COMMISSION
FIFTEENTH REGULAR SESSION
Honolulu, Hawaii, USA
10 – 14 December 2018

REFERENCE DOCUMENT FOR THE REVIEW OF CMM 2005-03 AND DEVELOPMENT OF HARVEST STRATEGIES UNDER CMM 2014-06
North Pacific Albacore (*Thunnus alalunga*)

WCPFC15-2018-17
9 November 2018

Paper prepared by the Secretariat

A. INTRODUCTION

1. The purpose of this paper is to provide a quick reference guide to the recommendations of the Scientific Committee (SC), the Northern Committee (NC) and the Technical and Compliance Committee (TCC) of relevance to the discussions on the development of a harvest strategy for North Pacific albacore tuna stock. It lists the recommendations drawn from the summary reports of SC14, NC14 and TCC14, including the adopted Harvest Strategy 2017-01 as an Attachment.

B. SCIENTIFIC COMMITTEE RECOMMENDATIONS

Status and trends and management advice (*Paragraphs 248 – 250, SC14 Summary Report*)

2. SC14 noted that no stock assessments were conducted for North Pacific albacore in 2018. Therefore, the stock status descriptions and management advice from SC13 are still current and be maintained for North Pacific albacore (refer to **Attachment 1** for the details from SC13). Updated information on catches was not compiled for and reviewed by SC14.

C. NORTHERN COMMITTEE RECOMMENDATIONS

Interim harvest strategy for North Pacific albacore fishery and review of the CMM 2005-03 *(Paragraphs 49-52, NC14 Summary Report*)

3. In relation to the absence of China, NC agreed to ask NC Chair to write a letter to China, urging its participation in NC activities and conveying concern of NC on a possible violation of the effort limits in CMM2005-03 (CMM for NP albacore).

4. The ISC Chair informed the NC that ISC is planning to hold another workshop on North Pacific albacore MSE in 5-7 March 2019, in Yokohama, Japan. The purpose of the workshop is to provide

information on the evaluation of candidate target reference points through MSE as requested in the adopted Harvest Strategy 2017-01 (**Attachment 2**). It was requested that the results of North Pacific albacore MSE workshop be presented to NC15.

5. Canada noted that IATTC Resolution on North Pacific albacore was revised to change the data reporting frequency from every 6 months to 1 year. It intends to submit a revision of CMM 2005-03 to change the obligation in conformity with IATTC in NC15.

D. TECHNICAL AND COMPLIANCE COMMITTEE RECOMMENDATIONS

6. [Provisional CMR report and Executive Summary] TCC14 recommended that WCPFC15 review and revise, as appropriate, the following obligations, noting that more information related to these recommendations is contained in the Provisional CMR:

a. CMM 2005-03, paragraph 2.

(TCC14 draft summary report, para 98)

Attachment 1

NORTH PACIFIC ALBACORE (*Paragraphs 340 – 345, SC13 Summary Report*)

Provision of scientific information

1. ISC presented working paper SC13-SA-WP-09 *Stock assessment of albacore tuna in the North Pacific Ocean in 2017*.

Stock status and trends

2. SC13 noted that the ISC provided the following conclusions on the stock status of North Pacific albacore.

3. Stock status is depicted in relation to the limit reference point (LRP; $20\%SSB_{current,\ F=0}$) for the stock and the equivalent fishing intensity (F20%; calculated as 1-SPR20%) (Figure NPALB-1). Fishing intensity (F, calculated as 1-SPR) is a measure of fishing mortality expressed as the decline in the proportion of the spawning biomass produced by each recruit relative to the unfished state. For example, a fishing intensity of 0.8 will result in a SSB of approximately 20% of SSB_0 over the long run. Fishing intensity is considered a proxy of fishing mortality.

4. The Kobe plot shows that the estimated female SSB has never fallen below the LRP since 1993, albeit with large uncertainty in the terminal year (2015) estimates. Even when alternative hypotheses about key model uncertainties such as natural mortality and growth were evaluated, the point estimate of female SSB in 2015 (SSB_{2015}) did not fall below the LRP, although the risk increases with these more extreme assumptions (Figure NPALB-1). The SSB_{2015} was estimated to be 80,618 mt and was 2.47 times greater than the LRP threshold of 32,614 mt (Table NPALB-1). Current fishing intensity, $F_{2012\text{-}2014}$ (calculated as 1- $SPR_{2012\text{-}2014}$), was lower than potential F-based reference points identified for the north Pacific albacore stock, except F50% (calculated as 1-SPR50%) (Table NPALB-1).

Based on these findings, the following information on the status of the north Pacific albacore stock is provided:

- The stock is likely not overfished relative to the limit reference point adopted by the WCPFC ($20\%SSB_{current\ F=0}$), and
- No F-based reference points have been adopted to evaluate overfishing. Stock status was evaluated against seven potential reference points. Current fishing intensity ($F_{2012\text{-}2014}$) is below six of the seven reference points (see ratios in Table NPALB-1), except for F50%.

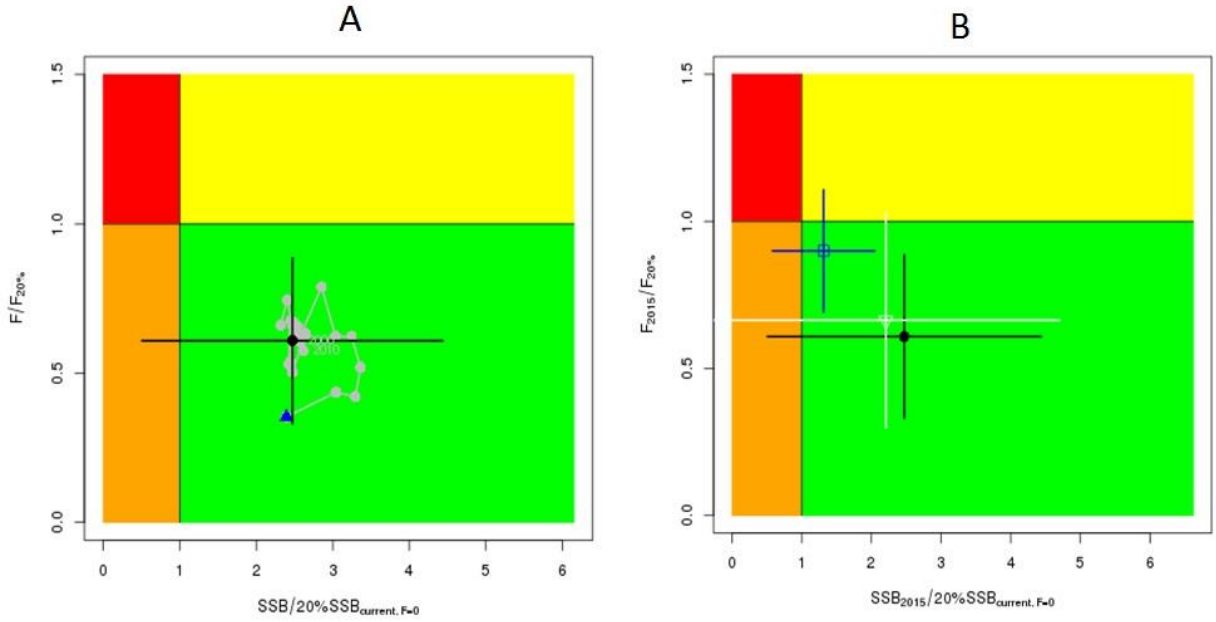

Figure NPALB-1. (A) Kobe plot showing the status of the north Pacific albacore (*Thunnus alalunga*) stock relative to the $20\%SSB_{current,\ F=0}$ biomass-based limit reference point, and equivalent fishing intensity ($F_{20\%}$; calculated as $1\text{-}SPR_{20\%}$) over the base case modelling period (1993-2015). Blue triangle indicates the start year (1993) and black circle with 95% confidence intervals indicates the terminal year (2015). (B) Kobe plot showing stock status and 95% confidence intervals in the terminal year (2015) of the base case model (black; closed circle) and important sensitivity runs with M = 0.3 y^{-1} for both sexes (blue; open square), and CV = 0.06 for L_{inf} in the growth model (white; open triangle). Fs in this figure are not based on instantaneous fishing mortality. Instead, the Fs are indicators of fishing intensity based on SPR and calculated as 1-SPR so that the Fs reflect changes in fishing mortality. SPR is the equilibrium SSB per recruit that would result from the current year's pattern and intensity of fishing mortality.

Table NPALB-1. Estimates of maximum sustainable yield (MSY), female spawning biomass (SSB) quantities, and fishing intensity (F) based reference point ratios for north Pacific albacore tuna for the base case assessment and important sensitivity analyses. SSB_0 and SSB_{MSY} are the unfished biomass of mature female fish and at MSY, respectively. The Fs in this table are not based on instantaneous fishing mortality. Instead, the Fs are indicators of fishing intensity based on SPR and calculated as 1-SPR so that the Fs reflect changes in fishing mortality. SPR is the equilibrium SSB per recruit that would result from the current year's pattern and intensity of fishing mortality. Current fishing intensity is based on the average fishing intensity during 2012-2014 ($F_{2012\text{-}2014}$).

Quantity	Base Case	M = 0.3 y^{-1}	Growth CV = 0.06 for L_{inf}
MSY (t) [A]	132,072	92,027	118,836
SSB_{MSY} (t) [B]	24,770	42,098	22,351
SSB_0 (t) [B]	171,869	270,879	156,336
SSB_{2015} (t) [B]	80,618	68,169	63,719
$SSB_{2015}/20\%SSB_{current,\ F=0}$ [B]	2.47	1.31	2.15
$F_{2012\text{-}2014}$	0.51	0.74	0.57
$F_{2012\text{-}2014}/F_{MSY}$	0.61	0.89	0.68
$F_{2012\text{-}2014}/F_{0.1}$	0.58	0.90	0.65
$F_{2012\text{-}2014}/F_{10\%}$	0.56	0.81	0.63
$F_{2012\text{-}2014}/F_{20\%}$	0.63	0.91	0.71
$F_{2012\text{-}2014}/F_{30\%}$	0.72	1.04	0.81
$F_{2012\text{-}2014}/F_{40\%}$	0.85	1.21	0.96
$F_{2012\text{-}2014}/F_{50\%}$	1.01	1.47	1.16

A – MSY includes male and female juvenile and adult fish

B – Spawning stock biomass (SSB) in this assessment refers to mature female biomass only.

Management advice and implications

5. SC13 noted the following conservation information from the ISC.

6. Two harvest scenarios were projected to evaluate impacts on future female SSB: F at the 2012-2014 rate over 10 years ($F_{2012\text{-}2014}$) and constant catch[1] (average of 2010-2014 = 82,432 mt) over 10 years. Median female SSB is expected to decline to 63,483 mt (95% CI: 36,046 - 90,921 mt) by 2025, with a 0.2 and <0.01 % probability of being below the LRP by 2020 and 2025, respectively, if fishing intensity remains at the 2012-2014 level[2] (Figure NPALB-2). In contrast, employing the constant catch harvest scenario is expected to reduce female SSB to 47,591 t (95% CI: 5,223 - 89,958 t) by 2025 and increases the probability that female SSB will be below the LRP to about 3.5 and 30 % in 2020 and 2025, respectively (Figure NPALB-3). In addition, as biomass declines during the projection period the fishing intensity approximately doubles by 2025. The probabilities of declining below the LRP in both harvest scenarios are likely higher in the future because projection results did not capture the full envelope of uncertainty. The ALBWG notes that the lack of sex-specific size data, uncertainty in growth and natural mortality, and the simplified treatment of the spatial structure of North Pacific albacore population dynamics are important sources of uncertainty in the assessment. Based on these findings, the following information is provided:

[1] It should be noted that the constant catch scenario is inconsistent with current management approaches for NPALB adopted by the IATTC and the WCPFC.

[2] Median future catch for the constant F scenario is expected to be below the average catch level for 2010-2014 (82,432 t – red line in Figure 7-6). This result is likely due to low estimated recruitment in 2011, which is expected to reduce female SSB beginning in 2015, the first year of the projection period.

- If a constant fishing intensity ($F_{2012\text{-}2014}$) is applied to the stock, then median female spawning biomass is expected to undergo a moderate decline, with a < 0.01% probability of falling below the limit reference point established by the WCPFC by 2025. However, expected catches in this scenario will be below the recent average catch level for this stock.
- If a constant average catch ($C_{2010\text{-}2014}$ = 82,432 mt) is removed from the stock in the future, then the decline in median female spawning biomass will be greater than in the constant F intensity scenario and the probability that SSB falls below the LRP will be greater by 2025 (30%). Additionally, the estimated fishing intensity will double relative to the current level ($F_{2012\text{-}2014}$) by 2025 as spawning biomass declines.

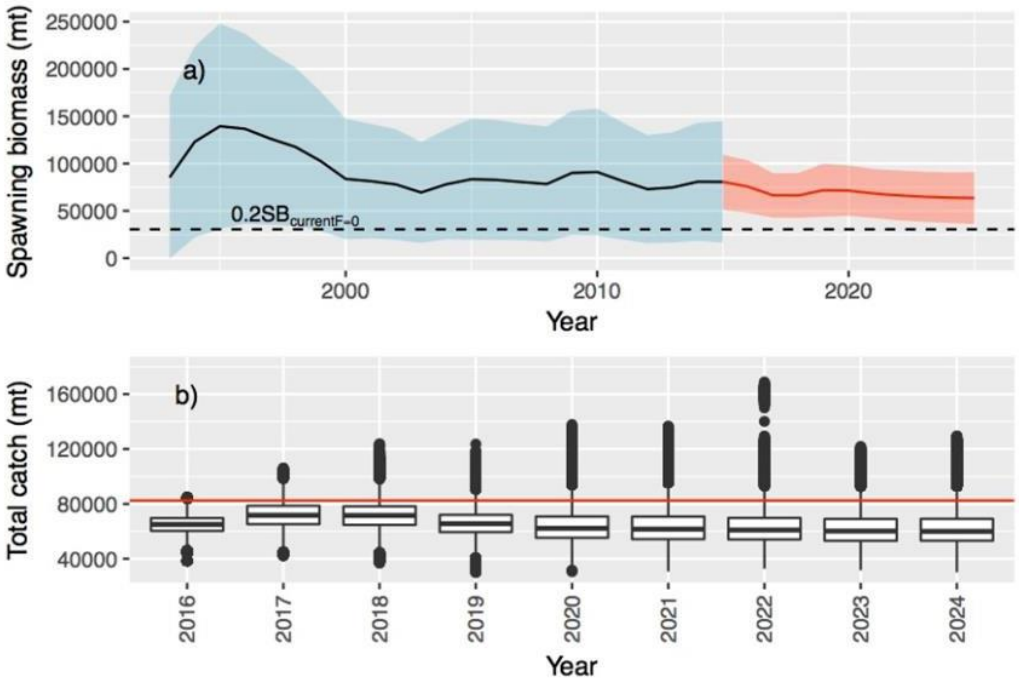

Figure NPALB-2. (A) Historical and future trajectory of North Pacific albacore (*Thunnus alalunga*) female spawning biomass (SSB) under a constant fishing intensity ($F_{2012\text{-}2014}$) harvest scenario. Future recruitment was based on the expected recruitment variability and autocorrelation. Black line and blue area indicates maximum likelihood estimates and 95% confidence intervals (CI), respectively, of historical female SSB, which includes parameter uncertainty. Red line and red area indicates mean value and 95% CI of projected female SSB, which only includes future recruitment variability and SSB uncertainty in the terminal year. (B) Expected annual catch under a constant fishing intensity ($F_{2012\text{-}2014}$) harvest scenario (2016-2025). The red line is the current average catch (2010-2014 = 82,432 mt).

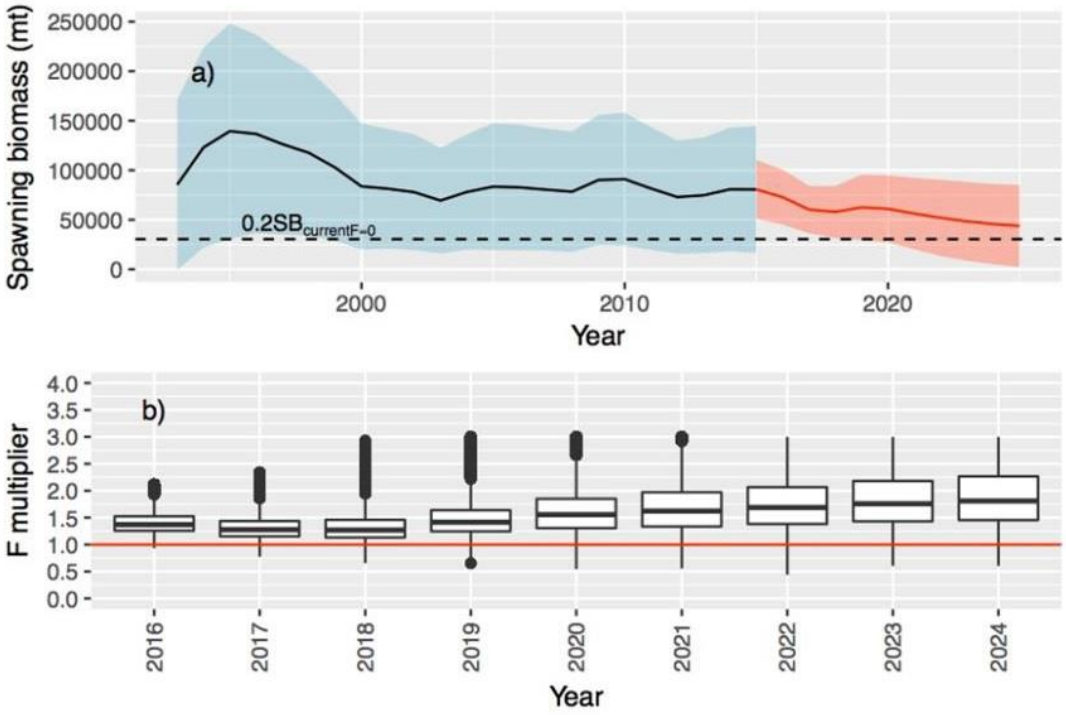

Figure NPALB-3. (A) Historical and future trajectory of North Pacific albacore (*Thunnus alalunga*) female spawning biomass (SSB) under a constant catch (average 2010-2014 = 82,432 mt) harvest scenario. Future recruitment was based on the expected recruitment variability and autocorrelation. Dashed line indicates the average limit reference point threshold for 2012-2014. Black line and blue area indicates maximum likelihood estimates and 95% confidence intervals (CI), respectively, of historical female SSB, which includes parameter uncertainty. Red line and red area indicates mean value and 95% CI of projected female SSB, which only includes future recruitment variability and SSB uncertainty in the terminal year. (B) Projected fishing intensity relative to the current fishing intensity (2012-2014) (red line) under a constant catch scenario (average 2010-2014).

Attachment 2

INTERIM HARVEST STRATEGY FOR NORTH PACIFIC ALBACORE FISHERY

Harvest Strategy 2017-01

This Interim Harvest Strategy replaces the "precautionary management framework for north pacific albacore" adopted at the 11th regular session of the Commission, which is based on the recommendation of the Northern Committee at its 10th regular session.

1. Interim management objective

The management objective for the North Pacific albacore fishery is to maintain the biomass, with reasonable variability, around its current level in order to allow recent exploitation levels to continue and with a low risk of breaching the limit reference point.

2. Biological reference points

Based on ISC's stock assessment advice and following the hierarchical approach adopted by the Commission, North Pacific albacore is to be treated as a Level 2 stock. The following is based on an average recruitment scenario:

- The limit reference point (LRP) for this stock is established at 20%SSBcurrent $_{F=0}$. This LRP is consistent with the Annex II of the UN Fish Stocks Agreement (UNFSA) and recent WCPFC decisions on LRPs for the three tropical tuna species and South Pacific albacore, where 20%SSBcurrent $_{F=0}$ was adopted. If this point is breached, management actions will be taken to return the stock to a predetermined level as outlined in the subsequent section on Decision Rules.

- The target reference point (TRP) for this stock will be determined following a comprehensive analysis under a management strategy evaluation (MSE) approach as outlined in section 4 on "Future Work". Historical fishing activity, anticipated fishing activity, and the source of increased fishing mortality will also be considered when evaluating a suitable TRP. Socioeconomic factors, as per UNFSA Article 6.3.c., will be further considered. The existing conservation and management measure (CMM) for the stock (WCPFC 2005-03) establishes through limits on current effort an overall management regime for the stock.

3. Decision rules

NC recommends a management strategy for the stock that ensures that the risk of the biomass decreasing below the LRP is low.

LRP rule: In the event that, based on information from ISC, the spawning stock size decreases below the LRP at any time, NC will, at its next regular session or intersessionally if warranted, adopt a reasonable timeline, but no longer than 10 years, for rebuilding the spawning stock to at least the LRP and recommend a CMM that can be expected to achieve such rebuilding within that timeline. NC will take into account historical fishing activity and the source of increased fishing mortality when developing management strategies to rebuild the stock, including in establishing effort reductions. NC will further consider socioeconomic factors, as per UNFSA Article 6.3.c., as well as which NC members, if any, contributed to exceeding the LRP.

4. Future work

This framework may be periodically reviewed and revised. To support such revisions, NC endorses the ongoing development and implementation of an MSE for the stock and fishery, which would yield new information that would enhance the robustness of this framework.