

# सिफरी समाचार CIFRINEWS

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Shri Gajendra Singh Shekhawat, Hon'ble Union Minister, Ministry of Jal Shakti, Govt. of India releasing tagged Hilsa in the River Ganga at Farakka



**Shri Pratap Chandra Sarangi**, Hon'ble Minister of State, Fisheries, Animal Husbandry and Dairying and MSME, Govt. of India visiting pen culture site at Rishia reservoir, Odisha

## Inside

Director's Column p-02; About ICAR-CIFRI p-02; Research Highlights p-03; Activities under NEH p-09; Technology Demonstration p-10; Ranching Programme p-10; Book/Bulletin p-11; Trainings & Capacity Buildings p-12; Documentary Films Developed p-14; Mass Awareness p-14; Staff Corner p-15; Meetings p-19; Events Organised p-21; ITMU News p-26; STC Activities p-27; Activities under SCSP p-28; Swachh Bharat Abhiyan Activities p-30; Hindi Section p-32.



Vadodara Research Station of ICAR-CIFRI shifted to the new building at GERI campus, Gotri, Vadodara, Gujarat

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## Director's Column



The world has witnessed an unprecedented health crisis in the form of COVID 19 since last quarter of 2019. During July-December 2020, the intensity of the disease was much lesser in India as compared to the first half of the year, although in some countries the second wave had struck. The Government of India started unlocking the economic activities. The institute also started the field sampling and outreach activities. However, many people lost their livelihood during the lock down period; farmers, fishers were also not exception. The institute tried its best to lessen the impact of this pandemic on the life and livelihood of fishers. The fishers were guided with the scientific management practices of wetlands and reservoirs through capacity building programmes. Fisheries inputs were also provided under SCSP, TSP projects.

We have successfully organized international webinars on Ganga Dolphin and on Small scale fisheries. The webinars witnessed participation of many delegates from foreign countries. In this pandemic time, the institute could conduct 9 training programmes for the fishers/fish farmers and two programmes for officers, scientists and youth. Besides, several mass awareness camps were conducted. Five ranching programmes were organized in Ganga River. National fish farmers day, Independence day, Hindi week, 150<sup>th</sup> Gandhi Jayanti Saptah, Vigilance awareness week, World fisheries day, Ganga utsav were some of the major events celebrated/organized by the institute. The institute filed two patent and one trademark applications during the period. Six MoUs were signed with different organizations for collaborative research and development activities in various parts of the country.

We are thankful to the Hon'ble Union Ministers, Shri Gajendra Singh Shekhawat and Shri Pratap Chandra Sarangi who visited our Hilsa Experiment site, Farakka, West Bengal and pen culture site at Rishia reservoir, Odisha, respectively. During the period, eight of our staff got promoted. Many staff got awards/recognitions and brings laurels to the institute. Seven of our young scientists were awarded with PhD degree. I congratulate all of them. Six of our staff got superannuated. I acknowledge their contributions in growth of the institute and wish them very healthy and happy retired life.

We have been saddened by the demise of our former colleagues Dr. B.C. Jha, Principal Scientist, Shri R.L. Balmiki, Technical Officer and Shri Kamlesh Kumar, SSS. We acknowledge their contributions in growth of the institute. The institute mourns for their death and prays to God for providing enough strength to the bereaved families to bear the loss.

Barrackpore,  
February 2021

**Dr. B. K. Das**  
Director

## About ICAR-CIFRI



Started as Central Inland Fisheries Research Station in March, 1947 at Barrackpore, West Bengal, ICAR-CIFRI has carved a niche in inland fisheries research. Induced fish breeding, composite fish culture and other scientific fish production practices developed during the sixties by the Institute helped in bringing the blue revolution in the country. Reservoirs and wetland fisheries management technologies developed and disseminated by the institute resulted in enhanced fish production from these resources. By the turn of the year 2000, the research and development agenda of the Institute concerning inland open waters shifted from fish as the only benefit to ecosystem health and ecological benefits with emphasis on sustainability, livelihood and nutritional security. In addition to the Headquarters at Barrackpore and two Research Stations at Kolkata and Kochi, CIFRI has four Regional Research Centres at Allahabad, Guwahati, Bengaluru and Vadodara, through which the issues of inland open water fisheries are being addressed.

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## Research Highlights

### Plant based fish aggregation device at middle and lower stretches of River Tapti, India

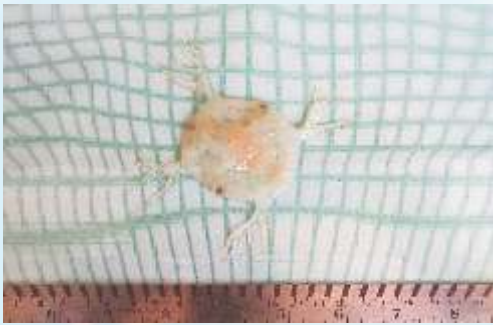
Branches of dried rose plants tied with nylon or coir ropes placed into the shallow and sluggish water adjacent to dipped big stones were used as a fish aggregating device in the middle and lower stretches of River Tapti for small prawns and fishes. Round the year, except for the monsoon season, this device is used. Fishermen select a particular area where the dried rose plant branches are kept, depending upon depth and hiding place during evening hours and harvest prawns/fishes in the next early morning by lifting those branches along with harvests with a push net, locally known as 'Pelni'. Prawn species like *Macrobrachium lamarrei lamarrei*, *Macrobrachium kistnense*, *Macrobrachium tiwari* and other small fishes like gobids, eels, barbs also were found in the catch composition. On average, CPUE was recorded as 0.25 to 2.5 kg/fisher/day.



Fish aggregation devices and the harvest

Dibakar Bhakta, W. A. Meetei, S. P. Kamble, Vaishak, G., T. N. Chanu, S. K. Koushlesh, J. K. Solanki, S. Samanta and B. K. Das

### Common jellyfish, *Aurelia aurita* (Linnaeus, 1758) at the estuarine stretch of river Narmada, Gujarat



Common jellyfish recorded from Narmada estuary, Gujarat, India

Common jellyfish (*Aurelia aurita*) was recorded for the first time between Bhadbhut and Mehgam region of Narmada river, Gujarat. *Aurelia aurita* is under the Phylum Cnidaria, order Semaestomeae, family Ulmaridae characterized by radial symmetry and tentacles around the mouth. It is commonly called as “common jelly” or “moon jelly” due to its milky, translucent colour and shape of the body. The moon jellyfish can effectively be identified by its delicate umbrella-shaped body, four horseshoe-shaped gonads, and four long and narrow oval arms hanging downwards. The gonads are slightly reddish or pinkish and are visible from the body surface. The disc is flat, and the diameter was measured as 55 mm. The colour of the body is entirely transparent or colourless, radial canals and tentacles are whitish. A single individual was observed from the bagnet (10 mm cod-end mesh size) catch during pre-monsoon (May 2019) sampling.

This common jellyfish are well distributed in the coastal waters of tropical and temperate oceans of all over the world. They are found in all zones of coastal waters of the Atlantic Ocean, Pacific Ocean and the Indian Ocean and can withstand temperature from 6-31 °C with the optimum temperature being 9-19 °C. This is also considered as inshore species and found in estuarine habitats and harbors. They are mainly found in surface water and swim horizontally. As reported, moon jellyfish is carnivorous and feeds on molluscs, young worms, crustaceans, and copepods. The moon jellyfish is generally considered as harmless for the human being, but they are occasionally known to sting people in various parts of India.

B. K. Das, Dibakar Bhakta, S. P. Kamble, Lohit Kumar, A. K. Sahoo and S. Samanta

### Isopod parasite *Alitropus typus* (Aegidae) infestation in freshwater fishes at the lower stretch of River Tapti, India

Infestation of ectoparasite, *Alitropus typus* H. Milne Edwards, 1840, was found in freshwater fishes, *Labeo boggut*, *Oreochromis niloticus*, *Systomus sarana*, and *Xenentodon cancila* during post-monsoon sampling of the lower stretch of River Tapti. The infested fishes were harvested by gill net (20-60 mm mesh size) from the Singalkanch (21°25'41.1" N, 74 °31'48.6" E) fishing site of Gujarat. *Alitropus typus* is attached to the body surface, buccal cavity and gill chamber of fishes, which causes atrophy of the



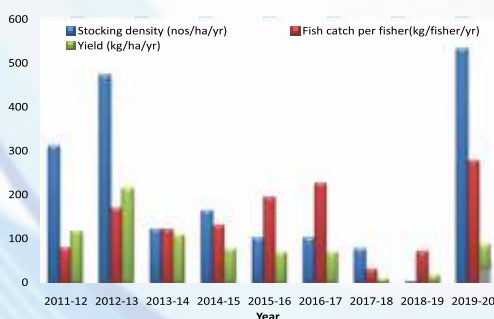
*Alitropus typus* and its infestation on the body surface of Nile tilapia (*Oreochromis niloticus*)

observed as 23.67 °C, 8.05, 9.76 mg l<sup>-1</sup>, 150.67 mg l<sup>-1</sup>, 126.32 mg l<sup>-1</sup>, and 117.33 cm, respectively on sampling time.

Dibakar Bhakta, S. P. Kamble, W. A. Meetei, Vaishak, G., J. K. Solanki, Raju Baitha, S. K. Das, S. Samanta and B. K. Das

gills, mouth deformation, changes in behaviour, feeding, and growth and deterioration of general health condition in fishes. It was found that *A. typus* parasitic isopod infected most of the fish species collected during the post-monsoon sampling period from Singalkanch sites of River Tapti. Isopod *A. typus* was not host-specific and might attack a wide variety of fishes. The water parameters, namely water temperature, pH, DO, alkalinity, total hardness, transparency, were

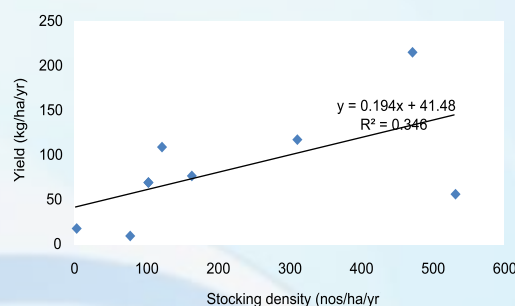
## Impact of fish seed stocking in Poondi reservoir



Stocking density and fish yield in Poondi reservoir during 2011-20

Poondi reservoir (13°11'6"N, 79°51'36"E) is one of the major reservoirs across Kosathalaiyar River in Thiruvallur district of Tamil Nadu. The area is 1729 ha at the full reservoir level. There are 9 fishery societies with 770 members in and around Poondi reservoir which issues license to its members for fishing. The seed stocking was 8.40 lakhs during 2019-20 and the exploitation target fixed at 8.4 tonnes for stocked and 130 tonnes for unstocked fishes. Major fish species

stocked in the reservoir were *Labeo catla*, *L. rohita*, *Cirrhinus mrigala* and *Cyprinus carpio*. The relationship of stocking density to yield was assessed by regression analysis and the relationship is  $y = 0.1948x + 41.48$  ( $R^2 = 0.3467$ ). The Pearson correlation analysis showed that stocking density has a strong positive correlation with fish yield ( $r = 0.59$ ).



Relationship between stocking density and fish yield in Poondi reservoir

V. L. Ramya, M. Karthikeyan, Preetha Panikkar, U. K. Sarkar, B. K. Das

## Exploration of Pong Reservoir, Himachal Pradesh

An exploratory survey was made at Pong reservoir, Kangra, Himachal Pradesh by the institute during 14-20 October, 2020. Assessment of primary production, limno-chemical profiles, biotic organisms, fish catch data, visiting landing centres, wildlife data collection, interacting with associated Fishery Officers, socio-economic data collection of fishers were done under GIZ sponsored project. Some of the fishers who left fishing for other activities like NREGS returned back to fishing, generating more revenues from this water body. The exploratory team was led by Dr. A. K. Das, Principal Scientist who held a meeting with the



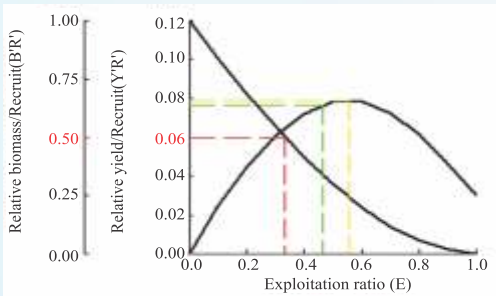
Harvested fishes from Pong reservoir



Director, DoF, Govt of H.P. discussing and sharing knowledge on how to enhance fisheries in this reservoir including developing package of practices for enhanced fisheries as well as up-scaling livelihood of the fishers.

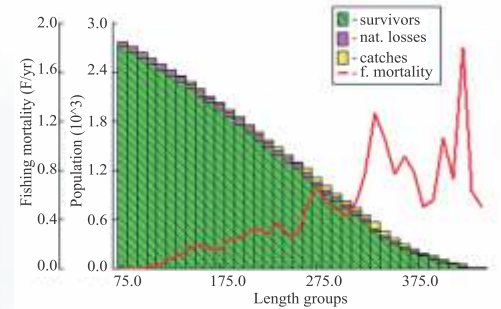
B. K. Das, A. K. Das, U. K. Sarkar and Lianthuamluaia

## Population dynamics of Tilapia in Halali Reservoir, Madhya Pradesh



Relative yield-per-recruit and biomass-per-recruit of *Oreochromis niloticus* in Halali Reservoir (Lc/L $\infty$  = 0.36, M/K = 0.95)

The sampling stations at Patra Nalah representative of lotic environment and dam site as a representative of lentic environment were selected for sampling during September 2018 to June 2019. Length-frequency data of *O. niloticus* were taken monthly from the commercial catches at different landing sites. Random samples of 1250 specimens were collected. Total length ranged from 75.0 to 445.0 mm and weight from 47.0 to 1050.0 g. The data were analysed using FiSAT II software package (FAO-ICLARM Stock Assessment Tools). The length frequency distribution plots of landings from lotic (Patra Nalah) as well as lentic sector (Halali dam site) revealed the higher relative abundance of larger size groups (250 mm TL and above) in the catches of Patra Nalah as compared to Halali dam site which indicates greater abundance of mature individuals. This can be attributed to higher level of detritus of allochthonous origin carried in the reservoir from Bhopal city and nearby areas. Growth parameters of von Bertalanffy growth formula of *O. niloticus* were estimated as L $\infty$  = 467.25 mm and K = 0.63/yr. The total mortality rate Z was estimated from Length converted catch curve method. The mortality rates M, F and Z computed were 0.60, 0.72 and 1.32, respectively. The rate of exploitation (E) was estimated as 0.54. It appears that the stock of *O. niloticus* do not exceed the maximum fishing pressure (E $_{max}$  = 0.55) and fishing mortality of *O. niloticus* seems to be above the optimum pressure (E < 0.50). The relative yield-per-recruit and biomass-per-recruit were determined as a function of knife edge selectivity (Lc/L $\infty$ ) and Beverton-Holt life history invariant (M/K) were 0.36 and 0.95 respectively. Values of the mean fishing mortality (F) and the mean exploitation rate (E) estimated by the analysis were 0.72 and 0.54 respectively. Since the exploitation rates were just above the optimum fishing pressure, the stock of *O. niloticus* is in a congenial state in the reservoir. Based on the study, we have recommended to increase the existing effort in terms of gill net mesh size with target size individuals (TL – 150 to 250 mm) to control the population of *O. niloticus* and a successive higher rate of annual stocking of IMCs may be followed in order to rejuvenate carp fishery in Halali reservoir.



Length-structured virtual population analysis of *Oreochromis niloticus* in Halali Reservoir

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*Oreochromis niloticus* landings of Halali reservoir

Canciyaal, J., Satish K. Koushlesh., U. K. Sarkar, A. K. Das and B. K. Das

## Waste to wealth-a green initiative by ICAR-CIFRI

The Institute has adopted the waste-to-wealth under the Swachh Bharat Abhiyaan programme and established a vermicompost manufacturing unit at its residential campus.

The organic waste materials, such as garden wastes, leaf litters, kitchen refuges, weed biomass, etc. are being converted into nutrient rich organic fertilizers using



Earth worms



Vermicompost bed



earthworm as composting inoculum. The present unit—having a composting period of 35-50 days—can convert more than 400 kg waste materials to about 100 kg manure. The converted manure contains a C:N ratio of 10:1, which is ideal for agricultural crops as well as source of nutrient for organic aquaculture. In addition, the unit also generates a good amount of revenue for the institute. The institute has filed a patent to the Indian Patent Office on 11 November 2020 (Patent application No. 202031049308) on the entire vermicomposting procedure including the composting ingredient used in the process.

Soma Das Sarkar, Basanta Kumar Das, Subir Kumar Nag, Srikanta Samanta

## Low-cost nutrient media for freshwater microalgae and biodiesel production

Vermicompost extract was prepared by both aerobic and anaerobic digestion method from vermicompost, which was obtained from organic waste materials like garden wastes, leaf litters, and kitchen refuges, weed biomass, etc. using earthworm as a composting inoculum. The culture media was prepared by adding vermicompost extract to BG11 medium at different proportions and the culture was kept at standard culture condition. Results revealed that 50:50 combination of anaerobically digested vermicompost extract and BG11 medium improved the growth performance (biomass  $\sim 34 \pm 0.7 \text{ mg L}^{-1} \text{ day}^{-1}$ ) of *Graesiella emersonii*, a sub-species of *Chlorella* among all the combinations. The lipid content and lipid productivity were found to be 15.11% and  $3.59 \pm 0.0004 \text{ mg L}^{-1}$ , respectively. Methyl palmitate was the dominant fatty acid as revealed by GCMS analysis. The developed low-cost nutrient media is beneficial for freshwater microalgae to be used as supplement feed for fishes. The Institute has filed a patent to the Indian Patent Office on 11th November 2020 (Patent application No. 202031049308) on the utilization of vermicompost extract for microalgae culture and biodiesel production.

Soma Das Sarkar, Santhana Kumar V., Basanta Kumar Das

## Successful captive breeding of a freshwater peacock eel, *Macrogathus aral*

*Macrogathus aral* (Bloch & J. G. Schneider, 1801), a fresh water eel successfully bred for the first time in captivity under “All India Network project on breeding and culture of ornamental fish”. Fishes were collected from North and South 24 Parganas, Nadia and Bankura districts of West Bengal and reared in captivity for five to six months, until they matured. Breeding season of freshwater eel starts with the onset of monsoon season with a peak during July-August in West Bengal. More than ten numbers of breeding trials were conducted in glass aquarium of 2' x 1.5' size during the peak season. The preferred water quality parameters were maintained. Small wooden logs and aquatic plants were provided as substratum for spawning. A mild flow of water was maintained in the aquarium with the help of electrical filter and aerator.

Female to male ratio were taken for breeding is 2:4. Spawning response varied from 10-12 hours. Eggs were round, adhesive, green in colour and found attached with bushy plants or another substratum. A total of 70-90 eggs of diameter 2.0-2.5 mm were collected from a pair of fish after 24 hours. Hatching took place after 48-56 hour of spawning. This was the first attempt to breed this fish in captivity; more trials are being continued to improve the larval rearing technology to increase the survival of the young ones.



Male and female of peacock eel

Fertilized egg

4 days after hatching

10 days after hatching

Developmental stages of *M. aral* from egg to larvae

Archana Sinha and Himanshu S. Swain

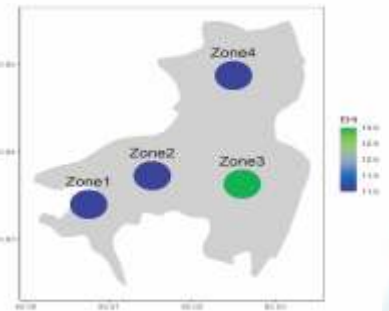


## Assessment of the ecological health of Derjang reservoir, Odisha

Ecological health of Derjang reservoir, Angul, Odisha was assessed using ecological health index based on fish species richness, number of exotic fishes, fish diversity indices, algal pollution index, and Trophic State Index. Derjang is a medium productive reservoir from the fisheries point of view. The ecological health index indicated the Zone 3 where streams are joining the reservoir showed the highest ecological health index. The study indicated that the ecological health of Derjang reservoir is in the moderate condition.



A view of Derjang reservoir, Odisha



Ecosystem health index of different zones of Derjang reservoir

Lianthuamluaia, U. K. Sarkar, T. Tayung, P. Majhi, A. K. Bera, B. K. Naskar and Y. Ali

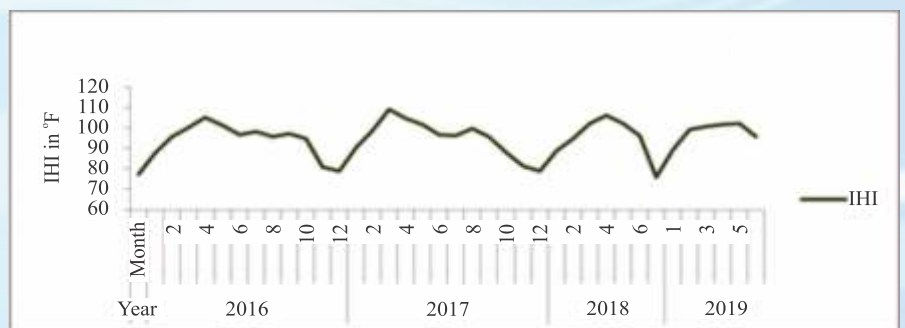
## Investigation on ecological status, conservation and enhancement of fisheries in Madhya Pradesh part of Sardar Sarovar Reservoir

The institute carried out a study spanning over two years (2018-20) to assess the status of the ecology (biotic and abiotic components), fish habitat characteristics, fisheries for the development of fisheries management strategies and suggested appropriate conservation measures for the restoration of threatened fish fauna in Madhya Pradesh part of Sardar Sarovar Reservoir. Seasonal samplings were carried out in four different stations of the reservoir namely Maheshwar, Rajghat, Koteshwar and Kakrana. The study indicated that water quality parameters in the reservoir are within optimum range and thus are congenial for fish production. The persistence of macro-habitat such as deep pool indicated the possibility of cage culture technology for table fish production. Abundance of planktonic groups like Bacillariophyceae and Chlorophyceae in all the three seasons indicated year-round availability of food for juveniles of most of the commercially important fishes. The analysis of fish catches showed rich diversity (56 species) of finfishes including small indigenous as well as economically important moderate and large sized fishes. The nonexistence of motorized fishing crafts in the region indicates that there is a need for improvement in the skill level as well as fishing inputs employed by the existing fishing communities for achieving better fish yields in coming years. Trophic state index (TSI) indicated that the studied part of Sardar Sarovar Reservoir in Madhya Pradesh as oligotrophic. The predicted value of the potential fish yield during study period was 42.8 kg/ha/year. However, this MSY value is double than the present mean yield (22.4 kg/ha/year). The CAFF (2006) categorization of fish species in the Sardar Sarovar Reservoir revealed presence of 15 finfish species under threatened categories (vulnerable and endangered) which includes the Mahseer and thus needs better management strategies for its protection in native habitats.

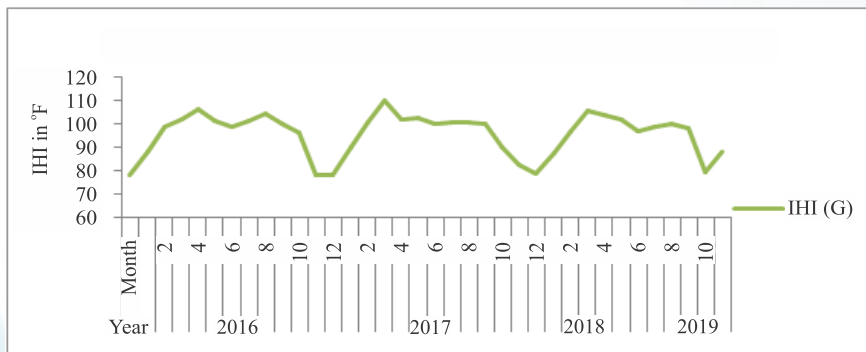
Satish Koushlesh, U. K. Sarkar, B. K. Das, C. Johnson, A. K. Das, B. K. Naskar, Y. Ali

## Impact of heat waves on wetland fisheries

A study on the impact of heat waves in a stretch of Ganga River and Bhomra wetland of West Bengal was carried out. The inland heat index (IHI) was derived from monthly data obtained from IMD. The study indicated predominant and periodic occurrence of inland heat waves under 'caution' category in these ecosystems during summer months. In order to identify the level of impact of heat index on the dependent variables such as hydrological variables, a principal component analysis was carried out. The study indicated that the first two components with loadings 2.9 and 2.4



Inland heat index in Bhomra wetland



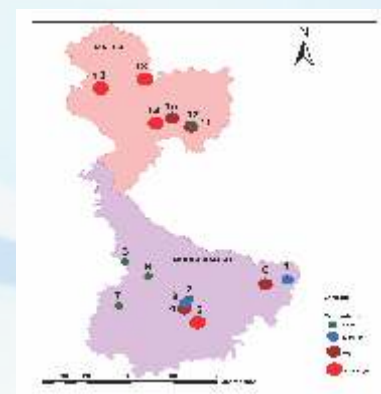
Inland heat index of Monirampore ghat of Ganga river

anthropogenic inland heat waves would take a great toll on the diversity and ecosystem worth of inland aquatic systems.

U. K. Sarkar, P. Mishal, G. Karnatak, A. Bandyopadhyay, B. Das Ghosh, B. K. Das

### Vulnerability assessment based on stakeholders' perception with regards to climatic variability

The study indicated that among the districts of West Bengal, Malda was highly vulnerable; whereas, Nadia and Bardhaman districts were less vulnerable. Cooch Behar, North 24 Parganas and Murshidabad were moderately vulnerable and required to be sustainably conserved for the utility of the wetland resources for the future generations. Among the 25 studied wetlands-Matikatha wetland in Malda district was highly vulnerable; whereas, Gorkha wetland in Cooch Behar district and Khalsi wetland in Nadia district were less vulnerable. Rests of the wetlands were moderately vulnerable. The index-based vulnerability comprised of two types of indicators: climatic indicators with long-term quantitative data and stakeholder perceived vulnerability specific to wetland fisheries. The high level of consensus (92%) provided strong evidence of climate anomalies in the last 15 years, which has also been validated through long-term data analysis. The Principal Component Analysis extracted five synthesized vulnerability indicators, explaining 83.35% variability of the original twelve indicators. The relative ranking of composite index scores, as well as categorization of the degree of vulnerability of each of the selected fifteen wetlands were provided for prioritizing the wetlands for strategic planning.

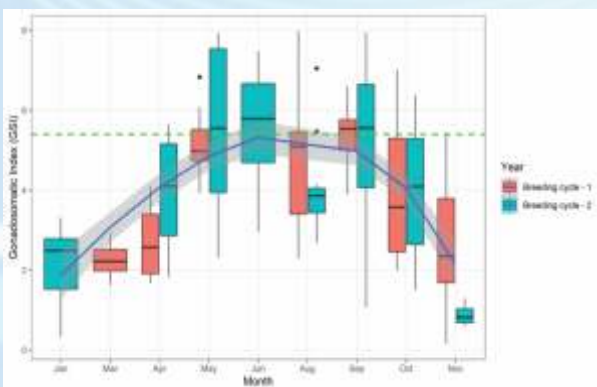


Vulnerability indices

G. Karnatak, U. K. Sarkar, B. Das Ghosh, Mishal, P., S. Kumari

### Climato- hydrological influences on breeding phenology of fishes

Reproductive dependencies of clupeid, *Gudusia chapra* (Indian river shad) were investigated in the lower Gangetic drainage (India) under context of climate change and overfishing. Monthly rainfall ( $\geq 60-100$  mm) followed by water temperature ( $\geq 31-32$  °C) are breeding cues for females. The species has maintained consistent breeding phenology over last two decades. Other breeding thresholds, relevant to fishing, include size at first maturity ( $\geq 6.8$  cm; have reduced) and pre-spawning girth ( $Girth_{spawn50} \geq 7$  cm; first record).  $Girth_{spawn50}$  is a proxy of minimum mesh size requirement of fishing nets to allow safe passage of 'gravid' females (+22% bulged abdomen) and breed. Presently operational fishing nets (3-10 cm mesh) are indiscriminative, indulged in size-selective fishing for generations. Overfishing seemed to be a bigger threat than climate change.



Monthly variations in Gonado Somatic Indices

U. K. Sarkar, G. Karnatak, B. Das Ghosh, S. Kumari, C. Johnson





## Activities under NEH Programme

### Fish stock enhancement programme for livelihood improvement of tribal fishers in Bamuni beel, Kamrup district (R) Assam



Stock enhancement in Bamuni beel

Bamuni Beel is a seasonally open floodplain wetland of lower Brahmaputra valley of 16 hectare water spread area. A total of 65 Bodo tribal households of Bamunigaon village under Bezera Development Block depend on the beel for meeting their nutritional and livelihood needs. The Beel was developed by ARIAS Society, Govt. of Assam (GoA) during 2006-07 under the World Bank funded ARIAS project. Under the project, a periphery bundh was constructed around the beel for facilitating supplementary stocking in the beel for enhancing its fish production. The bundh was further strengthened under the AACP project of ARIAS Society, Govt. of Assam during 2011-12. The local tribal community of Bamunigaon village formed the Bamunigaon Beel Development Committee (BBDC) for fisheries management of the beel during 2006-07. As the socio-economic condition of the beel user community is poor, the BBDC is only sporadically stocking the beel with fish seed,

with no stocking done last year reportedly for want of funds. As a result, the present estimated fish production is low (approximately 390 kg/ha/year) and yield modest annual income to the community (@ Rs 15,000.00 per household). The Institute has stocked 48,000 fish fingerling (@3000 no. per ha) comprising IMC, *Labeo bata*, Grass carp and Silver barb on 19 October 2020. The main objective of the programme was to create awareness among the fishers about fish stock enhancement programme in beels and improvement of livelihood of the tribal families (65 No.).

### Cage culture of Pengba (*Osteobrama belangeri*) in Loktak lake of Manipur

The institute, in collaboration with Department of Fisheries, Govt. of Manipur initiated an ambitious project of culturing *Osteobrama belangeri*, locally known as 'Pengba' in cages installed in Takmu pat, Sendra, Bishnupur district, Manipur. The fish was declared as the State Fish of Manipur in 2007 due to its importance and vulnerability in the state. The fish is highly relished and has a ready demand in the market due to its taste and meat quality. It is suitable for composite fish culture along with other carps, partially replacing rohu and common carp. The project is being executed with the active support of Director of Fisheries, Govt. of Manipur.



Stocking of Pengba

## New externally funded project/sponsored project sanctioned

- In collaboration with GIZ, the German Agency for International Cooperation, ICAR-CIFRI is undertaking a consultancy project on "Investigation on Fisheries and ecological status, threats and remedial measures for enhancement of fish productivity of Gobindsagar reservoir". The budget is Rs. 22.6115 lakhs. Dr. B. K. Das is the Chief Consultant. The study aims at assessment of fisheries productivity, biotic and abiotic factors determining fish productivity and recommending measures for productivity enhancement and sustainable fisheries management of the reservoir.
- Assessment and management of fisheries resources of Pong Reservoir, Himachal Pradesh' is also sponsored by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH for a sum of Rs. 30.78,384 lakhs. Dr. B. K. Das is the Chief Consultant. Studying ecology, fish abundance pattern, spatial and temporal trends of fisheries, socio-economic status of the fishers and developing suitable resource extraction models and guidelines to ensure sustainable and sustained resource extraction of Pong reservoir are the major objectives of the project.

## Technology Demonstration

### Successful demonstration of fish seed raising and table fish production in cages at Palair reservoir, Telangana

Telangana is a potential state in India for reservoir fisheries development through culture-based fisheries and enclosure culture. Considering this, carp seed raising and table fish production of diversified fish species was successfully demonstrated in 64 CIFRI-GI model cage installed at Palair reservoir, Telangana. The cages were stocked with fingerlings of *Pangasianodon hypophthalmus*, *Labeo rohita*, *Labeo rohita* (Jayanti variety), *Catla catla* and *Macrobrachium* sp. The stocked species attained marketable size in 8-10 months. A total of 106.6 tonnes of fish was harvested comprising 75.9 tonnes of pangas and 30.7 tonnes of rohu (Jayanti rohu and rohu) and 0.1 tonnes of freshwater prawn. The total revenue generated was Rs. 96.4 lakhs/crop benefitting 40 fishers. Besides, a total of 1,20,000 advanced fry (35-40mm) of Indian Major Carps was stocked in cages (5 m x 5 m x 2.5 m) @240 nos/m<sup>3</sup> and raised to advanced fingerling size (100-120 mm) with a survival rate of 79.4% (95,375 nos.) in 75 days for culture-based fisheries through fingerling stocking in the reservoir. Total 2 lakh seeds of pangas (50,000/battery), 80,000 seeds of rohu (20,000/battery) and 12,000 seeds of pabda were stocked for second crop production in cages. Partial harvest of 13.5 tonnes of table size fish fetching Rs. 15.2 lakhs were done from the cages. The total estimated production from cages is 88 tonnes.



Jayanti rohu produced in cages

U. K. Sarkar, P. Mishal, M. Ramteke, A. M. Sajina, C. Johnson, A. Saha, A. K. Das and B. K. Das

## Ranching Programme



River Ranching programme at Farakka, West Bengal

The holy Ganga has witnessed a gradual decline in many indigenous fish species including Indian major and minor carps. To restore the prized IMCs in the river, the Institute periodically conducts ranching programmes. Keeping the same tradition, a total of 5 ranching programmes were undertaken in the River Ganga during July to December, 2020 in the states of Uttar Pradesh, Jharkhand and West Bengal. At Farakka, West Bengal 1,20,000 advanced fingerlings of Rohu (*Labeo rohita*), Catla (*Labeo catla*), Mrigala (*Cirrhinus mrigala*), and Calbasu (*L. calbasu*) were ranched on 23 September 2020. Similar programmes at Maharajpur & Sahebgunj, Jharkhand was conducted in which 2 lakh advanced fingerling of Indian Major Carps were released. On the eve of Ganga Utsav on 4<sup>th</sup> November, 2020 the Institute released 50,000 seeds of Rohu, Catla and Mrigal in the river at Barrackpore Gandhi Ghat. 15,000 fingerlings of Indian Major

Carp (IMC) were released in the river on the occasion of World fishery Day on 21 November, 2020 at Prayagraj, Uttar Pradesh. Thus, around 3.85 lakh advance fry and fingerlings of carps were ranched during this period at different ghats of River Ganga. Simultaneously, mass awareness programmes were organised to create awareness among local fishers and other stakeholders for conservation and sustainable fisheries in different depleted stretches of the river.

In addition, live hilsa (average size of 350 g) were tagged and ranched to study the migratory path in the middle stretch of the river Ganga from Prayagraj to Farakka. During 2019-20, more than 3000 adult hilsa were ranched at upstream of Farakka



River Ranching programme at Maharajpur & Sahebgunj (Jharkhand)



Ranching of IMC fingerlings at  
Gandhi Ghat, Barrackpore



Ranching of IMC fingerlings at  
Dihaghat, Prayagraj

barrage and interestingly 2 tagged live hilsa were caught at Balia, Uttar Pradesh. Total 4819 numbers of hilsa ranched during the month of November, 2020. Total 180 numbers of hilsa ranched and 9 numbers of hilsa tagged during the month of December, 2020. Shri Gajendra Singh Shekhawat, Honourable Union Cabinet Minister, Ministry of Jal Shakti visited ICAR-CIFRI Hilsa ranching station at Farakka, West Bengal on 18.12.2020 and ranched tagged Hilsa in the river Ganga.



Ranching of tagged Hilsa in the river Ganga at Farakka by  
Shri Gajendra Singh Shekhawat, Hon'ble Union Minister, Ministry of Jal Shakti,  
Govt of India on 18 December 2020

## Book / Bulletin

Sarkar, U. K. and Das, B. K., 2020. Fisheries Biology: New Approaches and Changing Perspectives. Narendra Publishers, New Delhi. ISBN: 978-93-89996-57-9. 270 pp.

This book on 'Fisheries Biology: New Approaches and Changing Perspectives' is brought out with an aim to provide a comprehensive understanding on the recent advances in fish biology, representing experience and perspectives of various experts on different biological aspects of fishes. It encompasses 25 chapters covering multidisciplinary topics like impact of climate variability and modeling biological traits, integrated taxonomy, DNA barcoding and molecular tools, digital tools of fish taxonomy, stock identification methods, genetic markers for stock characterization, habitat fingerprinting, invasive biology of freshwater fishes, non-invasive tools for biological assessment, reproductive and ecological vulnerability, histological techniques for reproductive biology, emerging concepts in fish population dynamics, GIS application in modern fish biology research, statistical tools/applications for biological investigations, big data science and omics technology, ethical considerations in fisheries research etc. This book is intended for students studying fish biology and researchers, academicians and faculty members working in the related fields of aquatic sciences. It will be a useful reference for policy makers and fishery managers as often the national and international fisheries policies are determined based on the data provided by fish biological research.



## Trainings and Capacity Buildings

### Capacity building programmes for the fishers/fish farmers

Sl. No.	Name of the training	Date	Participants	Venue
1.	On-farm training on ornamental fishery under SCSP	20-22 September, 2020	Khalsi Beel, West Bengal	25 women beneficiaries
2.	Ornamental fish farming for women fishers of Odisha under TSP	29 September 2020	Nalagaja and Badasahi villages of Mayurbhanj district	45 women fishers
3.	Women empowerment and Gandhian perspective	1 October 2020	75 women	ICAR-CIFRI Barrackpore
4.	Ornamental fish culture under TSP	18 -24 October 2020	Bhadrak, Odisha	25 women fishers
5.	Beel fisheries management	27 November 2020	55 fish farmers from Assam	ICAR-CIFRI, RRC Guwahati
6.	Production enhancement through pen culture in inland open waters	04 December 2020	72 fish farmers from West Bengal	ICAR-CIFRI Barrackpore
7.	Production enhancement through cage culture in inland open waters	11 December, 2020	63 fish farmers from Bihar, UP, MP and Maharashtra	ICAR-CIFRI Barrackpore
8.	Production enhancement through pen culture in inland open waters	18 December, 2020	122 fish farmers from Odisha	ICAR-CIFRI Barrackpore



Training on pen culture for Odisha fishers



Training on cage culture



## Training on cage culture



Training on cage culture at Guwahati



Training on hilsa fisheries conservation

## Capacity building programmes for Faculty members, Scientists, Youths and Fisheries Officials

Sr. No.	Name of the training	Date	Venue	Participants
1.	Online training programme on uses of e-Matsya, a fish catch recording android software	17 June 2020	ICAR-CIFRI Barrackpore	17 officials of Odisha
2.	Knowledge empowerment of youth on inland fisheries management: A way towards Atmanirbhar Bharat	29 September 2020	ICAR-CIFRI Barrackpore	120 youths

## Documentary Films developed

1. Canal Fisheries Development in Sundarbans by ICAR-CIFRI (English)
2. Wild Fish Germplasm Breeding of River Ganga for Biodiversity Restoration (English)
3. Species Diversification in Inland Cage Culture (English)
4. High Value Species for Cage Culture in Reservoirs (English)
5. गंगा नदी में जैव विविधता पुनर्स्थापन हेतु वाइल्ड मछलियों का जर्मप्लाज्म प्रजनन (Hindi)
6. अंतर्स्थलीय जलक्षेत्रों के पिंजरे में मछली पालन हेतु प्रजाति विविधता (Hindi)

## Mass Awareness

Mass awareness programmes were organised along with river ranching programmes to create awareness among local fishers and other stakeholders for conservation and sustainable fisheries in different depleted stretches of river Ganga. Under this activity, ICAR-CIFRI conducted 7 awareness programmes during the period. A total of 475 numbers of fishers were sensitized through the awareness campaign in 4 states, Uttarakhand, Uttar Pradesh, Bihar and West Bengal on the detrimental effects of destructive methods of fishing to ban the operation of zero mesh size net and other destructive fishing gears, toxic chemicals, etc. for fishing and were advised not to catch the juveniles and brooders especially in the breeding seasons (June-August) for their sustainable fisheries in River Ganga. The campaigns were conducted at Farakka, West Bengal (23 September 2020), Maharajpur and Sahebgunj, Jharkhand (24 September 2020), Dasashwamedh Ghat, Varanasi (3 November 2020), Daraganj, Uttar Pradesh (4 November 2020), Prayagraj, Uttar Pradesh (21 November 2020), Chamba Block, New Tehri (21 November 2020).



Awareness at Sahebgunj



Awareness program during Ganga Utsav at Sangam Nose, Prayagraj



Mass awareness program at Village-Diha, Prayagraj



## Staff Corner

### Ph.D. degree awarded

Name	Awarding authority	Title of the thesis
Ms. Suvra Roy	Ghent University, Ghent, Belgium	Modulating innate immune memory in brine shrimp ( <i>Artemia franciscana</i> ) and in giant freshwater prawn ( <i>Macrobrachium rosenbergii</i> )
Shri Vikash Kumar	Ghent University, Ghent, Belgium	Acute hepatopancreatic necrosis disease (AHPND) in shrimp: virulence, pathogenesis and mitigation strategies
Ms. Sibina Mol S.	ICAR- Central Institute of Fisheries Education, Mumbai	Taxonomic evaluation of different <i>Labeo</i> spp. (family: cyprinidae) in Cauvery river
Shri Vaisakh G.	ICAR- Central Institute of Fisheries Education, Mumbai	Ecology and Biology of <i>Tenualosa ilisha</i> from Narmada River and Ukai (Vallabhsagar) Reservoir, Gujarat
Shri Shyamal Chandra Sukla Das	ICAR- Central Institute of Fisheries Education, Mumbai	Life history traits of <i>Cyprinus carpio</i> Linnaeus, 1758 from the river Ganga at Allahabad"
Shri Manoharmayum Shaya Devi	ICAR- Central Institute of Fisheries Education, Mumbai	An appraisal of single-day and Multi- day trawl fishery of mumbai coast
Shri Ningthoujam Samarendra Singh	ICAR- Central Institute of Fisheries Education, Mumbai	Microbial degradation of Polychlorinated Biphenyl (PCBs)

### Recognitions

- Dr. B. K. Das, Director was selected as a Member of Executive Council, Indian Science Congress Association. He was selected as a Member, Expert Committee on Inland Fishery Resources (ECIFR), Ministry of Fisheries, Animal Husbandry & Dairying and Member, Monitoring Committee of NMCG-WII Sponsored Project "Planning and Management for Aquatic species conservation and maintenance of Ecosystem service in the Ganga river basin for a clean Ganga".
- Dr. B. K. Das, Director was also elected as an External Member, Board of Management, ICAR-Central Institute of Fisheries Education, Mumbai and Member, Expert Committee for program under the School of Agriculture and Allied Sciences, Neotia University. He was also the member of NASI Council (Biological Sciences).
- Dr. B. K. Das, Director was selected as a Member, Central Standing Committee on Pradhan Mantri Matsya Sampada Yojana (PMMSY), Ministry of Fisheries, Animal Husbandry and Dairying, Department of Fisheries. He was also selected as a Member, National Advisory Committee of the International Symposium "Transforming Coastal Zone for Sustainable Food & Income Security, organized by Indian Society of Coastal Agricultural Research. He was also selected as a Member of the Technical Advisory Committee (TAC) of Farakka Barrage Project.
- Dr. B. K. Bhattacharjya was selected in the Honorary Board of Directors, Assam Fisheries Development Corporation Ltd., Guwahati.
- Dr. Kavita Kumari acted as a Moderator for the DTOL 2 session and the Conservation Genomics session for the Biodiversity Genomics 2020 Conference organized by Wellcome Sanger Institute, London.
- Dr. S. Dam Roy was a RAC Member of ICAR-Directorate of Coldwater Fisheries Research, Bhimtal and attended the first meeting of RAC during 20-21 May 2020. He was as a Member of Department of Biotechnology Monitoring Committee and attended the virtual Meeting on 20 November 2020.
- Dr. S. K. Manna was selected as a Member of the Core Committee for drafting Rules for the Aquatic Animal Disease and Health management Bill, 2019.



## Awards

Awardee	Name of the award	Awarding authority	Contribution
Shri Rajeev Lal	ICAR Cash Award Scheme 2019 (Adm. Category)	Indian Council of Agricultural Research, New Delhi	Effective leadership and managerial quality
Shri Archisman Ray, Ms. Akankshya Das and Ms. Nabanita Chakraborty	2 <sup>nd</sup> Prize in the 'Ideathon'	ICAR-CIFE, Mumbai	Designing robotic fish
Dr. Dibakar Bhakta	Best Doctoral Research Award -2020	Society for Biotic and Environmental Research (SBER), Khowai, Tripura, India	Outstanding research and quality of PhD thesis
Mr. Lohith Kumar K., Dr. Aparna Roy, Dr. Ranjan Kumar Manna, Dr. Srikanta Samanta and Dr. Basanta Kumar Das	Third prize the in the 6th Indian International Science Festival-2020	Ministry of Science and Technology, the Ministry of Earth Sciences & Vijnana Bharati (VIBHA), Govt. of India	Fish-tourism village concept in River Cauvery at Hogenakkal, Tamil Nadu
Dr. Dhruba Jyoti Sarkar	International Best Scientist	RULA AWARDS in Association with World Research Council and United Medical Council, 2020 at Trichy Tamilnadu, India	Environment pollution research
Dr. Soma Das Sarkar	International Best Scientist	RULA AWARDS in Association with World Research Council and United Medical Council, 2020 at Trichy Tamilnadu, India	Environmental pollution research







## Institute awards for best workers

### Award for 2019 (given on 26th January, 2021)

- Best Division : Riverine Ecology and Fisheries Division
- Best Scientist : Dr. R. K. Manna, Principal Scientist
- Best Technical : Smt. Sucheta Majumder, CTO and Shri Ashish Roy Chowdhury, TO
- Best Administrative Staff : Ms. Sohini Chatterjee, Stenographer
- Best Supporting : Shri Umashankar Ram
- Best Research Scholar : Ms. Shatabdi Ganguli

### Award for 2020 (given on 17th March, 2021)

- Best Scientist : Dr. H. S. Swain, Scientist
- Best Technical : Mr. Subhendu Mandal, Tech. Asstt.
- Best Administrative Staff : Mr. Sudipta Gupta, AAO
- Best Skilled Support Staff : Mr. Penappa
- Best Research Scholar : Mr. Ramesh Malik



Best Scientist, 2019 : Dr. R. K. Manna, Principal Scientist



Best Administrative Staff, 2019 : Ms. Sohini Chatterjee, Stenographer



Best Research Scholar, 2019 : Ms. Shatabdi Ganguli



Best Scientist, 2020 : Dr. H. S. Swain, Scientist

## Promotion of staff

Sl. No.	Name of the staff	Promoted to the post of	w.e.f.
1	Shri Lohith Kumar, Scientist	Scientist (Senior Scale)	01.01.2019
2	Shri Ratan Das, SSS	1 <sup>st</sup> MACP in the Pay Level 2 of 7 <sup>th</sup> CPC	13.01.2020
3	Shri Debasis Singha, SSS	2 <sup>nd</sup> MACP in the Pay Level 3 of 7 <sup>th</sup> CPC	08.02.2020
4	Shri M. Pennappa, SSS	3 <sup>rd</sup> MACP in the Pay Level 4 of 7 <sup>th</sup> CPC	30.03.2020
5	Shri S.C. Machi, SSS	2 <sup>nd</sup> MACP in the Pay Level 3 of 7 <sup>th</sup> CPC	06.10.2020
6	Shri S.C. Tadv, SSS	2 <sup>nd</sup> MACP in the Pay Level 3 of 7 <sup>th</sup> CPC	16.10.2020
7	Shri M. Mari, SSS	3 <sup>rd</sup> MACP in the Pay Level 4 of 7 <sup>th</sup> CPC	23.11.2020

## Transfer

Sl. No.	Name of the staff	From	To
1	Dr. Archana Sinha, Principal Scientist	ICAR-CIFRI, Barrackpore	ICAR-CIFRI Research Centre, Kolkata
2	Dr. Debrabata Das, Scientist	ICAR-CIFRI Research Centre, Kolkata	ICAR-CIFRI, Barrackpore
3	Shri K. Lohith Kumar, Scientist	ICAR-CIFRI Research Centre, Kolkata	ICAR-CIFRI, Barrackpore
4	Shri Ganesh Bhanja, UDC	ICAR-CIFRI, Barrackpore	ICAR-CIFRI Regional Centre Guwahati
5	Shri Rakesh Pal, Technical Assistant	ICAR-CIFRI Barrackpore	Maithan Research Station of ICAR-CIFRI

## Superannuation

Sl. No.	Name of the staff	Last place of posting	Date of Superannuation
1	Shri Ashis Roy Chowdhury, TO	ICAR-CIFRI, Barrackpore	30 November 2020
2	Ms. Sefali Biswas, AAO	ICAR-CIFRI, Barrackpore	30 November 2020
3	Ms. Divya Jain, Assistant		30 November 2020 (VRS)
4	Shri Ram Prasad, STA	ICAR-CIFRI, Vadodara	31 December 2020
5	Mrs. K. Sucheta Majumdar, CTO	ICAR-CIFRI, Barrackpore	31 December 2020
6	Shri Jai Ram Prasad, SSS		31 December 2020



Smt. Sefali Biswas

Sh. Ashis Roy Chowdhury



Smt. Sucheta Majumdar



Sh. Ramprasad



## Obituary

Shri R. L. Balmiki, Technical Officer, Dr. B. C. Jha, Former HoD and Shri Kamlesh Kumar, SSS left for their heavenly abode on 3 September, 4 October and 30 October 2020, respectively. We sincerely pray to the Almighty to let the souls rest in peace.



Dr. B. C. Jha

## Meetings

### Management review meeting of Quality Management System (QMS)

The meeting was conducted under the ISO surveillance audit on 17 August 2020. Dr. B. K. Das, Director presided over the meeting. All the HoDs and Incharges were present. The comments raised in the audit report of the first surveillance audit was discussed.

### International webinar for enhancing conservation of river dolphins

The indiscriminate and illegal fishing has resulted in catching juvenile fishes and accidental/illegal catching of dolphins from inland waters. A two days International Webinar on “Exploring the impact of COVID-19 on the ecosystem health of rivers and its dolphin population: Present status and future strategy for conservation in India-Bangladesh-Myanmar-Nepal” was held in ICAR-CIFRI, Barrackpore during 24-25 August 2020. The webinar was inaugurated by Shri Rajiv Ranjan Mishra, IAS, Special Secretary and Director General, National Mission for Clean Ganga (NMCG), Ministry of Jalashakti, Government of India. This Webinar aimed at the conservation of river dolphins in the South East Asian region through regional strategy and partnership. Experts on dolphins from various countries viz. India, Nepal, Myanmar, Bangladesh and Indonesia participated and shared their experience in this Webinar. More than 1000 participants from various Research Organizations, Colleges, Universities of India and other countries registered for this Webinar. A total 22 experts represented their country paper in this virtual seminar.



### Global Webinar on “Small Scale Fisheries in Inland open water: Status and opportunity”



The webinar was held on 9-10 September 2020 with virtual participation of experts, academicians and institutions from India, Bangladesh, Sri Lanka, Nepal, Malaysia along with the experts from Canada, FAO, and Belgium. The webinar was inaugurated by Dr. J. K. Jena, DDG (Fisheries Science), ICAR, New Delhi. Experts like Dr. B. K. Das, Director, ICAR-CIFRI, Dr. Dilip Kumar, Former Director, ICAR-CIFE, Dr. C. V. Mohan of WorldFish centre, Penang Malaysia spoke on this occasion. This webinar, organized jointly by ICAR-CIFRI, Barrackpore IFSI, Barrackpore and PFGF India, made a review of the present situation and formulated future strategies for enhancing small –scale fisheries management with the objective to fulfill five major Sustainable Development Goals through national and sub-regional cooperation. More than 30 research papers were presented in different technical sessions. More than 1700 participants including policy makers, scientists of India and

abroad registered and participated through web platforms.

## Workshop on empowering women of wetland dependent community

The workshop was organized on 20 November 2020 in Khalsi wetland to sensitize the women regarding integrated wetland management. The Khalsi, a 62 ha wetland, is surrounded by eight villages. The fisheries of the waterbody is managed by a fishery cooperative society which has 363 members of which almost 85 % of belong to backward community. The integrated wetland management is being demonstrated at this beel. Dr. B. K Das, Director, CIFRI stocked 200 kg fingerlings of IMCs in 0.5 ha the pen, to raise in-situ advanced stockable fingerling under Schedule Caste Subplan. 30 days old Rhode Island Red chicks, high yielding-disease resistant vegetable seeds and mushroom spawn were distributed among eighty women beneficiaries under DBT sponsored project. A multidisciplinary scientific team comprising Fisheries, Veterinary, Agriculture and Social Science under the leadership of Dr. B. K Das are making effort to empower the women of fisherfolk community through 'Eco-system based-Integrated wetland management'



Input distribution under DBT project

## Webinar on International Freshwater Dolphin Day for “Enhancing Conservation of River Dolphins”



Realizing the vulnerability of freshwater dolphins and its importance for conservation, a one-day International webinar on “Enhancing Conservation of River Dolphins” coinciding with International Freshwater Dolphin Day was organised by ICAR-CIFRI in collaboration with NMCG (National Mission for Clean Ganga), IFSI (Inland Fisheries Society of India), and PFGF (Professional Fisheries Graduates Forum) on 24 November, 2020. The webinar was inaugurated by Dr. Rajiv Ranjan Mishra, IAS, Special Secretary and Director General, National Mission of Clean Ganga (NMCG), Ministry of Jalshakti, Government of India. Experts on dolphins from various countries viz. India, Nepal, and Bangladesh participated and shared their experience. Dr. B. C. Choudhury, well-known dolphin expert emphasised on 6 Es for conservation which includes Ecological maintenance, Exploitation of the resources judiciously, E-flow, Empathy of community involvement, Exchange of scientific information and Education and awareness. More than 800 participants participated in this webinar through virtual mode.

## Women cell meeting

A women cell meeting was held on 14 December, 2020 at Institute Headquarter with all the lady staff of the institute. The meeting was conducted in the presence of Director, Dr. B. K. Das and also attended by Shri Rajeev Lal, Chief Administrative officer. All the women staff spoke on the occasion and thanked the director for providing congenial atmosphere to work at the institute. A total of 60 participants attended the meeting.



Women cell meeting



Awareness programme at Media beel

## Stakeholder's meet and distribution of inputs for climate smart wetland fisheries

A stakeholder meeting cum awareness program was organized by the Institute at Media beel, North 24 Parganas on 16 December, 2020 to create awareness on climate change and its deleterious impacts on wetland fisheries under the project “National Innovations on Climate Resilient Agriculture (NICRA)”. Dr. B. K. Das, Director, ICAR-CIFRI presided over the meeting. The meeting was attended by 100 fishers and project investigators from the Institute. The program was inaugurated with the



release of 45000 fish fingerlings of Indian Major Carps, bata (*Labeo bata*), puti (*Puntius sarana*) and Tengra (*Mystus sp.*). The Director stated that the Institute is committed to extend technological support to the inland fishers of the country and motivated them to build their capacities on scientific management practices and climate resilient tools for sustainable fisheries. Dr. U. K. Sarkar, Principal Investigator, NICRA spoke on the occasion. The office bearers of co-operative societies and fishers of Media and Panchpota wetlands expressed the difficulties and challenges faced in managing the wetland fisheries in the changing scenario.



Stocking in the Media beel

## Participatory Rural Appraisal (PRA) in Beledanga beel for problem identification



The Beledanga beel in North 24 Parganas district provides livelihood to the people living in the adjoining villages. The ecosystem of the beel is degraded and it has important implications for sustainable development. PRA was conducted to identify the threats perceived by the beel dependent community. Matrix ranking was done with active participation of the beel dependent community and it was found that encroachment, weed infestation, lack of technical knowhow, lack of capital in the hand of the FCS, lack of willingness of the management of the FCS, local politics, intensive poaching etc are the major issues, affecting production as well as the livelihoods of the beel dependent community.

## Events organized

### National Fish Farmers' Day

To commemorate the first success of induced breeding by Prof. Hira Lal Chaudhary, the Government of India has declared 10th July of every year to be celebrated as National Fish Farmers Day. The institute celebrated this day on virtual platform on 10 July 2020. The virtual event witnessed a gathering of more than 300 fish farmers, entrepreneur, students and fish production groups from fourteen different states of India including West Bengal, Bihar, Gujarat, Odisha, Assam, Kerala, Tripura, Meghalaya, Manipur and Arunachal Pradesh, Uttar Pradesh and Punjab. The chief Guest of the Programme was Shri Pratap Chandra Sarangi, Honourable Minister of State of Fisheries, Animal Husbandry & Dairying and MSME of Govt of India. Dr. M. R. Sinha, Dr. Joykrushna Jena, DDG, (Fisheries Science), ICAR, Prof. A. P. Sharma and Dr. B. K. Das were also present.



The Chief Guest paid gratitude to Late Hiralal Choudhury for his remarkable invention. He said that India should be the largest fish producer country in the world and that should be the target of all farmers, scientists and other stakeholders. Dr. Ravishankar, C. N., Director, ICAR-CIFT, Cochin, Dr. A Gopalakrishnan, Director, ICAR-CMFRI, Cochin, Dr. Gopal Krishna, Director & Vice Chancellor, ICAR-CIFE, Mumbai, Dr. Dilip Kumar, Former Director, ICAR-CIFE, Mumbai addressed the gathering.



### Independence Day

The institute celebrated 74th Independence Day on 15 August 2020. Dr. B. K. Das,

Director unfurled the tricolor and paid rich tribute to the nation. He remarked that in the last 73 years, the institute has grown tremendously along with the growth of the country. He congratulated all the staff for the great achievements. However, he cautioned that there is room for complacency. The FRP hatchery unit was inaugurated by the Director on this auspicious day. The day was also celebrated in all the regional centres.

## हिन्दी सप्ताह 2020

भाकृअनुप-केन्द्रीय अंतरर्थलीय मातिस्यकी अनुसंधान संस्थान, बैरकपुर में दिनांक 14-21 सितंबर 2020 के दौरान हिंदी सप्ताह मनाया गया। प्रत्येक वर्ष संस्थान में कार्यालय के काम में राजभाषा हिंदी को बढ़ावा देने के लिए हिंदी सप्ताह का आयोजन किया जाता है। वर्ष 2020 में कोरोना महामारी के कारण ऑनलाइन मोड में इंडियान साइंस कांग्रेस एसोसिएशन के संयुक्त तत्वाधान में हिंदी सप्ताह का उद्घाटन किया गया। उद्घाटन समारोह के मुख्य अतिथि डॉ. (श्रीमती) विजया लक्ष्मी सक्सेना, महासचिव (निर्वाचित), भारतीय विज्ञान कांग्रेस एसोसिएशन 2020-2021 थीं। डॉ. अशोक सक्सेना, पूर्व महासचिव, भारतीय विज्ञान कांग्रेस एसोसिएशन और डॉ. बी.पी. मोहंती, सहायक महानिदेशक (अंतरर्थलीय मातिस्यकी), भारतीय कृषि अनुसंधान परिषद्, नई दिल्ली ने भी कार्यक्रम में भाग लिया। उद्घाटन समारोह में संस्थान के निदेशक, डॉ. बि के दास ने बताया कि संस्थान पिछले तीन (3) वर्षों से भारतीय विज्ञान कांग्रेस के साथ मिलकर हिंदी सप्ताह मना रहा है। उन्होंने कहा कि कथित तौर पर, हिंदी में बोलने वालों का प्रतिशत बढ़कर 44 प्रतिशत हो गया, जो 2001 में 41 प्रतिशत था। इसके अलावा, हमारे संस्थान में हिंदी प्रकाशनों की संख्या में वृद्धि हुई है। हमारी गतिविधियों और उपलब्धियों को हिंदी में विभिन्न मीडिया प्लेटफार्मों में प्रकाशित किया जाता है ताकि यह समाज के हर वर्ग तक पहुंच सके। हिंदी में मासिक समाचार पत्र संस्थान की उपलब्धियों और अन्य विशेष जानकारी की मासिक गतिविधियों को दर्शाता है।



Inauguration of Hindi Saptah



Essay competition at ALD

हिंदी सप्ताह के समस्त कार्यक्रम 'गूगल मीट' प्लेटफॉर्म पर ऑनलाइन मोड में आयोजित किये गये जिनमें संस्थान मुख्यालय कर्मियों के साथ संस्थान के क्षेत्रीय केन्द्रों/स्टेशनों (इलाहाबाद, बेंगलूर, गुवाहाटी, वडोदरा, कोलकाता और कोच्चि) ने भी भाग लिया जो एक नवीन प्रयोग था। इस सप्ताह के दौरान आशुभाषण, निबंध लेखन, प्रश्नोत्तरी, कविता पाठ और अनुवाद जैसी कई प्रतियोगिताओं का आयोजन ऑनलाइन मोड में किया गया, जिससे समस्त क्षेत्रीय केंद्र एक साथ भाग ले सकें। समापन सत्र 20 सितंबर



Hindi week at Bangalore Centre

2020 को हुआ जिसमें प्रतियोगिताओं के विजेताओं को पुरस्कार दिए गए और अगस्त 2020 के हिंदी मासिक न्युजलेटर का विमोचन किया गया।

## Shri Pratap Chandra Sarangi, Hon'ble Minister of State for Fisheries, A.H.D & MSME visited CIFRI Pen demonstration site at Rishia reservoir, Balasore, Odisha

The Hon'ble Minister visited ICAR-CIFRI pen demonstration site at Rishia reservoir, Balasore on 30 September 2020. The Pen culture in Rishia reservoir is practiced for in-situ advance fingerling production and stocking in the reservoir. ICAR-CIFRI's low -



Hon'ble Minister stocking the fingerlings

cost in-situ fish seed production technology through CIFRI Pen HDPE for reservoirs and wetlands were being demonstrated in the reservoir. Two pens of 0.1 ha each has been installed in the reservoir and 32,000 fish seed were released in the pens by honourable Minister. He also distributed CIFRI CAGEGROW® fish feed to the fishers for feeding in pen culture. Dr. B. K. Das, Director, CIFRI was present on the occasion.



Hon'ble Minister interacting with the fishers

## 150th Gandhi Jayanti Saptah



On-line programme at Barrackpore

To commemorate 150th Birth Anniversary of Mahatma Gandhi, the Institute organized 150th Gandhi Jayanti saptah from 26th September to 2nd October 2020 with wide array of different programmes like Swachh Bharat programme, painting competition, capacity building programme for rural youth, lead lecture by Prof. Shankar Kumar Acharya on "Relevance of Gandhian Philosophy on Agriculture" webinar on Women empowerment. The weeklong celebration was culminated on 2nd October 2020 with Webinar cum stakeholders meet on "Reinventing Gandhian Philosophy in improving fishers' livelihood". More than 300 fishers from Northern, Eastern, Southern, Western and North Eastern states of India participated in this programme

through virtual platform. Dr. J. K. Jena, DDG (Fisheries Science), Dr. V. V. Sugunan, Ex ADG (Inland Fisheries), ICAR, Dr. Dilip Kumar, Former Director & VC, ICAR-CIFE, Fishers, fisherman Cooperative society members and farmer entrepreneurs from states of Manipur, Assam, Meghalaya, Karnataka, Kerala, Odisha, West Bengal, Bihar, Uttar Pradesh and Gujarat participated and give their opinion. The Prayagraj regional centre also celebrated Gandhi Jayanti on 2nd October, 2020 along with Headquarter, Barrackpore. On the occasion, aquaculture inputs were distributed to the farmers from Naraina village under SCSP programme.



Aquaculture inputs distribution to the farmers in the occasion of Gandhi Jayanti

## Vigilance Awareness Week



Vigilance awareness rally

The Institute observed "Vigilance Awareness Week" during 27th October to 2nd November 2020 focusing on the theme area, "Vigilant India – Prosperous India" maintaining the COVID 19 protocols. The week long observance was started with administration of pledge to the officials and staff on 27th October by the Director. Many of the staff also took e-pledge. Large numbers of posters, banners, placards were displayed at the campus premises showing the ill effects



Concluding programme

of corruption and the commitment of CIFRI toward zero tolerance on corruption. The walkathon arouse much interest of the locals and commuters. Quiz, extempore competition, in-house seminar was also organized. The week-long celebration was culminated through a concluding ceremony on 2nd November in which Shri Dhrubajyoti De, IPS, Joint Commissioner of Police, Barrackpore Police Commissionerate was the Chief Guest. He delivered a thought provoking lecture for upholding the highest standards of ethical conduct, honesty and integrity. Dr. B. K. Das, Director discussed the importance of transparency and preventive vigilance for a corruption free organization. Dr. Arun Pandit, Vigilance Officer of the institute presented the activities carried out during the vigilance awareness week.

## World Antimicrobial Resistance Awareness Week (WAAW-2020)

World AMR awareness week under the “Indian Network for Fisheries and Animal Antimicrobial Resistance (INFAAR)” programme was celebrated by ICAR-CIFRI, Barrackpore during 18th to 24th November 2020. The main objective of the programme is to create awareness among the fish farmers, fishermen, animal rearing farmers to reduce the use of antibiotics in the rearing and growing period of the fish and animals. In this connection, an awareness programme was conducted at Farakka, West Bengal on 18th Nov. 2020. Dr. A. K. Sahoo, PI of the project describes the importance of the week (18th to 24th November 2020) for creating wider awareness on the antibiotic uses and consequences of the over and under use of antibiotics towards developing antibacterial resistance. A pledge was taken by all the participants to stop misusing the antimicrobial products in animals and fisheries and in Inland open waters particularly in ponds, rivers and wetlands. As a part of the awareness programme, more than 40 students from Digsui Sadhana Banga Vidyalaya, Hooghly dist., West Bengal participated in a virtual platform on the topic “Antibiotics: Handle with Care” on 21st Nov 2020.



Anti microbial resistance awareness at Farakka

## World Fisheries day



World fishery Day celebration at Chamta

World Fisheries Day was celebrated on 21 November, 2020 at Chamta wetland, Bongaon, West Bengal along with on-field events like sensitization programme, demonstrations etc. The programme aimed at generating awareness among the beel dependent communities regarding the importance of climate resilient beel fisheries management and also to empower rural youth through climate resilient small-scale beel fisheries management. Dr. B. K Das, Director, CIFRI inaugurated the programme by stocking the fingerlings in the pens installed in the wetland. The issues

raised by fishers and fish farmers were addressed by the scientists. Fishers from Kholsi beel, Beledanga beel, Chamardaha beel and Panchita beel were also present in the programme. The Prayagraj centre arranged a ranching cum mass awareness programme in Diha village and 15,000 fingerlings were released into the Ganga River. About 50 fishermen participated in the programme.



World fishery Day celebration at Diha village by Allahabad centre

## Fish harvest Mela at Beledanga

ICAR-CIFRI is striving on the production enhancement strategy in wetlands under SCSP and WorldFish – W-3 project in various wetlands of West Bengal. In the same vein, the institute adopted Beledanga beel in North 24 Parganas of West Bengal and started pen culture demonstration last year with a target of increasing fish production up to 1000 kg/ha/year in three years time. Four numbers of CIFRI Pen HDPE® of 0.1 ha were installed in the wetland and fingerlings of Indian major carp were stocked in 3





Fishers harvesting fishes

and Grass carp was stocked in one pen. ICAR-CIFRI has provided technical support and guidance apart from the support in terms of fish feed, fish seed, coracle and boat to the society. The fish harvest mela has been organized from 14 to 18 December 2020. In the last year, the production of the wetland crossed 30,000 kg with productivity of 500 kg/ha. In the 1st year of intervention of ICAR-CIFRI, 42% increase in fish production has been achieved. It is anticipated that by the year 2022, the production will be doubled with productivity of 1000 kg/ha/year from this wetland.



Harvested fishes

### Shri Gajendra Singh Shekhawat, Union Minister of Jalshakti visited Hilsa ranching station of ICAR-CIFRI

Shri Gajendra Singh Shekhawat, Honourable Union Minister of Jal Shakti visited ICAR-CIFRI Hilsa ranching station at Farakka, West Bengal on 18 December 2020. Shri U. P. Singh, IAS, Secretary, Department of Water Resources, River Development and Ganga rejuvenation, Ministry of Jal Shakti, Shri A. K. Jain, Commissioner, Flood Control Management, Ministry of Jal Shakti, and Shri Saibal Ghosh, General Manager, Farakka Barrage Authority (FBA) and staff of FBA, Inland Waterways Authority (IWAI), Central Water Commission (CWC) and Dr. B. K. Das, Director and Co-ordinator and Dr. A.K. Sahoo, Sr. Scientist ICAR-CIFRI were present on this occasion.



Hon'ble Minister visiting the CIFRI facility

### Ganga Utsav 2020



Ganga Arti at Barrackpore Gandhi Ghat

The *Ganga Utsav 2020* initiated by National Mission for Clean Ganga (NMCG), fervently celebrated by ICAR-CIFRI during 2-4 November, 2020. The inaugural programme was graced by Mr. Dhrubajyoti Dey, IPS, Joint Commissioner of Police ( Barrackpore Police Commissionerate). Ranching of more than 300 number prized Hilsa (*Tenualosa ilisha*) was conducted in upstream of Farakka stretch. The prized species was also tagged. A cultural



Pledge by ICAR-CIFRI staff

event was organized in the CIFRI campus. A blissful Ganga Arati followed by a carp ranching program (50000 fish) was organized at Barrackpore Gandhi Ghat. The Prayagraj centre conducted two mass awareness programmes on the bank of river Ganga at Sangam Nose and Dasashwamedh Ghat on 3rd November and 4th November respectively. Around 80 participants were present in the occasion.

## Nanobiosensor lab inaugurated



The Nanobiosensor lab was inaugurated at Barrackpore headquarters by the Director on 10 December 2020.

## Constitution Day pledge

The institute staff took the Constitution Day pledge on 26 November 2020 in the headquarters as well as in all the centres.



Constitution Day pledge

The Director inaugurating the Nano-biosensor lab

## ITMU News

### Patent filed

- Patent on “Development of nanoemulsifiable concentrate formulations of hydrophobic bioactive molecules and method of preparation thereof” filed in the name of Indian Council of Agricultural Research at Patent Office, Kolkata, on 28<sup>th</sup> September 2020 with application number 202031042037.
- Patent on “Culture media from vermicompost for enhancing the growth and lipid productivity of *Chlorella* spp” filed in the name of Indian Council of Agricultural Research at Patent Office, Kolkata, on 11<sup>th</sup> November 2020 with Patent Appl. No. 202031049308.

### Trademark filed

- Trademark application “CIFRI Argcure” with application number 4614213 was filed in the name of Indian Council of Agricultural Research on 18<sup>th</sup> August 2020 under class 5.

### MoU signed

Sr. No.	Organization with whom MoU is signed	Purpose	Date
1	Govt. of Himachal Pradesh State Fisheries Dept.	Ecological assessment of GobindSagar reservoir, Himachal Pradesh	4 September 2020
2	Fisheries Cooperatives, wetland, Murshidabad, W.B.	Development of wetlands	11 October 2020
3	Assam Fisheries Development Corporation Ltd., Guwahati	Setting up a field station of ICAR-CIFRI Regional Centre at Ghorajan Beel, Amingaon	06 November 2020
4	CDAC, Kolkata	Research collaborations in sensors for monitoring of pollutions in aquatic bodies, disease occurrence, physiochemical parameters estimation, etc. and plan for establishing IOT (Internet of Thing) based inland fisheries management	01 December 2020
5	CSB-CSRTI	Utilization and diversification of silkworm pupae products for fish feed	08 December 2020
6	Brahmaputra Board, Ministry of Jalshakti, Guwahati	Brahmaputra rafting expedition and awareness campaign	16 December 2020



MoU with CSB-CSRTI



MoU with AFDC



MoU with FCS, Murshidabad

## International collaboration

Letter of agreement with FAO, Rome and ICAR-CIFRI, Barrackpore on 19<sup>th</sup> November 2020 for “A review of the inland fisheries of India and the creation of capacity in the collection and analysis of inland fisheries statistics”.

## STC Activities

Under STC, the institute is trying to support the livelihoods of the tribal people of West Bengal, Odisha, Assam, Meghalaya, Gujrat, Jharkhand, Assam states by providing them technical guidance and inputs.



Distribution of inputs

In West Bengal, ICAR-CIFRI has distributed one submersible pump set to the fishermen of Rangabelia, Gosaba, Sundarban belonging to scheduled tribal community on 13<sup>th</sup> October 2020. This pump set is utilized by 120 fishermen families living in the locality. To support the livelihoods of the tribal fishers, 35 cast nets were distributed to the tribal fishermen of Sagar Island through Krishnanagar Swami Vivekananda Youth Cultural



Awareness at Bolpur

Society, Sagar. In Palotghat, Kakdwip around 450 kg of fish seed and 3000 kg of lime were distributed to the 146 ST beneficiaries on 07 December 2020 to support their livelihoods. To stock the Check Dam at Pachagora, Purulia, West Bengal. 12500 nos. of fish fingerlings and 4000 kg of fish feed were distributed to 30 tribal fishers of the area on 12<sup>th</sup> October, 2020. The institute arranged a



sensitization programme for creating awareness about various schemes and projects related to fish farming and distributed the important input for fish farming on 05<sup>th</sup> November, 2020. On this day, 560 kg of fish seeds, 8000 kg fish feed and 6000 kg lime have been distributed to 72 tribal fishermen.

In Odisha, ICAR-CIFRI distributed 15 FRP tanks and 15 ornamental kits to fifteen tribal women of Chunakoli village, Khurda. The initiative was taken to provide an alternative livelihood opportunity to the tribal women so that they can be economically empowered.



Distribution of ornamental fish feed & seeds

In Meghalaya, cage culture was demonstrated in Umiam reservoir under STC programme to provide supplementary livelihood to the tribal fishers. The final harvests of the cages directly benefited the 50 fishers/farmers families of the Ri-Bhoi Farmers' Union. The community also deposited a part of the income generated through the sale of fish in the bank account of the society "Umniuh Khwan welfare fund" for sustaining the activity. Seeing the success of the experiment, the participating fishers are eager to continue the cage culture of fish with technical support from ICAR-CIFRI.



Harvested fishes from Umiam reservoir cages

## Activities under Scheduled Caste Sub Plan (SCSP)

ICAR-CIFRI utilizes the SCSP as an avenue for socio-economic upliftment of the SC fishermen through inland fisheries management. The demonstration of ICAR-CIFRI technology on sustainable wetland management and pen culture were done in the selected wetlands of West Bengal and Odisha. IMC (catla, rohu and mrigal) and grass carp fish seed were raised in HDEP pen, installed in the wetlands for advanced fingerling production which were stocked in the wetlands for culture based fisheries. Fish fingerlings were provided separately to complement the deficiency of fish seed, required to attain the fish yield potential of six wetlands.



Input distribution at Kultoli



Two ornamental fish clusters were developed in West Bengal. Twenty five numbers of ornamental culture kit and FRP tanks were provided to the fishers of Khalsi wetland and 35 ornamental culture kit and FRP tanks were provided to the fishers of Kultali, West Bengal. Another ornamental fish culture cluster was established at Kulana, Bhadrak, Odisha for SC women. 25 fish holding FRP tanks of 350 L capacity along with all accessories like ornamental fish, plants, medicines, heaters, air blowers and pipes were distributed among the SC women. On field training cum demonstration on 'Ornamental fish culture', support were provided to all the women fishers of all these clusters.



Fish production enhancement in backyard ponds



Director, ICAR-CIFRI addressing the gathering at Gangasagar

Fish production enhancement in ponds was also attempted. The Fish farmers were sensitized and provided with fish farming inputs. In Kultali area of Sunderban, 196 fishers were provided with fish seed, lime and fish feed for their livelihoods improvement. In Santiniketan, Birbhum district of West Bengal, 77 SC families were provided with the inputs like fish seed, fish feed and lime for fish culture in their individual ponds. Sagar Island was severely affected by Cyclone



Input distribution at Santiniketan

“Amphan”. For the livelihood improvement of the fish farmers, sensitization for the necessary steps for fish production enhancement was carried out and 250 SC beneficiary were provided with fish seed, feed and lime.

Training on ornamental fish culture was conducted at ICAR-CIFRI for the SC fishers of Amtali and Kochukhali, Sunderbans as an alternate livelihood options. On site hands on training on ornamental fish culture was conducted at Sunderbans for the SC community of Khalsi wetland, Kulutali women fishers and 25 women fishers of Bhadrak, Odisha. A mass awareness programme at Baghua reservoir of Odisha was conducted to sensitize the fishers on the benefits of the pen culture and in-situ raising of fish seeds for higher fish production from the reservoirs.



Mass awareness camp at Odisha



Input distribution by Prayagraj Centre

Prayagraj Regional centre of the Institute distributed 625 kg rice bran, 625 kg mustard oil cake, 250 kg lime, 25 kg mineral vitamin mixture, 25 numbers of gill net and 25 numbers of hand-net to 25 fish farmers. Due to Covid 19, programme was conducted in three phase (On 02.10.2020, 06.10.2020 and 08.10.2020) and input were distributed either by calling them to institute or on their door step (near village). Total 25 farmers of SC community from Naraina, Karchhana, Handiya, Dubawal villages were benefitted through this programme. Input related to fish farming like 25 kg rice bran, 25 kg mustard oil cake, 1 kg mineral vitamin mixture, 10 kg lime, one gill net and one hand net were distributed to each farmer to support them in this pandemic situation.



The Bengaluru Regional Centre of the institute distributed fish feed, mask, sanitizers and other disinfectants to fifty Scheduled Caste fishers from *Yallamma Thaayi Meenugaarara Sahakara Sangha*, Vaderahalli Village, Thataguni post, Bangalore South Taluk on 11<sup>th</sup> September 2020. They were educated on the importance of physical distancing, use of mask, sanitization & self-hygiene to stay safe during COVID - 19 pandemic.



Input distribution by Bengaluru Regional Centre

## Swachh Bharat Abhiyan Activities



Mask and sanitizer distribution in local areas plastic-free India, swachhta awareness at local levels, swachhta workshops were the highlights of the pakhwada.

The institute with all the regional/research centres celebrated 'Swachhata Pakhwada' during 15-31 December 2020. All the staff members of this institute, including contractual and research scholars, actively participated in various events during the program. Digitization of office records and e-office, sanitization and solid waste management, cleaning and beautification of the surrounding areas, vermicomposting, drive towards



Workshop on women role

An extensive cleaning program was undertaken in the aftermath of the cyclone 'Amphan', which hit West Bengal on 18 May 2020. An inventory of uprooted trees was created, and the institute planted an equivalent number of trees to fulfil the loss.

ICAR-CIFRI investigated the carry of plastic from home to an aquatic system and published a seminal research article (<https://doi.org/10.1016/j.scitotenv.2019.133712>). The results and key findings have been translated into lucid layman's language, and the message has been carried forward to common men under the swachh Bharat activities.



Swachhta activity at ICAR-CIFRI Campus



Plantation at ICAR-CIFRI campus



Vermicompost unit of ICAR-CIFRI



Awareness campaigning for plastic, microplastic free river



Cleaning activity at the Allahabad Center



Mass awareness programme organized by the Bangalore Center



Cleaning activity at the Vadodara Center



Cleaning activity at the Kochi Center



## अनुसंधान उपलब्धियां

### ताप्ती नदी के मध्य और निचले भागों में पादप आधारित मछली एकत्रीकरण उपकरण

ताप्ती नदी के मध्य और निचले भागों में छोटे झींगे और मछलियों को एकत्र करने के लिए उथले और स्थिर धारा प्रवाह वाले क्षेत्र में बड़े पत्थरों को रखा जाता है और इन पत्थरों के साथ गुलाब के पौधों की सूखी टहनियों को नायलॉन अथवा नारियल की रस्सियों से बांध दिया जाता है। इस पद्धति को मानसून महीनों को छोड़कर लगभग वर्ष भर उपयोग किया जाता है। इसके लिये मछुआरे एक विशेष क्षेत्र का चयन करते हैं जहां सूखे गुलाब की सूखी टहनियों को जलक्षेत्र की गहराई और मछलियों के छिपने के स्थान के आधार पर संध्या के समय रखा जाता है और अगली सुबह स्थानीय पुश जाल 'पेलनी' द्वारा इन टहनियों और उनमें फंसे झींगे/मछलियों को एकत्र कर लिया जाता है। इनमें झींगा प्रजातियाँ जैसे *मैक्रोबेकियम लैमरेई*, *लैमरेई*, *मैक्रोबेकियम काइसनैस*, *मैक्रोबेकियम टीवारी* और अन्य छोटी मछलियाँ जैसे गोबिड, ईल, बार्ब आदि प्रमुख हैं। औसतन, प्रति इकाई मत्स्ययन प्रयास (सीपीयूई) 0.25 से 2.5 कि.ग्रा. प्रति मछुआरा प्रति दिन दर्ज किया गया।

दिबाकर भक्त, डब्ल्यू. ए. मीतेई, एस. पी. कांबले, वैशाख, जी., टी. एन. चानू, एस. के. कौशलेष, जे. के. सोलंकी, एस. सामंता और बि. के. दास

### गुजरात के नर्मदा नदी मुहाने पर कॉमन जेलिफिश, ऑरिलिया ऑरिटा (लिनिअस, 1758) की उपस्थिति

कॉमन जेलिफिश (*ऑरिलिया ऑरिटा*) को पहली बार गुजरात के नर्मदा नदी के भद्रभूत और मेहगेम क्षेत्र के बीच दर्ज किया गया है। *ऑरिलिया ऑरिटा* (वर्ग: फाइलम सिनिडारिया, ऑर्डर : सेमेओस्टोमी, फैमिली : उलमारिडे रेडियल) के मुंह से युक्त तंतु सुडौल और चमकीले होते हैं। इसके दूधिया और पारभासी रंग तथा सुडौल शरीर के आकार के कारण इसे आमतौर पर 'मून जेली' अथवा 'कॉमन जेली' कहा जाता है। मून जेलीफिश का आकार नाजुक छतरी के समान होता है। इसमें घोड़े के नाल के आकार की चार जनन ग्रंथियां तथा मुंह से लगी चार लंबी और संकीर्ण भुजायें पाई जाती हैं जो नीचे की ओर लटकी होती हैं। इसकी जनन ग्रंथियां थोड़ी लाल या गुलाबी रंग की होती हैं जो शरीर की सतह से दिखाई देती हैं। इसका शरीर सपाट होता है जिसका व्यास 55 मिमी पाया गया है। इसका शरीर पारदर्शी या रंगहीन होता है, तथा रेडियल कैनल और तंतु सफेद होते हैं। मानसून पूर्व महीने (मई 2019) में सैंपलिंग के दौरान बैगनेट (10 मिमी कॉड-एंड जालछिद्र) से हुये मत्स्य पकड़ में ऐसा केवल एक ही जेलिफिश पाया गया है।

यह कॉमन जेलीफिश दुनिया भर के उष्णकटिबंधीय और समशीतोष्ण महासागरों, अटलांटिक महासागर, प्रशांत महासागर और हिंद महासागर के तटीय जलों में प्रचुर तौर पर पाया जाता है। यह जल के इष्टतम तापमान 9–19 डिग्री सेल्सियस तथा 6–31 डिग्री सेल्सियस तापमान के बीच जीवित रह सकता है। यह तटवर्ती प्रजाति मुख्य रूप से नदी मुहाना और बंदरगाहों के सतही जल में पाया जाता है। प्राप्त रिपोर्ट के अनुसार, मून जेलीफिश मांसभक्षी होता है जो मोलस्क, छोटे कीट, क्रस्टेशिया और कोपेपोड प्रजाति के जीवों को खाता है। आमतौर पर, मून जेलिफिश को मानव जाति के लिये हानिरहित माना जाता है, लेकिन कभी-कभी भारत के विभिन्न हिस्सों में लोगों को इसके डंक मारने की घटनायें भी देखी गई हैं।

बि. के. दास, दिबाकर भक्त, एस पी कांबले, लोहित कुमार, ए. के. साहू और एस. सामंता

### ताप्ती नदी के निचले हिस्से में मीठाजल मछलियों में आइसोपोड परजीवी, *एलीट्रोपस टाइपस* (एगिडे) का संक्रमण

ताप्ती नदी के निचले भाग में मानसून पश्चात् सैम्पलिंग में मीठाजल प्रजाति, *लेबियो बोगट*, *ओरियोक्रोमिस निलोटिकस*, *सिस्टोमस सरना* और *जेनेटोडोन कैन्सिला* में परजीवी, *एलीट्रोपस टाइपस* (एच. मिल्ले एडवर्ड्स, 1840) का संक्रमण पाया गया। गुजरात के सिंगलकांच में ताप्ती नदी के निचले भाग में गिलनेट द्वारा मत्स्य पकड़ में इन संक्रमित मछलियों को पाया गया था। *एलीट्रोपस टाइपस* परजीवी मछलियों के त्वचा सतह, मुख गुहा और गिल में पाया जाता है, जिसके संक्रमण के कारण मछली के गलफड़ों में सड़न, मुंह की विकृति, व्यवहार में बदलाव, भोजन ग्रहण में कमी, विकास का अवरुद्ध होना और मछलियों में स्वास्थ्य में गिरावट देखी गई है। ताप्ती नदी के सिंगलकांच से मानसून पश्चात् एकत्रित अधिकांश मछली प्रजातियों में *ए. टाइपस* परजीवी आइसोपोड का संक्रमण पाया जाता है। आइसोपोड *ए. टाइपस* किसी विशिष्ट मत्स्य प्रजाति ही नहीं बल्कि विभिन्न प्रकार की





मछलियों को संक्रमित कर सकता है। सैम्पलिंग के समय जल के प्राचल जैसे तापमान, पीएच, घुलित ऑक्सीजन, क्षारीयता, कुल कठोरता, पारदर्शिता, क्रमशः 23.67 डिग्री सें.ग्रे., 8.05, 9.76 मि.ग्रा. प्रति ली., 150.67 मि.ग्रा. प्रति ली., 126.32 मि.ग्रा. प्रति ली. और 117.33 से.मी. पाये गए।

दिबाकर भक्त, एस. पी. कांबले, डब्ल्यू.ए. मीती, वैशाख, जी., जे. के. सोलंकी, राजू बैठा, एस. के. दास, एस. सामंता और बि. के. दास

## पूंडी जलाशय में मत्स्य बीज भंडारण का प्रभाव

तमिलनाडु के थिरुवल्लूर जिले में कोसाथलैयर नदी पर स्थित पूंडी जलाशय देश के प्रमुख जलाशयों में से एक है। इसका क्षेत्रफल 1729 हेक्टेयर है। पूंडी जलाशय से जुड़ी 770 सदस्यों वाली 9 मत्स्य समितियां हैं और यह जलाशय मछली पकड़ने के लिए अपने सदस्यों को लाइसेंस जारी करती हैं। वर्ष 2019-20 के दौरान बीज भंडारण 8.40 लाख था और दोहन लक्ष्य संचयित मत्स्य बीजों के लिए 8.4 टन और असंचयित मछलियों के लिए 130 टन निर्धारित किया गया था। जलाशय में संचयित प्रमुख मछली प्रजातियां, *लेबियो कतला*, *एल रोहिता*, *सिरहिनस मृगला* और *साइप्रिनस कार्पियो* थीं। पियर्सन कोरिलेशन विश्लेषण में स्टॉकिंग घनत्व का मछली की उपज (आर = 0.59) के साथ एक मजबूत सकारात्मक संबंध देखा गया है।

वी. एल. राम्या, एम. कार्तिकेयन, प्रीता पणिकर, यू. के. सरकार और बि. के. दास

## हिमाचल प्रदेश के पौंग जलाशय का सर्वेक्षण

संस्थान ने दिनांक 14-20 अक्टूबर, 2020 के दौरान हिमाचल प्रदेश के कांगड़ा जिले में स्थित पौंग जलाशय का सर्वेक्षण किया था। इस सर्वेक्षण में संस्थान में जीआईजेड प्रायोजित परियोजना के तहत प्राथमिक उत्पादन, जलीय-रासायनिक प्रोफाइल, जैविक जीवों, मत्स्य पकड़ आंकड़ा, लैंडिंग केंद्रों का दौरा, वन्यजीव संबंधी आंकड़ा, संबद्ध मत्स्य अधिकारियों के साथ विचार-विमर्श तथा मछुआरों के सामाजिक-आर्थिक आंकड़ों को संग्रह किया गया था। कुछ ऐसे मछुआरों के आंकड़ें भी लिये गये हैं जिन्होंने नरेगा (NREGS) जैसी योजनाओं से युक्त होकर मछली पकड़ना छोड़ दिया था, पर वे इस जल निकाय से अधिक आय अर्जित करने के लिए वापस मछली पकड़ने के लिये लौट आए हैं। यह सर्वेक्षण डा. ए. के. दास, प्रधान वैज्ञानिक के नेतृत्व में हुआ जिन्होंने निदेशक, मत्स्य विभाग, हिमाचल प्रदेश सरकार के साथ बैठक में इस जलाशय में मत्स्य पालन को कैसे बढ़ाया जाय, उन्नत मत्स्य पालन के लिए पद्धतियों का विकास करना और मछुआरों की आजीविका को बढ़ाना आदि महत्वपूर्ण विषयों पर चर्चा की।

बि. के. दास, ए. के. दास, यू. के. सरकार और लियानथुमलुआइया

## मध्य प्रदेश के हलाली जलाशय में तिलपिया के जनसंख्या गतिकी का आंकलन

सितंबर 2018 से जून 2019 के दौरान पात्र नाला (लोटिक अर्थात् गतिमान प्रवाह वाला जलक्षेत्र) और बांध स्थल (लेंटिक अर्थात् स्थिर जलक्षेत्र) के सैम्पलिंग नमूना स्टेशनों का चयन किया गया। विभिन्न लैंडिंग स्थलों पर ओ. *नाइलोटिकस* की लंबाई-आवृत्ति संबंधी मासिक आंकड़ों को लिया गया तथा लगभग 1250 नमूने एकत्र किए गए। इन मछलियों की कुल लंबाई 75.0 से 445.0 मि.मी. और वजन 47.0 से 1050.0 ग्रा. तक पाई गई। आंकड़ों का विश्लेषण FiSAT II सॉफ्टवेयर पैकेज (FAO-ICLARM Stock Assessment Tools) द्वारा किया गया था। पात्र नाला और हलाली बांध स्थल के आंकड़ें यह बताते हैं कि हलाली बांध की तुलना में पात्र नाला के बड़े आकार की मछलियों (250 मिमी या उससे ऊपर) के उच्च सापेक्ष में बहुतायत और परिपक्व मछलियों की बहुलता को दिखाता है। इसका कारण भोपाल शहर और आसपास के क्षेत्रों से जलाशय में प्रवाहित होने वाला अपरद है।

लंबाई परिवर्तित कैच कर्व विधि से कुल मृत्यु दर का अनुमान लगाया गया। अनुमानित मृत्यु दर क्रमशः 0.60, 0.72 और 1.32 और मत्स्य दर 0.54 था। विश्लेषण में यह पाया गया कि ओ. *नाइलोटिकस* का संयचन अधिकतम मछली पकड़ दबाव (एमैक्स = 0.55) से अधिक नहीं है और इसकी मृत्यु दर इष्टतम दबाव ( $E < 0.50$ ) से ऊपर है। मछली पकड़ने में औसत मृत्यु दर और औसत दोहन दर क्रमशः 0.72 और 0.54 पाये गये। चूंकि दोहन दर इष्टतम मछली पकड़ दबाव से ऊपर थी, इसलिए ओ. *नाइलोटिकस* का संयचन जलाशय में अनुकूल स्थिति में है। अध्ययन में यह पाया गया कि गिलनेट के जालछिद्र का आकार को बढ़ाया जाना चाहिये जिससे ओ. *नाइलोटिकस* के लक्षित आकार (टीएल - 150 से



250 मिमी) की मछलियों की जनसंख्या को नियंत्रित किया जा सके। इससे इंडियन मेजर कार्प प्रजाति की मछलियों के वार्षिक संचयन दर क्रमिक तौर पर उच्च होगी और हलाली जलाशय में कार्प मत्स्य पालन का पुनरुद्धार किया जा सकेगा।

कैनसियाल, जे., सतीश के कौशलेष, यू. के. सरकार, ए. के. दास और बि. के. दास

## संस्थान द्वारा वेस्ट-टू-वेल्थ हरित कार्यक्रम के तहत एक पहल

संस्थान ने स्वच्छ भारत अभियान के तहत अवशिष्ट तत्वों (कचरे) के प्रयोग से संस्थान परिसर में वर्मीकम्पोस्ट बनाने के लिये एक इकाई की स्थापना की है।

इसके अंतर्गत जैविक अपशिष्ट पदार्थ, जैसे बगीचों के कचरे, सड़े हुये पत्तों, घरेलु कूड़ा-करकट, घास-फूस आदि को कंचुओं का उपयोग करके पोषक तत्वों से भरपूर जैविक उर्वरकों बनाया जाता है। इसमें 35-50 दिनों की कंपोस्टिंग से 400 किलोग्राम से अधिक अपशिष्ट पदार्थों से लगभग 100 किलोग्राम खाद बनाया जा सकता है। इस खाद में सी : एन अनुपात 10 : 1 होता है, जो कृषि फसलों के साथ-साथ जैविक जलीय कृषि के लिए पोषक तत्वों के स्रोत के लिए अत्यंत उपयोगी है। इसके अलावा, इससे संस्थान को राजस्व भी प्राप्त होता है। संस्थान ने 11 नवंबर 2020 को भारतीय पेटेंट कार्यालय में कंपोस्टिंग सामग्री सहित पूरी वर्मीकम्पोस्टिंग प्रक्रिया पर एक पेटेंट दायर किया है (पेटेंट आवेदन संख्या - 202031049308)

सोमा दास सरकार, बसंत कुमार दास, सुबीर कुमार नाग और श्रीकांत सामंता

## मीठाजल के सूक्ष्म शैवाल और बायोडीजल उत्पादन के लिए कम लागत वाला पोषक तत्व

वर्मीकम्पोस्ट से वर्मीकम्पोस्ट अर्क एरोबिक और एनारोबिक पाचन विधि द्वारा तैयार किया गया, जो जैविक अपशिष्ट पदार्थों जैसे बगीचों के कचरे, सड़े हुये पत्तों, घरेलु कूड़ा-करकट, घास-फूस आदि से प्राप्त किया जाता है। बीजी11 मीडियम में अलग-अलग अनुपात में वर्मीकम्पोस्ट का अर्क मिलाकर कल्चर मीडिया तैयार किया गया और इसे मानक कल्चर माना गया। परिणाम यह बताते हैं कि अवायवीय रूप से पचने वाले वर्मीकम्पोस्ट अर्क और बीजी11 मीडियम के 50 : 50 संयोजन से सभी संयोजनों के बीच क्लोरेला की एक उप-प्रजाति, ग्रेसीला इमर्सनी के विकास में सुधार देखा गया। लिपिड तत्व और लिपिड उत्पादकता क्रमशः 15.11 प्रतिशत और  $3.59 \pm 0.0004$  मि.ग्रा प्रति ली. पाई गई। जीसीएमएस विश्लेषण में प्रमुख फैटी एसिड के तौर पर मिथाइल पामिटेट को पाया गया। यह देखा गया कि मछलियों के लिए पूरक आहार के रूप में प्रयुक्त मीठाजल सूक्ष्म शैवाल कम लागत वाला एक पोषक आहार है। संस्थान ने माइक्रोएल्गे कल्चर और बायोडीजल उत्पादन के लिए वर्मीकम्पोस्ट के अर्क के उपयोग पर 11 नवंबर 2020 (पेटेंट आवेदन संख्या 202031049308) को भारतीय पेटेंट कार्यालय में एक पेटेंट दायर किया है।

सोमा दास सरकार, संधाना कुमार वी. और बसंत कुमार दास

## मीठाजल पीकॉक ईल प्रजाति, मैक्रोनेथस अराल का घेरे में सफल प्रजनन

संस्थान की 'ऑल इंडिया नेटवर्क प्रोजेक्ट ऑन ब्रीडिंग एंड कल्चर ऑफ ऑरनामेन्टल फिश' के तहत पहली बार मीठाजल पीकॉक ईल प्रजाति, मैक्रोनेथस अराल का घेरे में सफलतापूर्वक प्रजनन किया गया। इसके लिये पश्चिम बंगाल के उत्तर और दक्षिण 24 परगना, नदिया और बांकुड़ा जिलों से मछलियों को एकत्र किया गया और परिपक्व होने तक उनका पांच से छह महीने तक घेरे में पालन किया गया। पश्चिम बंगाल में मीठाजल ईल प्रजाति की मछलियों का प्रजनन मानसून के आरंभ में शुरू होता है और जुलाई-अगस्त में सबसे अधिक प्रजनन होता है। इस दौरान शीशे के एक्वेरियम (2' x 1.5') में दस से अधिक बार प्रजनन परीक्षण किए गए तथा उपयुक्त जल गुणवत्ता मानकों को बनाए रखा गया। लकड़ी के छोटे लट्टों और जलीय पौधों को स्पॉनिंग के लिए सबस्ट्रेट के रूप में रखा गया। एक्वेरियम में इलेक्ट्रिकल फिल्टर और एयररेटर की मदद से जल का हल्का प्रवाह भी नियत किया गया था।



प्रजनन के लिए मादा और नर अण्डों का अनुपात 2 : 4 लिया गया। स्पॉनिंग प्रतिक्रिया 10–12 घंटों के बाद दिखाई देती है। अंडे हरे रंग के गोल और चिपकने वाले थे तथा झाड़ीदार पौधों या किसी अन्य सबस्ट्रेट से जुड़े हुए पाए गए। कुल 24 घंटों के बाद मछली की एक जोड़ी से 2.0–2.5 मिमी व्यास के कुल 70–90 अंडे एकत्र किए गए। स्पॉनिंग के 48–56 घंटे बाद हैचिंग हुई। इस प्रकार के घेरे में मछली पालन का यह पहला प्रयास था। लार्वा पालन तकनीक में सुधार करने के लिए और भी अधिक परीक्षण किये जा रहे हैं ताकि पोना मछलियों की उत्तरजीविता को बढ़ाया जा सके।

अर्चना सिन्हा और हिमांशु एस.स्वैन

## डेराजंग जलाशय, ओडिशा के पारिस्थितिक स्वास्थ्य का आकलन

ओडिशा के अंगुल जिले में स्थित दारजंग जलाशय के पारिस्थितिक स्वास्थ्य का आकलन जलाशय में मछली प्रजातियों की जनसंख्या घनत्व, विदेशी मत्स्य प्रजातियों की संख्या, मत्स्य विविधता सूचकांक, शैवाल प्रदूषण सूचकांक और ट्रॉफिक स्टेट इंडेक्स के आधार पर किया गया। मत्स्य पालन की दृष्टि से दारजंग एक मध्यम उत्पादन वाला जलाशय है। पारिस्थितिक स्वास्थ्य सूचकांक के अनुसार इस जलाशय की पारिस्थितिक उच्चतम सूचकांक में है और इसका पारिस्थितिक स्वास्थ्य मध्यम स्थिति में है।

लियानथुमलुआइया, यूके सरकार, टी तायुंग, पी मांझी, एके बेरा, बी के नस्कर और वाई अली

## मध्य प्रदेश में सरदार सरोवर जलाशय की पारिस्थितिक स्थिति, संरक्षण और मात्स्यिकी संवर्द्धन पर सर्वेक्षण

संस्थान ने वर्ष 2018–20 के दौरान मध्य प्रदेश में सरदार सरोवर जलाशय की पारिस्थितिकी (जैविक और अजैविक घटक), मत्स्य आवास विशेषताओं, मत्स्य पालन प्रबंधन रणनीतियों के विकास के लिए मात्स्यिकी स्थिति का आकलन के लिए एक अध्ययन किया और संकटग्रस्त मछलियों की संख्या के पुनरुद्धार के लिए उचित संरक्षण उपायों पर सुझाव दिया है। इस जलाशय के चार अलग-अलग स्टेशनों, माहेश्वर, राजघाट, कोटेश्वर और काकराना में मौसमी नमूनों को लिया गया। अध्ययन से संकेत मिलता है कि जलाशय की जल गुणवत्ता मानदंड इष्टतम सीमा के भीतर हैं और मछली उत्पादन के अनुकूल हैं। उपयुक्त मत्स्य आवास जैसे गहरे पूल में बड़ी मछलियों के उत्पादन के लिए पिंजरा पालन तकनीक को अपनाया जा सकता है। तीनों मौसमों में बैसिलारियोफाइसी और क्लोरोफाइसी जैसे प्लवक समूहों की प्रचुरता व्यावसायिक रूप से महत्वपूर्ण मछलियों के पोनों के लिए भोजन की उपलब्धता का संकेत देते हैं। मछली पकड़ विश्लेषण में छोटी स्वदेशी मछलियां, आर्थिक रूप से महत्वपूर्ण मध्यम और बड़े आकार की मछलियों और फिनफिश की समृद्ध विविधता (56 प्रजातियां) को दिखाते हैं। इस क्षेत्र में मोटर चालित मछली गियर की अनुपलब्धता यह दर्शाता है कि आने वाले वर्षों में बेहतर मछली पैदावार प्राप्त करने के लिए मछुआरा समुदाय के कौशल स्तर में वृद्धि के साथ-साथ मछली पकड़ने वाली गियर जालों में सुधार की आवश्यकता है। ट्रॉफिक स्टेट इंडेक्स यह संकेत देते हैं कि मध्य प्रदेश में सरदार सरोवर जलाशय का भाग कम उत्पादन वाला है। अध्ययन अवधि के दौरान संभावित मछली उत्पादन का अनुमानित मूल्य 42.8 किग्रा/हे/वर्ष था। हालांकि, यह अधिकतम प्रतिपालित (एमएसवाई) उपज वर्तमान औसत उपज (22.4 किग्रा/हे/वर्ष) से दोगुना आंका गया है। सरदार सरोवर जलाशय में मछली प्रजातियों के सीएएफएफ (2006) वर्गीकरण से संकटग्रस्त प्रजातियां (लुप्त और लुप्तप्राय) के तहत 15 फिनफिश प्रजातियों को रखा गया, जिसमें महसीर भी शामिल है और इस प्रकार स्थानीय मत्स्य आवासों में इसके संरक्षण के लिए बेहतर प्रबंधन रणनीतियों की आवश्यकता है।

सतीश कौशलेश, यू. के. सरकार, बि. के. दास, सी. जॉनसन, ए. के. दास, बी. के. नस्कर और वाई. अली

## आर्द्रभूमि मत्स्य पालन पर ग्रीष्म हवाओं का प्रभाव

पश्चिम बंगाल की गंगा नदी और भोमरा आर्द्रभूमि पर ग्रीष्म हवाओं के प्रभाव का अध्ययन किया गया। इसके लिये अंतर्स्थलीय ताप सूचकांक (IHI) से मासिक आंकड़ों को प्राप्त किया गया। अध्ययन में गर्मी के महीनों के दौरान चलने वाली ग्रीष्म हवाओं से इन पारिस्थितिक तंत्रों पर हानिकारक प्रभाव का विश्लेषण किया गया। अध्ययन के अनुसार, ग्रीष्म लहर सूचकांक (Heat wave index) का सेकची डिस्क की गहराई और जलक्षेत्र गहराई पर सकारात्मक प्रभाव जबकि कुल घुलित ठोस तत्व (टीडीएस), लवणता और चालकता पर नकारात्मक प्रभाव पड़ता है। मानवजनित जलवायु परिवर्तन जैसे ग्रीष्म लहरें जल की गुणवत्ता को प्रभावित कर सकती हैं और इससे जलीय जीवों का दीर्घकालिक उत्पादन और अस्तित्व प्रभावित हो सकता है।

अध्ययन में इन पारिस्थितिक तंत्रों में प्लवक की सघनता और विविधता पर अंतर्स्थलीय ताप सूचकांक के संभावित प्रभाव की परिकल्पना की गई है, जिससे पारिस्थितिकी तंत्र में प्लवक की मछलियों की खाद्य संरचना में परिवर्तन होता है। अध्ययन में यह निष्कर्ष निकलता है कि मानवजनित कार्यकलाप से अंतर्स्थलीय ग्रीष्म तरंगों की आवधिक और अंतर्स्थलीय जलीय प्रणालियों की विविधता और पारिस्थितिकी तंत्र पर एक बड़ा प्रभाव पड़ता है।

यू. के. सरकार, पी. मिशाल, जी. कर्नाटक, ए. बंधोपाध्याय, बी. दास घोष, बि. के. दास

## जलवायु परिवर्तनशीलता के संबंध में हितधारकों की धारणा के आधार पर भेद्यता मूल्यांकन

संस्थान के अध्ययन के अनुसार, पश्चिम बंगाल का मालदा जिला जलवायु परिवर्तन के प्रभाव की दृष्टि से अत्यधिक संवेदनशील जबकि नादिया और बर्धमान जिले कम संवेदनशील पाये गये। कूचबिहार, उत्तर 24 परगना और मुर्शिदाबाद मध्यम रूप से अधिक संवेदनशील पाये गये। अतः आने वाली वर्षों में आर्द्रभूमि संसाधनों की उपयोगिता के लिए स्थायी रूप से इनके संरक्षण की आवश्यकता है। अध्ययन किये गये कुल 25 आर्द्रभूमि में मालदा जिले का मटीकाठा आर्द्रभूमि अत्यधिक संवेदनशील पाया गया जबकि, कूचबिहार जिले में गोरखा आर्द्रभूमि और नादिया जिले में खलसी आर्द्रभूमि कम संवेदनशील थे। शेष आर्द्रभूमि मध्यम रूप से अधिक संवेदनशील पाये गये। सूचकांक—आधारित भेद्यता में दो प्रकार के संकेतकों को सम्मिलित किया गया है— दीर्घकालिक मात्रात्मक आंकड़ा वाले जलवायु संकेतक और आर्द्रभूमि मत्स्य पालन के लिए हितधारक विशिष्ट भेद्यता। पिछले 15 वर्षों में उच्च सर्वसम्मति (92 प्रतिशत) ने जलवायु विसंगति संबंधित तथ्यों की पुष्टि की है जिसे दीर्घकालिक आंकड़ा विश्लेषण के माध्यम से भी मान्य किया गया है।

जी. कर्नाटक, यू. के. सरकार, बी. दास घोष, मिशाल पी और एस. कुमारी

## मछली प्रजनन पर जलवायु—जलीय कारकों का प्रभाव

निचले गंगा जल निकासी (भारत) में जलवायु परिवर्तन और अधिक मछली पकड़ने के संदर्भ में क्लूपीड प्रजाति, गुडुसिया छपरा की प्रजनन निर्भरता की जांच की गई। मासिक वर्षा ( $\geq 60-100$  मिमी) के बाद जल का तापमान ( $\geq 31-32$  डिग्री सेल्सियस) मादा मछलियों के प्रजनन के लिए संकेतक हैं। पिछले दो दशकों में इस प्रजाति ने लगातार प्रजनन होता रहा है। मछली पकड़ने के लिए प्रजनन कारक जैसे प्रथम प्रजनन के समय परिपक्वता पर आकार ( $\geq 6.8$  सेमी घट गया है) और निषेचन पूर्व मछली का आकार को लिया जाता है। Girthspawn50 न्यूनतम जाल आकार के लिये एक परोक्ष आवश्यकता है जिससे मादा (+22 प्रतिशत, उभरा हुआ पेट) को जाल से निकलने में आसानी हो और वह प्रजनन कर सके। वर्तमान में मछली पकड़ने के जाल (3-10 से.मी. जाल) मछलियों का अंधाधुंध शिकार करते हैं। जलवायु परिवर्तन की तुलना में मछलियों का अत्यधिक दोहन मात्स्यिकी संवर्द्धन के लिये एक बड़ा खतरा है।

यू. के. सरकार, जी. कर्नाटक, बी. दास घोष, एस. कुमारी और सी. जॉनसन

## 3 times Lifetime Achievement Award to Dr. K. V. Devaraj

Dr. K. V. Devaraj, Former Vice-Chancellor, University of Agricultural Sciences, Bengaluru was given Lifetime Achievement Award by Forum of Former Vice Chancellors of Karnataka State Universities in recognition of his contributions as a distinguished Teacher, Scientist and Great Administrator on 5<sup>th</sup> October 2019. He also received the lifetime award from the Asian Fisheries Society, Indian Branch (2017) and Forum of Fisheries Technologists, Bengaluru (2018) for his contributions in research, teaching and development of Inland aquaculture in India.

