MID-ATLANTIC
FISHERY MANAGEMENT COUNCIL

Atlantic Mackerel Rebuilding 2.0

April 2022

Agenda

- Review Atlantic mackerel rebuilding
- Recommendations for document

Assessments

- 2018 Benchmark (now RTA)
  - data through 2016 - Overfished/overfishing
  - Projected near 160,000 MT biomass at 2019 rebuild start (three years of projecting)
- 2021 Management Track Assessment (MTA)
  - data through 2019 - Overfished/overfishing
  - Near 40,000 MT biomass at 2019 rebuild start
  - Trending up since 2014 but…
  - Projections inherently uncertain!

Assessments

- vs Historical…
  - 1997 Atlantic mackerel allowable biological catch (ABC) was about TEN times higher than what we now think the total SSB was in that year.

Rebuilding and Specifications

- 10-year rebuilding
  - SSC advised long-term approach

- Just set for 2023 in this action
  - 2023 assessment can be used for 2024
  - 2023 is already 4 years of projection 2019-23
  - 2024 likely to change if projected now (5 years)
  - Getting assessments every other year forces adaptive approach

P* Risk Deduction

- Lower biomass = greater certainty about not overfishing = lower catch
- Normally applied to mortality rate ("F") that creates overfishing
- Can similarly apply to a rebuilding F
  - Lower biomass = greater certainty about not rebuilding as fast = lower catch (bluefish)

SSC Input

Atlantic Mackerel—SSC Overview

- Council passed a motion in requesting additional guidance from the SSC on rebuilding options for Atlantic Mackerel. Five distinct options were specified to achieve within a 10-year period.
- The options are distinguished by varying assumptions about
  - Recruitment
  - Desired probability of rebuilding within the 10- year period
  - Specification of risk for each proposed catch trajectory
- The need for reconsideration of rebuilding options arose when the 2021 MTA revealed that rebuilding was lagging behind earlier projections.
- The Council requested that the options would align with the Council's Risk Policy and the SSC's derivation of a 150% CV for the OFL.

Atlantic Mackerel—Rebuilding Options Definitions

- Rebuilding Risk Policies
  - 50% Probability by 2032
  - Use P* strategy
  - 60% Probability by 2032
  - Rebuild F with P*
- Recruitment Hypotheses
  - Density independent but continuation of low R since 2009==LOW
  - Density Dependent Two Stage Model==Split Model
    - IF SSB< ½ Bmsy = 90,545 then use Low R (2009 onward)
    - IF SSB>1/2 Bmsy=90,545 then all use R (1975 onward)

Atlantic Mackerel—SSC Terms of Reference #1

- *Provide acceptable biological catch (ABC) recommendations, in weight, for the Council's rebuilding alternatives. The rebuilding alternatives include either P* based calculations or a target probability of rebuilding (e.g., 50% or 60%) specified by the Council. The alternatives use one of the two recruitment assumptions previously recommended by the SSC – the most recent recruits (2009 onwards) or a two-phase approach that only incorporates the longer time series (1975 onwards) once biomass is over half of the rebuilding target. The SSC also previously recommended a 150% CV for the P* based calculations.*

Atlantic Mackerel—Rebuilding Options P scenarios assume 150% OVL CV*

Risk Policy	Recruitment	Rebuild Percent by 2032	Rebuild Year	Median 2023 Catch	Median 2024 Catch	10 YR Cumulative Catch
50% Prob	Low (2009+)	56.6	2031	703	865	12,866
P* Method	**Split at ½ Bmsy**	**51.5**	**2031**	**4,539**	**6,207**	**171,291**
60% Prob	Split at ½ Bmsy	60.5	2031	8,094	9,274	144,147
50% Prob	Split at ½ Bmsy	53.4	2032	9,371	10,591	157,821
Rebuild F with P*	Split at ½ Bmsy	62.3	2029	2,976	4,168	134,022

Atlantic Mackerel—SSC Terms of Reference #2

- *Provide any guidance regarding the relative risks associated with the different rebuilding alternatives and identify the most significant sources of scientific uncertainty associated with rebuilding;*
- The SSC reviewed all alternatives and recommends the P^* approach with the maximum fishing mortality threshold (MFMT) equal to the Fmsy proxy (Alternative 2).
  - Fulfills rebuilding plan requirements;
  - Most responsive to new information on changes in stock status;
  - Produces the highest rebuilding plan 10-year catch yield);
  - Fully consistent with the Council's P^* risk policy; and
  - Avoid "break points" in catch limit advice, which would reduce year-to-year changes in the ABC.

Atlantic Mackerel—SSC Terms of Reference #2: Alternative #1

- <u>Alternative #1 assumes LOW future recruitment</u>
- **Risks**
- Low ABC/Catch indicates high risk of a depleted industry and forgone catch once SSB recovers.
- Fishery-dependent data will become unavailable to support stock assessment.
- High discard potential if recruitment recovers under low catch

- **Scientific Uncertainties**
- Predictions of which recruitment regime exists is highly uncertain owing to lack of understanding on how recruitment is controlled (i.e., role of SSB, the environment, and the food web).
- Recreational catch/unreported removals may exceed low ABCs under this Alternative; knowledge about catch will needs to become more precise at low ABCs.
- Uncertainty accumulates with length of projections.

Atlantic Mackerel
Terms of Reference #2: Alternatives #2-5

- Two-stage SPLIT model for recruitment
- **Risks**
- Stock may not recover without the low F specified in Alternative 1.
- SSB trigger implies a sudden change in recruitment state, which is not supported by current understanding of what drives recruitment
- An immediate shift towards a higher recruitment regime is assumed at SSB≥0.5 SSB_{MSY}, whereas an unknown lag may occur between increased SSB and recruitment.
- S-R relationship has not been parameterized in the assessment
- Shifting recruitment regimes can have unexpected effects for stock rebuilding

Atlantic Mackerel
Terms of Reference #2: Alternatives #2-5

- Two-stage SPLIT model for recruitment
- **Uncertainties**
- Form of the underlying stock-recruitment relationship.
- Knowledge about catch needs to become more precise at low ABCs.
- Trigger SSB for using one or the other recruitment series is deterministic, without consideration of error.
- Uncertainty in small amplitude changes in SSB
- Uncertainty in long projections

Atlantic Mackerel
Terms of Reference #3

- *Provide any data and/or assessment considerations for the 2023 Atlantic Mackerel management track assessment;*

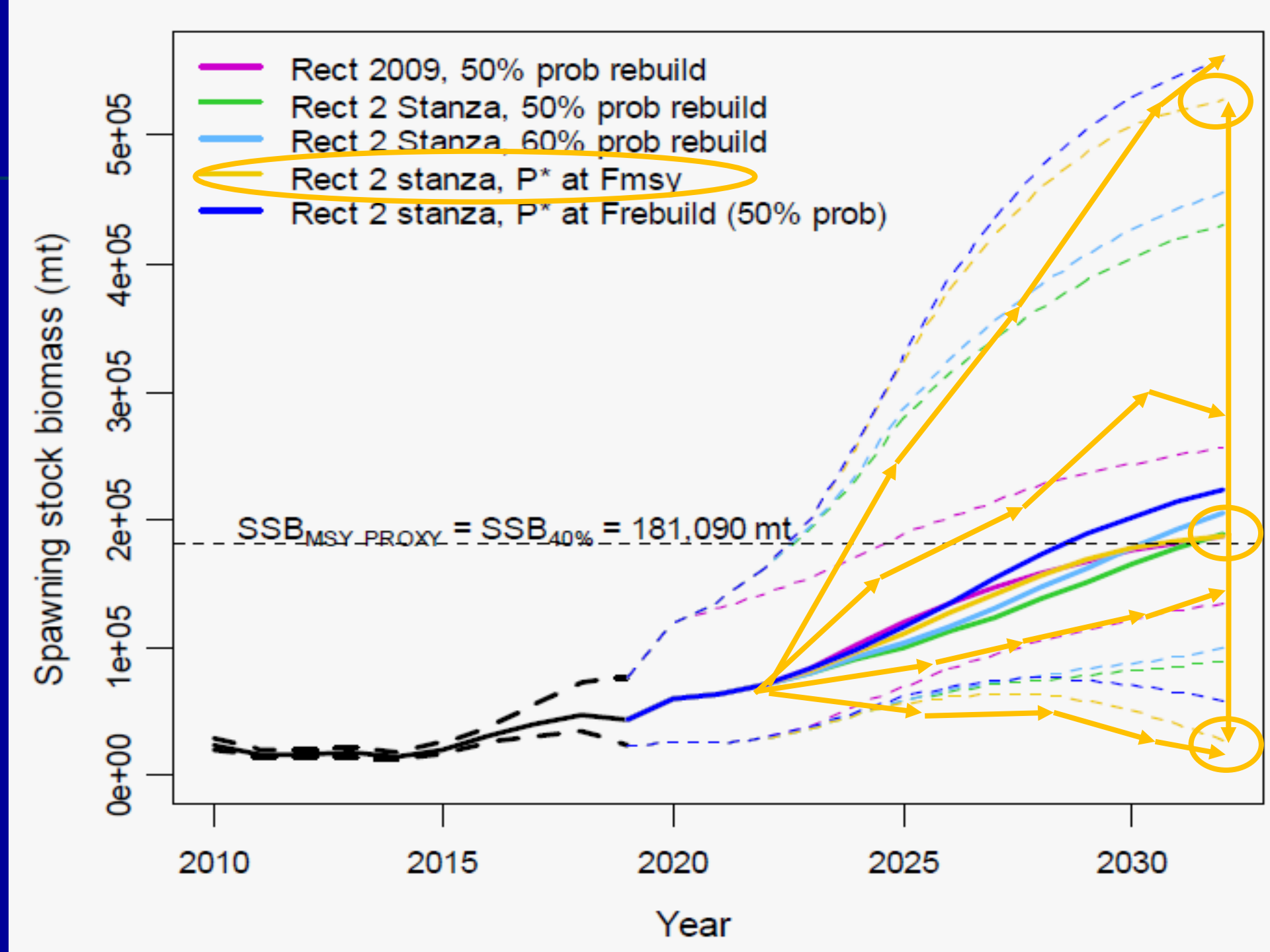
- The Atlantic mackerel egg surveys and related ichthyoplankton processing and data analysis are fundamental in assessment and projections of rebuilding.
- The US recreational sector is less represented in length data in the assessment than commercial sectors. Should evaluate recreational fishery data quality and assessment sensitivity.
- Shoreside sampling needs to be improved (multispecies issue)
- Evaluate how egg survey sampling error propagates to error in the spawning stock biomass index.

Atlantic Mackerel—SSC Discussion

- Suggestion alternative ways of capturing the patterns associated with each realization and illustrate that rebuilding may fail even with very long rebuilding periods. The distribution of SSB for each year would useful to characterize because it is expected to be skewed with heavy tail of high rebuild probabilities.
- Further investigation into potential environmental drivers for recent low recruitment.
- Rebuilding would be monitored via Management Track Assessments every two years. Adjustments to the rebuilding strategy are expected.
- The SSC emphasized the deliberative nature of discussions about the stock recruitment relationship and rebuilding strategies. These discussions included extensive consultations among NEFSC and SSC as well as the DFO Canada and other assessment partners.

Rebuilding v 2

- 10 years – start 2023, end June 2032
- 5 rebuilding options…
- 1 Assumes 2009+ (low) recruitment
  - Requires zero U.S. catch (10 years)
  - "Low R" illustrates dependence on recruitment
- 4 Assume 2009+ recruitment until get to ½ target biomass, then 1975+ recruitment…
  - "R+" – median recruitment increases during rebuilding but never as high as original rebuilding plan's projections – Why not?


Rect 2009, 50% prob rebuild
Rect 2 Stanza, 50% prob rebuild
Rect 2 Stanza, 60% prob rebuild
Rect 2 stanza, P* at Fmsy
Rect 2 stanza, P* at Frebuild (50% prob)
SSB_MSY PROXY = SSB_40% = 181,090 mt
Spawning stock biomass (mt)
0e+00
1e+05
2e+05
3e+05
4e+05
5e+05
2010
2015
2020
2025
2030
Year

Rebuilding v 2

- 1 Low R, minimal catch to rebuild
  F = 0.01
- 2 R+, rebuild F (0.14) minus P* deduction
  F = 0.04 to start
- 3 R+, just normal P*
  F = 0.07 to start
- 4 R+, 61% rebuild % in 10 years
  F = 0.12
- 5 R+, 53% rebuild % in 10 years
  F = 0.14

Rebuilding v 2

- 1 Low R, minimal catch to rebuild (57%)
  2023 catch = 703 MT
- 2 R+, rebuild F minus P* deduction (62%)
  2023 catch = 2,976 MT
- 3 R+, just normal P* (52%)
  2023 catch = 4,539 MT
- 4 R+, 61% rebuild % in 10 years
  2023 catch = 8,094 MT
- 5 R+, 53% rebuild % in 10 years
  2023 catch = 9,371 MT

What about Canada?

- 4,395 MT in 2021
- "Closed" in 2022
- Zero TAC in 2022/23 gives them about a coinflip chance of being 40% rebuilt by 2023

What about Canada?

- 2023 Canadian Assessment will be considered when they set 2023 quota. 2023…?

- So far: Consider 4,395 MT or half = 2,197 MT
  - Tradeoffs from under or over specifying
  - Less = good on paper but possible ABC overage
  - Still seems like a good central range, but 2023 Canadian catch could be lower or higher

Rebuilding v 2

- 1 low R, minimal catch to rebuild
  - 2023 US catch = Negative
- 2 R+, rebuild F minus P* deduction
  - 2023 US catch = Negative
- 3 R+, just normal P*
  - 2023 US catch = Negligible even with lower Canadian landings assumption: 4,539 ABC - 2,197 (Canada) – 2,195 (US Rec) – 115 (US Com Discards) = *32 MT for U.S. landings ??*

- 4/5: some U.S. Com quota depending on Canada and Rec catches… (has risk policy modification)

Measures

- Bag Limits (Committee recommended removing 5-fish limit)

Table 13. Theoretical Combined Bag Limit Reductions

	% Catch Reduction
Bag Limit	Combined
5 fish	47%
10 fish	30%
15 fish	22%

Measures

- Bag Limit – Stay with 2,582 MT Rec set-aside or only use 50% Credit

Table 14. Theoretical Alternative Recreational Catch Deductions and Savings

	Recreational Deduction	
Bag Limit	Combined (MT)	Savings (MT)
5 fish	1,975	607
10 fish	2,195	387
15 fish	2,298	284

Rebuilding v 2

- 4 R gets better, 61% rebuild % in 10 years
  - 2023 catch = 8,094 MT

Table 10. Alternative 4 2023 Specifications Summary

Alternative 4 - 2023 Specifications (MT)						
ABC	8,094					
Canadian Catch Options	2,197			4,395		
Rec Catch Options (10, 15, na)	2,195	2,298	2,582	2,195	2,298	2,582
Commercial Discards	115	115	115	115	115	115
Commercial Quota	3,587	3,484	3,200	1,389	1,286	1,002
Before May 1 First Closure Threshold (-886 MT)	2,701	2,598	2,314	Insufficient quota for directed fishing - begin closed		
May 1/after First Closure Threshold (-443 MT)	3,144	3,041	2,757			
Final Closure Threshold (-100 MT)	3,487	3,384	3,934	1,289	1,186	902

Rebuilding v 2

- 5 R gets better, 53% rebuild % in 10 years
  - 2023 catch = 9,371 MT

Table 15. Alternative 5 2023 Specifications Summary

Alternative 5 - 2023 Specifications (MT)						
ABC	9,371					
Canadian Catch Options	2,197			4,395		
Rec Catch Options (10, 15, na)	2,195	2,298	2,582	2,195	2,298	2,582
Commercial Discards	115	115	115	115	115	115
Commercial Quota	4,864	4,761	4,477	2,666	2,563	2,279
Before May 1 First Closure Threshold (-886 MT)	3,978	3,875	3,591	1,780	1,677	1,393
May 1/after First Closure Threshold (-443 MT)	4,421	4,318	4,034	2,223	2,120	1,836
Final Closure Threshold (-100 MT)	4,764	4,661	4,377	2,566	2,463	2,179

SSC (draft)

- Tradeoffs
  - Higher catches dependent on higher recruitment
    - High uncertainty about if/when/how that occurs
  - Accounting for very small catches
  - Limited fishery-dependent data w/ small catch
  - Discards w/ small landings
  - Fleet survival
  - Uncertainty in small amplitude changes in SSB
  - Uncertainty in long projections
  - 60%+ chance more likely to succeed

SSC (draft)

- P* Recommended
  - (1) fulfills rebuilding plan requirements;
  - (2) is the most responsive to new information on changes in stock status;
  - (3) produces the highest rebuilding plan 10-year catch yield);
  - (4) is fully consistent with the Council's P* risk policy; and
  - (5) would avoid "break points" in catch limit advice, which would reduce year-to-year changes in the ABC

SSC (draft)

- Highlight uncertainty to Council
- No guarantees…

Other Measures

- 3-inch minimum mesh
- River Herring and Shad Cap
  - Scaled to quota (very small), or
  - 129 MT minimum
- Permitting option
  - prohibitions list modified to include Atlantic mackerel possession by commercial and for-hire vessels without an appropriate mackerel permit (including bait)
  - Triggers VTR reporting requirements

Monitoring Committee

- Input folded into draft
- Just set specs for 2023
- Consider Canadian decision carefully
- Hard to predict recreational response
- Mesh uncertainty
- Permit ambiguity

AP

- NE buffer zone and lack of Atl herring RSA limiting catch 2021/2022
  - Fish inshore in 2021/2022
- Recreational catch effects on rebuilding
- Sampling concerns at current/proposed catch levels
- U.S. / Canada approaches complementing?

Committee

- Recommends including an alternative in the Amendment that considers a range of recreational bag limit options of 10 or 15 fish.
- Recommends that recreational seasonal closures be considered but rejected.
- Permitting discussion

Council

- Consider Committee Motions
- Document recommendations
- Hearings 4/25 – 5/2
  - MA (2), NH, ME, and a webinar
- Public comments due 5/9