



# Report on the First Stock Assessment Workshop for the Oceanic Fisheries Management Project

3<sup>rd</sup> -14<sup>th</sup> July 2006  
SPC Headquarters  
Noumea  
New Caledonia



## **Acknowledgements**

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Don Bromhead  
Brett Molony  
Adam Langley  
David Kirby  
Bruno Leroy  
Valerie Allain



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# **1. Background**

## **1.1 Introduction**

The Oceanic Fisheries Programme (OFP) of the Secretariat of the Pacific Community (SPC) hosted a Stock Assessment Workshop (SAW) for fisheries officers from Pacific Island Countries and Territories, at SPC headquarters in Noumea, New Caledonia, 3<sup>rd</sup>–14<sup>th</sup> of July 2006. The following section provides background information to explain why there was a need for such a workshop. Subsequent sections will outline the workshop design, content and outcomes.

## **1.2 The Oceanic Fisheries Management Project**

The SAW comprised one component of the much larger Oceanic Fisheries Management Project (OFMP). That project is funded by the Global Environment Facility (GEF) with the United Nations Development Fund assuming the role of Implementing Agency. The project is being executed by the Fisheries Forum Agency (FFA) in partnership with the SPC and the International Union for the Conservation of Nature (IUCN).

The OFMP has two overarching objectives:

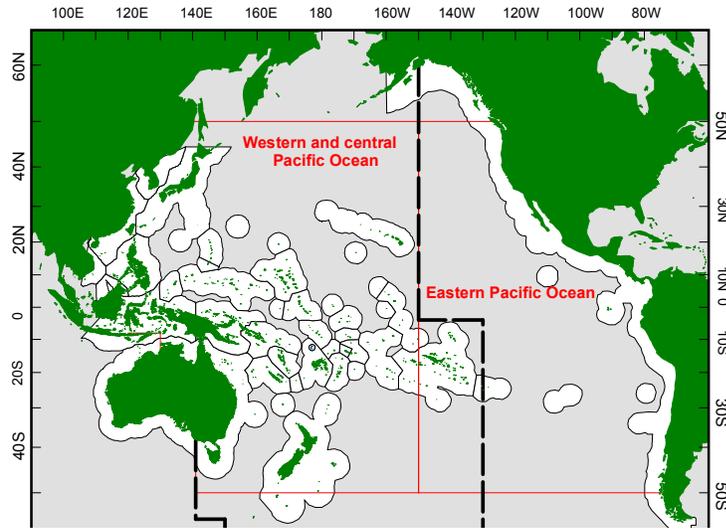
1. Information and Knowledge – to improve the understanding of the transboundary oceanic fish resources and related features of the Western and Central Pacific Ocean (WCPO) Warm Pool Large Marine Ecosystem; and
2. Governance – to create regional institutional arrangements, and reform, realign and strengthen national arrangements for the conservation and management of transboundary oceanic fishery resources.

The OFMP was instigated through the combined initiative of 15 governments within the WCPO region (Figure 1a); Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tokelau, Tuvalu and Vanuatu.

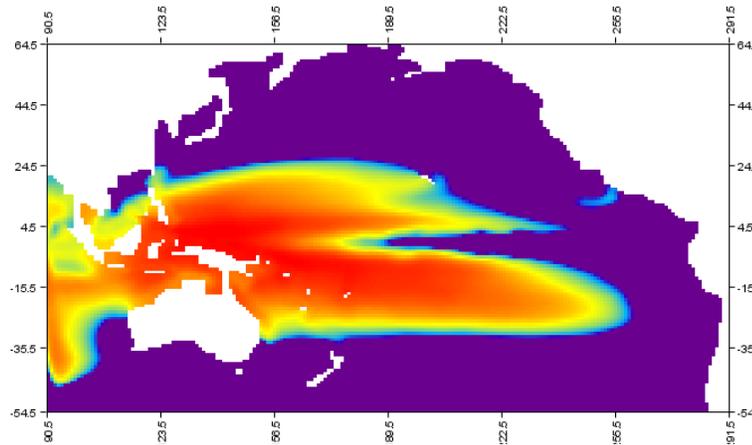
For a long time, these countries (along with other Pacific Island Countries and Territories) have recognized that they are collectively the custodians of one of the largest marine ecosystems in the world (the warm pool large marine ecosystem – LME – Figure 1b), within which resides the world's largest tuna resource. Approximately one half of the world's total tuna catch is taken from this region, with catches consistently increasing over the past three decades (Figure 1c) and surpassing 2 million tonnes per annum in recent years.

For some time these countries have had concerns over the sustainability of this resource which represents one of the only significant natural resources in the

A.



B.



C.

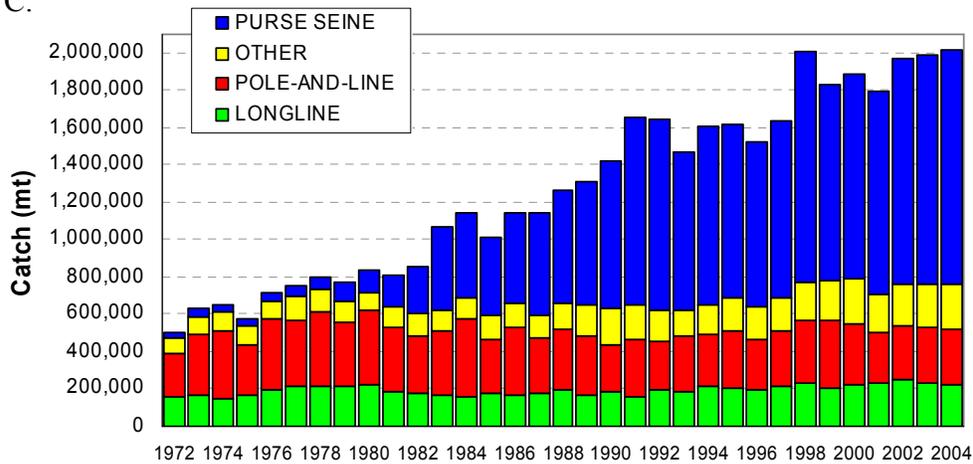


Figure 1 – A) The jurisdictional boundaries of the Western and Central Pacific Fisheries Commission encompasses the EEZs of many Pacific Island Countries and Territories. B) The boundaries of the warm pool large marine ecosystem can be defined in part by water temperature. Here, warm colours indicate the region of the warm pool in the Pacific Ocean (using an example month and year). C) Annual catches of tuna by gear in the WCP-CA.

region and which is one of the most economically important resources for these countries. Most PICTs are characterised as developing countries with limited resources and for some, tuna fishing access fees constitute as much as 40% of total government revenue. The long term economic and social aspirations of many of these countries rely heavily on the long term sustainability of the tuna resource.

### **1.3 Legal obligations and the importance of stock assessment**

There are a number of legally binding international conventions and agreements that are designed to ensure that global fish stocks are managed sustainably through cooperation. These include the United Nations Convention for the Law of the Sea (UNCLOS) and the UN Fish Stocks Agreement (UNFSA). In addition, many Pacific Island countries have negotiated and are party to cooperative agreements (e.g. legally binding treaties including the Niue Treaty, Nauru Agreement, Palau Arrangement, FSM Arrangement and US Multilateral Treaty) and are members of institutions (e.g. the Pacific Islands Forum Fisheries Agency - FFA) to ensure cooperation amongst themselves regarding the sustainable management and development of fisheries in the region. Most recently, these countries negotiated and became Contracting Parties to the Western and Central Pacific Fisheries Convention (hereafter referred to as the Convention) and as members of the Commission established by the Convention (hereafter referred to as the Commission), are bound by its mandate.

Within the two key international agreements of UNCLOS and UNFSA, and the Convention, are specific provisions for the use of stock assessments to assist in sustainable management of fish stocks.

Article 61 of UNCLOS makes direct reference to maximum sustainable yields (MSY) as an objective for sustainable fisheries, while the UN Fish Stocks Agreement states that any nations fishing on the high seas should:

*“Adopt measures for long term sustainability, based on best available scientific advice, applying the precautionary approach”.*

Both general scientific advice regarding sustainability, and the precautionary approach, are currently based on the outputs from stock assessments. The Convention being the first regional fisheries agreement to be adopted since the conclusion of UNFSA, similarly provides for the need to base conservation measures on best available scientific advice, maintaining stocks at MSY and applying the precautionary approach.

Given that there are both economic and legal imperatives that WCPO tuna stocks are managed sustainably, and the key role of stock assessment in providing advice on sustainability, it is clearly critical for the countries and territories in the region to have the capacity to interpret and use stock assessments in their domestic and regional decision making processes.

#### 1.4 A problem relating to scientific and legal capacity

In recent years, it has become very apparent to the governments and people of PICTs that while they have considerable obligations to meet under UNCLOS, UNSFA and the Convention, few if any of them have the required legal and scientific capacity to ensure that they can meet these obligations. The OFMP was specifically designed to increase the capacity of participating countries in the relevant areas of legal and scientific expertise.

In terms of science capacity, PICTs themselves recognise that they have limited capacity to interpret and use stock assessments (and associated scientific analyses) and to incorporate stock assessment outputs into decision making processes. This lack of capacity represents a significant impediment to the development and revision of tuna management plans, the ability to participate in regional fora (e.g. the Scientific Committee of the Commission) and to an improvement in understanding the potential consequences of different management options for the sustainable harvesting of tuna resources.

The following OFMP objective relates specifically to the need for increased understanding of stock assessment:

*“.....strengthen national capacities to use and interpret regional stock assessments, fisheries data and oceanographic information at the national level, to participate in Commission scientific work, and to understand the implications of Commission stock assessments.”(OFMP Document, outcomes 1.2, p.49)*

The intended outputs associated with this objective are:

1. Training of national technical and scientific staff to understand regional stock assessment methods, and interpret and apply the results, and to use oceanographic data; and to
2. Hold regional workshops on stock assessment methods and analyses of oceanographic impacts on fisheries.

SPC is responsible for developing and running two stock assessment workshops, one each to be held in the 2<sup>nd</sup> and 4<sup>th</sup> years of the OFMP. The following sections of this report describe the design and content of the first stock assessment workshop held at Noumea, New Caledonia between 3<sup>rd</sup> to 14<sup>th</sup> of July this year. An evaluation of the workshop's outcomes, and an assessment of areas for future workshop strengthening, are also presented.

### **3. Objectives**

The broad objective relating to stock assessment capacity building was used as a guide to create more specific functional objectives for the workshop against which performance could be easily measured. For the first stock assessment workshop, functional objectives were focused on increasing the capacity of participants to:

1. Understand what the various components of a stock assessment model are, how these are derived, and why each is important to the assessment;
2. Be able to understand the key scientific outcomes and recommendations of stock assessments and how they relate back to the model outputs and data;
3. Be able to identify where an assessment might be improved in the future and to understand statements regarding uncertainty, and
4. Be able to interpret stock assessment outputs and form conclusions regarding the implications of these for tuna fishery management at both national and regional levels, including the risk associated with different management options (at both levels).

### **4. Design and Content**

Careful consideration was given to the design and content of the workshop, so as to ensure that these objectives could be met. In the course of doing this, a number of challenges needed to be overcome.

The first challenge was to ensure that the workshop would, to the greatest extent possible, recruit participants with some degree of technical or analytical capability and knowledge of the regions tuna fisheries. Hence, the initial calls for nominations encouraging countries and territories to nominate technical officers from their fishery departments.

However, a second competing challenge was to design the workshop to also accommodate participants who did not fully meet these criteria. Most fishery departments in countries in the WCPO are very small, some with only one officer who might meet those criteria, and others with no officers who could meet those criteria. Subsequently the OFP received and accepted nominations from participants from a very wide range of technical and analytical backgrounds and previous exposure to stock assessment methods.

The design of the workshop attempted to take participant diversity into account so as to deliver both the basic concepts as well as enhance the understanding of

those with previous experience in the area. To achieve this, the workshop was necessarily quite long (two weeks).

The workshop comprised three main components, these being Basic Theory and Background, Parameter Estimation, and Interpretation and Management Implications (Table 1). It focused to a large degree on tuna species and the assessments currently used to assess these species in the Pacific Ocean.

#### **4.1 Basic Theory and Background**

This component provided an understanding of the basic biological and fisheries information and concepts that are necessary before undertaking an assessment. It included sessions on:

1. understanding how natural, unfished populations behave – if we are going to interpret how they respond to fishing, we need to be able to compare a fished population to their normal state and understand the natural variability of fish stocks;
2. understanding how and why different stocks and species of fish respond differently to fishing pressure;
3. understanding the types of information needed to measure the response of a fish stock to fishing (i.e. data needed in order to undertake a stock assessment) and how that information is used in an assessment; and
4. the types of models available and how to select an appropriate model for a given assessment.

#### **4.2 Parameter estimation**

This component was designed to use the background theory to guide participants in building a stock assessment model step-by-step, and included sessions which detailed the logic and methods used to estimate the key parameters of growth, recruitment, natural mortality, selectivity, catchability, fishing mortality, movement and the estimation of indices of abundance. These sessions were followed by discussions of biological reference points, and a summarization of how all model components fit together in a length/age based model, such as those used for tuna in the WCPO. The final section of this component looked at the estimation and interpretation of uncertainty and risk within stock assessments.

### **4.3 Ecosystem Approach to Fisheries**

Following the parameter estimation component there was a half day of presentations on the Ecosystem Approach to Fisheries (EAF). The international legal context of EAF was presented, followed by examples of oceanic ecosystem studies and ecosystem models used at SPC-OFP. The conceptual framework and data requirements to carry out Ecological Risk Assessments (ERAs) were also presented, in particular reviewing the ERA for WCPO tuna fisheries carried out by the OFP and presented to the Scientific Committee of the Commission. As ecosystem models and ecological risk assessments become further developed and start to be used for the provision of advice, future workshops may need to give increased emphasis to building the capacity of PICTs to interpret and use such information and advice in decision making processes (i.e. EAF implementation).

### **4.4 Interpretation and Implications**

The final component provided exercises to promote the discussion of the previous components in the context of tuna fisheries and assessments in the WCPO and the implications of these for domestic and regional fisheries management.

Overall, the three part structure was intended to meet the primary objective of this workshop, that being to provide participants with the capacity to use and interpret stock assessment results, to the degree that they can incorporate their understanding of the assessments into the provision of advice and input into governmental decision making processes regarding the management of fisheries.

### **4.5 Facilities and materials**

The workshop was held at SPC Headquarters, Noumea, utilizing a variety of teaching facilities including the large conference room, smaller teaching rooms and the computer laboratory. It ran over 11 days, with a 1.5 day break in the middle. Each day comprised 4 sessions, with the theme of each session outlined in Table 1. The sessions were either theory based or practical sessions. Practical sessions predominantly involved computing based exercises to give participants a working understanding of how stock assessment models function, and were designed to complement and reinforce concepts learnt in the previous theory session. Some practical sessions also involved looking at biological samples in the OFP biological laboratories.

Participants were provided with a workshop folder on the first day, which contained copies of the workshop presentations, structure and design, and more general information relating to the locations of sessions, local facilities and social functions. All practical session files were saved for each participant and will be

Table 1 – Outline of the design and content of the 1<sup>st</sup> Stock Assessment Workshop, held 3–14 July 2006 at SPC in Noumea.

| Day                     | BASIC THEORY AND BACKGROUND                           |  |                                   |                                    |   | PARAMETER ESTIMATION                        |     |  |                                       |   | INTERPRETATION - IMPLICATIONS                        |  |  |
|-------------------------|---|--|-----------------------------------|------------------------------------|---|---|-----|--|---------------------------------------|---|--|--|--|
|                         | Mon   | Tue  | Wed                               | Thu                                | Fri   | Sat   | Sun | Mon  | Tue                                   | Wed   | Thu  | Fri  |  |
| Session 1 Theme         | Introduction  | Fish and Fish Populations - Basic Principles   | Stock assessment - Key principles | Parameter Estimation - Growth      | Parameter Estimation - Natural Mortality        | Possible extra session (or agreed homework) |     | Parameter Estimation - Fishing Mortality       | Parameter Estimation - Movement       | Putting the model back together                 | EXERCISE 2 Understanding assessments                 | Review   |  |
| Session 1 (0830 - 1000) | Welcome/ Introductions                                | * Review D1                                    | * Review D1 & 2                   | Theory                             | * Review D3                                     | DISCUSSION/PAPER QUESTIONNAIRE              |     | Theory   | Theory                                | Model construction                              | SA PAPER QUESTIONNAIRES DISCUSSION                   | Review of the key issues                                   |  |
|                         | Course Materials and Overview / structure             | "Fished" populations                           | Key Principles and components     | Theory                             | Theory  | DISCUSSION/PAPER QUESTIONNAIRE              |     | Theory   | Theory                                | Model construction                              | SA PAPER QUESTIONNAIRES DISCUSSION                   | Review of the key issues                                   |  |
|                         | Background and Objectives                             | "Fished" populations                           | Key Principles and components     | Theory                             | Theory  | DISCUSSION/PAPER QUESTIONNAIRE              |     | Theory   | Theory                                | Model construction                              | SA PAPER QUESTIONNAIRES DISCUSSION                   | Review of the key issues                                   |  |
| Session 2 (1030 - 1200) | Overview - SA and Fisheries Management in WCPO        | Measuring characteristics of fish populations  | Types of model                    | Practical                          | Practical                                       | DISCUSSION/PAPER QUESTIONNAIRE              |     | Practical                                      | Practical                             | Uncertainty and risk                            | SA PAPER QUESTIONNAIRES DISCUSSION                   | Groups create stock assessment presentation to departments |  |
|                         | Overview - SA and Fisheries Management in WCPO        | Measuring characteristics of fish populations  | Types of model                    | Practical                          | Practical                                       | DISCUSSION/PAPER QUESTIONNAIRE              |     | Practical                                      | Practical                             | Uncertainty and risk                            | SA PAPER QUESTIONNAIRES DISCUSSION                   | Groups create stock assessment presentation to departments |  |
|                         | Biological reference points and management objectives | Measuring characteristics of fish populations  | Types of model                    | * Review D4                        | Practical                                       | DISCUSSION/PAPER QUESTIONNAIRE              |     | * Review D6                                    | * Review D7                           | Uncertainty and risk                            | SA PAPER QUESTIONNAIRES DISCUSSION                   | Groups create stock assessment presentation to departments |  |
| Session 3 Theme         | Fish and Fish Populations - Basic Principles          | Fish and Fish Populations - Basic Principles   | Length/age structured models      | Parameter Estimation - Recruitment | Parameter Estimation - Selectivity/Catchability |   |     | Parameter estimation - Indicators of abundance | Biological reference points revisited | Ecosystem Approach to Fisheries                 | EXERCISE 3 Interpreting Results, forming conclusions | EXERCISE 4 - Ppt presentations to departments              |  |
| Session 3 (1300 - 1430) | Intro / Basic definitions                             | 1. Lab - ageing/tagging<br>2. Prac - pop dynam | Length/age structured models      | Theory                             | Theory  |   |     | Theory   | Theory                                | Ecological Risk Assessment and ecosystem models | Writing a SA papers conclusions and discussion       | Groups create stock assessment presentation to departments |  |
|                         | Fish biology and life cycles                          | 1. Lab - ageing/tagging<br>2. Prac - pop dynam | Length/age structured models      | Theory                             | Theory  |   |     | Theory   | Theory                                | Ecological Risk Assessment and ecosystem models | Writing a SA papers conclusions and discussion       | Groups create stock assessment presentation to departments |  |
|                         | Fish biology and life cycles                          | 1. Lab - ageing/tagging<br>2. Prac - pop dynam | Modal progression - theory        | Theory                             | Theory  |   |     | Theory   | Theory                                | Ecological Risk Assessment and ecosystem models | Writing a SA papers conclusions and discussion       | Groups create stock assessment presentation to departments |  |
| Session 4 (1500 - 1630) | Fish population dynamics                              | Fishery Development                            | Practical                         | Practical                          | Practical                                       |   |     | Practical                                      | Practical                             | Gut contents analyses                           | Writing a SA papers conclusions and discussion       | PRESENTATIONS  |  |
|                         | Fish population dynamics                              | Fishery Development                            | Practical                         | Practical                          | Practical                                       |   |     | Practical                                      | Practical                             | Gut contents analyses                           | Writing a SA papers conclusions and discussion       | PRESENTATIONS  |  |
|                         | * Fish population dynamics *ReviewD1                  | Fishery Development                            | * Review D4                       | * Review D4                        | Practical                                       |   |     | * Review D4                                    | * Review D4                           | Gut contents analyses                           | Writing a SA papers conclusions and discussion       | PRESENTATIONS  |  |

provided to participants on CD, along with a copy of all PowerPoint presentations and a copy of this report.

## **5. Communication strategy**

The workshop was first advertised at the Heads of Fisheries meeting in April, 2006, through a direct presentation to the participants at that meeting and through individual contact and distribution of nomination forms to delegations from each participating country and territory.

It was re-advertised in the weeks following the Heads of Fisheries meeting through emails to SPC member country contacts and GEF project focal point contacts.

Nominations were followed up again at the annual FFC meeting held at Nadi, Fiji in May 2006, and following that by more email based reminders. Where email communications were impeded or no response was forthcoming, countries were contacted via fax and telephone. The deadline for nominations was extended on a number of occasions to accommodate those countries who were unable to commit staff to the workshop at earlier dates.

## **6. Participation**

SPC received 18 nominations for the workshop. One of these was subsequently withdrawn. The 17 participants that attended the workshop, along with a description of their current roles, are listed in Appendix I. As described in Part 4, the participants varied significantly in the level of technical and analytical ability and previous exposure to stock assessment. This is reflected to some degree in the diversity of roles the participants fulfill in their home departments.

## **7. Additional Funding**

The majority of the funding for the workshop came from the GEF OFMP project. However, for participants from non-GEF project countries and territories, other funding sources were identified and used:

1. GEF funds (for OFMP beneficiary countries)
2. Western Pacific Fisheries Management Council funds for US territories (Guam)
3. PROCFISH OCT funds for French territories (New Caledonia, French Polynesia)
4. PROCFISH ACP funds

The attendance of non-GEF member countries and territories at the workshop was very important, given that all participating members of the WCPF Commission have obligations under the Convention and international agreements (UNCLOS, UNSFA) to ensure that the highly migratory fish stocks of

the Western and Central Pacific Ocean, being shared resources, are exploited in a sustainable manner.

## **8. Final Budget**

The final cost of the workshop was USD 68 954, which exceeded the initial budget estimates. The increase in cost was mainly attributable to the greater than expected participation rate, and the workshop spanning a greater length of time than initially budgeted for. Other funding sources were sourced to cover the additional costs above those provided for in the OFMP budget. The following is a summary of workshop costs:

Airfares – 29 655  
Shuttle transfers – 256  
Perdiems – 38 296  
Stationary – 398  
T-shirts – 203  
Food (morning and afternoon teas) – 146

## **9. Contributing Facilitators (SPC staff)**

The workshop facilitators were Don Bromhead, Brett Molony, Adam Langley, John Hampton, David Kirby, Valerie Allain, Bruno Leroy, Kay Parry and Helene Ixeko. Additionally, numerous other SPC staff kindly provided logistical support to the workshop.

## **10. Assessment of Workshop**

Three main forms of assessment were used to determine the degree to which the workshop was able to meet its objectives. They were:

1. Assessment of participant's performance;
2. Assessment of the workshop by participants; and
3. Self assessment by SPC

### **10.1 Assessment of participant's performance**

The participant's performance was assessed by two means, a repeated questionnaire and an end of workshop presentation.

**10.1.1 Repeated Questionnaire** - Participants filled out a questionnaire at the start of the workshop which was used to determine their starting level of knowledge of stock assessment. The same questionnaire was then re-presented to them on the last day of the workshop. Questionnaire results were then compared using a simple ranking system for each question and the answer provided by each participant (4 – Answer shows significantly improved knowledge/understanding; 3 – Answer shows good understanding from start; 2 –

Answer shows poor understanding from start and no subsequent improvement; 1 – Answer shows a deterioration in level of understanding). The results from this comparison of questionnaires are summarised in Table 2.

Overall, the repeated questionnaire revealed a significant increase in the level of understanding by the majority of participants. On average, participants showed significantly increased understanding for 67% of the questions in the questionnaire, while already having a good understanding in relation to 22% of the questions from the start of the course. There was no apparent improvement in knowledge and understanding relating to 10% of questions on the questionnaire, while two participants had a poorer understanding of one of the questions at the end of the workshop. The latter two statistics will be used to help determine areas of improvement for future stock assessment workshops. Overall however, the questionnaires indicated a vast improvement in the understanding of stock assessment and its role in the WCPO for all of the participants.

**10.1.2 End presentation** – Participants understanding of stock assessment was also assessed informally on the last day of the workshop through the participants creating and presenting seminars on the relevance and implications of stock assessments to fisheries management in participating countries. Four groups of were formed based on proximity of countries, main fishing techniques (e.g. mainly longline or mainly purse-seine) and the similar issues and challenges faced by countries in the WCPO. The presentations were not formally graded (as this was not intended to be a university style course but rather an interactive workshop), but those participants who perhaps found some of the concepts difficult to understand or articulate were noted to allow extra attention to be provided on those specific issues at the next workshop. The presentations also highlighted the similar key management issues within the countries forming each groups, highlighting the coordinated approach needed for effective regional fisheries management.

## **10.2 Assessment by participants**

The second workshop assessment tool took the form of a generalized feedback questionnaire in which participants were asked a range of questions relating to the design, contents, presentation, structure and other aspects of the workshop.

The results from this assessment are summarized in Table 3 and indicate that the majority of participants felt that the workshop had clear objectives, was well planned, encouraged participation, had appropriate content and was well balanced, with practical sessions that complemented the theory sessions. In addition, most participants felt that they had a better understanding of stock assessment processes and would be able to apply what they had learnt in their daily work, as well as contribute to and discuss stock assessments at regional meetings (e.g. SC, WCPFC, HoF etc).

Table 2 – Summary of results from a comparison of start and end workshop surveys of participant’s knowledge of stock assessment. Participants answered the same 25 questions on stock assessment and its relevance in the WCPO tuna fisheries, at the start and end of the 2 week workshop. Each end-survey answer for each participant was compared to the same answer for the start survey and ranked according to whether the answer indicated either an increase in understanding, no increase due to already having a good understanding at the start, poor understanding and no improvement as a result of the workshop, and a deterioration in understanding. 10 participants completed both surveys.

| Participant    | UNDERSTANDING OF THEORY/METHODS |     |     |     |     |     |     |     |     |     | UNDERSTANDING OF FISHERIES, SPECIES, STATUS |     |     |     |     |     |     |     |     |     | WCPFC |     |     |     |     | % improved | % same-ok | % same-poor | % deteriorated |    |
|----------------|---------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|-----|-----|-----|-----|------------|-----------|-------------|----------------|----|
|                | 11                              | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21  | 22  | 23  | 24  | 25  | 26  | 27  | 28  | 29  | 30  | 31    | 32  | 33  | 34  | 35  |            |           |             |                | 36 |
| 1              | 4                               | 2   | 4   | 4   | 4   | 4   | 4   | 4   | 3   | 4   | 4   | 4   | 4   | 4   | 3   | 4   | 4   | 3   | 4   | 2   | 4     | 3   | 4   | 4   | 4   | 3          | 70        | 22          | 9              | 0  |
| 2              | 4                               | 4   | 4   | 4   | 3   | 4   | 4   | 4   | 4   | 4   | 3   | 2   | 3   | 4   | 4   | 4   | 2   | 1   | 3   | 4   | 4     | 4   | 4   | 4   | 4   | 70         | 17        | 9           | 4              |    |
| 3              | 4                               | 4   | 4   | 4   | 4   | 4   | 2   | 4   | 4   | 4   | 2   | 4   | 3   | 4   | 4   | 3   | 2   | 2   | 4   | 4   | 3     | 4   | 4   | 4   | 4   | 69         | 12        | 19          | 0              |    |
| 4              | 4                               | 4   | 3   | 4   | 4   | 3   | 4   | 4   | 3   | 3   | 3   | 3   | 2   | 4   | 3   | 4   | 4   | 4   | 4   | 4   | 4     | 4   | 4   | 4   | 4   | 69         | 27        | 4           | 0              |    |
| 5              | 4                               | 4   | 3   | 2   | 4   | 4   | 3   | 4   | 3   | 4   | 3   | 3   | 4   | 3   | 3   | 4   | 4   | 3   | 4   | 4   | 3     | 4   | 3   | 3   | 3   | 54         | 46        | 0           | 0              |    |
| 6              | 4                               | 4   | 4   | 4   | 4   | 4   | 4   | 3   | 4   | 4   | 4   | 4   | 4   | 4   | 4   | 4   | 4   | 4   | 3   | 3   | 4     | 2   | 4   | 3   | 3   | 63         | 33        | 4           | 0              |    |
| 7              | 4                               | 3   | 4   | 4   | 4   | 3   | 2   | 4   | 4   | 4   | 2   | 4   | 4   | 3   | 4   | 4   | 2   | 4   | 4   | 3   | 4     | 3   | 4   | 4   | 4   | 69         | 19        | 12          | 0              |    |
| 8              | 3                               | 2   | 4   | 4   | 2   | 2   | 2   | 4   | 4   | 4   | 4   | 4   | 2   | 4   | 4   | 2   | 3   | 4   | 4   | 4   | 4     | 4   | 4   | 4   | 4   | 63         | 13        | 25          | 0              |    |
| 9              | 4                               | 4   | 4   | 4   | 4   | 4   | 4   | 4   | 1   | 4   | 4   | 4   | 4   | 4   | 4   | 4   | 4   | 4   | 2   | 4   | 3     | 4   | 3   | 3   | 3   | 73         | 19        | 4           | 4              |    |
| 10             | 4                               | 4   | 4   | 4   | 4   | 4   | 4   | 4   | 4   | 4   | 2   | 2   | 4   | 3   | 2   | 3   | 4   | 4   | 4   | 4   | 4     | 4   | 4   | 4   | 4   | 75         | 8         | 17          | 0              |    |
| <b>AVERAGE</b> | 3.9                             | 3.9 | 3.8 | 3.3 | 4.0 | 3.5 | 3.2 | 3.8 | 3.3 | 3.9 | 3.1   | 3.4 | 3.4 | 3.7 | 3.4 | 3.6 | 3.3 | 3.6 | 3.2 | 3.5 | 3.8   | 3.5 | 3.6 | 3.8 | 3.6 | 67         | 22        | 10          | 1              |    |

**SCALE**  
4 - IMPROVED UNDERSTANDING  
3 - NO IMPROVEMENT, ALREADY OK  
2 - NO IMPROVEMENT, POOR UNDERSTANDING  
1 - UNDERSTANDING DETERIORATED

BLANK CELLS INDICATE WHERE THE QUESTION WAS CLEARLY MISINTERPRETED

indicator of level of improvement  
indicator of start level of understanding  
indicator of lack of improvement

**Table 3 – Summary of participant’s responses to survey on the clarity, design, contents and delivery of the stock assessment workshop. Numbers represent the number of participants providing a particular response to each statement or question.**

| <b>Part 1</b>   |  | <b>Strongly agree</b> | <b>Agree</b> | <b>Uncertain</b> | <b>Disagree</b> | <b>Strongly disagree</b> | <b>Total replies</b> |
|-----------------|--|-----------------------|--------------|------------------|-----------------|--------------------------|----------------------|
| <b>Question</b> |  |                       |              |                  |                 |                          |                      |
| 1               | The aims of the workshop were clear  | 12                    | 4            | 0                | 0               | 0                        | 16                   |
| 2               | Sessions were well planned and organized   | 13                    | 3            | 0                | 0               | 0                        | 16                   |
| 3               | The objectives for each session were clear   | 11                    | 4            | 1                | 0               | 0                        | 16                   |
| 4               | The explanations of the concepts and topics were clear   | 11                    | 4            | 1                | 0               | 0                        | 16                   |
| 5               | The presentations stimulated interest  | 11                    | 5            | 0                | 0               | 0                        | 16                   |
| 6               | There were enough opportunities to ask questions   | 13                    | 3            | 0                | 0               | 0                        | 16                   |
| 7               | The examples used in the theory and practical sessions improved my understanding   | 13                    | 3            | 0                | 0               | 0                        | 16                   |
| 8               | There was a good balance between theory and practical work   | 11                    | 4            | 1                | 0               | 0                        | 16                   |
| 9               | The practical and review material reinforced what was discussed in the theory sessions   | 9                     | 5            | 0                | 0               | 0                        | 14                   |
| 10              | The review exercises of previous stock assessments reinforced the theory and practical work  | 13                    | 3            | 0                | 0               | 0                        | 16                   |
| 11              | The review exercise of the new stock assessments reinforced the theory and practical work  | 11                    | 4            | 1                | 0               | 0                        | 16                   |
| 12              | I will be able to apply what I have learnt from the workshop in my daily work  | 5                     | 6            | 4                | 0               | 0                        | 15                   |
| 13              | After participating in this workshop, I have a better understanding of the processes involved in undertaking a regional meetings (e.g. SC, WCPFC, HoF, meetings) | 9                     | 6            | 0                | 0               | 0                        | 15                   |
| 14              |  | 7                     | 4            | 4                | 0               | 0                        | 15                   |

| <b>Part 2</b>   |  | <b>Answer</b> |          |          |          |          |          |          | <b>Total replies</b> |
|-----------------|--|---------------|----------|----------|----------|----------|----------|----------|----------------------|
| <b>Question</b> |  | <b>1</b>      | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> | <b>6</b> | <b>7</b> |                      |
| 15              | The aims of each section of the workshop were (1 = very unclear; 7 = very clear)   |               |          | 1        | 3        | 1        | 3        | 9        | 16                   |
| 16              | The various parts of the workshop were integrated (1 = very poorly; 7 = very well)   |               |          | 1        | 1        | 1        | 7        | 6        | 14                   |
| 17              | The amount of material covered in this workshop was (1 = far too little; 7 = far too much)   |               |          | 1        | 2        | 5        | 4        | 3        | 15                   |
| 18              | From this Workshop I have learnt (1 = very little; 7 = a great deal)   |               |          | 1        | 1        | 1        | 1        | 12       | 15                   |
| 19              | This Workshop challenged me to think critically about stock assessments (1 = not at all; 7 = very much)                                      |               |          | 1        | 1        | 1        | 2        | 11       | 14                   |
| 20              | I would recommend this workshop to other staff members (1 = not at all; 7 = very likely)   |               |          | 1        | 1        | 1        | 2        | 11       | 14                   |
| 21              | I would consider attending further Workshops on stock assessments in the future (1 = very unlikely; 7 = very strongly)                       |               | 1        |          | 1        | 1        | 1        | 12       | 15                   |
| 22              | Attending this workshop will assist me in my daily work (1 = not at all; 7 = a great deal)   |               |          | 1        | 2        | 1        | 3        | 10       | 15                   |
| 23              | Attending this workshop will assist my participation in future SC and Commission meetings (1= not at all; 7 = a great deal)                  |               |          | 1        | 1        | 1        | 3        | 9        | 16                   |
| 24              | After participating in this Workshop, I will be able to discuss stock assessment issues with my colleagues (1= not at all; 7 = a great deal) |               |          | 1        | 1        | 1        | 5        | 8        | 16                   |
| 25              | Overall, I think this workshop was (1 = not very useful; 7 = very useful)  |               |          | 1        | 1        | 1        | 3        | 12       | 16                   |

A few participants expressed uncertainty as to whether the workshop would assist them at regional meetings or in their daily work. Subsequent discussion with participants revealed a number of reasons for these responses. In some cases, the participants are not in positions whereby they would be likely to attend regional meetings. In addition, for some participants, very little of their daily work ever touches on issues relating to stock assessment. Also, the question might have been interpreted as asking whether they felt they could *undertake* (as opposed to use the information from) stock assessments as part of their daily work.

Finally, this workshop constituted the first of what will hopefully be a series of annual workshops. Given the complexity of the issues being dealt with, and the fact that not all of the participants had had significant previous exposure to stock assessment, it is perhaps not surprising that the level of confidence in using stock assessment knowledge in daily work and regional fora was not high for all participants. It is hoped that such confidence will be gained from further training and exposure to stock assessments.

The final part of the questionnaire departed from the ranking based answer system and asked participants the following:

***Which part(s) of the Workshop did you like the most? Why?*** 7 participants indicated they liked the entire workshop, 5 indicated that the practical sessions were the most useful, due to these enabling them to “visualize” the assessments and the links between different components.

***Which part(s) of the Workshop did you like the least? Why?*** The only significant complaint was that the practical sessions did not always allow enough time for all participants to complete the allocated exercises. We can address this next year by firstly, booking large conference centre/meeting rooms now, and secondly, ensuring that participants all bring laptops. This will mean practical session times will be significantly increased. In addition, we are developing CDs for each of the participants which will include all the workshop materials (presentations and practical exercises) so that participants will have the opportunity to continue working on exercises after the workshop or to review them prior to subsequent workshops.

***Can you suggest how future Workshops could be improved to make the outcomes more useful to participants?*** Again, the issue of time available in practical sessions was raised by a number of participants. A request was also made that we ensure participants receive workshop materials prior to workshop. The participants also wanted more time to interpret the stock assessment papers, and a few participants wanted more detail on the technical aspects of statistical techniques and modeling approaches. This highlighted the wide range of backgrounds of participants at the workshop. One potential way of addressing this issue is to run two workshops, one for new participants and one for more

experienced participants. However, this will require increased commitment from OFP staff and further resources.

One participant suggested in-country workshops, which is unrealistic in terms of SPC officer time and travel commitments in order to provide this type of workshop in all member countries. Getting everyone in the same place at same time in facilities that the conveners are familiar with and have control over, with substantial IT and administrative support, is by far the most efficient method.

***What were the strengths and weaknesses of the OFP staff who contributed to the Workshop?*** Those participants who provided comment were very complimentary of the staff member's enthusiasm, presentation skills, clarity, positive attitude, and willingness to answer questions and encourage active participation.

***Any other comments or suggestions?*** Requests were made for: follow-up SAWs prior to SC meetings each year; shortened SAWs for fisheries management staff; reading material (notes) to be developed and supplied in conjunction with the presentation handouts, and for a more advanced SAW for the future. Workshop participants also suggest that a follow-up SAW should be held sooner rather than later to help memory retention. Some of these suggestions are discussed further in section 9.3.

### **10.3 Self Assessment by SPC**

Overall, based on observations of the facilitators and from feedback received from workshop participants, both formally through the surveys and informally, the workshop was assessed by SPC as being a very significant first step towards meeting the overall stock assessment related objectives of the OFMP.

However, in recognition that this workshop represented only the first step in a longer process of building an improved understanding of stock assessment and capacity to use assessment results appropriately in domestic and regional decision making processes, SPC has spent significant time post-SAW in determining how future workshops might be further strengthened. The following represents a self appraisal of each of the areas involved in hosting a successful workshop.

#### ***10.3.1 Communication and nominations***

The communication strategy employed to advertise the stock assessment workshop in the months leading up to it was considered to be very successful. All countries were contacted directly (face to face) through regional meetings in the months prior and subsequently followed up by email, phone and fax. The presence of representatives from 17 different countries and territories at the workshop was testimony in part to the effectiveness of that strategy. Assistance

from the OFMP project coordinator, Barbara Hanchard, in seeking nominations was also of great benefit. A similar strategy should be employed for the next workshop. However, in future, countries will be encouraged to be far more proactive and timely in submitting their nominations. The very slow and late response of some countries caused some significant logistical and planning problems for SPC.

### **10.3.2 Participant eligibility**

It is very important that countries send participants who are in positions where they can contribute their improved knowledge of stock assessment into both the domestic and regional decision making processes and forums. Ideally they are officers who are actively involved in development and review of domestic tuna management plans, and who will participate in Commission processes, in particular the Scientific Committee and the Commission meetings each year. However, recognizing that not all countries and territories would be able to send such an officer, due to resource limitations, logistical and other issues, in this instance SPC did accept nominations for officers who do not fulfill those criteria fully. We will however continue to encourage more appropriate officer nominations in the future.

### **10.3.3 Workshop timing, structure and design**

A number of areas of improvement for future workshop structure and design were identified:

1. *Timing* – Holding the workshop a few weeks prior to the WCPFC Scientific Committee meeting is probably ideal, as it facilitates the participation of member countries in that forum. However, further consideration needs be given to potential clashes with other country commitments which might in some instances prevent the most appropriate officers from attending.
2. *Regularity* – The OFMP provides funding for the participation of its member countries in two stock assessment workshops over a 5 year period. However, it is the strong belief at SPC that in order to ensure significant increases in Pacific Island capacity to understand, interpret and use knowledge of stock assessment, such workshops must be held on a more regular basis (at least annually).

There are two main reasons for this. Firstly, there is relatively high turnover in staff of fisheries departments of many Pacific Island countries and territories. Secondly, stock assessment is a relatively complex subject and one workshop every 2-3 years will not provide sufficient reinforcement of the key concepts. Memory retention is the key consideration. A workshop every year before SC (where the key concepts are again

reinforced in application) is considered the bare minimum to ensure that the objectives relating to understanding and use of stock assessment are met. Increasing the regularity of the workshops to an annual basis will require additional funding sources to be found. This is currently being investigated.

The issue of memory retention may in fact need to be dealt with further, over and above holding annual workshops. SPC recognizes that many of the fisheries officers who attend the stock assessment workshop hold highly multi-tasking positions, for which an understanding of stock assessment is required for only one small component. Retaining the knowledge gained of stock assessment concepts under such conditions is very difficult without regular exposure to the concepts. Subsequently, some consideration is currently being given to mechanisms by which participants could refresh their understanding of stock assessment in between workshops. Potential mechanisms include the distribution of relevant papers and summaries of stock assessments on a tri-annual basis to workshop participants, and to hold online “quizzes”, to encourage them to stay up to date and refresh their memories of stock assessment concepts. Such processes might need to be formally endorsed (e.g. at the OFM project Regional Steering Committee meetings) to ensure adequate participation.

2. *Length* – At two weeks in length, the first workshop was probably slightly long. Learning about stock assessment is a relatively intensive process for those with little previous exposure, and concentration levels were (as subjectively judged by facilitators) starting to decline during the last 2 days.

A 7 or 8 day workshop that does not have two rest days in the middle might be more appropriate (and would reduce future workshop costs potentially by more than 30%). The cost-reductions may also be used to subsequently increase the likelihood of gaining additional funding by demonstrating the efficiencies of SAW processes.

3. *Facilities* – SPC’s main conference facilities had been booked 12 months in advance for a conference by an external organization, hence we were unable to utilize those facilities. This limited the number of participants we could accept to the workshop. The main conference centre facilities for next year’s workshop have already been booked in advance, with the workshop tentatively scheduled for Saturday 1<sup>st</sup> to Monday 17<sup>th</sup> July 2007 (to allow for the possibility of two back to back workshops for beginners and intermediates – see below).

4. *Practical sessions* – The capacity of the IT room at SPC Noumea is 12 people, and the 2006 workshop had 17 participants, forcing SPC to split

the practical sessions. While SPC tried to minimize the impact of this on time allocated to practical sessions per person, some time was lost. For the next workshop, SPC will request as a pre-requisite that participants come to the workshop with their own laptop computer, preferably with Microsoft Excel installed. Where this is impossible, a limited number of laptops will be made available by SPC. This will ensure that maximum time can be spent in the practical sessions each day by each participant, as we will not be limited to using the IT room.

*5. Split design (Intermediate and Beginner)* – It is suggested that in future, two workshops each a week long be held, the first being for fisheries officers who have attended previous workshops and are ready to go onto more advanced level of learning, and the second “starter” workshop for fisheries officers who have not attended any of the previous workshops.

This structure provides for two improvements. Firstly, funding allowing, we would be able to accommodate an increased number of participants, in some instances two per country/territory. There was a request from at least 4 countries to send two participants each to the first workshop, however due to a lack of space and adequate facilities, SPC were unable to accommodate these requests. However it is our intention to ensure that we can accommodate increased numbers in the future. The second advantage is in better tailoring of workshop materials to the learning level of the participants.

*6. Materials* – It is likely that the informal course notes developed by the workshop conveners will in future be developed into a more formal workshop booklet that participants can use in conjunction with the copies of the presentations they are provided.

*7.* Some consideration in future will be given to developing a shortened version of the workshop tailored to the needs of fishery managers specifically (rather than fishery technical officers).

#### **10.3.4 Workshop contents**

Feedback from participants indicates that the contents of the workshop were pitched at a very appropriate level and not delivered too fast or too slowly.

However, a number of exercises are being considered as additions to future stock assessment workshops. These include:

1. *Role playing scenarios* – it was noted that while the participants were clearly enthusiastic about learning about stock assessment and increased their knowledge substantially in that area throughout the workshop, that most lacked confidence to talk in open forums about this subject. This was

noted in both the stock assessment workshop, and from observing participation at subsequent Scientific Committee in Manila. It is believed that the incorporation of role playing scenarios (where participants assume the roles of scientist, fishery manager, industry representative, distant water fishing delegate, etc, in discussions of stock status and trends) into the workshop will provide opportunity for participants to practice speaking publicly about stock assessment. Participation in domestic and regional fora relies not just on knowledge but also on having the confidence to express that knowledge.

2. *Oceanographic Impacts* – the influence of oceanographic variables on fish distribution and availability to fisheries was discussed in many different parts of the workshop. In hindsight it would probably be useful to have a single session that deals with the multiple impacts of oceanography and which has an associated practical exercise that helps to explain the importance of oceanographic variability on fishery yields over time.
3. *Ecosystem Approach to Fisheries* – many PICTS are adapting their fisheries management procedures to implement EAF, yet ecosystem science is complex and it is not always clear how to incorporate ecosystem considerations into resource management decision making. Future workshops might make an enhanced effort in building capacity to understand how ecosystems are structured and how they function and how they support and are impacted by fisheries. Examination of case studies where ecosystem considerations have been central to fisheries management decisions may also prove to be a useful exercise.
4. *Reviewing* - increases in the level of reviewing that occurred throughout the workshop would be beneficial in order to reinforce key concepts of each section of the SAW.
5. *Management implications* – Consideration will be given to whether there might be any benefit to include presentations by FFA Fisheries Management Advisors to help explain potential implications of stock assessment for domestic and regional fisheries management. This would also highlight the links between scientific advice (from stock assessments) and management.
6. *Testing/screening for difficulties* – Tests of participants understanding of workshop material and concepts to be used every 2-3 days to pick up on those concepts that are not being clearly understood by participants, so further explanation can be provided in a timely manner.

## 11. Conclusion

Based on the above assessments, SPC considers that the first Stock Assessment Workshop was an important first step towards meeting the overall stock assessment related objectives of the OFMP, particularly in terms of building national capacity to meet Convention obligations and to participate effectively in the WCPF Commission. It will be important that the participants get the opportunity to build upon what they have learnt through further workshops, attachments and participation at scientific meetings. SPC aims to improve the workshop further in future years based on participant's assessments and feedback. It is worth noting that in a recent development, the workshop concept was endorsed by the Scientific Committee of the Western and Central Pacific Fisheries Commission, with the Commission to consider funding for future workshops when it meets in December 2006. The 2006 workshop, in part due to excellent participation response by countries and territories, went significantly over budget (by ~US \$26 000). This was able to be covered by other funding sources, and securing additional funding will be important if future responses (i.e. country nominations) remain at the same level. SPC has already secured and booked larger facilities for possible workshop(s) in 2007.

The outcomes of the workshop, as described in this report, will be presented at the 2<sup>nd</sup> OFMP Regional Steering Committee meeting to be held at Honiara, Solomon Islands, on the 10<sup>th</sup> of October 2006.

## Appendix I - Participants

### **Cook Islands**

Pamela Maru  
Director of Offshore Fisheries  
Ministry of Marine Resources  
P.O. Box 85  
Rarotonga

### **Federated States of Micronesia**

Steven Retalmai  
Data Coordinator  
NORMA Office  
PP Box PS 122  
Plaikir, PNI  
FSM 96941

### **Fiji**

Jone Amoe  
Fisheries Officer, Management Services  
Ministry of Fisheries and Forests  
PO Box 2218  
Suva  
Fiji

### **French Polynesia**

Maelle Poisson  
Deputy Head  
Statistics Division  
Fisheries Department  
B.P. 20 Papeete  
98713 Tahiti  
Polynésie Française

### **Guam**

Thomas Flores  
Offshore Fisheries Coordinator/Acting Supervisor  
Department of Agriculture  
Division of Aquatic and Wildlife Resources  
Dairy Road, 96913 Mangilao  
Guam

### **Kiribati**

Tiemaua Tebaitongo  
Senior Fisheries Officer - Oceanic Department  
P.O. Box 64  
Bikenibeu - Tarawa  
Kiribati

**Marshall Islands**

Berry Muller  
Chief Fisheries Officer - Oceanic and Industrial Affairs Division  
Marshall Islands Marine Resources Authority  
P.O. Box 860, 96960 Majuro  
Marshall Islands

**Nauru**

Terry Amram  
Oceanic Fisheries Manager  
Nauru Fisheries and Marines Resources Authority  
P.O. Box 449  
Aiwo District  
Nauru

**New Caledonia**

Christophe Fonfreyde  
Fisheries Officer  
Service Territorial de la Marine Marchande et des  
Pêches Maritimes  
B.P. 36  
98845 Nouméa Cedex  
Nouvelle-Calédonie

**Niue**

James Tafatu  
Ministry of Agriculture, Forestry and Fishery  
P.O. Box 74  
Alofi  
Niue

**Palau**

Kathy Sissior  
Bureau of Marine Resources, Ministry of Resources  
& Development  
PO Box 359  
Koror PW 96940  
Palau

**Papua New Guinea**

Ludwig Kumoru  
Manager - Tuna fisheries  
National Fisheries Authority  
P.O. Box 2016  
Port Moresby, NCD  
Papua New Guinea

**Samoa**

Ueta Fa'asili Jr.  
Senior Fisheries Officer (Offshore Fisheries)  
Ministry of Agriculture, Forests, Fisheries and Meteorology  
Fisheries Division  
P.O. Box 1874, Apia  
Samoa

**Tokelau**

Feleti Tulafono  
Department of Economic development, Natural Resources & Environment  
Fakaofu  
Tokelau

**Tonga**

Ulunga Fa'anunu  
Deputy Secretary for Fisheries  
Ministry of Fisheries  
P.O. Box 871  
Nuku'alofa  
Tonga

**Tuvalu**

Falasese Tupau  
Fisheries Information & Licensing Officer  
Fisheries Department  
Private Mailbag  
Teone, Funafuti,  
Tuvalu.

**Vanuatu**

William Naviti  
Senior Resource Manager  
Department of Fisheries  
Private Mail Bag 9045  
Port Vila, Vanuatu