



**Additional projections based on 2018 assessment
as requested by WCPFC and IATTC**

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Summary

In accordance with the requests from RFMOs, additional projections of PBF stock under various harvest scenarios were conducted based on the 2018 assessment and results are presented.

Introduction

In September 2018, the WCPFC-NC/IATTC Joint Working Group requested ISC to conduct projections for additional harvest scenarios based on the 2018 PBF stock assessment and to provide probability of achieving initial and 2nd rebuilding targets in accordance with paragraph 2.1 of HS2017-02 (WCPFC, 2018). The requested harvest scenarios are shown in the table below:

Table 1: Scenarios for catch increase requested by RFMOs to conduct projection.

Scenarios	West Pacific		East Pacific
	Small fish	Large fish	
1	0	600t	400t
2	5%	1300t	700t
3	10%	1300t	700t
4	5%	1000t	500t
5	0	1650t	660t
6	5%		5%
7	10%		10%
8	15%		15%

* 250t transfer of catch limit from small fish to large fish by Japan is assumed to continue until 2020.

Methods

The projection was conducted in the same manner as in the 2018 assessment (ISC, 2018) in accordance with the method described by Nakayama et al. (2018). The projection starts on 2016 based the results of the 2018 assessment and the statistical uncertainties come from the observation error in the assessment data and process error in the future recruitment are included. As instructed by the RFMOs, the recruitment scenarios follow the paragraph 2.1 of WCPFC Harvest Strategy 2017-02; the recruitment is kept at a low level (re-sampling from 1980-1989) until the initial rebuilding target is achieved then changed to the historical average level (for detail see Nakayama et al. 2018).

Scenarios 6, 7 and 8 are identical to scenarios 3, 4 and 5 conducted in the 2018 assessment, respectively. Thus, the results for those scenarios presented here are copied from the 2018 assessment results.

Results

Same outputs as presented in the 2018 assessment are produced, which are; Harvest scenarios used in the projection (Table 2), Future projection scenarios and their probability of achieving various target levels by various time schedules based on the 2018 base-case model (Table 3), comparison of projection results of various harvest scenarios (Fig. 1), and Expected annual yield under various harvesting scenarios based on the 2018 base-case model (Table 4).

Reference

WCPFC, 2018. Summary Report of the 14th Regular Session of the Northern Committee Attachment E.

https://www.wcpfc.int/system/files/0_NC14%20Summary%20Report%20rev.1%20%2810Dec2018%29_0.docx

Nakayama, S. et al., 2018. On the latest updates of R package “ssfuturPBF” and the representation of the stock assessment results.

http://isc.fra.go.jp/pdf/PBF/ISC18_PBF_1/ISC18_PBFWG-1_08_Nakayama.pdf

ISC, 2018. Stock Assessment of Pacific Bluefin Tuna (*Thunnus Orientalis*) in The Pacific Ocean in 2018.

http://isc.fra.go.jp/pdf/ISC18/ISC_18_ANNEX_14_Pacific_Bluefin_Tuna_Stock_Assessment_2018_FINAL.pdf

Table 2: Harvest scenarios used in the projection for Pacific bluefin tuna (*Thunnus orientalis*). For the ease of programming of projection, Korean catch is assumed to be fully on small fish (less than 30kg) and the increase of the catch limit for large fish (30kg or larger) in WPO is assigned to Japan and Taiwanese fleets. This does not prejudice the future allocation of increase of catch limit among fleets.

Scenario #	Fishing mortality	Catch limit					Catch limit Increase		
		WPO		EPO			WPO		EPO
		Small	Large	Small	Large	Sport	Small	Large	
Base case	F2002-2004	4725	6582	3300	-	-	0%		
Current catch limit	F2002-2004*2	4725	6582	3300	-	-	0%		
1	F2002-2004*2	4725	7180	3699	-	-	0%	600	400
2	F2002-2004*2	4960	7880	4000	-	-	5%	1300	700
3	F2002-2004*2	5196	7880	4000	-	-	10%	1300	700
4	F2002-2004*2	4960	7580	3800	-	-	5%	1000	500
5	F2002-2004*2	4725	8231	3960	-	-	0%	1650	660
6	F2002-2004*2	4960	6909	3465	-	-	5%		
7	F2002-2004*2	5196	7238	3630	-	-	10%		
8	F2002-2004*2	5433	7567	3794	-	-	15%		

Table 3: Future projection scenarios for Pacific bluefin tuna (*Thunnus orientalis*) and their probability of achieving various target levels by various time schedules based on the 2018 base-case model.

Scenario #	Catch limit Increase				Initial rebuilding target			Second rebuilding target		Median SSB (mt) at 2034
	WPO		EPO		The year expected to achieve the target with >60% probability	Probability of achieving the target at 2024	Probability of SSB is below the target at 2024 under the low recruitment	The year expected to achieve the target with >60% probability	Probability of achieving the target at 2034	
	Small	Large	Small	Large						
Base case	0%				2020	99%	0%	2028	96%	262,952
Current catch limit	0%				2021	97%	0%	2028	96%	264,748
1	0%	600	400		2021	95%	0%	2028	95%	256,252
2	5%	1300	700		2021	88%	0%	2029	91%	236,691
3	10%	1300	700		2021	81%	1%	2030	88%	224,144
4	5%	1000	500		2021	89%	0%	2029	92%	240,739
5	0%	1650	660		2021	92%	0%	2029	94%	246,593
6		5%			2021	93%	0%	2029	94%	248,757
7		10%			2021	86%	1%	2029	90%	232,426
8		15%			2021	76%	2%	2030	85%	215,385

Table 4: Expected annual yield for Pacific bluefin tuna (*Thunnus orientalis*) under various harvesting scenarios based on the 2018 base-case model.

Scenario #	Expected annual yield in 2019, by area and size category (mt)					Expected annual yield in 2024, by area and size category (mt)					Expected annual yield in 2034, by area and size category (mt)				
	WPO		EPO			WPO		EPO			WPO		EPO		
	small	large	small	large	sport	small	large	small	large	sport	small	large	small	large	sport
Base case	4,478	4,384	2,924	448	157	4,745	6,203	2,755	627	282	4,746	6,640	2,385	1,014	303
Current catch limit	4,520	6,031	2,949	421	160	4,772	6,607	2,597	759	271	4,780	6,684	2,363	1,014	308
1	4,518	6,322	3,301	463	159	4,771	7,115	2,919	834	270	4,780	7,293	2,652	1,128	307
2	4,731	6,551	3,543	511	151	5,004	7,557	3,163	882	256	5,015	7,994	2,874	1,210	298
3	4,948	6,513	3,521	529	143	5,239	7,431	3,156	878	242	5,251	7,973	2,877	1,207	289
4	4,732	6,456	3,369	489	151	5,004	7,361	3,001	846	257	5,016	7,694	2,729	1,154	298
5	4,516	6,721	3,532	490	158	4,770	7,913	3,136	875	268	4,779	8,360	2,844	1,199	306
6	4,733	6,174	3,076	452	152	5,005	6,852	2,729	786	258	5,016	7,016	2,485	1,060	299
7	4,950	6,300	3,199	485	145	5,240	7,029	2,858	813	244	5,252	7,337	2,608	1,105	290
8	5,168	6,398	3,319	522	137	5,472	7,106	2,978	839	228	5,488	7,637	2,730	1,147	281

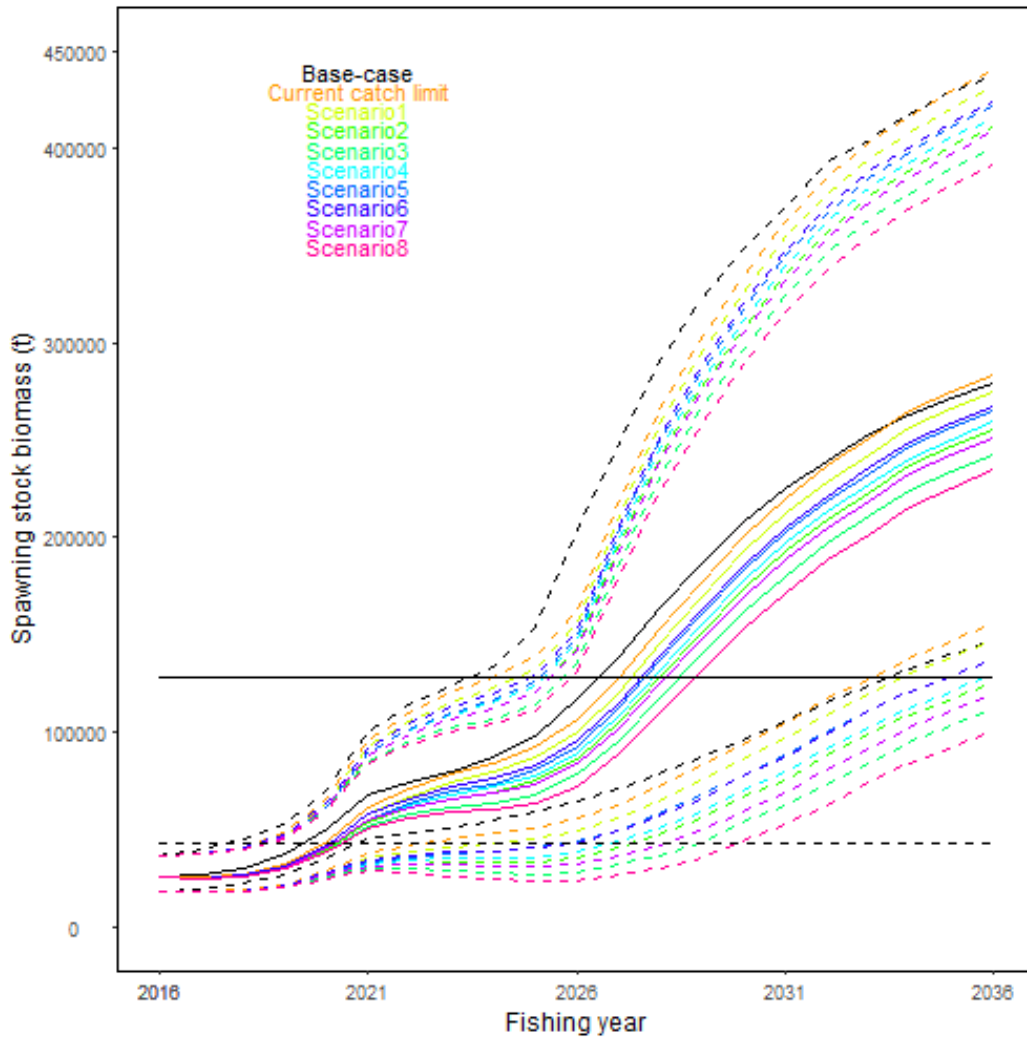


Figure 1. Comparison of projection results of various harvest scenarios from Table 2.