FINAL TECHNICAL REPORT GUIDELINES

DATE SHEET COMPLETED : Day\Month\Year 18 / 2 / 2005

TITLE OF PROJECT	R8360, Synthesis and Uptake Promotion of FMSP Stock Assessment Tools and Guidelines	
PROGRAMME MANAGER / INSTITUTION	Prof. John Beddington, MRAG Ltd	
REPORTING PERIOD	FROM 1 January 2004	TO 31 January 2005

1 Executive Summary:

A very brief summary of the purpose of the project, the research activities, the outputs of the project, and the contribution of the project towards DFID's development goals. (Up to 500 words).

The purpose of this project was to improve fisheries dependent livelihoods of the poor through the global uptake promotion and increased awareness of the wide range of stock assessment tools and guidelines produced by FMSP projects, and their increased use by fisheries resource managers as appropriate to their circumstances. The project promoted the uptake of stock assessment tools and guidelines developed by over 20 previous FMSP projects. These tools include new methodologies and software packages (LFDA, CEDA, Yield and ParFish) that provide significant benefits over other alternatives, particularly in terms of providing precautionary management advice allowing for uncertainties in assessments.

The project developed a framework guide to the use of the FMSP stock assessment tools, supported its distribution to a global target audience as an FAO Fisheries Technical Paper, and provided locally adapted training to potential users in DFID target states in India. The guide places the FMSP tools with a framework that is broadly based on the FAO Code of Conduct for Responsible Fisheries, and that emphasizes the important role of stock assessment in providing a scientific, feedback-based process for fishery management. It outlines the need for setting goals and operational objectives; for defining these explicitly as reference points for a range of fishery indicators; and for adopting decision control rules that include precautionary thresholds allowing for uncertainties and risk tolerances. The framework provides a basis for comparing and evaluating widely differing stock assessment methodologies in terms of the inputs required, and of the different intermediate parameters, fishery indicators and reference points produced. The project supported the publication and global distribution of 3 000 copies of the 15-chapter, 300-page document, including the software packages on a companion CD. A training workshop promoting the uptake of the FMSP software packages and other tools was held at Mangalore College of Fisheries, India in September 2004, under the guidance of a local steering committee of target institute members. The workshop was attended by 20 Indian trainees, and also by two participants from the Bangladesh DOF, funded at the expense of the DFID Fourth Fisheries Project.

These outputs will assist fishery scientists to select and use the most appropriate FMSP or other stock assessment tools for their circumstances, and thereby contribute to the sustainability of livelihoods for poor fishery stakeholders. Uptake of these outputs will be

further promoted by the development of a concise 'managers guide' to the FMSP stock assessment tools in a follow-on FMSP project (05/04); and also by further externally-funded training, e.g. as requested following the Mangalore workshop by the DFID Fourth Fisheries Project for Bangladesh, now being arranged.

2 Background:

Information should include a description of the importance of the researchable constraint(s) that the project sought to address and a summary of any significant research previously carried out. Also, some reference to how the demand for the project was identified.

Fisheries are vitally important to global livelihoods and food supplies. According to recent FAO figures (2002 SOFIA report), approximately 28 million people are employed in the primary capture fisheries industries. Reported total fish catches for the world excluding China (whose high fish production figures are in dispute) in 2000 returned to the historical peak levels of the early 1990s - about 77 to 78 million tones. Over the same time, however, the world's population has increased even more quickly than the total food fish supply. Excluding China, global per capita fish supply has decreased from 14.6 kg in 1987 to 13.1 kg in 2000. International trade in fish products is at a record level of US$55.2 billion. Net export trade from developing countries increased from US$10 billion in 1990 to US$18 billion in 2000, corresponding to a real (corrected for inflation) growth of 45 percent. Effective management of fish resources is thus critical to global sustainable development.

Since 1992, a cluster of 20 FMSP projects has produced a series of outputs relating to the assessment and management of exploited fish stocks. These outputs include new methodologies and software packages for assessing fish stocks and providing management guidance, comparisons of alternative management approaches, and applied research on specific country fisheries. The FMSP tools provide significant benefits compared to most other commercial and home-grown alternatives. Advantages include the use of non-equilibrium fitting methods and the inclusion of stock-recruit relationships and parameter uncertainty in the models. Such features should increase the likelihood of fishery analysts providing good advice to their managers. The earlier FMSP tools are already used in many places, have been well tested by users, and are now very well documented with their own help files and tutorials. Recent FMSP training courses in east Africa and south east Asia focused on the CEDA, LFDA and Yield packages. No previous project however had drawn together the full wealth of FMSP experience and knowledge.

Within the current geographic focus of the FMSP, programme level reviews and country visits (to Bangladesh, India, SE Asia and E Africa) consistently emphasized the demand for guidance on the latest stock assessment approaches to enable sustainable fisheries management for improved livelihood outcomes. This project specifically addressed the demand expressed during those country visits, subsequently incorporated into the revised FMSP strategy (Activity 4.3.2 of the FMSP logframe).

3 Project Purpose:

The purpose of the project and how it addressed the identified development opportunity or identified constraint to development.

The ultimate purpose of the project was to improve fisheries dependent livelihoods of the

poor through the global uptake promotion and increased global awareness of the wide range of stock assessment tools and guidelines produced by FMSP projects, and their increased use by fisheries resource managers as appropriate to their circumstances.

Fishery managers in both developing and developed countries are usually required to achieve policy goals aimed at sustainable production of fish yields for the benefit of fisher livelihoods, national food security and economic gain. Many different stock assessment models and software packages are available to assist managers in reaching these goals. These tools range from simple techniques for estimating parameters such as growth and mortality rates, up to full models of fishery systems allowing interactions between different species, fleets and gear types, and predicting the effects of different management strategies. The requirements of such tools, particularly the data inputs, vary greatly. Different tools are also applicable to different fisheries, depending on their ecology and the intended management strategy. Fishery managers need to select and use appropriate stock assessment tools from the wide range of choices, bearing in mind their capacity to collect the necessary data and their ability to use the models and implement the management guidance produced. Finding the best tool, however, can be constrained by the diversity of choices available and the difficulty of comparing the costs (input requirements) and benefits (type and precision of management advice) of each tool. As a result, many fisheries in developing countries are either not managed, or are managed with only nominal regulations and without any real assessment of the state of fish stocks. Such countries risk losing the many benefits obtainable from their resources.

To reduce the risks of unsustainable exploitation, the precautionary approach requires that managers should take active steps to conserve fish stocks and collect data that will help to develop a sound basis for sustainable management. The FAO Code of Conduct for Responsible Fisheries requires countries to gain the best possible guidance from their available data and to ensure that management measures are taken on the basis of scientific feedback on the state of the fishery. This project was designed to assist fishery managers in developing countries to select and use the best available fish stock assessment tools as appropriate to their needs and circumstances.

Towards this end, the project was designed to produce two main outputs, as listed below and described in detail in the following sections:

Output 1. Existing tools and guidelines from previous FMSP projects synthesized as a framework of alternative approaches for fish stock assessment in a range of different circumstances and emphasizing pro-poor management; tested, and promoted globally in widely recognized media.

Output 2. Stock assessment framework from Output 1 adapted to local context and needs of Indian or other target users, and locally appropriate training provided in the use of FMSP tools and methods.

4 Research Activities:

This section should include detailed descriptions of all the research activities (research studies, surveys, experiments etc) conducted to achieve the outputs of the project. Information on any facilities, expertise and special resources used to implement the project should also be included. Indicate any modification to the proposed research activities, and whether planned inputs were achieved.

<u>Output 1</u>

The main OVI for output 1, was the development, testing and publication of a new 'FMSP Stock Assessment Tools' manual, and its dissemination to global target institutes as an FAO Fisheries Technical Paper (or other suitable format), and in electronic format (e.g. via fisheries e-groups and websites).

Agreement was reached with FAO early in the project to publish the proposed manual (including the software on a CD) in the widely read FAO Fisheries Technical Paper series. A Letter of Agreement was signed between MRAG and FAO in May 2004, with the project contributing US$ 26 000 to cover the costs of production of 3 000 copies of the manual, within a total intended print run of 4 000 or more copies.

Production of the manual involved the preparation of different sections on each FMSP stock assessment tool or output, largely by the lead authors of the original projects, and their collation into a coherent universal framework. The framework produced is in broad alignment with recent FAO guidance including the Code of Conduct for Responsible Fisheries. It emphasizes the need for stock assessments to provide estimates of both reference points and performance indicators, allowing fishery management to be scientifically driven using feedback on the state of the fish stock or other fishery goals, and allowing for uncertainty.

Following initial discussions of the project team, the first draft of the manual was sent to all of the contributing authors, plus FAO, for initial comments on 9 August. The first draft was held up by the late delivery of two chapters, from (1) Prof Beddington and Dr Kirkwood about the 'R7040' methods, and (2) Dr Medley about the PFSA software (being developed in parallel by project R8397). The first 9 August version was circulated without these chapters. A summary paper on the R7040 methods was subsequently produced by Prof Beddington and Dr Kirkwood for a Royal Society Symposium. Approval was then received on 17 December from Royal Society for this to be simultaneously published (with appropriate recognitions) in the FAO paper. The chapter on the PFSA software (by then renamed 'ParFish'), was received from Dr Medley around the same time. With these two final inputs, the document was then completed and distributed for a second review on 20 December, by both the internal drafting team, and by external reviewers. Anticipating the late arrival of these inputs, the end-date for the project was extended by one month to 31 January 2005.

An updated but still incomplete first draft of the manual was distributed to the participants of the training workshop held in India in September (see output 2). Although this activity was intended to test the clarity and relevance of the manual, only a few comments were in fact received from the Indian 'testers' at the workshop (see workshop report). Given the intensity of the training course, and the length of the draft (275 pages), it proved difficult for the trainees to read the manual in depth. It was therefore recommended that the finalized draft (including the R7040 and PFSA sections) should be sent to two or more external expert reviewers to provide a paid review.

External experts were thus sought on 20 December, but options were restricted by the limited time available for the task, within the remaining project period coinciding with the Christmas holidays. Eight invitations to review the document were declined due to competing commitments (Robin Mahon, Marinelle Basson, Mark Bravington, Nelson Ehrhardt, Steve Ralston, Andy Cooper, Victor Restrepo and Terry Quinn), some of whom were offered an extended deadline of 28 January. No responses were received from two invitees (John Hampton and Pamela Mace). Only ex-ICLARM scientist, John Munro was available to provide a full paid review. FAO's Kevern Cochrane also, however, agreed to provide comments, unpaid, from FAO, as had Serge Garcia on the first draft. Kevin Stokes also provided unpaid comments on the first few sections of the second draft.

The document was then completed with these external inputs and with inputs from the internal drafting team. It is now ready for submission to FAO for publication, several months later than intended. The table of contents for the final version of the manual is given as Annex 1.

Some errors identified by the project in the LFDA, CEDA and Yield software were debugged and removed by Dr Kirkwood. These packages and the ParFish software and toolkit (produced by project R8397) are also being submitted to FAO for inclusion on a CD to accompany the document.

Output 2

For output 2 (the India training workshop), the College of Fisheries at Mangalore University was selected as host location, and a Memorandum of Understanding agreed as per activity 2.1 of the log frame. Mangalore was the location suggested by the CMFRI target institute, who were themselves unable to host the workshop due to ICAR policies. The workshop arrangements were coordinated by the Director of the College (and Secretary of the Asian Fisheries Society – India Branch), Dr Perar Keshavanath, who proved an excellent collaborator. At a total cost £9 843, the workshop was held for almost £4 000 less than the allocated budget.

The workshop was held on 20-24 September, as described in the attached workshop report. The workshop was led by project coordinator, Dr Daniel Hoggarth; PFSA designer and programmer Dr Paul Medley; and MRAG consultant Mr John Pearce, leader of two previous FMSP stock assessment training workshops (project PD001).

The training focused on the four FMSP software packages, LFDA, CEDA, Yield and PFSA, presented within the overall framework for stock assessment and fisheries management, developed for Part 1 of the FAO publication (output 1). Other FMSP outputs were also briefly mentioned, particularly as relating to empirical methods (projects R5030, R6178 and R7834), inland fisheries (R5953, R7043 etc) and adaptive management (R7335). The workshop programme is given as Annex 2.

The workshop plans were finalized during pre-workshop meetings with a local steering committee, comprising the following members:

- Prof. Mohan Joseph Modayil, Director, Central Marine Fisheries Research Institute (CMFRI)
- Dr. R.S.Biradar, Principal Scientist and Head, Fisheries Informatics and Technology Transfer Division, Central Institute of Fisheries Education (CIFE)
- Mr. U.S. Nandy, Director of Fisheries, West Bengal
- Mr. Satyabrata Sahu, I.A.S., Director of Fisheries, Orissa
- Dr. P. Krishnaiah, I.A.S., Commissioner of Fisheries, Andhra Pradesh (NB: unavailable for personal attendance at Mangalore meetings).

In addition to the logistic support and coordination of Dr Keshavanath, assistance with the training was provided by two senior ICAR scientists: CIFE's Dr Biradar, and CMFRI's Dr Srinath, both of whom had experience with the older FMSP tools, LFDA and CEDA.

The workshop was also attended by two participants from the Bangladesh Department of Fisheries, funded at the expense of the DFID Fourth Fisheries Project.

Building on the linkages developed at the India training workshop, efforts have since been made towards providing further training and data collection in India using project funds saved by the lower than anticipated costs of the workshop. Such activities are required to

initiate collection of fisheries data necessary for testing the FMSP tools and outputs in the follow-on project 05/04 (see below). Building on the informal participation of the ICAR scientists at the Mangalore workshop, it was hoped that the training and support for this activity could also be provided by the ICAR institutes. Although Drs Srinath and Biradar were enthusiastically supportive, this, however, again proved impossible due to policy decisions made at the higher levels of ICAR. To enable training to be provided in local languages, and to ensure compatibility with existing data collection systems and survey methods, the three target states have instead been encouraged to develop collaborations with their local university fisheries departments for the support of the data collection activities. Although Andhra Pradesh put good arrangements quickly in place with their local university at Visakhapatnam, and offered to provide support to the other two states, West Bengal and Orissa, formal commitment from those states has taken longer to confirm. These arrangements remain to be finalized, but are critically important for achieving the goal of the follow on project 05/04.

5 Outputs:

The research results and products achieved by the project. Were all the anticipated outputs achieved and if not, what were the reasons? Research results should be presented as tables, graphs or sketches rather than lengthy writing, and provided in as quantitative a form as far is as possible.

Output 1

The main output of the project was the document cited below, now accepted for publication by FAO (see Table of Contents in Annex 1):

Hoggarth, D.D., Abeyasekera, S., Arthur, R., Beddington, J.R., Burn, R.W., Halls, A.S., Kirkwood, G.P., McAllister, M., Medley, P., Mees, C.C., Parkes, G.B., Pilling, G.M., Wakeford, R.C., and Welcomme, R.L. *In press*. Stock Assessment for Fishery Management – A Framework Guide to the use of the FMSP Fish Stock Assessment Tools FAO Fisheries Technical Paper No. XXX. Rome, FAO. 2005. XXX pp.

Reviewers comments on the final draft of the document were generally positive, as illustrated by the quotes below.

> *In general, Part 1 is an excellent exposition on the methods available for fisheries assessment and management, including the most advanced and sophisticated techniques that are used by ICES, NAFO and other developed country organisations. The presentation is exceptionally clear and readable.*
> *Part 2, describing the FMSP Fish Stock Assessment Tools, gives a very useful overview of the application of the Tools and of the underlying search for estimates of the robustness of the results and of the degrees of uncertainty that must accompany any assessments.*
>
> John Munro, ex-ICLARM

> [This] *is a very useful product and will be a very useful addition to the material currently available for the mid-level stock assessment scientist and trainers. Chapters 1-5 … are very good and will provide useful guidance to many users.*
>
> Kevern Cochrane, FAO

Output 2

The Mangalore workshop provided training to 22 persons in the following categories (not including the members of the steering committee; see Annex 3 for names and contact

details):

- 15 state fisheries department staff (5 each from Andhra Pradesh, Orissa and West Bengal).
- 3 representatives of ICAR target institutes (dual role as trainees and potential future trainers): Dr R.S. Biradar, CIFE, Mumbai; Dr M. Srinath, CMFRI, Cochin; and Mr M. Karthikeyan, CIFRI, Bangalore.
- 2 staff members of the host institution, Mangalore College of Fisheries.
- 2 representatives of the Bangladesh Department of Fisheries, currently on secondment to the DFID-funded Fourth Fisheries Project (self funded).

Despite some challenges with the recipients having had little previous experience in stock assessment, the workshop was regarded as very successful and received high scores from the participants (see full workshop report, attached).

6 Contribution of Outputs:

Include how the outputs will contribute towards DFID's development goals. The identified promotion pathways to target institutions and beneficiaries. What follow up action/research is necessary to promote the findings of the work to achieve their developmental benefit? This should include a list of publications, plans for future dissemination, as appropriate. For projects aimed at developing a device, material or process, specify:

(a) What further market studies need to be done?
(b) How the product will be made available to intended users?
(c) What further stages will be needed to develop, test and establish manufacture of a product?
(d) How, and by whom, will the further stages be carried out and paid for?

The latest FMSP stock assessment tools have significant advantages over alternative products, allowing improved assessments and providing management guidance fully allowing for uncertainty. When distributed by FAO, the new guidelines to the FMSP tools (output 1) will assist fishery scientists in developing countries to select and use the best available tools for their needs. Effective application of these tools accompanied by good management may be expected to put fisheries on a sustainable track within a few years (depending on the turnover rates of fish stocks), and to thereby support the livelihoods of poor fishery-dependent stakeholders into the future.

To further promote the uptake of the FMSP tools and the manual developed in this project, a follow-on FMSP project (05/04) has also been designed to develop, test and publish an introductory guide to these methods that will aim to be more understandable by fishery managers and less experienced scientists in developing countries. This will be developed in collaboration with communications experts from the UK and India, and with the same target institutes in India.

Due to the delays in producing the document for FAO publication, it is now expected that Output OVI 1.2 will be only partially completed within the life span of the current project. Although the main FMSP tools document has been accepted by FAO for publication, it is unlikely that FAO will be able to release either the hard copies or any electronic versions of the document within the next few months. It is therefore proposed that the planned announcements of the publication on fisheries e-groups and websites be delayed until the release of the manual. Such promotion will now be linked to related activities in the follow-on project 05/04. The budget of £1,000 allocated for postal distribution of the hard copy

manuals to MRAG and DFID contacts, should be retained for eventual delivery of the manuals, when they are received from FAO.

Regarding output 2, the working group reports from the three states (see Mangalore workshop report, Annex 5) confirm the participants' intention to develop fishery management practices based on improved data collection and quantitative stock assessments using the FMSP tools. Activity 2.3 of the project was, however, only partly successful, being restricted by the lack of existing stock assessment data and capacities within the Indian target states. Since none of the three states are currently involved in any significant stock assessment work, it is clear that further support will be needed for successful applications in this area. Detailed testing of the FMSP tools using local data and leading to actual management recommendations will be undertaken by the follow-on FMSP extension project 05/04. As noted above, some of the savings from the current project have been re-allocated, with the programme manager's permission, to assist the three Indian states in initiating necessary data collection activities, in preparation for these analyses.

Further externally-funded promotion of the outputs is also expected in Bangladesh and possibly also in West Bengal. Following the Mangalore workshop, self-funded Bangladeshi participant Masood Siddique advised that DFID Bangladesh had agreed to support a second FMSP Stock Assessment Tools Training Workshop in Bangladesh, for around 10-12 participants, to be funded by the DFID Fourth Fisheries Project in-country training budget. The details of this proposal are now being developed between MRAG and the Fourth Fisheries Project. A request has also been received from West Bengal Fisheries Department's Dr Madhumita Mukherjee for further training on the FMSP tools in relation to a hilsa and shark biodiversity project.

NOTE: Four copies of the draft final technical report must be submitted to the Programme manager to be refereed. Once referee's comments have been incorporated, two copies of the finalised report should be sent to the Programme manager. Project Completion Reports and Final Technical Reports are also required by DFID in electronic format, for storing on the 'NARSIS' database. These should be submitted to the Programme Manager in either Word or Word Perfect formats. Where possible, portable display format (PDF) copies of the reports should also be submitted.

Annex 1. Table of Contents of Document prepared for FAO publication for Output 1.

Annex 2. Mangalore Training Course Programme [1]

Sunday 19 September – Arrivals

17.00 Registration at Hotel Poonja International
17.30 Introductory discussion ..... RSB [2]
19.00 Drinks reception at Hotel Poonja International

Day 1 – Monday 20 September

09.20 Depart hotel for Mangalore College of Fisheries
10.00 Workshop Inauguration at Mangalore College of Fisheries
11.00 Coffee break and depart for St Aloysius College
11.30 Course introduction and outline; Introduction of participants and trainers etc ..... DH
11.40 The new FAO framework for fishery management ..... DH
12.20 Stock assessment process and overview of the FMSP tools and guidelines ..... DH
13.00 *Lunch*
14.00 LFDA theory session ..... JP
15.00 LFDA practical session (*including break*) ..... JP
18.00 Close

Day 2 – Tuesday 21 September

09.00 'Yield' theory session ..... JP
11.00 'Yield' practical and feedback sessions (close at 17.30) ..... JP

Day 3 – Wednesday 22 September

09.00 CEDA theory session ..... DH
11.00 CEDA practical and feedback sessions (close at 17.30) ..... DH

Day 4 – Thursday 23 September

09.00 Empirical and other stock assessment approaches ..... DH
09.30 Bayesian approaches and decision making - theory session ..... PM
10.30 PFSA practical and feedback sessions (close at 17.30) ..... PM

Day 5 – Friday 24 September

09.00 Training overview ..... DH
09.30 Practical session with own data sets (where available) ..... PM
12.30 Lunch
13.30 Participants to form working groups to identify future strategies (and any further training needs) for data collection, stock assessment and fishery management ..... Facilitator: DH
15.00 Presentations from working groups ..... Participants / chairs
16.30 Windup session (including discussion and course evaluation) ..... DH
17.30 Workshop close

19.00 Workshop dinner at Hotel Poonja International

Saturday 25 September – Departures

Notes

[1] As reviewed and revised by local steering committee on 15-19th September.

[2] Trainers/facilitators: RSB – Dr R.S. Biradar, DH – Dr Daniel Hoggarth, JP – Mr John Pearce, PK – Dr Perar Keshavanath, PM – Dr Paul Medley.

Annex 3. Mangalore Training Course - List of participants

Names and addresses of Steering Committee Members

1. Dr. M. Mohan Joseph, Director, Central Marine Fisheries Research Institute (CMFRI), P.O. Tatapuram, Kochi-682014. Ph: 91 484 239 4798, Fax 91 484 239 4909, e-mail: mohan.joseph@vsnl.com
2. Dr. R.S.Biradar, Principal Scientist and Head, Fisheries Informatics and Technology Transfer Division, Central Institute of Fisheries Education (CIFE), Seven Bungalows, Versova, Mumbai-400061. Ph: 91 22 263 6446. Email: rbiradar@hotmail.com, fishinst@bom3.vsnl.net.in
3. Mr. U.S. Nandy, Director of Fisheries, West Bengal, Jessop Building, 63, N.S. Road, Kolkata-700001. Ph: 91 33 22135710, Fax: 91 33 22135773
4. Mr. Satyabrata Sahu, I.A.S., Director of Fisheries, Orissa, Jobra, Cuttack-753007. Ph: 91 671 261 4061. Email: orifish@rediffmail.com
5. Dr. P. Krishnaiah, I.A.S., Commissioner of Fisheries, Andhra Pradesh, Masab Tank, Hyderabad-500028 (NB: unavailable for personal attendance at Mangalore meetings).

Names and addresses of participants (trainees)

Andhra Pradesh

6. Mr. Y. Prakasa Rao, Joint Director of Fisheries, Fishing Harbour Complex, Visakhapatnam-530001. Ph: 91 891 2502953
7. Mr. Ch. Seshasayana Rao, Joint Director of Fisheries, Office of the Commissioner of Fisheries, Matsya Bhavan, 4th Lane, Santhinagar, Masab Tank, Hyderabad-500028. Ph: 91 40 23308585
8. Mr. M.A. Yakub Basha, Assistant Director of Fisheries, Office of the Joint Director of Fisheries, Fishing Harbour Complex, Visakhapatnam-530001. Ph: 91 891 2502953
9. Mr. G. Venkata Raju, Assistant Director of Fisheries, Office of the Commissioner of Fisheries, Matsya Bhavan, 4th Lane, Santhinagar, Masab Tank, Hyderabad-500028. Email: gvraju_fisheries@yahoo.co.in Ph: 91 40 23308585
10. Dr. K. Phani Prakash, Fisheries Development Officer, Office of the Assistant Director of Fisheries, Kaikalur-521333. Ph: (Mobile) 09440385191

Orissa

11. Dr. K.K. Samal, Assistant Director of Fisheries (B & T), Balugaon, Khurda District. Ph: 91 6756 220429
12. Mr. Subrat Kumar Dash, Junior Fishery Officer, Office of the Assistant Director of Fisheries (Marine), Sect. 21, Paradeep. Ph: (Mobile) 09437183412
13. Mr. Satyajit Kumar Bhuyan, Fishery Extension Officer, Office of the Sect. Assistant Director of Fisheries (Marine), Kujang, Jagatsingpur. Ph: 91 6722 236243. Email: satyajit99@rediffmail.com
14. Mr. Debabrata Samal, Fishery Extension Officer, Office of the Assistant Director of Fisheries (Marine), Basudevpur, Bhadrak District. Ph: 91 6782 250318
15. Mr. S.P. Burma, Statistical Investigator, Directorate of Fisheries, Orissa, Jobra, Cuttack. Ph: 91 671 2614061

West Bengal

16. Dr. Prasanta Kumar Jana, Deputy Director of Fisheries, 60A, Colootola Street, Kolkata-700073. Ph: 91 33 2156711
17. Dr. Madhumita Mukherjee, Deputy Director of Fisheries, Pailan, P.O. Pailan Hat, P.S. Bishnupur, Diamond Harbour Road, Kolkata-700104. Ph: 91 33 2323 7614 (Mobile) 0943 100 4500. Email: madmita@cal.vsnl.net.in, madhukol@rediffmail.com
18. Mr. Uttam Kumar Panja, Deputy Director of Fisheries, Western Zone, Meen Bhavan, Sepoy Bazar P.O. & Dist. Paschim Midnapore, West Bengal. Ph: (Mobile) 09434004342
19. Mr. Gautam Sarkar, Deputy Director of Fisheries, Central Zone, Meen Bhavan, P.O. Berhampore, Dist. Murshidabad, West Bengal. Ph: 91 3482 252286
20. Mr. Barindra Krishna Mitra, Deputy Director of Fisheries, Kolkata Zone, 9A, Esplanade East, Kolkata-700069. Ph: 91 33 22430463

Karnataka

21. Mr. M. Karthikeyan, Reservoir Fisheries Division of CIFRI, Bangalore Unit, Hesaragatta, Bangalore-560089
22. Dr. N. Jayabalan, Professor and Head (FRM), College of Fisheries, Mangalore-575002. Ph: 91 824 224 9256
23. Professor K.S. Udupa, Professor and Head (Statistics), College of Fisheries, Mangalore-575002. Ph: 91 824 224 9256

Bangladesh (participated at own cost)

24. Masood Siddique, Deputy Assistant Director, Fourth Fisheries Project, Department of Fisheries, Matshya Bhaban, Ramna, Dhaka. Ph. 880 2 956 0653 / 0171 281 216 (mobile). Fax. 880 2 956 7216. Email: masood@fisheries.gov.bd
25. Md. Abdul Barek, Statistical Officer, Fourth Fisheries Project, Department of Fisheries, Matshya Bhaban, Ramna, Dhaka. Ph. 880 2 956 0653. Fax. 880 2 956 7216. Email: barek@fisheris.gov.bd

Trainers / Resource Persons

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