

# The Oceanic Fisheries of the Western and Central Pacific

A baseline study

Strategic Action Programme (SAP) of the Pacific Small  
Island Developing States

Project No: RAS/98/G32/A/1G/99

July 2002

## **Summary**

### **Introduction**

Following an analysis of transboundary marine issues in the Pacific, a Strategic Action Programme (SAP) for the International Waters (IW) of the Pacific Islands region was completed in 1998. In the context of oceanic fisheries, the SAP noted that there was inadequate understanding of the definitive 'warm pool' oceanic ecosystem of the western and central Pacific Ocean (WCPO) and a lack of coherent strategies to manage the globally significant tuna fisheries based there. In early 2000 a UNDP/Global Environment Facility (GEF) IW Project valued at US\$12.06 million<sup>1</sup> commenced, including an Oceanic Fisheries Management (OFM) component to be completed over the period 2000 to 2003.

The 14 independent Pacific island countries of the WCPO are all participants in the IW project. They are also members of the two regional agencies through which the project is funded, the Forum Fisheries Agency (FFA) and the Pacific Community (PC). While the FFA and PC are responsible for the oceanic fisheries management and scientific research respectively, there is considerable cooperation between them at all levels.

This study provides a baseline review of the status of the oceanic fisheries resources of the WCPO and the fisheries based on them, as at early 2000. It will be used as a reference point for the evaluation of the OFM component of the current IW project.

### **Status of oceanic fisheries resources and associated research**

The WCPO oceanic fishery is based on four key tuna species – skipjack, yellowfin bigeye and albacore tuna. Total landings of these species in the WCPO region in 1999 were 1.7 million tonnes. Of this total, a little over one million tonnes were caught in the Pacific islands region, making it the most significant tuna fishery in the world. The WCPO tuna species are more productive than the more temperate tunas, including the heavily overfished northern and southern bluefin tuna. Research by the Secretariat of the Pacific Community (SPC) has shown that in general, WCPO tuna stocks are healthy, particularly when comparisons are drawn with other major fisheries worldwide. The impact of fishing on albacore and skipjack tuna has been light, while yellowfin tuna is considered to be fully exploited. Increasing catches, combined with low recruitment levels, have substantially reduced the bigeye stock. While the stock level has increased slightly, there is still a concern that low recruitment levels and continued high catches of juvenile bigeye tuna by purse seine in the WCPO will further reduce the stock level.

In common with other fisheries, increased attention is being paid in the WCPO to the ecosystem effects of oceanic fishing, including levels of non-target catches, otherwise known bycatch<sup>2</sup>. Overall, bycatch levels in the region are relatively low in comparison

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<sup>1</sup> All monetary values in this paper are in US dollars unless otherwise stated.

<sup>2</sup> For the purpose of this paper, bycatch is defined to include by-product species (i.e. those species that have commercial value and are retained) and other non-target species (i.e. those that have no value or are protected and are not retained).

with other fishing methods. The purse seine fishery, which accounts for around 80% of total catch in the region in 1999, has a bycatch rate of less than 1%. Longline fishing is more problematic; with bycatch rates as high as 40%. However, much of this catch has commercial value, and is landed as by-product. Information on the sustainability of most bycatch species is sparse and below that required to comply with recently agreed international legal instruments for fisheries.

Oceanic fisheries research is centred on the work on the Oceanic Fisheries Programme (OFP) of the SPC. The OFP has three major programmes – statistics and monitoring, which provides the basis for stock assessments at both regional and national levels; tuna biology and ecology, which undertakes analyses to understand biological parameters and environmental processes; and stock assessment and modelling. The tuna and related data sets held by OFP are considered to be among the best in the world, as are the techniques being used to assess stocks and related ecosystem interactions.

The quayside value of the Pacific islands region tuna catch was approaching 2 billion dollars in 1999. Income from the tuna fishery in the region has grown to around 11% of the combined GDP of Pacific islands and makes up about one-half of total exports. Globally, the regional catch accounted for about one third of the world's tuna supply, 60% of all canned tuna and about 30% of the tuna supplied to the Japanese sashimi market.

The majority of this fish (around 1 million tonnes) was taken by the purse seine fishery, which is dominated by the distant water fishing nation (DWFNs) fleets of Taiwan, USA, Japan and Korea. Purse seine vessels are technologically sophisticated and require extensive capital and maintenance. Almost none of the approximately 200 purse seine vessels operating in the region in early 2000 were locally owned and operated. Purse seine-caught fish is mostly skipjack tuna, which has a relatively low per unit value of around US\$1,000 per tonne and is used for canning.

Longline fishing targets large, high value tuna for the more valuable sashimi or table market. While the catch (around 185,000 tonnes in 1999) is a fraction of that taken by purse seiners it is comparable in value. The longlining fleet in the WCPO is large, with about 850 longline vessels operating in early 2000. The investment to establish a longline operation is less than for purse seining, and a growing number of the longline vessels operating in the Pacific islands region are locally owned and operated (385 in 1999). This fishery provides a major source of income and a very significant development opportunity for Pacific island countries.

### **Economic and development aspects**

All Pacific island States wish to derive greater value from their tuna fisheries, and are seeking to increase their direct involvement through employment, fleet services and local ownership and operation of fishing and processing operations. There have also been ongoing attempts to increase the level of access fees. In addition to national initiatives, regional agreements are being used to offer economic incentives to DWFN fleets to base locally and increase spending within Pacific islands.

To ensure a sustainable flow of benefits to Pacific island economies from the oceanic fishery, considerable effort is being expended on the development of effective fisheries management arrangements in the WCPO. Given the highly migratory nature of the tuna resource these arrangements are being designed to extend beyond national initiatives (that is, within exclusive economic zones or EEZs) to include regional and multilateral cooperative arrangements. Of particular significance are the areas of high seas, management guidelines for which are set out in the United Nations Fish Stocks Agreement (UNFSA). The UNFSA provided the basis for a major fisheries management initiative, the Multilateral High Level Conference (MHLCC) process, which was finalised in September 2000 with the adoption of a WCPO-wide Convention. The Convention outlines arrangements for the comprehensive management of the highly migratory fish stocks of the region within the area covered by the Convention. All SAP countries participated in this process.

Cooperation on a range of management issues through the FFA has led to a range of key conservation and management initiatives. Especially powerful have been the so-called Minimum Terms and Conditions (MTCs) that have laid down common requirements of access and fishing in the EEZs of FFA countries. The MTCs include a mandatory requirement for all DWFN vessels to be registered at FFA, the carriage of a vessel monitoring (tracking) system (VMS) and observers. Other agreements exist to restrict the level of fishing effort by purse seine vessels and to allow for cooperative monitoring control and surveillance (MCS) activities. These regionally-agreed initiatives are implemented at national level, and in some cases are administered or coordinated by the FFA Secretariat. Collectively, these initiatives have established a level of regional cooperation in oceanic fisheries management that is unique in the world.

At a national level, most FFA countries are at various stages of developing and implementing national management plans for their tuna fisheries. These lay the foundation for establishing reasonable allowable catches and / or levels of fishing effort and the control of fisheries development within EEZs. An effective body of fisheries law at a national level is also required to give effect to the rights and responsibilities of FFA countries. Through FFA regional programmes, countries are revising national laws, such as fisheries acts, to comply with emerging international agreements, including the UNFSA, as well as to support national fisheries management initiatives, including MCS activities.

### **The next five years**

The five years following the commencement of the IW project (February 2000) will be crucial for the future of the WCPO tuna fishery. Displaced vessels from fisheries that have been more heavily exploited are increasingly being attracted to the region at the same time as Pacific islands are seeking to increase their own fishing activity. While stocks are healthy at present, it has been agreed that a precautionary approach must be taken to prevent unsustainable fishing.

First, it will be necessary to develop a sufficient understanding of the population dynamics of tuna and related species, as well as environmental issues, including oceanic

ecosystems and oceanography, and information on bycatch species will be required. This will enable ecologically sustainable levels of catch or fishing effort to be set, monitored and adjusted as necessary. Secondly, the concurrent implementation of effective management measures, based on best available science, will be required. These arrangements will need to give due recognition to all interested parties, including FFA countries, DWFNs, non-FFA countries in the region and territories.

Increasing the understanding of how oceanic resources and their supporting ecosystems change over time requires good coverage of data. Considerable gaps exist, particularly in the case of the South East Asian fisheries (Indonesia and Philippines) and to a lesser extent in information from fisheries in FFA countries. The further development of observer and port sampling programmes, combined with training and other assistance will help increase data flow and provide invaluable validation for existing and future logbook data.

Stock assessment is likely to make major advances over the next five years, particularly with the application, testing and refinement of cutting-edge and increasingly robust integrated fisheries assessment models for the four key tuna species. Using these models, reference points will be developed against which the status of the fishery will be assessed. Managers will then use these assessments as the basis for the implementation of control measures both at national and multilateral levels. Research on the wider oceanic ecosystem and the effect of El Nino/Southern Oscillation (ENSO) events on the resource and associated fisheries will contribute to a more wholistic understanding of the dynamics of WCPO oceanic living resources.

The next five years will see the FFA group coming to terms with the implementation of a comprehensive multilateral fisheries management regime for the WCPO based on UNFSA and arising from the MHLC process. The Convention will provide a basis for the negotiation of detailed management measures, institutional structures and administrative arrangements. It is essential that these arrangements be efficient and cost effective. The vulnerability of island States in terms of their ability to contribute to the development of new management arrangements and participate effectively in relevant forums will be a critical issue to be addressed. In addition, it will be very much in the interests of FFA countries (and arguably, all MHLC participants) if current regional arrangements are grafted onto Commission-wide initiatives. These include OFP scientific services and the FFA regional register, observer programme and VMS.

While these structures and processes are being negotiated, growing concerns over the status of bigeye tuna stock will need to be addressed. FFA countries will need to give consideration to the development of a management framework for bigeye tuna, and possibly yellowfin. Control of the purse seine fleet in the Pacific islands area through a thorough review and updating of regional cooperative arrangements will be pivotal to gaining effective control over catch levels.

At a national level, FFA countries will continue to build a base of management-related initiatives through the completion of national management and development plans, MCS initiatives, and updated fisheries laws. Many of these actions will be based on the need to

give effect to the WCPO Convention. The domestic fishing and processing industry of the Pacific islands will continue to expand, with an emphasis on small to medium-sized tuna longlining operations.

### **Conclusion**

The SAP-based IW project has a critical niche to fill in supporting regional and national initiatives as outlined in this document. It will provide for incremental funding support across a wide suite of WCPO oceanic research and management initiatives to be implemented by FFA and SPC. This funding will add to the already substantial investment (estimated at \$16.5 million per annum) being made in oceanic fisheries management by other donors and Pacific island countries in the region. Such support will be crucial in determining if the use of WCPO oceanic resources can be placed on a truly ecologically sustainable basis, before the usual pattern of overfishing, severe depletion and economic hardship occurs.

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### List of Attachments

1. Terms of Reference
2. Oceanic fisheries resources (national): baseline status SAP Beneficiary Countries
3. International and Regional Fisheries Agreements – baseline status SAP Beneficiary Countries
4. Fisheries monitoring, control and surveillance: baseline status SAP Beneficiary Countries
5. Fisheries management: baseline status SAP Beneficiary Countries
6. Key oceanic fisheries management weaknesses, key areas addressed by SAP and project progress in 3/5
7. Baseline capital and recurrent costs of oceanic fisheries management
8. Key oceanic fisheries activities

**Acknowledgements:** The following kindly reviewed this document or parts thereof: Mr Andrew Wright (SPREP); Dr Tony Lewis (SPC); Dr John Hampton (SPC); Dr Transform Aqorau (FFA); Mr Len Rodwell (FFA); and Mr Les Clarke (FFA). A number of other staff from FFA and SPC had input into this report and their time and effort is gratefully acknowledged.



## ABBREVIATIONS

CES	catch and effort query system
CSPODP	Canadian South Pacific Oceans Development Programme
CPUE	catch per unit of fishing effort
DWFN	distant water fishing nation
ECOPATH	a software programme that allows for the modelling of entire ecosystems
EEZ	exclusive economic zone
ENSO	El Nino / Southern Oscillation
EPO	eastern Pacific Ocean
EU	European Union
FAD	fish aggregating device
FAO	Food and Agriculture Organisation of the United Nations
FFA	Forum Fisheries Agency
FFC	Forum Fisheries Committee
FOC	flag of convenience
GEF	Global Environment Facility
GLOBEC	global ocean ecosystem dynamics
IATTC	Inter-American Tropical Tuna Commission
ICWM	integrated coastal and watershed management
IUU	illegal, unregulated and unreported (fishing)
IW	International Waters
LME	large marine ecosystem
LOSC	UN Law of the Sea Convention, 1982
LODYC	Dynamic Laboratory of Oceanography and Climatology, University of Paris, France
MCS	monitoring, control and surveillance
MHLC	Multilateral High Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific
MTCs	Minimum Terms and Conditions (of access)
MULTIFAN-CL	a length-based age-structured computer model used for fish stock assessment

NAD	non-target, associated and dependent species
NFA	National Fisheries Assessment
OFCCP	Ocean Fisheries and Climate Change Project
OFM	Oceanic fisheries management
OFP	Oceanic Fisheries Programme of the Secretariat to the Pacific Community
PFRP/UH	Pelagic Fisheries Research Programme/University of Hawaii
PDO	Pacific Decadal Oscillation
RFMO	regional fisheries management organisation
RTTP	Regional Tuna Tagging Programme
SCTB	Standing Committee on Tuna and Billfish
SEPODYM	spatial environmental population dynamic model
SPC	Secretariat to the Pacific Community
SPRTRAMP	South Pacific Regional Tuna Research and Monitoring Programme
SSAP	Skipjack Survey and Assessment Programme
TFA	Tuna Fisheries Assessment
UNDP	United Nations Development Programme
UNFSA	United Nations Implementing Agreement on Highly Migratory Fish Stocks and Straddling Fish Stocks 1995 (short title)
WCPO	western and central Pacific Ocean

## 1. Introduction

### 1.1 SAP project overview

In 1997 the Global Environment Facility (GEF) undertook a comprehensive analysis of transboundary marine issues in the Pacific. Using this analysis, a Strategic Action Programme (SAP) for the International Waters (IW) of the Pacific Island Region was completed in 1998 (Cook Islands et al. 1998) for fourteen Pacific island States<sup>3</sup>. The SAP identified the unsustainable exploitation of living and non-living resources as an imminent threat, the root causes of which were related to two key areas: governance and understanding (of the resources and their dynamics). These areas formed the focus of an associated five-year UNDP GEF International Waters SAP implementation project. The Project was signed in February 2000 and is currently being implemented. The project has two key components: Oceanic Fisheries Management (OFM) and Integrated Coastal and Watershed Management (ICWM). This baseline study is concerned only with the three year OFM component (2000-2003).

The Project identifies the Western Pacific Warm Pool ecosystem<sup>4</sup> as the ‘defining feature’ of the region, with boundaries that coincide with the western and central Pacific Ocean (WCPO) tuna fishery. This fishery is of national, regional and global significance, with annual catches approaching two million tonnes of tuna per annum.

The SAP and associated IW project highlight as key issues the inadequate understanding of the warm pool ecosystem, and the interactions within it. These interactions include large-scale physical and biological dynamics<sup>5</sup> and the effects of fishing on both target and bycatch species. A lack of coherent management regimes at national and regional levels are noted in the SAP as constraints on the ability to effectively manage fishing effort and thereby optimise economic returns to island States from the WCPO tuna fishery.

Key proposed outcomes for the project are: sustainable ocean fisheries; improved national and regional management capability; stock and bycatch monitoring and research, and enhanced national and regional management links. Actions to achieve these are based on institutional strengthening; capacity building, awareness raising and education, and research and information to support decision making; and investment. The OFM component of the project is to be implemented by the Forum Fisheries Agency (FFA)<sup>6</sup> and the Oceanic Fisheries Programme (OFP) of the Secretariat to the Pacific Community (SPC)<sup>7</sup>.

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<sup>3</sup> Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. These countries are also named as the SAP Beneficiary Countries in the Project Document.

<sup>4</sup> Systems such as the Western Pacific Warm Pool ecosystem are commonly referred to as ‘LMEs’ (Large Marine Ecosystems)

<sup>5</sup> See Lehodey et al (1998).

<sup>6</sup> The Forum Fisheries Agency is based in Honiara, Solomon Islands. Formed by the South Pacific Forum in 1979, the FFA’s mission is to enable its members to manage, conserve and use their tuna resources, through enhancing national capacity and strengthening regional solidarity. All SAP participating countries are members of FFA.

<sup>7</sup> The Pacific Community (PC) has a wider membership than the FFA, and includes the US, France and the US and French Territories. It delivers a wide range of regional programmes, including coastal and oceanic fisheries (the OFP). All SAP participating countries are members of the PC.

## 1.2 The Baseline Study

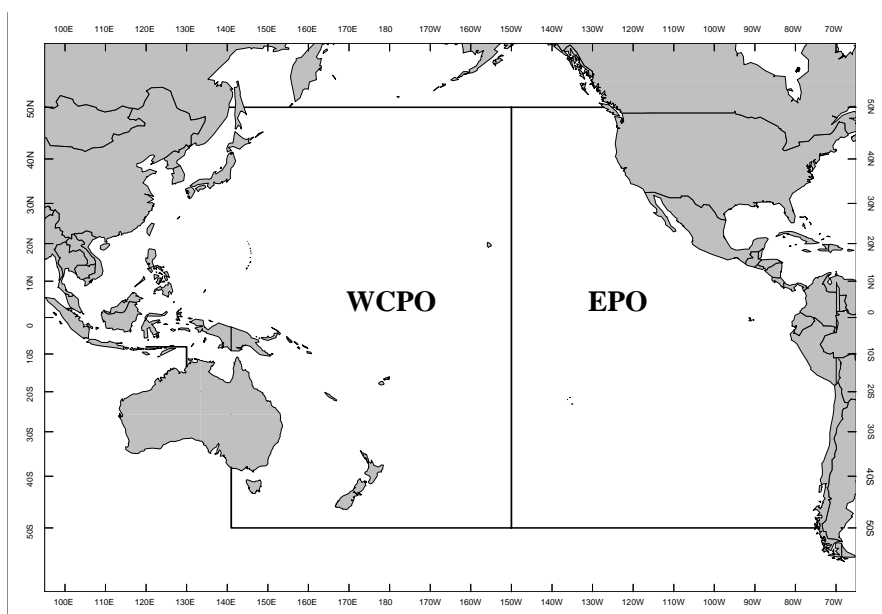
This study was commissioned by SPC in collaboration with FFA. The terms of reference for the study is provided as **Attachment 1**.

**The study presents the baseline situation in early 2000 concerning the knowledge and status of oceanic fisheries resources and associated fisheries in the WCPO. It describes current initiatives to address management and conservation issues, and the role of Pacific island States in these initiatives.**

In addition to the references provided, much of the information for the report was gathered directly from discussions and contributions from the staff of the FFA Secretariat and the OFP.

## 2. Biology and status of stocks

Figure 1 below shows the area referred to in this paper as the western and central Pacific Ocean (WCPO). It closely approximates to the Multilateral High Level Conference (MHLC)<sup>8</sup> Draft Convention Area as it stood at the beginning of 2000.



**Figure 1: Western and Central Pacific Ocean (WCPO) and Eastern Pacific Ocean (EPO)**

### 2.1 General biology

The tuna fisheries of the WCPO are based on four key species of tuna – skipjack, yellowfin, bigeye and albacore. The most productive area for tuna lies in the equatorial zone (10°N-10°S) where around 80% of all tuna landed in 1999 from the WCPO were caught (SPC data).

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<sup>8</sup> The Multilateral High Level Conference (MHLC) process was started in 1994 with the objective of developing a convention to establish a RFMO (regional fisheries management organisation) in the form of a Commission for the western and central Pacific.

Skipjack and small yellowfin and bigeye tuna school (frequently together) on the ocean surface and are commonly found in the tropical and subtropical waters of the WCPO. Schooling behaviour makes these fish vulnerable to surface fishing methods, the most significant being purse seine<sup>9</sup> and to a much lesser extent, pole and line. Larger yellowfin and bigeye are generally found in deeper water, where they are more widespread and are caught using longlines<sup>10</sup>. Some larger yellowfin (2-3 years) are also caught in free-swimming<sup>11</sup> schools.

In contrast to skipjack and yellowfin tuna, albacore concentrate in temperate areas where food is abundant. Small albacore are particularly common at the ocean surface where different water masses converge, while larger albacore are found in deeper waters (around the thermocline) and are caught on longlines.

Yellowfin and skipjack tuna spawn year round within 10 degrees of the equator and in waters in higher latitudes when the water is warm enough (>23-24°C). Bigeye tuna spawn to slightly higher latitudes but the duration of the spawning season is not known.

Tropical tunas are very productive and are generally much faster growing than their temperate counterparts (including albacore and southern bluefin tuna). A two year old skipjack is around 5-6 kg in weight and 65cm in length, while a two year old yellowfin can weigh close to 30 kg, with a length of 115-120 cm. Skipjack are sexually mature at age of one year or less, while yellowfin achieve maturity in probably less than two years.

Bigeye is the longest lived, slowest maturing (about three years) and largest of the tropical tunas, reaching a maximum length of over 200 cm. It is therefore less resilient to fishing than skipjack or yellowfin tuna. Albacore, as may be expected in colder water habitats are slower growing and longer lived, taking around 10 years to reach 20 kg in weight.

The biology (especially feeding habits, behaviour and mobility) of the key tuna species has an overriding influence on the distribution and type of fishing effort in WCPO oceanic fishery. The climatic and oceanographic effects associated with the El Niño/La Niña (or ENSO<sup>12</sup>) effect is known to have a particularly profound effect on the fishery. In this sense, an increased understanding of the biology and dynamics of the WCPO tunas within the context of the warm pool large marine ecosystem (LME) of the WCPO, is essential to achieving long term sustainability and optimal economic yields from the fishery (see Lehodey, 1998).

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<sup>9</sup> Purse seines consist of a wall of net that is used to surround schooling tuna and is then closed off by a wire to form a purse, holding up to more than 100t in a single set of the gear. Pole and line vessels catch surface fish from schools one by one, using a pole and lure.

<sup>10</sup> An extensive method of fishing using a mainline frequently over 100kms in length, from which baited hooks are suspended at regular intervals. The line and hooks are suspended from the surface by floats, which are also attached to the mainline.

<sup>11</sup> Purse seines are usually set around the following: i) natural floating objects (logs and floating debris), ii) specifically deployed objects called fish aggregating devices or FADs, or iii) free-swimming fish in schools that are not associated with an object. i) and ii) are sometimes known as associated sets. For reasons that are not well understood, tuna tend to aggregate around floating objects and fishing on these tends to increase the effectiveness of purse seines as well as catches of small bigeye, the latter where deeper nets are used.

<sup>12</sup> El Niño / Southern Oscillation.

Sections 2.2 to 2.6 below provide an overview of the status of stocks of the four key tuna species<sup>13</sup> and additional information concerning bycatch.

## 2.2 Status of key stocks

### 2.2.1 Skipjack

Skipjack tuna catches in the WCPO have increased steadily since the 1980s and have remained relatively stable at around 0.79 – 1.2 million tonnes during the 1990s. Tagging data has shown that the WCPO skipjack tuna stock is distinct from that in the eastern Pacific Ocean (EPO).

Catches of skipjack tuna (and associated small bigeye and yellowfin tuna) show considerable interannual variation and are strongly influenced by ENSO effects. The trend in CPUE (catch per unit effort<sup>14</sup>, expressed as metric tonnes of tuna caught per day) data for skipjack tuna over the last 10 years has been relatively flat. Increases in efficiency, particularly due to FAD fishing techniques, may however be leading to increases in fishing mortality, despite the fall in total boat days fished on skipjack tuna.

The CPUE trends in the purse seine fishery, reinforced by those in the pole and line fleet, indicate that the skipjack tuna stock of the WCPO remains in a healthy condition. Overall, the size of and age structure of skipjack tuna taken in the purse seine fishery has not changed significantly, again indicating that there has been no significant change in the size or age structure of the skipjack tuna population that could be attributed to fishing<sup>15</sup>.

Analysis of skipjack tagging data suggests that current catch rates represent a low to moderate level of exploitation of the skipjack tuna stock. A more recent skipjack tuna assessment covering the skipjack tuna fishery 1972-1999 has been undertaken by SPC (Hampton and Fournier 2001) using MULTIFAN-CL, an integrated, length-based, age-structured model. The results of this assessment, carried out in conjunction with Japanese scientists, conclude that:

- **annual mortality rates**<sup>16</sup> have increased steadily over time and are approximately 0.4-0.5 for adult skipjack tuna. Juvenile skipjack tuna are relatively lightly exploited;
- **recruitment**<sup>17</sup> is highly variable, and appears to be higher following El Nino episodes;
- **population biomass trends** are driven by recruitment, as expected in a short-lived species such as skipjack tuna. Recent total biomass levels of skipjack tuna are above long-term average levels; and

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<sup>13</sup> Sections 2.2 to 2.6 are based on the results of assessments and analyses presented in J. Hampton, A. Lewis, and P. Williams (2000 and 2001). Parts of these assessments were completed after the signing of the GEF project in February 2000; they are included to provide the best available baseline information on the status of stocks at that date.

<sup>14</sup> Catch taken by a given unit of effort (e.g. a fishing day) is a reasonable proxy for abundance – i.e. as a stock becomes less abundant, then less catch is taken for the same level of fishing effort.

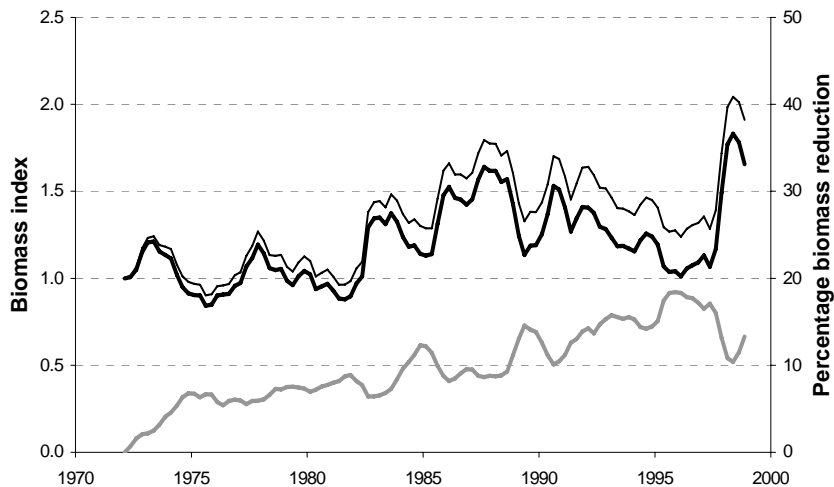
<sup>15</sup> As fisheries become heavily exploited the average size of fish caught often declines. Monitoring of fish size over time can potentially provide one of a number of possible indicators of the impact of fishing.

<sup>16</sup> Annual mortality rate is the proportion of the population (as measured at the beginning of the year) that dies during the year. Total mortality is divided into two components, those that die naturally (e.g. by predation) or through fishing activity (e.g. being captured in purse seines).

<sup>17</sup> Recruitment refers to the addition of tuna to the total stock.

- **the impact of the fishery** on the stock was highest in the 1990s when it is estimated that biomass was reduced by 10-20% of the level it would have attained in the absence of fishing.

The results of the MULTIFAN-CL analysis are generally consistent with the results of the fishery indicators and previous tag-based assessments – that is that the fisheries have had little measurable impact on the stock of skipjack tuna, as shown in Figure 2.



**Figure 2: Skipjack biomass estimates using MULTIFAN-CL. Thin line indicates changes in biomass with no fishing; thick line indicates impact of fishing on biomass; lower line is the difference between the two, expressed as a percentage of biomass reduction. (Source: OFP)**

### 2.2.2 Yellowfin

Unlike skipjack tuna, yellowfin tuna are targeted both by surface fishing methods, principally using purse seines, as well as deeper-set longlines. As with skipjack tuna, the WCPO yellowfin tuna stock is considered to be distinct from that of the EPO, with catches strongly influenced by ENSO conditions. Since 1990, the yellowfin tuna catch in the WCPO has varied between 322,000 and 458,000 tonnes.

Purse seine CPUE (which accounts for around 50-60% of the yellowfin catch) has shown higher variability than skipjack tuna over the last 10 years. It is believed that much of this variability is ENSO driven, which may be affecting the vulnerability of yellowfin tuna to purse seining<sup>18</sup> as well as stock size by influencing recruitment.

<sup>18</sup> For example, changes in the depth of the thermocline influence the depth at which the fish are found, which in turn can increase or reduce the effectiveness of purse seines.

CPUE data from longline-caught yellowfin tuna shows little change over the last two decades. While there has been a recent downward trend in standardised<sup>19</sup> longline CPUE (1995-1999) the current standardised CPUE is not much lower than that of the 1970s. This provides some reassurance that the effects of fishing on yellowfin tuna have not been too great. However, changes in technology (e.g. fish location) and techniques that may have been adopted by the longline fleet are not allowed for in estimates; if these have been significant there may have been some long-term reduction in longline CPUE over time, indicating a reduction in yellowfin tuna abundance.

Analysis of tagging data has shown a relatively light exploitation rate for yellowfin tuna similar to that of skipjack tuna. This suggests that the rate of exploitation of yellowfin tuna in the early 1990s was low to moderate. Estimated total mortality of the small size classes of yellowfin tuna (taken by surface fisheries, including purse seine) is much higher than for larger size classes. This would tend to reduce the effects of catching small yellowfin tuna on catches of larger, predominantly longline-caught fish.

The same integrated, length-based, age-structured model, MULTIFAN-CL used for skipjack (and albacore) tuna has been applied to yellowfin stock assessment. The key conclusions below are taken from the 1999 SPC assessment (Hampton and Fournier 2000):

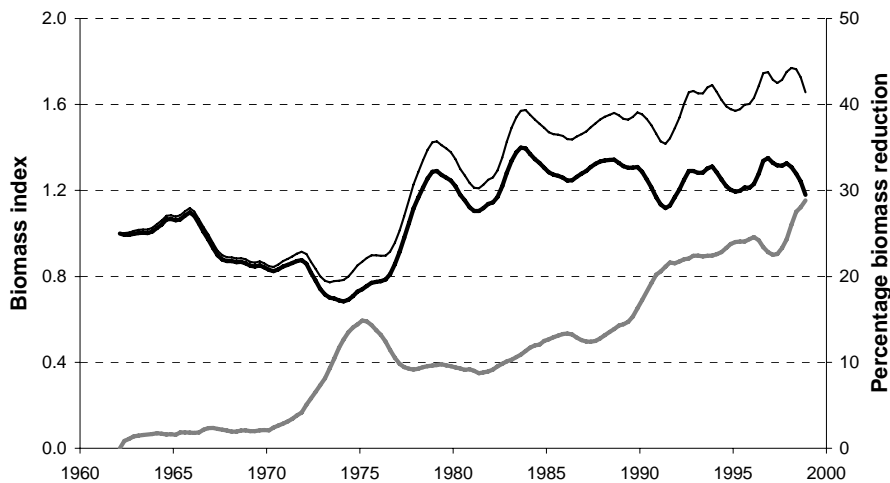
- **fishing mortality** has increased for all age groups except yellowfin tuna >4 years of age, with stronger increases in the period from 1996 to 1999;
- **recruitment** estimates display considerable variation, which may be linked to decadal-scale environmental as well as seasonal changes, with high recruitment associated with El Nino events and vice versa for La Nina events;
- **biomass** estimates peaked in the late 1980s and biomass has been trending downwards since that time – current biomass estimates are however estimated to be >40% than those at the beginning of the time series (1962); and
- **the impact of fishing** has strongly increased over time. In the early 1990's the biomass is estimated to have been reduced by about 20% compared with the level it would have been in the absence of fishing. In recent years, the estimated impact of fishing has increased to about 30% in 1999 (see Figure 3).

Evidence from fishery indicators, backed up by MULTIFAN-CL analysis, suggests that the yellowfin tuna stock is close to fully exploited, although there is considerable uncertainty in the data. Recent catch levels would be sustainable at long-term average levels of recruitment, but the lower recruitment in recent years may indicate that the stock is shifting to a lower productivity regime. If this is the case, catch and CPUE may decline in coming years.

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<sup>19</sup> To allow for different methods of longline fishing and specifically those targeting deeper-swimming bigeye tuna nominal CPUE information is adjusted. For example, deeper-set lines tend to catch more bigeye and less yellowfin tuna, lowering the CPUE for yellowfin.





**Figure 3: Yellowfin biomass estimates using MULTIFAN-CL. Thin line indicates changes in biomass with no fishing; thick line indicates impact of fishing on biomass; lower line is the difference between the two, expressed as a percentage of biomass reduction. (Source: OFP)**

### 2.2.3 Bigeye

There is a possibility that Pacific bigeye tuna may comprise a single stock for assessment and management purposes. Of the four key tuna species, bigeye tuna has a greater level of biological uncertainty concerning stock status and the possible impacts of fishing.

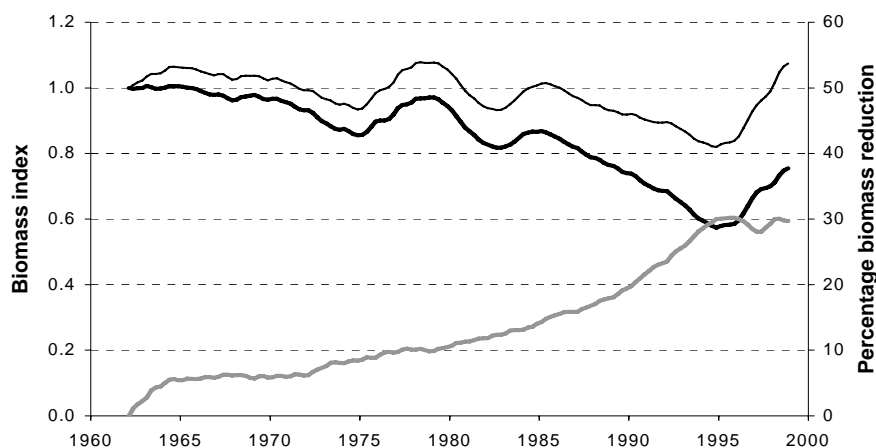
As with yellowfin, bigeye tuna is taken both by surface and longline gears. The major longline fishery for bigeye tuna is in the EPO, east of 150°W. Catches in this fishery peaked in 1986 and 1987 at around 100,000 tonnes. Since then catch has fluctuated between approximately 40-100,000 tonnes, but fell to 23,000 tonnes in 1999. By contrast, the WCPO longline catch has not declined significantly and has remained at about 40-65,000 tonnes. The 1999 estimated catch was 64,700 tonnes, the highest since 1990.

There have been large increases in surface caught (purse seine) bigeye in the EPO, rising from less than 10,000 tonnes per year in 1994 to 52,000 tonnes in 1997. The annual catch has declined to about 41,000 tonnes in 1999. This increase during the 1990s was due to a combination of factors including fishing in new or lightly fished areas, using FAD-based methods and deeper purse seine nets. A similar trend is emerging in the WCPO, with purse seine catches rising from less than 20,000 mt per annum up to 1996 to close to 34,000 tonnes in 1999.

CPUE estimates for the EPO longline fishery have been declining since 1990 but are relatively stable in the WCPO, despite increased targeting of bigeye tuna since the 1970s. However standardised data on effective bigeye tuna effort (i.e. hooks set at depths preferred by bigeye) show that there is a long-term declining trend in longline CPUE in the WCPO. The most recent standardised longline CPUE data for bigeye tuna is about half of the levels recorded in the early years of the fishery.

A new MULTIFAN-CL analysis assessment of bigeye for the WCPO based in the assumption that movement between the WCPO and EPO is minimal was completed for the 2000 OFP Fisheries Assessment Report (Hampton et al 2002). This analysis sheds light on the status of bigeye in early 2000 and concludes that:

- **fishing mortality rates** for juvenile (<100cm ) bigeye tuna have strongly increased with the development of the purse seine fishery on FADs. Fishing mortality rates for adult bigeye have also increased, with a steady rate of increase to about 1995, followed by a slight decline to early 2000;
- estimates of **average recruitment** have been fairly constant or have declined slightly in the period 1962-1999. Recent recruitment rates are at historical lows and, if confirmed by future analyses, may signal a period of reduced productivity of the tuna stock; and
- estimates of **biomass** have declined in the period 1962-1999, although some recovery is suggested since the mid 1990s (see Figure 4).



**Figure 4: Bigeye biomass estimates using MULTIFAN-CL. Thin line indicates changes in biomass with no fishing; thick line indicates impact of fishing on biomass; lower line is the difference between the two, expressed as a percentage of biomass reduction. (Source: OFP)**

If low levels of recruitment, and high catches and fishing mortality of juvenile bigeye tuna continue, further declines in the stock would be expected. If this occurs, management intervention is likely to be required.

#### **2.2.4 South Pacific Albacore**

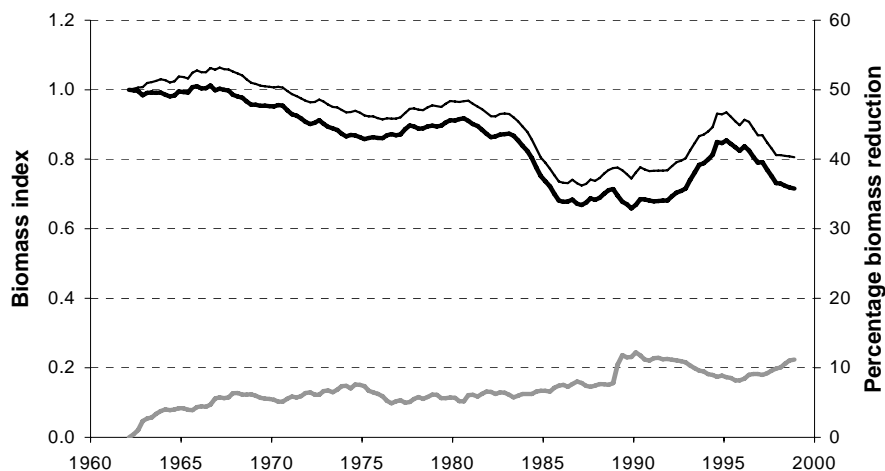
The most significant fishing method is longline, with a minor seasonal troll (surface) fishery. Catches in the 1990s in the WCPO have been between 23,000 and 35,000 tonnes.

Albacore CPUE from the Taiwanese longline fleet has been used as a fishery indicator. CPUE for this fleet has declined since the late 1960s up until about 1990, when it recovered slightly. It is believed that this reduction and that of stock biomass may be attributed to a sharp downward decline in recruitment from the mid-1970s to early 1990s related to a large-scale shift in climatic conditions.

A new assessment for South Pacific albacore based on MULTIFAN-CL was completed by OFP for the 2000 Fisheries Assessment Report (Hampton et al 2002). This analysis concludes that:

- average **annual mortality rates** for juvenile (<85cm) albacore tuna was very low in the period prior to the mid 1980s and increased with the development of surface fisheries, and in particular the driftnet fishery. After driftnet fishing ceased, mortality reduced to about one-third of its peak in the late 1980s. Adult (longline) mortality increased in the 1980s but as is the case with juvenile mortality, it is currently well below the estimates of natural mortality;
- **recruitment** has been highly variable since the start of the time series (1960s), particularly from the mid 80s to the baseline date. Early hypotheses have linked this variability to ENSO effects, with low recruitment following El Nino events and vice versa;
- **biomass** estimate trends declined during the 1980s and recovered to some extent in the 1990s; and
- the **impact of the fishery** on the South Pacific albacore stock has been small, with the percentage reduction in biomass due to fishing currently estimated to be in the vicinity of 10%.

In summary, the South Pacific albacore stock declined during the 1970s to the early 1990s. This decline was mainly recruitment driven, as is the recovery in the mid 1990s (see Figure 5). Further research on the relationship between recruitment and oceanographic changes is likely to further clarify the mechanisms behind these changes.



**Figure 5: Albacore biomass estimates using MULTIFAN-CL. Thin line indicates changes in biomass with no fishing; thick line indicates impact of fishing on biomass; lower line is the difference between the two, expressed as a percentage of biomass reduction. (Source: OFP)**

## 2.3 Bycatch species

Increasing interest is being shown in bycatch, or non-target species, particularly in the context of requirements under the UNFSA<sup>20</sup> to monitor bycatch and assess the impact of fishing on these species and move towards an ecosystem-based approach to management. Levels and species of bycatch vary with fishing method. Due to the relatively small numbers of some species and high degree of catch variability it is difficult to provide accurate total bycatch estimates, or detect the impact of tuna fishing on these species. The biology and population dynamics of nearly all bycatch species is also poorly known<sup>21</sup>.

In the purse seine fishery the level of bycatch is less than 1% (by weight) of the total catch. Bycatch from free-swimming sets are much lower on average (0.5%) than those from associated sets (0.9%). In addition to bycatch, there is some discarding of target species, of up to 5.7% for associated sets, and less (1.2%) for free sets (Lawson 1997). There are no dolphins taken in association with purse seining in the WCPO. The most important bycatch species are the shark species group and rainbow runners. Others include mackerels, ocean triggerfish, mahi mahi and marlin (blue and black).

Rates of bycatch in the longline fishery are considerably higher, at around 40% of the total catch. Much of this is however retained bycatch (by-product), which has some commercial value. Seabird mortality due to longlines is almost non-existent in the tropical WCPO compared with higher latitudes where problems have been experienced with albatross and other vulnerable species.

Sharks, billfish and turtles are key bycatch species taken by longlines. Sharks are relatively long-lived, have low fecundity and a low natural mortality, making them particularly vulnerable to fishing pressure. Some billfish (notably swordfish and blue marlin) are secondary and even primary target species in some areas. In early 2000 the overall catch of billfish in the WCPO was estimated to be in excess of 32,000 tonnes (SPC data). Small numbers of turtles are taken on longlines, particularly in shallow sets for swordfish and near known nesting areas. Given that most species of marine turtles are either threatened or endangered, longline mortality of turtles is of concern.

Overall, SPC considered that the region in early 2000 was not well placed to comply with the stated requirements of the UNFSA in terms of the conservation and management of non-target, associated or dependent species (Lewis 1999). It was noted that some baseline data had been collected and that the situation with respect to an understanding of bycatch levels and fisheries interactions was gradually improving.

## 3. WCPO tuna fisheries

This Section and Section 4 will deal with tuna fisheries in the Pacific islands region of the WCPO, and area commonly delineated as the former SPC statistical area (Figure 6). This area excludes the significant (and significantly different) fisheries of Indonesia and Philippines. In addition to FFA (SAP) countries, oceanic fisheries are also of significant importance to French Polynesia and New Caledonia where growing tuna longline fleets are becoming established, as

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<sup>20</sup> Full title: Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks.

<sup>21</sup> Recent reviews of bycatch have been undertaken by Bailey et al, (1996) and Lawson, (1997 and 2001).

well as American Samoa, which provides a base for a major fish processing industry producing canned tuna for the world market.

### **3.1 Purse seine**

The purse seine fishery is based on technically sophisticated vessels that require significant expertise and capital to operate. These factors have tended to hold back the domestication of the fishery and a number of past attempts to enter the fishery using locally owned and operated vessels have failed. As discussed later in this Section, recent efforts to locally base purse seine vessels is meeting with more success, particularly through the twin mechanisms of the Palau Arrangement and Federated States of Micronesia (FSM) Arrangement (see Section 4.3).

The purse seine catch is predominantly skipjack (around 80%) the balance being bigeye and yellowfin. The purse seine fleet is the most powerful in the Pacific island region, accounting for close to 1 million tonnes in 1999<sup>22</sup>, down from 1.16 million in 1998. The distant water purse seine fleet in 1999 was dominated by the vessels of four distant water fishing nations – Taiwan (42), USA (35), Japan (26) and Korea (26). 14 Spanish vessels were also licensed to fish, although it is unclear how much time they spent fishing in the region. The Philippines also operated 10 mostly small purse seine vessels, principally in Papua New Guinea.

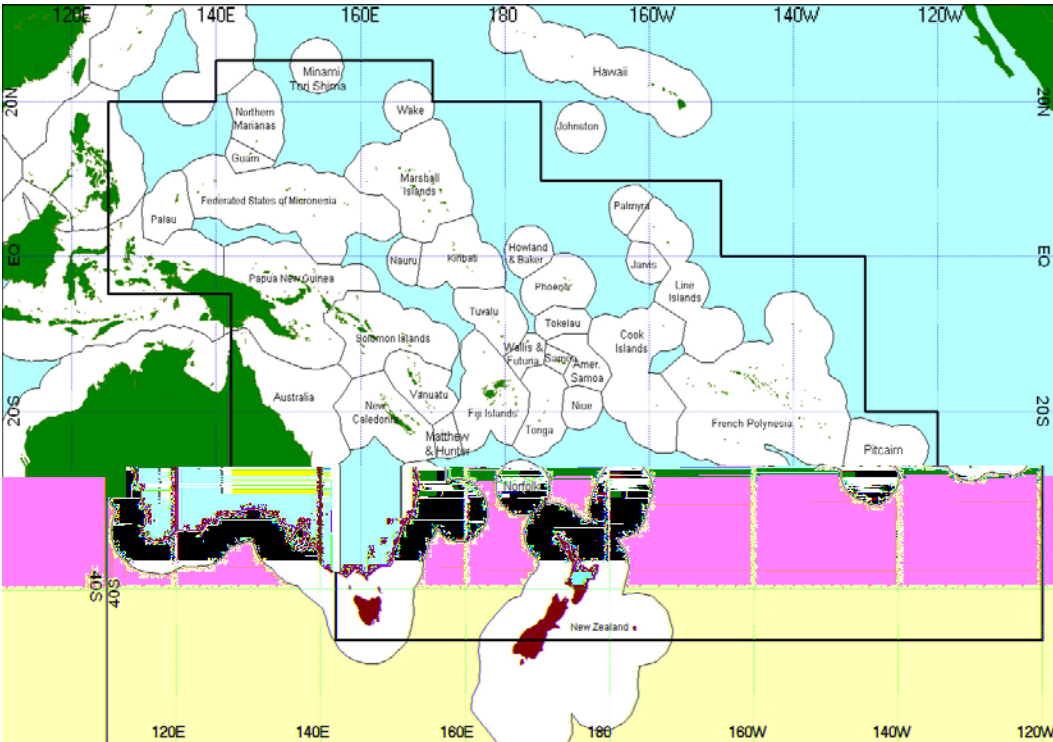
There has been a very significant increase in the use of drifting FADs by the DWFN fleet since the mid 1990s. This has tended to substantially increase catches of juvenile bigeye as well as sharply increasing the skipjack CPUE of the purse seine fleet. The US and Taiwanese fleets have been particularly active in changing over from free-swimming sets to drifting FAD sets, with Japan also increasing FAD fishing activity. This resulted in the largest bigeye catch by purse seine being taken in 1999 (34,000 mt). There are clear implications for bigeye management arising from this change in fishing technique. Korea has continued to favour free-swimming sets.

The domestic based purse seine fleet of 36 vessels is based mainly in Federated States of Micronesia, Papua New Guinea, Solomon Islands and Vanuatu. In 1999 their landings contributed around 12% to total purse seine landings.

Unfortunately the record catches of skipjack impacted heavily on the market with prices reaching a low of \$400 per tonne in November 1999. At these prices most fleets make a loss on variable costs and become economically unviable, even in the short term. Controls on FADs and landings have been made in the Atlantic and Indian Oceans, and some calls have been made for similar action to be taken in the WCPO in an attempt to maintain prices.

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<sup>22</sup> Data on purse seine fleet operation taken from FFA (1999).



**Figure 6: SPC Statistical Area, showing approximate exclusive economic zones of Pacific Island States and Territories**

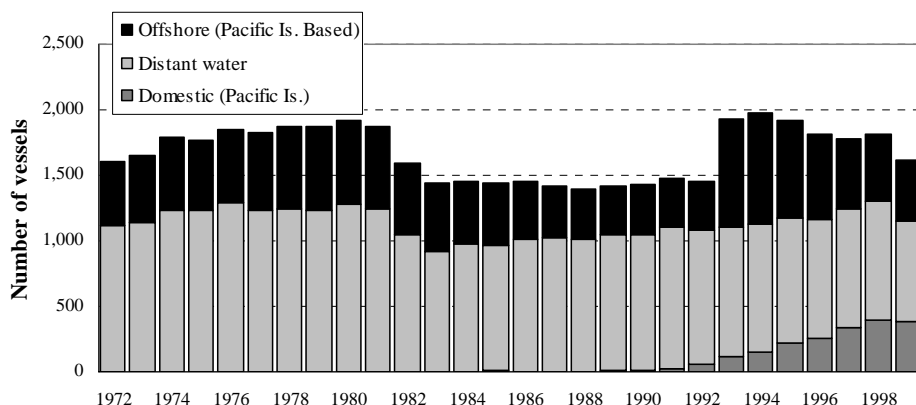
### 3.2 Longline

Longline fishing for tuna is less technically demanding and requires less capital than purse seining. Accordingly, it is of major and increasing significance to Pacific island nations and territories. There are considerably fewer barriers to entry to this fishery, the major constraint being the availability of air transport for the shipment of highly valuable fresh sashimi-grade tuna.

The longline fishery catch in 1999 was approximately 185,100 tonnes, of which two-thirds was yellowfin and bigeye, the balance being albacore. The DWFN fleets tend to take long voyages using relatively large freezer vessels (>250 tonnes). These vessels operate across a wide range within the WCPO area, fishing for yellowfin and bigeye in tropical waters and albacore in the subtropics. The major DWFNs with longline vessels on the FFA Regional Register in 1999 were Japan (213), Korea (166) and Taiwan (149). A total of 69 vessels flying flags of convenience (FOC) were also registered, including 25 from Vanuatu. While the catch taken by longline vessels is a fraction of the total tuna catch, its value rivals that of the purse seine fishery.

The domestic longline fleet in the Pacific islands has increased significantly in recent years as show in Figure 7 below. In 1999 there were 848 longline vessels based in Pacific island countries, of which 385 were locally owned and operated, the balance being owned offshore but based locally. This combined total is now larger than the distant water fleet. These locally based vessels

operate mostly with ice or chill capacity, serving local fresh or airfreight sashimi markets. This fishery is seen to offer the greatest potential for the Pacific islands to expand their domestic involvement in the tuna fishery.



**Figure 7: Longline vessels operating in the WCPO**

### 3.3 Pole and Line

The pole and line fishery is of decreasing significance to the Pacific islands due to economic factors and technological advances in the purse seine fishery. These advances have drastically reduced the costs of production of the purse seine sector, which targets the same species (skipjack tuna).

There remains a low level of distant-water pole and line activity by Japanese vessels in the Pacific islands region, with the bulk of the catch being taken by Japanese and Indonesian coastal fleets.

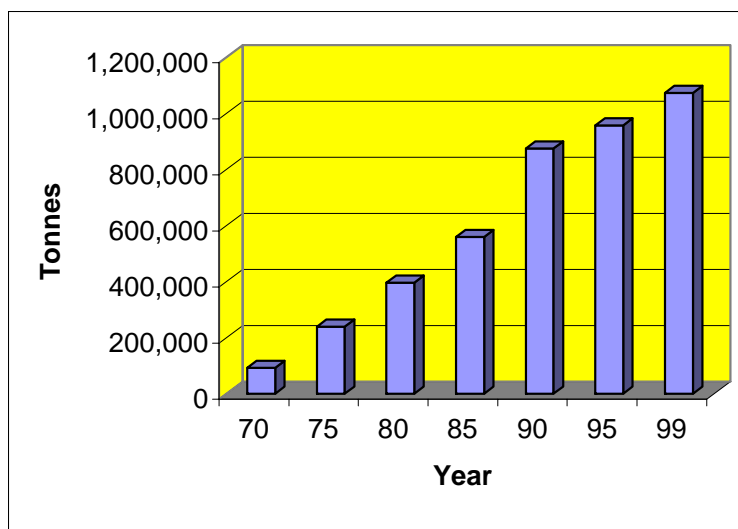
The only significant pole and line fleet in the FFA region in 1999 was based in the Solomon Islands (approximately 30 vessels), which accounted for landings of 22,100 tonnes. The French Polynesian *bonitier* fleet remains active and landed 826 tonnes in 1999, comprising mostly skipjack. It is unlikely that the pole and line fleet (domestic and distant water) will expand their operations in the region in the foreseeable future. It is likely that total catches by pole and line of skipjack will tend to level off or further decline due to both resource constraints and supply/price issues.

## 4. Economic significance of tuna fisheries to the Region

The Pacific islands area<sup>23</sup> is home to the most important tuna fishery in the world. It accounts for around one-third of the world's tuna supply, 60% of all canned tuna and about 30% of the tuna for Japanese sashimi market.

Catches from the tuna fishery in the Pacific islands have grown steadily over the last 30 years (see Figure 8).

<sup>23</sup> The SPC statistical area (see Figure 6).



**Figure 8: Annual tuna catch in the Pacific Islands Area – 1970-1999 (SPC 1999)**

Income from the tuna fishery represents around 11% of the combined GDP of all countries in the region and makes up about half the value of total exports. The quayside value of the fishery has risen sharply over the last 20 years, going from about \$375 million in 1982 to close to \$1.9 billion in 1998 (Gillette 2001).

The economic significance of tuna fishing to the region varies with latitude, with the most productive waters situated the 10N°-10S° equatorial region. In the five years to 1998 90% of the total tuna catch of the WCPO was taken in these waters: 70% of this from the combined EEZs of FFA member countries and other coastal States (SPC data). For atoll States such as Kiribati, Tuvalu and Marshall Islands there are few alternatives for development other than fisheries and some limited tourism, whereas some of the larger islands (Papua New Guinea, Fiji and Solomon Islands) have other significant economic opportunities, including timber and minerals.

#### **4.1 Tuna fishery development aspirations**

##### *National*

All FFA member countries seek to derive greater economic benefits from their tuna resources, primarily by expanding their involvement in the tuna industry beyond fee-for-access arrangement with DWFNs. The ability of individual States to achieve this involvement is limited by resource availability, infrastructure and other constraints (see Section 4.2). The following represents the key aspirations of FFA member countries at a national level:

- increased employment of nationals on fishing vessels and in shore-based processing industries;
- local ownership and operation of fishing and processing operations;
- increased levels of access fees; and
- an appropriate role for the artisanal and local small commercial fishing operations.



## ***Regional***

Cooperation between FFA member States has been exceptional in the area of securing rights to their fish in their EEZs as provided by the LOSC. They have also successfully cooperated to implement harmonised conservation and regulatory regimes primarily through monitoring, control and surveillance (MCS) initiatives. The history and success of regional economic cooperation among FFA member countries has not been so encouraging. It is clear, as expressed in the FFA member countries' approach to multilateral fisheries access negotiations, that regional economic cooperation will only be considered if the outcome is demonstrably better than would have been achieved through a national approach. While a good deal of competitive spirit generally prevails, some regional economic development aspirations are identifiable:

- cooperation to improve domestic industry development (e.g. preferential access via the FSM Agreement – see **Attachment 3**);
- coordinated bargaining positions to achieve increased access fees; and
- cooperation to bring down costs of support services to industry (e.g. air and sea freight, and fuel).

## **4.2 Domestic industry development**

Increases in the numbers of both domestically based foreign vessels and locally owned and operated vessels are being achieved. Increasingly, the private sector is leading the development of the locally based tuna industry and a number of substantial tuna fisheries-based enterprises are now established in FFA member countries. These include the tuna longline fleets of Samoa, Papua New Guinea, Fiji and Tonga, and tuna canning and processing in Papua New Guinea, Fiji, and Solomon Islands. American Samoa has major tuna canning factories, which provide spin-off employment, markets and other benefits to FFA countries. The French territories in the WCPO also have growing interests in domestically based tuna fisheries and significant domestic longline operations are being established in French Polynesia and New Caledonia.

This development has been achieved despite a range of key constraints to investment and development highlighted in a 1997 Asian Development Bank study (ADB, 1997). Although substantial progress has been made, some of the observations from that report remain pertinent to the situation prevailing in early 2000. These are:

**Infrastructure and transportation** – requirements for additional port facilities; availability of land complicated by traditional tenure systems; lack and cost of effective air cargo transportation services; lack of repair and maintenance facilities including slipways; and high fuel costs;

**Freshwater availability** – the reliance by atolls on water lenses for water supplies as a major constraint to the establishment of tuna processing facilities (overcome to some extent in the Marshall Islands);

**Governance and institutions** – lack of political stability; inadequate coordination of planning and development; excessive administrative interference in private sector operations; delays and inconsistencies in investment and licensing approval processes; law and order concerns; and lack of transparency; and

**Economic policy** – tendency towards unsustainable economic policy; emphasis on economic policies to raise revenue to support government expenditure rather than support for investment

in growth; unclear, complex and irrational investment climate; shortage of development finance; changeable and inconsistent fiscal policies including tax regimes; cost, restricted skill base and availability of labour.

Nationally, FFA member countries are moving to address these issues. In some cases, major international development banks are assisting with policy reform across a range of activities including fisheries, as is the case with the Federated States of Micronesia and Marshall Islands.

### 4.3 Current economic benefits<sup>24</sup>

Pacific island countries derive benefit from their tuna fisheries in a number of ways.

**Access fees** are paid by DWFNs in return for access rights to fish in the EEZs of Pacific island countries. For some island countries, these fees form a major source of income, e.g. Kiribati where they comprise close to 50% of GDP. There is frequently criticism from island countries concerning the level of these fees (typically 5% of gross landed value) and efforts are being made to negotiate higher fee levels.

**Employment** of island personnel as crew and on shore in processing and vessel support activities provides a valuable input into island economies. The economic value of an increase in fisheries-generated jobs assumes greater significance when viewed in the context of generally worsening economic conditions within countries.

Crewing is of particular interest and crewing agencies have been established in some countries (Kiribati and Vanuatu) to facilitate the engagement of island staff. The US Tuna Treaty<sup>25</sup> makes specific mention of the use of islanders on board US purse seiners and a number of crew have been engaged under these arrangements. Around 1,200 islanders are employed as crew on foreign fishing vessels, including the US purse seine fleet. Crewing provides an economic benefit that is available to all islands, including smaller states that are unable to establish major shore-based processing and other infrastructure, or have insufficient tuna resources to attract income from access fees.

Tuna processing, and in particular canneries and loining plants, provides a relatively large number of jobs. Canneries in Solomon Islands, Fiji and Papua New Guinea employ over 4,000 islanders. A loining plant in Marshall Islands and a number of smaller scale tuna processing operations employ around a further 1,000 islanders. A further 5,000 islanders from FFA countries (Samoa and Tonga) work in tuna canning operations in American Samoa.

The employment discussed above refers to jobs directly related to tuna fishing or processing. In addition there are substantial employment opportunities associated with indirect tuna related activities, including the maintenance and supply of locally-based fleets and processing plants, security services and so forth. Using the multiplier effect, a spin-off employment effect will occur as the disposable income spent by fish workers circulates in the economy.

**The locally based tuna fishing fleet** is increasing and the expenditure on behalf of these vessels and their crews is substantial. Based on estimates from Gillette et al, (2001), purse seiners spend

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<sup>24</sup> This Section draws heavily on a joint Asian Development Bank/ Forum Fisheries Agency publication 'Tuna: A Key Economic Resource in the Pacific Islands'. R. Gillett, M.McCoy, L. Rodwell and J. Tamate. 2001.

<sup>25</sup> The Multilateral Treaty on Fisheries between the US and Certain Pacific Island States includes provision for: ...'the employment of nationals of the Pacific Island Parties (to the Treaty) on board licensed fishing vessels of the United States' (Art.2.2.c).

in the region of \$300-450,000 per visit to the home port (usually 4-5 a year) and a longliner in Papua New Guinea may be expected to spend about US\$590,000 a year in home port expenditures.

The Federated States of Micronesia (FSM) Agreement<sup>26</sup>, completed in 1994, establishes a licensing regime that offers potential for distant water operators to relocate their operations to those Pacific islands where the Agreement is in force, in return for a form of preferential access to some of the major fishing grounds of the WCPO. Access is provided on terms and conditions that are no less favourable than those given to foreign fishing vessels under bilateral or multilateral access arrangements. Vessels wishing to operate under the Arrangement are first assessed on their proposed economic contributions to the Parties against criteria for eligibility to participate in the Agreement. If successful, applicants are eligible for a licence to fish in the EEZs of the Parties to the Arrangement. This offers a freedom of access under a single agreement similar to that provided to the US purse seine fleet under the US Tuna Treaty. The FSM Agreement is linked to the Palau Arrangement in that the number of vessels licensed under the FSM Agreement must be consistent with the numbers specified in the Palau Arrangement. In 1999, 7 vessels were licensed under the FSM Agreement.

As shown in Figure 7, the growth of domestically based small to medium sized tuna longliners in the region has been substantial. Close to 850 locally based longliners were active in 1999, targeting yellowfin and bigeye for the sashimi and fresh table consumption (tuna steaks etc.) and albacore for the canning market. The foreign owned and operated but domestically based longline fleet accounts for just over half the local fleet and is based primarily in Micronesia (Marshall Islands, FSM and Palau) and Solomon Islands. These vessels are generally foreign crewed and the majority of the revenue generated goes offshore. However some employment and revenue is generated through servicing vessels, fish handling and air transport.

The balance of the domestic longline fleet is locally based and owned, and generates considerable foreign revenue, employment and associated economic activity. The most significant portion of this fleet is in Samoa, where over 200 *Alia* (small catamaran-style boats, mostly <12m) vessels operated in 1999, primarily targeting albacore. Fiji, Tonga and Papua New Guinea also have significant locally owned and operated fleets, targeting the sashimi and fresh table market, but at times taking substantial quantities of albacore. The region continues to take advantage of the considerable potential in the tuna longlining sector and is seeking to increase its domestic longline fleet. The growth of the sector will however be constrained by the availability of affordable air transport.

The small locally based pole and line fleet in the region (Fiji and Solomon Islands) is finding it difficult to operate profitably and expansion in this fishery is unlikely.

#### **4.4 Tuna supply and price issues**

An expanding distant water fleet, increased efficiency resulting from FAD fishing and high recruitment has increased tuna catches dramatically. These factors, combined with increasing skipjack catches in the eastern Pacific Ocean have placed downward pressure on prices. As at early 2000 the prices of 'light meat' canned tuna prices had fallen dramatically from a high in August 1998 of \$1150/Mt for fish sized 4-7.5lbs c&f to around \$400/Mt, with an average 1999 price of \$642/Mt. (Infotish data). Yellowfin prices also declined substantially in the same period,

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<sup>26</sup> See Attachment 3

but not the same extent. In early 2000 the full impact of these lower prices was yet to flow on to access fees.

As capacity in the tuna purse seine fleet increases, it is likely that there will be sustained pressure on canned tuna prices. As discussed earlier, environmentally driven changes will continue to have substantial effects on purse seine catches, particularly of skipjack, and will add to the difficulty in predicting tuna prices.

Over time, longline tuna prices (yellowfin and bigeye) have generally displayed a greater degree of stability.

#### **4.5 Key fisheries development initiatives**

As discussed, FFA member countries have striven to increase their involvement in the oceanic fishery since the establishment of EEZs in the 1970s and even before. As the FFA Corporate Plan 1998-2001 states:

*In the past these benefits (from the tuna resource) have largely taken the form of access fees, but increasingly, FFA member countries are seeking to have a more active involvement in the tuna fishery, including the provision of crew, services and supplies, and the establishment of shore based infrastructure, including canneries and fish bases... and to encourage and nurture... in terms of policy reform... infant fishing ventures.*

By early 2000, these 'infant' fishing ventures in many FFA countries were becoming well established and are continuing across a wide range of initiatives outlined below<sup>27</sup>:

##### *National*

1. Development of national policies to encourage and sustain a domestic tuna industry
2. Identification of new investment opportunities
3. Economic appraisal of existing and proposed fishing enterprises
4. Increased role of private sector in fisheries development
5. Increased market awareness

##### *Regional*

1. Bioeconomic modelling in preparation for management of capacity and optimisation of returns from the fishery
2. Review of regional agreements made by the Parties to the Narau Agreement (PNA) group, including the Palau Arrangement and FSM Agreement

#### **5. Fisheries research arrangements**

The Standing Committee on Tuna and Billfish (SCTB) coordinates oceanic fisheries research in the WCP. The mission statement of SCTB is to 'provide member countries with the scientific information and advice necessary to rationally manage fisheries exploiting the region's resources of tuna, billfish and related species'. The outcomes of SCTB guide the outputs of the major provider of tuna research in the WCPO, the OFP of the SPC, based in Noumea, New Caledonia.

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<sup>27</sup> These initiatives were distilled from the FFA Corporate Plan (FFA 1998).

**Attachment 2** provides a baseline status for monitoring and research activities on oceanic fisheries in SAP Beneficiary Countries.

The OFP has three research areas and their current research focus on oceanic fisheries resources and the related environment are provided in the following Sections. At the end of each Section, key research questions that need to be addressed in the next 5 years are identified.

## **5.1 Statistics and monitoring**

### ***5.1.1 Current status***

A regional catch and effort database of industrial tuna fisheries has been established, based primarily on catch and effort logsheets and supported by port sampling programmes and observer programmes.

Catch and effort data is provided by two main sources – from coastal States in the form of logsheets and in an aggregated form from flag States, both on a voluntary basis. This data covers around 60-70% of the catch taken in the SPC statistical area. Problems have been experienced with gathering data on the substantial catches taken in the WCPO by non FFA States outside this area (45% of the total - 830,093 tonnes in 1999), particularly from Indonesia and the Philippines.

Observer programmes provide a wide range of data from most of the major industrial fleets of the region. This includes data for primary target species, non-target species (including bycatch) and length data. Coverage is uneven and generally low, the exception being the US purse seine fleet, which under an FFA-run observer programme has achieved a 20% coverage for three of the last 4 years. Coverage of the rest of the fleet is 1-2% and is achieved by both national and regional (SPC) programmes. A regional observer programme was operating under SPRTRAMP<sup>28</sup> in early 2000, with OFP observers gathering baseline data from all key fleets for scientific purposes only.

Port sampling is increasingly important as a source of data on the species composition and the length-frequency of the landed catch. In early 2000, OFP continues was supporting the collection of biological data and/or the collection of landings data from around 18 ports in 9 FFA member countries. Support includes training, technical and financial assistance, data processing, provision of forms and provision of sampling equipment.

Annual catch estimates by fleet, catch and effort data grouped by time-area from DWFNs and other statistical information are provided on a regular basis via OFP publications including the Regional Tuna Bulletin and the Tuna Fishery Yearbook.

Fisheries database systems have been established in several countries. The OFP processes data received from SPC members and, at the beginning of each quarter, returns the data to the SPC members for incorporation into databases that are maintained on computers within each country or territory.

Data are disseminated through the publications mentioned above and authorised (by relevant countries/other sources) releases of data to scientists outside the OFP. Public domain catch and effort data, grouped by gear type, 5° squares and month, for all fishing nations combined are available on the SPC website.

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<sup>28</sup> South Pacific Regional Tuna Research and Monitoring Programme. The observer component of the project was completed in September 2000.

In early 2000, tuna fishery databases had been developed and installed on computers in the fisheries departments of 9 FFA member countries. The systems are customised according to the needs of the member country but typically allow the production of data summaries and maps of fishing activity within their EEZ.

With FFA, OFP is assisting FFA member countries to establish national observer programmes, through the provision of observer training, design of data collection forms, processing of observer data and data quality assessment.

With the conclusion of the MHLC process concludes and as legally binding provisions for the collection of data are developed under new Commission (and UNFSA), substantial strengthening of observer and port sampling programmes will occur.

#### ***5.1.2 Key future activities***

1. Continue the compilation of annual catch estimates, catch and effort data, port sampling data and observer data
2. Estimation of catches of bycatch species using observer data, for fleets for which adequate observer data exist
3. Examination of the relationship between observer coverage rates and the bias and precision of estimates of catches of bycatch species
4. Continue the development of data processing and query software to support statistics and monitoring, tuna ecology and biology, and stock assessment and modelling
5. Improve observer and national port sampling coverage and efficiency through the provision of training and advice to national observer programmes
6. Train and support national coordinators to supervise observer and port sampling activities at a national level
7. Develop a regional sampling programme.

### **5.2. Tuna biology and ecology**

#### ***5.2.1 Current research***

The Tuna Biology and Ecology Section of the OFP undertakes analyses to understand the biological parameters and the environmental processes that influence the productivity of tuna stocks, which in turn are fundamental for stock assessment. Biological investigations focus on tuna age and growth, tuna movement and behaviour as observed from conventional tags or electronic data archiving tags. As well as field sampling and laboratory analyses, mathematical models are developed to identify the major environmental determinants of tuna fishery production, including impacts of climate fluctuation (ENSO, Pacific Decadal Oscillation, or PDO, and global warming).

Building on previous work with yellowfin and bigeye tuna, growth estimates based on otolith increment counts combined with tagging data are being developed for other species (skipjack, billfish, wahoo, kawakawa). Growth estimates for these and a range of other species will gradually become available in the future.

The Tuna Biology and Ecology Section is undertaking dedicated research on billfish by facilitating improved data coverage of billfish catches by all sectors, including gamefishing

(billfish catches are currently not well estimated). At the regional level, this will allow preliminary stock assessments to be undertaken. At the national level, resource profiles are now being prepared, and other information will be packaged to assist gamefish development.

Analysis of the occurrence of non-target, associated and dependent species, more commonly known as bycatch, in WCPO tuna fisheries is an ongoing function of the Section. Observer data has been the major source of such information and has enabled the WCPO bycatch to be characterised and preliminary estimates of the catch by species to be obtained. Coverage rates are acceptable in the US purse seine fishery (20%), are lower in the Taiwanese, Korean and Japanese purse seine fleets (<4%) and are less than 1% in the longline fishery.

There is growing interest at the international level to address marine exploitation issues from an ecosystem perspective. However, given the complexity of the task and the limited knowledge on the pelagic ecosystems, developing an ecosystem model to consider such questions remains a great challenge. Such an approach implies the integration of both spatio-temporal and multi-population dynamics and consideration of the interactions between the populations, and between populations and their physical and biological environment.

OFP is using a newly developed spatial environmental population dynamic model (SEPODYM) as a first step toward ecosystem modelling for tuna fisheries management. Currently the model is restricted to skipjack tuna in the equatorial 20°N-20°S area and explores the underlying variability that affects the pelagic ecosystem and tuna populations. It is planned to extend the area of coverage to the ocean basin level. The model seeks to achieve good spatial correlation between the predicted and observed catch using satellite-derived chlorophyll data as a proxy of productivity. The model takes account of inter-annual variability due to ENSO effects by using an Ocean General Circulation Model developed at the LODYC<sup>29</sup>. It considers the interaction between predicted tuna density and forage density, that is the coupling between the forage (prey) and tuna (predator) levels.

Using the model, considerable progress has been made in identifying the mechanisms by which the inter-annual climatic variations (El Nino – La Nina) influence the distribution of skipjack tuna in the western and central equatorial Pacific Ocean. In particular, the ENSO effect appears to have important consequences both for spatial distributions and migrations of the tuna populations and for their level of recruitment and biomass.

The stock structure of yellowfin, skipjack and albacore tuna has been available from tagging experiments, leading to general acceptance of an east-west population structure for skipjack and hemispheric structure for albacore in the Pacific. Much less information has been available for bigeye tuna, although a single Pacific-wide stock is now assumed. Stock structure is associated with spatial population dynamics and initial consideration is being given to investigating the issue through the use of a Pacific-wide, spatially disaggregated population model.

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<sup>29</sup> Dynamic Laboratory of Oceanography and Climatology, University of Paris, France.

### **5.2.2 Key research questions**

1. Fluctuations in tuna populations in relation to ENSO and PDO climatic signals over the range of the fishery
2. Develop and validate hypotheses explaining recruitment in skipjack tuna and other tuna species using the SEPODYM model, to support the prediction of fluctuations in tuna populations
3. Describe the pelagic food web using both stomach contents and isotopic analyses, and ECOPATH<sup>30</sup> modelling
4. Improve and validate inputs to the SEPODYM model including spatial distribution of tuna forage (using acoustic methods); primary production/tuna forage ratios (using previous food web analyses); and tuna habitat, movement and behaviour (using tagging and modelling)
5. Assess the impacts of the global climate change on tuna stocks (development of the Oceanic Fisheries and Climate Change Project, OFCCP GLOBEC<sup>31</sup>)

## **5.3 Stock Assessment and modelling**

### **5.3.1 Current research activity**

Stock assessment and population modelling continue to be major components of the OFP's work, in support of scientific advice on the status of the stocks that is provided regularly at both national and regional levels. Prior to the 1990s, stock assessment was based on relatively simple indicators from the fishery (CPUE and size structure), supplemented by large-scale (regional) tuna tagging programmes (SSAP and RTTP<sup>32</sup>), that provided estimates of fishing mortality and one-off estimates of stock size.

MULTIFAN-CL, a length-based, spatially-explicit, age-structured model, has been under development at SPC since 1991 and was first used for albacore in the early 1990s. This major step forward resulted in a modelling tool capable of providing a systematic stream of estimations of the major parameters that are needed for modern fisheries management. These include fishing mortality, relative and absolute (with less precision) stock size, size structure, effort trends, recruitment, impact of fishing and catchability. Importantly, these estimates are provided within a spatial structure and with measures of uncertainty for each parameter. The data files used in the MULTIFAN-CL model can be made available for independent review or analysis by interested scientists.

Stock assessments of the four major targeted tuna species in the western and central Pacific Ocean are undertaken annually by OFP in collaboration with scientists participating in the SCTB. Assessments for albacore and yellowfin tuna have been completed using the same model, MULTIFAN-CL. Simulation testing of MULTIFAN-CL is the subject of continuing research in the OFP. Skipjack and bigeye tuna data was entered into the MULTIFAN-CL model and preliminary assessments provided to SCTB 13 in July 2000.

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<sup>30</sup> A software programme that allows for the modelling of entire ecosystems.

<sup>31</sup> The Ocean Fisheries and Climate Change Project (OFCCP), conducted as part of the Global Ecosystem Dynamics (GLOBEC) programme.

<sup>32</sup> Skipjack Survey and Assessment Programme (1977-82) and Regional Tuna Tagging Project (1989-92)



Efforts are continuing, in collaboration with the Pelagic Fisheries Research Program (PFRP) of the University of Hawaii, to develop diffusion/advection/reaction models for application to skipjack and yellowfin tuna movement as represented by results from the SSAP and RTTP tagging experiments.

OFP produces National Fisheries Assessments (NFAs) and resources profiles on an ongoing basis to inform member countries of the status of their tuna fisheries and the stocks that support them. These reports include sections on the biology of the major tuna species, oceanographic influences in the EEZ, reviews of the fisheries and analyses of data, assessment of stocks and management recommendations, where requested. In some cases, the reports have included analyses of RTTP and/or in-country tagging project data, enabling more quantitative assessments and management advice. Scientific input has also been provided in the development of tuna management plans.

The OFP's tagging databases consist of more than 300,000 releases and approximately 26,000 recoveries. This large amount of data continues to be supplemented by long-term tag recoveries, some now nearly 8 years at liberty, and represents a valuable source of information for stock assessment and tuna research. A large amount of historical Japanese tagging data is also being prepared for use in an integrated skipjack tuna model.

### ***5.3.2 Key research questions***

1. The establishment of limit and target reference points for each stock and assessment of their status against these points, including approximate confidence intervals developed using MULTIFAN-CL
2. General model development of MULTIFAN-CL to add extra functionality, incorporate new data series and increase the reliability of estimates
3. A better understanding of the statistical properties of MULTIFAN-CL, including bias and precision under different data collection regimes, using simulation testing
4. Extension of the bioeconomic model to include new fisheries developments including continued expansion of the bigeye tuna purse seine fishery, as well as to respond to management requirements including investigation of allocation by fishing method under the future Commission
5. Improvement of inputs into MULTIFAN-CL model by undertaking medium to large scale (2-7 year) tagging studies using both traditional and archival tags

## **6. Fisheries Legislation and Monitoring, Control and Surveillance Arrangements**

### **6.1 Fisheries legislation**

#### ***6.1.1 Current status***

As efforts to regulate fisheries and prevent illegal, unregulated and unreported (IUU) fishing have intensified, so has the requirement for FFA member countries to review and update their fisheries legislation to give effect to the growing number of regional and international fisheries agreements. FFA continues to provide assistance to member countries in the implementation of the Law of the Sea Convention (LOSC) through the evaluation and revision of domestic laws against the requirements of LOSC and UNFSA as well as other international and regional fisheries agreements. **Attachment 3** provides additional information on the baseline status of these agreements.

A workshop held in Vava'u, Kingdom of Tonga, in August 1999, identified six priority areas to ensure that the principles of LOSC are applied in national legislation. These included:

- the development of a comprehensive regional oceans policy and national ocean policies;
- revision of national legislation to enable the implementation of sound principles of ocean management and conservation;
- promotion of marine scientific research and the establishment of proper regulatory frameworks;
- finalisation of maritime boundaries and an inventory of the geographical and geophysical information databases, and
- better monitoring of the correlation between fisheries and trade issues.

As attention is being focused on areas of high seas and means to prevent IUU fishing, there is a growing requirement for FFA member countries to adjust national legislation in order to implement an effective legal regime for in-zone and on the high seas. This includes flag State responsibilities, including vessel registration, authorisation to fish and maintenance of a national vessel register.

In the case of some countries whose legislation has been relatively recently been reviewed and updated, there will remain a requirement in the short to medium term for a further review to accommodate the requirements of the emerging WCPO Convention under the MHLC process.

The requirement for new legislation to support fisheries management initiatives is placing a considerable burden on national legal staff. Capacity building is a major challenge currently being addressed, both at a national level through bilateral assistance<sup>33</sup> and regionally through training programmes and attachments run by FFA. The attachments allow Pacific island lawyers and law students to undertake legal research or develop draft legislation under the supervision of FFA staff. An emphasis is being placed on dealing with regional/multilateral issues and the recruitment of women lawyers or legal students to undertake attachments.

The FFA VMS (see Section 6.2 below) is now operational and all FFA member countries have been provided with drafting and other assistance to incorporate provisions in national legislation. While the most effective means of providing the legal backing to the application of VMS is the enacting of VMS legislation, not all FFA countries had done so in early 2000.

Currently there is a growing pool of Pacific islanders who are gaining valuable experience and exposure to international law through direct participation in bilateral and multilateral negotiations, both within the region and at a multilateral level.

#### ***6.1.2 Key weaknesses and priority areas to be addressed***

1. Limited knowledge within national legal departments concerning fisheries and international ocean legislative and management issues
2. Lack of capacity to provide for the effective and timely drafting and incorporation of international law principles into domestic legislation

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<sup>33</sup> For example, ADB interventions in Marshall Islands and Papua New Guinea where short term legal technical assistance is reviewing existing fisheries legislation.

3. Increased awareness of the national and regional (FFA-wide) implications of the WCPO Convention
4. Disconnection between laws, MCS activities and successful prosecutions
5. Disconnection between legislation and emerging national fisheries management initiatives, including management plans
6. Renegotiation of terms of US Tuna Treaty, due to expire in June 2003
7. Review of the provisions of the FSM Agreement and Palau Arrangement to ensure compatibility with new regional initiatives and WCPO Convention
8. Broader stakeholder awareness of legislative requirements relating to LOSC, UNFSA, regional agreements and the new WCPO Convention

## **6.2 Monitoring, control and surveillance**

### **6.2.1 Current status**

With an area of ocean greater than 30 million square kilometres, the prevention of IUU fishing is a major challenge for the island nations of the WCP. It is however, one area in which substantial advances have been made in the region, both nationally and at a regional level through cooperation in the FFA forum.

The development of regional Minimum Terms and Conditions (MTCs) for Access developed by the Parties to the Nauru Agreement and subsequently adopted by FFC<sup>34</sup> has improved compliance by establishing a common standard of requirements under which foreign fishing vessels operate in the EEZs of island countries. These requirements currently include:

- the need to be in good standing on a regional register of foreign fishing vessels;
- provide regular reporting, both on entry and exit to the fishing zones and during fishing operations; and
- carriage of observers as required.

The most significant recent regional MCS development is the vessel monitoring system (FFA VMS), which is managed and administered from the FFA Headquarters in Honiara on behalf of member countries. This significant regional initiative was given additional impetus by the South Pacific Forum in October 1999 when Forum countries agreed to full implementation of the FFA VMS by October 2001. As at January 2000, 160 foreign vessels were equipped with the FFA VMS and could be tracked 24 hours a day within the zones of FFA States. Apart from the US purse seine fleet, adoption of the FFA VMS has been slow, due to resistance from DWFNs, driven by fishing industry interests. A target of 1,000 vessels carrying the FFA VMS by 2002 has been set to achieve a sustainable<sup>35</sup> operation and considerable efforts are being made by the FFA Secretariat and member countries<sup>36</sup> to achieve this. To back up the VMS initiative at country

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<sup>34</sup> The governing body of FFA, the Forum Fisheries Committee (FFC).

<sup>35</sup> In the sense that the costs of running the VMS will be cost-recovered by a levy applicable to all foreign fishing vessels on the FFA Regional Register.

<sup>36</sup> In some instances, FFA member countries have broken off bilateral access agreements where DWFN have refused to fit the FFA VMS as required under MTCs agreed in 1999. These countries include Solomon Islands and Palau.

level, FFA has supplied the necessary computing facilities to process VMS data in each country and is supplying comprehensive training to national staff.

Given the expense associated with MCS, the region is focusing on means of deploying surveillance assets in the most cost-effective manner. Aerial surveillance is provided on an opportunistic basis by the air forces of Australia, New Zealand and France. FFA fosters cooperation between the aircraft operators and FFA member countries to optimise allocated flying time.

The Niue Treaty (see **Attachment 3**) allows for the formation of subsidiary agreements between signatories to co-operate on MCS initiatives, including the sharing of MCS assets (and their costs) between parties. FFA actively promotes the development of agreements and as at early 2000, one subsidiary agreement has been signed between Tonga and Tuvalu, for one patrol only.

FFA runs a regional observer programme for the US purse seine fleet, as provided for within the US Tuna Treaty. 20% coverage of all purse seine trips undertaken by that fleet is covered by the programme, which has dual compliance/scientific roles. At a national level, an increasing number of island countries have established national observer programmes and FFA, in collaboration with SPC, assists with observer training and the establishment of in-country training programmes.

These regional programmes, as well as cooperation between FFA member countries, are co-ordinated through annual MCS Working Group meetings organised by FFA. This group also provides recommendations on MCS-related issues to FFC.

While cooperation on MCS issues between countries is possible at the regional level, all implementation is carried out at a national level. MCS officers within island countries are being provided training on national and regional MCS strategies and operation, including the VMS and observer training mentioned above. Limited coordination and cooperation between national agencies responsible for MCS, including fisheries, police, customs and the defence forces frequently constrains outcomes within individual countries. The establishment of comprehensive national tuna management plans provides an opportunity to align MCS strategies with management measures and to improve the overall coordination and delivery of effective in-country MCS arrangements.

The baseline status of SAP beneficiary countries with respect to MCS issues is provided at **Attachment 4**.

#### ***6.2.2 Key weaknesses and priority areas to be addressed***

1. Low and decreasing capacity in MCS evident in many FFA member countries
2. Competing priorities for MCS assets, such as patrol vessels
3. Continuing lack of coordination between national agencies responsible for MCS management plans
4. Under-utilisation of surveillance assets and lack of subsidiary agreements under the Niue Treaty
5. Lack of awareness of the new national MCS responsibilities under the WCPO Convention and regional strategies to implement MCS related Articles and Annexes in the Convention so as to reduce IUU fishing

## 7. Fisheries management and conservation arrangements

Fisheries management and conservation arrangements for oceanic fisheries resources in the WCP can be considered at three levels. Nationally, countries have jurisdiction over the living marine resources within their EEZ and the corresponding rights and obligations to explore, exploit, conserve and manage<sup>37</sup> these resources, including tuna. Regionally, the Pacific island countries have for two decades worked together under the umbrella of the FFA, and have developed a wide number of fisheries-related regional agreements, as listed in **Attachment 3**. The final level of fisheries management exists at the multilateral level, and includes DWFNs, the EU and the French and US Pacific Territories.

### 7.1 National

At the national level, many countries have tuna fisheries management arrangements in place either through somewhat ad hoc arrangements or through more comprehensive management plans under domestic legislation. A number of regionally developed agreements, including the MTCs, have resulted in management measures being implemented through access agreements. These include regional registration, the fitting of a FFA authorised VMS unit, observer programmes and the submission of a range of fisheries related data.

**Attachment 5** shows that in early 2000, five of the 14 Pacific island members of FFA had management plans in place, and a number of others are in the process of developing plans. The FFA Secretariat has been instrumental in assisting with the national fisheries management planning and development process, primarily through assistance provided under Canadian<sup>38</sup> funding.

The plans are an initial step in a process of developing a comprehensive approach to strengthening national fisheries management including legislative, MCS and regional/multilateral considerations. The plans spell out national policies and implementation strategies relating to: sustainable tuna management and development, socio-economic priorities, human resource development, financial sustainability and institutional arrangements. A significant part of this process is to ensure adequate consultation with, and therefore a degree of ownership by, all key stakeholders including various government sectors, industry, NGOs and the community. The development, and more significantly, successful implementation of these plans will stand Pacific island nations in good stead within the context of the growing body of international fisheries agreements. These agreements include UNFSA, the WCPO Convention and the non-binding initiatives of the FAO including the Code of Conduct and associated Technical Guidelines, and International Plans of Action (IPOAs<sup>39</sup>) on key conservation and management issues.

### 7.2 Regional

The more resource abundant countries of the FFA established the Nauru Agreement in 1982. The most significant fisheries management-related regional instrument developed by the PNA group is the Palau Arrangement. This Arrangement seeks to limit the total number of purse seine vessels operating in the waters of the Parties. The total number of purse seine vessels in February 2000

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<sup>37</sup> Article 56 i.(a) LOSC

<sup>38</sup> Canada, through the C-SPODP/II Project provided funding the development of management plans in the Solomon Islands, Palau and Vanuatu. Plans for Solomon Islands and Vanuatu were completed in 1999.

<sup>39</sup> As at early 2000 FAO IPOAs had been developed for sharks and seabirds, and an IPOA on the management of fishing capacity was under development.

(178) was divided between 146 DWFN and 32 locally based (domestic) vessels, against an overall cap of 205 vessels. Within the DWFN overall allocation there is a limit on how many vessels can operate under the Agreement, by flag State. This Agreement is currently under examination due to the expansion of fishing effort within the region and the need to make regional arrangements compatible with evolving MHLC arrangements.

The US Tuna Treaty is due to expire in June 2003 and negotiations for its renewal will commence in 2000. The Treaty, while providing substantial economic benefit (\$18 million per annum) to the Pacific island parties is also significant in terms of fisheries management. It is the region's only multilateral agreement and provides for a high level of co-operation and compliance (such as VMS and additional reporting requirements) and monitoring (agreed 20% observer coverage).

Other regional arrangements are listed in **Attachment 3**.

### **7.3 Multilateral**

A number of multilateral tuna management arrangements are in existence globally, none of which have proved adequate to prevent overcapacity and over fishing. Management arrangements for yellowfin tuna in the EPO developed by the Inter-American Tropical Tuna Commission (IATTC) is the only example approaching the relatively comprehensive management arrangements of the type envisaged for HMS under UNFSA. Several issues have however emerged in the EPO that have tended to undermine the effectiveness of the yellowfin tuna arrangement including purse seine over capacity, problems with bycatch and juvenile bigeye tuna catch, and a lack of management measures for the longline sector.

The MHLC process is the first attempt to develop a comprehensive regional fisheries convention and association commission under UNFSA guidelines in light of the FAO Codes of Conduct and IPOAs. Other regional fisheries management organisations (RFMOs), including IATTC, are watching developments in the WCP closely and the precedents set in the region will be of global significance to tuna management.

**Attachment 2** shows the current (February 2000) situation with respect to the signatures and ratifications to UNFSA, including those from FFA member countries. FFA encouraged its membership to add to the ratifications of UNFSA to enable its early entry into force. The entry into force of the UNFSA provided further support to the development of the regional convention based on UNFSA's strengthened (over LOSC) provisions, particularly with respect to flag State responsibility on the high seas and strengthened boarding and inspection procedures.

FFA member countries initiated the MHLC process in 1994, primarily as a response to MCS issues. The Chair of the first MHLC session, Robin Yarrow, summed up the objective as '...to promote the full implementation of responsible fishing operations for the fishing vessels operating in the South Pacific Region'. After a dormant period and in response to the entry into force of LOSC and the completion of UNFSA, the process restarted in Majuro with MHLC2 in June 1997. Up to the start of 2000, there were three sessions of the Conference, with MHLC6 scheduled for April 2000. The work of the FFA Secretariat during the period 1995-2000 was dominated with the funding, organisation and support for FFA member country participation in the process.

A number of key outcomes were set<sup>40</sup> for the MHLC process, the most significant of which were that:

- decisions of the Commission should be legally binding on parties so that conservation and management measures agreed to by the Commission can be effective and enforceable;
- the advances made under the UNFSA should not be eroded in the drafting of the new Convention;
- the provisions of the Convention should not unduly prejudice the sovereign rights of coastal States;
- the Commission should as far as possible adopt and not overly duplicate current regional arrangements with respect to scientific advice and the measures laid out in the FFA MTCs;
- the Commission should be cost-effective and not place a disproportionate burden on coastal States; and
- that arrangements be included in the budget and funding for the Commission to allow the effective participation of small island developing States in the work of the Commission.

The final text of the Convention will provide an indication of how well the region fared in achieving the inclusion of the above key negotiating points.

### ***7.3.1 Likely conservation and management developments during the next five years***

#### ***National***

- Completion and implementation of national management plans for tuna fisheries
- Improved inter-agency and industry cooperation and coordination in fisheries management, including on MCS
- Refocused and strengthened national fisheries management institutions

#### ***Regional***

- Effective control of fishing capacity/effort in the purse seine sector
- Improved adherence to regional agreements
- Improved regional coordination with respect to multilateral issues, including negotiations at the Commission

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<sup>40</sup> These outcomes were drawn from FFC papers, country statements at MHLC and discussions with FFA staff.

### *Multilateral*

- Completion of arrangements for establishment of new regional Commission
- Development of a regional agreement on an allocation process that will optimise sustainable returns from the resource and be supportable and achievable within the Commission envisaged under the MHLC process
- Clarification of the administrative and associated costs<sup>41</sup> of the MHLC process attributable to FFA member countries
- Negotiation of an MCS scheme for the high seas, including VMS, observers and boarding and inspection procedures
- Participation and clarification of the status of territories within the Commission
- Location of Commission

The baseline status of SAP beneficiary countries with respect to fisheries management is provided at **Attachment 5**.

### **8. Summary of critical issues for future review**

**Attachment 6** to this study provides a baseline summary of the key issues facing the WCPO tuna fishery, matched with expected outcomes from the IW project within three and five-year time frames.

This final Section summarises critical issues associated with development of future management and conservation initiatives relating to the oceanic fisheries resources in the WCPO. Issues are discussed in the context of emerging fisheries management arrangements at national, regional and multilateral levels.

One critical issue will be the completion (and accuracy) of stock assessments. A second will be the collection and analysis of a wide range of data that will support those assessments, as well as data required to assess the related impacts on non-target species and the ecosystem as a whole. The outcomes of the assessments will subsequently be used to formulate advice to fisheries managers in FFA member countries and regionally.

The measurement of environmental and fishing induced changes to the status of oceanic resources will rely on adequately funded and well-designed and executed research programmes. Most of these programmes are regional in nature, in part because of the nature of the resource, although capacity is also starting to be built at a national level to address more localised issues.

While the rights for coastal States to utilise oceanic resources have been reinforced by both the LOSC and the UNFSA, so too have the obligations to implement appropriate conservation and management measures. It will be a major challenge to increase the capacity of individual FFA member countries to enable them to effectively implement the relatively complex management arrangements that will be required to effectively manage oceanic fisheries and participate on an equal basis in technical debates at the multilateral level. Included in these measures will be the

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<sup>41</sup> Including the costs of data collection, stock assessment and scientific research, and MCS (observer programmes, VMS etc.)



need to better coordinate and achieve comprehensive and timely fisheries data collection and submission to OFP for analysis.

The nature of the new fisheries management regime under the future WCPO Commission, and the implications for coastal States within the region, are not yet clear. The difficult process of allocation and the need to optimise sustainable economic benefits from the tuna resource by balancing the ratio of surface caught (purse seine) and deeper water (longline) resources need to be considered.

## **8.1 Oceanic fisheries resources**

### ***8.1.1 Regional***

#### ***Target species***

**Table 1** outlines the status of the four key target species in early 2000 and related areas of research.

**Table 1: Key tuna species, status, assessment and critical issues**

<b>Species</b>	<b>Stock status early 2000</b>	<b>Stock assessment data/analysis available/used</b>	<b>Published estimates of stock size/status available</b>	<b>Reference Points/Projections</b>	<b>Critical issues/requirements</b>
<b>Skipjack</b>	Healthy. Subject to inter-annual variation, with little evidence that fisheries have had a measurable impact. Record catch and biomass in 1999.	Results from two tagging programmes; 1977-82 and 1989-92; catch, effort and size data.	Trends in biomass implied from fishery indicators. Tagging experiment-based assessments (1987 and updates).	No estimates of key reference points or projections available.	Application of modern stock assessment methods (MULTIFAN-CL); improved catch data – esp. Philippines and Indonesia (30% of total tuna catch of WCPO). Additional tagging.
<b>Yellowfin</b>	Probably healthy; stock close to fully exploited. Requires careful monitoring.	Results from two tagging programmes, esp. 1989-92; catch, effort and size data. MULTIFAN-CL analysis available.	Published estimates of relative biomass by sub-region available.	No estimates of key reference points or projections available.	Improved estimates of model parameters and catch data, esp. Philippines and Indonesia. Additional tagging - conventional and archival (latter to improve understanding of depth distribution/vulnerability to longlines).
<b>Albacore</b>	Healthy; catches increasing. Little evidence that fisheries have had a measurable impact.	Results from 1989-92 tagging programme; catch, effort and size data. MULTIFAN-CL analysis available.	Published estimates of relative biomass available.	No estimates of key reference points or projections available.	Refinement of stock assessment data. Additional tagging - conventional and archival (latter to improve understanding of depth distribution/vulnerability to longlines).
<b>Bigeye</b>	Uncertain; initial stock estimates raise concern of overfishing and decline in adult biomass. Management intervention may be required.	Results from 1989-92 tagging programme; catch effort and size data. MULTIFAN-CL analysis in early stages of development.	Trends in biomass implied from fishery indicators.	No estimates of key reference points or projections available.	Improve estimates of: surface catch, movements and mixing rates across the range of the stock and biological parameters, including growth and mortality rates. Improved overall catch data, esp. from Indonesia and Philippines. Additional tagging - conventional and archival (latter to improve understanding of depth distribution/vulnerability to longlines).

### ***Bycatch***

**Table 2** highlights issues associated with key bycatch species.

**Table 2: Bycatch issues in the WCPO**

<b>Species</b>	<b>Comments</b>	<b>Critical issues/requirements</b>
<b>Billfish</b>	Some target fisheries, especially for swordfish and striped marlin. Difficult to obtain adequate catch data. Billfish assessment (with bigeye) a priority research issue.	Sustainability of the harvest as a continuous incidental catch by the large, widely distributed longline fleet; role of billfish in the pelagic ecosystem; and interaction with sport fisheries. Current data holdings inadequate for stock assessment or to assess impact of fishing.
<b>Sharks</b>	Most important group in longline bycatch and overall in the WCPO offshore fishery. Life history makes shark species more vulnerable to overfishing. Some targeting, particularly for shark fin. No management arrangements currently in place. Some monitoring, initial stock assessment on blue shark in the north Pacific.	Increasing value of fins will continue to place pressure on stocks. Current data inadequate for stock assessment or to assess impact of fishing.
<b>Turtles</b>	Major conservation issue and the subject of intense lobbying by environmental groups. All species either endangered or threatened. Hawaiian longline fishery under threat because of issues relating to turtle bycatch and a lack of management measures to address this.	Current data sparse due to poor longline observer coverage and inadequate for stock assessment or to assess impact of fishing. Need to extend mitigation strategies to commercial fleet and raise awareness of release techniques to decrease post-capture mortality.
<b>Seabirds</b>	Catches of seabirds on longlines in the tropical waters of the Pacific islands region are very rare in comparison with temperate waters.	Current data is sparse, particularly in higher latitudes where a higher level of interaction may occur; need to address perception that all tuna longline results in seabird mortalities.
<b>Other species</b>	Over 50 fish species are taken by longlines and purse seines, some of which are of commercial value or of interest to the artisanal or recreational sectors.	No known significant sustainability issues, however little information exists on which to base such assumptions for most species.

### ***Other issues***

To support the regional (and national) assessment of target and bycatch species, the following priority activities will be required in the next five years:

<b>Activity</b>	<b>Critical issues</b>
Data verification, including observer programmes directed at priority gaps in current information	See Section 5.1.2
Increased knowledge of impact of climatic changes on the population dynamics of oceanic fisheries resources	See Section 5.2.2

### ***8.1.2 National***

Updated fisheries assessments will be required at a national level, both to support fisheries management plans and to underpin negotiating positions with respect to allocation under the future WCPO Commission. These will incorporate refinements to MULTIFAN-CL and other stock assessment developments. FFA member countries will need to continue to improve database management and expand observer programmes. **Attachment 2** provides a baseline position with respect to individual countries and critical issues in oceanic fisheries resources.

## **8.2 Management and conservation<sup>42</sup>**

### ***8.2.1 Multilateral***

#### ***MHLC process***

The MHLC process was completed in September 2000 with the adoption of the text of the Convention. Although the Convention text has been adopted, critical issues remain to be addressed over the next five years. Such issues include ensuring that the Convention enters into force as well as laying the foundation on various procedural and administrative issues in preparation for the new Commission. First, an analysis of the final Convention text will determine how effective Pacific island countries were at negotiating for the desired outcomes reflected in Section 7.3 above. Secondly, critical issues related to the key outcomes in Table 3 below will need to be discussed, and where possible agreed, at the Preparatory Conference. Finally, the success of the regime will be tested in the Commission following its establishment at the time of entry into force of the WCP Convention.

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<sup>42</sup> Including development, MCS and legal issues

**Table 3: Key desired outcomes from the WCPO Preparatory Conference**

<b>Desired outcome from Preparatory Conference</b>	<b>Rationale</b>
The effective participation of FFA States, in particular, small island developing States in the work of the Conference and its subsidiary bodies.	<p>The MHLC process placed States with different economic and political strengths as equal partners in the political process of the development of the Convention. The reality is that the MHLC participants have very different resource bases on which to underpin the effective implementation of the Convention. In establishing the Commission to manage and conserve the tuna resource, undue burdens should not be placed on the small island States. Effective participation in the work of the Commission can take the form of having a presence at the meeting as well as having the capacity to meaningfully and actively participate in all the work of the Commission.</p> <p>FFA States would want to avoid a Commission structure in which they effectively become bystanders while larger states with the financial resources and technical capacity effectively control the Commission. Effective participation in the Preparatory Conference will be a prelude to such involvement.</p>
Effective operation of the business of the Commission.	The Commission must not be unduly structured or operated in a way that disadvantages FFA States, especially small island States e.g. appropriate levels of funding should be available to allow full participation of FFA States.
The operations of the Commission are cost-effective.	FFA States will want to see that every effort is made to support a structure that is not only cost-effective in terms of its administrative and financial arrangements but also reasonable in respect of its size, budgetary support and institutional capacity to allow it to fulfil its functions.

Critical issues to be dealt with by the new Commission will be:

- allocation, including a provision for new entrants;
- effective control of IUU fishing through an MCS strategy;
- effective management/control of fishing capacity; and
- provision of independent scientific advice and robust data.

### **8.2.2 Regional**

#### ***Bigeye tuna and yellowfin tuna***

There is growing biological concern over the status of the bigeye tuna stock, and to a lesser extent over yellowfin tuna. Over the next five years, it is unlikely that fishing effort expended on these

stocks will be reduced without management intervention. The trend towards FAD fishing will likely be maintained, continuing to place pressure on immature bigeye tuna stocks.

A precautionary approach would suggest that FFA member countries should design and implement a management framework for bigeye tuna and prepare for a possible future long-term decline in yellowfin tuna. The complexity of formulating and implementing measures that will be acceptable to, and binding on all FFA parties (and later to members of the Commission) cannot be underestimated.

### ***Management of the purse seine fishery***

The Palau Arrangement has been examined both internally and externally (to the FFA) and been found to be deficient in effectively constraining and regulating purse seine effort as was originally intended. This is likely to be problematic in view of the biological uncertainty over the status of bigeye tuna stocks and some preliminary signals on yellowfin tuna. Also, progressive reductions in allocations under the Palau Arrangement to encourage domestic basing of purse seiners under the FSM Agreement have not occurred to the level envisaged. As key regional agreements that have the capacity to effectively control the management and development of the WCP purse seine fishery, they will require review and alignment to meet current concerns over increasing capacity. In addition, these agreements need to be strategically aligned with the future WCP Convention and provide support and a foundation for negotiations at the WCP Commission.

### ***Institutional Arrangements***

The completion of the MHLC process has laid the foundation for the WCPO Commission, however the role of FFA and OFP in the new multilateral regime still requires clarification.

FFA States and others strongly support the OFP forming the core of scientific advice and services to the Commission and for the Standing Committee on Tuna and Billfish to provide interim advice on the status of key stocks pending the Commission's establishment. This support is based on the OFP's well-established research programmes and associated core of expertise.

Being perceived as a tuna management agency, some observers have questioned the role and need for FFA in the post MHLC era. The three key services provided by FFA cannot be provided by the new Commission, indicating that FFA, including its technical Secretariat in Honiara, will continue to play a significant role in tuna fisheries management and development over the next five years and beyond. These are:

- the provision of a top level (on occasions at Ministerial level) forum (FFC) to discuss island perspectives on tuna fisheries management and development issues and in particular regional and sub-regional negotiating positions;
- administration of key regional initiatives including the US Tuna Treaty, the FSM Agreement and the Palau Arrangement, regional register and the FFA VMS; and
- the provision of technical advice on legal, MCS, fisheries management and marketing and information technology issues.

### ***Funding fisheries management, MCS and scientific services***

Fisheries management is not cheap. Most developed States spend up to 5% of the landed value of the catch on various forms of management, including MCS, data collection and verification, research and administration. Currently, the region spends less than 1% on these costs. In early 2000, the bulk of funding for OFP activity was derived from donor agencies (US\$2.4 million or

4%) of total funding, including AusAID and the EU, with minor contributions from other SPC member countries. A similar situation prevails at FFA where in 1999 more than 50% of total income (\$4.67m) was derived from donors and only 17% from member countries<sup>43</sup>.

Given the value of the fishery (close to \$2 billion per annum), and the development of the WCPO Commission, it is likely that in the next five years funding models will be put forward to decrease the commitments of long-term donors and increase contributions from the beneficiaries of the resource. Under the 'user pays' principle, these costs would be attributed to those holding or exercising the right to fish, which would effectively be DWFN vessel owners and increasingly, coastal States. Funding of long-term monitoring, programmes, biological and ecological research and stock assessment to support management decision making will require funding models that have greater certainty, rather than relying on donor preferences. Similar logic applies to management measures including those relating to MCS measures such as observers and VMS. The establishment of effective long term funding models for the Commission that will support adequate management without unduly burdening island States will be one useful measure of the success of the SAP, although the SAP is not solely responsible for achieving this outcome.

One inescapable fact is that cost recovery for management will tend to directly impact on coastal State revenue from oceanic fisheries, as was seen with the recent (1998/9) increase in the regional register fee and introduction of an FFA VMS levy. In these cases, DWFN operators treated these charges as increases in operating costs which directly impacted on their profitability, and hence their ability to pay access fees. It will also be difficult to argue that domestically based commercial vessels should be exempt from payment of at least a proportion of the management related costs that arise as a result of their activities.

**Attachment 7** provides an indication of current (1999) recurrent costs of oceanic fisheries management. Van Santen and Mueller (2001) discusses the incremental costs that are likely to arise from the new WCPO Convention and ways of reducing these costs through co-operation.

#### ***Niue Treaty***

Expansion of Niue Treaty-based agreements will better utilise scarce and expensive MCS assets and reduce the level of IUU fishing within the region. Attempts will be made by FFA to encourage member countries to engage in cooperative MCS arrangements and an agreement in Micronesia was well advanced in early 2000.

#### ***VMS***

Full implementation of the regionally based FFA VMS is a key target for FFA member countries to improve compliance and better control. A target of 1000 vessels on the FFA VMS register by 2002, each paying a registration fee of \$US845 has been set by the South Pacific Forum, as discussed previously.

### ***8.2.3 National***

#### ***Fisheries management planning (see also Section 7.1)***

Fisheries management planning to enable all FFA member countries to have sound domestic tuna policy and management arrangements in place has begun and the completion of these plans and more significantly, their implementation will be a critical issue. An integral part of this process

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<sup>43</sup> Of this total, Australia and New Zealand provided 74% (\$591, 156) while FFA island States contributed 26% (\$207,746)

will be to ensure the compatibility of these in-zone arrangements with regional (FFA-wide) arrangements, as well as multilateral arrangements to be developed under the Commission.

To support the implementation of these key initiatives, national fisheries administrations will be required to develop national capacity in fisheries departments and supporting agencies including legal and MCS departments. While current initiatives are providing some assistance, this is clearly a priority for the next five years against which there is limited financial and other support.

***Domestic industry development (see also Section 4.2 and 4.5)***

Countries will need to implement effective macroeconomic and other policies to overcome the constraints to domestic industry development identified in Section 4.1. Fisheries management planning will promote the development and implementation of these policies by bringing together key government, private sector and NGO interests. The small to medium longline sector offers considerable potential for developing a local equity interest in the tuna fishing sector, subject to fleet servicing and air transport availability. Where this is not an option, encouraging foreign vessels to base locally or use ports for transshipment also has considerable potential to increase economic benefit from tuna fishing.

***Monitoring, control and surveillance (see also Section 6.1)***

National MCS programmes will face increasing pressure as management arrangements are formulated and implemented. Current initiatives (FFA VMS, regional registration, patrol craft, observer programmes and port inspections) will form the basis of national programmes. As with other initiatives, recurrent funding will be an issue.

***Fisheries legislation (see also Section 7.1)***

New fisheries legislation will be required for most FFA member countries to implement the UNFSA, and the WCPO Convention, and this work has now commenced.

### **8.3 Assessing the SAP Project**

Whilst not strictly within the TORs it was agreed with FFA and SPC that it would be useful for this study to provide some consideration of the predicted outcomes against which specific contributions made by the SAP to oceanic fisheries management could be assessed. **Attachment 8** summarises key oceanic fisheries management weaknesses; areas addressed by the SAP and projected project progress over its three and five year time frames. It can be seen that a number of these activities will reach preliminary stages after three years and move to full implementation by year five. There is considerable complementarity between the work of FFA (management and economic advice) and SPC (monitoring and research and the provision of scientific advice). Other institutions, including SPREP<sup>44</sup> (environmental issues, including by catch and impacts on the coastal zone) and FORSEC<sup>45</sup> also run complementary activities that add significantly to the outcomes of the two core project implementing agencies.

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<sup>44</sup> South Pacific Regional Environment Programme

<sup>45</sup> Pacific Islands Forum Secretariat



## References:

- ADB (1997).** The Pacific's Tuna: The Challenge of Investing in Growth. Asia Development Bank Office of Pacific Operations, Pacific Studies Series. Manila, Philippines.
- Bailey, K., P.G. Williams and D.G. Itano (1996).** Bycatch and discards in western tuna fisheries; a review of SPC data holdings and literature. OFP Technical Report No. 34.
- Cook Islands et al. (1998).** Strategic Action Programme for International Waters of the Pacific Islands Region, SPREP, Apia, Samoa.
- FAO (2001).** Research implications of adopting the precautionary approach to the management of tuna fisheries. FAO Fisheries Circular No 963. Rome, FAO.
- FFA (1998).** South Pacific Forum Fisheries Agency Corporate Plan 1998-2001. Honiara, Solomon Islands.
- FFA (1999a).** South Pacific Forum Fisheries Agency Annual Report 1999. Honiara, Solomon Islands.
- FFA (1999b).** Report, Proceedings and Draft Convention from the Fifth Session of the Multilateral High-Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific.
- Gillette R., M. McCoy, L.Rodwell and J.Tamate (2001).** Tuna – A Key Economic Resource in the Pacific Islands. ADB Pacific Studies Series. Manila, Philippines.
- Hampton, J., and D. Fournier (2000).** Updated MULTIFAN-CL based assessment of yellowfin tuna. Working Paper YFT-1, SCTB 13, Noumea, New Caledonia.
- Hampton, J., and D Fournier (2001).** Stock assessment of skipjack tuna in the western and central Pacific Ocean. Working Paper SKJ-1, SCTB 14, Noumea, New Caledonia
- Hampton, J., A Lewis and P.Williams (2001).** The Western and Central Tuna Fishery: 1999 Overview and Status of Stocks. OFP Tuna Fisheries Assessment Report (2). Noumea, New Caledonia.
- Hampton, J., A Lewis and P.Williams (2002).** The Western and Central Tuna Fishery: 2000 Overview and Status of Stocks. OFP Tuna Fisheries Assessment Report (3). Noumea, New Caledonia.
- Lawson, T. (1997).** Estimation of bycatch in central and western Pacific tuna fisheries: preliminary results. OFP internal report No. 33, Noumea, New Caledonia.
- Lawson, T. (2000) (Ed.).** SPC Tuna Fishery Yearbook 1999. OFP, Noumea, New Caledonia.
- Lawson, T. (2001) (Ed.).** SPC Tuna Fishery Yearbook 2000. OFP, Noumea, New Caledonia.
- Lawson, T (2001).** Observer data held by the Oceanic Fisheries Programme covering tuna fishery bycatches in the western and central Pacific Ocean. OFP internal report No. 45, Noumea, New Caledonia.
- Lehodey P., Andre J-M, Bertignac M., Hampton J., Stoens A., Menkes C., Memery L., Grima N. (1998).** Predicting skipjack tuna forage distributions in the equatorial Pacific using a

coupled dynamical bio-geochemical model. *Fisheries Oceanography*, Volume 7 (3& 4): 317 - 325

**Lewis, A.D. (1999).** An update on non-target, associated and dependent species (NADs). Working Paper SKJ-1, SCTB 12, Tahiti, French Polynesia.

**Van Santen, G., and P. Muller (2001).** Working Apart or Together – The Case for a Common Approach to Management of the Tuna Resources in the Exclusive Economic Zones of Pacific Countries. Pacific Islands Discussion Paper Series No. 10. World Bank, Washington D.C.

**TERMS OF REFERENCE**

**Background**

The Strategic Action Programme (SAP) of the Pacific Small Island Developing States (Project Number RAS/98/G32/A/1G/99) is designed to assist Pacific island countries improve regional capacity for management of transboundary water resources and create improved management structures to address environmental degradation and ensure the long term sustainability of ocean fisheries in the Western Pacific ecosystem. The SAP also intends to promote improved integration of environmental concerns into local, national and regional policy, and improved water quality and the conservation of key coastal and ocean ecological areas.

Measures to achieve the long-term sustainable development of ocean fisheries in the region are a SAP priority. Regional level options to increase domestic benefits from the tuna fishery and associated bycatch are to be explored in an effort to reduce fishing pressure on increasingly degraded and over-exploited near-shore resources. The result is anticipated to protect and enhance globally significant biological resources and increase food security for the region.

**Purpose**

To describe the baseline situation, in early 2001, in relation to what is known about the oceanic fish resources of the Central and Western Pacific, the status of their exploitation and the administrative tools that have been applied to fisheries operating there to date. To also describe current initiatives to address management and conservation issues for these oceanic resources and the role of Pacific island States in these initiatives.

1. Briefly summarise current knowledge of the biology of the principal target oceanic fisheries resources in the CWP and the status of the major fisheries stocks. Describe current research that focuses on these resources and the regional oceanic environment and identify key research questions that need to be addressed during the next 5 years.
2. Briefly describe current knowledge of fisheries targeting these resources, both domestic and distant water, highlighting trends that provide an indication of likely developments during the next 5 years.
3. Summarise the status of fisheries legislation and monitoring, control and surveillance (MCS) arrangements applied in the region to assist with the administration of fishing activity. Identify key weaknesses in respect of improving the capacity of FFA member countries to administer fisheries, collaboratively on a regional scale and in respect of individual FFA member countries.
4. Describe the economic value of the fishery, nationally and regionally, to FFA member countries. Identify key fishery development aspirations and initiatives among Pacific island States (national and regional) at the current time.
5. Describe current regional and national oceanic fisheries resource management and conservation arrangements and identify likely developments during the next 5 years
6. Identify critical issues against which future reviews of the status of oceanic fisheries resources in the CWP and the status of the management and conservation arrangements, nationally and regionally, may be assessed against the situation existing in early 2001

## ATTACHMENT 2

### Oceanic fisheries resources (national): baseline status SAP Beneficiary Countries

Country	Most recent National Fisheries Assessment	Observer programmes	Port inspection programmes	Data Analysis
<b>Cook Islands</b>	NFA <sup>46</sup> in 1997	No observer programme	No port sampling	CES <sup>47</sup> Version 3.0 provided
<b>Federated States of Micronesia</b>	NFA in 1991, recent TFA <sup>48</sup> (October 2000)	Well-established observer programme for more than 10 years	Well-established port sampling in major ports of unloading	CES Version 5.3 provided
<b>Fiji</b>	NFA in 1994 (and in 2001); TFAs in 1996 and 1998	Some training, but no active observer programme	Port samplers in Levuka and Suva (one in each port)	CES Version 5.3 provided
<b>Kiribati</b>	NFA in 1991; Interaction Study in 1995	Some training, but no active observer programme. A couple of one-off trips	Some training but sampling irregular	CES Version 5.3 provided
<b>Marshall Islands</b>	NFA in 1998	Some training, but no active observer programme. A couple of one-off trips	Intermittent sampling	CES Version 5.3 provided
<b>Nauru</b>	NFA scheduled for 2000	No observer programme	Port Sampling training provided, but sampling opportunities rare	CES Version 5.3 provided

<sup>46</sup> National Fisheries Assessment – a comprehensive overview of oceanic fish stocks and issues relating to their harvest and management.

<sup>47</sup> Catch and Effort Query system, which interfaces with MS EXCEL and MAPINFO and allows the production of data summaries and maps of fishing activities in country.

<sup>48</sup> Tuna Fisheries Assessment – brief assessments of oceanic fisheries resources.

<b>Niue</b>	NFA in 2000	No observer programme	No port sampling	No
<b>Palau</b>	NFA in 1995	Some training, but no active observer programme	Active and effective port sampling programme	CES Version 5.3 provided
<b>Papua New Guinea</b>	NFA in 1993; (TFAs - 1996 and Nov 1999)	Some training provided; Observer programme not fully operational	Training provided, but irregular port sampling	CES Version 5.3 provided
<b>Samoa</b>	TFA in 1997	No observer programme	Regular port sampling; a few problems with the data provided	CES Version 3.0 provided
<b>Solomon Islands</b>	NFA in 1998	Some training provided; Observer programme not fully operational	Training provided but irregular port sampling	CES Version 5.3 provided
<b>Tonga</b>	NFA in 1997	No observer programme, but a couple of one-off trips	Irregular port sampling	CES Version 5.3 provided
<b>Tuvalu</b>	NFA in 2000	No observer programme	No port sampling	No
<b>Vanuatu</b>	NFA in 2000	No observer programme	No port sampling	CES Version 5.3 provided

### ATTACHMENT 3

#### International and Regional Fisheries Agreements – baseline status SAP Beneficiary Countries

Agreement	Date	Signatories as at February 2000	Purpose of Agreement	Other Comments
<b>Law of the Sea Convention</b> (United Nations Convention on the Law of the Sea 1982).	10 December 1982 (Adoption of final text).	Australia, Cook Islands, the Federated States of Micronesia, Fiji, Marshall Islands, Nauru, New Zealand, Palau, Papua New Guinea, Solomon Islands, Tonga, Vanuatu and Samoa	Establishes a comprehensive framework for the regulation of all ocean space, including provisions for fishing in the EEZ and on the high seas, as well as for highly migratory fish stocks, including tuna and tuna-like species.	Of those signatories the Federated States of Micronesia, Marshall Islands, and Tonga have ratified the Convention.
<b>Fish Stocks Agreement</b> (Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 in relation to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks).	4 December 1995 (Adoption of final text).	Australia, Cook Islands, the Federated States of Micronesia, Fiji, Marshall Islands, Nauru, New Zealand, Niue, Solomon Islands, Papua New Guinea, Samoa, Solomon Islands, Tonga and Vanuatu.	Extend provisions of the Law of the Sea Convention covering fishing on the high seas, particularly with respect to straddling fish stocks and highly migratory fish stocks, including tuna and tuna-like species.	Of those signatories Australia, Cook Islands, the Federated States of Micronesia, Fiji, Nauru, Papua New Guinea, Samoa, Solomon Islands and Tonga have ratified or acceded to the Agreement
<b>FFA Convention</b> (South Pacific Forum Fisheries Agency Convention).	Signed July 1979.	All FFA member countries.	Established the FFA, comprising the FFC and Secretariat, to facilitate co-operation on the conservation and management of marine, particularly oceanic, resources of the region.	Secretariat based in Honiara, Solomon Islands.

<b>US Treaty</b> (Treaty on Fisheries between Governments of Certain Pacific Island States and the Government of the United States of America).	Signed April 1987; entered into force June 1988.	All FFA member countries.	An access agreement allowing 55 (now 50) US purse seine vessels to enter the waters of FFA member countries, subject to certain restrictions.	Includes comprehensive fisheries management related provisions, relating <i>inter alia</i> to the supply of data and observers. Extended by 10 years in 1993.
<b>Nauru or PNA Agreement</b> (Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Interest).	Entered into force December 1982.	Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands and Tuvalu.	Provides an enabling agreement framework for cooperation between parties.	Three implementing agreements have been reached under the Nauru Agreement.
<b>First Implementing Agreement on MTCs</b> (Agreement on Minimum Terms and conditions of Access).	Re-signed 1993.		Sets out basic requirements for the conduct of vessel owners and operators fishing in the EEZs of FFA member countries. Second subsidiary agreement under the Nauru Agreement.	Includes such minimum terms as those covering Regional Register, observers, VMS and Transshipment regulation.
<b>Second Implementing Agreement on MTCs</b> (Agreement on Minimum Terms and Conditions of Access).	Adopted September 1992.		Added further MTCs.	
<b>Palau Arrangement</b> (Arrangement for the Management of the Western Pacific Purse Seine Fishery).	Signed October 1992.	As per the Nauru Agreement with the exception of Solomon Islands and Tuvalu.	Allows for coordination of the in-zone management arrangements of the parties with respect to the Purse Seine Fishery. First subsidiary agreement under the Nauru Agreement.	Provides a limit, by vessel category, of the number of purse seine vessels (currently 205) that may operate in the waters of Parties.

<b>Niue Treaty.</b>	Signed July 1992, entered into force May 1993.	All FFA member countries except Tuvalu and New Zealand.	Provides flexible arrangements for co-operation in fisheries surveillance and law enforcement.	Agreements made under the Niue Treaty may be on a bilateral, sub-regional or regional basis.
<b>FSM Arrangement</b> (Federated States of Micronesia Arrangement for Regional Fisheries Access)	Signed November 1994, entered into force September 1992.	Federated States of Micronesia, Kiribati, Palau, Nauru, Papua New Guinea and Solomon Islands.	Third sub-regional initiative under the Nauru Agreement.	Vessel numbers under the FSM Arrangement must be consistent with the Palau Arrangement.



## ATTACHMENT 4

### Fisheries monitoring<sup>49</sup>, control and surveillance: baseline status SAP Beneficiary Countries

Country	Control	Surveillance
<b>Cook Islands</b>	Drafting marine resources act. Tuna fisheries management plan developed that will incorporate flag state responsibilities, FFA VMS, Lacey-Act provisions and harmonised MTCs.	One patrol boat. Reporting procedures agreed with French naval ships transiting Cook Islands waters. Cooperation with French Navy, RNZAF and RAAF on aerial surveillance. FFA VMS established and operated by National Police. No observer programme.
<b>Federated States of Micronesia</b>	Drafting Marine Resources Act that will incorporate flag State responsibilities, FFA VMS, Lacey-Act provisions and harmonised MTCs. Discussions underway for a subsidiary agreement under Niue Treaty with Palau and Marshall Islands.	Three patrol boats. Occasional joint operations with the RAN in FSM waters. Cooperation with RNZAF and RAAF on aerial surveillance. Current observer programme. FFA VMS established and operated by National Police.
<b>Fiji</b>	Fisheries Regulations (1990) allow for Minister to request monthly data catch effort data. Revised regulations to be drafted to require the mandatory carriage of the FFA VMS as a licence condition.	Four patrol boats of different sizes. Cooperation with French Navy, RNZAF and RAAF on aerial surveillance. National observer programme to be developed. FFA VMS established and operated by National Police.
<b>Kiribati</b>	Licence conditions require the carriage of VMS, although not necessarily the FFA VMS.	One patrol boat. Cooperation with RNZAF and RAAF on aerial surveillance. National fisheries observer programme in place. FFA VMS established and operated by Ministry of Natural Resources Development.
<b>Marshall Islands</b>	Marine Resources Act (1997) requires carriage of VMS, although not necessarily the FFA VMS. Discussions underway for a subsidiary agreement	One patrol boat. Cooperation with French Navy, RNZAF and RAAF on aerial surveillance. National fisheries observer programme established. FFA VMS established and operated by the Marshall

<sup>49</sup> All FFA member countries submit catch and effort logsheets to OFP in Noumea for data entry. The timeliness of submission of that data and the coverage varies between countries. Some port inspection also occurs (see **Attachment 1**).

	under Niue treaty with Palau and FSM.	Islands Marine Resources Authority
<b>Nauru</b>	Fisheries Regulations (1997) govern the use of the FFA VMS on licensed vessels.	No patrol vessels. Multi purpose government owned fishing vessel can transport observers. FFA VMS established but not operational. Cooperation with French Navy, RNZAF and RAAF on aerial surveillance. No observer programme.
<b>Niue</b>	Position with respect to the mandatory carriage of FFA VMS on foreign vessels not known.	No patrol vessels. No observer programme. Cooperation with French Navy, RNZAF and RAAF on aerial surveillance. FFA VMS established and operated by Fisheries Division.
<b>Palau</b>	Regulation RPPL 5-36 requires carriage of FFA VMS as a condition of licence. Discussions underway for a subsidiary agreement under Niue Treaty with Marshall Islands and FSM.	One patrol boat. Cooperation with French Navy, RNZAF and RAAF on aerial surveillance. Observer programme not operational. FFA VMS established and operated by National Police.
<b>Papua New Guinea</b>	Fisheries Management Act (1998) requires that an FFA VMS be installed on each foreign vessel as a condition of licence. Tuna fisheries Management plan including MCS provisions being actively implemented.	Four patrol boats. Cooperation with RNZAF and RAAF on aerial surveillance. Very active national observer programme, incorporating compliance elements. FFA VMS established and operated by National Fisheries Authority (NFA). Domestic VMS for Papua New Guinea flag vessels operated by Papua New Guinea Defence Force. National surveillance coordination centre (NFA and Defence Force) coordinates surveillance in Papua New Guinea EEZ
<b>Samoa</b>	Fisheries Amendment Act (1999) and associated regulations require the FFA VMS to be installed on foreign licensed fishing vessels.	One patrol boat. Cooperation with RNZAF and RAAF on aerial surveillance. No observer programme. FFA VMS established and operated by National Police.
<b>Solomon Islands</b>	Fisheries Act (1998) requires the FFA VMS to be installed on foreign licensed fishing vessels. Tuna fisheries management plan including MCS provisions being actively implemented.	Three patrol boats. Cooperation with RNZAF and RAAF on aerial surveillance. Active observer programme incorporating compliance elements. FFA VMS established and operated by Fisheries Division.
<b>Tonga</b>	National MCS Network Committee established. FFA VMS is implemented as a licence condition. (NB apart from US Treaty vessels, no DWFN)	Two patrol boats. Cooperation with RNZAF and RAAF on aerial surveillance. No national observer programme. Single engined spotter aircraft operated by Tonga Defence Services FFA VMS established and

	fishing is permitted in EEZ).	operated by Ministry of Fisheries.
<b>Tuvalu</b>	FFA VMS implemented as a license condition.	One patrol boat. Cooperation with RNZAF and RAAF on aerial surveillance. No observer programme. FFA VMS established and operated by Fisheries Division
<b>Vanuatu</b>	A tuna management plan including MCS provisions is close to completion. FFA VMS is implemented as a licence condition.	One patrol boat. Cooperation with French Navy, RNZAF and RAAF on aerial surveillance. No observer programme. FFA VMS established and operated by National Police, with input from Fisheries Division

# ATTACHMENT 5

## Fisheries management: baseline status SAP Beneficiary Countries

Country	Tuna management planning	Domestic industry development	Fisheries contribution to GDP *
<b>Cook Islands</b>	Request made to FFA for assistance to prepare a plan	One longline vessel plus a small artisanal fishery only	8.69% (2000)
<b>Federated States of Micronesia</b>	ADB sponsored project to prepare a plan underway	5 purse seine vessels 47 locally based longline	5.8% (1998)
<b>Fiji</b>	Request made to FFA for assistance to prepare a plan	42 locally owned and operated longline vessels One pole and line vessel PAFCO cannery	2.14% (2000)
<b>Kiribati</b>	No formal plan	One purse seine vessel 2 longline vessels Large artisanal fishery	11.98% (2000)
<b>Marshall Islands</b>	ADB-sponsored technical studies undertaken – but no formal plan	Loining plant Active policy to encourage transshipment	7.4% (1999)
<b>Nauru</b>	Draft policy framework	No significant development	Not available
<b>Niue</b>	Plan completed in 1998	Small artisanal fishery	1.58% (2000)
<b>Palau</b>	Plan completed in 1999	80 locally based longline vessels	2.7% (1998)
<b>Papua New Guinea</b>	Plan completed in 1998	Cannery 15 purse seine vessels 34 domestic longline vessels	0.56% (1999)

Formatted: French (France)

<b>Samoa</b>	No formal plan, but policy studies underway	Locally owned and operated Alia fleet (220 albacore longine vessels)  Seven larger locally owned and operated longline vessels	8.31% (2000)
<b>Solomon Islands</b>	Plan completed in 1999	Cannery  5 domestic purse seine 20 locally based longline 30 domestic pole and line vessels	Not available
<b>Tonga</b>	Technical studies completed by FAO for preparation of a plan	12 locally owned and operated domestic longline vessels	7.1% (1999/2000)
<b>Tuvalu</b>	No formal plan	Artisanal fishery only	6.77% (2000)
<b>Vanuatu</b>	Work on preparation of a plan due to commence	One longline vessel plus a small artisanal fishery only	8.69% (2000)

\* FFA estimates based on Gillette 2001

## ATTACHMENT 6

### Key oceanic fisheries management weaknesses, key areas addressed by SAP and project progress in 3/5

Key weaknesses	Areas addressed by SAP	Predicted progress after 3 years	Predicted progress after 5 years
<b>1. Geographical gaps in fisheries management regimes (high seas)</b>	<b>Establishment of Multilateral oceanic fisheries (HMS) management arrangements</b>		
	<p>Participation of FFA island State delegates in two MHLC negotiating sessions. Preparation of technical advice to Pacific island delegations to achieve key outcomes within the new Convention text and at the preparatory Commission.</p> <p>Incorporation of key elements of UNFSA, including compliance arrangements.</p> <p>Establishment of ecologically sustainable fisheries management, compliance and research programmes under the Commission that will meet conservation and management needs and raise adequate funds from the beneficiaries of fisheries management.</p>	<p>Establishment and acceptance of FFA regional positions on a range of key issues.</p> <p>Completion of WCPO Convention, incorporating key outcomes for Pacific Island States.</p> <p>New Convention incorporates key elements of UNFSA, including compliance.</p> <p>Principles of Commission funding agreed.</p>	<p>WCPO Convention in force; Commission established.</p> <p>User pays/cost recovery system established; increased investment in fisheries conservation and management initiatives, without unduly disadvantaging Pacific island States.</p>
	Regional fisheries management workshops to develop new regional-level methodologies for implementation under the new commission	Incorporation of new regional initiatives in Commission rules and procedures.	Regional allocation model accepted by FFA member States and presented to Commission.

2. Functional gaps in regional programmes to address key conservation and management issues	Regional programmes of FFA and SPC strengthened		
Improved scientific advice relating to stock assessments of target species and advice on bycatch and oceanic ecosystem issues to support fisheries management decision-making.	<p>Testing and refinement of key assessment tool (MULTIFAN-CL model) under a range of complex scenarios to measure model outcomes against actual values derived from the fishery.</p> <p>Generation of reference points (limit and target) as required for the application of the precautionary approach to fisheries management, using MULTIFAN-CL.</p> <p>Study of the impact of ENSO and global climate change on tuna stock dynamics and the fishery, including predictive analysis.</p> <p>Preliminary ecosystem modelling for tuna fisheries management, including study of foodwebs and the underlying variability affecting the pelagic ecosystem and catch levels.</p> <p>Billfish stock assessment.</p> <p>Bigeye stock assessment.</p>	<p>First generation assessments available for the four key tuna species and progress in assessing fishery impacts on some bycatch species.</p> <p>Initial biological reference points generated for four tuna species.</p> <p>Preliminary understanding of impacts of climatic changes on tuna stock dynamics.</p> <p>Preliminary understanding of ecosystem building blocks; initial runs of ECOPATH model.</p> <p>Basic data for preliminary billfish assessments collected.</p> <p>As above.</p>	<p>Robust assessment models available and routinely applied to all four tuna species.</p> <p>Reference points refined and incorporated in national and regional (WCPO) management arrangements.</p> <p>Predictive capability that will assist industry and governments to more effectively manage oceanic resources.</p> <p>Functioning ecosystem model.</p>
Monitoring, control and surveillance (high seas).	<p>Fellowships for international experts to provide advice on compliance programmes for the new Commission.</p> <p>Negotiation and establishment of compliance regimes for the new Commission, including VMS, regional register and an observer programme.</p>	In-principle agreement for high-seas/Commission area MCS regime, based on WCPO Convention text.	Max. use of existing regional arrangements (science services; Regional Register; observer coordination; VMS – FFA) in new Commission.

Fisheries monitoring, including bycatch species.	Support for national port sampling and observer programmes; includes the establishment of national coordinators, manuals and training materials.  Supervision of data collection and data quality.	Establishment of national observer programmes.	Regional/Commission-wide sampling programme established, including observers and port sampling, based on co-ordination of national programmes.
Precautionary management action on key species.	Using OFP scientific advice, develop strategies for regional management action as necessary, with flow-on to WCPO Commission.	Strategies developed for key species/systems management, including bigeye, sharks, turtles and others arising from OFP and other assessments.	Management actions taken as necessary on bigeye issue and management of other target species and bycatch as necessary; regional position extended to PrepCon/Commission negotiations.
<b>3. Capacity of island States to participate in regional research and management processes, and apply oceanic fisheries management initiatives at national level</b>			
Regional fisheries agreements.	Review effectiveness of PNA group and Palau Agreement and FSM Arrangement.	Reviews of regional agreements completed.	Recommendations of reviews implemented, including that of the Palau Agreement to ensure effective management of purse seine capacity, compatible with Commission outcomes.
National fisheries management planning.	Preparation, revision and implementation of tuna management plans and associated legislation, including the incorporation of socio-economic development considerations.	Tuna management plans prepared and implemented in 8 FFA countries.  Development takes account of options to maximise socio-economic benefits to all sectors.	Tuna management plans prepared and implemented in all FFA countries.



Licensing of vessels without full information or regard for long-term resource sustainability.	Improved in-country arrangements for fisheries assessments, establishment of transparent and co-operative licensing and management arrangements.	Licensing of vessels linked to resource endowments and in accordance with regional agreements (for example, Palau Arrangement, MTCs, including VMS).	
Lack of skills and experience in contemporary fisheries management.	National fisheries management workshops.  Participation by FFA Secretariat staff and FFA country representative as observers in other tuna management organisations in the Atlantic, Indian and eastern Pacific Oceans.	Improved fisheries management decision-making, including establishment of co-management committees.  All FFA countries and Secretariat exposed to RFMO procedures in other oceans.	Establishment of more sophisticated national management measures, including rights-based management.  Effective participation of FFA representatives at the Commission; outcomes reflect best practice & avoid mistakes from other RFMOs.
Research and monitoring skills at a national level.	Establishment of national databases, data processing capacity and capability to use query software to access regional databases at OFP to obtain national fisheries statistics.	Improved national data collection systems; use of national fisheries statistics to support management and regulation of fisheries.	Well-established log-book, port sampling and observer programmes as appropriate for significant national fisheries in FFA countries; computerised data management systems operated by national staff; information routinely informing decision-making within national tuna management plan framework.

## ATTACHMENT 7

### Baseline capital and recurrent costs of oceanic fisheries management <sup>50</sup>

Cost categories	DWFN funded	Donor funded	FFA Island country funded
VMS installation	5,000		
VMS operation	850		350
Air surveillance		5,000	
Surface surveillance investment		120,000	
Surface surveillance operation		3,000	3,000
Observer programme	250	250	1,000
Regional Register	500		20
Compliance			???
Regional tuna research (SPC)	100	1,100	100
Regional data collection/monitoring/verification	400	500	200
National tuna research (Excluding Aust and NZ)	?	200	500
National catch data collection and reporting	100	?	500
Legal requirements		50	
Staff Training		500	500
Updating equipment		500	500
<b>Total investment</b>	<b>5,000</b>	<b>120,000</b>	
<b>Total recurrent (annual)</b>		<b>11,100</b>	<b>6,670</b>

<sup>50</sup> Adapted from Van Santen and Mueller (2001).

## ATTACHMENT 8

### Key oceanic fisheries activities

Activity	Core agency and role	Core agency funding source(s) and activities	Supporting agency (agencies) and role(s)	Supporting agency (agencies) funding source(s)	Outputs
<b>National fisheries management planning</b>	<b>FFA:</b> establish stakeholder committees, assist with drafting national tuna management plans and review fisheries legislation/MCS arrangements as required as required	<b>IW SAP</b> \$570,000 <b>CSPDP II</b> Consultancy services and funding for FFA/SPC \$1.7 million over 5 years) <b>AusAID</b> \$500,00 per annum <b>FFA</b> core budget	<b>SPC/OFP:</b> provision of scientific advice, stock assessment etc (one full time position and programme support) <b>SPC/CFS:</b> <sup>51</sup> Provision of advice on development alternatives, including domestic industry development	<b>AusAID,</b> <b>France</b> <b>EU</b>	Integrated fisheries management plans combining biological, economic and social considerations.
<b>Development of a WCPO multilateral arrangement</b>	<b>FFA:</b> provide forum for discussion and development of fisheries management strategies; technical advice; support for attendance at meetings	<b>IW SAP</b> \$800,000 Support for attendance at MHLC meetings	<b>SPC/OFP:</b> Advice on the provision of science, data and other relevant aspects of Convention, including species, boundaries.	<b>AusAID</b>	Effective fisheries management covering the full range of stocks; full Pacific Island participation in the Commission; equitable allocation and management outcomes

<sup>51</sup> Capture Fisheries Section

<b>Review of regional arrangements (PNA group, FSM and Palau Arrangements)</b>	<b>FFA:</b> manage consultancies and staff resources to review Arrangements.	<b>AusAid:</b> \$20,000 <b>ADB:</b> \$20,000	<b>SPC/OFP:</b> provision of data and advice <b>USP:</b>	<b>AusAID</b>	Amended arrangements taking account of recent international developments.
<b>Collection, analysis and verification of oceanic fisheries data</b>	<b>SPC/OFP:</b> continued collection of basic catch, port sampling and observer data	<b>IW SAP</b> \$740,000 <b>EU</b> <b>AusAID</b> <b>France</b>	<b>FFA:</b> US Treaty-based observer programme	<b>Treaty Parties:</b> \$110,000 per annum observer programme contribution from the US agreed under the Treaty.	Integrated regional databases to underpin monitoring and assessment
<b>National and regional MCS programmes</b>	<b>FFA:</b> Administration of regional register, <b>FFA VMS;</b> coordination of aerial surveillance Observer training	<b>IW SAP: \$140,000</b> <b>DWFNs:</b> through cost recovery on FFA Register and VMS \$US\$900,00 per annum <b>AusAID</b> \$120,00 per annum	<b>ADF:</b> Assistance with operation of Patrol boats in all FFA countries except Niue and Nauru ) <b>SPC:</b> Observer training and coordination	<b>ADF:</b> \$3 million	Improved control of IUU fishing; better data for fisheries management
<b>By-catch issues</b>	<b>SPC/OFP:</b> characterizing all components of the warm pool ecosystem and measuring fishery impacts on them	<b>IW SAP</b> <b>EU</b>	National and regional observer and port sampling programmes	<b>SPREP:</b> turtle programme <b>PFRP/UH*:</b> supplementary project funding	Fishery impacts on ecosystem components measured and management measures developed as necessary
<b>Stock assessment</b>	<b>SPC/OFP:</b> Robust assessment models applied to the four tuna species	<b>AusAID</b> <b>IW SAP</b>	Collaborative research (IATTC, Japan etc)	<b>PFRP/UH:</b> supplementary funding	Routine assessments conducted on the four main species

<b>Development of specific management measures (e.g. precautionary approach to bigeye)</b>	<b>FFA:</b> Analysis of management options.	<b>IW SAP:</b> \$300,000 <b>AusAID:</b> \$30,000	<b>SPC/OFP:</b> Stock assessment, development of reference points; provision of advice, framed as required	<b>AusAID</b>	Precautionary management approach to vulnerable species (bigeye) based on robust stock assessment
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\* Pelagic Fisheries Research Programme/University of Hawaii