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**REPORT ON THE 2007 STOCK ASSESSMENT WORKSHOPS FOR THE  
OCEANIC FISHERIES MANAGEMENT PROJECT**

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**WCPFC-SC3-2007/GN WP-14**

**SPC<sup>1</sup>**

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<sup>1</sup> Oceanic Fisheries Programme, Secretariat of the Pacific Community, Noumea, New Caledonia



# Report on the 2007 Stock Assessment Workshops for the Oceanic Fisheries Management Project

WCPFC-SC3-2007/GN WP-14

25<sup>th</sup> June - 7<sup>th</sup> July 2007  
SPC Headquarters  
Noumea  
New Caledonia



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# Report on the 2007 Stock Assessment Workshops for the Oceanic Fisheries Management Project

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# **1. Background**

## **1.1 Introduction**

The Oceanic Fisheries Programme (OFP) of the Secretariat of the Pacific Community (SPC) hosted two Stock Assessment Workshops (SAWs) for fisheries officers from Pacific Island Countries and Territories, at SPC headquarters in Noumea, New Caledonia, during the period 25<sup>th</sup> June – 7<sup>th</sup> July 2007. These workshops follow on from the first stock assessment workshop held in 2006, and have been predominantly funded (to date) by the Global Environment Facility (GEF), but also assisted by funding from other sources. These have included the Western Pacific Fisheries Management Council, SPC, OCP ProcFish, and the Japanese Government funded “WCPFC Project on Capacity Building in Fisheries Statistics, Regulation and Enforcement for Small Island Developing States” as administered by the WCPFC. The workshops were recognized/endorsed by the WCPFC Scientific Committee as an important endeavour in 2006.

The following section provides background information to explain the need for and purpose of these workshops, including a brief review of the 2006 workshop. Subsequent sections will outline the 2007 workshops design, content and outcomes.

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

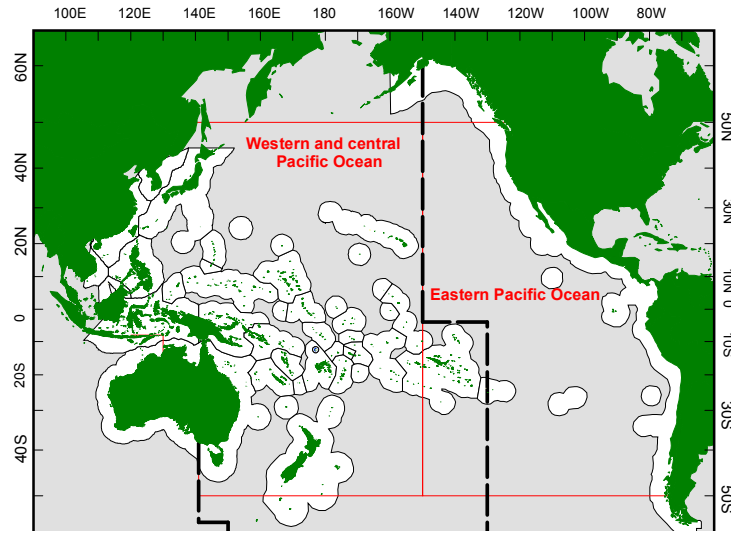
The SAWs were initially instigated as one component of the much larger Oceanic Fisheries Management Project (OFMP) (\*but have since been expanded to include other developing states who are not participants in that project). That project is funded by the Global Environment Facility (GEF) with the United 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:

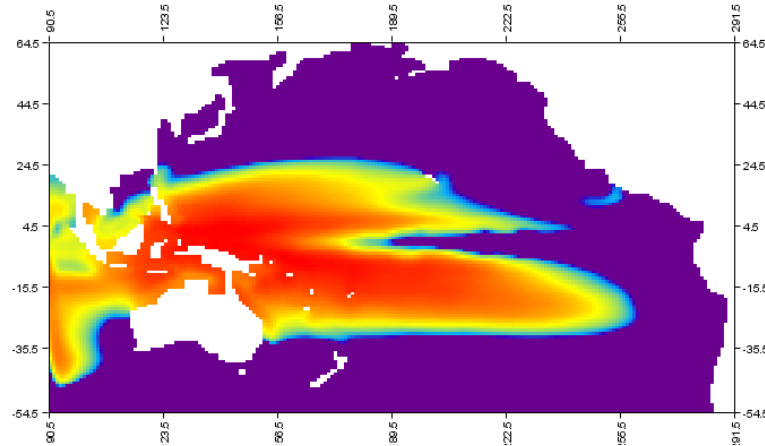
1. Information and Knowledge – to improve the understanding of the transboundary oceanic fish resources and related features of the Western and Central Pacific Ocean (WCPO) Warm Pool Large Marine Ecosystem; and
2. Governance – to create regional institutional arrangements, and reform, realign and strengthen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

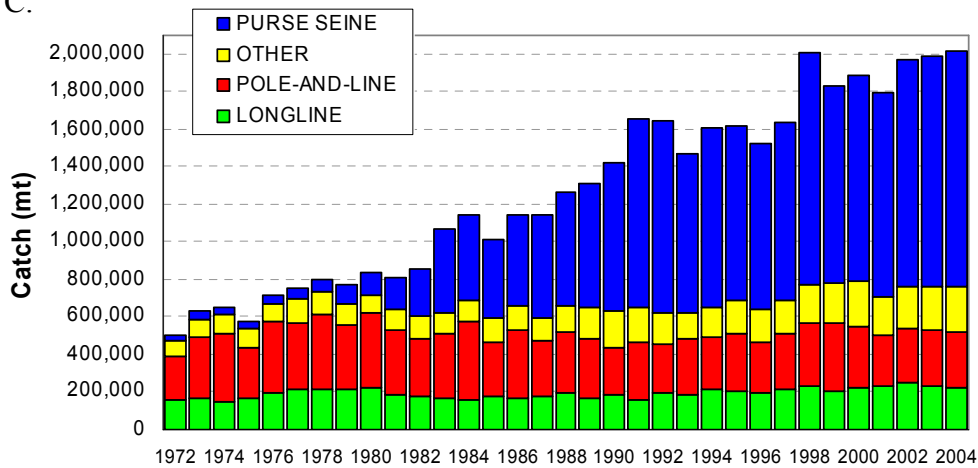
A.



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. (Source: SPC, 2006).**

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 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 regional 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.

## **2. Review of the 2006 stock assessment workshop.**

The original design of the OFMP held SPC 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 first of these was held in July 2006 and the following is a brief review of that workshop with emphasis on recommendations that came out of the workshop for future workshop design and content. The full report of that workshop was sent to participating countries and relevant regional organizations and can be obtained from SPC.

The 2006 workshop ran from the 3<sup>rd</sup> to the 14<sup>th</sup> July at SPC headquarters in Noumea, New Caledonia and involved 17 participants from fisheries departments from around the Western and Central Pacific region.

The bulk of the funding for the workshop came from the Global Environment Facility (GEF) with additional funding provided by PROCFish (Oceanic component) and the Western Pacific Fisheries Management Council, to allow non-OFMP project members to attend.

The workshop's 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. Understand the key outcomes/recommendations and how they relate back to the model outputs and data;
3. Identify and question weaknesses in an assessment and understand statements regarding uncertainty; and
4. Form conclusions regarding the implications of the assessment's outcome for tuna fishery management at national and regional levels, including the risk associated with different management options.

The workshop comprised three main components: Basic Theory and Background, Parameter Estimation, and Interpretation and Management Implications.

The Basic Theory and Background component provided an understanding of the basic biological and fisheries information and concepts required to undertake an assessment. It included sessions on the behaviour of unfished populations, exploited population dynamics, data requirements for stock assessment and the different types of assessment that can be undertaken.

The Parameter Estimation component used the background theory to guide participants in building a stock assessment model step by step, and included sessions that detailed the logic and methods used to estimate the key parameters of growth, recruitment, natural mortality, selectivity, catchability,

fishing mortality, movement and indices of abundance. These sessions were followed by discussions of biological reference points and a summarisation of how all the different 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.

Following the Parameter Estimation component there was a half-day of presentations relating to the ecological approach to fisheries management, in particular reviewing the types of research currently underway to provide scientific advice to support that approach in future.

The final Interpretation and Management Implications 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 decision-making.

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 the performance of participants;
2. Assessment of the workshop by participants; and
3. Self-assessment by SPC.

These assessments demonstrated that the level of understanding of stock assessment for the majority of participants had increased very significantly by the end of the workshop. Participants judged that the workshop had clear objectives, was well planned, encouraged participation, had appropriate content and was well balanced, with good presentations provided by the SPC staff.

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 spent significant time post-SAW in determining how future workshops might be further strengthened. Subsequently, the 2006 report recommendations included the following:

1. **Communication and nominations** – Countries to be encouraged to be far more proactive and timely in submitting their nominations. Earlier advertising to assist this cause.
2. **Participant eligibility** – Ensure countries only send participants who have an appropriate background and are in positions where they can

apply their improved knowledge of stock assessment into both the domestic and regional decision making processes and forums.

3. **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 (on the proviso that participants to the workshop also attend SC).
4. **Regularity** – In order to ensure significant increases in the capacity of developing states to understand, interpret and use stock assessment information, such workshops must be held on a more regular basis (at least annually). In addition, mechanisms need to be put in place that will ensure maximum possible memory retention by participants in between workshops. Such strategies could include online/remote training or revision exercises throughout the year, and opportunistic revision of key concepts at regional meetings (e.g. SC) often attended by participants, as well as in-country training/revision when OFP officers make in-country visits. These endeavours could protect against the loss of capacity due to memory loss over time, and turnover/loss of trained staff from departments over time.
5. **Length** – Reduce workshop length and/or contact hours to reduce meeting fatigue.
6. **Split design (Level 1 and Level 2)** – Hold two workshops, 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 “introductory” workshop for fisheries officers who have not attended any of the previous workshops. This may also allow some countries to have two officers participate and ensures better tailoring of workshop materials to the learning level of the participants.
7. **Materials** – Give consideration to the development of a more formal workshop booklet that participants can use in conjunction with the copies of the presentations they are provided.
8. **Workshops for managers** – Give consideration in future to developing a shortened version of the workshop tailored to the needs of fishery managers specifically (rather than fishery technical officers).
9. **Increasing confidence to talk science** – include exercises aimed to increase participant confidence to talk in open forums about stock assessment. Role playing scenarios, regular question/answer sessions, and group presentations aim to provide participants the communication skills they will require to actively participate in regional and Commission meetings.
10. **Oceanographic Influences on fish and fish stocks** – Include 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.
11. **Ecosystem Approach to Fisheries Management** – Incorporate session on the integration of scientific analyses and advice into the current EAFM approach.

12. **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. 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.
13. **Management implications** – Include participation of FFA Fisheries Management Advisors to help explain potential implications of stock assessment for domestic and regional fisheries management and highlight the links between scientific advice (from stock assessments) and management.

### **3. 2007 Workshop Objectives**

The 2007 stock assessment training was split into two workshops, the first to provide training to participants who were mostly new to stock assessment concepts and/or had not attended the first workshop in 2006. The second workshop aimed to further build upon the understanding of those participants who were returning from the 2006 workshop. The broad OFMP objective relating to stock assessment capacity building was used as a guide to create more specific functional objectives for both of the workshops. The primary functional objectives were as follows:

#### **Level 1 Workshop for first time participants**

1. Understand fish population dynamics (in both fished and unexploited populations) and the impacts of oceanography/climate on fish populations and fisheries.
2. Understand what the various components of a stock assessment model are, how these are derived, and why each is important to the assessment;
3. Be able to understand the key scientific outcomes and recommendations of stock assessments and how they relate back to the model outputs and data;
4. Be able to identify where an assessment might be improved in the future and to understand statements regarding uncertainty, and
5. 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).

#### **Level 2 Workshop for returning participants**

The primary objective was to enhance participants capacity to understand, interpret (and if necessary, challenge) a stock assessment *or analyses of*

*management options*, so as to be able to incorporate that information into decision making/advice provision at domestic and regional levels. The secondary objectives were to promote an understanding of:

1. Fish population dynamics (in both fished and unfished populations)
2. The impacts of oceanography/climate on fish populations and fisheries
3. Parameter estimation and building a model
4. Biological reference points
5. The application of tagging studies to stock assessment
6. Assumptions, uncertainty, risk and projections
7. Management options analyses and implications for decision making
8. Ecological risk assessment

## **4. 2007 Design and Content**

### **4.1 Overall Design**

Taking into account the objectives stated above and the recommendations flowing from the review of the 2006 stock assessment workshop, the 2007 workshop program delivered two 6-day workshops. The first was predominantly designed for participants who were mostly new to stock assessment concepts and/or had not attended the first workshop in 2006. The second workshop aimed to further build upon the understanding of those participants who were returning from the 2006 workshop. The workshops were each reduced to 6 days (noting that the 2006 workshop were 10 days) to reduce meeting fatigue and fit within funding restraints while still delivering appropriate training to two groups at different levels of understanding of stock assessment.

Similar to the 2006 workshop, the 2007 workshops comprised three main components, these being Basic Theory and Background, Parameter Estimation, and Interpretation and Management Implications (Tables 1 and 2). The Level 1 workshop was essentially a repeat of the 2006 workshop, but with additional sessions on oceanographic impacts and CPUE standardization. The Level 2 workshop provided 50% of time to revision of 2006 material, and 50% time to introduction of new material, specifically relating to oceanographic impacts, CPUE standardization, the use of tagging data in population assessments, the consideration of risk, uncertainty and projections in stock assessments, and management options analyses. The ecosystems session in both workshops focused on providing the participants with an understanding of Ecological Risk Assessment (ERA) and its relevance to fisheries management in the WCPO.

Both workshops focused on tuna and other pelagic species and the assessments currently used to assess these species in the Pacific Ocean.

## **4.2 Basic Theory and Background**

This component of both workshops provided an understanding of the basic biological and fisheries information and concepts that are necessary before undertaking an assessment, utilizing both theory and computer laboratory based exercises to emphasize concepts. 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.

## **4.3 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 theory and computer practical 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.

## **4.4 Ecosystem Approach to Fisheries**

In 2006, this session had introduced participants to a broad range of ecosystems research that will eventually feed into management decision making. In 2007, this component focused on one particular area, introducing the basic concepts of Ecological Risk Assessment (ERA). The ERA is a tool for assisting fisheries managers in identifying the risks to species, communities and habitats that come from the impact of fishing, and it is intended to help identify research and assessment priorities with respect to these. Currently, an ERA for the entire WCPO region has been commissioned by the WCPFC and is being undertaken by scientists in the OFP and is due to be presented at SC3. Because this

approach is likely to be applied at national levels in the future, it is important that developing member states of the Commission are able to interpret and use ERA outputs in their domestic and regional decision making processes. The main purpose of the session was to provide participants with basic background information required for interpreting risk categorisation. A broad overview was provided on how risk is calculated, why sources of linguistic and information uncertainty need to be identified and accounted for in any assessment, and how the methods of risk assessments can use a mix of qualitative to quantitative information. A detailed description on how these analyses are constructed and should be interpreted was provided.

#### **4.5 Interpretation and Implications**

The Level 1 workshop included a final day exercise that required participants to interpret the potential subregional and national level implications of regional stock assessments as part of their final group presentations.

In the Level 2 workshop, the final component provided theory session and practical exercises to promote the discussion and understanding of management options analyses that typically might follow on from the original stock assessments. The final day of the workshop provided participants with an excel based, age structured stock assessment model for a hypothetical one species, two region, two gear fishery. They were then tasked with, firstly, interpreting and describing the results of an initial stock assessment, and secondly, through discussion with “fisheries managers”, identifying and running analyses of various management options for that fishery. They were then required to present these analyses back to the workshop in a 20 minute presentation to demonstrate their understanding of stock assessment and management options concepts.

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 at both domestic and regional levels.

#### **4.6 Facilities and materials**

Both workshops were held at SPC Headquarters, Noumea, utilizing the small conference room and the new and enlarged computer laboratory. Both workshops ran over 6 days, with, in general, each day generally comprised 4 sessions, with the theme of each session outlined in Tables 1 and 2. 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. Each

day started with a review of key points from the previous days session, including a question/answer session where participants were expected to show their understanding of the previous days content. The same method was used on the last day when reviewing the entire week.

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. They were also provided with a CD onto which they could burn a copy of all presentations and practical sessions at the end of the week.

## **5. Communication strategy**

The workshops were first advertised via email to OFMP focal points and heads of fishery departments in February 2007. Follow up emails to remind potential participant countries to submit their nominations were sent out once per month for the following 3 months.

Where email communications were impeded or no response was forthcoming, countries were contacted via fax, telephone or hand delivered invitations at regional meetings. 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.

Following the workshops it is SPC's intention to provide feedback on the workshops to participating countries, territories, funding bodies and interested regional organizations. This will be done through the distribution of the workshop report (including to SC3), communications via email to heads of fishery departments, and a summary of the workshops posted on the SPC website.

**Table 1 – Outline of the design and content of the Level 1 Stock Assessment Workshop, held June 2007 at SPC in Noumea.**

Day	Day 1 - Monday	Day 2 - Tuesday	Day 3 - Wednesday	Day 4 - Thursday	Day 5 - Friday	Day 6 - Saturday
Theme	Background	Stock assessment - Key principles	Parameter Estimation - Recruitment	Parameter Estimation - Selectivity/Catchability	Biological reference points	Discussion Paper
Review 8.15am	Welcome/ Introductions/Overview/Background/Objectives	Review Of Day 1 Key Principles and components	Review Of Day 2 Theory	Review Of Day 3 Theory	Review Of Day 4 Theory	Review Of Day 5 Preparation
Session 1 (0830 - 1000)	Overview - Stock assessment and tuna fisheries in the WCPO	Key Principles and components	Theory	Theory	Theory	Preparation
	Discussion - how are stock assessments currently used in country	Types of model	Theory	Theory	Practical	Preparation
<b>MORNING TEA (1000 - 1030)</b>						
Theme	Fish populations and fished population dynamics	Modal Progression - length cohorts	Parameter Estimation - Recruitment	Parameter Estimation - Selectivity/Catchability	Biological reference points	Final Review
Session 2 (1030 - 1200)	Fish population dynamics	Theory	Practical	Practical	Practical	Review Week
	Fish and "fished" population dynamics	Theory	Practical	Practical	Practical	Review Week
	Fished population dynamics	Theory	Prac/Discussion	Prac/Discussion	Prac/Discussion	Preparation
<b>LUNCH (1200 - 1300)</b>						
Theme	Oceanographic Considerations	Parameter estimation - Growth	Parameter Estimation - Mortality (Natural and Fishing)	Abundance indices & fitting CPUE data	Ecosystems Research for Fishery Management	Discussion Paper
Session 3 (1300 - 1430)	Oceanography of the WCPO	Theory	Theory	Theory	Theory	Preparation
	Oceanographic impacts on fish populations	Theory	Theory	Theory	Theory	Preparation
	Oceanographic impacts on fisheries	Theory	Theory	Theory	Theory	Preparation
<b>AFTERNOON TEA (1430 - 1500)</b>						
Theme	Oceanographic Considerations	Growth/Modal progression	Parameter Estimation - Mortality (Natural and Fishing)	Abundance indices & fitting CPUE data	Ecosystems Research for Fishery Management	Discussion Paper
Session 4 (1500 - 1630)	Population dynamics practical	Practical	Practical	Practical	Practical	Presentations
	Oceanographics practical	Practical	Practical	Practical	Practical	Presentations
	Oceanographics practical	Prac/Discussion	Prac/Discussion	Prac/Discussion	Practical	Presentations

**Table 2 – Outline of the design and content of the Level 2 Stock Assessment Workshop, held July 2007 at SPC in Noumea.**

Day	Day 1 - Monday	Day 2 - Tuesday	Day 3 - Wednesday	Day 4 - Thursday	Day 5 - Friday	Day 6 - Saturday
Theme	Background	Stock assessment - Key principles	Parameter Estimation - Recruitment	Parameter Estimation - Selectivity/Catchability	Biological reference points	Discussion Paper
Review 8.15am	Welcome	Review Of Day 1	Review Of Day 2	Review Of Day 3	Review Of Day 4	Review Of Day 5
Session 1 (0830 - 1000)	Overview	Theory	Theory	Theory	Theory	Preparation
	Fish population dynamics	Theory/Prac	Theory	Theory	Theory	Preparation
	Fish population dynamics/ Fished population dynamics	Prac/Discussion	Theory	Theory	Theory	Preparation
<b>MORNING TEA (1000 - 1030)</b>						
Theme	Oceanographic Considerations	Recruitment	Fitting CPUE data	Tagging	Management Options	Final Review
Session 2 (1030 - 1200)	Oceanography of the WCPO	Theory	Practical/Discussion	Prac	Theory	Review Week
	Oceanographic impacts on fish populations	Theory/Prac	Practical/Discussion	Prac	Theory	Review Week
	Oceanographic impacts on fisheries	Prac/Discussion	Practical/Discussion	Prac/Discussion	Theory	Preparation
<b>LUNCH (1200 - 1300)</b>						
Theme	Oceanographic Considerations	Mortality	Biological Reference points	Ecosystems Research for Fishery Management	Management Options	Discussion Paper
Session 3 (1300 - 1430)	Fish population dynamics prac	Theory	Theory	Theory	Theory/Discussion	Preparation
	Oceanographics prac	Theory/Prac	Theory	Theory	Theory/Discussion	Preparation
	Oceanographics prac	Prac/Discussion	Theory	Theory	Theory/Discussion	Preparation
<b>AFTERNOON TEA (1430 - 1500)</b>						
Theme	4. Stock assessment - Key principles	Selectivity/Catchability	Biological Reference points	Ecosystems Research for Fishery Management	Management Options	Discussion Paper
Session 4 (1500 - 1630)	Key Principles and components	Theory	Prac	Prac	Prac	Presentations
	Key Principles and components	Theory/Prac	Prac	Prac	Prac	Presentations
	Types of model	Prac/Discussion	Prac/Discussion	Prac/Discussion	Prac/Discussion	Presentations

## 6. Participation

SPC received 22 nominations for the workshops. Two of these were subsequently withdrawn, and one participant was unable to attend due to a ferry breakdown. Two fisheries management officers from FFA were also invited to attend, one to each workshop. The 10 participants that attended the Level 1 workshop and 11 that attended the Level 2 workshop, along with a description of their current roles, are listed in Appendix I.

## 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. Participation was funded as follows:

1. GEF funds (for OFMP beneficiary countries)
2. Western Pacific Fisheries Management Council funds for US territories (Guam)
3. SPC small projects funding (French Territories)
4. Japanese Government funded "WCPFC Project on Capacity Building in Fisheries Statistics, Regulation and Enforcement for Small Island Developing States" as administered by the WCPFC (Philippines, FSM, Fiji)

The attendance of non-GEF member countries and territories at the workshop was very important, given that these participating members of the WCPFC Commission have similar needs (e.g. stemming from obligations under the Convention and international agreements (UNCLOS, UNSFA)). Note also that Japanese/WCPFC funding for FSM and Fiji was sought by SPC to ensure that their 2006 participants were able to continue their training, after those countries nominated different officers in the first instance.

## 8. Final Budget

Table 3 - summary of workshop costs (in US dollars)

<b>Cost item</b>	<b>USD</b>
Airfares	29 179
Shuttle transfers	693
Per diems	28 047
Stationary	164
T-shirts	335
Catering	1 000*
<b>Total</b>	<b>59418</b>

\* estimate for catering based on initial quote

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

The workshop facilitators were Don Bromhead, Brett Molony, Adam Langley, John Hampton, Simon Nicol, Helene Ixeko and Kay Parry. Additionally, two FFA fisheries management staff, Steve Shanks and Samasoni Sauni, also kindly assisted in facilitation/presentation of some sessions relating stock assessment to fisheries management. 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 workshops were able to meet their objectives. These were:

1. Assessment of participant's performance;
2. Assessment of the workshop by participants; and
3. Self assessment by SPC, including:
  - a. Implementation of changes recommended from 2006.
  - b. Additional improvements to be made for 2008

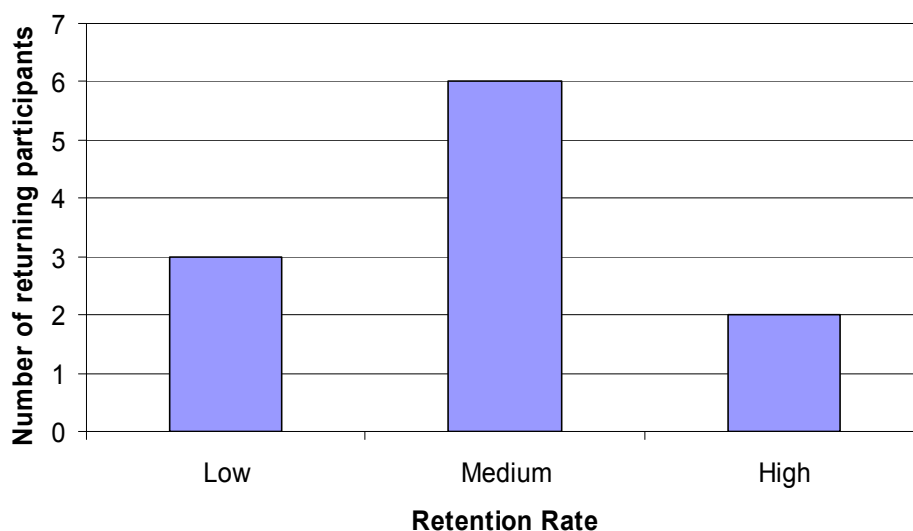
### **10.1 Assessment of participant's performance**

Given the workshop style nature of this endeavour, participant performance was not formally assessed on an individual basis by written or oral examination. However, informal assessment methods were used, including the following.

**10.1.1 Testing of memory retention** – A questionnaire was provided to Level 2 workshop participants on the first morning of the first day to try and gain some idea of the degree to which they had retained knowledge of stock assessment from the 2006 workshop. The questionnaire comprised 12 questions testing their understanding of basic principles of stock assessment as well as their memory of key outputs from current assessments. Answers were marked by facilitators on a scale of 1 to 4, with 1 indicating no answer or a completely wrong answer, 2 indicating limited understanding, 3 indicating significant understanding and 4 indicating comprehensive understanding. A comparison of the survey results with those from the end of the 2006 workshop suggest significant loss of memory of what was learnt in 2006 for many of the participants.

This is a key issue and under the current structure will impede progress towards achieving the ultimate objectives of the workshops. It highlights the requirement for mechanisms to be put in place to ensure participants are able to retain and build upon and use their understanding of stock assessment over the long term, not just in the few months proceeding a workshop.

SPC recognized that this was an issue during the review of the 2006 workshop but had no funding or staff resources to follow through and address this. It had



**Figure 2** – Number of returning participants to Level 2 workshop who scored either low, medium or high on their questionnaires aimed at testing the retention of knowledge learnt in the 2006 stock assessment workshop. “Low” indicates a mean question score of between 1-2, suggesting little or no retention of knowledge. “Medium” indicates a mean score of 2-3, suggesting partial retention of knowledge, and “High” indicates a mean score of 3-4, suggesting very significant retention of knowledge.

not been recognized as an issue in the original OFMP plan, which only suggested a requirement for 2 workshops over 5 years. However, SPC has recently applied for funding to the WCPFC administered and Japanese Government funded “WCPFC Project on Capacity Building in Fisheries Statistics, Regulation and Enforcement for Small Island Developing States”. SPC is hopeful of not only being able to run annual stock assessment workshops but also develop web based training/revision tools for participants that will facilitate memory retention in between workshops. Discussion of this issue with workshop participants in 2007 indicated a great willingness to participate in remote/online revision exercises, potentially on a once monthly basis. If instigated, SPC may discuss with participating countries the possibility of making participation in online revision exercises a prerequisite for individuals future participation in subsequent workshops. This concept will need to be discussed with and signed off by participating countries and territories.

**10.1.2 Laboratory Exercises** – Workshop facilitators were able to judge participant understanding of concepts throughout the workshop by assessing answers and progress during the laboratory exercises. Where participants showed a lack of understanding of key concepts, short interludes in the laboratory sessions were held to go over those concepts again and ensure uptake of key principles. The laboratory exercises were particularly useful in highlighting those participants who might not yet have the required technical skills and background to benefit from workshops such as this (see section 10.3.2 for further discussion of this issue).

**10.1.3 Daily revision** – Each day of the workshops started with a 15-30 minute review of the preceding days material, presented as a informal verbal exam to the group. This was aimed at encouraging them to revise material overnight, to ensure they understood the key concepts, and to provide a non-threatening opportunity to build confidence in speaking about stock assessment in front of their peers. Workshop facilitators were impressed with the ability of participants to answer most of the questions posed to them regarding the previous days material, indicating good short term uptake. A similar exercise was run on the last day of the workshop but revising key concepts from the entire week. Again, participants ability to respond to questioning was judged to be very good.

**10.1.4 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 either the relevance and implications of regional stock assessments to fisheries management in participating countries (Level 1 workshop) or using a stock assessment model to run management options analyses based on a hypothetical fishery situation, and present these back to the group (Level 2 Workshop). 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.

**10.1.5 Post workshop evaluation** – Throughout both workshops the facilitators spent significant time with each of the participants (mostly during the laboratory sessions) and, in combination with assessment of final presentations, were able to gain a good understanding of the relative ability and understanding levels of each of the participants. After the workshop finished, both the main facilitators ranked each participant according to their demonstrated technical ability and theoretical understanding of the concepts. The final score for each participant was the average of the two facilitators separate scores.

The results of this exercise suggested that 16 of the participants had sufficient to very good overall technical ability and theoretical grasp of concepts, while 4 were “barely sufficient” and 6 participants clearly struggled with both technical and theoretical components. Whether some countries might in future wish to nominate participants with more appropriate technical skills and theoretical background will be discussed further with the countries involved. SPC recognizes and appreciates that in some cases, a country simply will not have staff with the required starting skill levels, and will in those instances try to adapt course content to ensure those participants can still participate and gain from the training. This strategy may also include SPC undertaking some opportunistic one on one training when in country or at regional meetings.

## 10.2 Assessment by participants

The second workshop assessment tool took the form of a generalized feedback questionnaire (Table 3) in which participants were asked a range of questions relating to the design, contents, presentation, structure and other aspects of the workshop. This assessment was undertaken by the Level 1 workshop only. The Level 2 workshop did not complete the questionnaire due to the workshop running very late on the last day. SPC has since sent out this questionnaire to Level 2 participants but had not received all feedback in time for this report.

The results from the assessment by Level 1 participants is 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). One participant expressed uncertainty as to whether the workshop would assist them at regional meetings or in their daily work. It should be noted that in some cases, the participants may not be in positions whereby they would be likely to attend regional meetings in the short term, although this likelihood may increase with training such as this.

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

**Table 3** – Frequency of responses of Level 1 workshop participants to end survey regarding the stock assessment workshop.

	The material and its presentation	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
1	The aims of the workshop were clear	8	1			
2	Sessions were well planned and organized	6	3			
3	The objectives for each session were clear	7	1	1		
4	The explanations of the concepts and topics were clear	8	1			
5	The presentations stimulated interest	6	3			
6	There were enough opportunities to ask questions	6	2	1		
7	The examples used in the theory and practical sessions improved my understanding	7	1			
8	There was a good balance between theory and practical work	6	2	1		
9	The practical and review material reinforced what was discussed in the theory sessions	6	3			
10	The review exercises of previous stock assessments reinforced the theory and practical work	7	1			
11	The review exercise of the new stock assessments reinforced the theory and practical work	7	1			
12	I will be able to apply what I have learnt from the workshop in my daily work	5	3	1		
13	After participating in this workshop, I have a better understanding of the processes involved in undertaking a stock assessment	7				
14	After participating in this workshop, I will be better able to contribute and discuss stock assessments domestically and at regional meetings (e.g. SC, WCPFC, HoF meetings)	5	3	1		
	How would you rate the Workshop overall ?	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
15	This Workshop challenged me to think critically about stock assessments	5	3			
16	I would recommend this workshop to other staff members	7	1			
17	I would consider attending further Workshops on stock assessments in the future	8				
18	Overall, I think this workshop was useful	8				
General Comments						
19	Which part(s) of the Workshop did you like the most? Why?					
20	Which part(s) of the Workshop did you like the least? Why?					
21	Can you suggest how future Workshops could be improved to make the outcomes more useful to participants?					
22	What were the strengths and weaknesses of the OFP staff who contributed to the Workshop?					
23	Any other comments or suggestions?					

***Which part(s) of the workshop did you like the most? Why?*** Many participants indicated that the practical sessions were the most useful, due to these enabling them to “visualize” the assessments and the links between different components, and to consolidate their understanding of the theory sessions. Some preferred the theory sessions, finding the practical component technically challenging.

***Which part(s) of the workshop did you like the least? Why?*** With three French territory participants in this workshop, difficulties in understanding materials was the most common issue raised. Unfortunately, significantly greater funding would be required to ensure translation services were available during sessions and all documents were translated into French. However, this issue will be considered further in future.

***Can you suggest how future workshops could be improved to make the outcomes more useful to participants?*** Again, the issue of language was raised and will be looked at in 2008. There was significant interest in being able to undertake exercises that involve the use of MULTIFAN-CL, and the possibility of setting up a simplified age structured assessment using MULTIFAN will be investigated for 2008. Some requests for the workshop to be longer were made, however this will depend on funding and OFP capacity/workload. Requests were also made for regular remote revision exercises to be undertaken and this is one key area that OFP will definitely look to develop over the next 12 months to ensure memory retention of what was learnt at the 2007 workshops.

***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 availability.

***Any other comments or suggestions?*** Requests were made for: follow-up SAWs prior to SC meetings each year; pooling participants on a subregional basis, increased use of materials/examples from outside the Pacific (e.g. other RFMO assessments).

### **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 another very significant step towards meeting the overall stock assessment related objectives of the OFMP.

However, SPC is also very aware that such capacity building exercises do not achieve their goals overnight and are a long term and ongoing endeavor. SPC has spent significant time post-SAW in determining how future workshops might

be further strengthened. The following represents a self appraisal of some key elements of the 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 far more successful than in 2006. There was a much better response to the request for countries to be far more proactive and timely in submitting their nominations (relative to 2006), which made logistical organization of the workshop much easier.

### ***10.3.2 Participant eligibility***

It is very important that countries send participants who, firstly, have sufficient technical skills and ability to work with programs such as Microsoft Excel, and secondly, 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.

A number of the assessment and review mechanisms employed during the workshop were able to identify those participants who might not yet have the required technical skills and background to benefit from workshops such as this. This particular issue will be raised in an appropriate manner with the heads of department in the countries that nominated these officers. It is important to note that capacity building will most likely be achieved if countries nominate their most qualified officers in the first instance and then continue to nominate those same officers in subsequent years to reinforce and build upon their understanding. Some countries look to alternate nominated officers to spread training opportunities across staff, however it should be noted that this strategy will ultimately result in a very low level of capacity within departments, because staff quickly lose skills and knowledge if not involved in these endeavors over a long time period.

However, SPC does recognize that not all countries and territories would be able to send such an officer, due to resource limitations, logistical and other issues, and in 2007 SPC did accept nominations for officers who do not fulfill those criteria fully. We will however continue to encourage appropriate nominations in the future. SPC will also try, whenever funding and resources allow, to accommodate countries who wish to send a second “untrained” officer to start their training at these workshops, recognizing this strategy protects departmental capacity against staff turnover.

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

SPC responded to and met nearly all recommendations coming out of the review of the 2006 stock assessment workshop. In particular, as recommended, the workshop was held a month prior to SC, is likely to be run on an annual basis, was split into two components to separately accommodate the differing knowledge levels of returning participants and new participants, and shortened to reduce meeting fatigue,

SPC did not instigate an online training mechanism for participants as had been hoped due to a lack of funds and staff resources but this significant endeavour will hopefully be addressed in 2007/08 if sufficient funding and staff resources can be acquired (See previous discussion).

### **10.3.4 Workshop contents**

Responding to recommendations from the review of the 2006 workshops, the OFP:

1. Increased the number of opportunities where participants were actively encouraged to ask questions and speak to the group on the topic of stock assessment. This element of the workshop probably still needs to be strengthened further, but is a little constrained between time needed to teach the materials and time available for group discussion. This will be looked at further in 2008.
2. Included specific sessions on oceanographic impacts and science for the ecosystems approach to fishery management
3. Substantially increased the amount of reviewing of key concepts throughout the workshop.
4. Undertook testing of participant understanding throughout the workshop in order to identify concepts which required further explanation.

Feedback from participants indicates that the contents of the workshop were pitched at an appropriate level. However, a number of exercises are being considered as additions to future stock assessment workshops. These include:

1. Expansion of sections involving tagging data: regional tagging programmes are underway and likely to be expanded in the near future. These programmes are critical in providing estimates of a range of parameters that will be incorporated into future stock assessments for the WCP-CA (e.g. movement, growth, mortality, biomass). It is essential that participants at all SAW levels are made aware of the utility of tagging programmes to stock assessments, and how and where parameter estimates from tagging programmes can be incorporated in assessment models. This will involve an expansion of theory and practical sessions in 2008

2. Extension of CPUE standardization: this is an important issue where increased emphasis and understanding of the issues and methods would be important to participants. While CPUE standardizations theory and practical session were presented to both levels at 2007 workshops, it is likely to be expanded in 2008.
3. Emphasis on the most recent stocks assessments for the main tuna species and other species that interact within tuna fisheries in the WCP-CA as they become available. This may be undertaken by the participants during the workshop or throughout the year but will emphasize the assessments and concepts raised in the Workshops, including interpretations and uncertainties.

### **10.3.5 Other issues**

Two final points require mention here. Both revolve around the future of stock assessment workshops as a capacity building endeavour.

Firstly, SPC will also look to develop some indicators that will help determine if the stock assessment workshops actually result, over the long term, in increased participation by countries in the SC, and if participants are actually using their training/knowledge of stock assessment in domestic and regional decision making processes.

Secondly, in the original planning of the stock assessment workshops for the OFMP project, it was intended that after an initial period of development of material and running workshops, that the materials and concept would be handed over to the University of the South Pacific, who might then incorporate these into a more formal education/training framework, although with continued collaboration and participation by SPC. This possibility is still under discussion between SPC and USP and will be reported on again at the next SC.

## **11. Conclusion**

Based on the above assessments, SPC considers that the 2007 Stock Assessment Workshops will contribute significantly towards meeting the longterm 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. However, 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, as well as the development of online/remote training and revision facility that will ensure memory retention of key concepts in between the workshops. SPC aims to improve the workshop further in future years based on participant's assessments and feedback. This report has highlighted where improvements are required in the stock assessment workshop program, however, the degree to which these

improvements will be made will very much depend on securing the required funding and staff resources.

The workshop concept was endorsed by the Scientific Committee of the Western and Central Pacific Fisheries Commission in 2006 and the outcomes of the workshop, as described in this report, will be presented at the SC3 and at the 4<sup>th</sup> OFMP Regional Steering Committee meeting to be held in the Cook Islands, in October 2007.

## Appendix I - Participants

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