Application and promotion of FMSP
Participatory Fisheries Stock Assessment
(ParFish)

Training Workshop Report

St Alyoises College, Mangalore, India
25 – 29 July 2005
Introduction

Small-scale fisheries provide important contributions to the livelihoods of poor people in developing countries through income and food security. Stock assessments are an important component of managing fisheries, but existing methodologies require considerable historical data on the fishery, which are often lacking especially in developing countries. The result is that there is often no information available on which to base management decisions, which can result in the unsustainable exploitation of stocks, leading to associated social and economic problems.

Participatory Fisheries Stock Assessment (ParFish) has been developed to fill this gap by providing a resource-efficient and rapid stock assessment technique that does not require long-term time series data, can be applied with limited resources to provide a starting point for management decisions and contributes to co-management by involving the resource users in setting management objectives, data collection and management planning.

The previous projects R7947 and R8397 developed the ParFish methodology and a Toolkit to assist users in its implementation, consisting of Guidelines, Software, Software Manual and supporting materials. The projects also resulted in considerable interest in the methodology from a range of institutions. This training workshop run under current project R8464 aimed to increase capacity in ParFish in participating institutions and support its promotion and uptake.

Aims of the workshop & Learning objectives

The aims of the workshop were for the participants to:

- Understand the 6 stages of ParFish and how to implement them;
- Have a greater understanding of stock assessment theory and practice;
- Become familiar with the ParFish Software and analysis;
- Become familiar with various participatory techniques;
- Learn about each other’s fisheries;
- Consider how ParFish can be applied in their fisheries;
- Provide feedback to improve and refine the ParFish training course and ParFish methodology.

Methods and teaching materials used in the workshop

The training methods employed in the workshop involved a mixture of lectures, practicals, participatory techniques, group work and discussions and computer practicals. All participants were provided with a copy of the ParFish Toolkit, and other teaching materials provided included an imaginary ParFish case study, and various practical experiments.

Participants and Facilitators

There were 14 participants, from a range of Indian state and national level fisheries management, research and teaching institutions from Andhra Pradesh, Orissa, West Bengal, Karnataka and Kerala, and from Kenya. The workshop was run by Dr Paul
Participants' Expectations and Concerns

Participants were asked to write their expectations and concerns about the workshop on cards, which are summarised as follows:

### Expectations

| ParFish general | - Learn and understand ParFish  
|                 |   - To know what ParFish is: Methodology, How to apply  
|                 |   - To acquaint with the technology where the primary data for stock assessment is lacking  
|                 |   - To know about the importance and usefulness of the ParFish software  
|                 |   - To know its implementation including the fishers (co-management)  
|                 |   - To know how ParFish is helpful in assessment of fish stock  
|                 |   - To know what is ParFish and in what way it is useful to the fisheries sector  
|                 |   - To know the methodology adopted for this stock assessment  
| Co-management   | - Explore the possibility of implementation of co-management  
|                 |   - Future plans follow up  
|                 |   - Strategies that can be adopted should not hamper the profession in co-management  
|                 |   - Better management practices  
|                 |   - To study present level of resources exploitation through ParFish  
|                 |   - To guide sustainable fisheries management through ParFish  
|                 |   - To provide Mgt advice under uncertainty and encourage co-management  
| Software        | - To get acquainted with ParFish software  
|                 |   - To know the methodological details (Algorithms)  
|                 |   - To have more number of programs to make the software popular  
|                 |   - To make it more applicable in Par/comparison with other software available  
|                 |   - Familiarise with ParFish software  
|                 |   - Learn the difficulties experienced in its implementation  
|                 |   - Know the basis behind the models used in its operation  
|                 |   - To familiarise with the ParFish software tools  
| Tools           | - To know best practices of ParFish from Zanzibar  
|                 |   - How to do stakeholder analysis  
| Specific case studies | - To know the results of crab fishery that was done in AP  
|                     | - To apply the technique in an island nation  
|                     | - To understand how ParFish can be used in commercial fisheries  
|                     | - To find ways to get more catch to fishermen  

### Concerns

| Concept understanding | - Implementation schedule  
|                       | - Level of interaction (statistical package)  

- Clarity of concepts
- More statistics – mathematics

| Implementation methodology | - Rest the data generated on crab fishery
- Unable to do field work
- Adequate financial and logistic support for collection of data from field
- Implementation at field level
- Positive response for co-management implementation an crab fishery
- Data collection, Fisheries development |

| Reliability and testing | - To manage commercially important fish species exploited heavily
- Selection of right software tools for different types of fisheries
- Has the technique been tested in any other fisheries
- Is it a reliable technique?
- The method could lead to subjective conclusions |

| General logistic of workshop | - Time limitation 5 days too short understand ParFish clearly
- Home work |

| Socio-economic aspects of community | - Poorness, Literacy, Drinking, Vulnerability
- Poorness, More population, Less income |

### Teaching Schedule

A copy of the Agenda for the workshop can be found in Annex 2. A summary of the teaching sessions is provided below.

#### Introduction to ParFish

Dr Paul Medley and Ms Suzannah Walmsley gave an introductory lecture to ParFish, explaining the potential application of the methodology, data requirements and data collection, statistical techniques underlying the methodology and the participatory framework. The powerpoint slides can be found in Annex 3.

#### Previous experiences of ParFish

Dr Narriman Jiddawi gave a presentation about the experiences of developing and testing ParFish in Kizimkazi, Zanzibar. Mr G. Venkata Raju (Department of Fisheries, Andhra Pradesh) gave a presentation about the experiences of initiating testing of ParFish in the mud crab fishery in the Coringa Mangroves, East Godavari District, Andhra Pradesh. Presentations can be found in Annex 3.

#### Introduction to Bayesian Statistics

Dr Paul Medley gave a presentation introducing Bayesian Statistics, uncertainty, probability, decision theory and the theory underlying ParFish. The presentation can be found in Annex 3. Practical and participatory exercises were used to illustrate the concepts, such as estimating the number of oranges in a jar (or lemons in a jug in this case).

#### Understanding the context and collecting background information

Suzannah Walmsley introduced the first stage of ParFish, understanding the context and what background information should be collected and where to look for it. An imaginary case study had been developed that brings out various important lessons.
that have been learnt in previous testing experiences of ParFish. Participants were split into three groups of four or five, with people from different states in each group, and asked to identify what is already known about the case study fisheries, what extra information they would look for or collect before starting to implement ParFish and where they would look for it or how they would collect it.

Dr Narriman Jiddawi led a session on stakeholder analysis, firstly explaining the background and how to do it. Participants then worked in their groups again to carry out a stakeholder analysis of the case study fishery. A similar process was followed by Suzannah Walmsley for the communications plan and the participants carried out the exercise for the case study.

The groups’ work for all the above exercises is presented in Annex 4.

**Data collection techniques**

*Interviews*
The theory and models behind the stock assessment interview and preference interview were explained, and ways of adapting and presenting the questions to the fishers were discussed. Presentations can be found in Annex 4. The use of the binary tree for ranking the preference cards was explained and participants practiced carrying out the interviews on each other.

*Fishing experiments*
A simulation of a fishing experiment was constructed, using a large cardboard box filled with shredded paper (being the area of the fishery, and the shredded paper being the medium, or water). The objective was to explain the principles behind the use of fishing experiments to estimate parameters of the fish stock in the ParFish Software. 35 ping-pong balls were added to the shredded paper, representing the fish stock, 10 of which had been numbered from 1 – 10. The numbered balls represented tagged fish.

A workshop participant was then asked to be a fisher, and to ‘fish’ for ping-pong balls for six successive 1-minute periods. During each period, he gathered as many ping-pong balls as he could find, which represented the total catch for each day of the fishing experiment.

The results (numbers of ping pong balls found during each 1-minute session) were then used in a modelling exercise to estimate the initial number of ping-pong balls in the box, or rather, the initial population size of the fish stock. The modelling results are shown below. The estimated initial population size was 34.8 ping pong balls.

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<tr>
<th>Day</th>
<th>No. of Fish</th>
<th>Cumulative Catch</th>
<th>Nt</th>
<th>CPUE</th>
<th>Expected CPUE</th>
<th>Squares</th>
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Software
A day was spent on the use of the ParFish software. Participants were taken through, step-by-step, the 6 steps of the software, from entering background information, setting up models and drawing posterior samples, checking their data, entering preferences and controls and carrying out the analysis. Each step was explained on the overhead projector and individual support was given to participants throughout. The Turks and Caicos conch data was used as an example. Some participants then moved on to look at the Dimbani data from Zanzibar.

Feedback and management planning
The interpretation of the analysis outputs was explained and ways of feeding back the results to fishers was discussed.

Evaluation of the Workshop
Stage 6, Evaluation of the ParFish process, was discussed.

Evaluation of Workshop
In general, participants felt that their expectations for the workshop had been satisfied. They expressed a greater understanding of the overall ParFish process, the use of the ParFish software and how and when it can be applied, and how it can support co-management. After being concerned about the reliability and applicability of ParFish at the beginning of the workshop (identified in the Expectations and Concerns exercise), at the final evaluation, participants said they were 90% satisfied that ParFish is applicable and reliable. They also felt that the mathematical background provided was sufficient for software understanding. However, there will often be some participants that would like to go into the underlying models in more depth, and a sub-seminar could be organised on this in future workshops for those interested, while the others continue to practice the use of the software.

Participants felt that the length of the workshop, 5 days, was good, but that more time spent on the software would be useful. The possibility of field work to practice the interviews would also be useful, although this would require a longer workshop. Video footage of carrying out interviews with the fishers (translated / with subtitles) and other data collection activities would be useful for training. Some participants also expressed the need for evidence of the success of co-management and/or the implementation of ParFish for policy makers to adopt the co-management approach.
# Annex 1: Participants list

## Participants list – ParFish Workshop Mangalore 25-29 July 2005

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Organisation</th>
<th>Address</th>
<th>Email</th>
<th>Tel</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Dr Satyajit Kumar Bhuyan</td>
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<td>09437 160510 06722 236243</td>
<td>yes</td>
</tr>
<tr>
<td>Subrat Kumar Dash</td>
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<td>Dept of Fisheries, Orissa</td>
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<td>094371 83412</td>
<td>Yes</td>
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<td>Yes</td>
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<td>9390209023</td>
<td>yes</td>
</tr>
<tr>
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<td>98851-44557</td>
<td>yes</td>
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<tr>
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<td>9440814708</td>
<td>yes</td>
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<tr>
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<td><a href="mailto:wbjdmems@vsnl.net">wbjdmems@vsnl.net</a></td>
<td>033 2215 6711</td>
<td>Yes</td>
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<tr>
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<tr>
<td>Dr M. Srinath</td>
<td>Principal Scientist &amp; Head</td>
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<td>PBN01603, Cochin 682018</td>
<td><a href="mailto:mudumby@yahoo.com">mudumby@yahoo.com</a></td>
<td>0484 239 4867</td>
<td>Yes</td>
</tr>
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<td><a href="mailto:rbiradar@hotmail.com">rbiradar@hotmail.com</a></td>
<td>022 2636 1446</td>
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</tr>
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<td><a href="mailto:udupa47@hotmail.com">udupa47@hotmail.com</a></td>
<td>0824 2243503</td>
<td>Yes</td>
</tr>
<tr>
<td>Prof. N. Jayabalan</td>
<td>Professor of Fishery Biology</td>
<td>College of Fisheries</td>
<td>1-5 3/26 Darbar Hill, Padil, Mangalore-7</td>
<td><a href="mailto:maljaya2@yahoo.com">maljaya2@yahoo.com</a></td>
<td>0824 2432328</td>
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# Annex 2: Agenda

**ParFish Training Workshop**  
**Mangalore, 25 – 29 July, 2005**

## Agenda

### Day 1

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<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Presenter(s)</th>
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<tbody>
<tr>
<td>08.30 – 09.00</td>
<td>Registration</td>
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<tr>
<td>09.00 – 09.15</td>
<td>Opening Ceremony</td>
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</table>
| 09.15 – 10.30 | Introductions  
Participants’ expectations and concerns  
Brief introduction to ParFish and workshop learning objectives | PM/SW        |
| 10.30 – 11.00 | **Coffee Break**                                                                              |              |
| 11.00 – 13.00 | Introduction to ParFish  
Previous experiences of ParFish  
- Kizimkazi, Zanzibar (Dr. Narriman Jiddawi, Institute of Marine Sciences, Zanzibar)  
- Kakinada, Andhra Pradesh (G. Venkata Raju, Department of Fisheries, Andhra Pradesh) | PM/SW, NJ, GR |
| 13.00 – 14.00 | **Lunch**                                                                                      |              |
| 14.00 – 15.30 | Background to stock assessment and Bayesian Statistics                                          | PM           |
| 15.30 – 16.00 | **Coffee Break**                                                                              |              |
| 16.00 – 17.30 | Practical stock assessment and concepts: key ideas of depletion, biology, modelling and uncertainty. | PM/SW (oranges in jar etc) |

### Day 2

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Presenter(s)</th>
</tr>
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</table>
| 08.30 – 10.30 | Stage 1: Understand the Context  
- Background information  
- Stakeholder Analysis | SW, NJ       |
| 10.30 – 11.00 | **Coffee Break**                                                                              |              |
| 11.00 – 12.00 | Stage 1 cont.  
- Communications Planning | SW           |
| 12.00 – 13.00 | Stage 2: Engaging Stakeholders  
- Meetings with fishers, key informant interviews and participatory mapping | SW & NJ      |
| 13.00 – 14.00 | **Lunch**                                                                                      |              |
| 14.00 – 15.30 | Stage 3: Undertake ParFish stock assessment  
Planning – what data needs to be collected? | PM           |
| 15.30 – 16.00 | **Coffee Break**                                                                              |              |
| 16.00 – 17.30 | Data collection methods I: Stock assessment interviews                                           | PM           |

### Day 3

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Presenter(s)</th>
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<tbody>
<tr>
<td>08.30 – 10.30</td>
<td>Data collection methods II: Preference interviews</td>
<td></td>
</tr>
<tr>
<td>10.30 – 11.00</td>
<td><strong>Coffee Break</strong></td>
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</table>
| 11.00 – 13.00 | Data collection methods III:  
- Catch-effort data  
- Fishing Experiments | PM. Computers needed. |
<p>| 13.00 – 14.00 | <strong>Lunch</strong>                                                                                      |              |
| 14.00 – 15.30 | Stock assessment techniques:                                                                     | PM. Computers |</p>
<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>15.30 – 16.00</td>
<td>Coffee Break</td>
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<tr>
<td>16.00 – 17.30</td>
<td>Modelling in MS Excel cont. PM. Computers needed.</td>
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**Day 4**

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<th>Time</th>
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<td>08.30 – 09.00</td>
<td>ParFish Software introduction: inputs and outputs to the software</td>
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<tr>
<td>09.00 – 10.30</td>
<td>The ParFish Software practical: Data input to Excel and setting up simulation models</td>
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<tr>
<td>10.30 – 11.00</td>
<td>Coffee Break</td>
</tr>
<tr>
<td>11.00 – 13.00</td>
<td>The ParFish Software practical cont: Importing data and setting up Probability Models</td>
</tr>
<tr>
<td>13.00 – 14.00</td>
<td>Lunch</td>
</tr>
<tr>
<td>14.00 – 15.30</td>
<td>The ParFish Software practical cont: Analysis</td>
</tr>
<tr>
<td>15.30 – 16.00</td>
<td>Coffee Break</td>
</tr>
<tr>
<td>16.00 – 17.30</td>
<td>The ParFish Software practical cont: Analysis and interpretation</td>
</tr>
</tbody>
</table>

**Day 5**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>08.30 – 10.30</td>
<td>Stage 4: Interpret results and give feedback: Recommendations from the analysis outputs</td>
</tr>
<tr>
<td>10.30 – 11.00</td>
<td>Coffee Break</td>
</tr>
<tr>
<td>11.00 – 13.00</td>
<td>Stage 5: Initiate management planning: Feeding back results to fishers and building consensus Stage 6: Evaluating ParFish implementation</td>
</tr>
<tr>
<td>13.00 – 14.00</td>
<td>Lunch</td>
</tr>
<tr>
<td>14.00 – 15.30</td>
<td>Planning ParFish implementation back at ‘home’</td>
</tr>
<tr>
<td>15.30 – 16.00</td>
<td>Coffee Break</td>
</tr>
<tr>
<td>16.00 – 17.30</td>
<td>General discussion, workshop evaluation and Closing Ceremony</td>
</tr>
</tbody>
</table>

Evening: Final dinner for participants
Annex 3: Presentations

**Management Plans**
- Process of developing and implementing a management plan requires institutional support and commitment to co-management

**Evaluation**
- Aims:
  - To assess what the process has achieved and what we have learnt
  - To learn from the experience and improve planning for future assessments
- Process:
  - Discussions with various groups
  - Independent evaluations

**FMSP software**
- CEDA, LFDA, YIELD, ParFish
- www.fmsp.org.uk
Welcome to the **parfish**
PARTICIPATORY FISHERIES STOCK ASSESSMENT
Training Workshop
23rd - 25th July 2005
College of Fisheries, Mangalore

What is ParFish?
- An approach to stock assessment
- Involves fishers and other stakeholders
- Suitable for small-scale fisheries
- Rapid assessment
- Appropriate for data-poor situations

ParFish Process
1. Understand the context
2. Agree objectives with stakeholders
3. Undertake ParFish stock assessment
4. Integrate results and provide feedback
5. Evaluate ParFish processes
6. Implement management planning

ParFish Toolkit
- Guidelines: guidance for carrying out the process, data collection, assessment and management planning
- Software for carrying out the stock assessment and Software Manual

Overview of the Assessment

Learning Objectives
- By the end of the workshop, you will:
  - Understand the 6 stages of ParFish and how to implement them;
  - Have a greater understanding of stock assessment theory and practice;
  - Be familiar with the ParFish software and analysis;
  - Become familiar with various participatory techniques;
  - Have enjoyed yourself!
Other objectives

- Learn about each other’s fisheries;
- Consider how ParFish can be applied in your fisheries;
- Provide feedback to us to improve and refine the ParFish training course and ParFish itself.

Software Structure

Generating Parameter Probabilities

- ParFish software takes frequency observations, and estimates the underlying probability distribution from which they were drawn.

- Probability density functions from various data sources can be combined into a single ‘posterior’ PDF.
Conventional and Novel Information Sources

- Current version uses logistic (Schafer) as simulation model: $r$, $\beta$, and $q$.
- Various data types and sources can be combined e.g.
  - Long term catch-effort data models
  - Interviews
  - Fishing experiments
  - Biological parameters
  - Others?

Fishing Experiments

- Estimate population size and catchability
- Fishers concentrate their fishing effort in a specific area, catches and effort are recorded
- Complemented by underwater visual surveys of fish population

Interviews

- Stock assessment interviews gather fishers’ knowledge about the resource and provide a starting point for the stock assessment
- Preference interview indicates how much fishers would like or dislike different outcomes of catch and effort

Utility & Decision Theory

- Utility refers to how good something is for someone
- Modelling provides a variety of possible outcomes from different decisions
- Decision Theory helps us decide which of a set of actions to take, based on their expected utility (probability of happening times cost)
- Bayes action: Choose the action which will maximise the expected (average) utility

Preference Interviews

- Scenario cards - different levels of catch and effort
- Pair-wise ranking then scoring
- Score indicates ‘utility’
Example pairwise comparison

- Keep current work level in the fishery, but get 25% more income/fish, OR
- Keep fishery income the same, but for 25% less time which could be used for other work.

Outputs of Analysis

- Output reference points, fishery states etc. as probabilities
- Limit and target control levels:
  - Recommended (target) control levels
  - Limit control levels with acceptable chance of overfishing

Participatory Framework

- Involve fishers at an early stage
- Helps their acceptance of assessment results
- Participatory framework draws on Adaptive Learning, Participatory Action Plan Development, Consensus Building Methodology, participation literature
- Supports co-management

Understanding the context

- Fishery and management context
- Stakeholder Analysis
- Communications Plan

→ Gather background information

Engaging stakeholders

- Set objectives for the assessment
- Introduce concepts: uncertainty, fish stock dynamics, probability, overfishing
- Participatory techniques
Feedback and Planning
- Communicating the results of the assessment to fishers and fisheries management institutions;
- Building consensus on problems and possible solutions for the fishery;
- Developing a management plan or action plan;
- Evaluating the process

Bayesian Approach
A brief introduction

Summary
- Introduction to probability
- Likelihood
- Bayes rule
- Decision theory and utility
- A practical application: ParFish

Mathematical Probability
- Probabilities are between 0 and 1.0
- 0 = impossible
- 1.0 = certainty
- Probabilities often defined as sets of possible events or outcomes
- A set of exclusive events, one of which must occur, sum to one
Subjective Probability

- People assess a risk even without direct observations.
- Some events we may wish to estimate we do not wish to observe, such as nuclear war or overfishing.

Discrete → Continuous

Example Probability Density

Likelihood

- Probability when p is known:
  - Pr(H) = p
  - Pr(T) = 1-p
- Likelihood when H/T is known:
  - Pr(p | H) = p
  - Pr(p | T) = 1-p

Binomial Likelihood

Pr(p | r Heads) = C_r p^r (1-p)^{n-r}

where

\[ C_r = \frac{n!}{r!(n-r)!} \]

- \( C_r \) is the number of ways (combinations) \( r \) heads could occur in \( n \) trials.

Likelihood: 8 Heads 2 Tails
Fishing Experiment
- Population size on day 0 = n
- We catch $C_0$ fish on day 0
- Population size on day 1 = $n - C_0$
- We catch $C_1$ fish on day 1
- Population size on day 2 = $n - C_0 - C_1$
- Population size on day t = $n - \sum C_i$

Bayes Rule
- Posterior = Prior * Likelihood
- $Pr(p, n | Data) = Pr(p, n) * L(Data | p, n)$

Lake Fishing Likelihood
$Pr(p, n | Fish) = 'C_i', \mu' (1-p)'$

Updating Using Bayes
$Pr(p, n | Data) = Pr(p, n) * L(Data | p, n)^*$
$L(Data | p, n)^*$

Which gives
$Pr(p, n | Data) = Pr(p, n | Data)^* * L(Data | p, n)^*$
Lake Fishing Experiment

Lake Fishing Likelihood

Lake Fishing Posterior

Utility
- Score cost / benefits of outcomes in one dimension
- Not monetary
- Used in economics to manage risk
- Explains why people enter games where they expect to lose money

Example Utility Curves

Decision Theory
- Combines probability and utility
- Bayes action
- Choose the action which will maximise the expected (average) utility
Parasitic stock assessment approach on
Coringa mangrove mud crab fishery
in Andhra Pradesh

PRESENTATION LAYOUT
- Selection criteria for fishery
- About crab fishery
- General impression of fishers
- Collection of background information
- Preparation and finalisation of data collection system
- Interviews and compilation of data
- Problems during interviews
- Relevance of Parasitic tools
- Expectations

SELECTION CRITERIA FOR FISHERY
- Crab fishery has been chosen to apply Parasitic tools since
  - It is a small fishery
  - Easy to take up pilot study
  - Needs immediate attention as it is over-exploited
  - Easy to understand and communicate to all stakeholders
  - Easy accessibility
  - Small group of fishers

ABOUT CRAB FISHERY
- Single species, the mud crab is an important food item in the diet of the local populace
  - It is a small fishery
  - Easy to take up pilot study
  - Needs immediate attention as it is over-exploited
  - Easy to understand and communicate to all stakeholders
  - Easy accessibility
  - Small group of fishers
- Crab fishing is done with hand line and ambush gear
- Crab is caught during night time
- Crab is sold at local markets
- Crab is used as food

COLLECTION OF BACKGROUND INFORMATION
- Skills training and situation analysis
- Preparation of key informant formats
- Needs with crabs fishers in different villages
- Visits to fishing grounds
- Interviews with fishermen
- Information from Fisheries Dept
- BOBP and CMFRI publications

- First Session: September - January
- Last Session: February - August
- No. of Working Days: 20 per month
- 90% of the harvested females in November - December
- 10% of the harvested males in November - December
- Crab fishing is done in May month
- Crab is eaten as food
- Crab is sold at local markets
- Crab is used as food

- Small (under 150 g) - In June & July
- Medium (150 g - 300 g) - In August & September
- Big (300 g and above) - In November & December
**DATA COLLECTION SYSTEM ADOPTED**

- Field trials were conducted to finalize the appropriate questionnaire.
- Questions were prepared in two formats.
- Stock assessment forms.
- Preference interview formats.
- Preference cards prepared.
- Cooperation for providing database sought from fisheries.
- Target species caught from 100 fisheries.
- Research mapping.

**INTERVIEWS AND COMPILATION OF DATA**

- Conducted 110 stock assessment interviews.
- Conducted 30 preference interviews.
- Conducted 1 group interview for both stock assessment and preference interviews.
- Resource map prepared.
- Compiled data in excel sheet.
- Poster on status of crab prepared.
- Information was kept in website of Fisheries Dept.
  www.nyp-fisheries.org

**PROBLEMS DURING INTERVIEWS**

- Understandability of questions found to be difficult.
- Time taken for interviewing the fisher is tedious.
- Fishers are panic to certain questions like recovery time etc.

**GENERAL IMPRESSION OF FISHERIES**

- Increase in the no. of boats / fishers (increasing effort).
- Destruction of nursery areas.
- Destruction of mangrove areas for shrimp farms and other uses.
- Pollution from factories.
- Natural disturbances (cyclone, tsunami).
- Cattle no longer allowed to graze on the island resulting in less input of nutrients.

**RELEVANCE OF FISHER TOOLS**

- Appropriate to the present system of data availability.
- Rapid assessment.
- Responsive.
- Participation.
- Enhance the capacity building on fishery.
EXPECTATIONS

• Testing the data on Parfish software
• Interpret the results with fishers
• Feedback from fishers on management options
• Explore the possibilities of Co-management
• Plan for implementation of a pilot project
Welcome to the participatory fishery stock assessment training workshop

Day 2

25th-29th July 2009
College of Fisheries, Mangalore

Objectives

- Context and background
  - What background data to collect; how to obtain background information on the fishery; planning stakeholder engagement
- Engaging stakeholders
  - Meetings with fishers; management objectives
- Data collection options for stock assessment
- Stock assessment interview

Characteristics of a suitable fishery

- Sedentary local species (not highly migratory e.g., tuna)
- Fishers responsible for the majority of fishing mortality can be identified
- One or more fishing villages involved (depending on resources)
- Co-management situation or wishing to develop co-management
- Fishery can be spatially defined as a 'management unit'

But ...

- Uses tried and tested stock assessment theory and models
- Can be used on any fishery that conforms to the underlying model

Question:

What background information do we need about the fishery before we start?

How can we get it?

STAKEHOLDER ANALYSIS
Stage 1 of the ParFish Guidelines explains how to assess the context of the fishery in order to frame the stock assessment.
- It is a preparatory stage before undertaking the assessment and involves four main activities:
  - Understanding the fishery;
  - Identifying stakeholders;
  - Therefore, one important aspect in ParFish is to identify which are the individuals or organisations that will be affected by or influenced by fisheries management.

Who is a stakeholder
- A stakeholder is:
  - someone affected (positively or negatively) by the impact of an activity;
  - someone who can influence the process or impact of an activity.
- Eg fisheries Management

Why use it?
- The aim of ParFish is to be participatory.
- Therefore it is important that you understand who the key stakeholders are in the fishery in question.
- A Stakeholder Analysis gives a clear picture of who is or should be, involved in the process and their potential impact on the process and its impact.
- Identifying and involving stakeholders at an early stage increases the chance that stakeholders understand and support recommendations and can build consensus on improving management of the fishery.

Why use it?
- ParFish will succeed by engaging the right people during the different stages of the process who will collect information, understand the assessment, and plan feasible actions. Therefore it is important to do the process with various stakeholders eg beach recorders, fishers, etc.
- Can keep updating

What is it?
- Stakeholder Analysis is a way of identifying groups of people and organisations that have a role or an interest in a process, and describing what their involvement or interest is.
- These need to do a Grid which can help to choose people who will be affected or interested in making decisions and who could be engaged in such activities.

How to do it
- A Stakeholder Analysis could be undertaken as a desk-based activity or within a group. It is best to involve lots of people using a participatory approach. The main steps of a stakeholder analysis are:
  - Create a list of all potential stakeholders and classify them (primary or secondary);
  - List each group’s interests;
  - Assess the potential impact of the process on each group;
  - Indicate their relative priority and influence of each stakeholder;
  - Record your results.
Classifying Stakeholders
- Stakeholders can be divided into two main groups:
  - Primary stakeholders are those directly affected by changes in the fishery and management arrangements, e.g., those that benefit from or are adversely affected by an activity. Usually, they live in or very near the resources in question.
  - Secondary stakeholders include all other people and institutions with an interest or intermediary role in the fishery or area being considered.

List each group's interests
For each stakeholder group, list their interests in relation to the process and its objectives. Remember that each group may have several objectives and roles in the process.

Assess the potential impact of the process on each stakeholder
- Assess whether the process will potentially have a positive or negative impact on each stakeholder group. Try using the following symbols:
  - + potential positive impact
  - - potential negative impact
  - +/- possible positive and negative impacts in different circumstances
  - ? uncertain

Indicate the relative priority and influence of each stakeholder
- Use the following grid to rate the priorities and influences of each stakeholder:
  - Priority: High, Medium, Low
  - Influence: High, Medium, Low

Priority and influence matrix for the Stakeholder Analysis
- Use the grid to determine the priorities and influences of each stakeholder:
  - High priority - High influence (H-H)
  - High priority - Low influence (H-L)
  - Low priority - High influence (L-H)
  - Low priority - Low influence (L-L)
- Top right-hand square - high priority and a high influence. It will be important to build good working relationships with these stakeholders to ensure an effective decision of support for project implementation.

- Bottom left-hand square - low priority and low influence. These groups should be kept informed, but are not a priority to be actively involved.

- Bottom right-hand square - low priority and high influence. These remain relatively unaffected by the project and its impacts. If supportive, they may be very useful in providing support, but if not then care should be taken to avoid these stakeholders diverting or disrupting the process, with negative impacts for primary stakeholders.

An example of a table that can be used to record the stakeholder analysis:

<table>
<thead>
<tr>
<th>Stakeholder Category</th>
<th>Influence (High, Medium, Low)</th>
<th>Priority (High, Medium, Low)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Stakeholders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End-users (consumers)</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Other community leaders</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Secondary Stakeholders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investors</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Shareholders</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

Stakeholder engagement plan:

- Identify the communications objective for each stakeholder
- Define communications messages for each stakeholder
- Assess appropriate materials for each stakeholder
- Define communication channels
- Define monitoring indicators

Key informant interviews:

- Who are key informants?
- What can you find out from key informant interviews?
- How do you prepare one?
  - Who, when, where, what?
Engaging stakeholders

- Techniques for collecting background information also help involve stakeholders.

Meetings with fishers

- Concepts
  - Why management is important
  - Why stock assessment is needed
  - Fish stock dynamics and behaviour
  - Participatory mapping
  - Problem census

What data is needed?

- Interviews
- Catch-effort data
- Fishing experiments
- Other data

Welcome to the parfish
PARTICIPATORY FISHERIES STOCK ASSESSMENT
Training Workshop
Day 3
23rd - 24th July 2009
College of Fisheries, Mangalore

ParFish Process

1. Understand the context
2. Agree objectives with stakeholders
3. Undertake ParFish stock assessment
4. Analyse results and provide feedback
5. Initiate management planning
6. Realise ParFish process

Stock Assessment Interview

- The time, catch and effort units need to be identified and used consistently for all interviews.
- Hents, weight/numbers, daily fishing
- The total effort in this fishery over the last year (t_y).
- For each interviewee:
  - Identify each interviewee’s main gear, then last years CPUE (c_y) and the years CPUE (c_t) for each gear.
  - A catch rate range for the unexploited stock (\text{c_0})
  - The time for recovery (t_r).
Step 1

- The individual catch rates are regressed towards the mean of the sample. For the jth fisher:

\[
\hat{q}\beta_j = \left( \frac{q\beta_j}{\sqrt{N}} \right) \sqrt{N}
\]

where \( q\beta_j \) = mean CPUE of the interviews.

Step 2

- Estimate current state of stock based on ratio of current to unexploited catch rates:

\[
\hat{q}B_0 = \frac{U_j + U_s}{2}
\]

\[B_{\text{ave}} = \frac{\hat{q}B_0}{\hat{q}}\]

Step 3

- For each fisher, calculate the intrinsic rate of increase \( r \) by solving the non-linear projection equation for the unknown \( r \):

\[
X_i = X_i \left( 1 + r \left( 1 - X_i \right) \right) \quad \text{and} \quad X_i = X_i \left( 1 + \frac{r}{\hat{q}} \left( 1 - X_i \right) \right)
\]

\[X_i = \frac{\hat{q}B_0}{\hat{q}B_0} \quad X_i = \frac{U_j + U_s}{2} \quad \text{and} \quad \hat{q}B_0 = \frac{U_j + U_s}{2}
\]

Step 4

- With \( r \) defined, catchability can be estimated from the current catch rate and effort adjusted for stock change due to production and catch:

\[
\hat{q} = \left( \frac{\hat{q}B_{\text{ave}} - \hat{q}B_0}{s} + r \hat{q}B_{\text{ave}} \left( 1 - \hat{q}B_{\text{ave}} \right) \right) \left( f_{\text{ave}} \hat{q}B_{\text{ave}} \right)
\]

Step 5

- Unexploited biomass can be estimated from \((U_j + U_s)\hat{q}\) and the estimate of \( q \).

\[B_0 = \frac{\hat{q}B_0}{\hat{q}} = \frac{(U_j + U_s)}{2\hat{q}}\]

Getting Utility

- Contrast two variables to obtain function shape.
- Primary variables are catch (income) and effort (work done).
- Rank various outcomes defined as combinations of variable values.
- Score relative difference between outcomes.
Preference Interviews

- Scenario cards - different levels of catch and effort
- Pair-wise ranking then scoring
- Score indicates "utility"

Example pairwise comparison

- Keep current work level in the fishery, but get 25% more income/fish, OR
- Keep fishery income the same, but for 25% less time which could be used for other work.
Welcome to the ParFish Workshop

Day 5

20th-21st July 2009
College of Fisheries, Mongalpore

Giving feedback on the results
- Important so that fishers understand the results
- Understanding is necessary for co-management

Review the ParFish assessment
- Recap on how the assessment was carried out
  - Interviews
  - Fishing experiments
  - Catch-effort data

State of the Stock
- Review concepts
  - Chance that the stock is overfished
    - Recap uncertainty, evidences, number of people that would believe it is overfished
  - Is more information needed?
    - What information?

Recommended controls
- Levels of control relative to current situation
- Target control i.e. would be preferred by fishers
- What the expected impact on CPUE would be
  - Use of preference cards
  - Compare scientific vs. fisher information

Prioritising issues and developing an action plan
- Workshop process, participatory, all relevant stakeholders involved
- Identify the issues and problems in the fishery, considering the assessment results
- Prioritise and identify possible solutions
- Plan for implementation
Management Plans
- Process of developing and implementing a management plan requires institutional support and commitment to co-management

Evaluation
- Aims:
  - To assess what the process has achieved and what we have learnt
  - To learn from the experience and improve planning for future assessments
- Process:
  - Discussions with various groups
  - Independent evaluations

FMSP software
- CEDA, LFDA, YIELD, ParFish
- www.fmep.org.uk
## Annex 4: Group exercises

### Background information on ParFish case study

After reading the case study the participants were requested to identify the information they would need to do ParFish and where will they get that information

#### GROUP 1

<table>
<thead>
<tr>
<th>Information needed</th>
<th>Source of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population in each village- men, women, children, migratory fishers</td>
<td>Published material</td>
</tr>
<tr>
<td>Number of fishers- Active/ Part time/ Migratory</td>
<td>Group interviews</td>
</tr>
<tr>
<td>Particulars on crafts and gears, Number and types</td>
<td>Fisheries department</td>
</tr>
<tr>
<td>Annual catch statistics, species, gear, craft</td>
<td>Market people</td>
</tr>
<tr>
<td>Seasonality, peak, lean</td>
<td>NGOs</td>
</tr>
<tr>
<td>Biology of important fishery</td>
<td>Hoteliers</td>
</tr>
<tr>
<td>Market information Local and export)</td>
<td>Cooperatives</td>
</tr>
<tr>
<td>Management issues if any</td>
<td></td>
</tr>
<tr>
<td>Infrastructure</td>
<td></td>
</tr>
<tr>
<td>Other livelihood opportunities</td>
<td></td>
</tr>
<tr>
<td>Stakeholders involved</td>
<td></td>
</tr>
<tr>
<td>Organisation involved</td>
<td></td>
</tr>
<tr>
<td>Conflict measurement measures</td>
<td></td>
</tr>
</tbody>
</table>

#### GROUP 2

<table>
<thead>
<tr>
<th>Information needed</th>
<th>Source of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other livelihoods- Agriculture, Animal husbandry, Tourism Handicraft,</td>
<td>Village elders</td>
</tr>
<tr>
<td>Types of gear hook and line, traps, nets</td>
<td>Fisheries department</td>
</tr>
<tr>
<td>Type of fisheries-mixed pelagics, demersal, octopus</td>
<td>Village elders</td>
</tr>
<tr>
<td>Organisation involved fisheries department, NGO, Cooperative society</td>
<td>Fishers (men, women)</td>
</tr>
<tr>
<td>Financier-NGO</td>
<td>Other stakeholders</td>
</tr>
<tr>
<td>Fishing conflict between Net and trap fisher, large vessels from outside vs local</td>
<td></td>
</tr>
<tr>
<td>traditional, visiting fishers vs locals, Between villages</td>
<td></td>
</tr>
<tr>
<td>Future scope --scuba diving by men on reefs</td>
<td></td>
</tr>
<tr>
<td>Infrastructure</td>
<td></td>
</tr>
</tbody>
</table>

**Group 2**

**Background elaborated by Group**—4 villages, Fishery important livelihood activity

- Nearest market (Kanosh), done by women, nearby tourist Hotel (Octopus), exports
- Control by village elders
- There is Major road for Kanosh, Minor road for Demosa graded, Tourist lodge
GROUP 3

<table>
<thead>
<tr>
<th>Information needed</th>
<th>Source of data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame survey</td>
<td>Published material</td>
</tr>
<tr>
<td>Number of fishers</td>
<td>Other organisations</td>
</tr>
<tr>
<td>No of craft and gears</td>
<td>Research and Academic organisations, NGOs, CDOs, Fisheries department, cooperative societies</td>
</tr>
<tr>
<td>Spatial distribution of fishery</td>
<td>Key informants, fishers other stakeholders</td>
</tr>
<tr>
<td>Information on species composition</td>
<td>Primary data collection</td>
</tr>
<tr>
<td>Information on actual effort</td>
<td>Money lenders, financier</td>
</tr>
<tr>
<td>Information on management regime</td>
<td>Internet</td>
</tr>
<tr>
<td></td>
<td>Maps</td>
</tr>
</tbody>
</table>

Is the fishery suitable for ParFish? (Fishery 3 which is localised and sedentary is suitable but fishery one and two which are mixed gear and migratory arte not suitable)

STAKEHOLDER ANALYSIS
Stakeholders analysed

Stakeholders’ interests and influence
The participants were then asked to categorise the stakeholders into Primary and Secondary stakeholders and write what interests each has in the fishery and in ParFish and whether ParFish is expected to have a positive or negative impact on them.

GROUP 1

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Interests</th>
<th>+ve or-ve impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fishers</td>
<td>Catching fish sustainable</td>
<td>+</td>
</tr>
<tr>
<td>Purchaser</td>
<td>Regular supply</td>
<td>+/-</td>
</tr>
<tr>
<td>Fish trader/Vendor</td>
<td>Collection and transport of fish</td>
<td>+/-</td>
</tr>
<tr>
<td>Consumers</td>
<td>Availability of quality product</td>
<td>+/-</td>
</tr>
<tr>
<td>Financier</td>
<td>Regular income</td>
<td>+/-</td>
</tr>
<tr>
<td>Fisheries Department</td>
<td>Sustainability</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Socio economic development</td>
<td></td>
</tr>
<tr>
<td>SECONDARY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Craft makers</td>
<td>Continued work/business/income</td>
<td>+/-</td>
</tr>
<tr>
<td>Gear makers/Vendors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scuba makers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Researchers</td>
<td>Data analysis</td>
<td>?</td>
</tr>
<tr>
<td>Hotelier</td>
<td>Business</td>
<td>+/-</td>
</tr>
<tr>
<td>Village leaders</td>
<td>Village harmony</td>
<td>+/-</td>
</tr>
<tr>
<td>Tourists</td>
<td>Entertainment</td>
<td>?</td>
</tr>
<tr>
<td>Policy makers</td>
<td>Sustainability/Socio economic upliftment</td>
<td>+</td>
</tr>
<tr>
<td>Coops</td>
<td>Welfare</td>
<td>+</td>
</tr>
<tr>
<td>NGO</td>
<td>Capacity building</td>
<td>?</td>
</tr>
<tr>
<td></td>
<td>Alternate employment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Savings/thrift</td>
<td></td>
</tr>
</tbody>
</table>
GROUP 2

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Interests</th>
<th>+ve or-ve impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRIMARY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Fishers</td>
<td>Catching fish</td>
<td>+</td>
</tr>
<tr>
<td>Traders</td>
<td>earning livelihood</td>
<td>+</td>
</tr>
<tr>
<td>Dpt of fisheries</td>
<td>marketing</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>profits</td>
<td>-/+</td>
</tr>
<tr>
<td></td>
<td>Management</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Sustainability</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Welfare</td>
<td>+</td>
</tr>
<tr>
<td>Exporters</td>
<td>Marketing (overseas), profits</td>
<td>-/+</td>
</tr>
<tr>
<td>Migratory fishers</td>
<td>Livelihoods, Catching fish, Fishing, profits</td>
<td>-/?</td>
</tr>
<tr>
<td>Large fishing vessels owners</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td><strong>SECONDARY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NGO</td>
<td>Resource sustainability</td>
<td>+</td>
</tr>
<tr>
<td>Hoteliers</td>
<td>Business</td>
<td>+</td>
</tr>
<tr>
<td>Tourists</td>
<td>Fish food</td>
<td>+</td>
</tr>
<tr>
<td>Co-op</td>
<td>Livelihood</td>
<td>+</td>
</tr>
<tr>
<td>Crafts and gear makers</td>
<td>Management</td>
<td>+</td>
</tr>
<tr>
<td>SCUBA-markers</td>
<td>Business</td>
<td>-/+</td>
</tr>
<tr>
<td></td>
<td>Business</td>
<td>-/+</td>
</tr>
<tr>
<td>Financial Institutions</td>
<td>Credit facility</td>
<td>+/-</td>
</tr>
<tr>
<td>Village leaders</td>
<td>Income, management</td>
<td>-,-</td>
</tr>
<tr>
<td></td>
<td>Dispute settlement</td>
<td>+</td>
</tr>
<tr>
<td>Villagers</td>
<td>Economics of village</td>
<td>+</td>
</tr>
<tr>
<td>Consumers</td>
<td>Food</td>
<td>+</td>
</tr>
</tbody>
</table>

GROUP 3

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Interests</th>
<th>+ve or-ve impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRIMARY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fishers</td>
<td>Continue fishing</td>
<td></td>
</tr>
<tr>
<td>trap</td>
<td>sustainable catch rates</td>
<td></td>
</tr>
<tr>
<td>net</td>
<td>livelihood security</td>
<td></td>
</tr>
<tr>
<td>hook and lines</td>
<td>alternative employment</td>
<td></td>
</tr>
<tr>
<td>octopus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish traders (including</td>
<td>Regular supply</td>
<td></td>
</tr>
<tr>
<td>women)</td>
<td>Higher marketing margin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Less marketing channels</td>
<td></td>
</tr>
<tr>
<td>Consumers</td>
<td>Regular supply</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accessibility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cost</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Quality</td>
<td></td>
</tr>
<tr>
<td>Boat/Net Makers</td>
<td>Increased fishing activity</td>
<td></td>
</tr>
<tr>
<td>Fuel suppliers</td>
<td>Regular fishing without break</td>
<td></td>
</tr>
<tr>
<td>Fishing cooperatives</td>
<td>Higher productivity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Greater participation in fishing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Socioeconomic welfare and members</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Avoidance and middlemen</td>
<td></td>
</tr>
<tr>
<td>Large vessel operators</td>
<td>Increased resource utilisation</td>
<td></td>
</tr>
<tr>
<td><strong>SECONDARY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stakeholders</td>
<td>Benefits/Actions</td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Migrant fisher</td>
<td>Higher productivity</td>
<td></td>
</tr>
<tr>
<td>Hotels and restaurant</td>
<td>Regular and timely supply of fish at reasonable rate and of good quality</td>
<td></td>
</tr>
<tr>
<td>Tourists</td>
<td>Quality of fish</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pristine ecosystem</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cleanliness</td>
<td></td>
</tr>
<tr>
<td>NGOs</td>
<td>Enhance microfinancing system</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Welfare activities</td>
<td></td>
</tr>
<tr>
<td>Fishery Department</td>
<td>Evolve management strategies</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data collection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ensuring livelihood security</td>
<td></td>
</tr>
<tr>
<td>Scuba supplier</td>
<td>Increased octopus fishery</td>
<td></td>
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</tbody>
</table>

The participants then categorised the stakeholders according to their priority and influence each would have on ParFish

<table>
<thead>
<tr>
<th>Group 1</th>
<th>H-H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishers</td>
<td>Fishery Department</td>
</tr>
<tr>
<td>Purchasers</td>
<td>Policy makers</td>
</tr>
<tr>
<td>Fish traders</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 1</th>
<th>L-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer</td>
<td>Village leaders</td>
</tr>
<tr>
<td>Financier</td>
<td>NGO</td>
</tr>
<tr>
<td>Makers of crafts and gears</td>
<td>NGO</td>
</tr>
<tr>
<td>Tourists</td>
<td>Fisher cooperatives</td>
</tr>
<tr>
<td>Hoteliers</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 2</th>
<th>H-H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishers</td>
<td>Fisheries Department</td>
</tr>
<tr>
<td>traders</td>
<td>Cooperatives</td>
</tr>
<tr>
<td>exporters</td>
<td>Money lenders</td>
</tr>
<tr>
<td>NGOs</td>
<td></td>
</tr>
<tr>
<td>Craft and gear makers</td>
<td></td>
</tr>
<tr>
<td>Consumers</td>
<td></td>
</tr>
</tbody>
</table>

The participants then categorised the stakeholders according to their priority and influence each would have on ParFish
COMMUNICATIONS PLANNING

GROUP 1

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Fishers</th>
<th>Fish Traders</th>
<th>Fisheries department</th>
<th>NGOs/CBOs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication objectives</strong></td>
<td>To understand ParFish process</td>
<td>What and why ParFish Data collection</td>
<td>Understand ParFish tools, approach and application Data collection and interoperations of results</td>
<td>Application of Par fish assessment</td>
</tr>
<tr>
<td><strong>Communication message</strong></td>
<td>Present state of fish stock through</td>
<td>Present Yield</td>
<td>Planning and management options</td>
<td>Capacity building</td>
</tr>
<tr>
<td>Communication material</td>
<td>Village level meetings, posters, handouts, mass media</td>
<td>Meetings, handouts</td>
<td>Training, workshops, publishing material, software</td>
<td>Posters, handouts</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------------------------------</td>
<td>-------------------</td>
<td>---------------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Communication channels</td>
<td>NGOs. CBOs, Fisheries Dpt (extension), Village meetings, Fishermen’s cooperatives societies</td>
<td>Fisheries Dpt, NGOs. CBOs/Associations</td>
<td>MRAG website</td>
<td>Fisheries Department</td>
</tr>
<tr>
<td>Monitoring indicators</td>
<td>Meetings attendance and distribution of publicity material</td>
<td>Meetings attendance and distribution of publicity material</td>
<td>Implementation</td>
<td>meetings arranged, number of attendance</td>
</tr>
</tbody>
</table>

GROUP 3

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Fishers</th>
<th>Fish Traders</th>
<th>Consumers</th>
<th>Co-op Soc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication objectives</td>
<td>To understand importance of ParFish to fishery management</td>
<td>Sustainable fish supply will be ensured by management through ParFish</td>
<td>Ensuring regular fish supply and easy accessibility</td>
<td>Par fish will increase cooperation in the village</td>
</tr>
<tr>
<td>Communication message</td>
<td>Guidelines for fisheries management plan and results of ParFish</td>
<td>Inform results and utility of ParFish</td>
<td>Sustainable management ensures sustainable supply</td>
<td>Success story of co-management</td>
</tr>
<tr>
<td>Communication material</td>
<td>Interactive meetings, posters, pamphlets, audio video, street plays</td>
<td>Pamphlets and meetings</td>
<td>Posters and Pamphlets</td>
<td>meetings, reports, interviews</td>
</tr>
<tr>
<td>Communication channels</td>
<td>NGOs. Co-op Societies, Fisheries Dpt, Local bodies</td>
<td>NGOs. And traders organisations</td>
<td>Radio, TV advertisement</td>
<td>Direct meetings</td>
</tr>
<tr>
<td>Monitoring indicators</td>
<td>Attendance in meetings</td>
<td>Intensity of trading activities</td>
<td>Consumer preference? Behaviour</td>
<td>Increase in membership and activity</td>
</tr>
</tbody>
</table>

Example provided by Suzannah

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Fishers</th>
</tr>
</thead>
</table>

43
| **Communication objectives** | To understand ParFish process  
Why stock assessment and management are important  
Data collection  
Results of the assessment and management options |
|-----------------------------|---------------------------------------------------------------------------------|
| **Communication message**   | ParFish is a way of understanding the stock  
-Results of the assessment |
| **Communication material**   | Newspapers, meetings, Posters ,Road/street plays |
| **Communication channels**   | Via NGOs/CBOs/Cooperative Societies |
| **Monitoring indicators**    | Number of fishers at meetings  
Number of posters distributed etc |