वार्षिक प्रतिवेदन 1993–94

हिन्दी खण्ड

संपादक : विश्व रामन प्रसाद सिन्हा
बैंकिंग पंड्र झा
पी. आर. राव

सामग्री कम्पीलिंग/ : भो. कासिम
लेजर प्रिंटिंग

केंद्रीय अंतर्वर्तीय प्राप्ति वाल्यक अनुसंधान संस्थान
(भारतीय कृषि अनुसंधान परिषद्)
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निदेशक के कार्य से

जैसा कि मैं 1992-93 के वर्षहित प्रतिवेदन में आफको सूचित कर दुका हैं किय अपरिहार्य कारणों के 1993-94 का प्रतिवेदन पहले नहीं प्रकाशित हो पाया। इसे देर से प्रकाशित होने का हमें खेद है।

इस कर्म के दीर्घायु केन्द्रीय अंतर्देशीय प्रभाव मतभागी अनुसंधान संस्थान' बैरकपुर, पश्चिम बंगाल ने अन्य हर उद्देश्य प्राप्ति की दिशा में कई महत्वपूर्ण कदम बढ़ाये हैं। मुझे लगता है कि इस संस्थान के वैज्ञानिकों ने समय के जरिये को समझने हेतु प्रभावितक तक संस्थानों के वातावरिन्स स्वरूप को बनाये रखने के लिए सम्बोधित कदम उठाया है।

आज हमारा लक्ष्य है ‘संस्कार’ और इसलिए हम गंगा नदी के साथ-साथ इसकी सहायक नदियों के पारिस्थितिकी का निर्माण अभ्यास कर रहे हैं एवं मुझे आशा है नहीं पूर्ण सफलता है कि जल्द ही इस परिस्थिति के लिए दौड़ प्रलय लेकर देश के सामने आजमें। इसी समय दोहरी बौद्धिक के प्रभाव स्वतंत्र में हिंसा महत्व की कमी गंगा नदी के समस्ता मान में आयी है उनकी पूर्वाभाव कार्य में भी हम जुटे हैं। हाकिम नदी का महत्व देश का सबसे बड़ा जलवायु प्रभाव है एवं यह में व्यापार में नवोदय जोल का महत्वपूर्ण अत्याचार है अत: हम अपने शोध द्वारा इसके संस्थानका की ओर ध्यान दे रहे हैं। गंगा एवं बुरहुदू तथा क्षेत्रों में परिवर्त विकसकी श्रीर जीत महत्वपूर्ण संस्थान हैं। इसमें लाखों प्रकार के कारणों एवं जनसंख्या का मूल्यांकन हमारे रक्तीय ध्वस्त है। इसका प्रयास है कि इसकी पारिस्थितिकी की जानों तथा संस्थान में संयुक्त तत्वों का पैदाव हो जाय ताकि वे जीवित कर रहे रखें।

यो हमारे अनुसंधान का मुख्य लक्ष्य अर्थिक से अधिक मद्दत का पूर्णार्थ कर सके। लेकिन ऐसे विकास का व्याप्त उपचार होना जब हमारे जल संस्थानों का स्वरूप ही विकसित हो जाएगा एवं विराजमान में मिली वस्तुपरिशोधक एवं जनसंख्या की विधि जिन्होंने हम सदा के लिए हो दी थी। अतए अपने समय आ गया है कि हमारे उपरोक्त के आसन बदल आदित। बुझू नये फूलिया तक हमारा नाम या 'उपचार बदले'। यह सब एक उपाय है, जो हमारे रक्तीय ध्वस्त हो जाय। इस प्रक्रिया में हम इस्तेमाल में दिग्गज शस्त्रों की बहुत मूल्य है। इस प्रक्रिया में हम इस्तेमाल कर देगे कि हमारे जल संस्थानों के पारिस्थितिकी में ठेली से हो जाए बदलाव की ओर हम उपचार कर नहीं दे पाए, लेकिन अब हमें अपनी सीच बदलनी होगी। परिवर्तन के साथ आधिकरिक
बेंग खाड़ धातक सिध्द हो रहा है। अतः मैं समझता हूँ कि आज के संदर्भ में हमारा लवण प्रकृति
कर्तव्यों का पूर्ण संक्रमण एवं सभी विकास होना चाहिए। यह तब समाप्त होगा जब हमारा नारा होगा
'संसाधन बचाओ, उपज बढ़ाओ'।

इस संस्थान के वैज्ञानिक साहित्यों की तरफ से मैं आपको आश्वासन देना चाहता हूँ कि अब हम
इस दिशा में अग्रदृष्टि बनने के नए आयाम लेकर वर्तमान आसफ सम्बन्ध होगे।

आप यह वार्षिक प्रतिवर्ती आग पसंद करिए।

आभकामनाओं के साथ,

विश्व रणग प्रसाद सिन्हा

1 अगस्त, 1995
वार्षिक प्रतिवेदन 1993-94
केंद्रीय अंतर्वहनीय प्रथम मात्रकी अनुसंधान संस्थान
(भार. कृ. अनु. प.) : ब्राह्मपुर : परिषद संगठ

संक्षिप्त इतिहास

केंद्रीय अंतर्वहनीय प्रथम मात्रकी अनुसंधान संस्थान मात्रकी श्रेणी एवं प्रवर्थ व सेवानीय स्थान रहना है। यह संस्थान अब अपने स्थायि संस्थान के 47वें वर्ष में प्रेस कर चुका है। इसकी स्थापना 17 मार्च 1947 को करकमला में 'केंद्रीय अंतर्वहनीय मात्रकी अनुसंधान केंद्र' के रूप में भारत सरकार के द्वारा ऐसे मुख्य मंत्रालय के अंतर्गत दृष्टि, वामनीकी तथा मात्रकीय से सम्बन्धित उप-समिति ने इसका जोड़दार ज्ञान में अनुमोदन किया था।

इस संस्थान के छोटे से इतिहास काल में कई महत्वपूर्ण पड़ोस आये। सबसे पहला पड़ोस था 1959 का जब करकमला में स्थित 'अनुसंधान केंद्र' को 'अनुसंधान संस्थान' का पुरुष दर्शन प्राप्त हुआ एवं ब्राह्मपुर में हुई। नीति के सटे पर नवीनिता भव्य भवन तथा मनोरम परिवेश में इसका स्थानांतरण हुआ।

इस संस्थान के इतिहास में दूसरा महत्वपूर्ण पड़ोस था 1967 का जब यह संस्थान भारतीय श्रेणी अनुसंधान परिषद का निपटाव संस्थान बना और इस प्रकार मात्रकीय श्रेणी कार्यों को ली भारतीय प्रथम अधिक स्थायित्व प्राप्त हुआ।

1970 का दस्तक इस संस्थान के इतिहास में जरूरत है। फलस्वरूप एवं नौसंघ भारतीय समाजसेवी राज्यवादी परियोजनाओं में मात्रकीय अनुसंधान को नई दिशा ही नहीं दिया अर्थव्यवस्था मुक्त जागरूकता का भी सुझा किया। ये परियोजनाएँ थीं 'मित्र मात्र राज्य', 'नीती मात्र बीज वैज्ञानिक', 'भारतीय मस्त्र बीज', और 'जनकलय परिचयितकरण का आवरण एवं प्रबन्धन' एक और समाजवादी राज्यवादी परियोजना 1973 में 'हरा जल मस्त्र पालन' के रूप से की गयी। इसके साथ 1974 में प्रथम से परियोजनाओं का एकीकरण होकर 'मित्र मस्त्र पालन एवं मस्त्र बीज उत्पादन' हो गया। मस्त्र पालन के उपयोगिता को समर्थन 'हरा जल मस्त्र क्रिया' अनुसंधान पुरस्कृत ने 1977 में 'भारत मस्त्र पालन अनुसंधान एवं परिचयितकरण केंद्र' की स्थापना की, जिसका निकाय, यथार्थ बाद में कारक संस्थान का दर्शन हस्ताक्षर किया। मित्र मस्त्र पालन एवं मस्त्र बीज उत्पादन परियोजनाओं ने विवेकानन्द मस्त्र अनुसंधान एवं उत्पादन में आवश्यक स्थान आर्थिक विशेषता विशेषता किया और
इस प्रकार मस्तकीय उपादन के अन्दर में एक नये विभिन्न का उदय हुआ। लोगों में मस्तक पालन के प्रति सही अनुभव का साथ-साथ कृति के इस अभाव के प्रति विश्वास का भी जागरण हुआ और इस प्रकार मस्तक पालन ने एक आपूर्ति का रूप ले किया और यही कारण है कि अज इसे उदय के रूप में देख रहे हैं।

संस्थान के इतिहास ने एक और क्रिया किया। क्योंकि 1985 में जब इस संस्थान ने तीन नये मस्तकीय अनुसंधान संस्थाओं का जन्म दिया और वे हैं:- केंद्रीय मीठा जल जीव पालन अनुसंधान संस्थान, धौली, उड़ीसा, केंद्रीय खाद्य पानी की जलजन्म पालन अनुसंधान संस्थान, मद्रास एवं राष्ट्रीय शीतलप निकाय मस्तकीय अनुसंधान केन्द्र, हसदरानी। अप्रैल, 1987 को इस संस्थान ने अपने नामकरण 'केंद्रीय अंतरराष्ट्रीय प्रबंध मस्तकीय अनुसंधान संस्थान' हो गया एवं इसे उन्मुक्त जलीय संस्थानों में शही का कार्यार्थी लीया गया ताकि इन संस्थानों का मस्तकीय प्रबंधन प्रयोग के अनुसूची हो सके और साथ ही इनका संस्थान भी हो सके।

प्रारम्भ से ही संस्थान के शही कार्यक्रम का प्रमुख उद्देश्य था मस्तकीय संसाधनों का सही मुख्यांक, उच्चता संरक्षण तथा उद्देश्यपूर्ण उपयोग। अतः इस संस्थान ने अपने शही कार्यक्रम का मान्य निर्देश नहीं किया और इस निर्देश को आधार को की विशिष्टता भी स्पष्टत है। ऋणन प्रकार के जलीय संसाधनों जैसे कि नदी, जलाशय, हील, पेट्रोल, तालाब, जलजन्म पालन आदि के परिसीमिती के गुणित को सुलभता के साथ प्रयोग के साथ-साथ मस्तक उपादन और प्रबंधन प्रक्रियाओं में भी समस्तता सुप्रभाव लाया है। इस संस्थान ने जलीय प्रबंधन का भी मुख अभ्यास एवं शीतल क्रिया है ताकि 'विज्ञान विश्लेषण' के तर को बनाए रखने के उपयोग खोजे जा सके और स्वस्थ महजियों का उपादन हो सके।

इस संस्थान का उद्देश्य यदि हैं यदि अनुभव का ही परिषद है कि अज देश के समस्त कई मस्तकीय तकनीकी एवं प्रबंधन प्रणालियों उत्पन्न हैं जो निम्न हैं--

1) नदी संसाधनों में मस्तक बीज संस्थान प्रणाली।
2) मस्तक बीज परिषद स्वाभाविक तकनीक।
3) कार्य महजियों का प्रति प्रजनन एवं नसरी प्रबंधन प्रणाली।
4) चायनिज कार्य का बंद प्रजनन विभाग।
5) जलीय अवधियों का निकटाक्ष विभाग।
6) निकटाक्ष मस्तक पालन प्रणाली।
7) वायु-प्रकाश महजियों का उत्पादन प्रणाली।
8) छोटे जलाशयों में मात्रकीय प्रबन्ध।
9) खाना जल में मत्स्य पालन प्रणाली।
10) धोंगा उत्पादन प्रणाली।

आज देश के अंतर्गत मत्स्य उत्पादन करीब 20.0 लाख टन है जो 1950-51 के 2.2 लाख टन से लगभग नौ गुना अधिक है। यह अभी आप में एक कीर्तिमान है। इसमें उभरता तकनीक एवं शोध प्रणालियों का ही योगदान है।

संस्थान के उद्देश्य

इस संस्थान के निर्माणित मुख्य उद्देश्य हैं--

1) अंतर्गत की जलीय संसाधनों में मत्स्य संमुद्र की संख्या एवं प्रकार पर शोध कर समस्त प्रबन्ध प्रणाली का विकास तथा उत्पादन में वृद्धि।

2) मात्रकीय जल संसाधनों में रिसर्च प्रकार के जीव-जन्तुओं का प्रभाव पर शोध द्वारा उचित वैज्ञानिक प्रणाली का विकास कर इसका संस्करण और विकास।

3) नदी-चांदी परियोजनाओं का नदी तथा जल एवं जलाशयों के पारिस्थितिक पर निर्देश भ्रमण का समस्त प्रबन्ध तथा इसके प्रबन्धण के लिए उचित वैज्ञानिक पद्धति का विकास।

4) अंतर्गत की मात्रकीय से संबंधित झींकों का क्रम-बद्र संवर्धन एवं प्रसार।

5) मात्रकीय परियोजना, प्रशिक्षण एवं प्रसार कार्यक्रमों का आयोजन।

6) मत्स्य प्रबन्धन तथा उत्पादन, जलीय प्रदूषण, संरक्षण आदि पर परम्परागत समावेश।
उल्लोक उदाहरणों की प्राप्ति हेतु संस्थान के अनुसार व्यावहारिक तथा वक्तव्य के प्रमुख मतस्थता संस्थानों के अनुसार उल्लोक उदाहरणों को अंतर्गत रखा गया है। नई दिशा मतस्थताएँ, उन्होंने इसका उल्लोक हिस्सा मुख्यालय से देश के प्रमुख निदेशों में प्रवाहण संस्थान को संबंधित मान और कर्तव्य कर रहा है तथापि एक समान प्रवाहण प्राप्त हो सके। नई दिशा उदाहरण देश के विभिन्न परिवेशों में गंगा, यमुना, ब्रह्मपुत्र, नम्ब्र और इत्यादी इसकी सहभागिता और आत्मीयता है। जलवायु मतस्थता प्रमाण का मुख्यालय ब्राह्मणों में है एवं इसके के दृष्टि शामिलता, आकर्षण प्रदान, माध्य प्रदेश, हिमालय प्रदेश तथा उत्तर प्रदेश में है।

यह उदाहरण जलवायु की परम्परागति का अध्ययन कर संस्थानों में माध्यम प्रवाहण के लिए संस्थान प्राप्ति करना है। बैराकपुर उदाहरण ज्ञानांतर्दृष्टि मतस्थता प्रमाण देश के सबसे बड़े खाना जल प्रवाह हुली-महासागर तत्त्व का बिंदु आयामों पर शीघ्र कर रहा है। नेपाल ज्ञानांतर्दृष्टि पर भी अनुसंधान करने के उदाहरण के अंतर्गत होता है। परवर्ती अनुसंधान प्रमाण देश के विभिन्न जलवायु प्रायस्थानों में माध्यम के अवश्य इतिहासिक विख्यातियों पर पड़ते जरूर इसकी प्रमाण प्राप्ति करना है। आदि क्षेत्र प्रमाण का मुख्यालय बैराकपुर में है और यह गंगा तथा ब्रह्मपुत्र तथा देश के बाद बहुत शीर्षों में परम्परागति का माध्यम प्रवाहण कर इसको संस्थान की दिशा में कार्यरत है।

इन जल संस्थानों में फल रहे इतिहासिक विख्यातियों को त्यों को व्यक्तित्व बनाए रखकर माध्यम प्रवाहण में वृद्धि के लिए प्रवाहण के लिए प्राप्ति करने वाली प्राश्रय के लिए प्राप्त है। हिल्सा मतस्थता प्रमाण, नागदर, हिल्सा मंडलों पर शीघ्र कर रहा है एवं प्रमाण कर रहा है कि गंगा नदी में इसकी पुनर्संस्थान हो सकते हैं। माध्यम संस्थान मुख्यालय प्रमाण, बैराकपुर मुख्यालय से देश के माध्यम संस्थानों का मुख्यालय, विकल्प एवं माध्यम संस्थानों के प्रश्न कर के माध्यम प्रवाहण एवं माध्यम प्रवाहण के लिए नए आयामों का विकसित करने का प्रयास कर रहा है।

मुख्य उपकरण

परवर्ती अनुसंधान एवं मतस्थता संस्थान

इस कालान्तर में संस्थान के माध्यम-प्रारंभिक बैंकिंग एवं अन्य जलवायु प्रायस्थानों के आयार पर हुली ज्ञानांतर्दृष्टि प्रमाण इसमें अन्वेषण आदि क्षेत्र में परवर्ती अनुसंधान का कार्य किया एवं प्रायस्थान के कुछ तत्त्व को प्रकट कर दिया। ऐसा देखा गया कि इस तत्त्व के भौगोलिक, माध्यम प्रवाहण का भी जलवायु प्रवाहण के प्रभाव का नहीं है कारण। उम्मीद (0.2-0.3/पी/पी.एम) का शारीरिक जलवायु प्रायस्थान और प्रायस्थान के तत्त्व के यह अवधारणाओं की अधिकता से देश मुख्यत्व का कार्य करना पड़ता है। कारण इसके उद्देश्य से मलिकों के शारीरिक नीतियों के दो प्रकार का विलक्षण को देखा पाए- शारीरिक-नीतियों के अनुसार भाग में सुझाव हो जाता है (हस्ताक्षर उत्तरप्रसिद्ध) एवं इसके उपरुस्त तत्त्व के तत्त्वों में अलगाव स्वीकार जा जाता है, लेकिन यह उल्लोक नदी जल प्रवाह बाले भौगोलिक में ही अधिक पाया गया।
इस संदर्भ में कुछ विशेष मेरियों में सूचक परजीवी बैक्टीरिया का अध्ययन किया गया जो निम्न सारणी में उल्लिखित है।

| संख्या (हजार) | हैंटरदेट्रिविक बैक्टीरिया | फॉलसेंट संबंध- बैक्टीरिया | एरोबिक जाइड्रोजन दिशागत बैक्टीरिया | इ-कोलाइज | कोलाइजर्म | महली के | महली के
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संपन्नोत्तेजित मल्यांकन संसाधनों की उपयोगिता

गंगा तरा क्षेत्र के शीरों में पेन ज़ारानी द्वारा शीगा मबली का उत्पादक से उद्देश्य हूँ।

अकाशपुर बील (स्थानीय पाठा में फैला) में पेन ज़ारानी द्वारा शीगा मबली के उपादन में आयातित स्वल्प बील हुआ एकमात्र यह विषय एक ठोस प्राणी के रूप में उपर कर सकने आया। इस प्रकार यह विषय का पुनर्वनस्करण की गई; उसमें 87 दिनों में प्रति शीगा को क्षेत्र में 82 प्रतिशत ग्राम की आवश्यकता पूर्ण की गई और 0.16 हेक्टर पेन क्षेत्र से 1573.76 कि. ग्राम प्रति हेक्टर की दर से बढ़ी बील (भेंटिकिमिया रेडजनलर्जी) का उत्पादन प्राप्त किया गया। इस प्रकार में एक नित्य संसाधन द्वारा आवश्यक की गई मल्यांकन आहार (17-20% प्रोटिन, 25-30% कॉबोहॉमोडेट एवं 9-11% पेट) दिया गया। इस अनुसंधान का अंतिम परिणामों से पता चला है कि इस विषय से वर्ष में तीन फलस्वरूप दिन पर सक्षम है। 0.16 हेक्टर पेन क्षेत्र में प्रतिशत दो उपज के आयाम पर बनाए गए आवश्यक विशेष से ज्ञात होता है कि वार्षिक स्थानीय उत्पाद 23,207 रु. तथा आकृती उत्पाद 9550 रु. होगी एवं फलस्वरूप की विनिर्देश से 65,400 रु. प्राप्त होगी। अतः प्रतिक्ष दो रुपए का युक्ति अभी तक स्थानीय से मल्यांकन उत्पादन तथा प्राणन में विशेष निरीक्षा आ गई है।
कृषि विज्ञान केन्द्र में किस्मों के लिए प्रशिक्षण कार्यक्रम

कालकूटी, 24 घरगुच्छ, पश्चिम बंगाल में स्थित संस्थान का कृषि विज्ञान केन्द्र ने अन्य क्षेत्रों की तलही इस क्षेत्र में भी मृदुलकी, फलस्वरूप, बालबादी और गृह-विज्ञान सम्बन्धी प्रशिक्षण कार्यक्रम भी आयोजित किया। इस संस्थान में नियमित प्रशिक्षण, कालकूटी, नालगंगा एवं गंगापुर नगर पंचायतों के 100 परिवारों का चयन कर मा. क. अनु. परिस्थिति का प्रयोगार्थ से भूमि की ओर नगर निर्माण की जीवन एवं खाद्य बांध का अध्ययन किया। परिवारों के चयन में इस वर्ष का खाना रखा गया कि अनुभूतिएँ एवं अनुभूतियों को प्रशिक्षित करें। वर्ष 1993-94 में पश्चिम बंगाल सरकार एवं पश्चिम बंगाल सत्यमंगळ वर्ष 1993-94 में पश्चिम बंगाल सरकार एवं पश्चिम बंगाल सत्यमंगळ निर्माण से भूमि का आयोजन का आयोजन किया।

(1) लघूपीठ जल क्षेत्र में महसूस बीज संयंत्र।
(2) लघूपीठ तथा अलग-अलग नसरी तलाबों का प्रबन्ध।
(3) भारतीय एवं बिहारी कार्य मखलियों का प्रशिक्षण।
(4) सिविल मृदुल पालन।
(5) मृदुल जल एवं अन्य सामग्रियों का रख-रखव।

हिंदी संसार

भारत संघ के राज्याध्यक्ष कार्यक्षेत्र नीति के अनुसार भूमि का आयोजन के तहत 14 से 20 सितंबर, 1993 को हिंदी संसार के अंतर्गत इस संस्थान ने हिंदी निम्नलिखित शीर्षों प्रतिभा एवं सांक्षेपिक कार्यक्रमों का आयोजन किया।

मुख्य बैठकें

वर्ष 1993-94 के दौरान संस्थान में निम्नलिखित बैठकें संचालित हुईं।

1) कर्मचारी अनुसंधान परिषद की बैठक दिनांक 27 व 28 अगस्त, 1993 को।
2) संस्थान की प्रबन्ध संगठन की 9 वीं बैठक 21 सितंबर '93 को।
3) संस्थान की प्रबंध समिति की 10 वीं बैठक 22 जनवरी '94 को।
4) संस्थान की प्रबंध समिति की 11 वीं बैठक दिनांक 23 मार्च '94 को।
5) संस्थान के संयुक्त कर्मचारी परिषद की दूसरी बैठक दिनांक II अगस्त '93 को।
6) पंचवर्षिक समीक्षा दल की बैठक कोटदा में दिनांक 24 व 25 जुलाई '93 को।
7) क्षेत्रीय समिति-2 की बैठक गुजरात में दिनांक 9 व 10 जून '93 को।

अनुसंधान कार्य में सहयोग

इस कार्य के दौरान संस्थान ने अनेक राष्ट्रीय एवं अंतरराष्ट्रीय संस्थाओं एवं संस्थाओं के साथ अनुसंधान और प्रशिक्षण के क्षेत्र में सहयोग किया।

संस्थान को विभिन्न राज्य सरकारों से मनस्तातीय शोध के लिए सहयोग प्राप्त हुए जिसके लिए हम आभारी हैं।

परम्पराक भवनां

1993-94 में इस संस्थान ने अनेक संस्थाओं को अन्य संस्थान भवनों प्रदान किया। इसमें मुख्य हैं

1) उत्तर-पूर्वी परिषुद्ध, शिलांग को मध्यम जलाशयों में मरस्य विकास की सम्पादनों पर परम्पराक भवनों दे रहा है।
2) भारत सरकार के प्रवाशय एवं वन मंत्रालय द्वारा वर्तमान पश्चिम बंगाल के गंगा नदी में जलीय गुप्तता का अनुसंधान और मूल्यांकन नामक परियोजना पर यह संस्थान कार्य कर रहा है। इस परियोजना में दी दिशा में पूर्ण सफलता तैयार कर उत्तर मंत्रालय को देगा।
प्रीयोगिकी हल्लांकरण
प्रसार व राखून निर्माण कार्य
संस्थान ने अपना प्रसार कार्य मुख्य वैकल्पिक स्थित अन्य प्रसार अनुभाग तथा काकड़ी पिया कृषि निर्माण केंद्र के माध्यम से समन्वय किया। संस्थान के अन्य केन्द्रों भी इस दिशा में प्रयत्नशील रहे।
प्रसार शिक्षा में धोष कार्य
गूह कार्य संचालन में महिलाओं की महाराणी एवम् नीति निर्माण सामाजिक अन्वेषणों से पता चला कि प्रामाण्य महिलाओं अब जागरूक हो गई हैं एवम् उनकी महाराणी अब बढ़ गई है तथा ये केन्द्र घर के पाहारीदीवारी तक ही सीमित नहीं है जफ़्वर घर से बाहर होने वाले कार्यों जैसे मस्तक पालन, मस्तक बीज संचयन आदि में भी है। यह स्वस्थ दुनियाँ क्षेत्र में किया गया, कारण इसे दृश्य क्षेत्र माना जाता है।
प्रशिक्षण
निम्त्रा एवम् मणिललूक के मस्तक पालकों के लिए अंतर्द्वारिय निर्माण किया और दो अंतर्कलाइन प्रशिक्षण का आयोजन किया गया।
मस्तक पालक दिवस
संस्थान ने मंदिर एवम् छोटाकुण्डिलिया शहरों में आयोजित मस्तक पालक दिवसों में भाग
लिया।
प्रदर्शनी
संस्थान ने मस्तकों को लोगों के बीच पहुँचाने के उद्देश्य से छोटाकुण्डिलिया, कलकत्ता एवम्
काकड़ी प्रेम में आयोजित प्रदर्शनीयों में भाग लिया।
प्रथम वित्तांक के 1993-94 के दौरान प्रशिक्षण, सर्वेक्षण, प्रोग्रामाला से मूल्य की ओर, लिखित व दललन का निर्माण आदि कार्यों में संलग्न रहा। इस के बाद ने अपने लक्ष्य 77 से अधिक 100 प्रशिक्षण पाठ्यक्रमों का आयोजन किया जिलमें 2396 प्रशिक्षण पाठ्यक्रमों ने भाग लिया जबकि लक्ष्य 1290 प्रशिक्षणों का था।

पुस्तकालय व प्रोग्राम सेवाएँ

इस संस्थान के पुस्तकालय ने अनुसंधान प्रयोग कार्यों में महत्वपूर्ण योगदान दिया है। इस पुस्तकालय का उपयोग ने केवल संस्थान के वैज्ञानिकों ने किया अपने अनेक विश्वविद्यालयों एवं संस्थाओं से आर प्राप्त पुस्तक, विद्यार्थियों एवं शोधकर्ताओं ने भी इसका सार्वजनिक उपयोग किया। इस के पुस्तकालय ने 128 पुस्तकें तथा 70 विभिन्न प्रकाशित क्रमांकों की बुझी किया, साथ ही 53 विद्वानों तथा 59 विद्वानों ज्ञानों को वंदा। आज संस्थान के पुस्तकालय के पुस्तक 6806 पुस्तकें, 3020 आच्य प्रकाशन, 4278 नुस्तित लेख उपलब्ध हैं। इस के पैतृक राष्ट्रीय एवं अंतरराष्ट्रीय संस्थाओं के साथ विभिन्न समाचार स्थापित हुए।

संस्थान के पुस्तकालय ने अपने विभिन्न विभागों को विभिन्न संस्थाओं, विश्वविद्यालयों, उद्योगों और मानव विकास के नियुक्त मैनेजर का काम जारी रखा। अन्तर-पुस्तकालय इंटर के रुप में 42 पुस्तकें अधिक पुस्तकालयों को भेजी गई।

पुस्तकालय एवं प्रोग्राम अनुमान के अन्तर्गत "प्रोग्राम मार्क" एवं "प्रोग्राम हैट" सेवाओं ने संक्षिप्त रहकर उत्तम कार्य दिया है। इसका यह संस्थान के वैज्ञानिकों के अधिकता विभिन्न अनुसंधान संस्थाओं और संस्थाओं के भी उद्यम है। साइक्लोस्टेईलिंग एवं जल्दीस्वल एकक ने भी महत्वपूर्ण कार्यों को जांच किया है।

तकनीकी रिपोर्ट

पुस्तकालय एवं प्रोग्राम अनुमान ने आज तक 22 से भी अधिक तकनीकी प्रशिक्षण का योगदान किया है। इसके अलावा वैज्ञानिकों द्वारा दिया गये शोध पत्रों के प्रकाशन हेतु मेनेजर से पुस्तक क्रमांकित किया परे प्रशिक्षण कार्य से सम्बन्धित अन्य कार्यों जैसे सेनियर, संगठन आदि में भी पूर्ण सहयोग प्रदान किया।
अनुसंधान परियोजना फाइल

अनुसंधान परियोजनाओं से सम्बन्धित प्रणाली रिपोर्ट एवं अन्य सूचनाओं को संरक्षित किया। शीर्ष के परियोजना फाइलों का संचयन आदि। इस अनुभाग का महत्वपूर्ण दायित्व है।

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ANNUAL REPORT
1993 - 94

English Section

CENTRAL INLAND CAPTURE FISHERIES RESEARCH INSTITUTE
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)
Barrackpore 743 101 West Bengal INDIA
This report includes unprocessed or semiprocessed data which would form the basis of scientific papers in due course. The material contained in the report, therefore, may not be made use of without the permission of this Institute, except for quoting it as scientific reference.

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BRIEF HISTORY

The Government of India, in a memorandum brought out in 1943, stressed the need for having a separate central department in the best interest of the development of fisheries resources of the country. This memorandum was later endorsed by the Fisheries Sub-Committee of the Central Government Policy Committee on Agriculture, Forestry and Fisheries. Based on this, the Central Inland Fisheries Research Station was formally been established on 17 March, 1947 in Calcutta under the Ministry of Food and Agriculture, Government of India. From the modest beginning as an interim scheme, the organisation has since grown to the status of a premier research institution in the field of inland fisheries in the country. By the year 1959, the Station acquired its status as Central Inland Fisheries Research Institute (CIFRI) and moved to its own buildings at Barrackpore, West Bengal.

Since 1967, the Institute is under the administrative fold of Indian Council of Agricultural Research (ICAR). The main objectives were to conduct investigations for a proper appraisal of inland fisheries resources of the country and to evolve suitable methods for their conservation and optimum utilisation. While fulfilling the above objectives, the Institute directed its research efforts towards understanding the
ecology and production functions of inland water bodies available in the country like the river systems, lakes, ponds, tanks, reservoirs and ox-bow lakes. These studies have unravelled the complex trophic structure and functions vis-a-vis the environmental variables in different aquatic ecosystems.

In 1971 the Institute initiated All India Coordinated Projects on "Composite Fish Culture", "Riverine Seed Prospecting", "Airbreathing fish culture" and "Ecology and Fisheries management of Reservoir". One more All India Coordinated Project on "Brackishwater Fish Farming" was also initiated in 1973. However, the 1st two projects were combined together as "Composite Fish Culture and Seed Production" in 1974. This was the turning point in the history of fish culture in India and the resounding success of Composite Fish Culture and Seed Production project has given the firm support for the development of freshwater aquaculture in the country, on the basis of which the Government of India and the State Governments initiated a number of programmes to raise the aquaculture production in the country.

The Institute has the credit of evolving and popularising the following technologies: (1) Technology for fish seed prospecting from rivers; (2) Technology for fish seed transportation; (3) Technology for induced breeding and nursery management of carp; (4) Technology for bundh breeding of Chinese carp; (5) Technology for composite fish culture; (6) Technology for aquatic weed control; (7) Technology for air-breathing fish culture; (8) Fisheries management of small reservoirs; (9) Technology on brackishwater fish farming and (10) Technology for snail farming. The country has witnessed inland fish production from a mere 0.22 million t in 1950-51 to 2.0 million t in 1994-95. The above technologies have contributed immensely towards this achievement.

Thus the Institute focussed on aquaculture research and development in consonance with plan priorities of Government of India and thus established the Freshwater Aquaculture Research and Training Centre (FARTC) at Dhauli, Orissa in 1977, which eventually became Central Institute of Freshwater Aquaculture in 1985. Similarly, Central Institute of Brackishwater Research was also established and research on Brackishwater aquaculture was entrusted to the new Institute in the same year. National Research Centre on Coldwater Fisheries, was also established by the ICAR, which started looking after the research needs of Cold water Fisheries. Thus the Institute gave birth to three major Fisheries Institution. Thereafter keeping in line with emerging trends in fishery science and needs of research in the country, the Institute concentrates on research activities related to capture fisheries resources of India.
Thus the mandate of the Institute was later modified giving added emphasis on capture fisheries resources of the country and the Institute was rechristened as CENTRAL INLAND CAPTURE FISHERIES RESEARCH INSTITUTE with effect from 1.4.1987. Under the changed set up, the CIFRI is entrusted with the responsibility to conduct research on open water bodies where the fisheries management norms are closely associated with environmental monitoring and conservation.

MANDATE

The mandate has the following functions:

(i) To study fish population dynamics of exploitable inland open-water ecosystems and to evolve management systems for optimizing fish production.

(ii) To investigate causes and effects of population in open-water fishery resources and to provide research support to evolve remedial measures for their conservation and maintenance.

(iii) To study the impact of river-valley projects on the ecology of river basins and productivity of reservoirs and to evolve strategies for their management.

(iv) To act as a repository of information on inland fisheries with a systematic data-base.

(v) To conduct training, education and extension-education programmes.

(vi) To provide consultancy services.

ORGANISATION

In order to achieve the above mandate, the research at CIFRI has been organised under three Divisions, corresponding to the major fishery resources of the country.

The Riverine Division, with its headquarters at Allahabad, strives to develop systems for effective management of the vast riverine fisheries resources of the country with adequate emphasis on the conservation of riverine environment. The research projects under the Division cover the rivers Ganga, Yamuna, Brahmaputra and Narmada. However, it is mandated to work in all the rivers of the country.

The Reservoir Division has its headquarters at Bangalore with centres in Tamil Nadu, Andhra Pradesh, Uttar Pradesh, Madhya Pradesh, Himachal Pradesh and Maharashtra. The investigations being carried out at the Division aim at developing management norms for optimizing fish yield from large tanks, lakes, and reservoirs of the country.

The Estuarine Division is based at Barrackpore and it presently works on the entire Hooghly-Matlah
estuarine system and the Narmada Estuary. The effluents from a number of industrial units, agricultural wastes, municipal wastes etc. make the Hooghly estuary one of the most polluted stretches of the Ganga river system which is being investigated by the Division. Hilsa, the most important fish of Indian estuaries is being subjected to intensive research.

The following four new divisions i.e., (i) Environmental Monitoring & Fish Health Protection Division at Barrackpore (ii) Floodplain Wetlands Division at Barrackpore (iii) Resource Assessment Division at Barrackpore and (iv) Hilsa Division at Maldah/Farakka have been created in addition to the three existing divisions viz., (i) Riverine Fisheries Division, (ii) Reservoir Fisheries Division and (iii) Estuarine Fisheries Division.

Other areas covered include the engineering aspects of fisheries as well as investigations on fishery economics and statistics.

The Institute's researches have been organised under 20 research projects and a Central Sector Scheme. The projects are operated from the Headquarters at Barrackpore, 10 Research Centres, 4 Survey Centres and a Krishi Vigyan Kendra covering 10 states of the country. The distribution of research and survey centres and different sections are shown in the organisation chart (Appendix - III).
IMPORTANT ACHIEVEMENTS

Environmental monitoring and their effect on fisheries resources

As a part of the environmental monitoring programme of the Institute, the Hooghly estuary and the associated wetlands are being subjected to ecological surveillance. The investigations on fish parasites, bacterial load, physico-chemical attributes of water and histopathology were conducted in selected estuarine impoundments (bheries) during the period under report.

Bacterial load recorded in water and fish tissue of investigation areas

<table>
<thead>
<tr>
<th>Place</th>
<th>Water phase</th>
<th>E.coli</th>
<th>Coliform</th>
<th>Fish muscle (C. mrigala)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kalyani</td>
<td>HB 7.0 x 10^2</td>
<td>PSB 2.6 x 10^2</td>
<td>ANFB Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Kantatala</td>
<td>HB 2.5 x 10^2</td>
<td>PSB 3.7 x 10^3</td>
<td>ANFB 1.2 x 10</td>
<td>Nil</td>
</tr>
<tr>
<td>Minakhan</td>
<td>HB 9.3 x 10^3</td>
<td>PSB 2.1 x 10^3</td>
<td>ANFB 9.0 x 1</td>
<td>Nil</td>
</tr>
</tbody>
</table>

( HB = Heterotrophic bacteria, PSB = Phosphate solubilizing bacteria, ANFB = Aerobic nitrogen fixing bacteria)

Most of the water quality variables recorded from the ecosystem studied were within the normal range except unionised ammonia which was high (0.2-0.3 ppm) causing stress to fish in the sewage fed wetland. This chronic ammonia stress induced distal hyperplasia and in some instances epithelial separation in gill lamellae.

Assessment of exploited fishery resources

Pilot scale Pen culture in beels: In continuation to the successful experiments conducted last year, pilot-scale studies were initiated in Akaipur beel to culture the giant freshwater prawn, Macrobrachium rosenbergii. The stocked juveniles gained on average weight of 82.1 g (from 74.88 mm/4.0 g to 191.83 mm/86.1 g) in a short rearing period of 87 days. The gross production was estimated to 1373.76 kg ha^-1 pen area. A feed supplied by a private firm comprising 17-20% protein, 25-30% carbohydrate and 9-11% fat was used for the purpose. Under an arrangement with the Akaipur Fishermen’s Co-operative Society the production was
handed over to the Society. The results indicated the possibilities for harvesting at least three crops in a year. The economics has been worked out on the basis of two crops in a year. The annual capital cost (Rs.23,207.00) and recurring cost (Rs.9,550.00) were worked out. As sum of Rs.65,400.00 can be obtained from sale proceeds and as such a net income of Rs.32,643.00 per year/0.16 pen are is expected.

**IMPORTANT EVENTS**

**Training courses in KVK for farmers**

The off-campus and on-campus training pertaining to crop production, horticulture and home science has been very useful in equipping the beneficiaries with operational insight in solving day to day problems. Further, the kendra implemented phase IV & V of the ICAR's Lab to Land Programme by adoption of hundred farm families belonging to villages viz. Nischintapur, Kakdwip, Narayanpur and Nandabhanga. The KVK worked in close collaboration with various Governmental and Non-governmental agencies. The training needs identified by the KVK comprise areas such as: (i) Seed collection technologies and brackishwater species; (ii) Nursery management; (iii) Induced breeding; (iv) Composite fish culture and (v) Fabrication and repair of nets.

**HINDI WEEK**

In compliance with the Official Language Implementation Policy of the Indian Union, as a part of the Hindi Week (14-20 September, 1993), the Institute organised a programme containing Hindi Essay Competition, Cultural Programme, etc.

**MEETINGS**

Staff Research Council Meeting held on 27th 28th April 1993.
9th Meeting of the Institute Management Committee held on 21-9-1993.
10th Meeting of the Institute Management Committee held on 22-1.1994.
11th Meeting of the Institute Management Committee held on 23.3.1994.
2nd Meeting of the Institute's Joint Staff Council held on 11.8.93.
Quinquennial Review Team Meeting held at Vadodara on 24 & 25 July 1993.
Regional Committee Meeting Meeting held on 9 & 10 June 1993 at Guwahati.
Adverse effects of metal pollution in River Hooghly

Enlarged gall bladder of an affected fish *Rita rita*

A normal fish
Fishing activity in a beel in West Bengal

A pen construction is in progress in a beel
COLLABORATION

The Institute collaborated with a number of national and international agencies during 1993-94 for research and training activities.

With State Govts.

The Institute records with thanks the much needed help and cooperation-in terms of facilities and input supplies that has been forthcoming from various state governments for the period under report.

CONSULTANCY SERVICES BY CIFRI

1. The Institute is working on a consultancy project entitled "Feasibility studies for fisheries development in Khandong and Umrong reservoirs in the North-East" offered by North-East Council, Shillong. The work is likely to be completed by December 1995.

2. An ad-hoc consultancy project on "Water quality monitoring and evaluation in river Ganga in West Bengal" was sponsored to the Institute by the Ganga Project Directorate, Ministry of Environment and Forest, Govt. of India. The work is in progress and likely to be completed by October 1995.

MANPOWER DEVELOPMENT

Training/Participation Abroad

Dr. K.K. Vass, Principal Scientist was deputed to Kuala Lumpur, Malaysia for attending an Workshop on the Development of Guidelines for Environmentally Sound Management of Asian Wetlands in Relation to their role in Watershed management for 3 days from 24-26 March '94. The Workshop was jointly organised by the United Nations Environment Programme (UNEP) and Asian Wetland Bureau (AWB). He also availed ODA(UK) fellowship for research attachment at the Institute of Aquaculture, Stirling, U.K. for six months between March-October 1993, on Aquatic Resource Management and Ecotoxicology.
Dr. Manas Kumar Das, Sr. Scientist of the Institute participated the Regional Seminar on Epizootic Ulcerative Disease jointly organised by O.D.A. of the British Government and the Aquatic Animal Health Research Institute (AAHRI), Thailand, for 3 days from 25-27 January '94.

Training/Participation Inland

Dr. S.N. Singh, Sr. Scientist participated in the "IARI-ISRO Winter School on Remote Sensing of Crop Environment" sponsored by the Dept. of Space, Govt. of India and organised by the Division of Agricultural Physics, Indian Agricultural Research Institute, New Delhi from 2nd to 27th November 1993.

Dr. V. Pathak, Sr. Scientist of the centre attended the training course on the "Safety aspects in the Research Applications of Ionising Radiation" at Radiological Physics Division of Bhabha Atomic Research Centre, Trombay, Bombay.

Shri M. Karthikeyan, Scientist participated in the Summer Institute on Advances in Agricultural Statistics held from May 17 to June 5, 1993 at Indian Agricultural Statistics Research Institute, New Delhi.

Shri R.A. Gupta, Principal Scientist attended a training course on Models in Survey Sampling at Indian Agricultural Statistics Research Institute, New Delhi from 20-24 December 1993.

HONOURS, AWARDS, ETC.

Dr. Krishna Chandra, Sr. Scientist has been awarded the Degree of Master of Science in Environmental Management from the Griffith University, Queensland (Australia) during his training abroad under Colombo Plan.

Shri M.M. Bagchi, Sr. Scientist has been elected as the fellow of the Institute of Chemists (India), Calcutta.

Dr. S.N. Singh, Sr. Scientist was recognised as one of the members of the Experts Group, constituted by the Narmada Planning Group, Govt. of Gujarat, Gandhinagar to chalk out the strategy for mitigating the adverse effect on the downstream environment of Sardar Sarovar due to closure of sluice gates.

Dr. R.K. Tyagti, Sr. Scientist was awarded D. Phil. degree from the University of Allahabad in the discipline of statistics.
Dr. Krishna Chandra, Sr. Scientist was awarded D.Sc. degree by the Allahabad University on the topic "Pollutants in relation to Aqua and other Environment".

TRANSFER OF TECHNOLOGY

EXTENSION AND NATION-BUILDING ACTIVITIES

The Institute's extension activities were carried out mainly by the Extension wing at the headquarters and the Krishi Vigyan Kendra of Kakdwip. Other centres of the institute also participated in the technology transfer activities.

Research in Extension Education: Rural women were integral part of decision making process along with their male folk with regard to aquaculture operations but the quality and performance was very much linked to level of literacy and exposure to various cultural practices.

TRAINING

Two short-term training courses on Inland Fisheries were organised for the Fish Farmers of Tripura and Manipur.

FISH FARMER'S DAY

Participated in two Fish Farmer's days in Meccheda and Chhotojagulia.

EXHIBITION: The Institute organised/participated in three exhibitions in Chhotojagulia, Calcutta and Kakdwip.

KRISHI VIGYAN KENDRA

During the year 1993-94 the Kendra, has been engaged in Training, extension, survey, lab to Land programme, 1st line demonstration of oil seeds and pulses programme and adaptive research. The Kendra have organised and conducted 100 training courses out of targeted 77 covering 2396 trainees out of 1290 target beneficiary under on and off-Campus programme. All the integrated Adaptive Research-Cum-demonstration were conducted under Council's on Farm activities.
The CICFRI library played a very significant role in the progress of research and developmental activities of the Institute. The library was used fruitfully not only by the scientists of the Institute, but also used frequently by the research scholars, teachers and trainees from different institutions and organizations. The library added 128 books, 70 miscellaneous publications to its collection and subscribed 31 foreign and 59 Indian journals. The library has now a total holdings of 6806 books, 3020 miscellaneous publications and 4218 outside reprints. Five new exchange relationships with leading national and international research information centres were established during the year.

The Institute continued free mailing of its publications to various research organizations, universities, entrepreneurs and farmers to keep them abreast with the latest developments in fisheries research. As a part of resource sharing, it lent out 42 publications to other libraries as inter-library loan. The total expenditure incurred by the library during the year was Rs. 10,78,417.00.

The section maintains an active photography unit and reprography services. Photographs, reprints and photocopies were supplied to the scientists of the Institute as well as of other research institutes and universities free of cost. The section also maintains a duplicating (cyclostyled) and binding unit to serve the various units of the Institute.

Technical reports

The library has the credit of compiling 22 technical reports on the progress of research activities of the Institute. Research papers of CIFRI scientists were scrutinised before publication in various journals. Technical queries regarding the activities of the Institute from various quarters of the country and abroad were attended to by the section. The section also assisted the participation of scientists in seminars, symposia, conferences, etc.

Research Project Files

Annual progress reports of all the research projects and the contribution made by individual scientists are being maintained in the Primary Project Files and Scientists' Files. Monitoring research progress through RPF I, II and III; Activity Milestones; and Monthly, Quarterly and Annual reports are some of the major responsibilities of the Section.
KVK trained rural women engaged in various activities in Kakdwip, West Bengal.
Dr. P.V. Dehadrai, Dy Director General (Fy), ICAR, inaugurating the new KVK building in Kakdwip

Dr. Dehadrai examining the handworks of rural women in an exhibition
Publications

The following departmental publications were brought out by CIFRI during the year April 1993 to March 1994.


(ii) Occasional publications:


(B) Fisheries development of the North Eastern States: A Ten year perspective Plan ed. by Dr. M. Sinha.


(D) Approach to Fisheries Development of Jamkhandi Reservoir.

(E) CIFRI, Barrackpore, West Bengal - a leaflet.

(F) Studies on Fisheries Conservation in Narmadasagar, Sardar Sarovar and its downstream - A desk review sponsored by Narmada Control Authority by Dr. S.N. Singh.

(G) Status paper of Regional Committee Meeting II.

CONFERENCES, SYMPOSIA, ETC.

The Scientists of the Institute participated/presented/submitted papers in the National Workshop on Aquaculture for Rural Development, organised by M.P. Council of Science & Technology, Bhopal; 3rd Indian Fisheries Forum, held at College of Fisheries, G.B. Pant Univ. of Agriculture & Technology, Pantnagar, U.P.; Asia-Pacific symposium on Mangrove Ecosystem Research Centre, The Hong Kong Univ. of Science & Technology, Hongkong; Inter National Seminar on Conservation of Fish Germplasm Resources and their habitats, New Delhi; Indo-Brittish Workshop on Conservation and Sustainable use of Floodplain Wetlands organised by British Council at Calcutta; Seminar on Reservoir Fisheries, Bhopal; Scientific Meetings
convened by the Executive Member, Narmada Planning Group, Govt. of Gujarat, Gandhinagar; Workshop on Identification of Priorities in Coldwater Fisheries, held at Kullu (Himachal Pradesh).

A total of 14 papers were presented by the scientists of the Institute in the above mentioned seminars/workshops/meetings etc.

VISITORS

A large number of distinguished personalities visited the Institute's Headquarters and its different centres during 1993-94. They are:

Amini, G. (Dr.), Head of Iranian Fisheries Research and Training Organization (IFRTO), 43 Zafar Street, Tehran, Iran.

Bora, D.(Ms.), Chair person, Assam Fishery Development Corporation.

Choudhury, S., Jt. Director, Deptt. of Fisheries, Govt. of Assam.

Das, A.(Ms.), Addl. Secy.(F), Union Ministry of Agriculture, accompanied by Shri D.K. Ghosal (Addl. Secy.F), Shri B.K. Roy (Addl.D.F.) and Shri B.C. Chakraborty (Jt. D.F.), Govt. of W.B.

Dass, P.(Dr.), Director, Research, Assam Agricultural University, Khanapara, Guwahati.

Dutta, A.(Dr.), Professor, Deptt. of Zoology, Guwahati Univ., Guwahati, Assam.

Dutta, O.K. (Dr.), Principal, fisheries College, Raha.

Gangopadhyay, D.K. (Dr.), Addl. Chief Secretary to the Govt. of Assam.

Goswami, U.C. (Dr.), Professor, Deptt. of Zoology, Guwahati Univ., Guwahati, Assam.

Kakoti, Dr., Jt. Director, Deptt. of Fisheries, Govt. of Assam.

Mondal, B.(Dr.), Chairman, KVK-QRT, Dr. D.J. Roy, Dr. G.L. Ray, Dr. R. Sinha & Ms. Shanti Chakraborty, KVK-QRT.

Mullick S.K., Jt. Director, Deptt. of Fisheries, Govt. of Assam.

Ravi, V.(Mr.), M.P., Kerala.

Silas, E.G.(Dr.), Vice-Chancellor, Kerala Agricultural University, Kerala.

Singh, G.(Dr.), ADG(Engg.), ICAR, New Delhi.

Soni,Trupti (Ms.) Reporter, Abhiyan, a Gujarati Weekly Magazine. Unnikrishnan, K.P.(Mr.), M.P., Convenor, Sub-Committee on Marine Products, Parliamentary Standing Committee on Commerce.

Venkateswarlu, U.(Dr.), M.P., Bapatla, Guntur, Andhra Pradesh.

Yadava, Y.S.(Dr.), Adviser, Fisheries, North Eastern Council Shillong.

**FINANCE**

For the year 1993-94
(Rs. in lakhs)

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## PROGRESS OF RESEARCH

### CENTRE-WISE LIST OF ONGOING PROJECTS 1993-94

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Overseas Development Administration, U.K. experts headed by Dr. J. Tarbit are discussing research activities of the Institute.

Dr. V.L. Chopra, Director General, ICAR on his visit to the Institute’s centre in Agra.
Iranian delegates in CIFRI discussing various research activities with the scientists and Dr. M.Y. Kamal, Asstt. Director General, ICAR (middle)
FISH CATCH STATISTICS OF BRAHMAPUTRA

Fish catch statistics of Brahmaputra were collected at Uzanbazar fish assembly centre, where catch is brought from about 30 km stretch of the river. During 1993-94, the bulk of landing was recorded between August and October (143.2 t, 68.8%), being the maximum in October (90.7 t). However the minimum was during May (1.9 t). The reason for the maximum catch during August-October may be attributed to large scale capture of fingerlings. A substantial increase in the catch (86.9%) could be recorded as compared to proceeding year.

Large cat fish comprising of M. seenghala, M. aor, and W. attu contributed 16.6 t (8%), W. attu being the dominant contributor (6.6%). Featherbacks contributed 4.25% and T. ilisha (2.41%). A marginal decline in the catch of major carps and T. ilisha was observed as compared to the previous year. However, appreciable improvement in the arrival of minor carps could be noticed.

Physico-chemical characteristics of R. Bharalmukkh:

The physico-chemical characteristics of the river revealed no pollution at its origin point (Basistha) with high values of dissolved oxygen (9.6 mg l⁻¹) and low values of free carbon dioxide (5.28 mg l⁻¹), alkalinity (28.0 mg l⁻¹) sp., conductance (40.8 micro mhos), total dissolved solids (20.8 mg l⁻¹), dissolved organic matter (0.8 mg l⁻¹), chloride (14.4 mg l⁻¹), silicate (5.0 mg l⁻¹), iron (0.14 mg l⁻¹) phosphate (0.01 mg l⁻¹) and nitrate (0.25 mg l⁻¹). At the city stretch and before the meeting point in river Brahmaputra, the pollutional load increased to such an extent that dissolved oxygen reduced to zero and free CO₂ increased to the extent of 55.0 mg l⁻¹. pH showed a decline from 7.3 to 6.9. Other chemical parameters like alkalinity (206 mg l⁻¹), sp. conductance (442.0 micro mhos), total dissolved solids (221.0 mg), dissolved organic matter (4.8 mg), chloride (62.4 mg l⁻¹), silicate (8.0 mg l⁻¹), iron (0.4 mg l⁻¹), phosphate (2.0 mg l⁻¹) and nitrate (0.4 mg l⁻¹) showed significant increase. The complete absence of dissolved oxygen, very high BOD load (412.8 mg l⁻¹) and free CO₂ (66.0 mg l⁻¹) together with other chemical parameters indicated adverse impact in the parent river specially at the meeting point.
Biotic productivity of Bharulumukh

Plankton

The plankton population of river ranged between 250 u/l to (Vashishtha) to 1825 u/l (just before the confluence). The Vashishtha reference zone had high species diversity, dominated by pennate diatoms where as the river in the city stretch showed the dominance of bluegreens and sewage funges. Protozoans and notifiers were the dominant zooplankton in the city stretch.

Benthos

A marked diversity in the macrobenthic fauna was evident in clean water and polluted zones of the river. The population estimated ranging between 230 nos/m2 and 9027 nos/m2, being the minimum at Basistha and the maximum at the extreme end of the river. the dominant molluscan biota at the head water were replaced by high incidence of chironomid population through out the city stretch under investigation.

Impact or R. Bharalukkh on the water quality of R. Brahmaputra:

Data revealed that river Brahamputra prior to the confluence of Bharulumukh was quite rich in dissolved oxygen (7.82 mg l⁻¹) and poor in free CO₂ (4.92 mg l⁻¹). Water was slightly alkaline in reaction with pH ranging from 7.0 to 7.6. Other chemical parameters like alkalinity (0.6 mg l⁻¹), sp. conductance (152.3 micro mhos), total dissolved solids (77.3 mg l⁻¹), dissolved organic matter (0.56 mg l⁻¹), chloride (22.12 mg l⁻¹), nitrate (0.3 mg l⁻¹), phosphate (0.06 mg l⁻¹), silicate (6.75 mg l⁻¹) and iron (0.035 mg l⁻¹) all were comparatively low in the AOF zone. But at the confluence point (OF) all the above parameters showed sudden change with oxygen declining upto 4.82 mg l⁻¹ and free CO₂ increasing to 27.47 mg l⁻¹. Other chemical parameters like alkalinity (116.0 mg l⁻¹), conductance (201.2 micro mhos), total dissolved solids (110.4 mg l⁻¹), dissolved organic matter (1.17 mg l⁻¹), chloride (26.62 mg l⁻¹), phosphate (0.12 mg l⁻¹) and to some extent silicate (8.0 mg l⁻¹) and iron (0.063 mg l⁻¹) showed sudden increase from their low values in AOF. The impact continued even upto the BOF zone with little sign of improvement. It was thus obvious that the city sewage discharge into Brahmaputra through Bharulumukh had severe impact on the water quality of the river which was also reflected from the rate of carbon production.

The rate of gross and net carbon synthesis (mg C m⁻² day⁻¹) ranged from 337.56 to 540.0 and 201.6 to 337.56 above the discharge point (AOF), which showed a sharp reduction at the confluence (OF) zone with gross ranging from 67.56 to 202.56 mg C m⁻² day⁻¹ and net from 45.6 to 110.4 mg C m⁻² day⁻¹. The production rate again showed improvement in the BOF zone (gross 134.4 to 487.56 mg, and net 86.4 to 321.6 mg C). It was thus evident that the discharged effluents through Bharulumukh had significant impact on the rate of carbon synthesis.

The confluence area of river Brahmaputra and Bharulumukh reflected comparatively bigger community size of the plankton population (920-1240 u/l) as compared to the river stretch above the confluence (520-644 u/l). The dominant biota, at the outfall area, were Euglenophyceae and Sewage-fungus which remained totally absent in the main river, prior to the
joining of river Bharalumukh. Similarly so with the protozoan and rotifer populations which were conspicuous by their greater abundance at the confluence and below confluence areas as compared to the above confluence areas. The macrobenthic fauna with high incidence of Chironomid population at and below the confluence areas also indicated environmental stress.

PROJECT : FC/B/10

EVALUATION OF FISH COMMUNITY STRUCTURE IN THE CONTEXT OF ENVIRONMENTAL MODIFICATIONS IN RIVER YAMUNA.

Personnel : D.N. Mishra, Shree Prakash, Usha Moza, Krishna Chandra, Suresh Singh, Sudarshan Bandopadhay

Duration : 1988-1995

Location : Agra

Fish landing

The total fish landings at Agra was 39.28 tonnes (1994) as against 43.62 tonnes in 1993, showing continuous decline since 1989. The miscellaneous fish landing was recorded to the tune of 16.0 tonnes (40.66%) as against 11.83 tonnes (27.13%) in 1993, followed by large-sized cat fish 11.73 tonnes (29.77%) as against 20.60 tonnes (47.22%) in 1993 and major carp recorded 11.65 tonnes (29.57%) as against 11.19 tonnes (25.65%) in 1993. Amongst major carp L. calbasu (50.29%) was dominant, followed by C. mrigala (23.27%), L. rohita (16.49%) and C. catla (9.95%). amongst the large cat fish M. seenghala (73.79%) was dominant followed by W. attu (23.03%) and M. aor (3.18%). The presence of C. carpio (4.30%) an exotic species in the riverine landing at Agra reflected their natural recruitment in R. Yamuna.

At Ferozabad total fish landings was 4.54 tonnes and comprised of cat fish 3.03 tonnes (68.53%), major carp 0.94 tonnes (19.54%) and miscellaneous group 0.57 tonnes (11.93%). C. mrigala amongst major carp and M. seenghala amongst cat fish were dominant in the landings.

Physico-chemical properties:

The physico-chemical studies at different stretches at Mathura, Agra and Firozabad indicated severe pollutional status of river Yamuna, maximum being at Agra followed by Mathura and Firozabad. The severity was maximum during summer followed by winter and minimum in monsoon.

The Agra stretch of river Yamuna was grossly polluted due to sewage and industrial combined wastes (tanneries, foundaries, steel finishing units) @ 5000 to 10000 cubic meters/hour through more than 16 outlets from water works to Tajmahal downstream. The impact of waste was severe at this zone due to high rate discharge of sewage waste throughout the day of the year, particularly in summer months when high temperature accelerated the decomposition of organic matter present in the water.
Primary productivity

The maximum primary production, 87.47 to 216.6 mgC/m²/hr (gross) and 52.12 to 174.47 mgC/m²/hr (net) were recorded at reference zones of Vridavan (Mathura), Kailash (Agra) and Firozabad during winter followed by summer and least production was recorded in monsoon months. The increase and decrease of primary production was also dependent upon nutrients influx in water.

The physico-chemical characteristics did not show any appreciable variations when compared to previous year.

Biochemical studies

The fat content in test fish reduced (5.8%) and 5.2% in 30 days exposure period in sub-lethal concentration (10% by volume) of tannery wastes as compared to untreated fish (fat-6.3%). The decrease may be due to utilization of lipid to meet the additional energy requirement under stress. The protein content also reduced from 550 ug g⁻¹ to 100 and 165 ug g⁻¹ (oven dry basis) in muscles of the test fish, L. rohita as the protein of the fish under stress is likely to undergo hydrolysis and oxidation through TCA cycle to meet the increased demand of energy.

Plankton

The total plankton in river Yamuna from Mathura to Agra has been found in the range of 355 u/l (AOF Agra-Kailash) to 44 u/l (BOF Oil refinery). Higher abundance of plankton (146 u/l) was recorded at AOF areas of Mathura as against only 67 u/l at OF and BOF areas (112 u/l). In Oil refinery zone the outfall area has been found holding maximum plankton (155 u/l) dominated by diatoms in comparison to AOF (68 u/l) and BOF (44 u/l) zones. At Agra the maximum abundance was recorded at AOF (355 u/l), the fresh zone, and minimum at OF (148 u/l), the zone directly affected by sewage and iron/steel industry wastes. The population however increased marginally at BOF (257 u/l).

The plankton population consisted of diatoms (26.50%), green algae (25.68%), blue green algae (22.49%), rotifers (9.12%) and crustaceans (16.21%).

Periphyton

The periphyton comprised diatoms (93.45%), green algae (2.85%), blue green algae (2.88%) and desmids (1.69%). The maximum abundance (520 u/cm²) was recorded at Firozabad and minimum in BOF zone of Mathura (162 u/cm²).

Benthos

The benthic population was the maximum at Agra in the range of 7212-8036 nos m⁻² and the minimum of 216-249 nos m⁻² at Firozabad. The association of communities also changed from Chironomid larvae (58%) and gastropods (40%) at Agra to tubificids (50%) and
chironomid larvae (33.46%) at Firozabad. Diversity index was computed as 1.13 at Mathura; 1.3 at Refinery area; 1.3 at Agra and 1.6 at Firozabad indicating stressed condition through out the stretch under investigation.

Macrophytes

Macrophytes present only during May-June and Dec.-Jan. Mean macrophyte biomass was 200 gm m$^{-2}$ (Mathura); 50 gm m$^{-2}$ Agra and 100 gm m$^{-2}$ (Firozabad). *Eichornia crassipes* was the sole representative throughout the stretch.

Heavy metals

Maximum level of zinc (366.48 ug g$^{-1}$) and copper (96.44 ug g$^{-1}$) were present in the sediments at OF stretch of Mathura dye wastes, which slightly declined at Agra 348.96 ug g$^{-1}$ and 52.78 ug g$^{-1}$ respectively. The chromium content was however higher (39.18 ug g$^{-1}$) at Agra. The contamination of water and sediments by heavy metals in *R. Yamuna* was also reflected by accumulation of metals in fish (*L. rohita*) tissue (zinc 108.96 to 948.8 ug g$^{-1}$ and copper 8.28-67.98 ug g$^{-1}$). The accumulation of mercury was detected to be maximum in liver (0.24 ug g$^{-1}$) followed by gills (0.14 ug g$^{-1}$), intestine (0.125 ug g$^{-1}$) and muscles (0.015 ug g$^{-1}$) of the fish.

PROJECT : FC/B/11

ASSESSMENT OF ECODEGRADATION IN THE GANGA RIVER SYSTEM AND CHARACTERISATION OF BIOLOGICAL AND TECHNICAL RELATIONSHIPS BETWEEN THE MAIN GANGA AND TRIBUTARIES


Duration : 1991-1996

Location : Barrackpore

Ecosystem degradation

Investigations at four centres viz., River Yamuna and Hindon confluence, River Ganga and Kosi confluence, River Hooghly and Saraswati confluence, River Hooghly and Haldi confluence and River Damodar, were carried out during the year under report. The sampling was carried out in summer and winter from the entire stretches.

Physico-chemical monitoring

Various water quality parameters apart from indicating routine fluctuations also revealed significant stress with regard to some important factors. For instance, during winter low level of
D.O. 3.36 ppm was recorded in R. Yamuna which was much below the saturation level. This significant drop in oxygen during winter often put biotic communities under stress. Similarly Saraswati-Hooghly centre also showed low oxygen in the range of 4-5 ppm, while in both case the references site recorded higher oxygen (Kosi 8.68 ppm, and Haldi-Hooghly 6.92 ppm). Similarly increased values for specific conductance, total alkalinity and nutrients recorded in Hindon-Yamuna and Saraswati-Hooghly in comparison to Kosi/Ganga further supported the contention that the former two centres showed signs of water quality degradation.

**Biomonitoring**

The plankton data from different centres revealed differences with nutrient loading and other stress factors together with a shifting trend in population structure. In stressed environmental condition cyanobacteria-protozoa association was predominant at Hindon-Yamuna confluence as compared to chlorophyceae Hindon-Yamuna copepod association in less stressed stretch, Koshi-Ganga and middle smaller of Ganga.

In River Kosi the species diversity was of higher order as the index ranged between 2.0012 to 3.3198, but it dropped to 0.8539 in polluted Hindon-Yamuna confluence stretches. Similarly low diversity (0.6392) was recorded at Saraswati-Hooghly confluence, and (0.7238) at Haldi-Hooghly confluence. But in the main river at Haldi site the diversity was very high (3.1922) while it was relatively low (1.3690) at Saraswati site.

Dynamics of benthic population revealed that at more polluted stretches viz., Hindon and Saraswati confluence higher density 165 nos m$^{-2}$ in comparison to Kosi registering only 38 nos, m$^{-2}$. Low diversity index of 1.7233 at Saraswati as compared to 2.3928 at Kosi was indicative that environmental stress does influence benthic population also.

**Metal contamination/accumulation**

Metal levels in abiotic components showed variation with regard to sampling site and level of environmental stress and in this connection, *Rita rita* has been analysed for various metals in different organs. The data revealed maximum accumulation in kidney followed by liver, bile and tissue. Among different metals zinc and copper showed maximum accumulation followed by chromium, lead, and cadmium. The fishes from Hindon-Yamuna recorded highest levels of all metals in kidney followed by the fishes collected from Saraswati-Hooghly while the least concentrations were registered in samples obtained from Nabadwip- Ganga (relatively less polluted zone). This was also supported by high percentage of stress recorded in gills, liver and kidney of *Rita rita* from Hindon-Yamuna in comparison to very low percentage of organ stress recorded in fish collected from main Ganga. In fact 25-50% cases of gill enlargement have also been noticed in *Rita rita* showing high metal accumulation.

**Physiological stress**

To evaluate physiological stress, monitoring of blood parameters in *Rita rita* has been carried out on the same specimens which recorded high metal accumulation and collected from the same stretch. The data revealed a significant relationship between level of metal stress and
blood parameters. It drop in RBC count and fall in Hb and HCT percentage in blood of fishes from stressed conditions.

Biochemical stress

In *Rita rita*, biochemical investigations were carried out. Parameters analysed were total protein, non-protein nitrogen, urea nitrogen. To develop a marker enzyme activity, lactic dehydrogenase was also assessed. The higher values of urea nitrogen (15-15.5 mg/1000 ml) in blood of *Rita rita* from Hindon-Yamuna and Saraswati-Hooghly confluences indicated renal incapacities arising out of stress conditions. Further, to evaluate a marker enzyme, inhibition of mitochondrial respiration was taken as index, in which the activity of enzyme ‘lactic dehydrogenase (LDH)’ was measured. Data revealed that in comparison to reference site the activity in Hindon-Yamuna and Saraswati-Hooghly was very high, indicating depression in mitochondrial respiration in *Rita rita* collected from Hindon-Yamuna and Saraswati-Hooghly confluences.

Histological stress

Different tissues viz., gill, liver and kidney of *Rita rita* were examined histologically to evaluate the stress impact at cellular level. The specimen from Hindon-Yamuna showed 80% gill damage with extreme hyperplasia in secondary gill lamellae and degeneration of gill filament too was a common feature. Liver showed 60% damage with necrosis and swelling of hepatic cells and kidney recorded 90% damage with disintegration of tubular epithelium and necrosis. The samples collected from Saraswati - Hooghly confluence recorded 75-100% damaged organs with almost same histological manifestations. In comparison, no such tissue abnormalities were observed for specimens obtained from Kosli. At relatively less stressed site of Nabadwip, damage of the organs was marginal (10-20%) with occasional hyperplasia and enlargement of gill.

River Damodar

*Waste loading into the river*

It has been estimated that the river receives 0 to 0.5 million cu m/d of mine water, 0.08 million cu m/d effluent from coal washeries having 500 to 1500 mg/l total suspended solids, 500 to 900 mg/l TDS and 600 to 880 mg/l COD. The seven thermal power plants contribute about 3000 tonnes/d TSS and 1.368 tonnes/d of oil & grease to the system. The major industrial discharges from the Durgapur industrial complex amounts to 12297 cu m/d.

*Water quality*

The river water indicated high concentration of ammonia (0.12 to 5.56 mg/l), nitrate (0.16 to 10.56 mg/l) and phenol (0.16 to 2.17 mg/l) through out the year. The COD was 10.53 mg/l at the reference zone which increased to the tune of 224.64 to 1235.52 mg/l at the industry infested stretch.
Heavy metals

Heavy metals viz. Zn, Cu, Cd, Pb and Cr were found to be in high concentrations in almost all the zones.

Plankton and benthos

The plankton population ranged between 10 and 100 u/l at the reference zone which showed significant increase at the zones receiving organic effluents. The community structure was largely dominated by bluegreens and diatoms.

Fish fauna

A total of 56 species belonging to 21 families could be recorded out of which 16 species were of economic value.

Bioassay experiment

In situ cage experiments for 96 hours exposure with Indian Major Carp, fingerlings were conducted at some selected sites revealed maximum stress condition near Durgapur (LC$_{50}$ 16 hrs.) followed by Kargali (LC$_{50}$ 44 hrs.) Burdwan (LC$_{50}$ 46 hrs.) and Ramgarh.

PROJECT : FC/B/12

ECOSYSTEM PROCESSES IN THE GANGA RIVER SYSTEM WITH SPECIAL EMPHASIS ON ITS TRIBUTRIES


Duration : 1993-1998

Location : Riverine Division, Allahabad and Patna, Lalgola Centres

River Ramganga

Physico-chemical factors :

Physico-chemical features of Ram Ganga reflected that the water was highly alkaline (175.0-256.6 mg l$^{-1}$) and hard (129.3-164 mg l$^{-1}$) supported by moderate values of specific conductivity and TDS. Nutrients level was also moderate. Dissolved oxygen was low (1.76-5.12 mg l$^{-1}$ whereas free CO$_2$ was moderate (3.3-10.0 mg l$^{-1}$) and COD low (5.8-24.0 mg l$^{-1}$) at non-
polluted points as compared to polluted zones (66.6-120.8 mg l⁻¹). It has been observed that the pollutional load was highest at Bareilly as compared to Moradabad and Rampur.

**Primary productivity**

Primary productivity was relatively high at all the centres during the month of October (587.5-812.0 Mg C m⁻³ h⁻¹) as compared to winter months (131.25 Mg C m⁻³ h⁻¹ to 437.5 Mg C m⁻³ h⁻¹). The below out fall areas generally showed higher primary production which coincided with the greater abundance of phytoplankton.

**Heavy metals**

Concentrations of zinc, arsenic and chromium were low (17.4 mg l⁻¹) at Moradabad to moderate at Bareilly (40.0 mg l⁻¹).

**Plankton**

The plankton abundance fluctuated between 556 to 3950 νl being the highest in BOF zone at Bareilly and the lowest at Moradabad of fall areas. High incidence of sewage fungus at OF at Moradabad followed by OF at Rampur reflected stressed condition. Greater abundance of chlorophyceae in particular and total plankton in general at BOF areas in different stretches reflected least impact.

**Benthos**

The study of benthic fauna revealed relatively higher stress condition at OF zones as indicated by the greater abundance of oligochaete and dipteran larvae and mild stress at at AOF and BOF at Rampur and Bareilly as indicated by the presence of gastropods and dipteran larvae. The severity of pollution was of high order at OF as no organism was found in October and December showing polysaprobic condition. The average benthic population ranged between 44 nos m⁻² and 1276 nos m⁻² being the highest at Rampur stretch and the lowest at Moradabad stretch.

**River Gomti**

**Physico-chemical studies**

Water quality of river Gomti revealed low pollution at Kooraghat which sharply increased at Lucknow centres due to the contamination from different types of effluents. The pollutional load was less at Jaunpur. Kooraghat, relatively less polluted stretch, had high DO content in the range of 8.2-10.8 mg l⁻¹, and the trend was almost same till the reference zone (Gaughat) at Lucknow. However, at the out fall areas of Mohan Meakin distillery the DO dropped to 1.92-4.0 mg l⁻¹. But the same showed remarkable recovery at Bajrangghat at Jaunpur (5.92-9.12 mg l⁻¹). BOD (64-86.4 mg l⁻¹) and COD (74.8-98.0 mg l⁻¹) were significant at OF areas of Mohan Meakin distillery at Lucknow. The water remained alkaline in reaction throughout the stretch from Kooraghat to Jaunpur with pH in the range of 7.4 to 8.4 except at Mohan Meakin waste discharge point (6.76-7.81).
Plankton

The plankton population ranged between 110 u/l and 416 u/l being the highest at Lucknow stretch and the lowest at Jaunpur stretch. The qualitative texture of planktonic abundance, by and large, was governed by the greater abundance of Bacillariophyceae. However the Lucknow stretch showed mild upsurge in bluegreens and sewage fungus specially in the out fall areas, indicating stressed aquatic environment of mesosaprobic status.

Primary productivity

Primary productivity, both gross and net, was found to be low in the range of 50-95 mg C m\(^{-3}\) h\(^{-1}\) and 30-62.4 mg C m\(^{-3}\) h\(^{-1}\) respectively.

Heavy metals

Concentrations of zinc, arsenic and chromium were low at at Jaunpur (18.0 mg l\(^{-1}\)) and high at Mohan Meakin (38.0 mg l\(^{-1}\)) and Haidar nallah (39.0 mg l\(^{-1}\)) at Lucknow but within permissible level.

Benthos

The study of bottom fauna revealed heavy to moderate pollution at OF and BOF areas in river Gomti at Lucknow, Kooraghat and jaunpur in that order as indicated by the presence of Oligochaete and dipteran larvae. The population was found in the range of 154 nos m\(^{-2}\) to 3080 nos m\(^{-2}\) being the highest out fall areas and the lowest in the reference zones.

River Ganga

Physico-chemical studies

Physico-chemical characteristics of water of Ganga indicated relatively higher pollution at Varanasi (Raighat-Sewage) and the lowest at Nagawa (Varanasi). There was an improvement in the water quality as indicated by higher D.O. concentrations and low values of BOD (10.6 mg/l) and COD (13.35 mg/l) as compared to the preceeding year. Water was highly alkaline and hard and chloride concentration was low. Nutrients at AOF and non-polluted points were low to moderate. Calcium and magnesium were low at AOF and high at OF. Primary production was moderate at all the centres except at Varanasi (56.25 mg C/m\(^{3}\)/hr to 119.7 mg C/m\(^{3}\)/hr). The Kanpur stretch of the river indicated significant improvement in water quality as compared to the preceeding year.

Heavy metals

Concentration of heavy metals viz., zinc (18.0-40.0 mg/l\(^{-1}\)), arsenic (9.4-20.0 mg/l\(^{-1}\)) and chromium (1.6-3.2 mg/l\(^{-1}\)) were within the permissible limits. Though the zinc (40 mg/l\(^{-1}\)) and
arsenic (20 mg/l) were higher at Rajghat (Varanasi) and lower at Nagawa (18.0 mg/l and 9.4 mg/l). Chromium was highest at Mavaiya (3.2 mg/l) near Allahabad.

**Plankton**

The presence of sewage fungus (Z. ramigera and Sphaerotilus sp.) along with other pollution resistant species viz., Microcystis, Nostoc, Oscillatoria, Brachionus and Nematodes indicated B-mesosaprobic conditions at Bhagwaighat and Jainmu effluents discharge points.

On the basis of presence of sewage fungus (Z. ramigera, Thiodicyon sp.) at OF's of Rajghat and Nagawa indicated grossly polluted condition at these centres. However, greater abundance of Myxophyceae and Chlorophyceae at Mehdaurighat (OF) and Begum Sarai suggested mild pollution.

**Benthos**

The benthic spectrum at Mehdaurighat was similar at OF and BOF I except molluscs which were more at Bank I (24.5%) as compared to OF (1.0%), which indicated impact of mild pollutional stress. The benthic population at Mavaiya centre was dominated by chironomid larvae at OF but abruptly changed at BOF, indicating the effect of pollution upto OF region only.

At Kanpur, the benthic population was dominated by chironomid larvae at OF and Bank I together with low species diversity indicating high magnitude of pollution. The benthic population was dominated by oligochaetes and dipteran larvae at OF (Rajghat) Varanasi suggesting high degree of pollution at this stretch. The severity of pollution was of low order at Nagawa as revealed by the presence of gastropods alongwith oligochaetes larvae.

**River Yamuna**

**Physico-chemical studies**

Physico-chemical parameters of water have revealed that the impact of sewage at Baluaghat was moderate. Concentrations of nutrients viz., nitrate (0.92-1.8 mg/l) and phosphate (0.75-0.85 mg/l) were quite high at OF as compared to AOF and BOF as confirmed from high values of BOD (40-64 mg/l) and COD (48-76.8 mg/l). Primary productivity was of average order (GP range between 62.5 and 125.0 mg C/m³/hr) and (NP 37.5-100 mgC/m³/hr).

**Heavy metals**

Concentrations of zinc, arsenic and chromium were found to be moderate in water and sediment.

**Plankton**

Phytoplankton dominated over zooplankton during all the seasons. Bacillariophyceae, in phytoplankton and rotifers among zooplankton were dominant. Outfall areas showed lowest population (255 u/l) of plankton when compared to other points. Dominance of sewage fungus at outfall indicated polluted conditions.
Fish catch statistics

The estimated catch at Allahabad showed a disturbing trend in fish landings. The fishery of all the species has declined sharply over the past. Lalgola centre has given a different picture where the landing showed an increasing trend for all the species except T. ilisha which used to be the main fishery at this centre. The estimated fish landing at Sadiapur, Daraganj and Lalgola was 49.38 t, 21.29 t and 94.63 t respectively. The species wise catch were as under:

Landings in tonnes:

<table>
<thead>
<tr>
<th>Fish species</th>
<th>Sadiapur</th>
<th>Daraganj</th>
<th>Lalgola</th>
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</thead>
<tbody>
<tr>
<td><strong>Major carps</strong></td>
<td></td>
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<tr>
<td>C. mrigala</td>
<td>0.99</td>
<td>0.04</td>
<td>1.82</td>
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<tr>
<td>C. catla</td>
<td>0.90</td>
<td>0.00</td>
<td>1.89</td>
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<tr>
<td>L. rohita</td>
<td>0.43</td>
<td>0.23</td>
<td>1.76</td>
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<tr>
<td>L. Calbasu</td>
<td>1.00</td>
<td>0.44</td>
<td>1.48</td>
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<tr>
<td><strong>Selected cat fish</strong></td>
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<tr>
<td>M. aer</td>
<td>7.71</td>
<td>1.01</td>
<td>4.68</td>
</tr>
<tr>
<td>M. seenghala</td>
<td>4.70</td>
<td>0.14</td>
<td>2.21</td>
</tr>
<tr>
<td>W. attu</td>
<td>0.25</td>
<td>0.17</td>
<td>2.74</td>
</tr>
<tr>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>32.51</td>
<td>18.94</td>
<td>60.09</td>
</tr>
<tr>
<td>T. ilisha</td>
<td>0.89</td>
<td>0.32</td>
<td>17.96</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>49.36</td>
<td>21.29</td>
<td>94.63</td>
</tr>
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</table>

PROJECT: FC/A4
ECODYNAMICS AND FISHERY MANAGEMENT OF BEEL ECOSYSTEMS IN WEST BENGAL


Duration: 1986-1994

Location: 2 beels each in Coochbehar, Murshidabad, Nadia, Hooghly and 24-Parganas (North) in the State of West Bengal

Two beels in Maldah (Haripur and Ghumamani) and one each in Midnapore (Sarasankha) and Burdwan (Bansdaha) were selected for ecological and fisheries investigations. The samplings were carried out in two extreme seasons of winter and summer. The observations are as under:
Physical characteristics of the beels

The Sarasankha in Midnapore is a meteorite beel while Haripur, Ghurnamani and Bansdaha beels are meanders of tributaries of the Ganga River System. These beels fall in the category of shallow and medium deep water bodies with average depth ranging between 0.93 and 3.60 m. Among all, Ghurnamani beel receives river flow during monsoon season when it gets connected with the flooded parent river.

Physico-chemical features

The thermocline in the beels was significant during summer when maximum temperature gradient of 11 °C between 30 °C to 19 °C was recorded in Bansdaha, the deepest beel under investigation.

The water in Sarasankha beel was acidic (pH; 6.3 - 6.75) while in Haripur (pH 7.98 - 8.88), Ghurnamani (pH, 7.53 - 8.15) and Bansdaha (pH; 7.50 - 8.31) were alkaline in nature. Moderate level of dissolved oxygen indicated high productivity of the beel water. Among all the beels Sarasankha showed comparatively low level of dissolved oxygen in water during the period of summer. Like temperature, stratification in DO content of water was also significant in summer when 22-45% decline in the DO values were recorded at the bottom layer of the beels. Bansdaha experienced the widest oxygen gradient of 1.92 mg l⁻¹ between 4.80 mg l⁻¹ (surface) and 2.88 mg l⁻¹ (bottom). Haripur beel in Maldah was free from free CO₂, perhaps because of the submerged weeds utilizing the free CO₂ for photosynthesis.

From nutrients point of view Haripur beel had maximum nitrate (0.03 ppm), phosphate (0.0624 ppm) and silicate (3.203 ppm) contents in water. The macronutrients in other beels were sufficient to maintain productivity at optimum level.

Primary productivity

The productivity through phytoplankton chain was comparatively low in Haripur beel which might be due to macrophytes utilising maximum nutrient resource for photosynthesis. Maximum primary production at phytoplankton level was recorded in Ghurnamani beel during summer months.

Soil

The basin soil of the beels was sandyclay with 63-82% sand, 9-23% clay and 5-18% silt. In Maldah the soil was near neutral (pH 7.4 - 7.5) while in Burdwan and Midnapore pH indicated acidic properties (pH 4.36 - 6.94). Soil macronutrients were of moderate levels in all the beels. Specific conductance was high in soil phase of Ghurnamani and Bansdaha beels at Maldah and Burdwan districts respectively.
Plankton

The winter drop in water temperature favoured the proliferation of phytoplanktonic organisms in all the beels except Ghurnamani with dense E. crassipes infestation. During winter the comparatively deep beels, Haripur and Bansdaha, exhibited vertical gradient in plankton distribution. The plankton density at the bottom layer of these beels were 700 to 3200% more than the surface. With the increase in temperature the plankton density showed a declining trend and the vertical gradient also reduced to 139 to 159% without altering the pattern of distribution. In summer Ghurnamani and Bansdaha beels were rich in plankton population (2128 and 2703 UL) while Haripur (273 UL) and Sarasankha (317.4 UL) harboured lower density of these micro-organisms. The temperature raise in summer boosted up the zooplankton population and as a group this constituted 12.5 to 83.5% of the total plankton population supported by copepods, cladocerans and rotifers. Ghurnamani showed maximum percentage of zooplankton in summer months. Similarly blue green algae were also in higher percentage in summer season. The population explosion of plankton in winter phase was because of the blooms of green algae (Planktosphaeria sp., Zygnemopsis sp.) and Dinophyceae (Ceratium hirundinella).

Benthos

All the beels except Bansdaha were rich in benthic fauna in summer. The condition was just reverse in Bansdaha beel in Burdwan when winter density of the benthic population was more. As a group molluscs represented by Gabia sp., Gyraulus sp., Amnicola sp., Lymnaea columna and Belamya bengalensis constituted maximum (44.17 - 97.46%) to the benthic population. Though the density of the benthic organisms was high during summer in some of the beels, the fauna was more diverse in the winter months.

Macrophytes

Variations in weed infestation was significant in these beels. Haripur beel showed minimum, only 15-20% infestation with submarged macrophytes namely Najas sp., and Ceratophyllum sp. The other beels had varying percentage of surface coverage with E. crassipes, Salvinia sp. and Trapa sp.

Weed inhabiting fauna

The population of associated fauna varied with the types of weeds available in the beels. Haripur mainly infested with submerged weeds harboured Hemipteran larvae as the major insect fauna, while Dipteran larvae constituted the bulk of insect fauna in Ghurnamani, Bansdaha and Sarasankha beels where floating weeds covered more than 50% of the water surface as their roots provided food and shelter for the particular group of insects. Molluscs population was omnipresent with the support of Gabia orcula and Gyraulus convexiusculus.

Fish and Fisheries

The beels except Ghurnamani and Haripur are regularly stocked with IMC fingerling (4" - 6") and the fisheries of which constitute the major source of income for the FCS.
Haripur beel water recorded maximum level of t-HCH (59.00 ppb) and t-DDT (10.24 ppb). In Gharmamani only t-DDT (4.75 ppb) could be detected. Banasdaha and Sarasankha did not show any pesticide content in water phase.

Pesticides were detected from the bed soils of Ghumamani (t-DDT-0, 13 ppb), Haripur (t-DDT-0.14 ppb) and Sarasankha beels (t-DDT-0.018 ppb).

Fish samples from Haripur and Sarasankha contained both t-HCH and t-DDT in flesh. In Haripur the values were Nil - 3.03 & NIL-44.42 ppb respectively. The fish flesh in Sarasankha accumulated NIL-0.54 ppb of t-DDT.

**PROJECT : FC/A/7**

**ECOLOGY AND FISHERIES OF FRESHWATER RESERVOIRS WITH CENTRES AT BANGALORE (MARKONAHALLI RESERVOIR), KANGRA (PONG RESERVOIR) AND HOSHANGABAD (TAWA RESERVOIR).**


**During :** 1987-1994

**Location :** Bangalore, Raipur, Pune, Kangra.

**Bangalore (Markonahalli reservoir)**

**Fish yield and species composition**

The significant increase in fish catch recorded during 1992-93 was maintained this year also. The total catch for 1993-94 was recorded at 54.75 t as against 46.0 t in 1992-93 thus an increase of 19%. The yield was estimated at 74.70 kg/ha as against 62.8 kg of previous year.

*L. rohita* contributed 45.46%, *C. catla* 9.89% and miscellaneous species 40.24% in the total catch. Other species like *C. mrigala* (1.2%), *C. carpio* (1.8%), *L. calbasu* (0.85%) and *W. attu* (0.56%) were insignificant. When compared to 1992-93, the catches of *C. catla* declined from 10.78 t to 5.4 t while *L. rohita* recorded increased catch from 16.96 t to 24.89 t. Similarly miscellaneous species increased from 15.08 t to 22.03 t. The species under this group included *N. notopterus, C. reba, P. sarana, murrels* etc.
<table>
<thead>
<tr>
<th>Species</th>
<th>1992-93</th>
<th>1993-94</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. catla</td>
<td>10,736 (23.34)</td>
<td>5,414 (9.89)</td>
</tr>
<tr>
<td>L. rohita</td>
<td>16,955 (36.86)</td>
<td>24,891 (45.46)</td>
</tr>
<tr>
<td>C. mrigala</td>
<td>735 (1.60)</td>
<td>656 (1.20)</td>
</tr>
<tr>
<td>L. calbasu</td>
<td>323 (0.70)</td>
<td>467 (0.85)</td>
</tr>
<tr>
<td>C. carpio</td>
<td>1,046 (2.44)</td>
<td>983 (1.80)</td>
</tr>
<tr>
<td>W. attu</td>
<td>1,124 (2.44)</td>
<td>307 (0.56)</td>
</tr>
<tr>
<td>Misc.</td>
<td>15,085 (32.79)</td>
<td>22,033 (40.24)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>46,004</strong></td>
<td><strong>54,751</strong></td>
</tr>
<tr>
<td>Yield (kg/ha)</td>
<td>62.77</td>
<td>74.75</td>
</tr>
</tbody>
</table>

Stocking and Reservoir management

Stocking is an essential part of management of Markonahalli reservoir as the natural recruitment of major carps is insignificant. The stocking of 91,000 fingerlings of catla and rohu in 1990 contributed substantially to the catch during 1992 and 1993. The Govt. of Karnataka is reported to have stocked over 6 lakhs fingerling consisting of catla (4.43 lakhs) and rohu (1.63 lakhs) during 1991. Again during 1992, 4.5 lakhs of major carp (catla and rohu) have been stocked. The 1991 stock is yet to make its impact to the catch as the stocking rate has been rather heavy at 822 fingerlings/ha. Similarly, the stocking rate in 1991 was 614 no/ha. Such heavy stock of only 2 species is not conducive for the growth of individual fish.

Primary productivity

Primary productivity ranged from 46.87 (Aug) to 310.0 mgC/m³/d (Oct) with an average of 170.74 mgC/m³/d. The ratio between the rate of gross primary production (P) and rate of ecosystem respiration (R) was <1 during October and November when usually this reservoir experienced flood influx, which caused heavy disturbance of the bottom. The P/R values for the year ranged from 0.82 (Nov.) to 3.12 (May). These values indicated that more organic matter was respired than produced within the system, P/R value 1.0 in Nov. (flood period) indicated that reservoir largely depend upon the allochthonous organic matter as an energy source. Higher P/R value (3.12) was recorded in summer (May).

Plankton

The plankton density ranged between 494 units/l (May) and 9956 units/l (March 94). As previous years zooplankton (58.09%) had an edge over phytoplankton (41.91%).

Dinophyceae (34.64%) Bacillariophyceae (4.17%), Myxophyceae (1.87%) and Chlorophyceae (1.23%) constituted the phytoplankton community.
Copepods were the dominant groups in zooplankton and was particularly abundant during July, September and November. The important forms representing zooplankton were *Diaptomus* spp., *Cyclops* sp. and their nauplii (Copepoda), *Moina* sp. and *Bosmina* sp. (cladocera), *Brachionus* spp. and *Keratella* spp. (rotifera).

**Bottom biota**

Benthic population and biomass (No/g m) ranged from nil (Nov.) to 627/76.38 (May), nil (Nov.) to 304/38.19 (Sept) and nil (Nov.) to 247 No/15.5 gm in lotic, intermediate and lentic sectors respectively. Species diversity and biomass of bottom biota were the highest in lotic sector as compared to intermediate and lentic sectors.

**Fish fauna**

*Heteropneustes fossilis* was recorded during this year. With this the number of species recorded so far in the reservoir has been twentyeight belonging to ten families.

II. **KANGRA**

<table>
<thead>
<tr>
<th>a. Sub project</th>
<th>Ecology and Fisheries of Pong reservoir.</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. Personnel for the year</td>
<td>D.K. Kaushal, V.R. Chitranshi, V.K. Sharma, Sushil Kumar</td>
</tr>
<tr>
<td>c. Duration of Project</td>
<td>1990-91 to 1993-94</td>
</tr>
<tr>
<td>d. Location</td>
<td>Pong reservoir, Dist. Kangra, (Himachal Pradesh)</td>
</tr>
</tbody>
</table>

**Thermal stratification**

The water of lentic zone exhibited thermal stratification in depth profile of 30 m for a period of 4 months from June to September. The stratification was more pronounced in June showing temperature difference of 12.5 in surface (30.5 C) and bottom water (18.0 C). The fall in temperature was significant (7.5 C) in the depth range of 14 to 21 m. The stratification further recorded in July with reduced difference in temperature. The occurrence of thermal stratification in the reservoir was noted last year also.

**Chemical stratification**

The period between June to October clearly showed the existence of biogenic chemical stratification in the reservoir being a productive character of the water. While the dissolved oxygen decreased from surface to bottom, pH total alkalinity and specific conductivity showed reverse trend. The fall in the values of dissolved DO from surface (6.0 ppm) to bottom (1.6 ppm) indicated klinograde distribution of DO in June.

**Plankton**

The average monthly population ranged from 669 u/l (April) to 12786 u/l (November) indicating more or less similar trend as observed in 1992-93. In this case the primary peak was in November (12786 u/l), secondary in January (10500 u/l) and tertiary in June (4790 u/l). The plankton biomass by volume varied from 0.65 ml/m (June) to 2.63 ml/m (October). Spatial
distribution showed that biomass was rich in lentic (1.59 ml/m$^2$) followed by intermediate (1.46 ml/m$^2$) and lotic (0.24 ml/m$^2$).

**Macrobenthos**

The average standing crop of benthic community for the entire reservoir was 571 nos/m$^2$ (21 g/m$^2$) showing marginal increase over that of last year's population (511 nos/m$^2$). The primary peak was in May (1359 nos/m$^2$), secondary in November (653 Nos/m$^2$) and tertiary in January (434 nos/m$^2$). Spatial distribution showed maximum density in intermediate zone (685 nos/m$^2$) followed by lentic (466 nos/m$^2$) and lotic (450 nos/m$^2$).

**Periphyton**

The average population of periphyton was estimated as 1430 nos/m$^2$ from the entire reservoir in this year against 1540 nos/m$^2$ of last year. Though the concentration of epiphytes was comparatively more in October and November (1938-1941 nos/m$^2$), the population was more or less uniform throughout the year with the predominance of diatoms (87.74%).

**Fish fauna**

With the addition of *Channa striatus*, a total of 34 fish species has been recorded from this reservoir and its associated waters.

**Breeding**

During the course of investigations conducted in different khads joining the reservoir (Gah, Baner, Dehri and Dehar) for location of breeding grounds, developing eggs were collected in spurts with maximum intensity of 2500 ml/hr/net in the confluence area of Dehar and Dehri Khads. The eggs on rearing showed dominance of *L. rohita* (80%). The associates commonly encountered were *Barilius bendelisis*, *B. vagra*, *Ambassis nama*, *T. putitora* and *M. seenghala*.

**Fish yield**

During the period April 93 to February 94 a total fish catch of 327.8 t was recorded as against 364.37 t in 1992-93 thus a decrease of 10% from the preceding year. *M. seenghala* (48.87%) was the most dominating followed by *L. rohita* (22.53%), *T. putitora* (13.42%), *L. caibasu* (5.12%), *C. catla* (4.17%), *W. attu* (2.65%) and *C. mrigala* (1.33%). While *M. seenghala* increased from 158.0 t of last year to 160.0 t of this year, *L. rohita* did not show any change (74.0 t) but *T. putitora* declined from 58.6 t (1992-93) to 43.9 t (1993-94). The overall scenario of the fishery indicated that the earlier dominance of *L. rohita* had been replaced by *M. seenghala*.

The commercial fishing of the reservoir was carried out for 10 months in a year observing 'closed' season for 2 months from 16th June to 15th August. The monthly catch data of the reservoir is given below.
Monthly distribution of fish catch in tonnes

**Pong reservoir 1993-94**

<table>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>327.80</td>
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<tr>
<td>35.16</td>
<td>58.90</td>
<td>35.50</td>
<td>18.66</td>
<td>44.00</td>
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<td>17.21</td>
<td>31.94</td>
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</tr>
<tr>
<td>10.7%</td>
<td>18.0%</td>
<td>10.8%</td>
<td>5.7%</td>
<td>13.5%</td>
<td>8.5%</td>
<td>6.4%</td>
<td>5.2%</td>
<td>9.7%</td>
<td>11.5%</td>
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<td>100.00</td>
</tr>
</tbody>
</table>

Sub project : ECOLOGY AND FISHERIES OF TAWA RESERVOIR

**Personnel** : Dhirendra Kumar, N. P. Srivastava, B. L. Pandey, K. K. Agarwal

**Duration** : 1993-99

**Location** : Tawa reservoir, Hosangabad, M. P.

Physical features

Tawa reservoir, situated at a latitude $22^\circ 30' 40''$ N and longitude $77^\circ 58' 30''$ E, was commissioned in the year 1979 and has average productive water spread area of 20,240 ha. It is located 33 km from Itarsi Railway Station on Central Railway.

Hydrology

The average water level of the reservoir started receding from October (355.20 m) and continued till February (349.74 m). The total water outflow between October and December was 1175.00 MCM. The outflow was nil in other months.

Fish yield and stocking

A total fish catch of 21.9 t has been estimated during October 93 to February '94. The fish landing from this reservoir registered steady rise from 1984-85 (16.8 t) to 1993-94 (21.9 t) (Table 1). The reservoir was stocked with advanced major carp fingerlings @ 17 to 84 nos/ha/yr.
Table 1. Fish yield and fishing effort (Oct. 93 to Feb. 94)

<table>
<thead>
<tr>
<th>Month</th>
<th>Catch (kg)</th>
<th>Days</th>
<th>Catch/day (kg)</th>
<th>No. of nets</th>
<th>Catch/net (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct '93</td>
<td>5367.5</td>
<td>19</td>
<td>282.5</td>
<td>513</td>
<td>10.46</td>
</tr>
<tr>
<td>Nov.</td>
<td>4734.0</td>
<td>16</td>
<td>295.8</td>
<td>160</td>
<td>29.58</td>
</tr>
<tr>
<td>Dec.</td>
<td>3348.5</td>
<td>20</td>
<td>167.4</td>
<td>240</td>
<td>13.95</td>
</tr>
<tr>
<td>Jan.'94</td>
<td>4142.0</td>
<td>25</td>
<td>165.7</td>
<td>1250</td>
<td>3.31</td>
</tr>
<tr>
<td>Feb.</td>
<td>4360.5</td>
<td>28</td>
<td>155.7</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>21,952.5</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The catch structure of major carps revealed the dominance of *C. catla* (86.01-97.10%) followed by *C. mrigala* (1.65-3.57%) and *L. rohita* (0.27-0.54%). The catch of other fishes was negligible owing to biased fishing practices as only bigger mesh size gill nets have been found in operation.

Fish fauna

12 species of fish belonging to 8 genera and 4 families could be recorded viz. *Notopterus notopterus* (Notopteridae), *Catla catla*, *Cirrhinus mrigala*, *Labeo calbasu*, *L. fimbriatus*, *L. gonius*, *L. rohita*, *L. beta*, *Puntius sarana sarana*, Tor sp. (Cyprinidae); *Aorichthys seenghala* (Bagridae) and *Wallago attu* (Siluridae).

**PROJECT**: FC/A/16

**ECOLOGY AND FISHERIES MANAGEMENT OF BEEL IN BRAHMAPUTRA BASIN (ASSAM)**


**Duration**: 1998-1994

**Location**: Ghorajan beel, Kamrup, Assam

Ecological studies in Ghorajan beel in Kamrup district of Assam, reflected some interesting features and differentiating this beel from other such waters of the region. The low values of dissolved oxygen, acidic pH with low alkalinity, dissolved salts, conductance, hardness with poor nutrient status in the water phase and very high concentration of free CO$_2$ upto 36.3 mg/l at times clearly indicated unhealthy conditions for fish production. However the organic carbon and available nutrients in the soil phase were quite high. The diurnal fluctuation of the chemical parameters indicated increasing DO level (8.5 mg/l) at peak hours of the day (14.00 hrs), the free CO$_2$ was also high (26.0 mg/l) which was indicative that proper utilization of energy was not taking place in the beel. The trophic status of the beel in respect of plankton abundance was also interesting. In contrast to other beels, as many as 13 species of desmids were recorded in Ghorajan beel and the group contributed more than 23% of the total phyto
plankton population, thereby showing ultra-oligotrophic nature of the beel. The water body reflected very low fish yield (12.57 kg/h/yr). The growth of fish in pen culture experiment was also very poor. The general appearance of macrophytes was unhealthy perhaps due to poor water quality.

The rate of carbon production at primary level was low and the conversion efficiency from producer energy to fish was very poor (0.0123%), indicating the harvest of only 1.68% of the production potential of the beel.

**PROJECT**: FC/A/18

**PRODUCTION DYNAMICS AND FISHERIES DEVELOPMENT IN A SMALL RESERVOIR IN M.P.**


**Duration**: 1991-1995

**Location**: Riverine Division, Allahabad

**Soil**

The soil of the reservoir was deficient in organic carbon (0.32%), available nitrogen (7.3 mg/100 g soil), phosphate (2.6 mg/100 g soil) and potassium (4.7 mg/100 g soil).

**Physico-chemical factors**

The low alkalinity values with moderate status of nutrients indicated low productivity of the reservoir.

**Primary production**

The average annual gross and net primary production was estimated at 92.18 mg C/m³/hr and 36.71 mgC/m³/hr respectively.

**Plankton**

The average plankton, periphyton and benthos were 60 u/l, 2560 u/cm² and 396 nos/m² respectively.

**Management**

On the basis of tagged specimen, growth rate of catla was computed to be at 0.52 mm/1.7 g/day which was poor as compared to other small reservoirs.
To enhance the fish food organisms and to overcome the deficiency of nitrogen in the reservoir fertilization was done in March '94.

**PROJECT**

FC/A/19

PRODUCTION DYNAMICS AND FISHERIES MANAGEMENT IN THIRUMOORTHY RESERVOIR, TAMIL NADU

**Personnel**

Shri C. Selvaraj, Shri V. K. Murugesan, Dr. V. K. Unnithan, Shri S. Manoharan, Shri C. K. Vava

**Duration**

1991-1996

**Location**

Coimbatore, Tamil Nadu

Fish fauna and recruitment in the reservoir

In addition to the Indian and exotic carp stocked in the reservoir, the endemic species recorded as *Puntius carnaticus*, *P. filamentosus*, *Amblypharyngodon melethinus*, *Oreochromis mossambicus*, *Anguilla bangalensis bengalensis*, *Mystus malaricus*, *Clossogobius giuris* and *Garra meecilobhandi*. Shore-line netting and other biological sampling methods did not indicate natural recruitment of cultivable carp in the reservoir. As such, the fish landings through commercial fishing depends mainly on the fingerlings stocked in the reservoir.

Soil characteristics

The soil samples showed acidic in reaction with pH ranging from 6.4 to 6.82. The electrical conductivity measured from 0.1 to 0.3 mhos/cm. Soil contained 1.56 to 2.61 g organic carbon, 30.9 to 53.2 mg available nitrogen and 0.15 to 0.5 mg available phosphorus per hundred gram indicating a low nutrient status for the reservoir basin.

Physico-chemical features

The salient features of the reservoir water indicated a high heat budget (average temperature-28.9 oC), high transparency (111.5 cm, av.), alkaline pH (7.0-8.25; av. 7.4); moderate dissolved oxygen content (4.2-8.3), low phenolophelin alkalinity (av. 0.17 ppm), low methyl orange alkalinity (16.0-33.0) and low TDS (av. 18.2 ppm). There was a significant rise in the average values of alkalinity (16.8 to 2619 ppm), TDS (12.2 to 28.0 ppm) and conductivity (29.2 to 61.1 ppm) during the post monsoon months (December-February). Comparatively, high values of carbon dioxide (4.2 ppm) was observed during November after heavy inflow of rain water.
Plankton

The volume of plankton ranged from 2 to 6 ml/m³ with an average value of 4 ml/m³. Phytoplankton dominated the population and their contribution ranged from 87.9 to 99.6%. Among the phytoplankton, Chlorophyceae with an average contribution of 57.1% dominated, followed by Bacillariophyceae. The contribution by Myxophyceae and Chrysophyceae was negligible.

Primary production

The average gross production rate was arrived at 1355.5 mg C/m³ day for the reservoir during the period of study. This amounted to 0.578% of radiant energy fixed by the primary producers. Consequently, the fish yield potential was arrived at 141.6 to 362.0 kg/ha/year with an average value of 233.1 kg/ha/year. The present level of harvest (135.3 kg/ha) therefore leads to a realisation of 58.04% of the potential indicating further scope for yield enhancement.

Benthos

A total of 15 species were observed to contribute the macrobenthic population. Insect larvae together contributed 58.71%, followed by Oligochaetes (including Tubifex sp.) to the extent of 37.78%. Oligochaetes other than Tubifex contributed 33.25% (608 nos/m²) forming the most prominent group among the macrobenthos. Chironomus species had a density of 559 nos/m² (30.56%) and Chaoborus species 389 um² (21.25%). Miscellaneous forms comprising of molluscs, crab larvae, ostracods and Diaptomus ax. together formed 3.51% of the total benthic population. The overall density of the benthic population was to the tune of 1930 nos/m² (390-2938 nos/m²).

Stocking

A total of 77816 nos. of fingerlings were stocked during the period from March ‘93 to February ‘94 @ of 363 nos/ha/year.

Age and growth studies through marking techniques

Targeting experiment: Out of forty-seven fingerlings of tagged C. catla specimen which were released into the reservoir during March 1992, the first recovery was made on 24.12.93 after a free-life period of one year and nine months. The fish had attained a length of 692 mm weighing 6000 g as against the initial size of 204 mm/105 g.

Clipping of pelvic fin: A total of 14315 fingerling consisting of 3172 catla, 2302 rohu, 4659 mirgal and 4182 common carp were clipped of their right pelvic fin and released into the reservoir after treating the wound with tetracycline, hydrogen peroxide and furacin. The first recovery was of common carp after a free-life period of 3 months. The fish had attained 335 mm/750 g. Subsequently, the recovery of clipped fish was a regular affair. More than twenty fish were recaptured on a single day. The first specimen weighing more than 1 kg size was recorded after 5 1/2 months of its stocking.
Fish yield

A total of 29015.65 kg of fish was harvested during the period of 11 months. The reservoir yielded a production of 135.3 kg/ha/year for 1993-94 against a yield of 131 kg/ha/yr in 1992-93. There has been an improvement in the catch per unit effort/day with the average monthly catch ranging from 3.35 kg to 17.68 kg and an average of 9.1 kg, as compared to 7.01 kg obtained during 1992-93.

Formulation of stocking and exploitation policy

Studies have clearly established that the fisheries can substantially be improved if the reservoir is stocked with advanced fingerlings of major carps alone. In absence of natural recruitment in the reservoir, the fish yield depends purely on the quality of the seed stocked every year.

PROJECT : FC/A/20

ECOLOGY AND FISHERIES OF YERRA KALVA RESERVOIR


Duration : 1993-1999

Location : Eluru, Andhra Pradesh

Fish catch statistics

Based on eleven month data since the start of the research project in April 1993, the fish production during the year from Yerra Kalva reservoir was estimated to be 64,862.27 kg. The month of September '93 presented the highest production of 21,565.20 kg followed by July '93 (8977.88 kg), August '93 (6134.09 kg) and October '93 (4772.06 kg).

The highest CPUE/hr was obtained in February '94 from basket traps (0.4444 kg). Cast nets were operated during monsoon months only and the CPUE/hr in this net varied from 180 g. in Sept. to 472 g in June. Nylon set gill nets and traps were consistently operated during all the months of the year. Drag nets were operated during the monsoon months of August and September only. Disco net, a gill net in principale presented figures varying between 172 g and 292 g and was operated during summer and monsoon seasons only. Badisa vala, a type of drag net was in operation in August only and the CPUE/hr was found to be 83 g.

The most consistently available species during almost all the months were found to be C. reba (15.27%), N. notopterus (14.61%), C. striatus (7.79%), M. aculeatus (6.63%), W. attu (6.80%), L. calbasu (6.13%), P. sarana (4.95%), N. nandus (4.34%), C. punctatus (4.00%), and
H. fossilis (4.09%). L. rohita appeared only in the months of June and September. G. giuris was also recorded during monsoon months of August and September but in negligible quantities. The highest percentage (63.61) of M. malcomsonii was recorded during June only and Anabas sp. during May only. Anguilla sp was observed in the catches of summer and early monsoon months.

Physico-chemical features

Water temperature varied between 23 °C and 32.5 °C. Transparency ranged from 43 cm and 178 cm. Dissolved oxygen was very low in February ranging between 2.0 ppm and 3.2 ppm. However, it usually varied from 4.8 ppm in August '93 and 8.8 ppm in December '93. Total alkalinity ranged between 100 ppm to 212 ppm. Hardness of water varied from 80 ppm to 140 ppm.

Primary productivity

The bathymetric distribution of primary productivity in July '93 it varied from 4.66 mg C/m³/hr to 104.16 C/m³/hr.

Plankton

Numerical estimation of plankton ranged from 31 u/l in July '93 to 120 u/l in August. In general, zooplankton dominated over phytoplankton in the reservoir. The former varied from 59% in July to 82% in September; cladocerans and copepods together formed the bulk of the population.

Macrophytes

Submerged vegetation like Vallisneria and Hydrilla contributed maximum to the biomass which varied from 1.4 kg to 4.0 kg m².

Benthos

The numerical estimation of benthic organisms was 156 nos/m² at 76.5 m. level 1326 u/m² at 74.5 m. level 1287 nos/m² at 72.5 m level and 390 nos/m² at 69.5 m level, which revealed that columnar layers were more productive than surface and bottom layers. Chironomid larvae generally formed the bulk of the benthic population ranging from 75% (76.5 m) to 100% (74.5 m level). However, gastropods formed 61% in August and consisted of Indoplanorbidus, Lymnaea and Bellamy's.
STUDIES ON THE FISHERIES POTENTIAL OF ESTUARINE WETLAND


Duration: 1986-1993 (extended to March 94)

Location: Estuarine Division, Barrackpore

Rearing of *M. rosenbergii*

Investigations were conducted in low-saline sewage fed wetlands at Minakhan, North 24-Parganas to assess the feasibility of growing giant freshwater prawn *Macrobrachium rosenbergii* in such water bodies. Three plots in two adjacent wetlands were stocked with *M. rosenbergii* juvenile @ 5000/ha. The prawns grew from 76.7 mm/4.66 g to 175.5 mm/55.8 g in one of the wetlands with 90% survival in 60 days. Final harvesting could not be done because of difficulties in dewatering the enclosed area and thick growth of *Enteromorpha* sp. which posed problem in cast netting.

In two other sections of another wetland the prawns grew from 62.25 mm/3.85 g to 145.7 mm/28.77 g and 74.0 mm/4.37 g to 144.25 mm/27.33 in two months time.

Physico-chemical parameters

High values of ammonical nitrogen were recorded at Kantatala (0.67 to 2.5 ppm) and Minakhan (0.51-1.7 ppm). PO₄-P was found to be ranging between 0.20 and 1.9 (Kantatala) while 0.08 and 0.10 ppm (Minakhan). The nitrate-nitrogen demonstrated higher values at Kantatala ranged between 1.58 and 2.80. At Minakhan, it ranged between 0.25 and 0.84. The DO ranged between 6.0 and 8.5 ppm at Kantatala in mining but the level, often increased to 15.5 ppm by mid-day. However, at Minakhan, the DO ranged between 4.5 and 10.6 ppm. The gross primary production was found to be higher at Kantatala ranging from 718.4 to 897.2 mgC/m³/hr while at Minakhan it ranged between 300.0 and 464.0 mgC/m³/hr. The salinity ranged between 0.30 ppt (July-Sept.) and 0.19 ppt (Feb., 1994) at Kantatala while at Minakhan it ranged between 1.34 (rainy season) and 5.6 ppt (April, 1993). The transparency was of low order at Kantatala ranging from 12.0 to 15.3 cm (rainy season) but at Minakhan it ranged between 8.6 and 25.0 cm. The pH was alkaline at both the places. Heavy metal concentration in water phase was not significant.

Plankton/benthos

The plankton density was observed in the range of from 0.3 to 2.5 ml/50 I in the kantatala wetland. Studies on the diurnal variation of plankton demonstrated highest settled
volume at 14-30 hrs. (0.7 ml/50 l) followed by 0.5 ml/50 l at 22-30 hrs, 0.3 ml/50 l at 2-30 AM and 0.4 ml/50 l at 8-30 AM with 1926, 864, 630 and 684 u/l respectively. The benthos population also indicated variation both in terms of the fauna and flora. Zoofoms were found in greater numbers at mid-day whereas at midnight phytoforms dominated. In general the benthos abundance in the freshwater sewage-fed wetland ranged at 2249 and 5583 nos m⁻² whereas in of low saline zone it was between 2900 and 6840 nos m⁻².

**Bacterial load in fish muscle**

Studies on the bacterial load in fish muscle indicated lowest concentration in *Catla catla* and highest in *Cirrhinus mrigala* in Kantatala wetland, during post-monsoon period. The sample of *C. mrigala*, collected during Feb., 1994 had still higher concentration in the muscle (8.6 x 10⁴/g). Bacterial load in *L. parasia* ranged between 1.4 x 10⁴/g to 2.4 x 10⁴/g.

**Salinity tolerance of wetland fishes**

Under laboratory conditions, *M. rosenbergii* juveniles of 1.5 g in average weight could tolerate salinity levels of 2% and 3% without any mortality during the experimental period of 72 hrs. duration. Direct transfer from low saline (3%) to freshwater did not affect the prawns.

**PROJECT** : BF/B/3  
**ECOLOGY AND PRODUCTION BIOLOGY OF HOOGHLY MATLAH AND KULTI ESTUARINE SYSTEM**


**Duration** : 1983 - 1995  
**Location** : Estuarine Division  
Barrackpore and Canning, Uluberia, Diamond-Harbour, Digha,  
Frazerganj Survey centres

**Ecological investigations**

The Hooghly main channel- a positive estuary, receives tremendous amount of freshwater discharge from the Ganga drainage system carrying nutrients in the form of soluble and dispersed clay minerals which ultimately accumulate in the mouth of the estuary. As a result, the lower zone of the Hooghly estuary was observed to be highly productive. On the contrary, Matlah estuary is considered an estuarine inlet, was less productive as compared to Hooghly since it hardly receives any nutrients through freshwater drainage system.
The salinity values of the main Hooghly channel ranged from 0.03 to 0.54 g/l⁻¹ (uppermost zone, Nawabdwip and Barrackpore), 0.39–2.3 g/l⁻¹ (between Barrackpore and Diamond Harbour) and 5.0–27.8 g/l⁻¹ (lowermost estuary).

Relatively higher primary production, 40.4 mg C/m³/hr (Jamboo) and 63.3 mgC/m³/hr (Canning) was recorded.

As regards net primary production of Matlah estuary higher values (35.5 mgC/m³/hr) were recorded at Jhorkali centre of the lower zone as compared to those at Basanti (28.6 mgC/m³/hr) and Canning (28.6 mgC/m³/hr).

Hydrological condition during bore tide

Effect of bore tide on the fluctuation of hydrological parameters, primary production and plankton population of the estuary were assessed at Diamond Harbour during summer and winter seasons. Considerable diurnal change in nutrient concentration in the system was observed.

Soil-characteristics of Hooghly and matlah estuaries

The soil study revealed that in both Hooghly and Matlah estuaries, no appreciable variations in the pH, D.O., turbidity, alkalinity, hardness, specific conductivity, nitrate and phosphate were observed when compared with the respective values of last year.

Fish and Fisheries

The total estimated fish catch from the Hooghly estuary was 22524.7 t during the period February, 1993 to January 94 compared to 30941.1 t during 1992-93 exhibiting substantial decline in the catch by 8416.4 t (27.2%). Whereas, the total catch from the Digha landing centre was 11015.5 t during 1993-94 compared to 8092.6 t during 1992-93 showing an increase in the catch by 2922.9 t (36.1%). Thus the total catch from both Hooghly estuary and Digha landing centre was estimated to 33540.2 t during the current year as compared to 39033.7 t during 1992-93. The decline in catch from the Hooghly estuary in the current year was attributed to decrease in catch by 8653.3 t of winter migratory bagnet fisheries in lower estuary, while an improved level of catch at Digha centre was recorded due to the abundance of Pama pama, Sciaenab auritus and prawns. Decline of winter bagnet fishery occurred this year was probably due to increased drift gill net fishing in the entire estuary throughout the year.

The lower estuarine zone, as usual, accounted for almost 95% of the total fish catch of the entire estuary.

Hilsa fishery by drift gill net

Drift gill net contributed 96.5% catch of total hilsa for the estuary at Digha centre. The hilsa fishery of Hooghly estuary and Digha landing centre during 1993-94 yielded an estimated catch of 1529.0 and 1922.2 t, respectively.
Total estimated winter migratory bagnet catch in lower estuary during November 93 to January 94 recorded as 17693.0 t, accounting for 78.5% of the total Hooghly estuary catch compared to 26346.3 t during last year. The sharp decline in winter bagnet catch was mainly due to decrease in average CPUE from 124.42 kg in last season to 78.2 kg in the current season.

**Estimation of wanton destruction of young ones of hilsa**

Indiscriminate exploitation of young ones (fry and fingerlings) resulting in wanton destruction of hilsa through small meshed seine net (chat ber jal) and bagnets in the upper stretch of the estuary was estimated as 43070 kg during the 1993-94 compared to 31035 kg during February 1993- January 1993.

**PROJECT**

BF/B/9

ECOLOGY AND FISHERIES OF NARMADA ESTUARINE SYSTEM SPECIAL REFERENCE TO IMPOUNDMENT OF RIVER NARMADA (SARDAR SAROVAR).

**Personnel**

Dr. S. N. Singh, Shri S. K. Sarkar, Shri Vijnay Kokekar, Shri G. C. Laha Shri R. C. Mandi

**Duration**

1988-89 (extended up to 1996)

**Location**

Vadodara

Based on the topography and salinity ingress, eight sites viz. Mehegam, Bhabhodut, Bharuch, Jhanor, Sisodara, Poicha, Vedgam and Gadher were identified for ecological studies.

**Hydrological regime**

**Water**

Transparency of the water decreased considerably during this year as compared to the last year and this declining trend was more severe at transitional and freshwater extent. The transparency drifted from 3.0 to 122.0 cm. An identical trend was also observed for dissolved oxygen level which varied from 0.51 to 8.24 mg l⁻¹ as compared to the last year (5.6 to 12.48 mg l⁻¹). The dissolved oxygen content at Vedgam was recorded as low as 0.51 mg l⁻¹ coupled with very high silt load in November, 94 causing fish mortality.

The phosphate content varied from 0.04 to 0.46 mg l⁻¹ which can be considered as fairly rich. Nitrate was also available in fairly high quantity, 0.10 to 0.38 mg l⁻¹. Silicate content of the system was observed to be moderate in the range of 16.0 to 19.5 mg l⁻¹.

The salinity and sp. conductance were relatively higher towards the lower stretch of the estuary as compared to higher stretch. So was the care with TDS and dissolved organic matter.
Soil

The soil reaction was slightly alkaline with pH in the range of 7.2 to 8.2. Free Calcium carbonate content reflected a zonal demarcation and fluctuated from 1.0 to 6.75%. No definite trend could be observed regarding the organic carbon content. Available phosphorus showed by and large even distribution.

Biological regime

The average planktonic density of the Narmada estuarine system as a whole ranged between 46 (Jhanor) and 112 nos. 1\(^{-1}\) (Mahegam). Phytoplankton, the major component of this planktonic community varied from 47.95 to 92.20% and was mainly contributed by Bacillariophyceae and Chlorophyceae. The zooplankton population was meagerly represented and Rotifera and Copepoda were the most dominant groups.

The average macro-benthic abundance for Narmada estuarine system as a single entity fluctuated from 77 (Vedgam) to 2551 nos. m\(^{-2}\) (Jhanor). By and large, Oligochaeta/Polychaeta excelled as the most prominent macro-faunal population. The macrobenthic spectrum of the system consisted of Oligochaeta/polychaeta, Malacostraca, Diptera, Mollusca, Trichoptera, Ostracoda and Ephemeroptera.

Primary production

Gross production varied from 13.54 to 75.0 mg C m\(^{-3}\) hr\(^{-1}\) while the net production fluctuated from 5.21 to 42.71 mg C m\(^{-3}\) hr\(^{-1}\). Community respiration was observed to involve greater part of gross production.

PROJECT BF/B/10

INVESTIGATIONS ON PRODUCTION DYNAMICS OF SALINE BHERIES IN RELATION TO THEIR FISHERIES DEVELOPMENT

Personnel


Duration: April 1991 to March 1995

Location: Calcutta (Bheries taken up at Kharibari in North 24-Parganas and Malancha and Basanti in South 24-Parganas.

Experimental bheries were selected for three saline zones (Low, medium and high) at Khavibari, Malancha and Chandipur-Ramgopalpur area respectively in the district of 24-Parganas.

The soils of all the bheries showed near neutral to alkaline in reaction (pH 6.0 - 8.4). Low saline bheries indicated high organic carbon (1.32 - 1.50%) providing favourable condition, but the high pH (8.0 - 8.2) might have depressed mineralisation at bottom. At medium saline zone the neutral soil (pH 6.0 - 7.3), favourable salt concentration (E.C. 0.70 - 0.90 lmhos/cm),
available phosphate (8.0 - 12.0 Omg/100g) and organic carbon (0.75 - 1.62%) indicated high fertility status. The soil of high saline zone bheries of mangrove infestation (E.C. 1.4 - 2.4 mmhos/cm), available phosphate (8.0 - 12.0 mg/100g) and organic carbon (0.84 - 0.96%) and the mangrove non-infested bheries (E.C. 1.6 - 2.4 umhos/cm) available phosphate 5.6 - 10 mg/100g; and organic carbon 0.72 - 0.96%) did not exhibit any wide difference.

At water phase the salinity at Kharibari was low in the range from 0.54 - 3.0% , while at mid saline zone (Malancha) it ranged 2.5 - 7.4% . At the high saline bheries the salinity was higher (6.6 - 23.5%). The primary productivity ranged from 41.66 - 541.8, 166.7 - 333.3 and 62.5 - 250 mgC/m^2/hr at low, mid and high saline bheries respectively.

Benthic flora, fauna and plankton

Plankton study revealed that during monsoon period, phytoplankton (Oscillatoria sp., Oedogonium sp., Microcysts sp., Ulothrix sp., Nitsschia sp. etc) was found to dominate at low saline area while zooplankton (Nauplii, Brachionus sp., Cyclops sp., Mysids & Daphnis sp.) was high percentage in the mid and high saline zones. Diatoms like Gyrosigma sp., Fragilaria sp., Pleuressigma sp. etc. were encountered at high saline area. The bottom biota was represented by Gastropod shell, Tanaids, Mysids, Polychaete worms etc.

Macrovegetation

The macrovegetation of all the three zones were represented by Spirodela sp., Ceratophyllum sp., Panicum sp., Ruppia sp., Lemna sp., Alternenthera sp., Nechamendia sp., Cyperus sp., Acanthus sp., Avicennia sp., Sonneratia sp., Suaeda sp., Sesuvium sp., etc.

Assessment of production from bheries

Three bheries each from low and medium saline zones and two bheries (including one, 1 ha) from high saline zone were selected for assessment of production of fish and prawn. The estimated total production from 3 bheries of low saline zone was observed to be 2540.430 kg/ha/335 days (P. monodon - 2D2:1.563 kg), 648.821 kg/ha/330 days (P. monodon - 143.771 kg) and 391.623 kg/ha/280 days (P. monodon - 152.235 kg). Total production from the 3 selected medium saline zone bheries were found as 1763.4 kg/ha/330 days (P. monodon - 850 kg), 600 kg/ha/330 days (P. monodon - 123.788 kg), respectively. While from high saline zone bheries the total production was 764.361 kg/ha (P. monodon - 594.5 kg) in 330 days and small bhery (area 0.4 ha) produced 440.0 kg/ha/330 days (P. monodon - 302.5 kg) during the period.

Fish and prawn pathogens

The isopod parasite, Nerocilia sp. appears to be a new species collected from the high saline zone and identified as a new host record. Primarily the parasite infests and destroys the pectoral and ventral fins of the host, further causes wounds in the skin. The marked maciation of the host and poor growth of the fish were the striking features.
Identification of pathogens

A total of 26 pathogens from different fish hosts and from different ecosystems have been identified and documented.

Bacterial load in soil, water and fish muscle

Bacterial load in the water phase, from different ecosystems, was far below infective level ($10^7$ ml$^{-1}$). In the present case it never exceeded the order of $10^5$ ml$^{-1}$. However, the same was recorded in the range of $10^5$ g$^{-1}$ to $10^7$ g$^{-1}$ at the bottom soil perhaps due to higher concentration of nutrients at the soil water interface.

Physico-chemical studies

Important physico-chemical factors of the study sites were evaluated and found within the optimum range except ammonia which was high in some sewage fed bheries, causing stress to fishes.

Histopathological studies

Distal and basal hyperplasia and rarely epithelial separation in gill lamellae were recorded in C. catla and C. mrigala due to ammonia stress.

Monitoring of EUS

Attempt was made with success to control EUS disease in Dhokarda beel (9 ha) by applying lime @ 100 kg ha$^{-1}$. 

Biological features

The Plankton density in different estuaries of the Sundarbans which varied from 434.8 to 818.0 u/l during monsoon became nearly 1/3 in winter (143.9-356.1 u/l) due to changed salinity and fall in the phosphate level associated with low temperature.

Primary productivity was found to be higher in winter as compared to the rainy season. This may be due to the availability of bright sunlight and higher transparency.

Bacterial load in L. parsia and available prawn (P. indicus) has been estimated during 1993-94. No significant difference could be noted in bacterial count in the same fish or prawn collected from different places. However, the bacterial count in prawn has been found to be higher than that of L. parsia.

Biochemical aspects

Studies were carried out in monsoon and winter seasons, from six major estuaries of the Sundarbans, viz., Jheela, Bidya, Matlal, Thakuran, Saptamukhi and Hooghly pertaining to the changes in the blood fractions of essential metabolites in freshly captured fish from the estuaries. Tissue lipid fractions, particularly the polyunsaturated fatty acids (PUFA) of the lipids, was studied too.

Blood glucose levels have been found to be in the normal range in fish from the rivers Thakuran and Saptamukhi. However, its level was slightly higher in fish from Jheela and Hooghly. A higher level of blood glucose in fish of Jheela and Hooghly indicated lesser utilization in cells for metabolism or an increased breakdown from the reserve tissues of liver and muscle. There was no appreciable seasonal difference with respect to blood glucose content.

Serum total protein in fish indicated no gross change in their values. All the captured fish from the estuaries in both the seasons exhibited values between 3.7-4.7 g/100 ml.

Determination of serum cholesterol, a precursor for sex hormone synthesis or indicator of polutional load indicated higher values in monsoon season (216-280 mg/100 ml) in all the estuaries compared to their level in the winter season (180-212 mg/100 ml).
The percent composition of 5 important PUEA of both W₆ and W₃ series (C₁₈:₂, C₂₀:₄, C₂₀:₅, C₂₂.₅, C₂₂:₆) and the ratios of W₆/W₃ was worked out. It could be observed that for both the fishes, *Polynemus paradiseus* and *Pama pama*, the percentage of the W₃ series fatty acids remained more than the W₆ series fatty acids.

**Seed prospecting and socioeconomic studies**

An investigation was carried out in Sunderbans to study fin & shell fish availability and socioeconomic status of seed collectors. The efficiency of various gears were also tested.

The seed collectors mostly (65.83 percent) have 5-10 year experience of seed collection. All of them were found operating shooting nets, from collection and seed due to its better efficiency and they operated nets for 6 hours/day (55.77 percent). During peak season they used to collect on an average about 2000-3000 postlarvae of tiger shrimp per day, however, during off season they used to manage only 100-400 nos. Collection of tiger shrimp is done between February and August. However, peak collection is being made during March to May. The income during peak season was varying between Rs. 600 and Rs. 1600 whereas in off season it was found to be in the range of Rs. 200 and Rs. 800.

**Project : BF/A/21**

**ECONOMICS OF MIGRATORY WINTER FISHERY OF HOOGHLY ESTUARY**

**Personnel :** Shri S. Paul, Dr. D. K. De, Sri P. M. Mitra, Shri N. C. Mondal, Sri H. K. Sen, Sri Pratrad Singh

**Duration :** December 1995

**Location :** CIFRI, Barrackpore

During 1993-94 economic data comprising 6 centres covering about 256 fishing camp ("Khutis") located at Sagardwip, Bakhali, Frasergang, Kalistan, Upper Jamboo & Lower Jamboo were subjected to financial analysis with regard to input-output relationship at market prices. The cost constituents such as annual capital costs of fishing inventory, wage bill fuel expenditure of mechanised crafts, maintenance and repair etc. showed that the total operational cost approximated to Rs. 1,48,68,493 as against 17,700 tonnes (live weight) of estuarine fish valued at Rs. 10,01,98,660. The consolidated accrual to all the fishing camp ("Khuti") amounted to Rs. 8,53,30,1676.
Development Implications

Contrary to subsistence character of rivering fisheries of freshwater zone, winter migratory fishery seems to be a pronounced activity at highly remunerative levels and it needs to be studied in depth from various bio-economic angles such as population dynamics of popularly transacted varieties of fish, value addition due to processing and existing post-harvest facilities. So far, these aspects have received scanty attention.

Since this activity of migratory fishery is exclusively in the private sector, reliability of data parted with by the Khuti owners is limited as compared to data supplied by Government agencies/Co-operatives. These figures, at best, may be treated as broad indicators of financial viability of fishing operations.

PROJECT : BF/A/22

IMPACT OF FARAKKA BARRAGE ON RECRUITMENT OF HILSA


Duration : 1993-1997

Location : Estuarine Division, Barrackpore and Farakka Centre, Farakka

Total fish landing at Farakka region

The total fish landing at Farakka region was estimated to 75,545.73 kg, a decline of 22.21% from last year. Cat fish (23.83%) was the dominant contributor followed by *T. ilisha* (21.27%), major cats (12.29%), prawns (6.47%) and miscellaneous (35.20%).

Seasonal distribution of Fishery at Farakka region

Post monsoon months were observed to be most productive followed by monsoon, winter and summer. However, all the seasons registered low production to the tune of 7.57, 38.26, 7.00 tonnes respectively and 38.97% less than that of 1992-93.

Assessment of Hilsa fishery at Farakka region

The total hilsa (*T. ilisha*) catch from Ganga River System at Farakka region during the period April, 1993 to March, 1994 was estimated at 15,856.77 kg thereby contributing 21.23% to the total fish landing but 30.86% less as compared to 1992-93. The share of adult hilsa declined by 92.47% in total catch. Substantial increase in juvenile hilsa C. 80% with a corresponding decline in adult fish by 36.05% was estimated as compared to preceding year.
Availability of juveniles and adults indicated an inverse relationship with the setting in of decreasing trend of adult and increasing trend of juveniles. The total landing of juveniles during the year was estimated to be 1193.56 kg out of which Taltala, the landing centre above the barrage contributed 697.78 kg, constituting 58.462% while Baniagram, the landing centre below the barrage contributed 114.01 kg i.e., 9.55%. This may be due to lack in operation of proper gears in the Baniagram centre. When compared to previous year's catch pattern, it was observed that Taltala contributed maximum with 425.26 kg out of 661.13 kg of total landing registering a percentage contribution of 64.32. However, during the year under report 272.52 kg more juveniles had been recorded.

**Water quality/primary productivity**

Silicate, sulphate, Ca and Mg contents were 11.6 & 10.7; 8.3 and 7.7; 50.0; and 27.0 and 28.0 ppm respectively

Primary productivity determined by C^{14} technique, was found to be poor in the Ganga with only 10.3 mg C/m^{3}/day (net).

**Soil character**

The pH of soil in the Ganga, during the period was 8.74; organic carbon and available phosphate (as P_{2}O_{5}) were found to be 0.27% and 1.9 g/100 g of soil.

**Electrophoretic studies**

Blood samples for the study have been drawn from live hilsa both from above and below the Farakka Barrage, Feeder canal and the Nawabgunj stretch of Hooghly river. Native polyacrylamide Gel Electrophoresis runs were performed in vertical gel tubes. The work is in progress.

**Mechanism of water flow in Hilsa hatchery**

Topographical survey of the area allotted for hatchery complex at Farakka has been completed and a design for continuous water flow mechanism is under preparation.
STOCK ASSESSMENT AND DYNAMICS OF FISH POPULATION IN THE MAJOR INLAND WATER SYSTEM


Duration: 1991-1995

Location: CSS, Barrackpore

Technical programme

i) Estimation of catch, catch structure and other population parameters of the fishery.
   a) The Ganga River System at Kanpur, Allahabad, Varanasi and Patna
   b) Flood plain lakes in West Bengal
   c) Hooghly-Matlah estuary in West Bengal
   d) Two reservoirs (to be named)

ii) Interspecies interaction and their effect on catch composition and yield.

iii) Production of fish yield.

Dynamics of fish stocks of the Ganga River System have been studied from the landing data collected at Allahabad. The results showed the drastic changes in the species composition of the stock and had significant interaction between the major carp group with rest of the stocks. The study of the landing data has indicated that the ratio of major carp to rest of the species which was ranging from 1.5 to 3.0 had been steadily increasing to 9.0 and 15.6 during 1992 and 1993 respectively. The average length (mm) in the catch of various major carp and major cat fish species was estimated and the results have been presented below:

<table>
<thead>
<tr>
<th>Major carps</th>
<th>1992</th>
<th>1993</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. calbasu</td>
<td>390.0</td>
<td>414.6</td>
</tr>
<tr>
<td>Catla catla</td>
<td>611.1</td>
<td>772.1</td>
</tr>
<tr>
<td>C. mrigala</td>
<td>517.1</td>
<td>542.0</td>
</tr>
<tr>
<td>L. rohita</td>
<td>511.3</td>
<td>689.0</td>
</tr>
<tr>
<td>M. seenghala</td>
<td>469.2</td>
<td>451.2</td>
</tr>
<tr>
<td>M. aor</td>
<td>446.7</td>
<td>483.0</td>
</tr>
</tbody>
</table>
Fluctuations in the abundance of fishery of Allahabad centre has indicated steep decline from 120 t during 1975-1985 to 63.2 t during 1992 and 45.6 t during 1993. Data have further been collected to identify the short and long term measures which may help in rehabilitating the fishery. The work is still in the investigative stage.

**PROJECT**

CSS/1
DEVELOPMENT OF INLAND FISHERIES STATISTICS

**Personnel**

R.A. Gupta, S. Paul, S.K. Mondal

**Duration**

1985-March '94 (Extended to VIII Five Year Plan)

**Location**

CICFRI, Barrackpore.

A system of data collection and estimation of resources under Inland fisheries was further refined with improved methodologies of estimation. Simplified version of estimation procedure was developed on the basis of sampling methods and the work was extended to two more states namely Rajasthan and Haryana during the year under report. Estimation of fish production from flowing waters was also undertaken in West Bengal after preparing the inventory of landing centres/fisheries villages on the stretches of the river Hooghly.

Stratified two stage cluster sampling has been proposed for resource estimation under ponds and tanks.

**Area estimates of ponds and tanks alongwith other parameters**

<table>
<thead>
<tr>
<th>District</th>
<th>Cluster total Area (ha)</th>
<th>Estimate Catch (t)</th>
<th>Per pond area/ Estimate Pond (ha)</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>% S.E.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bharatpur</td>
<td>37.45</td>
<td>10.46</td>
<td>38.38</td>
<td>10.46</td>
</tr>
<tr>
<td>Alwar</td>
<td>215.30</td>
<td>1.80</td>
<td>14.25</td>
<td>1.60</td>
</tr>
<tr>
<td>Ganganagar</td>
<td>56.47</td>
<td>2.03</td>
<td>54.60</td>
<td>2.03</td>
</tr>
</tbody>
</table>

Stratified two stage systematic sampling has been suggested for catch estimation from rivers, streams, estuaries etc. by stratifying landing centre/fishing village according to the quantity of fish landed with landing centre/fishing village as first stage unit, fishing unit as second stage unit and making a systematic selection of sampling days in a month with interval of 10 days. An inventory of all the fishing villages/landing centres in West Bengal in respect of riverine and estuarine fisheries undertaken during this period indicated that there were 82 such units located on the entire cross section of river basin out of which 40 pertain to the Bhagirathi, 11 to river Hooghly and 6 to remaining small rivers namely the Silabati, the Kangsabati and Haldi in Midnapore. The catch data for some centres were incomplete and could not be collected. The inventory of fishing villages in Tamil Nadu showed that there were 98 fishing villages in the lower stretch of the river Cauvery and 18 in the middle stretch.


PERSONNEL

The following scientists rendered their services to the Institute during the period April 1993 to March 1994.

Dr. S.P. Ayyar, Director

RIVERINE DIVISION

Allahabad Centre
Shri Ravish Chandra, Pr. Scientist
Shri S.K. Wishard, Scientist (SG)
Shri S.N. Mehrotra, Sr. Scientist
Dr. Balbir Singh, -do-
Dr. R.K. Tyagi, -do-
Shri R.N. Seth, -do-
Shri R.K. Dwivedi, -do-
Dr. H.P. Singh, -do-
Dr. D.N. Singh, -do-
Dr. M.A. Khan, -do-
Shri P.N. Jaitly, -do-
Shri P.K. Kattha, Scientist

Lalgola Centre

Patna Centre
Dr. G.K. Bhatnagar, Pr. Scientist

Agra Centre
Dr. R.S. Panwar, Pr. Scientist
Shri D.N. Mishra, Sr. Scientist
Dr. Shree Prakash, -do-
Dr. (Ms.) Usha Moza, -do-
Dr. K. Chandra, -do-

Guwahati Centre
Shri K.P. Srivastava, Sr. Scientist
(Retd. on 31.3.1994)
Dr. B.C. Jha, Sr. Scientist
Dr. V. Pathak, -do-
Dr. M. Choudhury, Scientist (Sr. Scale)

Bangalore Centre
Dr. V.R. Desai, Pr. Scientist
Dr. M. Ramakrishnatah, Sr. Scientist
Dr. A.K. Laal, -do-
Dr. D.S. Krishna Rao, -do-
Dr. P.K. Sukumaran, Scientist
(Sr.Scale)
Shri M. Karthikeyan, Scientist

Eluru Centre
Shri Ch. Gopalakrishnayya, Pr. Scientist
Shri K.V. Rao, Sr. Scientist
Shri J.B. Rao, -do- (Retd. on 31.1.1994)
Coimbatore Centre
Shri C. Selvaraj, Pr. Scientist
Shri V.K. Murugesan, Sr. Scientist
Dr. V.K. Unnathan, -do-

Pune Centre
Shri P.L.N. Rao, Sr. Scientist
Dr. B.K. Singh, Scientist (Sr. Scale)
Dr. M.D. Josolkar, -do-
(Retd. on 31.8.1993)
Dr. B.L. Pandey, Scientist

Raipur Centre
Dr. D. Kumar, Sr. Scientist
Shri N.P. Srivastava, Scientist (Sr. Scale)

Kangra Centre
Dr. D.K. Kaushal, Sr. Scientist
Dr. V.R. Chitranshi, -do-
Dr. V.K. Sharma, Scientist (Sr. Scale)

Calcutta Centre
Dr. A.K. Ghosh, Pr. Scientist
Dr. R.K. Banerjee, Sr. Scientist
Dr. K.R. Naskar, -do-
Shri H.C. Karmakar, -do-
Dr. P.K. Pandit, -do-
Shri A.B. Mukherjee, Pr. Scientist

Vadodara Centre
Dr. S.N. Singh, Sr. Scientist
Shri G.C. Laha, -do-
Shri S.K. Sarkar, -do- (Retd. on 31.1.1994)
Shri V. Kolekar, Scientist

Farakka Centre
Shri A.R. Chaudhury, Scientist

Canning Centre

---

ESTUARINE DIVISION

Barrackpore Centre
Dr. M. Sinha, Pr. Scientist
Shri U. Bhaumick, Sr. Scientist
Shri P.K. Chakraborti, -do-
Shri M.M. Bagchi, -do-
Dr. D.K. De, -do-
Shri P.M. Mitra, -do-
Dr. D. Nath, -do-
Dr. M.K. Mukhopadhyay, -do-
Shri A. Hazra, Scientist

ENVIRONMENTAL MONITORING & FISH HEALTH PROTECTION DIVISION

Barrackpore Centre
Dr. K.K. Vass, Pr. Scientist
Shri M.M. Bagchi, Sr. Scientist
Dr. R.K. Das, -do-
Dr. M.K. Das, -do-
Dr. H.P. Singh, -do- (Posted at Allahabad)
Dr. K. Chandra, Sr. Scientist (posted at Agra)
Dr. R.K. Banerjee, -do- (Posted at Calcutta)
FLOODPLAIN LAKES & WETLANDS DIVISION

Barrackpore Centre
Dr. V.V. Sugunan, Sr. Scientist
Dr. Y. S. Yadava, -do- (Lien to NECS, Shillong).
Dr. B.C. Jha, -do- (Posted at Guwahati)
Dr.(Ms.) Krishna Mitra, Sr. Scientist
Ms. G.K. Vinci, -do-
Dr. M.K. Mukhopadhyay, -do-
Dr. M. Choudhury, Scientist (Sr.Scale)
(Posted at Guwahati)

RESOURCE ASSESSMENT DIVISION

Barrackpore Centre
Shri R.A. Gupta, Sr. Scientist
Shri S.K. Mondal, Sr.Scientist
Shri H.C. Karmakar, -do- (Posted at Calcutta)

HILSA DIVISION

Maldah Centre
Dr. A. Mukherjee, Sr. Scientist
Dr. Amitabha Ghosh, Sr. Scientist
Shri A.R. Choudhury, Scientist

OTHER SECTIONS
Economics Section, Barrackpore
Shri S. Paul, Sr. Scientist

Krishi Vigyan Kendra, Kakdwip
Shri J.G. Chatterjee, Sr. Scientist

Scientists & staff on Deputation/Lien

Dr. Y.S. Yadava, Sr. Scientist, North-Eastern Council, Shillong
Shri M. F. Rahman, T-5, Karnataka Power Corporation Ltd., Bangalore.

The following members of staff (Technical/Auxiliary) rendered their services during the year.

T-7
Dr. A.K. Chattopadhyaya
Smt. Mira Sen

T-6
Shri S.K. Sadhukhan
Shri A.R. Mazumder

T-5
Shri Ramchandra
Shri P.S.C. Bose
Shri R.N. De
Shri R.C. Singh
Ms. Anjali De
Shri P.K. Ghosh
Shri S.K. Das
Shri N.K. Srivastava
Shri K.S. Rao
Shri T.S. Rama Raju
Shri R.C. Satapati
Shri K.K. Agarwal
Shri R.C. Mandy
Shri Sanjoy Bhowmick
Md. S.K. Syed Shakul Hameed
Shri R.R. Mukherjee
Shri M.F. Rahaman
Shri A.R. Paul
Shri K.S. Banerjee
Shri D.N. Srivastava
Shri B.D. Saroj
Shri Alok Sarkar
Shri N.N. Mazumdar
Shri S.P. Ghosh
Shri N.C. Mondal

T-4
Shri P. Dasgupta
Shri C.N. Mukherjee
Ms. Satnam Kaur
Shri Lalu Ram Mahabhar
Shri H. Chaklader
Shri Amiya Kr. Banerjee
Shri Fatik Manna
Shri Camil Lakra
Shri M.P. Singh
Shri B.K. Biswas
Shri D.K. Biswas
Shri S.K. Srivastava
Shri H.C. Banik
Ms. Keya Saha
Shri S. Manoharan

T-II-3
Shri J.P. Mishra
Shri Ramji Tiwari
Shri T. Chatterjee
Shri Pintu Biswas
Ms. K. Sucheta Majumder
Shri B.B. Das
Shri Swapan Kr. Chatterjee
Shri Sushil Kumar
Ms K. Jacqueline
### T-I-3
- Shri D. Sanful
- Shri Donald Singh
- Shri M.M. Das
- Shri S.N. Sadhukhan
- Shri Swapan Chatterjee
- Shri K.P. Singh
- Shri R.K. Halder

### T-2
- Shri D. Chatterjee
- Ms. Rilla Basak
- Shri B.N. Bas
- Shri P. Rajani
- Shri Bhai Lal
- Shri A. Mitra
- Shri C.K. Vava
- Ms. Abhijita Sengupta
- Shri L.K. Parbat
- Shri C.G. Rao
- Shri S. Kottaiah
- Shri N.K. Saha

### T-I
- Shri Prahlad Singh
- Shri D. Saha
- Shri S. Bandopadhyay
- Shri Atanu Das
- Shri H.L. Biswas
- Shri A.K. Barui
- Shri Hiralal Biswas
- Shri K.K. Das
- Shri H.K. Routh
- Ms. Shuvra Saha
- Shri S.K. Chakraborty
- Shri Rajesh Kumar Sah
- Shri S.G. Biswas
- Shri Ashis Roy Chowdhury
- Shri C.P. Singh

### Auxiliary
- Shri P.R. Rao, Hindi Translator
- Shri Swapan Kr. Das, Time Keeper
- Shri S.K. Biswas, Carpenter
- Shri S.K. Dev, Plumber
- Shri K.L. Chakraborty, Sr. Gestetner Operator
- Shri S.C. Bhowmick, Sr. Gestetner Operator
- Shri M.C. Raikwar, Sr. Gestetner Operator
- Shri D. Bergyoary, Driver
- Shri K. Ganesan, Driver
- Shri K.L. Das, Driver
- Shri Rananjan Datta, Driver
- Shri U.K. Chatterjee, Driver
- Shri R.L. Balmiki, Driver
- Shri S. Bahadur, Driver
- Shri Badal Lal Singh, Driver
- Shri V.G. Dhindore, Driver
- Shri N.C. Biswas, Driver
- Shri K.R. Deb, Driver
- Shri Ramjit Singh, Driver
- Shri M.C. Paul, Driver
- Shri Virendra Kumar, Driver
- Shri Ram Prasad, Driver
- Shri Sundeep Singh, Driver (Resigned on 1.10.2000)
- Shri Arun Kumar Mondal, Driver
- Shri Subhendu Mondal, Boat Driver
- Shri Saradindu Chakraborty, Srang
- Shri A.K. Goswami, Driver
- Shri P. Ramalingeswar Rao, Driver
- Shri Sukla Bairagi, Pump Man
- Shri B. Bhattacharjee, Carpenter
- Shri T.P. Ghosh, Lunch Driver
- Shri C.R. Das, Pump Man
- Shri A.K. Majumder, Driver
- Shri Ram Sajiwan, Driver
The following members of staff (Administrative) rendered their services during the year.

**Senior Administrative Officer**
Shri A.C. Ghosh (from 31.5.1993).

**Accounts Officer**
Shri J.R. Verma (upto Sr. G.P. Sharma (from

**Assistant Administrative Officer**
Shri M.R. Roy (upto
Shri S.C. Roy
Shri N.K. Sarkar (Retd. on 30.4.1993).

**P.A. to Director**
Shri G. Lahiri

**Senior Stenographer**
Shri U.K. Ghosh (from 22.2.92)

**Superintendent**
Shri T.P. Das
Shri Ranjit Kr. Ghosh (A & A)

**Assistant**
Shri S. Dasgupta (Retd. on 31.12.1993).  
Shri B.C. Bhattacharjee  
Shri M.M. Neogi  
Shri D.C. Bose  
Shri I.N. Kodandaraman

Ms. Bani Roy (Retd. on 31.1.1994).  
Ms. Namita Choudhury  
Ms. S. Majumder  
Shri D.K. Banerjee  
Shri S.P. Sastry (Retd. on 31.12.1993).  
Shri C.C. Das  
Shri R.C.P. Singh  
Shri N.K. Mitra  
Shri S.K. Kar  
Shri M. Kachhap  
Shri L.P. Misra  
Shri J.C. Patra  
Shri K. Prasad

**Stenographer**
Shri T.K. Roy  
Shri S. Bhattacharjee

**Senior Clerk**
Shri T.K. Sreedharan  
Shri L.P. Mishra  
Shri Bajj Nath  
Shri H.K. Nath  
Shri J.N. Banerjee  
Shri S.K. Sarkar  
Shri D.N. Baidya  
Shri S.R. Halder  
Shri H.L. Sarkar  
Shri B.B. Mukherjee (Retd. on 31.1.1994).  
Shri B.C. Mazumdar  
Shri S. Bhowmick  
Shri M.K. Das  
Shri D.K. De Sarkar  
Shri A.B. Biswas  
Shri Samir Kr. Roy  
Shri S.B. Roy  
Shri H.B. Sutar  
Shri T.K. Mazumder
Shri Kalu Singh  
Shri S.S. Sinha  
Shri Surendra Kumar  
Shri M.L. Biswas  
Ms. Sikka Mazumder  
Shri Biswanath Sah  
Shri P. Lahiri  
Shri P.K. Dutta  
Shri B.K. Das  

**Junior Stenographer**  
Ms. G. Vinoda Lakshmi  
Ms. Jolly Saha  

**Junior Clerk**  
Ms. N. Banerjee  
Ms. G. Mazumder  
Ms. M. Banerjee  
Ms. Anita Mazumder  
Ms. Bulbul Mallick  
Ms. A. Neogi  
Ms. A. Chakraborty  
Ms. Jayasree Pal  
Ms. Swapna Chattopadhyay  
Ms. Sefali Biswas  
Ms. Shyamali Mitra  
Ms. Arati Panigrahi  
Shri S.P. Mondal  
Shri K. Majhi  
Shri Paras Ram  
Shri S.K. Maranappan  
Shri Kunja Behari  
Shri Chotla Lal  
Shri Ambika Lal  
Shri S.K. Bose  
Shri N.R. Kundu  
Shri J. Roy  
Shri S.K. Tikadar  
Shri U. Bhattacharjee  
Shri P.K. Ghosh  
Md. Quasim  

Shri C.K. Pandey  
Shri C.K.N. Sahi  
Shri K.S. Rao  
Shri Debesh Chowdhury  
Shri Brahmapal Balmiki  
Shri S. Karmakar  
Shri Sukumar Sarkar  
Shri A.K. Dey  
Shri M.K. Joardar  
Shri S.K. Ghosh  
Smt. S. Sumithra Devi  
Shrt Santosh Sarkar  
Shri Rajesh Khandelwal  
Shri C.D. Parmer  

The following members of staff of supporting grade rendered their services during the period.  

**Supporting Grade IV**  

Shri R.L. Raikwar  
Shri J.M. Kujur  
Shri Antiram Das  
Shri H.K. Das  
Shri T.K. Biswas  
Shri Sunil Kr. Das  
Shri M.S. Burman  
Shri H.K. Pramanick  
Shri Nar Bahadur  
Shri Sharam Balmiki (upto 30.6.63)  
Shri A.M. Patra  
Shri B. Prakash  
Shri D.D. Poudel  
Shri S.C. Balmiki  
Smt Parmila Taman
Supporting Grade III

Shri P. Sayalu
Shri S.P. Yadav
Shri B.N. Mondal
Shri R.N. Tar
Shri B.B. Das
Shri S.N. Burman
Shri G.C. Mondal
Shri Jungli
Shri Jugal Kishore
Shri S.K. Boral
Shri Tek Bahadur
Shri H.S. Burman
Shri S.S. Burman
Shri L. Samulu
Shri Bhim Bahadur
Shri K.L. Balmiki
Shri N.L. Das
Shri H.K. Burman
Shri Ram Sunder
Shri J. Khalko
Shri C.P. Singh
Shri Khemchand Balmiki
Shri Gulab Shaw
Shri A. Murugasan
Shri S.K. Burman
Shri Nar Bahadur
Shri P.C. Kachari
Shri A.L. Yadav
Shri K.D. Raju

Shri D.C. Das
Shri B.C. Das
Shri B. Hazarika
Shri M.L. Saha
Shri J. Mukhia
Shri A.K. Biswas
Shri L.K. Halder
Shri A.C. Ghosh
Shri J.N. Mallah
Shri Subrahmani
Shri M. Mahadeva
Shri G.C. Paramanick
Shri R.U. Muchi
Shri K. Ningigowda
Shri S.T. Gavate
Shri S. Mahendran
Shri V. Marilappan
Shri A. Ramaswamy
Shri M.V. Krishnan
Shri K. Kaliane
Shri Ram Prasad
Shri Karam Raj
Shri Satyendra Burman
Shri Lalita Prasad
Shri Sita
Shri Rajdhari Mallah
Shri Sukchand Biswas
Shri Bideshi Lal
Shri B. Pugalendhi
Shri Om Prakash
Shri M.P. Bind
Shri A. Gangalagh
Shri K. Bahadur
Shri A. Biswas
Shri R. Palaneswar
Shri K.K. Dhiri
Shri S.S. Bondre
Shri B.N. Krishnappa
Shri Gunadhur Dhibar
Shri Sankar Bose
Shri G.J. Roundale
Shri Parameswar (Retd. on 20.10.1993)
Shri Umesh Chowdhury
Shri U. Satyanarayana

Supporting Grade II

Shri Munnilal Mallah
Shri Maha Singh
Shri Dukkharan Sahani
Shri Laxmi Ram
Shri Suraj Bahadur
Shri B.N. Mondal
Shri Rajendra Ram
Shri A. Sahani
Shri P. Seshanna
Shri P.C. Bez

Shri Om Prakash
Shri M.P. Bind
Shri A. Gangalagh
Shri K. Bahadur
Shri A. Biswas
Shri R. Palaneswar
Shri K.K. Dhiri
Shri S.S. Bondre
Shri B.N. Krishnappa
Shri Gunadhur Dhibar
Shri Sankar Bose
Shri G.J. Roundale
Shri Parameswar (Retd. on 20.10.1993)
Shri Umesh Chowdhury
Shri U. Satyanarayana
<table>
<thead>
<tr>
<th>Supporting Grade I</th>
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<tbody>
<tr>
<td>Shri Lakshmi Ram</td>
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<tr>
<td>Md. Yusuf Dar</td>
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<tr>
<td>Shri Suresh Kumar</td>
</tr>
<tr>
<td>Shri Kuldeep Singh</td>
</tr>
<tr>
<td>Ms. Bimala Devi</td>
</tr>
<tr>
<td>Shri Kawalpati Ram</td>
</tr>
<tr>
<td>Shri Mahadeep Panika</td>
</tr>
<tr>
<td>Shri N. Rajak</td>
</tr>
<tr>
<td>Shri Suresh Rajak</td>
</tr>
<tr>
<td>Shri A. Kistalah</td>
</tr>
<tr>
<td>Shri P. Atchahal</td>
</tr>
<tr>
<td>Shri S. Kalita</td>
</tr>
<tr>
<td>Shri N. Deha</td>
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<tr>
<td>Shri Khagen Ch. Das</td>
</tr>
<tr>
<td>Shri Bhabalu Boro</td>
</tr>
<tr>
<td>Shri Jai Ram Prasad</td>
</tr>
<tr>
<td>Ms. Godhuli Mondal</td>
</tr>
<tr>
<td>Ms. Mina Rani Bahadur</td>
</tr>
<tr>
<td>Ms. Mina Biswas</td>
</tr>
<tr>
<td>Ms. B. Balmiki</td>
</tr>
<tr>
<td>Shri K.C. Malakar</td>
</tr>
<tr>
<td>Shri H.P. Bhanja</td>
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<tr>
<td>Shri T. Ghosh</td>
</tr>
<tr>
<td>Shri Sankar Bose</td>
</tr>
<tr>
<td>Shri Muktipada Das</td>
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<tr>
<td>Shri Harban Kumar</td>
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<tr>
<td>Shri Man Bahadur</td>
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<tr>
<td>Shri Bhaskar Sardar</td>
</tr>
<tr>
<td>Shri Pasupati Ghosh</td>
</tr>
<tr>
<td>Shri Jagdish Balmiki</td>
</tr>
<tr>
<td>Shri S. Banerjee</td>
</tr>
<tr>
<td>Shri Sibu Lal Das</td>
</tr>
<tr>
<td>Shri S.C. Sadhukhan</td>
</tr>
<tr>
<td>Shri Dipak Chakraborty</td>
</tr>
<tr>
<td>Shri Biswanath Bose</td>
</tr>
<tr>
<td>Shri Ananta Kr. Bhanja</td>
</tr>
<tr>
<td>Shri Rabi Kr. Sardar</td>
</tr>
<tr>
<td>Shri Lal Bahadur</td>
</tr>
<tr>
<td>Shri Dilip Kr. Das</td>
</tr>
<tr>
<td>Ms. B. Sakuntala</td>
</tr>
<tr>
<td>Shri Mohan Lal Sarkar</td>
</tr>
<tr>
<td>Ms. Hemlata Halder</td>
</tr>
<tr>
<td>Shri Balkishen Balmiki</td>
</tr>
</tbody>
</table>
Shri Gour Gharami
Shri M. Mari
Shri Satya Prakash
Shri Ganesh Bhanja
Smt. N.K. Chaki
Shri S. Salda
Shri M.C. Gharami
Shri C. Muniappa
Shri T.K. Halder
Shri Ganesh Chandra Burman
Shri R. Rajendran

Smt. Suvar Chakraborty
Shri Kamlesh Kumar
Shri Ranjit Kumar Roy
Shri M.C. Das
Shri P.N. Rao
Shri Sitaram Nisad
Shri M. Pannappa
Shri K. Mohanan
Shri Bablu Mondal
Sk. Abdullah
Ms. Sibanl Roy
The following members of staff were promoted on recommendation of the Assessment Committee/Departmental Promotion Committee during the period April 1993 to March 1994.

<table>
<thead>
<tr>
<th>Name</th>
<th>Designation</th>
<th>Promoted to</th>
<th>With effect from</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shri J.C. Patra</td>
<td>Senior Clerk</td>
<td>Assistant</td>
<td>20.1.1994</td>
</tr>
<tr>
<td>Shri K. Prasad</td>
<td>Senior Clerk</td>
<td>Assistant</td>
<td>18.2.1994</td>
</tr>
<tr>
<td>Shri P. Lahiri</td>
<td>Junior Clerk</td>
<td>Senior Clerk</td>
<td>21.1.1994</td>
</tr>
<tr>
<td>Shri P.K. Dutta</td>
<td>Junior Clerk</td>
<td>Senior Clerk</td>
<td>18.2.1994</td>
</tr>
<tr>
<td>Shri B.K. Das</td>
<td>Junior Clerk</td>
<td>Senior Clerk</td>
<td>18.2.1994</td>
</tr>
<tr>
<td>Shri A.R. Majumder</td>
<td>T-5</td>
<td>T-6</td>
<td>19.2.1994</td>
</tr>
<tr>
<td>Shri M.P. Singh</td>
<td>T-II-3</td>
<td>T-4</td>
<td>1.1.1993</td>
</tr>
<tr>
<td>Shri B.K. Biswas</td>
<td>T-II-3</td>
<td>T-4</td>
<td>1.1.1993</td>
</tr>
<tr>
<td>Shri D.K. Biswas</td>
<td>T-II-3</td>
<td>T-4</td>
<td>1.1.1993</td>
</tr>
<tr>
<td>Shri S.K. Srivastava</td>
<td>T-II-3</td>
<td>T-4</td>
<td>1.1.1993</td>
</tr>
<tr>
<td>Smt. Keya Saha</td>
<td>T-II-3</td>
<td>T-4</td>
<td>1.1.1993</td>
</tr>
<tr>
<td>Shri H.C. Banik</td>
<td>T-II-3</td>
<td>T-4</td>
<td>1.1.1993</td>
</tr>
<tr>
<td>Shri G.C. Pramanick</td>
<td>SSG I</td>
<td>SSG II</td>
<td>1.11.1993</td>
</tr>
<tr>
<td>Shri S.C. Roy</td>
<td>Supdt.</td>
<td>AAO</td>
<td>30.8.1993</td>
</tr>
<tr>
<td>Shri Ranjit Kumar Ghosh</td>
<td>Senior Clerk</td>
<td>Supdt. (A&amp;A)</td>
<td>30.8.1993</td>
</tr>
<tr>
<td>Shri A. Murugesan</td>
<td>SSG II</td>
<td>SSG III</td>
<td>12.7.1993</td>
</tr>
<tr>
<td>Shri A.L. Yadav</td>
<td>SSG II</td>
<td>SSG III</td>
<td>18.2.1994</td>
</tr>
<tr>
<td>Shri K. Dharma Rajju</td>
<td>SSG II</td>
<td>SSG III</td>
<td>2.2.1994</td>
</tr>
<tr>
<td>Shri R.U. Moochi</td>
<td>SSG I</td>
<td>SSG II</td>
<td>12.7.1993</td>
</tr>
<tr>
<td>Shri S.C. Balmiki</td>
<td>SSG III</td>
<td>SSG IV</td>
<td>1.4.1993</td>
</tr>
<tr>
<td>Shri Gulab Shaw</td>
<td>SSG II</td>
<td>SSG III</td>
<td>1.4.1993</td>
</tr>
<tr>
<td>Shri G.J. Runadala</td>
<td>SSG I</td>
<td>SSG II</td>
<td>1.4.1993</td>
</tr>
<tr>
<td>Shri Umesh Choudhury</td>
<td>SSG I</td>
<td>SSG II</td>
<td>31.1.1994</td>
</tr>
<tr>
<td>Shri U. Satyanarayan</td>
<td>SSG II</td>
<td>SSG II</td>
<td>24.2.1994</td>
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</table>

The following members were granted **merit increments/stagnation increments** as below on the recommendation of the Assessment Committee.

<table>
<thead>
<tr>
<th>Name</th>
<th>Designation</th>
<th>Merit increment</th>
<th>With effect from</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shri R.C. Satpathi</td>
<td>T-5</td>
<td>One</td>
<td>1.1.1993</td>
</tr>
<tr>
<td>Shri Ranjit Tiwari</td>
<td>T-II-3</td>
<td>Two</td>
<td>1.1.1993</td>
</tr>
<tr>
<td>Shri T. Chatterjee</td>
<td>T-II-3</td>
<td>One</td>
<td>1.1.1993</td>
</tr>
<tr>
<td>Smt. Anjali De</td>
<td>T-5</td>
<td>One</td>
<td>1.7.1992</td>
</tr>
</tbody>
</table>
### Retirement during the period

<table>
<thead>
<tr>
<th>Name</th>
<th>Designation</th>
<th>Date of retirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. M.D. Pisolkar</td>
<td>Scientist (SG)</td>
<td>31.8.1993</td>
</tr>
<tr>
<td>Shri J.B. Rao</td>
<td>Scientist (SG)</td>
<td>31.1.1994 (AN)</td>
</tr>
<tr>
<td>Smt. Bani Roy</td>
<td>Assistant</td>
<td>31.1.1994 (AN)</td>
</tr>
<tr>
<td>Shri B.B. Mukherjee</td>
<td>Senior Clerk</td>
<td>31.1.1994 (AN)</td>
</tr>
<tr>
<td>Shri S.P. Sastry</td>
<td>Assistant</td>
<td>31.12.1993 (AN)</td>
</tr>
<tr>
<td>Shri S. Dasgupta</td>
<td>Assistant</td>
<td>31.12.1993 (AN)</td>
</tr>
<tr>
<td>Shri K.P. Srivastava</td>
<td>Scientist (SG)</td>
<td>31.3.1994 (AN)</td>
</tr>
<tr>
<td>Shri Parmeshwar</td>
<td>SSG II</td>
<td>20.10.1993 (AN)</td>
</tr>
<tr>
<td>Shri S.K. Sarkar</td>
<td>Scientist (SG)</td>
<td>31.1.1994 (AN)</td>
</tr>
<tr>
<td>Shri Munshi Ram Balmiki</td>
<td>SSG III</td>
<td>30.6.1993 (AN)</td>
</tr>
<tr>
<td>Shri R.K. Saxena</td>
<td>Scientist (SG)</td>
<td>31.7.1993 (AN)</td>
</tr>
<tr>
<td>Shri N.K. Sarkar</td>
<td>AAO</td>
<td>30.4.1993 (AN)</td>
</tr>
<tr>
<td>Shri J.L. Bose</td>
<td>T-2</td>
<td>31.8.1993</td>
</tr>
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### Resignation

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<tr>
<td>Shri Sunder Singh</td>
<td>Driver</td>
<td>3.6.1993</td>
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<tr>
<td>Shri P. Sampathu</td>
<td>SSG I</td>
<td>19.1.1993 (FN)</td>
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</table>

### Appointments

Following appointments were made during the period

<table>
<thead>
<tr>
<th>Name</th>
<th>Designation</th>
<th>Place of posting</th>
<th>Date of appointment</th>
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</thead>
<tbody>
<tr>
<td>Shri A.C. Ghosh</td>
<td>Sr.A.O</td>
<td>Barrackpore</td>
<td>31.5.1993</td>
</tr>
<tr>
<td>Shri Ram Sajwan</td>
<td>Driver</td>
<td>Allahabad</td>
<td>12.11.1993</td>
</tr>
<tr>
<td>Shri S. Manoharan</td>
<td>T-4</td>
<td>Coimbatore</td>
<td>4.6.1993</td>
</tr>
<tr>
<td>Miss K. Jacqueline</td>
<td>T-II-3</td>
<td>Barrackpore</td>
<td>29.4.1993</td>
</tr>
<tr>
<td>Shri Neeraj Swrup</td>
<td>T-II-3</td>
<td>Agra</td>
<td>6.9.1993</td>
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The following transfers were made during the period April 1993 to March 1994.

<table>
<thead>
<tr>
<th>Name</th>
<th>Designation</th>
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<th>To</th>
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<tbody>
<tr>
<td>Dr. Ardhendu Mukherjee</td>
<td>Senior Scientist</td>
<td>Barrackpore</td>
<td>Malda</td>
</tr>
<tr>
<td>Dr. Amitabha Ghosh</td>
<td>Senior Scientist</td>
<td>Barrackpore</td>
<td>Malda</td>
</tr>
<tr>
<td>Shri K.P. Ram</td>
<td>SSG I</td>
<td>Patna</td>
<td>Farakka</td>
</tr>
<tr>
<td>Shri Lakshmi Ram</td>
<td>SSG II</td>
<td>Patna</td>
<td>Farakka</td>
</tr>
<tr>
<td>Shri A.R. Choudhury</td>
<td>Scientist</td>
<td>Farakka</td>
<td>Malda</td>
</tr>
<tr>
<td>Shri T. Chatterjee</td>
<td>T-II-3</td>
<td>Barrackpore</td>
<td>Malda</td>
</tr>
<tr>
<td>Shri S. Sarkar</td>
<td>Junior Clerk</td>
<td>Farakka</td>
<td>Malda</td>
</tr>
<tr>
<td>Shri R.L. Tiar</td>
<td>SSG III</td>
<td>Farakka</td>
<td>Malda</td>
</tr>
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<td>Shri M.P. Bind</td>
<td>SSG II</td>
<td>Farakka</td>
<td>Malda</td>
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<tr>
<td>Shri B.N. Mondal</td>
<td>SSG II</td>
<td>Farakka</td>
<td>Malda</td>
</tr>
<tr>
<td>Shri D. Sahani</td>
<td>SSG II</td>
<td>Farakka</td>
<td>Malda</td>
</tr>
<tr>
<td>Shri Dipak Chakraborty</td>
<td>SSG I</td>
<td>Farakka</td>
<td>Malda</td>
</tr>
<tr>
<td>Smt. Sikha Majumder</td>
<td>Senior Clerk</td>
<td>Barrackpore</td>
<td>Saltlake</td>
</tr>
<tr>
<td>Shri S.P. Mondal</td>
<td>Junior Clerk</td>
<td>Saltlake</td>
<td>Barrackpore</td>
</tr>
<tr>
<td>Shri A.B. Mukherjee</td>
<td>Principal Scientist</td>
<td>Saltlake</td>
<td>Barrackpore</td>
</tr>
<tr>
<td>Shri J.R. Verma</td>
<td>F &amp; AO</td>
<td>Barrackpore</td>
<td>ICAR HQ.</td>
</tr>
<tr>
<td>Dr. Y.S. Yadava</td>
<td>Senior Scientist</td>
<td>Barrackpore</td>
<td>NECS Shillong</td>
</tr>
<tr>
<td>Shri C.K. Pandey</td>
<td>Junior Clerk</td>
<td>Canning</td>
<td>Barrackpore</td>
</tr>
<tr>
<td>Shri Gunadhar Dhibar</td>
<td>SSG II</td>
<td>Digha</td>
<td>Uluberia</td>
</tr>
<tr>
<td>Shri N. Rajak</td>
<td>SSG I</td>
<td>Patna</td>
<td>Allahabad</td>
</tr>
<tr>
<td>Dr. P.K. Pandit</td>
<td>Senior Scientist</td>
<td>Barrackpore</td>
<td>Saltlake</td>
</tr>
<tr>
<td>Shri R.R. Mukherjee</td>
<td>T-5</td>
<td>Bangalore</td>
<td>Barrackpore</td>
</tr>
<tr>
<td>Shri Suresh Kumar</td>
<td>SSG I</td>
<td>Agra</td>
<td>Allahabad</td>
</tr>
<tr>
<td>Shri Subhendu Mandal</td>
<td>Boat Driver</td>
<td>Canning</td>
<td>Barrackpore</td>
</tr>
</tbody>
</table>
APPENDIX-I

Statement showing the total number of employees in the CIFRI, Barrackpore pertaining to the employees under Scheduled Castes and Scheduled Tribes categories. (Period from 1.4.1993 to 31.3.1994)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Class of Posts</th>
<th>Total No. of posts sanctioned</th>
<th>Total No. of employees in position</th>
<th>Total No. of Sch. castes among them</th>
<th>Total No. of Sch. Tribes among them</th>
<th>% of total employees</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. SCIENTIFIC POSTS</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Experimental Scientist</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Scientist</td>
<td>*85</td>
<td>**49</td>
<td>2</td>
<td>4.08%</td>
<td>-</td>
<td>*This includes 2(two) Scientists. Sanctioned under C.S.S. on Inland Fisheries Statistics.</td>
</tr>
<tr>
<td></td>
<td>Sr. Scientist</td>
<td>10</td>
<td>15</td>
<td>1</td>
<td>6.66%</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pr. Scientist</td>
<td>7</td>
<td>9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RMP Scientist</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td></td>
<td><strong>103</strong></td>
<td><strong>74</strong></td>
<td><strong>3</strong></td>
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</tr>
<tr>
<td>2. TECHNICAL POSTS</td>
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<tr>
<td></td>
<td>Category-I</td>
<td>34</td>
<td>31</td>
<td>7</td>
<td>22.58%</td>
<td>1</td>
<td>3.22%</td>
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<tr>
<td></td>
<td>Category-II</td>
<td>*52</td>
<td>49</td>
<td>10</td>
<td>20.40%</td>
<td>2</td>
<td>4.08%</td>
</tr>
<tr>
<td></td>
<td>Category-III</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>100</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><strong>89</strong></td>
<td><strong>81</strong></td>
<td><strong>18</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

** These includes Scientist in the pay scale of Rs. 2200-4000, Scientist (Sr. Scale) in the pay scale of Rs. 3000-5000 and Scientist (Selection Grade) in the pay scale of Rs. 3700-5700.
### 3. ADMINISTRATIVE POSTS

<table>
<thead>
<tr>
<th>Post Type</th>
<th>Sr. A.Os/A.Os/Accounts Officer etc.</th>
<th>AAOs/Supdt.(A/cs)/Supdt.</th>
<th>Hindi Officer/S.C./Jr. Analyst/Desk Officer</th>
<th>Assistants</th>
<th>Stenographers(Sr. &amp; Jr.)</th>
<th>Sr. Clerks/U.D.Cs</th>
<th>Jr. Clerks/Hindi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>*16</td>
<td>*7</td>
<td>28</td>
<td>44</td>
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<tr>
<td></td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>14</td>
<td>6</td>
<td>26</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>33.33%</td>
<td>28.57%</td>
<td>33.33%</td>
<td>30.77%</td>
<td>20.51%</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>203</strong></td>
<td><strong>90</strong></td>
<td><strong>23</strong></td>
<td><strong>103</strong></td>
<td><strong>91</strong></td>
<td><strong>22</strong></td>
<td><strong>39</strong></td>
</tr>
<tr>
<td></td>
<td><strong>24.18%</strong></td>
<td><strong>17.14%</strong></td>
<td><strong>6.25%</strong></td>
<td><strong>4.40%</strong></td>
<td><strong>1.85%</strong></td>
<td><strong>7.69%</strong></td>
<td><strong>16.67%</strong></td>
</tr>
</tbody>
</table>

*This includes 1(one) Assistant, 1(one) Stenographer and 1(one) Jr. Clerk posts under C.S.S.

### 4. SUPPORTING STAFF

<table>
<thead>
<tr>
<th>Grade</th>
<th>*99</th>
<th>91</th>
<th>22</th>
<th>24.18%</th>
<th>4</th>
<th>4.40%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>54</td>
<td>54</td>
<td>17</td>
<td>31.48%</td>
<td>1</td>
<td>1.85%</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>26</td>
<td>8</td>
<td>30.77%</td>
<td>2</td>
<td>7.69%</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>12</td>
<td>6</td>
<td>50%</td>
<td>2</td>
<td>16.67%</td>
</tr>
</tbody>
</table>

*This includes 1(one) SG.I post sanctioned under C.S.S.

### 5. SUPPORTING STAFF

(SAFAIWALA)

<table>
<thead>
<tr>
<th>13</th>
<th>13</th>
<th>0</th>
<th>69.23%</th>
</tr>
</thead>
<tbody>
<tr>
<td>204</td>
<td>108</td>
<td>62</td>
<td>9</td>
</tr>
</tbody>
</table>

### 6. AUXILIARY POSTS

| 45 | 32 | 7 | 21.88% | 2 | 6.25% |

*This includes 1(one)

| Note: The other posts available may also please be shown in the respective class of posts mentioned above and the posts, if any, do not come under the above mentioned categories may be shown separately. |
CENTRAL INLAND CAPTURE FISHERIES RESEARCH INSTITUTE
(I.C.A.R.) : BARRACKPORE : WEST BENGAL

Address List of Research/Survey Centres

Central Inland Capture Fisheries
Research Institute,
Barrackpore - 743 101, West Bengal

Telegram/Telephone/
Telz/FAX/E - Mail
Cable: FISHSEARCH
Tele : (033) 5561190 5561191
Telex : 021 8552 CIFI IN
Fax: (033) 5560388
E- Mail - CICFRI @ 400. nlcgw. nic. in

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24, Pannalal Road,
Allahabad - 211 002,
Uttar Pradesh

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Telz/FAX/E - Mail
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Tele : (0532) 600531

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Bhangagarh-Rajagarh Road ,
(Opp. UCO Bank), Guwahati 781 005

Reservoir Division of CIFRI,
No. 22 (Old No. 1031-C & D),
80 ft. Road, 1st Main, IV Block
Rajajinagar, Bangalore - 560 010

Telex : (0361) 548757

Coimbatore Research Centre of CIFRI,
No. 68, Rajunaidu Road,
Tatabad,
Coimbatore - 641 012

Cable: FISHSEARCH

Contd......
Alappuzha Research Centre of CIFRI  
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Near Vazhicherry Bridge,  
Alappuzha - 688 001,  
Kerala

Eluru Research Centre of CIFRI,  
24-B/10-53 Panugantivari Street,  
P. O. RAMACHANDRAPURAM,  
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ELURU - 534 002 A. P.

Karnal Research Centre of CIFRI,  
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Karnal-132 001, Haryana

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Opp. PWD Guest House, Kothi Bazar,  
Hoshangabad - 461 001, M.P.

Calcutta Research Centre of CIFRI,  
M. S. O. Building (2nd Floor 'C'),  
DF Block, Salt Lake City,  
Calcutta 700 064.

Vadodara Research Centre of CIFRI,  
(Opp. Bhirnath Mahadev Temple),  
Sayajigunj, Vadodara 781 005

Maldah Research Centre of CIFRI  
House of Sri S. K. Pal, Subhas Pally  
Station Road, Maldah, West Bengal.
Lalgola Survey Centre of CIFRI,
Lalgola - 742148, Dist. Murshidabad,
West Bengal.

Canning Survey Centre of CIFRI,
R.N. Tagore Road, Canning - 743329,
West Bengal.

Diamond Harbour Survey Centre of CIFRI,
House of Bidhu Bhushan Bhuyan,
New Madhavpur, P.O. Diamond Harbour,
Dist. 24 Parganas (South), West Bengal.

Uluberia Survey Centre of CIFRI,
Uluberia, Dist. Howrah,
West Bengal.

Krishi Vigyan Kendra of CIFRI,
Kakdwip, 24 Parganas (S)
West Bengal.
CENTRAL INLAND CAPTURE FISHERIES RESEARCH INSTITUTE
BARRACKPORE - 743 101, WEST BENGAL

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- Extension Section

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- Audit Section
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