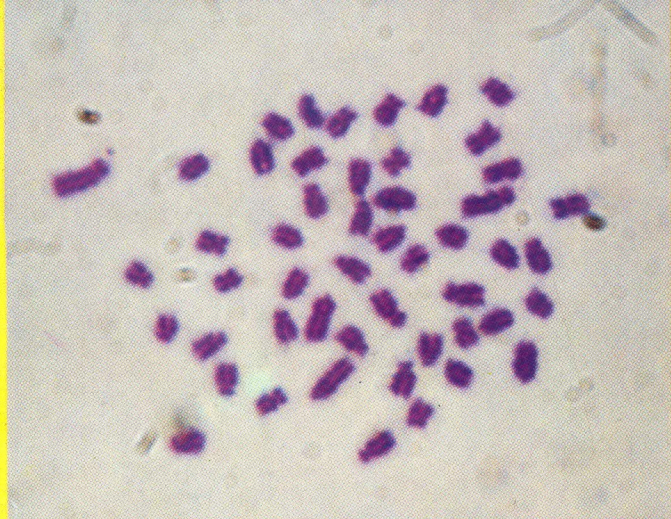


PME CELL

5135



वार्षिक प्रतिवेदन

Annual Report 1993-94



NBFGR
ICAR

NATIONAL BUREAU OF FISH GENETIC RESOURCES

6. Transfer of Technology	39-40
6.1 Advisory services	39
6.2 Other activities	39
6.3 Talks Delivered from All India Radio	40
7. Library and Documentation Services	41-42
7.1 Library services	41
7.2 Exchange services	41
7.3 Information services	41
7.4 Technical reports	41
7.5 Reprography services	42
7.6 General Publications	42
8. Conferences, Symposia etc.	42-51
8.1 Important meetings	42
8.2 Participation	42-51
9. Visitors	52-53
10. Scientific Publications	54-62
11. Personnel	63-66
11.1 List of personnel	63-65
11.2 Appointments	65
11.3 Promotion	65-66
11.4 New Assignment	66
12. Management Committee	66-67
13. Staff Welfare Activities	68-69
13.1 Institute Joint Staff Council	68
13.2 Grievance Cell	69
Appendix— I. Percentage of SC/ST among staff	69-71
Appendix— II. Organisational chart	72

वार्षिक प्रतिवेदन का हिन्दी सारांश

१९६३-६४

भूमिका

संक्षिप्त इतिहास

हमारे देश के अन्तर्स्थलीय एवं समुद्री मत्स्य विकास सम्बन्धी राष्ट्रीय कार्यक्रमों के अन्तर्गत यह सुनिश्चित किया गया है कि मछली उत्पादन में केवल उत्पादन ही पर्याप्त नहीं हैं अपितु प्रकृति प्रदत्त विभिन्न मत्स्य प्रजातियों एवं उनमें पायी जाने वाली विभिन्नता का संरक्षण भी अत्यन्त आवश्यक हैं। भारत सरकार द्वारा इसके महत्व को ध्यान में रखते हुये कुछ समय पूर्व राष्ट्रीय मत्स्य आनुवंशिक संसाधन ब्यूरो की स्थापना का अनुमोदन किया गया। भारतीय कृषि अनुसंधान परिषद के अन्तर्गत ब्यूरो ने पिछले कुछ वर्षों से अपना कार्य भी आरम्भ कर दिया है।

उद्देश्य:

- राष्ट्र के समस्त मत्स्य आनुवंशिक संसाधनों के विषय में समग्र सूचनाओं तथा ज्ञान का एकत्रीकरण एवं वर्गीकरण (कैटलागिंग)
- मत्स्य आनुवंशिक संसाधनों का संरक्षण
- अन्य संस्थानों के सहयोग से मत्स्य आनुवंशिक संसाधनों का रखरखाव और लुप्तप्राय (एन्डैन्जर्ड) प्रजातियों का संरक्षण
- भारतीय जल संसाधनों के लिये विदेशी मत्स्य प्रजातियों का चयन एवं नियंत्रण

संगठन :

ब्यूरो के कार्य को सुचारु रूप से क्रियान्वयन हेतु ब्यूरो के संगठनात्मक ढांचे में निम्नलिखित चार केन्द्रों का प्रस्ताव है।

- (१) मृदु जलीय संसाधन केन्द्र
- (२) शीत जलीय संसाधन केन्द्र
- (३) क्षार जलीय संसाधन केन्द्र
- (४) समुद्र जलीय संसाधन केन्द्र

उपरोक्त चारों केन्द्रों पर सम्बन्धित मत्स्य प्रजातियों के संरक्षण एवं शोध कार्य होंगे। इसके अतिरिक्त मुख्यालय पर स्थित निम्न चार सम्भाग (सेक्शन) संरक्षण एवं शोध क्षेत्र में कार्यरत हैं।

- (१) कोशिकानुवंशिकी
- (२) जीव रसायन आनुवंशिकी
- (३) जीव विज्ञान
- (४) संरक्षण एवं प्रबन्धन

३.१: एफ०बी०-१ भारत के मत्स्य आनुवंशिक संसाधनों का कैटलाग तैयार करना

मत्स्य जर्मप्लास्म संसाधन संबन्धी जानकारीयों का संकलन

क:- भिन्न भिन्न परिस्थितियों जैसे शीत जल, गर्म जल तथा समुद्री जल में उपलब्ध मत्स्य संसाधनों का संकलन किया गया जो कि वृहद सर्वेक्षण तथा पूर्व प्रकाशित सूचियों पर आधारित है इसमें मछलियों के वर्गीकरण एवं उनकी प्रकृति में उपलब्धता का वर्णन है। यह प्रकाशन हेतु तैयार है।

ख:- भारतीय मत्स्य संसाधन पर एक कैटलाग बनाया जा रहा है जिसमें पूर्व सूची का विस्तार किया गया है तथा उनकी पहचान, वर्गीकरण, आवासीय वातावरण, उपलब्धता, जैवज्ञान, जीवन चक्र, मत्स्य पैदावार, आनुवंशिकी, लैंगिकता, मत्स्य पालन तथा संरक्षण सम्बन्धी जानकारी का संकलन किया गया है यह कार्य प्रगति पर है।

ग:- मत्स्य जर्मप्लास्म के डाटा बैंक का कार्य प्रारम्भिक अवस्था में है जिसमें व्यवहारिक दृष्टि से महत्वपूर्ण मछलियों के विशिष्ट लक्षणों का संकलन किया जा रहा है।

घ:- **भारतीय लुप्तोन्मुख मछलियाँ:** राष्ट्रीय मत्स्य आनुवंशिक संसाधन ब्यूरो द्वारा आयोजित राष्ट्रीय सेमिनार 'इन्डैन्जर्ड फिसेस आफ इंडिया' में ख्याति प्राप्त वैज्ञानिकों, पर्यावरणविदों एवं संरक्षणविदों से विचार विमर्श एवं प्रस्तुत सूचनाओं पर आधारित अस्थायी सूची तैयार की गयी है जिसमें लुप्तोन्मुख मत्स्य प्रजातियों को आई०यू०सी०एन० पद्धति के आधार पर पाँच वर्गों में बाँटा गया है (१) लुप्त (२) लुप्त प्राय (३) वलनरेबल (४) अनिश्चित/संदिग्ध (इन्डीटरमिनेट) तथा (५) दुर्लभ।

- १:- **लुप्त :-** वह मत्स्य प्रजातियों जो विगत ५० वर्षों से प्रकृति अथवा पालन अवस्था में नहीं पायी गई।
- २:- **लुप्तप्राय :-** वह मत्स्य प्रजातियाँ जिनकी संख्या बहुत कम हो गयी है अथवा जिनकी जनसंख्या सोचनीय हो गयी है तथा तीव्र गति से कम होती जा रही है अथवा जिनके आवासीय स्थलों में प्रतिकूल परिवर्तन हो गया है अथवा जिनके वितरण क्षेत्रों में तीक्ष्ण संकुचन हुआ है जिसके कारण निकट भविष्य में समस्त या कुछ क्षेत्रों से इनकी प्रजातियों के लुप्त हो जाने की सम्भावना है।
- ३:- **वलनरेबल-** वह प्रजाति जिसकी संख्या कम होने के कारण निकट भविष्य में सम्पूर्ण अथवा कुछ प्रक्षेत्रों से लुप्तप्राय हो जाने की आशंका हो। इसके अतिरिक्त वह प्रजातियाँ जो प्रतिकूल वातावरणीय कारणों

के प्रभाव के कारण सीमित स्थानों में संकुचित रहती हैं जहां तीव्र पर्यावरणीय परिवर्तन या अपनी जीवन्तता के लिये निश्चित आवासो पर निर्भर रहते हैं ऐसी प्रजाति जो पूर्व में वृहद स्थानों में फैली थी किन्तु वर्तमान में जिनकी जनसंख्या कम हो गयी हो। इसके अतिरिक्त वह प्रजाति जिनकी अधिकतम जनसंख्या छोटे से क्षेत्र में संकुचित हो गई हो या ऐसा वर्ग जिसकी अधिकतम अथवा समस्त जनसंख्या तीक्ष्ण रूप से घट रही है।

४:- **अनिश्चित/संदिग्ध (इनडिटरमिनेट)** वह वर्ग जिसके लुप्तप्राय या वलनरेबल हो जाने की सम्भावना हो तथा जिसके स्थिति मूल्यांकन हेतु समुचित आंकड़ों का अभाव है।

५:- **दुर्लभ-** वह वर्ग जो वर्तमान में न तो लुप्तप्राय हो न ही वलनरेबल हो किन्तु निकट भविष्य में अपनी छोटी सी जनसंख्या का विस्तृत क्षेत्र में छोटे छोटे निकायों में सीमित होने के कारण वलनरेबल हो जाने की सम्भावना हो।

लुप्तोन्मुख:- वह वर्ग जो "लुप्तप्राय" "वलनरेबल" "दुर्लभ" "अनिश्चित/संदिग्ध" या "अपर्याप्त सूचित" हो।

३.२: एफ० बी०-२ उच्च जल क्षेत्रों में महाशीर संरक्षण

लधिया व शारदा नदियों का अध्ययन

उत्तर प्रदेश के पर्वतीय भाग में लुप्तप्राय महाशीर मछली के इन सीटू संरक्षण हेतु टुनियास से टनकपुर बांध तक शारदा नदी तथा इसकी एक सहायक लधिया नदी को चुना गया है। इस नदी में महाशीर संरक्षण के उद्देश्य से निम्नलिखित प्रभावी कदम उठाये गये हैं।

१:- महाशीर संरक्षण समितियों का गठन

स्थानीय जनता में महाशीर का महत्व, जनसंख्या ह्रास, संरक्षण की आवश्यकता एवं उपाय सम्बन्धी जागरूकता उत्पन्न करने हेतु लधिया एवं शारदा नदियों के जलागम क्षेत्र में तीन महाशीर संरक्षण समितियों का गठन किया गया है।

१.१: उपरी लधिया जलागम

लधिया नदी के ऊपरी जलागम क्षेत्र में रीठा साहिब, कुलियाल गांव, बडेला, तलाडी (पिनाना), चौड़ा मेहता, परेवा, मंगलेख, पोखरी, इत्यादि गांवों को सम्मिलित कर एक समिति का गठन किया गया है, श्री जगत सिंह कुलियाल, प्रधान ग्राम सभा चौड़ा मेहता को इस क्षेत्र की १६ सदस्यीय महाशीर संरक्षण समिति का अध्यक्ष मनोनीत किया गया है।

१.२: मध्य लधिया जलागम

लधिया नदी के मध्य जलागम क्षेत्र में स्थित अमोड़ी, बेलखेत, द्यूरी, बेलोन, कठौला, नौलापानी, ब्याटा, चल्थी, गंगसेर इत्यादि गांवों को सम्मिलित कर स्थानीय महाशीर संरक्षण समिति का गठन किया गया है।

श्री रतन सिंह बोहरा, प्रधान-ग्राम सभा द्यूरी को समिति का अध्यक्ष मनोनीत किया गया है। समिति में कुल १६ सदस्य हैं।

१.३: लधिया एवं शारदा जलागम

इस क्षेत्र की महाशीर संरक्षण समिति में तुलिगाढ़, बरमदेव व टनकपुर के निवासियों को सम्मिलित किया गया है। श्री जगत सिंह रावत, भूतपूर्व अध्यक्ष नगर पालिका टनकपुर को १२ सदस्यीय समिति का अध्यक्ष मनोनीत किया गया है।

२: जन जागृति कार्यक्रम

उपर्युक्त समितियों के गठन के अतिरिक्त लधिया व शारदा नदियों के जलागम क्षेत्र में स्थानीय जनता को महाशीर के महत्व, जनसंख्या ह्रास, संरक्षण की आवश्यकता एवं उपाय सम्बन्धी जानकारी प्रदान करने के उद्देश्य से वृहत् जन जागृति अभियान चलाया गया। स्थानीय छात्रों, अध्यापकों, मछुआरों, जन प्रतिनिधियों एवं सामान्य जनता की सहभागिता से उक्त क्षेत्र में अनेक महाशीर संरक्षण गोष्ठियों का आयोजन किया गया। स्थानीय समितियों ने गोष्ठियों के आयोजन में सक्रिय रूप से भाग लिया।

लुप्तप्राय महाशीर के संरक्षण हेतु उचित आयोजना के उद्देश्य से जलागम क्षेत्र से आंकड़े संग्रहित किये गये। ग्रामीणों से पूछताछ तथा ब्यूरो की अनुसंधान टीम द्वारा प्रयोगात्मक मत्स्य आखेट से आंकड़े प्राप्त किये। सीमित उपलब्ध आंकड़ों के आधार पर टौर प्यूटीटोरा की कुल उपलब्धता तथा प्रति इकाई पकड़ प्रयास (कैच पर यूनिट एफर्ट) का आकलन किया गया। एक वर्ष अवधि के विभिन्न स्थानों से संग्रहित आंकड़ों का उचित विश्लेषण किया गया। कुल पकड़ी गयी मछलियों में से टौर प्यूटीटोरा का औसत भार के अनुसार ०.०७३६ से १.० तथा संख्या के आधार पर ०.५८८ से १.०० रहा तदनुसार टौर प्यूटीटोरा का औसत भार १२५.२८ ग्राम जो कि सामान्य से बहुत कम है। विभिन्न स्थानों पर "कैच पर यूनिट एफर्ट (ग्राम/व्यक्ति प्रतिदिन) ५३७.०१ से ५०००.०० ग्राम रहा। लधिया में विसौरिया नाले के संगम के समीप तथा शारदा नदी में तुलिगाढ़ के निकट उच्च मत्स्य शिकार सम्भवतः निपुण मछुआरों द्वारा रात्रि में आखेट करने से प्राप्त हुआ।

३:- फोटो प्रदर्शनी

दृश्य प्रदर्शन संचार का एक सशक्त माध्यम है, इस कारण उपर्युक्त जलागम क्षेत्र के विभिन्न स्थानों में महाशीर के अनेक पहलुओं को दृष्टित करने हेतु अनेक फोटो प्रदर्शनियां आयोजित की गयी, तत्सम्बन्धी पुस्तिकाओं तथा अन्य लिखित सामग्री का वितरण भी किया गया। इस क्षेत्र में आयोजित जन जागृति कार्यक्रमों सम्बन्धी जानकारी को क्षेत्रीय समाचार पत्रों-अमर उजाला, दैनिक जागरण इत्यादि में उचित स्थान दिया गया, ब्यूरो के इस प्रयास द्वारा स्थानीय लोगों में लुप्त प्राय महाशीर के संरक्षण हेतु निश्चित रूप से जागृति उत्पन्न हुई है।

४:- अभ्यारण्य घोषित करने की आवश्यकता

महाशीर को इनसीटु संरक्षण जैसे प्रभावी उपाय से सुरक्षा प्रदान करने हेतु अभ्यारण्य की स्थापना का विचार ब्यूरो में बहुत समय से महसूस किया जा रहा है। चल्थी से लधिया नदी के शारदा से संगम

के स्थान तथा पुनः शारदा नदी के टनकपुर बांध तक के जल क्षेत्र को लुप्त प्राय महाशीर हेतु अभ्यारण्य घोषित करने की आवश्यकता है। इस ३० किमी. के जल क्षेत्र का अत्यधिक दोहन हो रहा है। इस क्षेत्र में टौर प्यूटीटोरा तथा टौर टौर के अतिरिक्त साइजोथोरेक्स रिचार्डसोनी, लेबियो डेरो, लेबियो डायोचिलस, बेरिलियस बोला मछलियां भोजन प्राप्त करने के लिए आती हैं।

अध्ययन के दौरान यह पता चला कि शीत तथा ग्रीष्म ऋतु में छोटी एवं छिछली नदियों व नालों की मछलियां अनुकूल आवास के कारण इस जल क्षेत्र में आती हैं लेकिन यहां मत्स्य आखेटकों द्वारा छोटे छिद्रो के गिल नेट तथा अन्य विनाशकारी विधियों द्वारा इन मछलियों का अत्यधिक दोहन किया जाता है। इस समस्या को ध्यान में रखकर स्थानीय महाशीर संरक्षण समिति इस बहुमूल्य जैव सम्पदा को बचाने के लिए विचार कर रहा है।

५:- महाशीर प्रजनन कार्यक्रम

महाशीर प्रजनन की संभावना का पता लगाने हेतु उत्तर प्रदेश मत्स्य विभाग द्वारा स्थापित ढकरानी (देहरादून) हैचरी का सर्वेक्षण किया गया। ब्यूरो द्वारा उक्त हैचरी में वांछित सुधार कराने हेतु सम्बन्धित विभाग को उचित सुझाव दिये गये महाशीर संरक्षण हेतु यह निश्चित रूप से उचित कदम होगा।

३.३ बी० जी० ७ : मुख्य कार्प, लुप्तप्राय तथा अन्य मत्स्य प्रजातियों में तुलनात्मक जैव रासायनिक आनुवंशिकीय अध्ययन

प्रकृति में पायी जाने वाली मत्स्य समुदायों की विभिन्न प्रजातियों में प्रजाति के भीतर आनुवंशिकी विभेद हेतु विभिन्न नदियों से रोहू और चाइनीज कार्प, तिलैपिया के नमूने लिये गये तथा आइसो एन्जाइम पद्धति एवं समविद्युत विभव केन्द्रीकरण (आइसो इलेक्ट्रिक फोकसिंग) आई०ई०एफ० विधि द्वारा अध्ययन किया गया।

समविद्युत विभव केन्द्रीकरण

ऊटी से प्राप्त साइप्रिनस कार्पियो एवं इलाहाबाद से प्राप्त रोहू, बाटा, कतला, तिलैपिया (ओरियोक्रोमिस मोसाम्बिकस) एवं साइप्रिनस कार्पियो प्रजाति के नेत्र ताल के स्फाटिक प्रोटीन का समविद्युत विभेद केन्द्रीकरण विधि द्वारा तुलनात्मक अध्ययन किया गया एवं परिणाम चित्र (५) में प्रदर्शित किया गया है। समविद्युत विभव केन्द्र (पी०आई०) के मूल्य के आधार पर बैन्ड्स को छः मंडलों में विभक्त करके विभिन्न प्रजातियों का तुलनात्मक अध्ययन किया गया है। गंगा के रोहू में आनुवंशिकीय अनेकाकृति (जेनेटिक पालीमार फिजम) छठे मंडल में पाया गया है जिसके समविद्युत विभव मूल्य ६.५५ से ७.५५ है जो कि राप्ती से प्राप्त रोहू की तरह ही है।

आइसोएन्जाइम पद्धति द्वारा अध्ययन

एन्जाइम स्तर पर अध्ययन करने पर विभिन्न प्रजातियों एवं विभिन्न स्थान से एकत्र की गयी मछलियों में भिन्नता पायी गयी है। मल्टी लोसाई इन्जाइम में आनुवंशिकीय विभेद के कारण बैन्ड पैटर्न में भिन्नता

का पता लगाना कठिन है। इस्ट्रेज भी मल्टी लोसाई पद्धति का एक सदस्य है और इसीलिए इसका अध्ययन रोहू में किया गया है और इसमें ७ सवस्ट्रेट प्रयोग में लाये गये। अन्य मछलियों की तरह रोहू में एवं नैन में सबस्ट्रेट्स विशेष क्रिया नहीं देखी गयी। इस तरह यह पता लगता है कि इस्ट्रेज एन्जाइम द्वारा प्राप्त बैन्ड पद्धति से रोहू एवं नैन में समानता पायी गयी यह प्रदर्शित करता है कि रोहू और नैन में आनुवंशिकीय समानता इस्ट्रेज एन्जाइम में होती है।

३:४ : सी एम - ३ : लुप्तोन्मुख (इन्डेन्जर्ड) तथा प्रकृति में पायी जाने वाली बहुमूल्य मत्स्य प्रजातियों के लिए शुक्राणु बैंकिंग तकनीक का विकास

शुक्राणु बैंकिंग परियोजना के अन्तर्गत लुप्तोन्मुख टैनुलिसा इलिसा (हिल्सा) पर प्रथम बार शुक्राणु हिम परीक्षण अध्ययन किये गये। यह अध्ययन फरक्का बैराज के नीचे गंगा में पाई जाने वाली हिल्सा पर किया गया।

अध्ययन से ज्ञात हुआ कि हिल्सा के शुक्राणु के लिए दूसरी मछलियों की तुलना में अत्यधिक पोटैसियम आयन्स की आवश्यकता है जो कि शुक्राणुओं को सक्रिय होने से रोकता है। इसके लिए अन्य अवयव सोडियम क्लोराइड ५०० मि०ग्रा०/१०० मि०ली०, कैल्सियम क्लोराइड २० मि०ग्रा०/१००मि०ली० के साथ पोटैसियम क्लोरोराइड का प्रभाव २०मि०ग्रा०/१०० मि०ली० से २५०० मि०ग्रा० तक देखा गया। अन्ततः पोटैसियम क्लोराइड की मात्रा १५००-२००० मि०ग्रा०/१०० मि०ली० उपयुक्त पाई गयी।

हिम परीक्षण हेतु पोटेशियम क्लोराइड की मात्रा १५०० मि०ग्रा०/१०० मि०ली० का प्रयोग अवयव सोडियम क्लोरोराइड, कैल्सियम क्लोराइड, मैग्नीसियम सल्फेट, अन्य मैनिटोल, ग्लूकोसट्रिस, नोबिन, सीरम एल्ब्यूमिन तथा अंडपीतक का प्रयोग सर्वोत्तम पाया गया। सात माह के परीक्षण के पश्चात ३०-४० प्रतिशत शुक्राणु सक्रिय पाये गये।

३.५: सी० एम० ४ : भारतीय मुख्य कार्प एवं लुप्त प्राय मछलियों के एक्स सीटू संरक्षण हेतु अण्डों एवं भ्रूण का शीतकालीकरण विधि का विकास

शुक्राणु शीतकालीकरण की तकनीक का विकास हो जाने पर यह अत्यावश्यक हो गया है कि पूर्ण जिनोम की पुनः रचना हिम कालीन वीर्य से बनाने की तकनीक का विकास किया जाय। गुण सूत्र का परिचालन प्रक्रिया से अब यह संभव है कि अगुणित गुण सूत्र धारक की रचना एक अगुणित शुक्राणु से हो जिसमें मादा जिनोम का कोई भी सहयोग न हो।

एन्ड्रोजेनेसिस पर प्रयोग किये जा रहे हैं जिसमें उत्पत्ति मूलक निष्क्रिय अण्डों को ताजे वीर्य से संसेचित किया जाता है। इस प्रयोग में कामन कार्य के ताजे नग्नीकृत अण्डे का अल्ट्रा वाइलेट तरंगों से १,५, ६ व ६ मिनटों का प्रदीपन किया जाता है प्रदीपन के पश्चात अण्डों के एक छोटी इकाई को ताजा किये हुए वीर्य से संसेचित किया जाता है तथा ५,१०,१२,१५,२०,३० व ४० मिनट संसेचन के पश्चात गर्म झटका (४२ से ६० सेकेण्ड के लिए) दिया जाता है। एक अगुणित गुण सूत्र का निरीक्षण हेतु प्रयोग साथ में रखा जाता है। प्रयोग सत्यापन हेतु सामान्य अण्डे पर एन्ड्रोजेनेसिस अगुणित गुण सूत्र धारक सेट बगैर

गर्म झटके के रख दिया जाता है।

उत्तरजीविता का प्रतिकृति प्रयोग वाले व अगुणित नियंत्रण समूह की पांच परीक्षण हेतु मादा में बहुत भिन्नता पायी गई। द्वितीय व तृतीय मादा में जिवनश्रम डिंभक पाये गये सारे ६ के ६ सेट्स पर चतुर्थ व पंचम मादा में केवल २ अगुणित गुणसूत्र वाले डिंभक मिले जो कि केवल एक दिन व ४ चार जीवित रहे। ज्यादा दिन तक जीवित रहने वाले डिंभक उन सेट्स पर पाये गये जिनको केवल एक मिनट तक ही प्रदीपन किया गया था। इस प्रयोग से यह निष्कर्ष निकलता है कि एन्ड्रोजेनेटिक प्राणी का विकास केवल अगुणित गुणसूत्र धारक जीवनरक्षक प्राणी की अनुपस्थिति अगुणित नियन्त्रण सेट जो कि ४ व ५ सेट की मादा में थी जबकी कोई भी रंग या निशान प्रयोग में नहीं लाया गया इस कारण मिथक एन्ड्रोजेनेटिक प्राणी की संज्ञा दी गयी। उन डिंभको की आनुवंशिक सत्यापन की जायेगी।

३.६: सी०एम०-५ विदेशी मत्स्य प्रजातियों की एकलिंगी समुदाय उत्पादन तकनीक का प्रमाणीकरण

तिलपिया की ओरियोक्रोमिस मोसैम्बिकस प्रजाति पर सम्यक नर समुदाय उत्पादन सम्बन्धित कई प्रयोग किये गये जिसमें यह पाया गया कि ७-दिन (सोक-सैक अवस्था) के बच्चों को १७-अल्फामेथाइल टेस्टोस्टीरोन (१७-एमटी) मिश्रित भोजन (३० मि०ग्रा० प्रति कि०ग्रा० की दर से) ६० दिनों तक खिलाने तथा दीर्घ दीप्ति काल (१६एल:८डी) में रखने से शत प्रतिशत नर उत्पादन हो जाता है। इस प्रयोग ग्रुप में बच्चों की वृद्धि तथा विकास एवं जीवंतता प्रतिशत के उत्साह वर्धक परिणाम आये हैं।

एक अन्य प्रयोग में तिलपिया प्रजनन योग्य (ब्रूड) स्टॉक पर (i) कम तापमान (१६-२३° से०) तथा अल्प दीप्तिकाल (८एल:१६डी) (ii) अधिक तापमान (२८-३२°से०) तथा दीर्घ दीप्तिकाल (१६एल०:८डी) और (iii) सामान्य तापमान (२८=१° से०) तथा सामान्य दीप्तिकाल का लिंग विकास (गोनेडल डेवलपमेंट) तथा विभेदन का अध्ययन किया गया। विभिन्न आंकड़ों के विश्लेषण से ज्ञात हुआ कि कम तापमान एवं अल्प प्रकाश अवस्था में लिंग विभेद एवं विकास की प्रक्रिया निरूध हो जाती है तथा इसका तिलपिया के पोषण एवं क्षेत्रीय व्यवहार पर भी विपरीत प्रभाव पड़ता है। इस प्रकार के प्रयोग ७ दिन के (योक्-सैक) बच्चों पर भी किये गये तथा यह पाया गया कि उनमें लिंग परिवर्तन का अनुपात सामान्य मेन्डेलियन अनुपात से स्पष्ट रूप से विचलित था।

उक्त प्रयोगों से विदित होता है कि तापमान एवं दीप्तिकालिता तिलापिया के लिंग विभेदन तथा विकास में महत्वपूर्ण भूमिका अदा करते हैं।

३.७ सी जी ६:-प्रकृति में पाये जाने वाले भारतीय मुख्य कार्प, चयनित वायुश्वासी मत्स्य प्रजाति एवं लुप्तप्राय (इन्डेन्जर्ड) समुदायों में कोशानुवंशकीय विभेद सम्बन्धी अध्ययन

कोशिकानुवंशकीय विभेद परिस्थितिकी में गुणसूत्रों में होने वाले परिवर्तन के अध्ययन हेतु विभिन्न प्रकार की मछलियों जैसे रोहू (नदी एवं हैचरी से प्राप्त), बाटा, महासीर और मांगुर के गुणसूत्रों का परीक्षण किया गया। इस अवधि में विभिन्न परिस्थितिकियों से प्राप्त मछलियों के ४२ नमूने लिये गये तथा उनके गलफड़े एवं वृक्क ऊतक के स्लाइड बनाये गये तथा चुने गये १४६ मेटाफेज अवस्था में सामान्य स्टेनिंग

प्रक्रिया के आधार पर गुणसूत्रों का अध्ययन किया गया। गंगा नदी (६ नमूने) तथा उ०प्र० मत्स्य विभाग की हैचरी से प्राप्त (७ नमूने) मछलियों के गुणसूत्रों में कोई अन्तर नहीं पाया गया। यद्यपि विकसित तकनीक के आधार पर इनमें अन्तर पाने की सम्भावना से इन्कार नहीं किया जा सकता है।

न्यूक्लीयर आरगनाइजर रीजन (एन०ओ०आर०) के आधार पर गंगा नदी और हैचरी के रोहू में कोई अन्तर नहीं पाया गया। रोहू में एन०ओ०आर० एक जोड़े सब-मेटासेट्रिक गुणसूत्र के छोटी भुजा पर स्थित पाया गया। इस तरह का अध्ययन पहली बार साइजोथोरैक्स रिचर्डसोनी और साइप्रीनस कार्पियो स्पेक्यूलेरिस में भी किया गया।

उ०प्र० के कोसी नदी से प्राप्त साइजोथोरैक्स रिचर्डसोनी जिसमें गुणसूत्रों की संख्या २ एन-६८ था एवं दो जोड़े गुणसूत्रों में एन०ओ०आर० पाया गया। भीमताल (कुमायूं, उ०प्र०) से प्राप्त साइप्रिनास कार्पीओ स्पेक्यूलेरिस के एक जोड़ी बड़े गुणसूत्रों के लम्बे सिरे पर एन०ओ०आर० स्थित पाया गया।

गोल्डन महासीर टौर प्यूटीटोरा के नमूने गरमपानी (कुमायूं, उ०प्र०) के कोसी नदी से तथा चल्थी (उ०प्र०) के समीप लधिया नदी से प्राप्त नमूनों का तुलनात्मक अध्ययन किया गया। कुल २५ मछलियां कोसी से लायी गईं तथा ८ मछलियाँ लधिया से प्राप्त की गईं तथा गुणसूत्रों एवं एन०ओ०आर० का अध्ययन किया गया। यह अध्ययन गुणसूत्रों के साथ-साथ महासीर के विपरीत परिस्थितिक वातावरण में जिसमें महासीर रह रही है के ऊपर प्रकाश डालेगा एवं भविष्य में इनके संरक्षण हेतु नीति निर्धारण में सहायक होगा।

क्यू एवं सी बैंड

क्यू बैंड का अध्ययन करने के लिये दोहरी स्टेनिंग पद्यति जिसमें क्यूनाक्रिन मस्टर्ड तथा एक्टीनोमाइसीन-डी का प्रयोग किया गया। क्यू बैंड बहुत हलके रंग के थे अतः इनका फोटो नहीं लिया जा सका। कम निरीक्षणों के कारण बैंडों में पालीमार्फिज्म नहीं ज्ञात हो सका।

लैंगिक गुणसूत्र

क्रमबद्ध गुणसूत्रों के अध्ययन से मछलियों में लैंगिक गुणसूत्रों का अध्ययन किया गया। मछलियों के गुणसूत्रों में प्रायः सभी प्रकार के लैंगिक लक्षण पाये जाते हैं। नर हेटरोगैमीटी, मादा हेटरोगैमीटी तथा बहुलैंगिक प्रकार के क्रोमोसोम पाये जाते हैं। क्योंकि मछलियों में गुणसूत्रों का आकार छोटा होता है इसलिये लैंगिक विभेद साधारण विधि द्वारा कर पाना कठिन है। यह कार्य प्रगति पर है।

कोशिका कल्चर

कोशिका के विभिन्न स्थितियों और उसमें गुणसूत्रों के गुणों का अध्ययन करने के लिये मछली के पूर्ण रक्त का पालन ईगल्स एम०ई०एम० जिसमें २० प्रतिशत फीटल बोवाईन सीरम मिश्रित माध्यम में किया गया जिसके उत्साहजनक परिणाम प्राप्त हुए हैं। इसका अध्ययन भविष्य में कोशिका कल्चर की विधियों में तकनीकी फेरबदल करके किया जायगा।

७: पुस्तकालय सेवाएं

रा०म०आ०सं० ब्यूरो का पुस्तकालय मत्स्य आनुवंशिक अनुसंधान कार्य में सम्बन्धित वैज्ञानिकों, प्रोफेसरों, तकनीकी अधिकारियों एवं कर्मचारियों, विद्यार्थियों और उद्भवियों के लिये आवश्यक सूचनाएं प्रदान करने के लिए मुख्य स्रोत है। इस वर्ष पुस्तकालय ने अपने भंडार में १०१ पुस्तकों, १७८ विविध प्रकार के प्रकाशन, वैज्ञानिकों लेखों की ४८१ पुनर्मुद्रित प्रतियां तथा १० मानचित्रों को संयोजित किया है।

पुस्तकालय अपने सदस्यों के लिए ६० स्वदेशी एवं विदेशी वैज्ञानिक पत्रिकाओं को खरीदता है और ६१ देशी एवं विदेशी वैज्ञानिक पत्रिकाओं तथा पत्र-पत्रिकाओं विनिमय के माध्यम से अथवा निःशुल्क प्राप्त करता है। इस समय पुस्तकालय में कुल ११६६ पुस्तक, ३५०० खंड पत्रिका, ८४३ विविध प्रकार के प्रकाशन, वैज्ञानिक लेखों की १५०७ पुनर्मुद्रित प्रतियां तथा ११५ मानचित्रों का भंडार है। इस वर्ष पुस्तकालय के लिए खर्च की गई राशि रू० ६,१६,४१२.०० थी।

इस पुस्तकालय ने ६५ अग्रणी राष्ट्रीय और अंतर्राष्ट्रीय अनुसंधान संस्थानों और कृषि विश्वविद्यालयों के साथ विनिमय सम्बन्ध स्थापित किया। ब्यूरो का वार्षिक प्रतिवेदन और विभागीय प्रकाशनों को विभिन्न अनुसंधान संगठनों, विभिन्न विश्वविद्यालयों, उद्भवियों तथा मत्स्य पालकों को निःशुल्क भेजे गये ताकि वे ब्यूरो के अनुसंधान की प्रगति के विषय में जानकारी प्राप्त कर सकें।

इस अनुभाग में रेप्रोग्राफी सेवाओं के लिए एक सक्रिय खंड है। इसके अलावा एक साइक्लोस्टाइलिंग एवं कोम बाइंडिंग की भी सुविधा उपलब्ध है।

तकनीकी रिपोर्ट

ब्यूरो के अनुसंधानात्मक प्रगति से संबंधित २६ तकनीकी प्रतिवेदनों का संकलन किया गया और भा०कृ० अ०प० को भेजा गया। वैज्ञानिकों के अनुसंधानात्मक लेखों को विभिन्न वैज्ञानिक पत्रिका में प्रकाशन हेतु भेजा गया और पत्राचार भी किया गया। समस्याओं और प्रश्नों का जबाब भी इस अनुभाग द्वारा प्रस्तुत किया गया और भेजा गया। इस अनुभाग ने ब्यूरो के वैज्ञानिकों द्वारा सेमिनार, संगोष्ठी, सम्मेलन आदि में भाग लेने के संबंधित कार्य भी किया है।



2. INTRODUCTION

2.1 Brief History

In view of the national programmes for improvement and expansion of both inland and marine fisheries of the country, it has been recognised that enhancement of fish production alone is not enough and conservation of the diversity of the natural fish population is a necessary prerequisite. Appreciating this, the Government of India approved establishment of the Bureau at the end of the Sixth Five Year Plan.

The National Bureau of Fish Genetic Resources was thus sanctioned in December 1983 under the Indian Council of Agricultural Research.

2.2 Mandate

- * Collection, classification and evaluation of information on fish genetic resources of the country;
- * Cataloguing of genotypes;
- * Maintenance and preservation of fish genetic material in co-ordination with other agencies and conservation of endangered fish species; and
- * Monitoring the introduction of exotic fish species in Indian waters.

2.3 Organisation

The organisational set up of the Bureau was structured for meeting the objectives. Four centres have been approved in order to take up work on different resources. These are: (i) Freshwater fish genetic resource centre, located at the headquarters of the Bureau (ii) Brackishwater fish genetic resource centre to be located at the headquarters of the Central Institute of Brackishwater Aquaculture (iii) Marine fish genetic resource centre is being set up at the Central Marine Fisheries Research Institute at Cochin (iv) Coldwater fish genetic resource centre will be located at the headquarters of the National Research Centre for Coldwater Fisheries.

The following subject matter sections have been set up at the headquarters of the Bureau at Allahabad:

- i) Cytogenetics
- ii) Biochemical Genetics
- iii) Biology
- iv) Conservation and Management.

The sections at serial no (i) & (ii) would be under the Genetic Characterisation division while the other Sections would be under the Conservation Biology Division.

2.4 Staff Position

The overall staff position as on 31st March 1994 is given below:-

Sl. No.	Category of Post	Post sanctioned (No.)	Posts created (No.)	Staff in position	Posts vacant (out of created posts)
1	2	3	4	5	6
1.	Research Management (Director)	1	1	1	-
2.	Scientific	30	30	12	18
3.	Technical	35	18	18	-
4.	Administrative	15	9	9	-
5.	Auxiliary	2	2	2	-
6.	Supporting	29	13	13	-
	Total	112	73	55	18

2.5 Finance

Allocation of fund and expenditure incurred during the year 1993-94.

Budget	Allocation (Rs.in lakhs)	Expenditure (Rs.in lakhs)
Plan	150.00	22.48
Non plan	40.00	39.99
Total	190.00	62.47

3. RESEARCH ACHIEVEMENTS

3.1: FB.1 Cataloguing of Fish Genetic Resources of India

D. Kapoor, P.C. Mahanta, S.P. Singh, A.K. Pandey, P. Punia, A.K. Singh, R. Dayal, S.M. Srivastava, R.S. Patiyal, K.D. Joshi, Ajay Singh and S.K. Paul

Compilation of information on fish germplasm resources of India

a) While there are books and checklists on fishes of different states and of ecosystems, a complete and comprehensive checklist of fishes of entire India comprising fishes of coldwater ecosystem, warmwaters of the plains, brackishwaters of the estuarine habitat and the seas around India was long felt necessary. A comprehensive literature survey followed by field visits wherever feasible has led to a comprehensive checklist of fishes of India with their systematics and distribution. The checklist is being finalized for printing in the form of a book.

b) The draft detailed Catalogue (under preparation) on fish genetic resources of India has been further expanded by incorporating detailed information on taxonomy, morphology, morphometric characters, distribution, habitat, bionomics, life history, food and feeding, sexuality, fishery and aquaculture, genetics & conservation status.

c) The Data Bank of Fish Germplasm Resources has been initiated with specific information on some commercially important fish genetic resources of India.

Threatened fishes of India

Based on the discussions with eminent scientists, naturalists, conservationists and other published information including the papers presented at the Seminar at NBFGR on Endangered Fishes of India, a list of threatened fishes of India had been provisionally prepared with five categories: Extinct(Ex), Endangered(E), Vulnerable(V), Indeterminate(I) and Rare (R.) The IUCN pattern has been followed in categorization of fishes.

Extinct(Ex): Species not definitely located in wild or in a domesticated state during the past 50 years.

Endangered (E): Species whose number has been reduced to a critical level or with a small population, declining at an alarming rate and/or whose habitat has been so drastically altered and/or with a drastically reduced distribution range that they are deemed to be in danger of extinction through all or significant portion of their range in the near future.

Vulnerable (V): Species which are at the risk of being endangered in the near future throughout all or significant portion of its range due to having small population. Besides, they are under threat from adverse factors through significant portion of their range and/or found in restricted habitats susceptible to rapid environmental changes or dependent on a specific habitat for their survival. Also, those whose present range distribution is much reduced as compared to its historic distribution. Besides, included are species with a relatively large population occupying one small area or those with most or all population declining at alarming rate.

Indeterminate(I): Taxa expected to be endangered or vulnerable but for which sufficient data is not available to make an assessment.

Rare (R): Taxa which are not presently endangered or vulnerable but can become vulnerable because of small populations usually located in restricted scattered over a more extensive range.

Threatened (T): Species which are 'Endangered', 'Vulnerable,' 'Rare', 'Indeterminate', or 'Insufficiently known'.

Based on the criteria, Table 1 below depicts the number of threatened fishes of India from different ecosystems.

Table 1: Number of threatened fishes of India.

	Endangered	Vulnerable	Rare	Indeterminate	Total
Freshwater	3	13	2	28	46
Coldwater	1	4	-	12	17
Brackishwater	-	2	-	4	6
Marine	-	2	-	8	10
Total	4	21	2	52	79

LIST OF THREATENED FISHES OF INDIA

FRESHWATER FISHES

ENDANGERED

1. *Ompok pabda* - Ganga, Brahmaputra river system.
2. *Ompok pabo* - Freshwaters of Assam, W.B.
3. *Tor musullah* - Cauvery, Bhawani river.

VULNERABLE

1. *Ailia coila* - Freshwater of Krishna, Darjeeling, Assam, Orissa, M.P.
2. *Anguilla bengalensis* - Throughout India.
3. *Bagarius bagarius* - Ganga river and its tributaries.
- ✓ 4. *Eutropiichthys vacha* - Freshwaters of Punjab, U.P., Bihar, Darjeeling, Calcutta, Orissa,
5. *Labeo dyocheilus* - Doon valley, Kashmir, Poonch, Assam.
6. *Ompok bimaculatus* - Freshwaters of Kashmir, Punjab, U.P., Bihar, Manipur, Assam, W.B.
7. *Puntius sarana* - Throughout India except peninsular India.
8. *Semiplotus semiplotus* - Freshwater of Assam & Darjeeling.
9. *Cirrhinus cirrhosa* - Cauvery, Godavari, Krishna river system, Narmada & Pench river in M.P.
10. *Osphronemus nobilis* - Rivers of N.E. Bengal and Assam.
11. *Labeo dero* - All along Himalayan foot hills, Darjeeling, W.B.
12. *Labeo dussumieri* - Western Ghats upto N.Canara.
13. *Osteobrama belangeri* - Manipur (previously found in Bengal from where it has disappeared).

RARE

1. *Horaglanius krishnai* - Kottayam, Kerala State.
2. *Schistura sijuensis* - Throughout India

INDETERMINATE

- ✓ 1. *Notopterus chitala* - Freshwater rivers, streams of India.
2. *Pangasius pangasius* - Freshwater of U.P., Bihar, M.P., Darjeeling, Assam, Orissa, Madras.

- | | | | |
|-----|----------------------------------|---|---|
| 3. | <i>Tenulosa ilisha</i> | - | Indian Ocean, coastal waters, estuaries, rivers. |
| 4. | <i>Thynnichthys sandkhol</i> | - | Freshwaters of S.India, Krishna and Godavari river system. |
| 5. | <i>Tor khudree</i> | - | Freshwater of U.P., Orissa, Kerala, Peninsular India. |
| 6. | <i>Balitora brucei</i> | - | Darjeeling, Assam. |
| 7. | <i>Barbus dukai</i> | - | Eastern Himalaya & Assam. |
| 8. | <i>Chagunius chagunio</i> | - | Brahmaputra and Ganga drainages along the Himalaya foot hills. |
| 9. | <i>Crossocheilus latius</i> | - | Drainages of the Ganga & Brahmaputra in N. India, Mahanadi river drainage in Orissa & Western ghats, south to the head waters of Krishna river. |
| 10. | <i>Gadusia chapra</i> | - | Ganga, Brahmaputra river system, Mahanadi river, Bay of Bengal. |
| 11. | <i>Glyptosternum maculatum</i> | - | Sikkim. |
| 12. | <i>Labeo fimbriatus</i> | - | Northern hills of Nepal border, Sindh, Punjab, Orissa, Southern India except Malabar and Canara. |
| 13. | <i>Labeo gonius</i> | - | Freshwater of Assam, Darjeeling, W.B., Bihar, U.P., Orissa. |
| 14. | <i>Mastacembalus armatus</i> | - | Throughout India. |
| 15. | <i>Mystus tengara</i> | - | Throughout N.India. |
| 16. | <i>M. aor</i> | - | River Ganga, Yamuna, Brahmaputra, Mahanadi. |
| 17. | <i>Nandus nandus</i> | - | Throughout India. |
| 18. | <i>Olyra logicaudata</i> | - | Base of Darjeeling, Himalaya, Meghalaya and Assam. |
| 19. | <i>Psylorhynchus homaloptera</i> | - | Assam, Brahmaputra drainage. |
| 20. | <i>Puntius carnaticus</i> | - | Freshwater of Nilgiri, Wynaad., Canara hills. |
| 21. | <i>Puntius conchoniuis</i> | - | Ganga, Brahmaputra, U.P., Bihar. |
| 22. | <i>Rasbora rasbora</i> | - | Freshwaters of all the Indian States, most common in the valley of Ganges. |
| 23. | <i>Setipinna phasa</i> | - | Ganga river system and Orissa. |
| 24. | <i>Silonia childreni</i> | - | Freshwaters of Krishna, Godavary, Cauvery river system. |

- | | | | |
|-----|---------------------------|---|-----------------------------------|
| 25. | <i>Silonia silondia</i> | - | Freshwater of Punjab,U.P., Bihar. |
| 26. | <i>Tor mosal</i> | - | Hill streams of Himalayas. |
| 27. | <i>Xenentodon cancila</i> | - | East coast of India. |
| 28. | <i>Bengala elonga</i> | - | Bihar,U.P., WB.,Assam. |

COLDWATER FISHES

ENDANGERED

- | | | | |
|----|----------------------------|---|-----------------|
| 1. | <i>Gymnocypris biswasi</i> | - | Chusul, Ladakh. |
|----|----------------------------|---|-----------------|

VULNERABLE

- | | | | |
|----|---------------------------------|---|---|
| 1. | <i>Tor putitora</i> | - | All along the Himalaya, Darjeeling. |
| 2. | <i>Psilorhynchus balitora</i> | - | Yamuna river in Delhi, river Gomti. |
| 3. | <i>Raiamas bola</i> | - | India, confined to the hilly areas of the northern provinces (Haryana, H.P., U.P., Bihar, Assam, W.B., Orissa). |
| 4. | <i>Schizothorax kumaonensis</i> | - | Kumaun hills. |

INDETERMINATE

- | | | | |
|-----|---------------------------------------|---|--|
| 1. | <i>Botia almorhae</i> | - | Kumaun hills specially in Kosi river. |
| 2. | <i>Lepidopygopsis typus</i> | - | Periyar river and Lakes of Kerala. |
| 3. | <i>Noemacheilus rapicola</i> | - | W. Himalaya, Kumaun through Garhwal Himalaya to Yamuna Sutlej & Beas drainages of H.P. |
| 4. | <i>Tor tor</i> | - | U.P. hills, Darjeeling, M.P., Bihar, North Bengal, Assam. |
| 5. | <i>Noemacheilus clangatus</i> | - | Meghalaya near Shillong. |
| 6. | <i>Schizothorax richardsoni</i> | - | Sub-Himalayan range. |
| 7. | <i>Puntius chillinoides</i> | - | Himalayan foot hills, Ganga river system. |
| 8. | <i>Schizothorax plagiostomus</i> | - | Along the Himalayan foot hills. |
| 9. | <i>S.progastus</i> | - | J & K Valley, Ganga river in U.P. and Brahmaputra river in Assam. |
| 10. | <i>Schizothoraichthys esocinus</i> | - | Indus river and its tributaries in Ladakh & Kashmir. |
| 11. | <i>Schizothoraichthys longipinnis</i> | - | Kashmir valley & Indus river system. |
| 12. | <i>Schizopygopsis stolickeae</i> | - | Leh and headwaters of Indus, also tributaries of the Yarkand and Oxus river. |

BRACKISHWATER FISHES

VULNERABLE

1. *Lates calcarifer* - Indian estuarine & marine waters.
2. *Odontamblyopus rubicundus* - Coastal waters & estuaries, seas of India, very common in Hooghly at Calcutta.

INDETERMINATE

1. *Osteogeniosus militaris* - India, inhabits sea, estuaries and tidal rivers.
2. *Periophthalmus koelreuteri* - Mouth of river Hooghly, Sunderbans, W.B., Port Blair, Nunkauri Islands, Nicobar, visiting freshwaters.
3. *Etroplus suratensis* - Kerala, Tamil Nadu, Andhara, Orissa.
4. *Plotossus canius* - Along esturaries of India.

MARINE

VULNERABLE

1. *Rhinodon typus* - Throughout the tropical parts of Indian Ocean
2. *Platycephalus maculipinna* - Cochin, Kerala.

INDETERMINATE

1. *Lactarius lactarius* - Coast of India.
2. *Tachysurus dussumeri* - India, Kerala coast.
3. *T.tenuispinis* - Maharashtra, Karnataka, Andhra & Orissa coasts of India.
4. *T. thalassinus* - East and west coast of India Andhra, Orissa, W.B. coast, Vizhinjam (Kerala).
5. *T. sona* - Bombay coast
6. *Platycephalus indicus* - Coast of India.
7. *Polynemus heptadactylus* - Bombay coast, north-west coast of India.
8. *Congresox talabanoides* - North-western coast of India, Bombay and Gujarat coast.

3.2: FB 2 Conservation of Mahseer in upland Waters

P.C.Mahanta, D.Kapoor, S.P.Singh, A.K.Pandey, P.Punia, A.K.Singh, R.Dayal, K.D.Joshi, S.M.Srivastava, R.S.Patiyal, Ajai K.Singh and S.K.Paul

Studies on Ladhiya and Sharda Rivers

With a view to plan strategies for *in situ* conservation of Mahseer- an endangered fish in northern hills of U.P., different locations near Ladhiya- a tributary of Kali and Sharda rivers at Tanakpur have been identified and effort has been made to take appropriate steps for the conservation of this fish which are as follows:

1. Formation of Committees: "Mahseer Bachao Samiti" (Mahseer conservation committee) were formed at three places along Ladhiya and Sharda catchment with the objective to create mass awareness among local population about the importance of this game fish, its declining population in that area, requirements for its conservation and its possible ways and means.

(I) Upper Stretch

The Mahseer Conservation Committee covers the upper Ladhiya catchments, along the villages Ritha Sahib, Kulial Gaon, Badela, Taladi (Pinana), Chaura Mehta, Parewa Manglekh and Pokhari etc. The committee which consists of 16 members is headed by Shri Jagat Singh Kulial, Pradhan, Chaura Mehta.

(II) Middle stretch

The villages participating in the Mahseer Bachao Samiti in this region are Amori, Belkhet, Dyuri, Belon, Kathanla, Naulapani, Byatta, Chalthi, Gangesar etc. The 15 member committee is headed by Shri Ratan Singh Bohra, Pradhan, Dyuri.

(III) Lower stretch near Sharda river at Tanakpur

In this region, the said Committee covers the villages situated in the lower Ladhiya river stretch upto Tanakpur, Dist. Nainital. The 12 member committee is headed by Shri Jagat Singh Rawat, Ex - Chairman, Nagar Palika, Tanakpur.

2. Mass Awareness Programme

Besides formation of above Mahseer Bachao Samitis, mass awareness camps were launched along the Ladhiya and Sharda catchments with the objective to attract attention of the people dwelling the area towards importance of this game fish- Mahseer, its declining trend and conservation measures to be adopted. The Mahseer Bachao Samitis have been organized at the following places which involved students, teachers, fishermen, peoples, representatives and common men. (Fig. 1, 2, 3)



Fig.1-Shri P.C. Mahanta, Senior Scientist, delivering a motivating talk on Mahseer Conservation on the National Science Day at Government Inter College, Tanakpur, U.P.

Fig.2-Shri Pyush Punia motivating common people of Tanakpur in U.P. Hills on Conservation under Mahseer Bachao Gosthi.

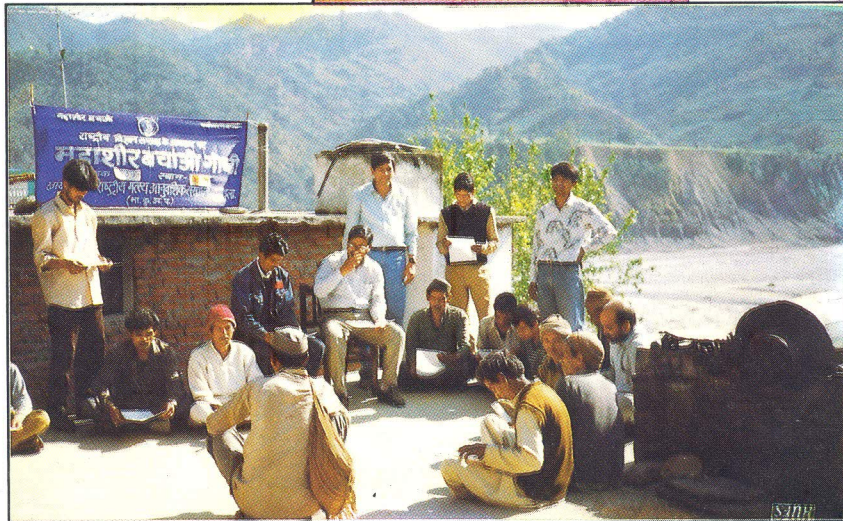


Fig.3- A view of the Mahseer Bachao Gosthi organised by NBFGR along the river Ladhiya for Conservation of Mahseer in upland waters.

	VENUE	DATE
(I)	Government Inter College, Tanakpur	28.2.94
(II)	Government High School, Sukhidhang	2.3.94
(III)	Kumaun Mandal Vikas Nigam, Tanakpur	4.3.94
(IV)	Government High School, Amori	5.3.94
(V)	Belkhet Market, Belkhet	5.3.94

The local Mahseer Conservation Committees took active part in organizing these meetings.

With a view to evolve suitable conservation strategies for endangered Mahseer and abundance of fish community, data were collected from lower stretch of Ladhiya stream

and nearby places. Information collected by means of query from villagers and actual fishing operations undertaken by the research team of the Bureau. Data collected during the year was compiled for analyses. Summary of results is given in Table 2.

Table 2 : Summary of data on Mahseer collected during 1993-94.

Place	No. of sample	Proportion of Tor putitora in catch		Average wt. of Tor putitora	No. of Fishes	CPUE G/Manday
		Wt.	No.			
Belkhet	2	0.3441	0.3750	106.67	3	676.36
Ritha	3	0.1150	0.1667	97.50	2	981.82
Sahib						
Below	1	0.2273	0.25	145.00	2	880.00
Chalthi						
Kathaul	2	0.2320	0.20	50.00	1	537.01
Chalthi	3	0.0739	0.0588	105.00	1	710.00
Bisauria	1	1.00	1.00	125.00	200	5000.00
Thuligad	1	0.1079	0.0909	150.00	5	4633.00
Tanakpur	2	1.00	1.00	150.00	4	N.A.

On the basis of available limited number of samples, some metric characters of *Tor putitora* and catch per unit of effort (CPUE) were estimated. Proportion of *T. putitora* in total catch varies from 0.0739 to 1.0 (fish weight) and from 0.0588 to 1.00 (fish number), respectively over different places covered under the study. Weighted average of *T. putitora* was found 125.28 g. This is too less, however, catch per unit effort (in g/manday) varied from 537.01 g. to 5000.00 g. over different places. CPUE at Bisoria dam and Thuligad was exceptionally high probably due to fishing in night by skilled persons.

3. Photo Exhibitions

As visual display plays an important role in communications, photo exhibitions displaying various aspects of Mahseer and importance of its conservation were organized at the places identified for Mahseer conservation (Fig.4). Handouts and pamphlets were also distributed among the visitors of the exhibition. The mass awareness programme launched by the Bureau received wide coverage in the newspapers including the daily Dainik Jagaran and Amar Ujala. This effort on the part of Bureau has no doubt aroused consciousness among local inhabitants regarding conservation of this diminishing fish.

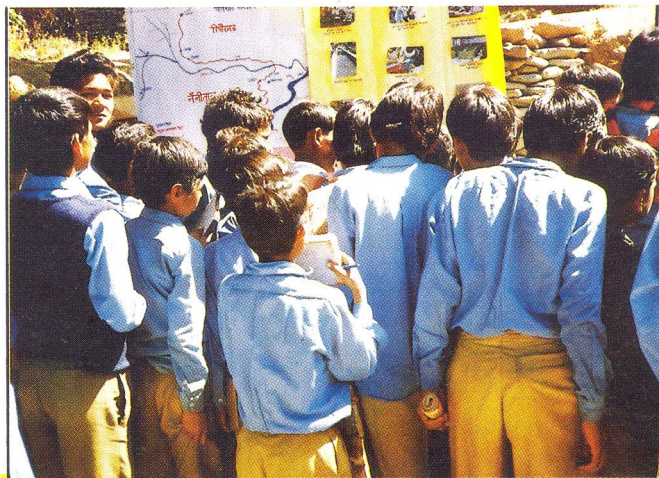


Fig.4 - A view of student interact at the photo exhibition organised under Mahseer Bachao Gosthi.

4. Requirement for Declaration of Sanctuary

As an effective measures of *in situ* conservation of Mahseer, the need of establishing a sanctuary has long been felt by the Bureau. As such the lower stretch of Ladhiya from Chalthi village to its confluence with Sharda upto the barrage at Tanakpur is required to be declared as sanctuary for endangered Mahseer. This stretch is of about 30km and is highly exploited zone. The water area of this zone is feeding ground for many other species of fish including *Tor putitora* and *Tor tor*. The other fishes of commercial values are: *Schizothorax richardsonii*, *Labeo dero*, *Labeo dyocheilus*. *Barilius bola* etc.

During the course of investigations, it has been observed that during winter and summer months, the large sized fishes from smaller and shallow tributaries move to deeper

water of this zone where all the fish species are over-exploited by the fishermen with the help of gill nets of smaller mesh-size and other destructive devices. Keeping in view this fact, mahseer conservation committee is considering conservation of the gene pool of this precious game fish.

5. Mahseer Breeding Programme

Dhakrani Fish Hatchery of State Fisheries Department has been surveyed to assess the potentiality for Mahseer breeding. Suggestions to improve the hatchery has been given by the Bureau to the concerned

department. This would certainly be a positive step in meeting the objectives of mahseer conservation.

3.3: BG 7: Population genetics of major carps, endangered species and other groups of fishes through biochemical genetic techniques

A.G.Ponniah, A.Gopalakrishnan, K.K.Lal, P.K.Sahoo and S.K.Srivastava

With a view to getting picture of variation in different population of fishes, genetic characterization of *Labeo rohita* and Chinese

Table 3: Number of bands ascertained from the isoelectric focussing (pH 3.5 - 9.5) pattern of soluble eye lens protein directly from the gel.

Species	Zones						Total no. of bands
	I	II	III	IV	V	VI	
	pH						
	4.80	5.31	5.76	6.46	7.56	8.26	
	Range	5.30	5.75	6.45	7.55	8.25	9.00
<i>L.rohita</i>	4	4	7	6	3	3	27
<i>L.bata</i>	3	3	4	8	3	4	25
<i>C.mrigala</i>	4	2	6	8	3	3	26
<i>C.catla</i>	3	2	4	8	3	4	24
<i>C.carpio</i>	3	4	7	6	2	5	27
<i>O.mossambicus</i>	2	6	13	6	6	0	33

carp, *C. carpio* from natural resources have been undertaken using isoelectric focussing and isozyme studies. The same are as follows:

I. Isoelectric focussing studies

The comparative band pattern of water soluble crystalline eye lens proteins of *Cyprinus carpio* from Allahabad and Ooty stocks and *Labeo rohita*, *Labeo bata*, *Oreochromis mossambicus* and *Catla catla* of Allahabad were studied (Fig:5). The results are presented in Table 3.

to the (pI) position of bands and even those bands having common isoelectric focussing point(pI), the intensity greatly varied giving an overall distinct pattern for each species. On the basis of pI values the bands have been categorized into six zones (Table 3) and the different species are compared.

In the first and second zone only two bands with pI 5.2 and 5.5 were common in all the above species screened. In the third zone, maximum number of bands appeared in case of *O. mossambicus* but only three bands with pI 6.0, 6.2 and 6.3 were common

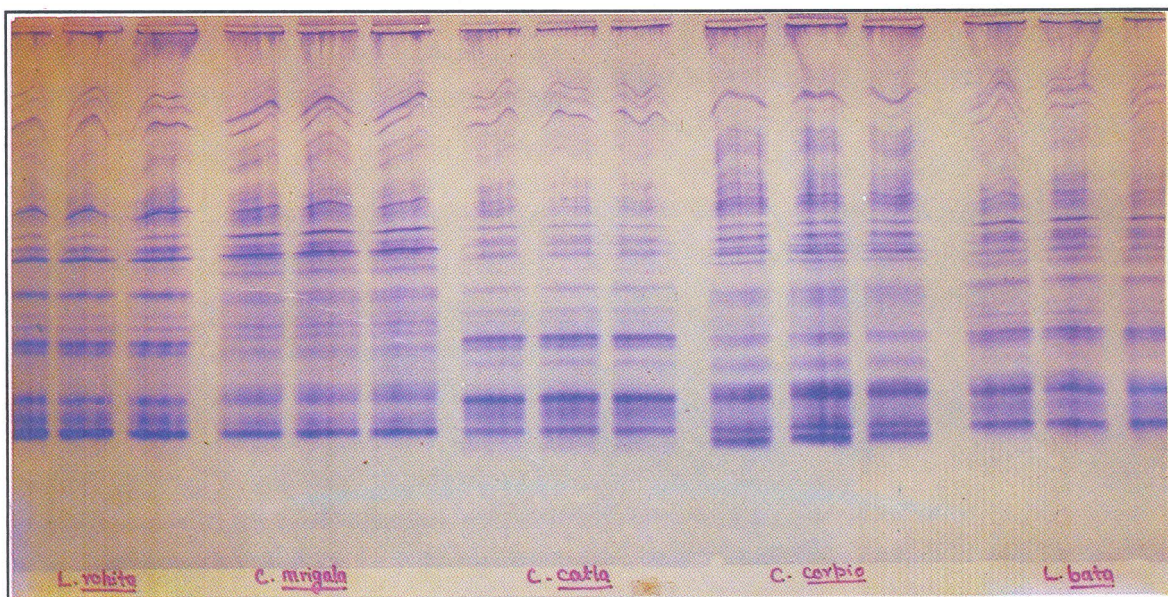


Fig.5- Comparative isoelectric focussing profiles of eyelens of *Labeo rohita*, *Labeo bata*, *Cirrhinus mrigala*, *Catla catla* and *Cyprinus carpio*.

Though the overall number of bands did not vary significantly, it was interesting to note that within each region there were variations between species and within species. The variations are basically with regard

in all the species. In the IV zone, three bands with pI 6.5, 6.7 and 7.2 were common. Indian carps have equal number of bands in the V zone with common bands of pI values 7.7 & 7.8. In VI zone in all the

fishes except tilapia had common bands at pI values 8.5, 8.7 and 8.8. During the course of these studies, it has become possible to identify homo- and heterozygote. The genetic polymorphism has been detected in the zone IV with pI values 6.45 to 7.55 in the Gangetic stock of *L.rohita*. This was similar to Rapti stock variations which were indicative of genetic polymorphism.

II. Isozyme studies

Variations at enzymatic level in different species and stocks of fishes have been studied. In multiloci enzyme system, it was difficult to detect changes in band pattern due to genetic variation. Each band is characterized individually. Esterase is also a candidate of this multilocus enzyme system which has been studied in *L.rohita* and for the purpose 7 substrates as below have been tested :

1. α - naphthyl acetate (A)
2. α - naphthyl butyrate (B)
3. α - naphthyl caprylate (C)
4. α - naphthyl laurate (L)
5. α - naphthyl propionate (P)
6. β - naphthyl Oleate (O)
7. Naphthol-AS-D-acetate (D)

All the bands stained sharply and equally with substrates A, B and P, however, with substrates like C,L and O the bands failed to take stain even after 24 hours in the staining mixture. Naphthyl propionate (P) stained the bands with high mobility more

intensely while naphthol AS-D-acetate failed to stain in this zone. During the course of experiments, it was experienced that out of 3 stain buffers used, tris pH 8 was superior. Unlike other fishes, in rohu and mrigal substrate specific reaction could not be observed. As such, further experiments are being conducted by employing specific inhibitors which are expected to provide clear differentiation in bands. In mrigal the substrates A, B, P and D produced bands of similar to rohu which indicate its genetic similarity with regard to esterase enzyme.

3.4: CM 3: Fish spermatozoa Cryopreservation technique for gene banking

A.G.Ponniah, A.Gopalkrishnan, K. K. Lal, P.K.Sahoo and S.K.Srivastava

With a view to conserving the depleting genetically distinct species of fishes and to manipulate/regulate the progenies of fishes with desired traits/characters, gene bank of fishes have long been felt. Long term cryopreservation technique for male gamete of fishes has already been standardised by the NBFGR.

Further experiments were carried out with *Labeo rohita*, *Cirrhinus mrigala* and *Cyprinus carpio* to enhance the percentage of hatching when fertilized with cryopreserved milt. Seven extenders have been tested during the experiments out of which six happened to be new and gave better performance than the earlier ones. The highest hatching percentage of 77 was recorded against control

of 89. Under the present experiment, delayed water activation of fish eggs have also been tested. The freshly collected eggs fertilized with cryopreserved milt were activated at 0,10,30,60 seconds. The optimum time required for fertilization ranged between 10 to 30 seconds depending on the extender used and quality of eggs fertilized. Out of the two extender and milt ratios 1:4 and 1:9 for milt dilution, the ratio of 1:4 has been found superior with high hatching percentage.

Another set of experiments was conducted to test whether hatching was affected by *in vitro* ageing of eggs after stripping. In many females delay in fertilization after stripping of eggs resulted in reduced hatching percentage, however, the rate of decline was not uniform in all the females of *L.rohita* and *C.mrigala* tested, the reason for which may be attributed to genetic and / or physiological differences within species.

Cyprinus carpio

A small breeding unit was set up at NBFGR for breeding of common carp (Fig 6). Brood stock (N=71) were conditioned in a depth of 5'5". After 18 days, males and females together were segregated and females (N=32) were shifted to separate 6' diameter plastic pool. For breeding males and females were put in the ratio 1:2 in hapas set inside the 6' diameter plastic pool. Regular monitoring of oocyte with the help of catheter and only those showing appropriate stages were induced to spawn with ovaprim.

Trials were carried out to assess, if addition of activating solutions to eggs fertilised with cryopreserved milt could enhance fertilisation rate. The activating solutions tested were Dexter, Karokura (1987) buffer, aquarium and tap water. Dexter and 1.5% $\text{Na}_2\text{S}_2\text{O}_3$ have been found to be superior than other. Though sodium sulphite was found superior, high degree of variability between trials have been observed. The mean hatching percentage of 88.3 has been recorded as against control. In our other experiment, activating solution was added to the eggs fertilized by cryopreserved milt at different time intervals of 10,30,40 and 90 seconds. The time interval between addition of milt and fertilizing solution of 40 seconds was found to be optimum with high fertility and hatching whereas 10 and 90 seconds showed lower hatching percentage



Fig.6- An improvised breeding facility for the biotechnological experiments on cryopreservation.

3.5 : CM4: Methodology development for cryopreservation of eggs and embryos of Indian major carps and endangered species for *ex situ* conservation

A.G.Ponniah, A.Gopalakrishnan, P. Punia, A.Barat and S.K.Srivastava

With the successful development of techniques of milt cryopreservation, it has become a necessity to develop techniques for the retrieval of whole genome from cryopreserved spermatozoa. Now with the chromosomal manipulation technique of androgenesis, it should be possible to develop a fully diploid individual from haploid spermatozoa without maternal genome contribution. Experiments have been carried out on androgenesis by fertilizing the genetically inactivated eggs with fresh milt. The main steps of androgenesis involve the steps depicted below:-

- Inactivation of maternal genome (egg) by UV irradiation.
- Fertilization of genetically inactivated eggs with fresh milt.
- Restoring diploid number of chromosomes by shock treatment at appropriate stage of mitotic division.

Under the experiment, freshly stripped eggs of common carp were exposed to UV irradiation for 1, 3, 6 & 9 minutes(Fig 7). The UV light source used were two 15 watt tube at a distance of 5 cm from the egg layer. After the UV radiation treatment the batch of eggs were fertilized with freshly

collected milt (Fig 8) and heat shocked (42 °C) for 90 seconds after 5, 10, 12, 15, 20, 30 and 40 minutes of fertilization (TAF). A diploid control of normal eggs and an androgenetic haploid set of UV irradiated without heat shock were also kept for verification of results.



Fig.7- Genetic engineering through heat shock for production of androgenetic individual.



Fig.8- Collections of milt for androgenetic experiments.

In the first fish TAF 40, 50 and 60 minutes was tested and no developing larvae was observed in treated as well as in control groups. In the next batch of 3 females, TAF 10,12.5, 15, 20,30 and 40 minutes was tested and individuals were obtained from 2nd, 3rd and 5th females out of the total 51 treated groups which may be androgenetic and thus termed as 'putative androgenesis'. Genetic verification when the young ones grow to a reasonable size would only conclude the present inferences. Putative androgenetic individuals were produced in nine experimental groups giving a low yield of 2.3 ± 1.21 percent. Under the present experiment, the optimal range of parameters required for production of putative androgenetic individuals was 3-6 minutes exposure of egg to UV light source and TAF 15-20 minutes.

The pattern of survival of experimental and haploid control groups varied greatly between five females. In the second and third female viable larvae were observed in all the six haploid sets. In the fourth and fifth fish, only in two sets haploid larvae could be obtained which died after day 1 and 4. The longer survival of days of haploid larvae was observed in the set which was irradiated for 1 minute. From this experiment, it is evident that androgenetic individual development was based on absence of viable individuals in haploid control set of 4th and 5th female treatment group. Since no colour or marker were used in the experiment, the term 'putative' androgenetic individual have been used for the larvae so obtained which

are subject to genetic verification.

In another experiment, effect of storage of eggs before fertilization have been investigated. Prior to fertilization, eggs were kept in 3 egg storage solutions and in all the three solution there was no hatching after fertilization. Another sets the eggs were kept over crushed ice and it was observed that hatching was less than 1% .

Experiments have also been conducted with the programmable freezer which was commissioned in March 1994 to test the cooling of 10% DMSO and glycerol at the cooling rate of $1^{\circ}\text{C}/\text{min}$. Ice seeding at -6°C for 10 seconds was found to be better than 30 seconds because shorter seeding time resulted in gradual ice formation. It took 45 to 60 seconds for ice formation in the whole straw where without ice seeding the freezing temperature was 10 to 13°C . The temperature at which the solution thawed was $5-6^{\circ}\text{C}$ at a thawing rate of $1^{\circ}\text{C}/\text{min}$.

3.6: CM 5: Standardization of monosex production technique in exotic fishes

A.K.Singh and A.K.Pandey

Experiments on sex reversal of exotic fish have successfully been conducted and all male progeny through feeding of hormone incorporated diet (17- α -methyl testosterone @ 35 g/kg feed) to the 7 day old swim-up juveniles of *Oreochromis mossambicus* maintained in laboratory conditions under long photoperiod (16 L:8D) for sixty days.

Absolute sex reversal and striking growth was recorded in the treated group of fish. Attempts have also been made to investigate the environmental implications in exotic species of tilapia.

During the course of experiments, temperature and photoperiod were observed as potential proximate factors in gonadal development and differentiation. Experimental observations have confirmed that low temperature and scotophase inhibited gonadal development and differentiation process in tilapia. The feeding and territorial behaviour of these fishes under low temperature group and scotophase were reduced as compared to the controls.

To clinch the effect of photoperiod and temperature on sex differentiation, 50 healthy brood stock of *Oreochromis mossambicus* were maintained in the laboratory conditions under photophase for 16 hrs light and scotophase for 16 hrs darkness and also at two temperature ranges of 19-23 °C and 28-32 °C. The fishes maintained at normal day length and temperature 28 ± 1 °C served as control in this experiment. Sex ratio of these experimental fishes from all the groups were recorded and analyzed. Similar experiments have been done by employing 7 day old swim-up fry which were raised to maturity under different temperature and photoperiod. Analyses of data revealed a sharp deviation in sex ratio against expected Mendelian ratio.

3.7: CG 6: Cytogenetic variation in natural population of Indian major carps, selected air breathing fishes and endangered Species

O. P. Pandey, N. S. Nagpure, P. Punia and A. Barat

Studies under this project have been carried out with a view to find out genetic variations within and between population of fishes and to devise suitable methods to identify variations at chromosomal level.

During the course of investigation, 42 specimens collected from different ecosystems had been processed for cytogenetic studies. Chromosome slides were prepared from gill and kidney tissues by routine splash technique and screened for good metaphase spreads. A total of 149 metaphase spreads (Table 4) were scored and used for different studies by application of standard established staining and banding techniques.

To have a clear picture of the effect of inbreeding in hatchery populations of *Labeo rohita*, a comparative study on chromosomal profile of *Labeo rohita* of Ganga and U.P. State Hatchery had been done. In this study a total of 16 specimens (9 from river Ganga and 7 from hatchery stock of U.P. State Fisheries of Allahabad.) had been compared for chromosomal profile. No variation whatsoever could be observed. The study indicates that for gross chromosome structure, the hatchery stocks do not differ from

the wild stocks. However, remote possibilities of detection of genetic variations between these two stocks by using advance techniques can not be ruled out.

Nucleolar Organizer Regions (NOR)

NORs are the sites of genes for ribosomal RNA (rRNA) and has a crucial role in the formation of mature ribosomes. After staining with silver nitrate, these regions appear as black dots while rest of the chromosome becomes golden yellow. There is a marked interspecific variation in size, location and number of NOR in different species of fish. However, no intraspecific variation has been observed during the course of studies in *Labeo rohita* from both the riverine and hatchery populations. The NORs were

found located on short arm of one pair of submetacentric chromosome in *Labeo rohita*. The protocol of silver nitrate staining has been further improvised by fixing the slides in 5% sodium thiosulphate ($\text{Na}_2 \text{S}_2\text{O}_3$) for 2 to 3 minutes. This treatment improved the clarity of NORs on the chromosomes. Studies were carried out with *Schizothorax richardsoni* and *Cyprinus carpio* var *specularis* whose NOR band patterns had not been reported earlier. In *S. richardsoni* collected from Kosi river (U.P.), a chromosome complement of $2n=98$ and 2 pairs of chromosome with NOR were observed (Fig 9). In *C. carpio* var *specularis* from Bhimtal lake of Kumaun hills (U.P.), NOR was observed in the terminal end of one pair, large size metacentric chromosome set (Fig 10)

Table 4 : Number of metaphase complements scored in different species of fish.

Sl. No.	Name of Species	No. of Specimen	No. of Metaphase Spreads Studied
1.	<i>Labeo rohita</i> (From river Ganga)	9	67
2.	<i>Labeo rohita</i> (From hatchery)	7	34
3.	<i>Labeo bata</i>	1	-
4.	<i>Tor putitora</i>	24	38
5.	<i>Clarias batrachus</i>	1	10
Total		42	149

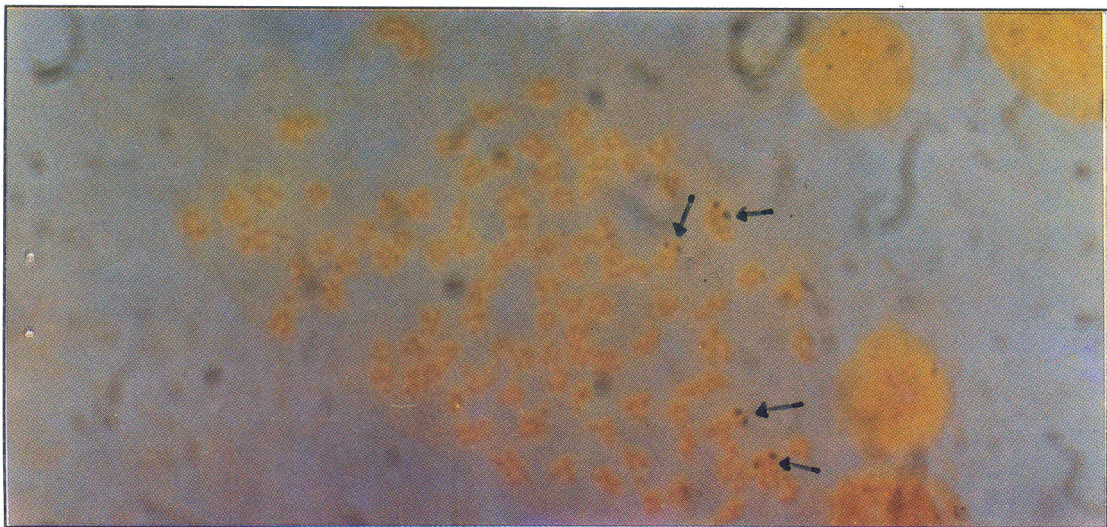


Fig.9- Metaphase complements of Schizothorax richardsoni showing two pairs of NORs.

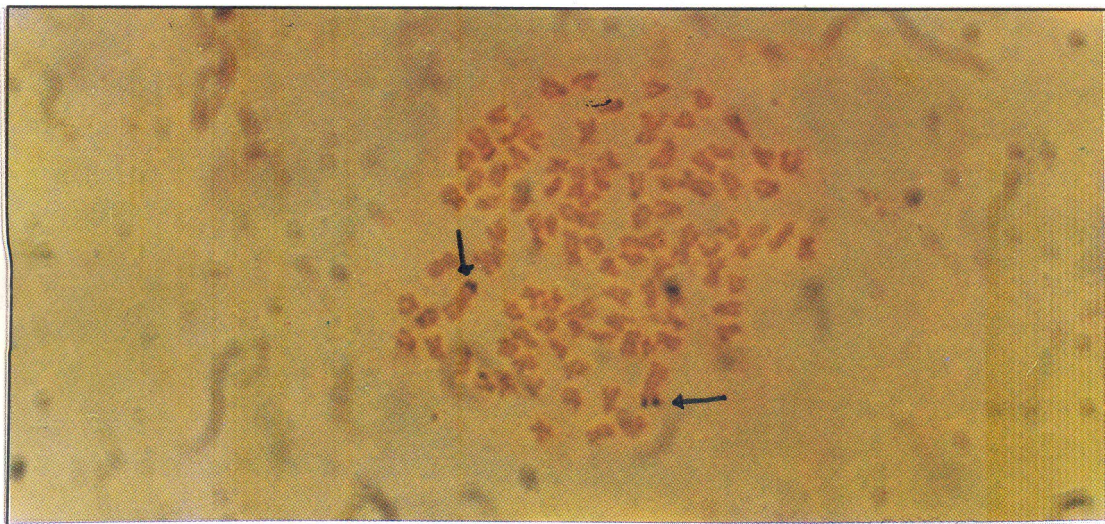


Fig.10- NOR Chromosome banding patterns in Cyprinus carpio var. specularis.

Comparative cytogenetic studies on two populations of golden mahseer *Tor putitora* i.e. one from Kosi near Garampani and other from Ladhiya near Chalthi, Belkhet of Kumaun hills Uttar Pradesh had been undertaken. A total of 25 specimens from Kosi river and 8 from Ladhiya have been screened for diploid number of chromosomes and NOR patterns. This study would provide information on occurrence of different polymorphs in respect of chromosomal profile as well as stressful condition the mahseer is encountering. This would help in formulation of conservation strategies.

Q and C bands

Studies on Q banding have been done by application of double staining method by quinacrine mustard and actinomycin. D. The Q bands faded so quickly that it could not be photographed with a slow speed film. In absence of adequate number of observations, it is premature to identify any polymorphism of the band.

Detailed studies had been conducted on C bands using barium hydroxide/saline/ giemsa(BSG) technique (Summer, 1972). These bands represent constitutive heterochromatin and as such any variation if exists can be identified by this technique. Though encouraging results had been obtained, due to inconsistency of results and less samples, scoring of polymorphism was difficult.

Sex Chromosomes

The analyses of karyotypes of the specimens were studied and efforts made to identify sex chromosome but due to tiny size of the chromosomes in fishes and of various shapes, no clear cut distinction of sex chromosomes could be made. Fishes show all types of sex chromosomes indicating male heterogamety, female heterogamety and multiple sex type. Different banding techniques were employed to identify sex chromosomes in Indian major carps but in absence of adequate repeatable results, identification of sex chromosome could not be authenticated. However, the work is in progress.

Cell culture

To study the various cell growth stages and chromosome behaviour, cell culture using whole blood of fish *Labeo rohita* had been undertaken in a trial. The cell culture provides a method by which one can score good quality metaphase spreads in adequate numbers. The blood samples were incubated with Eagles MEM supplemented with 20% foetal bovine serum. The results have been encouraging and further trials would be undertaken to improve the protocol for fishes which show variation in culture conditions like temperature, microenvironment etc.

4. COLLABORATION

4.1 National

1. Central Inland Fisheries Research Institute, Barrackpore, West Bengal.
2. Central Institute of Freshwater Aquaculture, Kausalyaganga, via Bhubaneswar, Orissa.
3. Central Institute of Brackishwater Aquaculture, Egmore, Madras, Tamil Nadu.
4. Central Marine Fisheries Research Institute, Cochin, Kerala.
5. National Research Centre on Coldwater Fisheries, Haldwani, U.P.
6. Department of Fisheries, Govt. of U.P., Lucknow.
7. Directorate of Fisheries, Govt. of H.P., Bilaspur.
8. Zoological Survey of India, Madras, Tamil Nadu.
9. Zoological Survey of India, Calcutta, West Bengal.
10. Industrial Toxicology Research Centre, Lucknow.
11. Nature Conservators, Muzaffarnagar, U.P.
12. Department of Biotechnology, Ministry of Science & Technology, New Delhi.

4.2 International

Under the USAID sub-project on 'Animal Genetic Resource Conservation' collaborative programme for research and training continued.

5. MANPOWER DEVELOPMENT

5.1 Scientific and Technical

The following personnel had undergone training courses at different organisations in their respective fields as below:

- Shri Peyush Punia, Scientist had undergone the short term training course on 'Computer Applications in Agricultural Research and Management' at NAARM, Rajendranagar, Hyderabad during 15 to 25th June 1993.
- Shri S.P.Singh, Scientist had attended the Summer Institute on 'Advances in Agricultural Statistics' held during 17th May to 5th June, 1993, at IASRI, New Delhi.
- Dr. A.K.Singh, Asstt. Farm Manager had attended the Summer Institute Course on 'Recent Advances in Freshwater Aquaculture' held during 20 May to 8th June, 1993 at CIFA, Kausalyaganga, Orissa.
- Drs.A.Gopalakrishnan & P.K.Sahoo, Scientists had attended the training course on 'Safety Aspects in the Research Applications of Ionising Radiations' conducted by the Radiological Physics Division, Bhaba Atomic Research Centre, Trombay, Bombay during 2 to 10 August, 1993.
- Mrs.S.Das, Librarian and Shri P.Chithamparam, Library Assistant had undergone the course on 'Computer

Applications for Information Storage and Retrieval' held during 3 to 13 August, 1993 at NAARM, Rajendranagar, Hyderabad.

- Dr. Kuldeep kumar Lal, Scientist had undergone the '21st Short-term Course on use of Computer' during 16 to 30 September, 1993 at IASRI, New Delhi.
- Mrs. S.Das, Librarian visited the IARI Library and Bio-informatics Centre of IARI at Pusa, New Delhi during 18-19 January, 1994 for acquainting herself with the computerised activities of the Centre and collected updated database information for Library.



Fig.12- A batch of B.F.Sc. students of College of Fisheries, University of Agricultural Sciences, Mangalore seen in the Conservation and Management laboratory.

Training Imparted

- Dr.P.Das, Director delivered a lecture on 'Matsya Palan-Kaal aur Aaj' on 26 July 1993 to the fish farmers at Motilal



Fig.11- Shri. P.C. Mahanta explaining conservation biology activities to the trainees of Mangalore Fisheries Training Centre.

Nehru Farmers Training Institute, Phulpur, Allahabad.

- Shri Punit Chandra, Scientific Officer (Biochemistry) of G.S.Sugrcane Breeding & Research Institute, Seorahi (U.P.) was trained in the techniques of Electrophoresis (PAGE & SDS PAGE) by the Scientists of the Biochemical Genetics Laboratory of the Bureau.
- A batch of M.Sc. students of CIFOT, CIFE, Chinhat, Lucknow visited the Bureau on 20 July 1993 and were appraised of the research activities of different laboratories (Fig 11 & 12).
- Fishery Officials of M.P.Fishery Training Centre, Nowgaong visited this Bureau on 27 January 1994 and were appraised of the research activities of different divisions.

A batch of B.F.Sc.(Final year) students of the College of Fisheries, University of Agricultural Sciences, Mangalore visited the Bureau on 25 Feb. 1994 and were taken around to the laboratories where the Scientists demonstrated the ongoing research activities of the Bureau & also about fish genetics in general.

5.2 Honours and Awards

- Dr.P.Das, Director was honoured through presentation of a memento by the Society of Nature Conservators (NATCON) for his overall guidance and supervision for developing the technique of longterm cryopreservation of fish milt which led to a Mini Gene Bank at the Bureau. (Fig. 13) The NBFGR team leader Dr. A. G. Ponniah was awarded
- Dr. P.Das, Director became the Member of the Advisory Board of the Forum for Technical Recognition of Fishery Technologists, Calcutta.
- Dr.P.Das, Director became the Member of the Editorial Board of the Journal of Bioved published by the Bioved Research Society, Allahabad.



Fig.13- A Memento from Society of Nature Conservators is being presented by Prof. (Dr.) V.L. Chopra, Director General, ICAR to Dr. P. Das, Director, NBFGR.



Fig.14- The prestigious Gold Medal of Nautre Conservators is being presented to Dr. A.G. Ponniah by Prof. (Dr.) V.L. Chopra, Director General, ICAR.

- Dr.P.Das, Director was appointed as Examiner of Ph.D. Thesis of the Meerut University seperately on 2 occasions.
- Dr.A.K.Pandey, Scientist (Senior Scale) was elected Fellow of the Bioved Research Society (FBRS) of Allahabad.

6. TRANSFER OF TECHNOLOGY

6.1 Advisory Services

A good number of fish farmers visited the NBFGR during the year for getting technical know how on various aspects of fish culture. Necessary technical advise on polyculture, integrated fish culture, induced breeding, disease control, renovation of old ponds and construction of fish farms were imparted to the interested respective personnel.

6.2 Other Activities

- National Science Day Celebration

National Science Day was celebrated on 28.2.94 at Govt. Inter College, Tanakpur(U.P.) by the Scientists and Technical staff of the Fish Conservation Division of this Bureau with active involvement of students and teachers of the college. Lectures, photo exhibition and discussions were arranged with a focal theme on "Conservation of Endangered Mahseer in Ladhiya and Sharda rivers".

Considering the urgent need of mass awareness and public participation for saving Endangered mahseer, a series of "Mahseer Bachao Gosthi" were organised along the catchments of Ladhiya and Sharda rivers in Kumaun hills (U.P.) during Feb.28-March 5, 1994.

Mass awareness programme on small scale were also organised near Kurai, Phaphamau and Mansaita area of Ganga river at Allahabad.

Three "Mahseer Conservation Committees" were established at Ladhiya and Sharda river catchments of U.P. hills to involve local population in the programmes of mahseer conservation.

World Environment Day

The world environment day was celebrated on 5th June 1993. The Director, scientists and the staff of the Bureau, on that occasion expressed their concern on the deteriorating environment. They urged for a cleaner environment for serving the mankind. As a token action by the NBFGR for maintaining the environment through afforestation drive, plantation was also taken up by the Director in the NBFGR premises (Fig 15).

6.3 Talks Delivered from All India Radio, Allahabad

- Dr. P.Das, Director delivered A radio talk on 'Machhli Palan vikas avam sambhavanaya, on 21 April 1993.
- Dr. P. Das, Director delivered a radio talk on 'Machhliyo ki barwar kab aur kitna' on 4 August 1993.
- Dr. P. Das, Director delivered a radio talk on 'Machhli ka santulit ahar' on 4 Feb 1994.
- Dr. D. Kapoor, Sr.Scientist delivered a radio talk on 'Machhliyo ko kritim ahar' on 1 September 1993.
- Dr. D. Kapoor, Sr.Scientist delivered a radio talk on 'Machhli palan ke liya talab ka chayan' on 7 January 1994.
- Dr. A. K. Singh, Asstt. Farm Manager delivered a radio talk on 'Machhli ki pramukh bemariya: kaaran avam bachav' on 7 April 1993.



Fig.15- Plantation at NBFGR by Dr. P. Das, Director on World Environment Day.

7. LIBRARY AND DOCUMENTATION SERVICE

7.1 Library Services

The objective of the NBFGR library services is to provide a comprehensive information service to the scientific & technical personnel. The library supports NBFGR projects by providing literature-based information, primary documents and bibliographic data. It has now build up a good collection of 1196 books, over 3500 volumes of journals and serials, 843 publications, 1507 reprints and photocopies and 115 maps and charts to meet the needs of its users.

101 new books, 178 publications, 481 reprints and photocopies, 10 maps and charts were acquired during the year under report. The library subscribed to 60 National and International journal titles and received 61 titles on exchange / as gratis. It has a collection of seven selected databases loaded in floppy diskette and in printout form. The total expenditure incurred by the library during the year was Rs. 6,19,412.00.

7.2 Exchange Services

The Library maintained exchange relationship with 65 leading International and National Research Institutes, organisations and Agricultural Universities by mailing Annual Report, reprints of scientific papers and other departmental publications.

The Library continued free mailing of Bureau's publications to various Research Organisations, Universities, State Deptts, Fish Farmers Development Agencies and to Fish Farmers. Besides, it provided services to the Scientific personnel of Research Institutes & Universities, Research Scholars, Students and individuals through interlibrary loan services and reading room facilities.

7.3 Information Services

Current awareness tools, bibliographic search service, document supply and reference services including selected databases are offered by the library to its users. The library supplied approximately 750 photocopies of scientific papers to NBFGR Scientists, Technical staff and to external organisations & individuals on request. A database on library books has been compiled on PC hard-disk and database of mailing list for Annual Report has been prepared.

7.4 Technical Reports

Technical reports on the progress of research activities of the Bureau were compiled and sent to ICAR. 33 review and research papers of the Director and Scientists were communicated to various National, International journals and Symposia/Seminars/Conferences for presentation and publication.

Technical queries regarding the activities of the Bureau from various quarters of

the country and abroad were attended to. Bio-data sheets in respects of the Scientists were compiled and mailed to 15 organisations for inclusion in different year-books and directories.

7.5 Reprography Services

The Section maintained active reprography services by producing departmental publications. The Section also attended cyclo-styling, comb-binding and electrodata binding facilities for departmental publications.

7.6 General Publications

The following publications were brought out by the Bureau during the year:

1. Annual Report for the year 1991-92.
2. Matter for Fifth Meeting of the Management Committee of NBFGR, 18 May, 1993.
3. Matter for Sixth Meeting of the Management Committee of NBFGR, 16 September, 1993.
4. Research Project Proposal, 1993-1996 in collaboration with Pesticide Toxicology Laboratory, Industrial Toxicology Research Centre, Lucknow.

8. CONFERENCES, SYMPOSIA ETC.

8.1 Important Meetings

The following meetings were organised by the Bureau during April 1993 to March 1994:

- The Annual SRC meeting was conducted on 11 May, 1993 which was presided over by Dr. P.V. Dehadrai, Dy. Director General (Fisheries). Review of ongoing projects were made and future research projects formulated.
- Fifth meeting of the Management Committee held on 18 May, 1993 at NBFGR.
- Sixth meeting of the Management Committee held on 16 September, 1993 at NBFGR.
- The half yearly SRC meeting was held on 12 November 1993 to discuss about the progress of ongoing project work.

8.2 Participation

The Scientists and Technical staff of the Bureau participated in the following Conferences/Symposia/Meetings etc.

Sl. No.	Conferences/Symposia/Seminar etc.	Organised by	Title of the paper & author (s)	Name of the participants
1.	National Seminar on Animal Genetic Resources & their Conservation, 22-23 April, 1993.	National Bureau of Animal Genetic Resources & National Institute of Animal Genetics, Karnal.	Endangered fishes of India and strategies for their conservation. -P. Das	Dr.P.Das
			Gene banking for fish. -A.G.Ponniah	Dr.A.G. Ponniah
			Prospects of fish hybridization in India. -O.P.Pandey & N.S.Nagpure	Dr.O.P. Pandey
			Application of Ag.NOR banding in fish chromosome. -A.Barat	Dr.O.P. Pandey
			Threatened ichthyofauna of Kumaun Hills & possible measures for conservation. -K.D. Joshi	Dr.K.D. Joshi

- | | | | |
|--|---|---|-----------------------|
| 2. National Workshop on Cold-Water Fisheries, 10-11 May, 1993. | Directorate of Fisheries, H.P. & Union Ministry of Agriculture at Kullu. | Use of cryopreserved milt for genetic improvement of common carp and brown trout stocks of Himachal Pradesh.
-A.G.Ponniah
<i>et al.</i> | Dr.A. Gopala-krishnan |
| 3. International Network on Genetics in Aquaculture, (INGA), July, 1993. | ICLARM, Manila, Philippines. | Present status of aquaculture genetics in India-P.V. Dehadrai, S.D.Tripathi & P.Das. | |
| 4. Seminar on Strategies & Selected High Priority Topics for increasing Agricultural Production in Uttar Pradesh, 16-17, August, 1993. | U.P.Council of Agricultural Research, Lucknow. | - | Dr.P.Das |
| 5. 3rd Asian Fisheries Forum, 11-14 Oct. 1993. | College of Fisheries, G.B. Pant University of Agriculture & Technology, Pantnagar, U.P. | Fish genetic resources and their conservation in India.
-P.Das | |

Specific genetic
manipulations can
boost fish production.

-P.Das and
K.D.Joshi

Production of
hybrids through
cryopreserved milt.

Dr. A.G.
Ponniah

-A.G.Ponniah
& P.K.Sahoo

Perspectives
of red tilapia culture.

Dr.L.B.Singh &
Dr.O.P. Pandey

-N.N.Sahebrao
et al.

Histomorphology
of the hypothal-
amoneurosecretary
system of the
Indian scad *Dec-
apterus tabl*
(Berry 1968).

Dr.A.K.Pandey

-A.K.Pandey
& M.Peer Mohamed

Histopathological
lesions in gill,
kidney and liver
of an estuarine
mullet, *Liza parsia*
caused by sublethal
exposure to DDT.

6. 8th All India
Congress of
Cytology and
Genetics, 15-18
October, 1993.

Deptt. of Zoology
Berhampur Univer-
sity, Berhampur,
Orissa.

-A.K.Pandey et. al.
Use of ultrathin
isoelectrofocussing
technique for species
differentiation.

Dr.A.K.
Pandey

-S.K.Srivastava
& A.G.Ponniah

Dr.S.K.
Srivastava

A promising
technique of hor-
monal sex control
in *Oreochromis*
mossambicus
for its aquaculture
production.

Dr.A.K.
Singh

- A.K.Singh
and P.Das

A preliminary report
on NOR polymorphism
in snowtrout, *Schizothorax*
richardsonii (Gray),
Fam. Cyprinidae.

- K.D.Joshi &
P.C.Joshi

Specific genetic
manipulations for
fish stock improvement.

- P.Das

Comparative study of
eye lens proteins of
Cyprinus carpio var.
specularis and *Tilapia*
mossambicus.

-A.G.Ponniah and
S.K.Srivastava

Application of
restriction endonucleases
in fish chromosome
studies.

-N.N.Sahebrao and
O.P.Pandey

Localisation of
Ag-NORs in some
teleostean fishes.

-A.Barat

Esterases in
Labeo rohita.

-A.Gopalakrishnan
et al.

Tissue specific
expression of allozyme
in *Labeo rohita*.

-P.K.Sahoo and
A.G.Ponniah

Non-lethal
sampling for
biochemical
genetic studies
in *Heteropneustes
fossilis*.

Dr.K.K.Lal

- K.K.Lal and
A.G.Ponniah

- | | | | |
|--|--|---|----------|
| 7. Conference
Marine Bio-
technology
in the Asian
Pacific Region,
16-20 Nov.,1993. | National Centre for
Genetic Engineering
and Biotechnology,
Ministry of Science,
Bangkok, Thailand. | Status of marine
biotechnology in
India with emphasis
on aquaculture.
- P.Das | |
| 8. International
Symp. on Rec-
ent Trends in
Life Sciences,
19-22 Nov.,
1993. | Indian Society of
Life Sciences,
Kanpur,U.P. | Influence of
pineal melatonin
in an testost-
erone-induced sex
inversion in
<i>Oreochromis
mossambicus</i> .
- A.K.Singh
& P.Das | |
| 9. WWF Steering
Committee Mee-
ting on Biodi-
versity, 16
Dec.1993. | M.S.Swaminathan
Research Foundation,
Madras. | - | Dr.P.Das |
| 10. Symposium on
Biodiversity
Inventories &
Monitoring,17
December 1993. | M.S.Swaminathan
Research Foundation,
Madras. | - | Dr.P.Das |
| 11. Workshop on
Preserving our
Protected
Areas: Role of
Community-Fore-
sts-Media Coali-
tions, 18-19
December, 1993. | M.S.Swaminathan
Research Founda-
tion, Madras. | - | Dr.P.Das |

- | | | | |
|---|----------------------------------|---|--|
| 12. 81st Session of Indian Science Congress, 3-8 Jan.1994. | University of Rajasthan, Jaipur. | Status of ichthyofauna of the Kali river system, U.P. | Dr.K.D. Joshi |
| | | - K.D.Joshi | |
| 13. National Symposium on Conservation, Natural Resources, Planning and Management, 7-8 Jan.1994. | K.A.D.College, Allahabad. | Fish biodiversity conservation is our evolutionary responsibility.
-P.Das
(Lecture paper) | Dr.P.Das |
| | | Impact of population growth on biodiversity. | |
| | | - D.Kapoor | |
| | | Ecotechnological approach for conserving imperiled aquatic resources. | Dr.A.K. Singh |
| | | - A.K.Singh <i>et al.</i> | |
| | | Fish germplasm resources of U.P. hills: present status.
-K.D.Joshi <i>et al.</i> | Dr. K. D. Joshi
Shri.R.S. Patiyal
Shri.S.M. Srivastava |
| | | Use of electrophoretic markers in species identification. | Dr.S.K. Srivastava |
| | | - S.K.Srivastava | |

- | | | | |
|---|--|---|---|
| | | Biotechnology
for human welfare.
- O.P.Pandey
<i>et al.</i> | Drs. L.B.Singh
O.P. Pandey
A.Barat
N.S.Nagpure |
| 14. Workshop on
Perspectives
in Bioinformatics and its
Application
to Aquaculture,
22-26, Feb.,
1994. | Central Institute
of Freshwater
Aquaculture,
Bhubaneswar. | - | Shri
Peyush Punia |
| 15. National Symposium on Pests
of Agricultural
Importance and
their Management
19-21
Feb., 1994 | Bioved Research
Society,
Allahabad | Genetic selection
enhances disease
resistance.
- P.Das | |
| | | Branchial and
renal lesions
induced by BHC
in an estuarine
mullet, <i>Liza parsia</i>
(Hamilton Buchanan).
- A.K.Pandey <i>et al.</i> | Dr.A.K.Pandey |
| | | Genotoxic effects of pesticides in fishes.

- O.P.Pandey
<i>et al.</i> | Drs. L.B.Singh
O.P.Pandey
N.S.Nagpure
A.K.Pandey |

Problems in fisheries through the use of pesticides and possible measures.

Dr. O.P.Pandey

-L.B.Singh *et al.*

Fish pathology : problems and prospects.

Drs.D. Kapoor
A.K.Singh

- A.K.Singh *et al.*

Problems of mass mortality of fishes in the upland waters.

-K.D. Joshi
et al.

Sh.P.C.
Mahanta
Dr.K.D.
Joshi
Sh.S.M.
Srivastava
Sh. R.S.
Patiyal
Mrs. S. Das

Histopathological alternations in gill, kidney, liver and intestine of *Puntius sophore* (Ham.) exposed to the fertilizer factory effluents.

Dr.A.K.
Pandey

- Shyam Lal and
A.K.Pandey

Agricultural inputs, aqua-environments and fish pathology.

Dr.A.K.Singh

-A.K.Singh *et al.*

9. VISITORS

The following distinguished personalities visited the Bureau during 1993-94.

Bagchi, D.P.	Resident Commissioner, Govt.of Orissa, New Delhi.
Bagchi, B.C.	Jt. Secretary, Govt. of India, New Delhi.
Dehadrai,P.V. (Dr.)	Dy. Director General (Fisheries), ICAR, New Delhi.
Kamal, M.Y.(Dr.)	Asstt. Director General (FY), ICAR, New Delhi.
Khan, M.A.	Dy. Director, Fisheries Training Institute, Nowgong, M.P.
Pathak, S.C. (Dr.)	Dy. General Manager (Fisheries), NABARD, Bombay
Prasad, Ravi R.	Sr. Correspondent, The Statesman, Bangalore.
Singh, C.S. (Prof.)	Prof. & Dean, Faculty of Fisheries, G.B. Pant Agric. & Tech. Univ., Pantnagar.
Tripathi, Y.R.(Dr.)	Ex-Director, Dept. of Fisheries, U.P., Lucknow.
Agarwal, Anil (Dr.)	Sr. Scientist, ICAR, New Delhi.

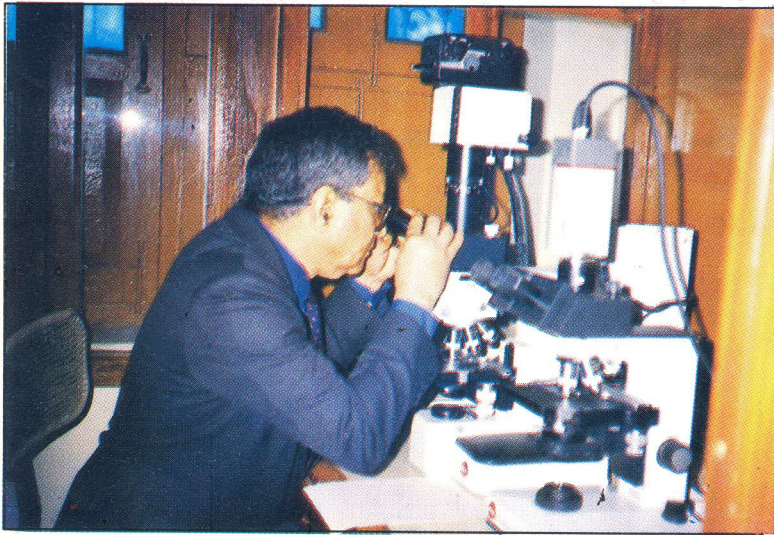


Fig.16-Dr. P.V. Dehadrai, Dy. Director General (Fy.), ICAR observing the chromosome banding pattern, recently developed by the NBFGR.

Fig.17-Discussion on current programmes in the Fish Cytogenetics Lab. with Dy. Director General (Fy.) and ADG (Fy.)

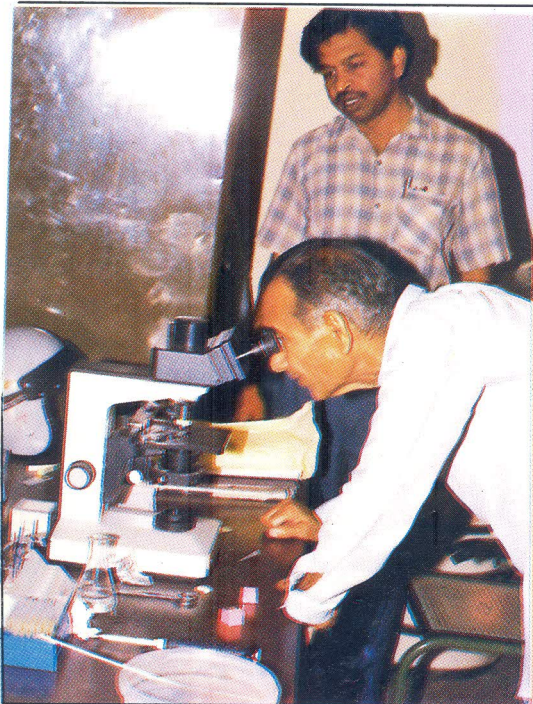


Fig.18- Dr. Y.R. Tripathi, Retd. Director of Fisheries, U.P. Fisheries, observing the motility of cryopreserved sperm.

10. SCIENTIFIC PUBLICATIONS

Barat, A., 1993.

Ag-NOR banding on fish chromosomes. (Abstract). *In* the National Academy of Sciences, India, Sixtythird Annual Session, Nov. 24-26, 1993, Section of Biological Sciences, Abstract of Papers, held at Indian Institute of Sciences, Bangalore, p. 3.

Barat, A., 1993.

Application of Ag-NOR banding in fish chromosomes. (Abstract). *In*: National Seminar on Animal Genetic Resources & their Conservation, April 22-23, 1993, at Karnal, Abstracts of Invited & Contributed Papers, Organised by National Instt. of Animal Genetics/National Bureau of Animal Genetic Resources, Karnal & Nature Conservators, Muzaffarnagar, (U.P.), p. 43.

Barat, A., 1993.

A preliminary report on NOR-polymorphism in snow trout, *Schizothorax richardsoni* (Gray) (Fam. : Cyprinidae). (Abstract). *In*: Asian Fisheries Society : Third Indian Fisheries Forum, Oct. 11-14, 1993, Pantnagar, Abstracts, Org. by College of Fisheries, G.B. Pant Univ. of Agric. & Technology, Pantnagar, p. 53.

Barat, A., 1993.

Localisation of Ag-NORs in some teleostean fishes. (Abstract). *In* : Eighth All India Congress of Cytology and Genetics, Programme & Abstracts, Spon. by All India Congress of Cytology & Genetics & hosted by Dept. of Zool., Berhampur Univ., Orissa, Oct. 15-18, 1993, p. 15.

Das, P., 1993.

Endangered fishes of India and strategies for their conservation. (Abstract). *In*: National Seminar on Animal Genetic Resources & their Conservation, April 22-23, 1993 at Karnal, Abstracts of Invited & contributed Papers, Organised by National Instt. of Animal Genetics/National Bureau of Animal Genetic Resources, Karnal & Nature Conservators, Muzaffarnagar (U.P.), p. 19.

Das, P., 1993.

Genetic upgradation of fishes for production enhancement. (Abstract). *In* : The National Academy of Sciences, India, Sixtythird Annual Session, Nov. 24-26, 1993, Section of Biological Sciences, Abstract of Papers, held at Indian Instt. of Sciences, Bangalore, p. 15.

Das, P., 1993.

Need for conservation of fish genetic resources of India. *In* : Souvenir : Third Indian Fisheries Forum, Oct. 11-14, 1993, College of Fisheries, G.B.Pant Univ. of Agric. & Tech., Pantnagar, pp. 38-40.

Das, P., 1993.

Specific genetic manipulation - an approach in enhancing fish production. *Fishing Chimes*, 13(1) : pp. 9-11.

Das, P., 1993.

Specific genetic manipulations for fish stock improvement. (Abstract). *In* : Eighth All India Congress of Cytology and Genetics : Programme & Abstracts, Org. by the All India Congress of Cytology & Genetics at Dept. of Zool, Berhampur Univ., Orissa, Oct. 15-18, p. 6.

Das, P. & K.D. Joshi, 1993.

Why sustainable fish harvesting? *Intensive Agriculture*, 31 (5-6): 18- 22.

Das, P., 1994.

Fish biodiversity conservation is our evolutionary responsibility. (Abstract). *In* Souvenir : National Symposium on Conservation of Natural Resources : Planning & Management, 7th & 8th Jan., 1994, Org. by KAD College, Allahabad, No. 38.

Das, P., 1994.

Genetic selection enhances disease resistance. (Abstract). *In* National Symposium on Pests of Agricultural Importance & their Management, Abstracts, 19-21 Feb., 1994, Org. by BIOVED Research Society, Allahabad, p. 11.

Das, P. & A.G.Ponniah, 1990.(Issued in 1993)

Aquaculture stock improvement through genetic techniques. *In* Proceedings of the National

Seminar on Aquaculture Development in India-Problems and Prospects, 27-29 November, 1990, ed. by P. Natarajan & V. Jayaprakas, pub. by Dept. of Aquatic Biol. & Fish., University of Kerala, Thiruvananthapuram, pp. 233-238.

Das, P. & K.D. Joshi, 1993.

Fish genetic resources and their conservation in India. (Abstract). *In Asian Fisheries Society: Third Indian Fisheries Forum*, Oct. 11-14, 1993, Abstracts, Org. by College of Fisheries, G.B.Pant Univ. of Agric. & Tech., Pantnagar, pp. 54-55.

Das, P. & K.D.Joshi, 1993.

Ichthyo-faunal diversities of India. *In Man, Science and Environment* by R. Prakash. New Delhi, Ashish publishing House, 1993, pp. 247-257.

Das, P. & K.D. Joshi, 1993.

Specific genetic manipulations can boost fish production. (Abstract). *In Asian Fisheries Society : Third Indian Fisheries Forum*, Oct. 11-14, 1993, Abstracts, Org. by College of Fisheries, G.B.Pant Univ. of Agric. & Tech., Pantnagar, p. 55.

Das, P., A. Mishra & D.Kapoor, 1993.

Some observation on Epizootic Ulcerative Syndrome (EUS) in fishes around Allahabad. *Ad. Bios.*, 12(1) : 1- 8.

Gopalakrishnan, A., P.K.Sahoo & A.G.Ponniah, 1993.

Esterases in *Labeo rohita*. (Abstract). *In Eighth All India Congress of Cytology & Genetics, Programme & Abstracts*, spon. by All India Congress of Cytology & Genetics, hosted by Dept. of Zool., Berhampur Univ., Orissa, Oct. 15-18, 1993, p. 16.

John, G. 1990.(Issued in 1993)

Relevance of genetics in aquaculture. *In Proceedings of the National Seminar on Aquaculture Development in India- Problems and Prospects*, 27-29 Nov. 1990, ed. by P. Natarajan & V. Jayaprakas, pub. by Dept. of Aquatic Biol. & Fish., Univ. of Kerala, Thiruvananthapuram, pp. 239-241.

John, G., A. Barat, & W.S. Lakra, 1992.(Issued in 1993)

Localization of nucleolar organizer regions in fish species, *Catla catla* and *Mystus vittatus*. *The Nucleus*, 35(2&3): 179-241.

John, G., A. Gopalakrishnan, W.S. Lakra & A. Barat, 1992. (Issued in 1993)

Inheritance of golden yellow in *Cyprinus carpio*. *J. Inland Fish Soc. India*, 24 (1) : 8-10

John, G., A. Barat & W.S. Lakra, 1992.(Issued in 1993)

Localization of nucleolar organizer regions in *Labeo* (Cyprinidae). *La Kromosoma*, 11-70 : 2381 - 2384.

Joshi, K.D., 1993.

Threatened ichthyo-fauna of Kumaun hills and possible measures for conservation. (Abstract). *In National Seminar on Animal Genetic Resources & their Conservation*, April 22-23, 1993 at Karnal. Abstract of Invited & contributed Papers, Org. by National Instt. of Animal Genetics/National Bureau of Animal Genetic Resources, Karnal & Nature Conservators, Muzaffarnagar (U.P.), p.18.

Joshi, K.D. & P.C. Joshi, 1993.

The histo-morphological structure of hypothalmo-neurohypophyseal system of an upland fish *Puntius dukai*. (Abstract). *In The National Academy of Sciences, India, Sixty-third Annual Session*, Nov. 24-26, 1993, Section of Biological Sciences, Abstract of papers, held at Indian Instt. of Sciences, Bangalore, p. 2.

Joshi, K.D. & P.C.Joshi, 1993.

Seasonal morpho-histological changes in the ovary of a hillstream fish, *Puntius dukai* (Day). (Abstract). *In Asian Fisheries society: Third Indian Fisheries Forum*, Oct. 11- 14, 1993, Abstracts, Org. by College of Fisheries, G.B.Pant Univ. of Agric. & Tech., Pantnagar, p. 45.

Joshi, K.D. 1994.

Status of ichthyo-fauna of the Kali river system, U.P. (Abstract). *In Proceeding 81st Session of the Indian Science Congress*, Jaipur, 1994, Section of Zoology, Entomology and Fisheries, p. 94.

Joshi, K.D., R.S.Patiyal & S.M.Srivastava, 1994.

Fish germplasm resources of U.P. Hills: present status. (Abstract). *In* Souvenir : National Symposium on Conservation of Natural Resources : Planning & Management, 7th & 8th Jan., 1994. Org. by KAD College, Allahabad. No. 40.

Joshi, K.D., P.C.Mahanta, S.M.Srivastava & R.S.Patiyal, 1994.

Problems of mass mortality of fishes in the upland waters. (Abstract). *In* National Symposium on Pests of Agricultural Importance and their Management, 19 -21, Feb. 1994. Org. by BIOVED Research Society, Allahabad. p. 32.

Kapoor, D., 1994.

Impact of population growth on biodiversity. (Abstract). *In* Souvenir : National Symposium on Conservation of Natural Resources: Planning & Management, 7th & 8th Jan. 1994,Org. by KAD College, Allahabad. No. 43.

Lal, Kuldeep Kumar & A.G.Ponniah, 1993.

Non-lethal sampling for bio-chemical genetic studies in *Heteropneustes fossilis*. (Abstract). *In* Eighth All India Congress of Cytology & Genetics, programme & abstracts. Spon. by AICCG hosted by Dept. of Zoology, Berhampur Univ., Orissa, Oct. 15 - 18, 1993, p. 17.

Lal, S. & A.K.Pandey, 1994.

Histopathological alterations in gill, kidney, liver and intestine of *Puntius sophore* (Hamilton) exposed to the fertilizer factory effluents. (Abstract). *In* National Symposium on Pests of Agricultural Importance & their Management, 19 - 21 Feb., 1994, Org. by BIOVED Research Society, Allahabad, p. 10-11.

Lakra, W.S. & A.Gopalakrishnan, 1993.

Chromosome banding in fishes. (Abstract). *In* Asian Fisheries Society : Third Indian Fisheries Forum, Oct. 11 -14, 1993, Org. by College of Fisheries, G.B.Pant Univ. of Agric. & Tech., Pantnagar, p. 53.

Lakra, W.S. & P.Das, 1993.

The biology and conservation of deccan mahseer, *Tor khudree* (Sykes). In Advances in Limnology: Proceedings of the National Symp. on Advances in Limnology and Conservation of Endangered Fish Species, Oct. 23- 25, 1989, ed. by H.R. Singh. Delhi, Narendra Publishing House, pp. 355 - 360.

Lakra, W.S. & P.Das, 1994.

Genetic engineering in aquaculture. (Abstract). In Second Asia Pacific Conference on Agricultural Biotechnology in Madras during March 6- 10, 1994, Abstract, p. 81.

Pandey, A.K., 1993.

Hypothalamo-neurosecretory system of the Indian mackerel, *Rastrelliger kanagartha* Cuvier. *National Academy of Science Letters*, 16(9 & 10): 265-268.

Pandey, A.K., 1993.

Occurrence of collagenous capsule in the ovary of a marine prawn, *Parapenaeopsis styliifera* (H.Milne Edwards). *New Agriculturist*, 4(1) : 67-68.

Pandey, A.K. & M.Peer Mohamed, 1993.

Histomorphology of the hypothalamo-neurosecretory system of the Indian scad, *Decapterus tabl* (Berry 1968). (Abstract). In Asian Fisheries Society : Third Indian Fisheries Forum, Oct. 11-14, 1993, Org. by College of Fisheries, G.B.Pant Univ. of Agric. & Tech., Pantnagar, p. 41 - 42.

Pandey, A.K., M.Peer Mohamed & K.C.George, 1993.

Histopathological lesions in gill, kidney and liver of an estuarine mullet, *Liza parsia*, caused by sublethal exposure to DDT. (Abstract). In Asian Fisheries Society: Third Indian Fisheries Forum, Oct. 11 - 14, 1993, Org. by College of Fisheries, G.B.Pant Univ. of Agric. & Tech., Pantnagar, p. 98.

Pandey, A.K., M.Peer Mohamed & K.C.George, 1994.

Branchial and renal lesions induced by BHC in an estuarine mullet, *Liza parsia* (Hamilton-Buchanan). (Abstract). In National Symposium on Pests of Agricultural Importance and their Management, Feb.19-20, 1994. Org. by BIOVED Research Society, Allahabad, p. 74.

Pandey, O.P. & N.S.Nagpure, 1993.

Prospects of fish hybridization in India. (Abstract). *In National Seminar on Animal Genetic Resources & their Conservation*, April, 22-23, 1993 at Karnal, Org. by NIAG/NBAGR, Karnal & Nature Conservators, Muzaffarnagar, p. 48.

Pandey, O.P., L.B.Singh & N.S. Nagpure, 1994.

Biotechnology for human welfare. (Abstract). *In Souvenir : National Symposium on Conservation of Natural Resources : Planning & Management*, 7th & 8th Jan. 1994, Org. by KAD College Allahabad, No. 42

Pandey, O.P., L.B. Singh & N.S. Nagpure and A.K. Pandey, 1994.

Genotoxic effects of pesticides in fishes. (Abstract). *In National Symp. on Pests of Agricultural Importance and their Management*, 19-21 Feb. 1994. Org. by BIOVED Research Society, Allahabad, p. 34.

Pandey, O.P., N.S. Nagpure, A.K.Pandey & L.B. Singh, 1993.

Steroid synthesizing cellular sites in the gonads of *Labeo rohita*, *Cirrhinus mrigala* and *Cyprinus carpio* var. *communis*. *New Agriculturist*, 4(2) : 143- 146.

Ponniah, A.G., 1990.(Issued in 1993)

Biotechnological inputs for enhancing Indian aquaculture production. *In Proceedings of the National Seminar on Aquaculture Development in India - Problems and Prospects*, 27-29 Nov. 1990, ed. by P. Natarajan & V.Jayaprakas, Pub. by Dept. of Aquatic Biol. & Fish., University of Kerala, Thiruvananthapuram, pp. 243-247.

Ponniah, A.G., 1993.

Gene banking for fish. (Abstract). *In National Seminar on Animal Genetic Resources & their Conservation*, April 22-23 1993 at Karnal, Abstracts of Invited & Contributed Papers, Org. by National Institute of Animal Genetics/National Bureau of Animal Genetic Resources, Karnal & Nature Conservators, Muzaffarnagar (U.P.), p. 24.

Ponniah, A.G. & P.K.Sahoo, 1993.

Production of hybrids through cryopreserved milt. (Abstract). *In Asian Fisheries Society:*

Third Indian Fisheries Forum, Oct. 11-14, 1993, Org. by College of Fisheries, G.B.Pant Univ. of Agric. & Tech., pp. 56-57.

Ponniah, A.G. & S.K. Srivastava, 1993.

Comparative study of eye lens proteins of *Cyprinus carpio* var. *specularis* and *Oreochromis mossambicus*. (Abstract). In Eighth All India Congress of Cytology & Genetics, Programmes & Abstracts, spon. by AICCG hosted by Dept. of Zool., Berhampur Univ., Orissa, Oct. 15-18, 1993, p. 18.

Sahebrao, N.N. & O.P. Pandey, 1993.

Application of restriction endonucleases in fish chromosome studies. (Abstract). In Eighth All India Congress of Cytology and Genetics, Programme & Abstracts, spon. by AICCG hosted by Dept. of Zool., Berhampur Univ, Orissa, Oct. 15-18, p.15.

Sahebrao, N.N., O. P. Pandey & L.B. Singh, 1993.

Perspectives of red tilapia culture. (Abstract). In Asian Fisheries Society : Third Indian Fisheries Forum, Oct. 11-14, 1993, Org. by College of Fisheries, G.B. Pant Univ. of Agric. & Tech., Pantnagar, p. 15.

Sahoo, P.K. & A.G. Ponniah, 1993.

Tissue specific expression of allozymes in *Labeo rohita*. (Abstract). In Eighth All India Congress of Cytology & Genetics, Programme & Abstracts, spon. by AICCG hosted by Dept. of Zool., Berhampur Univ., Orissa, Oct. 15-18, 1993,p. 16.

Singh, A.K. & P.Das, 1993.

A promising technique of hormonal sex control in *Oreochromis mossambicus* for its aquacultural production. (Abstract). In Asian Fisheries Society: Third Indian Fisheries Forum, Oct. 11-14, 1993, Org. by College of Fisheries, G.B.Pant Univ. of Agric. & Tech., Pantnagar, pp. 57-58.

Singh, A.K.,D. Kapoor & P.C. Mahanta, 1994.

Ecotechnological approach for conserving imperiled aquatic resources. (Abstract). In Souvenir: National Symposium on Conservation of Natural Resources: Planning and Management . 7th & 8th Jan. 1994, Org. by KAD College, Allahabad, No. 39.

Singh, A.K., D.Kapoor, R.Dayal and A.K.Pandey, 1994.

Fish pathology : problems and prospects. (Abstract). In National Symp. on Pests of Agric. Importance and their Management, 19 - 21 Feb. 1994. Org. by BIOVED Research Society, Allahabad, p. 33.

Singh, L.B., O.P.Pandey, N.S.Nagpure, S.P.Singh & A.K.Pandey, 1994.

Problems in fisheries through the use of pesticides and possible measures. (Abstract). In National Symp. on Pests of Agricultural Importance and their Management, 19 -21 Feb., 1994. Org. by BIOVED Research Society, Allahabad, p. 34.

Srivastava, S.K., 1993.

Changes in protein fractions of the human cataractous lenses. (Abstract). In The National Academy of Sciences, India, Sixtythird Annual Session, Nov. 24-26, 1993, Section of Biological Sciences, held at Indian Instt. of Sciences, Bangalore, p. 4.

Srivastava, S.K., 1994.

Use of electrophoretic markers in species identification. (Abstract). In Souvenir : National Symposium on Conservation of Natural Resources : Planning & Management, 7th & 8th Jan. 1994, Org. by KAD College Allahabad No. 41.

11. PERSONNEL

11.1 List of Personnel

RESEARCH MANAGEMENT

1. Dr.P. Das - Director

SCIENTIFIC

1. Dr. L.B.Singh - Principal Scientist
2. Dr. A.G.Ponniah - Principal Scientist
3. Dr. George John - Principal Scientist (On Deputation)
4. Dr. D.Kapoor - Senior Scientist
5. Shri P.C.Mahanta - Senior Scientist
6. Dr. O.P.Pandey - Scientist (Sr.Scale)
7. Dr.A.K.Pandey - Scientist (Sr.Scale)
8. Shri S.P.Singh - Scientist (Sr.Scale)
9. Dr. A.Gopalakrishnan - Scientist
10. Dr. N.S.Nagpure - Scientist
11. Shri Peyush Punia - Scientist
12. Dr. Kuldeep Kumar Lal - Scientist

TECHNICAL

1. Dr. A.K.Singh - Asstt. Farm Manager (T- 6)
2. Smt. S.Das - Librarian (Technical Officer) (T-5)
3. Shri A.K.Mishra - Electrical Foreman (Technical Officer) (T-5)
4. Dr.A.Barat - Sr.Laboratory Technician (Cytogenetics) (T-5)
5. Shri Babu Ram - Farm engineering Assistant (T - 5)
6. Shri Rajesh Dayal - Field Surveyor (T- 4)
7. Shri S.M. Srivastava - Field Surveyor (T- 4)
8. Shri R.S.Patiyal - Farm Assistant (T-4)

- | | |
|----------------------------|--|
| 9. Dr.K.D.Joshi | - Sr.Laboratory Technician
(Fish Biology) (T-4) |
| 10. Dr. S.K.Srivastava | - Sr.Laboratory Technician
(Biochemical Genetics) (T-4) |
| 11. Shri P.Chithamparam | - Library Assistant (T-4) |
| 12. Shri A.K.Singh | - Junior Survey Assistant (T-2) |
| 13. Shri S.K.Paul | - Junior Survey Assistant, T-2 |
| 14. Shri B.K.Rao | - Sample Sorter, T-2 |
| 15. Shri R.K.Sukla | - Sample Sorter, T-2 |
| 16. Shri Bhola Nath Pathak | - Gestetner Operator, T-1 |
| 17. Shri Ved Prakash | - Library Attendant, T-2 |
| 18. Shri R.S.Sah | - Dark Room Assistant, T-2 |

ADMINISTRATIVE

- | | |
|------------------------|-------------------------------------|
| 1. Shri R.C.Srivastava | - Asstt. Finance & Accounts Officer |
| 2. Shri A.Sah | - Superintendent |
| 3. Shri R.C.P.Sinha | - Stenographer |
| 4. Shri K.P.Nath | - Assistant (upto 4.10.93) |
| 5. Shri A.K.Srivastava | - Senior Clerk (upto 5.3.94) |
| 6. Shri Panchoo Lal | - Senior Clerk |
| 7. Smt. Chanda Tiwari | - Senior Clerk |
| 8. Shri Mohan Tiwari | - Senior Clerk |
| 9. Shri Navin Kumar | - Junior Clerk |

AUXILIARY

- | | |
|------------------------|----------|
| 1. Shri Samarjit Singh | - Driver |
| 2. Shri Om Prakash | - Driver |

SUPPORTING

1. Shri Sree Ram - Fieldman, SSG. IV
2. Shri Madan Lal - Fisherman, SSG-II
3. Shri Raj Bahadur - Laboratory Attendant,SSG-II
4. Shri Swapan Debnath - Laboratory Attendant, SSG-II
5. Shri K.K.Singh - Fieldman, SSG-II
6. Shri Ram Baran - Fisherman, SSG-II
7. Shri Laxchman Prasad - Fisherman, SSG-II
8. Shri Dukhi Shyam Deo - Fisherman, SSG-I
9. Shri Inderjit Singh - Messenger, SSG-I.
10. Shri Anil Kumar - Safaiwala, SSG-I
11. Shri Prahalad Kumar - Safaiwala, SSG-I
12. Shri Chhote Lal - Fisherman, SSG-I
13. Shri Vinay Kumar Srivastava - Laboratory Attendant,SSG-I

11.2 APPOINTMENTS

1. Dr. S.K.Srivastava was appointed to the post of Senior Laboratory Technician (Biochemical Genetics) T-4 in the pay scale of Rs. 1640-2900 and he joined at the Bureau on 14.12.93 (AN).

11.3 PROMOTION

1. Shri Panchoo Lal, Senior Clerk was promoted to the post of Assistant in the pay scale of Rs. 1400-2300 w.e.f. 5.10.93 (FN)
2. Smt. Chanda Tiwari, Junior Clerk was promoted to the post of Senior Clerk in the pay scale of Rs. 1200-2040 w.e.f. 5.10.93 (FN)
3. Shri Mohan Tiwari, Junior Clerk was promoted to the post of Senior Clerk in the pay scale of Rs. 1200-2040 w.e.f. 6.3.94(FN)

4. Shri Sree Ram, Fieldman, SSG-III was promoted to SSG-IV in the pay scale of Rs. 825-1200 w.e.f. 13.7.93.
5. Shri Laxchman Prasad, Fisherman, SSG-I was promoted to SSG-II in the pay scale of Rs. 775-1025 w.e.f. 18.7.93.
6. Shri Ram Baran, Fisherman, SSG-I was promoted to SSG-II in the pay scale of Rs. 775-1025.

11.4 NEW ASSIGNMENT

1. Shri K.P.Nath, Assistant, has joined as Superintendent (A&A) at Central Soil & Water Conservation Research & Trg. Institute, Dehradun (relieved on 4. 10.93).
2. Shri A.K.Srivastava, Senior Clerk has joined as Superintendent (A&A) at Central Sheep & Wool Research Institute, Avikanagar, Rajasthan (relieved on 5.3.94).

12. MANAGEMENT COMMITTEE

The Bureau's Management Committee, as below, was functioning during the year under report:

- | | |
|--|------------|
| 1. The Director
NBFGR | - Chairman |
| 2. The Assistant Director General
(Inland Fisheries), ICAR, New Delhi. | - Member |
| 3. The Director of Fisheries Govt.
of U.P., Lucknow | - Member |
| 4. Dr. C.S.Singh
Prof. & Head, College of Fisheries,
G.B.pant University of Agriculture
and Technology, Pantnagar, U.P. | - Member |
| 5. Shri P.C.Chakraborty
Jt. Director of Fisheries,
Govt. of West Bengal, Calcutta. | - Member |

6. Shri Mohammad Akil, Secretary
Matsya-Jiwi Sehkari Samiti Ltd., Allahabad, U.P. - Member
7. Shri Narendra Kumar Nishad, Lawyer
Representative, National Association
of Fishermen, Allahabad, U.P. - Member
8. Dr. L.B.Singh
Principal Scientist, NBFGR - Member
9. Dr. A.G.Ponniah
Sr. Scientist, NBFGR - Member
10. Dr.D.Kapoor, Sr. Scientist
NBFGR - Member
11. Shri P.C.Mahanta
Sr. Scientist, NBFGR - Member
12. Shri R.C.Srivastava
A.F.& A.O., NBFGR - Member
13. Shri A.Sah, Superintendent
NBFGR - Member - Secretary

During the year under report two meetings were held on 18 May, 1993 and 16 Sept., 1993.

13. STAFF WELFARE ACTIVITIES

13.1 Institute Joint Staff Council

The Institute Joint Staff Council as mentioned below existed in the year under report.

Nominated (Official Side)

1. Dr.L.B.Singh, Principal Scientist - Member
2. Dr.D.Kapoor, Sr.Scientist - Member
3. Shri P.C.Mahanta, Sr.Scientist - Member
4. Shri R.C.Srivastava, AF & AO - Member Secretary
5. Shri A.K.Mishra, T-5 - Member
6. Shri A.Sah, Superintendent - Member

Elected (Staff side)

1. Shri Panchoo Lal, Assistant - Secretary
2. Shri Mohan Tiwari, Sr.Clerk - Member
3. Shri S.K.Paul, T-2 - Member
4. Shri Ved Prakash, T-1 - Member
5. Shri Raj Bahadur,
Laboratory Attendant, SSG-II - Member
6. Shri Ram Baran, Fisherman
SSG-II - Member

13.2 Grievance Cell

There exists also a Grievance Cell to look into the staff's grievances concerning official matters. The members of the Grievance Cell are as below:

Nominees of the Director

1. Dr.L.B.Singh, Principal Scientist - Chairman
2. Dr.A.G.Ponniah, Sr.Scientist - Member

- | | |
|----------------------------------|--------------------|
| 3. Shri R.C.Srivastava, A.F.A.O. | - Member |
| 4. Shri A.Sah, Superintendent | - Member-Secretary |

Elected Staff Representatives

- | | |
|-------------------------------------|------------------|
| 1. Shri S.P.Singh, Scientist | - Scientific |
| 2. Shri A.K.Mishra, T-5 | - Technical |
| 3. Shri K.P. Nath, Assistant | - Administrative |
| 4. Shri Madan Lal, Fisherman SSG-II | - Supporting |

Statement showing the total number of employees and number of the Scheduled Castes and Scheduled Tribes amongst them as on 31.3.1994.

Appendix -I

Group/Class	Total No. employees	SC	%SC	ST	%ST
GROUP 'A' (CLASS-I)					
1. Director	1	-	-	-	-
2. Principal Scientist	1	-	-	-	-
3. Senior Scientist	3	-	-	-	-
4. Scientist(Sr.Scale)	2	-	-	-	-
5. Scientist	6	-	-	-	-
6. Asstt. Farm Manager, T-6	1	-	-	-	-
Total :-	14	-	-	-	-

GROUP 'B' (CLASS -II)

Group/Class employees	Total No.	SC	%SC	ST	%ST
1. Asstt. Finance & Account Officer	1	-	-	-	-
2. Technical Officer(T-5)	2	-	-	-	-
3. Superintendent	1	-	-	1	100
4. Technical (T-4)	7	1	14.2	1	14.2
Total:-	11	1		2	

GROUP 'C' (CLASS-III)

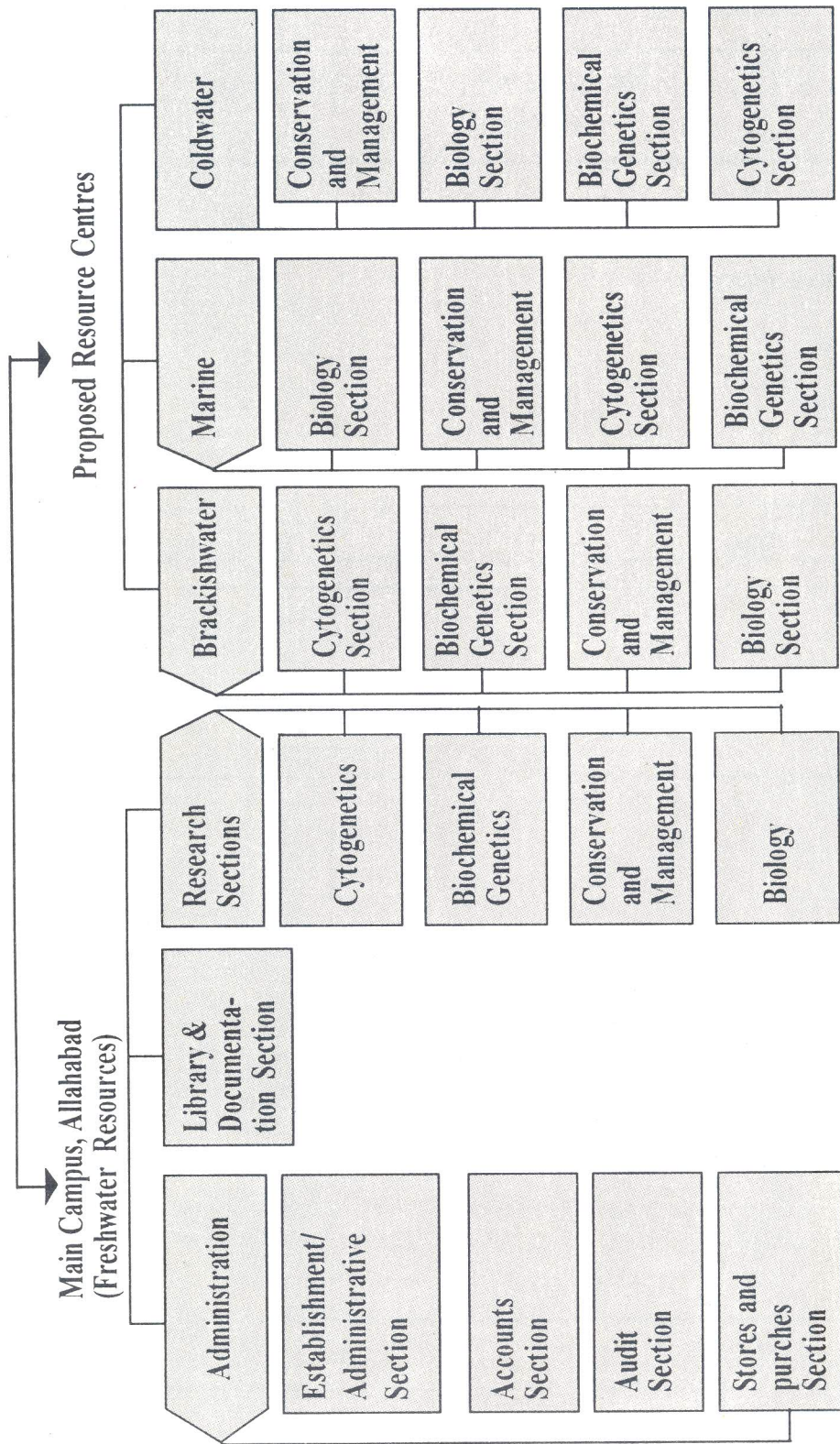
Group/Class employees	Total No.	SC	%SC	ST	%ST
1. Technical T-II-3	1	-	-	-	-
2. Technical T-2	2	-	-	-	-
3. Technical T-1	5	1	20	1	20
4. Stenographer	1	-	-	-	-
5. Assistant	1	1	100	-	-
6. Senior Clerk	2	-	-	-	-
7. Junior Clerk	1	1	100	-	-
8. Driver	2	1	50	-	-
9. Fieldman, SSG-IV.	1	1	100	-	-
Total :-	16	5		1	

GROUP 'D' (CLASS-IV)

Group/Class	Total No. employees	SC	%SC	ST	%ST
1. Fisherman	5	1	20	1	20
2. Laboratory Attendant	3	-	-	-	-
3. Fieldman	1	-	-	-	-
4. Messenger	1	-	-	-	-
5. Safaiwala	2	2	100	-	-
Total :-	12	3		1	

Appendix-II Organizational Chart

Director



The Research Sections would be elevated to Research Divisions when adequate number of scientists come in position during the VIII Plan period.