

National Conference on Aquatic Genetic Resources

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I am happy to be here on the occasion of 25th Anniversary Celebration of National Bureau of Fish Genetic Resources that has rendered commendable service to research and management of aquatic biodiversity of this country and has provided a leadership role for the entire region.

This conference is being organized at a very appropriate time when there is increased attention towards aquatic organisms as source of food, medicines, industrial products and livelihood security. With advancements in biotechnology there is also growing interest to look for the genes they have with unique traits. Since genetic resources have high value in terms of economic, ecological and social uses, they need to be characterized, managed and utilized judiciously on a sustainable basis. Therefore strong R & D base is important to develop appropriate conservation strategies and actions to safeguard the aquatic biodiversity of the country for the benefit of the present, as well as, future generations.

The National Bureau of Fish Genetic Resources with a humble beginning in 1983 has emerged as a Centre of Excellence in cataloguing and conserving aquatic bio-resources of India. The recent achievements towards database development for 2,225 fish species, population genetic structure analysis of several prioritized species, technology standardization for *in situ* and *ex situ* gene banks of endangered species and diagnostic capabilities for exotic pathogens in relation to the evaluation of exotic fish species are praiseworthy. The discovery of 31 new fish species in the recent past has opened up new vistas in the quest for more species from the unexplored areas.

India has a coastline of 8,129 km, which includes those of Andaman, Nicobar and Lakshadweep groups of islands. The Exclusive Economic Zone (EEZ) encompasses 2.02 million sq. km. of coastal and offshore areas off eastern, western and southern parts of India. The major Inland aquatic resources include 1.2 million hectares of brackish water area, 2.38 million ha of freshwater ponds and tanks, 3.15 million ha of reservoirs besides about 0.19 million kilometers of rivers and canals. In India, large and medium dams have created almost 250 million cubic meters of water storage.

India is endowed with rich aquatic biodiversity. Of the 27,800 fish species globally reported, about 11% are found in Indian waters. A total of 2,225 finfish species have been

reported from India including 629 from freshwater, 182 brackish water and 1,370 from marine ecosystem. Apart from finfish resources, nearly 2,934 species of crustaceans, 5000 mollusks and 765 species of echinoderms also contribute to India's rich aquatic germplasm resources.

Indian aquaculture growth popularly known as, the **Blue Revolution**, happened due to captive propagation of three Indian major carps which subsequently developed as composite fish culture technology during the sixties. Today, India is the third largest producer of fish in the world and second largest producer of inland fish. The total fish production has grown nearly 12 fold in last five decades and stands at 6.9 million tones. The fisheries sector provides employment to seven million fishermen with its share of 1.4% in GDP.

Seed is one of the most critical inputs for enhancing the farm productivity. As a major initiative, a Mega Seed Project was launched by ICAR during 2005 to strengthen the existing seed production and processing facilities for the Indian NARS. The project resulted in enhancement of supply of seed including planting material and fish seeds. Enhanced production must be commensurate with assured quality of seed. For crops, seed Act was passed in 1966, and Minimum Seed Certification Standards were adopted way back in 1971; however no such certification guidelines are in place for fisheries sector. **The fish seed production of India is estimated to be over 3,167 crore fry through a network of nearly 1,100 hatcheries. However, there are concerns with regard to quality pertaining to inbreeding depression, inadvertent hybridization as also improper sizes of seed stocked**, leading to non-realization of full potential. India, with a total post larvae production capacity of 1,058 crore from about 266 hatcheries, is one of the major shrimp producers in the world. However, **the shrimp farming in the country is plagued with white spot viral disease since 1995** and the seed is considered as one of the major source for spread of the viral infection. To ensure quality of seed and sustainability in its production process, it is essential that the hatcheries use broodstock, breeding and husbandry practices as per scientific norms. There is an immediate need for regulations of seed certification and accreditation of seed production centers on the lines of provisions existing in the farming sector. I am happy to note that a document in this regards was prepared for both carp and shrimp seed during the last year.

Our aquatic biodiversity offers several potential cultivable

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species for aquaculture development. In view of the stagnating or declining capture fishery resources, advancements in aquaculture sector are likely to play a pivotal role in providing nutritional security to the burgeoning Indian population. A population of a species is composed of genetic stocks, which are local evolving units and develop attributes of adaptive significance to the diversified local environments. Such intra-specific variability in the species can be a source of useful characters with potential application in domestication and genetic improvement of the species. The ICAR has initiated an outreach programme on identification of genetic stocks of important cultivable species of India. The programme is aimed to document genetic variation of the species in their native distribution range with respect to their production, morphological and molecular characteristics.

Today, it is a known fact that the population increase and environmental degradation have caused damage to the biodiversity and this damage could be severe and may result in loss of genetic diversity, populations and eventually to the extinction of species. The environmental threats could be man made and natural or in combination with cascading and interlinked impacts. Such threats are wide ranging including **overexploitation of resources, habitat alterations, reduction of natural habitat areas, construction of dams, diversion or reclamation of river beds for urbanization, that reduce water discharge in rivers which subsequently lead to eutrophication, enhanced accumulation of pollutants**, introduction of non-native species that may directly impact through predation, compete for food and space with native species. The foremost need becomes to harmonize the concerns and priorities of regulatory authorities on water resources, biological resources and conservation. This is necessary so that water is regulated keeping in view that rivers have environmental flow of water round the year to sustain the aquatic life as well as conservation and management strategies implemented for such resources.

The impact of these stresses is the decline in effective population size over a period of time depending upon original population size and magnitude of the threat. There is an increasing possibility that the natural populations of commercial species may face genetic alterations through interbreeding with farm escapes and ranched conspecific. Generally, loss of biodiversity is perceived as loss of some populations within a species or the complete extinction of a species. But, there is growing body of evidence to prove that species constitute an assemblage of genetically divergent units, differently termed as subspecies, stocks, strains, populations and evolutionary significant units. This is another level of loss of biodiversity, which is known as loss of genetic variation and most often this is ignored. Therefore, any conservation programme to preserve biodiversity must aim to conserve the inherent genetic variation within a species also.

Economic valuations of genetic resources are required to justify conservation research in quantifiable terms. They must consider all kinds of benefits ranging from socio-economic, nutritional security, the products to possible source of important genes. The collaborative efforts between biologists, economists and social scientists are necessary to develop models for economic valuations of biodiversity, necessary for prioritisation of research and conservation on genetic resources.

In the era of technological revolution, the greatest challenge is to secure the IPRs related to aquatic germplasm and related traditional knowledge so that the country is able to maintain its stake on its natural wealth and their potential benefits. **Hence, developing repositories of genetic and genomic resources that store the registered germplasm accessions, is a necessity.** Such repositories will maintain accessions for future use to retrieve information as well as the whole or a part of genome, if the species is not found in nature. To harness the potentials of biotechnological innovations, it will be essential that DNA, whole and modified, is also part of the repositories. **Besides protecting IPR, these will also provide material for future research.** For IPR protection and rapid documentation of germplasm in public domain, ICAR has taken a step forward for registration of fish germplasm.

Large scale efforts to characterize genomic resources from fish species such as expressed sequence tags and type-I markers will lead to identification of genes for various commercially important traits, adaptations against abiotic and biotic stresses not only for aquaculture use but also for imparting adaptation to other components of agrobiodiversity. The information and repository of such resources will help to put up a technological base for varied applications such as marker assisted selection, transgenic to improve species for production values, resistant to stress conditions or even against the climate changes. **Stem cell research also needs to be actively pursued not only as *ex situ* conservation tool for genetic resources but necessary for producing modified animals on large-scale.**

Disease outbreaks are being increasingly recognized as a significant constraint to aquaculture production and trade and are affecting economic development of the sector in several ways. Aquatic animal diseases are one of the major threats for increasing aquaculture production and most of these diseases are the consequence of unregulated movement of live aquatic animals resulting in unintentional transfer of pathogens. **Biosecurity provides science based quarantine assessments and policy advice protects aquaculture production system and also safeguards human health and consumer confidence in aquatic animal products.** Implementation of Biosecurity measures provides a strategic framework and integrated approach to assess the risks associated with movement of live aquatic animals. The three **main concerns** dealing with biosecurity in aquaculture are:

(i) Introduction of exotic or alien fish species; (ii) Aquatic animal pathogens/ diseases; and (iii) Genetically modified organisms (GMOs).

Planning of **Aquatic biosecurity measures** should include technical evaluations of the optimal balance of the application of **specific pre-border, border, surveillance and response procedures to ensure prevention of entry, early detection post-entry and cost-effective eradication of potential exotic organisms**. Planning should result in the development of optimal procedures to ensure security against the organisms that present greatest risk. Disease surveillance and reporting is considered to be another fundamental component of any national strategy on aquatic animal health and forms an integral part of aquatic animal biosecurity. Efforts have also been made towards biosecurity from the exotic fish germplasm. In this regard **NBFGR** has prepared two important documents, viz. '**Natational Strategic plan for Aquatic exotics and Quarantine**' and '**Aquatic exotics and quarantine guidelines**'. **NBFGR** has also developed diagnostic capability to diagnose a number of OIE listed pathogens based on molecular techniques, which can help in screening of the fishes.

From strategic outlook, **cooperation mechanisms of India with SAARC** and other neighboring countries in

conservation research and programmes are very important. The three **mega biodiversity hotspots are located in India, Western Ghats, North Eastern Hills, and Himalayas** but are shared with SAARC and other neighbouring countries. The river channels are also shared between these countries; hence, the gene pool is also shared. **The loss of germplasm out of the shared genepool will be against India's interest**. Such germplasm might have been lost to other country through **biopiracy or bilateral cooperation between neighboring nation and other country**. The exotic fish introduced in neighboring countries will find way to Indian waters including rivers and will add to clandestine introductions threatening the biosecurity. Our conservation programmes spreads along the continuous river systems and benefits are reaped by adjoining countries without any cost involvement. In the changing world scenario, lack of such reciprocal cooperation will offset the efforts made to implement measures to protect biodiversity, biosecurity and IPR management.

I compliment the Director, Scientists and staff members of **NBFGR** for their sincere contributions to the growth of this organization over the past 25 years. With these words, I am happy to inaugurate this Conference "Aquatic Genetic Resources" and wish you all the best.