secondary bacterial infections, opportunistic fungi, different parasites are some of the pathogens that had a significant impact on the yield and productivity of Indian and exotic fish culture systems in Andhra Pradesh. However, there are no major emerging bacterial, fungal or parasitic pathogens in freshwater aquaculture systems in Andhra Pradesh. Survey on fish samples collected for antimicrobial resistance revealed no major specific antimicrobial resistance of microbes in freshwater aquaculture. Red disease (*Aeromonas spp.*) was found

to be most common and troublesome bacterial disease causing huge financial loss to fish farmers and cause 3% extra expenditure to fish farmers. Rohu (*Labeo rohita*) is commonly affected (57%) by red disease followed by common carp (18%), catla (9%), mrigal (7%). Red disease was also found to be not uncommon in pangas and pacu which occurs at a rate of 6% and 3%, respectively.

SUCCESS STORY

Breakthrough in breeding and seed production of Indian major carps using CIFABROOD™ during January in Tamil Nadu

For the first time in the country, a breakthrough was achieved in successful breeding of Indian Major Carps (IMC) during January in a private and a government hatchery at Tamil Nadu. CIFABROOD™ was provided during North East monsoon and the spent fishes of July-August 2019 were attained maturity after feeding CIFABROOD™ for 45-49 days in the two farms, and the fishes were bred successfully in December 2019-January 2020. The Pugazh Aqua farm, Cuddalore successfully bred both rohu and catla, but the government fish farm at Manimuthar, Tirunelvelli could breed only rohu. No maturation of rohu and catla could be observed in the control ponds fed with commercial diet in both the places. The breeding parameters and spawn recovery was almost comparable with the June-July monsoon. The spawn produced during December-January had grown very fast to fry as well as advanced fingerlings and juvenile and was ready for stocking by March-2020, which is much earlier than June. Demand of such stockable fingerling from the neighboring aquaculture states like Andhra Pradesh and Telangana are expected to rise in the coming years. Thus, the culture period may be extended by 3 more months starting from March to October. This success has a long term implication as Tamil Nadu can be developed into a major seed producing state especially during non-breeding/winter season, which will contribute substantially for the aquaculture production in the country.

Seed production at Pugazh Aqua Farm, Cuddalore and advance fingerling production at Govt. Fish Farm, Manimuthar, Tamil Nadu

IMPORTANT EVENTS

3rd International Symposium on Genomics in Aquaculture (ISGA-III)

ICAR-CIFA in association with the Association of Aquaculturists', Bhubaneswar organized the "3rd International Symposium on Genomics in Aquaculture" during 21-23 January, 2020. Prof. S. M. Patnaik, Vice-Chancellor, Utkal University, Bhubaneswar inaugurated the symposium and Dr. Victor Martinez, Director, FAVET-INBIOGEN, Chile graced the function as the Guest of Honour. Over 200 researchers from the various parts of the country and abroad participated in the symposium. There were four keynote speakers, 23 lead lectures, 20 oral and 73

poster presentations along with 14 award presentations during the symposium.

The keynote speaker Dr. Victor Martinez gave brief overview of genetic improvement program on *Seriola lalandi* using genomics as a tool. The recommendations from the first technical session pertaining to genetics, breed improvement and molecular breeding were more about policy initiatives at National level towards next generation genomics research with translational approach, and need of specific Mission Mode program on Aquaculture genomics for food fishes and ornamental fishes like10K, Indigen and India Genome and prioritization of institutional convergence to develop quality manpower. In the second session titled 'Genome editing, biosafety and biosecurity', the keynote speaker Dr.R. S. Tomar, IISER, Bhopal, discussed on mechanism of epigenetic regulation, H3 modification and H3 clipping and their role on gene expression. Other themes covered by the presenters include epigenomics, regenerative therapy using stem cells and transgenics for farmed fishes. During the third session on 'Genome Informatics and Intellectual Property Rights', the keynote speaker Dr. Subha Bhassu, associate professor from University of Malaya, Kuala Lumpur, Malaysia, discussed about the various stock improvement strategies and production of genetically improved, disease resistance stocks of black tiger shrimp. Other lead lecturers deliberated on issues pertaining to magur, shrimp and hilsa genomics. Discussions regarding exploration of various stock improvement strategies, commercialization potential of breeding line of SPF and SPR broodstock along with intensive implementation of IPRs for protection of innovations were also made. Dr. J. K. Jena, Deputy Director General (DDG), Animal Sciences and Fishery Sciences, ICAR, and Co-Chair, stressed on multilocation trials for the novel GnRH analogue developed for induced breeding of *Clarias magur*. The fourth session was on 'Genomics in fish health, nutrition and reproduction' and it comprised of one keynote address followed by eight lead lectures and seven oral presentations. Dr. N. Saha, Professor, Department of Zoology, North-Eastern Hill University, Shillong spoke about the mechanism involved in induction of key regulatory OUC genes in different tissues of two air-breathing catfish *H.fossilis* and *C.magur*.

The plenary session was held on 23 January under chairmanship of Dr. P.K. Agrawal, Vice Chancellor, OUAT, Bhubaneswar. Recommendations were made regarding development of efficient linkages among Institutes and national facilities for effective collaborations and constituting a master plan of prioritised species for genetic improvement. Comprehensive genomic resources for each prioritised species, phenomic database in fish towards genomic selection and magur to be made a model for in-depth studies on ammonia toxicity and formation of inter-disciplinary core group was also recommended. During this symposium, a special session for ISGA III awards sponsored by DBT was also scheduled. Around 50 abstracts were screened and five presenters for each category of awards were selected for presentation and three awards viz. ISGA-3 MS award, PhD award and Young scientist award were given to best presenters.

The chief guest of the valedictory session was of Dr. J. K. Jena, DDG, Animal Sciences and Fisheries. Dr. B.K. Das, Director, ICAR-CIFRI, Barrackpore graced the occasion as special guest. Dr B R Pillai, Director, ICAR-CIFA and Convener ISGA III, Dr Hirak K Barman, Organizing Secretary, ISGA III and Dr Subha Bhassu, University of Malaya, Kuala Lumpur, Malaysia also were present on the dias.

Review Workshop on CIFABROOD™

ICAR-CIFA, Bhubaneswar and Department of Fisheries (DoF), Govt of Tamil Nadu jointly organised one-day consultation-cum-review workshop on "Perception and Implications of IMC Breeding during North East Monsoon in Tamil Nadu by using CIFABROOD™" on 6 March 2020 at DoF, Chennai involving more than 45 fish farmers, hatchery owners and seed growers. Alongwith the stake holders, the scientists from ICAR-CIBA, state fisheries officials and extension functionaries from Govt. of Tamil Nadu participated in the workshop. The meeting was chaired by Dr. G. S. Sameeran, IAS, Director, DoF, Govt of Tamil Nadu in presence of Dr. J. K. Sundaray, Dr. S. Nandi, Dr. N. K. Barik, Dr. P. N. Ananth, Mr K. Anantharaja from ICAR-CIFA and Dr.Reena Selvi, Joint Director (Extension), DoF, Tamil Nadu as well as the scientists from ICAR-CIBA. Dr. Sameeran expressed his happiness on the successful IMC breeding during December-January in Tamil Nadu using CIFABROOD™. The Scientists-farmer interaction meet was held to discuss and clarify the doubts of the stake holders.

Constitution Day Celebration

ICAR-CIFA organized an invited talk on "Important Constitutional Amendments and their Significance" on 29 January 2020 at CIFA, Bhubaneswar to create awareness among the staff members on important constitutional amendments and their need for the society. Mrs. Archana Mishra, Senior Advocate and Member, District Legal Service Authority (DLSA), Khordha was the guest speaker of the occasion. She enlightened the gathering about important constitutional amendments and their significance especially GST, National Commission for Backward Classes and Reservation for Economically Weaker Sections (EWSs). The Institute also organized another invited talk on "Indian Constitution and Land Legislation & Reforms" on 20 February 2020. Dr Ashok Kumar Mohapatra, Senior Advocate, Odisha High Court, Cuttack enlighten the staff members about Indian Constitution and Land legislation & Reforms.

Celebration of International Women's Day 2020

ICAR-CIFA observed International Women's Day (IWD) 2020 during 8-9 March 2020. The theme of this year IWD was "I am Generation Equality; Realizing Women's Rights for an Equal Future". On 8 March 2020, a training-cum-workshop on "Advanced Entrepreneurship Development Programme for Women of Odisha" was held at ICAR-CIFA. Around 150 women farmers, entrepreneurs and SHG members from different parts of Odisha had participated in the event. Scientists from ICAR-CIFA spoke about various entrepreneurial opportunities on different aspects of fish farming. Experts from APICOL and other stakeholders like banks, MSME, KVK, Department of Agriculture and Horticulture spoke about availability of incentives and support of Government and banks to the women entrepreneurs. Successful entrepreneurs spoke about their achievements in the field of freshwater aquaculture. A farmers-scientist interaction meet was also held during the programme. In continuation to the IWD, 2020, a meeting was organized on 9 March 2020 at ICAR-CIFA, Bhubaneswar. Mrs. Guha Poonam Tapas Kumar, IAS, Director, Department of ST & SC, Govt. of Odisha, and the Chief Guest of the occasion spoke about the contribution of women towards the improvement of family as well as field and emphasized on their education and health. Ms. Sabarmati, eminent conservationist and Padma Shri designate and the Chief Speaker of this occasion spoke on 'Women and Food'. She applauded the contribution and responsibility of women in the process of 'Plot to Plate. Prof. Pravat Kumar Raul, Managing Director, APICOL and Guest of Honour spoke about the nutritional and economic security of women. To mark the occasion of International Women's Day, different competitions were arranged for the staff of ICAR-CIFA and the prizes were distributed by the Chief Guest of the programme. Seven successful women entrepreneurs were also felicitated for their significant achievements in agriculture and allied sectors. A Blood donation camp was also arranged by the institute with help of Red Cross Blood Bank of Capital Hospital, Govt. of Odisha, Bhubaneswar.

Inauguration of the Digital Outreach Center of the Institute

The Digital Outreach Center (DOC) was inaugurated in the ATIC facility of the institute by Shri Sanjay Kumar Singh, IAS, Additional Secretary, DARE and Secretary, ICAR on 21 February 2020. The DOC was established with the funding support from National Fisheries Development Board, Hyderabad to develop online learning modules (both audio and video modules) on different aspects of freshwater aquaculture.

EXTENSION ACTIVITIES / TECHNOLOGY TRANSFER

S. N.	Programme	No.	No. of participant		
			Male	Female	Total
1.	**Training programmes**	09	230	43	273
2.	**Exposure visits**	48	1045	393	1438
3.	**Field Days**	03	48	43	91
4.	**Inplant training of B.F.Sc students of College of Fisheries, OUAT, Ranagilunda (4 January to 7 March 2020)**	01	00	11	11

Commercialisation of technology

ICAR-CIFA commercialised four technologies, viz., CIFA-CARP STARTER, CIFA-CARP GROWER, Nanoplus@CIFA and Fish Hydrolysate during the period under report. The technology license agreements for CARP STARTER, CIFA-CARP GROWER and Nanoplus@CIFA were handed over to Agrawal Trading Corporation, Raipur, Chhattisgarh, and agreement for fish hydrolysate was handed over to M/S Smart Farming, Odisha at a special function held on 3 March 2020 at ICAR-CIFA, Bhubaneswar.

CIFA-CARP STARTER is a nursery feed for carp (34-35% crude protein and 5-6 % crude fat) which was developed to ensure higher survival, faster and uniform growth, higher palatability, improved digestion, immunity against infections and production of healthy fingerlings.

CIFA-CARP GROWER is a floating feed for carp (28% crude protein and 4% crude fat) which was developed to ensure higher growth, improved FCR, improved digestion, production of healthy and tastier fish. This is suitable for carp growers to enhance their production and profitability.

Nanoplus@CIFA, a formulation prepared from nanoparticles of two important trace minerals i.e., Zinc Sulphate and Sodium Selenite and is used as fish feed additive. Addition of these two trace minerals in nano form has synergistic effect on growth, better feed utilization and disease resistance in fish. It improves breeding performance, egg development, keeps the fish fin/scale healthy and promotes rapid wound healing. Moreover, it reduces the toxicity of other minerals and heavy metals contamination of water.

Fish Hydrolysate is a fermentation product prepared by fermenting the fish wastes with molasses, yeast and starter culture at ambient temperature that extracts amino acids, fatty acids, macro- and micronutrients, minerals and trace minerals, hormone and peptides. Recycling of fish or prawn processing waste in to the final product having a pH of 4.0-4.5 and self-stable without any microbial contamination.

Nursery feed For Carp "CIFA-CARP STARTER"

Floating feed For Carp "CIFA-CARP GROWER"

Dr. B. R. Pillai, Director, ICAR-CIFA handing over the MOU of Commercialized Technologies

Dr. B. R. Pillai, Director, ICAR-CIFA handing over the feed Packet to M/s Agrawal Trading Co, Raipur

Skill Development Programme "Fish Health Management and Disease Diagnosis for Sustainable Aquaculture"

One skill development programme on "Fish Health Management and Disease Diagnosis for Sustainable Aquaculture" was conducted at Bhagabanpur, Garadapur Block, Kendrapara district of Odisha during 27-29 February 2020. Fifty fish farmers from Kendrapara, Jagasingpur and Cuttack attended the programme. The water samples brought by the farmers were tested on spot and advisories were provided. An interaction meet between scientists and nearly one hundred fish farmers was conducted regarding the occurrence of various disease problems and responsible use of drugs and chemicals.

Fish Farmers-Scientists Interface Meet at Haldia, West Bengal

One Fish Farmers-Scientists Interface Meet on "Improved Variety of Carp and Freshwater Prawn for Enhancing Farmers' Income" was organized on 6 March 2020 at Haldia Bhawan, Haldia, West Bengal in collaboration with Department of Fisheries, Government of West Bengal under ICAR-WorldFish collaborative project. The objective of program was to sensitize the fish farmers of the state about the advantages of using genetically improved varieties of carps and freshwater prawn for higher production and income. About 80 participants including 63 progressive farmers from Haldia attended the program. Dr S. Adhikari, Pr. Scientist and Scientist-in-Charge, Regional Research Center (RRC), Rahara, ICAR-CIFA welcomed the farmers and guests and gave a brief overview of the interface meet. Shri Smrutiranjan Mohanty, IAS, Sub-Divisional Officer, Haldia was the Chief Guest of the function. Dr. (Mrs). M. Mukherji, Addl. Director Fisheries (Tech.), Govt. of West Bengal, Mrs. T. D. Banerjee, WBCS, Block

Development Officer, Haldia and Mr. S. N. Jha, General Manager (HR), IOCL, Haldia, West Bengal graced the occasion as invited guests. Dr. B. R. Pillai, Director, ICAR-CIFA highlighted about the developed genetically improved rohu, catla and freshwater prawn by the institute. She urged the farmers to take this benefit of these improved varieties. In the technical session, Dr. K. D. Mahapatra, Principal Scientist, ICAR-CIFA gave an overview of importance of genetically improved carps for increasing farmer's income. Eight scientists from ICAR-CIFA participated in the meet and gave presentations on various aspects of aquaculture. The farmer-scientist interaction was coordinated by Dr.H.K. De and Dr.B.N. Paul, Pr. Scientists of ICAR-CIFA.

The Institute participated in the following exhibitions:

S. N.	Programme	Venue	Duration
1.	International Symposium on "Marine Ecosystems Challenges & Opportunities (MECOS-3)"	Marine Biological Association of India (MBAI), Kochi	7-10 January, 2020
2.	23rd Banga Sanskriti Utsav	Kalyani, Nadia, W.B.	10-19 January, 2020
3.	Krushi Odisha 2020	Janata Maidan, Bhubaneswar	20-24 January, 2020
4.	International Symposium on Genomics in Aquaculture (ISGA-III)	ICAR-CIFA	21-23 January, 2020
5.	Conference on Ecosystem Health and Fisheries of Indian Inland Waters	Pantnagar, Uttarakhand	17-19 February, 2020
6.	ICAR-CIBA-Brackishwater Aquaculture Farmers' Conclave (BAFAC-2020)	Surat International Exhibition and Convention Centre, Surat	19-20 February, 2020
7.	Pusa Krishi Vigyan Mela-2020	IARI, New Delhi	1-3 March, 2020
8.	Farmers Fair-cum-Exhibition	OUAT, Bhubaneswar	7 March, 2020

OTHER EXTENSION ACTIVITIES

Fish Health Camp

- Farmers meet and awareness programme on "Responsible Fish Health & Environment Management for sustainable Development" was organized by ICAR-CIFA, Bhubaneswar and Regional Research Centre of ICAR-CIFA, Vijayawada, Andhra Pradesh at Undi, Bhimavaram, Andhra Pradesh on 26 January 2020.
- Scientist and Farmers interaction meet was conducted on "Fish health Management & Antimicrobial Resistance: One health Concept" organized by ICAR-CIFA, Bhubaneswar and Regional Research Centre of ICAR-CIFA, Vijayawada, at Vijayawada, Andhra Pradesh on 28 January 2020.

TRIBAL SUB-PLAN (TSP/STC)

Odisha

- Trainings on "Tuber Cop Production" and "Aquaculture Based Integrated Farming System" were organized at KVK, Gajapati during 14-15 February 2020. Around 100 tribal WSHG members from 22 SHGs from Nuagada, Rayagada & R. Udayagiri blocks attended the programme. The inputs like fish fingerlings, poultry chicks, ducklings, mango, guava, litchi planting materials, mushroom seeds, poultry feed, fish feed etc., were distributed to the beneficiaries under this program.

- ICAR-CIFA conducted training and demonstration programme on "Aquaculture Based Integrated Livelihood Development in Gajapati, Odisha" at Ajaygada, Gumma block, Gajapati on 07 March 2020. About 120 Primitive Vulnerable Tribal Groups (PVTG) women tribal beneficiaries from 19 Women Self-help Groups (WSHGs) from Gumma block participated in the programme. Various inputs, viz., improved variety of chicks, Khaki Campbell ducklings, mango grafts, guava gootees, solar lanterns, poultry feed, lime, mushroom seeds and feeding trays were distributed to beneficiaries. Fish fingerlings and floating fish feed were distributed to the Harabhangi reservoir tribal PFCS members at Adava, Mohana Block.
- ICAR-CIFA participated in International Women's Day and Seed Mela at Koraput, Odisha on 8 March 2020.

Jharkhand

- Visits were made to the farmers' ponds and sampling was done to evaluate the growth performance of fish which ranged between 15-25 g in grow-out ponds in both the areas (Chakradharpur and Chaibasa). It was noticed that farmers are not giving regular feed to the fishes due to winter since last 2-3 months and they were advised to provide feed regularly to the fish under culture in grow-out ponds. In some ponds alkalinity was observed below 80 and they were suggested to apply lime as per dose calculations.

A one day training programme on "On Farm Feed Preparation and Pond Management in Carp Culture" at Gram Panchayat Office, Gopinathpur village, Chakradharpur block was organized by ICAR-CIFA along with State Fisheries Department Officials and PRADAN representatives on 5 March 2020. Around 100 farmers were participated in the training programme. Some inputs such as plastic crates, weighing balances, dragnets and $KMnO_4$ were distributed to the selected farmers of the block under study.

SCSP

West Bengal

Identification and selection of beneficiaries under livestock component was completed and 200 beneficiaries including 70% women were selected. This activity was being carried out in collaboration with Ashok Nagar KVK under WBUAFS. Under fisheries component, lime and aluminum fish containers were distributed to 147 beneficiaries of Shahebrabad I and II and Baburabad village, Sonarpur, South-24-Parganas and 90 beneficiaries of

Chakdah Block, North-24-Parganas. Floating fish feed were distributed to the beneficiaries of South 24-Parganas and North 24-Parganas. Scientists of ICAR-CIFA demonstrated fish feed dispensing measures to be taken up for minimizing loss. Horticulture plants were distributed to 90 beneficiaries of Gaighata block, North 24-Parganas, West Bengal. These saplings are to be planted on pond dykes towards development of integrated farming systems.

Odisha

A total of 27 fish farmers have been identified in Kendrapara district and the action plan for demonstration of scientific fish culture for this region have been prepared in collaboration with District Fishery Officer, Kendrapara. A meeting was held with the framers to understand their problem regarding aquaculture practices and they were also sensitized on scientific aquaculture practices.

Andhra Pradesh

A taining-cum-demonstration programme on "Scientific Fish Farming and Management Practices in Freshwater Aquaculture" organized by RRC, ICAR-CIFA, Vijayawada at Kuchipudi village, Guntur District, Andhra Pradesh during 25-27 February 2020. A total of 30 fishermen and fish farmers were participated in the training programme. The programme aimed at capacity building of SC farmers for improvement of livelihood and income generation. Dr. D. Srinivas, ADF, Vijayawada, Shri. B. Krishna Kishore, FDO, Kuchipudi, and V. Ratnaprakash, Programme Assistant, KVK, Guntur District, A.P. was present as resource persons. Inputs like portable water and soil test kits (10 Nos.) and ice chillers (20 Nos.) were distributed to the beneficiaries who had attended the training programme. Floating fish feed (50 bags) was distributed to the beneficiaries in the third phase of inputs distribution who have successfully adopted fish farming in Amruthalur block, Guntur district, Andhra Pradesh.

Punjab

Regional Research Centre, ICAR-CIFA, Bhatinda in collaboration with KVK, Bathinda and State Fisheries Department, Punjab organised a two-day training-cum-input distribution programme on "Technical Intervention for Sustainable Livelihood Development of SC Farmers of Bathinda, Punjab" during 28-29 January 2020. Mr Ajit Singh, ADF, Bathinda, Dr J. S. Brar, Associate Director, KVK, Bathinda and Dr.M.K. Bairwa, SIC, RRC, Bhatinda spoke on the occasion. Different aspects of beekeeping, mushroom cultivation, dairy farming and value addition of fruits & vegetables were discussed by the experts from KVK Bathinda. The training was attended by 33 farmers and various inputs were provided to the farmers.

Tamil Nadu

One day training programme on "Scientific Aquaculture Practices and Backyard Poultry Farming" was organized at Maduranthakam, Tamil Nadu on 11 February 2020. About 100 women beneficiaries selected from different Self-Help Groups participated for backyard poultry farming and 13 beneficiaries for grow-out culture of carps. The beneficiaries were provided with backyard poultry cages, 5000 Nos. of day old desi poultry chicks for rearing in cages and starter poultry feed. Grow out technology of rohu with necessary inputs and scientific guidance of ICAR-CIFA was demonstrated at Chitamur, Maduranthakam and Lathur Blocks of Kanchipuram district. Advanced fingerlings of rohu (about 30,000 Nos) were stocked in ponds of SCSP beneficiaries.

MGMG Programme

Inauguration of Field School on Carp Culture at Sarakana

A "Field School on Carp Culture", sponsored by ATMA, Khordha was inaugurated on 17 January 2020 at Aquaculture Field School, Sarakana. Twenty five practicing fish farmers participated in the school. The operator farmer, Sri Batakrishna Sahoo welcomed the farmers and the resource persons. Dr G.S. Saha, Dr H. K De, Scientists from ICAR-CIFA; Sri Raghunath Nayak, Retired AFO and Sri A.K. Bastia, AFO Balianta were present on the occasion. The field school will have five more sessions where the farmers will get an opportunity to share their experiences and learn from each other. A booklet in Odia *'Machha Chasa'* was released on the occasion.

Scientist-Farmers Interaction Meet at Jagannathpur, Odisha

A "Farmers- Scientists Interaction Meet was held at Jagannathpur village Balianta block, Khordha district, Odisha on 5 February 2020 where about 25 farmers participated. Scientific cultivation/husbandry practices of bush type French bean variety, Falguni, photo-insensitive variety of cauliflower Fujiyama and green gram in rice fallow and okra and health management of fish was discussed. Farmers were also provided with relevant extension literature.

Farmer-Government Interface Meet

A Farmer-Government Interface Meet was organised by Darbar Sahitya Sansad in association with Bhargabi Fish Farmers Producers Company Limited

on 07 February 2020 at Naroda Balipatna. About 50 member fish farmers participated in this programme in which Dr M. Sinha, Senior Executive Officer, NFDB; Mr. A.P. Sahoo, representative from Samunnati Financial Intermediation and Services Pvt. Ltd; Dr H. K. De, Pr. Scientist, ICAR-CIFA had joinbed as resource persons. The farmers were made aware about the availability of various govt. schemes for improving their farming practice.

IMPORTANT VISITORS

Visit of Additional Secretary, DARE and Secretary, ICAR

Additional Secretary, DARE and Secretary, ICAR Shri Sanjay Kumar Singh, IAS visited ICAR-CIFA, Bhubaneswar on 21 February 2020. He visited the CIFA farm facilities such as hatchery for Jayanti rohu, carp culture unit, murrel/Anabas unit, ornamental fish unit, feed mill and KVK, Khordha of the institute. He also witnessed the haul of diversified fish species.



AWARDS

- Mrs Sweta Pradhan received the First Prize in Hindi Essay Competition from Ministry of Home Affairs, Department of Official Language, Nagar Rajbhasha, Bhubaneswar.
- Dr. D. K.Verma, ACTO, In-charge, Official language received the Consolation Prize of Best Hindi Patrika Award for the Institute Hindi Patrika "NILITIMA-2019" (Edited by D. K. Verma, S. Saurabh & Rakhi Kumari) of ICAR-CIFA by Chairman, Town Official Language Implementation Committee, Bhubaneswar on the occasion of 66 TOLIC Meeting on 21 January 2020 held at Institute of Physics, Bhubaneswar.
- Mrs. Puja Singh was awarded Ph.D degree from Vidyasagar University, Medinipore, West Bengal on 14 January 2020 for her research work on "Utilization of certain organic wastes in aquaculture" under the supervision of Dr. B. N. Paul, Pr. Scientist, RRC, Rahara.

SUPERANNUATION

- Shri Jogendra Dalai, UDC on 31 January, 2020
- Shri Jagannath Ojha, SSS on 29 February, 2020

भाकृअनुप
ICAR

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