

# MOLECULAR TECHNIQUES IN FISHERIES

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## INTRODUCTION

Conventional technologies to elicit various facets in fisheries sciences are well established. With the recent developments in the biological sciences and molecular technologies, which have already shown promising results in the medical and agricultural sciences, there now is an opportunity of implementing the same in the fisheries sciences.

There is need to do so because molecular studies are the study of basic bio-molecules of life. The study of DNA, RNA and Proteins. They explicit the various processes and phenomenon with more precise accuracy.

In the last few decades enormous data has been collected in the karyology and biochemical genetics using enzyme markers etc. The recent DNA technologies have proved to be more advantageous in screening a much wider spectrum of genome. With the recent advent of PCR (polymerase chain reaction) mediated DNA amplification and molecular cloning becoming more feasible, these techniques have almost replaced the earlier ones. This is especially the case in other life sciences.

Further use of the techniques of molecular cloning for developing DNA probes, their localization on chromosomes by fluorescent in situ hybridization, nucleotide sequencing and molecular computations has made it a virtual reality to analyse the selected parameters in fisheries to the minutest level of nucleotide bases.

The usage of these techniques are wide in the applied areas of Molecular systematics, ecology, aquaculture, biotechnology, and environmental impact assessments etc. The selection of the method to be adopted depends upon the researchers goal and availability of facilities.

## TECHNIQUES :

- Genetic engineering by the manipulation of chromosomes:
  - Gynogenesis / Androgenesis
  - Induced polyploidy / Triploidy / Tetraploidy
- Protein Assays:
  - Protein immunology
  - Protein electrophoresis
- DNA Assays:
  - DNA-DNA Hybridization
  - Restriction Analyses
  - Animal mitochondrial DNA
  - Single copy nuclear DNA
  - Ribosomal RNA Genes and other middle-repetitive Gene families
  - Sequences and DNA fingerprinting
  - DNA Sequencing and the Polymerase chain reaction

- FLUORESCENT IN-SITU HYBRIDIZATION:
  - Localization of specific repetitive DNAs
  - I.i Centromere and telomere specific sequences
  - I.ii Sex chromosomes or sex specific sequences.
- LOCALIZATION OF MULTICOPY GENES
  - Ribosomal DNA
  - Histone genes
- USE OF REPETITIVE SEQUENCES TO STUDY CHROMOSOME REARRANGEMENTS AND ELIMINATION :
  - Telomeric sequences as markers of chromosomal rearrangements.
  - Chromosomal elimination in the japanese hagfish
  - Chromosomal microdissection.

### APPLICATIONS :

A few applications are mentioned here :

1. the taxonomic identification of species to the sub population level during all life history stages can lead to information of finding spawning grounds of various fishery.
2. The gene transfer applications in aquaculture for improvement of stocks.
3. In estimating results of genetic engineering experiments in aquaculture e.g of polyploidy, gynogenesis & andogenesis using DNA probes.
4. The specific origin of chromosome the hybrids.
5. In studying gene flow to establish migrations and ecological niches of various fishery – by comparing nucleotide sequences
6. To study population dynamics by DNA probes and nucleotide sequencing.
7. Sublethal Pollution affects at the nucleotide base level
8. Disease screening – by species specific probes and comparing nucleotide sequences to analyse karyotypes of species on the submicroscopic level –by flourescent in situ hybridization techniques
9. Intraspecific chromosomal rearrangements
10. Sex differences at gene level
11. Gene mapping
12. Chromosome banding
13. To construct genomic , cDNA and expression libraries for future industrial
14. Applications etc.

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