**COMMISSION**
**FOURTEENTH REGULAR SESSION**
Manila, Philippines
3 – 7 December 2017

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

**WCPFC14-2017-14 (Rev.01)**
**17 November 2017**

**Paper prepared by the Secretariat**

## A. Introduction

1. The purpose of this paper is to provide a quick reference guide to the key findings and recommendations of the Scientific Committee (SC13) and Northern Committee (NC13) of relevance to the discussions in support of the review of the CMM for North Pacific albacore (CMM 2005-03) and the development of a harvest strategy for the fisheries. The summary reports are available on the meeting page and they provide the context and discussion in support of the recommendations.

## B. Scientific Committee Recommendations

***Provision of scientific information*** (*SC13 Paragraphs 340 – 345*)

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

***Stock status and trends***

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

4. 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.

5. 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%.

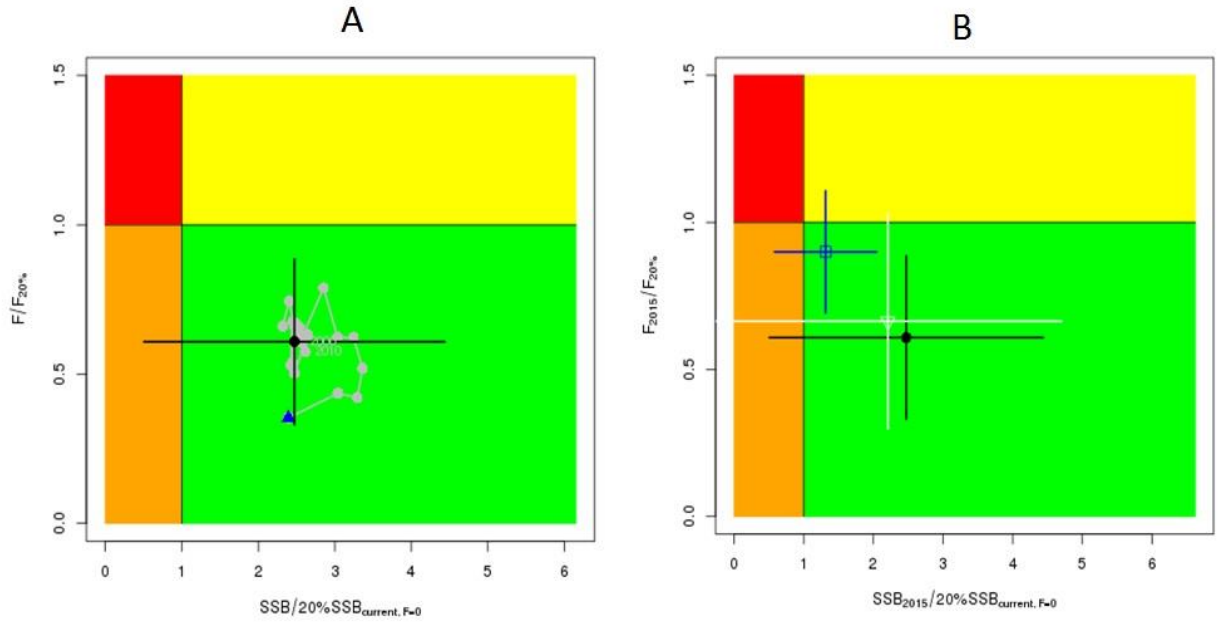


**Figure NPALB-1.** (A) Kobe plot showing the status of the north Pacific albacore (*Thunnus alalunga*) stock relative to the $20\%SSB_{current,\ F=0}$ biomass-based limit reference point, and equivalent fishing intensity ($F_{20\%}$; calculated as 1-$SPR_{20\%}$) over the base case modelling period (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***

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

7. 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.

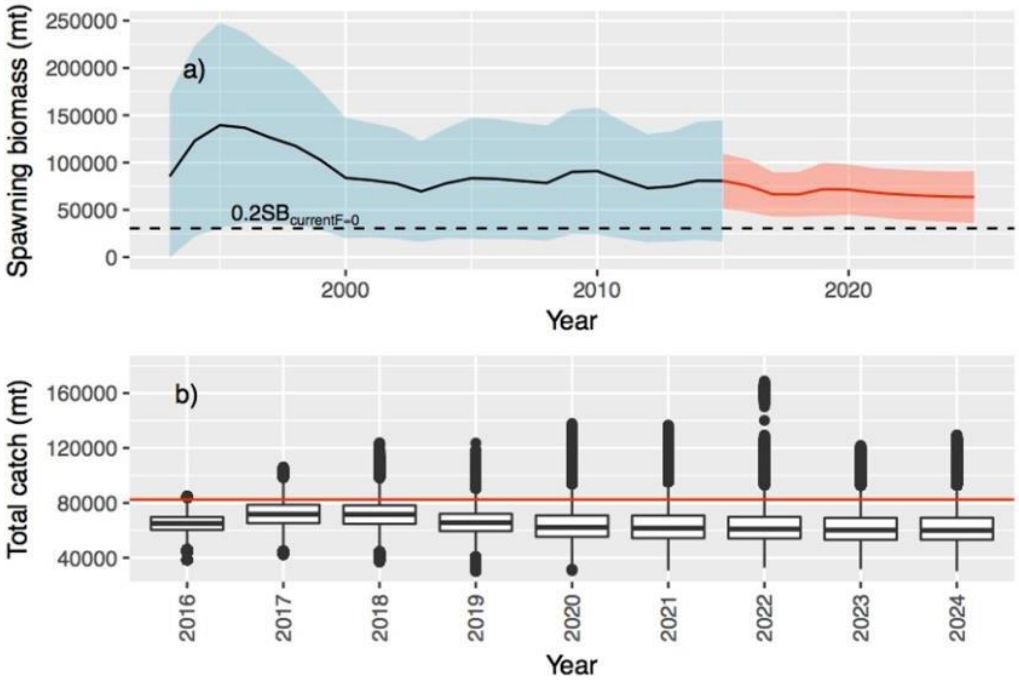


**Figure NPALB-2.** (A) Historical and future trajectory of North Pacific albacore (*Thunnus alalunga*) female spawning biomass (SSB) under a constant fishing intensity ($F_{2012\text{-}2014}$) harvest scenario. Future recruitment was based on the expected recruitment variability and autocorrelation. 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).

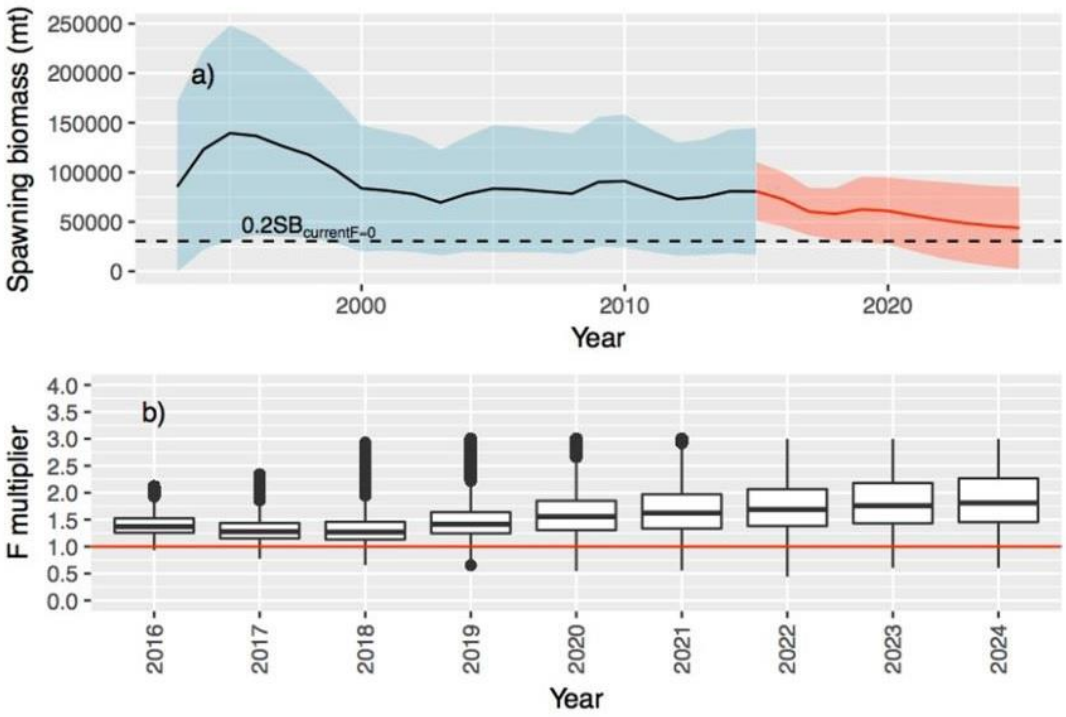


**Figure NPALB-3.** (A) Historical and future trajectory of North Pacific albacore (*Thunnus alalunga*) female spawning biomass (SSB) under a constant catch (average 2010-2014 = 82,432 mt) harvest scenario. Future recruitment was based on the expected recruitment variability and autocorrelation. Dashed 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).

## C. Northern Committee Recommendations (*NC13 Paragraphs 67 – 75*)

***Precautionary management framework of NP albacore***

8. NC13 recommends that the Commission adopt the attached revision to the title of previously adopted precautionary management framework for North Pacific albacore (*see* **Attachment A**), so that it may be recognized as a harvest strategy. In addition, NC13 recommends that the Commission direct the Secretariat to make this harvest strategy available, as a stand-alone harvest strategy document, on a web page dedicated to this and other harvest strategies, including interim harvest strategies, agreed to by the Commission.

9. NC13 requested ISC to calculate LRP for NP albacore as 20% of the dynamic unfished SSB of the terminal year in the latest assessment.

10. NC13 also noted that ISC is planning the 3rd MSE workshop for NP albacore in Vancouver, Canada on 17-19 October 2017 and urged the participation of relevant stakeholders to the meeting.

***Review of the conservation and management measure***

11. Chair reminded NC13 of the results of the latest assessment of NP albacore which indicated that the current level of catch would decrease the stock in a long-term, while, if the current effort is maintained as stipulated in the current CMM, the stock will remain stable.

12. NC13 agreed that no change is necessary for the current CMM 2005-03.

**Attachment A**
(NC13 Summary Report, Attachment H)

**The Commission for the Conservation and Management of**
**Highly Migratory Fish Stocks in the Western and Central Pacific Ocean**
**Northern Committee**
**Thirteenth Regular Session**
August 28 – September 1, 2017
Busan, Korea

**Interim Harvest Strategy for North Pacific Albacore Fishery**

**Harvest Strategy 2017-XX**

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.