



1993-94
वार्षिक प्रतिवेदन
ANNUAL REPORT



केन्द्रीय अंतस्थलीय प्रग्रहण मात्स्यकी अनुसंधान संस्थान • बैरकपुर

CENTRAL INLAND CAPTURE FISHERIES RESEARCH INSTITUTE • BARRACKPORE

वार्षिक प्रतिवेदन 1993-94

हिन्दी खण्ड

संपादक : विश्व रमण प्रसाद सिन्हा
बकिम चन्द्र झा
पी. आर. राव

सामग्री कम्पोजिंग/ : मो. कासिम
लेजर प्रिंटिंग

केन्द्रीय अंतर्स्थलीय प्रग्रहण मात्स्यकी अनुसंधान संस्थान
(भारतीय कृषि अनुसंधान परिषद्)
बैरकपुर: पश्चिम बंगाल

1.	निदेशक के कक्ष से	i
2.	संक्षिप्त इतिहास	1
3.	संस्थान के उद्देश्य	3
4.	संगठन	4
5.	मुख्य उपलब्धियाँ	4
	5.1 पर्यावरणीय अनुमापन एवम् मत्स्यकीय संसाधन	4
	5.2 गंगा तल क्षेत्र के झीलों में 'पेन' प्रणाली द्वारा झींगा मछली का उत्पादन	5
6.	मुख्य घटनाएँ	6
	6.1 कृषि विज्ञान केन्द्र में किसानों के लिए प्रशिक्षण कार्यक्रम	6
7.	हिन्दी सप्ताह	6
8.	मुख्य बैठकें	6
9.	अनुसंधान कार्य में सहयोग	7
10.	परामर्शक सेवाएँ	7

11.	प्रौद्योगिकी हस्तांतरण	8
11.1	प्रसार एवम् राष्ट्र निर्माण	8
11.2	प्रसार शिक्षा में शोध कार्य	8
11.3	प्रशिक्षण	8
11.4	मत्स्य पालक दिवस	8
11.5	प्रदर्शनी	8
12.	कृषि विज्ञान केन्द्र	9
13.	पुस्तकालय एवम् प्रलेखन सेवाएँ	9

निदेशक के कक्ष से

जैसा कि मैं 1992-93 के वार्षिक प्रतिवेदन में आपको सूचित कर चुका हूँ कि अपरिहार्य कारणों से वर्ष 1993-94 का प्रतिवेदन पहले नहीं प्रकाशित हो पाया। इसे देर से प्रकाशित होने का हमें खेद है।

इस वर्ष के दौरान 'केन्द्रीय अंतर्स्थलीय प्रग्रहण मत्स्यकी अनुसंधान संस्थान' बैरकपुर, पश्चिम बंगाल ने अपने उद्देश्य प्राप्त की दिशा में कई महत्वपूर्ण कदम बढ़ाये हैं। मुझे खुशी है कि इस संस्थान के वैज्ञानिकों ने समय के जरूरत को समझते हुए प्रकृतिजन्य जल संसाधनों के वास्तविक स्वरूप को बनाये रखने के लिए सम्योचित कदम उठाया है।

आज हमारा लक्ष्य है 'संरक्षण' और इसलिए हम गंगा नदी के साथ-साथ इसकी सहायक नदियों के पारिस्थितिकी का विस्तृत अध्ययन कर रहे हैं एवम् मुझे आशा ही नहीं पूर्ण विश्वास है कि जल्द ही इनकी संरक्षणता के लिए ठोस प्रस्ताव लेकर देश के सामने आयेगे। इसी तरह फरक्का बाँध के प्रभाव स्वरूप जो हिल्सा मछली की कमी गंगा नदी के ऊपरी भाग में आयी है उसकी पुर्नस्थापना कार्य में भी हम जुटे हैं। हुगली नदी का मुहाना देश का सबसे बड़ा ज्वारनदमुख है एवम् इस क्षेत्र में व्याप्त मैन्ग्रोव जंगल का विशेष महत्व है अतः हम अपने शोध द्वारा इसके संरक्षणता की ओर ध्यान दे रहे हैं। गंगा एवं बहापुत्र तल क्षेत्रों में उपस्थित प्राकृतिक झील अति महत्वपूर्ण संसाधन हैं। इनमें लाखों प्रकार के वनस्पति एवम् जन्तुओं का वास है जो हमारी राष्ट्रीय धरोहर हैं। हमारा प्रयास है कि इनकी पारिस्थितिकी को अच्छी तरह समझकर इनसे संतुलित मछली की पैदावार ली जाय ताकि ये जैविक विविधता के खजाने को बनाये रखें।

यों तो हमारे अनुसंधान का मुख्य लक्ष्य अधिक से अधिक मत्स्य का उत्पादन है ताकि हम देश को 'नील क्रांति' से परिचय करा सकें। लेकिन ऐसे विकास का क्या अर्थ होगा जब हमारे जल संसाधनों का स्वरूप ही विकृत हो जायगा एवम् विरासत में मिली वनस्पति एवं जन्तुओं की विविधता को हम सदा के लिए खो देंगे? अतः अब समय आ गया है कि हमारे दृष्टिकोण में आवश्यक बदलाव आये। कुछ वर्ष पहले तक हमारा नारा था 'उत्पादन बढ़ाएँ'। तब शायद समय की यही माँग थी। इस प्रक्रिया में हम इतने मशरूफ हो गये कि हमारे जल संसाधनों के पारिस्थितिकी में तेजी से हो रहे बदलाव की ओर हम उचित ध्यान नहीं दे पाए, लेकिन अब हमें अपनी सोच बदलनी होगी। पर्यावरण के साथ अत्यधिक

छेड़ छाड़ घातक सिद्ध हो रहा है । अतः मैं समझता हूँ कि आज के संदर्भ में हमारा लक्ष्य प्राकृतिक वरदानों का पूर्ण संरक्षण एवम् सही विकास होना चाहिए । यह तब संभव होगा जब हमारा नारा होगा 'संसाधन बचाओ, उपज बढ़ाओ' ।

इस संस्थान के वैज्ञानिक साथियों की तरफ से मैं आपको आश्वासन देना चाहता हूँ कि अब हम इस दिशा में मत्स्य प्रबन्धन के नये आयाम लेकर यथाशीघ्र आपके समक्ष होंगे ।

आशा है यह वार्षिक प्रतिवेदन आप पसन्द करेंगे ।

शुभकामनाओं के साथ,

विश्व रमण प्रसाद सिन्हा

1 अगस्त, 1995

वार्षिक प्रतिवेदन 1993-94

केन्द्रीय अंतर्स्थलीय प्रग्रहण मात्स्यकी अनुसंधान संस्थान
(भा. कृ. अनु. प.) : बैरकपुर : पश्चिम बंगाल

संक्षिप्त इतिहास

केन्द्रीय अंतर्स्थलीय प्रग्रहण मात्स्यकी अनुसंधान संस्थान मात्स्यकी शोध एवं प्रबन्ध में अग्रणीय स्थान रखता है। यह संस्थान अब अपने स्थापना के 47वें वर्ष में प्रवेश कर चुका है। इसकी स्थापना 17 मार्च 1947 को कलकत्ता में 'केन्द्रीय अंतर्स्थलीय मत्स्य अनुसंधान केन्द्र' के रूप में भारत सरकार के खाद्य एवम् कृषि मंत्रालय के अंतर्गत हुई थी। यह भारत सरकार के 1943 के उस ज्ञापन का परिणाम था जिसमें मात्स्यकीय संसाधनों के विकास पर अविलम्ब कार्यवाही करने पर बल दिया गया था। तदुपरान्त, कृषि, वानिकी तथा मात्स्यकीय से सम्बन्धित उप-समिति ने इसका जोरदार शब्दों में अनुमोदन किया था।

इस संस्थान के छोटे से इतिहास काल में कई महत्वपूर्ण पड़ाव आये। सबसे पहला पड़ाव था वर्ष 1959 का जब कलकत्ता में स्थित 'अनुसंधान केन्द्र' को 'अनुसंधान संस्थान' का पूर्ण दर्जा प्राप्त हुआ एवं बैरकपुर में हुगली नदी के तट पर नवनिर्मित भव्य भवन तथा मनोरम परिवेश में इसका स्थानांतरण हुआ।

इस संस्थान के इतिहास में दूसरा महत्वपूर्ण पड़ाव था वर्ष 1967 का जब यह संस्थान भारतीय कृषि अनुसंधान परिषद् का विधिवत् सदस्य बना और इस प्रकार मात्स्यकीय शोध कार्यों को सही मान्यता एवम् अधिक स्वायत्तता प्राप्त हुआ।

1970 का दशक इस संस्थान के इतिहास में अत्यंत ही फलदायी एवम् गौरवशाली रहा है। 1971 में शुरू हुए चार अतिविशिष्ट और समयोचित समन्वित राष्ट्रीय परियोजनाओं ने मात्स्यकीय अनुसंधान को नई दिशा ही नहीं दिया अपितु समुचित जागृति का भी सृजन किया। ये परियोजनाएँ थी 'मिश्रित मत्स्य पालन', 'नदीय मत्स्य बीज संचयन', 'वायु श्वासी मत्स्य पालन' और 'जलाशय पारिस्थितिकी का अध्ययन एवं प्रबन्धन' एक ओर समन्वित राष्ट्रीय परियोजना 1973 में 'खारा जल मत्स्य पालन' के नाम से की गयी थी। सन् 1974 में प्रथम दो परियोजनाओं का एकीकरण होकर 'मिश्रित मत्स्य पालन एवम् मत्स्य बीज उत्पादन' हो गया। मत्स्य पालन के उपयोगिता को समझते हुए भारतीय कृषि अनुसंधान परिषद् ने 1977 में 'मीठा जल जीव पालन अनुसंधान एवम् प्रशिक्षण केन्द्र' की स्थापना धौली, उड़िसा में किया, जिसने बाद में चलकर संस्थान का दर्जा हासिल किया। मिश्रित मत्स्य पालन एवं मत्स्य बीज उत्पादन परियोजना ने विशेषकर, मत्स्य अनुसंधान एवं उत्पादन में आशातित सफलता हासिल किया और

इस प्रकार मत्स्यकीय उत्पादन के अम्बर में एक नये क्षितिज का उदय हुआ । लोगों में मत्स्य पालन के प्रति सही चेतना के साथ-साथ कृषि के इस आयाम के प्रति विश्वास का भी जागरण हुआ और इस प्रकार मत्स्य पालन ने एक आन्दोलन का रूप ले लिया और यही कारण है कि आज हम इसे उद्योग के रूप में देख रहे हैं ।

संस्थान के इतिहास ने एक और करवट लिया । वर्ष 1985 में जब इस संस्थान ने तीन नये मत्स्यकीय अनुसंधान संस्थानों को जन्म दिया और वे हैं:— केन्द्रीय मीठा जल जीव पालन अनुसंधान संस्थान, धौली, उड़िसा, केन्द्रीय खारा पानी जलजन्तु पालन अनुसंधान संस्थान, मद्रास एवं राष्ट्रीय शीतजल मत्स्यकीय अनुसंधान केन्द्र, हल्दवानी । अप्रैल, 1987 को इस संस्थान का पुनः नामकरण 'केन्द्रीय अंतर्स्थलीय प्रग्रहण मत्स्यकीय अनुसंधान संस्थान' हो गया एवं इसे उन्मुक्त जलीय संसाधनों में शोध का कार्यभार सौंपा गया ताकि इन संसाधनों का मत्स्यकीय प्रबन्धन पर्यावरण के अनुकूल हो सके और साथ ही इनका संरक्षण भी हो सके ।

प्रारम्भ से ही संस्थान के शोध कार्यक्रम का प्रमुख उद्देश्य था मत्स्यकी संसाधनों का सही मूल्यांकन, उचित संरक्षण तथा उद्देश्यपूर्ण उपयोग । अतः इस संस्थान ने अपने शोध कार्यक्रमों का मात्र निर्वाह ही नहीं किया अपितु कई कीर्तिमान भी स्थापित किए । विभिन्न प्रकार के जलीय संसाधनों जैसे कि नदी, जलाशय, झील, पोखर, तालाब, ज्वारनदमुख आदि के पारिस्थितिकी के गुणधर्मों को सुलझाने के सार्थक प्रयास के साथ-साथ मत्स्य उत्पादन और प्रग्रहण प्रक्रियाओं में भी समुचित सुधार लाया है । इस संस्थान ने जलीय पर्यावरण का भी गहन अध्ययन एवं शोध किया है ताकि 'जैविक विविधता' के स्तर को बनाये रखने के उपाय खोजे जा सकें और स्वस्थ मछलियों का उत्पादन हो सके ।

इस संस्थान द्वारा किये गये ठोस अनुसंधान का ही परिणाम है कि आज देश के समक्ष कई महत्वपूर्ण तकनीकी एवं प्रबन्धन प्रणालियाँ उपलब्ध हैं जो निम्न हैं:—

- 1) नदीय संसाधनों से मत्स्य बीज संचयन प्रणाली ।
- 2) मत्स्य बीज परिवहन सम्बन्धित तकनीक ।
- 3) कार्प मछलियों का प्रेरित प्रजनन एवं नर्सरी प्रबन्धन प्रणाली ।
- 4) चाइनिज कार्प का बंध प्रजनन विधि ।
- 5) जलीय अपतृणों का नियंत्रण विधि ।
- 6) मिश्रित मत्स्य पालन प्रणाली ।
- 7) वायु-श्वसी मछलियों का उत्पादन प्रणाली ।

- 8) छोटे जलाशयों में मत्स्यकीय प्रबन्धन ।
- 9) खारा जल में मत्स्य पालन प्रणाली
- 10) घोंघा उत्पादन प्रणाली ।

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

संस्थान के उद्देश्य

इस संस्थान के निम्नलिखित मुख्य उद्देश्य हैं:-

- 1) अंतर्स्थलीय जलीय संसाधनों में मत्स्य समुदाय की संख्या एवम् प्रकार पर शोध कर समुचित प्रबन्धन प्रणाली का विकास तथा उत्पादन में वृद्धि ।
- 2) मत्स्यकीय जल संसाधनों में विभिन्न प्रकार के जीव-जन्तुओं का प्रभाव पर शोध द्वारा उचित वैज्ञानिक प्रणाली का विकास कर इनका संरक्षण और प्रबन्धन ।
- 3) नदी-घाटी परियोजनाओं का नदी तल क्षेत्र एवं जलाशयों के पारिस्थितिकी पर विपरीत प्रभाव का समुचित अध्ययन तथा इनके प्रबन्धन के लिए उचित वैज्ञानिक पद्धति का विकास ।
- 4) अंतर्स्थलीय मत्स्यकीय से सम्बन्धित आँकड़ों का क्रम-बद्ध संचयन एवम् प्रसार ।
- 5) मत्स्यकीय शिक्षा, प्रशिक्षण एवम् प्रसार कार्यक्रमों का आयोजन ।
- 6) मत्स्य प्रग्रहण तथा उत्पादन, जलीय प्रदूषण, संरक्षण आदि पर परामर्शक सेवाएँ ।

संगठन

उपरोक्त उद्देश्यों की प्राप्ति हेतु संस्थान के अनुसंधान कार्यक्रम देश के प्रमुख मत्स्यकी संसाधनों के अनुरूप सात प्रभागों के अंतर्गत रखा गया है। नदीय मत्स्यकी प्रभाग, अपने इलाहाबाद स्थित मुख्यालय से देश के प्रमुख नदियों में पर्यावरण संरक्षण को सर्वोपरि मान कर शोध कार्य कर रहा है ताकि एक समान प्रबन्धन प्रणाली का विकास हो सके। नदीय प्रभाग के तत्काल परियोजनाओं में गंगा, यमुना, ब्रह्मपुत्र, नर्मदा एवम् इसकी सहायक नदियाँ आती हैं। जलाशय मत्स्यकी प्रभाग का मुख्यालय बंगलोर में है एवम् इसके केन्द्र तमिलनाडु, आन्ध्र प्रदेश, मध्य प्रदेश, हिमाचल प्रदेश तथा उत्तर प्रदेश में स्थित हैं। यह प्रभाग जलाशयों की पारिस्थितिकी का अध्ययन कर संसाधनों से मत्स्य उत्पादन के लिए उचित प्रबन्धन प्रणाली विकसित करता है। बैरकपुर स्थित ज्वारनदमुखी मत्स्यकी प्रभाग देश के सबसे बड़े खारा जल प्रवाह हुगली-मातलाह तंत्र के विभिन्न आयामों पर शोध कर रहा है। नर्मदा ज्वारनदमुख पर भी अनुसंधान कार्य इस प्रभाग के अंतर्गत होता है। पर्यावरण अनुमापन प्रभाग देश के विभिन्न जलीय संसाधनों में प्रदूषण की अवस्था एवम् जैविक विविधता पर पड़ने वाले इसके दुष्प्रभाव पर शोध का संचालन बैरकपुर मुख्यालय से करता है, साथ ही इसके उपचार के लिए भी दिशा निर्देश तैयार करता है। आर्द्र क्षेत्र प्रभाग का मुख्यालय बैरकपुर में स्थित है और यह गंगा तथा ब्रह्मपुत्र तल क्षेत्र के बाढ़ बहुल झीलों में पारिस्थितिकी का गहन अध्ययन कर इनके संरक्षण की दिशा में कार्यरत है साथ ही साथ इन जल संसाधनों में पल रहे जैविक विविधता के स्वरूप को यथास्थित बनाये रखकर मत्स्य उत्पादन में वृद्धि के लिए प्रबन्धन के नये प्रणालियों के विकास के लिए प्रयासरत है। हिल्सा मत्स्यकी प्रभाग, मालदह, हिल्सा मछली पर शोध कर रहा है एवम् प्रयास कर रहा है कि गंगा नदी में इसकी पुनःस्थापना हो सके। मत्स्य संसाधन मूल्यांकन प्रभाग, बैरकपुर मुख्यालय से देश के मत्स्य संसाधनों का मूल्यांकन, वर्गीकरण एवम् मत्स्य सांख्यिकी पर शोध कर के मत्स्य उत्पादन एवम् पालन के लिए नए आयामों को विकसित करने का प्रयास कर रहा है।

मुख्य उपलब्धियाँ

पर्यावरणीय अनुमापन एवं मत्स्यकीय संसाधन

इस कालावधि में संस्थान ने मत्स्य-परजीवी बैक्टिरिया एवम् अन्य जलीय प्राचालों के आधार पर हुगली ज्वारनदमुख एवम् इससे सम्बद्ध आर्द्र-क्षेत्र में पर्यावरणीय अनुमापन का कार्य किया एवम् कुछ ठोस आँकड़ें इकट्ठा किया। ऐसा देखा गया कि इस तल क्षेत्र के भेरियों का जल मत्स्य उत्पादन के प्रतिकूल नहीं है कारण अमोनिया (0.2-0.3/पी.पी.एम) को छोड़कर अन्य सारे जलीय प्राचाल सामान्य स्तर के थे। अमोनिया की अधिकता से मत्स्य समुदाय को कष्ट का सामना करना पड़ता है, कारण इसके दुष्प्रभाव से मछलियों के श्वास-तंत्र में दो प्रकार की बिमारियों को देखा गया— श्वास-तंत्र के निचले भाग में सूजन हो जाता है (डिस्टल हाईपरप्लेसिया) एवम् इसके ऊपरी सतह के तन्तुओं में अलगाव आ जाता है, लेकिन यह अवस्था गंदे जल प्रवाह वाले 'भेरियों' में ही अधिक पाया गया।

इस संदर्भ में कुछ विशेष भेरियों में सूक्ष्म परजीवी बैक्टीरिया का अध्ययन किया गया जो निम्न सारणी में उघृत है ।

संसाधन (धेरी)	हैटरोट्राफिक बैक्टीरिया	फॉसफेट सोल्यू- बिलाइजिंग बैक्टीरिया	एरोबिक नाइट्रोजन फिक्सींग बैक्टीरिया	इ-कोलाई	कोलीफॉर्म	मछली के मांस में (मिरगल) प्रति ग्राम
कल्याणी	7.0×10^2	2.6×10^2	-	-	3.4×10^4	3.1×10^3
कान्चताल्ला	2.5×10^2	3.7×10^3	1.2×10	-	3.3×10^3	8.6×10^4
मिनाखान	9.3×10^3	2.1×10^3	9.0×1	-	-	2.4×10^4

समुपयोजित मत्स्य संसाधनों की उपयोगिता

गंगा तल क्षेत्र के झीलों में 'पेन' प्रणाली द्वारा झींगा मछली का उद्देश्यपूर्ण उत्पादन

अकायपुर झील (स्थनीय भाषा में बील) में 'पेन' प्रणाली द्वारा झींगा मछली के उत्पादन में आशाकृत सफलता प्राप्त हुआ एवम् यह विधि एक ठोस प्रणाली के रूप में उभर कर सामने आया । इस वर्ष प्रयोग की पुनरावृत्ति की गई, उसमें 87 दिनों में प्रति झींगा के वजन में 82 प्रतिशत ग्राम की औसतन वृद्धि पाई गयी और 0.16 हेक्टर पेन क्षेत्र से 1373.76 कि. ग्राम प्रति हेक्टर की दर से बड़े झींगे (मेक्रोबेकियम रोजनबरजी) का उत्पादन प्राप्त किया गया । इस प्रयोग में एक निजी संस्था द्वारा आपूर्ति की गई मत्स्य आहार (17-20% प्रोटीन, 25-30%, कॉर्बोहाइड्रेट एवं फैट 9-11%) दिया गया । इस अनुसंधान से प्राप्त परिणामों से पता चला है कि इस विधि से वर्ष में तीन फसल लिए जा सकते हैं । 0.16 क्षेत्रफल पेन क्षेत्र में प्रतिवर्ष दो उपज के आधार पर बनाए गए आर्थिक विवरण से ज्ञात होता है कि वार्षिक स्थापना लागत 23,207 रु. तथा आवर्ती खर्च 9550 रु. होगी एवं फसल की बिक्री से 65,400 रु. प्राप्त होगी । अतः प्रतिवर्ष 32,643 रु. का शुद्ध लाभ होगा जो काफी उत्साहवर्द्धक है । आशा है यह प्रणाली मत्स्य-जीवी समुदाय के लिए मील का पत्थर साबित होगा, कारण इधर कुछ वर्षों से इन जल संसाधनों से मत्स्य उत्पादन तथा प्रग्रहण में विशेष गिरावट आ गई है ।

मुख्य घटनाएँ

कृषि विज्ञान केन्द्र में किसानों के लिए प्रशिक्षण कार्यक्रम

काकद्वीप, 24 परगना, पश्चिम बंगाल में स्थित संस्थान का कृषि विज्ञान केन्द्र ने अन्य वर्षों की तरह ही इस वर्ष भी मत्स्यकी, फसल उत्पादन, बागवानी और गृह-विज्ञान सम्बन्धित प्रशिक्षण कार्यक्रमों का आयोजन किया। इस संदर्भ में इस क्षेत्र के निश्चिन्तपुर, काकद्वीप, नारायणपुर एवम् नंदाभंगा ग्रामों के 100 परिवारों का चयन कर मा. कृ. अनु. परिषद् का 'प्रयोगशाला से भूमि की ओर' कार्यक्रम की चौथी एवं पाँचवी चरण को पूरा किया। परिवारों के चयन में इस बात का ख्याल रखा गया कि अनुसूचित एवम् अनुसूचित जनजातियों को प्राथमिकता मिल सके। कृषि विज्ञान केन्द्र ने पश्चिम बंगाल सरकार एवम् इसके सहयोगी संस्थाओं तथा क्षेत्रीय पंचायतों के माध्यम से कार्यक्रमों का संचालन किया। इस केन्द्र में निजी सर्वेक्षण से निम्न उद्धृत विषयों पर प्रशिक्षण की आवश्यकता का आकलन किया।

- (क) लवणीय जल क्षेत्र में मत्स्य बीज संचयन।
- (ख) लवणीय तथा अलवणीय नर्सरी तालाबों का प्रबन्धन।
- (ग) भारतीय एवं विदेशी कार्प मछलियों का प्रेरित प्रजनन।
- (घ) मिश्रित मत्स्य पालन।
- (ङ) मत्स्य जाल एवम् अन्य सामग्रियों का रख-रखाव।

हिन्दी सप्ताह

भारत संघ के राजभाषा कार्यान्वयन नीति के अनुपालन के तहत 14 से 20 सितम्बर, 1993 को हिन्दी सप्ताह के अवसर पर इस संस्थान ने हिन्दी निबन्ध लेखन प्रतियोगिता एवम् अन्य सांस्कृतिक कार्यक्रमों का आयोजन किया।

मुख्य बैठकें

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

- 1) कर्मचारी अनुसंधान परिषद् की बैठक दिनांक 27 व 28 अप्रैल, 1993 को।
- 2) संस्थान की प्रबन्ध समिति की 9 वीं बैठक 21 सितम्बर '93 को।

- 3) संस्थान की प्रबन्ध समिति की 10 वीं बैठक 22 जनवरी '94 को ।
- 4) संस्थान की प्रबन्ध समिति की 11 वीं बैठक दिनांक 23 मार्च '94 को
- 5) संस्थान के संयुक्त कर्मचारी परिषद् की दूसरी बैठक दिनांक 11 अगस्त '93 को ।
- 6) पंचवर्षीय समीक्षा दल की बैठक वदोदरा में दिनांक 24 व 25 जुलाई '93 को ।
- 7) क्षेत्रीय समिति-2 की बैठक गुवाहाटी में दिनांक 9 व 10 जून '93 को ।

अनुसंधान कार्य में सहयोग

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

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

परामर्शक सेवाएँ

1993-94 में इस संस्थान ने अनेक संस्थाओं को अपनी परामर्शक सेवाएँ प्रदान किया । इनमें मुख्य हैं:-

- 1) उत्तर-पूर्वी परिषद्, शिलांग को मध्यम जलाशयों में मत्स्य विकास की सम्भावनाओं पर परामर्शक सेवाएँ दे रहा है ।
- 2) भारत सरकार के पर्यावरण एवं वन मंत्रालय द्वारा प्रदत्त पश्चिम बंगाल के गंगा नदी में जलीय गुणवत्ता का अनुमापन और 'मूल्यांकन' नामक परियोजना पर यह संस्थान कार्य कर रहा है एवम् निकट भविष्य में ही इस दिशा में पूर्ण मार्गदर्शन तैयार कर उक्त मंत्रालय को देगा ।

प्रौद्योगिकी हस्तांतरण

प्रसार व राष्ट्र निर्माण कार्य

संस्थान ने अपना प्रसार कार्य मुख्यतः बैरकपुर स्थित अपने प्रसार अनुभाग तथा काकद्वीप स्थित कृषि विज्ञान केन्द्र के माध्यम से सम्पन्न किया। संस्थान के अन्य केन्द्र भी इस दिशा में प्रयत्नशील रहे।

प्रसार शिक्षा में शोध कार्य

गृह कार्य संचालन में महिलाओं की भागीदारी एवम् नीति निर्णय सम्बन्धि अन्वेषणों से पता चला कि ग्रामीण महिलाएँ अब जागरुक हो गई हैं एवम् उनकी भागीदारी अब बढ़ गई है तथा ये केवल घर के चाहारदीवारी तक ही सीमित नहीं है अपितु घर से बाहर होने वाले कार्यों जैसे मत्स्य पालन, मत्स्य बीज संचयन आदि में भी है। यह सर्वेक्षण सुन्दरवन क्षेत्र में किया गया, कारण इसे पिछड़ा क्षेत्र माना जाता है।

प्रशिक्षण

त्रिपुरा एवं मणिपुर के मत्स्य पालकों के लिए अंतर्स्थलीय मत्स्यकी विषय पर दो अल्पकालीन प्रशिक्षणों का आयोजन किया गया।

मत्स्य पालक दिवस

संस्थान ने मचेदा एवम् छोटोजुगिलिया शहरों में आयोजित मत्स्य पालक दिवसों में भाग लिया।

प्रदर्शनी

संस्थान ने मत्स्यकी को लोगों के बीच पहुँचाने के उद्देश्य से छोटोजुगिलिया, कलकत्ता एवम् काकद्वीप में आयोजित प्रदर्शनियों में भाग लिया।

कृषि विज्ञान केन्द्र

कृषि विज्ञान केन्द्र वर्ष 1993-94 के दौरान प्रशिक्षण, सर्वेक्षण, प्रयोगशाला से भूमि की ओर, तिलहन व दलहन का निरूपण आदि कार्यों में संलग्न रहा। इस केन्द्र ने अपने लक्ष्य 77 से अधिक 100 प्रशिक्षण पाठ्यक्रमों का आयोजन किया जिसमें 2396 प्रशिक्षार्थियों ने भाग लिया जबकि लक्ष्य 1290 प्रशिक्षार्थियों का था।

पुस्तकालय व प्रलेखन सेवाएँ

इस संस्थान के पुस्तकालय ने अनुसंधान एवम् विकास कार्यों में महत्वपूर्ण योगदान दिया है। इस पुस्तकालय का उपयोग न केवल संस्थान के वैज्ञानिकों ने किया अपितु अनेक विश्वविद्यालयों एवं संस्थाओं से आए प्राध्यापक, विद्यार्थी एवं शोधकर्त्ताओं ने भी इसका सार्थक उपयोग किया। इस वर्ष पुस्तकालय ने 128 पुस्तकें तथा 70 विविध प्रकाशनों की वृद्धि किया, साथ ही 31 विदेशी तथा 59 देशी शोध जर्नलों को मंगाया। आज संस्थान के पुस्तकालय में कुल 6806 पुस्तकें, 3020 अन्य प्रकाशन, 4218 पुनर्मुद्रित लेख उपलब्ध हैं। इस वर्ष पाँच राष्ट्रीय एवं अंतरराष्ट्रीय संगठनों के साथ विनिमय सम्बन्ध स्थापित हुए।

संस्थान के पुस्तकालय ने अपने विभागीय प्रकाशनों को विभिन्न संगठनों, विश्वविद्यालयों, उद्यमियों और मत्स्य पालकों को निःशुल्क भेजने का काम जारी रखा। अन्तर-पुस्तकालय ऋण के रूप में 42 पुस्तकें अन्य पुस्तकालयों को भेजी गईं।

पुस्तकालय एवं प्रलेखन अनुभाग के अंतर्गत 'फोटोग्राफी' व 'रेप्रोग्राफी' सेवाओं ने सक्रिय रहकर उत्तम कार्य किया है। इसका लाभ संस्थान के वैज्ञानिकों के अतिरिक्त विभिन्न अनुसंधान संस्थानों और विश्वविद्यालयों ने भी उठाया है। साइक्लोस्टोइलिंग एवं जिल्दसाजी एकक ने भी महत्वपूर्ण कार्यों को अंजाम दिया है।

तकनीकी रिपोर्ट

पुस्तकालय एवम् प्रलेखन अनुभाग ने आज तक 22 से भी अधिक तकनीकी प्रतिवेदनों का संकलन किया है। इसके अलावा वैज्ञानिकों द्वारा दिये गये शोध पत्रों का प्रकाशन हेतु भेजने से पूर्व संवीक्षण किया एवम् शोध कार्य से सम्बन्धित अन्य कार्यों जैसे सेमिनार, संगोष्ठी आदि में भी पूर्ण सहयोग प्रदान किया।

अनुसंधान परियोजना फाइल

अनुसंधान परियोजनाओं से सम्बन्धित प्रगति रिपोर्ट एवम् अन्य सूचनाओं को संग्रहित किया। शोध परियोजना फाइलों का संचयन आदि इस अनुभाग का महत्वपूर्ण दायित्व है।

ANNUAL REPORT

1993 - 94

English Section

CENTRAL INLAND CAPTURE FISHERIES RESEARCH INSTITUTE
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)
Barrackpore 743 101 West Bengal INDIA

Editorial Board

Editors : Dr. V.R.P. Sinha, Dr. B.C. Jha,
Mrs. G.K. Vinci, Mr. S. Paul

Assistance : Mr. H. Chaklader
Mrs. A. De

LASER Composing : Mr. H. Chaklader
Mrs. S. Biswas
Md. Quasim

Printing : Md. Quasim

*Cover (Reservoirs of
North-East region)* : Mr. P. Dasgupta

Published By :
The Director
CIFRI Barrackpore

Printed at :
Documentation Section
CIFRI Barrackpore

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.

Central Inland Capture Fisheries Research Institute (CIFRI) Annual Report is not a priced publication. Recipients of complimentary copies are not permitted to sell the photocopies of the report in part or in full.

ISSN 0970-6267

CONTENTS

	Page
1 BRIEF HISTORY	1
2 MANDATE	3
3 ORGANISATION	3
4 IMPORTANT ACHIEVEMENTS	5
5 COLLABORATION	7
6 MANPOWER DEVELOPMENT	7
7 HONOURS AND AWARDS	8
8 TRANSFER OF TECHNOLOGY	9
9 LIBRARY AND DOCUMENTATION SERVICE	10
10 CONFERENCE, SYMPOSIA, ETC.	11
11 VISITORS	12
12 FINANCE	13
13 PROGRESS OF RESEARCH	14
14 ONGOING PROJECTS	
(i) Project No. FC/B/9	15
(ii) Project No. FC/B/10	17
(iii) Project No. FC/B/11	19
(iv) Project No. FC/B/12	22
(v) Project No. FC/A/4	26
(vi) Project No. FC/A/7	29

	Page
(vii) Project No. FC/A/16	34
(viii) Project No. FC/A/18	35
(ix) Project No. FC/A/19	36
(x) Project No. FC/A/20	38
(xi) Project No. BF/B/2	40
(xii) Project No. BF/B/3	41
(xiii) Project No. BF/B/9	43
(xiv) Project No. BF/B/10	44
(xv) Project No. BF/B/11	46
(xvi) Project No. BF/B/12	47
(xvii) Project No. BF/A/21	48
(xviii) Project No. BF/A/22	49
(xix) Project No. AN/A/15	51
(xx) Project No. CSS/1	52
15 PUBLICATIONS	53
16 PERSONNEL	55
APPENDIX - I STAFF POSITION	68
APPENDIX - II ADDRESS LIST OF RESEARCH/SURVEY CENTRES	70
APPENDIX - III ORGANISATION CHART	73

ANNUAL REPORT 1993-94

CENTRAL INLAND CAPTURE FISHERIES RESEARCH INSTITUTE
BARRACKPORE

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 optimising 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

Place	<u>Water phase</u>			<i>E.coli</i>	Coliform	Fish muscle (<i>C. mrigala</i>)
	HB	PSB	ANFB			
Kalyani	7.0×10^2	2.6×10^2	Nil	Nil	3.4×10^4	$3.1 \times 10^3/g$
Kantatala	2.5×10^2	3.7×10^3	1.2×10	Nil	3.3×10^3	$8.6 \times 10^4/g$
Minakhan	9.3×10^3	2.1×10^3	9.0×1	Nil	Nil	$2.4 \times 10^4/g$

(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 Akaiapur 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 Akaiapur 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.

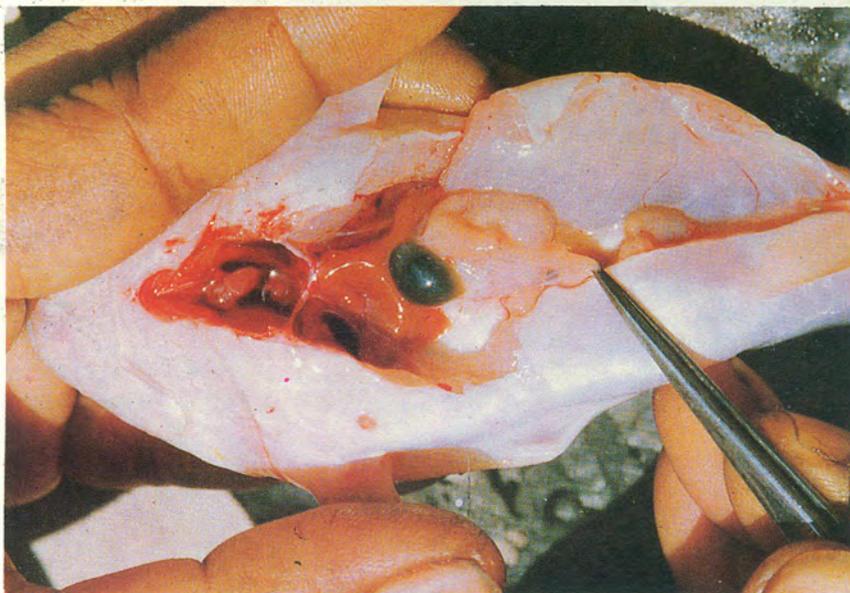
HINDI WEEK

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..

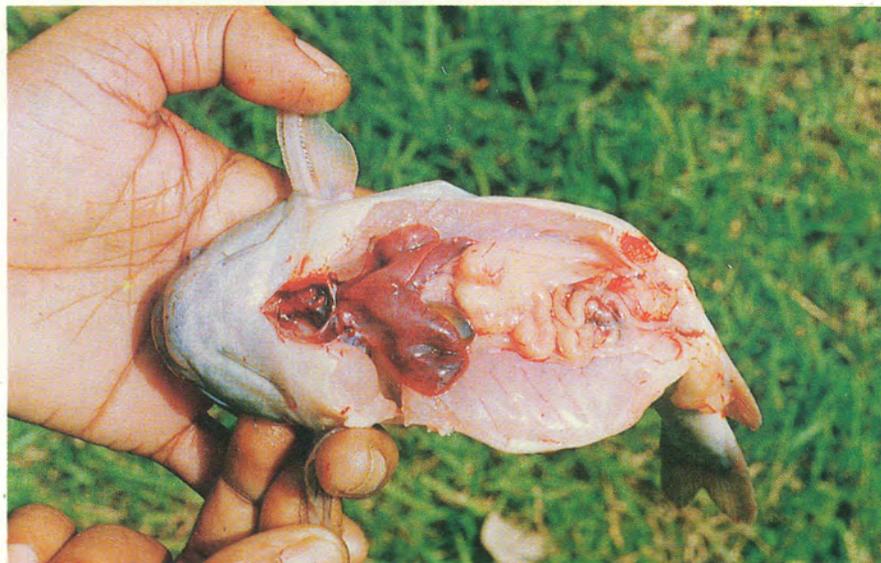
MEETINGS

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 from 2nd to 10th August 1993 in Radiological Physics Division of Bhaba 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. Tyagi, 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 targetted 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.

LIBRARY & DOCUMENTATION SERVICE

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 (cyclostyling) 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.

- (i) Annual Report 1991-92.
- (ii) Occasional publications :
 - (A) Twelfth Meeting of the Regional Committee No. II, June 10-11, 1993. Agenda notes & Status of Centre-state Coordination in Agricultural Research Education and Extension, ICAR, New Delhi.
 - (B) Fisheries development of the North Eastern States : A Ten year perspective Plan ed. by Dr. M. Sinha.
 - (C) Indira Gandhi Nahar (Rajasthan) Present status and future approaches for fisheries development - A technical report by K.K. Vass, H.C. Joshi & M.K. Mukhopadhyay.
 - (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-British 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.

Mara, Duncan(Dr.), Lagoon Technology International Leeds, U.K., Mills, Stylen(Mr.), Lagoon Technology International Leeds, U.K., Hubley, John (Dr.), Consultant, Leeds, U.K., Edwards, Peter(Mr.), AIT, U.K., Dunaion, H.(Dr.), Michs Agronomics, U.K., Clerk David(Dr.), Economist, U.K.

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.

Ravii, 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)

	B.E. 1993-94 (Rs.)	R.E. 1993-94 (Rs.)	Actual Expenditure 1993-94 (Rs.)
Plan :	100.00	92.00	92.00
Non-Plan :	249.00	345.00	345.00
Total :	349.00	437.00	437.00

PROGRESS OF RESEARCH**CENTRE-WISE LIST OF ONGOING PROJECTS 1993-94**

BARRACKPORE	FC/B/11 BF/B/3 BF/A/21 CSS-1	FC/A/4 BF/B/11 BF/A/22	BF/B/2 BF/B/12 AN/A/15
AGRA/KARNAL	FC/B/10	FC/B/11	
ALLAHABAD	FC/B/11	FC/B/12	FC/A/18
BANGALORE	FC/A/7		
CALCUTTA	FC/B/11	BF/B/10	
COIMBATORE	FC/A/19		
CANNING	BF/B/3		
DIAMOND HARBOUR	BF/B/3		
ELURU	FC/A/20		
FARAKKA/MALDAH	BF/A/22		
GUWAHATI	FC/B/9	FC/A/16	
LALGOLA	FC/B/12		
PUNE/RAIPUR/HOSHANGABAD	FC/A/7		
ULUBERIA	BF/B/3		
VADODARA	BF/B/9		



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)**



PROJECT : FC/B/9
INVESTIGATIONS ON FACTORS RELATING TO DECLINE IN FISHERY OF THE RIVER BRAHMAPUTRA AND ITS TRIBUTARIES.

Personnel : K.P. Srivastava, B.C. Jha, V. Pathak, M. Choudhury, A. Sarkar, B.K. Biswas

Duration : 1985-1994

Location : Guwahati

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 khos), 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 ($0.14 \text{ l}^{-1} \text{ mg}$), 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 CO_2 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 CO_2 (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 fungus. Protozoans and rotifers 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 of R. Bharalumukh on the water quality of R. Brahmaputra :

Data revealed that river Brahmaputra 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 (0.0 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 (210.2 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 321d.6 mg C). It was thus evident that the discharged effluents through Bharalumukh had significant impact on the rate of carbon synthesis.

The confluence area of river Brahmaputra and Bharalumukh 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 Bandopadhyay

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* (34.18%). 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 catr 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 down stream. 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 acclerated the decomposition of organic matter present in the water.

Primary productivity

The maximum primary production, 87.47 to 216.6 mgC/m³/hr (gross) and 52.12 to 174.47 mgC/m³/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/lather 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). *Eichornnia 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

Personnel : K.K. Vass, M.K. Mukhopadhyay, M.M. Bagchi, K. Mitra, A. Hajra, Keya Saha, D.K. Biswas, S. Bandopadhyay

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-protzoa 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 (1.3696) 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 tabular 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 Kosi. 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 wahsries 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 indiated 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 (LC₅₀ 16 hrs.) followed by Kargali (LC₅₀ 44 hrs.) Burdwan (LC₅₀ 46 hrs.) and Ramgarh.

PROJECT : FC/B/12

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

Personnel : Ravish Chandra, S. K. Wishard, H. P. Singh, D. N. Singh, R. K. Saxena, Balbir Singh, M. A. Khan, R. N. Seth, R. K. Dwivedi, P. N. Jaitly, R. K. Tyagi, P. K. Katiha, N. K. Srivastava, Ram Chandra, D. N. Srivastava, B. D. Saroj, R. C. Singh, L. R. Mahavar, Ramji Tiwari, J. P. Misra, P. Rajani, M. P. Singh, G. K. Bhatnagar, H. C. Banik.

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 CO₂ 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 polluttional 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 u/l being the highest in BOF zone at Bareilly and the lowest at Moradabad out 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 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 polluttional 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 (Rajghat-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/m³/hr to 119.7 mg C/m³/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^{-1}) were higher at Rajghat (Varanasi) and lower at Nagawa (18.0 mg/l^{-1} and 9.4 mg/l^{-1}). 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 Bhagwatghat and Jajmau effluents discharge points.

On the basis of presence of sewage fungus (*Z. ramigera*, *Thiodictyon* 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 Banmk 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 ($0.92\text{-}1.8 \text{ mg/l}^{-1}$ and phosphate ($0.75\text{-}0.85 \text{ mg/l}^{-1}$) were quite high at OF as compared to AOF and BOF as confirmed from high values of BOD ($40\text{-}64 \text{ mg/l}^{-1}$) and COD ($48\text{-}76.8 \text{ mg/l}^{-1}$). Primary productivity was of average order (GP range between 62.5 and $125.0 \text{ mg C/m}^3/\text{hr}$) and (NP $37.5\text{-}100 \text{ mgC/m}^3/\text{hr}$).

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:

Fish species	Sadiapur	Daraganj	Lalgola
Major carps			
<i>C. mrigala</i>	0.99 (2.0)	0.04 (0.2)	1.82 (1.9)
<i>C. catla</i>	0.90 (1.8)	0.00 (0.0)	1.89 (2.0)
<i>L. rohita</i>	0.43 (0.9)	0.23 (1.1)	1.76 (1.9)
<i>L. Calbasu</i>	1.00 (2.0)	0.44 (2.1)	1.48 (1.6)
Selected cat fish			
<i>M. aor</i>	7.71 (15.6)	1.01 (4.7)	4.68 (4.9)
<i>M. seenghala</i>	4.70 (9.6)	0.14 (0.7)	2.21 (2.3)
<i>W. attu</i>	0.25 (0.5)	0.17 (0.8)	2.74 (2.9)
M			
Miscellaneous	32.51 (65.80)	18.94 (89.0)	60.09 (63.6)
<i>T. ilisha</i>	0.89 (1.8)	0.32 (1.5)	17.96 (18.8)
Total	49.36	21.29	94.63

- PROJECT** : **FC/A/4**
ECODYNAMICS AND FISHERY MANAGEMENT OF BEEL
ECOSYSTEMS IN WEST BENGAL
- Personnel** : V. V. Sugunan, G. K. Vinci, K. Mitra, M. K. Mukhopadhyay, M. M. Bagchi, Y. S. Yadava, D. K. Biswas, Keya Saha, S. Bandhopadhyay
- 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 Ghurnamani) 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 sandy clay 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 collumela* and *Bellamyia 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 submerged 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.

Pesticide

Haripur beel water recorded maximum level of t-HCH (59.00 ppb) and t-DDT (10.24 ppb). In Gharnamani 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 Ghurnamani (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/A7

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

Personnel : Ch. Gopalakrishnayya, M. Ramakrishniah, A.K. Lal, D.S. Krishna Rao, P.K. Sukumaran, A. Hajra, M. Karthikeyan, V.R. Desai, Dharendra Kumar, N.P. Srivastava, K.K. Agarwal, P.L.N. Rao, M.D. Pisolkar, B.K. Singh, B.L. Pandey, G.K. Bhatnagar, D.K. Kaushal, V.K. Sharma

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.

Species	1992-93	1993-94
<i>C. catla</i>	10,736 (23.34)	5,414 (9.89)
<i>L. rohita</i>	16,955 (36.86)	24,891 (45.46)
<i>C. mrigala</i>	735 (1.60)	656 (1.20)
<i>L. calbasu</i>	323 (0.70)	467 (0.85)
<i>C. carpio</i>	1,046 (2.44)	983 (1.80)
<i>W. attu</i>	1,124 (2.44)	307 (0.56)
Misc.	15,085 (32.79)	22,033 (40.24)
TOTAL	46,004	54,751
Yield (kg/ha)	62.77	74.75

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 ummer (May).

Plankton

The plankton density ranged between 494 units/l⁻¹ (May) and 9956 units/l⁻¹ (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

- | | | |
|---------------------------|---|--|
| a. Sub project | : | Ecology and Fisheries of Pong reservoir. |
| b. Personnel for the year | : | D.K. Kaushal, V.R. Chitranshi, V.K. Sharma, Sushil Kumar |
| c. Duration of Project | : | 1990-91 to 1993-94 |
| d. Location | : | Pong reservoir, Dist. Kangra, (Himachal Pradesh) |

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/m³) followed by intermediate (1.46 ml/m³) and lotic (0.24 ml/m³).

Macrobenthos

The average standing crop of benthic community for the entire reservoir was 571 nos/m² (21 g/m²) showing marginal increase over that of last year's population (511 nos/m²). The primary peak was in May (1359 nos/m²), secondary in November (653 Nos/m²) and tertiary in January (434 nos/m²). Spatial distribution showed maximum density in intermediate zone (685 nos/m²) followed by lentic (466 nos/m²) and Lotic (450 nos/m²).

Periphyton

The average population of periphyton was estimated as 1430 nos/m² from the entire reservoir in this year against 1540 nos/m² of last year. Though the concentration of epiphytes was comparatively more in October and November (1938-1941 nos/m²), 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 preceeding year. *M. seenghala* (48.87%) was the most dominating followed by *L. rohita* (22.53%), *T. putitora* (13.42%), *L. calbasu* (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 • (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											
April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	TOTAL
35.16	58.90	35.50	18.66	44.00	27.82	21.04	17.21	31.94	37.57		327.80
10.7%	18.0%	10.8%	5.7%	13.5%	8.5%	6.4%	5.2%	9.7%	11.5%		100.00

Sub project :

ECOLOGY AND FISHERIES OF TAWA RESERVOIR

Personnel : Dharendra 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 of 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 out flow 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)

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

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. bata*, *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)

Personnel : M. Chaudhary, K. P. Srivastava, B. C. Jha, V. Pathak, A. Sarkar, B. K. Biswas.

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 CO₂, upto 36.3 mg/l⁻¹ 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 hors), the free CO₂ was also high (26.0 mg/l⁻¹) 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.

Personnel : R. K. Dwivedi, H. P. Singh, D. N. Singh, Balbir Singh, M. A. Khan, R. K. Tyagi, N. K. Srivastava, Ram Chandra, B. D. Saroj, Ramji Tiwari, J. P. Misra.

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 bengalensis bengalensis*, *Mystus malabaricus*, *Clossogobius giuris* and *Garra meeclibhandi*. 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 μ 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 phenolphthelin 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 2819 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 nos/m² (21.25%). Miscellaneous forms comprising of molluscs, crab larvae, ostracods and *Diaptomus* etc. together formed 3.51% of the total benthic population. The overall density of the benthic population was to the tune of 1830 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

Targing 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 mrigal and 4182 common carp were clipped off 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

Personnel : Shri Ch. Gopalakrishnayya, Shri K. V. Rao, Shri J. B. Rao, Shri T. S. Rama Raju, Shri K. S. Rao, Shri P. S. C. Bose, Shri C. C. Rao, Shri S. Kotaiah.

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 principle 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 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 *Indoplanorbis*, *Lymnaea* and *Bellamys*.

PROJECT : **BF/B/2**

STUDIES ON THE FISHERIES POTENTIAL OF ESTUARINE WETLAND

Personnel : M. Sinha, Amitabha Ghos, R. K. Das, P. K. Chakraborty, K. R. Naskar, H. C. Karmakar, N. N. Majumdar and T Chatterjee.

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-Setp.) 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 l 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. parsia* 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 C 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

Personnel : Dr. M. Sinha, Dr. D. K. De, Dr. D. Nath, Dr. M. K. Mukhopadhyah, Shri P. M. Mitra, Sri H. C. Karmakar, Sri R. N. Dey, Sri A. R. Paul, Sri N. C. Mondal, Sri T. Chatterjee, Sri P. Biswas, Sri DJ. Sanfui, Sri S. Mondal, Sri B. B. Das, Sri A. Mitra, Sri B. N. Das, Sri A. Roychowdhury, Sri P. Singh, Sri C. P. Singh,

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 (upper most zone, Nawabdwip and Barrackpore), 0.39- 2.3 g/l⁻¹ (between Barrackpore and Diamond Harbour) and 5.0 - 27.8 g/l⁻¹ (lower most 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 Jhorkhali 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*, *Sciaena bauritus* and prawns. Decline of winter bagnet fishery occurred this year was probably due to increased drift gill net fishing in the entire estuary through out 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 1992- 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 Vijay 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, Bhadbhudt, 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 case 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. l^{-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	:	G.N. SAHA, A.K. Ghosh, A.C. Nandy, R.K. nanerjee, H.C. karmakar, K.R. Naskar, S.K. Chatterjee, B.B. Das, A. Mitra, Abhijita Sengupta, L.K. Parbat, Amoy Barul, D. Saha
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 phosphatge 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 /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., *Microcystis* sp., *Ulothrix* sp., *Nitsschia* sp. etc) was found to dominate at low saline area while zooplankton (*Nauplii*, *Bhachionus* sp., *Cyclops* sp., *Mysids* & *Daphnis* sp.) was high percentage in the mid and high saline zones. Diatoms like *Gyrosigma* sp., *Fragilaria* sp., *Pleurosigma* 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 *Spirodella* sp., *Ceratophyllum* sp., *Panicum* sp., *Ruppia* sp., *Lemna* sp., *Alternanthera* sp., *Nechamendra* 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, - 2021.563 kg), 648.821 kg/ha/330 days (P. monodon - 143.771 kg) and 391.603 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.

PROJECT : BF/B/11

INVESTIGATIONS ON DISEASES OF FISHES INHABITING ESTUARIES, ESTUARINE IMPOUNDMENTS AND BEELS.

Personnel : M. K. Das, R. K. Das, S. P. Ghosh, Sanjoy Bhowmik

Duration : 1991-1995

Location : Division of Environmental Monitoring & Fish Health Protection
Barrackpore

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 lamelle 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.

PROJECT : BF/B/12

SPATIO-TEMPORAL VARIATIONS IN THE BIOTIC AND ABIOTIC FEATURES OF THE MAJOR ESTUARIES AMIDST SUNDARBAN MAGROVES

Personnel : Shri P. K. Chakrabarti, Shri R. K. Das, Shri A. Hajra, Shri Utpal Bhaumik

Duration : 1993-1997

Location : Estuarine Division, Barrackpore

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, Matlah, 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 pollutional 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 W_6 and W_3 series ($C_{18:2}$, $C_{20:4}$, $C_{20:5}$, $C_{22:5}$, $C_{22:6}$) and the ratios of W_6/W_3 was worked out. It could be observed that for both the fishes, *Polynemus paradiseus* and *Pama pama*, the percentage of the W_3 series fatty acids remained more than the W_6 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 HOOGLHY ESTUARY

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

Personnel : A. Mukherjee, M. Sinha, A. R. Chowdhury, D. K. De, Amitabha Ghosh, D. Nath, P. M. Mitra, A. Hajra, A. B. Mukherjee, K. S. Banerjee, N. N. Majumder, T. Chatterjee, D. Sanfui, K. P. Singh & J. A. Roychowdhury

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 carps (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 preceeding 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 Beniagram 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 C¹⁴ technique, was found to be poor in the Ganga with only 10.3 mg C/m³/day (net).

Soil character

The pH of soil in the Ganga, during the period was 8.74; organic carbon and available phosphate (as P₂O₅) 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.

PROJECT : ANA/15

STOCK ASSESSMENT AND DYNAMICS OF FISH POPULATION IN THE MAJOR INLAND WATER SYSTEM

Personnel : Sri R. A. Gupta, Sri P. M. Mitra, Sri S. K. Mondal, Sri H. C. Karamakar, Sri R. K. Tyagi, Sri M. Kartikayan, Sri Balbir Singh, Sri P. N. Jaitley

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) *Intraspecies 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:

Major carps	1992	1993
<i>L. calbasu</i>	390.0	414.6
<i>Catla catla</i>	611.1	772.1
<i>C. mrigala</i>	517.1	542.0
<i>L. rohita</i>	511.3	689.0
<i>M. seenghala</i>	469.2	451.2
<i>M. aor</i>	446.7	483.

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

District	Cluster total Area (ha)	Estimate % S.E.	Catch (t)	Per pond area/ Pond (ha)	Estimate % S.E.	TOTAL
Bharatpur	37.45	10.46	38.38	0.09	10.46	32.24
Alwar	215.30	1.80	14.25	1.01	1.60	213.37
Ganganagar	56.47	2.03	54.60	1.03	2.03	54.32

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.

PUBLICATIONS 1993-94

- Bhatnagar, G.K. & A.K. Ekka (1992). Food and feeding habits of small fishes of Getalsud reservoir. *Punjab Fish. Bull.*, **16**(2) : 13-17.
- Bhaumik, Utpal, P.K. Pandit & H.C. Karmakar (1992). Adoption behaviour of fish farmers towards composite fish culture. *J. Inland fish. Soc. India*, **24**(1) : 50-55.
- Bhaumik, Utpal, P.K. Pandit & J.G. Chatterjee (1993). Involvement of Women in the development of Inland fisheries. *Environment & Ecology*, **11**(3) : 641-644.
- Das, Manas & R.K. Das (1993). A review of the fish disease epizootic ulcerative syndrome in India. *Environ & Ecol.*, **11**(1) : 134-145.
- De, Dilip Kumar (1993). Janapriya maach Ilish O tar chaser sambabhana (in Bengali). (Hilsa - its popularity and possibility for culture). *Sabuj Bhabana*, **6**(8) : p. 1.3 & 4.
- Desai, V.R.(1993). Infection of *Isoparorchis hypselobagri* in Tor mahseer, *Tor tor* (Ham.) of river Narmada. *J. Parasite Appl. Anim. Biol.*, **2**(2) : 109-112.
- Gupta, R.A. & R.K. Tyagi (1992). Analytical approach to analysis of fish stock of the Ganga River system. *J. Inland Fish. Soc. India.*, **24**(2) : 20-27.
- Jhingran, Arun g. (1990). Recent advances in reservoir fisheries management in India. In *Reservoir Fisheries Asia : Proceedings of 2nd Asian reservoir fisheries Workshop held in Hangzhou, People's Republic China, 15-19 October, 1990*, ed. by Sena S. De Silva, Ottawa, IDRC, XVI, 279 p.
- Kaushal, D.K. (1991). Dwindling *Catla catla* population of Govindsagar reservoir. *Indian J. Fish.*, **38**(4) : 245-248.
- Lal, A.K., & M. Karthikeyan (1993). Rotifers - pollution or productivity indicators. *Curr. Sci.*, **65**(11) : 874-875.
- Mitra, P.M. & H.C. Karmakar (1992). Examination of optimum sample size for estimation of fish catch at landing centres of lower Hooghly estuary. *J. Inland Fish. Soc. India*, **24**(2) : 91-93.
- Mukhopadhyay, M.K., B.B. ghosh & M.M. Bagchi (1994). toxicity of heavy metals on fish, prawn and fish food organism of Hooghly Estuarine System. *Geobios*, **21**(1) : 13-17.

- Pandey, B.L. (1992). Impact of Farakka barrage on the fishery of river Padma. *Him. J. Env. Zool.*, **6** : 117-125.
- Pandey, B.L. (1993). A short note on the special catching device for *Clupsoma garua* (Ham.) in river Ganga around Bhagalpur. *Punjab Fish. Bull.*, **17**(1) : 33-34.
- Pandey, B.L., M.D. Pisolkar & P.L.N. Rao (1992). Community structure of periphyton in a polluted model colony fish pond, Shivaji Nagar, Pune, Maharashtra. *Sci. & Cult.*, **58**(11-12) : 245-246.
- Pisolkar, M.D., P.L.N. Rao, B.K. Singh & B.L. Pandey (1992). A note on periphytic communities of Bhatghar reservoir, Pune, Maharashtra, *Sci. & Cult.*, **58**(11-12) : p. 239.
- Selvaraj, C., V.K. Murugesan, & P.K. Aravindakshan (1992). Mass scale destruction of eggs and hatchlings of major carps in hapas by the catfish *Mystus malabaricus* (Jerdon). *J. Inland Fish. Soc. India*, **24**(1) : 77-78.
- Sharma, V.K. & K.K. Tandon (1993). The fish and fisheries of Himachal Pradesh of India. A. Fish fauna with zonal distribution. *Punjab Fish. Bull.*, **16**(2) : 39-45.
- Sharma, V.K. & K.K. Tandon (1993). Observations on the fecundity and reproduction in *Cyprinus carpio* Linn. from Govindsagar reservoir of Himachal Pradesh. *Punjab Fish. Bull.*, **16**(2) : 19-27.
- Shrivastava, K.P. (1993). On some larval stages of *Wallago attu* and exploitation of its fishery from Rihand reservoir (Uttar Pradesh). *J. Parasit Appl. Anim. Biol.*, **2**(2) : 89-91.
- Singh, Balbir, & S.K. Verma (1992). Studies on the composition and seasonal abundance of benthic macrofauna of a tropical fish pond in Gangetic plains, India. *J. Inland Fish. Soc. India*, **24**(1) : 69-72.
- Singh, B.K., P.L.N. Rao, M.D. Pisolkar & B.L. Pandey (1992). Impact of various physico-chemical characteristics of pond in fish farming at Hadapsar Fish Seed Farm, Puna, Maharashtra. *Fishing chimes*, **16**(2) : 35-38.
- Srivastava, G.N., S.K. Wishard, Shree Prakash & K.Chandra (1992). On the seed resources of two siluroids *Cluptionsoma garua* and *Eutropitchthys vacha*. *J. Inland Fish. Soc. India*, **24**(1) : 79-81.

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

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)

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-

LACUSTRINE DIVISION

Bangalore Centre

Dr. V.R. Desai, Pr. Scientist
 Dr. M. Ramakrishnaiah, 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. Gopalakrishnaya,
 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. Unnithan, -do-

Pune Centre

Shri P.L.N. Rao, Sr. Scientist
 Dr. B.K. Singh, Scientist (Sr. Scale)
 Dr. M.D. Pisolkar, -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)

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

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

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.

Shri U.K. Ghosh, Senior Stenographer
 on lien for 2 years from the afternoon
 of 25th February 1992 at Income-Tax
 Appellate Tribunal, Calcutta.

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

Shri H.K. Sen
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
Shri H.K. Sen
Shri Sukumar Saha

T-4

Shri P. Dasgupta
Shri C.N. Mukherjee
Ms. Satnam Kaur
Shri Ladu 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. Rina Basak
 Shri B.N. Das
 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 Kanchan 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 Ranjan Singh, Driver
 Shri M.C. Paul, Driver
 Shri Virendra Kumar, Driver
 Shri Ram Prasad, Driver
 Shri Sunder Singh, Driver (Resigned on 3.6.1993).
 Shri Anon Kumar Mondal, Driver
 Shri Subhendu Mondal, Boat Driver
 Shri Saradindu Chakraborty, Ssrang
 Shri A.K. Goswami, Driver
 Shri P. Pamalingeswara Rao, Driver
 Shri Suklal 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
Shri 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 Baij 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. Sikha Mazumder
 Shri Biswanasth 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 Chotte 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
 Shri 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 ~~S~~taram 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

SShri 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

Supporting Grade II

Shri Munnilal Mallah
 Shri Maha Singh
 Shri Dukhharan 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 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. Mariappan
 Shri A. Ramaswamy
 Shri M.V. Krishnan
 Shri K. Kallanan
 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. Gangaiah
 Shri K. Bahadur
 Shri A. Biswas
 Shri R. Palaneswami
 Shri K.K. Dhir
 Shri S.S. Bondre
 Shri B.N. Krishnappa
 Shri Gunadhar Dhibar,
 Shri Sankar Bose
 Shri G.J. Roundale
 Shri Parameswar (Retd. on 20.10.1993)
 Shri Umesh Chowdhury
 Shri U. Satyanarayana

Supporting Grade I

Shri Lakshmi Ram
 Md. Yusuf Dar
 Shri Suresh Kumar
 Shri Kuldeep Singh
 Ms. Bimla Devi
 Shri Kawalpati Ram
 Shri Mahadev Panika
 Shri N. Rajak
 Shri Suresh Rajak
 Shri A. Kistalah
 Shri P. Atchalah
 Shri S. Kalita
 Shri N. Deka
 Shri Khagen Ch. Das
 Shri Bhabalu Boro
 Shri Jai Ram Prasad
 Ms. Godhuli Mondal
 Ms. Mina Rani Bahadur
 Ms. Mina Biswas
 Ms. B. Balmiki
 Shri K.C. Malakar
 Shri H.P. Bhanja
 Shri T. Ghosh
 Shri Sankar Bose
 Shri Muktipada Das
 Shri Kharban Kumar
 Shri Man Bahadur
 Shri Bhaskar Sardar
 Shri Pasupati Ghosh
 Shri Jagdish Balmiki
 Shri S. Banerjee
 Shri Sibulal Das
 Shri S.C. Sadhukhan
 Shri Dipak Chakraborty
 Shri Biswanath Bose
 Shri Ananta Kr. Bhanja
 Shri Rabi Kr. Sardar
 Shri Lal Bahadur
 Shri Dilip Kr. Das
 Ms. B. Sakuntala
 Shri Mohan Lal Sarkar
 Ms. Hemlata Halder
 Shri Balkishen Balmiki

Shri S.N. Nan
 Shri Mahendra Balmiki
 Shri Ullas Naik
 Ms. Rupali Chatterjee
 Shri Ashok Kr. Dey
 Shri Iswarram Balmiki
 Ms. Anjali Dutta
 Shri Bharat Kr. Halder
 Shri Anil Ch. Das
 Shri S. Guin
 Shri P. Singh
 Shri D. Singh
 Shri Atiullah
 Shri Sitla Prasad
 Ms. Kamal Devi
 Shri M.S. Bhoi
 Shri T.H. Ghume
 Shri K. Subbatya
 Shri R. Nagraj
 Shri S. Govindarajan
 Shri K. Subramahaiyan
 Shri Gopal Chand
 Ms. Kalosasi Mondal
 Shri G. Lal
 Shri Sree Nath
 Shri A.C. Biswas
 Shri R.D. Chaudhury
 Sk. Monsur Ali
 Shri S.K. Chakraborty
 Shri Prasad Sahani
 Shri Amar Nath Prasad
 Shri Umashankar Ram
 Shri P.C. Paramanick
 Shri Prakash Ch. Paramanick
 Shri N.K. Das
 Shri Joydev Patra
 Shri A. Bhattacharjee
 Ms. Dharamaya
 Shri M. Mutta
 Shri Basudev Gharami
 Shri T.K. Gayen
 Shri B.P. Samanta
 Shri B.P. Mishra
 Shri R.P. Halder
 Shri N.T. Dolui

Shri Gour Gharami
 Shri M. Mari
 Shri Satya Prakash
 Shri Ganesh Bhanja
 Smt. N.K. Chaki
 Shri S. Saïda
 Shri M.C. Gharami
 Shri C. Muniappa
 Shri T.K. Halder
 Shri Ganesh Chandra Burman
 Shri R. Rajendran

Smt. Suvra 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. Sibani Roy

PROMOTIONS

The following members of staff were promoted on recommendation of the Assessment Committee/Departmental Promotion Committee during the period April 1993 to March 1994.

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

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

Name	Designation	Merit increment	With effect from
Shri R.C. Satpathi	T-5	One	1.1.1993
Shri Ramji Tiwari	T-II-3	Two	1.1.1993
Shri T. Chatterjee	T-II-3	One	1.1.1993
Smt. Anjali De	T-5	One	1.7.1992

Retirement during the period

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

Resignation

Name	Designation	With effect from
Shri Sunder Singh	Driver	3.6.1993
Shri P. Sampathu	SSG I	19.1.1993 (FN)

Appointments

Following appointments were made during the period

Name	Designation	Place of posting	Date of appointment
Shri A.C. Ghosh	Sr.A.O	Barrackpore	31.5.1993
Shri Ram Sajiwan	Driver	Allahabad	12.11.1993
Shri S. Manoharan	T-4	Coimbatore	4.6.1993
Miss K. Jacqueline	T-II-3	Barrackpore	29.4.1993
Shri Neeraj Swrup	T-II-3	Agra	6.9.1993

Transfers

The following transfers were made during the period April 1993 to March 1994

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

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)

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

** 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

Sr.A.Os/A.Os/Accounts Officer etc.	2	2	-	-	-	-	*This includes 1(one)
AAOs/Supdt.(A/cs)/Supdt./	6	3	1	33.33%	-	-	Assistant, 1(one)
Hindi Officer/S.C./Jr. Analyst/Desk Officer	-	-	-	-	-	-	Stenographer and
Assistants	*16	14	4	28.57%	1	7.14%	1(one) Jr. Clerk posts
Stenographers(Sr. & Jr.)	*7	6	2	33.33%	-	-	under C.S.S.
Sr. Clerks/U.D.Cs	28	26	8	30.77%	1	3.85%	
Jr. Clerks/Hindi	*44	39	8	20.51%			
	103	90	23		2		

4. SUPPORTING STAFF

Grade-I	*99	91	22	24.18%	4	4.40%	*This includes 1(one)
Grade-II	54	54	17	31.48%	1	1.85%	SG.I post sanctioned
Grade-III	26	26	8	30.77%	2	7.69%	under C.S.S.
Grade-IV	12	12	6	50%	2	16.67%	

5. SUPPORTING STAFF (SAFAIWALA)

	13	13	0	69.23%	-	-	
	204	198	62		9		

6. AUXILIARY POSTS

	45	32	7	21.88%	2	6.25%	
--	----	----	---	--------	---	-------	--

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/
Telex/FAX/E - Mail**

Cable: FISHSEARCH
Tele : (033) 5561190 5561191
Telex : 021 8552 CIFI IN
Fax : (033) 5560388
E- Mail - CICFRI @ 400. nicgw. nic. in

**Riverine Division of CIFRI,
24, Pannalal Road,
Allahabad - 211 002,
Uttar Pradesh**

Cable: FISHSEARCH
Tele : (0532) 600531

**Guwahati Research Centre CIFRI,
Bhangagarh-Rajagarh Road ,
(Opp. UCO Bank), Guwahati 781 005**

Tele : (0361) 548757

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

Cable: FISSEARCH
Tele : (080) 357213

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

Cable: FISHSEARCH

Contd..... 

Telegram/Telephone/
Telex/FAX/E - Mail

Alappuzha Research Centre of CIFRI
Vayalar Sukumaran Building,
Near Vazhicherry Bridge,
Alappuzha - 688 001,
Kerala

Eluru Research Centre of CIFRI,
24-B/10-53 Panugantivari Street,
P. O. RAMACHANDRARAO PET,
West Godavari District,
ELURU - 534 002 A. P.

Karnal Research Centre of CIFRI,
Session House Marg,
Karnal-132 001, Haryana

Reservoir Fisheries Research Centre of CIFRI,
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.

☎ - (33) 379444

Vadodara Research Centre of CIFRI,
(Opp. Bhimnath Mahadev Temple),
Sayajigang, Vadodara 781 005

Tele : (0265) 31717

Maldah Research Centre of CIFRI
House of Sri S. K. Pal, Subhas Pally
Station Road, Maldah, West Bengal.

Contd..... 

**Telegram/Telephone/
Telex/FAX/E - Mail**

**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 Bhuiya,
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

ORGANIZATION CHART, 1993 - 1994

