

**The Commission for the Conservation and Management of  
Highly Migratory Fish Stocks in the Western and Central Pacific Ocean**

**Scientific Committee  
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**STRATEGIC RESEARCH PLAN 2007–2011**

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**INTRODUCTION**

**The Convention and the Commission**

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPFC) was established by the Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (the Convention). The objective of the Convention is to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean.

The Commission is tasked with developing and adopting specific measures to promote these objectives, as detailed in Articles 5 and 6 of the Convention. Fundamental duties of the Commission necessary to promote conservation, sustainability and optimal utilization that are supported by science-based information include:

- assessing the impact of fishing on marine resources and the western and central Pacific Ocean (WCPO) ecosystem;
- protecting biodiversity and promoting ecosystem based approaches to management;
- minimizing waste, pollution and impacts on both target and non-target or associated or dependent species (NTADs);
- preventing or eliminating overfishing and excess fishing capacity;
- promoting the collection, compilation and dissemination of complete and accurate fisheries data and information from national and international research programmes.

To implement and enforce these goals, the Commission is required to utilize the best scientific evidence available. This evidence must be incorporated into a fishery management

regime consistent with the principles of the precautionary approach and in consideration of target species, NTADs, environmental factors and habitats of special concern.

### **The Scientific Committee**

Article 11 of the Convention establishes a Scientific Committee, the functions of which are described in Article 12. They include reviewing the results of research, analysis and status assessments of target stocks or NTADs in the Convention Area and to assist development and assess information resulting from a regional observer programme<sup>1</sup>.

The Convention requires that the Scientific Committee recommend a research plan to the Commission<sup>2</sup>. The Strategic Research Plan<sup>3</sup> described here has been prepared in response to this requirement. The Plan will be complemented by rolling work plans, reviewed and amended annually as appropriate by the Scientific Committee.

This Strategic Research Plan is intended to serve an initial period of five years from 2007. As there will be an ongoing need for an adaptive research plan to support the Scientific Committee's objective of providing the best available scientific advice, the Plan will be periodically reviewed to ensure it remains responsive to the Commission's needs.

### **RESEARCH PRIORITIES**

The Commission has four overall research and data collection priorities:

- collection and validation of data from the fishery
- monitoring and assessment of stocks
- monitoring and assessment of the ecosystem
- evaluation of management options

#### **Collection, compilation and verification of data from the fishery**

Data from the fishery are required to monitor catch and effort, and are an essential input to stock assessment. Increases in data quality and coverage will enable more accurate estimates of catches and are key to reducing uncertainty in stock assessments. Data are also required for tracking fleet dynamics and monitoring changes in the fisheries. A critical role of the Scientific Committee is to promote the collection and compilation of all necessary data and to assist in increasing data accuracy and coverage. Research activities include:

- estimating total fishing effort which includes incremental increases in effective effort, catches and related mortalities of target and non-target species, stratified, as appropriate, by area, time, species or stock, size, sex and other characteristics;

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<sup>1</sup> Including work undertaken by scientific experts engaged by the Commission under Article 13, and for the observer programme, in conjunction with the Technical and Compliance Committee.

<sup>2</sup> Article 12(2)(a)

<sup>3</sup> for the period 2006 to 2011

- monitoring the accuracy and coverage of operational-level catch and effort data, aggregated catch and effort data, and size composition data compiled by the Commission, and developing programmes to improve accuracy and coverage and to address data gaps that are identified;
- developing programmes for the collection and compilation of related fisheries data, such as gear and vessel attributes, and other information, that can be used to standardize fishing effort and estimate fishing capacity and changes in effective fishing effort;
- rescuing historical fisheries data and related metadata useful for stock assessment and effort standardization;
- developing draft standards for the collection of operational catch and effort data, port sampling data, observer data and other types of data, as required, including minimum standards for data collection forms;
- determining appropriate data fields to collect and developing sampling designs, including sampling protocols, for the collection of these data through observer and port sampling programmes; and
- developing programmes to assist Members and Cooperating Non-members in meeting data-related Convention obligations.

### **Monitoring and assessment of stocks**

Stock assessment and modelling are the primary scientific tools used to estimate the condition of fish stocks and to evaluate the efficacy of conservation measures. Structural uncertainty in stock assessment derives, in part, from inaccurate or incomplete data from the fishery, mistaken assumptions about underlying biological processes, and an incomplete lack of understanding of fishing gear and vessels operations. Addressing uncertainties in stock assessment is a useful guide to assigning priorities to components of the scientific the programme.

#### ***Stock assessment and modeling***

Research activities directly supporting stock assessments include:

- Routine application of existing methods;
- Characterisation of statistical and structural uncertainty in stock assessments;
- Improvement of existing methods and development of new methods;
- Refinement of biological reference points for use in stock status determination;

- Use of simulation models to evaluate the sensitivity of stock assessment tools to violation of specific assumptions about biological processes (e. g. the dependency of natural mortality on age); and
- Improvement of data inputs to stock assessment models, in particular analyses to standardise fishing effort or catch-per-unit-effort to provide reliable indices of abundance.

### ***Biological studies***

Understanding of key biological processes and the identification and definition of regional variability in these processes in an area as large as the WCPO is required to underpin stock assessments of target species and selected NTADs. Enhanced understanding of these processes will reduce “structural” uncertainty and possible bias in stock assessments. Required studies include:

- age and growth of pre- and post-recruit segments of the population;
- reproductive parameters and capacity;
- length, weight and sex composition in response to environmental and anthropomorphic factors;
- characterisation of stock structure;
- movement and migration;
- behaviour and habitat utilisation;
- recruitment variability and the environmental influences thereon; and
- tagging studies.

Tagging is an important tool for biological and behavioural studies of fish and has special importance in the assessment highly migratory fish stocks (HMS). Stock assessments for other types of fish (e. g. small pelagic and demersal species), benefit greatly from “fishery independent” survey data, which provide information on population size independent of data from the commercial fishery. Such survey data can potentially reduce the bias and uncertainty in the stock assessments. Unfortunately, routine scientific survey methods are not applicable to HMS because of the large geographical scales and resultant costs. Tagging studies on all scales are the closest approximation to fishery independent data currently available to support WCPFC management activities. Tagging studies provide information on rates and direction of movement, mortality, habitat utilization, aggregation and vulnerability, all of which are directly used in the stock assessments. Tagging activities include:

- mass tagging with conventional tags to determine large-scale population movement and mortality rates;

- specialized deployment of data storage tags, both conventional archival tags and pop-up satellite tags, to better define horizontal and vertical habitat preferences;
- deployment of other types of electronic tags to determine small-scale movements or residence times in relation to natural features and floating objects, such as seamounts and fish aggregating devices; and
- implementation of comprehensive tag recovery procedures, and studies (e.g. tag seeding) to estimate the rates of reporting of recaptured tags.

### **Monitoring and assessment of the ecosystem**

The ecosystem approach to fisheries requires managers to consider more than the impact of the fishery on single target stocks. Additional considerations include assessing the impact of environmental variability on target stocks, and assessing the impact of the fishery on other species including prey, competitors, species caught in association with the target species (NTAD or non-target, associated and dependent species), and on habitat. Research activities include:

- undertaking regular ecological risk assessments (using Productivity-Susceptibility Analysis or other approaches), to identify priorities for enhanced monitoring, biological research, stock assessment and management intervention;
- establishing ecosystem indicators to monitor the effects of fishing, other anthropogenic effects and natural variability on ecosystem structure, function and biodiversity;
- identifying habitats of special concern, and the fishery impacts, other anthropogenic impacts and the effects of environmental variability thereon;
- estimating maximum aggregate yield of all species that can be safely removed from the ecosystem without disrupting ecosystem structure and function;
- identifying oceanographic features, processes and fishing practices that influence the distribution and abundance of fish stocks and their vulnerability to fishing gear;
- investigating trophic relationships (food webs, aggregation, maturity, spawning, ecological modelling, predator/prey relationships, depredation, etc.);
- synthesising data and ideas across disciplines into ecosystem-based models; and
- conducting bycatch mitigation research including socio-economic and technical options to minimise bycatch and discards.

### **Evaluation of management options**

The impacts of potential management measures on target stocks, NTADs and the ecosystem as a whole (including socioeconomic impacts) should be considered by the Commission where possible before the implementation of such measures. In particular, insights into the

robustness and effectiveness of management measures in achieving the objectives of the Commission, and the associated trade-offs across these objectives, under uncertainty in our current understanding of population and ecosystem dynamics can be obtained from computer simulations. Such simulations may range in complexity from simple projections or equilibrium yield analyses incorporated into single species stock assessment models to complex multi-species management strategy evaluation (MSE) models, in which the stock, fleet and ecosystem dynamics, fishing impacts, data collection, stock assessment, management response and management implementation are modelled as a single integrated system. The research required to develop an MSE framework for the WCPO convention area includes:

- Development of an appropriately structured multi-species operational model that incorporates, inter alia, the effects of oceanographic variability;
- Development of behavioural models of fleet dynamics, including bio-economic models which integrate resource and fleet dynamics;
- Quantification of management objectives and the development of biological and economic performance indicators against which the achievement of management objectives can be assessed;
- Development of candidate feedback decision-rules for updating management measures in response to assessment outcomes;
- Characterisation of uncertainty in the evaluation of management measures;
- Development of computer software, or adaptation of existing software, to integrate the above models with modules simulating data generation, assessment, management response and implementation.

## **IMPLEMENTATION AND REVIEW**

Monitoring the implementation of this Strategic Research Plan will be the responsibility of the Chair of the Scientific Committee in collaboration with the Executive Director. Members of the Commission, including Cooperating Non-members, participating territories, observers, scientific experts and the Secretariat will share responsibility for implementation of the Plan. Opportunities to take responsibility for activities supporting implementation of components of the Plan will be considered at each meeting of the Scientific Committee.

At each regular session of the Scientific Committee each Specialist Working Group (SWG: Statistics, Fishing Technology, Methods, Biology, Stock Assessment and Ecosystems and Bycatch) will review the elements of the Plan relevant to their respective terms of reference and will develop operational work programmes consistent with the Plan. Coordination of the review and work programme development will rest with the Chair of the Scientific Committee in consultation with convenors of the SWGs, the manager of the science provider and the Executive Director.

Opportunities to involve individuals and institutions from developing countries and territories should be a strong feature of the implementation of the Plan. Promoting such involvement should be aimed at both utilising available expertise from developing countries and

territories, and at providing important opportunities for building scientific and technical capacity within those countries and territories.

Full implementation of the Strategic Research Plan will ~~likely probably~~ be beyond the means of the Commission's core budget. Extra-budgetary funds from voluntary contributions of Members and other sources will be required and actively sought by the Commission. Nevertheless, adoption of the Plan by the Scientific Committee and subsequent strong support from the Commission is a prerequisite to securing the necessary extra-budgetary funds.

An independent external review of the Plan will take place every five years. The Scientific Committee will be responsible for preparing the terms of reference for the review. The Scientific Committee will present the report of the review to the next regular session of the Commission.

## **RELATIONS WITH OTHER ORGANISATIONS**

Article 22 of the Convention provides that the Commission will consult, cooperate and collaborate with other relevant organizations, particularly those with related objectives and which can contribute to the attainment of the objective of the Convention. In relation to this Plan, relationships with the following institutions are of particularly significance.

### **Technical and Compliance Committee**

The Executive Director, in consultation with the Chair of the Scientific Committee, will ensure that the Technical and Compliance Committee is consulted on any element of the Plan directly relevant to the functions of the Technical and Compliance Committee.

The Executive Director will provide the Technical and Compliance Committee with copies of reports of the Scientific Committee relating to implementation and review of the Plan.

This commitment will be reflected in the memorandum of understanding (MOU) developed between the Scientific Committee and the Technical and Compliance Committee.

### **International Committee for Scientific Research on Tuna and Tuna-like Species in the North Pacific**

The Executive Director, in consultation with the Chair of the Scientific Committee, will ensure that the International Committee for Scientific Research on Tuna and Tuna-like Species in the North Pacific (ISC) is informed of relevant elements of the Plan that may have a bearing on the research conducted by the ISC.

This commitment, together with a commitment to collaboration, consultation and coordination, is reflected in the Memorandum of Understanding developed between the Commission and the ISC.

The ISC will be invited to participate in each regular session of the Scientific Committee.

### **Inter-American Tropical Tuna Commission**

The Executive Director, in consultation with the Chair of the Scientific Committee, will ensure that the Director of the Inter-American Tropical Tuna Commission (IATTC) is informed of any element of the Plan directly relevant to the functions of IATTC.

This commitment, together with a commitment to collaboration, consultation and coordination, is reflected in the Memorandum of Understanding between the Commission and the IATTC. The MOU provides for collaboration with respect to the collection and sharing of data and information, subject to data sharing protocols of each organisation, the development and implementation of joint research initiatives and the harmonisation of conservation and management measures.

The IATTC will be invited to participate in each regular session of the Scientific Committee.

### **Secretariat of the Pacific Community – Oceanic Fisheries Programme**

As the provider of scientific services, provided for under Article 14 of the Convention, the Secretariat of the Pacific Community – Oceanic Fisheries Programme (SPC-OFP), will have a pivotal role in the Scientific Committee's monitoring, review and periodic refinement of the Plan.

SPC-OFP is a standing member of the Scientific Committee and, as scientific expert to the Commission has the capacity to report directly to the Commission on science matters.

The Executive Director, in consultation with the Chair of the Scientific Committee, will ensure that SPC-OFP is consulted at regular intervals between regular sessions of the Scientific Committee on progress with implementation of the Plan. An MOU between the Commission and SPC-OFP reflects these arrangements.

### **Indian Ocean Tuna Commission**

The Executive Director, in consultation with the Chair of the Scientific Committee, will ensure that the Director of the Indian Ocean Tuna Commission (IOTC) is informed of any element of the Plan directly relevant to the functions of the IOTC. Strong similarities exist between the fisheries and fishery management concerns and objectives of each regional fisheries management organization (RFMO). Implementation of research plans by both organizations will benefit from open and transparent communication in many areas, including research related to purse seine and longline fisheries, data collection and verification, illegal, unregulated and unreported (IUU) fleets, capacity and vessel registries. The geographic areas of concern to each party overlap in Southeast Asia, further reinforcing the need for collaboration. Tuna tagging programmes are active within both Commission areas, which will test the ability of both organizations to organize a single, coherent tag recovery and reward system in cooperation with coastal states and distantwater fishing nations. Due to the fact that frozen tagged tuna will move between ocean basins for processing, some formal link and communication bridge between RFMOs and their research plans would be desirable.

### **Food and Agriculture Organization**

The Commission's Rules of Procedures provide for the participation of FAO in the meetings of the Commission and its subsidiary bodies. In relation to the Scientific Committee and this Research Plan potential areas for collaboration include the Coordinating Working Party on

Fishery Statistics (CWP, [www.cwpnet.org](http://www.cwpnet.org)) and the Fishery Resources Monitoring System (FIRMS) which is part of the FAO Fisheries Global Information System (FIGIS, a network of integrated fisheries information). FIRMS draws together a unified partnership of international organizations, regional fishery bodies and, in the future, national scientific institutes, collaborating within formal agreement to report and share information on fisheries resources. For effective fisheries information management, FIRMS also participates in the development and promotion of agreed standards.