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**Projection analysis of alternative management options for south Pacific albacore**

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# Projection analysis of alternative management options for south Pacific albacore

Oceanic Fisheries Programme, SPC

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## Introduction

This paper provides a brief summary of the projection analyses undertaken for south Pacific albacore in accordance with the Eighth Scientific Committee (SC8) recommendations. Specifically, these were to

*“conduct deterministic projections for south Pacific albacore to be presented to WCPFC9. Projections would be based on scalars of the 2010/2011 [final year<sup>1</sup>] catches as used in the assessment. Outputs should be similar to those commonly reported for projections, plus information on predicted changes in vulnerable biomass. In making this request it is noted that the management advice was based on the median of the uncertainty grid.”*

## Methodology

Several methodological assumptions were made in the current albacore projections, some of which differ from those made in the current projections for tropical tunas (BET, SKJ, and YFT). The main assumptions were:

- for each management option, each of the 540 assessment model runs from the uncertainty grid associated with the 2012 South Pacific albacore stock assessment ([WCPFC-SC8-2012-SA-WP-04](#)) were used. This approach was the basis for the management recommendations made at the SC8 (i.e., based upon the median outputs across the uncertainty grid);
- a deterministic projection was run for each model in the uncertainty grid;
- each projection was run for ten years (2011-2020) from the last year of the assessment model for each management option (below);
- future annual recruitment was assumed to occur at the average of the level estimated over the recent period 2000-2009; and
- uncertainty in the form of process error was included by summarizing results across all 540 projections (presented as the median and the 10<sup>th</sup> and 90<sup>th</sup> percentiles).

SC8 requested projection analyses that evaluate alternative management options (‘scalars’) that set future catches at levels scaled from the 2010/2011 catch by 0.7 to 1.5 in 0.1 increments for longline fisheries and 1, 2, and 5 for the surface troll fishery. After further discussion with the CCM requesting this work, it was determined that the following catch scalars would be used to reduce overall computational time while maintaining a similar contrast in longline catch scalars.

Longline scalars: 0.6, 0.8, 1.0, 1.2, and 1.4

Troll scalars: 1.0, 2.0, and 5.0.

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<sup>1</sup> Note that the ‘year’ in the albacore model runs from 1 July to 30 June so the catches presented in this paper do not match the calendar catches provided in the Yearbook.

Catch was scaled according to 2010/2011 levels (the “base year”) as recommended by SC8.

## Results

The median (across the structural uncertainty grid) performance of alternative longline and troll management options (scaled 2010/2011 catches) is shown in Table 1. Selected performance indicators used to summarize projection results include:

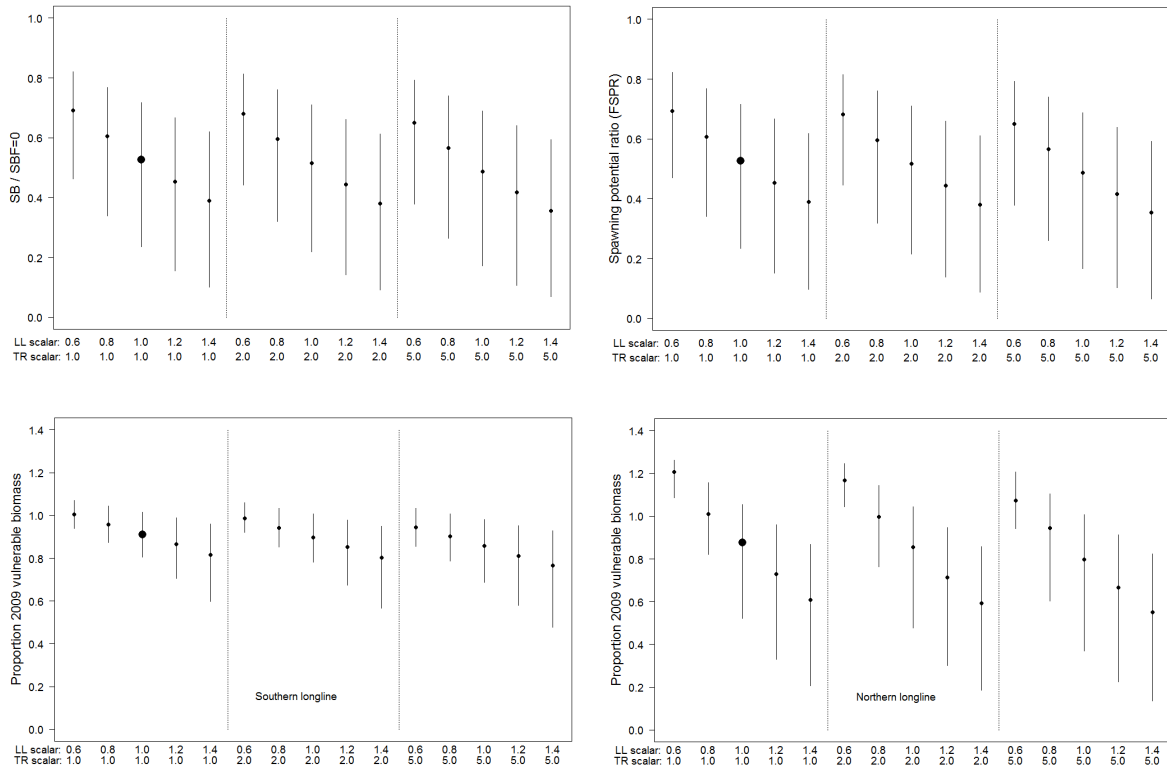
- projected longline catch in the year 2020 ( $Catch_{2020}$ );
- proportion of spawning biomass relative to the spawning biomass in the absence of fishing in the year 2020 ( $SB_{2020}/SBFO_{2020}$ );
- proportion of spawning biomass remaining in 2020 compared to 2009 levels ( $SB_{2020}/SB_{2009}$ );
- spawning potential ratio: proportion of spawner per recruit in 2020 to the spawner per recruit in the absence of fishing in 2020 ( $FSPR_{2020}$ ); and
- proportion vulnerable biomass remaining in 2020 compared to 2009 levels ( $VB_{2020}/VB_{2009}$ ) for a representative southern longline fishery, a representative northern longline fishery, and troll fisheries.

**Table 1.** Summary of south Pacific albacore projection results for each longline and troll scalar combination. Projection results under status quo conditions are shaded.

Scalars LL TR		Catch <sub>2020</sub> (mt)	SB <sub>2020</sub> / SBFO <sub>2020</sub>	SB <sub>2020</sub> / SB <sub>2009</sub>	FSPR <sub>2020</sub>	VB <sub>2020</sub> / VB <sub>2009</sub> (Southern LL)	VB <sub>2020</sub> / VB <sub>2009</sub> (Northern LL)	VB <sub>2020</sub> / VB <sub>2009</sub> (Troll)
0.6	1.0	55,924	0.691	1.180	0.693	1.004	1.207	1.051
0.8	1.0	71,712	0.605	1.004	0.607	0.956	1.010	1.046
1.0	1.0	87,064	0.526	0.872	0.526	0.910	0.875	1.039
1.2	1.0	100,985	0.453	0.748	0.454	0.864	0.730	1.028
1.4	1.0	113,115	0.389	0.646	0.389	0.815	0.609	1.014
0.6	2.0	55,766	0.681	1.144	0.683	0.987	1.168	1.047
0.8	2.0	71,604	0.595	0.991	0.596	0.942	0.998	1.041
1.0	2.0	86,874	0.516	0.853	0.517	0.897	0.855	1.034
1.2	2.0	100,707	0.444	0.731	0.445	0.851	0.713	1.022
1.4	2.0	112,697	0.380	0.631	0.380	0.802	0.592	1.006
0.6	3.0	55,461	0.650	1.062	0.650	0.945	1.072	1.034
0.8	3.0	71,067	0.565	0.936	0.565	0.903	0.946	1.024
1.0	3.0	86,194	0.488	0.796	0.487	0.858	0.797	1.015
1.2	3.0	99,875	0.418	0.687	0.417	0.812	0.666	1.001
1.4	3.0	111,392	0.356	0.583	0.353	0.767	0.550	0.980

The range of performance (10<sup>th</sup> to 90<sup>th</sup> percentile) of management options across the grid of 540 runs provides the extent of potential outcomes when considering model uncertainty, and the resulting range for key performance indicators are shown in Figure 1. The range of results showed a skewed distribution, so the median result was chosen to characterize overall average performance. Other

performance indicators are presented in the Excel spreadsheet (REFrunsALB\_gridALL.xls) accompanying this paper, which is available on the WCPFC website.



**Figure 1.** Summary of projection results for alternative longline (LL) and troll (TR) fishery management options: spawning biomass relative to unfished spawning biomass in year 2020 (top left); spawning potential ratio in year 2020 (top right); and the proportion of 2009 vulnerable biomass in 2020 for a representative southern longline fishery (bottom left) and northern longline fishery (bottom right). Shown are the median estimate (circle) and the 10<sup>th</sup> and 90<sup>th</sup> percentile range (solid line) across all model runs (540) in the structural uncertainty grid for each management option (set of scalars). Projection results under status quo conditions are shown with an enlarged circle.