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Review of North Pacific Albacore and Pacific Bluefin Tuna CMMs

WCPFC20-2023-19
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Prepared by the Secretariat

Introduction and Purpose

1. The purpose of this paper is to provide summary information to support the Commission's review of the North Pacific (NP) albacore tuna CMM and Pacific bluefin tuna CMM, and associated harvest strategies, including SC and TCC consideration. The paper also provides updates from the 19th Regular Session of the Northern Committee (NC19) related to the NP albacore tuna CMM and Pacific bluefin tuna CMM, and associated harvest strategies. NC19 met 6-7 July 2023 in Fukuoka, Japan.
2. The Northern Committee's establishment and management purview is set out in Article 11.7 of the WCPFC convention, which covers the northern stocks (NP albacore tuna, Pacific bluefin tuna, and NP swordfish) in the area north of 20° North. The NC also participates in a Joint Working Group (JWG) with members of the Inter-American Tropical Tuna Commission (IATTC) on the shared management of Pacific bluefin tuna. The 8th JWG met just prior to NC19, also in Fukuoka, Japan.

North Pacific Albacore (CMM 2019-03)

3. The Commission adopted CMM 2019-03 at its 16th Regular Session, which replaced CMM 2005-03. [Paragraph 2](#) of the CMM is an "*effort-based limit for vessels fishing for*" which applies to most CMMs with vessels fishing for NP Albacore tuna in the Convention Area. Canada, China, Japan, Republic of Korea, Chinese Taipei and United States have notified their fishing days limits, in reference to 2002-04 levels. The Philippines limit is not specified because it has been noted that estimates for Philippines handline fishery in the North Pacific fishing for NP albacore tuna are under review.¹
4. The limit and annual reporting requirement obligations in the NP albacore tuna CMM ([CMM 2019-03 03](#)) were last assessed by TCC17 in 2021, covering 2020 activities. Noting that information provided against limit obligations is self-reported, no compliance issues were raised by TCC. The Commission adopted Audit Points for relevant CMM paragraphs, but this CMM was not included in the list of obligations for compliance review by TCC19 covering RY 2021 and RY 2022.

¹ In early 2023, the Secretariat released an enhanced CMM page that includes Audit Points and Limits (<https://cmm.wcpfc.int/>)

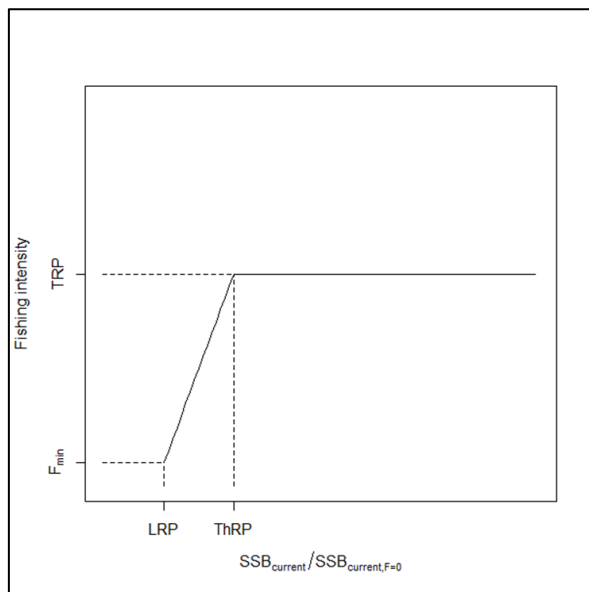
Harvest strategy of North Pacific Albacore Fishery

5. NC19 adopted and recommended the revised *Harvest Strategy for North Pacific Albacore Fishery* (Attachment A) for the Commission’s consideration and adoption. The harvest control rule parameters produce a relationship between stock status and fishing intensity as shown in Figure 1 and are as follows with the minimum allowed fishing intensity (F_{min}) equal to $F_{87\%}$, which is the fishing intensity (F) level that results in the stock producing 87% of spawning potential ratio (SPR):²

- If $SSB_{current}/SSB_{current, F=0}$ is above or equal to $SSB_{threshold}$ with a probability of at least 50%, fishing intensity shall be maintained at or below the TRP on average over 10 years.
- If $SSB_{current}/SSB_{current, F=0}$ is below $SSB_{threshold}$ with a probability greater than 50%, and is above the LRP with a probability of at least 50%, fishing intensity shall be reduced to a level in accordance with following formula:

$$F = *(SSB_{current}/SSB_{current, F=0} - LRP) + F_{min}$$

- If $SSB_{current}/SSB_{current, F=0}$ is at or below the LRP with a probability greater than 50%, the WCPFC shall, in collaboration with the IATTC, consult with the ISC and adopt rebuilding measures that will rebuild SSB to levels of at least the $SSB_{threshold}$ with a probability of at least 65% within 10 years of $SSB_{current}/SSB_{current, F=0}$ having been identified to be at or below the LRP with a probability greater than 50%. In the absence of such rebuilding measures, fishing intensity shall be set at F_{min} .



The original proposal for the revision of the NP albacore harvest strategy is in NC19-DP-02 and the NC19’s recommended revision is in Attachment I of the NC19 Summary Report. IATTC has adopted similar measures contained in IATTC Resolution C-23-2 (Amendment to Harvest Strategy for North Pacific Albacore in the Eastern Pacific Ocean), at its annual meeting in August 2023. Recognizing Pacific-wide distribution of the NP albacore tuna stock, it is important that WCPFC and IATTC continue to collaborate in the management of this fishery throughout its entire migratory range across the Pacific Ocean north of the equator.

Figure 1. Illustration of the harvest control rules with target reference point (TRP), threshold reference point (ThRP), limit reference point (LRP), and the minimum allowed fishing intensity (F_{min}). The harvest control rules include the triggering of a rebuilding measure if the $SSB_{current}/SSB_{current, F=0}$ falls below the LRP.

² $SSB_{current}$ refers to spawning stock biomass in the terminal year of the assessment and $SSB_{current, F=0}$ to the terminal year dynamic unfished spawning stock biomass.

Stock status and management advice

6. The following stock status and conservation status from ISC was noted by SC19, which indicates a mostly healthy state:

North Pacific Albacore Tuna
(Paragraphs 82 and 84, SC19 Outcomes Document)

Stock status

- 1) The stock is likely not overfished relative to the threshold ($30\%SSB_{current, F=0}$) and limit ($14\%SSB_{current, F=0}$) reference points adopted by the WCPFC (Harvest Strategy 2022-01) and IATTC (Resolution C-23-02),
- 2) The stock is likely not experiencing overfishing relative to the adopted target reference point ($F45\%_{SPR}$).
- 3) Current fishing intensity ($F_{2018-2020}$) is lower than the fishing intensity from the 2002-2004 period (the reference level for IATTC Resolution C-05-02³ and WCPFC CMM 2019-03).

Conservation Status

- 1) If fishing intensity over the next ten years is maintained at the current fishing intensity ($F_{2018-2020}$), then female SSB is expected to remain around $54\%SSB_{current, F=0}$ (90,098 t), with a 97.7% probability of the female SSB remaining above the $14\%SSB_{current, F=0}$ (LRP) for all ten years, and the management objectives of IATTC and WCPFC will likely be met.
- 2) If fishing intensity over the next ten years is similar to the 2005-2019 period, then female SSB is expected to decrease to $52\%SSB_{current, F=0}$ (87,669 t), with a 98.1% probability of the female SSB remaining above the $14\%SSB_{current, F=0}$ (LRP) for all ten years, and the management objectives of IATTC and WCPFC will likely be met.

Pacific bluefin tuna (CMM 2021-02)

7. The Commission adopted CMM 2021-02 at the 18th Regular Session, to replace CMM 2020-02. The inaugural Pacific bluefin tuna CMM was adopted by the Commission at its 6th Regular Session in 2009 (CMM 2009-07), and since then the Pacific bluefin tuna CMM has been incrementally revised at each regular annual session, except for the 8th Regular Session (2011).
8. Paragraph 2 of the CMM is an “effort based limit for vessels fishing for” limit that applies to most CCMs vessels fishing for Pacific bluefin tuna in the area north of 20N. Japan, Korea and Chinese Taipei have notified vessel number limits for applicable fisheries in the Convention Area north of 20N based on 2002 – 2004 levels. Australia, Canada, China, European Union, New Zealand, Philippines, United States have an unspecified limit because these CCMs have declared that they do not have any fisheries targeting Pacific bluefin tuna in the applicable area.
9. Paragraph 3 specifies the annual catch limits for Pacific bluefin tuna that apply to the fisheries of Japan, Korea and Chinese Taipei with vessels fishing for Pacific bluefin tuna in the Convention Area. Paragraph 4 specifies an annual 10mt catch limit for Pacific bluefin tuna 30kg or larger, which applies to catches in fisheries of Australia, Canada, China, European Union, Philippines, and the United States.

³ Also refer to RESOLUTION C-18-03 (Amendment to Resolution C-13-03 supplementing Resolution C-05-02 on North Pacific albacore)

10. In 2023, TCC19 used agreed CMS Audit Points to assess the limits and the annual reporting requirement obligations (CMM 2021-02 08 and CMM 2021-02 14) in the Pacific bluefin tuna CMM (CMM 2021-02) for RY 2021 and RY 2022. Noting that information provided against limit obligations is self-reported, no compliance issues were raised by TCC.

Harvest strategy of Pacific Bluefin Tuna Fisheries

11. The first Harvest Strategy for Pacific Bluefin Tuna Fisheries was adopted in 2017 (HS 2017-02), which describes two rebuilding targets as follows:

- *Initial rebuilding target: The initial rebuilding target for the PBF stock size is the median SSB estimated for the period 1952 through 2014, to be reached by 2024 with at least 60% probability.*
- *Second rebuilding target: The second rebuilding target for the PBF stock size is 20%SSBF=0, to be reached by 2034, or 10 years after reaching the initial rebuilding target, whichever is earlier, with at least 60% probability.*

12. Under the Decision Rules in HS 2017-02, the following detailed harvest control rules are applied during the initial rebuilding period:

Harvest controls rules during initial rebuilding period: The interim harvest control rules below will be applied based on the results of stock assessments and SSB projections to be conducted by ISC.

(a) If the SSB projection indicates that the probability of achieving the initial rebuilding target by 2024 is less than 60%, management measures will be modified to increase it to at least 60%. Modification of management measures may be (1) a reduction (in %) in the catch limit for fish smaller than 30 kg (hereinafter called "small fish") or (2) a transfer of part of the catch limit for small fish to the catch limit for fish 30 kg or larger (hereinafter called "large fish"). For this purpose, ISC will be requested, if necessary, to provide different combinations of these two measures so as to achieve 60% probability.

(b) If the SSB projection indicates that the probability of achieving the initial rebuilding target by 2024 is at 75% or larger, the WCPFC may increase their catch limits as long as the probability is maintained at 70% or larger, and the probability of reaching the second rebuilding target by the agreed deadline remains at least 60%. For this purpose, ISC will be requested, if necessary, to provide relevant information on potential catch limit increases.

13. Under the Decision Rules in HS 2021-01, the following detailed harvest control rules were added during the second rebuilding period:

The harvest control rules during the second rebuilding period below will be applied based on the results of stock assessments and SSB projections to be conducted by ISC.

a) If the SSB projection indicates that the probability of achieving the second rebuilding target by 2034 or 10 years after reaching the initial rebuilding target, whichever is earlier, is less than 60%, management measures shall be modified to increase it to at least 60%. For this purpose, the ISC will be requested, if necessary, to provide information on possible management measures to achieve 60% probability.

(b) If the SSB projection indicates that the probability of achieving the second rebuilding target by 2034, or 10 years after reaching the initial rebuilding target, whichever is earlier, is at 75% or larger, fishery controls may be changed, including adjustment of catch limits, as long as the probability is maintained at 70% or larger. For this purpose, ISC will be requested, if necessary, to provide relevant information on potential fishery controls.

(c) Any adjustments to management measures shall be considered in cooperation between the two RFMOs taking into account historical and future projected proportional fishery impacts on SSB between fisheries in the EPO and fisheries in the WCPO. For this purpose, ISC will be requested, if necessary, to provide relevant information, including projected proportional fishery impact of potential management measures changes.

(d) This harvest control rule will be reviewed and modified, as necessary, if depletion estimates across the time-series have been adjusted due to changes in assumptions and/or settings of the stock assessment model.

14. The NC19 recommended the revised Harvest Strategy for Pacific Bluefin Tuna Fisheries (Attachment H, NC19 Summary Report) for review and adoption by the Commission. Under the Decision Rules in the revised HS 2021-01 (HS 2023-XX), the following detailed harvest control rules were added for the post-second rebuilding period:

The following harvest control rules shall be applied based on the results of stock assessments and SSB projections to be conducted by the ISC during the period from the year in which the stock is projected to achieve the second rebuilding target of 20%SSB0 to the year a long-term harvest strategy based on an MSE process is implemented.

- a) If the SSB projection indicates that SSB will be below 20%SSB0 with a probability of 60%, management measures shall be modified to increase the SSB to at least 20%SSB0 with 60% probability. For this purpose, the ISC is requested to provide information on possible management measures to achieve 60% that the stock is above 20%SSB0 after 10 years of the latest stock assessment.*
- b) If the SSB projection indicates that SSB will be greater than 20%SSB0 with a probability of 60%, management measures should be adjusted so long as any changes maintain SSB greater than 20%SSB0 with a probability of 60%. For this purpose, the ISC is requested to provide information on possible management under which the stock is maintained above 20%SSB0 with a probability of 60%.*
- c) Any adjustments to management measures shall be considered in cooperation between the two RFMOs taking into account historical and future projected proportional fishery impacts on SSB between fisheries in the EPO and fisheries in the WCPO. For this purpose, ISC is requested, to provide relevant information, including projected proportional fishery impact of potential management measures changes.*
- d) This harvest control rule will be reviewed and modified, as necessary, if depletion estimates across the time-series have been adjusted due to changes in assumptions and/or settings of the stock assessment model.*

Update of Pacific bluefin tuna stock assessment information

15. SC19 noted that no stock assessments were conducted for Pacific bluefin tuna in 2023 and no updated information was presented on the status of Pacific bluefin tuna. Therefore, the stock status descriptions from SC18 are still current for Pacific bluefin tuna.

Pacific Bluefin Tuna

(Paragraphs 24 – 30, SC18 Summary Report)⁴

Status and trends

1. SC18 welcomed successful completion of an updated Pacific bluefin tuna (PBF) stock assessment and noted the following stock status and conservation information provided by ISC.

PBF spawning stock biomass (SSB) has gradually increased in the last 10 years, and the rate of increase is accelerating. These biomass increases coincide with a decline in fishing mortality, particularly for fish aged 0 to 3, over the last decade. The latest (2020) SSB is estimated to be 10.2% of SSBO.

 - 1) No biomass-based limit or target reference points have been adopted for PBF, but the PBF stock is overfished relative to the potential biomass-based reference points (20%SSBO) adopted for other tuna species by the IATTC and WCPFC. On the other hand, SSB reached its initial rebuilding target (SSBMED = 6.3%SSBO) in 2019, 5 years earlier than originally anticipated by the RFMOs.
 - 2) No fishing mortality-based reference points have been adopted for PBF by the IATTC and WCPFC. The recent (2018-2020) F%SPR is estimated to produce a fishing intensity of 30.7%SPR and is below the level corresponding to overfishing for many F-based reference points proposed for tuna species (Table PBF2), including SPR20%.
2. SC18 noted that while the gradual improvement of the Pacific bluefin tuna stock is a step in the right direction, it must be remembered that the current spawning biomass of the stock is only 10.2% of the unfished level. This is well below the LRP of 20% adopted for the key tuna species in WCPFC and suggests the Pacific bluefin tuna stock remains overfished relative to the LRP of key tuna species.
3. SC18 noted some CCMs encourage a precautionary approach towards the management of Pacific bluefin tuna until such time as the second rebuilding target is met, especially as the stock assessment and projection results are based on certain assumptions, including those on future recruitment, that may not always be met.
4. SC18 supported the continued monitoring of recruitment and spawning stock biomass, and research on a recruitment index for the stock assessment given the uncertainty in future recruitment and the influence of recruitment on stock biomass, as well as the impact of changes in fishing operations due to management changes.

Management Advice and Implications

1. SC18 noted that the updated stock assessment presented at SC18 indicates that the stock is likely recovering as planned or possibly faster, which suggests that the measures incorporated in CMM 2021-02 appear to be working as intended.

⁴ Source: <https://www.wcpfc.int/doc/06/pacific-bluefin-tuna>

2. SC18 recommended that the Commission exercise a precautionary approach, and noted that the PBF stock is still in a depleted state (10.2% of SSB_0) when it considers any revisions to the current CMM. Consideration of any increases to the catch limit needs to be weighted against reducing the probability of recovering to the second rebuilding target.
3. SC18 further welcomed ISC's effort on further investigation of structural uncertainty to incorporate it in future management advice.
4. SC18 noted the following management information from ISC:

After the steady decline in SSB from 1996 to the historically low level in 2010, the PBF stock has started recovering, and recovery has been more rapid in recent years, consistent with the implementation of stringent management measures. The 2020 SSB was above the initial rebuilding target but remains below the second rebuilding target adopted by the WCPFC and IATTC. However, stock recovery is occurring at a faster rate than anticipated by managers when the Harvest Strategy to foster rebuilding (WCPFC HS 2017-02) was implemented in 2014. The fishing mortality ($F_{\%SPR}$) in 2018-2020 has been reduced to a level producing 30.7%SPR, the lowest observed in the time series. Based on these findings, the following information on the conservation of the Pacific bluefin tuna stock is provided:

- 1) The PBF stock is recovering from the historically low biomass in 2010 and has exceeded the initial rebuilding target ($SSB_{MED1952-2014}$) five years earlier than expected. The rate of recovery is increasing and under all projection scenarios evaluated, it is very likely the second rebuilding target (20% SSB_0 with 60% probability) will be achieved (probabilities > 90%) by 2029 (Table PBF-3). The risk of SSB falling below the historical lowest observed SSB at least once in 10 years is negligible.
- 2) The projection results show that increases in catches are possible without affecting the attainment of the second rebuilding objective. Increases in catch should consider both the rebuilding rate and the distribution of catch between small and large fish.
- 3) The projection results assume that the CMMs are fully implemented and are based on certain biological and other assumptions. For example, these future projection results do not contain assumptions about discard mortality. Although the impact of discards on SSB is small compared to other fisheries, discards should be considered in future harvest scenarios.
- 4) Given the uncertainty in future recruitment and the influence of recruitment on stock biomass as well as the impact of changes in fishing operations due to the management, monitoring recruitment and SSB should continue and research on a recruitment index for the stock assessment should be pursued.
- 5) The results of projections from sensitivity models with lower productivity assumptions show that this conservation information is robust to uncertainty in stock productivity.

16. Concern was expressed at SC19 that no scientific evaluation was provided to SC19 related to the increase in converting part of the small fish catch limit to the large fish catch limit in CMM 2021-02 as recommended by NC19. However, it was clarified that assessment results provided to SC18 showed that the projection under which part of the small fish catch limit was converted to the large fish catch limit using the current conversion factor provides benefit to stock recovery.

Catch Documentation Scheme for Pacific Bluefin Tuna

17. The 4th CDS Technical Meeting met on 3 July 2023 in Fukuoka, Japan, in conjunction with JWG08 and NC19. The CDS Technical Meeting reviewed options for budgetary and administrative considerations for the development of the ePBCD system ([IATTC-NC-CDS04-2023/02](#)) and concluded:

(1) *Basis of the system development*

The participants tentatively agreed on option (b) to use resources from the CCSBT e-CDS as a basis for development, and potentially draw inspiration or elements from the ICCAT Electronic Bluefin Tuna Catch Document Programme (eBCD) as described in option (a).

(2) *Location of the system*

The participants agreed to make use of a cloud-based system.

(3) *Use of an external company in development and maintenance of the system*

The participants agreed to pursue option (a) of contracting an external company for the development and maintenance of the ePBCD system with general preference for the one for the CCSBT e-CDS, considering option (b) of hiring a specialist officer within the Secretariat if there is an expansion in the scope of the system (i.e., species coverage) in the future.

(4) *Demarcation of responsibility between the IATTC and WCPFC Secretariats in the operational work for the development and maintenance of the system*

The participants agreed to generally support option (a) of having both the IATTC and WCPFC Secretariats take on responsibilities on an equal basis, acknowledging the need for further discussion to materialize demarcations of responsibility such as management of the system based on the area of the catch.

(5) *Cost Sharing between the IATTC and WCPFC and/or among CPCs of each RFMO*

The participants agreed to further consider the possible formula to calculate contributions between the WCPFC and IATTC, and members within each RFMO.

The participants also agreed to request both Secretariats to review the discussion and results of this meeting and provide their questions, comments, and concerns to the small working group.

Recommendations

Harvest Strategy for North Pacific Albacore Fishery

18. The NC19 revised HS 2022-01 (*Harvest Strategy for North Pacific Albacore Fishery*) and recommended to the Commission for review and adoption ([Attachment A](#)).

Conservation and Management Measure for Pacific Bluefin Tuna

19. The NC19 revised CMM 2021-02 (Conservation and Management Measure for Pacific Bluefin Tuna) and recommended adoption by the Commission ([Attachment B](#)).

20. To support CCMs implementation and reporting obligations in the revised Pacific bluefin tuna CMM, the Commission should consider whether revised Audit Points are needed, and if so to adopt these at the earliest practical opportunity.

Harvest Strategy for Pacific Bluefin Tuna Fisheries

21. The NC19 revised HS 2021-01 (*Harvest Strategy for Pacific Bluefin Tuna Fisheries*) and recommended to the Commission for review and adoption ([Attachment C](#)).

**Commission for the Conservation and Management of
Highly Migratory Fish Stocks in the Western and Central Pacific Ocean**

**NORTHERN COMMITTEE
NINETEENTH REGULAR SESSION**

Fukuoka, Japan
6 – 7 July 2023

HARVEST STRATEGY FOR NORTH PACIFIC ALBACORE FISHERY

Harvest Strategy [2023-XX](#)

Introduction and scope

This Harvest Strategy, applicable to all fisheries that harvest North Pacific albacore, was developed based on the results of the Management Strategy Evaluation (MSE) completed by the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean (ISC) in 2021.

1. Management objectives

Considering the overarching objective of ensuring the sustainability of North Pacific albacore tuna and current fisheries supported by the stock in the Western and Central Pacific Ocean, the following management objectives are established:

- (a) Maintain Spawning Stock Biomass (SSB) above the Limit Reference Point (LRP), with a probability of at least 80% over the next 10 years.
- (b) Maintain depletion of total biomass around historical (2006-2015) average depletion over the next 10 years.
- (c) Maintain fishing intensity (F) at or below the target reference point with a probability of at least 50% over the next 10 years.
- (d) To the extent practicable, management changes (e.g., catch and/or effort) should be relatively gradual between years.

2. Reference points

For the purpose of the North Pacific albacore tuna harvest strategy, the following reference points are established.:

- (a) Target reference point (TRP) = $F_{45\%}$, which is the fishing intensity (F) level that results in the stock producing 45% of spawning potential ratio (SPR)
- (b) Threshold reference point ($SSB_{\text{threshold}} = 30\%SSB_{\text{current},F=0}$), which is 30% of the dynamic unfished spawning stock biomass
- (c) Limit reference point (LRP) = $14\%SSB_{\text{current},F=0}$, which is 14% of the dynamic unfished spawning stock biomass.

3. Acceptable levels of risk

The risk of breaching the Limit Reference Point based on the most current estimate of SSB shall be no greater than 20%.

4. Monitoring strategy

The ISC will conduct a stock assessment every three years, at which time the status relative to the reference points established under paragraph 2 will be evaluated.

When performing a stock assessment, the ISC will consider the criteria for identification of exceptional circumstances developed by the ISC, and notify the Northern Committee if these exceptional circumstances have occurred.

5. Harvest Control Rules (HCR)

The harvest control rules apply to all fisheries harvesting albacore in the EEZ and high seas in the Convention Area north of the equator.

The harvest control rule parameters produce a relationship between stock status and fishing intensity as shown in Figure 1 and are as follows with the minimum allowed fishing intensity (F_{min}) equal to $F_{87\%}$, which is the fishing intensity (F) level that results in the stock producing 87% of spawning potential ratio (SPR). $SSB_{current}$ refers to spawning stock biomass in the terminal year of the assessment and $SSB_{current, F=0}$ to the terminal year dynamic unfished spawning stock biomass.

- If $SSB_{current}/SSB_{current, F=0}$ is above or equal to $SSB_{threshold}$ with a probability of at least 50%, fishing intensity shall be maintained at or below the TRP on average over 10 years.
- If $SSB_{current}/SSB_{current, F=0}$ is below $SSB_{threshold}$ with a probability greater than 50%, and is above the LRP with a probability of at least 50%, fishing intensity shall be reduced⁵ to a level in accordance with following formula:
$$F = \frac{TRP - F_{min}}{SSB_{threshold} - LRP} * (SSB_{current}/SSB_{current, F=0} - LRP) + F_{min}$$
- If $SSB_{current}/SSB_{current, F=0}$ is at or below the LRP with a probability greater than 50%, the WCPFC shall, in collaboration with the IATTC, consult with the ISC and adopt rebuilding measures that will rebuild SSB to levels of at least the $SSB_{threshold}$ with a probability of at least 65 % within 10 years of $SSB_{current}/SSB_{current, F=0}$ having been identified to be at or below the LRP with a probability greater than 50%. In the absence of such rebuilding measures, fishing intensity shall be set at F_{min} ⁶.

If $SSB_{current}/SSB_{current, F=0}$ is above the LRP and below $SSB_{threshold}$ the maximum increase or decrease in catch or effort between the three-year management periods shall be 20% relative to the catch and effort levels specified for the previous year.

In the year following the relevant ISC stock assessment, the Northern Committee will recommend adjustment to the existing CMM for North Pacific Albacore to ensure fishing intensity is at or below the level set forth by this HCR using the latest ISC stock assessment. Changes to fishing intensity in accordance with the harvest control parameters shall apply between assessments starting the year after the stock assessment was completed, until the year following the next stock assessment that provides an estimate of unfished SSB.

⁵ When adopting proposed revisions to the conservation and management measures proposed, which may include *inter alia* reductions in fishing effort, CCMs will take into account historical fishing activity and the source of increased fishing mortality in reference to the average effort referenced in CMM 2019-03.

⁶ Ibid.

Other Provisions

The Commission shall promote compatibility between the harvest strategy adopted herein and the harvest strategy adopted by the Inter-American Tropical Tuna Commission with respect to North Pacific albacore tuna.

This Harvest Strategy replaces the “Harvest Strategy for North Pacific Albacore Fishery” adopted as Harvest Strategy 2022-01.

A review of the performance of the Harvest Strategy by the Northern Committee and the ISC shall be completed by 2030 and 2033. The aim of the review is to ensure the Harvest Strategy is performing as expected and to determine whether there are conditions that justify its continuation, or that warrant: reconditioning the MSE operating models; retuning the existing Harvest Strategy; including new indices into a new Harvest Strategy; and/or considering alternate candidate management procedures or development of a new MSE framework. Based on those reviews and subsequent ISC advice, the Northern Committee in 2030 and 2033 shall decide on the future of the Harvest Strategy.

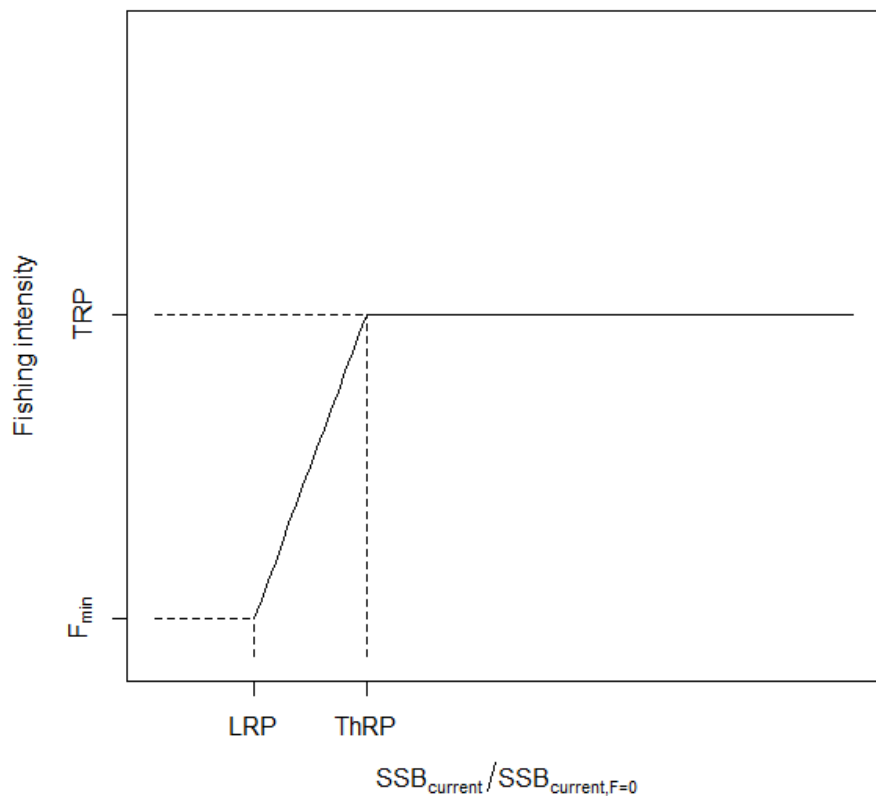


Figure 1. Illustration of the harvest control rules with target reference point (TRP), threshold reference point (ThRP), limit reference point (LRP), and the minimum allowed fishing intensity (F_{min}). The harvest control rules include the triggering of a rebuilding measure if the $SSB_{current} / SSB_{current,F=0}$ falls below the LRP.

**Commission for the Conservation and Management of
Highly Migratory Fish Stocks in the Western and Central Pacific Ocean**

**NORTHERN COMMITTEE
NINETEENTH REGULAR SESSION**

Fukuoka, Japan
6 – 7 July 2023

**CONSERVATION AND MANAGEMENT MEASURE FOR
PACIFIC BLUEFIN TUNA**

Conservation and Management Measure [2023-XX](#)

The Western and Central Pacific Fisheries Commission (WCPFC):

Recognizing that WCPFC6 adopted Conservation and Management Measure for Pacific bluefin tuna (CMM 2009-07) and the measure was revised ten times since then (CMM 2010-04, CMM 2012-06, CMM 2013-09, CMM 2014-04, CMM 2015-04, CMM 2016-04, CMM2017-08, CMM 2018-02, CMM 2019-02 and CMM 2020-02) based on the conservation advice from the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) on this stock;

Noting the latest stock assessment provided by ISC Plenary Meeting in July 2020, indicating the following:

- (1) spawning stock biomass (SSB) fluctuated throughout the assessment period (fishing years 1952- 2018), (2) the SSB steadily declined from 1996 to 2010, (3) the slow increase in the stock biomass has been continuing since 2011, (4) total biomass in 2018 exceeded the historical median with an increase in immature fish; and (5) fishing mortality (F%SPR) declined from a level producing about 1% of SPR in 2004-2009 to a level producing 14% of SPR in 2016-2018;
- A substantial decrease in estimated F has been observed in ages 0-2 in 2016-2018 relative to the previous years;
- Since the early 1990s, the WCPO purse seine fisheries, in particular those targeting small fish (age 0-1) have had an increasing impact on the spawning stock biomass, and in 2016 had a greater impact than any other fishery group;
- Harvesting small fish has a greater impact on future spawning stock biomass than harvesting large fish of the same amount;
- The projection results indicate that, under all the examined scenarios, the initial goal of rebuilding the stock to SSBMED by 2024 with at least 60% probability, is reached with 99% or 100% probability, and that the risk of SSB falling below SSBloss is negligible; and
- The projection results also indicate that, under all the examined scenarios, the estimated probability of achieving the second biomass rebuilding target (20% of SSBF=0) 10 years after the achievement of the initial rebuilding target or by 2034, whichever is earlier, is greater than 90%.

Recalling that paragraph (4) of the Article 22 of the WCPFC Convention, which requires cooperation between the Commission and the IATTC to reach agreement to harmonize CMMs for fish stocks such as Pacific bluefin tuna that occur in the convention areas of both organizations;

Adopts, in accordance with Article 10 of the WCPFC Convention that:

General Provision

a. This conservation and management measure has been prepared to implement the Harvest Strategy for Pacific Bluefin Tuna Fisheries (Harvest Strategy 2017-02), and the Northern Committee shall periodically review and recommend revisions to this measure as needed to implement the Harvest Strategy.

Management measures

b. CCMs shall take measures necessary to ensure that total fishing effort by their vessel fishing for Pacific bluefin tuna in the area north of the 20° N shall stay below the 2002–2004 annual average levels.

c. Japan, Korea and Chinese Taipei shall, respectively, take measures necessary to ensure that its catches of Pacific bluefin tuna less than 30 kg and Pacific bluefin tuna 30 kg or larger shall not exceed the annual catch limits in the tables below. The basis for the limits is as follows; annual catch limits for Pacific bluefin tuna less than 30 kg are 50% of the 2002-2004 average annual levels and annual catch limits for Pacific bluefin tuna 30 kg or larger are 115% of the 2002-2004 average annual levels or 30 metric tons for a CCM who does not have an initial catch limit for Pacific bluefin tuna 30 kg or larger before 2022.

Pacific Bluefin tuna less than 30kg

	2002-2004 average annual level	Annual initial catch limit
Japan	8,015 metric tons	4,007 metric tons
Korea	1,435 metric tons	718 metric tons

Pacific Bluefin tuna 30kg or larger

	2002-2004 average annual level	Annual initial catch limit
Japan	4,882 metric tons	5,614 metric tons
Korea	0 metric tons	30 metric tons
Chinese Taipei	1,709 metric tons	1,965 metric tons

d. CCMs, not described in paragraph 3, may increase their catch of Pacific bluefin tuna 30kg or larger by 15% above their 2002-2004 annual average levels. CCMs with a base line catch of 10 tons or less of Pacific bluefin tuna 30 kg or larger may increase their catch as long as it does not exceed 10 metric tons per year.

e. Any overage or underage of the catch limit shall be deducted from or may be added to the catch limit for the following year. The maximum underage that a CCM may carry over in any given year shall not exceed 5% of its annual initial catch limit⁷.

f. CCMs described in paragraph 3 may use part of the catch limit for Pacific bluefin tuna smaller than 30 kg stipulated in paragraph 3 above to catch Pacific bluefin tuna 30 kg or larger in the same year. In this case, the amount of catch 30 kg or larger shall be counted against the catch limit for Pacific bluefin tuna

⁷ Notwithstanding paragraph 5, a CCM may carry over up to 17% of its initial catch limits in 2021, 2022 and 2023, which remain uncaught, to 2022, 2023 and 2024, respectively.

smaller than 30 kg⁸. CCMs shall not use the catch limit for Pacific bluefin tuna 30 kg or larger to catch Pacific bluefin tuna smaller than 30 kg.

g. All CCMs except Japan shall implement the limits in paragraph 3 on a calendar-year basis. Japan shall implement the limits using a management year other than the calendar year for some of its fisheries and have its implementation assessed with respect to its management year. To facilitate the assessment, Japan shall:

- i. Use the following management years:
 1. For its fisheries licensed by the Ministry of Agriculture, Forestry and Fisheries, use the calendar year as the management year.
 2. For its other fisheries, use 1 April – 31 March as the management year⁹.
- ii. In its annual reports for PBF, for each category described in a.1 and a.2 above, complete the required reporting template for both the management year and calendar year clearly identifying fisheries for each management year.

h. CCMs shall report to the Executive Director by 31 July each year their fishing effort and <30 kg and ≥30 kg catch levels, by fishery, for the previous 3 year, accounting for all catches, including discards. CCMs shall report their annual catch limits and their annual catches of PBF, with adequate computation details, to present their implementation for paragraph 5 and 6, if the measures and arrangements in the said paragraphs and relevant footnotes applied. The Executive Director will compile this information each year into an appropriate format for the use of the Northern Committee.

i. CCMs shall intensify cooperation for effective implementation of this CMM, including juvenile catch reduction.

j. 10. CCMs, in particular those catching juvenile Pacific bluefin tuna, shall take measures to monitor and obtain prompt results of recruitment of juveniles each year.

k. Consistent with their rights and obligations under international law, and in accordance with domestic laws and regulations, CCMs shall, to the extent possible, take measures necessary to prevent commercial transaction of Pacific bluefin tuna and its products that undermine the effectiveness of this CMM, especially measures prescribed in the paragraph 3 above. CCMs shall cooperate for this purpose.

l. CCMs shall cooperate to establish a catch documentation scheme (CDS) to be applied to Pacific bluefin tuna in accordance with the **Attachment** of this CMM.

m. CCMs shall also take measures necessary to strengthen monitoring and data collecting system for Pacific bluefin tuna fisheries and farming in order to improve the data quality and timeliness of all the data reporting.

⁸ In 2022, 2023 and 2024, a CCM may count the amount of catch 30 kg or larger adjusted with the conversion factor 0.68 (catch 30 kg or larger multiplied by 0.68) against the catch limit for Pacific bluefin tuna smaller than 30 kg up to ~~3040~~3025% of its initial catch limit for Pacific bluefin tuna smaller than 30 kg. Notwithstanding the first sentence of this footnote, a CCM who does not have an initial catch limit for Pacific bluefin tuna 30kg or larger before 2022 may apply the conversion factor 0.68 up to ~~3040~~3025% instead of ~~3040~~3025% of its initial catch limit for Pacific bluefin tuna less than 30kg for the same period.

⁹ For the category described a.2 of paragraph 7, the TCC shall assess in year 20XX its implementation during the management year that starts 1 April 20XX-1 (e.g., in the 2020 compliance review, the TCC will assess Japan's implementation for its fisheries licensed by the Ministry of Agriculture, Forestry and Fisheries during calendar-year 2019 and for its other fisheries during 1 April 2019 through 31 March 2020).

n. CCMs shall report to Executive Director by 31 July annually measures they used to implement paragraphs 2, 3, 4, 7, 8, 10, 11 13 and 16 of this CMM. CCMs shall also monitor the international trade of the products derived from Pacific bluefin tuna and report the results to Executive Director by 31 July annually. The Northern Committee shall annually review those reports CCMs submit pursuant to this paragraph and if necessary, advise a CCM to take an action for enhancing its compliance with this CMM.

o. The WCPFC Executive Director shall communicate this CMM to the IATTC Secretariat and its contracting parties whose fishing vessels engage in fishing for Pacific bluefin tuna in EPO and request them to take equivalent measures in conformity with this CMM.

p. To enhance effectiveness of this measure, CCMs are encouraged to communicate with and, if appropriate, work with the concerned IATTC contracting parties bilaterally.

q. The provisions of paragraphs 2 and 3 shall not prejudice the legitimate rights and obligations under international law of those small island developing State Members and participating territories in the Convention Area whose current fishing activity for Pacific bluefin tuna is limited, but that have a real interest in fishing for the species, that may wish to develop their own fisheries for Pacific bluefin tuna in the future.

r. The provisions of paragraph 17 shall not provide a basis for an increase in fishing effort by fishing vessels owned or operated by interests outside such developing coastal State, particularly Small Island Developing State Members or participating territories, unless such fishing is conducted in support of efforts by such Members and territories to develop their own domestic fisheries.

s. This CMM replaces CMM 202¹-02. On the basis of stock assessment conducted by ISC in 202⁴, and other pertinent information, this CMM shall be reviewed and may be amended as appropriate in 202⁴.

Development of a Catch Document Scheme for Pacific Bluefin Tuna

Background

At the 1st joint working group meeting between NC and IATTC, held in Fukuoka, Japan from August 29 to September 1, 2016, participants supported to advance the work on the Catch Documentation Scheme (CDS) in the next joint working group meeting, in line with the development of overarching CDS framework by WCPFC and taking into account of the existing CDS by other RFMOs.

1. Objective of the Catch Document Scheme

The objective of CDS is to combat IUU fishing for Pacific Bluefin Tuna (PBF) by providing a means of preventing PBF and its products identified as caught by or originating from IUU fishing activities from moving through the commodity chain and ultimately entering markets.

2. Use of electronic scheme

Whether CDS will be a paper based scheme, an electronic scheme or a gradual transition from a paper based one to an electronic one should be first decided since the requirement of each scheme would be quite different.

3. Basic elements to be included in the draft conservation and management measure (CMM)

It is considered that at least the following elements should be considered in drafting CMM.

- (1) Objective
- (2) General provision
- (3) Definition of terms
- (4) Validation authorities and validating process of catch documents and re-export certificates
- (5) Verification authorities and verifying process for import and re-import
- (6) How to handle PBF caught by artisanal fisheries
- (7) How to handle PBF caught by recreational or sport fisheries
- (8) Use of tagging as a condition for exemption of validation
- (9) Communication between exporting members and importing members
- (10) Communication between members and the Secretariat
- (11) Role of the Secretariat
- (12) Relationship with non-members
- (13) Relationship with other CDSs and similar programs
- (14) Consideration to developing members
- (15) Schedule for introduction
- (16) Attachment
 - (i) Catch document forms
 - (ii) Re-export certificate forms
 - (iii) Instruction sheets for how to fill out forms
 - (iv) List of data to be extracted and compiled by the Secretariat

4. Work plan

The following schedule may need to be modified, depending on the progress on the WCPFC CDS for tropical tunas.

2017 The joint working group will submit this concept paper to the NC and IATTC for endorsement.

NC will send the WCPFC annual meeting the recommendation to endorse the paper.

2018 The joint working group will hold a technical meeting, preferably around its meeting, to materialize the concept paper into a draft CMM. The joint working group will report the progress to the WCPFC via NC and the IATTC, respectively.

2019 The joint working group will hold a second technical meeting to improve the draft CMM. The joint working group will report the progress to the WCPFC via NC and the IATTC, respectively.

20XX The joint working group will hold a third technical meeting to finalize the draft CMM. Once it is finalized, the joint working group will submit it to the NC and the IATTC for adoption. The NC will send the WCPFC the recommendation to adopt it.

**Commission for the Conservation and Management of
Highly Migratory Fish Stocks in the Western and Central Pacific Ocean**

**NORTHERN COMMITTEE
NINETEENTH REGULAR SESSION**

Fukuoka, Japan
6 – 7 July 2023

HARVEST STRATEGY FOR PACIFIC BLUEFIN TUNA FISHERIES

Harvest Strategy [2023-XX](#)

Introduction and scope

This harvest strategy has been prepared in accordance with the Commission's Conservation and Management Measure on Establishing a Harvest Strategy for Key Fisheries and Stocks in the Western and Central Pacific Ocean.

Although the provisions of this harvest strategy are expressed in terms of a single stock, they may be applied to multiple stocks as appropriate and as determined by the Northern Committee.

1. Management objectives

The management objectives are, first, to support thriving Pacific bluefin tuna fisheries across the Pacific Ocean while recognizing that the management objectives of the WCPFC are to maintain or restore the stock at levels capable of producing maximum sustainable yield, second, to maintain an equitable balance of fishing privileges among CCMs and, third, to seek cooperation with IATTC to find an equitable balance between the fisheries in the western and central Pacific Ocean (WCPO) and those in the eastern Pacific Ocean (EPO).

2. Reference points

Because steepness in the stock-recruitment relationship is not well known but the key biological and fishery variables are reasonably well estimated¹, the stock of PBF is to be treated as a Level 2 stock under the Commission's hierarchical approach for setting biological limit reference points.

2.1 Rebuilding targets

Initial rebuilding target:

The initial rebuilding target for the PBF stock size is the median SSB estimated for the period 1952 through 2014, to be reached by 2024 with at least 60% probability.

¹ See the information provided by the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (WCPFC-NC9-2013/IP-03) in response to a request made by the Northern Committee at its Eighth Regular Session (Attachment F of the report of NC8).

Recruitment scenario during initial rebuilding period:

The low recruitment scenario (resampling from the relatively low recruitment period (1980-1989)) or the recent recruitment scenario (resampling from the last 10 years), whichever is lower, will be used for the ISC's SSB projections until 2024 or until the SSB reaches the initial rebuilding target, whichever is earlier. The ISC is requested to periodically evaluate whether the recruitment scenario used during the initial rebuilding period is reasonable given current conditions, and to make recommendations on whether a different scenario should be used. If ISC recommends a different scenario, this will be considered by the NC.

Second rebuilding target:

The second rebuilding target for the PBF stock size is $20\%SSB_{F=0}^2$, to be reached by 2034, or 10 years after reaching the initial rebuilding target, whichever is earlier, with at least 60% probability.

However, if: (1) the SSB reaches the initial rebuilding target earlier than 2024; (2) ISC recommends a recruitment scenario lower than the average recruitment scenario; and (3) the SSB projections indicate that the second rebuilding target will not be achieved on this schedule, the deadline for rebuilding may be extended to 2034 at the latest.

Also, if there is a recommendation from the Northern Committee that $20\%SSB_{F=0}$ is not appropriate as the second rebuilding target, taking into account consideration from IATTC, scientific advice from ISC, IATTC or WCPFC SC, and socioeconomic factors, another objective may be established.

Recruitment scenario during second rebuilding period:

After the initial rebuilding target is reached and until the second rebuilding target is reached, the recruitment scenario to be used for the SSB projections will tentatively be the average recruitment scenario (resampling from the entire recruitment period).

The ISC is requested to periodically evaluate whether the recruitment scenario used during the second rebuilding period is reasonable given current conditions, and to make recommendations on whether a different scenario should be used. If ISC recommends a different scenario, this will be considered by the NC.

2.2 Development of reference points

The Northern Committee will develop more refined management objectives as well as limit reference point(s) and target reference point(s) through MSE process specified in Section 6.

3. Acceptable levels of risk

Until the stock is rebuilt, the Northern Committee will recommend conservation and management measures as needed to ensure rebuilding in accordance with the probabilities specified in sections 2.1 and 5 for each of the two rebuilding targets.

² $SSB_{F=0}$ is the expected spawning stock biomass under average recruitment conditions without fishing.

Once the stock is rebuilt, in accordance with Article 6.1(a) of the Convention, the Northern Committee will recommend conservation and management measures as needed to ensure that any target reference point(s) (once adopted) are achieved on average in the long term, and ensure that the risk of the stock size declining below the B-limit (once adopted) is very low.³

4. Monitoring strategy

The ISC will periodically evaluate the stock size and exploitation rate with respect to the established reference points and the report will be presented to the Scientific Committee. Until 2024, while the MSE is being developed (see section 6), the ISC is requested to conduct stock assessments in 2018, 2020 and 2022.

In order to cope with the adverse effects on the rebuilding of the stock due to drastic drops of recruitment: (1) all the available data and information will be reviewed annually, including recruitment data provided by the ISC and in National Reports; and (2) the ISC is requested to conduct in 2019, and periodically thereafter as resources permit and if drops in recruitment are detected, projections to see if any additional measure is necessary to achieve the initial rebuilding target by 2024 with at least 60% probability.

5. Decision rules

Harvest control rules during initial rebuilding period:

The interim harvest control rules below will be applied based on the results of stock assessments and SSB projections to be conducted by ISC.

- (a) If the SSB projection indicates that the probability of achieving the initial rebuilding target by 2024 is less than 60%, management measures will be modified to increase it to at least 60%. Modification of management measures may be (1) a reduction (in %) in the catch limit for fish smaller than 30 kg (hereinafter called “small fish”) or (2) a transfer of part of the catch limit for small fish to the catch limit for fish 30 kg or larger (hereinafter called “large fish”). For this purpose, ISC will be requested, if necessary, to provide different combinations of these two measures so as to achieve 60% probability.
- (b) If the SSB projection indicates that the probability of achieving the initial rebuilding target by 2024 is at 75% or larger, the WCPFC may increase their catch limits as long as the probability is maintained at 70% or larger, and the probability of reaching the second rebuilding target by the agreed deadline remains at least 60%. For this purpose, ISC will be requested, if necessary, to provide relevant information on potential catch limit increases.

Harvest control rules during second rebuilding period:

The harvest control rules during the second rebuilding period below will be applied based on the results of stock assessments and SSB projections to be conducted by ISC.

³ WCPFC13 agreed that any risk level greater than 20 percent to be inconsistent with the limit reference point related principles in UNFSA (as references in Article 6 of the Convention) including that the risk of breaching limit reference points be very low.

- (a) If the SSB projection indicates that the probability of achieving the second rebuilding target by 2034 or 10 years after reaching the initial rebuilding target, whichever is earlier, is less than 60%, management measures shall be modified to increase it to at least 60%. For this purpose, the ISC will be requested, if necessary, to provide information on possible management measures to achieve 60% probability.
- (b) If the SSB projection indicates that the probability of achieving the second rebuilding target by 2034, or 10 years after reaching the initial rebuilding target, whichever is earlier, is at 75% or larger, fishery controls may be changed, including adjustment of catch limits, as long as the probability is maintained at 70% or larger. For this purpose, ISC will be requested, if necessary, to provide relevant information on potential fishery controls.
- (c) Any adjustments to management measures shall be considered in cooperation between the two RFMOs taking into account historical and future projected proportional fishery impacts on SSB between fisheries in the EPO and fisheries in the WCPO. For this purpose, ISC will be requested, if necessary, to provide relevant information, including projected proportional fishery impact of potential management measures changes.
- (d) This harvest control rule will be reviewed and modified, as necessary, if depletion estimates across the time-series have been adjusted due to changes in assumptions and/or settings of the stock assessment model.

Harvest control rules post second rebuilding period:

The following harvest control rules shall be applied based on the results of stock assessments and SSB projections to be conducted by the ISC during the period from the year in which the stock is projected to achieve the second rebuilding target of 20%SSB0 to the year a long-term harvest strategy based on an MSE process is implemented.

- a. If the SSB projection indicates that SSB will be below 20%SSB0 with a probability of 60%, management measures shall be modified to increase the SSB to at least 20%SSB0 with 60% probability. For this purpose, the ISC is requested to provide information on possible management measures to achieve 60% that the stock is above 20%SSB0 after 10 years of the latest stock assessment.
- b. If the SSB projection indicates that SSB will be greater than 20%SSB0 with a probability of 60%, management measures should be adjusted so long as any changes maintain SSB greater than 20%SSB0 with a probability of 60%. For this purpose, the ISC is requested to provide information on possible management under which the stock is maintained above 20%SSB0 with a probability of 60%.
- c. Any adjustments to management measures shall be considered in cooperation between the two RFMOs taking into account historical and future projected proportional fishery impacts on SSB between fisheries in the EPO and fisheries in the WCPO. For this purpose, ISC is requested, to provide relevant information, including projected proportional fishery impact of potential management measures changes.

d. This harvest control rule will be reviewed and modified, as necessary, if depletion estimates across the time-series have been adjusted due to changes in assumptions and/or settings of the stock assessment model.

The Northern Committee will, through MSE development process, develop decision rules related to the limit reference points once adopted including for the case of their being breached.

6. Performance evaluation

Until the stock is rebuilt, the Northern Committee will work with the ISC and the Scientific Committee and consult with the IATTC to identify and evaluate the performance of candidate rebuilding strategies with respect to the rebuilding targets, schedules, and probabilities.

The ISC is requested to start the work to develop a management strategy evaluation (MSE) for Pacific bluefin tuna fisheries in 2019 and have a goal of completing it by 2024.

To support development of the MSE, ISC is encouraged to identify at least two experts and NC members are encouraged to provide additional funds for the ISC's work on the MSE.

The Joint WG will start to discuss in 2018, and aim to finalize no later than 2019, guidelines for the MSE, including at least one candidate long-term target reference point (TRP), two candidate limit reference points (LRPs) and candidate harvest control rules (HCRs), which will be provided to the ISC. Those candidate TRPs, LRPs and HCRs will be tested and changed if appropriate during the MSE development process.

In preparation for the Joint WG meeting in 2019, the ISC is requested to organize workshops in early 2018 and 2019 to support the identification of specific management objectives, including level of risks and timelines. The workshops will include managers, scientists and stakeholders, taking into account any recommendations of the Joint WG, and the number of representatives should be relatively small, as it was for the MSE workshop for North Pacific albacore.

In evaluating the performance of candidate target reference points, limit reference points, and harvest control rules, the Northern Committee, in consultation with the ISC and the Scientific Committee, should consider the following criteria:

- 1) Probability of achieving each of the rebuilding targets within each of the rebuilding periods (if applicable).
- 2) Time expected to achieve each of the rebuilding targets (if applicable).
- 3) Expected annual yield, by fishery.
- 4) Expected annual fishing effort, by PBF-directed fishery.
- 5) Inter-annual variability in yield and fishing effort, by fishery.
- 6) Probabilities of SSB falling below the B-limit and the historical lowest level.
- 7) Probability of fishing mortality exceeding FMSY or an appropriate proxy, and other relevant benchmarks.
- 8) Expected proportional fishery impact on SSB, by fishery and by WCPO fisheries and EPO fisheries.

Recognizing that developing the operating model and other aspects of the MSE will take time and additional resources, and might require further dialogue between the Northern Committee, the ISC, and

the IATTC, while the MSE is in development the ISC is requested to perform this work using the best means at its disposal.