South Pacific Regional Fisheries Management Organisation (SPRFMO)

Draft Research Programme

1. Introduction

The development of a research programme within a Regional Fisheries Management Organization (RFMO) is essential to support collaboration and coordination within and between different organizations and contracting parties.

Many fish stocks or other resources straddle beyond national waters and migrate between different areas and national boundaries should therefore not constitute a limit to develop research. Problems related to fisheries research and management require cooperation and coordination between states and organizations.

The development of research programmes is a first step to combine efforts and to enhance collaboration between parties. These programmes should prioritise research in line with clearly defined objectives and should have a short, medium and long term scope.

The convention of the South Pacific Regional Fisheries Management Organization (SPRFMO) calls for cooperation in scientific research. The main fisheries identified in the SPRFMO convention area are the jack mackerel (*Trachurus murphyi*) fishery and associated species, the orange roughy (*Hoplostethus atlanticus*) fishery and associated species and the squid (*Dosidicus gigas*, *Stenoteuthis oualaniensis*, *Ommastrephes bartrami*) fishery.

Other identified fisheries include the alfonsino (*Beryx splendens*) and associated species and the blue nose (*Hyperoglyphe antarctica*), bass and associated species.

The SPRFMO research programme should therefore incorporate as much as possible the different components of exploited resources and habitats. Three main programmes can therefore be established:

- The jack mackerel Research Programme

- The deepwater Research Programme

- The squid Research Programme

The SPRFMO has already made important progress in summarising all available information, which is accessible at the web site of the organization[1]. In particular the species and habitat profiles provide a comprehensive overview for the main resources. Important research has already been developed by many contracting parties of the organization.

The objective of this research programme is therefore to combine efforts and to address important issues that still need to be developed in order to apply the precautionary approach and the ecosystem approach to fisheries management and to ensure the long-term conservation and sustainable use of fishery resources as stated in the objectives of the SPRFMO convention.

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[1] http://www.southpacificrfmo.org/swg-meetings/

2. The Jack Mackerel Research Programme

Jack mackerel (*Trachurus murphyi*) is widely distributed in the South-East Pacific, from south of Ecuador to southern Chile and extending from the south-central Chile across the Pacific Ocean and reaching New Zealand and Tasmanian waters. The research activities related with jack mackerel should therefore include a wide number of countries and coastal states.

Information regarding the biology, geographical distribution and historical development of the fisheries is available at the SPRFMO web site. Important research has been developed by many states and by the organization[2].

The jack mackerel research programme is structured into the following components: 1) Biology and ecology, 2) Stock Structure, 3) Stock assessment, 4) Conservation and Rebuilding plan and Management Procedures and 5) Ecosystem Approach to Fisheries Management.

These components are interdependent and should be linked as progress is made. Information regarding biology and ecology is relevant for all components and advances in the stock structure analysis should be reflect in the stock assessment and conservation plan components. Also, the development of rebuilding and conservation plans is dependent on progress in stock assessment and estimation of biological reference points.

2.1 Biology and ecology

[Need to include recent workshop on ageing + other]

Tasks to be developed
1) Follow up on ageing,
2) Migration patterns
3) Link to environmental conditions – El Nino and La Nina

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[2] http://www.southpacificrfmo.org/jack-mackerel-sub-group/

2.2 Stock structure

The stock structure of jack mackerel is a key subject for the management of this resource in the South Pacific. From a conservation and a management point of view, it is fundamental that the establishment of management areas is based on biological criteria. This is particularly important for jack mackerel due to the wide distribution area of this species in the South Pacific.

Important research has been developed by different states in the past and in recent years regarding population structure analysis of jack mackerel. This information is available and summarised at the SPRFMO web site.

However, the different analysis and studies performed on population structure do not provide a clear picture and results are not entirely consistent.

Tasks to be developed

Two different research areas on population structure analysis are proposed to be developed:

1) **Development of the international joint research programme**
   The Science Working Group of the SPRFMO developed in 2008 a proposal for an international joint research programme to analyse the population structure of jack mackerel. This proposal includes a wide biological sampling scheme on a spatial and temporal scale and the application of a wide number of techniques as: genetics analysis, morphometry (otoliths and body), parasites, life history and microchemistry of otoliths. This programme is very comprehensive and applies the state of the art methods used in other areas for population structure studies.
   Currently, progress on this programme is based on collaborative research between parties. The international joint research programme is available at the SPRFMO web site[3].

2) **Simulation based analysis on stock structure and management**
   This task should be linked to the stock assessment component and management strategy evaluation related to conservation and rebuilding plans. This task does not foresee additional biological sampling or processing techniques and should be complementary to the research programme on population structure.
   Through this task all available data and information should be combined to identify the most likely stock structure hypothesis for jack mackerel. Different management strategies should be evaluated through simulations in order to analyse the outcomes of considering uncertainty in population structure and management objectives.

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[3] See Annex D of the Workshop Report: http://www.southpacificrfmo.org/2008-chilean-jack-mackerel-workshop-santiago/

2.3 Stock assessment

The main aim stock assessments is to provide managers with information on the exploitation status and what measures could be adopted to support sustainable exploitation in line with management objectives. For this purpose it is necessary to routinely collect:

- Fisheries related information as catch and effort statistics, biological information as fish lengths, ages and maturity stages.
- Fisheries independent information as: 1) acoustic surveys to estimate abundance and the spatial distribution of the species and 2) egg surveys to provide relative estimates of the spawning biomass.

Fisheries dependent information should be submitted by all parties fishing actively for small pelagic species according to the data submission standard[4]. Fisheries independent information has been provided by the coastal states.

Stock assessment models are commonly used to describe the past dynamics of an exploited stock and its expected future development according to different management measures. Biological reference points are commonly used to classify the stock status and assess the future developments.

During 2010 an Assessment Simulation Task Team within the SPRFMO developed the Joint Jack Mackerel stock assessment model (JJM)[5]. The JJM is a statistical catch at age model and further developments of this model should include a spatial and seasonal structuring and the incorporation of environmental variables that might influence the population dynamics.

Tasks to be developed

The following tasks should be maintained or developed.

Data related tasks:

- Collection of fisheries information as specified in the data collection standards.
- Acoustic and egg surveys should be routinely undertaken.

Stock assessment model related tasks:

- Further development of the JJM model to incorporate seasonal and spatial structuring in order to evaluate area specific management measures as seasonal and/or spatial closures (areas with concentration of juveniles or adults);
- Further development of the JJM model to incorporate the effect of environmental factors on the population dynamics of jack mackerel;
- Analysis of minimum landing size and minimum mesh sizes;
- Estimation of biomass and fishing mortality reference points;

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[4] http://www.southpacificrfmo.org/standard-submission-templates/
[5] see SWG-09-JM Documents at http://www.southpacificrfmo.org/ninth-swg-meeting/

It is emphasized that explicit incorporation of spatial structuring into assessment models, and investigating of the effects of alternative spatial management approaches and area-specific management measures, will require all the necessary data to be provided at fine spatial resolution, at least at the spatial scale at which spatial management approaches are to be investigated.

For catch and effort data, this will require that all participants submit tow-by-tow data, including fishing position data. For biological data (including catch-at-length, catch-at-age and gonad condition / spawning activity data), this will require that observer and onshore sampling programmes are adequate to provide the necessary biological data at adequate spatial scale for all areas covered by the fisheries. Observer programmes will need to be planned to ensure adequate spatial coverage of all areas. This will likely require that scientific observer coverage levels be increased above 10%.

Conservation and Rebuilding plan and Management Procedures

The development of conservation and rebuilding plans and the adoption of management procedures require communication and close collaboration between fisheries management and science. Management Strategy Evaluation (MSE) is an important tool to incorporate uncertainties in stock assessment and provide managers with information on likely future stock dynamics according to different management procedures. This tool helps managers to find the right balance between biological risk and stability or profitability of harvesting over time.

Tasks to be developed

For the development of conservation and rebuilding plans and adoption of a management procedure using MSE, it is necessary to have clear management objectives and biological reference points. This component of the jack mackerel research programme is therefore dependent on managers to decide on management objectives and on progress regarding the research components linked to stock assessment and development of biological reference points.

It is emphasized that development and evaluation of Management Procedures and Harvest Control Rules is an iterative process that will require sequential, repeated and close consultation between scientists, fisheries managers and Commissioners throughout the process.

Ecosystems Approach to Fisheries Management

Using available observer and other appropriate data, conduct initial evaluations of the composition and rates of by-catch of non-target, associated and dependant species, both retained and discarded, including impact assessments.

It should be noted that, to enable the above evaluations to be done, participants will need to ensure that data collected by observers includes data on retained and discarded by-catch, as required by the Data Standards for observer data.

[To be developed]

Tasks to be developed

[To be developed]

3. The deep-water Research Programme

Habitats:
- Seamounts
- Ridges/plateaus

Species:
- Orange roughy (*Hoplostethus atlanticus*)
- Alfonsino (*Beryx splendens*)

The SWG work plan should include the areas identified in the 2010 DWSG report, including:
- Predictive modelling to evaluate the likelihood of the presence of vulnerable marine ecosystems (VMEs),
- Methods to assess deepwater species and the provision of advice on their stock status and potential management approaches.
- Using available observer and other appropriate data, conduct evaluations of the composition and rates of by-catch of non-target, associated and dependant species, both retained and discarded, including impact assessments.

Tasks to be developed

4. The squid research programme

Species:
- Jumbo flying squid – Dosidicus gigas

The SWG work plan should include the development of an understanding of the squid fishery, including stock status, predation rates on other species, potential management approaches and initial evaluation of by-catches.

Tasks to be developed