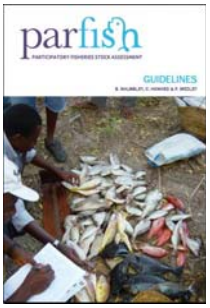

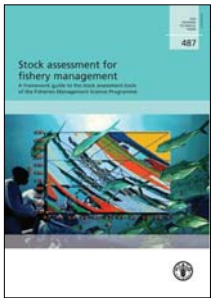

Report of the ParFish Workshop: "Participatory Fisheries Stock Assessment (ParFish), an alternative method of determining stock status"

Conducted at the 61st Gulf and Caribbean fisheries Institute (GCFI),
Le Gosier Guadeloupe 10-14 November 2008 08:30-15:00

Sponsored by the

National Marine Fisheries Service (NMFS)
Southeast Fisheries Science Center (SEFSC)

and

Marine Resources Assessment Group (MRAG) Americas, Inc.

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Abstract

ParFish (Participatory Fisheries Stock Assessment), a recently developed fisheries assessment method, is aimed at obtaining information on stock condition in situations where data are limited or completely absent (Walmsley et al. 2005). The ParFish method has particular utility for small, artisanal coastal fisheries and where fisher input into management is desired. ParFish can be thought of as a management tool, potentially providing a starting point for obtaining consensus on stock status and management action when previously unavailable and as a method capable of incorporating multiple data types as well as fisher feedback into management. A workshop with the aim of furthering the awareness of the ParFish stock assessment method among fishery biologists, managers, and other interested persons, was organized at the 61st GCFI by the NMFS, SEFSC and MRAG Americas. Some twenty four scientists, managers, fishers, individuals from NGOs, and graduate students took part in the Special Workshop.

Acknowledgements

This workshop was made possible by the GCFI Program Committee as a Special Workshop during the 61st GCFI in Gosier, Guadeloupe. Workshop venue and presentation equipment were provided through the GCFI Program Committee. Special oral presentations were made by the ParFish Software developer, Dr. Paul Medley and Ms. Suzannah Walmsley, developer of the ParFish Software Guidelines document. Dr. Robert Wakeford presented information on several case studies as well as basic logistical requirements for carrying out a ParFish assessment. Dr. Joe Kimmel assisted with summarizing the workshop minutes. Nancie Cummings served as Rapporteur.

Sponsorship for the Special workshop was aided in part by the NMFS, SEFSC, Miami Florida and MRAG Americas Inc., St. Petersburg, Florida. The views expressed herein do not necessarily represent those of NMFS, SEFSC.

1. Background

Objectives

To date, the ParFish methodology has been developed and tested through a number of pilot studies conducted on various fisheries throughout the world, including the Caribbean, East Africa and India. The specific objectives of the GCFI Special Workshop were to:

- Increase awareness of the approach within the Caribbean region, where fisheries often lack the necessary quantitative data to conduct more traditional forms of stock assessment.
- Provide more in-depth knowledge and understanding of the approach, from project planning, logistics of data collection through to analysis of data and interpretation of results.
- Provide an opportunity to identify fisheries within the Caribbean region to apply the ParFish methodology, particularly where co-management initiatives are considered.

Arrangements

Throughout the GCFI Symposium and Special Workshop new contacts and networks were established that could utilize the ParFish approach. These included lobster fisheries in Venezuela, artisanal fisheries within Guatemala, Belize and Honduras, and spawning aggregations in Colombia, for example.

2. ParFish Workshop

Welcome and introductions

The workshop was opened by welcoming all attending the ParFish Special Workshop. It was noted that the attendees represented a number of groups including: fishery scientists, natural resource managers, fishers, and NGOs. A general outline of the workshop agenda was presented (Appendix 1) noting that the workshop would continue to build on the oral presentations given earlier during the formal Symposium.

The two oral Symposium presentations included an overview of the methodology and the importance of stakeholder participation within the ParFish process, and more technical details on the data analysis using Bayesian statistics. These two presentations highlighted situations where the ParFish method would be most useful, namely for small coastal fisheries and/or situations where classical fisheries information is lacking. Existing case studies included: Turks and Caicos conch, Zanzibar multi-species reef fish, India mud crab, and the currently ongoing Puerto Rico deepwater snapper. Also ongoing is the Trinidad shrimp ParFish study recently begun during 2008.

The workshop provided additional details regarding the process, including logistics of carrying out the project, which would facilitate scientists and managers in evaluating the method as a practical research tool. During the Special ParFish Workshop, several presentations were given, all which dealt with more in-depth aspects of the ParFish process. These presentations were directed towards operational logistics of carrying out a ParFish assessment, including data collection and the development of two types of questionnaire; stock assessment and fisher preference. The former is used to collect quantitative information to estimate specific parameters used in the stock assessment model (production and/or yield per recruit), whereas the latter is used to quantify the preference or 'utility' of individual fishers to alternative management arrangements.

Overview

A brief review of the objectives of a ParFish assessment was given by Robert Wakeford, which included a description of the six key steps involved in the process (Figure 1), and the utility of the methodology particularly to small-scale coastal fisheries. The method has merit in situations where classical fisheries data are lacking and when management needs information relatively quickly. It was noted that the method has additional utility in providing guidance for improving data collection systems. The pilot studies that have been carried out or are underway were also outlined.

Following the overview presentation, participants were invited to ask a variety of questions relating to the method. These included the following:

- **Information requirements:** What information is needed in order to conduct a ParFish assessment and also how long would it take to carry out an assessment? A brief overview was given of the two population models currently available in the ParFish software (production model and yield per recruit), and the information requirements for each. The format of an existing questionnaire from the Turks and Caicos conch ParFish pilot study was presented to illustrate what questions were asked to conduct a stock assessment using a production model (Appendix 2). It was emphasized that while scientific advice could be obtained only from the questionnaire, management action under these circumstances would be rational, but still risky. The method recommends using the questionnaire to initiate data collection programmes, but with the co-operation of the fishers. The typical duration of an assessment is between 6-12 months, although developing management options can take considerably longer.

- **Definition of stock boundaries:** How do stock boundaries impact the method and the results obtained? ParFish handles the definition of "stocks" in the same way as any other stock assessment method. While a stock should strictly speaking be a closed population, a weaker more realistic assumption which is adequate is that the population being exploited can be managed as a single unit (i.e. fishing the population less results in an increase in abundance and conversely fishing it more results in a decrease). However, if a fishing experiment is being conducted as part of the ParFish assessment caution should be taken to undertake the experiment over a relatively short time period to minimize impact of movement in/out of the experimental area.

- **Data collection**: How many interviews are needed to obtain reliable information? In general, it is advisable to conduct as many interviews as possible within the logistical and financial constraints of the assessment. Any sample less than 20 should be treated with the utmost caution. However, it is recognized that even if all fishers are interviewed in small fisheries, the sample size may be small, but represents the whole population. The software guards against small samples by having a minimum uncertainty associated with all interviews.

- **IUU fishing (poaching)**: How does ParFish account for illegal or unreported catches? This aspect relates to the ability to obtain information on the stock from all user groups and emphasizes the importance of identifying and including all stakeholders at the start of the assessment. If however, some amount of removals from unexplained sources is occurring this would have some impact on the stock assessment results. Where information is available on the quantity of removals, this can be considered in the procedure else sensitivity runs can be made based on various management scenarios. Although the current models do not allow for it, it would also be possible to include the amount of IUU fishing as a parameter, which could be estimated in the same way as other parameters, through interviews.

Stock assessment questionnaire

Following the general review of the methodology and discussion of logistics attention was directed to more detailed aspects of the ParFish process, including what basic information to collect and how to conduct the interviews. A sample stock assessment questionnaire is given in Appendix 2. Following the presentation, a number of interesting questions were raised during the discussion, including:

- **Technological change and bias:** How might the results be impacted from changes in technological advances and from biases in interviewer response? Paul Medley noted that the procedure deals with projections of relative changes in abundance and not in absolute numbers except for a measure of the total current fishing effort. Past technological change would need to be accounted for if historical data were used.

- **Weighting factors:** Is it possible to include information on fisher experience as a weighting factor into the stock assessment? It was indicated that a weighting factor is allowed for in the ParFish software, currently this relates to the number of years of experience in the fishery, although any factor could be used. In sensitivity analyses, it was not found to make much difference, but tends to undermine the participation element of the approach.

- **Level of uncertainty:** If the results of the assessment are based solely on fishers' knowledge and experience, one might expect the results to have a fair amount of uncertainty associated with them – how useful is this? It was noted that the procedure is an educational one as well in that if you do get large disparity between responses this indicates that as a whole the group do not know the 'true state' of the resource. This result can further help the group and managers to see that they need to incorporate sciences into the process to better help refine the result. In addition, this scenario (of not knowing the true state) highlights the importance of recovery time also. Clearly, convincing the fisher community it needs to co-operate with scientific data collection is useful, but also shows that the stock assessment interviews themselves are of little use. To counteract this problem, the preference interviews are used to identify the best management option, even if results are unsure.

- **Outreach and education:** The discussion highlighted the need for all key informants in the fishery and individuals involved in the stock assessment (i.e., managers, scientists, fishers, etc.) to understand the questions being asked and to be involved in all phases of the assessment, including development of the questionnaire.

Fisher utility (preference) survey

Ms. Suzannah Walmsley gave a presentation on carrying out the fisher preference survey and gave examples of some of the participatory techniques developed to encourage fisher involvement and to explain some of the concepts involved. This presentation was facilitated through the use of several teaching aids. Participants were shown through the use of choice cards how they could select one

scenario relating to costs (fishing effort) and benefits (expected catch) over another scenario (Appendix 3). The choices (preferences) from each individual in the survey could then be used to develop a utility function to determine their preference for likely outcomes from alternative management options. A period of useful discussion followed the presentation and provided some interesting and informative feedback from the attendees, which suggested how the fishers' input could play a role in management of their resources using this type of tool. During this time, a number of issues were raised, including:

- **Number of interviews:** Does the number of preference interviews have to equal the number of stock assessment interviews? Paul Medley relayed that this was not a requirement of the method nor do the preference interviews need to be conducted with the same participants as the stock assessment interviews.

- **Duration of interview:** Much discussion took place concerning the amount of time the preference survey took. Some participants thought the survey would require more time than most fishers would allow, particularly at the end of a hard fishing trip and when the fishers were most interested in getting their harvest to market. It was noted that in most situations, the fisher preference survey would be conducted at a separate time from the stock assessment interview and at a convenient time for the fisher to minimise disruption for them. One participant asked if the number of fisher preference cards could be reduced from the current number (about 17) to about 9. This could be done however a significant loss of information would result. It was suggested that the optimal scenario was to organize a separate time to collect the preference information.

- **Future management options:** It was noted that the collection of fisher preference data was critical in the process of incorporating stakeholder information into future management. Thus, researchers should make every effort to fully represent the stakeholder opinions on what levels of catch and effort are acceptable by implementing the preference interview. The workshop presenters again emphasized the need for early discussions with the stakeholders as to the importance of the interviews and how the information could be used in management of resources. This early work to build rapport between fishers and scientists could have large benefits when and during conducting the subsequent surveys, both stock assessment and preference. In addition, the efforts expended to develop buy-in at an early stage of the entire process will contribute directly to the quality of information given by the individuals in both the stock assessment interview and the preference interview.

- **Fisher 'buy-in' to management options:** How or what mechanism could be used to increase 'buy-in' for this component of the process? Paul Medley responded that if a consensus could be arrived at relating to stock status, then the fisher preference survey could be one mechanism to allow fishers to have a say in how they wish to deal with arriving at a target level of resource condition. The utility or fisher preference interview phase of the process is a mechanism for evaluating a variety of alternatives of arriving at a target level simultaneously incorporating

stakeholders into the process. Even if you have a very precise stock assessment, you still need to decide what to do and that implies decisions involving preferences and trade-offs.

ParFish software demonstration

Paul Medley gave a presentation with the current version of the software, which utilizes the production model. Another model that incorporates a yield per recruit model is also under development. A variety of questions were posed during this session, many having to do with data input, analysis steps, and result outputs. Issues discussed included:

- **Benchmarks:** Several participants asked whether standard resource condition benchmarks such as $B_{current}/B_{0,}$ MSY, B_{MSY} and F_{MSY} are available in the ParFish software as model outputs. Paul Medley indicated that there are a large number of potentially useful management outputs that can be generated within the software. These standard indicators can be generated, depending on the stock assessment model used. Due to the Bayesian statistical analysis, uncertainty in results is shown as probability density functions (Appendix 4), and reference points are stated in probability e.g. the percentage chance of a stock being overfished. This raises the possibility of having to reduce catches to a very low level where there is high uncertainty, although this is an indication that more data are required to reduce the uncertainty of the assessment.

- **Scientific rigor:** How is the method ('short cut approach') viewed by traditional stock assessment scientists? Nancie Cummings replied that this issue was discussed in a recent meeting at the SEFSC in Miami with 'traditional' stock assessment scientists, and they were interested in comparing the different approaches, and also in using the ParFish approach for specific aspects of stock assessment, such as catchability, q. Paul Medley added that interviews are not 'science' but are a way of making rational decisions when the science is lacking. ParFish can use as much science as is available for the stock assessment, and complement this with interviews where data are not available. In some stock assessment review processes, the review panel has to make a best guess at particular parameters for the stock assessment. ParFish provides a better way of obtaining such estimates – from the people who are intimately involved in the fishery.

Discussion

After a brief demonstration of the current ParFish software, the discussion that followed related to all previous material presented. This was an opportunity for the participants to ask additional questions relating to logistics of the process, information requirements, as well as provide input as to potential problems which they may have concerns for if considering implementing in their respective areas. Questions and comments that arose included:

- **Multi-species fisheries – seasonal/ spatial distribution:** How does one deal with species that overlap? For example, the Belize attendee noted that there are 3 months of snapper fishing, 9 months of lobster and 9 months of conch. Paul Medley indicated that a target model must be specified (e.g. logistic, yield per recruit, but it could be any model). In this situation where there is a closed season, a model with a closed season can be fitted, and a Delury estimator could be useful as an adjunct fishing experiment to provide information to the stock assessment model. More preference information might be needed, for example, how much more do you prefer lobster to conch? The more parameters involved, the more complex it gets.

- **Multi-species fisheries – vulnerable species:** The trap fisheries in both US Virgin Islands and Puerto Rico harvest a number of species all considered currently at risk of overfishing. In order to optimize the catch across the fishery and allow recovery, participants in the fishery may have to forego catch in the short term. The use of the yield per recruit model with the ParFish process could be useful in situations like this multi-species fishery.

Additional discussion took place on future of software and needs. These included further testing and evaluating biases. A discussion on possible case studies also took place:

- The US Caribbean is already looking at deepwater snapper in Puerto Rico, and there are opportunities in other fisheries such as grouper (some species such as yellowfin and tiger are considered at risk), queen conch in St Croix, and parrotfish.

- In Jamaica, the queen conch fishery is the most important in terms of volume and export value, and ParFish could be used to complement the 17 years of catch-effort data that are available.

- South Atlantic US fishery has 70 species of snapper complexes with some catch and effort data, but not enough for a SEDAR assessment.

- Small-scale fisheries in Guatemala, Honduras and Belize have limited data, and ParFish could be a useful tool to incorporate with statistics and ecology.

Closing Statements

After the discussion several summary statements were made regarding the information presented during the Special Workshop. These comments represented how the participants relayed how they perceived the overall ParFish process as to the potential for success in their own situations and/or further concerns or points considered noteworthy. Interest in the method was high. Results from the pilot studies to date well illustrate the need to develop rapport between all stakeholders early in the process in order to increase the buy-in from fishers and managers. Several mechanisms exist to achieve buy-in, including outreach meetings among stakeholders, developing instructional flyers, videos, and others. Also, early in the process large efforts need to be expended towards careful construction of the basic stock assessment interview and subsequent utility interview. Outreach and training workshops are a necessity at this phase, in order to substantiate that all involved in the process are fully aware of the information being requested. Information quality is integral to the stock assessment output and efforts to achieve credible information cannot be minimized at this phase. Finally, the process is not meant to provide a definitive answer but rather to provide a tool to build consensus on management actions. In addition, the process provides a mechanism for increasing capacity within management and scientific areas and can serve to educate stakeholders as to the importance in providing reliable information.

The hosts thanked the Workshop attendees (Appendix 5) for setting aside the time to participate in the ParFish workshop. Many useful questions and points were raised during the workshop all of which will aid in improving the ParFish process. Several photos were taken during the workshop also (Appendix 6).

3. Reference

Walmsley, S., Howard, C. & Medley, P. 2005. Participatory Fisheries Stock Assessment (ParFish) Guidelines. Marine Resources Assessment Group Ltd, London, UK. 156pp.

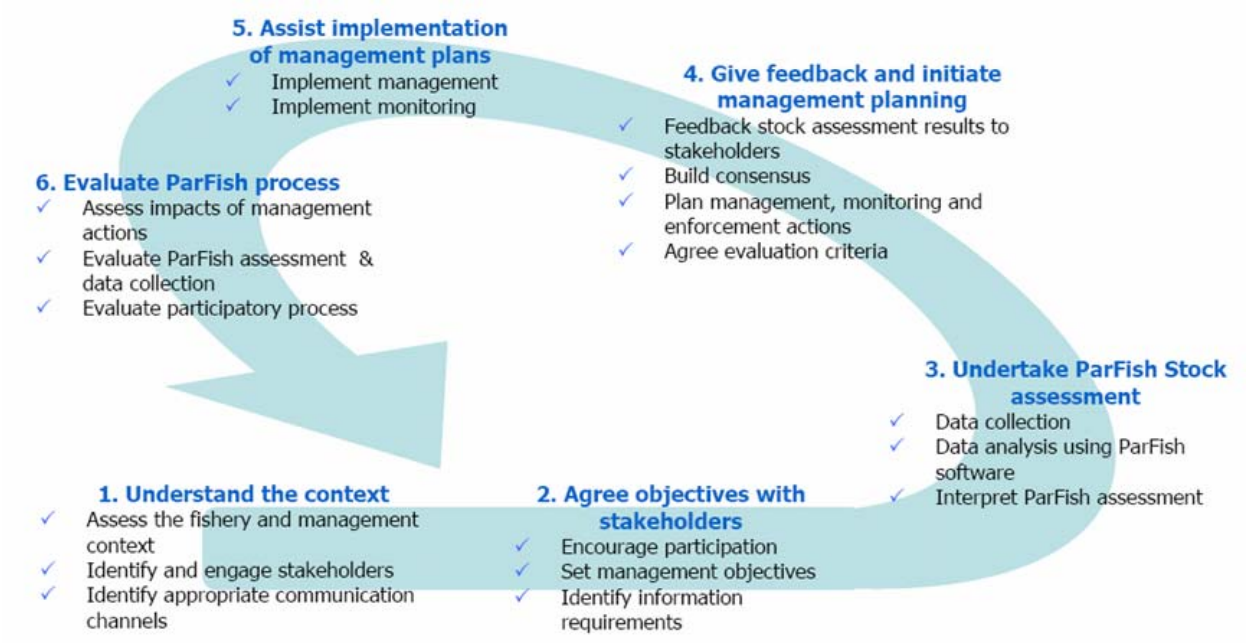


Figure 1: Steps in the ParFish (Participatory Fisheries Stock Assessment) Process.

Appendix 1: ParFish Workshop agenda

08:30 – 09:00	Introductions and welcome
09:00 – 10:00	Background: ParFish methodology (Dr. Wakeford)
10:00 – 10:15	Coffee Break
10:15 – 12:00	Data collection: stock assessment and preference interviews (Ms. Walmsley)
12:00 – 13:00	Lunch
13:00 – 14:30	Data analysis: ParFish software and outputs (Dr. Medley)
14:30 – 15:00	General Discussion
15:00	Close

Appendix 2: Example stock assessment questionnaire

Units of effort (e.g. days fishing)	Days
Units of catch (e.g. kg, numbers, baskets etc.)	Number of fish
Units of Time (e.g. Calendar month, Lunar month, year)	Lunar Month

Stock Assessment Interview

Effort and Catch Rates

1. For how many years have you been fishing?	33	
2. Which is your main gear, the one you are most familiar with?	Handline	
3. Normally, how many sets/hauls do you make in one *unit of effort*?	-	
4. In each *unit time*, how many *units of effort* do you usually spend fishing in this fishery?	20 days	
5. How many *units of effort* did you actually fish this last year?	240	
6. Normally how many *unit catch* do you catch in one *unit effort*?	15 fish	Catch Category A B C D E (empty)
7. Over the last few years, has your catch rate been about the same, declining or increasing?	Decrease	
8. If the catch rate has been changing: In the same season last year, normally how many *unit catch* did you get in one *unit effort*?	17 fish	
9. If you were to fish in a fresh ground (never fished before or like the old days), normally how much fish do you think you would catch in one day? (Get an estimated range)	Min: 30 Max: 50	

10. If fishing were to stop tomorrow, how many months or years do you think it would take for the fish stocks to recover fully? ….or as close as possible to what it was before fishing started	3 months
11. Do you think the amount of fishing for the size of the resource, is:	could be greater **<u>just right</u>** too much

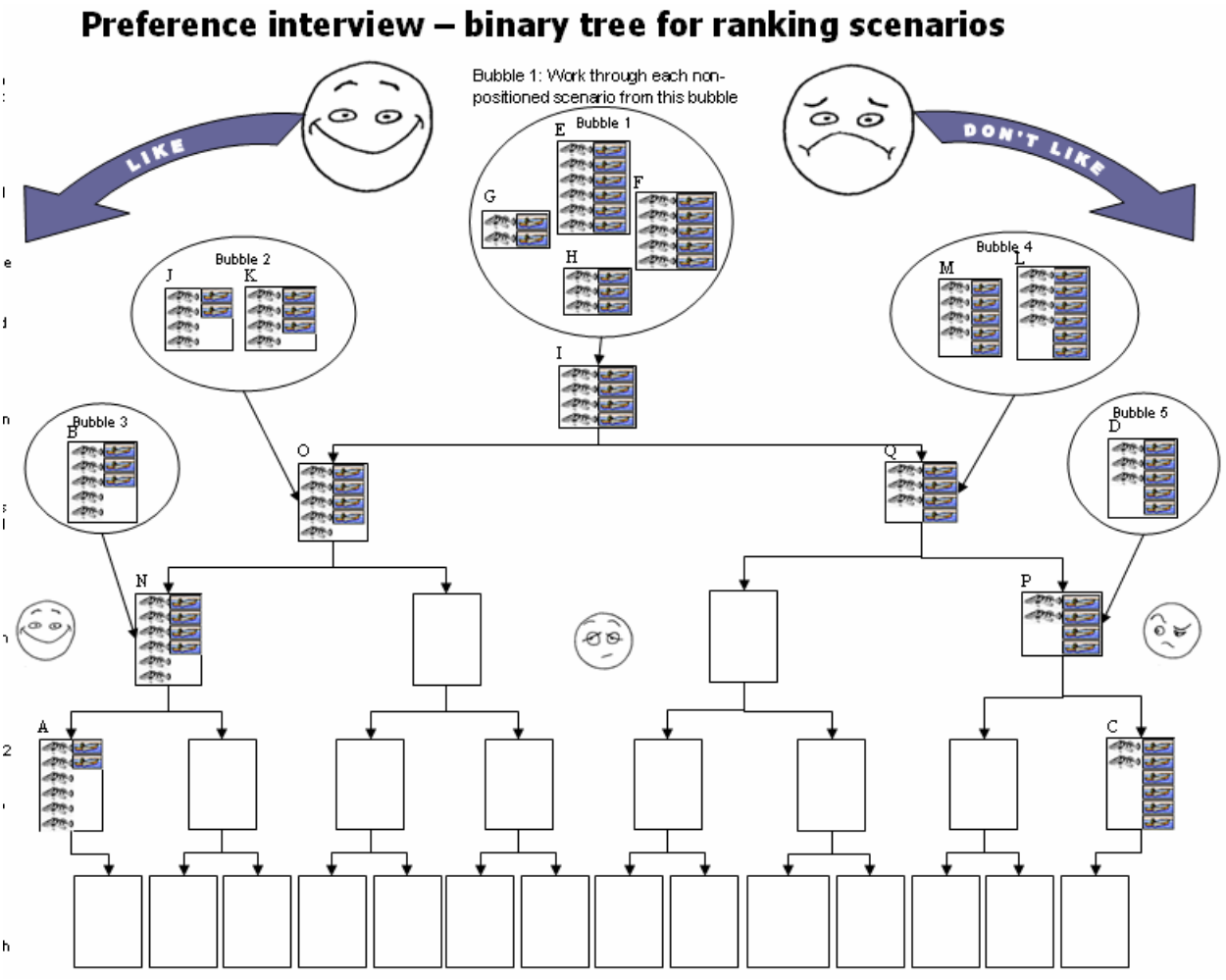
Constraints

12. What is the minimum *unit catch* in one *unit effort* you would fish before switching to an alternative livelihood?	10 fish
13. What are the minimum average *units of catch* in a unit of time you would accept before switching to an alternative livelihood?	20 fish
14. What is the maximum *unit catch* in one *unit effort* you could cope with your current gear?	400-500 fish
15. What are the maximum number of gear you could haul / set in a unit effort?	-
16. What are the maximum *units of effort* you could apply with your current gear in a *unit time*?	30 days

Other Gears

17. Other gears	1.					2.				
Sets / day (as for 3)										
Usual effort (as for 4)										
Days last year (as for 5)										
Current Catch Rate (as for 6)										
Catch Category	A	B	C	D	E	A	B	C	D	E
Maximum number of gear? (as for 16)										

Appendix 3: Example fisher utility preference survey card



Appendix 4: Example assessment output (for production model)

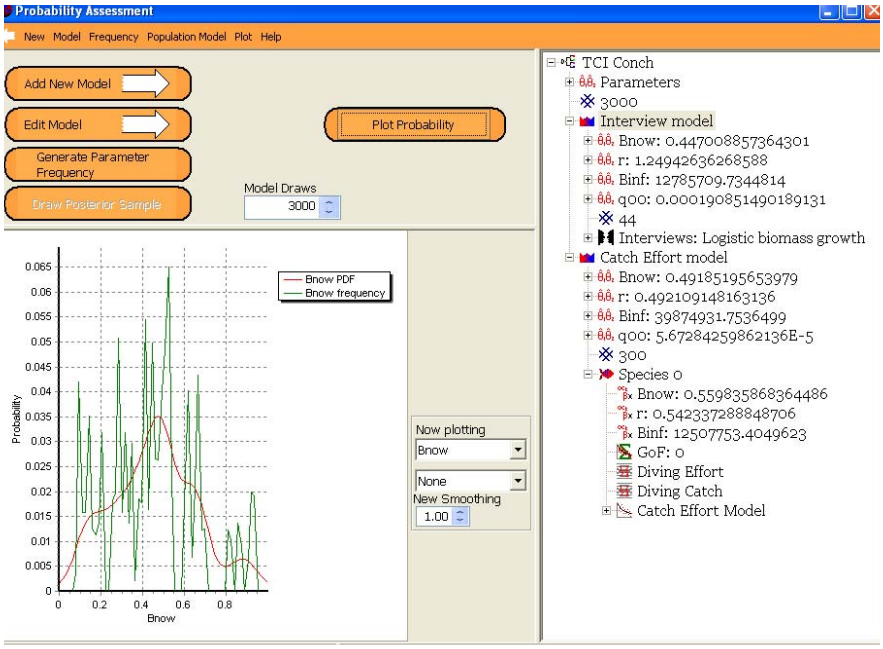


Figure A1: Example of ParFish software GUI used for data analysis

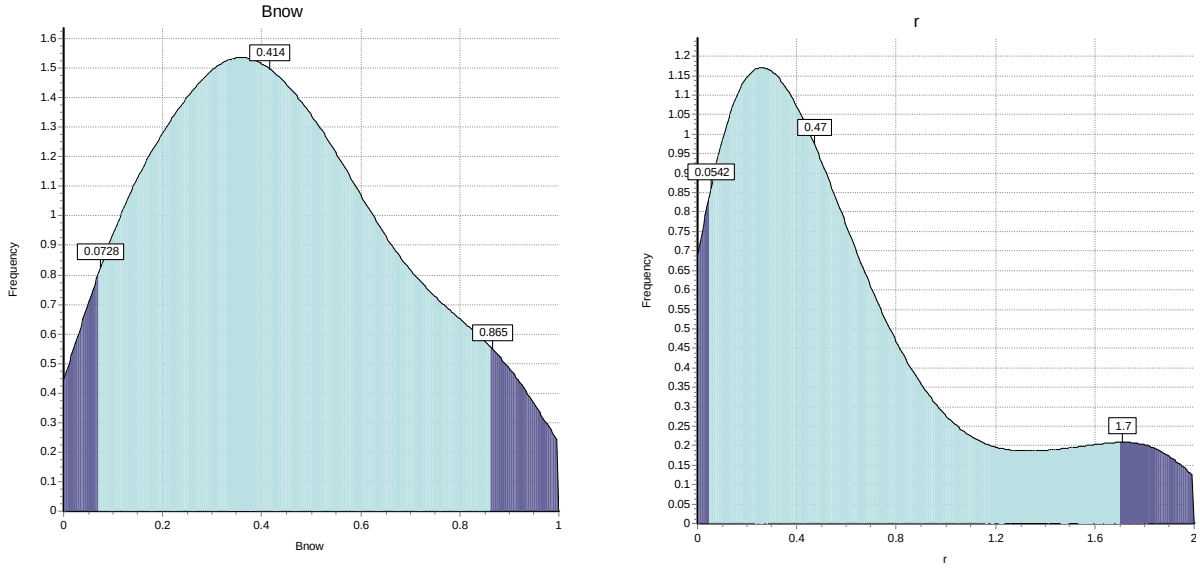


Figure A2: Example of output generated from ParFish showing distribution of stock assessment parameters and associated uncertainty (95% CI)

Appendix 5: Workshop participants

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Appendix 6: Photographs from the ParFish workshop