

केन्द्रीय अंतर्स्थलीय प्रग्रहण मात्स्यकी अनुसंधान संस्थान : बैरकपुर

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

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वर्ष 1994-95 का वार्षिक प्रतिवेदन समय पर आपके सम्मन रखते हुए मुझे अपार खुशी हो रही है। अपरिहार्य कारणों से वार्षिक प्रतिवेदन के प्रकाशन में जो विलम्ब हो रहा था, उसे दूर कर लिया गया है।

पिछले वर्षों में जल संसाधनों के संरक्षण का हमने जो संकल्प लिया था उस दिशा में हम एक कदम और आगे बढ़े हैं। 'चैलनजिंग फरेन्टियर ऑन इनलैण्ड फिशरिज' नामक एक वैज्ञानिक संगोष्ठी का आयोजन दिसम्बर '94 में किया गया। इसमें देश-विदेश से सौ से भी अधिक शोध पत्र आए एवम् पढ़े गये। अनेक विशिष्ट वैज्ञानिकों ने इस संगोष्ठी में भाग लेकर इसे सफल बनाया। दिसम्बर '94 में ही 'बॉइयोमॉनिटोरिंग ऑफ वेटलैन्ड' नामक कार्यशाला का आयोजन ब्रिटिश परिषद् के सहयोग से किया गया था। इसमें दोनों देशों के अनेक ख्यातिप्राप्त वैज्ञानिकों ने अपना सफल योगदान दिया था। इस कार्यशाला में 40 से भी अधिक विभिन्न प्रदेशों से आए अधिकारियों को बाढ़-बहुल आर्द्र क्षेत्रों के सम्बन्ध में ठोस जानकारी प्रदान की गई एवम् इनके संरक्षण के विभिन्न पहलुओं पर प्रकाश डाला गया।

मुझे खुशी है कि हमारा संस्थान मत्स्यकी अनुसंधान, प्रबन्धन, जलीय प्रदूषण, संसाधन संरक्षण, जैविक विविधता आदि पहलुओं पर उत्कृष्ट कार्य के कारण आज राष्ट्रीय एवम् अंतरराष्ट्रीय स्तर पर एक विशेष स्थान रखता है। इसके द्योतक हैं देश-विदेश की संस्थाओं द्वारा परामर्श के लिए इस संस्थान को आग्रह करना। वर्तमान में हम राष्ट्रीय ताप विद्युत निगम, भारत सरकार को जल संसाधनों में ताप प्रदूषण का प्रभाव एवम् इसके समाधान के उपाय पर परामर्श दे रहे हैं। हम आशा करते हैं कि यथाशीघ्र उचित-दिशा निर्देश राष्ट्रीय ताप विद्युत निगम को हम दे सकें ताकि इस तरह के प्रदूषण पर भविष्य में प्रभावी कदम उट्टाया जा सकेगा।

हम उत्तर-पूर्वी सचिवालय, गृह मंत्रालय, भारत सरकार, शिलांग के लिए भी परामर्शदाता के रूप में कार्य कर रहे हैं एवम् इस वर्ष के अंत तक इस क्षेत्र के कुछ जलाशयों में मत्स्य उत्पादन में बढ़ोतरी के सम्बन्ध में वैज्ञानिक तरीके की जानकारी दे देंगे जो पर्यावरण के अनुकूल होगा।

गंगा परियोजना निदेशालय, नई दिल्ली को भी हम अपनी परामर्शक सेवाएँ दे रहे हैं एवम् गंगा नदी में प्रदूषण से उपजी विकृतियों का अध्ययन कर रहे हैं।

हम महाराष्ट्र सरकार के लिए भी परामर्शदाता के रूप में अपनी सेवाएँ दे रहे हैं। नर्मदा नदी (महाराष्ट्र भाग) में जैविक विविधता की वर्तमान अवस्था एवम् इस पर भौतिक-रसायन प्राचालों का प्रभाव इस परियोजना का मुख्य उद्देश्य है।

पिछले प्रतिवेदन के वादानुसार जलीय संसाधनों के संरक्षणता एवम् जैविक विविधता के अध्ययन को अग्रता प्रदान करते हुए हमने इस दिशा के प्रथम चरण में देश के प्रमुख नदियों तथा ज्वारनदमुख के बहुआयामी अनुसंधान के लिए एक तड़ित परियोजना का बलू-प्रिंट तैयार कर लिया है एवम् कार्य करना शुरू कर दिया है। इस तड़ित परियोजना से इन नदियों और ज्वारनदमुखों की पूर्णरूपेण वास्तविक मत्स्यकीय एवं पर्यावरणीय अवस्था का पता चल पायगा एवम् इनकी संरक्षणता के लिए उचित प्रणालियों का विकास किया जा सकेगा।

आइये, 'जलीय संसाधन तथा जैविक विविधता बचाओ और मत्स्य उत्पादन बढ़ाओ' के नारे को पुनः बुलन्द करें।

शुभकामनाओं के साथ।

1 सितम्बर, 1995

विश्व रमण प्रसाद सिन्हा

वार्षिक प्रतिवेदन 1994-95
केन्द्रीय अंतर्स्थलीय प्रग्रहण मात्स्यकी अनुसंधान संस्थान
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संक्षिप्त इतिहास

केन्द्रीय अंतर्स्थलीय प्रग्रहण मात्स्यकी अनुसंधान संस्थान मात्स्यकी शोध एवं प्रबन्ध में अग्रणीय स्थान रखता है। यह संस्थान अब अपने स्थापना के 48वें 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 मत्स्यकीय संसाधनों के विकास पर अविलम्ब कार्यवाही करने पर बल दिया गया था। तदुपरान्त, कृषि, वानिकी तथा मत्स्यकीय 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 मत्स्यकीय शोध कार्यों को सही मान्यता एवम् अधिक स्वायत्ता 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 मत्स्यकीय 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। 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 गुत्थियों 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-श्वासी 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 22.0 लाख टन है जो 1950-51 के 2.2 लाख टन से लगभग दस 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

जलीय प्रदूषण आंकलन हेतु नूतन जैव सूचक

प्रदूषित जलीय वातावरण के आंकलन के लिए सूक्ष्म जीवी 'सीलीएट', 'ट्रायकोडिना' एवम् 'ट्रायपॉरटिएला' नामक जन्तुओं का सफल प्रयोग किया गया। शोध द्वारा ऐसा पाया गया कि मछली के श्वास तंत्र (गिल) में पाये जाने वाले लिसलिसे तरल पदार्थ में ये सूक्ष्म जीवी पनपते हैं और अगर 0.05 मी. ली. लिसलिसे तरल में इनकी संख्या 20 या उससे अधिक पायी जाय तो ऐसा समझना चाहिए कि मछलियाँ प्रदूषण ग्रसित हैं।

हिल्सा मछली के अभिगमन पर नई रोशनी

पिछले कुछ वर्षों से फरक्का के ऊपर गंगा नदी में हिल्सा मछली की संख्या में अत्यन्त गिरावट आ गई है एवम् ऐसा समझा जाता है कि फरक्का बाँध बनने से इन्हें तैर कर गंगा के ऊपरी क्षेत्र में जाने में कठिनाईयों का सामना करना पड़ रहा है। इस दृष्टिकोण के मद्देनजर संस्थान ने इनके अभिगमन प्रक्रिया (एचल्कनव्ख) को समझने हेतु एक प्रयोग किया गया जिससे इस विषय पर एक नई रोशनी पड़ी। संस्थान द्वारा 1153 पट्टेदार हिल्सा मछलियों को मुख्य नदी में फरक्का के ऊपर, नीचे एवम् पोषक नहर (भागीरथी) में बाढ़ के समय छोड़ा गया। कुछ दिनों के पश्चात् पट्टेदार मछलियों को गंगा नदी में फरक्का के ऊपर प्रग्रहित किया गया जो इस बात के द्योतक है कि जब नदी का जल स्तर बाढ़ के कारण बढ़ा हुआ हो एवम् बाँध के द्वार खुलें हो तब हिल्सा फरक्का बाँध को पार कर सकती है। इस तथ्य से हमे इसकी गंगा के ऊपरी भाग में पुनःस्थापना में मदद मिलेगी।

बाढ़-बहुल झीलों का वर्गीकरण

पश्चिम बंगाल के ग्रामीण अर्थव्यवस्था में बाढ़-बहुल झीलों का विशेष महत्व है। इन झीलों में उत्पादन प्रक्रिया अनेक विधाओं पर निर्भर करता है जैसे पर्यावरण की अवस्था, मानवजनित अतिक्रमण आदि। इधर कुछ वर्षों से इन संसाधनों के मछली उत्पादन क्षमता में ह्रास हुआ है जो सुदृढ़ वैज्ञानिक प्रबन्धन प्रणालियों के अभाव के कारण है। अतः समुचित प्रबन्धन प्रणाली विकास के तहत इस संस्थान ने अपने अध्ययन के प्रथम चरण में इन जलाशयों के वर्गीकरण को प्राथमिकता देते हुए पश्चिम बंगाल के झीलों को वर्गीकृत किया ताकि समूह विशेष झीलों के लिए उपयुक्त प्रबन्धन प्रणाली का विकास किया जा सके। इस वर्गीकरण के लिए जलाशयों की गहराई, भौतिक-रसायनिक प्राचारों की अवस्था एवम् जैविक उत्पादन तथा खाद्य श्रृंखला को आधार बनाया गया।

प्रथम समूह में ऐसे झील आते हैं जिनकी गहराई 10 मी. से अधिक है और इनमें तापमान का स्तरिकरण होता है साथ ही जलीय ऑक्सीजन गहराई के विपरीत घटता है। इन झीलों में मत्स्य उत्पादन प्लवक आधारित होते हैं तथा अपतृणों का प्रसार तुलनात्मक दृष्टिकोण से निम्नतम होता है। इन झीलों में औसत मत्स्य उत्पादन 580 कि. ग्रा. प्रति हेक्टर प्रति वर्ष के आस-पास पाया गया है।

दूसरे समूह में ऐसे झील आते हैं जिनकी गहराई 3-10 मी. के बीच होती है। इनमें तापमान का स्तरिकरण नहीं होता तथा अपतृणों का विस्तार मध्यम स्तर का होता है। इन झीलों के तलहट्टी में अवस्थित खाद्य सामग्री (डेट्रॉयट्स) मत्स्य उत्पादन में मुख्य भूमिका निभाती है। इन झीलों में औसत उत्पादन 675 कि. ग्रा. प्रति हेक्टर प्रति वर्ष के आस-पास पाया गया है।

तीसरे समूह में ऐसे झील आते हैं जो दल-दल परिवर्तन प्रक्रिया के लगभग अंतिम अवस्था में हैं और इनकी गहराई 3 मी. से कम है एवम् अपतृणों के अत्यधिक विस्तार के साथ साथ पल्वक की पैदावार नगण्य होती है। इन झीलों का औसत वार्षिक उत्पादन वैसे तो 625 कि. ग्रा. प्रति हेक्टर के आस-पास है पर इनमें छोटे किस्म की एवं वायु श्वासी मछलियों की बहुतायत होती है।

झीलों का यह वर्गीकरण इनके पारस्थितिकी एवम् उत्पादन प्रक्रिया पर प्रकाश डालने के साथ भविष्य में उचित प्रबन्धन प्रणाली विकसित करने में योगदान देगा।

मुख्य घटनाएँ

2-3 दिसम्बर '94 को भारतीय अंतर्स्थलीय मत्स्यकीय समिति, बैरकपुर के सिल्वर जुबली वर्ष के उपलक्ष में एक राष्ट्रीय वैज्ञानिक संगोष्ठी 'चैलेनजिंग फरन्टियर ऑफ इनलैण्ड फिशरीज' के नाम से आयोजित की गई। इसके उद्घाटन समारोह की अध्यक्षता डा. एस. जेड. कासिम, सदस्य योजना आयोग ने किया और मत्स्य अनुसंधान के विभिन्न पहलुओं पर प्रकाश डाला। इस संगोष्ठी में देश-विदेश से अनेक शोध-पत्र एवम् अन्य सम्बन्धित लेख आए एवम् पढ़े गए। इस अवसर पर तरुण वैज्ञानिकों के लिए एक निबन्ध प्रतियोगिता का भी आयोजन किया गया।

हिन्दी सप्ताह

भारत सरकार के राजभाषा कार्यान्वयन नीति के तहत हिन्दी सप्ताह (14-20 सितम्बर '94) के दौरान एक बैठक का आयोजन किया गया एवम् हिन्दी के प्रगति एवं प्रसार के सम्बन्ध में विचार विमर्श किया गया।

बैठकें

1. कर्मचारी अनुसंधान परिषद् बैठक 28-29 अप्रैल '94 को
2. 12वीं प्रबन्ध समिति बैठक, 10 जून '94 को
3. तीसरी संयुक्त कर्मचारी समिति की तीसरी बैठक 27 अगस्त 94 को

4. प्रबन्ध समिति की 13वीं बैठक 4 नवम्बर '94 को
5. कर्मचारी अनुसंधान परिषद् की बैठक 5 दिसम्बर '95 को
6. चौथी संयुक्त कर्मचारी समिति की बैठक 2 फरवरी '95 को
7. प्रबन्ध समिति की 14वीं बैठक 4 नवम्बर '94 को

प्रौद्योगिकी का हस्तांतरण

प्रसार एवं राष्ट्र-निर्माण कार्यक्रम

पश्चिम बंगाल के कुछ क्षेत्रों में झींगा उत्पादकों के लिए प्रशिक्षण कार्यक्रम

पश्चिम बंगाल के पाँच जनपदों में झींगा उत्पादन के अध्ययन से पता चला है कि उत्पादकों को 12 मुख्य क्षेत्रों में प्रशिक्षण की आवश्यकता है। ऐसा पाया गया कि मत्स्य उत्पादकों की उम्र, शैक्षणिक योग्यता, अनुभव आदि प्रशिक्षण के पक्ष में, जबकि कुछ विशेष जाति, व्यवसायी एवम् सामाजिक व्यवस्था आदि प्रशिक्षण के पक्ष में नहीं थी। 67 प्रतिशत खेतीहर झींगा खेती के पक्ष में ये कारण इससे अधिक आमदनी होती है।

मिश्रित मत्स्य पालन तकनीक में परिवर्तन की आवश्यकता

प. बंगाल के चार जनपदों में केन्द्रीय अंतर्स्थलीय प्रग्रहण मात्स्यकी अनुसंधान संस्थान द्वारा दिए गए मिश्रित मत्स्य पालन तकनीकी का असर आज के परिप्रेक्ष्य में ऐसा ज्ञात हुआ कि मात्र 8% मत्स्य पालक इस तकनीक के सारे 11 आयामों का अक्षरंश पालन करते हैं। बाकि के 92% मत्स्य पालक इस तकनीक से हट कर मत्स्य उत्पादन करते हैं। ऐसा देखा गया कि ये मत्स्य पालक साल में कई फसल के पक्ष में थे। मत्स्य पालकों का मानना है कि मिश्रित मत्स्य पालन तकनीक के अपनाने से लागत अधिक आता है एवं उत्पादन की सुरक्षा की भी समस्या आती है। अतः वर्तमान संदर्भ में इस तकनीक में आवश्यक परिवर्तन की आवश्यकता है, ऐसा मत्स्य पालकों का मानना है।

प्रसार कार्यक्रम

परामर्शक सेवाएँ

इस वर्ष 179 मत्स्य पालकों, जिनके पास पोखरों की संख्या 201 थी तथा अन्य 37 सरकारी तथा गैर-सरकारी मत्स्य प्रसार संस्थाओं को उनके आवश्यकतानुसार परामर्शक सेवाएँ उपलब्ध कराई गयीं। इसके अलावा आवश्यक सेवाएँ व्यक्ति विशेष एवं अनेक अन्य संस्थाओं को भी पत्रों या उनके स्थान पर जाकर दिये गए।

प्रशिक्षण

अंतर्स्थलीय मात्स्यकी विकास पर एक 10 दिन का प्रशिक्षण कार्यक्रम अंतरराष्ट्रीय लूथेरन सेवार्थियों के लिए आयोजित किया गया।

वार्ता

इस वर्ष मत्स्य पालकों/मत्स्य जीवी लोगों/विद्यार्थियों/प्रशिक्षणार्थियों आदि को 21 वार्ता द्वारा लाभ पहुँचाया गया।

प्रदर्शनी

इस वर्ष दो प्रदर्शनीयों न एक बैरकपुर एवं दूसरा काकद्वीप में आयोजित किए गए।

कृषि विज्ञान केन्द्र

इस वर्ष कृषि विज्ञान केन्द्र काकद्वीप ने 143 प्रशिक्षण कार्यक्रमों का आयोजन किया जिसमें 2314 प्रशिक्षणार्थियों को पाँच विधाओं में जैसे की मत्स्यकी, बागवानी, गृह विज्ञान, पशुपालन आदि में लाभ पहुँचाया गया।

प्रदर्शनी

केन्द्र ने तेल बीज एवं दाल के उत्पादन तथा विकास कार्यक्रम को सुन्दरवन क्षेत्र में लागू किया। इस कार्यक्रम के अंतर्गत 20 हे. में सरसों, 2 हे. में सूर्यमुखी 20 हे में सिसम और 20 हे में मूंग ऊपजाए गये।

प्रयोगशाला से भूमि की ओर

आवश्यकतानुसार इस केन्द्र ने विभिन्न तकनीकों को लोगों के बीच पहुँचाया।

क्षेत्रीय अभिप्रयोग

इसके तहत निम्नलिखित कार्यक्रमों पर काम शुरू किया गया:-

- क) मूंग की फसल के लिए फॉसफोरस की आवश्यकता और प्रभाव।
- ख) फॉसफोरस और नाइट्रोजन का सूर्यमुखी फसल पर प्रभाव
- ग) पशुधन एवं ग्रास कार्प मछलियों के लिए पारा घास का उत्पादन।
- घ) धान और झींगा की साथ-साथ खेती।

काकद्वीप क्षेत्र के 10 ग्रामों के 100 परिवारों को अनेक तकनीकों के बारे में जानकारी दी गई ताकि वे अपने संसाधनों का बेहतर उपयोग कर सकें।

प्रदर्शनी/मेला

इस केन्द्र ने तीन किसान मेलाओं का आयोजन किया। दो ग्रामीण प्रदर्शनियों का भी आयोजन किया गया जिसमें 1920 लोगों ने भाग लिया और लाभ उठाया।

सहयोग

केन्द्र ने पश्चिम बंगाल में एक विशेष कृषि प्रशिक्षण कार्यक्रम का आयोजन किया। केन्द्र ने विधान चन्द्र कृषि विश्वविद्यालय के काकद्वीप में स्थित स्थानीय केन्द्र के साथ सार्थक सहयोग से समुद्र तटीय क्षेत्रों में मिश्रित कृषि अनुसंधान कार्यक्रम का संचालन किया। सुन्दरवन विकास परिषद तथा स्थानीय पंचायतों के साथ भी सार्थक सहयोग रखा ताकि ग्रामीण अंचलों के लोगों का सामाजिक तथा आर्थिक अवस्था में सुधार किया जा सके।

राष्ट्रीय

राष्ट्रीय ताप विद्युत निगम द्वारा प्रदत्त 'सिंगरौली उच्च ताप स्टेशन से गर्म जल बहिःस्त्राव का रिहंड जलाशय के जीव-जन्तुओं पर असर' परियोजना पर संस्थान ने अगस्त '94 से कार्य प्रारम्भ कर दिया है। इस विषय पर भारत में वैज्ञानिक जानकारी की अत्यन्त कमी है। अतः यह परियोजना समयोचित है। इस शोध कार्यक्रम में निम्न विषयों पर प्रकाश डालने का प्रयास किया जायगा।

1. गर्म जल बहिःस्त्राव का भौतिक-रसायनिक एवम् जैविक प्राचालों पर प्रभाव।
2. कुछ विशेष जीव-जन्तुओं पर गर्मी सहिष्णुता पर प्रयोग
3. गर्म जल बहिःस्त्राव से पारिस्थितिकी पर होने वाले बदलाव का आकलन आदि।

अंतरराष्ट्रीय

मछलियों में जन्तुमारी ब्रणकारी संलक्षण रोग

मत्स्य मारक जन्तुमारी ब्रणकारी संलक्षण रोग हमारे देश में भी मत्स्य-पालकों एवं वैज्ञानिकों को संशय में डाल रहा है। देश भर में इस रोग का आकलन और इससे सम्बन्धित अनुसंधान हमारे संस्थान द्वारा किया जाता है जो 'नाका' (एन. ए. सी. ए.) बैकाक, थाइलैन्ड द्वारा संचालित 11 देशों का संयुक्त अनुसंधान अभियान के अंतर्गत आता है।

संस्थान द्वारा किए गए अब तक के अन्वेषण को बैंकाक में आयोजित ओ.डी.ए. क्षेत्रीय संगोष्ठी में विचार-विमर्श के लिए रखा गया। इस संगोष्ठी में कई देशों के वैज्ञानिकों ने भाग लिया तथा इस रोग के निदान के लिए निम्न उपायों का अनुमोदन किया।

1. ऐसा देखा गया है कि इस रोग की शुरुआत 'एफेनोमॉसिस' कवक से मछलियों में छूत लग जाता है जो कालान्तर में दानेदार घावों में परिवर्तित हो जाता है। अतः मीठा एवं खारा जलों में इस कवक की उपस्थिति पर गौर करने की आवश्यकता है।
2. हाल में प्राप्त 'फैथोलोजिकल' एवं 'इपीज्यूटीओलोजिकल' कार्यों से ऐसा इंगित होता है कि आस्ट्रेलिया में मछलियों पर पाए जाने वाले लाल दाग रोग (रेड स्पॉट डीजिज) तथा जापान में पाए गये कवकीय दानेदार रोग जन्तुमारी ब्रणकारी रोग से भिन्न नहीं है। अतः हमारा अन्वेषण इन सारी बातों के मद्देनजर होनी चाहिए।
3. संगोष्ठी में प्रस्तुत जानकारियों के आधार पर ऐसा लगता है कि अभी तक इस रोग के नियंत्रण एवम् उपचार के उपाय बहुत ही सीमित हैं। चूने के प्रयोग द्वारा रोग का नियंत्रण मात्र एक आंशिक उपचार है। अतः किसी ठोस उपचार के विकास न होने तक ऐसे जलाशयों को स्वच्छ रख कर तथा प्रदूषण के प्रभाव को कम करके हम इस रोग के फैलाव पर कुछ हद तक काबू पा सकते हैं।

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 347 पुस्तकें 22 पुनः मुद्रित शोध पत्र तथा 91 विविध प्रकाशनों की वृद्धि किया, साथ ही 32 विदेशी तथा 58 देशी शोध जर्नलों को मंगाया। आज संस्थान के पुस्तकालय में कुल 7153 पुस्तकें, 3121 अन्य प्रकाशन, 4240 पुनर्मुद्रित लेख उपलब्ध हैं। इस वर्ष पाँच राष्ट्रीय एवं अंतरराष्ट्रीय संगठनों के साथ विनिमय सम्बन्ध स्थापित हुए।

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

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Dr. V.R.P. SINHA joins CIFRI

Dr. V.R.P. Sinha, former Director of CIFE, Bombay, joined the CIFRI to discharge the duty of Director. Born in Bihar in 1938, he has been involved in fisheries research, planning, teaching and extension for last 34 years in different countries, particularly Bangladesh, Myanmar, Hungary, India, Malaysia, North Korea, the Philippines, the U.K. and Thailand. He did his Ph.D. from Liverpool University in 1965 and after working in the U.K. and Malaysia came back to serve the country and joined the ICAR in 1971 as Project Coordinator of All India Coordinated Project on Composite Fish Culture and Seed Production. He has been Consultant to the World Bank, CGIAR/TAC, FAO & WFP of the United Nations.

Dr. Sinha has made contributions to various aspects of the biology of eel, which are recognised all over the world. While working in England, he clarified the sex-change theory in eel and the Atlantic eel problem, whereas in Malaysia he made a breakthrough in the fractionation of the fish pituitary extract for isolating the gonadotropin used in fish spawning. In India, working as All India Coordinator, he succeeded in explaining why major carp do not breed in confined water of ponds and advanced the hypothesis of the gonadal hydration for successful spawning of carp. He showed through composite fish culture, how small farmers can raise carp production in pond from very small amount to 3-10 ton/ha/yr.

In 1985, he established the world's one of the largest aquaculture institutes namely the Central Institute of Freshwater Aquaculture (CIFA), at Dhauli near Bhubaneswar in Orissa. He was involved in aquaculture project formulation in Bangladesh, Hungary, North Korea and Burma. He was a visiting Professor at the International Rice Research Institute, Manila, Philippines for the course on 'Prosperity through Rice'. During 1986-88, worked in the FAO of the United Nations as Senior Aquaculturist (Research and Training) at Bangkok and played a very crucial role in the transfer of technologies through the technical cooperation among the developing countries. During his tenure of directorship, the CIFE was upgraded in 1988 as a Deemed University under ICAR. Recently from 1992-94 he served as United Nation/FAO Senior Specialist, Research Planning and Management at Bangladesh.

He represented India in many of the International Conferences and has shared the Hooker Award (1975), Rafi Ahmed Kidwai Memorial Prize (1976) and Team Leader Award of the ICAR (1978), Lalbahadur Shastri Award (1989), Great Son of the Soil Award (1991), Glory of India Award (1992), and Aasirwad Award (1992) for his scientific attainment. He is a Fellow of the Indian National Science Academy since 1992. He is also a Fellow of the National Science Academy, Allahabad and of the Indian National Agricultural Science Academy, New Delhi. He is the President of the Inland Fisheries Society of India. Besides many popular articles he has over one hundred publications in different journals, both Indian and foreign, and has authored four books, one published by the Liverpool University Press and three in the country.

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At the foundation stone laying ceremony at CIFRI, Dr. R.S. Paroda, Director General, ICAR being welcomed by Dr. V.R.P. Sinha, Director, CIFRI (left) and Dr. P.V. Dehadrai, Deputy Director General, ICAR (right)

Dr. Paroda laying the foundation stone



Dignitaries at the meeting that followed the ceremony



His Excellency the Governor of Orissa Shri B. Satyanarayana Reddy in the Atomic Absorption Spectrophotometer laboratory of the Institute (top).

Parliamentary delegation headed by Shri K.P. Unnikrishnan at CIFRI library (below).



ANNUAL REPORT 1994-95

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 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 2.2 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 involves 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 mandates, the research at CIFRI has been organised under seven Divisions, corresponding to the major fishery resources and other research needs of the country related to fisheries development.

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 presently it 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 *Environmental Monitoring and Fish Health Protection Division*, stationed at Barrackpore, is mandated to monitor the man-made changes in the riverine,

reservoir and estuarine ecosystems and evolve suitable amelioration measures. Experiments are being carried out in the laboratory condition also to substantiate the findings from natural resources. The studies under the division include collection of basic information on habitat variables, impact identification through known indicators and biodiversity, screening of toxicants in controlled condition, microbiological studies to ascertain organic load in aquatic environment and fish health diagnostics and control. Mitigation action plan will also be developed for ecosystem restoration.

The **Wetland Division** has its headquarters at Barrackpore. The ecodynamics of wetlands spread over the floodplains of Ganga-Brahmaputra basins are being carried out in order to evolve management norms for sustainable development. The wetlands associated with the floodplains of Ganga and Brahmaputra rivers are not only unique by their rich biodiversity, they also constitute an important fishery resource in the states of Bihar, West Bengal and Assam. The new Division of Floodplain wetlands strives to carry out research on the ecosystem processes and fish productivity from this resource with special attention on promotion of biodiversity and environment-friendly development technologies.

The **Resource Assessment Division** is located at Barrackpore and conducting research aiming at to generate data base in the fisheries sector of the country. The Division is geared up to study fish populations to evolve suitable population models for yield optimisation.

The **Hilsa Division** is located at Maldah/Farakka (West Bengal). The main aim of the division is to carry out research on hilsa with special emphasis on the ranching and rehabilitation of its population in river Ganga.

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

The Institute's research activities 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

Indicator ciliate species for stressed water

A methodology has been developed to quantify the presence of urceolariid ciliate parasites *Trichodina* sp. and *Tripartiella* sp. as indicators of stressed environment in aquatic ecosystem. Presence of these ciliates above 20 number in 0.05 ml of gill mucous is indicative of stress in fish.

New light on Hilsa migration

Recent experiment conducted by the Institute has confirmed the upstream migration of hilsa, *Tenualosa ilisha*, across the Farakka barrage during the flood season. The depletion of hilsa stock above Farakka barrage has been a subject of animated controversy for many years. This highly prized anadromous fish had constituted a sizeable fishery in the middle stretches of Ganga prior to mid 70's. Subsequently the pathway of their migration was believed to be obstructed by the construction of Farakka barrage. In the recent years, however, the fish was reported to be negotiating the barrage. The tagging experiments conducted by the Institute has further confirmed that hilsa negotiates the barrage only during flood season, when the gates are opened.

A total of 1153 tagged hilsa were released in the main river, above and below Farakka barrage and in the feeder canal (Bhagirathi). The recovery of tagged specimens (142 nos.) upstream beyond Farakka barrage is an evidence of migration of hilsa across the barrage.

Categorisation of Floodplain lakes in West Bengal

Flood plain lakes constitute one of the prime fishery resources of West Bengal by playing a vital role in the rural economy. The production processes of this dynamic ecosystem exhibits wide variations depending on an array of environmental and anthropogenic factors. With a view to developing appropriate management norms, the floodplain lakes of West Bengal have been classified on the basis of criteria such as depth profile, physico-chemical properties and community metabolism. Three major categories are clearly discernible with distinct limnological attributes and production potential.

The first category of lakes in the depth range of >10 mt. exhibit thermal stratification and klinograde oxygen distribution. Energy transformation takes place primarily through grazing chain and has an average yield of around 580 kg/ha/yr.

The second category lakes has a depth range of 3-10 mt. with total absence of thermal or chemical stratification. The lakes have moderate macrophytic infestation with pronounced detritus food-chain and the average yield of around 675 kg/ha/yr.

The third category comprises shallow lakes (<3 mt.) and in an advanced stage of swampification. The lakes are heavily infested with macrophytes, resulting into very little availability of plankton. Though the fish yield is good 625 kg/ha/yr like other categories but dominated by miscellaneous and air-breathing fishes.

The aforesaid findings not only throw light on production dynamics but also pave the way for developing an environment friendly and sustainable fisheries management plans.

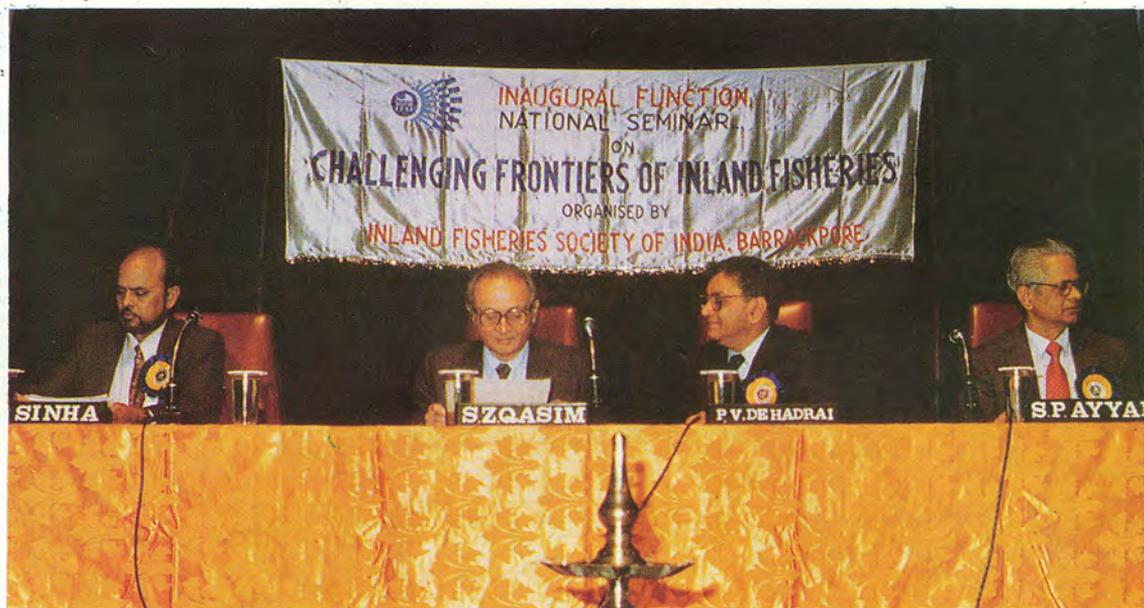
IMPORTANT EVENTS

National Seminar on Inland Fisheries

A National Seminar on the "Challenging frontiers of inland fisheries" was held at Barrackpore on 2-3 December, 1994 on the auspices of the Silver Jubilee Celebrations of the Inland Fisheries Society of India. The inaugural session was presided by Dr. S.Z. Qasim, Member Planning Commission. He also delivered the key-note address. Five sequential Technical Sessions on Environmental issues, Biotic Communities, Production processes, Socio-economics and Pre- and Post-harvest Management were attended by a cross section of the fisheries fraternity comprising scientists, environmentalists, engineers, technocrats, senior officials of the Centre and State Governments, administrators, planners and policy makers. An essay contest for young scientists was also conducted on the subject "How environment friendly is inland fisheries development".

HINDI WEEK

In compliance with the Official Language Implementation Policy of the Indian Union, as a part of the Hindi Week (14-20 September, 1994) a meeting was organised at the Institute to discuss how best the working in hindi could be improved..



Dr. S.Z. Qasim, Member, Planning Commission, Govt. of India, giving the Inaugural speech at the Seminar conducted in CIFRI (Top)

Dr. P.V. Dehadrai, Dy Director General (Fy), ICAR, Inaugurating a fishery exhibition in CIFRI (Below)



INDO - BRITISH TRAINING COURSE ON BIOMONITORING OF WETLANDS

DECEMBER 7- 21, 1994

Jointly organised by

BRITISH COUNCIL, CALCUTTA & CICFRI, BARRACKPORE



**Dr. S.P. Ayyar, Dr. J. Sloan and Prof. A.N. Bose at the
Inaugural function of Indo-British Training course on
Biomonitoring of wetlands**

MEETINGS

Staff Research Council Meeting held on 28-29 April, 1994.
Staff Research Council Meeting held on 5th December, 1994.
12th Management Committee Meeting held on 10.6.94.
13th Management Committee Meeting held on 4.11.94.
14th Management Committee Meeting held on 13.3.95.
Institute Joint Staff Council Meeting (3rd) held on 27.8.94.
Institute Joint Staff Council Meeting (4th) held on 7.2.95..

COLLABORATION/CONSULTANCY

NATIONAL

NTPC Consultancy Project

A consultancy project entitled "Study on impact of hot water discharge from Singrauli Super Thermal Station on aquatic life of the Rihand reservoir" was offered to the Institute by the NTPC, Ministry of Power, Govt. of India, in August 1994. The investigation aims at evaluating the impact of cooling discharge of the thermal project on the aquatic life of Rihand reservoir. Scientific information on impact of hot water discharge from Thermal Power Station on aquatic life in tropical conditions like India is very scanty. At present, Indian regulations do not permit disposal of hot water discharge with a temperature rise of more than 5°C. The study would involve following aspects :

- i) Physicochemical and biological characteristics of the reservoir receiving the hot condenser cooling water.
- ii) Bioassay experiments for thermal tolerance.
- iii) Impact on aquatic organisms due to entrapment, impingement and entrainment and thermal discharges.
- iv) Evaluation of ecological changes due to hot water discharge.

The data generated will serve as a guideline for other Thermal Power Plants in the country.

INTERNATIONAL

Epizootic Ulcerative Syndrome in Fishes

Outbreak of Epizootic Ulcerative Syndrome, the dreaded fish killer disease in India has caused serious concern to the general public and fishery scientists alike. The CIFRI is monitoring the disease in the country as a part of a 11 nation collaborative research programme with NACA, Bangkok.

The results of the research work conducted by the Institute on EUS were presented and discussed at the ODA Regional Seminar on EUS at Bangkok, Thailand. Scientists from several countries participated in the Seminar and a set of recommendation was formulated for tackling the dreaded disease in the affected countries. The recommendations were :

- 1 EUS is a seasonal epizootic condition of freshwater and estuarine warm water fish of complex aetiology characterised by the presence of invasive *Aphanomyces* infection necrotizing ulcerative lesions typically leading to a granulomatous response.
- 2 Recent pathological and epizootiological evidences have indicated that the condition known as *red spot disease* in Australia is indistinguishable from EUS. Similarly, all available evidence suggests that the condition known in Japan as mycotic granulomatosis is indistinguishable from EUS.
- 3 It appeared from information presented at the Seminar that although some results may be achieved by ad-hoc options such as liming, the options for the treatment of the disease are currently limited to empirical management of pond situations. There is need to understand the current inadequate control methods.
- 4 All available evidences suggest that consumption of EUS, infected fish poses no proven specific health problems to human, provided they are prepared in sanitary conditions.

MANPOWER DEVELOPMENT

Training/Fellowship overseas

Shri M. Karthikeyan, Scientist deputed for a training under DAAD Fellowship programme in the field of Agricultural Sciences and Resources Management in Tropics and Subtropics for 18 months 1.4.94 to the University of Bonn, Germany.

Dr. S.N. Singh, Senior Scientist underwent a training course in Fisheries/Aquaculture at University of Tasmania, Launceston, Australia from 9.5.1994 to 4.11.1994. This training programme was sponsored by the Australian International Development Assistance Bureau, Department of Foreign Affairs and Trade, Government of Australia included Environmental Impact Assessment component and Salmonid Hatchery Management besides formal instruction component.

Dr. B.C. Jha, Sr. Scientist attended a training course on Fisheries Management and Eutrophication in Inland Waters at the University of Queensland, Australia from 28 July 1994 to 28 January 1995, which was sponsored by Australian International Development Assistance Bureau, Department of Foreign Affairs and Trade, Govt. of Australia.

Dr. V.V. Sugunan, Sr. Scientist deputed for Andre Mayer Research Fellowship Programme for fourteen and half months (effective from 3.10.94) to undertake research work in the area of "Fish production in small waterbodies in selected countries" under FAO.

Training Inland

Smt. Mira Sen, T-7 and Shri Sukumar Saha, T-5, attended a training programme entitled Krishi Vigyan Orientation cum Training Programme at Purulia, Kalyan from 22.4.94 to 24.4.94.

Shri S. Bhowmick, T-5, underwent a training on Aquatic microbiology in freshwater aquaculture during 17-23 May, 1994 at CIFA, Bhubaneswar.

Shri J.G. Chatterjee, Scientist (SG) attended summer institute on "Advances in Agricultural Extension Education" organised at Division of Agricultural Extension, IARI, New Delhi from 21.9.94 to 10.10.94.

Shri S.K. Sadhukhan, T-6 and Shri C.N. Mukherjee, T-5 attended a training course on First Line Demonstration on Oil seeds and Pulses at Nimpith from 5.12.94 to 8.12.94.

Shri C.N. Mukherjee, T-5 attended a training course on Biotechnology in Agriculture at H.F.C., KVK, Durgapore from 8.3.95 to 10.3.95.

Shri J.G. Chatterjee, Scientist (SG) and Dr. A.K. Chattopadhyaya, T-7 participated a group meeting-cum-training for C.T.O. held at Kalyani, Agriculture University from 14.3.95 to 15.3.95.

Dr. D.K. Kaushal, Senior Scientist has completed the XXVII short-term course on use of Computer in Agricultural Research at Indian Agricultural Statistics Research Institute, New Delhi from 1st April 1995 to 15th April 1995.

HONOURS, AWARDS, ETC.

Mrs. G.K. Vinci (Team leader), Dr. V.V. Sugunan and Dr. V.K. Unnithan (Associates), Senior Scientists received the ICAR Award for Team Research for 1991-93 for their significant contribution in Aquaculture.

Dr. S. Bijoy Nandan, Technical Officer, CIFRI Centre, Alappuzha has been awarded the Jawaharlal Nehru Award for 1993 instituted by the ICAR for outstanding post-graduate agricultural research. The award was in recognition to his significant research contribution in the field of Aquatic Biology and Fisheries.

Shri P.K. Katiha, Scientist has been awarded the degree of Doctor of Philosophy in Agricultural Economics by Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan (H.P.) for his thesis entitled "Natural resource management : A case study of reservoir fisheries in Himachal Pradesh".

Dr. K.R. Naskar, Sr. Scientist has been awarded as ICAR National Fellow for his contribution in the field of Research to frontier areas of Agricultural Research in this country.

Dr Srikanta Samanta, Scientist has received the ISCA Young Scientist' Award from the Indian Science Congress Assiciation for the Section of Agricultural Sciences, in the 82nd Indian Science Congress held at Calcutta during January 3-8, 1995. Dr. Samanta was also awarded IARI Gold Medal (Merit Medal) on the basis of academic performance and the paper presented on his Ph.D. work during the 33rd Convocation held on 12th February 1995 at IARI, New Delhi.

TRANSFER OF TECHNOLOGY

EXTENSION AND NATION-BUILDING ACTIVITIES

Training needs of giant freshwater prawn producers in some areas of West Bengal

The study conducted on training needs of giant freshwater prawn producers in 5 districts of West Bengal had identified 12 main areas of training needs. It revealed that age, education, experience in prawn farming, farm size and area under giant freshwater prawn farming had positive and significant correlation with the training needs in the main areas of training whereas caste, occupation, social participation and income were found to be negatively correlated. Freshwater prawn farmers' attitude towards giant freshwater prawn farming indicated that 67 percent of the respondents had a favourable notion as it was highly profitable.

Need for modification of composite fish culture technology as perceived by the fish farmers

An investigation was carried out in four districts of West Bengal to know the impact of the composite fish culture technology under post demonstration situation. The study revealed that 8 percent of the respondents have been continuing with total 11 recommended package of practices of CIFRI, even after withdrawal of the demonstration programmes whereas rest 92% of the respondents have deviated from the recommended packages and following multiple stocking and multiple harvesting or single heavy stocking and multiple harvesting practices. Constraint analysis indicated that high cost of input and security of fish crop, mainly have compelled the respondents to deviate from the total recommended management practices. Thus, as perceived by the fish farmers there is need to modify the package of practices of composite fish culture considering the present circumstances.

Extension activities

Advisory services : A total of 179 clientele having 201 waterbodies and 37 extension functionaries of various State Fisheries Departments and Non-Government Organisations were offered advice as per their requirements. Necessary advice/suggestions were also rendered to a number of personnel/agencies through letters, field visits etc.

Training : A 10-day training course of Inland fisheries development was organised for the extension functionaries for Lutheran World Services (India).

Talks delivered : 21 talks were delivered on fisheries and extension education to the fish farmers/fishermen/students/trainees.

Exhibition : 2 exhibitions were organised at Barrackpore and Kakdwip, respectively.

KRISHI VIGYAN KENDRA

The KVK, Kakdwip had organised 143 on-campus and off-campus training courses, in which 2314 trainees were benefitted in 5 disciplines viz., Fisheries, Agronomy, Horticulture, Home-science and Animal science.

Demonstration : The Kendra has implemented the Mission oriented Oil seed and Pulses development programme in Sunderbans. The demonstrations were conducted towards production of mustard in 20 ha, sunflower in 2 ha, sesamum in 20 ha and Moong in 20 ha covering 389 farmers under Oil seeds and 186 farmers under Pulses.

Lab to land : The Kendra was engaged to disseminate various technologies relating to multiple disciplines depending on local needs and resources. The lab to land programme was implemented by adopting 100 poor farm families in different villages.

On-farm trial : Under On-farm trial for refining the technologies for adoption in the coastal tract of Sunderbans the following programmes were undertaken :

1. Determination of dose and effect of phosphorus on moong.
2. Effect of phosphorus and nitrogen on sunflower.
3. Production of paragrass for cattle feeding and grass carp production.
4. Paddy cum prawn farming.

Exhibition/Fair : The kendra organised 3 Kishan Mela and 2 Rural exhibition where 1920 visitors were benefitted.

Collaboration : The KVK organised specialised training programme in collaboration with the department of Agriculture, Govt. of West Bengal on NWDPR. A close linkage was maintained with NARP (BCKV) at the regional Research Station, Kakdwip and collaborative research programme on integrated farming system in coastal area have been undertaken. Collaborative efforts have also been strengthened with the Sunderban Development Board, Govt. of West Bengal and Non-Govt. organisation and Local bodies like Panchayat samity to uplift the socio-economic condition of the rural poor through training and extension programmes.

Lab to land programme : During the period under report Frontline demonstration on Lab to land programme was implemented in the villages viz., Nandabhanga, Narayanpur, Frezergunj, Madangunj, Belpukur, Laxipasa, Provabatipore, Nischintapur, Dayarumpore, Kakdwip adopting 100 farm families. The Kendra was engaged towards transfer of technologies related to multiple disciplines depending on the local need and available resources. The Kendra had transferred different appropriate technologies to farmers and farm women covering five disciplines viz., Fisheries, Crop production, Horticulture, Animal husbandry and Home Science with encouraging results.

LIBRARY & DOCUMENTATION SERVICE

The CIFRI has been an attraction to a variety of users including researchers, university professors, officials, students and entrepreneurs. The library added 347 books, 22 reprints of the scientific papers, 91 miscellaneous publications to its collection and subscribed 32 foreign and 58 Indian journals. The Library has now a total holding of 7153 books, 4240 reprints, 937 maps and 3111 miscellaneous publications.

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 115 publications to other libraries on inter-library loan. The total expenditure incurred by the library during the year was Rs.10,23,484.00.

The section maintains an active laser printing, photography and reprography services. to cater the needs of the Institute. Photographs, reprints and photocopies were supplied to the scientists of the Institute as well as of other research institutions 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

More than 22 technical reports pertaining to progress of research activities of the Institute were compiled. Research publications 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. Participation of scientists in seminars, symposia, conference etc. was monitored by the section.

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 of 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.

Publications

The following departmental publications were brought out by CIFRI during the year April 1994 to March 1995.

- 1 Factors relating to decline of fisheries in the river Brahmaputra, Bulletin No. 60.
- 2 Hirakud Reservoir - Strategies for fisheries development. Bulletin No. 66.
- 3 Suraha Tal : Prospects for fisheries development, Bulletin No. 64.
- 4 Progress report of KVK, Kakdwip, CIFRI, Barrackpore.
- 5 Abstracts of the Seminar on Challenging Frontiers of Inland Fisheries.
- 6 Technical Brief on activities and achievements of CIFRI (Submitted to the Parliamentary Sub-Committee, March 2, 1995) alongwith the Hindi version.

CONFERENCES, SYMPOSIA, ETC.

The following important Meetings/Workshops/Seminars, etc. were attended/presented papers by the scientists during April 1994 to March 1995.

National Seminar on "Challenging frontiers of Inland Fisheries", held at Barrackpore on 2nd and 3rd December, 1994; Indo-British Training Course on Biomonitoring of wetlands held at Barrackpore from 7-21 December 1994; Seminar on "Blue-Revolution in National and International Context-2000 A.D." at Pragati Maidan, New Delhi from 8-12 March, 1995; National Seminar on "Fish Diseases" organised by the Department of Aquatic Biology and Fisheries, Univ. of Kerala, Trivandrum on 15.3.1994; Workshop on "Fisheries Development in Kuttanad" organised by the Changnassery Social Service society on 28.3.1995 at Regional Agricultural Station, Kumarakom; Seminar on "Fish Quarantine Pests and Diseases and their area of distribution" at Cipanus, Indonesia in January 1995; National Seminar on "Current and Emerging Trends in Aquaculture and its Impact on Rural Development" held at College of Fisheries, Rangailunda, (OUAT), Orissa from 14-16 February, 1995; National Symposium on "Perspective Diversity" organised by the Zoological Society of India, and Dept. of Botany at Indian Institute of Chemical Biology, Jadavpore on 24-25 March, 1995.

A total of 50 papers were presented by the scientists of the Institute in the above mentioned seminars/workshops/meetings, etc.

VISITORS

A large number of distinguished personalities including national leaders visited the Institute's Headquarters and its different centres during 1994-95. This include **Shri S.N. Reddy, Hon'ble Governor of Orissa.**

The following is the list of other distinguished visitors from India and overseas who visited :

Agarwal (Mr.), Deputy Director, Haryana Fisheries Department, Haryana

Ahamad, Nazir (Mr.), Jt. Director, Fisheries, Kerala.

Bandopadhyay, A.K. (Dr.), Director, CARI, Port Blair.

Bharti (Mr.), C.E.O. Karnal, Haryana Fisheries Department, Haryana

Bhattacharya, S.K. (Dr.), Head, Department of Mathematics and Statistics, University of Allahabad, U.P.

Bora, Dally (Smt.), Chairperson, Assam Fisheries Development Corporation, Assam.

Chakraborty, P.C. (Shri), Jt. Director of Fisheries, Govt. of West Bengal, West Bengal.

Choudhury, S.(Mr.), Jt. Director, Dept. of Fisheries, Govt. of Assam, Guwahati.

Das, Ashalata (Smt.), Addl. Secy. (F), Union Ministry of Agriculture, Govt. of India, New Delhi.

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

Das, P. (Dr.), Director, National Bureau of Fish Genetic Resources, Lucknow, U.P.

Das, S.K.(Dr.), Zonal Coordinator (AE), Zone II, Indian Council of Agricultural Research, New Delhi.

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

Dutta, Amal (Mr.), Member of Parliament, West Bengal.

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

Gangopadhyay, D.K. (Mr.), Additional Chief Secretary to the Govt. of Assam, Assam.

- Ghosal, D.K.(Shri), Addl. Secy. (F), Union Ministry of Agriculture, Govt. of India, New Delhi.
- Goswami, U.C.(Dr.), Professor, Dept. of Zoology, Guwahati Univ., Guwahati, Assam.
- Gowda, L.S.(Dr.), Associate Professor of Aquaculture, Fisheries College, Mangalore.
- Gowri Amma, K.R.(Smt.), MLA, Kerala Assembly.
- Kakoti,(Dr.), Jt. Director, Dept. of Fisheries, Govt. of Assam, Guwahati.
- Kamal, M.Y. (Dr.), Asstt Director General (Fy), Indian Council of Agricultural Research, New Delhi
- Khanna, P.N. (Dr.), Joint Director, IVRI, Izzatnagar
- Mathew, P.M.(Dr.), Professor, Fisheries College, Panangad, Kerala.
- Mullick, S.K.(Mr.) Jt. Director, Dept. of Fisheries, Govt. of Assam, Guwahati.
- Pandey, S.N. (Dr.), Director, Jute Technological Research Laboratory, Calcutta.
- Ranadhir, M.(Mr.), Director, Central Institute of Freshwater Aquaculture, Bhubaneswar.
- Rao, G.P.S.(Dr.), Associate Professor of Aquaculture, Fisheries College, Mangalore.
- Ravi, Vayalar (Mr.), Member of Parliament, Kerala, Sub-Committee of Marine Products, Parliamentary Standing Committee on Commerce, Govt. of India.
- Roy, B.K. (Shri), Addl. Director of Fisheries, Govt. of West Bengal, West Bengal.
- Sarma, S.K.(Dr.), Chief Relation Officer, Indian Council of Agricultural Research, New Delhi.
- Sasidharan, K.M. (Mr.), Commissioner, Fishermen Welfare Fund Board, Trichur, Kerala.
- Sharma, B.M. (Mr.), Ex-Director, Haryana Fisheries Department, Haryana
- Silas, E.G. (Dr.), Vice-Chancellor, Kerala Agricultural University, Kerala
- Singh, H.R. (Dr.), Head, Department of Zoology, University of Allahabad

- Srivastava, C.B.L. (Dr.), Professor of Zoology, University of Allahabad
- Srivastava, J.P. (Dr.), Former Head of the Botany Department, C.M.P. Degree College, Allahabad
- Swaroop, Krishna (Dr.), Former Head, Department of Zoology, Gorakhpur University
- Tuli, R.P.(Mr.), retired Director of Fisheries, Govt. of Madhya Pradesh, Bhopal, M.P.
- Unnikrishnan (Mr.), Jt. Director, Dept. of Fisheries, Kerala.
- Unnikrishnan, K.P. (Mr.), Member of Parliament, Kerala, Convenor, Sub-Committee of Marine Products, Parliamentary Standing Committee on Commerce, Govt. of India.
- Venkateswarlu, U. (Dr.), Member of Parliament, Andhra Pradesh,
- Viswanathan (Dr.), Jt. Director, Industrial Toxicology Research Centre, CSIR, Lucknow, U.P.
- Yadava, Y.S.(Dr.), Adviser, Fisheries, NEC, Shillong.

FINANCE

For the year 1994-95 (Rs. in lakhs)

	B.E. 1994-95 (Rs.)	R.E. 1994-95 (Rs.)	Actual Expenditure 1994-95 (Rs.)
Plan :	170.00	83.277	83.277
Non-Plan :	270.00	326.50	326.50
Total :	440.00	409.777	409.727

PROGRESS OF RESEARCH

CENTRE-WISE LIST OF ONGOING PROJECTS 1994-95

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
KARNAL	FC/B/10	FC/B/11	FC/A/7
ALLAHABAD	FC/B/11	FC/B/12	FC/A/18
ALAPPUZHA	FC/B/13		
BANGALORE	FC/A/7		
CALCUTTA	FC/B/11	BF/B/10	
COIMBATORE	FC/A/19		
CANNING	BF/B/3		
DIAMOND HARBOUR	BF/B/3		
DIGHA	BF/B/3		
ELURU	FC/A/20		
FARAKKA/MALDAH	BF/A/22		
GUWAHATI	FC/B/14	FC/A/22	
LALGOLA	FC/B/12		
HOSHANGABAD	FC/A/7		
ULUBERIA	BF/B/3		
VADODARA	BF/B/9		

PROJECT : FC/B/10

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

Personnel : R. S. Panwar, D. N. Mishra, Shree Prakash, (Mrs.) Usha Moza,
K. Chandra, S. K. Srivastava, Neeraj Swarup.

Duration : 1994-95

Location : Agra and Karnal

Estimation of fish landings and population parameters of commercially important fishes

A total fish landing of 11.95 t was recorded from November '94 to March '95. In the upper stretch of river Yamuna between Yamunanagar and Panipat. Miscellaneous group (5.19 t, 43.43%), dominated the catch followed by large cat fish (4.77 t, 39.92%) and major carp (0.93 t, 7.78%). *Tor* sp. to the tune of 0.94 t (7.87%) and *Ctenopharyngodon idella* 0.12 t (1%) contributed in total production and were restricted to upper stretches only. *C. catla* was completely absent in the landing. Amongst major carp *L. rohita* was predominant (76.34%).

Total fish landing of 13.70 t was recorded in the middle stretch of river Yamuna (Agra to Firozabad) between April and June, '94, and showed the dominance of large catfish (5.90 t, 43.10%), followed by major carp (3.14 t, 22.94%) and miscellaneous group (2.70 t, 19.72%). Amongst major carp, *L. calbasu* (72.29%) was dominant followed by *L. rohita* (13.69%), *C. mrigala* (12.10%) and *C. catla* (1.92%), while amongst large cat fish, *M. seenghala* (91.36%) was pre-dominant followed by *W. attu* (8.64%). The landing of *Cyprinus carpio*, an exotic carp, to the tune of 1.95 t in the middle stretch of R. Yamuna (between Mathura and Agra), contributing 14.24% of total fish yield, was significant.

The average catch/unit effort was 0.0339 kg/man/hr as against 0.0320 kg/man/hr in 1993-94 of the same period, showing marginal increase. Miscellaneous fish was the maximum (32.63%) followed by large cat fish (24.73%), major carp (22.83%) and *Cyprinus carpio* (19.82%).

Availability of spawn/fry of exotic carp

Preliminary market survey between Vrindaban and Agra (Virindaban, Mathura, Refinery gate, Runukta and Agra) revealed the presence of *Cyprinus carpio* fingerlings during peak summer (April to June) and winter months coinciding with low water level in river Yamuna.

Impact of environmental changes on abiotic factors

The physico-chemical studies indicated severe stress in the middle stretch of river Yamuna; being the maximum at Delhi followed by Agra, Mathura and Firozabad. The river stretch at Yamunanagar indicated severe pollution with nil DO and higher values of CO_2 (16.0-24.5 mg l^{-1}) alkalinity (640-984 mg l^{-1}), sp. conductance (2642-10560.59 micro mhos-cm) and BOD (186.5-210.0 mg l^{-1}). The Delhi stretch of the river showed pollutional stress as ammonia (1.0-3.5 mg l^{-1}) and CO_2 (1.4-16.2 mg l^{-1}) values were in higher order.

The chemical characteristics of water of the combined waste disposal areas at Agra had low dissolved oxygen (3.60-4.16 mg l^{-1}) and higher values of sp. conductance (829-2426 micro mhos-cm), chlorides (21.52-26.5 mg l^{-1}), carbon-dioxide (14.5-26.4 mg l^{-1}) and ammonia (8.8-13.5 mg l^{-1}). The BOD values were also on the higher side (47.5-96.4 mg l^{-1}). So with nitrate and phosphate values which ranged from 1.09-1.18 mg l^{-1} and 1.54-2.09 mg l^{-1} respectively. The above parameters indicated stress condition in this stretch of the river Yamuna.

The stretch of river Yamuna in Firozabad got contaminated from combined wastes of lead and synthetic dyes discharged by bangle industries and carried to the river through city sewage @ 5000 cubic meter/day. The outfall areas indicated low values of D.O. (4.07 mg l^{-1}). The value of carbon-dioxide (13.40-16.60 mg l^{-1}) BOD, (29.84-37.52 mg l^{-1}), ammonia (1.5-6.5 mg l^{-1}) and sp. conductivity (1648-2652 $\mu\text{micro mhos-cm}$) were under the permissible limits.

Primary productivity

The reference zones (AOF) at Mathura, Agra and Firozabad reflected moderate carbon production (Gross production in the range of 62.5-218.54 $\text{mgC/m}^3/\text{hr}$ and net production in the range of 57.50-156.25 $\text{mgC/m}^3/\text{hrs}$). The outfall areas, however, indicated relatively higher primary productivity in the range of 162.5-307.5 $\text{mgC/m}^3/\text{hr}$ (gross) and 45.56-194.02 (net) probably due to enrichment of nutrients through sewage influx.

Soil

The sediment of upper stretch of river Yamuna showed relatively poor organic carbon (0.21%) while the polluted stretches at Yamunanagar indicated higher values (0.60%), Karnal (0.35%), Delhi (0.63%), Mathura (0.55%), Agra (1.05%) and Firozabad (0.64%).

Plankton

The upper stretch of river Yamuna showed relatively poor plankton production in the range of 301 μl (Dakpathar) and 492 μl (Yamunanagar) as compared to the middle stretch (from Delhi to Agra) where it ranged between 3634 μl and 6034 μl .

Plankton spectrum showed the over all dominance of phytoplankters to the tune of 68.0% to 98.0% and amongst them members of Bacillariophyceae were predominant. The zooplankters were represented mainly by rotifers and copepods. Significantly Euglenoids and

Myxophycean forms amongst the phytoplankton and rotifers amongst the zooplankton showed a definite preference for sewage zones for their better proliferation.

Macrobenthos

The benthos population ranged between 44 nos/m² (Hathnikund) and 87 nos/m² (Dakpatther) in the upper stretch of Yamuna and the Odonata was the most dominant biota. The size of benthic population was however much higher in the middle stretch, (508 nos/m² to 4540 nos/m²). The texture of the community showed the dominance of *Chironomids* and *tubifex* (sewage zones) and gastropods (reference zones).

Benthic diversity index found to be narrow in range from 1.3 at Mathura and Agra to 1.4 at Firozabad and accordingly the entire middle stretch of the river between Mathura and Agra indicated mesosaprobic status.

Bio-monitoring of fish health in river Yamuna through histopathological observations

Histopathological studies conducted on *Rita rita*, collected from Agra stretch, indicated aberrations in gill with hypertrophy and hyperplasia, liver with sinusoid congestion and kidney with macrophage formation.

Histopathological studies followed by bioassay experiments with Fort Nalla effluent of Agra at 10% dilution and *C. mrigala* as test fish, showed degenerative changes like aneurism and epithelial necrosis in gills (10%), hepatocyte necrosis in liver (5%), renal tubular atrophy (25%) and hematopoietic tissue degeneration in kidney (27%). Inflammatory tendency of organs was also found.

PROJECT : FC/B/11

EVALUATION OF BIOLOGICAL STRESS & CHARACTERISATION OF PHYSIOLOGICAL & BIOCHEMICAL RELATIONSHIP IN THE RIVER GANGA AND ITS TRIBUTARIES

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Duration : 1991-96

Location : Environmental Monitoring & Fish Health Protection Division, Barrackpore

Water quality fluctuations

Data revealed poor water quality in river Yamuna near Okhla with low dissolved oxygen content (1.4 mg/l - 3.36 mg/l), high levels of free CO₂ (10.65-31.8 mg/l) and BOD (66.5-98.44

mg/l). The nutrients such as nitrogen (0.92-0.98 mg/l) and phosphate (0.61-3.51 mg/l) were relatively higher, indicating the impact of high organic discharge into the system. The middle stretch of the river Ganga near Kanpur, indicated relatively more stressed condition in comparison to Allahabad and Varanasi stretches. The riverine water at Farakka, Saraswati-Hooghly confluence and Rishra was comparable and indicated normal physico-chemical environment in the lower stretch of the Ganga river system.

Plankton

The Yamuna-Hindon confluence at Okhla showed higher incidence of plankton with greater dominance of indicator species of diatoms and rotifers and thus suggestive of appreciable amount of organic load in the system. Compared to river Hindon, the river Yamuna at Okhla and Hindon confluence showed high percentage of bacillariophycean and rotifer population which was indicative of organic load in the river. The Ganga in the middle stretch also harboured rich rotifer population which indicated clearly that the stretches at Kanpur, Allahabad and Varanasi have been subjected to high organic load. The qualitative distribution of various groups of plankton in lower Ganga did not indicate significant sign of unusual stress.

Benthic fauna

The bottom sample at Okhla and Hindon-Yamuna confluence were devoid of benthic fauna, perhaps the sediment environment was unsuitable for benthic colonisation. In the middle stretch of Ganga, the benthic fauna showed wide fluctuation with regard to different sampling stations. Near Kanpur the density of bottom dwellers was the maximum and were represented by chironomids only in winter season while chironomids and oligochaetes in summer season. In the stretch at Allahabad the density of benthic population was the minimum and comprised of mixed types. The stretch at Varanasi, however, again recorded high density of benthic fauna with the greater dominance of oligochaetes. Higher percentage of chironomids and oligochaete worms indicated high organic deposition at the sediment. Mixed population of benthic fauna comprised of polychaetes, gastropods and fly nymphs was recorded at Farakka which revealed improvement in habitat environment at these sites. However, the faunal characteristics near Saraswati-Hooghly confluence was indicative of organic load impact. In winter the benthic population in the Ganga-Yamuna river system showed improvement, both in quality and quantity.

Fish health condition

The health condition of *Rita rita* in respect of length-weight relationship, relative condition factor, hepatosomatic-relationship and haematological factors were examined depending on availability of the species in different sampling location. Farakka centre indicated less environmental stress, the health condition of the fish was the best and taken to be normal for comparative studies. The specimens tested at Saraswati-Hooghly confluence (Smithghat) and Rishra showed significant differences in the health parameters. The fishes in the industrially polluted zone of lower Ganga indicated low growth rate, liver hypotropy, haematological aberrations and tissue level damages in gill, liver and kidney. The fish *Rita rita* collected near Hindon-Yamuna confluence and the main Yamuna apart from *M. seenghala* collected from Kanpur and Allahabad also showed signs of poor health conditions compared to the healthy ones at Farakka.

Biochemical response of environment

Evaluation of LDH (Lactic dehydrogenase) and GPT (Glutamate-pyruvate transaminase) level was carried out in fish samples collected from Hindon-Yamuna confluence in Yamuna river system and Kanpur, Allahabad, Varanasi, Farakka, Smithghat and Rishra in Ganga river system. The samples at Hindon-Yamuna confluence and Kanpur recorded higher values of LDH and GPT compared to the normal levels recorded at Farakka. The increase in LDH indicated renal insufficiency, depression of mitochondrial respiration and stress arising from environmental impact. Similarly the higher values of GPT was a response of liver inactivation.

Toxicity to fish

Toxicity of Zn (as $ZnCl_2$) and Cd (as $CdCl_2$) at post larval stage of *Catla catla* was tested under static laboratory condition. The LC_{50} , LC_{50} and LC_{95} for both the metals were statistically extrapolated and derived to be 0.25 ppm, 2.45 ppm and 4.55 ppm for Zn while it was 2.0 ppm, 8.7 ppm and 17.0 ppm for Cd. The ambient temperature (28 °C), DO (7.2 ppm) and pH (7.8) were also recorded for the experimental media during laboratory studies.

Histopathological impact

The histological investigations conducted on *Rita rita*, collected from Hindon-Yamuna confluence, revealed necrosis of liver cells leading to pycnosis and evacuolization sinusoidal damage in liver. Necrosis of tissues in kidney, degeneration of tubular epithelium, luminal dilation and enlargement of glomerulus were also observed. Gills showed extreme hyperplasia of secondary gill leading to degeneration of gill filament. Similarly, *Rita rita* specimens collected from the Ganga river at Kanpur and Saraswati-Hooghly confluence also showed similar histological damages in liver, kidney and gills as recorded for samples from Hindon-Yamuna confluence. Relatively less metal contaminated stretches of the Ganga viz. Farakka (West Bengal) and Varanasi (Uttar Pradesh) indicated least abnormalities in tissues.

Metal accumulation

Studies conducted on the accumulation of metals in different organs of *Rita rita* indicated maximum metal accumulation in kidney followed by liver, gonad, gill and muscles. Among different metals, lead and cadmium showed higher accumulation in comparison to zinc and copper. The specimens of *Rita rita* collected from Rishra centre of Ganga indicated higher metal accumulation in kidney as compared to the specimens collected from Tribeni and Farakka.

PROJECT : FC/B/12

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

Personnel : Ravish Chandra, G. K. Bhatnagar, S. K. Wishard (till 31.8.94), S. N. Mehrotra, H. P. Singh, D. N. Singh, Balbir Singh, M. A. Khan, R. N. Seth (on study leave), R. K. Dwivedi, P. N. Jaitly, R. K. Tyagi, P. K. Katiha, R. C. Singh, N. K. Srivastava, Ram Chandra, D. N. Srivastava, B. D. Saroj, L. R. Mahavar, Ramji Tiwari, J. P. Mishra, M. P. Singh, P. Rajani, H. C. Banik.

Duration : 1983-95

Location : Allahabad, Uttar Pradesh

**River Ram Ganga
Fish landing**

A total fish landing at Bareilly was estimated to be 19.65 t, followed by Lucknow (18.69 t) and Jaunpur (7.52 t), comprising all the four species of Indian major carp, three species of catfish and many miscellaneous fishes. The landing showed the dominance of smaller size group.

Water quality

The city stretch of the river at Moradabad receiving sewage, indicated stressed environment with higher values of CO₂ (20.0 mg l⁻¹), alkalinity (350.6 mg l⁻¹), hardness (153.3 mg l⁻¹), sp. conductance (698.33 µmhos/cm), ammonia (0.46 mg l⁻¹), COD (94.33 mg l⁻¹) and low dissolved oxygen (1.81 mg l⁻¹).

The pulp and paper waste stretch at Rampur too had a similar trend with low dissolved oxygen (1.86 mg l⁻¹), high sp. conductance (739 µmhos/cm) and COD (76.66 mg l⁻¹).

The Bareilly stretch of the river, receiving rubber and sugar factory wastes, however, showed marginal recovery as dissolved oxygen was recorded in the range of 5.33-6.72 mg l⁻¹ together with substantial decline in COD value (47.0 mg l⁻¹).

Primary production

The primary production (mgC/m³/hr) showed moderate productivity in the range of 37.50-131.20 (gross) and 41.66-72.91 (net), being the maximum at Rampur stretch and the minimum at Moradabad stretch.

Plankton

A rich plankton population at AOF, moderate at BOF and poor at OF have been the characteristics of the river at all the observation sites, ranging between 1800 and 2350 u/l at Moradabad, 85-600 u/l at Rampur and 460 to 10644 u/l at Bareilly.

Based on the abundance and texture of phytoplankton and zooplankton communities the entire stretch of the river could be characterised between α *eutrophic* and α *mesotrophic status*. Bluegreens amongst the phytoplankton and rotifers amongst the zooplankton were predominant at the outfall areas, whereas the reference zones (AOF) showed the dominance of diatoms and green algae.

Benthos

The high incidence of dipteran larvae (150-1184 nos/m²) at the benthic niche revealed stressed habitat all along the river course and showed near septic condition at all the OF areas. At Bareilly however, the magnitude of impact, based on the texture of benthic population, appeared to be less intense as compared to the previous year.

Heavy metals

In the water phase, high concentration of Zn (40 ug/l) was recorded at Bareilly as compared to Rampur and Moradabad. The sediment phase indicated higher content of Zn (82.0 ug l⁻¹) at Bareilly, whereas arsenic (20.0 ug l⁻¹) and mercury (0.05 ug l⁻¹) were higher at Rampur. A gradual increase in heavy metals from Moradabad to Bareilly was recorded, perhaps due to cumulative impact of various effluents. The values were higher as compared to previous year.

River Gomti Fish landing

The fish landing recorded at Lucknow and Jaunpur were 18.69 t and 7.52 t respectively; comprising all the four species of Indian major carp, three species of major catfish and several miscellaneous species. The landing was devoid of juveniles but dominated by smaller size groups.

Water quality

The river stretch receiving city sewage showed poor water quality characterized by acidic pH, low DO content (1.2-6.0 mg l⁻¹) and higher nitrate (0.18--0.3 mg l⁻¹), phosphate (0.16-0.36 mg l⁻¹), SiO₃ (7.2-15.8 mg l⁻¹), BOD (30-96 mg l⁻¹) and COD (50-86 mg l⁻¹) values. However, at reference zones the water quality appeared to be near normal. The river stretch at Lucknow receiving distillery waste of Mohan Meakin was worst affected as indicated by factor like DO (nil-0.32 mg l⁻¹), BOD (96 mg l⁻¹) and COD (138 mg l⁻¹).

Primary production

The primary production values of the river ranged between 75-237.5 mgC/m³/hr (gross) to 50-212 mgC/m³/hr (net), indicating low productivity potential.

Plankton

A rich plankton population (416-1875 u/l) was recorded at reference and recovery zones. The stretch being affected by city sewage, showed upsurge of certain green algae. Perhaps they got necessary nutrient through city sewage and thus could be characterised as bio indicator of sewage pollution. Similarly, the river stretch affected by the discharge of Mohan Meakins had been found having rich population of diatoms (38.8%) comprising of certain specific species which may be considered as bioindicator of distillery wastes. In this regard mention may be made of *Synedra* sp., *Diatoma* sp., *Meridion* sp. (Bacillariophyceae), *Hydrodictyon* sp., *Spirogyra* sp., *Ulothrix* sp. (Chlorophyceae) and *Brachionus* sp., (rotifer), which were predominant at the stress points.

The presence of certain pollution resistant varieties viz., *Oscillatoria* sp., *Nostoc* sp., *Brachionus* sp., *Microcystis* sp., *Synedra* sp., sewage fungus (*Zoogloea ramigera*) and nematodes along with meagre quantity of zooplankton especially at outfalls of Haider nallah indicated that the sector was under pollutional stress of α mesosaprobic status.

Benthos

The higher numerical abundance of benthic population at polluted zones (618-828 um⁻²) and low numerical abundance at comparatively fresh zones (110-148 um⁻²) have been observed this year. The persistent abundance of oligochaetes and chironomids at OF and BOF zones, reflected the permanent nature of pollutional effect, specially along the stretch in the city.

Heavy metals

The stretch affected by sewage and industrial effluents such as Haider nallah and Mohan Meakins had high metal content like zinc (460 u gl⁻¹), arsenic (30.0 ugl⁻¹) and mercury (0.04 ug l⁻¹). Similar trends were observed for chromium (12.0 ug l⁻¹) in sediments.

Sub-Project B : Production dynamics in the river Ganga and Yamuna

River Ganga Fish landing

The fish landing at Sadiapur, Daraganj and Lalgola were estimated as 64.38, 31.50 and 98.68 t respectively as against 49.38, 21.29 and 94.65 t during 1993-94. The stock comprised all the four Indian major carp, three major catfish, Hilsa and miscellaneous group. Considerable increase in total fish landings (44.50 t) as against 31.76 t in 93-94 has been recorded in spite of poor Hilsa catch.

Table 1. Fish landing in tonnes

Species	Centres		
	Sadiapur	Daraganj	Lalgola
<i>C. mrigala</i>	0.42 (0.7)	0.14 (0.4)	2.14 (2.2)
<i>C. catla</i>	2.18 (3.4)	0.07 (0.2)	3.07 (3.1)
<i>L. rohita</i>	1.86 (2.9)	0.02 (0.1)	2.44 (2.5)
<i>L. calbasu</i>	1.54 (2.4)	0.34 (1.2)	1.94 (2.0)
MAJOR CARP	6.00	0.60	9.59
<i>M. aor</i>	6.89 (10.7)	2.31 (7.3)	4.02 (4.1)
<i>M. seenghala</i>	5.30 (8.2)	3.02 (9.6)	4.06 (4.1)
<i>W. attu</i>	0.54 (0.8)	0.38 (1.2)	4.08 (4.1)
CAT FISH	12.73	5.71	12.16
<i>H. ilisha</i>	1.16 (1.8)	0.29 (0.9)	16.56 (16.8)
MISCELLANEOUS	44.50 (69.1)	24.91 (79.1)	60.37 (61.1)

Figures in parenthesis % in total

Water quality

The physico-chemical features of the water had shown marginal improvement at all the sampling centres in comparison to last year. The pollutional load in Ganga has been lowered as the sewage effluents have been diverted. This was indicated by the relatively lower values of BOD and COD.

Primary productivity

Primary productivity was moderate. Production at Bhagwatghat (Kanpur) and Begumsarai (Allahabad) decreased whereas it increased at Jajmau (Kanpur), Manaiya (Allahabad) and Rajghat (Varanasi) from previous year.

Plankton

Plankton population did not show much variation in any of the collection sites. Diatoms dominated at Bhagwatghat and Jajmau excepting monsoon and autumn. At OF zones sewage, fungus besides blue-green algae were recorded which indicated moderate pollution at Jajmau. Almost similar conditions were recorded at Allahabad at the industrial effluents zones.

Benthos

The benthic population at Kanpur city was dominated by chironomid larvae at OF and Bank I, which indicated impact of pollution. However, at non-polluted zones, though the species diversity was more, the quantitative abundance was less. In Allahabad (Mehdaurighat) sewage zone the benthic population was dominated by Oligochaetes at OF and by Chironomids at Bank I, whereas it was dominated by gastropods at Bank II, indicating mild pollutional stress at OF and Bank I stretches only. At Mavaiya, the population was dominated by Oligochaetes (59.5%) at OF but the composition suddenly changed in to gastropod dominance (97.6%) at BOF which indicated the impact was restricted to OF areas only.

Heavy metals

All the metals viz. Zinc, arsenic, chromium and mercury in water and sediments were within the permissible level as prescribed.

River Yamuna

Water quality

River Yamuna had been contaminated by city sewage, carried through Chachar nala at Baluaghat. The rate of discharge ranged between 500-700 litres/sec and as a result values of nitrate, phosphate, silicate, BOD and COD had shown abrupt rise specially at the OF region. It also resulted in decreasing the pH and dissolved oxygen values.

Plankton

The average plankton population was found to be poor, both quantitatively and qualitatively, and average population during premonsoon, monsoon and post-monsoon was recorded as 51, 148 and 335 u/l respectively. Phytoplankton dominated over zooplankton in all the seasons. Species composition was almost the same throughout the period except certain isolated forms of Bacillariophyceae restricted to post-monsoon and at AOF areas only. Sewage fungus showed their appearance at OF areas only during June '94 which was indicative of stressed condition during summer months.

Spawn prospecting

Observations on variation in the spawn availability revealed two spawning spurts during monsoon. A total of 2061 ml of spawn was collected as against 473 ml in preceeding year. The first flood contributed the maximum spawn (68.8%) followed by second flood (31.25). The third flood was of very high intensity and of longer duration but contributed no spawn. Analysis showed greater abundance of desirable spawn in the first flood (52.6%) followed by second (34.6%). The indices of quality and quantity as found after rearing were 42.4% and 690 ml as against 27.7% and 158 ml, last year. Percentage composition showed rohu 16.6%, catla 13.8%, mrigal 10.5% and calbasu 1.5%.

PROJECT : FC/B/13

**ECOLOGICAL CHARACTERISATION AND IMPACT ASSESSMENT
OF ENVIRONMENTAL MODIFICATIONS ON THE FISHERIES
RESOURCE IN THE FRESHWATER ZONE OF VEMBANAD LAKE IN
KERALA.**

Personnel : V. K. Unnithan, S. Biojoy Nandan, C. K. Vava.

Durtation : 1994-97

Location : Alapuzha, Kerala

Morphometry

Vembanad lake extending from Alappuzha to Azhikode (lat 9° 31'-10° 12' N; long 76° 10' and 76° 29' E), has a total length of 113 km while the width varies from a few hundred meters to about 14.5 km. It covers an estimated water spread area of 24924 ha. After the construction of a barrage across the middle of the lake in 60s two distinct zones, viz., a predominantly freshwater zone and a saline zone have been created. The lake is exposed to a variety of anthropogenic activities such as reclamation, disposal of wastes, tourism, etc.

Physico-chemical features

The lake water exhibited a narrow range of temperature (25.5 - 31 °C) and near circumneutral pH (6.9) contrary to the lake bottom which was strongly acidic (av. pH, 4.9).

The dissolved oxygen levels were conducive to productivity. Free carbon dioxide was present at all the stations and on all sampling dates. The average alkalinity values (48.7 mg/l) reflected a medium level of productivity. Water hardness (av. 77 mg/l) and total dissolved solids (485 mg/l) closely followed the salinity pattern. The values were substantially higher during February following the opening of the sluices.

Sediment

Surface as well as subsurface sediment were rich in organic matter (2.0-8.6 and 3.0-12.4% respectively).

Primary productivity

The gross productivity varied between 0.9 and 4.1 gC/m³/day while the net productivity varied between 0.7-3.3 gC/m³ day (Table 2).

Table 2. Primary productivity (g C/m³/day) in Vembanad lake.

Station	(Punnamada)		(Komalapuram)	
	<u>Dec. '94</u>	<u>Feb. '95</u>	<u>Dec. '94</u>	<u>Feb. '95</u>
Surface				
GP	4.1	3.6	1.4	2.2
NP	3.3	2.8	1.3	1.6
Subsurface (1 m)				
GP	2.3	3.1	0.9	2.2
NP	2.4	2.5	0.7	1.7

Mean Gross productivity (GP) = 2.48 Mean Net productivity (NP) = 2.04

Plankton

The total plankton biomass ranged from 0.7 ml/m³ (July) to 64 ml/m³ (December) 1994. The higher biomass value in December could be attributed to the presence of suspended materials.

Phytoplankton

The phytoplankton population and the diversity was studied in September and October '94 only and a total of 40 species (green algae 23, blue green algae 7, desmids 6 and diatoms 4) were recorded. The average phytoplankton assemblage was estimated in the range of 142 u/l to 644 u/l. The community structure showed the dominance of green algae (50.8%) followed by bluegreen (21.81%) and diatoms (1.0%). *Microspora* sp, *Desmidium* sp. (Chlorophyceae) and *Oscillatoria* (Myxophyceae) were the predominant phytoplankters.

Zooplankton

The average density of zooplankton was estimated to be 51 u/l. Members of cladocera were the most dominant zooplankters followed by copepods and rotifers.

Benthos

The average density of benthic population, for the lake as a whole, was estimated at 3275 nos/m² with greater dominance of Gastropoda (39.1%) and followed by Polychaeta (19.1%) Bivalvia (17.8%), Amphipoda (12.3%), Insecta (10.4%), Oligochaeta (0.9%) Harpacticoid Copepoda (0.3%) and miscellaneous larvae (0.1%).

Fishery

Twenty-six landing centres have been identified around the lake for the collection of group-wise and gear-wise landings. The work was in progress.

PROJECT : FC/B/14

BIODIVERSITY AND PRODUCTION DYNAMICS IN BRAHMAPUTRA RIVER SYSTEM WITH SPECIAL EMPHASIS ON ITS TRIBUTARIES

Personnel : B. C. Jha, V. Pathak, M. Choudhury, Alok Sarkar, B. K. Biswas

Duration : 1994-1997

Location : Guwahati

River Bharulumukh

Physico-chemical characteristics

The water quality of the river was studied at Basistha head water and just before it joins with Brahmaputra. No sign of pollution was observed at Basistha as the stretch indicated very high value of dissolved oxygen (10.46 mg l^{-1}) and low value of free CO_2 (3.6 mg l^{-1}), alkalinity (34.8 mg l^{-1}), sp. conductance ($47.28 \mu\text{mhos}$, TDS (23.84 mg l^{-1}), hardness (34.0 mg l^{-1}), dissolved organic matter (0.69 mg l^{-1}) and chloride (21.0 mg l^{-1}). The river in the city, receiving high discharge of both domestic and industrial effluents, indicated very low dissolved oxygen (0.6 mg l^{-1}) but parameters like free CO_2 (68.0 mg l^{-1}), alkalinity (198.6 mg l^{-1}), sp. conductance ($486 \mu\text{mhos}$), TDS (226.6 mg l^{-1}), hardness (179.2 mg l^{-1}), dissolved organic matter (2.95 mg l^{-1}), phosphate (2.14 mg l^{-1}) and chloride (60.6 mg l^{-1}) indicated higher values.

Impact of Bharalumukh tributary on the water quality of river Brahmaputra

In order to assess the impact of the tributary on the quality of water in the river Brahmaputra, studies were made in three different zones viz. above the confluence point (AOF), at the confluence point (OF) and below the confluence point (BOF). River Brahmaputra, above the confluence of Bharalumukh (AOF), was rich in dissolved oxygen (9.28 mg l^{-1}) and comparatively poor in free CO_2 (3.2 mg l^{-1}), total alkalinity (78.4 mg l^{-1}), sp. conductance ($140.44 \mu\text{mhos/cm}$), TDS (70.66 mg l^{-1}), hardness (69.8 mg l^{-1}), phosphate (0.065 mg l^{-1}) and chloride (20.0 mg l^{-1}). A sudden change in the water quality, at the OF areas, was recorded as dissolved oxygen declined to 1.82 mg l^{-1} and free CO_2 increased to 23.52 mg l^{-1} . Other chemical parameters like alkalinity (166.6 mg l^{-1}), sp. conductance ($369.8 \mu\text{mhos/cm}$), nitrate (1.25 mg l^{-1}), phosphate (1.34 mg l^{-1}) and chloride (40.0 mg l^{-1}) also showed significant increase. This trend in the water quality persisted to about 200 m in the BOF areas.

Impact on the productivity potential of river Brahmaputra

The rate of carbon synthesis and energy fixation by producers in the AOF zone of river Brahmaputra was $366.92 \text{ mg C m}^{-3} \text{ day}^{-1}$ (Gross) and $246.3 \text{ mg C m}^{-3} \text{ day}^{-1}$ (net) while the average energy fixation was $3603 \text{ Cal m}^{-3} \text{ day}^{-1}$ (Gross) and $2149 \text{ Cal m}^{-3} \text{ day}^{-1}$ (net). A sudden drop in the values of primary productivity and energy fixation at OF, $155.3 \text{ mg C m}^{-3} \text{ day}^{-1}$ & $1525 \text{ Cal m}^{-3} \text{ day}^{-1}$ (gross) and $69.8 \text{ mg C m}^{-2} \text{ day}^{-1}$ & $685 \text{ Cal m}^{-3} \text{ day}^{-1}$ (net) were recorded. Quick recovery, however, was observed below the confluence areas.

Biotic productivity

Impact on the plankton abundance in Brahmaputra

The head water (Basistha) recorded minimum plankton (av. 16 u l^{-1}) with diatom as the dominant constituent (78.57%) showing complete absence of myxophyceae. The river showed maximum plankton (656 u l^{-1}) before the confluence point but the qualitative spectrum revealed a different texture as the diatom population of head water was replaced by myxophyceae (74.86%) together with the appearance of bacterioplankton (9.5%). The zooplankton spectrum revealed the dominance of cladocerans (64.71%) at head water while rotifers (49.13%) and protozoans (40.25%) were the dominant zooplankters of the outfall and below outfall areas.

Impact on qualitative and quantitative abundance of macrobenthos

A marked diversity in the macrobenthic fauna was observed between clean zone and polluted zone of Bharalumukh river. The population was minimum at Basistha showing 54 nos m^{-2} and maximum at the extreme end before the confluence point as 4633 nos m^{-2} . The dominant molluscan biota (60%) at the head water was replaced by turbificids (98.37%) at the extreme end. The most visible impact of the tributary on river Brahmaputra was in the abundance of tubificids population from very low, i.e. 205 nos m^{-2} at AOF to as high as 2717 nos m^{-2} at OF and 2172 nos m^{-2} at BOF zones. The dominant biota of the river, above the confluences were mollusc (57.68%) and chironomids (42.32), the composition of which changed completely at the OF and BOF zones as tubificids occupied the niche to the tune of 90.05% to 96.44%.

Fish catch statistics

A total of 150.5 t of fishes was estimated at Uzanbazar fish assembly centre of the river Brahmaputra as compared to 208 t in the previous year, showing a decline of 27.64%.

The landing was the maximum between July and October (60%). However, the highest was in August and the lowest in May. Large scale landing of IMC fingerlings and minor carp have been recorded during August & September.

Miscellaneous group of fish (50.43%) dominated the fishery, followed by minor carp (18.44%), major carp (16.65%), cat fish (6.89%), *T. ilisha* (4.73%) and featherback (2.86%). *L. rohita*, *L. bata* and *W. attu* were the most dominant species in the commercial catches.

PROJECT : FC/A/4

ECO-DYNAMICS AND FISHERY MANAGEMENT OF BEEL ECOSYSTEMS IN WEST BENGAL

Personnel : V. V. Sugunan, M. K. Mukhopadhyay, M. M. Bagchi, G. K. Vinci, K. Mitra, Abul Hassan, Archan Kanti Das, D. K. Biswas, Keya Saha, S. Bandopadhyay, Suvra Saha

Duration : 1986-95

Location : Floodplain Lakes & Wetland Fisheries Division, Barrackpore

Water quality fluctuation in beels

The investigated beels showed wide fluctuation in physico-chemical characteristics of water. By and large the water remained clear in winter and thereafter turned turbid with lowerig of depth and high wind action during summer. High temperature amplitude was recorded in Haripur and Bansdaha beels which retained comparatively higher depth of water (3.7-5.2 m) together with stratification in dissolved oxygen content of water. Primary productivity in Haripur and Bansdaha beels were moderately high indicating dominance of phytoplankton in the systems. Sarasankha and Ghurnamani had low productivity potential which might be due to low depth and high macrophyte infestation restricting phytoplanktonic growth.

Plankton dynamics in beel ecosystems

The species diversity and density distribution of planktonic flora and fauna were highly variable with time and space. The variations in plankton population structure revealed the impact of habitat morphometrics and ecology. Significant variations in group wise distribution of plankton indicating dominance of Dinophyceae (*Ceratium hirundinella*) and rotifers (*Keratella valga*, *K. quadrata*, *Brachionus* spp.) in Ghurnamani and Haripur beels. These beels are connected to different tributaries of the Ganga river system and receive large quantities of organic wastes (human and cattle). On the other hand Sarasankha and Haripur beels had lesser but balanced population of different groups of plankton. Summer population of plankton was less than that of winter in all the beels.

Benthic fauna in beel ecosystem

The benthic fauna could be correlated with bottom deposition in the beels. Ghurnamani and Haripur beels registered high organic deposition and also very high population of benthic fauna (Ghurnamani 4836-21656 u/m²; Haripur-1296-3252 u/m²) dominated by Gastropods and annelid worms. Bansdaha (898-2412 u/m²) harboured comparatively lower density while lowest population of benthic fauna was recorded in Sarasankha (36-447 u/m²).

Macrophyte population

The extent and type of macrophytic infestation found varying with the depth of the beels. The maximum infestation consisting of floating (*Salvinia* sp.), submerged (*Potamogeton crispus*) and marginal (*Ludwigia* sp.) was recorded in Sarsankha and Ghurnamani beels owing to their shallow nature. The least of infestation was however found in Haripur beel, a relatively deep beel.

Biodiversity and similarity in the beel habitats

The change in species diversity from habitat to habitat and the comparison of the qualitative and quantitative make up of different communities were analysed following the similarity index by Sorensen. The result of the analysis revealed biotic similarity in beels being related with the morphometric feature like depth and ecological characteristic of organic load.

Fish and fisheries potentiality

The population distribution of fish fauna were different with varying ecological conditions of the beels. In shallow and high macrophyte infested waterbodies the fish fauna comprised air-breathing cat fish (*H. fossilis*, *C. batracrus*), murrels (*Channa marulius*, *C. striatus*, *C. punctatus*, *C. gachua*, featherback (*Notopterus notopterus*), perches (*Anabus testudineus*) and small prawns. While the deeper beels like Haripur and Bansdaha harboured a composite population of major carp (*L. rohita*, *L. calbasu*, *C. mrigala*, *C. catla*), minor carp (*C. reba*, *L. bata*), minnows (*Amblypharingodon mola*, *Puntius* spp., *Gambusia affinis*, *E. danricus*, *C. fasiatus*) clupids (*Gadusia chapra*) cat fishes (*Mystus vittatus*, *M. aor*, *W. attu*) and small prawns.

Recruitment stocking

Haripur and Ghurnamani beels were autostocked through the river connection and in addition stocked with fingerlings of major carps. The closed type beels Sarasankha and Bansdaha were stocked with fingerling of major carp @ 1500/ha.

Culture experiment with *M. rosenbergii*

Experiments on pen culture of giant freshwater prawn (*M. rosenbergii*) was initiated in 3 pens of 0.026 ha each in Bhomra beel of Nadia district in West Bengal. Pens (0.026 ha) were fabricated with split bamboo screens with inner nylon net lining. The pens were limed @ 500 kg/ha. Hatchery raised *M. rosenbergii* were released @ 39,000/ha in all the three pens. The prawns were fed with locally available prawn feeds containing 42% protein twice a day @ 8 to 4% of body weight. Bamboo trays were used for feeding.

On an average the prawn grew to 77.23 mm/5.33 g on 20th day and 82.50 mm/6.8 gm on 30th day of stocking. The experiments were in progress. Abiotic and biotic factors of the pens were also monitored.

PROJECT : FC/A7

ECOLOGY AND FISHERIES OF FRESHWATER RESERVOIRS WITH CENTRES AT MARKONAHALLI, PONG AND TAWA RESERVOIR

Sub-project : Ecology and fisheries of Markonahalli reservoir

Personnel : Ch. Gopalakrishnayya, M. Ramakrishnnayya, A. K. Laal, P. K. Sukumaran, M. Karthikeyan, S. K.S. Hameed.

Duration : 1989-95

Location : Bangalore (Markonahalli reservoir)

Important achievements

Markonahalli reservoir (Bangalore)

The fish catch from Markonahalli reservoir was estimated at 34.85 t during 1994-95. The catch suffered a decline during the year by 36% from the 1993-94 level. The estimated yield was 47.45 kg/ha in 1994-95 compared to 74.70 kg/ha in 1993-94.

Major carp accounted for only 21.18% as bulk of the catch (72.95%) was contributed by miscellaneous group of fishes (*N. notopterus*, *C. reba*, *P. sarana*, *M. cavasius*, *C. marulius* etc.). Among other species *C. carpio* alone was important. When compared to 1993-94, except for miscellaneous group and *C. carpio*, all other species declined. The sharp decline in major carp species could be attributed to erratic stocking and continuous failure of monsoon for two successive years resulting in poor monsoon run-off and high outflow.

Plankton study

Plankton population in Markonahalli reservoir ranged between 320 u/l (April 94) and 840 u/l (December 94). It was comparatively low during this year when compared to that of last year probably due to failure of monsoon.

Phytoplankton

The phytoplankton was less in abundance (about 43%) and was represented mainly by *Ceratium hirundinella*. However, eighteen genera of phytoplankters belonging to four classes were recorded viz., Myxophyceae (*Microcystis*, *Nostoc* and *Rivulavia* sp.) Chlorophyceae (*Ulothrix*, *Spirogyra*., *Pediastrum*, *Cosmarium*, *Oedogonium*, and *Cladophora*.) Bacillariophyceae (*Navicula*, *Pinnularia*, *Rhopalodia*, *Mastogloia*, *Gyrosigma* and *Nitzschia*) and Dinophyceae (*Ceratium hirundinella*).

Zooplankton

Zooplankton was dominant (57.0%) over phytoplankton in the reservoir throughout the period and was represented by Protozoa (*Diffugia*, and *Centropyxis*), Rotifera (*Brachionus*, *Keratella* and *Filinia*), Cladocera (*Moina*, *Diaphanosoma*, *Daphnia*, and *Bosmina*), and Copepoda (*Diaptomus*, and *Cyclops*).

Sub Project : Ecology and fisheries of Pong reservoir

Personnel : D. K. Kaushal, V. R. Chitranshi, V. K. Sharma

Duration : 1989-85

Location : Kangra, H. P.

Soil analysis

The reservoir soil was sandy in texture and poor in organic carbon (0.17 to 0.75%). The soil showed alkaline pH (7.3 -8.2) with available nitrogen as 14.2-44.2 mg/100 g of soil, available phosphorus as 3.4-5.6 mg/100 g, and CaCO_3 as 0.5-1.0%. The analysis of soil revealed its medium productive character.

Thermal stratification

Thermal stratification of water was observed this year also in June as in the previous years. The temperature difference between surface (28.0 °C) and bottom (22.0 °C) was 6.0 °C with the existence of thermocline between 11-12 m (26-27 °C) and 17-18 m (24-25 °C) of the water column.

Chemical stratification

The stratification pertained to depth variation in respect of four chemical parameters. Dissolved CO_2 being more at surface (8.0 ppm) but decreased to 6.8 ppm at 30 m, pH also decreased from surface to bottom, total alkalinity and specific conductivity increased from surface to bottom. The biogenic chemical stratification and klinograde distribution of oxygen was observed in summer (April-June) which indicated the medium productive character of the reservoir.

Primary production

The gross and net primary production ranged from 27.77 to 55.55 $\text{mgC/m}^3/\text{hr}$ and 13.88 to 27.77 $\text{mgC/m}^3/\text{hr}$ respectively. The respiration varied from 12.50 to 33.3 $\text{mgC/m}^3/\text{hr}$. The ratio between the net and gross primary production was 0.50 which indicated productive water.

Plankton

Average plankton population ranged from 799 u/l in May to 10,617 u/l in November indicating more or less similar trend as noted during 1993-94. Seasonal distribution of plankton indicated three distinct peaks, the primary (10,617 u/l) in November, secondary (7199 u/l) in January and tertiary (3017 u/l) in June. The primary and tertiary pulses were mainly represented by *Synedra* whereas the secondary pulse was contributed by *Rhizoclonium*. Thus diatoms (Bacillariophyceae) dominated the population from June (66.01%) to October (95.75%). Rotifers were the dominant among zooplankton. Spatial distribution of biomass showed that lentic sector was the richest (1.45 ml/m³) followed by intermediate (0.94 ml/m³) and lotic (0.41 ml/m³) sectors.

Macrobenthos

The average annual standing crop of benthos in the reservoir was estimated at 638 nos/m² as against 541 nos/m² during 1993-94 and 511 nos/m² during 1992-93. The population was mainly represented by dipterans (52.9%) and oligochaets (41.4%), followed by Molluscs (5.7%). Seasonal abundance of macrofauna indicated trinemic distribution with primary peak in September (1037 nos/m²), secondary in January (915 nos/m²) and tertiary in May (492 nos/m²).

Periphyton

During this year, an average of 1344 nos/cm² of periphyton was estimated from the entire reservoir. The community showed the dominance of Bacillariophyceae (83.8-91.3%) followed by Chlorophyceae (5.4-14.0%) and Myxophyceae (2.2-10.8%). The forms commonly encountered were *Navicula*, *Cymbella*, *Nitzschia*, *Synedra*, *Caloneis*, *Frustulia*, *Characium* and *Schizothrix*.

Fish yield

A total of 320.7 t of fish was landed from the reservoir which indicated per hectare production of 21.4 kg. The fishery seemed to be stable as shown by the yield of 327.8 t during the previous year. The catch was contributed mainly by *M. seenghala* (53.0%) followed by *T. putitora* (16.2%), *L. rohita* (14.2%), *C. catla* (9.6%), *L. calbasu* (2.4%), *W. attu* (1.8%), *C. mrigala* (0.9%) *C. carpio* (0.1%). *M. seenghala* increased from 160.0 t of previous year to 169.9 t of this year while *L. rohita* considerably declined from 74.0 t to 45.8 t. A marginal improvement in the fishery of *T. putitora* from 43.9 to 51.8 t was observed.

Fish population dynamics

The catch per unit of effort (CPUE) was calculated to be 1.270 kg/net/12 hrs during this year as against 1.314 kg/net/12 hrs of previous year. In the CPUE, the catch of *C. catla* (0.504 kg) was the highest followed by *M. seenghala* (0.282 kg), *L. rohita* (0.234 kg), *T. putitora* (0.167 kg), *L. calbasu* (0.033 kg), *W. attu* (0.016 kg), *P. sarana* (0.013 kg), *C. carpio* (0.011 kg) and *C. mrigala* (0.011 kg).

Sub-Project : Ecology and fisheries of Tawa reservoir

Personnel : N. P. Shrivastava, B. L. Bandey, K. K. Agarwal.

Duration : 1989-99

Location : Tawa reservoir (Hoshangabad)

Fish yield estimation

A total fish catch of 98,559.5 kg was landed from the reservoir till January as a result of 154 days of fishing. In the overall catch, *C. catla* (73.2%) was dominant whereas *C. mrigala* contributed 5.6%, *L. rohita* 1.7%, Catfish 7.0%, miscellaneous group 6.9% and minnows 5.5%.

Plankton

Abundance of plankton population varied from 669 to 5775 μl^{-1} . Maximum biomass was observed in June as 3.52 ml/m^3 . The community structure of plankton showed the dominance of zooplankton (63.3-77.3%) and among them copepods (30.8-54.2%) were the most important followed by cladocerans (2.4-25.0%), rotifers (4.2-22.6%) and protozoans (5.1-13.6%). Phytoplankton (22.7-36.7%) was represented by Myxophyceae (7.3-24.2%), Chlorophyceae (4.8-19.4%) and Bacillariophyceae (2.4-8.3%).

Stocking

A total fish seed of 17.9 lakh in the size range of 26-55 mm were stocked in the reservoir with a species composition of *C. mrigala* (52.9%), *L. rohita* (26.7%) and *C. catla* (20.4%). The rate of stocking was 147 nos/ha this year.

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. Mishra.

Duration : 1991-95

Location : Riverine Division, Allahabad

Soil Quality

The soil was moderately alkaline (pH 7.88) and low sp. conductivity (146.0 $\mu\text{mhos}/\text{cm}$). Low values of average organic carbon (0.29%), free calcium carbonate (2.95%),

total nitrogen (20.1 mg/100 g of soil), phosphorus (199.0 mg/100 g of soil) and potassium (80.0 mg/100 g of soil) were recorded. The critical evaluation of these factors revealed low productivity of the soil.

Physico-chemical characteristics of water

The average water temperature was 25.2 °C. The reservoir water was clear with an average transparency of 57.7 cm. Carbonate alkalinity was absent throughout the year except in summer (4.8 mg^l⁻¹). Bicarbonate alkalinity was low in monsoon (28-32 mg^l⁻¹) and high in summer (74-76 mg^l⁻¹). Total alkalinity showed an increasing trend (av. 51.97 mg^l⁻¹) as compared to previous year (39.33 mg^l⁻¹). DO was fairly high (9.54 mg^l⁻¹) being the minimum in June (5.76 mg^l⁻¹) and the maximum in February (12.0 mg^l⁻¹). The nutrients like NO₃ (0.21 mg l⁻¹) and PO₄ (0.20 mg^l⁻¹) were moderate. Calcium concentration was relatively low (13.97 mg^l⁻¹) whereas magnesium was moderate (3.27 mg^l⁻¹).

Primary productivity

The average primary productivity was estimated to be 110.4 mgC/m³/hr(gross) and 75.0 mgC/m³/hr(net). Respiration was estimated to be 45.0 mgC/m³/hr.

Bottom biota

The average macrobenthic fauna was estimated at 466 nos/m² in the range of nil to 1012 nos/m². It was represented by Chaoborus (35.2%), Oligochaeta (32.4%), Chironomids (16.9%), Gastropods (7.1%), Odonata and Coleoptera (4.2% each). The benthic population was low as compared to previous year (660 nos/m²).

Plankton

The average plankton population was estimated at 256 u/l in the range of 39 u/l (in August '94) and 962 u/l (in February '95). Phytoplankton (88.59%) dominated over zooplankton (11.4%). Among phytoplankton, Chlorophyceae (68.16%), Dinophyceae (16.57%), and Bacillariophyceae (3.86%) were predominant. Among zooplankton, rotifers (6.51%), crustacea (3.30%) and nauplii (1.60%) were encountered.

Periphyton

Average periphyton population of Naktara reservoir fluctuated between 800 u/cm² and 7822 u/cm². On an average it was found to be at 2724 u/cm² and was dominated mainly by Bacillariophyceae (67.64%).

Stocking

During October 1994, 20,000 fingerlings of catla, mrigal and rohu having average size of 132, 92 and 82 mm respectively were stocked in the ratio of 4:3:3.

Commercial fishing

The reservoir has been auctioned in February 1995 for a sum of Rs. 25,000/- against a fixed quota of 50 quintals.

PROJECT : FC/A/19

PRODUCTION DYNAMICS AND FISHERIES MANAGEMENT IN THIRUMOORTHY RESERVOIR, TAMIL NADU

Personnel : C. Selvaraj, V. K. Murugesan, S. Manoharan.

Duration : 1991-96

Location : Coimbatore, Tamil Nadu

Fish fauna and recruitment

Intensive stocking of advanced fingerlings of major carp had resulted in the gradual disappearance of miscellaneous fish in the reservoir. The stocking of IMC fingerlings remained the mainstay of fish yield in absence of natural recruitment of the same.

Water quality

The mean value for water temperature and transparency were 25.9 °C and 132 cm respectively. Studies on the chemical parameters of water revealed low free carbon dioxide (1.6 ppm), phenolphthalein alkalinity (0.1 ppm), total alkalinity (15.4 ppm) and specific conductivity (31.1 umhos/cm). Seasonal as well as diel variation studies did not indicate any chemical stratification.

Plankton

The plankton of the reservoir was dominated by phytoplankton (95.0%). However, the total plankton was found ranging from 1636 to 32774 u/l, with an average of 15003 u/l. The average biomass of the plankton was 5.0 ml/m³.

Primary productivity

The average primary productivity of the reservoir was 921.3 mgC/m²/day, amounting to 0.397% of radiant energy fixed by the primary producers. The fish yield potential of the reservoir at 0.5% of the energy conversion worked out to be 197.6 kg/ha/yr.

Bottom biota

The average benthic organisms was estimated at 1622 nos/m² and was comprised of *Chaborus* sp. and *Chironomus* sp.

Fish seed production

The early fry of major carp were reared in the farm ponds till they attained an average length of 100 mm. A total of 92510 numbers of advanced fingerlings comprised of catla (24.94%), rohu (20.25%), mrigal (21.03%) and common carp (33.73%) were stocked at frequent intervals, with a stocking density of 395 nos/ha/annum.

Fish yield from the reservoir

A significant increase in the yield (38.6 t) was recorded this year when compared to that (31.5 t) obtained during 1993-94. The bulk of the catch was comprised of major carp (91.0%) while the rest was by Tilapia. The reservoir yielded an annual production of 165 kg/ha. There was a substantial improvement in the catch per unit effort this year (12.5 kg/unit/day) as against 9.2 kg/unit/day recorded during 1993-94.

PROJECT : FC/A/20

ECOLOGY AND FISHERIES OF YERRA KALVA RESERVOIR

Personnel : Ch. Gopalakrishnayya, K. V. Rao, T. S. Rama Raju, K. Subba Rao, P. S. C. Bose, P. Biswas, Ch. G. Rao, S. Kotaiah

Duration : 1993-1998

Location : Eluru, A. P.

Fish catch statistics

The total catch during the year was estimated to be 58321 kg as against 64,074.58 kg of last year. This decline in catch was mainly due to cessation of gill net fishing consequent upon leasing out of the reservoir to a private party. The yield of the reservoir was 51.204 kg/ha as against 56.255 kg/ha of last year.

Among the fish species maximum contribution was made by *Notopterus notopterus* (14.66%) followed by *Cirrhinus reba* (13.23%), *Channa striata* (13.29%), *Channa punctatus* (10.12%), *Mastacembelus aculeatus* (10.2%), *M. malcomsonii* (6.91%), *Heteropneustes fossilis* (6.83%), *Nandus nandus* (6.00%) and others (18.76).

Physico-chemical features of water

Water quality studies revealed circumneutral pH in the range of 7.0-8.0, poor alkalinity (12-165.5 ppm) and moderate hardness (85-140 ppm). Dissolved oxygen varied between 2.24 ppm (bottom) to 8.8 ppm (sub-surface).

Primary production

The net primary production was found to be poor (1.01 mgC/m³/h to 10.4 mgC/m³/h).

Stocking

The reservoir was stocked with 6.9 lakh fingerlings of IMC, comprising of 4.2 lakhs of catla and 2.7 lakhs of rohu having an average size of 50 mm, in September '94.

PROJECT: FC/A/22

TROPHIC DYNAMICS AND FISHERY MANAGEMENT OF FLOOD PLAIN LAKE ECOSYSTEMS IN ASSAM

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

Duration : 1994-97

Location : Guwahati, Assam

Water Quality

Preliminary investigations on the trophic assessment of four beels - Mandira, Arikata, Bidhanjika and Rangai, were made in Kamrup district of Assam. Water quality of these beels reflected slightly acidic pH ranging between 6.0 & 6.5; dissolved oxygen ranging between 5.6 & 9.6 mg l⁻¹ at Mandira, 6.8 & 10.9 mg l⁻¹ at Arikata, 5.8 & 9.8 mg l⁻¹ at Bidhanjika and 5.6 & 10.83 mg l⁻¹ at Rangai, while free CO₂ was in low range 5.2 to 8.0 mg l⁻¹ in all the beels. The parameters like alkalinity, sp. conductance, TDS and hardness were comparatively low in all the beels. Dissolved organic matter was considerably higher ranging between 1.48 & 3.12 mg l⁻¹. All the beels were poor in nutrients, such as nitrate (0.08 to 0.28 mg l⁻¹) and phosphate (0.01 to 0.15 mg l⁻¹), which may be attributed to high macrophyte infestation.

Primary production

The average total primary production in Mandira, Bidhanjika, Arikata and Rangai beels ranged between 3875.0 mg C/m³/day and 7007.4 mg C/m³/day, being the maximum in Bidhanjika and the minimum in Arikata. Significantly, the contribution of macrophytes was to the

tune of 87.3% (Mandira) to 90% (Arikata) in the total production. The average energy fixed by phytoplankton ranged between $4543 \text{ cal m}^{-3} \text{ day}^{-1}$ and $8098 \text{ cal m}^{-3} \text{ day}^{-1}$, being the maximum in Bidhanjika and the minimum in Arikata.

Plankton

Maximum abundance of plankton was in Mandira beel (948.0 u l^{-1}) and minimum in Bidhanjika (661 u l^{-1}). Phytoplankton contributed 90 to 95% of the total population. Among the various groups of phytoplankters, Chlorophyceae was the most dominant (69.38 to 87.42%), in the community structure followed by Dinophyceae, Bacillariophyceae and Myxophyceae, while among zooplankters copepods were the most dominant, followed by rotifers and cladocerans.

Benthos

The average macrobenthic population, on an average, was 501 nos. m^{-2} (Mandira), 545 nos. m^{-2} (Arikata), 272 nos. m^{-2} (Bidhanjika) and 172 nos. m^{-2} (Rangai). Chironomids were the most dominant biota (71.01 - 84.19%) in Mandira, Arikata and Bidhanjika beels where as in Rangai beel mollusc (58.38%) was dominant.

Productivity potential

From the primary production studies the fish production potential was estimated between $800 \text{ \& } 1760 \text{ kg ha}^{-1} \text{ yr}^{-1}$.

PROJECT : BF/B/3

ECOLOGY AND PRODUCTION BIOLOGY OF HOOGHLY-MATLAH AND KULTI ESTUARINE SYSTEM

Personnel : M. Sinha, D. K. De, D. Nath, P. M. Mitra, H. C. Karamkar, A. Hajra.

Duration : 1983-95

Location : Barrackpore with Canning, Uluberia, Diamond Harbour, Digha and Frazerganj/Namkhana

The study revealed no appreciable variation in the Hooghly-Matlah estuarine system with respect to physical and chemical parameters when compared with those of last three years.

Primary production

Maximum primary production @ $11\text{-}460 \text{ mg C/m}^3\text{/hr}$ was found in the marine zone, whereas medium production of $2.0\text{-}123.0 \text{ mg C/m}^3\text{/hr}$ and comparatively low production of $2.5\text{-}25.8 \text{ mg C/m}^3\text{/hr}$ were observed on the upper freshwater and middle gradient zones respectively.

Boretide fluctuation

Effect of bore tide on the fluctuation of hydrobiological parameters and primary production of the estuary assessed at Diamond Harbour during summer season revealed considerable change in nutrient concentration in the system. Increased level of salinity, total alkalinity, silicate, phosphate, nitrate, total nitrogen, hardness, specific conductivity was recorded in the estuary just after the bore tide. Gross primary production and community respiration showed increasing trend during bore tide.

Plankton

Studies on the plankton during 1994-95 revealed no appreciable change in fauna and flora in the estuary though considerable quantitative variations were observed.

The bottom macro-fauna was studied this year at different centres viz. Nabadwip, Medgachi, Barrackpore, Kokaghat, Diamond Harbour, Kakdwip, Sagar and Frazerganj. The abundance of benthic organisms was recorded as 4784 units/m² in March (Nabadwip), 528 units/m² in March (Medgachi), 3403 units/m² in February (Barrackpore), 920 units/m² in February (Kolaghat), 662 units/m² in March (Diamond Harbour), 405 units/m² in April (Kakdwip), 810 units/m² in April (Sagar) and 184 units/m² in February (Frazerganj). Minimum concentration of benthic fauna was observed during August in upper freshwater zone (55 units/m²) and during June and July in lower estuarine zone (18 units/m² and 37 units/m²). The overall composition of the bottom macrofauna of the estuary was dominated by gastropods followed by annelids.

Fishery

Total fish landing from Hooghly estuarine system and Digha centres was estimated to be 24,476.6 tons and 13,713.0 t respectively during February, 1994 to January, 1995. These were marginally higher when compared to 1993-94 levels of 22,524.7 t and 11,015.5 t respectively.

The reasons for the increased fish yield from both the places may be attributed to the higher level of catch from winter migratory bagnet fishery in the lower Hooghly estuary by 3127.4 t and also because of more fishing effort through different gears in the coastal regions of Digha. The lower zone of the estuary alone contributed 2,3088 t which formed 92.6% of the total fish catch of total Hooghly estuary. However, during 1993-94 the lower zone contributed 21,399 t and formed about 95% of the total fish catch.

Dominant species of the estuary in order of abundance were *Harpodon nehereus*, *Setipinna* sp., *Pama pama*, *Trichiurus*, *Tenualosa ilisha*, *Coilia* sp., *Stromateus cinereus*, *Tachysurus jella* and prawns. In Digha centre the dominant species was *T. ilisha*, followed by prawn, *P. pama*, *T. jella*, *S. cinereus*, *Setipinna* spp. *Coilia* sp. and *Sciaena bauritus* and *Ilisha elongata*. The catch of freshwater fishes (*Glossogobius giuris*, *Macrobrachium rosenbergii*, *Rita rita*, *Mystus aor*) in the upper estuary amounted to 63.7 t compared to 114.6 t in 1993-94.

The hilsa fishery of Hooghly estuary and Digha landing centre during 1994-95 yielded an estimated catch of 904.1 t and 1699.9 t respectively. The catch for the corresponding period of last year was 1529.0 t for Hooghly estuary and 1922 t for Digha centre. The 41% decline of hilsa catch from the Hooghly estuary was due to very low catch in lower estuary during monsoon period which amounted to 265.2 t compared to 972.3 t in 1993. The hilsa catch enhanced in upper estuary and did not decline during monsoon. Digha landing centre showed very poor catch of 144.6 t in December, 1994 compared to 502.5 t in December, 1993.

Excluding winter migratory bagnet fishery, hilsa continued to be the major component of estuarine fishery, accounting 22.2% of the total yield.

Indiscriminate exploitation of young ones (fry and fingerlings) resulting in wanton destruction of hilsa juveniles through small mesh nets, particularly the bagnet, in the upper stretch of the estuary was estimated as 63301 kg. during the period under report compared to 43070 kg during February 93-January 94.

Winter migratory bagnet catch in lower estuary was estimated to be 20820.4 t between November, 1994 and January, 1995, accounting 54% of the combined landing of Hooghly estuary and Digha fish assembly centre. The average CPUE of 93.7 kg was estimated this year whereas it was 78.2 kg in 1993-94.

Biological studies

Based on monthwise length frequency data, growth of *Liza parsia* and *P. paradiseus* was studied.

Bagda (*Penaeus monodon*) seed arrivals in the markets

The total arrival of 'Bagda' seed was estimated to be 760.321 millions, indicating an increase of 83.99% when compared to 1993-94 level. The sale price was also higher this year inspite of greater availability of seeds, indicating increased demand.

PROJECT : **BF/B/9**

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

Personnel : S. N. Singh, B. K. Singh, Vijay Kolekar, G. C. Laha, R. C. Mandi, R. K. Sah

Duration : 1988-1993

Location : Vadodara, Gujarat

Hydrological regime

Water

Marked improvement in the transparency values (3.0 to 176.0 cm) particularly at the transitional and freshwater extents was observed. An even distribution of DO was recorded and the water was alkaline (pH 7.94 to 8.28) in reaction. Total alkalinity ranged from 72.0 to 180.0 mg l⁻¹ indicating high production potential. Nutrient status of the system in terms of phosphate, nitrate and silicate was moderate. Chlorinity was high at lower estuarine stretches. Dissolved organic matter indicated higher values at estuarine zones.

Soil quality

Soil was slightly alkaline in reaction. There has been considerable increase in free calcium carbonate content in the system. Organic carbon content varied from 0.23 to 0.95% but no definite trend could be established.

Biological regime

Plankton

The average plankton density for the Narmada estuarine complex as a single entity fluctuated from 41 to 102 nos l⁻¹. Phytoplankton was the mainstay of this abundance and was composed mainly of Bacillariophyceae. Zooplankton population was by and large constituted by Copepoda and Rotifera.

Benthos

The average macro-benthic density ranged from 86 to 4097 nos. m⁻². Oligochaeta/ Polychaeta were the most emergent macro-faunal organisms at estuarine stretches while Diptera dominated at upper freshwater zones.

PROJECT : BF/B/10

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

Personnel : A. K. Ghosh, R. K. Banerjee, P. K. Pandit, K. R. Naskar, H. C. Karmakar, B. B. Das, S. K. Chatterjee, Abhijita Sengupta, L. K. Parbat, Amoy Barui, Debasis Saha

Duration : 1991-95

Location : Calcutta

A total of six bheries two each from low, medium and high saline zones at Kharibari, Malancha and Chandipur Ramgopalpur area respectively were selected for ecological study and pen culture experiments of *Penaeus monodon*.

Primary production

The salinity in bheries ranged from 0.9 - 5.4 ppt at low, 2.5-16.5 ppt. at medium and 9.1 - 32.5 ppt at high saline area during the year. The temperature varied from 15.0 °C to 34.0 °C while the average water depth varied between 0.30-1.20 meter in all the bheries. The primary productivity values ranged from 41.5 to 583.0 mgC/m³/hr., 31.25 to 562.5 mgC/m³/hr and 41.6 to 583.0 mgC/m³/hr at low, medium and high saline bheries respectively. The primary productivity was found to be high (583.0 to 854.0 mgC/m³/hr) during the winter period. The correlation between primary productivity and available phosphate was significant at 5% level.

Plankton

Maximum plankton biomass (3.0 ml/50 litres of water) was recorded at low saline bherly when the phosphate level was also high (0.5 ppm).

Benthos

Gastropod shell, Bivalve shell, Tanaid, Amphipod, Polychates, Mysids & *Acetes* sp. were encountered as the bottom fauna from these bheries.

Macrovegetation

The biomass of macrovegetation (wet weight) showed an ascending trend from low salinity bherly to high salinity bherly. The biomass found ranging between 0.5-1.5 kg/m² in low saline bheries, 0.8 - 2.0 kg/m² in medium saline bheries and 0.75-2.5 kg/m² in high saline bheries.

Soil characteristics

The average soil salinity was much higher (5.34%) in high saline bheries as compared to low and medium bheries (1.9% and 2.9% respectively). The soil characteristics of high saline bheries remained distinctly saline throughout the year contrary to low and medium ones which became near normal in monsoon. The organic carbon was fluctuating from 0.12-1.74% in these bheries. It was found moderate at low (0.12-1.14%) and medium (0.6-1.7%) saline bheries but comparatively poor (0.54-0.84%) at the high saline ones.

Assessment of production from bheries

The estimated total annual production with species composition from two bheries each in high saline, medium saline and low saline regimes have been presented in table below:

<u>Water bodies</u>	<u>Fish harvested</u>	<u>Production in kg/ha</u>		
		<u><i>P. monodon</i></u>	<u>Others</u>	<u>Total</u>
<u>Low saline</u>				
Bhery I (Badartola)	Major carps, Grass carps, <i>Tilapia</i> spp., <i>M. rosenbergii</i> , mulletts, <i>P. monodon</i> & miscellaneous	108.8	225.5	334.3
Bhery II (Moller khal)		435.2	563.3	998.5
<u>Medium saline</u>				
Bhery I (Pantu)	<i>P. monodon</i> , <i>Tilapia</i> spp. mulletts, bhetki & miscellaneous	120.7	221.9	342.6
Bhery II (Majnu)		386.5	535.7	922.2
<u>High saline</u>				
Bhery I (Chandipur)	- do -	159.5	117.0	276.5
Bhery II (Ramgopalpur)		114.3	209.6	323.9

Pen culture experiment

The post larvae of *P. monodon* (11.5-25.5 mm/0.04-0.12 g.) were stocked in a 100 m² bamboo pen enclosure. Better survival of the prawn was observed from the high saline pen (60-70%) as compared to low saline (40-45%) and medium saline (50%) pens. However, better growth was obtained from low saline pen (30 g) then that of high saline (20-25 g) and medium (25 g) pens in 4 months of culture period.

Fish and prawn disease

During post monsoon months Bopyrid and Isopod parasites were collected from the gills of *P. monodon* and other prawns from high saline bheries. In low saline bheries encrustation of algal mats (associated with fungi) was noticed over the body and chelate legs of *M. rosenbergii*. During winter months infection caused by *Palaegyga* sp. was observed in the branchial chamber of bagda (*P. monodon*).

PROJECT : BF/B/11

INVESTIGATION ON DISEASES OF FISHES INHABITING ESTUARIES, ESTUARINE IMPOUNDMENTS AND BEELS

Personnel : M. K. Das, R. K. Das, S. P. Ghosh, Sanjay Bhowmick

Duration : 1991-95

Location : Division of Environmental Monitoring & Fish Health Protection
Barrackpore

During the reported period 600 fishes were examined critically in relation to fish disease and a total of 17 pathogens were isolated and identified (Table 3).

Table 3. Pathogens from different ecosystems on fish host

Site	Host	Pathogen
Dhokarda Beel Kantata	<i>C. catla</i>	<i>Trichodina reticulata</i> , <i>Tripartiella copiosa</i> , <i>Neothelohanellus krishnagarensi</i> , <i>Myxobolus catlae</i> , <i>Dactylogyrus</i> sp.
-do-	<i>C. mrigala</i>	<i>Myxobolus mrigalae</i> , <i>M. calbasui</i> , <i>M. sphericum</i> , <i>Tripartiella copiosa</i> , <i>T. bulbosa</i>
-do-	<i>L. rohita</i>	<i>Thelohanellus rohita</i> , <i>T. bulbosa</i>
Bheri	<i>L. parsia</i>	<i>Ergasilus</i> sp., <i>Trichodina</i> sp.
Estuary	<i>L. parsia</i> <i>M. gulio</i>	<i>Mugulicola</i> sp., <i>Trichodina</i> sp. <i>Trichodina</i> sp.

The prevalence of *Ergasilus* sp. in *L. parsia*, cultured in a bheri were recorded during the year. It revealed as in previous years that the incidence and abundance increased with increase in the size of fish, however, growth was retarded.

Bacteriological studies of water Phase

Resource	Water		Phase	
	H.B.*	P.S.B.**	ANFB***	Coliform
Dhokarda Beel	3.37x10 ³ m l ⁻¹	1.42x10 ³ ml ⁻¹	3.0x10 ml ⁻¹	3.0x10.100 m l ⁻¹
Kantatala Wetland	5.8x10 ³ ml ⁻¹	6.8x10 ² ml ⁻¹	2.2x10 ² ml ⁻¹	1.0x10 ³ .100 ml ⁻¹

* H. B. - Heterotrophic bacteria ** PSB - Phosphate solublizing bacteria
*** ANFB - Anerobic nitrogen fixing bacteria

Pseudomonas sp. and *Edwardsiella tarda* were isolated and identified from the muscles of *Catla catla* and *Labeo rohita* respectively.

The urceolariid ciliate parasite group *Trichodina* sp. and *Tripartiella* sp. were found to serve as biological indicators of stress in ecosystem. A methodology was developed to quantify the presence of these ciliates with stress in a sewage-fed ecosystem.

Preliminary studies were conducted to determine the normal physiological parameters in the blood of Indian major carp, responsive to stress from a non-stressed aquatic environment have been presented in Table 5.

Table 5. Physiological parameters*

Haemoglobin (g/100 ml)	:	4.0 - 7.1
Haematocrit (%)	:	27.5 - 47
Clotting time (sec)	:	32.0 - 54
Plasma chloride (m Eq/l)	:	79.0 - 100
Plasma glucose (mg/100 ml)	:	43.9 - 86.2
Liver glucogen (mg/gm)	:	1.0 - 3.0*
Muscle glucogen (mg/gm)	:	2.0 - 4.0
Cholesterol (mg/100 ml)	:	154.4 - 387

(Fish species L. rohita, no. of specimen - 80, weight range- 25-40 gm)

Histopathological examination of gill of *C. mrigala* from Kantatala sewage-fed wetland showed different stages of lamellar changes varying from mild hyperplasia to severe hyperplasia (primarily distal in 60% of the examined fishes).

PROJECT : BF/B/12

SPATIOTEMPORAL VARIATIONS IN THE BIOTIC AND ABIOTIC FEATURES OF THE MAJOR ESTUARIES AMIDST SUNDARBAN MANGROVES

Personnel : P. K. Chakrabarti, R. K. Das, A. Hajra, Utpal Bhaumik, N. N. Majumder, B. N. Das, Arunava Mitra.

Duration : 1993-97

Location : Estuarine Division
(Matlah and Thakuran estuaries)

During the period ecological, microbial and biochemical investigations from six major estuaries *i.e.*, Jheela, Bidya, Matlah, Thakuran, Saptamukhi and Hooghly were carried out. Beside these *P. mondon* seed prospecting and data generation on the socio-economic aspects of the seed collectors were conducted in the western sector of the Sundarbans.

Plankton

Plankton abundance ranged between 161 u/l and 772 u/l being the highest in Bidya and the lowest in Hooghly estuaries. Density independent factors like turbidity affected specific association of plankton in specific zone *viz.*, *Rhizochonium* association preferred relatively less

turbid water as compared to *Cladophora* association. Similarly better proliferation of Bacillariophyceae and Myxophyceae was recorded in high saline zones compared to Chlorophyceae which preferred lower salinity. Zooplankters also showed zonal distribution in relation to density independent factors.

Biochemical studies

Blood glucose levels have been found in the normal physiological ranges in fish from the Saptamukhi and Thakuran rivers (42.0-47.0 mg/100 ml). However, its level was slightly higher in fish from Hooghly estuary (51.0-54.5 mg/100 ml). A higher level of blood glucose of fish in Hooghly was perhaps due to lesser utilization in cells for metabolism or an increased breakdown from the reserve tissues of liver and muscle (glycogen).

Serum total protein in fishes from different estuaries indicated no gross change in their content (3.9-4.6 g/100 ml) either between the estuaries or between the season. This indicated no major deprivation of food and nutrition of the test specimens.

Determination of blood serum cholesterol values in fish from estuaries indicated fluctuating levels. The levels were higher in monsoon season (236.0-272.0 mg/100 ml) as compared to winter season (176-223 mg/100 ml). An increased blood cholesterol content during the monsoon might be due to the preparedness of physiological mechanisms to spawning in monsoon. A very high level of the cholesterol content (272 mg/100 ml) in fish from Hooghly in monsoon, might be due to an increased synthesis but lesser utilization probably owing to the pollutional load in this estuary.

The observed urea levels ranged between 8.5 and 13.0 mg/100 ml (monsoon) and 9.0-15.0 mg/100 ml (winter) which is suggestive of renal stress in the winter season.

Investigations on tissue lipids, particularly the polyunsaturated fatty acids (P.U.F.A.) in fish (*L. parsia* and *S. panigeus*) from mangrove ecosystem, have also been carried out. It has been observed that for both the fishes the percentages of W_3 series fatty acids remained more than the W_6 series.

Ammonia, nitrite-nitrate-nitrogen, phosphate-phosphorus and bacterial load increased during monsoon season because of the ingress of the flood water which brought organic and inorganic nutrients into the mangrove areas. Gradual decline in these factors was observed during late winter and summer months. Dissolved oxygen remained optimum in all seasons due to churning action of the tidal waves and high photosynthetic activity in the mangrove zones. pH and alkalinity were found to be in the productive range.

Bacteriology

Bacterial load in fish flesh was much below the infective stage but was slightly higher in winter months. Domination of heterotrophic bacteria at Bidya and Jheela; phosphate solubilizing bacteria at Saptamukhi and Thakuran and aerobic nitrogen fixing bacteria at Thakuran were observed.

Investigation on estuarine seed prospecting

The wild seed collection varied between 8099 and 20,177 nos. per day per net. Percentage of availability of tiger shrimp seed was observed to be varying between 0.96 percent in December to 4.99 percent in August in ascending order.

PROJECT : **BF/A/21**

ECONOMICS OF MIGRATORY WINTER FISHERY OF HOOGLHY ESTUARY

Personnel : S. Paul, D. K. De, P. M. Mitra, N. C. Mondal, H. K. Sen, Prahlad Singh.

Duration : 1992-95

Location : Economics Section
Barrackpore

During 1994-95 data comprising six centres covering about 192 fishing camps ("Khuties") located at Sagardwip, Bakhali, Frazergunj, Kalisthan, Upper Jambu & Lower Jambu were subjected to financial analysis with regard to input-output relationship at market prices. The following interim findings may merit attention.

Production

Total fish catch of 20,820 t was harvested by 192 fishing units. Since the disposal of the bulk of the catch (20,383) was after sun-drying, the dried weight amounted to 4173 t valued at Rs. 6.55 crores. Besides this quantity 437 t of wet fish valued at Rs. 3.08 crores contributed to gross sale proceeds.

Employment generation

The income per fishermen was about Rs. 3000/- as wage and 4,175 fishermen were engaged in winter fisheries.

Relevant inferences

Migratory winter fishery is highly remunerative activity as per available information. The income generation to the extent of Rs. 9 crores may act as a potent production incentive to owners of Khuties but it is apprehended that exploitation of fish at current commercial levels may not be sustainable for the forthcoming years since there are no supporting scientific studies analysing both inter-year and intra-year fluctuations in production and productivity over the years. It is felt that there is need to establish reasonably meaningful linkage between commercial level of exploitation and latent stocks necessary for self-sustaining fisheries.

PROJECT : BF/A/22

IMPACT OF FARAKKA BARRAGE ON RECRUITMENT OF HILSA

Personnel : A. Mukherjee, Amitabha Ghosh, A. R. Chowdhury, T. Chatterjee, K. S. Banerjee, K. P. Singh.

Duration : 1993-97

Location : Hilsa Division, Farakka

General Assessment of Fish landing

The total fish landing from the Farakka region above and below the Farakka barrage has been estimated to the tune of 93.54t, an increase of 25.49% over that of 1993-94. Taltala contributed 37.65% to the total fish landing of the region followed by Beniagram (31.64%) and Feeder Canal (30.69%). *Tenulosa ilisha* formed the bulk (34.01%) of the total fish landing followed by miscellaneous varieties of fish (28.63%), catfish (17.47%), Indian Major carp (10.83%) and prawn (6.01%). Featherback and murrels contributed the least (3.05%).

Hilsa Fishery in the Farakka Region

The total catch of hilsa, *Tenulosa ilisha* at the Farakka region has been estimated to the tune of 31.82t forming 34.01% of the total fish landing. Beniagram Fish Landing Centre contributed 51.32% to the total catch of hilsa followed by Feeder Canal (37.04%) and Taltala (11.64%). The present catch of hilsa from the region has registered an increase of 100.67% and 34.86% over that of 1993-94 and 1992-93 respectively.

The adult hilsa population (130-562 mm/45-2050 gm) of 24.24t formed 76.19% of the total catch of hilsa from the region and indicated an increase of 65.32% and 5.71% over that of 1993-94 and 1992-93 respectively. Beniagram accounted for the bulk of the adult hilsa (67.25%) followed by Feeder Canal (30.5%) and Taltala (2.25%).

The juvenile hilsa population (below 100 mm) of 7.58t formed 23.81% of the total catch. This showed an increase of 534.84% and 1046.1% over that of 1993-94 and 1992-93 respectively. Feeder Canal shared 57.98% and Taltala shared 41.68% of the total landing of hilsa juveniles from the region. Beniagram contributed only 0.33%.

The significant increasing trend in the catch of hilsa juveniles at the Farakka region with particular reference to Taltala Fish Landing Centre in the upstream of river Ganga above the Farakka barrage was significant. The juveniles of hilsa at Taltala comprising 85.3% of the total catch indicated natural recruitment of the species above the Farakka barrage.

The morphometric measurements of 676 numbers of hilsa exhibited that the males ranged between 230 and 483 mm in length and 125 and 1320 gm in weight while the females ranged between 256 and 562 mm in length and 270 and 2050 gm in weight. The representation of male and female in the catches at the Farakka region had indicated the dominance of females



Scientist tagging hilsa to study its migratory course

A haul of hilsa





**Aliyar reservoir (above) and a part of its catch (below)
in Tamil Nadu**



over the males. The ratio of male to female has been worked out to be of 1:1.61 against 1:1.91 during the last year.

It has been observed that mainly three types of fishing nets viz., Shangla, Chandi and Kachal were in operation for hilsa fishing in the region. Catch per unit of effort has been estimated to be of 0.08 kg/man/hr for Shangla, 0.05 kg/man/hr for Kachal and 0.04 kg/man/hr for Chandi.

PROJECT : **ANA/15**

STOCK ASSESSMENT AND DYNAMICS OF FISH POPULATIONS IN THE MAJOR INLAND WATER SYSTEMS

Personnel : S. K. Mondal, R. A. Gupta, P. M. Mitra, H. C. Karmakar, R. K. Tyagi, M. Karthikeyan, P. N. Jaitly, N. C. Mondal, R. N. Dey, B. D. Saroj, N. K. Srivastava, Ramji Tiwari, Sucheta Majumder, K. Jacqueline.

Duration : 1991-95

Location : Central Sector Scheme
Barrackpore

Stock Assessment

Stock assessment studies of *L. parsia* and *P. paradiseus* were conducted on the data collected during 1987-1990 from the Hooghly-Matlah estuarine system. The growth parameters estimated by the Estuarine Division were utilised for further studies. The total mortality co-efficient Z was estimated to be 6.465 with natural mortality coefficient $M=1.5549$ and fishing mortality co-efficient $F=4.9101$ based on asymptotic length $L_{\infty}=23.68$ cm, curvature parameter $k=0.7388$ and $t=-0.537$ for *L. parsia*. The MSY was worked out at 17.84 t with effort level 0.4625 times of the present level indicating over-exploitation and suggesting 0.5375 times reduction of the present fishing intensity on *L. parsia*. For *P. paradiseus* the total mortality co-efficient Z was calculated as 8.19 with natural mortality co-efficient $F=6.0008$ based on asymptotic length $L_{\infty}=28.4$ cm, curvature parameter $k=1.348$ and $t=-0.52$. The maximum sustainable yield (MSY) was estimated to be 181.13 t at 1.0875 times of the present fishing effort. It indicated that fishing pressure on *P. paradiseus* was at reasonable level and an increase by 8.75% was advised for more catch from the estuarine system.

Month-wise mean length of different groups of *P. paradiseus*

Month	Mean length (mm)		
	1st group	2nd group	3rd group
March '94	122.21	137.92	152.17
April '94	130.64	146.66	166.06
May '94	140.36	161.61	181.23
June '94	128.41	148.51	171.54
Sept. '94	141.49	153.98	-
Oct. '94	139.34	156.69	-
Nov. '94	123.80	138.28	157.72
Dec. '94	147.50	-	-

Month-wise mean length of different groups of *L. parsia*

Month	Mean length (mm)			
	1st group	2nd group	3rd group	4th group
March '94	84	110	128	-
April '94	85	104	132	-
May '94	84	100	119	-
June '94	83	102	130	-
July '94	84	105	122	134
Aug. '94	84	105	123	133
Sept. '94	83	106	131	-
Oct. '94	84	123	-	-
Nov. '94	83	100	124	-
Dec. '94	83	104	123	-

PROJECT : **CSS/1**

DEVELOPMENT OF INLAND FISHERIES STATISTICS

Personnel : R. A. Gupta, S. K. Mondal, S. Paul, S. Majumdar, K. Jaquiline

Duration : 1984-97

Location : CIFRI, Barrackpore

An action plan was formulated on the basis of investigations made in the earlier years and a detailed survey strategy was prepared in respect of sampling units, sample size and estimation procedure at the state level for different type of resources comprising rivers, reservoirs, estuaries, aquaculture ponds and tanks. Technical guidance and training was also imparted to the officers of participating states namely Tamil Nadu, Andhra Pradesh, Maharashtra and Rajasthan. Some of the states also sent their data for analysis and the data sets were compiled and analysed during the period. The data received from Kurnool district of Andhra Pradesh and three other districts of Tamil Nadu were analysed Table 6.

Table 6. Estimates of area and other parameters

	<i>District</i>			
	Pasumpon Thevar Thirumagan (T.N.)	Kurnool (A. P.)	Salem (T. N.)	Kamrajar (T. N.)
Total no. of villages	495	918	852	410
Total area (ha) (cluster basis)	11474	1802.63	44.49	692.11
% SE	10.44	26.72	41.11	35.45
Area per village (ha)	23.18	1.96	0.05	1.69
Area per pond (ha)	1.93	1.63	0.045	0.25
% SE	7.39	23.77	45.01	29.31
Total catch (t)	1834	N. A.	N. A.	37

The average annual per hectare catch for the state of Rajasthan has been worked out as 521 kg from ponds and tanks, 30.71 kg from waterbodies having area between 10 and 500 ha, 6.41 kg from waterbodies having area between 500 and 1000 ha and 14.94 kg from waterbodies having area above 1000 ha.

The average annual per hectare catch for different districts of Madhya Pradesh has also been worked out in respect of ponds and tanks. The catch/ha estimated as 41.25 kg, 287.83 kg, 121.22 kg, 58.86 kg, 629.63 kg and 219.20 kg in Baster, Satna, Dhar, Betul, Seoni and Sarguya respectively.

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PERSONNEL

The following scientists rendered their services to the Institute during the period April 1994 to March 1995.

Dr. S.P. Ayyar, Director (Retd. on 31.12.1994).

Dr. V.R.P. Sinha, Director (from 9.1.1995)

RIVERINE DIVISION

Allahabad Centre

Shri Ravish Chandra, Pr. Scientist
 Dr. R.S. Panwar, Pr. Scientist.
 Dr. L.B. Singh, Pr. Scientist. (from NBFGR, Allahabad)
 Dr. G.K. Bhatnagar, Pr. Scientist
 Shri S.K. Wishard, Sr. Scientist (Retd. on 31.8.1994)
 Shri S.N. Mehrotra, -do-
 Dr. H.P. Singh, -do-
 Dr. D.N. Singh, -do-
 Dr. Balbir Singh, -do-
 Dr. M.A. Khan, -do-
 Dr. Shree Prakash, -do-
 Dr. A.K. Laal, -do-
 Shri R.N. Seth, -do-
 Shri R.K. Dwivedi, -do-
 Dr. R.K. Tyagi, -do-
 Dr. B.K. Singh, -do-
 Shri P.N. Jaitly, Scientist
 Shri P.K. Katihia, -do-

Lalgola Centre

Guwahati Centre

Dr. B.C. Jha, Sr. Scientist
 Dr. V. Pathak, -do-
 Dr. M. Choudhury, -do-

LACUSTRINE DIVISION

Bangalore Centre

Dr. V.R. Desai, Pr. Scientist
 Dr. M. Ramakrishnaiah, Sr. Scientist
 Dr. D.S. Krishna Rao, -do-
 Dr. P.K. Sukumaran, -do-
 Shri M. Karthikeyan, Scientist

Eluru Centre

Shri Ch. Gopalakrishnayya, Pr. Scientist
 Shri K.V. Rao, Sr. Scientist (Retd. on 31.7.1994)

Coimbatore Centre

Shri C. Selvaraj, Pr. Scientist
 Shri V.K. Murugesan, Sr. Scientist

Alappuzha Centre

Dr. V.K. Unnithan, Sr. Scientist

Hoshangabad Centre

Shri P.L.N. Rao, Sr. Scientist
(Retd. on 30.9.1994)
Dr. M.D. Pisolkar, Sr. Scientist (Retd.
on 31.8.1993)
Dr. D. Kumar, Sr. Scientist
Shri N.P. Srivastava, -do-
Dr. B.L. Pandey, Scientist

Karnal Centre

Shri D.N. Mishra, Sr. Scientist
Dr. D.K. Kaushal, -do-
Dr. V.R. Chitranshi, -do-
Dr. V.K. Sharma, -do-
Dr. (Mrs.) U. Moza, -do-
Dr. Shree Prakash, -do-

ESTUARINE DIVISION**Barrackpore Centre**

Dr. M. Sinha, Pr. Scientist
Shri U. Bhaumick, Sr. Scientist
Shri P.K. Chakraborti, -do-
Dr. D.K. De, -do-
Shri P.M. Mitra, -do-
Dr. D. Nath, -do-
Shri M.M. Bagchi, -do-
Shri A. Hazra, Scientist (Sr. Scale)
Dr.S. Samanta, Scientist

Calcutta Centre

Dr. A.K. Ghosh, Sr. Scientist
Dr. R.K. Banerjee, -do-
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
Dr. B.K. Singh, -do-
Shri G.C. Laha, Scientist (Sr. Sc.)
Shri V. Kolekar, 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. B.C. Jha, -do-
Dr. M.K. Mukhopadhyay, -do-
Dr. H.P. Singh, -do- (Posted at
Allahabad)
Dr. K. Chandra, Sr. Scientist
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 Dept. of
 Agriculture, Govt. of India)
 Dr. B.C. Jha, Sr. Scientist
 Dr.(Ms.) Krishna Mitra, -do-
 Ms. G.K. Vinci, -do-
 Dr. M.K. Mukhopadhyay, -do-
 Dr. M. Choudhury, -do-
 (Posted at Guwahati)
 Dr. Archan Kanti Das, Scientist
 Dr. Md. Abul Hassan, -do-

RESOURCE ASSESSMENT DIVISION

Barrackpore Centre

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

HILSA DIVISION

Maldah Centre/Farakka Centre

Dr. A. Mukherjee, Sr. Scientist
 Dr. Amitabha Ghosh, -do-

Dr. B.K. Singh, -do-
 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**

Shri M. F. Rahman, T-5, Karnataka
 Power Corporation Ltd., Bangalore.

Dr. Y.S. Yadava, Sr. Scientist,
 (Deputation to Ministry of
 Agriculture, Govt. of India)

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 K.S. Banerjee
 Shri N.N. Mazumdar
 Shri S.P. Ghosh
 Shri H.K. Sen
 Shri A.R. Paul
 Shri D.N. Srivastava(Retd. on 30.9.94)
 Shri B.D. Saroj
 Shri Alok Sarkar
 Shri N.C. Mondal
 Shri Sukumar Saha
 Shri P. Dasgupta
 Dr. S.B. Nandan
 Shri C.N. Mukherjee
 Ms. Satnam Kaur (Inter-Institutional
 Transfer on 1.12.1994)

T-4

Shri H. Chaklader
 Shri Amiya Kr. Banerjee
 Shri Fatik Manna
 Shri Ladu Ram Mahabhar
 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
 Shri Ramji Tiwari
 Ms. Kum Kum Das

T-II-3

Shri J.P. Mishra
 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. Sanfui
 Shri Donald Singh
 Shri M.M. Das
 Shri S.N. Sadhukhan
 Shri Swapan Chatterjee
 Shri K.P. Singh
 Shri R.K. Halder
 Shri A. Mitra
 Shri P. Rajani
 Shri B.N. Das
 Ms. Rina Naiya

T-2

Shri D. Chatterjee
 Shri C.K. Vava
 Ms. Abhijita Sengupta
 Shri L.K. Parbat
 Shri C.G. Rao
 Shri S. Kottalaiah
 Shri N.K. Saha

Ms. Shuvra Saha
 Shri A.K. Barui
 Shri K.K. Das
 Shri H.K. Routh
 Shri Atanu Das
 Shri H.L. Biswas

T-I

Shri Prahlad Singh
 Shri D. Saha
 Shri S. Bandopadhyay
 Shri Rajesh Kumar Sah
 Shri S.G. Biswas
 Shri Ashis Roy Chowdhury
 Shri C.P. Singh

Auxiliary

Shri P.R. Rao, Hindi Officer
 (from 25.6.1994)
 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 Ranjit Singh, Driver
 Shri M.C. Paul, Driver

Shri Virendra Kumar, Driver
 Shri Ram Prasad, Driver
 Shri Arun Kumar Mondal, Driver
 Shri Subhendu Mondal, Boat Driver
 Shri Saradindu Chakraborty, Sarang
 Shri A.K. Goswami, Driver
 Shri P. Ramalingeswara 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
 Shri B.K. Naskar, Boat Driver
 Shri A.K. Jana, Boat Driver

The following members of staff
 (Administrative) rendered their
 services during the year.

Senior Administrative Officer

Shri A.C. Ghosh

Accounts Officer

Sri G.P. Sharma

Assistant Administrative Officer

Shri S.C. Roy (Retd. on 1.7.94)
 Shri T.P. Das (from 18.7.94)

P.A. to Director

Shri G. Lahiri

Senior Stenographer

Shri U.K. Ghosh

Superintendent

Shri C.C. Das (from 30.12.94)
 Shri Ranjit Kr. Ghosh (A & A)
 Shri B.C. Bhattacharya (from 16.9.94)
 Shri I.N. Kodandaraman (from 23.9.94)
 Shri M.M. Neogi (from 30.12.94)

Assistant

Shri D.C. Bose
 Ms. Namita Choudhury
 Ms. S. Majumder
 Shri D.K. Banerjee
 Shri R.C.P. Singh
 Shri N.K. Mitra
 Shri S.K. Kar
 Shri M. Kachhap
 Shri J.C. Patra (Retd. on 30.6.94)
 Shri K.Prasad
 Shri S.R. Halder
 Shri T.K. Sreedharan
 Shri H.K. Nath
 Shri H.B. Sutar
 Shri S.K. Sarkar
 Shri D.N. Baidya
 Shri J.N. Banerjee

Stenographer

Shri T.K. Roy
 Shri S. Bhattacharjee

Senior Clerk

Shri Baij Nath
 Shri H.L. Sarkar
 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 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
 Shri Kunj Behari
 Shri Ambika Lal
 Ms. Bulbul Mallick
 Ms. Anita Mazumder
 Ms. N. Banerjee

Junior Stenographer

Ms. G. Vinoda Lakshmi
 Ms. Jolly Saha

Junior Clerk

Ms. G. Mazumder
 Ms. M. Banerjee
 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 Chotte 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 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 Sunil Kr.
 Shri M.S. Burman
 Shri H.K. Pramanick
 Shri Sitaram Balmiki
 (Retd. on 30.6.94)
 Shri A.M. Patra
 Shri B. Prakash ()
 Smt Parmila Taman
 Shri J. Khalko
 Shri Jugol Kishore
 Shri Jangli
 Shri S.P. Yadav

Supporting Grade III

SShri P. Sayalu
 Shri B.N. Mondal
 Shri R.N. Tar
 Shri B.B. Das
 Shri S.N. Burman
 Shri G.C. Mondal
 Shri Tek Bahadur
 Shri H.S. Burman
 Shri S.S. Burman
 Shri L. Samulu
 Shri Bhim Bahadur
 Shri N.L. Das
 Shri H.K. Burman
 Shri Ram Sunder
 Shri C.P. Singh (Expired on 27.4.94)
 Shri Khemchand Balmiki
 Shri Gulab Shaw
 Shri A. Murugasan
 Shri S.K. Burman
 Shri Nar Bahadur
 Shri P.C. Kachari
 Shri A.L. Yadav
 Shri K.D. Raju
 Shri Bideshi Lal
 Shri P.C. Paramanick
 Shri T.K. Biswas
 (Reversion to SSG III from 1.5.94)
 Shri Nar Bahadur
 (Reversion to SSG III from 1.4.95)
 Shri D.D. Poudel
 (Reversion to SSG III from 1.10.94)
 Shri S.C. Balmiki
 (Reversion to SSG III from 1.6.94)

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 (Expired on 24.10.94)
 Shri S. Mahendran
 Shri V. Mariappan
 Shri A. Ramaswamy
 Shri M.V. Krishnan
 Shri K. Kalianan
 Shri Ram Prasad
 Shri Karam Raj
 Shri Satyendra Burman
 Shri Lalita Prasad
 Shri Sita
 Shri Rajdhari Mallah
 Shri Sukchand Biswas
 Shri B. Pugalendhi
 Shri Om Prakash
 Shri M.P. Bind
 Shri A. Gangalah
 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 Umesh Chowdhury

Shri U. Satyanarayana
 Shri Pravash Ch. Paramanick

Supporting Grade I

Shri Lakshmi Ram
 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 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 Attullah
 Shri Sitla Prasad
 Ms. Kamal Devi
 Shri M.S. Bhoi
 Shri T.H. Ghume
 Shri K. Subbaiya
 Shri R. Nagraj
 Shri S. Govindarajan
 Shri K. Subramahnatyan
 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 Sahanl
 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. Dutta
 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. Saida
 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
 Shri J.L. Balmiki
 Ms. M.G. Soudamini
 Shri T.V. Velayudhan
 Shri P.V. Shajil
 Ms. Luxmi Devi
 Shri M. Anjanappa

PROMOTIONS

The following members of staff were promoted on recommendation of the Assessment Committee/Departmental Promotion Committee during the period April 1994 to March 1995.

Name	Designation	Promoted to	With effect from
Shri G.C. Laha	Scientist (Sr.S)	Scientist (S.G.)	01.01.1986
Shri S.K. Sarkar	Scientist (Sr.S)	Scientist (S.G.)	01.01.1986
Dr. P.K. Sukumaran	Scientist (Sr.S)	Scientist (S.G.)	01.01.1986
Shri N.P. Srivastava	Scientist (Sr.S)	Scientist (S.G.)	01.01.1986
Dr. B.K. Singh	Scientist (Sr.S)	Scientist (S.G.)	01.01.1986
Dr. V. K. Sharma	Scientist (Sr.S)	Scientist (S.G.)	07.01.1986
Dr. M. Chowdhary	Scientist (Sr.S)	Scientist (S.G.)	01.01.1986
Shri A.R. Chowdhary	Scientist	Scientist (S.S.)	01.07.1987
Shri P.N. Jaitly	Scientist	Scientist (Sr.S)	01.07.1989
Shri A. Hajra	Scientist	Scientist (Sr.S)	01.07.1989
Shri V. Kolekar	Scientist	Scientist (Sr.S)	01.07.1990
Shri T.P. Das	Supdt.	A.A.O.	18.07.1994
Shri B.C. Bhattacharjee	Asstt.	Supdt.	16.09.1994
Shri I.N. Kodanda Raman	Asstt.	Supdt.	23.09.1994
Shri C.C. Das	Asstt.	Supdt.	30.12.1994
Shri M.M. Neogi	Assistant	Supdt.	30.12.1994
Shri S.R. Halder	Senior Clerk	Assistant	16.09.1994
Shri K. Ganesan	Driver (T-2)	Driver (T-1-3)	01.07.1994
Shri J. Khalko	SSG III	SSG IV	01.05.1994
Shri Jugal Kishore	SSG III	SSG IV	01.06.1994
Shri Jangali	SSG III	SSG IV	26.07.1994
Shri Bideshi Lal	SSG II	SSG III	18.08.1994
Shri P. C. Paraminick	SSG II	SSG III	06.09.1994
Shri S.P. Yadav	SSG III	SSG IV	01.10.1994
Shti T.K. Sreedharan	Senior Clerk	Assistant	13.01.1995
Shri H.K. Nath	Senior Clerk	Assistant	14.11.1994
Shri H.B. Sutar	Senior Clerk	Assistant	30.12.1994
Shri S.K. Sarkar	Senior Clerk	Assistant	30.12.1994
Shri D.N. Baidya	Senior Clerk	Assistant	30.12.1994
Shri J.N. Banerjee	Senior Clerk	Assistant	30.12.1994
Shri Kunj Behari	Junior Clerk	Senior Clerk	24.01.1995
Shri Ambika Lal	Junior Clerk	Senior Clerk	28.11.1994
Smt. Bulbul Mallick	Junior Clerk	Senior Clerk	31.12.1994
Smt. Anita Majumder	Junior Clerk	Senior Clerk	30.12.1994
Smt. Narayani Banerjee	Junior Clerk	Senior Clerk	30.12.1994

Contn.

Name	Designation	Promoted to	With effect from
Shri P.K. Dasgupta	T-4	T-5	01.07.1993
Shri Ramji Tiwari	T-II-3	T-4	01.01.1994
Shri Arunava Mitra	T-2	T-I-3	01.01.1994
Shri P. Rajani	T-2	T-I-3	01.01.1994
Shri Bholanath Das	T-2	T-I-3	01.01.1994
Smt. Rina Naiya	T-2	T-I-3	01.01.1994
Smt. Shuvra Saha	T-1	T-2	01.01.1994
Shri A.K. Barui	T-1	T-2	01.01.1994
Shri S. Chakraborty	T-1	T-2	01.01.1994
Shri K.K. Das	T-1	T-2	01.01.1994
Shri H.K. Routh	T-1	T-2	01.01.1994
Shri Atanu Das	T-1	T-2	01.01.1994
Shri Hiralal Biswas	T-1	T-2	01.01.1994

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 Alok Sarkar	T-5	Three	01.07.1993
Shri Ram Chandra	T-5	Three	01.07.1993
Shri D. Sanfui	T-1-3	Three	01.07.1993
Shri K.P. Singh	T-1-3	One	01.07.1993
Shri Nirmal Chandra Biswas	T-1-3	One	01.07.1993
Shri K.L. Chakraborty	T-2	Three	01.07.1993
Shri J.L. Bose	T-2	Three	01.07.1993
Shri Sukumar Saha	T-5	Three	01.01.1994
Shri T. Chatterjee	T-II-3	One	01.01.1994
Shri Dipankar Chatterjee	T-2	Two	01.01.1994
Shri Chittaranjan Das	T-I-3	One	01.01.1994
Shri A.K. Majumder	T-I-3	Three	01.01.1994

Reversion on option

Name	Designation	Reverted to	With effect from
Shri T.K. Biswas	SSG IV	SSG III	1.5.1994
Shri S.C. Balmiki	SSG IV	SSG III	1.6.1994

Retirement during the period

Name	Designation	Date of retirement
Shri K.V. Rao	Sr. Scientist	31.7.1994
Shri S.K. Wishard	-do-	31.8.1994
Shri P.L.N. Rao	-do-	30.9.1994
Shri D.N. Srivastava	T-5	30.9.1994
Shri J.C. Patra	Assistant	30.6.1994
Shri Sitaram Balmiki	SSG IV	30.6.1994
Shri S.C. Roy	Asstt. Adm. Officer	01.7.1994 (Vol. Retirement)
Dr. S.P. Ayyar	Director	31.12.1994

Appointments

Following appointments were made during the period

Name	Designation	Place of posting	Date of appointment
Dr. S. Bijoy Nandan	T-5	Alappuzha	08.09.1994
Shri Jam Lal Balmiki	SSG I	Calcutta	03.09.1994
Dr. Md. Abul Hassan	Scientist	Barrackpore	14.09.1994
Shri Srikanta Samanta	Scientist	Barrackpore	05.08.1994
Shri Archan Kanti Das	Scientist	Barrackpore	26.08.1994
Miss Kum Kum Das	T-4	KVK, Kakdwip	26.07.1994
Shri Bablu Kumar Naskar	Boat Driver (Auxiliary)	Hoshangabad	26.11.1994
Miss M.G. Soudamini	SSG - I	Alappuzha	23.01.1995
Shri T.V. Velayudhan	SSG - I	Alappuzha	23.01.1995
Shri P.V. Shajil	SSG - I	Alappuzha	16.01.1995
Smt. Luxmi Devi	SSG - I	Allahabad	26.12.1994

Transfers

The following transfers were made during the period April 1994 to March 1995

Name	Designation	From	To
Shri Badal Lal Singh	Driver	Barrackpore	Malda
Shri N.C. Biswas	-do-	Barrackpore	Kakdwip
Shri V.G. Dhindare	-do-	Barrackpore	Hoshangabad
Shri P. Ramalingeswara Rao	-do-	Eluru	Allappuzha
Dr. A.K. Laal	Sr. Scientist	Bangalore	Allahabad
Dr. G.K. Bhatnagar	Principal Scientist	Patna	Allahabad
Dr. R.S. Panwar	Principal Scientist	Agra	Karnal
Dr. (Mrs.) U. Moza	Sr. Scientist	Agra	Karnal
Dr. K. Chandra	Sr. Scientist	Agra	Karnal
Dr. Shree Prakash	Sr. Scientist	Agra	Karnal
Shri D.N. Mishra	Sr. Scientist	Agra	Karnal
Shri S.K. Srivastava	T-4	Agra	Karnal
Shri Neeraj Swarup	T-II-III	Agra	Karnal
			(Resigned on 4.2.95)
Shri Kallu Singh Varma	Senior Clerk	Agra	Karnal
Shri Rajesh Khandelwal	Junior Clerk	Agra	Karnal
Shri Virendra Kumar	Driver	Agra	Karnal
Smt. Parmila Tomar	SSG.IV	Agra	Karnal
Shri S.P. Yadav	SSG. III	Agra	Karnal
Shri S.C. Balmiki	SSG. III	Agra	Karnal
Shri Munnilal Mallah	SSG. II	Agra	Karnal
Shri Maha Singh	SSG. II	Agra	Karnal
Shri J.N. Mallah	SSG. II	Agra	Karnal
Shri Lakshmi Ram	SSG. I	Agra	Karnal
Shri Satya Prakash	SSG. I	Agra	Karnal
Shri Paramjeet Singh	SSG. I	Agra	Karnal
Dr. D.K. Kausal	Sr. Scientist	Kangra	Karnal
Dr. V.R. Chitranshi	Sr. Scientist	Kangra	Karnal
Dr. V.K. Sharma	Sr. Scientist	Kangra	Karnal
Shri Paras Ram	Junior Clerk	Kangra	Karnal
Shri Kuldeep Singh	SSG. I	Kangra	Karnal
Shri Dalbir Singh	SSG. I	Kangra	Karnal
Smt. Kamla Devi	SSG. I	Kangra	Karnal
Shri Rajesh Sah	T-1	Patna	Vadodara
Shri C.K.N. Sahi	Junior Clerk	-do-	Malda

Contn..

Name	Designation	From	To
Shri Suraj Bahadur	SSG.II	-do-	Barrackpore
Shri C.P. Singh	SSG. III	-do-	Allahabad
			(Expired on 27.4.95)
Smt. Bimala Devi	SSG.I	-do-	Malda
Shri Pintu Biswas	T-II-3	Barrackpore	Eluru
Shri Camil Lakra	T-4	Patna	Shaktinagar (Singrauli), Dist.Mirzapur, U.P.
Dr. L.B. Singh	Principal Scientist	NBFGR,Allahabad	CICFRI, Allahabad
Shri K.B. Soni	Junior Clerk	Vadodara	Allahabad
Shri S.S. Sinha	Senior Clerk	Allahabad	Barrackpore
Shri P. Sayalu	SSG III	Eluru	Chakradevarapalli, Eluru
Shri U. Styanarayana	SSG II	-do-	-do-
Shri S. Khasim Saida	SSG I	-do-	-do-
Shri A. Sahani	SSG II	Kangra	Barrackpore
Shri Sushil Kumar	T-II-3	Kangra	Nagrota Suriyan
Shri Om Prakash	SSG II	-do-	-do-
Shri Laxmi Ram	SSG II	Farakka	Barrackpore
Shri A.K. Goswami	Driver	Barrackpore	KVK, Kakdwip
Dr. B.C. Jha	Scientist (SG)	Guwahati	Barrackpore
Dr. K. Chandra	Senior Scientist	Karnal	Barrackpore
Dr. Shree Prakash	Senior Scientist	Karnal	Allahabad
Dr. R.S. Panwar	Principal Scientist	Karnal	Allahabad
Smt. Satnam Kaur	T-5	KVK, Kakdwip	CIPHET, Ludhiana (Inter-Institutional transfer)
Shri M.P. Singh,	T-4	Allahabad	Barrackpore
Shri N.C. Biswas	T-1-3 (Driver)	KVK, Kakdwip	Barrackpore
Shri Sushil Kumar	T-II-3	Nagrota Suriyan	Karnal
Shri Om Prakash	SSG-II	-do-	-do-
Shri Ganesh Chandra Burman	SSG-I	Vadodara	Barrackpore
Shri Ranjit Kumar Roy	SSG-I	-do-	-do-

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 1.4.1994 to 31.3.1995)

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	-	-	-	-	-	-	
	Scientist	*60	*46	2	4.39	-	-	
	Sr. Scientist	30	15	1	6.66	-	-	
	Pr. Scientist	10	11	-	-	-	-	
	RMP Scientist	1	1	-	-	-	-	
		101	73	3				
2. TECHNICAL POSTS								
	Category-I	34	31	7	22.58	1	3.22	
	Category-II	*50	47	10	21.23	2	4.25	
	Category-III	3	1	1	100	-	-	
		87	79	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	-	-	-	-
A.AOs/Supdt.(A/cs)/Supdt./	11	7	2	28.58	-	-
Hindi Officer/S.C./Jr. Analyst/Desk Officer	-	-	-	-	-	-
Assistants	19	15	5	33.33	-	-
Stenographers(Sr. & Jr.)	7	6	2	33.33	-	-
Sr. Clerks/U.D.Cs	28	24	5	20.83	1	4.17
Jr. Clerks/Hindi	36	33	7	21.21	-	-
	103	87	23	21	1	

4. SUPPORTING STAFF

Grade-I	97	93	25	26.88	4	4
Grade-II	54	52	17	32.69	1	3.77
Grade-III	25	25	8	32	2	8.70
Grade-IV	14	14	7	50	2	7.7

5. SUPPORTING STAFF (SAFAIWALA)

	13	13	9	69.23	-	-
	203	197	66		9	
6. AUXILIARY POSTS	48	33	7	21.21	2	6.06
	48	33	7		2	

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

	Telegram/Telephone/ Telex/FAX/E - Mail
Central Inland Capture Fisheries Research Institute, Barrackpore - 743 101, West Bengal	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: FISHEARCH Tele : (080) 357213
Coimbatore Research Centre of CIFRI, No. 68, Rajunaidu Road, Tatabad, Coimbatore - 641 012	Cable: FISHSEARCH

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P. O. RAMACHANDRARAOPET,
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,
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DF Block, Salt Lake City,
Calcutta 700 064.

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(Opp. Bhimnath Mahadev Temple) ,
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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.**



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ORGANIZATION CHART, 1994 - 1995

