भाकृअनुप
ICAR

NBFGR News

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RESEARCH HIGHLIGHTS

Microsatellite markers identified from expressed sequence tags of Indian catfish *Clarias batrachus* spleen

Expressed Sequence Tags (ESTs) form an efficient approach for development of molecular resources useful for functional genomics, gene mapping, marker-assisted selection and also in comparative genomics. Polymorphic microsatellites within genes of known function i.e. Type I markers, that are conserved in a wide spectrum of species through evolution, are useful for comparative gene mapping. Using ESTs and EST derived Type 1 markers, linkage maps have been constructed in many aquaculture species.

Clarias batrachus, an Indian catfish species, is endemic to the Indian subcontinent. Owing to its favourable taste, medicinal and high market value, it is very popular and a potential cultivable species. Despite high commercial and evolutionary significance, the research on development of genomic resources including Type I markers, in Clarid catfishes is very limited. Therefore, NBFGR has undertaken studies in this field.

A total of 608 ESTs were generated from normalized cDNA library from spleen of *C. batrachus*. Of these, 71 (11.6%) ESTs were found to contain microsatellites. Dinucleotide repeats were the most abundant within *C. batrachus* ESTs which accounted for 50.6% of all microsatellite-containing ESTs, followed by 37.3%, 10.6% and 1.3%, respectively, for tri, tetra and pentanucleotide repeats. Clustering and assembly of microsatellite containing ESTs resulted into identification of 6 contigs containing 12 ESTs, having 2.0 as the redundancy number. Thus, a total of 65 unique microsatellites containing ESTs, including 59 singletons and 6 contigs were identified. Gene identities of ESTs were established through BLAST searches and 17 of the 65 ESTs showed high identity to annotated genes, confirming them as Type I markers. Of the identified 65 microsatellites containing ESTs, 30 ESTs that included all kinds of repeats, were randomly selected and primers were designed. Primer pairs for the identified 30 loci were tested on *C. batrachus* DNA samples. A total of 29 primer pairs amplified loci successfully in expected size range. Twelve loci were found to be polymorphic and suitable for genetic diversity analysis.


Clarias batrachus

Thus, 17 Type I markers were identified in *Clarias batrachus* which will be particularly valuable for genetic mapping and serving as anchor loci for comparative genomic studies. In addition, 12 polymorphic microsatellite loci identified, are useful to determine genetic variation in wild populations of *C. batrachus*.

NATIONAL BUREAU OF FISH GENETIC RESOURCES, LUCKNOW
(Indian Council of Agricultural Research)

Low genetic differentiation in the populations of the Malabar carp *Labeo dussumieri*

Labeo dussumieri (Valenciennes, 1842) a cultivable food fish, popularly known as 'Malabar Labeo'; or 'thooli' or 'pullan' (in Malayalam) or 'hiri kanaya' (in Sinhalese), is endemic to the west flowing rivers originating from the southern part of Western Ghats, India and lowlands of Sri Lanka. In India, the species is one of the highly esteemed food fishes and commands a higher price as compared to the Indian major carps, especially in Kerala State. To date, stock assessment of this important species have not been done in different rivers. Hence, there is no information about the current exploitable potential of Malabar Labeo. In recent years, there has been a massive hunt for the species from the wild in India and its occurrence became sparse in the rivers. This species has been categorized as 'endangered' based on IUCN criteria including, restricted distribution, loss of habitat, over-exploitation, destructive fishing practices and trade.

In view of the above, *L. dussumieri* was short-listed for taking up stock-specific, propagation assisted rehabilitation programme in rivers where it is naturally distributed. In order to devise adequate conservation and management strategies for an endangered species, it is important to investigate its population history, geographical partitioning throughout its natural distributional range; and distribution of genetic diversity within and among populations through genetically controlled markers. This can also help in scientific planning of propagation assisted rehabilitation programmes and monitoring their impact on natural gene pool.

The population structure of *Labeo dussumieri* from three riverine locations in the Western Ghats, India was investigated using allozyme, microsatellite and RAPD markers. Samples were obtained from Meenachil, Manimala and Pamba river basins, Kerala. Fourteen (46.7%) out of 30 allozyme loci, seven microsatellite loci and 12 RAPD Operon decamers gave polymorphic pattern. Six allozyme loci (*AAT-2**, *EST-4**, *GLDH**, *GPI-2**, G_6PDH* and *LDH-2**) and three microsatellite loci (*LdussG1*, *MFW19* and *Bgon22*) exhibited consistent significant deviation from Hardy-Weinberg Equilibrium expectations in different populations, after probability level ($P<0.05$) was adjusted for sequential Bonferroni correction. All the three marker types demonstrated concordant results and various estimates revealed genetic variability within the subpopulations but surprisingly low level (θ = 0.0034 to 0.0081) of genetic differentiation among *L. dussumieri* from different river samples. AMOVA

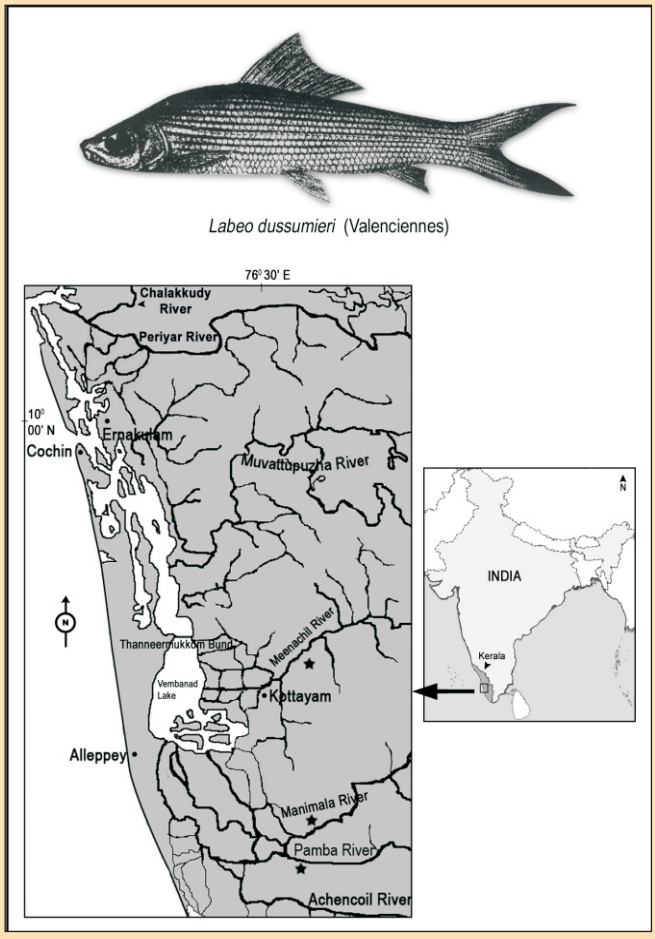


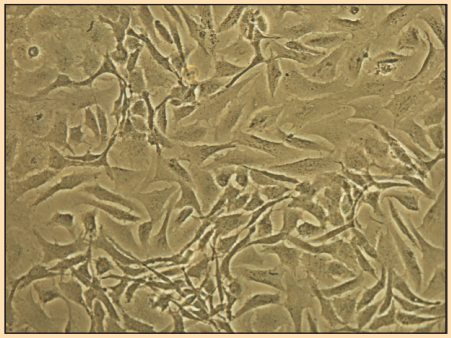
Fig. 1. Map the collection sites (★) of Labeo dussumieri from Kerala

Fig. 2. *Labeo dussumieri*

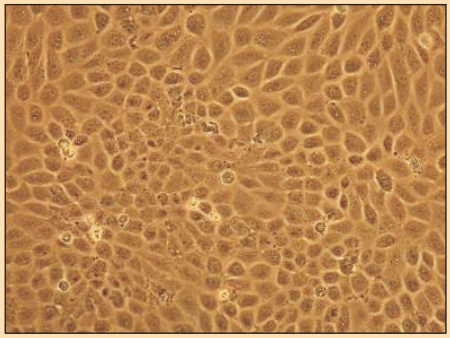
analysis also indicated low differentiation among subpopulations. No evidence for a recent genetic bottleneck was observed in *L. dussumieri* populations based on allozyme and microsatellite data set analysis. Meenachil, Manimala and Pamba rivers open in to the southern end of Vembanad Lake in Kerala and are connected to each other in the lower reaches through an extensive network of natural canals. Common ancestry in the prehistoric period; and possible mixing of fish populations resulting in high gene flow across the rivers through the lake and interconnecting canals, could have been responsible for the lack of significant allelic heterogeneity among the *L. dussumieri* populations. The stocks from the three rivers do not require different management strategies and for propagation assisted river ranching programme of this species, large effective breeding population can be developed by mixing individuals from three rivers.

Development and characterization of cell lines from freshwater and marines fishes

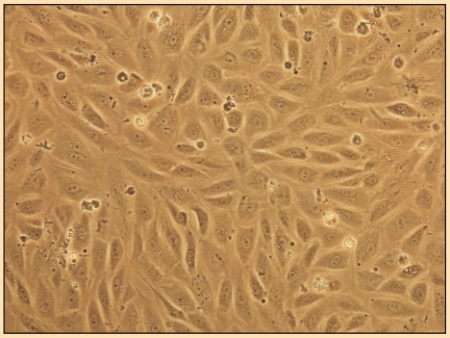
The NBFGR has strengthened its efforts towards developing cell lines from fish species. Five cell lines were developed from fin tissue of *Etroplus suratensis* (Pearl spot), *Pristolepis fasciata* (Malabar Catopra), *Puntius denisonii* (Red-lined torpedo fish), *Cyprinus carpio* koi (Koi Carp) and *Puntius fasciata* (Melon barb). The fin cells adhered well to the substratum and achieved confluence in 4-6 days at 28^{0}C in L-15 medium containing 15% Foetal Bovine Serum (FBS). The fin cell lines have been subcultured 20 - 54 times. Morphologically, fin cell lines were composed of fibroblastic type cells, whereas the fin cells of pearl spot composed of epithelial-like cells. Fin cells were able to grow at temperatures 24^0-32^{0}C. However, maximum growth was obtained at 28^{0}C. No significant cell growth was observed at temperature below 20^{0}C. Maximum growth in all fin cells occurred with



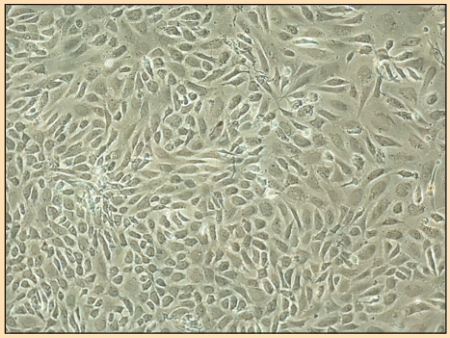
Phase Contrast photomicrograph of monolayer of *Pristolepis fasciatus* (Malabar Catopra) fin cells (200X)



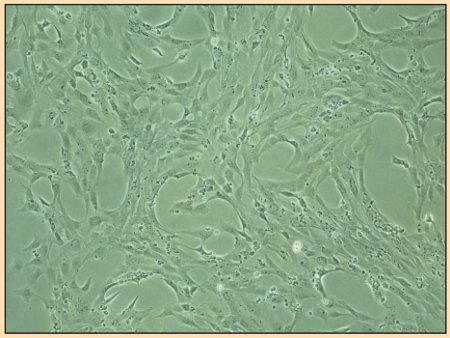
Phase Contrast photomicrograph of monolayer of *Etroplus suratensis* (Pearl spot) fin cells (200X)



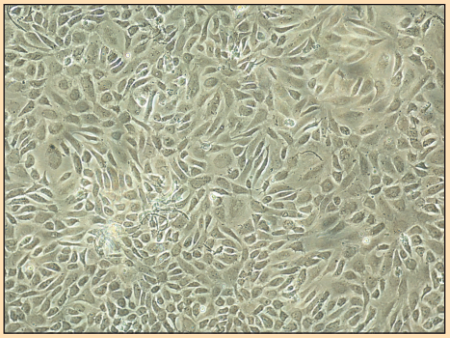
Phase Contrast photomicrograph of monolayer of *Cyprinus carpio* koi (Koi Carp) fin cells (200X)



Phase Contrast photomicrograph of monolayer of *Puntius denisonii* (Red-lined torpedo fish) fin cells (100X)



Phase Contrast photomicrograph of monolayer of *Puntius fasciatus* (Melon Barb) fin cells (100X)



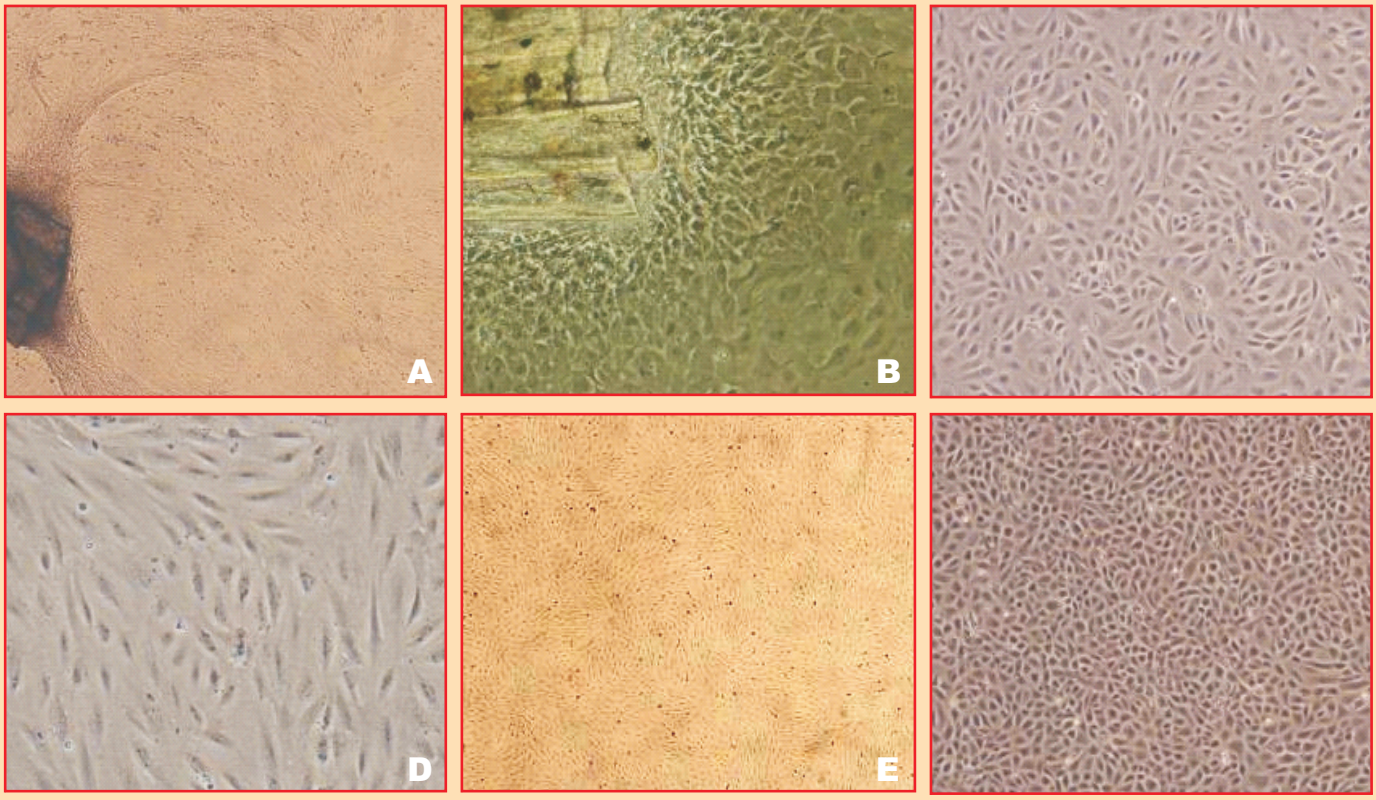
Phase Contrast photomicrograph of monolayer of *Puntius denisonii* (Red-lined torpedo fish) fin cells (100X)

Growth characteristic of cell lines developed from different fish species

10–20% FBS, whereas no appreciable growth occurred with 5% FBS. The fin cells were stored in liquid nitrogen (-196^{0}C) for 3 - 6 month. All the cell populations showed 70-85% viability after thawing and grew at 28°C. Following storage, no obvious alterations in morphology or growth pattern were observed for cells. The origin of the cell lines were confirmed by analyzing the nucleic acid sequences of 16S rRNA and COI region of the respective fish species.

In another experiment, three new cell lines were developed from *Labeo rohita* and named as RF (Rohu Fin), RH (Rohu Heart) and RSB (Rohu Swim bladder). The cells from the fin of rohu grew continuously and subcultured at intervals of 8 to 10 days. The initial subcultures of rohu fin (RF) consisted of both epithelial-like and fibroblast-like cells. The cells were split in a ratio of 1:2. The cells adhered well to the substratum and achieved confluence in 8-12 days at 28^{0}C in L-15 medium containing 15% FBS. Morphologically, RF was composed of epithelial-like cells. The subcultured cells were grown in fresh L-15 with 15% FBS medium. Till now, the rohu fin cell line has been subcultured 35 times.

Cell lines were characterized using molecular markers and cytogenetic studies. The originality of the cell lines was confirmed using mitochondrial DNA markers (16S rRNA & COI). Amplification from 16S rRNA and COI genes for cell lines revealed the expected PCR products of 496 bp and 655 bp, respectively. The sequences were submitted to NCBI Genbank (Accession Nos. FJ183811-FJ183813 and FJ183808- FJ183810). All the cell lines had similar chromosome morphology. The modal number of chromosomes for all the cell lines was found to be 50. The evaluation of the viability of cell lines stored in liquid nitrogen (-196^{O}C) revealed the capability of cells to survive after six months of storage.



Different stages of development of cell lines from *L. rohita*
A - Fin explant (40X): B– Fin explant (200X): C- 95% Confluent (100X), D) 95% Confluent (200X): E –100% confluent (40X); F – confluent (100X)

Rapid Progress in DNA Barcoding of Fishes

The NBFGR has made a rapid progress in DNA Barcoding Indian Fishes. A total 3403 fish samples of 656 species have been collected from Vishakhapatnam, Mandapam, Chennai, Tuticorin, Andaman & Nicobar Islands, Mumbai, Cochin, Lakshadweep and Gujarat coast. For freshwater fishes, sampling was done at Lucknow (Gomti), Allahabad (Ganga), Kanpur (Ganga), Chakghat (Tones), Srinagar (Alakananda), Malda (lower Ganga), Deheradun (Yamuna), Maldevta (Song), Guwahati (Brahamaputra) and Shillong (Umiam), Khanda Gad Srinagar (Alkananda), Dhuburi (Bhramputra), Serou, Bishenpur, Manipur (Iril), Poringalkuthu Dam and Athirrapally, Thrissur, (Challakudy), Solayar Dam Near Valparai, Karnataka (Kali river). In total, 739 samples of 132 fin fish species and 57 samples of 12 shell fish species were collected from freshwaters. Till date 1509 DNA barcodes of over 400 species have been prepared for Indian fishes. A total of 1107 barcode sequences have been submitted to the NCBI GenBank. In addition, 21 DNA barcodes of helminth parasites of fishes were also prepared by NBFGR in collaboration with Allahabad Central University.

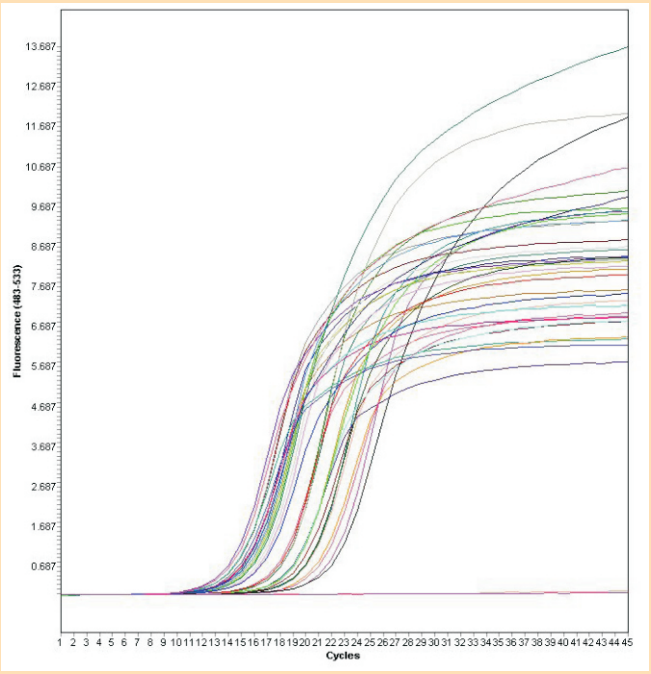
DNA barcode sequences submitted to NCBI GenBank

Sl. No.	Accession Numbers	No. of sequences
Freshwater Fishes		
1.	EU030664- EU030672	9
2.	EU417753- EU417809	57
3.	EU924631- EU924638	8
4.	FJ459394- FJ459541	148
5.	FJ711226- FJ711438	213
6.	FJ229970- FJ230075	106
Marine Fishes		
7.	EF609497- EF609637	141
8.	EU014211- EU014265	55
9.	EU148511- EU148596	86
10.	EU392177- EU392208	32
11.	FJ226516- FJ226533	18
12.	FJ347933- FJ347967	34
13.	FJ237535- FJ237613	79
Fish Parasites		
14.	EU741046	1
15.	EU912551- EU912554	4
16.	FJ172978- FJ172993	16
Total		**1107**

Molecular biomarker in Murrel, *Channa punctata*

In the present scenario of aquatic pollution especially due to heavy metals, there is a need to develop molecular biomarker in aquatic fauna that can provide the early warning information regarding the presence of xenobiotics and also that the organism is responding to stressors. Therefore, a biomarker study, first of its kind in Indian freshwater teleosts, was carried out for observing differential gene expression pattern of metallothionein (MT) gene in a snakehead murrel, *C. punctata*, using liver as a candidate tissue due to heavy metal salt cadmium chloride exposure.

Fish was exposed to sub-lethal concentrations of metal salt (6.7 ppm) for various exposure durations (0-8 hrs). Biomarker study was done by quantitative real time reverse transcription polymerase chain reaction, using MT gene specific primers (GenBank Accession FJ869867). The Actin Beta (ACTB) was used in normalization of MT mRNA levels.



Amplification curve of MT gene in liver tissue of C. punctata by RT PCR

The findings indicated that the liver shows early response to the stressor in a time dependent manner and MT mRNA level in liver of *C. punctata* can be used as a biomarker for heavy metal pollution in water bodies.

New species discovered from North Eastern India

The North Eastern Region of India, comprising eight states, possesses a unique potential of fishery resources. It is considered as one of the hot spots of freshwater biodiversity in the world. In a collaborative research programme of NBFGR with the universities of the region, a total of 296 species belonging to 110 genera of 35 families have been described from this region. The region is characteristic in having several endemic genera of fishes, viz., *Aborichthys* Chaudhuri, *Akysis* Blyth, *Amblyceps* Blyth, *Badis* Hamilton, *Bangana* Hamilton, Chaca Gray, *Conta* Hora, *Erethistoides Hora*, *Erethistes* Muller & Troschel, *Exostoma* Blyth, *Meyersglanis* Hora & Silas, Olyra McClelland, *Parachiloglanis* Wu, *Pareuchiloglanis* Regan, *Pseudecheneis* Blyth and *Pseudolaguvia* Misra. The rivers Brahmaputra and Barak form the principal drainage of the region with their numerous tributaries and myriads of rivulets and lentic water bodies flowing through different states of the region. Therefore, the region is a priority area for NBFGR's biodiversity exploration and conservation programme.

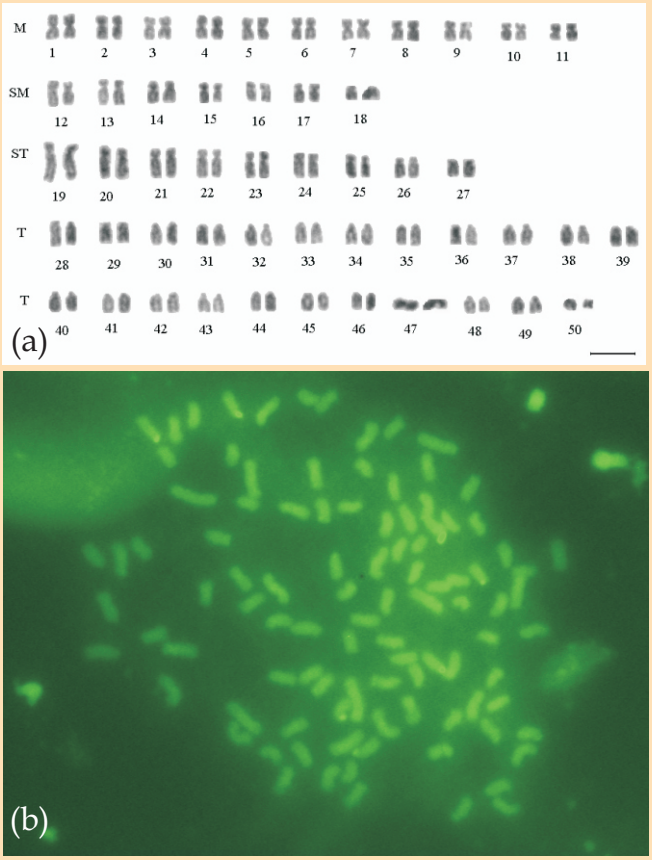
During exploration carried out under NBFGR's collaborative programme with Department of Zoology, Manipur University and Rajeev Gandhi University, Itanagar, Arunachal Pradesh, two new fish species namely, *Psilorhynchus arunachalensis* (Psilorhynchidae) and *Exostoma barakensis* (Sisoridae) were discovered. *P. arunachalensis* was collected from Dirang river (a tributary of Brahmaputra river basin, Arunachal Pradesh) and *E. barakensis* was collected from Iyei River, Manipur. These will be new addition to the fish fauna of India.

Psilorhynchus arunachalensis (Nebeshwar, Bagra & Das)

Exostoma barakensis (Vishwanath & Joyshree)

Cytogenetic characterization of *Tor mosal mahanadicus*

Cytogenetic characterization of *Tor mosal mahanadicus* (David), collected from River Mahanadi, Orissa, was undertaken using Giemsa, silver and chromomycin A_3 staining and C-banding techniques. The species was found to possess a diploid number of 100 chromosomes with karyo-morphology of 22m+14sm+18st+46t (FN= 136). The Ag-NOR and CMA_3 signals were present on 3 pairs of chromosomes, i.e. 6^{th} sm, 7^{th} st, 9^{h} st. The C-bands were localized on 3 pairs at telomeric regions of 6^{th} sm, 8^{th} and 11^{th} st chromosomes. The position of signals on the chromosomes and the location of these chromosomes in the karyotype can be used for identification of this species.



Cytogenetic characterization of Tor mosal mahanadicus: (a) Karyotype, and (b) CMA3 stained NORs. (Bar= 5μM)

SYMPOSIA /MEETINGS/ TRAINGS ORGANIZED

National Workshop on Evaluation and Valuation of Fish Genetic Resources

A Technical Session in progress

at addressing the conceptual and methodological issues related to the valuation of aquatic genetic resources. The workshop brought together identified experts from relevant fields and institutes to deliberate on key identified issues. In his inaugural address, Dr. W.S Lakra, Director, NBFGR, Lucknow emphasized that valuation of aquatic genetic resources is a national priority and it is an important mandate of NBFGR. He mentioned that lot of literature is now available on valuation of genetic resources, however, most of it is focused on crops/ plants. In comparison, the literature on valuation of aquatic genetic resources is very meager and scanty. He also emphasized the role of stakeholders and community in valuation and conservation of aquatic genetic resources. The workshop included a series of presentations, group discussions and finalization of future course of action. In the concluding session, Dr. W.S. Lakra emphasized upon developing research programmes on valuation of ornamental fish diversity at priority level. Dr. Lakra called for collaborative efforts in this endeavour of national priority.

Refresher Course on Advanced Technologies for Aquaculture and Fisheries Management

The Institute organized a two-day refresher course on "Advanced Technologies for Aquaculture and Fishery Management" for U.P. State Fishery Officers during July 10-11, 2009. The programme was sponsored by Uttar Pradesh Diversified Agriculture Support Project (UP-DASP). The training aimed at refreshing the knowledge and skills of state fishery officers so that they may facilitate further transfer of technological advancement to the fish farmers of the state. A total of 30 fishery officers of UP including, Deputy Directors and Assistant Directors from various divisions and districts of the state participated in the programme. The course was inaugurated by Mrs. Aaradhana Shukla, Co-ordinator, UP-DASP whereas Dr. W. S. Lakra, Director, NBFGR, Lucknow presided over the inaugural function.

Participants with Guests and Faculty Members

Twenty five progressive farmers of Uttar Pradesh were also invited to participate in the inaugural session since July 10th which happened to be the Fish Farmers' Day. On this occasion, a certificate of appreciation was given to three fish farmers Shri Mohd. Anas (Rudauli), Shri Om Prakash (Masauli) and Shri Mizba-Ur-Rahman (Badagaon) identified by the NBFGR for their distinguished achievements in the field of fish seed production and aquaculture.

The technical programme was specifically planned so as to cover various aspects of advanced techniques of fish and prawn culture including, fish feed for prosperity of the farmers, fish diseases and their management, culture of new indigenous and exotic species, biotechnology in aquaculture and fisheries management, reservoir fishery management, innovative fishery products; crafts and gears in inland fisheries and application of nanotechnology to fisheries. In addition, a talk was also arranged on the project formulation and monitoring in fisheries sector with special reference to inland fisheries projects. Altogether there were eleven invited lectures in the training programme. The resources person for the two days training programme were from Central Inland Fisheries Research Institute, Barrackpore; Central Institute of Fishery Education, Mumbai; Central Institute of Fishery Technology, Kochi; College of Fisheries, GBPUAT, Pantnagar; ICAR; NABARD, Mumbai; Institute of Sciences, Bangalore and NBFGR, Lucknow. In the concluding session, Dr. W.S. Lakra, Director NBFGR, Lucknow gave away certificates to the participating fishery officers.

Workshop on Genomic DNA isolation from animal sources

A one day workshop on "Genomic DNA isolation from animal source" was organized jointly with Institute of Transgenic Life Science at ARTU, Chinhat, NBFGR. In this workshop organized under the "Public-Private Partnership" on September 25, 2009, a total of 27 students from various colleges of Kanpur participated.

AWARDS / RECOGNITIONS

- Dr. W.S. Lakra, Director was conferred the Gold Medal of the Academy of Science, Engineering and Technology, Bhopal.
- Dr. W.S. Lakra, Director was conferred the Hari Om Ashram Trust Award of ICAR 2009 for his contributions in the field of fisheries research.
- Dr. L. K. Tyagi, Scientist (Sr. Scale) was nominated as Associate Editor in the Editorial Board of the Indian Research Journal of Extension Education; by the Executive Council of the Society of Extension Education, Agra.

A view of the ICAR Award Ceremony 2009. Dr. W.S. Lakra receiving Hari Om Ashram Trust Award from Hon'ble Union Minister for New and Renewable Energy, Dr. Farooq Abdullah and Dr. Mangla Rai, Secretary DARE and Director General ICAR in the presence of Shri A.K. Upadhyay, Additional Secretary, DARE.

PARTICIPATION IN WORKSHOPS /SEMINARS/ MEETINGS/ TRAININGS

Abroad

- Dr. M. Goswami, Sr. Scientist participated in the 10th International Symposium on Genetics in Aquaculture (ISGA X, 2009) during June 22-26, 2009 at Bangkok, Thailand.

  Shri Rajeev Kumar Singh, Scientist (Sr. Scale) attended advanced training at Institute of Aquaculture, Sterling University, U.K. in the area of Market Assisted Selection, under National Agricultural Innovation Project from May 18, 2009 to July 17, 2009.

- Mrs. Poonam J. Singh, Scientist (Sr. Scale) participated in the Conference on Patenting Life Forms and LLM Alumni Senior Day at World Intellectual Property Organization, Geneva, Switzerland on October 1, 2009.

In India

- Dr. W.S. Lakra, Director participated in the following conferences/ meetings/ programmes:
  - As Chief Guest in a Summer school on 'Recent advances in molecular identification and characterization of agriculturally important microorganisms" at NBAIM, Mau, UP on September 21, 2009.
  - A Doordarshan programme in Delhi on September 17, 2009.
  - Meeting of the Chairs of QRTs and RACs and Directors of ICAR Fisheries Institutes at CMFRI, Kochi during August 20-21, 2009.
  - Director's Conference and the ICAR Award Ceremony in New Delhi.
  - The 9th Agricultural Science Congress at Srinagar, J & K during June 22-24, 2009.
  - The 16th Annual General Body Meeting of the National Academy of Agricultural Sciences at NASC, New Delhi during June 4-5, 2009.
  - International Day for Biological Diversity at NBPGR, New Delhi on May 22, 2009.
  - Delivered a lecture on "Aquatic biodiversity conservation at H N B Garhwal Central University on May 28, 2009.
  - As Chief Guest in a Workshop on DNA barcoding at Assam University, Silchar on April 7, 2009.
  - A Brainstorming workshop on "Strategy for conservation of animal genetic resources" organized by the Trust for Advancement of Agricultural Sciences and Birsa Agriculture University, Ranchi during April 10-12, 2009.
- Dr. W.S. Lakra, Director; Dr. A. K. Singh, Dr. P.P. Srivastava, Dr. P.K. Varshney, Sr. Scientists and Shri A. K. Yadav, Technical Officer (T-7-8) participated in the National Workshop on Advances in Aquaculture and Fisheries: Perspectives, Prospects and Challenges, organized by Ministry of Agriculture, New Delhi; ICAR and STE on July 3, 2009 at Pragati Maidan, New Delhi.
- Dr. W.S. Lakra, Director; Dr. L. K. Tyagi, Scientist (Sr. Scale) and Shri A.S. Bisht, T-4 participated in State Fisheries Minister's Conference, at Bhubaneswar during July 04-05, 2009.
- Dr. A. K. Singh, Sr. Scientist participated in the meeting of NFDB, Hyderabad on July 24, 2009 for Formulation of guidelines on the aquaculture *of Pangasius sutchi.*
- Dr. P.P. Srivastava, Sr. Scientist participated in the Fish farmers' festival organized by the NFDB at Hyderabad during July 10-12, 2009.
- Dr. A. K. Singh, Sr. Scientist delivered a Radio

talk on *"Mishrit Matsya Palan"* on Sept 9, 2009 at Akashwani Lucknow.

- Dr. P. K. Varshney, Sr. Scientist participated in T.V. programme on *"Machli Palan – Ek Labhkari Vyavasai"* which was telecasted by the Lucknow Doordarshan under its "Gramoday" programme, on August 11, 2009.
- Dr. A. K. Singh, Sr. Scientist participated in the MDP Workshop on Policy and Prioritization, Monitoring and Evaluation Support to Consortia based Research in Agriculture at NAARM, Hyderabad during Aug 31 - Sept 5, 2009.
- Dr. L. K. Tyagi, Scientist (Sr. Scale) and Shri A.S. Bisht, T-4 participated in the Matsya Sahkari Sangosthi organized by the UP Fisheries Cooperative Federation Ltd., Lucknow and UP State Fisheries Dept, Lucknow on July 14, 2009.
- Shri Ashish Srivastava, AF&AO attended a training on "Standard Rules and Procedures of the World Bank for Procurement of Goods, Works and Services" at NIFM, Faridabad during September 7-18, 2009.
- Shri Jogindra Singh, Assistant attended a training course on "Handling of CAT Cases" at ISTM, New Delhi during July 29-31, 2009.
- Shri S.N. Srivastava, Sr. Clerk attended a training on "Cash Accounting to Accrual Accounting – A Complete Solution" at Eco-Soft Solution, New Delhi during September 12 -14, 2009.

EXTENSION ACTIVITIES

Training programmes on 'Aquaculture Technologies and Productivity Enhancement' for Fish Farmers

The NBFGR at its Chinhat Unit, Lucknow organized a series of short-term training programmes sponsored by Agricultural Technology Management Agency, Bihar and UP-DASP. A total of 5 training programmes of six days duration for fish farmers of different districts of Bihar were conducted as follows :

A group photographs of the Trainee Farmers alongwith the Director and Faculty of NBFGR

- Nabada (April 20 - 25, 2009)
- Darbhanga (June 01 – 06, 2009)
- West Champaran (July 13 - 18, 2009)
- Madhubani (August 17 – 22, 2009)
- East Champaran (Sept. 14 – 19, 2009)

Similarly, five training programmes of five days duration were conducted for fish farmers of different districts of UP as follows :

- Rai Bareli (May 22 – 26, 2009)
- Sitapur and Lakhimpur Khiri (June 16–20, 2009)
- Lucknow, Unnao and Hardoi (July 27–31, 2009)
- Kanpur Nagar, Kanpur Dehat and Aurraia (August 03 – 07, 2009)
- Etawa and Rai Bareli (September 07 – 11, 2009).

A total of 164 fish farmers (87 from Bihar and 77 from UP) were trained in the above programmes. In training programmes, major emphasis was given on practical demonstration and field oriented activities. Apart from theory classes laboratory demonstrations and exercise were made. Field visit to the fish farms of the Institute were made to expose the trainees with various fisheries activities like preparation of

pond, manuring and stocking of fishes. Explanation on induced breeding and hatchery management was also imparted. A visit to private fish farms in districts Barabanki and Faizabad in UP were conducted for interaction of the trainees with entrepreneurs, as well as, to observe the viability of the technologies. Invited lectures from resource persons on various topics were also arranged. A training manual containing the lecture notes and demonstration material was released on the occasion and distributed to the participating fish farmers on the occasion.

Participation in Exhibitions

The Institute participated in the following exhibitions related to fisheries and aquatic resources:

- Exhibition organized on the occasion of the State Fisheries Minister's Conference, at Bhubaneswar during July 04-05, 2009.
- ILDEX (International Livestock and Dairy Expo) organized at Pragati Maidan, New Delhi during July 02 – 04, 2009.
- The Fish farmers' festival organized by the NFDB at Hyderabad during July 10-12, 2009.
- Matsya Sahkari Sangosthi and Pradarshni organized by the UP Fisheries Cooperative Federation Ltd., Lucknow and UP State Fisheries Dept, Lucknow on July 14, 2009.

Dr. W.S. Lakra explaining the activities of the Institute to the Hon'ble Union Minister for Agriculture, Prof. K.V. Thomas

Farmers & Students visits conducted

The following batches of farmers visited different laboratories, hatchery and fish farm of the Institute during the period:

- A group of eight progressive fish farmers from FFDA, Raebareli.
- A group of ten fish farmers under ATMA Training Programme from District Jalaun, UP.
- Four batches of trainees from Indira Gandhi Institute of Co-operative Management, Lucknow.
- A batch of 15 students of Baba Sahib Bhimrao Ambedkar University, Lucknow.

OTHER ACTIVITIES

- A flag hoisting ceremony was observed on the Independence Day. Dr. W.S. Lakra, Director hoisted the National Flag in the presence of staff members of the Bureau. On this occasion, a cultural programme was also organized.
- A function was organized on Sept. 14, 2009 to celebrate the Hindi Day. Dr. W.S. Lakra, Director inaugurated the Hindi Day programmes by lighting the lamp. The Institute also observed a Hindi Pakhwada during Sept. 14-30, 2009 during which 7 Hindi competitions were organized among the staff of the Institute to promote the use of Hindi in official work. All the winners were given prizes by Prof. H.R. Singh, Former Vice Chancellor, Allahabad Central University, Allahabad and the Chief Guest of the Valedictory function. Shri S.N. Srivastava, Sr. Clerk won the prize for the Best Hindi Competitor – 2009. Shri Akhilesh Kumar Mishra, T-4 was awarded a 'Special Hindi Trophy - 2009' for his outstanding performances in Hindi competitions during past years.

STAFF NEWS

Welcome

- Dr. S. Raizada, Principal Scientist, CIFE, Rohatak Centre joined NBFGR, Lucknow on inter-institutional Transfer on Sept. 02, 2009.

Congratulations!

The following Scientists were appointed to different posts at the Institute:

- Dr. N.S. Nagpure, Sr. Scientist was appointed to the post of Head, Division of Molecular Biology and Biotechnology w.e.f. Sept. 8, 2009.
- Dr. K.K. Lal, Sr. Scientist was appointed to the post of Head, Division of Fish Conservation w.e.f. Sept. 9, 2009.
- Dr. Peyush Punia, Sr. Scientist was appointed to the post of Head, Division of Fish Health Management w.e.f. Sept. 9, 2009.

The NBFGR family extends hearty congratulations to all the above staff members for their success.

Transfer

- Dr. S.K. Srivastava, Technical Officer (T-6), NBFGR, Lucknow was appointed to the post of Sr. Scientist, Directorate of Coldwater Fisheries Research (DCFR), Bhimtal. He was relieved from the Institute on June 25, 2009 to join at DCFR, Bhimtal.

New Appointment

- Smt. Seema Devi was appointed on Compassionate Ground to the post of Skilled Support Staff w.e.f. May, 2009.

DISTINGUISHED VISITORS

- Dr. S.N. Dwivedi, Former Additional Secretary, Government of India and Former Vice Chancellor, CIFE, Mumbai.
- Dr. S.P.S. Ahalawat, Vice Chancellor, Ujjain University, Ujjain.
- Prof. H.R. Singh, Former Vice Chancellor, Allahabad Central University, Allahabad.
- Mrs Leena Nair, Chairperson, MPEDA, Kochi.
- Dr. R.N. Hegde, Senior Fellow, National Institute of Rural Development, Hyderabad.
- Prof. C.S. Singh, Former Dean, College of Fisheries, GB Pant University of Agriculture & Technology, Pantnagar.

Dr. S. Ayyappan, DDG (Fy.) addressing the Scientists

Mrs Leena Nair, chairperson, MPEDA interacting with Dr. W.S. Lakra, Director and Scientists

PRICED PUBLICATIONS OF NBFGR

S.No.	Title of Publication	Price
1.	Fishes of North East India	Rs.950/-
2.	Ornamental Fishes of North East India: An Atlas	Rs.750/-
3.	Freshwater Fish Diversity of Central India	Rs.500/-
4.	Ornamental Fishes of the Western Ghats of India	Rs.900/-
5.	Fish Introductions and Quarantine: Indian Perspective	Rs. 200/-
6.	Indigeneous Knowledge and Policy Issues in Fisheries	Rs. 200/-
7.	Matsya Palan Darshika (in Hindi)	Rs. 150/-
8.	Uttar Parvatiya Rajyon ki Matsya Vividhta: Sarankshan evam Prabandhan (in Hindi)	Rs.500/-
9.	Lucrative Alien Ornamental Fish Species for Aquarium Trade of India	Rs.300/-
10.	Fish Biodiversity of India	Rs. 750
11.	Fish Pathogens and Diseases in India: A Bibliography	Rs. 500 (Discount 30%)
12.	Participatory Approach for Fish Biodiversity Conservation in North East India	Rs. 500 (Discount 20%)
13.	Indian Fish Pathologists Directory	Rs.300 (Discount 30%)
14.	Endemic Fish Diversity of Western Ghats	Rs. 350 (Discount 30%)
15.	Fish Biodiversity of North East India	Rs. 250 (Discount 30%)
16	Fish Chromosome Atlas	Rs. 750 (Discount 50%)

अनुसंधान समाचार

भारतीय कैटफिश *क्लेरिअस बट्रैकस* के एक्सप्रेस्ड सिक्वेन्स टैग्स से माइक्रोसेटेलाइट मार्कर्स की पहचान

एक्सप्रेस्ड सिक्वेन्स टैग्स (ईएसटी) मालीक्यूलर संसाधनों के विकास हेतु एक प्रभावकारी टूल होते हैं जो कि फंक्शनल जीनोमिक्स, जीन मैपिंग तथा तुलनात्मक जीनोमिक्स में उपयोगी होते हैं। ईएसटी व इनसे प्राप्त होने वाले टाइप-I मार्कर्स को प्रयोग करते हुए, बहुत सी जलकृषि प्रजातियों में, लिंकेज मैप्स विकसित किए गए हैं। *क्लेरिअस बट्रैकस*, भारतीय उपमहाद्वीप की एक महत्वपूर्ण संकटग्रस्त प्रजाति है। इस प्रजाति का अत्यन्त व्यापारिक व इवोल्युशनरी महत्व होते हुए भी, इसके जीनोमिक संसाधनों के विकास पर बहुत सीमित अनुसंधान हुआ है। इसीलिए एनबीएफजीआर ने इस महत्वपूर्ण प्रजाति की स्प्लीन के ईएसटी से, टाइप-I माइक्रोसेटेलाइट मार्कर्स विकसित करने का कार्य किया।

उक्त अध्ययन में कुल 608 ईएसटी, *क्लेरिअस बट्रैकस* की स्प्लीन की नार्मलाइज्ड सीडीएनए लाइब्रेरी से उत्पन्न किए गए, इनमें से 71 ईएसटी में माइक्रोसेटेलाइट उपस्थित थे। कुल 65 ऐसे विशिष्ट माइक्रोसेटेलाइट पाए गए जिनमें ईएसटी उपस्थित थे। ईएसटी की जीन पहचान ब्लास्ट सर्च द्वारा स्थापित की गई तथा 65 में से 17 ईएसटी ने एनोटैटिड जीन्स से उच्च समानता दिखाई। इस प्रकार ईएसटी की 17 टाइप I मार्कर्स के रूप में पुष्टि हुई। ये टाइप I माइक्रोसेटेलाइट मार्कर्स, इस प्रजाति की जेनेटिक मैपिंग में उपयोगी होंगे तथा तुलनात्मक जीनोमिक्स हेतु एंकर लोसाई का कार्य करेंगे।

मालाबार कार्प *लैबियो डुसेमेरी* की जनसंख्याओं में निम्न आनुवंशिक भिन्नता

मालाबार कार्प के नाम से प्रचलित *लैबियो डुसुमेरी* पश्चिमी घाटों के दक्षिणी भागों से पश्चिम की ओर बहने वाली नदियों तथा श्रीलंका के निचले भागों, की एक देशज प्रजाति है। भारत में यह एक अत्यन्त मूल्यवान खाद्य प्रजाति है। अभी तक इस प्रजाति की जनसंख्याओं व स्टाक का मूल्यांकन नहीं हुआ है जबकि ये प्रजाति संकटग्रस्त प्रजातियों की श्रेणी में आती है। अतः ब्यूरो *लै. डुसुमेरी* की जनसंख्या संरचना का अध्ययन किया। पश्चिमी घाटों के तीन नदीय स्थानों (मीनचित्र, मनीमाला व पाम्बा नदी बेसिन) से प्राप्त इस प्रजाति की जनसंख्याओं को एलोजाइम, माइक्रोसेटेलाइट्स तथा आरएपीडी मार्कर्स द्वारा अध्ययन किया गया।

अध्ययन में 30 में से 14 एलोजाइम लोसाई; 7 माइक्रोसेटेलाइट लोसाई तथा 12 आरएपीडी ओपेरान डिकेमर्स ने पालीमारफिक पैटर्न प्रदर्शित किए। तीनों प्रकार के मार्कर्स ने समानार्थी परिणाम दिए किन्तु रोचक रूप से, इस प्रजाति की उपरोक्त तीन नदीय स्थानों से प्राप्त जनसंख्याओं में निम्न आनुवंशिक भिन्नता पाई गई। यद्यपि किसी आनुवंशिक अवरोध का कोई प्रमाण नहीं मिला। उपरोक्त तीनों नदी बेसिन, निचले भागों में एक दूसरे से विभिन्न नहरों द्वारा कनेक्ट रहते हैं। अतः निम्न आनुवंशिक भिन्नता का कारण, इन नदियों की जनसंख्याओं का समान पूर्वज इतिहास तथा जनसंख्याओं का मिश्रण होना, हो सकता है। अतः इन नदियों की जनसंख्याओं के पुनर्वास व प्रबंधन हेतु एक साझा रणनीति बनाई जा सकती है।

मत्स्य प्रजातियों से कोशिका लाइन्स का विकास एवं चरित्र-चित्रण

एनबीएफजीआर ने मत्स्य प्रजातियों से कोशिक लाइन्स विकसित करने की दिशा में महत्वपूर्ण सफलता हासिल की है। पाँच प्रजातियों, *इट्रोप्लस सुरेटेन्सिस, प्रिस्टोटेपिस फासिएटा, पुन्टियस डेनीसोनी, पु. फासिएटा* तथा *साइप्रिनस कार्पियो* के फिन टिशू से पांच कोशिका लाइन्स विकसित की गई। फिन कोशिकाएं, सब्स्ट्रेटम से अच्छी तरह चिपकी रहीं और कोशिकाओं ने L-15 मीडियम (15% फोइटन बोवाइन सीरम) में 28^0 सेग्रे. पर 4-6 दिनों में कोन्फ्लुऐन्स प्राप्त कर लिया। फिन कोशिका लाइन्स को 20-54 बार, सबकल्चर किया गया। कोशिका लाइन्स ने 24^0-32^0 सेग्रे. तापमान पर वृद्धि की, कोशिका लाइन्स की अधिकतम वृद्धि 28^0 सेग्रे. पर हुई जबकि 20^0 सेग्रे. से कम तापमान पर कोई सार्थक वृद्धि नही हुई। सभी फिन कोशिकाओं में अधिकतम वृद्धि 10-20%, एफबीएस में हुई जबकि 5% एफबीएस में कोई सार्थक वृद्धि नहीं हुई। कोशिकाओं में -196^0 सेग्रे. पर 3-6 माह तक भंडारण किया गया। सभी कोशिकाओं ने थायिंग के पश्चात 70-85% जीवितता दिखाई।

इसी प्रकार के एक दूसरे प्रयोग में महत्वपूर्ण कार्प प्रजाति *लै. रोहिता* से तीन कोशिका लाइन्स; रोहू फिन, रोहू हर्ट व रोहू स्विम ब्लैडर; विकसित की गई। रोहू फिन कोशिका लाइन्स को अभी तक 35 बार सब-कल्चर किया जा चुका है। कोशिक लाइन्स को, मालीक्युलर मार्कर्स व सायटोजेनेटिक विधियों द्वारा चरित्र-चित्रण किया गया। कोशिका लाइन्स की मौलिकता की पुष्टि की गई तथा प्राप्त सिक्वेन्सेज़, एनसीबीआई जीन बैंक में भेजे गए।

मछलियों की डीएनए बारकोडिंग में तीव्र प्रगति

ब्यूरों ने मछलियों की डीएनए बारकोडिंग में तीव्र प्रगति की है। देश के विभिन्न भागों में कुल 656 मत्स्य प्रजातियों के 3403 नमूने एकत्र किए गए। अभी तक 400 प्रजातियों के कुल 1509 डीएनए बारकोड तैयार किए जा चुके हैं। कुल 1107 बारकोड सिक्वेन्सेज़ एनसीबीआई जीन बैंक में सम्मिलित किए जा चुके हैं। इनके अलावा मछलियों के हेल्मिन्थ परजीवियों के 21 डीएनए बारकोड भी, इलाहाबाद केन्द्रीय विश्वविद्यालय के सहयोग से तैयार किए गए।

चन्ना पंक्टेटा में मालीक्यूलर बायोमार्कर अध्ययन

भारत में पहली बार किसी मीठाजल टेलीओस्ट प्रजाति, *चन्ना पंक्टेटा*, में एक बायोमार्कर अध्ययन किया गया जिसका उद्देश्य, भारी धातु केडमियम क्लोराइड के कारण, मेटालोथिओनीन (एमटी) जीन के जीन अभिव्यक्ति पैटर्न का अवलोकन करना था। इस अध्ययन में पाया गया कि *चन्ना पंक्टेटा* का लिवर, इस भारी धातु के दबाव के प्रति समय-सापेक्ष शीघ्र प्रतिक्रिया दिखाता है। इस प्रजाति के लिवर में एमटी एमआरएनए स्तर को, जलनिकायों में भारी धातु प्रदूषण के बायोमार्कर के रूप में, प्रयोग किया जा सकता है।

भारत के उत्तरी-पूर्वी क्षेत्र से नई मत्स्य प्रजातियों की खोज

भारत का उत्तरी-पूर्वी क्षेत्र मीठा जल, मत्स्य विविधता के मामले में अत्यन्त धनी है। इसलिए यह क्षेत्र, ब्यूरो के जैवविविधता अन्वेषण में एक प्राथमिकता का क्षेत्र है। संस्थान उत्तर-पूर्वी क्षेत्र में विभिन्न स्थानीय विश्वविद्यालयों के साथ सहयोगी रूप में शोध कार्यक्रमों का संचालन कर रहा है। इसी क्रम में, मणीपुर विश्वविद्यालय के जन्तु विज्ञान विभाग तथा राजीव गाँधी विश्वविद्यालय, इटानगर, अरूणाचल प्रदेश के साथ किए गए अन्वेषणों में इस क्षेत्र, से दो नई प्रजातियों *एक्सोस्टोमा बराकेन्सिस* तथा *सिलोरिनकस अरूणाचलेन्सिस*, क्रमशः, की खोज हुई।

टौर मोसल महानदीकस का कोशिकानुवंशिकीय चरित्र-चित्रण

उड़ीसा में महानदी से एकत्र की गई प्रजाति *टौर मोसल महानदीकस* का कोशिकानुवंशिकीय चरित्र-चित्रण किया गया। इस प्रजाति में डिप्लायड क्रोमोसोम की संख्या 100 पाई गई। Ag-NOR तथा CMA3 संकेत, क्रोमोसोम के तीन जोड़ों पर उपस्थित थे जबकि C बैन्डस भी क्रोमोसोम के टीलोमरिक रीजन के तीन जोड़ों पर उपस्थित थे।

सम्मेलन/प्रशिक्षण का आयोजन

मत्स्य जननद्रव्य संसाधनों के मूल्यांकन एवं मूल्यन पर राष्ट्रीय कार्यशाला

संस्थान ने मत्स्य जननद्रव्य संसाधनों के मूल्यांकन एवं मूल्यन पर जुलाई 24-25, 2009 को एक राष्ट्रीय कार्यशाला का आयोजन किया। इस कार्यशाला में देश के विभिन्न भागों से आमंत्रित विभिन्न सम्बन्धित विषयों के चुनिन्दा विशेषज्ञों ने भाग लिया। कार्यशाला में मत्स्य जननद्रव्य संसाधनों के मूल्यांकन एवं मूल्यन की अवधारण व इनके अध्ययन की पद्धतियों पर विस्तार से चर्चा की गई।

जलकृषि एवं मात्स्यिकी प्रबंधन हेतु उन्नत तकनीकियों पर प्रशिक्षण कार्यक्रम

संस्थान ने उपरोक्त विषय पर जुलाई 10-11, 2009 के दौरान एक प्रशिक्षण कार्यक्रम आयोजित काय। इस कार्यक्रम में उत्तर प्रदेश मात्स्यिकी विभाग के 30 अधिकारियों ने भाग लिया। कार्यक्रम का उद्देश्य अधिकारियों के ज्ञान व कौशल को बढ़ाना था ताकि उनके माध्यम से नई तकनीकियों का लाभ मत्स्य पालकों तक पहुँचाया जा सके। इस कार्यक्रम में 25 मत्स्यपालकों को भी आमंत्रित किया गया तथा तीन प्रगतिशील मत्स्यपालकों को, मत्स्य पालन में उनकी उपलब्धियों के फलस्वरूप, मत्स्यपालक दिवस (10 जुलाई) पर, प्रोत्साहन प्रमाण-पत्र प्रदान किए गए।

पुरस्कार एवं सम्मान

संस्थान के निदेशक डा. वजीर एस. लाकड़ा को भारतीय कृषि अनुसंधान परिषद् का प्रतिष्ठित हरीओम आश्रम अवार्ड 2009 प्रदान किया गया।

संस्थान के निदेशक डा. वजीर एस. लाकड़ा को एकेडमी आफ साइंस, टेक्नोलाजी एण्ड इंजीनियरिंग, भोपाल का प्रतिष्ठित गोल्ड मेडल 2009 भी प्रदान किया गया।

डा. ललित कुमार त्यागी, वैज्ञानिक (व.वे.) को प्रतिष्ठित 'इडियन रिसर्च जर्नल आफ एक्टेंशन एजुकेशन, आगरा के संपादक मंडल में एसोसिएट एडिटर के रूप में मनोनयन हुआ।

अन्य मुख्य गतिविधियां

संस्थान के तीन वैज्ञानिकों श्री राजीव कुमार सिंह, डा. मुकुन्दा गोस्वामी तथा श्रीमती पूनम जयंत सिंह ने प्रशिक्षण/सम्मेलनों में भाग लेने हेतु क्रमशः यूनाइटेड किंगडम, थाईलैन्ड तथा स्विटज़रलैन्ड का दौरा किया।

संस्थान ने बिहार एवं उत्तर प्रदेश के विभिन्न जनपदों के मत्स्यपालकों हेतु 10 प्रशिक्षण कार्यक्रम आयोजित किए जिनमें कुल मिलाकर 164 मत्स्यपालकों ने प्रशिक्षण प्राप्त किया।

संस्थान ने इस दौरान 4 प्रदर्शनियों में भाग लिया।

संस्थान में स्वतंत्रता दिवस, तथा हिन्दी दिवस, हिन्दी पखवाड़ा कार्यक्रमों का आयोजन धूमधाम से किया गया। हिन्दी पखवाड़ा के दौरान आयोजित प्रतियोगिताओं में श्री सुरेन्द्रनाथ श्रीवास्तव, व. लिपिक ने 'सर्वश्रेष्ठ हिन्दी प्रतियोगी 2009 का पुरस्कार जीता जबकि श्री अखिलेश कुमार मिश्र, टी-4 को विशिष्ट हिन्दी ट्राफी-2009' प्राप्त हुई। सभी विजेताओं को मुख्य अतिथि प्रो. एच.आर.सिंह, पूर्व कुलपति, इलाहाबाद विश्वविद्यालय, इलाहाबाद ने पुरस्कार प्रदान किए।

संस्थान में डा. सुधीर रायजादा ने प्रधान वैज्ञानिक के रूप में कार्यभार ग्रहण किया।

संस्थान के तीन वरिष्ठ वैज्ञानिकों डा. एन.एस. नागपुरे, डा. कुलदीप कुमार लाल तथा डा. पीयुष पुनिया की विभागाध्यक्षों के रूप में नियुक्ति हुई।

संस्थान के तकनीकी अधिकारी डा.एस.के. श्रीवास्तव की नियुक्ति वरिष्ठ वैज्ञानिक के रूप में शीतजल मात्स्यिकी अनुसंधान निदेशालय, भीमताल में हुई। अतः उन्हें कार्यमुक्त किया गया।

श्रीमती सीमा देवी को संस्थान में एस.एस.जी. श्रेणी में नियुक्त किया गया।

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