

## NATIONAL MARINE FISHERIES SERVICE (NMFS) REPORT ON BIENNIAL HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES

This report provides an overview of completed or pending status determinations for stocks of HMS management unit species (MUS) based on stock assessments reviewed in 2021 and 2022. A list of these assessments is included in this report. Additionally, this report provides estimates of the maximum sustainable yield (MSY), or appropriate proxies, maximum fishing mortality threshold (MFMT), and minimum stock size threshold (MSST); as well as updates on reference points adopted by Regional Fishery Management Organizations (RFMOs) for the stocks discussed below.

### *International Scientific Committee (ISC) Assessments*

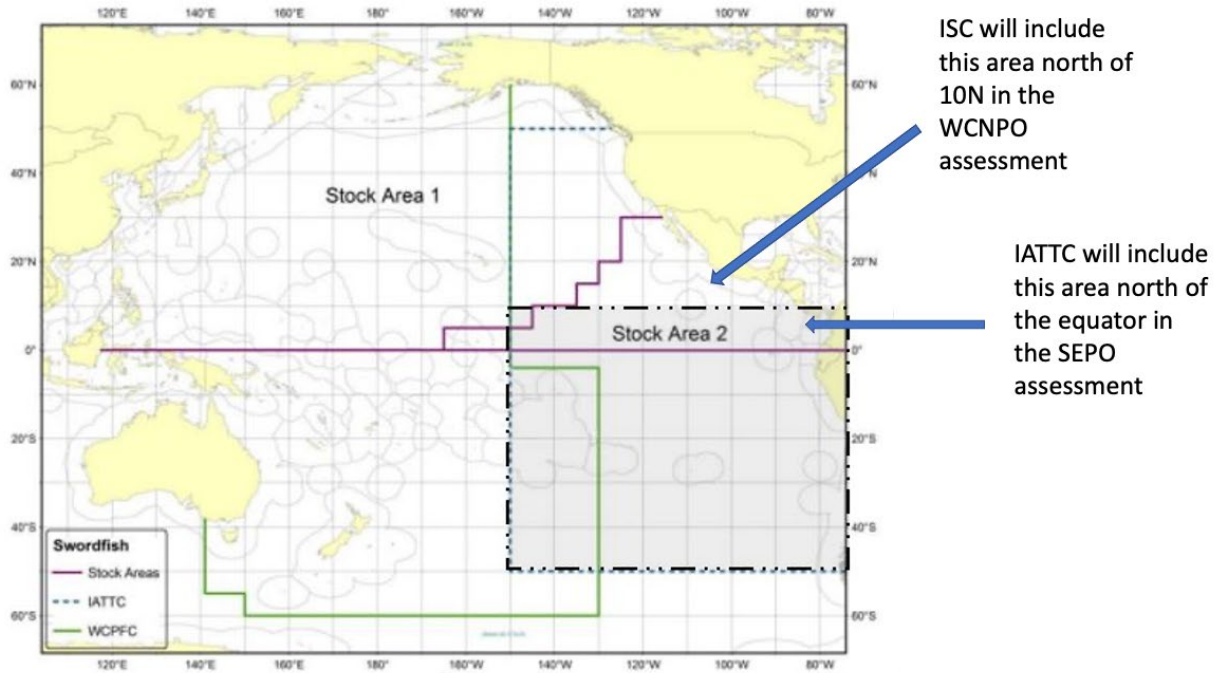
The ISC Working Groups did not perform stock assessments for MUS in the HMS FMP in 2021. However, in 2022, ISC Working Groups assessed bluefin tuna (PBF, *Thunnus orientalis*) and blue shark (*Prionace glauca*) in the North Pacific Ocean (NPO). The results from these stock assessments, reflected in Tables 1 and 2, are considered BSIA.

These results indicate that blue shark is not overfished nor subject to overfishing and that PBF is no longer subject to overfishing, but that the stock is still overfished. However, NMFS' status determinations for these stocks are pending. Note, NMFS proposes using  $1-SPR_{20\%}$  and  $20\%SSB_0$ , which are reported in the recent bluefin assessment, as MSY proxies and noted by ISC as appropriate for use in management. The 2022 assessments were reviewed at the 22nd plenary meeting of the ISC. The PBF assessment was considered at the recently held Sixth Joint Inter-American Tropical Tuna Commission (IATTC)-Northern Committee (NC) Working Group Meeting on PBF Management in July 2022 and the 100th meeting of the IATTC in August 2022. Both the PBF and blue shark assessments will also be considered during the 18th Regular Session of the NC to the Western and Central Pacific Fisheries Commission (WCPFC) in October 2022 and by the WCPFC in December 2022.

Given that the results of the PBF and blue shark assessments indicate that neither stock is subject to overfishing, NMFS does not anticipate a need for Council recommendations to address excessive fishing mortality. Current domestic regulations for PBF are consistent with international measures that appear effective in increasing biomass of PBF to achieve rebuilding targets adopted by the RFMOs. Projections in the 2022 PBF assessment indicate that the initial rebuilding target (i.e., 6.3% of unfished spawning stock biomass ( $SSB_0$ )) has been met, and the second rebuilding target (i.e.,  $20\%SSB_0$ , a proxy for  $SSB_{MSY}$ ) will be met sooner than anticipated.

*Stock boundaries - SWO 2023 assessment:* In preparation for an assessment of swordfish in the North Pacific Ocean in 2023, the ISC Billfish Working Group agreed to change the stock boundaries to account for uncertainty in the movement data. In 2018, an assessment was prepared for the Western Central North Pacific Ocean (WCNPO) stock and according to the boundaries shown as Stock Area 1 in Figure 1 below. For the 2023 assessment, ISC will conduct a new North

Pacific-wide assessment of swordfish. The ISC has engaged in discussion with the IATTC about covering the Eastern Pacific Ocean (EPO) SWO area in the next assessments. IATTC assessed the southeast Pacific Ocean stock including catches to 10N in 2022. The ISC will include the area north of 10N in the EPO that is not included in the SEPO SWO assessment.



**Figure 1.** Stock Area 1 depicts boundaries used in the 2018 Western and Central North Pacific Ocean swordfish stock assessment. Stock Area 2 depicts boundaries for the Eastern Pacific Ocean stock in the North Pacific Ocean. The green line indicates the Western Central Pacific Fisheries Commission convention area and the blue dashed line indicates the Inter-American Tropical Tuna Commission convention area. The square area outlined with a long-dash line indicates boundary areas for consideration in a South Eastern Pacific Ocean stock assessment.

### ***IATTC Assessments***

In 2020, the IATTC changed the assessment schedule for tuna stocks in the EPO such that a new assessment would occur every three years. The next assessments for yellowfin and bigeye tuna are planned for 2023.

In 2022, the IATTC scientific staff conducted an interim assessment of the EPO stock of skipjack tuna (*Katsuwonus pelamis*). [The model will continue to be improved towards the benchmark assessment in 2023, including incorporating the results of the analysis of recently collected tagging data.] This assessment was reviewed by the Scientific Advisory Committee (SAC) to the IATTC and considered by the IATTC. The results indicate that the stock is not subject to overfishing nor overfished. According to harvest control rules adopted in [IATTC Resolution C-16-02](#),  $F_{MSY}$  and  $B_{MSY}$  are target reference points; however, the IATTC scientific staff use proxies for these MSY-based reference points. The proxy for  $B_{MSY}$  is  $30\%SSB_0$  and the proxy for  $F_{MSY}$  is the level of fishing mortality corresponding with the biomass target (i.e.,  $F_{Btarget}$  where  $B_{target}$  is equal to  $30\%SSB_0$ ). Applying these proxies to domestic status determination criteria results in an  $MFMT = F_{Btarget}$  and  $MSST = 0.5 \times 30\%SSB_0$ . Because the assessment results indicate that  $F_{current}/F_{Btarget} = 0.25$  (i.e., less than 1), current fishing mortality is lower than the MFMT. Additionally, because the assessment results indicate that current spawning biomass is above  $B_{target}$ , then it is also above the MSST for this stock.

### ***Secretariat of the Pacific Community (SPC) Assessments***

In 2021 and 2022, the SPC completed assessments of Southwest Pacific Ocean stocks of swordfish (*Xiphias gladius*), blue shark (*Prionace glauca*), and shortfin mako shark (*Isurus oxyrinchus*). We include references to these assessments below; however, we do not report on the relevance of reference points from these assessments to SDCs in the HMS FMP because the boundaries for these stocks are both distant from the U.S. West Coast EEZ and fishing effort by U.S. West Coast-based vessels.

In 2022, SPC staff also assessed the WCPO stock of skipjack tuna (*Katsuwonus pelamis*). However, at the time of writing this report, the assessment has yet to undergo international review. Nonetheless, we include reference to this assessment below.

### ***Update on the Adoption of International Stock Reference Points***

During its 100th annual meeting, the IATTC adopted Resolution [C-22-04](#), which contains a harvest strategy for NPO albacore tuna. By adopting this Resolution, the IATTC adopted a biomass limit reference point (LRP) of 14 percent of unfished spawning stock biomass ( $14\%SSB_0$ ). The LRP of  $14\%SSB_0$  generally equates to  $SSB_{MSY}$  or the level of spawning stock biomass that supports maximum sustainable yield. As such, it is a more conservative limit reference point than MSST (i.e.,  $(1 - \text{natural mortality}) \times B_{MSY}$ ). Of note, it is likely that the WCPFC Northern Committee will consider amending the WCPFC LRP from  $20\%SSB_0$  to  $14\%SSB_0$  during its 2022 annual meeting. Rather than considering amending MSST in the HMS FMP to be consistent with this internationally adopted LRP, NMFS recommends retaining MSST as currently specified in the HMS FMP and using  $14\%SSB_0$  as an MSY-based proxy. A scenario where MSST is lower than the international LRP should prevent the need for the Council to make

recommendations to address stock status falling below the international LRP (or MSST) before IATTC measures can be put in place.

### ***List of 2021-2022 HMS Stock Assessments***

#### North Pacific Ocean stocks:

- [Pacific Bluefin \(2022\): Stock Assessment of Pacific Bluefin Tuna in the Pacific Ocean in 2020. ISC Pacific Bluefin Tuna Working Group. International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean 12-18 July 2022.](#)
- [Pacific Blue Shark \(2022\): Stock Assessment and Future Projections of Blue Sharks in the North Pacific Ocean through 2020. ISC Shark Working Group. International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean 12-18 July 2022.](#)
- [Skipjack \(EPO\) \(2022\): Skipjack Tuna in the Eastern Pacific Ocean, 2021: Interim Assessment. M. Maunder et al. Prepared for the 13th Meeting of the IATTC SAC, May 16-20, 2022, La Jolla, California USA. Doc SAC-13-07.](#)

#### Southwest Pacific Ocean stocks:

- [Stock Assessment for southwest Pacific swordfish. N. Ducharme-Barth, C. Castillo-Jordan, J. Hampton, P. Williams<sup>1</sup>, G. Pilling, P. Hamer. WCPFC-SC17-2021/SA-WP-04. July 21, 2021.](#)
- [Blue shark \(SWPO\) \(2021\). 2021 Stock assessment of Southwest Pacific blue shark. Philipp Neubauer, Kath Large and Stephen Brouwer. WCPFC-SC17-2021/SA-WP-03 Rev. 1. August 10, 2021.](#)
- [Shortfin Mako Shark \(SWPO\) \(2022\): Stock assessment of Southwest Pacific Shortfin Mako shark. Large, K., Neubauer, P. and Brouwer, S. Western and Central Pacific Fisheries Commission, August 10-18, 2022. WCPFC-SC18-2022/SA-WP-02.](#)
- [Skipjack \(WCPO\) \(2022\): Stock assessment of skipjack tuna in the western and central Pacific Ocean – Rev.3. Jordán, C.C., Tears, T., Hampton, J., Davies, N., Phillips, J.S., McHenchie, S., and others . Scientific Committee Eighteenth Regular Session. Western and Central Pacific Fisheries Commission, August 10-18, 2022. WCPFC-SC18-2022/SA-WP-01.](#)

Table 1. Stock assessment information for the purposes of determining whether HMS stocks are subject to overfishing

Management Unit Species	Assessment Overview			Overfishing					
	Assessment or Indicator Analysis	Assessment Year	Assessment Lead	MFMT (Fmsy or Proxy)	Current Fmsy or proxy quantity estimate	Current F quantity estimate	RFMO Ref. point (if adopted)	F/Fmsy ratio	Subject to Overfishing?
North Pacific albacore tuna	Assessment	2020	ISC	FMSY	0.83	F2015-17= 0.5	NA	0.6	No
Blue shark in the NPO	Assessment	2017	ISC	FMSY	0.35	F2002-14 = 0.13	NA	0.37	No
Blue shark in the NPO	Assessment	2022	ISC	FMSY	0.76	F2017-19 = 0.33	NA	0.45	pending; not subject to overfishing
Pacific bluefin tuna in the NPO	Assessment	2020	ISC	1-SPRMSY	0.79	1-SPR2016-18 = 0.86	NA	1.09	Yes
Pacific bluefin tuna in the NPO	Assessment	2022	ISC	1-20%SPR	0.8	1-SPR2018-20 = .693	NA	0.86625	pending; not subject to overfishing
Shortfin mako shark in the NPO	Assessment	2018	ISC	1-SPRMSY	0.26	1-SPRmsy2013-15 = 0.16	NA	0.62	No
WCNPO swordfish	Assessment	2018	ISC	FMSY	0.68	F2013-15 = 0.32	NA	0.47	No
Bigeye tuna in the EPO	Assessment	2020	IATTC	FMSY	NA	NA	NA	median of F2017-19/Fmsy = 1.00	No
Yellowfin tuna in the EPO	Assessment	2020	IATTC	FMSY	NA	NA	NA	median of F2017-19/Fmsy = 0.65	No

Table 1 (continued). Stock assessment information for the purposes of determining whether HMS stocks are subject to overfishing

Management Unit Species	Assessment Overview			Overfishing					
Stock	Assessment or Indicator Analysis	Assessment Year	Assessment Lead	MFMT (Fmsy or Proxy)	Current Fmsy or proxy quantity estimate	Current F quantity estimate	RFMO Ref. point (if adopted)	F/Fmsy ratio	Subject to Overfishing?
Skipjack tuna in the EPO	Assessment	2004	IATTC	NA	NA	NA	NA	NA	No
Skipjack tuna in the EPO	Assessment	2022	IATTC	Fbtarget, where btarget = 0.3SSB0	NA	NA	NA	0.25	pending; not subject to overfishing
Common thresher shark	Assessment	2018	NMFS	1-SPRMSY	0.45	1-SPR2012-14 = 0.097	NA	0.21	No
Bigeye tuna in the WCPO	Assessment	2020	SPC	FMSY	0.05	F2018 = NA	NA	0.74	No
Yellowfin tuna in the WCPO	Assessment	2020	SPC	FMSY	0.105	F2018=NA	NA	0.366	No
EPO swordfish	Assessment	2014	ISC	U (exploitation rate = catch/biomass)	0.18	F2012 = 0.19	NA	1.11	Yes
EPO striped marlin	Assessment	2010	IATTC	F	NA	NA	NA	0.16	No
Dorado									Unknown
WCNPO striped marlin	Assessment	2019	ISC	FMSY	0.6	F3-12 ages in 2015-2017 = 1.07	NA	1.78	Yes

Table 2. Stock assessment information for the purposes of determining whether HMS stocks are overfished

Management Unit Species	Assessment Overview			Overfished						
	Assessment or Indicator Analysis	Assessment Year	Assessment Lead	B <sub>MSY</sub> or proxy	Current B <sub>MSY</sub> or proxy estimate	Current B quantity estimate	MSST (1-Mx <sub>B</sub> B <sub>MSY</sub> or 0.5B <sub>MSY</sub> )	Current B/MSST	RFMO Ref. point (if adopted)	Overfished?
North Pacific albacore tuna	Assessment	2020	ISC	SSB <sub>msy</sub>	19,535 mt	SSB2018 = 58,858 mt	10,158 mt	5.79	20%SSB <sub>current</sub> , F=0 =25,590 mt	No
Blue shark in the NPO	Assessment	2017	ISC	SSB <sub>msy</sub>	179,539 mt	SSB2015 = 308,286	136,450-154,608 mt*	2.0 - 2.3	NA	No
Blue shark in the NPO	Assessment	2022	ISC	Female SSB <sub>msy</sub>	83,545	SSB <sub>2020</sub> = 92,954	63,494-71,013	1.3-1.46	NA	Pending not overfished
Pacific bluefin tuna in the NPO	Assessment	2020	ISC	SSB <sub>msy</sub>	131,363 mt	SSB2018 = 28,228 mt	98,522 mt	0.29	NA	Yes
Pacific bluefin tuna in the NPO	Assessment	2022	ISC	20%SSB <sub>0</sub>	128,716 mt	SSB <sub>2020</sub> = 65,464	96,537	0.678	NA	Pending, overfished
Shortfin mako shark in the NPO	Assessment	2018	ISC	S <sub>A</sub> <sub>MSY</sub>	633,700 female sharks	SA2016 = 860,200 female sharks	(1-0.128)x633700 = 552,586 female sharks	1.6	NA	No
WCNPO swordfish	Assessment	2018	ISC	SSB <sub>MSY</sub>	15,702 mt	SSB2016 = 29,403 mt	(1-0.22)x15702 = 12,248 mt	2.4	NA	No

\*Blimit = 136,450-154,608 because mortality changes with age and ranges from 0.24-0.14 for mature fish; females are 50% mature at age 5-6.

Table 2 (continued). Stock assessment information for the purposes of determining whether HMS stocks are overfished

Management Unit Species	Assessment Overview			Overfished						
Stock	Assessment or Indicator Analysis	Assessment Year	Assessment Lead	B <sub>MSY</sub> or proxy	Current B <sub>MSY</sub> or proxy estimate	Current B quantity estimate	MSST (1-MxB <sub>MSY</sub> or 0.5B <sub>MSY</sub> )	Current B/MSST	RFMO Ref. point (if adopted)	Overfished?
Bigeye tuna in the EPO	Assessment	2017	IATTC	B (age 3+ quarters old fish) at MSY	96,360 mt	B (age 3+ quarters old fish at start of 2017) = 118,523	48,130 mt	2.9	NA	No
Yellowfin tuna in the EPO	Assessment	2018	IATTC	S <sub>MSY</sub> (S= unitless spawning biomass index)	3,634	S = 3,925 (S= unitless spawning biomass index)	1,817	2.1	NA	No
Skipjack tuna in the EPO	Assessment	2004	IATTC	NA	NA	NA	NA	NA	NA	No**
Skipjack tuna in the EPO	Assessment	2022	IATTC	30%SSB0	NA	SB <sub>2021</sub> = 26,871	NA	Greater than 1 since SB <sub>current</sub> >30%SSB0 (or B <sub>msy</sub> proxy)	BMSY target, with 30%SSB0 as proxy	Pending, not overfished
Common thresher shark	Assessment	2018	NMFS	SSB <sub>MSY</sub>	101,500 mature females	SSB = 136,800 mature females	97,500 mature females	1.4	NA	No

\*\*for EPO skipjack, no minimum stock size threshold (MSST, overfished threshold) was calculated, but because the stock was above B<sub>MSY</sub>, it was above MSST



Table 2 (continued). Stock assessment information for the purposes of determining whether HMS stocks are overfished

Management Unit Species	Assessment Overview			Overfished						
Stock	Assessment or Indicator Analysis	Assessment Year	Assessment Lead	B <sub>MSY</sub> or proxy	Current B <sub>MSY</sub> or proxy estimate	Current B quantity estimate	MSST (1-MxB <sub>MSY</sub> or 0.5B <sub>MSY</sub> )	Current B/MSST	RFMO Ref. point (if adopted)	Overfished?
Bigeye tuna in the WCPO	Assessment	2020	SPC	SSB <sub>MSY</sub>	320,162 mt	544,162 mt	NA	NA	20%SBF=0 where SBF=0 is average over 2008–2017	Not overfished
Yellowfin tuna in the WCPO	Assessment	2020	SPC	SSB <sub>MSY</sub>	860,326 mt	2,090.592 mt	NA	NA	20%SBF=0 where SBF=0 is average over 2005–2014	No
EPO swordfish	Assessment	2014	ISC	B <sub>MSY</sub>	31,200	B2012 = 58,590 mt	20,280 mt	3***	NA	No
EPO striped marlin	Assessment	2010	IATTC	SSB <sub>MSY</sub>	1246 mt	SSB2009 = 1488 mt	623 mt	2.3	NA	No
Dorado	NA	NA	NA	NA	NA	NA	NA	NA	NA	Unknown
WCNPO striped marlin	Assessment	2019	ISC	SSB <sub>MSY</sub>	2604 mt	SSB2017 = 981 mt	1302 mt	0.75	NA	Yes

\*\*\*For EPO swordfish, appears B2012/B<sub>MSY</sub> = 1.87 used for the status determination instead of B2012/B<sub>MSST</sub> = 3; status is the same, not overfished.