

South Pacific Regional Fisheries Management Organisation

1st Meeting of the Scientific Committee

La Jolla, United States of America, 21-27 October 2013

SC-01-INF-13

Drafting an advice sheet for the SPRFMO Scientific Committee

Niels Hintzen, Francois Gerlotto, Ad Corten

The Science Working Group (SWG) and now the Science Committee (SC) have been asked, on a regular basis, by the Commission to provide advice on, among others, sustainable catch opportunities for Jack Mackerel in the South Pacific. Up till this point, a specific paragraph was devoted in the SWG reports on advice. It is however often heard that the advice is difficult to find and to place the developments of the stock into context with the developments in biology, fishery and historic advice. An advice sheet, specifying the core elements of the status of the Jack mackerel stock and its catch advice, could be communicated through a short and graphical 'advice sheet'. An attempt is made to design such an advice sheet below.

To the authors opinion, the advice sheet should be short, clear and understandable to a broad public. It should contain graphics that instantly show the status of the stock and indicate potential problems in its assessment and forecast. The core text should be no longer than two pages and supplementary material should only be added if it supports the core text and/or provides important information on historic advice.

Below, an example advice sheet is given. Text and figures are added for illustration purposes only and might therefore not be complete or fully accurate.

South Pacific Regional Fisheries Management Organisation

Advice October 2012

Stock: Jack Mackerel (*Trachurus murphyi*)

Region: SPRFMO convention region, including EEZ of Chile, Peru and Ecuador

Advice for 2013

The SPRFMO Science Committee advises that effort should be maintained at or below 2012 levels. This results in catches for 2013 of no more than 441 000 t.

Stock status

		2010	2011	2012
Fishing mortality in relation to	Target	NA	NA	NA
	Limit	NA	NA	NA
Spawning stock biomass in relation to	Target	NA	NA	NA
	Limit	NA	NA	NA

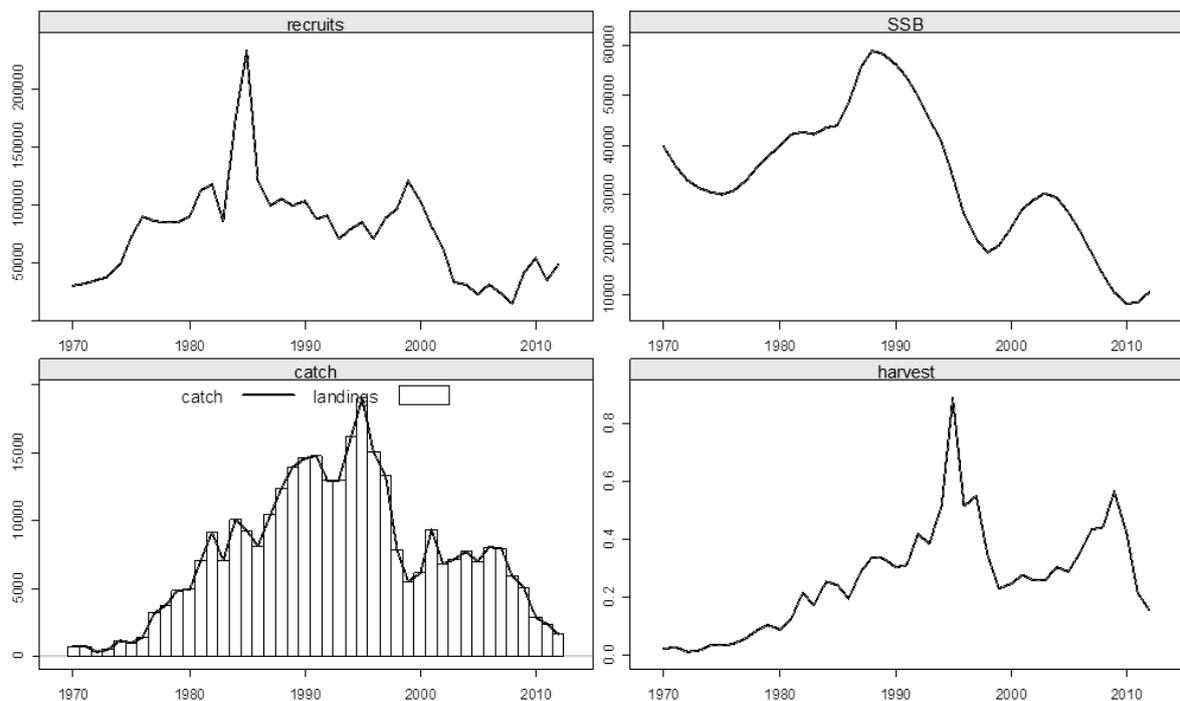


Figure 1. Jack Mackerel in the SPRFMO convention region, including the EEZ of Chile, Peru and Ecuador. Summary of stock assessment. Recruitment is measured in thousands, SSB in thousand tonnes, catch in thousand tonnes and harvest (fishing mortality) as a rate per year.

Management considerations

The Jack Mackerel stock is currently not managed by an agreed management plan or on the basis of reference points.

Biology

Recruitment

Recruitment and population dynamics are influenced by climate variability at a variety of scales from interannual, interdecadal, centennial to millennium. There is large variation in recruitment

success from year to year and high uncertainty is associated with its estimation. The predictability of recruitment is low.

Spawning

Two major spawning areas have been identified, respectively south of 30°S and north of 20°S. The southern spawning area is most stable in its geographical location and timing of spawning. It is believed to be the most important spawning area in terms of egg abundance. The southern spawning area is located west of the Centre-South zone of Chile, from 100 to 300 NM from the coastline. The northern spawning area is less stable in its geographical location (moving from north to south Peru) and less important in terms of egg abundance. No clear knowledge of a possible offshore spawning area exists (west or 100°W). Spawning takes place mostly in austral summer (October / November) and fish disperse during the spawning season.

Growth

Jack mackerel in the southern areas is a ... growing fish. In the northern areas, it is known to grow faster due to ...

Predation and mortality / role in the food web

No major predators for adults Jack mackerel can be identified. There are indications that tunas predate on juvenile Jack mackerel when they overlap in their distribution. In periods of high abundance the Jack mackerel stock can locally deplete the micronekton. Jack mackerel is an opportunistic feeder, where its most important prey are: Euphausiids, Myctophids and copepods. Jack mackerel feeds by night in dense schools close to the surface.

Stock structure

4 stock structure hypotheses are listed by SPRFMO. Additional work is needed to identify the most likely structure.

Environmental influences on the stock

Jack mackerel is adapted to the South Pacific high environmental variability and especially to ENSO events. Its distribution and potentially recruitment success are linked to ENSO and decadal variations.

The fisheries

General description of the fisheries

Reported catches of jack mackerel up to the end of 2012 are shown in Figure 1. Historically, the jack mackerel stock has been exploited for more than 40 years, with total catches peaking at 4.700kt in 1995.

Changes in the fisheries

Over the past two years, the spatial and temporal distribution of Jack mackerel catches in the south-eastern Pacific appears to have changed drastically. The observed fish lengths suggests a displacement of juvenile fish from the international waters off Chile towards the EEZ of Ecuador and Chile, possibly as a result of the cooling of the waters (La Niña) or the appearance of a strong year-class in Ecuador and Peru. Chilean catches in 2011 were preliminary taken inside the Chilean EEZ, contrary to the location of the catches in the years before.

The monitoring

Monitoring is based upon 3 activities.

Scientific acoustic surveys have been performed by the 3 main fisheries (Chile, Peru, Russia) since the 1970s and are continued (Chile and Peru: 1 or 2 surveys per year). These surveys cover approximately ... % of the Jack mackerel distribution. The surveys provide information on ...

Fishing vessels data (excluding catch data) provide informations on the fishing grounds (spatial, dynamic and ecological complexity). Data is collected in all fishing seasons by fishing ships

equipped with a digital echo sounder. Data series exist in Peru and Chile since the 1980s for systematic surveys.

Environmental monitoring is obtained from satellite sensors and acoustic information collected on-board fishing vessels. The monitoring data provides information on Jack mackerel habitat, based on relationships between environmental conditions and the distribution of Jack mackerel.

The assessment

The Joint-Jack mackerel stock assessment model has been used to assess the Jack mackerel stock in 2012. Updates to catch data and survey time series were available and have been evaluated.

Quality considerations

A number of changes were made to the model assumptions and data available to assess the status of the stock. These changes have been evaluated stepwise to ensure improvement of the model. Given the current debate on stock structure, two model configurations were tested whereby the Far North fleet was isolated and used in a separate assessment. The results of these model configurations and isolation of the Far North fleet is given in figure 2.

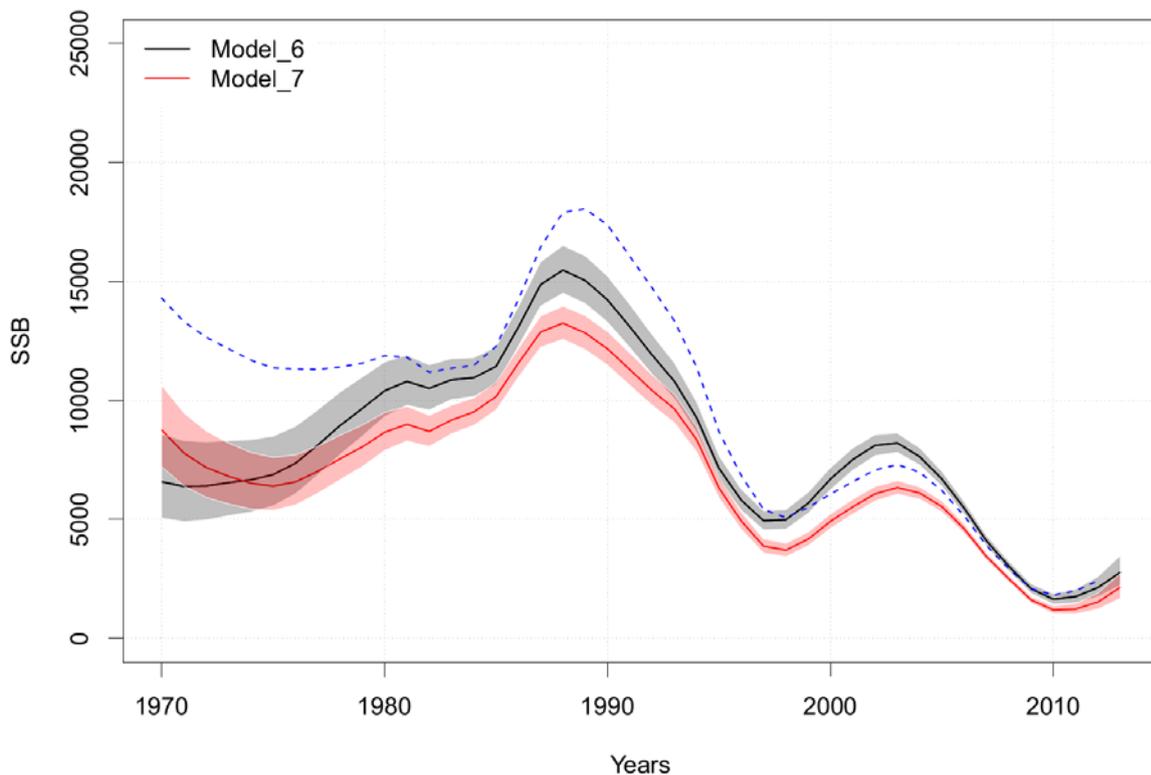


Figure 2: Spawning biomass estimates (t) comparing 3 final model configurations. Model 6 indicates a model configuration assuming a low recruitment regime while model 7 indicates a model configuration with more variability in selection. Model 8 indicates the sum of two assessment models, one based on catch data without the Far North fishery and one based on the Far North catch data only.

Outlook for 2014

Constant fishing mortality scenarios were explored at 100%, 75%, 50%, 25% and 0% of $F_{2012} = 0.29$. Advice is based on an accepted tentative risk criteria: fishing at a constant mortality rate must ensure that there is a >90% probability that biomass in 2021 > biomass in 2012.

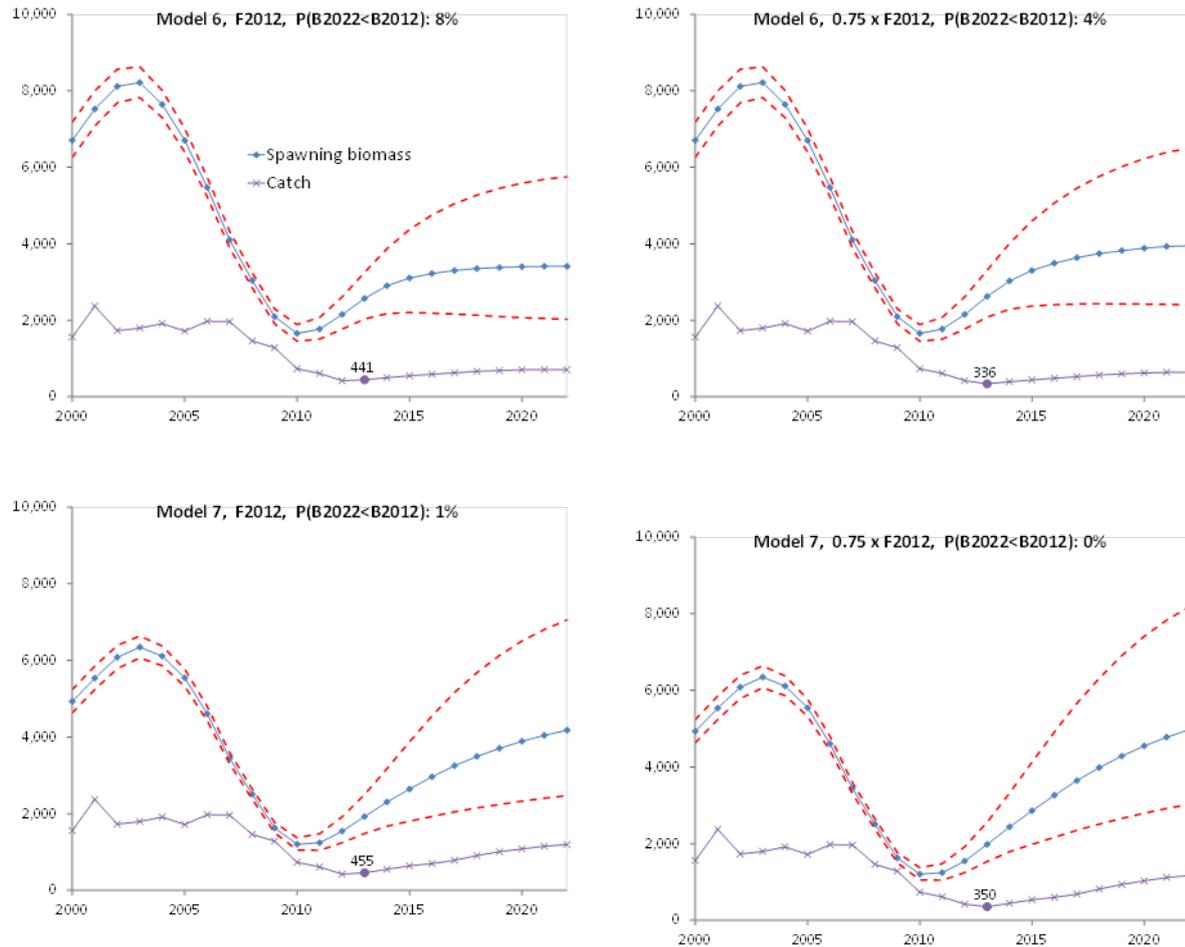


Figure 2: Jack mackerel projections showing catch (lower line) and spawning biomass (dash lines represent 90% confidence bands) for Models 6 (top row) and 7 (bottom row) assuming the same fishing mortality as in 2012 (left column) and at 75% of that level (right column).

Reference points

Currently no reference points have been defined

Catch by countries

Year	Fleet 1		Fleet 2		Fleet 3 (Far north)				Fleet 4 Trawler fleet off Chile (outside EEZ)										
	N Chile (1)	Chile CS (1)	Peru(1)	Ecuador (2)	USSR	Cuba (2)	Subtotal	Belize	Peru	Japan	China	EU	Faroe I.	Korea	Russia /USSR 1)	Cuba	Vanuatu	Subtotal	Total
2002	108727	1357185	154219	604			154823					76261						76261	1696996
2003	142016	1272302	217734				217734					94690		2010	7540		53959	158199	1790251
2004	158656	1292943	187369				187369					131020		7438	62300		94685	295443	1934411
2005	168383	1262051	80663				80663	867			143000	6179		9126	7040		77356	243568	1754665
2006	155256	1224685	277568				277568	481			160000	62137		10474			129535	362627	2020136
2007	172701	1130083	254426	927			255353	12585			140582	123511	38700	10940			112501	438819	1996956
2008	167258	728850	169537				169537	15245			143182	106665	22919	12600	4800		100066	405477	1471122
2009	134022	700905	74694	19834			76629	5681	13326	0	117963	111921	20213	13759	9113		79942	371918	1283474
2010	169010	295681	17559	4613			22172	2240	40516	0	63606	67749	11643	8183	0		45908	239845	726708
2011	23945	194532	257241	69153			326394	0	674	0	32862	2248	0	9253	8229	8	7672	60946	605817
2012	12000	208403	168779	104			168883	0	2996	0	10797	0	0	5492	0	0	8746	28031	417317

Underlined figures have been updated in 2012. 2012 data are preliminary and reflect the best estimates for the year

SPRFMO Advice and Catch / Landings (table)

Year	Advised catch	Agreed catch	Reported catch
2008			1471122
2009			1283474
2010			726708
2011			605817
2012			417317
2013	441000	441000	