



# Atlantic States Marine Fisheries Commission

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## MEMORANDUM

**TO:** Atlantic Striped Bass Management Board

**FROM:** Atlantic Striped Bass Technical Committee and Stock Assessment Subcommittee

**DATE:** April 17, 2023

**SUBJECT:** Rebuilding Projections with 2022 Preliminary Data and Ocean Commercial Quota Utilization Scenarios

The Striped Bass Technical Committee (TC) and Stock Assessment Subcommittee (SAS) met via webinar on March 14 and March 30, 2023 to develop updated stock rebuilding projections as tasked by the Striped Bass Management Board. Before developing the projections, the TC-SAS reviewed a correction to the rebuilding probabilities in the 2022 Stock Assessment Update Report.

### ***Correction to Short-Term Projections and Probabilities in 2022 Stock Assessment Update***

The 2022 Atlantic Striped Bass Stock Assessment Update (terminal year 2021) was reviewed by the Board in November 2022. The assessment includes short-term projections estimating the probability of female spawning stock biomass (SSB) reaching the SSB threshold and SSB target (rebuilt) under three constant fishing mortality ( $F$ ) scenarios. The projections and probabilities are summarized in Table 10 and Figure 18 of the assessment report.

After the assessment report was completed, the assessment team identified an issue with the calculated error around those projections. When the assessment report was developed, the projections inadvertently used standard error, instead of coefficient of variation (CV), in the error calculations. This resulted in larger error than should have been shown around the SSB projections. The projections were later corrected using CV in the error calculations. The corrected projections have a smaller error around the projected SSB, which results in updated probabilities. This update did not affect the median SSB projection, only the error around the projection and associated probabilities.

The TC-SAS reviewed this correction on March 14, 2023, and the 2022 Stock Assessment Update Report will be updated to reflect the correction. The updated Table 10 from the Assessment Report is enclosed as an Appendix to this memo showing the change.

### ***New Rebuilding Projections***

In November 2022 and January 2023, the Board tasked the TC-SAS with two items:

- Task 1: Evaluate whether 2022 removals remained at a level associated with the 2021 fishing mortality rate.

- Task 2: Conduct stock projections to determine how specific ocean commercial quota utilization scenarios would impact the stock rebuilding timeline.

The Board requested projections in time for the May 2023 Board meeting, and requested the projections include 2022 preliminary removals data. The TC-SAS developed the following suite of projections to address both Board tasks.

### ***Data Inputs for New Projections***

Projections were conducted using the 2022 stock assessment model configuration, including using the low recruitment assumption. Age-1 recruitment was estimated using the 2021 Maryland YOY index to predict 2022 recruitment, and using the 2022 Maryland YOY index to predict 2023 recruitment for the quota utilization scenarios. The low-recruitment assumption was used for all other years.

Preliminary 2022 removals were compiled in number of fish. Preliminary 2022 commercial landings were provided by each state. It is important to note that commercial landing estimates will likely be updated as states complete final harvest accounting in the coming months. Commercial discards for 2022 were estimated by applying the 2021 discard-to-landings ratios for each region to the preliminary 2022 commercial landings. For recreational removals, preliminary 2022 MRIP data were used for recreational harvest and release mortality (9% of recreational live releases). Final MRIP data are expected to be published in late April 2023.

Preliminary MRIP data for 2022 indicate a 91% increase in recreational harvest and 3% increase in recreational live releases, relative to 2021. This results in an overall 40% increase in recreational removals, with a preliminary estimate of 6.2 million fish in 2022 relative to 4.4 million fish in 2021.

Total preliminary removals from both sectors was estimated to be about 6.9 million fish in 2022, a 33% increase from 5.2 million fish in 2021. These removal estimates will be updated in August 2023 as part of the FMP Review Report for the 2022 Fishing Year based on state compliance reports, but the TC does not expect significant changes from these preliminary numbers.

For the ocean quota utilization scenarios, the projections assume there would be additional commercial harvest starting in 2023 to reflect using all, or most of, the ocean commercial quota. To estimate commercial harvest for 2023 under Scenario 2 (full ocean quota used), any unused 2022 ocean quota was converted from pounds to number of fish and added to the total removals. For states with active commercial fisheries, unused 2022 quota was converted to number of fish using state-specific average commercial fish weight. For states with inactive commercial fisheries (ME, NH, CT, NJ, and NC), unused quota was converted to number of fish using the coastwide ocean average commercial fish weight (15.3 pounds). For Scenario 3 (full ocean quota used except NJ), New Jersey's quota in number of fish was subtracted from that additional harvest. Scenario 3 reflects the fact that New Jersey's commercial quota is currently unavailable for quota transfers because it has been re-allocated to the recreational fishery.

### **Projection Scenarios and Assumptions**

The TC-SAS focused on three scenarios with constant  $F$  projections through 2029. Scenario 1 is based on preliminary 2022 removals only. Scenarios 2 and 3 have different assumptions for 2023-2029 by accounting for the ocean commercial quota utilization scenarios requested by the Board and by using a constant removals assumption between years 2022 and 2023 instead of a constant  $F$  assumption as in scenario 1. The TC-SAS decided to apply these quota utilization scenarios starting in projection year 2023 because 2023 is the first year that quota transfers could potentially be permitted.

For 2023-2029 projection years, all three scenarios assume a constant three-year average  $F$ . The TC-SAS emphasized that striped bass catch and  $F$  rates vary from year-to-year, even under the same regulations. Using a three-year average acknowledges that variability. The estimated  $F$  rate for 2022 (scenario 1) or the estimated  $F$  rate for 2023 + additional quota utilization (scenarios 2 and 3) were averaged with  $F$  rates from 2019 and 2021. 2020 was not included due to COVID-19 uncertainty. The 3-year average  $F$  was very close to the  $F_{prelim2022}$ , and projections with constant  $F_{prelim2022}$  were explored as a sensitivity run.

Scenario 1 uses preliminary 2022 removals (6.9 million fish) to estimate  $F$  in 2022. For 2023-2029 projections,  $F_{prelim2022}$  is averaged with  $F_{2019}$  and  $F_{2021}$ .

Scenario 2 uses preliminary 2022 removals data to estimate  $F$  in 2022. Starting in 2023,  $F$  is adjusted to account for harvesting the full ocean quota each year; active fisheries use all their quota and inactive fisheries transfer all their quota via commercial quota transfers.  $F_{2023+fullquota}$  is calculated assuming preliminary 2022 removals plus an additional commercial harvest (~41,500 fish) are removed from the 2023 population. For 2023-2029 projections,  $F_{2023+fullquota}$  is averaged with  $F_{2019}$  and  $F_{2021}$ . Because the landed NJ commercial quota is counted both in the “full commercial quota” and in the re-allocation of the commercial quota to the recreational fishery, those fish are double-counted for this scenario.

Scenario 3 uses preliminary 2022 removals data to estimate  $F$  in 2022. Starting in 2023,  $F$  is adjusted to account for harvesting the full ocean quota each year except for New Jersey’s quota; active fisheries use all their quota and inactive commercial fisheries, except NJ, transfer all their quota via commercial quota transfers.  $F_{2023+fullquotaminusNJ}$  is calculated assuming preliminary 2022 removals plus additional commercial harvest (~27,400 fish) are removed from the 2023 population. For 2023-2029 projections,  $F_{2023+fullquotaminusNJ}$  is averaged with  $F_{2019}$  and  $F_{2021}$ .

### **Projection Results**

For all scenarios, projected  $F$  rates were between the current  $F$  target of 0.17 and  $F$  threshold of 0.20. These projected  $F$  rates are higher than  $F_{2021}$  of 0.14. If  $F$  stays between the target and the threshold from 2023-2029, the probability of rebuilding the stock to SSB target by 2029 decreases substantially compared to the rebuilding probability associated with  $F_{2021}$ . The 3-year average  $F$  was very close to the  $F_{prelim2022}$  and the projection results using  $F_{prelim2022}$  as a sensitivity run were not substantially different from the results presented here.

Table 1 summarizes the projected  $F$  rates for each scenario and the associated rebuilding probability of reaching the SSB target by 2029. The table also includes the 2022 Stock Assessment Update projection based on  $F_{2021}$  for comparison.

**Table 1.**

Description	Scenario	Year	Projected $F$	Pr SSB > target in 2029	Pr SSB > thresh- old in 2029
2021 Fishing Mortality from 2022 Stock Assessment Update	-	2022-2029	$F$ in 2021	97.5 %	99.9 %
2022 Preliminary Removals	1	2022	$F$ in 2022	15 %	94 %
		2023-2029	Average $F$ (2019,2021, 2022)		
2022 Preliminary Removals + Full Ocean Quota in 2023	2	2022	$F$ in 2022	11 %	91 %
		2023-2029	Average $F$ (2019,2021, 2023+fullquota)		
2022 Preliminary Removals + Full Ocean Quota minus NJ in 2023	3	2022	$F$ in 2022	11 %	91 %
		2023-2029	Average $F$ (2019,2021, 2023+fullquota minusNJ)		

Figure 1 shows the SSB projection and the probability curves for reaching the SSB threshold and SSB target for each scenario. For comparison, Figure 1 also shows the SSB projection and probability curves associated with constant  $F_{2021}$  from the 2022 Stock Assessment Update.

**Discussion of 2022 Removals**

Increased recreational removals in 2022 are driving the increased  $F$  rates and lower rebuilding probabilities in all scenarios. The projections indicate SSB will increase over time before stalling between the target and threshold. Since the estimated  $F_{\text{prelim}2022}$  (and all other projected fishing mortalities) is between the  $F$  target and threshold, it is expected that SSB will also remain between the SSB target and threshold, without fully rebuilding to the SSB target level. Because the  $F$  reference points are calculated to achieve the SSB reference points in the long-term, SSB will reach its target over the long-term only if  $F$  is at (or below) its target. In order to meet the SSB target by 2029 (i.e., a short-term timeline),  $F$  would need to be below its target, as demonstrated by the high rebuilding probabilities associated with  $F_{2021}$ , which was below  $F$  target.

While the projections indicate a low probability of rebuilding to the *target* by 2029 under these higher  $F$  rates, the probability of reaching the SSB threshold in 2029 (no longer overfished) is above 90% for all scenarios. The TC-SAS noted that angler effort and behavior continue to be an

important factor and source of uncertainty. As the stock recovers and strong year classes become available to the recreational fishery, effort may increase, contributing to both increased harvest and live releases.

The outcome of projections is dependent on which constant  $F$  or catch level is assumed (as well as assumptions about recruitment and selectivity). The TC-SAS emphasized that projections assuming a constant  $F$  or constant catch are not necessarily representative of future years since striped bass catch and  $F$  vary from year-to-year. These new projections based on 2022 removals represent a higher catch outlook, while the projections based on 2021 removals represent a lower catch outlook (Figure 2). If future catch and  $F$  are somewhere in the middle, the rebuilding probability may also fall between the low 15% associated with 2022 removals and the high 97% associated with 2021 removals. The ocean quota utilization scenarios overlap almost completely with the 2022 removals scenario, indicating the additional quota utilization has a minimal impact on the projections compared to the increase in total removals from 2021 to 2022 (Figure 2). For the first years of the projections, the three new scenarios overlap significantly with the 2021-based projection, but diverge further in later years, where we have less confidence in our assumptions about  $F$  and recruitment (Figure 2).

#### ***Discussion of Quota Utilization Scenarios***

The 2023-2029 projected  $F$  for the ocean quota utilization scenarios 2-3 is based on a worst-case scenario and is only about 2% higher than the projected  $F$  for the 2022 removals scenario 1. This slight increase in  $F$  results in a slightly lower (-4%) probability of rebuilding by 2029. However, this slight difference results from the assumptions used to generate the projected fishing mortality rates more than the addition of the ocean quota utilization. In scenario 1, an average  $F$  (2019,2021,2022) was applied to all remaining projection years (2023-2029), while in scenarios 2-3, an average  $F$  (2019,2021,2023) was applied to all remaining years (2023-2029). Consequently, both population dynamics between 2022 and 2023 and increased quota utilization are responsible for the differences between scenario 1 and 2-3.

The projections indicate that the impact of additional quota utilization on  $F$  and rebuilding probability is negligible. The maximum quota utilization scenario 2 only adds 41,500 extra fish to removals, which is less than 1% of total removals. The addition or subtraction at a scale of tens of thousands of fish relative to the total removals scale of several million has negligible impacts on overall  $F$ , as also demonstrated by the negligible difference between scenarios 2 and 3 (difference of 14,000 fish).

#### ***Discussion on Interim Projections***

The TC-SAS discussed the benefits and challenges of conducting stock projections between stock assessments. In this case, the benefit of these interim projections is a timely update to the Board considering the significant increase in recreational catch in 2022 following two low catch years, which also included COVID-19 uncertainty. In addition, 2022 aligned with the emergence of the strong 2015-year class in the ocean fishery, which likely contributed to the large change between 2021 and 2022. The TC noted these projections are not the same as a full

stock assessment update where the model would be re-run to include the 2022 catch-at-age and index data to produce estimates of  $F$  and SSB in 2022 to determine stock status.

The TC-SAS noted that conducting annual stock projections would not be particularly useful given interannual variability in removals under constant regulations, and the life history of striped bass (long-lived, slow to mature, etc.). Instead, the TC-SAS talked about the potential benefits of aligning projections and assessments with planned management changes.

If the Board is considering management changes, the TC-SAS recommends the Board be as specific as possible with the types of measures they would consider and their intent (e.g., reduce removals to a particular  $F$  rate or rebuilding probability, protect year classes, etc.).

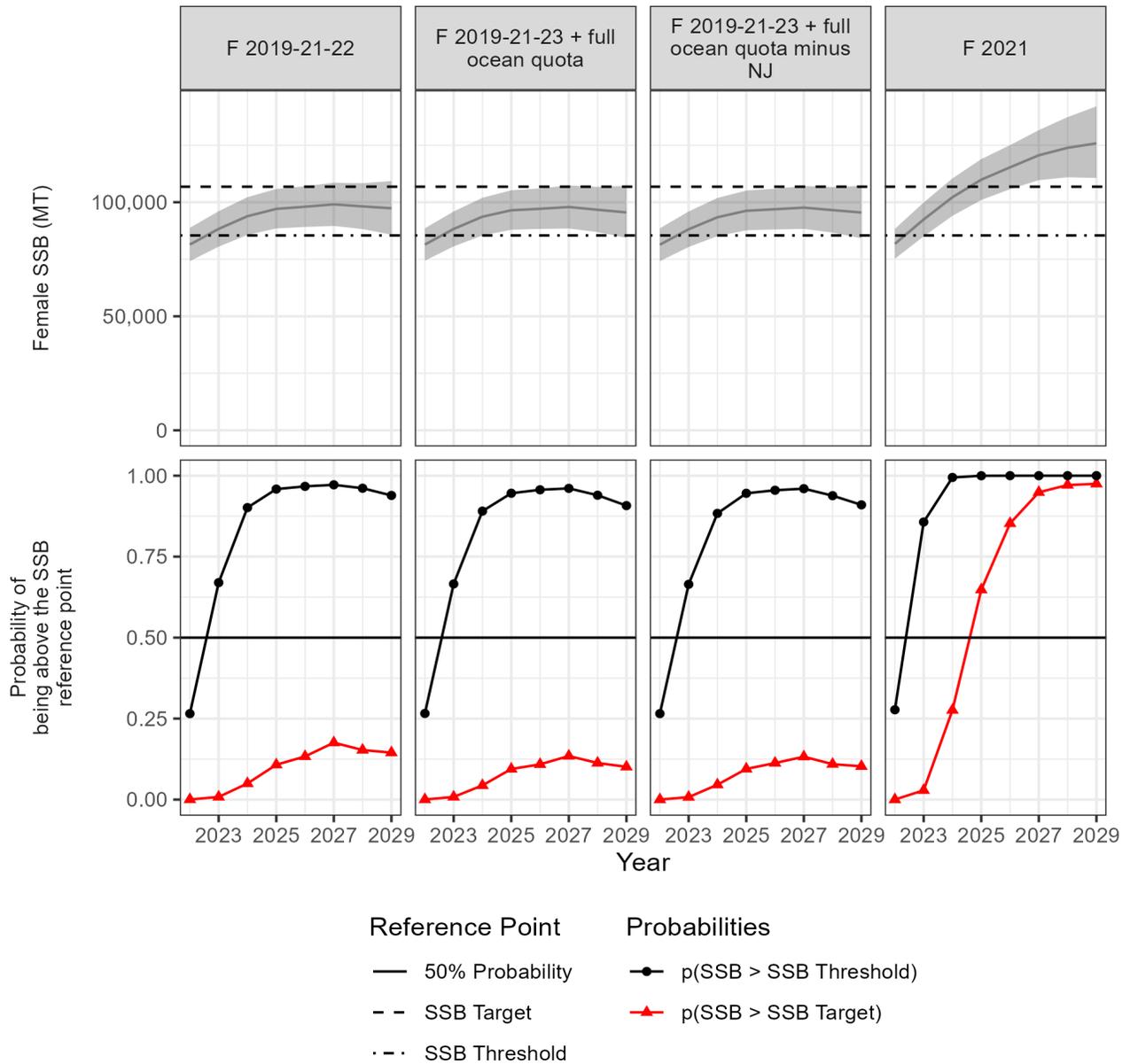
***TC-SAS Members in Attendance on March 14 and 30***

Nicole Lengyel Costa (TC Chair, RI), Mike Celestino (SAS Chair, NJ), Michael Brown (ME), Kevin Sullivan (NH), Gary Nelson (MA), Kurt Gottschall (CT), Caitlin Craig (NY), Brendan Harrison (NJ), Tyler Grabowski (PA), Margaret Conroy (DE), Alexei Sharov (MD), Luke Lyon (DC), Ingrid Braun (PRFC), Brooke Lowman (VA), Joshua McGilly (VA), Charlton Godwin (NC), Steve Minkkinen (USFWS), John Sweka (USFWS), Tony Wood (NOAA)

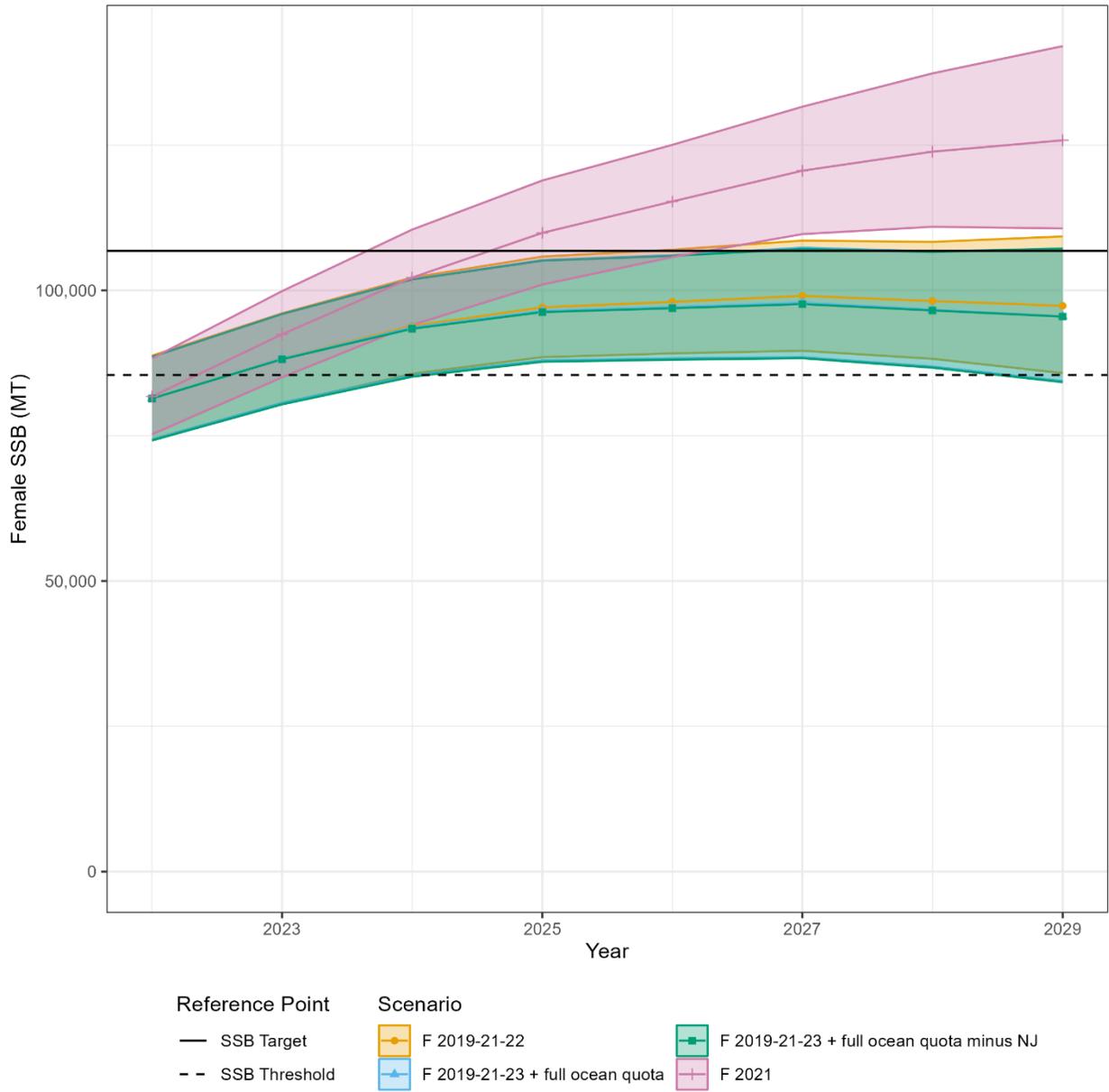
***Board Members and Public in Attendance on March 14 and 30***

Chris Batsavage, David Borden, Emerson Hasbrouck, Max Appelman, David Sikorski, Mike Wilberg, Rob Latour, Adena Schonfeld, Samara Nehemiah, Alan Bianchi, Jessica Best, Evan Dintman, Glen Fernandes, Tony Friedrich, Peter Himchak, Jesse Hornstein, Nichola Meserve, Chris Moore, Marisa Ponte, Will Poston, Cody Rubner, Patrick Rudman, Antonia Santegata, Ross Squire, David Stormer, Taylor Vavra, Mike Waine, Esther Wang, Charles Witek, Steve Witthuhn, Michael Woods

***ASMFC Staff:*** Katie Drew, Emilie Franke



**Figure 1.** Projected female SSB with 95% confidence intervals (top row) and the probability of SSB being above the SSB reference point (bottom row) for the three new projection scenarios and for the original  $F_{2021}$  projection scenario from the 2022 assessment update.



**Figure 2.** Projected female SSB with 95% confidence intervals for the three new scenarios (yellow, blue, green) and the original  $F_{2021}$  projection scenario from the 2022 assessment update (pink).

**Appendix. Correction to 2022 Stock Assessment Update Report**

Table 10, Figure 18, and associated text in the 2022 Stock Assessment Update Report will be updated to reflect the correction.

**Table 10 Corrected.** Probability of SSB being at or above the SSB threshold or target under different constant F scenarios. Bolded final row indicates 2029, the rebuilding deadline. Shaded green columns are the corrected probabilities compared to the originally reported values in grey text.

Year	Probability SSB ≥ SSB threshold under current F		Probability SSB ≥ SSB target under current F		Probability SSB ≥ SSB threshold under F target		Probability SSB ≥ SSB target under F target		Probability SSB ≥ SSB threshold under F threshold		Probability SSB ≥ SSB target under F threshold	
	Grey	Green	Grey	Green	Grey	Green	Grey	Green	Grey	Green	Grey	Green
2021	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2022	34.4%	27.9%	0.4%	0.0%	34.5%	27.4%	0.4%	0.0%	34.5%	27.4%	0.4%	0.0%
2023	70.2%	86.1%	14.9%	2.8%	61.9%	76.5%	13.1%	1.3%	53.2%	61.2%	11.6%	0.5%
2024	86.0%	99.3%	39.0%	27.6%	74.1%	95.3%	29.2%	10.0%	61.8%	80.7%	23.2%	2.2%
2025	91.8%	99.9%	56.1%	64.7%	79.3%	99.1%	40.3%	25.1%	64.3%	87.7%	28.6%	4.7%
2026	94.1%	99.9%	65.7%	85.1%	81.4%	99.6%	45.5%	36.7%	63.4%	88.3%	30.3%	5.3%
2027	95.7%	99.9%	72.7%	94.8%	82.8%	99.8%	49.9%	49.0%	63.4%	87.3%	31.9%	5.9%
2028	96.4%	99.9%	76.6%	97.2%	82.8%	99.8%	52.0%	53.4%	61.7%	83.5%	31.6%	5.7%
<b>2029</b>	<b>96.7%</b>	<b>99.9%</b>	<b>78.6%</b>	<b>97.5%</b>	<b>82.4%</b>	<b>99.6%</b>	<b>52.5%</b>	<b>53.9%</b>	<b>59.4%</b>	<b>76.9%</b>	<b>30.5%</b>	<b>5.4%</b>

Corrected values in green