Atlantic States Marine Fisheries Commission

1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • www.asmfc.org

MEMORANDUM

TO: Atlantic Striped Bass Management Board

FROM: Atlantic Striped Bass Technical Committee

DATE: September 28, 2023

SUBJECT: Spawning Potential Ratio Adjustment for Commercial Maximum Size Options

Background

As part of Addendum II, the Atlantic Striped Bass Board requested options that imposed a maximum size limit on the Chesapeake Bay and ocean commercial fisheries. Commercial quotas are managed in weight, and changing the size limit of the commercial fishery will change the average size of the fish in the catch, potentially increasing the number of fish removed for the same poundage of quota, and will change the selectivity of the commercial fishery, thus changing the age-classes which are impacted by the fishery. In the past, when states have changed their commercial size limits, their quota has been adjusted to reflect these impacts with the intent of setting a new quota that maintains the same effect on the population in terms of the spawning potential as the Amendment 6 commercial size limits. The Board elected to take this approach for the maximum size limit options for draft Addendum II.

Methods

The spawning potential ratio (SPR) analysis requires life history information and information on the selectivity of the fishery. The selectivity is calculated from the age-length keys for each state. The TC discussed a number of issues regarding the SPR analysis to ensure that all states were using consistent methods and inputs.

Age-Length Keys (ALK) and Selectivity

For the age-length keys, the TC recommended:

- Pool 2021 and 2022 data to represent the most recent time period and increase sample size.
- If any ages have less than 10 lengths sampled, borrow from other years or other states to increase the sample size. This does not apply to the ages beyond the range of the commercial catch – e.g., if no age-2 or age-14 fish are present in the sampling, a state does not need to borrow data; if ages are present but poorly sampled, a state should borrow

Selectivity is also influenced by availability of fish. For example, in the Bay, when older, larger fish are present, they are fully vulnerable to the gear, but they are not available year-round, so using only samples from the Bay commercial fisheries may overstate the selectivity of the Bay fishery on older ages and overestimate the impact of a maximum size limit on the population. The TC recommended the Bay states discuss the issue and agree on how to better represent availability of age classes, not just vulnerability to the gear when developing selectivity curves. This may also be an issue for ocean states like Delaware and New York which also may not have year-round availability of the targeted size classes, but there is more state-to-state variability in the ocean fisheries. Ocean states should consider this issue as it applies to their own data and decide how to pool data from non-commercial sources to better capture the availability as well as the vulnerability of striped bass to their fisheries if necessary.

The TC discussed whether to explicitly include the length frequency from the commercial fishery as part of the selectivity calculations, and in the end decided not to, as the length frequency is influenced by year-class strength and fisher behavior and this analysis should focus on what proportion of each age is legally vulnerable to harvest. If the ALK is predominately commercial sampling data in the ages that overlap any max size changes, the length frequency of the commercial fishery (for 2021 and 2022 or whichever years were added) will be implicitly part of the selectivity calculations.

The TC discussed whether to include the maximum size limit bin in the calculation of vulnerability. Most states calculate their length bins by flooring the measurements; i.e., the 38" bin includes fish from 38.00" to 38.99". For this addendum, the PDT is recommending inclusive size limits, so that a 38.0" fish would be legal to harvest under a 28"-38" slot limit. In this case, excluding the 38" bin from the selectivity calculations would exclude some legal fish, but including would include fish above the size limit (the 38.99" fish, for example). The TC recommended including the maximum size limit bins in the calculations and acknowledged this as a source of uncertainty.

Weight-at-Age

The TC recommended that the SSB weight-at-age and catch weight-at-age be the same values used in the most recent stock assessment reference point calculations and projections.

F Increment and F Target for Calculations

The original SPR analysis was done in R, where the *F* increment over which SPR is calculated is specified by the user; smaller increments give better, more precise estimates but are more computationally expensive and take longer to run. G. Nelson developed an alternative to the R calculations that can be done in Excel using Visual Basic macros which can get more precise answers more efficiently. The TC elected to use this spreadsheet version to do the calculations instead of the R method.

The *F* target used to start the calculations also has an impact on the final results. The method that has been used historically uses the current *F* target (*F*=0.167) as the base case. The TC discussed whether to continue to use the overall *F* target, or to use a smaller *F* that represents the proportion of the total *F* due to the commercial fishery. Although the estimated quota reduction was different between the methods, using the smaller *F* did not necessarily result in a smaller quota reduction. However, the current assessment model does not calculate a separate *F* for the commercial and recreational fleets, so the TC agreed that trying to calculate an *F* for each individual state's commercial fishery would increase the uncertainty in the overall analysis and recommended using the *F* target as had been done in the SPR calculations in the CE proposals for previous commercial size limit changes. This was highlighted as another source of uncertainty for the SPR analysis.

Discard Mortality

The TC discussed whether to adjust the estimated selectivity curves for discard mortality. One option that was considered was similar to what was done for the slot limit analysis for Amendment 7, where the proportion of fish-at-age above the legal size limit could be multiplied by a commercial discard mortality rate. In the end, the TC decided not to adjust the selectivity for discard mortality, as this would have the effect of making the new selectivity curves more similar to the status quo and reducing the difference between the status quo quotas and the SPR-equivalent quotas, meaning in most cases, the quota with discard mortality included would be higher than the adjusted quota without discard mortality included. Since commercial discards are not counted against the commercial quota, this would have the effect of allowing more directed commercial harvest while not reducing discards. Instead, the TC recommended trying to estimate the increase in commercial discards that would be expected under the different options and presenting this information in the Addendum as context. This was highlighted as another source of uncertainty for the SPR analysis.

Results:

Table 1. Ocean commercial quota changes under a maximum size of 38, 40, and 42 inches

	Option A. Status Quo (No maximum size applies)		Option B1. 42" maximum size limit		Option B2. 40" Maximum Size Limit		Option B3. 38" Maximum Size Limit	
	2022 Size Limit	**2022 Quota**	**Size Limit**	**Quota (% change)**	**Size Limit**	**Quota (% change)**	**Size Limit**	**Quota (% change)**
ME	N/A*	154	28 - 42"	129 (-16.2)	28 - 40"	122 (-20.8)	28 - 38"	113 (-26.6%)
NH	N/A *	3,537	28 - 42"	2,968 (-16.1%)	28 - 40"	2,796 (-21%)	28 - 38"	2,585 (-26.9%)
MA	35" min	735,240	35 - 42"	634,400 (-13.8%)	35 - 40"	581,483 (-21%)	35 - 38"	545,161 (-25.9%)
RI	26" min FFT; 34" min GC	148,889	26 - 42" FFT 34 - 42" GC	133,040 (-10.6%)	26 - 40" FFT 34 - 40" GC	128,735 (-13.5%)	26 - 40" FFT 34 - 40" GC	119,905 (-19.5%)
CT	N/A **	14,607	28 - 42"	22,255 (52.4%)	28 - 40"	20,642 (41.3%)	28 - 38"	18,821 (28.9%)
NY	26 - 38"	640,718	26 - 42"	704,286 (9.9%)	26 - 40"	672,744 (5%)	26 - 38"	640,718 (0%)
NJ	bonus program 24 - <28"	215,912	24 - 42"	321,708 (49%)	24 - 40"	303,825 (40.7%)	24" - 38"	284,243 (31.7%)
DE	28", except 20" for gill nets in DE Bay/River 2.15-5.31	142,474	28 - 42", except 20 - 42" for gill nets in DE Bay/River 2.15-5.31	133,506 (-6.3%)	28 - 40", except 20 - 40" for gill nets in DE Bay/River 2.15-5.31	128,252 (-10%)	28 - 40", except 20 - 40" for gill nets in DE Bay/River 2.15-5.31	118,854 (-16.6%)
MD	24" min	89,094	24 - 42"	83,141 (-6.7%)	24 - 40"	78,160 (-12.3%)	24 - 38"	72,563 (-18.6%)
VA	28" min	125,034	28 - 42"	118,768 (-5%)	28 - 40"	113,478 (-9.2%)	28 - 38"	107,008 9 (-14.4%)
NC	28" min	295,495	28 - 42"	275,782 (-6.8%)	28 - 40"	264,820 (-10.3%)	28 - 38"	245,048 (-17.1%)

*Assumes the Amendment 6 standard minimum size limit of 28".

** Assumes the minimum size (22-28") of the bonus program that CT's quota was last based on (the bonus program is no longer in use).

Table 2. Chesapeake Bay commercial quota changes under a 36 inch and a seasonal 28 and 36 inch maximum size limit.

	Option A. Status Quo (no maximum size applies)		Option E1. 36" Maximum Size		Option E2. 28" Maximum Size Limit Jan - May; 36" Maximum Size Limit Jun - Dec	
	2022 Size Limit	2022 Quota	Size Limit	Quota (% change)	Size Limit	Quota (% change)
MD Ches Bay	18 - 36"	1,445,394	18 - 36"	1,445,394 (0%)	18 - 28" Jan-May; 18 - 36" Jun - Dec	1,407,463 (-2.6%)
PRFC	18" min, 36" max during 2.15-3.25	572,861		558,626 (-2.5%)		554,767 (-3.2%)
VA Ches Bay	18" min, 28" max during 3.15-6.15	983,393		768,978 (-21.8%)		730,240 (-25.7%)

Results

Table 1 and 2 show the adjusted commercial quotas under different maximum size limit options (Table 1 is for the ocean commercial fishery and table 2 is for the Chesapeake Bay commercial fishery). It should be noted some states (CT, NY and NJ) quotas increase with the change in maximum size, because their existing quotas are based on a maximum size limit that is lower than the proposed options. For states with an increase to their quota, the increase ranges from 5 to 52.4 percent. For states with decreases to their quota, the decrease ranges from 5 to 26.9 percent. A maximum size limit decreases the quota for the majority of states with active commercial fisheries with the exception of New York.

TC Comments

The TC raised concerns about the implementation of a commercial maximum size limit as a management tool. If a maximum size limit is implemented without a quota adjustment, total removals in numbers of fish will increase, as the average size of the fish in the catch is smaller and the discards of oversize fish will increase. The SPR calculations discussed here attempt to account for this by calculating an adjusted quota that will keep a state's commercial impact on the overall spawning potential of the stock the same under the new size limits so that these quotas are conservationally equivalent to the commercial quotas under the status quo regulations. However, the TC notes that there are numerous sources of uncertainty for this analysis, such as the challenge of accurately characterizing the realized change in selectivity under the new regulations, especially combined with the unpredictable effect the new regulations will have on the behavior of the commercial fishery. For example, if the new maximum size is higher than the current maximum size in a state, the SPR calculations allow the quota to be increased to account for the harvest of larger fish. However, the fishery may not actually realize harvest of larger fish due to market demands, availability of larger fish, and gear restrictions or limitations, resulting in higher overall removals with regard to SPR under the higher quota. In addition, the effects of increased discards of oversize fish and the other issues highlighted in the methods section increase the uncertainty about the effects of this management change. Implementing a more uncertain management option that is designed to have no effect on overall stock productivity increases the uncertainty around the rebuilding probabilities and the impact on the stock without having a positive impact on overall stock productivity. There is an increased downside and no upside to implementing this management change from a technical analysis.

The TC understands that the Board's intent with this option is to protect larger, older fish from harvest. However, the TC refers the Board to previous analyses evaluating the impact of slot limits vs. maximum size limits in the recreational fishery, where lower selectivity on older fish had a negligible impact on long-term spawning stock biomass and did not affect the timeline for rebuilding. Fishing mortality and total removals was the driving factor in whether the stock had a high probability of rebuilding by 2029.