A review of model setting and updated scenarios for the 2022 future projection of Pacific bluefin tuna.

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1. Abstract

As the PBF future projection, 'ssfuture' has been used since 2012 stock assessment. Through some stock assessment, the future projection model was updated several times. This document provides the explanation of the latest projection setting, corresponding to the new CCMs decided by WCPFC and IATTC commissions and future harvesting scenarios requested by the WCPFC Northern Committee. In addition, the dynamics has been calculated for one more year of the assessment terminal year by the SS ver. 3.3 and the NAA at the beginning of the next year of assessment terminal year is available. It is recommended that the future projection is started from the terminal +1 year to reflect the catch and size data observed on the assessment terminal year.

2. Introduction

ISC PBFWG assesses PBF stock conditions, and estimates the future condition based on the stock assessment outputs. These projection results have been provided as the information to consider the conservation measure in WCPFC and IATTC. The future projection platform for PBF that is distributed as an R-package named 'ssfuture' was firstly introduced in 2012 assessment. This software can simulate quarterly age-structured population dynamics in a forward direction, which is identical in model structure used in the stock assessment model of PBF ('Stock Synthesis,' Methot and Wetzel 2013).

Since 2012, in order to accommodate complex management measures adopted in the WCPFC and IATTC, the software has been updated to add several options (periodical resampling for future recruitment, capping rule by fish size range/fishery group etc...) (Takeuchi et al. 2014; Fukuda et al. 2015; Akita et al., 2015).

This document provides the explanation of the latest projection setting, corresponding to the new CCMs decided by both commissions and future harvesting scenarios requested by the WCPFC Northern Committee.

3. Settings

Bootstrap

Each projection is conducted based on the 300 bootstrap replicates of assessment followed by twenty stochastic simulations, thus 6000 runs in total are estimated for each scenario.

In Fukuda et al., 2020, the difference of the outputted variables between the point estimates of assessment base case and the median of bootstrap replicates was pointed out. Therefore, in the future projections of the 2020 stock assessment, the difference between the projections from the base case point estimates and those from median estimators of bootstrap replicates

were adjusted to prevent any bias due to the bootstrap replicates (ISC PBFWG 2020). In Lee et al., 2021, the authors identified possible sources of the biases during the bootstrapping procedure, and the new method for bootstrap replicates were showed. The new method of the bootstrap replicates were generally agreed by WG (ISC PBFWG 2021).

Grouping of fleets

Fleets can be lumped into groups of fleets in the projection. Common age-based fishing mortality (F@Age from the assessment) and size-based catch quota are shared among the fleets in a group. Number of groups should be equal or smaller than number of fleets. For the bluefin assessment, the groups are defined by country/area/fisheries in the latest stock assessment.

Time series

In the 2020 stock assessment, the projection calculations are started from 2018 fishing year (terminal year of the assessment). The reason for this procedure would be that the Numbers at Age (NAA) in the next quarter of the assessment terminal year (Terminal year + 1) is not available in the Stock Synthesis ver 3.2. Currently, the dynamics has been calculated for one more year of the assessment terminal year by the SS ver. 3.3 and the NAA at the beginning of the next year of assessment terminal year is available. Thus, the future projection can start from the next year of the assessment terminal year (Figure 1). Recruitments are given on July (Calendar year), and catch allocation are renewed on January 1st of each calendar year.

Recruitment

In the WCPFC-NC 17th meeting, the future recruitment scenarios to be used in the ISC stock projection were discussed and they requested the ISC to conduct an evaluation of the future recruitment scenario and make recommendations on whether a different recruitment scenario should be used. Currently, future recruitment were assumed to be low (stochastic resampling from past low recruitment period (x63% of historical average); 1980-1989) until SSB reaching to the initial rebuilding target (historical median) for the sake of precautional approach if there is a stronger stock recruitment relationship than the assumption of the assessment. If the stock meets initial rebuilding target in the projection, the future recruitments are assumed to be an historical average level (stochastic resampling from whole stock assessment period; 1952-2018). Assuming the historical average level of the recruitment when the stock size is at or around historical median would be one of the broadly applied approaches in the other stock projections. Also, the ISC did not recognize any of the strong environmental or other effect to make bias. The current assumption of average recruitment includes 67 annual recruitments which deviates +164% to -76% of the historical average. Although this issue and the response

to the NC should be discussed by the WG as well as the ISC plenary level, the authors did not see any inappropriateness to the current recruitment assumptions.

New CMM and requested scenario from NC

The Joint Working group held on September discussed possible amendments to the WCPFC CMM 2020-02 and the IATTC Resolution C-20-02 and agreed amendments outlined (JWG 2021, Appendix A). Those amendments were then adopted in the both commissions for the management measures in 2022 onwards (WCPFC 2021, Appendix B). Also, the WCPFC NC requested some harvesting scenarios (WCPFC 2021, Appendix C) to the ISC for analysis.

The new harvesting scenarios are listed for 2022 stock assessment in Table 1 and following are the notes for each scenario.

#1: reflects the new catch limits in 2022 based on agreements at RFMOs, with F at 2002-2004 level as prescribed by the WCPFC CMM.

#2: #1 with increased F to exhaust catch limit.

#3-5: #2 + increase of catch limit as prescribed in the Table of Attachment F of NC17 Report (Appendix C to this document).

#6: #2 + conversion of small fish catch limit to large fish with the conversion factor of 0.68:1, as per the request in paragraph 3 of Attachment F of NC17 Report (10% of JPN and 25% of KOR).

#7-10: based on #2, explore appropriate increase levels to achieve the target WCPO-EPO impact ratio, as prescribed in Attachment F of NC17 Report. Specifically, first, the catch limits of WCPO (including/not including small fish) and EPO are increased at the same proportion to achieve 60% probability to reach 2nd rebuilding target 10 years after reaching the initial rebuilding target. Then, the WCPO catch limit and EPO catch limit are adjusted from that level to find achieve the prescribed accumulated impact (W-E; 75:25 or 80:20) in the year achieving 2nd rebuilding target. Note: the impact plot shows the proportion of the accumulated impact given by respective fleets up to a given year (Nakatsuka et al. 2019). Under the harvest scenarios 7-10, the proportion of historically accumulated WCPO v.s. EPO impact will gradually change to achieve the specified ratio in the specified year. Thus the proportion is dynamic and may change further in a longer term if the same harvest scenario continues beyond the target year.

#7: 75:25 impact including increase of small fish

#8: 75:25 impact not including increase of small fish

#9: 80:20 impact including increase of small fish

#10: 80:20 impact not including increase of small fish

#11: CMM in 2021.

#12: 0 catch for all fleets.

Performance indicators

Since the PBF stock is likely approaching to the initial rebuilding target, some indicator used in 2020 stock assessment are not suited as performance indicators (ex, Probability of archiving the initial rebuilding target at 2024, Probability of SSB falling below the historical lowest at any time during the projection period). Thus we recommend that these indicators replace to new indicators. In addition to the performance indicators, the NC requested to the ISC to explore at least one harvesting scenario that satisfies those matters simultaneously; 1) Stock meets the second rebuilding target (20%SSB0) in 60 % of probability at 10 years after the stock meeting the initial rebuilding target; 2) Achieving the future fishery impact ratio between the WPO and EPO being 75%:25% and 80%:20%. For this kind of the request, we also add the future fishery impact ratio between the WPO and EPO at year when the stock meets the second rebuilding target at 60% of probability as well as at 2040 (the last year of the projection).

The candidates are shown in Table 2.

4. Conclusion

As written in Time series section, the future projections on 2020 stock assessment are started from the beginning of on the assessment terminal year. However, stock synthesis 3.30, which are used in the 2020 stock assessment, has a forecast part on report file and we can pick up the NAA on the beginning of the terminal+1 year (Figure 2). The comparison between the result started in terminal year and the result started in terminal year + 1 year shows little difference (Figure 3).

The authors recommend that the future projection is started from the terminal +1 year to reflect the catch and size data observed on the assessment terminal year.

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Table 1. The scenario list based on NC request.

Reference No	Scenarios				Catch limit in the projection				Note
	WCPO		EPO		WCPO		EPO		
	Small	Large	Small	Large	Small	Large	Small	Large	
1	New CMM				4,725	7,610	3,995		NC request (paragraph 1; New CMM) 15% catch limit increase for WPO large PBF fishery and EPO commercial fishery, and 30 and 200 tons increases for Korea large PBF fishery and EPO commercial fishery, respectively.
2	New CMM (full TAC catch)				4,725	7,610	3,995		New CMM, with increased F to fully catch the limit
3	New CMM	500 tons increase on the New CMM	500 tons increase on the New CMM		4,725	8,110	4,495		NC request (Paragraph 1, Appendix table 1st line)
4	110% of CMM				5,198	8,371	4,395		NC request (Paragraph 1, Appendix table 2nd line)
5	120% of CMM				5,670	9,132	4,794		NC request (Paragraph 1, Appendix table 3rd line)
6	-580	853	0		4,145	8,463	3,995		NC request (paragraph 3; conversion factor scenario) 10% for JPN and 25% for KOR of small fish catch limit per new CCM were transferred to their largefish catch limit with the conversion factor (0.68).
7	Explore	Explore	Explore		Explore	Explore	Explore		Achieving 2nd rebuilding target at 10 years after achieving initial rebuilding target in 60 % probability. Fishery impact ratio at rebuilding year is 75:25. Exploring harvest scenario by changing catch limit for WPO large fish fishery and EPO commercial fishery.
8	0	Explore	Explore		4,725	Explore	Explore		Achieving 2nd rebuilding target at 10 years after achieving initial rebuilding target in 60 % probability. Fishery impact ratio at rebuilding year is 75:25. Exploring harvest scenario by changing catch limit for WPO large fish fishery and EPO commercial fishery.
9	Explore	Explore	Explore		Explore	Explore	Explore		Achieving 2nd rebuilding target at 10 years after achieving initial rebuilding target in 60 % probability. Fishery impact ratio at rebuilding year is 80:20. Exploring harvest scenario by changing catch limit for WPO large fish fishery and EPO commercial fishery.
10	0	Explore	Explore		5,198	Explore	Explore		Achieving 2nd rebuilding target at 10 years after achieving initial rebuilding target in 60 % probability. Fishery impact ratio at rebuilding year is 80:20. Exploring harvest scenario by changing catch limit for WPO large fish fishery and EPO commercial fishery.
11	Old CMM (50% of 2002-04 average level)	Old CMM (2002-04 average level)	Old CMM		4,725	6,591	3,300		Old CMM
12	0	0	0		0	0	0		0 catch for all fisheries

Table 2. The candidate performance indicators

Performance indicator							
The fishing year expected to achive the initial rebuilding target with >60% propability	The fishing year expected to achive the 2nd rebuilding target with >60% propability	Risk to breach the initial rebuilding target at 2024	Probability of achiving the 2nd rebuilding target at 10 years after achieving initial rebuilding	Median SSB at 10 years after achieving initial rebuilding target	Median SSB at 2034	Fishery impact ratio of WPO fishery at 10 years after achieving the initial rebuilding target	Fishery impact ratio of EPO fishery at 10 years after achieving the initial rebuilding target

Calendar year	2020/1-	2020/7-	2021/1-	2021/7-	2022/1-	2022/7-
Fishing year	2019/7-	2020/1-	2020/7-	2021/1-	2021/7-	2022/1-
Stock assessment time series	Terminal point			Forecast		
Future Projection time series		Starting point				
Future Projection allocation		Actual catch	CMM for CY 2021		CMM for CY 2022	

Figure 1. The relationship between stock assessment and future projection started since terminal year.

Calendar year	2020/1-	2020/7-	2021/1-	2021/7-	2022/1-	2022/7-
Fishing year	2019/7-	2020/1-	2020/7-	2021/1-	2021/7-	2022/1-
Stock assessment time series	Terminal point			Forecast		
Future Projection time series				Starting point		
Future Projection allocation				[CMM for CY 2021]-[actual catch in CY 2021/1-6]	CMM for CY 2021	

Figure2. The relationship between stock assessment and future projection started since terminal+1 year.

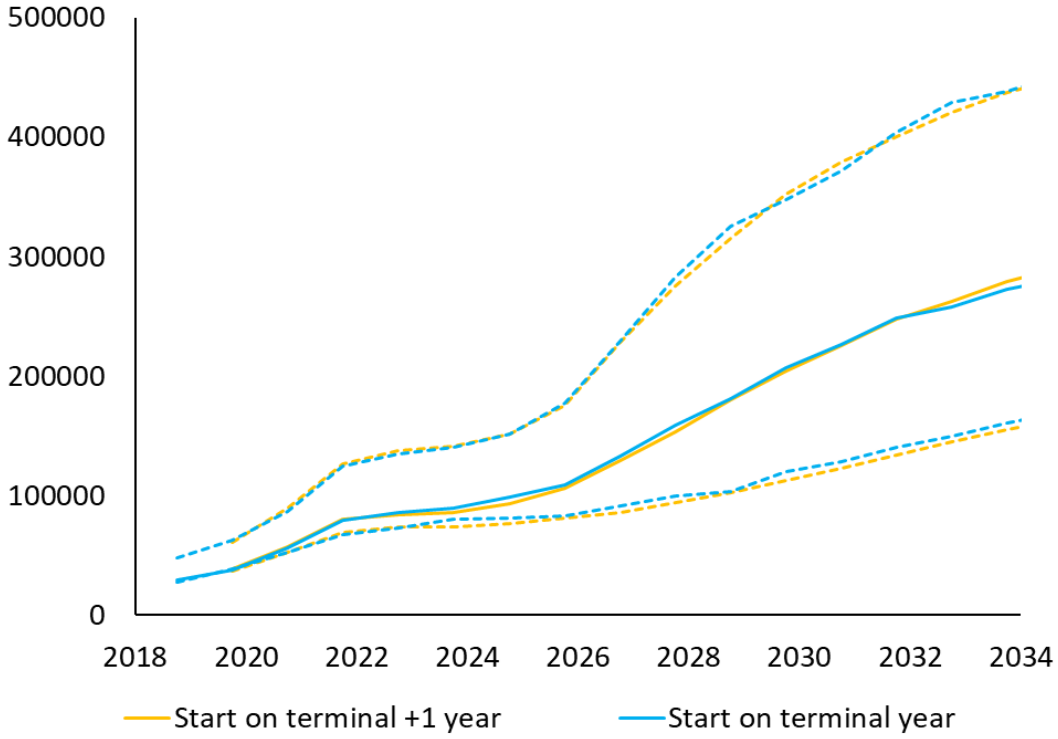

Figure 3.

The Comparisons of projected SSB from the 2020 basecase model (blue line) and from starting on terminal + 1 year model (orange line).

Appendix A- Chairs' Summary of the 6th Joint IATTC and WCPFC-NC Working Group Meeting on the Management of Pacific Bluefin Tuna, Annex C: Proposed amendments to CMM 2020-02 for Pacific Bluefin Tuna and C-20-02 Measures for the Conservation and Management of Pacific Bluefin Tuna in the Eastern Pacific Ocean

Appendix B- NC REPORT attachement D: Conservation and Management Measure for Pacific Bluefin Tuna, Conservation and Management Measure 2021-X

Appendix C- NC REPORT attachment F: NC17 Requests to the ISC

Appendix A

Annex C

JOINT IATTC AND WCPFC-NC WORKING GROUP MEETING ON THE MANAGEMENT OF PACIFIC BLUEFIN TUNA
SIXTH SESSION

ELECTRONIC MEETING
8am-11am, Japan Standard Time
27-29 July 2021

Proposed amendments to CMM 2020-02 for Pacific Bluefin Tuna and C-20-02 Measures for the Conservation and Management of Pacific Bluefin Tuna in the Eastern Pacific Ocean

Potential Package

- Catch increases
    - 15% increase for WCPO large fish; 0% increase for small fish
    - Additional 30 mt of WCPO large fish for parties who do not have a large fish catch limit
    - 15% increase for EPO
    - Additional 200 mt increase for EPO

- JWG would agree to recommend these increases in each area but the new catch level for each CCM with PBF fisheries would be represented in a table that is agreed to in NC (Japan, Korea and Chinese Taipei) and IATTC (Mexico and USA), respectively.

- In the WCPO: the transfer of small fish to large fish quotas allowed, with up to 10%[1]* of small fish catch limit per CCM using the conversion factor of 0.68.

- In the WCPO: a 17% carryover in three years (2021-2022, 2022-2023, and 2023-2024).

- In the EPO: the same carry forward framework will be used in the biennial cycle that has been the typical format of the IATTC measure through 2024. This will result in an amendment to the current measure that adds 3 years (2022-2024) onto the current measure. As such, the resolution would contain two biennial cycles within a single resolution (i.e., 2021-2022 and 2023-2024).

[1] Notwithstanding this provision, parties who do not have a WCPO large fish catch limit may apply 25% instead of 10%.

Appendix B

Attachment D

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean
Northern Committee
Seventeenth Regular Session
Electronic Meeting
5-7 October 2021

CONSERVATION AND MANAGEMENT MEASURE FOR PACIFIC BLUEFIN TUNA

Conservation and Management Measure 2021-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 SSB_{MED} by 2024 with at least 60% probability, is reached with 99% or 100% probability, and that the risk of SSB falling below SSB_{loss} 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

1. 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

2. 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.

3. 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

4. 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.

5. 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 limit[1].

6. 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 smaller than

[1] 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.

30 kg[2]. CCMs shall not use the catch limit for Pacific bluefin tuna 30 kg or larger to catch Pacific bluefin tuna smaller than 30 kg.

7. 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:
   a. 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 year.[3]

   b. 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.

8. 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.

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

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.

11. 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.

12. 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.

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[2] 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 10% 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 25% instead of 10% of its initial catch limit for Pacific bluefin tuna less than 30kg for the same period.

[3] 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).

13. 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.

14. 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.

15. 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.

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

17. 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.

18. 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.

19. This CMM replaces CMM 2020-02. On the basis of stock assessment conducted by ISC in 2022, and other pertinent information, this CMM shall be reviewed and may be amended as appropriate in 2022.

Appendix C

Attachment F

The Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean
Northern Committee
Seventeenth Regular Session
Electronic Meeting
5-7 October 2021

NC17 REQUESTS TO THE ISC

1. The Northern Committee (NC) requests the ISC to perform projections based on the new stock assessment and on catch increases agreed to at the 6th Meeting of the Joint Working Group and the revised conservation and management measures adopted in WCPFC and IATTC meetings in 2021 and to provide the proportionate fishery impact of WCPO fisheries and EPO fisheries on SSB over the projection period. Additionally, NC requests that the ISC provide projections of the scenarios in the **Appendix** as well as projections with at least one scenario that achieve
   a. Effort and catch limits for EPO and WCPO that would satisfy the rebuilding objective and by 2034, or 10 years after reaching the initial rebuilding target, whichever is earlier achieve a proportional fishery impact on SSB of approximately 75% from WCPO fisheries and 25% from EPO fisheries or
   b. Effort and catch limits for EPO and WCPO that would satisfy the rebuilding objective and by 2034, or 10 years after reaching the initial rebuilding target, whichever is earlier achieve a proportional fishery impact on SSB of approximately 80% from WCPO fisheries and 20% from EPO fisheries.

The NC does not recommend the ISC perform projections of the scenarios performed in the 2020 stock assessment.

2. The NC reiterates to the ISC the standing request in the current harvest strategy that "[t]he ISC...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 recruitment scenario should be used." In 2022 and with each benchmark or update stock assessment thereafter, the NC requests the ISC to conduct such an evaluation and make recommendations on whether a different recruitment scenario should be used. If the ISC recommends alternative recruitment scenarios, then they should be included as projection runs in the benchmark or update stock assessment.

3. The NC requests that the ISC analyze in the projections the impacts of a transfer of 10% for Japan and 25% for Korea of small fish limit to large fish limit using a conversion factor of 0.68:1 small:large.

Appendix: Scenarios for catch increase

West Pacific		East Pacific
Small fish	Large fish	
0	500t	500t
10%		10%
20%		20%