

Working Paper 3

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Deepwater snapper: Towards improved stock assessments and management

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DEEPWATER SNAPPER: TOWARDS IMPROVED STOCK ASSESSMENTS AND MANAGEMENT

Purpose

1. The purpose of this paper is to:
 - highlight the work achieved to date under SPC's deepwater snapper project;
 - present a work plan for the remainder of the project;
 - illustrate how the results can be used to improve the monitoring and management of deepwater snapper fisheries; and
 - invite Heads of Fisheries to discuss the outcomes of the project and make recommendations for future research directions for deepwater snapper and other similarly data-poor fisheries.

Background

2. Deepwater snapper are an important fisheries resource in many Pacific Island Countries and Territories (PICTs). However, a lack of adequate biological and fisheries data has limited the development of quantitative assessments and management plans for deepwater snapper stocks in the Pacific region.
3. At the 7th Heads of Fisheries meeting in 2011, members endorsed efforts by SPC to seek funding for a deepwater snapper project aimed at building capacity in snapper fishery management.
4. Since the HoF7 meeting, SPC obtained funding for deepwater snapper projects from Australia, the French Pacific Fund (FPF) and The French Development Agency (AFD) (*L'Agence Française de Développement*). The funding from Australia provides support for deepwater snapper management to those countries who requested assistance for deepwater snapper in their existing SPC Joint Country Strategy (JCS), which included Tonga, Samoa, Vanuatu and the Marshall Islands. The funding from the FPF and the AFP provides specific support to New Caledonia.
5. In July 2011, a meeting was held at SPC to develop a work plan to support deepwater snapper management in the region and identify priority information and training needs. The meeting was attended by representatives from 12 PICTs where deepwater snapper fisheries are of particular interest. The agreed outcomes from the workshop included a framework and work plan for SPC's deepwater snapper project.
6. The overall objective of the project is to improve the stock assessments for deepwater snapper in PICTs to allow sustainable development of the fisheries, while developing national capacity to undertake this kind of work.
7. The work plan is focussed on Tonga, Samoa, Vanuatu and Marshall Islands in line with priorities identified in SPC Joint Country Strategies. However, additional complementary work has been done in New Caledonia and Papua New Guinea.

8. The work plan focuses on 4 priority work areas:
 1. fisheries data collection systems;
 2. improving biological knowledge;
 3. capacity development; and
 4. fisheries assessment and management.

Results

Fisheries Data Collection Systems

9. Recent experiences to assess the status of tuna and shallow inshore coastal species clearly demonstrate substantial benefits of adopting a standardised approach to fisheries data collection across the Pacific region. These include:
 - facilitating the development and maintenance of a common database system in each PICT, which minimises development and maintenance costs;
 - providing consistency in how and what data are collected and analysed; and
 - facilitating comparisons of fisheries among PICTs; and allowing data fields to be categorised and prioritised depending on their intended use.
10. Results achieved to support fisheries data collection systems for deepwater snapper include:
 - Consultation with Fisheries Departments revealed that SPC's artisanal fisheries database (TUF-ART) and data collection forms were the best option for consistent collection and management of deepwater snapper fisheries data.
 - The TUF-ART database was installed and associated logsheets were provided to Tonga, Vanuatu, and Samoa.
 - The development of fisheries monitoring programs (port sampling) was supported in Tonga, Vanuatu, Samoa, New Caledonia and Papua New Guinea.
11. It should be noted that successful data collection programs will require the continued support from Fisheries Departments.

Improving biological knowledge

12. Estimates of biological parameters, such as growth and mortality rates, are fundamental to the understanding of a species population dynamics and for predicting responses of populations to fishing. Limited biological knowledge exists for deepwater snapper, especially in the Pacific region.
13. Results achieved in improving biological knowledge of deepwater snapper include:
 - Scientific surveys and port sampling activities have been completed, which provided biological samples from >4,000 fish across 7 PICTs (Tonga, Vanuatu, Samoa, New Caledonia, Fiji, Wallis and Futuna, and Papua New Guinea).

- Methods have been developed to distinguish between two species (*Etelis carbunculus* and *E. marshi*) that were previously thought to be a single species. Reports describing the results and a species identification manual are available on the SPC website¹.
- Habitat modelling for deepwater snapper was completed and maps of the predicted distribution of deepwater snapper across the Western and Central Pacific Ocean were generated. Reports describing the results are available on the SPC website¹.
- Methods have been developed to estimate the age of deepwater snapper using otolith morphometrics without the need for time consuming and costly processing of otoliths.
- Preliminary estimates of longevity and growth rates are available for five key species (Table 1).

Table 1. Preliminary estimates of maximum size and age (derived from counting increments in otoliths) for five deepwater target species.

| Common Name | Species Name | Maximum fork length | Maximum age |
|--------------------|------------------------------------|---------------------|-------------|
| Ruby snapper | <i>Etelis carbunculus</i> | 115 cm | 52 years |
| Flame snapper | <i>Etelis coruscans</i> | 94 cm | 40 years |
| Pygmy ruby snapper | <i>Etelis marshi</i> | 63 cm | 30 years |
| Crimson jobfish | <i>Pristipomoides filamentosus</i> | 78 cm | 64 years |
| Eightbar grouper | <i>Hyporthodus octofasciatus</i> | 174 cm | 65 years |

Capacity development

14. The deepwater snapper project has provided financial and technical support for 4 Pacific Island fisheries graduates to complete post-graduate studies to enhance capacity for deepwater snapper management and assessment in their home country.
 - Vanuatu — Jeremie Kaltavara (MSc, University of Tasmania) Thesis title: “Biology and Fishery of the Deepwater Eteline Snappers in Vanuatu”.
 - Samoa — Ueta Fa’asili Jr (MSc, University of Wollongong) Thesis title: “Review of Samoa’s Deepwater Snapper Fisheries Data”.
 - Tonga — Hau Halafihi (PhD, University of Canterbury) Thesis title: “Ecology and biology of *Etelis coruscans* and *Pristipomoides filamentosus* at seamounts: Case Study at Tonga Deepwater Drop-line Fishery”.
 - Tuvalu — Etuati Poulasi (MSc, Australian Maritime College) Thesis title: “Age, growth and reproductive biology of saddleback snapper *Paracaesio kusakarii* Fisheries assessment and management”.

¹ <http://www.spc.int/fame/en/projects/fisheries-fo-food-security/improving-the-mgt-of-deepwater-snapper-resources>

Fisheries assessment and management

15. The lack of available data for deepwater fish species in many PICTs has prevented the development of traditional stock assessments for these species. A substantial effort, including the collection of fine scale catch and effort data, over a long period (>10 years) would be required to support the development of robust stock assessments. The cost of such data collection would most likely exceed the value of deepwater fisheries in most PICTs. Therefore, it is unlikely that traditional stock assessments will be developed for deepwater snapper fisheries in the foreseeable future.
16. There is a need to develop alternative management reference points for deepwater snapper. Our approach is to develop a set of indicators (e.g. fish size, catch rates etc.) that are relatively easy to monitor, and provide a proxy for stock status and/or a measure of fishery performance.
17. In addition, we propose the development of a Management Procedures (MP) framework for the integration of these indicators into the management process. MPs are formal specifications of the management actions that will be taken when indicators reach certain threshold reference points.

Project collaborations

18. Collaborations with scientists at other agencies have provided additional project benefits for SPC member countries (Table 2). In particular, research on the stock structure of key deepwater snapper species using genetic markers, otolith chemistry, otolith shape and parasite analyses, will provide SPC member countries with information with which to delineate management units for these species.

Table 2. Collaborative research projects for deepwater snapper.

| Research area | Agency |
|--|--|
| Stock Structure: | |
| Genetics | University of Canterbury, New Zealand University of Hawaii, USA |
| Otolith Chemistry | James Cook University, Australia |
| Otolith Shape | Department of Renewable Marine Resources, Spain |
| Parasites | Coastal Fisheries Programme, SPC, New Caledonia |
| Biology/Ecology | Department of Fisheries, Western Australia |
| Economic analysis, stock assessment, adaptive management | National Institute of Water and Atmospheric Research (NIWA), New Zealand |

Work plan for 2015

19. The deepwater snapper project will conclude in November 2015. The project will focus on the following priority activities for the remainder of 2015:
 - i. processing the remainder of the otoliths and gonads collected during the project;
 - ii. providing estimates of growth, mortality and reproductive biology of key deepwater snapper species for inputs into assessments and for delineating management units;
 - iii. evaluating potential biological indicators and reference points suitable for application within an MP framework.

Application of results

20. The results from the deepwater snapper project can improve the monitoring and assessment of deepwater snapper fisheries SPC member countries in the following ways:
 - The new deepwater species identification booklets can be used by fishers and fisheries officers to accurately distinguish between species of deepwater snappers and groupers. As such, catch and effort data can be recorded at the species level.
 - The TUF-ART data base and logsheets can be used to collect and manage catch and effort data from deepwater snapper fisheries.
 - The established port sampling programs can be continued to build an ongoing repository of biological samples required for regular assessments.
 - The methods developed to derive age estimates from otolith morphometrics can be used to generate age compositions of the catch without the need for time consuming and costly processing of otoliths.
 - The biological and fishery monitoring data can be used to select appropriate indicators for the development of a management procedure approach.

Recommendations

21. Heads of Fisheries are invited to:
 - note the progress that has been made with activities in SPC's deepwater snapper project;
 - note that the project will end in November 2015;
 - give consideration to the need for funding beyond the life of this project (2015) for maintaining data collection programs and port sampling activities to support the monitoring and management of deepwater snapper fisheries; and
 - provide recommendations for the need for similar research on other data-poor coastal and oceanic fisheries.