# SCIENTIFIC SUPPORT FOR OCEANIC FISHERIES MANAGEMENT IN THE WESTERN AND CENTRAL PACIFIC OCEAN (SCIFISH)

**9.ACP.RPA.013 & 9.PTO.REG.008**

(9th European Development Fund)

Photo: Malo Hosken-SPC

## Terminal Report

| Funding Agency | Implementing Agency | Contracting Agency (ACP Component) | Contracting Agency (OCT Component) |
|---|---|---|---|
| | SPC Secretariat of the Pacific Community | PACIFIC ISLANDS FORUM SECRETARIAT | GOUVERNEMENT DE LA NOUVELLE CALÉDONIE |

June 2012 (revised in September)

Signature Page:

On behalf of the implementing agency I have pleasure in providing herewith the final Terminal Report of the project, which has been revised in line with comments from the Delegation for the Pacific.

Date: 11th September 2012

Richard Mann
Officer-in-Charge
Secretariat of the Pacific Community

Approved by:

Date:

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Deputy Secretary General and
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# List of Abbreviations

| | |
|---|---|
| ACP | African, Caribbean and Pacific group of countries |
| AWP | Annual Work Plan |
| CMM | Conservation and Management Measure |
| CSIRO | Commonwealth Scientific and Industrial Research Organisation (Australia) |
| DEVFISH 2 | Development of sustainable tuna fisheries in Pacific ACP Countries phase 2 |
| EDF | European Development Fund |
| EEZ | Exclusive Economic Zone |
| EMIA | Joint Forces High Command (Nouméa) |
| EU | European Union |
| FAD | Fish Aggregation Device |
| FFA | Forum Fisheries Agency |
| FFC | Forum Fisheries Committee |
| FSM | Federated States of Micronesia |
| GEF | Global Environment Facility |
| GLOBEC | Global Ocean Ecosystem Dynamics (UNESCO) |
| IUU | Illegal, Unreported and Unregulated (fishing) |
| KRA | Key Result Areas |
| MCS | Monitoring Control and Surveillance |
| MSY | Maximum Sustainable Yield |
| NTFSR | National Tuna Fishery Status Report |
| OCT | Overseas Countries and Territories |
| OFP | Oceanic Fisheries Programme (SPC) |
| OVI | Objectively Verifiable Indicator |
| P-ACP | Pacific ACP |
| PICT | Pacific Island Countries and Territories |
| PIFS | Pacific Islands Forum Secretariat |
| PRIP | Pacific Regional Indicative Programme |
| PNA | Parties to the Nauru Agreement |
| PNG | Papua New Guinea |
| PROCFISH | Pacific Regional Oceanic and Coastal Fisheries Management and Development Project |
| PSAT | Pop-up Satellite Tags |
| PSC | Project Steering Committee |
| RAO | Regional Authorising Officer |
| RTTP | Regional Tuna Tagging Project |
| SEAPODYM | Spatial Ecosystem and Population Dynamics Model |
| SCIFISH | Scientific Support for Oceanic Fisheries Management in the Western and Central Pacific Ocean |
| SciCoFish | Scientific Support for the Management of Coastal and Oceanic Fisheries in the Pacific Islands Region |
| SPC | Secretariat of the Pacific Community |
| SPRTRAMP | South Pacific Regional Tuna Resource Assessment and Monitoring Project |
| T-RFMO | Tuna Regional Fisheries Management Organisation |
| TUFMAN | Tuna Fisheries Data Management System |
| VMS | Vessel Monitoring System |
| WCPFC | Western and Central Pacific Fisheries Commission |
| WCPO | Western and Central Pacific Ocean |

# 1 Non-Technical Summary of the Project and its Results

The European Union funded the SCIFISH project to help the Pacific Islands (ACP countries and French territories) with the scientific advice that they need to manage their important tuna fisheries. The project was carried out by the Oceanic Fisheries Programme of the Secretariat of the Pacific Community, and worked together with a number of other programmes to make sure the aid was used to good effect.

The project worked in three main areas:-

- Fisheries monitoring - SCIFISH trained observers (Government officers who work on board commercial fishing boats collecting information on catches and fishing). It also helped fisheries departments to store and manage information on fishing on computers.
- Stock assessment – SCIFISH used computer models to come up with estimates of how much fish is in the sea, and how much can be caught.
- Understanding ocean systems – SCIFISH looked at how tuna fisheries can harm other marine creatures like turtles and sharks, how fish move through the Pacific, and how this may be driven by ocean currents and the movement of their food. This part of the project included tagging a large number of tuna (catching them, marking them with a small plastic tag and releasing them until they are caught again so that scientists can see how they move and how much they have grown), and developing a computer model called SEAPODYM.

The project also looked at ways of tackling illegal fishing. A trial of a searching for fishing boats using satellites was tested in the sea around New Caledonia; while studies on how to cut down illegal tuna fishing were completed by FFA for the Pacific ACP countries.

The project, supported by other programmes, met or exceeded its targets in nearly all areas:

- More than 600 Pacific Island observers were trained so that all of the purse seine vessels fishing in the region (the biggest boats that catch most of the fish) could be better monitored by carrying an observer at all times. SCIFISH also made good progress with training Pacific Island countries to train their own observers.
- The project improved and put in place systems for managing tuna fisheries data, and trained national staff in their use; by the end of the project 14 P-ACP countries were using these systems.
- SCIFISH completed many more stock assessments than planned, and the results were internationally agreed as the basis for new measures to improve regional tuna fisheries.
- The project developed the SEAPODYM model so that it can now forecast the impacts of climate change on tuna.
- It gave new ideas on the impact of fishing on threatened species such as turtles and whale sharks, leading to new international rules to improve conservation.
- It also carried out a major ocean research programme of tuna tagging, giving scientists much new information on tuna growth and movements. This is now being used to improve our understanding of the stocks.

The project has given out key results of the project widely. This has lead to greater awareness of tuna fisheries management problems by the heads of Government of the region, who are now calling for the region's tuna resources to be managed better. While this is a long-term process, big steps have already been taken at national, regional and international levels.

While some parts of the project have been now moved to other funding arrangements which can be expected to continue, work also continues under the EU-funded SciCOFish project and other aid programmes. It is likely that further support of this kind will be needed well into the future.

# 2 Background

A project entitled **Scientific Support for Oceanic Fisheries Management in the Western and Central Pacific Ocean** (SCIFISH) was carried out by the Secretariat of the Pacific Community (SPC) located in Nouméa, New Caledonia, with the assistance of its member countries. The project was designed to generate improved scientific and policy information for use in by national and regional organisations, such as the Western and Central Pacific Fisheries Commission (WCPFC), in managing oceanic fisheries. SCIFISH consisted of two components:

- An **African Caribbean and Pacific (ACP) component** serving the needs of fourteen ACP states in the western and central Pacific;
- An **Overseas Countries and Territories (OCT) component** which assisted the French OCTs

SCIFISH was funded by the 9$^{th}$ European Development Fund (EDF9).

The Financing Agreement was signed by the EU Commission on 24 Oct 2007. The Pacific Islands Forum Secretariat (PIFS) signed on 19 Nov 2007 (on behalf of the ACP States) and the Government of New Caledonia on 17 Dec 2007 (on behalf of the OCT States: French Polynesia, New Caledonia and Wallis and Futuna). SPC, as implementing agency, commenced draw-down of funds in March 2008 after signing of the Contribution Agreements. Following completion of all programme components, this terminal report was prepared in June 2012 by SPC's Fisheries Aquaculture and Marine Ecosystems Division.

**Table 1. Summary of basic project data for the SCIFISH programme.**

| | **SCIFISH** |
|---|---|
| *Project Name* | Scientific Support for Oceanic Fisheries Management in the Western and Central Pacific Ocean |
| *Location* | 14 ACPs (Cook Islands, Fiji, Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Niue, Papua New Guinea, Palau, Solomon Islands, Samoa, Tonga, Tuvalu, and Vanuatu) and 3 OCTs (New Caledonia, Wallis and Futuna and French Polynesia) |
| *Duration* | March 2008 – December 2011 |
| *Value (Audited Expenditure)* | €6,610,000 (€4,000,000 for ACP component; €2,610,000 for OCT component) |
| *Key Stakeholders* | ACP and OCT governments, regional organizations including the Western and Central Pacific Fisheries Commission, the Forum Fisheries Agency and the Parties to the Nauru Agreement |

The objective and purpose of the SCIFISH project was to "ensure the conservation and sustainable use of oceanic fish resources of the Western and Central Pacific Ocean (WPCO)" through "improved policy and scientific information for better management of regional and national oceanic fisheries". Three key result areas (KRAs) were defined as i) enhanced oceanic fisheries monitoring; ii) enhanced stock assessment; and iii) enhanced understanding of the pelagic ecosystem.

In the fisheries monitoring portion of the project, SPC developed data tools, delivered observer training programmes, and explored techniques for combating illegal, unreported and unregulated (IUU) fishing. The improvement and dispersion of the TUFMAN system under SCIFISH enabled participating ACPs to manage their own data, thus increasing their capacity to participate in regional fishery management decision-making and to inform national tuna fishery management plans. By the end of the project, and directly attributable to the development of new systems by SPC, the number of WCPFC member countries submitting annual catch data within one week of the 30 April deadline had improved from 60% to 100%. Under SCIFISH, SPC trained a total of 642 observers, and conducted debriefer workshops, regional observer coordinator workshops and train-the-trainer workshops. This allowed all ACP/OCT participating countries to meet the requirements for 100% purse seine coverage mandated from 1 January 2010 by the WCPFC Conservation and Management Measure (CMM) for bigeye and yellowfin tuna (CMM 2008-01). Studies on satellite tracking feasibility and tools to support a regional Monitoring, Control and Surveillance (MCS) strategy were delivered as intended under the IUU fishing work stream.

Under the stock assessment portion of the project SPC conducted several analyses of CMM 2008-01 examining, *inter alia*, catch limits and a closure of fishing on Fish Aggregation Devices (FADs) which indicated that the measure was working as intended. However, as maintaining tuna stocks at sustainable levels requires political will by WCPFC members, SPC's scientific advice *per se* cannot guarantee achievement of the indicator goals. In particular, the effects of revisions to CMM 2008-01 by the WCPFC in early 2012 remain to be examined. Each of the four main tuna species (bigeye, yellowfin, albacore and skipjack) were assessed at least twice during SCIFISH. All stock assessments were accepted by the WCPFC Scientific Committee and forwarded to the Commission for decision-making. SPC kept pace with its commitments under SCIFISH and other programmes to provide comprehensive technical support to ACP/OCT participating countries for tuna fishery management, including preparing nine National Tuna Fisheries Status Reports as well as numerous other *ad hoc* technical deliverables.

In studies designed to enhance understanding of the pelagic ecosystem, SCIFISH support enabled SPC to produce an ecological risk assessment of all highly migratory and associated/dependent species which then contributed to new WCPFC Conservation and Management Measures for sea turtles, the listing of thirteen species of sharks as "key" species for monitoring and assessment, and a ban on intentional setting of purse seines on cetaceans. During the course of the ACP component of the SCIFISH project, SPC conducted twelve tagging cruises for tropical tunas (bigeye, yellowfin and skipjack), conventionally tagging a total of >217,000 fish of which >35,800 were recovered (~16%). In addition, >1,300 archival tags were attached with a >13% recovery rate and at-liberty times of several days to 18 months. Tagging studies for albacore conducted under the OCP component attached nearly 3,000 conventional tags and 19 pop-up satellite tags, and collected other biological data which has led to the testing of new hypotheses about population dynamics in the eastern and western Pacific. SEAPODYM, now recognized as one of the world's leading tools for understanding the relationship between oceanic conditions, the productivity of prey populations, and the distribution and abundance of predatory fish such as tunas,

was enhanced and described in 18 scientific papers. SEAPODYM was also endorsed by the WCPFC for provision of scientific advice on tuna management policies, and has provided access to all participating ACP and OCT countries to estimates of EEZ-scale biomass distribution and associated environmental variability for skipjack, bigeye and albacore tuna.

The Mid-Term Review characterised SPC's management of SCIFISH as exemplary. Two Results Orientated Monitoring Missions, conducted in September 2009 and September 2010, assessed SCIFISH as "good" or "very good" in all evaluation categories, including impact, relevance and efficiency of implementation.

Many of the SCIFISH products have not only set new standards for science-based fisheries management in the region, they have been enthusiastically welcomed by and incorporated into national programmes. The quality benchmarks set by these products represent a lasting contribution to fisheries management in the region. Several of the project components advanced under SCIFISH, such as observer training, ecosystem modelling and tuna tagging, were initiated under earlier EU-funded projects, such as the Regional Tuna Tagging Project (EDF 6), SPRTRAMP (EDF 7) and PROCFISH (EDF 8). SCIFISH built on these early successes of what have been long-term initiatives by SPC and donor partners. Currently, SciCoFish (and other donor-funded projects) are continuing several aspects of the SCIFISH work, both to enhance the scope of the work and, given current differences in ACP/OCT countries' capacity to maintain and utilise the various project products for themselves, to continue to broaden their uptake across the Pacific ACP and OCT community. The slow progress with cost recovery initiatives in the WCPFC and other t-RFMOs means that it is likely that donor support for scientific support of tuna fisheries management in this region will continue to be required for some years to come. Key lessons learned during the course of the project included the need for flexibility given rapidly shifting fisheries policy and institutional landscapes; the need for specific and measureable Objectively Verifiable Indicators (OVIs); and the need for continued resourcing of support functions during the start-up phase of institutional strengthening.

# 3 Review of Progress and Performance at Completion

## 3.1 Policy and programme context, including linkage to other ongoing operations/activities

For Pacific Island Countries and Territories (PICTs), fisheries management is one of the most critical ingredients in attaining the Millennium Development Goals of poverty alleviation, employment creation, environmental sustainability and resource stewardship. Tuna fisheries are of paramount importance to the region producing nearly 2.5 million t (60% of the world's total) with a value of €3.4 billion in 2010. Recognizing these issues, the 9th European Development Fund (EDF)'s Pacific Regional Indicative Programme (PRIP, paras. 144-145) called for enhancing scientific information on oceanic marine resources and their ecosystem, and for contributing to the effectiveness of the Western and Central Pacific Fisheries Commission (WCPFC).

The SCIFISH project responded directly to these intentions by strengthening scientific techniques for fishery monitoring and assessment, and developing a foundation for ecosystem-based fisheries management. The SCIFISH project built upon the results of previous projects including the Pacific ACP and French Pacific OCT Regional Oceanic and Coastal Fisheries Development Project (PROCFish) under the 8th EDF, the South Pacific Regional Tuna Resource Assessment and Monitoring Project (SPRTRAMP) under the 7th EDF and the Regional Tuna Tagging Project (RTTP) under the 6th EDF. In some cases, such as tagging and ecosystem modelling, research programmes were continued to deepen understanding of factors affecting fish population dynamics, whereas in other cases, such as the development of tools for combating IUU fishing, new technologies and systems were explored.

Initially, the SCIFISH project was envisaged as a collaborative effort between the Secretariat of the Pacific Community (SPC), the Forum Fisheries Agency (FFA) and the WCPFC. While these partners remained integrally involved, the institutional landscape for fisheries management shifted during the project with the empowerment of new sub-regional organizations such as the Parties to the Nauru Agreement (PNA), the FFC (Forum Fisheries Committee) Sub-committee on South Pacific Tuna and Billfish, and Te Vaka Moana which were also supported by SCIFISH technical products. In terms of research collaboration SCIFISH studies were expanded through cooperation with programmes conducted by CSIRO (Australia) and ZoNeCo (New Caledonia).

<u>Historical background:</u>

The OFP is the regional focal point for tuna fisheries science and data acquisition, and the primary technical implementing agency for SCIFISH. The OFP can trace its origins back to the establishment of the **Skipjack Survey and Assessment Programme (SSAP)** in SPC in 1977, whose main role it was to provide advice to SPC member states on skipjack pole-and-line fishery and associated baitfish resources of the SPC region, and to support the development and management of these fisheries (which dominated at that time). SSAP undertook pioneering large-scale tagging experiments which revealed the exploitation potential of the skipjack tuna resources of the region.

The Tuna and Billfish Assessment Programme (TBAP) was established in 1982 as a follow-up programme to the SSAP, and in response to the growing need to document tuna catch and effort and to understand tuna population dynamics and the interaction among the fisheries. TBAP established the **Regional Tuna**

**Fisheries Database** and implemented a second successful large-scale tagging experiment, the **Regional Tuna Tagging Project (RTTP)**, funded under the 6th EDF. The RTTP focused on the three principal tropical tuna species: skipjack, yellowfin and bigeye tuna, and also implemented an albacore tagging project with complementary French OCT funding. The RTTP provided updated information on the exploitation status of skipjack tuna, and the first tag-based information on the exploitation, growth, mortality and movements of yellowfin, bigeye and South Pacific albacore tuna. The results of these tagging experiments continue to make an important and direct contribution to routine stock assessments for the four species.

In 1995, the TBAP was renamed the **Oceanic Fisheries Programme (OFP)**, to reflect the need for SPC members to collect information on the pelagic ecosystem in general. The OFP implemented the 7th EDF-funded South Pacific Regional Tuna Resource Assessment and Monitoring Project (**SPRTRAMP**), which was designed to establish continuous and comprehensive scientific monitoring of the region's tuna fisheries, to undertake studies of the biology and ecology of the main exploited species, and to develop and enhance methods for providing scientific advice on the status of stocks and the impacts of fishing. The tuna tagging activities under SCIFISH (which is the main focus of Result number 2) evolved from RTTP (6th EDF), and SPRTRAMP (7th EDF).

While EDF funding has clearly played a crucial role in the development of tuna fisheries science in the region, it is important to note that the work of the OFP in recent years has typically been supported by more than twelve other funding sources, providing over two-thirds of the annual budget. These are used to deliver on a comprehensive work programme which is developed in consultation with all SPC members and in which SCIFISH activities have been an integral part. This provides for a high degree of coordination of donor inputs and is in line with the best principles of aid effectiveness.

<u>Related and complementary programmes:</u>

OFP oceanographic and ecosystem research has received support from the **Pelagic Fisheries Research Programme** (**PFRP**) of the University of Hawaii, particularly in the development of the SEAPODYM model. PFRP forms part of a larger International Geosphere-Biosphere Programme and “Oceanic Fisheries and Climate Change Project” (OFCCP GLOBEC), which aims to predict the effect of short and long term climate changes on productivity and distribution of the oceanic tuna stocks and fisheries. The aim here is to develop a realistic simulation model that can be used to test outcomes under various global warming scenarios. The support provided under SCIFISH has allowed considerable progress towards SEAPODYM achieving this aim.

A summary of recently concluded, and current EDF-funded projects, is given below:

The **Pacific ACP and French Pacific OCT Regional Oceanic and Coastal Fisheries Development Project** (**PROCFish – 8th EDF**): 2002-2007. An oceanic component (**PROCFISH-OCEANIC): €3.9 m (ACP countries), and €1.0 m (OCTs)**, provided scientific support to P-ACPs, P-OCTs and the fledgling WCPFC for the sustainable management of the region’s oceanic fisheries resources. A coastal fisheries component (**PROCFISH-COASTAL/ COFISH**): €7.6 m between 2001-2009, produced rigorous, comparable information on the status and prospects of reef fisheries, provided for the process of developing reef fishery management measures.

**DEVFISH Project**: **DEVFISH: €3 m – 2005-2009 (EDF9):** provided support for the development of domestic tuna industries and targeted the improvement and co-ordination of poverty eradication-oriented national fisheries sector policies. DEVFISH complemented PROCFISH, in fulfilling the vision of the Regional Strategy Paper and the RIP for P-ACP/EC cooperation in fisheries. DEVFISH sought to broaden cooperation between the P-ACP countries and the EC in fisheries generally.

**Programme for Strengthening Fisheries Management in ACP countries** (**ACP Fish II**): **€30 m of which €1.4 m reserved for Pacific activities – 2009-2014.** This EU-funded intervention supports the development of fisheries policy, and fostering improved institutional capacity for fisheries and aquatic resources management in all ACP countries.

**SCIFISH - €4 m (ACP), €2.6 m (OCT) - 2008-2011 (EDF9):** aims to provide a scientific basis for regional and national oceanic fisheries management decision-making by the WCPFC and by Pacific ACP and OCT Governments.

**SCICOFISH - €9 m – 2010-14 (EDF10):** Aims to provide a reliable and improved scientific basis for management and decision making in oceanic and coastal fisheries. Many aspects are extensions of SciFish.

**DEVFISH 2 - €8.2 m 4 years (EDF10):** focuses on the development of sustainable domestic tuna industries.

## 3.2 Project objectives, activities undertaken and achievements

The objective and purpose of the SCIFISH project was to "*ensure the conservation and sustainable use of oceanic fish resources of the WCPO*" through "*improved policy and scientific information for better management of regional and national oceanic fisheries*". Three key result areas (KRAs) were defined as i) enhanced oceanic fisheries monitoring; ii) enhanced stock assessment; and iii) enhanced understanding of the pelagic ecosystem. Annual and six-monthly reports for Years 1-3 (2008-2010) reported against eleven objectively verifiable indicators (OVIs) defined beneath the project objective, purpose and KRAs. In response to the results of Result Orientated Monitoring Missions (September 2009 and 2010), and the November 2010 SCIFISH Mid-Term Review, which found that the OVIs were not sufficiently specific and measurable, the SCIFISH Project Logframe was revised for Year 4 (Annex 1). The revised OVIs and the SCIFISH activities and achievements relevant to each are shown below by KRA.

### 3.2.1 Enhanced oceanic fisheries monitoring

*Data Tools*

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| **OVI Purpose-1.** | **100% of ACP and OCT participating countries have access to the most accurate data on tuna catch and species population dynamics for decision making.** |

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| **OVI Purpose-3.** | **100% of assessments have access to the most accurate data on tuna catch and species population dynamics.** |

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|---|---|
| **OVI Results-2.** | **100% of P-ACPs provided with capacity and tools for implementing continuous data auditing to maximize data quality for scientific decision making.** |

Activities undertaken:

SPC's TUFMAN (Tuna Fisheries Database Management) system for customized data entry, data management, administration, and reporting modules was delivered, installed and supported in most of the participating ACP countries (Papua New Guinea and French Polynesia have established their own systems, while New Caledonia continues to rely on SPC for data entry). To encourage timely data submission SPC installed hardware, built customized software and established FTP sites to speed the exchange of data from ACP/OCTs who used to send paper forms by post. To further increase data quality, SPC developed TUFMAN audit tools such as: i) automatic identification of dubious and missing data through comparison between logsheets, Vessel Monitoring System (VMS) records and unloadings data; ii) port sampling and logsheet self-audit workbooks for PICT use; and iii) *ad hoc*, opportunistic, in-country data audits conducted for all participating countries with major fisheries.

Indicator assessment:

The improvement and dispersion of the TUFMAN system under SCIFISH enabled participating ACPs to manage their own data, thus increasing their capacity to participate in regional fishery management decision-making and to inform national tuna fishery management plans. At the close of the SCIFISH project 15 SPC members (of which all but one, Tokelau, are ACPs), were using the TUFMAN system (up from 11 at project commencement). In addition, several non-SPC members (Indonesia, Philippines and Vietnam) have begun to use TUFMAN, with assistance provided by SPC and WCPFC under the GEF-funded West Pacific East Asia Oceanic Fisheries Management Project, thus spreading the benefits of this work to the wider group of countries that are engaged with WCPFC. Prior to the commencement of SCIFISH, only 60% of WCPFC member countries submitted annual catch data within one week of the 30 April deadline. By the end of the project, and directly attributable to the development of new systems by SPC, the compliance rate had improved to 100%. Although stock assessments made use of the most accurate data both before and after the SCIFISH project, the degree of completeness and quality control improved significantly as a result (see Annex 4, references 1, 2, 6 and 7).

Impact assessment:

TUFMAN is used on a day-to-day basis in national fisheries offices. The system facilitates routine tasks such as logsheet data entry and licensing documentation in an efficient and effective fashion. It also allows analyses of data to determine compliance with license conditions and gaps in reporting, which can then be followed up with the fishing companies or flag states concerned. TUFMAN incorporates a variety of reporting modules that allow summary data to be compiled in tabular or graphical form. This information is routinely used in access negotiations and in the development and review of national tuna fisheries management plans. The system also provides capability for data to be extracted and compiled for provision to WCPFC both as raw data and in Part 1 and Part 2 reports, thus assisting countries to meet key international obligations.

*Observer programmes*

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| **OVI Results-1.** | **Observer capacity and institutional infrastructure established so that P-ACPs and P-OCTs can achieve 100% of national and regional observer and port sampling coverage and data collection requirements and standards.** |

Activities undertaken:

Under SCIFISH in 2008-2011, SPC, with the assistance of member countries and the FFA, held over 37 observer courses training a total of 642 to Agreed Competency Based Standards developed by SPC and endorsed by FFC. In order to meet WCPFC requirements for 100% purse seine observer coverage by 1 January 2010, SPC showed considerable flexibility in 2008-2009 by streamlining courses to focus on purse seine training and training a larger than expected number of cadets (239 trained). Once that milestone had been achieved, the focus shifted to i) Debriefer Workshops (6 workshops with 89 participants) to improve data quality; ii) Regional Observer Coordinator Workshops (one each in 2010-2011) to support national administration of observer programmes; and iii) Train-the-Trainer Workshops (7 participants in 2011) to devolve training capacity to national programmes. In response to ACP/OCT requests, 11 port samplers were trained in six countries and territories. Comparison of paired grab and spill sampling was accomplished by observers for 254 sets on 17 fishing trips and the results, confirming a bias toward sampling of yellowfin and bigeye tuna, and allowing adjustment of species composition data for stock assessments (see Lawson 2011). Further development and testing of alternative sampling schemes was unsuccessful in five of six attempts due to misunderstandings between samplers and crew but is being continued under other research programmes (see Lawson and Sharples 2011).

**Figure 1.** Observer in PNG being taught fish measuring techniques using callipers by trainers Lucas Tarapik and Manoi Kutan, June 2011) (left); and longline and cadet upgrade observer course in Tarawa studying otolith removal techniques with trainer Glen English, July 2011 (right). (Photos: Malo Hosken-SPC).

Indicator assessment:

SCIFISH supported efforts by SPC toward strengthening of observer and port sampling programmes and allowed all participating ACP and OCT countries to meet the requirements for 100% purse seine coverage mandated by the WCPFC Conservation and Management Measure (CMM) for bigeye and yellowfin tuna (CMM 2008-01). Participating OCTs were the first two PICT members of WCPFC to exceed the requirement for 5% coverage in longline fisheries. The target coverage for port sampling (10%) has been greatly exceeded by both New Caledonia and French Polynesia (>20% and >72%, respectively) in each year of the project. In addition to expanding coverage, data quality has improved through the agreement on and application of competency-based training standards, more extensive debriefing, and new techniques for accounting for sample bias.

Impact assessment

Increased observer coverage provides a wealth of additional scientific information on the fishery, including the impact on by-catch species such as sharks and turtles which are often of particular conservation value. Observers also play an important role in combating IUU fishing as the 'eyes and ears' of the coastal states on the fishing grounds. An important reason for the 100% coverage requirement on purse seiners has been to monitor compliance with new management measures to reduce the catch of small bigeye tuna, and observer testimony has recently been used in court proceedings against vessel captains who are suspected of non-compliance with these restrictions. In addition to these objectives, the increase in observer coverage has generated some 500 new jobs for Pacific Islanders. The independent mid-term review of the project considered that the improvement in fisheries monitoring represented the largest single impact of the project.

Particularly good progress was achieved in Papua New Guinea, which now has one of the largest observer programmes in the world, including the capacity to train their own observers at the National Fisheries College; but all participating countries with industrial tuna fishing in their waters benefitted from this training.

*Illegal, Unreported and Unregulated (IUU) fishing*

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| **OVI Results-3.** | **100% of P-ACPs provided with capacity, tools and access to information for detecting and managing IUU fishing activities.** |

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| **OVI Results-4.** | **100% of P-OCTs provided with an evaluation of the feasibility of applying existing satellite technologies for detecting IUU fishing activities.** |

Activities undertaken:

A study was undertaken in 2009 on behalf of SPC and the Joint Forces High Command (EMIA) in Nouméa examining the potential for using radar satellite scanning of fishing grounds coupled with VMS data to identify IUU fishing activities. The study concluded that most satellite passes did not detect any vessels, and that the method was inaccurate in determining speed, vessel size, and heading, therefore it will not be particularly useful in identifying suspicious fishing activities until radar satellite resolution improves. Funds disbursed to FFA provided for a series of five analytical studies by MRAG-Asia Pacific to support the development of a Regional MCS Strategy: i) residual risk ranking given current MCS implementation; ii) review of MCS implementation by FFA members; iii) a data policy to support MCS initiatives; iv) opportunities and framework for MCS cooperation; and v) application of surveillance aircraft and patrol vessels for MCS purposes. FFA continues to develop anti-IUU information systems, such as enhanced visualization and analysis of VMS data, on the basis of the recommendations of these five studies.

Indicator assessment:

While reports on satellite tracking feasibility and tools to support a regional MCS strategy were delivered as intended, the SCIFISH Mid-Term Review noted that due to staffing shortfalls there have been delays in progressing planned elements of an MCS strategy. However, with a new FFA Operations Director in post since early 2011 FFA is embarking on a work programme involving the development of

MCS information management software, a data warehouse and a Regional Strategic Information Technology Plan to support the priorities identified in the MRAG studies.

Impact assessment:
While the trial of radar satellite scanning for illegal fishing vessels was essentially unsuccessful, the use of a small pilot project in one OCT EEZ has ensured that the waste of resources that would have involved a wider deployment of the technology has been avoided, as well as providing information on the technological improvements that will be needed before this system would be effective. The completion of systematic studies into the problem of IUU fishing has informed regional strategy and will provide a firm basis for future action in P-ACP countries.

### 3.2.2 Enhanced stock assessment

*Resource status*

| **OVI Objective-1. Effort on target species in the western and central Pacific is managed regionally and nationally so it does not exceed the level of $F_{MSY}$.** |
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| **OVI Objective-2. Catch of target species in the western and central Pacific is managed regionally and nationally so it does not exceed the level of $B_{MSY}$.** |
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Activities undertaken:

SCIFISH supported SPC's scientific evaluation of tuna fishery management measures in the WCPFC, in particular, the comprehensive CMM 2008-01 which provides for, *inter alia*, catch limits and a closure of fishing on Fish Aggregation Devices (FADs). Several SPC analyses conducted in 2009, 2010 and 2011 (Annex 4) highlighted that the reduction of catch resulting from the effectiveness of the FAD closures (Figure 2, top) and other measures in 2010 was expected to substantially reduce fishing mortality on bigeye tuna (Figure 2, bottom right) and would, if maintained, result in achieving a sustainable level of exploitation of this species, i.e. $F < F_{MSY}$, by 2015. In addition to SPC's regional work, SCIFISH also supported training of national scientists in stock assessment techniques through annual stock assessment workshops held mid-year in each year of the project.

Indicator assessment:

CMM 2008-01 was designed to ensure that there is no overfishing (i.e. $F < F_{MSY}$) of bigeye and yellowfin tuna and that the stocks are not overfished (i.e. $B > B_{MSY}$). Stock assessments conducted by SPC indicate that yellowfin, skipjack and albacore tuna are currently neither overfished nor is overfishing occurring. However, the most recent assessments suggest that overfishing is still occurring for bigeye tuna (Figure 2, bottom right). Furthermore, while the individual measures contained within CMM 2008-01 were being implemented as allowed by the CMM, collectively they were not likely to be sufficient to remove bigeye overfishing. This advice has lead to further efforts by WCPFC in 2012 to revise CMM 2008-01 to be a more comprehensive and effective measure. However, maintaining tuna stocks at sustainable levels requires political will by WCPFC members; SPC's scientific advice *per se* cannot guarantee achievement of the indicator goals. It remains to be seen if WCPFC will be able to develop a new measure that responds effectively to the scientific advice that has been provided to date.

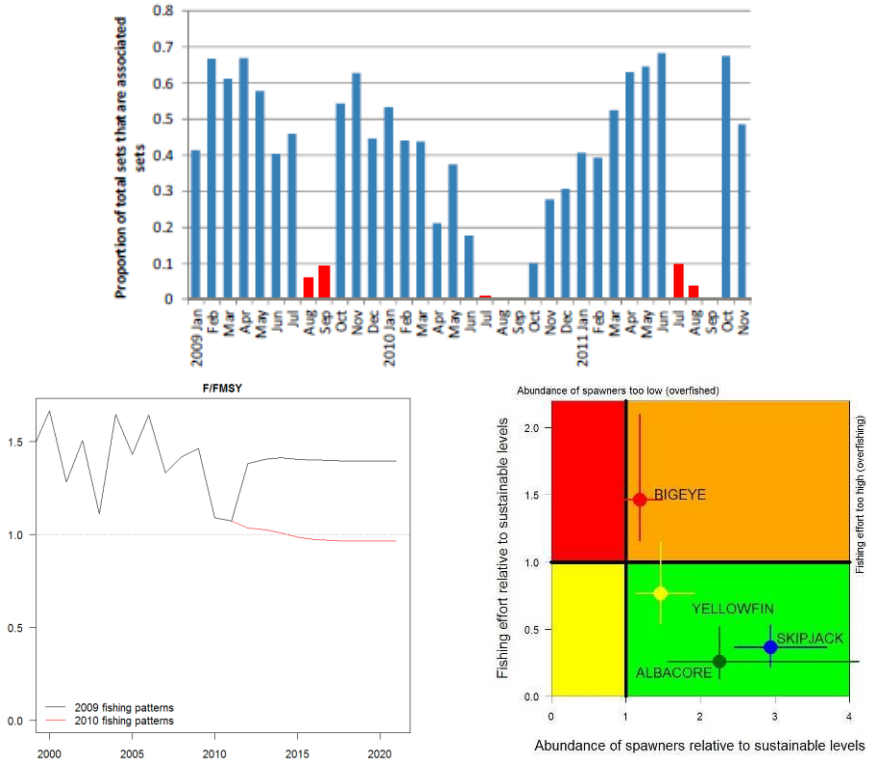


**Figure 2.** Proportion of purse seine sets on FADs with FAD closure months in red (top panel); recent historical and projected $F/F_{MSY}$, for bigeye tuna under the 2009 and 2010 fishing patterns (bottom left panel), and Kobe plot showing 2011 stock status for the four main tuna species (bottom right panel).

Impact assessment:

Maintaining fish stocks at levels which can at least generate maximum sustainable yield is clearly an important objective in its own right. Currently three of the four major tuna species, accounting for 95% of the catch volume, meet this standard; while efforts to improve the status of bigeye tuna continue. These have been informed by the stock assessments and other analysis provided by SPC to P-ACPs and OCTs; and indeed every significant management measure introduced has been driven by this group. As shown in the figures above, the restriction on fishing around floating objects has shown great potential for reducing bigeye tuna mortality, while allowing the continued capture of other species. The assessments are now being used as the basis for a comprehensive management framework, which includes specific limits, targets and harvest control rules. This should ensure that the species that are currently in good condition will remain so, and that bigeye tuna exploitation is reduced to sustainable levels.

*Stock assessments*

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| **OVI Purpose-2.** | **The current stock status for the four main tuna species assessed at least once during the implementation of SCIFISH.** |

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| **OVI Purpose-4.** | **100% of these assessments accepted by the WCPFC Scientific Committee and forwarded to the Commission for decision-making.** |

Activities undertaken:

During the SCIFISH project SPC conducted 12 stock assessments (four for bigeye, two for yellowfin, three for albacore and three for skipjack; see Annex 4) using the state-of-the-art MULTIFAN-CL model. In addition to detailed technical reports on the assessments provided to WCPFC, assessment results are published in a more concise and user-friendly form for fisheries managers in annual Tuna Fisheries Assessment Reports; the most recent TFAR can be downloaded from :

http://www.spc.int/oceanfish/en/publications/doc_details/1007-the-western-and-central-pacific-tuna-fishery-2010-overview-and-status-of-stocks.

In addition, a shorter brochure-style policy brief has also been published, to provide information on tuna stock status aimed at political and upper administrative levels. This document can be downloaded from:

http://www.spc.int/oceanfish/en/publications/doc_details/1008-policy-brief-142012-the-western-and-central-pacific-tuna-fishery-2010-overview-and-status-of-stocks.

Indicator assessment:

Each of the four main tuna species were assessed at least twice during SCIFISH. All stock assessments were accepted by the WCPFC Scientific Committee and forwarded to the Commission for decision-making. In 2011, the WCPFC introduced a new system of independent peer review of stock assessments. The first of these, for the bigeye assessment concluded, *inter alia,* that "the stock assessment for bigeye tuna in the WCPO is based on state-of-the art methods and is analytically very thorough. The analysis of raw data, where available, is more comprehensive than is common for most assessment applications."

Impact assessment:

The provision of high quality science on which to base management was fundamental to the purpose of the project. The number of assessments provided exceeded the targets set for the project, and their acceptance by a committee of scientific experts, re-confirmed by independent review, has confirmed the quality of the work undertaken.

The success of efforts to communicate the findings of this work to Fisheries Officers of the participating countries and territories is evidenced by the strength of the group in the WCPFC scientific committee, leading to the representative of Cook Islands being appointed vice-chair. This has led to the same group promoting management measures in the WCPFC and, when frustrated in these efforts, imposing them within their own jurisdictions.

*Management plans*

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| **OVI Purpose-5.** | **100% of National Tuna Management Plans developed with the most comprehensive set of summarized information available on tuna fishery and population dynamics.** |

Activities undertaken:

SCIFISH supported SPC in providing country-specific scientific advice for tuna fishery management in the form of National Tuna Fisheries Status Reports (NTFSRs) provided to Niue, Nauru, Palau, the Federated States of Micronesia (FSM),the Marshall Islands, Samoa, Kiribati, the Solomon Islands and the Cook Islands (draft). NTFSRs present a variety of detailed information on the fisheries in-zone and where

appropriate in other locations by the national fleets, tuna biology and ecology, oceanographic influences, by-catch issues, and more specific management advice as may be requested by the country concerned. The reports are provided directly to the countries concerned and made available on secure national web pages hosted on the SPC website. Because NTFSRs may contain data summaries that are not considered to be public domain, the dissemination of these reports beyond the national government is at the discretion of the country concerned.

In addition to NTFSRs, shorter reports to assist fishery management and development in New Caledonia (through the ZoNeCo Project) and Wallis and Futuna were provided by the project. During the course of the project, and in response to PICT requests, the emphasis for provision of national advice has shifted to issue-specific national reports (e.g. the impact of the WCPFC FAD closure on each PICT, and factors affecting the performance of locally-based longline fisheries for albacore), the development of new features of the NTFSRs (e.g. a shark analysis in the Marshall Islands NTFSR), and the creation of country-specific web pages that can be updated annually.

A national example of where this work has been particularly valuable is in Fiji where the Government has needed a sound scientific basis to restrict the number of vessels licensed to fish in the EEZ, in order to preserve the economic viability of the domestic fleet.

Indicator assessment:

SPC has kept pace with its commitments under SCIFISH and other programmes to provide comprehensive technical support to PICTs for tuna fishery management, including preparing nine NTFSRs as well as numerous other *ad hoc* technical deliverables. However, not all planned NTFSRs have been initiated (e.g. Tuvalu and Fiji) in part due to the death of one of the NTFSR scientists in 2009, and one NTFSR awaits finalization by the recipient. The development of National Tuna Management plans involves collaboration with FFA and the fisheries stakeholders in the country concerned, while SPC's scientific inputs provide an important basis for decision making.

Impact assessment:

Although tuna is a shared stock and requires regional cooperation for effective management, the provision of scientific advice at the national level allows countries to evaluate the mix of management measures that will be most advantageous. National management plans are particularly important in regulating the management and development of locally based fleets in the countries where tuna fishing makes the largest economic contribution.

### 3.2.3 Enhanced understanding of the pelagic ecosystem

*Ecosystem status*

**OVI Objective-3. Ecosystem impacts of fishing oceanic resources are minimised.**

Activities undertaken:

SCIFISH support enabled SPC to produce an ecological risk assessment of all highly migratory and associated/dependent species (see Kirby 2009) as well as several studies of taxa-specific bycatch components including seabirds, sea turtles, sharks and cetaceans during 2008-2011 (see Annex 4). These studies laid the foundation for the three-year WCPFC Shark Research Plan endorsed and funded

by the WCPFC in December 2010 (see Clarke and Harley 2010; Clarke et al. 2010). Other work on the ecosystem impacts of fishing is described under "Biological Studies" and "SEAPODYM" headings below.

Indicator assessment:

The SPC studies contributed directly to a new WCPFC CMM for sea turtles (CMM 2008-03), the listing of thirteen species of sharks as "key" species for monitoring and assessment (CMMs 2008-06, 2009-04, 2010-06), and a ban on intentional setting of purse seines on cetaceans including provisions for safe release from unintentional sets (CMM 2011-03). In addition, work conducted under SCIFISH catalyzed the WCPFC Shark Research Plan which represents the most comprehensive assessment of shark stocks of any of the world's t-RFMOs.

Impact assessment:

The incidental catch of threatened and often iconic marine creatures by the fishing industry represents a major threat to both global biodiversity, and the acceptability of fisheries products in environmentally conscious markets. The project has supported the development of measures to reduce the catch of some of these species across the fishery, as well as initiating new research on species for which more information and analysis are required.

*Biological studies*

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| **OVI Results-5.** | **Establish the most comprehensive tagging dataset for tropical tunas in the WCPO for inclusion in regional stock assessments and analyses of population dynamics.** |

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| **OVI Results-6.** | **Establish the most comprehensive tagging and biological parameter dataset for south Pacific albacore for inclusion in regional stock assessments and analyses of population dynamics.** |

Activities undertaken:

During the course of the SCIFISH project, SPC, with the assistance and cooperation of its member countries, conducted twelve tagging cruises for tropical tunas (bigeye, yellowfin and skipjack) under the ACP component. Collaborating agencies included the governments of Australia, France, Korea, New Zealand, Papua New Guinea and Taiwan as well as contributions from the WCPFC, the Pelagic Fisheries Research Program of the University of Hawaii, the Global Environment Fund and SciCoFish. SCIFISH tagging cruises, which focused on skipjack and yellowfin in the western Pacific and bigeye in the central Pacific (Figure 3), conventionally tagged a total of >217,000 fish of which >35,800 were recovered (~16%). In addition, >1,300 archival tags were attached with a >13% recovery rate and at-liberty times of several days to 18 months. Up to date information on the tagging project is maintained on www.spc.int/tagging.

In the OCT component, tagging studies on albacore comprised both conventional tags (n=2,858) and pop-up satellite tags (PSATs, n=19) and were conducted in collaboration with the New Caledonia government's ZoNeCo project in three key albacore aggregation locations (Figure 3). Although 18 PSATs transmitted useable data, in all cases the duration of transmission was less than desired (i.e. <300 days) suggesting that there may have been problems with tag retention and/or fish mortality. Biological sampling to inform population dynamics modeling parameters occurred in partnership with Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO) and the WCPFC. Age estimates were used to estimate growth, including sex-specific growth (see Williams et al. 2012) and reproductive

data collected from over 3,000 samples ranging from Australia to Pitcairn (see Farley et al. 2012) were used to estimate maturity and spawning stock assessment modeling.

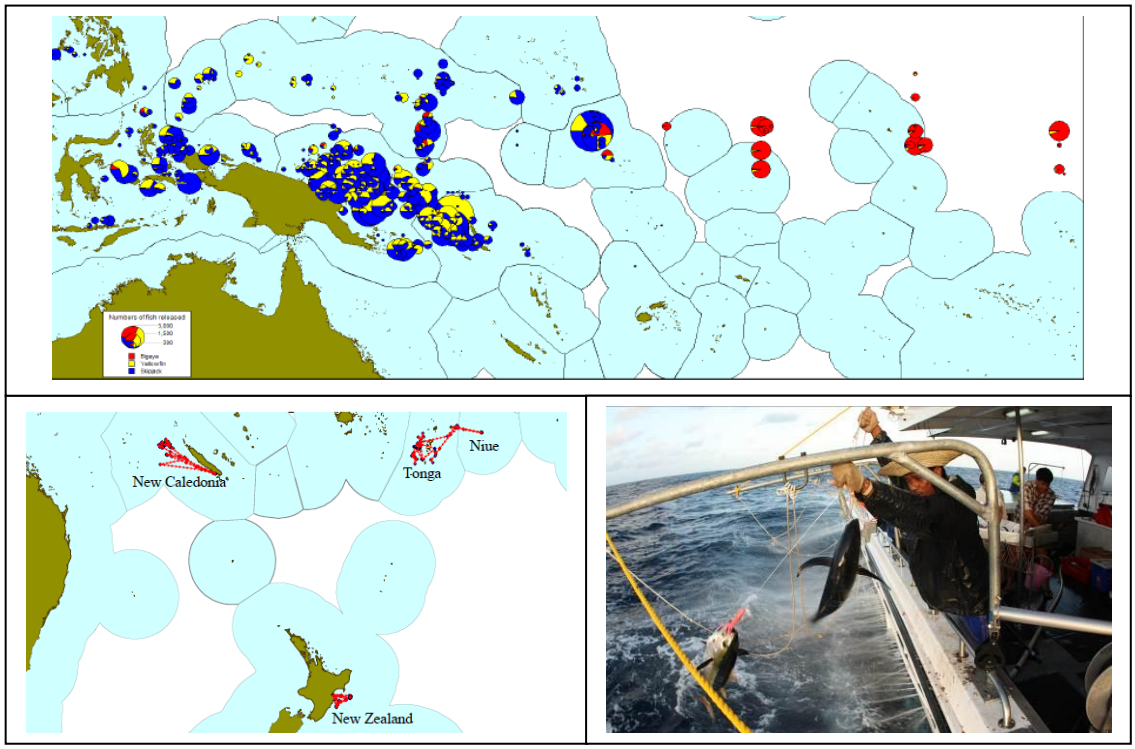


**Figure 3.** Distribution map of bigeye, yellowfin and skipjack tag releases, 2006-2010 (top panel). Cruise tracks of FV Yellowfin (New Caledonia), FV Genesis (New Zealand), and FV Pacific Sunrise (Tonga) during Phase 2 of the Albacore Tagging Project (ATP) in 2010 (bottom left panel). Tropical tuna tagging cruise in November 2010 (bottom right panel, photo: Malo Hosken, SPC).

Indicator assessment:

The spatial and temporal scope of the tropical tuna tagging programme is the world's largest to date. The high tag recovery rate is reflective of the intensity of exploitation in the region, but is also attributable to the skill of the tagging scientists and SCIFISH employment of a dedicated tag recovery officer. For albacore, both tagging and biological sampling substantially deepened scientific understanding of key population parameters. Findings from both programmes are being incorporated into stock assessment modelling to better inform management decision-making by the WCPFC. For albacore, as a direct result of the SCIFISH findings, the population is now being modeled as eastern and western components to examine the implications of differences in growth rates by area.

Impact assessment:

The understanding and assessment of fisheries typically relies heavily on information from the fishing industry on catches and fishing effort, which can often be biased or misleading. Tagging complements this data with independent information. Some important data, for example on fish migration, cannot be derived otherwise. Its importance has been recognized in other tuna fisheries, but this region has developed by far the most extensive set of tagging data, which is being used to improve stock assessments and inform management. The component is also a highly visible activity, raising awareness of project activities in member countries as well as issues with the tuna stocks.

*SEAPODYM*

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| **OVI Results-7.** | **Provide 100% P-ACPs and P-OCTs with infrastructure to evaluate tuna management policies in the context of current and future environmental variability at both the regional and EEZ scales.** |

Activities undertaken:

The SCIFISH programme provided for continued development of the Spatial Ecosystem and Population Dynamics Model (SEAPODYM) initiated under the SPRTRAMP (1996-2000) and PROCFISH/O projects (2002-2009) by Collecte Localisation Satellites (CLS) of France. This development included the production of high resolution reference models for simulating population dynamics of skipjack, bigeye, south Pacific albacore and yellowfin tunas. Work on a swordfish model was also begun. Each model contains habitat indices for national Exclusive Economic Zones (EEZs) which allow simulation of fisheries policies, environmental change (e.g. El Niño), and long-term climate change. Eighteen scientific papers related to SEAPODYM were produced during the SCIFISH project with seven already published in peer-reviewed journals and several more under review (see Annex 4).

Indicator assessment:

SEAPODYM is now recognized as one of the world's leading tools for understanding the relationship between oceanic conditions, the productivity of prey populations, and the distribution and abundance of predatory fish such as tunas. SEAPODYM now plays an important role in modelling the effects of climate change on marine populations under the GLOBEC research programme, and SEAPODYM has been endorsed by the WCPFC for provision of scientific advice on tuna management policies. All participating ACP and OCT countries have been provided with access (through OFP and CLS) to tools that estimate EEZ-scale biomass distribution and associated environmental variability for skipjack, bigeye and albacore tuna.

Impact assessment:

SEAPODYM provides an alternative and complementary tool to the single-species models that have been used for region-wide assessments. While its use in improving the management of oceanic fisheries resources was only just beginning at the end of the project, it has already provided important projections of the effects of climate change on two tuna species. Estimates of stock distribution and abundance are also being used to inform discussions regarding zone-based allocation of fishing rights. Further development of the model will allow other uses to inform fisheries management.

## 3.3 Resources and budget used

Total project resources were €4,000,000 for the ACP component and €2,610,000 for the OCT component. Of these funds, €53,000 from the ACP component and €45,000 from the OCT component were withheld to fund project evaluations and external audits. At the close of Year 3, release of contingency funds (€26,000 for ACP and €30,000 for OCT) for all years was requested and approved to cover administrative support costs as recommended in the Mid-Term Review. As a result, the total funds available to SPC for the project were €3,947,000 for the ACP component and €2,565,000 for the OCT component, for a grand total of €6,512,000.

In Year 1 of the project, ACP funds were overspent due to recruitment of Technical Assistance (TA) positions sooner than anticipated after the commencement of the project in March 2008. However, the opposite situation occurred in Year 1 with OCT funding due to delays in recruiting TA positions and lower than expected fishery monitoring coverage in New Caledonia and French Polynesia resulting in a lower demand for SPC training and equipment provision. By Year 2 expenditure for both components matched expectations with the exception of a delay in the start of Monitoring, Control and Surveillance (MCS) activities. These delays continued through Year 3 due primarily to staff vacancies at FFA where the work was to take place. All funds earmarked for MCS activities under the ACP component have been transferred to FFA for use in the implementation of the Regional MCS Strategy.

At project termination (December 2011), expenditure for the ACP component totalled €3,945,341 of the total budget of €3,947,000, an under-expenditure of €1,659, or 0.04% of the total budget (see Annex 3). Total funds advanced to date are €3,800,512, leaving €144,829 (the difference between the total expenditure and advance) to be claimed. For the OCT component, expenditure totalled €2,568,538 of the ACP budget of €2,565,000. This represented an over-expenditure of €3,538, or 0.14% of the OCT budget. Total funds advanced to date are €2,451,492, leaving €113,508 (the difference between the total budget and advance) to be claimed. SPC has absorbed the €3,538 over-expenditure into other funding sources. The final payments of €144,829 for the ACP component and €113,508 for the OCT component will be requested following the finalisation of the final project audit.

## 3.4 Assumptions and risks – status/update

SCIFISH assumptions and risks were articulated in the project's logical framework to include constraints on study inputs (e.g. availability and affordability of MCS technology; ability to recruit capable human resources; availability of tagging vessels) and limitations on uptake of study products (e.g. the risk that results would not be used by participating countries or in regional decision-making). By the time of the Mid-Term Review (October –November 2010), it was concluded that all assumptions had been fulfilled such that there was no negative impact on project implementation.

Subsequent to the Mid-Term Review only minor and typical constraints on study inputs were encountered such as staff resignations, delays in cash flow, and late delivery of materials (tags). Potential limitations on the uptake of study products became easier to assess as the project neared completion. Some SCIFISH products such as Agreed Competency Based Standards for observer training, National Observer Coordinator and Train-the-Trainer courses, and the TUFMAN data management system were enthusiastically welcomed by participating PICTs. For stock assessments and ecosystem studies, whose integration into regional fisheries management policy may require setting aside short-term economic and political gains for long-term ones, the degree to which SCIFISH products have influenced decision-making is more difficult to assess. At a minimum, a more informed scientific understanding of stock status is a pre-requisite for successful tuna fisheries management. In this sense, SCIFISH has achieved its aims even if in the WCPFC and national administrations, policy is not always set in line with scientific advice.

## 3.5 Management and coordination arrangements

As Regional Authorising Officer (RAO) of the European Development Fund, the Secretary General of the Pacific Islands Forum Secretariat (PIFS), served as the Contracting Authority for the ACP component of

SCIFISH. For the OCT component, the Contracting Authority was the President of the Government of New Caledonia (as Regional Authorising Officer). The recipient organisation, SPC's Nouméa office undertook project management for SCIFISH according to formal and standard protocols. All six-monthly and annual reports were prepared and submitted in a timely manner as required.

Coordination with participating countries/territories was achieved through periodic meetings of the Project Steering Committee (PSC), which comprised the Directors of Fisheries or their representatives from each of the participating ACPs and OCTs. The PSC usually met in the margins of other regional fisheries meetings and was tasked with approving the Annual Work Plans (AWPs) to ensure they aligned with national and regional priorities. However, it was noted in the Mid-Term Review that there were no specific Terms of Reference for the PSC, and as it usually met after the approval of the Annual Work Plans (AWPs) by the RAO and the EU Delegation, that it did not play a significant role in monitoring and evaluation of SCIFISH. The Mid-Term Review also commented negatively on the lack of detail provided for targets and indicators in the AWP and Six-Monthly Reports, stating that this situation did not facilitate effective monitoring. It should be noted, however, that overall the Mid-Term Review characterised OFP's management of SCIFISH as exemplary. In response to these comments, the SCIFISH logical framework was revised (Annex 1) and this Terminal Report organized to facilitate evaluation against the new OVIs. .

In addition to the Mid-Term Review conducted in November 2010, two Results Orientated Monitoring Missions were conducted in September 2009 and September 2010. Both missions assessed SCIFISH as "good" or "very good" in all evaluation categories, including impact, relevance and efficiency of implementation. All three of the reviews highlighted the need for better definition of performance indicators which was addressed through a revised logical framework in Year 4.

### 3.6 Financing arrangements

The Contribution Agreement for the ACP component of SCIFISH was signed on 24 January 2008 in the amount of €4,000,000 between SPC, PIFS and the EU Delegation. The Contribution Agreement for the OCT component of SCIFISH was signed on 13 March 2008 in the amount of €2,610,000 between SPC, the Government of New Caledonia and the EU Delegation. As noted in section 3.3, €53,000 from the ACP component and €45,000 from the OCT component were withheld to fund project evaluations and external audits.

SCIFISH proceeded under a series of annual work plans and budgets (Years 1-4) prepared by the project coordinators and approved by the PSC, the RAO and the EU Delegation. At the end of each programme year expenditures under ACP and OCT components were accounted for separately under the categories of technical assistance, MCS activities, travel, equipment, tagging operations, training, observer and port sampling operations, data processing and IT support, administrative support, SPC overhead, contingencies, evaluation and audit. At the end of each year, all expenditure was audited externally in line with EU requirements. The audit reports were then provided to the RAO with the request for the 80% advance against the approved AWP and budget. The Mid-Term Review concluded that the financial aspects of the Six-Monthly and Annual Reports were consistently well-documented.

## 3.7 Communications and visibility

It is generally accepted that effective communication of scientific results is essential to promote changes in fisheries management. The project addressed this challenge in a number of ways:

- The production of a large number of scientific and technical reports (listed in annex 4) to inform fisheries specialists within the region and beyond;
- Raising the capacity of national fisheries staff to understand and interpret stock assessments through a series of stock assessment workshops (largely supported by other donors but complementing SCIFISH work);
- Participating actively in national meetings and stakeholder consultations to develop fisheries management plans;
- Participating in, and presenting material to, all of the key regional meetings at which fisheries management measures are debated and approved, in particular working closely with the FFA and PNA;
- Direct one-on-one advice provided to senior fisheries officials on the fringes of these meetings

The effectiveness of these communication efforts is seen in the efforts of the Pacific Island administrations to introduce new management measures described above. The impact of advocacy at the higher levels of Government is demonstrated by the declarations of Pacific Island leaders on the need for improved management of oceanic resources at every Forum leaders' meeting since the project began. However, the need to improve communications further and develop understanding of the issues more widely has been recognised, and for the SciCOFish project has included: assigning responsibility for project communications to a professional staff member; media and communications training for senior OFP staff; the development of a communication strategy; increased attention to broadcasts and print articles in regional media; and the production and dissemination of short easily read policy briefs on key issues.

Efforts to ensure visibility of the SCIFISH project and the EU funding provided have included: acknowledgement of the project and funding source in all major technical publications that it has generated; an annual steering committee meeting to discuss in detail the work programme and budget; acknowledgement of EU funding in presentations of the OFP work programme to a wide range of audiences; and the development of a special SCIFISH web-page on the SPC website. In spite of these efforts the mid-term review found that the project had low visibility. A number of reasons for this can be suggested:-

1. The project modality favoured by many donors has resulted in a bewildering array of relatively small regional projects and many people simply lose track of which is which.
2. The project was well integrated into a broader programme of work associated with the implementing agency – while this is in line with principles of aid effectiveness, it tends to reduce the visibility that is sometimes achieved with stand-alone activities.
3. SCIFISH dealt with technical and scientific issues, was successful and involved no celebrities or scandals and therefore failed to attract media interest.

While these issues are inherent in the nature of such projects and difficult to resolve, as with communications, renewed efforts are being made under the SciCOFish project including: development of a project logo; production and distribution of project merchandise (briefcases, T-shirts, flashdrives);

commissioning a regular section of the widely distributed SPC newsletter to report on project activities; and more regular updating of the project webpage with stories intended for a general readership.

### 3.8 Key quality/sustainability issues

Many of the SCIFISH products have not only set new standards for science-based fisheries management in the region, they have been enthusiastically welcomed by and incorporated into national programmes. The transfer of competency-based SPC observer training programmes to national coordinators and trainers; the use of the TUFMAN system and its data quality audit tools by ACP/OCT countries to manage their own data; and the nationalisation of the extensive tagging research programme in PNG waters are some examples of sustainable innovations effected under SCIFISH. Continuing improvement of assessment models such as MULTIFAN-CL and SEAPODYM under SCIFISH, particularly in terms of their abilities to provide EEZ-specific estimates of current and projected stock status, has underpinned progressive fishery management measures such as the PNA's Vessel Day Scheme, and the WCPFC FAD and high seas closures. The quality benchmarks set by these products represent a lasting contribution to fisheries management in the region.

It is acknowledged that several of the project components advanced under SCIFISH, such as observer training, ecosystem modelling and tuna tagging, were initiated under earlier EU-funded projects, such as the Regional Tuna Tagging Project (EDF 6), SPRTRAMP (EDF 7) and PROCFISH (EDF 8). SCIFISH built on these early successes of what have been long-term initiatives by SPC and donor partners. Currently, SciCoFish (and other donor-funded projects) are continuing several aspects of the SCIFISH work, both to enhance the scope of the work and, given current differences in ACP/OCT countries' capacity to maintain and utilise the various project products for themselves, to continue to broaden their uptake across the Pacific ACP and OCT community. The slow progress with cost recovery initiatives in the WCPFC and other t-RFMOs means that it is likely that donor support for scientific support of tuna fisheries management in this region will continue to be required for some years to come.

# 4 Lessons Learned

## 4.1 Policy and programme context - including institutional capacity

Integrating science into ongoing policy making: SCIFISH accomplished an ambitious programme of work not only through the competency and dedication of its staff, but also because its products directly responded to critical regional fisheries management issues. By fulfilling the needs of ACP/OCT participating countries and informing the WCPFC, SCIFISH directly contributed to several major advances in data systems, ecological understanding and stock management. The project clearly demonstrated the importance of integrating scientific advancement into ongoing policy-making processes.

Responsiveness to shifting institutional landscapes: Another feature of the SCIFISH project was its ability to channel scientific products to user-groups in an evolving management environment. Although WCPFC and ACP/OCT participating countries remained key clients throughout the project, emerging sub-regional organisations such as the PNA and Te Vaka Moana were also supported without jeopardizing SPC's objectivity. This successful model of institutional interactions is recommended for future projects.

## 4.2 Process of project planning/design

Use of specific and measurable OVIs: Both Results Orientated Monitoring Missions (September 2009 and September 2010), as well as the November 2010 Mid-Term Review, highlighted that the SCIFISH OVIs were not sufficiently specific and measurable. As a consequence, in Year 4 the SCIFISH Project logical framework was revised but in some cases the OVIs remained difficult to assess, lacked baseline values and/or were beyond the scope of the project to deliver. Greater attention will be paid to the definition of specific and measurable OVIs in future projects.

Underestimation of support time for transferred data systems: The SCIFISH project design was based on the development and transfer of data collection and management systems to ACP/OCT participating countries. It was initially envisaged that the majority of effort would be invested in the design and installation of the systems at which point they would operate independently. One of the lessons learned in SCIFISH was that even as data entry time decreases with development of new systems, the time necessary for system support increases. Fortunately, with the increase in internet bandwidth now available in many participating countries, many of the diverse support tasks that arise can be handled through remote access. This approach is being incorporated into SPC's current work, including activities under the SciCOFish project.

## 4.3 Project scope (objectives, resources, budget, etc)

Importance of visibility of EU funding: The Mid-Term Review commented that the name-recognition of the project was not high and recommended that steps be taken to improve its visibility. In response SPC constructed a project website with links to key project documents. Although SPC produced numerous scientific reports and peer reviewed publications under SCIFISH (with the funding source formally acknowledged in those publications), aside from the website, there were few materials produced or formatted for a general audience. This was a deficiency in the original project design,

which has been rectified in the SciCOFish project, with project visibility and communications being given a much greater emphasis as detailed in section 3.7. .

Need for more in-depth training for stock assessment capacity building: One of the successes of SCIFISH was its ability to build capacity for data collection and management in ACP/OCT participating countries. SCIFISH also supported training of ACP/OCT scientists in annual stock assessment workshops. This training was effective in building a better level of understanding of regional assessment and ecosystem modelling work, which facilitated a higher level of engagement in WCPFC's scientific discussions by ACPs and OCTs and promoted the use of these products in national level decision-making. However, both our own observation and several reviews of SPC-implemented projects have recognised the importance of longer-term attachments. Future projects should consider building in intensive training opportunities, e.g. six-month attachments, to allow key individuals hands-on and in-depth experience with quantitative studies.

## 4.4 Assumptions and risks

Risk that trial technologies will prove ineffective: A number of new technologies were trialled under the SCIFISH project. Some of these technologies, e.g. scanning protocols for national data submission and the initiation of web-based NTFSRs, substantially sped access to data and saved printing and postage fees. On the other hand, others, such as the use of radar satellites to detect IUU fishing activities and PSAT tags for albacore tracking, proved ineffective. In both cases further technological developments (in radar satellite resolution and the miniaturisation of tags) are awaited, and the need to pursue other methods in the interim was confirmed.

Risk that management decisions are not science-based: In any resource management decision-making arena there is a tension between short- and long-term interests. The role of science can only be to inform this debate of the range of consequences, not to determine whether sustainable utilisation is achieved. To the extent that the SCIFISH products were a key basis for the WCPFC bigeye and yellowfin tuna CMM (2008-01), and the SPC stock assessments continue to receive the full attention of the Commission, SCIFISH has fulfilled its purpose. However, experience during SCIFISH has demonstrated that until a more structured management framework consisting of harvest control rules is implemented, it is likely that the response of the WCPFC to scientific advice will be partial, slow and compromised.

## 4.5 Project management/coordination arrangements and stakeholder participation

Flexibility in observer training: The decision of WCPFC and the PNA to implement 100% observer coverage in the purse seine fishery from 1 January 2010 provided a major challenge to regional and national observer programmes. SPC staff supported by the SCIFISH project went to extraordinary lengths to train as many observers as possible given available resources, including developing a streamlined training course focusing on purse seine competency and developing observer training capacity in-country. This was particularly successful in PNG where PNG trainers not only run their own courses, they now assist in the delivery of observer training courses in other parts of the region. In achieving the training of 642 observers and allowing national programmes to meet regional requirements, SPC demonstrated the importance of flexibility and responsiveness in delivering training.

Delays resulting from decentralized project management: Despite initial debate regarding the need for its inclusion in the SCIFISH project, funding for tasks relating to IUU fishing was allocated to SPC with the understanding that it would be conducted by FFA. Due to a vacancy in the key FFA project management post of Operations Director until early 2011, much of the IUU fishing-related work did not get underway until the end of the project. While deliverables will be produced, it is perhaps useful to consider the costs and benefits of dividing project management responsibilities between agencies for future projects.

Effectiveness of the project steering committee: It has been noted that the effectiveness of the PSC suffered through the lack of specific Terms of Reference and that the timing of PSC meetings did not enable meaningful input into the upcoming year's work plan. If PSC's are to persist as features of project governance, then some stronger guidance through specific ToRs should be given. However, conducting regional meetings at times convenient to the project cycle is becoming increasingly difficult due to the crowded fisheries meeting agenda that the Region now has to deal with. Options that might be considered are (1) to conduct such meetings electronically or (2) to entrust project governance to the implementing agency's existing processes, which in this case would be the SPC Heads of Fisheries Meeting, which discusses and develops the overall work programme of which EDF projects are an important component.

## 4.6 Project financing arrangements

Adequate resourcing of administrative costs: In response to recommendations in the Mid-Term Review, SPC requested access to contingency funds for Years 1-4 to support administrative activities relating to SCIFISH progress tracking and reporting. Expenditure in Years 1-3 had been higher than anticipated and were expected to continue in Year 4. Through this experience SPC now has a fuller understanding of the true costs of administrative support and will include these in the budgets of future projects.

Strengthening of institutional systems: Prior to the SCIFISH project, the EU conducted an Institutional Assessment of SPC's procurement and administrative systems which resulted in several recommendations for improvements. These improvements were effected and as a result SPC was favourably assessed. The new systems will continue to be applied in any future EU-funded projects to ensure compliance with EU regulations.

## 4.7 Sustainability

There is no group of developing small island states anywhere in the world that is able to support the necessary scientific and technical services needed for the management of shared fish stocks without external funding support. Nevertheless the project has achieved some progress in terms of sustainability.

- French Polynesia and New Caledonia have taken over responsibility for funding of their observer programmes, while other countries are moving increasingly towards full cost-recovery from the fishing industry. Good progress has been achieved in training observer trainers so that SPC will be able to withdraw from the direct training role in future.
- Much of the work on region-wide stock assessments supported by the SCIFISH project is now funded by the WCPFC from funds raised by major fishing nations.

- Although the SciCOFish project has supported some continuing tagging operations, the largest field programme in the region is now directly funded and managed by Papua New Guinea, including a contribution to technical support of the project by SPC.

There are, however, some important lessons to be learned in pursuit of sustainability.

Long-term support requirements for new institutional capacity: One important aspect of sustainability learned during the SCIFISH project is the need for long-term support for new institutional capacity. As described above in terms of data collection and management support, once participating countries began to manage their own data, their needs shifted to system maintenance and trouble-shooting tasks at a similar service level as before. More broadly, even once institutional capacity is attained staff turnover will create a continuous demand for re-training which may not be met by in-country personnel. While the objective of institutional strengthening and sustainability remains critical, SCIFISH experience has demonstrated that support functions must continue to be resourced in the start-up period.

Diversity of capabilities and priorities in participating countries: In parallel with the need for long-term support during start-up, SCIFISH also recognized the diversity of capabilities and priorities in participating countries. For example, PNG is leading the region in observer training, data management and a nationalized tuna tagging programme. SCIFISH's interaction with PNG represented an excellent match of technical products with capable personnel, and national funding and institutional support. While the same levels of input were made by SCIFISH in other participating countries, the response has not been as strong and continuing efforts will be required. In the future, it may be possible to reduce inputs to some ACP/OCT countries without detriment, and to allocate a greater amount of resources to those which require more assistance.

**ANNEX 1: Logical Framework for SciFish**

| INTERVENTION LOGIC | OBJECTIVELY VERIFIABLE INDICATORS | SOURCES OF VERIFICATION | ASSUMPTIONS |
|---|---|---|---|
| **Overall Objective:**<br>Conservation and sustainable use of oceanic fish resources of the western and central Pacific | • Effort on target species in the western and central Pacific is managed regionally and nationally so it does not exceed the level of $F_{MSY}$.<br>• Catch of target species in the western and central Pacific is managed regionally and nationally so it does not exceed the level of $B_{MSY}$.<br>• Ecosystem impacts of fishing oceanic resources are minimized. | • Conservation and management measures for oceanic fisheries.<br>• Regional stock assessment reports.<br>• National tuna status reports. | . |
| **Project Purpose:**<br>Improved policy and scientific information for better management of the regional and national oceanic fisheries. | • 100% of ACP and OCT participating countries have access to the most accurate data on tuna catch and species population dynamics for decision making.<br>• The current stock status for the 4 main tuna species assessed at least once during the implementation of SciFish.<br>• 100% of these assessments have access to the most accurate data on tuna catch and species population dynamics.<br>• 100% of these assessments accepted by the WCPFC Scientific Committee and forwarded to the Commission for decision making<br>• 100% of National Tuna | • Reports of the WCPFC Scientific Committee.<br>• Reports of the WCPFC Technical Compliance Committee.<br>• Reports of the WCPFC.<br>• Peer review reports of stock assessment<br>• Tuna management plans.<br>• Policy briefs.<br>• Papers in scientific journals. | • ACP and OCT governments fully consider the best scientific advice when making decisions. |

| | | | |
|---|---|---|---|
| | Management Plans developed with the most comprehensive set of summarized information available on tuna fishery and population dynamics. | | |
| **Project Results:**<br>Result Area 1: Enhanced oceanic fisheries monitoring.<br><br>Result Area 2: Enhanced stock assessments.<br><br>Result Area 3: Enhanced understanding of the pelagic ecosystems. | • Observer capacity and institutional infrastructure established so that P-ACPs can achieve 100% of national and regional observer and port sampling coverage and data collection requirements and standards.<br>• 100% of P-ACPs provided with capacity and tools for implementing continuous data auditing to maximise data quality for scientific decision making<br>• 100% of P-ACPs provided with capacity, tools and access to information for detecting and managing IUU fishing activities.<br>• 100% of P-OCTs provided with an evaluation of the feasibility of applying existing satellite technologies for detecting IUU fishing activities.<br>• Establish the most comprehensive tagging dataset for tropical tuna for inclusion in regional stock assessments and analyses of population dynamics.<br>• Establish the most comprehensive tagging and biological parameter dataset for | • Observer reports & training reports.<br>• Regional and national databases.<br>• MOUs signed.<br>• IUU compliance audits.<br>• FFA and SPC reports.<br>• Evaluation reports.<br>• Stock assessment data and reports.<br>• Stock assessment models.<br>• Tagging data.<br>• WCPFC reports.<br>• Publications.<br>• Update SEAPODYM.<br>• Project reports. | Appropriate and compatible technologies available to strengthen existing monitoring, control and surveillance infrastructure.<br>Sufficient number of observers available for observer and port sampling missions.<br>Commitment by governments to seriously address IUU fishing.<br>ACP and OCT governments will commit to implementing fishery monitoring methods as recommended by the project.<br>Availability of vessel to be chartered for tuna tagging exercise. |

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| | south Pacific albacore for inclusion in regional stock assessments and analyses of population dynamics.<br>• Provide 100% p-ACPs and P-OCTs with infrastructure to evaluate tuna management policies in the contact of current and future environmental variability at both the regional and EEZ scales. | | |
| **Activities:**<br>• Training programmes for scientific observers & port samplers.<br>• Provide quality control for scientific and port sampling data.<br>• Develop and trial new technologies for enhancing quality of data and timeliness of data collection.<br>• Develop harmonised fisheries monitoring systems and data sharing protocols.<br>• Undertake compliance audits and IUU risk assessments.<br>• Develop and implement methodologies to verify fisheries data.<br>• Develop and trial new technologies including satellite based technologies for detection of IUU fishing activities.<br>• Conduct large-scale conventional and electronic tagging and associated biological studies of tuna.<br>• Conduct analyses of tagging, | **Cost Estimate (Euro)** **ACP** **OCT** **Total**<br>Technical Assistance 1,080,000 853,000 1,933,000<br>MCS Activities 480,000 100,000 580,000<br>Travel 150,000 112,000 262,000<br>Equipment 134,000 138,000 272,000<br>Tagging Operations 1,200,000 350,000 1,550,000<br>Training 90,000 24,000 114,000<br>Observer & Port Sampling 90,000 714,000 804,000<br>Data Processing and IT Support 330,000 60,000 390,000<br>Administration / Audit 129,000 42,000 171,000<br>Indirect Costs 257,000 157,000 414,000<br>Contingencies 27,000 30,000 57,000<br>Evaluation 33,000 30,000 63,000<br>**TOTAL** **4,000,000** **2,610,000** **6,610,000** | | • Availability of technical expertise for long and short term engagement.<br>• New technologies for surveillance and data management affordable.<br>• Commitment from the countries to trial new technologies.<br>• Status of tuna stocks at good levels to undertake scientific work covering targeted species. |

| | | |
|---|---|---|
| biological and fishery oceanographic data to better understand population dynamics, behaviour & biology of tuna.<br>• Develop models to assess status of targeted tuna stocks and impacts of fishing.<br>• Develop and enhance models of the pelagic ecosystem supporting targeted oceanic fish stocks.<br>• Provide scientific advice on ecosystems aspects of fishery management including:<br>• impacts of environment variability on oceanic fish stocks and fisheries;<br>• the effects of fishing on the pelagic ecosystem; and<br>• potential benefits and effectiveness of specific ecosystem management measures such as marine protected areas. | | |

**ANNEX 2**: Summary performance data for SCIFISH

| | Project Plan / Logical Framework | Status at Project Close-out |
|---|---|---|
| **Purpose** | Improved policy and scientific information for better management of the regional and national oceanic fisheries. | • 100% of ACP/OCT participating countries have accessed the most accurate data on tuna catch and species population dynamics for decision-making (see Section 3.2.1 (Data Tools)).<br>• 100% of assessments have accessed the most accurate data on tuna catch and species population dynamics (see Section 3.2.1 (Data Tools)).<br>• The current stock status for the four main tuna species was assessed at least twice during the implementation of SCIFISH (see Section 3.2.2 (Assessments)). |
| **Objectives** | Conservation and sustainable use of oceanic fish resources of the western and central Pacific | • Effort on target species in the western and central Pacific is managed regionally and nationally so it does not exceed the level of $F_{MSY}$ for yellowfin, skipjack and albacore but overfishing of bigeye continues (see Section 3.2.2 (Resource Status))<br>• Catch of target species in the western and central Pacific is managed regionally and nationally so it does not exceed the level of $B_{MSY}$ for yellowfin, skipjack, albacore and bigeye (see Section 3.2.2 (Resource Status))<br>• Ecosystem impacts of fishing oceanic resources are minimised (see Section 3.2.3 (Ecosystem Status)) |
| **Results** | Conservation and sustainable use of oceanic fish resources of the western and central Pacific | • Observer capacity and institutional infrastructure established so that P-ACPs and P-OCTs achieved 100% of national and regional observer and port sampling coverage and data collection requirements and standards (see Section 3.2.1 (Observer Programmes)).<br>• 100% of P-ACPs provided with capacity and tools for implementing continuous data auditing to maximize data quality for scientific decision making (see Section 3.2.1 (Data Tools)).<br>• 100% of P-ACPs provided with capacity, tools and access to information for detecting and managing IUU fishing activities (see Section 3.2.1 (IUU Fishing))<br>• 100% of P-OCTs provided with an evaluation of the feasibility of applying existing satellite technologies for detecting IUU fishing activities (see Section 3.2.1 (IUU |

| | | |
|---|---|---|
| | | Fishing))<br>• Established the most comprehensive tagging dataset for tropical tunas in the WCPO for inclusion in regional stock assessments and analyses of population dynamics (see Section 3.2.3 (Biological Studies))<br>• Established the most comprehensive tagging and biological parameter dataset for south Pacific albacore for inclusion in regional stock assessments and analyses of population dynamics (see Section 3.2.3 (Biological Studies))<br>• Provided 100% P-ACPs and P-OCTs with infrastructure to evaluate tuna management policies in the context of current and future environmental variability at both the regional and EEZ scales (see Section 3.2.3 (SEAPODYM)). |
| **Expenditure** | €3,947,000 (9th EDF, ACP component)[1]<br>€2,565,000 (9th EDF, OCT component)[2] | €3,945,341 (99.96%)<br>€2,568,538 (100.14%) |

[1] Corrected allocation for administrative support which does not include €20,000 for audit shown in original annex III" as shown on page 47/50 of the "Year 3 Annual Report and Provisional 2011 Work Plan and Cost Estimate" submitted in May 2011 for the ACP component

[2] In the original annex the allocation for external audit was shown in error against this line item [Administrative assistance/audit] - see page 49/52 of the "Year 3 Annual Report and Provisional 2011 Work Plan and Cost Estimate" submitted in May 2011 for the OCT component

**ANNEX 3**: Full summary of income and expenditure, SCIFISH Years 1-4.

## SCIFISH YEAR 1-2-3-4 - FINANCIAL SUMMARY OF EXPENDITURE BY ACTIVITIES

For period 01 January 2008 to 31 December 2011

| ACTIVITIES | Budget | | T6 code | Advance received | | Expenditure | | Balance of advance | | % of initial advance | Balance of budget remaining | | % of bugdet spent |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | in XPF | in EUROS | | in XPF | in EUROS | in XPF | in EUROS | in XPF | in EUROS | | in XPF | in EUROS | |
| **ACP COMPONENT** | | | | | | | | | | | | | |
| **Technical assistance** | | | | | | | | | | | | | |
| 1.1 Port sampling & observer coordination | **35 600 253** | **298 330** | **SFA011** | 34 279 029 | **287 258** | 35 600 193 | **298 330** | (1 321 164) | **(11 071)** | 103,85% | 60 | **1** | 100,00% |
| 1.2 Port Sampling & Observer Trainer | **30 220 156** | **253 245** | **SFA012** | 29 098 601 | **243 846** | 30 220 236 | **253 246** | (1 121 635) | **(9 399)** | 103,86% | (80) | **(1)** | 100,00% |
| 1.3 Tagging Technician | **32 965 597** | **276 252** | **SFA013** | 31 742 152 | **265 999** | 33 063 119 | **277 069** | (1 320 967) | **(11 070)** | 104,16% | (97 522) | **(817)** | 100,30% |
| 1.4 Ecosystem Modeller | **27 347 196** | **229 170** | **SFA014** | 26 332 266 | **220 664** | 27 040 319 | **226 598** | (708 053) | **(5 933)** | 102,69% | 306 877 | **2 572** | 98,88% |
| 1.5 Ecosystem Modelling Services | **11 935 642** | **100 021** | **SFA015** | 11 492 677 | **96 309** | 11 935 589 | **100 020** | (442 912) | **(3 712)** | 103,85% | 53 | **0** | 100,00% |
| **MCS Activities** | | | | | | | | | | | | | |
| 2.1 Harmonised MCS data sharing protocols | **37 226 969** | **311 962** | **SFA021** | 35 845 372 | **300 384** | 37 237 912 | **312 054** | (1 392 540) | **(11 669)** | 103,89% | (10 943) | **(92)** | 100,03% |
| 2.2 Compliance audits, IUU risk assessments | **3 345 858** | **28 038** | **SFA022** | 3 221 683 | **26 998** | 3 345 858 | **28 038** | (124 175) | **(1 041)** | 103,85% | 0 | **0** | 100,00% |
| 2.3 Data verification methodologies | | | **SFA023** | 0 | - | - | - | 0 | **0** | 0,00% | 0 | **0** | 0,00% |
| 2.4 Satellite detection of IUU fishing pilot | **16 706 444** | **140 000** | **SFA024** | 16 086 421 | **134 804** | 16 706 444 | **140 000** | (620 023) | **(5 196)** | 103,85% | 0 | **0** | 100,00% |
| **Travel** | | | | | | | | | | | | | |
| 3.1 Port Sampling & Observer | **7 577 836** | **63 502** | **SFA031** | 7 296 601 | **61 146** | 8 586 812 | **71 957** | (1 290 211) | **(10 812)** | 117,68% | (1 008 976) | **(8 455)** | 113,31% |
| 3.2 Tagging | **6 758 279** | **56 635** | **SFA032** | 6 507 461 | **54 533** | 5 677 498 | **47 577** | 830 | **6 955** | 87,25% | 1 080 781 | **9 057** | 84,01% |
| 3.3 Ecosystem Modelling | **995 771** | **8 345** | **SFA033** | 958 815 | **8 035** | 995 814 | **8 345** | (36 999) | **(310)** | 103,86% | (43) | **(0)** | 100,00% |
| **Equipment** | | | | | | | | | | | | | |
| 4.1 Port Sampling & Observer | **2 615 633** | **21 919** | **SFA041** | 2 518 560 | **21 106** | 2 615 578 | **21 919** | (97 018) | **(813)** | 103,85% | 55 | **0** | 100,00% |
| 4.2 Tagging / biological | **10 697 089** | **89 642** | **SFA042** | 10 300 091 | **86 315** | 10 842 357 | **90 859** | (542 266) | **(4 544)** | 105,27% | (145 268) | **(1 217)** | 101,36% |
| 4.3 Computer | **1 722 970** | **14 439** | **SFA043** | 1 659 025 | **13 903** | 1 556 862 | **13 047** | 102 | **856** | 93,84% | 166 108 | **1 392** | 90,36% |
| **Tagging operations** | | | | | | | | | | | | | |
| 5.1 Vessel charter / operations | **126 833 473** | **1 062 865** | **SFA051** | 122 126 329 | **1 023 419** | 126 772 654 | **1 062 355** | (4 646 325) | **(38 936)** | 103,80% | 60 819 | **510** | 99,95% |
| 5.2 Tag rewards, publicity, etc | **11 468 477** | **96 106** | **SFA052** | 11 042 850 | **92 539** | 11 471 427 | **96 131** | (428 577) | **(3 591)** | 103,88% | (2 950) | **(25)** | 100,03% |
| **Training** | | | | | | | | | | | | | |
| 6.1 Port Sampling & Observer | **6 250 077** | **52 376** | **SFA061** | 6 018 119 | **50 432** | 6 281 595 | **52 640** | (263 476) | **(2 208)** | 104,38% | (31 518) | **(264)** | 100,50% |
| 6.2 Stock Assessment | **1 178 878** | **9 879** | **SFA062** | 1 135 126 | **9 512** | 1 178 868 | **9 879** | (43 742) | **(367)** | 103,85% | 10 | **0** | 100,00% |
| **Observer & port sampling operations** | | | | | | | | | | | | | |
| 7.1 National observer programmes | **9 019 382** | **75 583** | **SFA071** | 8 684 647 | **72 777** | 9 021 553 | **75 601** | (336 906) | **(2 823)** | 103,88% | (2 171) | **(18)** | 100,02% |
| 7.2 National port sampling programmes | **2 317 534** | **19 421** | **SFA072** | 2 231 524 | **18 700** | 2 403 306 | **20 140** | (171 782) | **(1 440)** | 107,70% | (85 772) | **(719)** | 103,70% |
| **Data processing & IT support** | | | | | | | | | | | | | |
| 8.1 Scientific programming support | **27 798 921** | **232 955** | **SFA081** | 26 767 226 | **224 309** | 27 840 661 | **233 305** | (1 073 435) | **(8 995)** | 104,01% | (41 740) | **(350)** | 100,15% |
| 8.2 Data processing support | **10 024 351** | **84 004** | **SFA082** | 9 652 320 | **80 886** | 10 008 438 | **83 871** | (356 118) | **(2 984)** | 103,69% | 15 913 | **133** | 99,84% |
| **Administrative Support / Evaluation** | | | | | | | | | | | | | |
| Administrative Support / Evaluation | **19 607 524** | **164 311** | **SFA090** | 18 879 834 | **158 213** | 19 610 018 | **164 332** | (730 184) | **(6 119)** | 103,87% | (2 494) | **(21)** | 100,01% |
| **SPC Overhead @ 7% of Direct costs** | | | | | | | | | | | | | |
| SPC Overhead @ 7% of Direct costs | **30 787 603** | **258 000** | **SFA100** | 29 644 989 | **248 425** | 30 791 290 | **258 031** | (1 146 301) | **(9 606)** | 103,87% | (3 687) | **(31)** | 100,01% |
| **CONTINGENCIES** | | | | | | | | | | | | | |
| CONTINGENCIES | - | - | **SFA110** | 0 | - | - | - | 0 | **0** | 0,00% | 0 | **0** | 0,00% |
| **EVALUATION** | | | | | | | | | | | | | |
| EVALUATION | - | - | **SFA120** | 0 | - | - | - | 0 | **0** | 0,00% | 0 | **0** | 0,00% |
| **Subtotal - ACP COMPONENT** | **471 001 913** | **3 947 000** | | **453 521 718** | **3 800 512** | **470 804 401** | **3 945 341** | **(17 282 683)** | **(144 829)** | **104%** | **197 512** | **1 655** | **99,96%** |
| **OCT COMPONENT** | | | | | | | | | | | | | |
| **Technical assistance** | | | | | | | | | | | | | |
| 1.1 National Coordinator FP | **17 984 982** | **150 714** | **SFO011** | 17 189 094 | **144 045** | 14 955 738 | **125 329** | 2 233 | **18 716** | 87,01% | 3 029 244 | **25 385** | 83,16% |
| 1.2 National Coordinator NC | **18 238 716** | **152 840** | **SFO012** | 17 431 600 | **146 077** | 18 364 111 | **153 891** | (932 511) | **(7 814)** | 105,35% | (125 395) | **(1 051)** | 100,69% |
| 1.3 Albacore Biologist | **32 267 811** | **270 404** | **SFO013** | 30 839 866 | **258 438** | 32 315 713 | **270 806** | (1 475 847) | **(12 368)** | 104,79% | (47 902) | **(401)** | 100,15% |
| 1.4 Fisheries Oceanographer | **32 392 583** | **271 450** | **SFO014** | 30 959 118 | **259 437** | 35 579 128 | **298 153** | (4 620 010) | **(38 716)** | 114,92% | (3 186 545) | **(26 703)** | 109,84% |
| 1.5 Ecosystem Modelling Services | **5 967 847** | **50 011** | **SFO015** | 5 703 753 | **47 797** | 5 967 847 | **50 011** | (264 094) | **(2 213)** | 104,63% | 0 | **0** | 100,00% |
| **MCS Activities ( contracted work)** | | | | | | | | | | | | | |
| 2.1 Satellite detection of IUU fishing pilot (NC) | **17 903 541** | **150 032** | **SFO021** | 17 111 258 | **143 392** | 17 903 541 | **150 032** | (792 283) | **(6 639)** | 104,63% | (0) | **(0)** | 100,00% |
| **Travel** | | | | | | | | | | | | | |
| 3.1 FP | **1 053 654** | **8 830** | **SFO031** | 1 007 027 | **8 439** | 2 679 247 | **22 452** | (1 672 220) | **(14 013)** | 266,06% | (1 625 593) | **(13 622)** | 254,28% |
| 3.2 NC | **789 477** | **6 616** | **SFO032** | 754 541 | **6 323** | 312 825 | **2 621** | 442 | **3 702** | 41,46% | 476 652 | **3 994** | 39,62% |
| 3.3 WF | **828 619** | **6 944** | **SFO033** | 791 951 | **6 637** | 907 419 | **7 604** | (115 468) | **(968)** | 114,58% | (78 800) | **(660)** | 109,51% |
| 3.4 Regional | **6 226 449** | **52 178** | **SFO034** | 5 950 911 | **49 869** | 4 975 378 | **41 694** | 976 | **8 175** | 83,61% | 1 251 071 | **10 484** | 79,91% |
| 3.5 Contractor travel | **2 462 228** | **20 633** | **SFO035** | 2 353 267 | **19 720** | 2 460 443 | **20 619** | (107 176) | **(898)** | 104,56% | 1 785 | **15** | 99,93% |
| **Equipment** | | | | | | | | | | | | | |
| 4.1 Fishery monitoring FP | **137 416** | **1 152** | **SFO041** | 131 335 | **1 101** | 137 416 | **1 152** | (6 081) | **(51)** | 104,63% | 0 | **0** | 100,00% |
| 4.2 Fishery monitoring NC | **172 855** | **1 449** | **SFO042** | 165 206 | **1 384** | 172 855 | **1 449** | (7 649) | **(64)** | 104,63% | 0 | **0** | 100,00% |
| 4.3 Fishery monitoring WF | **265 870** | **2 228** | **SFO043** | 254 105 | **2 129** | 265 870 | **2 228** | (11 765) | **(99)** | 104,63% | 0 | **0** | 100,00% |
| 4.4 Tagging / biological | **13 833 438** | **115 924** | **SFO044** | 13 221 269 | **110 794** | 13 876 100 | **116 282** | (654 832) | **(5 487)** | 104,95% | (42 662) | **(358)** | 100,31% |
| 4.5 Computer | **677 493** | **5 677** | **SFO045** | 647 511 | **5 426** | 691 680 | **5 796** | (44 169) | **(370)** | 106,82% | (14 187) | **(119)** | 102,09% |
| **Tagging operations** | | | | | | | | | | | | | |
| 5.1 Vessel charter | **29 318 758** | **245 691** | **SFO051** | 28 021 319 | **234 819** | 28 694 663 | **240 461** | (673 344) | **(5 643)** | 102,40% | 624 095 | **5 230** | 97,87% |
| 5.2 Tag rewards, publicity | **447 915** | **3 753** | **SFO052** | 428 093 | **3 587** | 388 249 | **3 254** | 40 | **334** | 90,69% | 59 666 | **500** | 86,68% |
| 5.3 Contract personnel | **7 702 089** | **64 543** | **SFO053** | 7 361 251 | **61 687** | 8 225 577 | **68 930** | (864 326) | **(7 243)** | 111,74% | (523 488) | **(4 387)** | 106,80% |
| **Training** | | | | | | | | | | | | | |
| 6.1 FP | **2 434 380** | **20 400** | **SFO061** | 2 326 652 | **19 497** | 2 403 351 | **20 140** | (76 699) | **(643)** | 103,30% | 31 029 | **260** | 98,73% |
| 6.2 WF | - | - | **SFO062** | 0 | - | - | - | 0 | **0** | 0,00% | 0 | **0** | #DIV/0! |
| **Observer & port sampling operations** | | | | | | | | | | | | | |
| 7.1 FP Observers | **32 370 657** | **271 266** | **SFO071** | 30 938 162 | **259 262** | 31 786 839 | **266 374** | (848 677) | **(7 112)** | 102,74% | 583 818 | **4 892** | 98,20% |
| 7.2 NC Observers | **12 886 822** | **107 992** | **SFO072** | 12 316 542 | **103 213** | 12 523 074 | **104 943** | (206 532) | **(1 731)** | 101,68% | 363 748 | **3 048** | 97,18% |
| 7.3 WF Observers | **76 900** | **644** | **SFO073** | 73 496 | **616** | 76 900 | **644** | (3 404) | **(29)** | 104,63% | 0 | **0** | 100,00% |
| 7.4 Port sampling FP | **22 308 022** | **186 941** | **SFO074** | 21 320 826 | **178 669** | 22 509 868 | **188 633** | (1 189 042) | **(9 964)** | 105,58% | (201 846) | **(1 691)** | 100,90% |
| 7.5 Port sampling NC | **12 189 596** | **102 149** | **SFO075** | 11 650 170 | **97 628** | 13 142 275 | **110 132** | (1 492 105) | **(12 504)** | 112,81% | (952 679) | **(7 983)** | 107,82% |
| **Data processing & IT support** | | | | | | | | | | | | | |
| Data Processing and IT Support | **8 454 799** | **70 851** | **SFO080** | 8 080 650 | **67 716** | 8 454 799 | **70 851** | (374 149) | **(3 135)** | 104,63% | 0 | **0** | 100,00% |
| **Administrative Support / Evaluation** | | | | | | | | | | | | | |
| Administrative Support | **6 826 355** | **57 205** | **SFO090** | 6 524 269 | **54 673** | 6 866 840 | **57 544** | (342 571) | **(2 871)** | 105,25% | (40 485) | **(339)** | 100,59% |
| **SPC Overhead @ 7% of Direct costs** | | | | | | | | | | | | | |
| SPC Overhead @ 7% of Direct costs | **18 735 239** | **157 001** | **SFO100** | 17 906 150 | **150 054** | 18 735 155 | **157 001** | (829 005) | **(6 947)** | 104,63% | 84 | **1** | 100,00% |
| **CONTINGENCIES** | - | - | | | | | | | | | | | |
| CONTINGENCIES | | | **SFO110** | 0 | - | - | - | 0 | **0** | 0,00% | 0 | **0** | 0,00% |
| **AUDIT** | | | | | | | | | | | | | |
| AUDIT | **1 131 490** | **9 482** | **SFO120** | 1 081 418 | **9 062** | 1 135 165 | **9 513** | (53 747) | **(450)** | 104,97% | (3 675) | **(31)** | 100,32% |
| **EVALUATION** | | | | | | | | | | | | | |
| EVALUATION | - | - | **SFO130** | 0 | - | - | - | 0 | **0** | 0,00% | 0 | **0** | 0,00% |
| **Subtotal - OCT COMPONENT** | **306 086 001** | **2 565 000** | | **292 540 810** | **2 451 492** | **306 508 066** | **2 568 538** | **(13 967 256)** | **(117 046)** | **105%** | **(422 065)** | **(3 537)** | **100,14%** |
| | | | | | | | | | | | | | |
| **GRAND TOTAL** | **777 087 914** | **6 512 000** | | **746 062 528** | **6 252 004** | **777 312 467** | **6 513 878** | **(31 249 939)** | **(261 874)** | **104,19%** | **(224 553)** | **(1 882)** | **100,03%** |

SECRETARIAT OF THE PACIFIC COMMUNITY
SECRETARIAT GENERAL DE LA COMMUNAUTE DU PACIFIQUE

**ANNEX 4**: SCIFISH Publication List by OVI (peer reviewed publications in bold)

*Data Tools*

| | |
|---|---|
| **OVI Purpose-1.** | **100% of ACP and OCT participating countries have access to the most accurate data on tuna catch and species population dynamics for decision making.** |

| | |
|---|---|
| **OVI Purpose-3.** | **100% of assessments have access to the most accurate data on tuna catch and species population dynamics.** |

| | |
|---|---|
| **OVI Results-2.** | **100% of P-ACPs provided with capacity and tools for implementing continuous data auditing to maximize data quality for scientific decision making.** |

*The following publications provide independent evidence of the improvements in submission of fisheries data to the WCPFC; illustrate the range and complexity of data collection and management systems that have been mastered by fisheries staff in country; and includes one of the training resources used to achieve this.*

1. SPC. 2008. Scientific data available to the Western and Central Pacific Fisheries Commission. WCPFC-SC4-2008/ST IP-2. Accessed online at http://www.wcpfc.int/doc/st-ip-2/scientific-data-available-western-and-central-pacific-fisheries-commission-0
2. SPC. 2009. Scientific data available to the Western and Central Pacific Fisheries Commission. WCPFC-SC5-2009/ST IP-1. Accessed online at http://www.wcpfc.int/doc/st-ip-01/spc-ofp-estimates-annual-catches-wcpfc-statistical-area-spc-noumea-new-caledonia
3. SPC. 2009. Tuna Fisheries Data Logsheet Systems Audit Workbook for Western and Central Pacific Ocean Tuna Fisheries. Version 1.0.
4. SPC. 2009. Tuna Fisheries Data Port Sampling Systems Audit Workbook for Western and Central Pacific Ocean Tuna Fisheries. Version 1.0.
5. SPC. 2009. Tuna Fisheries Data Management System (TUFMAN) – Video training tool. Version 1.0.
6. Williams, P. 2010. Scientific data available to the Western and Central Pacific Fisheries Commission. WCPFC-SC6-2010/ST IP-1. Accessed online at http://www.wcpfc.int/node/2929
7. Williams, P. 2011. Scientific data available to the Western and Central Pacific Fisheries Commission. WCPFC-SC7-2011/ST IP-1. Accessed online at http://www.wcpfc.int/doc/st-wp-01/scientific-data-available-western-and-central-pacific-fisheries-commission

*Observer Programmes*

| | |
|---|---|
| **OVI Results-1.** | **Observer capacity and institutional infrastructure established so that P-ACPs and P-OCTs can achieve 100% of national and regional observer and port sampling coverage and data collection requirements and standards.** |

*The following papers summarise an important finding of the observer programme in demonstrating that the species identification in other catch reports has greatly underestimated the impact of purse seine fishing on bigeye tuna. They further identify ways of improving the collection of data, which can*

*be biased unless a proper random sampling technique is used by observers. The extent of the bias in data has been quantified and can be corrected before the data is used in stock assessments. The final paper summarises the status of observer data entry, which has been a big challenge with the great increase in observer coverage.*


8. Lawson, T. 2008. Factors affecting the use of species composition data collected by observers and port samplers from purse seiners in the Western and Central Pacific Ocean. WCPFC–SC4–2008/ST–WP–3. Accessed online at http://www.wcpfc.int/doc/st-wp-3/factors-affecting-use-species-composition-data-collected-observers-and-port-samplers-pur
9. Lawson, T. 2009. Selectivity bias in grab samples and other factors affecting the analysis of species composition data collected by observers on purse seiners in the Western and Central Pacific Ocean. WCPFC-SC5-2009/ST-WP-03. Accessed online at http://www.wcpfc.int/doc/st-wp-03/lawson-t-selectivity-bias-grab-samples-and-other-factors-affecting-analysis-species-com
10. Lawson, T. 2010. Update on the estimation of selectivity bias based on paired spill and grab samples collected by observers on purse seiners in the Western and Central Pacific Ocean. WCPFC–SC6–2010/ST–WP-02. Accessed online at http://www.wcpfc.int/node/2930
11. Lawson, T. 2011. Purse-Seine Length Frequencies Corrected for Selectivity Bias in Grab Samples Collected by Observers. WCPFC–SC7–2011 / ST–IP–02. Accessed online at http://www.wcpfc.int/doc/st-ip-02/purse-seine-length-frequencies-corrected-selectivity-bias-grab-samples-collected-observ
12. Lawson, T. and P. Sharples. 2011. Report on Project 60: Collection and Evaluation of Purse-Seine Species Composition Data. WCPFC–SC7–2011 / ST–WP–03. Accessed online at http://www.wcpfc.int/doc/st-wp-03/report-project-60-collection-and-evaluation-purse-seine-species-composition-data
13. Williams, P. 2011. Status of observer data management. WCPFC-SC7-2011/ST IP-06. Accessed online at http://www.wcpfc.int/node/3682


*Illegal, Unreported and Unregulated (IUU) Fishing*

| | |
|---|---|
| **OVI Results-3.** | **100% of P-ACPs provided with capacity, tools and access to information for detecting and managing IUU fishing activities.** |

| | |
|---|---|
| **OVI Results-4.** | **100% of P-OCTs provided with an evaluation of the feasibility of applying existing satellite technologies for detecting IUU fishing activities.** |

*These papers provide the results of the largely unsuccessful trial of Radar-sat technology for fisheries surveillance in New Caledonia, and present the results of analysis used to develop the regional MCS strategy for P-ACP countries.*


14. CLS (Collecte Localisation Satellites). 2009. Radar Satellite Surveillance of Fisheries New Caledonian Campaign Report. Technical Memorandum to Contract PRO 93/27/2 WP 11/8/1. 15 July 2009.

15. MRAG Asia Pacific. 2009. Safeguarding the Stocks: A report on analytical projects to support the development of a Regional MCS Strategy for Pacific oceanic fisheries. Brisbane, Australia.

*Resource Status*

| **OVI Objective-1. Effort on target species in the western and central Pacific is managed regionally and nationally so it does not exceed the level of $F_{MSY}$.** |
|---|

| **OVI Objective-2. Catch of target species in the western and central Pacific is managed regionally and nationally so it does not exceed the level of $B_{MSY}$.** |
|---|

*The following papers provide a series of analyses of the effectiveness of a series of measures introduced first by the PNA countries and then more generally adopted by the WCPFC to stop the overfishing of bigeye tuna. The measures included a closure of certain high seas areas to purse seine fishing, restriction of purse seining around floating objects (which attract small bigeye tuna) to 9 months of the year, a ban on the discard of undersized tuna, and restrictions on longline catches of bigeye. The measures had demonstrable impacts in reducing bigeye catches, particularly the 3-month ban on setting on floating objects; but the overall impact was largely negated by an overall increase in purse seine fishing over the period. Further action will be needed to limit fishing activities.*

16. Hampton, J., and Harley, S. 2009. Assessment of the potential implications of application of CMM-2008-01 for bigeye and yellowfin tuna. WCPFC-SC5-GN-WP-17. Accessed online at http://www.wcpfc.int/doc/gn-wp-17/john-hampton-and-shelton-harley-assessment-potential-implications-application-cmm-2008-
17. Hampton, J. and S.J. Harley. 2010. Further Analysis of CMM-2008-01. WCPFC-SC6-2010/SA-WP-5. Accessed online at http://www.wcpfc.int/node/3057
18. Harley, S. J., and N. Davies. 2011. Evaluation of stock status of bigeye, skipjack, and yellowfin tunas against potential limit reference points. WCPFC-SC7-MI-WP-04. Accessed online at http://www.wcpfc.int/node/3651
19. Harley, S.J., J. Hampton and P. Williams. 2010. Characterization of Purse Seine Fishing Activities during the 2009 FAD Closure. WCPFC-SC6-2010/MI-WP-03. Accessed online at http://www.wcpfc.int/node/2878
20. SPC. 2009a. Assessment of the Potential Implication of Application of CMM 2008-01 for Bigeye and Yellowfin Tuna. WCPFC6-2009/IP17. Accessed online at http://www.wcpfc.int/doc/wcpfc6-2009ip17/assessment-potential-implications-application-cmm-2008-01-bigeye-and-yellowfin-t
21. SPC. 2009b. Further consideration of CMM 2008-01 with respect to bigeye tuna. WCPFC6-2009/IP18. http://www.wcpfc.int/doc/wcpfc6-2009ip18/further-consideration-cmm-2008-01-with-respect-bigeye-tunaSPC. 2010. Review of the Implementation and Effectiveness of CMM 2008-01. WCPFC7 -2010/15. Accessed online at http://www.wcpfc.int/doc/wcpfc7-2010-15/review-implementation-and-effectiveness-cmm-2008
22. SPC. 2011a. Projections based on 2011 stock assessments. WCPFC-SC7-2011/MI-WP-02. Accessed online at http://www.wcpfc.int/node/3649

23. SPC. 2011b. Projections based on the 2011 stock assessments. WCPFC-TCC7-2011/31. Accessed online http://www.wcpfc.int/doc/wcpfc-tcc7-2011-31/projections-based-2011-stock-assessments
24. SPC. 2011c. Review of the Implementation and Effectiveness of CMM 2008-01. WCPFC8 - 2011 - 43. Accessed online at http://www.wcpfc.int/node/4520

*Assessments*

| | |
|---|---|
| **OVI Purpose-2.** | **The current stock status for the 4 main tuna species assessed at least once during the implementation of SCIFISH.** |

| | |
|---|---|
| **OVI Purpose-4.** | **100% of these assessments accepted by the WCPFC Scientific Committee and forwarded to the Commission for decision-making.** |

*These papers present the results of the stock assessments of each of the four main tuna species. They show that:*

- *bigeye tuna is experiencing overfishing, and fishing mortality needs to be reduced by more than 30%;*
- *yellowfin tuna is fully exploited and should experience no further increases in fishing effort in the main fishing grounds;*
- *skipjack tuna is not overfished or experiencing overfishing, and the fishery can be considered sustainable;*
- *albacore tuna is not experiencing overfishing, but because the longline fishery targets only a part of the population comprising the largest individuals, countries may wish to limit fishing effort to preserve the profitability of domestic fishing fleets.*

25. Davies, N., S. Hoyle, S. Harley, A. Langley, P. Kleiber, J. Hampton. 2011. Stock assessment of bigeye tuna in the western and central Pacific Ocean. WCPFC-SC7-2011/SA-WP-2. Accessed online at http://www.wcpfc.int/doc/sa-wp-02/stock-assessment-bigeye-tuna-western-and-central-pacific-ocean
26. Harley, S., S. Hoyle, A. Langley, J. Hampton and P. Kleiber. 2009. Stock assessment of bigeye tuna in the western and central Pacific Ocean. WCPFC-SC5-2009/SA-WP-4. Accessed online at http://www.wcpfc.int/doc/sa-wp-04/harley-s-1-s-hoyle-1-a-langley-a-2-j-hampton-1-and-p-kleiber-3-stock-assessment-bigeye-
27. Harley, S., S. Hoyle, P. Williams, J. Hampton, P. Kleiber. 2010. Stock assessment of bigeye tuna in the western and central Pacific Ocean. WCPFC-SC6-2010/SA-WP-4. Accessed online at http://www.wcpfc.int/node/2937
28. Hoyle, S. 2011. Stock assessment of albacore tuna in the South Pacific Ocean. WCPFC-SC7-2011/SA-WP-6. http://www.wcpfc.int/node/3689
29. Hoyle, S. and N. Davies. 2009. Stock assessment of albacore tuna in the South Pacific Ocean. WCPFC-SC5-2009/SA-WP-6. Accessed online at http://www.wcpfc.int/doc/sa-wp-06/hoyle-s-and-n-davies-stock-assessment-albacore-tuna-south-pacific-ocean-spc-noumea-new-

30. Hoyle, S., A. Langley, and J. Hampton. 2008. Stock assessment of albacore tuna in the South Pacific Ocean. WCPFC-SC4-2008/SA-WP-8. Accessed online at http://www.wcpfc.int/doc/sa-wp-8/stock-assessment-albacore-tuna-south-pacific-ocean
31. Hoyle, S., P. Kleiber, N. Davies, S.J. Harley, J. Hampton 2010. Stock assessment of skipjack tuna in the western and central Pacific Ocean. WCPFC-SC6-2010/SA-WP-10. Accessed online at http://www.wcpfc.int/node/2938
32. Hoyle, S., P. Kleiber, N. Davies, A. Langley, J. Hampton. 2011. Stock assessment of skipjack tuna in the western and central Pacific Ocean. WCPFC-SC7-2011/SA-WP-4. Accessed online at http://www.wcpfc.int/doc/sa-wp-04/stock-assessment-skipjack-tuna-western-and-central-pacific-ocean
33. Langley, A. and J. Hampton. 2008. Stock assessment of skipjack tuna in the western and central Pacific Ocean. WCPFC-SC4-2008/SA-WP-4. Accessed online at http://www.wcpfc.int/doc/sa-wp-4/stock-assessment-skipjack-tuna-western-and-central-pacific-ocean
34. Langley, A., J. Hampton, P. Kleiber and S. Hoyle. 2008. Stock assessment of bigeye tuna in the western and central Pacific Ocean, including an analysis of management options. WCPFC-SC4-2008/SA-WP-1. Accessed online at http://www.wcpfc.int/doc/sa-wp-1/stock-assessment-bigeye-tuna-western-and-central-pacific-ocean-including-analysis-manage
35. Langley, A., S. Harley, S. Hoyle, N. Davies, J. Hampton and P. Kleiber. 2009. Stock assessment of yellowfin tuna in the western and central Pacific Ocean. WCPFC-SC5-2009/SA-WP-3. Accessed online at http://www.wcpfc.int/doc/sa-wp-03/langley-a-s-harley-s-hoyle-n-davies-j-hampton-and-p-kleiber-stock-assessment-yellowfin-
36. Langley, A., S. Hoyle, J. Hampton. 2011. Stock assessment of yellowfin tuna in the western and central Pacific Ocean. WCPFC-SC7-2011/SA-WP-3. Accessed online at http://www.wcpfc.int/doc/sa-wp-03/stock-assessment-yellowfin-tuna-western-and-central-pacific-ocean

*Management Plans*

| | |
|---|---|
| **OVI Purpose-5.** | **100% of National Tuna Management Plans developed with the most comprehensive set of summarized information available on tuna fishery and population dynamics.** |

*The published paper reports on the progress of developing management plans for tuna fisheries. The tuna status reports aim to provide a comprehensive assessment of the tuna fisheries of each of the countries concerned to inform the development of management plans or other national management measures.*

37. **Langley, A., A. Wright, G. Hurry, J. Hampton, T. Aqorau, L. Rodwell. 2009. Slow steps towards management of the world's largest tuna fishery. Marine Policy 33: 271-279.**
38. (Nine confidential, country-specific National Tuna Fishery Status Reports delivered)

*Ecosystem Status*

| **OVI Objective 3.** | **Ecosystem impacts of fishing oceanic resources are minimized.** |
|---|---|

*These papers provide:*

- *A preliminary assessment of the status of key shark species impacted by tuna fisheries and recommendations and progress reports on efforts to improve the analysis;*
- *The use of risk assessment to identify the species most likely to be seriously impacted by tuna fisheries;*
- *The use of observer data to analyse interactions between fishing boats and whale sharks and whales and dolphins;*
- *Analysis of the frequency with which turtles are caught by fishing boats, and whether they are in a state that will allow them to survive when released;*
- *Identification of the areas in which tuna fishing is likely to have serious impacts on seabirds such as albatross;*
- *Analysis of the effectiveness of measures that have been introduced by the WCPFC to mitigate by-catch of these species.*


39. Clarke, S. 2009. An Alternative Estimate of Catches of Five Species of Sharks in the Western and Central Pacific Ocean based on Shark Fin Trade Data. WCPFC-SC5-2005/EB-WP-02. Accessed online at http://www.wcpfc.int/doc/eb-wp-02/shelley-clarke-alternative-estimate-catches-five-species-sharks-western-and-central-pac

40. Clarke, S. and S.J. Harley. 2010. Proposal for a Research Plan to Determine the Status of the Key Shark Species. WCPFC-SC6-2010/EB-WP-01. Accessed online at http://www.wcpfc.int/node/2950

41. Clarke, S., T. Lawson, D. Bromhead and S. Harley. 2010. SPC-Progress Toward Shark Assessments. WCPFC7-2010/16. Accessed online at http://www.wcpfc.int/doc/wcpfc7-2010-16/spc-progress-toward-shark-assessments

42. Kirby, D. 2008. Ecological Risk Assessment (ERA) Progress Report (2007/8) & Work Plan (2008/9). WCPFC-SC4-2008/EBSWG-WP-1. http://www.wcpfc.int/doc/eb-wp-1/ecological-risk-assessment-era-progress-report-20078-work-plan-20089

43. Kirby, D. 2009. Ecological Risk Assessment Implementation Report. WCPFC-SC5-2009/EB-WP-05. Accessed online at http://www.wcpfc.int/doc/eb-wp-05/d-kirby-ecological-risk-assessment-implementation-report-spc-ofp-noumea-new-caledonia

44. Kirby, D. 2009. Monitoring the effectiveness of Conservation and Management Measures for bycatch. WCPFC-SC5-2009/EB-WP-09. Accessed online at http://www.wcpfc.int/doc/eb-wp-09/david-se%C3%83%C2%A1n-kirby-monitoring-effectiveness-conservation-and-management-measures-bycatch-

45. Kirby, D., S. Waugh, D. Filippi. 2009. Spatial risk indicators for seabird interactions with longline fisheries in the western and central Pacific. WCPFC-SC5-2009/EB-WP-06. Accessed online at http://www.wcpfc.int/doc/eb-wp-06/d-kirby-s-waugh-d-filippi-spatial-risk-indicators-seabird-interactions-with-longline-fi

46. Manning, M., D.B. Bromhead, S.J. Harley, S.D. Hoyle, and D.S. Kirby. 2009. The feasibility of conducting quantitative stock assessments for key shark species and recommendations for providing preliminary advice on stock status in 2010. WCPFC-SC5-2009/EB-WP-08. Accessed online at http://www.wcpfc.int/doc/eb-wp-08/michael-j-manning-donald-b-bromhead-shelton-j-harley-simon-d-hoyle-and-david-s-kirby-fe

47. SPC. 2010. Summary Information on Whale Shark and Cetacean Interaction in the Tropical WCPFC Purse Seine Fishery. WCPFC7-2010-IP/01. Accessed online at http://www.wcpfc.int/doc/wcpfc7-2010-ip-01/summary-information-whale-shark-and-cetacean-interactions-tropical-wcpfc-purse

48. SPC. 2011. Summary Information on Whale Shark and Cetacean Interaction in the Tropical WCPFC Purse Seine Fishery. WCPFC8-2011-IP/01. Accessed online at http://www.wcpfc.int/node/4476

49. **Waugh, S.M., Filippi, D.P., Kirby, D.S., Abraham, E. & Walker, N. 2012. Ecological Risk Assessment for seabird interactions in Western and Central Pacific longline fisheries. Marine Policy doi.org/10.1016/j.marpol.2011.11.005.**

50. Williams, P, D. Kirby and S. Beverly. 2009. Encounter rates and life status for marine turtles in WCPO longline and purse seine fisheries. WCPFC-SC5-2009/EB-WP-07. Accessed online at http://www.wcpfc.int/doc/eb-wp-07/p-williams-d-kirby-s-beverly-encounter-rates-and-life-status-marine-turtles-wcpo-longli

*Biological Studies*

| | |
|---|---|
| **OVI Results-5.** | **Establish the most comprehensive tagging dataset for tropical tunas in the WCPO for inclusion in regional stock assessments and analyses of population dynamics.** |

| | |
|---|---|
| **OVI Results-6.** | **Establish the most comprehensive tagging and biological parameter dataset for south Pacific albacore for inclusion in regional stock assessments and analyses of population dynamics.** |

Tropical Tuna Tagging (ACP)

*These papers consist of:*

*a series of operational reports on status of the tropical tuna tagging programme recording the cruises undertaken, numbers of fish tagged, and the numbers that have been recovered;*

*presentation of the results of acoustic tagging which show that tuna tend to remain at a shallower depth around floating objects and are thus more vulnerable to purse seine fishing;*


51. Hampton, J., S. Nicol, B. Leroy, B. Kumasi, A. Lewis and D. Itano. 2008. PTTP Operational Plans 2008-11. WCPFC-SC4-2008/ GN-IP-4. Accessed online at http://www.wcpfc.int/doc/gn-ip-4/pttp-operational-plans-2008%C3%A2%E2%82%AC%E2%80%9C09
52. Kumasi, P., B. Leroy, J. Hampton, S. Nicol, A. Lewis and D. Itano. 2008. Issues Relating to the Recovery of Tags as part of the Pacific Tuna Tagging Project. WCPFC-SC4-2008/ GN-IP-5. Accessed online at http://www.wcpfc.int/doc/gn-ip-5/pttp-tag-recovery-issues
53. Leroy, B., J. Hampton, B. Kumasi, A. Lewis, D. Itano, T. Usu, S. Nicol, V. Allain, S. Caillot. 2009. PTTP Summary Report: Review Phase 2. WCPFC-SC5-2009/ GN-IP-13. Accessed online at http://www.wcpfc.int/doc/gn-ip-13/b-leroy-j-hampton-b-kumasi-a-lewis-d-itano-t-usu-s-nicol-v-allain-sylvain-caillot-pttp-
54. Leroy, B., D. G. Itano, T. Usu, S. J. Nicol, K. N. Holland, and J. Hampton. 2009. Vertical behaviour and the observation of FAD effects on tropical tuna in the warm-pool of the Western Pacific Ocean. pp. 161-180 IN: Nielsen, J.L., H. Arrizabalaga, N. Fragoso, A. Hobday, M. Lutcavage, and J.Sibert (eds.), Tagging and Tracking Marine Animals with Electronic Devices. Kluwer Academic Publishers, The Netherlands.
55. Nicol, S., J. Hampton, B. Leroy, B. Kumasi, A. Lewis, and D. Itano. 2009. PTTP Work Plan 2009-10. WCPFC-SC5-2009/ GN-IP-15. Accessed online at http://www.wcpfc.int/doc/gn-ip-15/s-nicol1-j-hampton1-b-leroy1-b-kumasi1-a-lewis1-d-itano2-pttp-work-plan-2009-2010-1-spc
56. Nicol, S., A. Lewis, D. Itano, T. Usu, B. Kumasi, B. Leroy, S. Caillot, C. Sanchez and J. Hampton. 2010. Pacific Tuna Tagging Project Progress Report and Work Plan for 2010. WCPFC-SC6-2010/GN IP-04. Accessed online at http://www.wcpfc.int/node/2916
57. Nicol, S., B. Leroy, S. Caillot, J. Hampton, A. Lewis, A. Williams, T. Usu, B. Kumasi and L. Kumoru. 2011. Pacific Tuna Tagging and PNG Tagging Project Progress Report and Work Plan for 2011-2012. WCPFC-SC7-2011/ST IP-05. Accessed online at http://www.wcpfc.int/doc/st-ip-05/pttp-progress-report-and-work-plan-2011-2012
58. PTTP Steering Committee. 2008. Report of the PTTP Steering Committee. WCPFC-SC4-2008/GN-WP-7. Accessed online at http://www.wcpfc.int/doc/gn-wp-7/report-pttp-steering-committee
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*SEAPODYM*

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| **OVI Results-7.** | **Provide 100% P-ACPs and P-OCTs with infrastructure to evaluate tuna management policies in the context of current and future environmental variability at both the regional and EEZ scales.** |

*These papers provide information on the development of the SEAPODYM model, validation of the model against real fishing data, analyses for tuna species and swordfish, and presentation of the*

*projections for the impacts of climate change on key tuna species. In summary, climate change will affect the distribution and abundance of the different tuna species up to the end of the century. Skipjack tuna will initially be favoured by climate change, and the centre of abundance will shift gradually to the East; while deep swimming tuna such as bigeye will be adversely affected by changes in the ocean currents.*


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