Mid-Atlantic Fishery Management Council
800 North State Street, Suite 201, Dover, DE 19901
Phone: 302-674-2331 | FAX: 302-674-5399 | www.mafmc.org
Michael P. Luisi, Chairman | P. Weston Townsend, Vice Chairman
Christopher M. Moore, Ph.D., Executive Director

MEMORANDUM

Date: January 28, 2021

To: Council

From: J. Didden

Subject: River Herring/Shad (RH/S) Cap White Papers

Several topics have repeatedly surfaced during discussions about the RH/S cap in recent years. To facilitate either progress or closure regarding these topics, staff drafted the attached white papers for Council consideration: 1) potential cap alignment with New England, 2) spatial considerations, and 3) ways to modify the cap based on biological indicators of abundance. Staff will review the papers and request guidance from the Council on which topics (if any) to further develop.

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MEMORANDUM

Date: January 28, 2021

To: Council

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Subject: Potential Joint Mid-Atlantic Fishery Management Council (MAFMC) and New England Fishery Management Council (NEFMC) River Herring and Shad (RH/S) Cap(s)

Current Caps

MAFMC: The current MAFMC RH/S cap for the Atlantic mackerel (simply "mackerel" hereafter) fishery originated from historical encounter rates to incentivize RH/S avoidance by the mackerel fishery, or close the mackerel fishery once the cap is reached. Encounter rates from 2005-2012 data were used to set the cap so that if the fishery achieves a RH/S encounter ***rate*** lower than the 2005-2012 median, then the fishery should be able to catch the mackerel quota. Co-landings of mackerel and other species (mostly Atlantic herring) are considered and integrated into both cap setting and monitoring. The total landings of all species on cap trips are combined with the in-season RH/S rate to calculate cap usage through each year[1]. While the cap was set to account for the mixed nature of the fishery, such accounting is approximate because the species mixing varies from year to year. At the current RH/S cap (129 MT[2]), if typical mixing of mackerel and other species occurs, the fishery should be able to catch the mackerel quota if the RH/S encounter rate on cap trips stays below ***half a percent*** (0.50%) of total retained catch.

As the mackerel quota has varied, so has the RH/S cap amount (it was originally 236 MT in 2014), theoretically preserving a similar incentive to avoid RH/S each year[3]. Since there is little quantitative information on the impact of ocean bycatch on RH/S stocks, and there is ongoing debate about what stressors most impact RH/S stocks, the MAFMC's approach has focused on generally incentivizing avoidance. Given the high variability in interannual distributions in the NEFSC trawl survey, the relatively small quantities of RH/S involved, and the effects on precision of low observer coverage, the MAFMC did not further divide the mackerel RH/S cap by gears and/or areas.

NEFMC: The NEFMC uses four RH/S caps for the Atlantic herring fishery: Cape Cod Mid-water Trawl, Gulf of Maine Mid-water Trawl, Southern New England Bottom Trawl, and

[1] NMFS recommended during cap development that extrapolating based on total kept fish had less potential for bias than using just a targeted species' landings.
[2] One metric ton (MT) equals about 2204.6 pounds.
[3] The level of interaction is also dependent on RH/S abundances, which are not accounted for so far.

Southern New England Mid-water Trawl. The NEFMC caps are also based on historical estimates; 2008-2014 are considered the "reference period" before RH/S catch caps were implemented.[4] The NEFMC's general approach has been to cap to reference period catch amounts, so the Atlantic herring fishery's RH/S caps have been largely static despite substantial changes in the Atlantic herring quotas. The four NEFMC caps have totaled 361 MT since the 2016 fishing year (originally 312 MT 2014-2015).

Cap Performance

Details on cap performance can be found in recent Council documents- https://www.mafmc.org/s/Tab11_RHS-Update_2019-08.pdf for mackerel and at https://s3.amazonaws.com/nefmc.org/Final-white-paper-on-River-herring-and-Shad.pdf for Atlantic herring. In general the caps appear to have been performing as intended – RH/S catch has been below the caps in most instances, and when closures have been triggered the final estimates have been relatively close to the cap amount. Because of the overlap in the mackerel and Atlantic herring fisheries, and because fish on one trip are sometimes counted against both the mackerel and Atlantic herring caps (as planned and accounted for), the mackerel and Atlantic herring cap totals can't be added. Given the different approaches taken by the two Councils, there is no "allocation" of a total amount of RH/S between the caps. Each Council has taken a different approach to the caps in the absence of information about coastwide fishing mortality and abundance.

Implementation of the caps coincides with reduced at-sea RH/S catch estimates (combined, all gear types). The average/median catches from the 2005-2012 mackerel base years were 535 MT/483 MT while the average/median catches since the cap implementation with available estimates (2014-2018) were 281 MT/255 MT (see Council documents linked above). It is not clear if this trend (a reduction by nearly half) is coincidental or causally linked to the RH/S caps, but much of the core fleet has been active in real-time communication efforts to avoid RH/S (https://www.umassd.edu/smast/bycatch/).

Joint and/or Aligned Caps

The designed double counting and differential cap usage from year to year among the various caps result in ongoing consideration of further coordination. A disconnect between bycatch estimate amounts by fishery (the caps) and by gear/area fleet (SBRM) may also occur. From MAFMC staff's perspective however, unless there is first a more fully aligned joint policy goal there may not be much utility in pursuing joint caps. Given their current approaches, one Council or the other seems likely to view a particular joint cap amount as overly or insufficiently restrictive. While NMFS could be given the authority to unilaterally resolve cap specification differences (as currently exists for spiny dogfish), it is not clear that the two Councils would want to assign this reconcilement task to NMFS.

If the Councils want to further pursue joint or aligned caps, simultaneous actions (either Amendments or Frameworks) could develop the exact mechanisms, likely with cap trip definitions rooted in a combined amount of mackerel and/or Atlantic herring by area and/or gear (or only using area and gear definitions). The actions would also need to describe the procedures

[4] Both Councils have decided not to update bycatch rates using data from more recent years when the fisheries have been under a cap as doing so could provide incentive for fishermen to actually increase their RH/S catch (to then get a higher cap), or penalize the fishery for having reduced RH/S catch.

for NMFS to resolve instances where the two Councils cannot agree on annual joint cap amounts. There would likely need to be adjustments to the timing of specifications and more time may need to be built-in for both Councils to consider joint caps, or the RH/S catch caps could be set separately from the traditional specifications. Either case would likely require additional staff resources.

In conclusion, staff can envision mechanisms that could make the caps joint, but it is not clear what benefits directly related to RH/S catch reduction would be served by such mechanisms. Setting clear purposes and aligned policy goals for a joint cap would seem a necessary first step before expending the considerable effort that would be needed for linked Council actions, associated rulemaking, and ongoing future reconcilements.

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Date: January 28, 2021

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Subject: River Herring and Shad (RH/S) Spatial Considerations

Staff examined NMFS **observer** data from three time periods for this analysis: 2008-2011, 2012-2015, and 2016-2019. These time groupings were the "analyst's choice," to balance increasing the number of observations in a group versus the potential to see change (or consistency) over time. For this initial analysis, staff used all available observer data (no trip definition to limit data), and simply binned combined RH/S catch by ten-minute squares (TMS). There was no extrapolating (by area or gear type), so the results are impacted/biased by the observer deployment protocols (the Standardized Bycatch Reporting Methodology (SBRM)) and fishing effort. This admittedly simple approach seemed like a reasonable first step, and makes use of the most observer data possible – all trips with any recorded RH/S catch were included. Table 1 summarizes the trips that had some catch of RH/S by gear type. Like the spatial analysis, the summary trip counts are influenced by observer coverage levels.

Table 1. Included trips by gear type, which is also the number of trips that had any recorded RH/S catch.

Gear	2008-2011	2012-2015	2016-2019
Bottom Trawl	1,072	1,295	2,005
Gill Net	203	353	310
Mid-Water Trawl	199	107	46
Other	27	27	18

The TMSs (about 100 square miles each) were sorted from most to least RH/S catch, and then grouped and labeled "1", "2," "3," or "4." The TMSs with the most RH/S catch that totaled at least 25% of the RH/S catch for a time period were labeled "1s." In a time period, it may have been a single TMS, or several TMSs to make up that first 25% of observed RH/S catch (raw data). For each following group/label (2,3,4), the other TMSs that account for the next 25% of catch are grouped and labeled similarly. Since the TMSs are first sorted from high to low catch, it takes relatively few initial TMSs (which have the highest catch) to get the first 25% of total catch (group 1), more TMSs to get the next 25% of total catch (group 2), and so on. So there are few of the darkest blue TMSs and more lighter blue TMSs.

There do seem to be some areas that have repeated higher RH/S catches common among two or three time periods. Staff noted (subjective visual inspection and drawing by staff) four areas with

green dashed outlined boxes in the figures below that appear to have repeated higher RH/S catches. As was considered with previous actions, the real effects of closing any area mostly depend on how the relevant fisheries respond to closures, and the proportions of both the targeted species and RH/S in the areas where any re-directed effort ends up. If a fishery is pushed into an area with lower abundance of RH/S but where the targeted species is scarce, the net effect could increase total RH/S catch if the fishery expends additional effort to compensate. Nevertheless, the four highlighted areas accounted for 65% of observed RH/S catch in 2008-2011, 61% in 2012-2015, and 57% in 2016-2019. In addition, most (74%-89%) of the RH/S in those four areas occurred during the months of January, February, November, and December. For reference, the approved (effective February 10, 2021) NEFMC inshore midwater trawl restricted areas are also included in Figure 4.

If the Council would like to explore this issue further, staff recommends that the Council request revenue maps from the NEFSC (like were done for the coral amendment) for small mesh bottom trawl and mid-water trawl gear corresponding to these time periods (January, February, November, and December of 2008-2011, 2012-2015, and 2016-2019). Then with those maps, staff could gather input from the advisory panel during planned 2021 meetings on whether possible restrictions in these times/areas could facilitate the fishery avoiding RH/S while still catching the relevant quotas (or whether restrictions could just re-shuffle effort in an inefficient manner). Based on the revenue maps and AP input, the Council could then consider whether to evaluate potential time-area closures in a 2022 action, with additional analysis conducted by an FMAT.

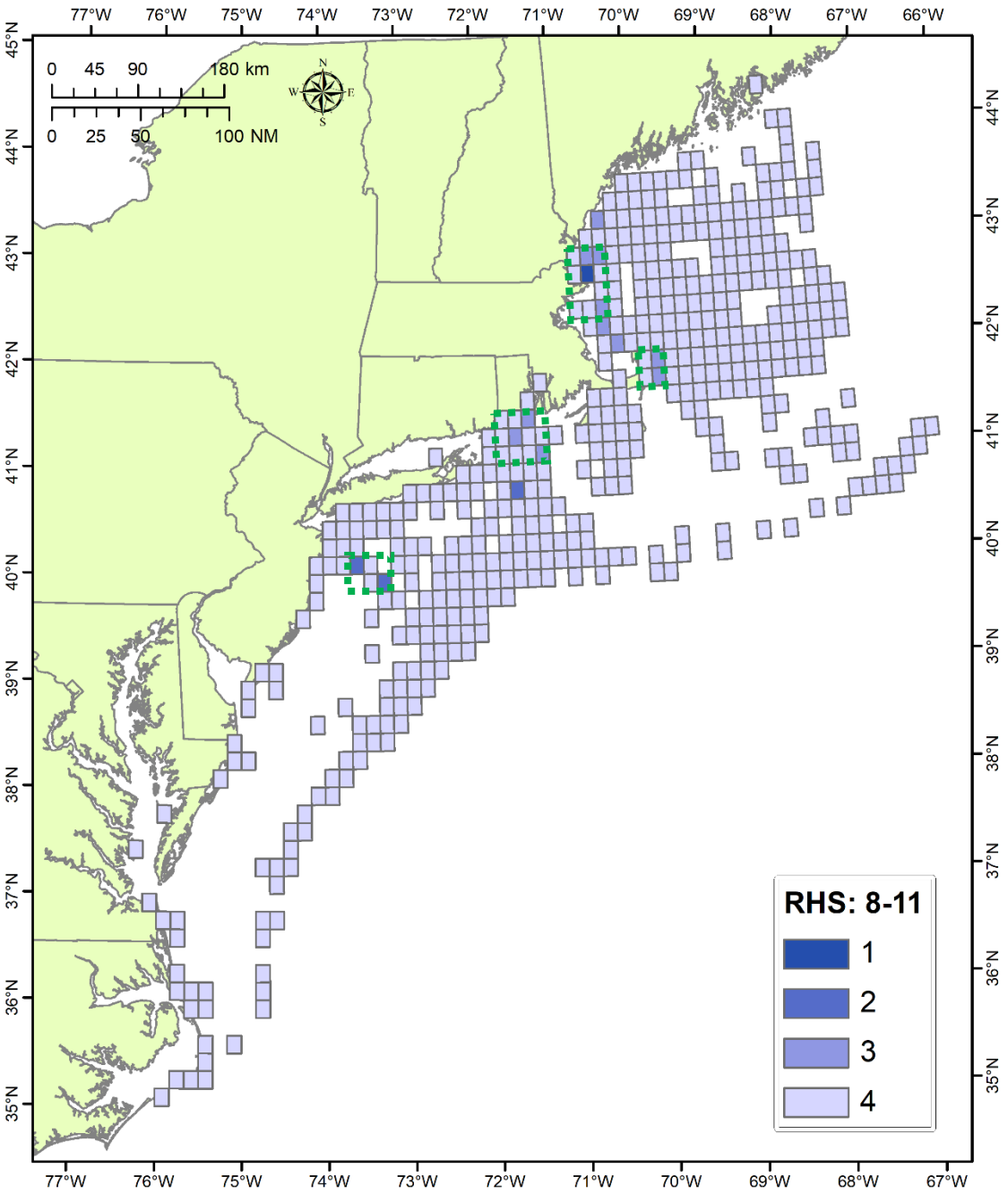

Figure 1. RH/S catch density (raw data) in 2008-2011 observer data, all gears. 1 = those ten minute squares that had highest RH/S catch and accounted for 25% of total observed RH/S catch, and so on for other quartiles of total RH/S catch and less dense groups of ten minute squares. Staff noted (subjective visual inspection and drawing by staff) four areas with green dashed outlined boxes that appeared to have repeated higher RH/S catches.

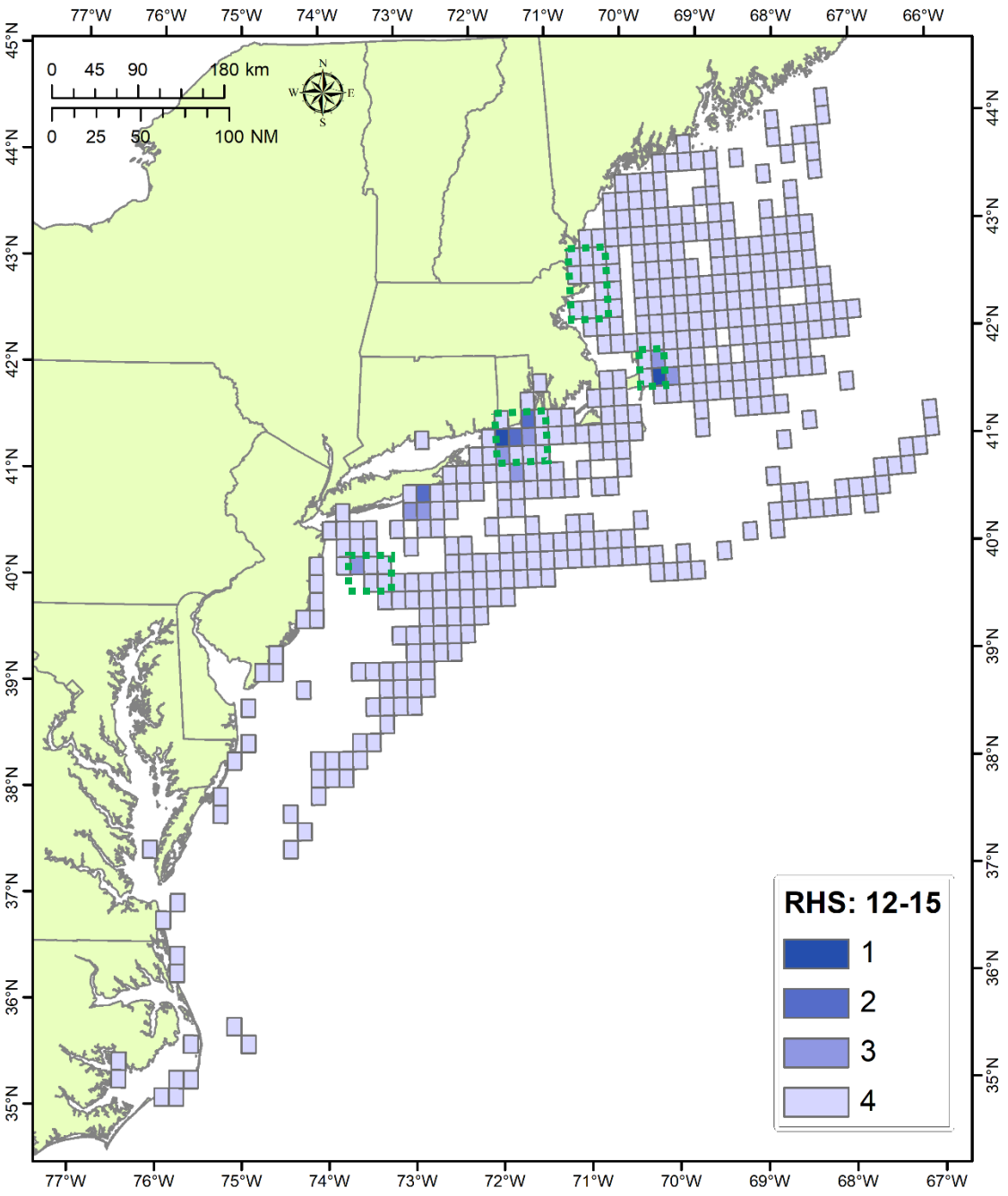

Figure 2. RH/S catch density (raw data) in 2012-2015 observer data, all gears. 1 = those ten minute squares that had highest RH/S catch and accounted for 25% of total observed RH/S catch, and so on for other quartiles of total RH/S catch and less dense groups of ten minute squares. Staff noted (subjective visual inspection and drawing by staff) four areas with green dashed outlined boxes that appeared to have repeated higher RH/S catches.

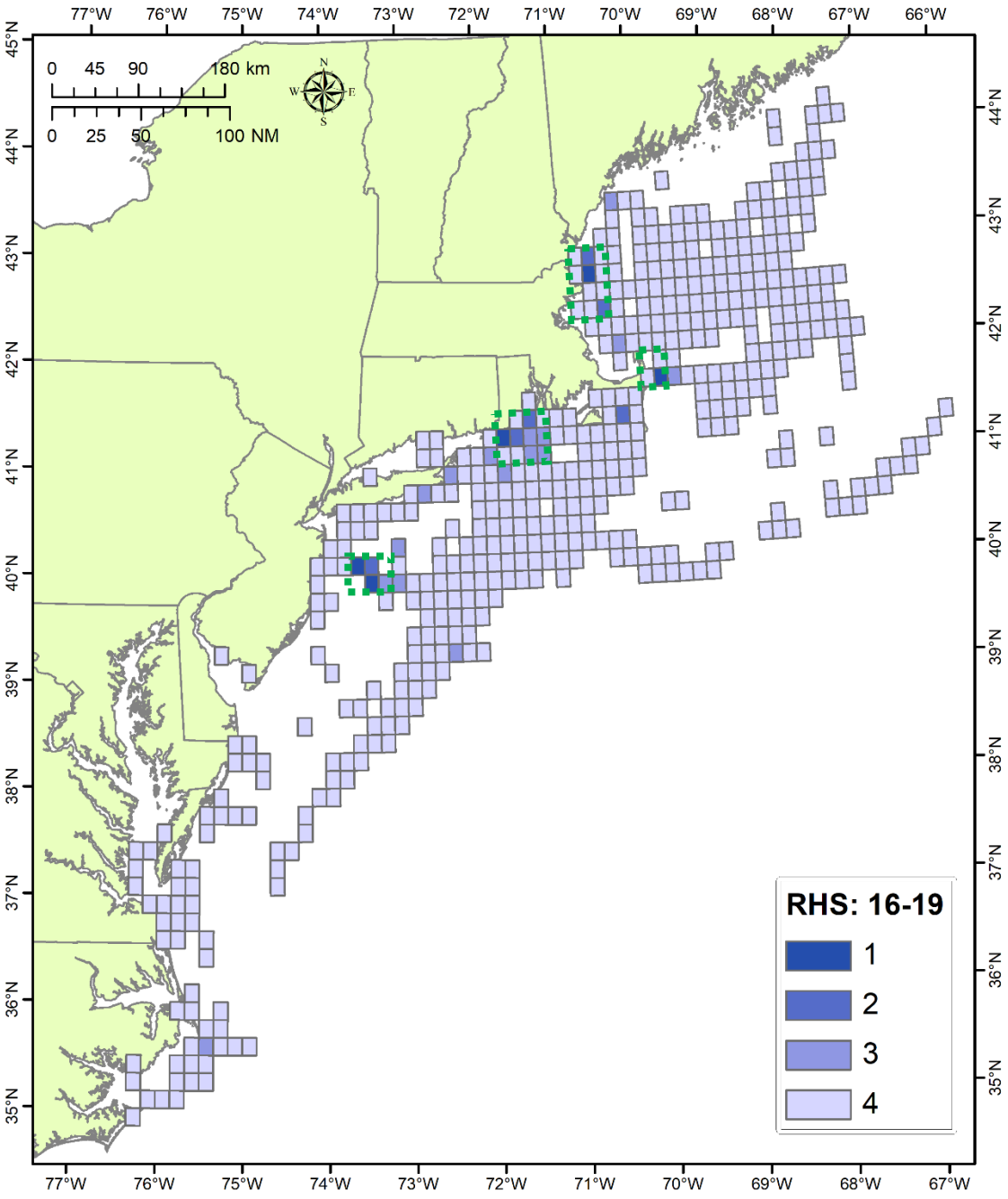

Figure 3. RH/S catch density (raw data) in 2016-2019 observer data, all gears. 1 = those ten minute squares that had highest RH/S catch and accounted for 25% of total observed RH/S catch, and so on for other quartiles of total RH/S catch and less dense groups of ten minute squares. Staff noted (subjective visual inspection and drawing by staff) four areas with green dashed outlined boxes that appeared to have repeated higher RH/S catches.

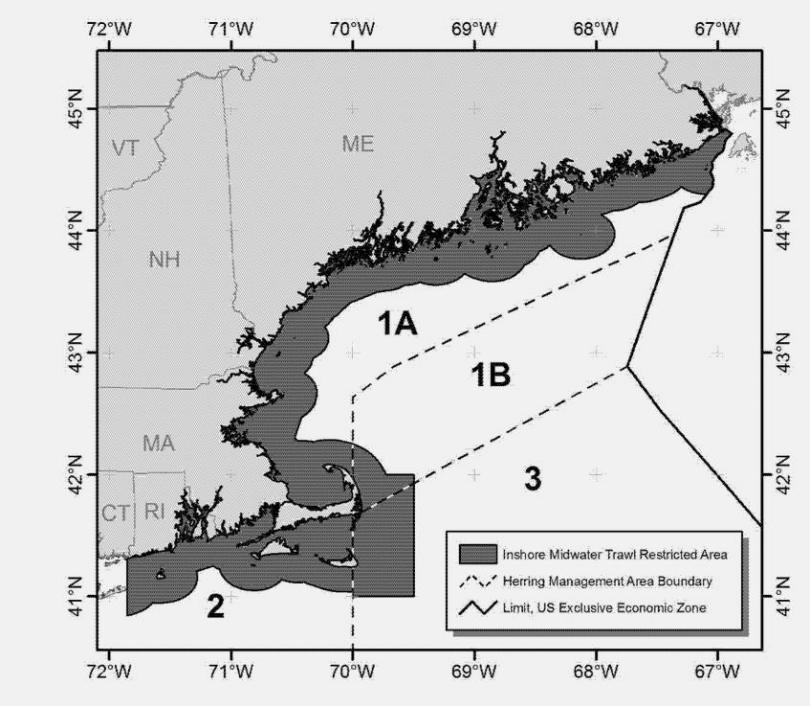

Figure 4. NEFMC Inshore Midwater Trawl Restricted Area (Effective February 10, 2021)

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MEMORANDUM

Date: January 28, 2021

To: Council

From: J. Didden

Subject: Modification of River Herring and Shad (RH/S) Cap based on Biological Indicators

Current Cap

The current MAFMC RH/S cap for the Atlantic mackerel (simply "mackerel hereafter) fishery originated from historical rates to incentivize RH/S avoidance by the mackerel fishery, or close the mackerel fishery once the cap is reached. Encounter rates from 2005-2012 data were examined, and the cap is set such that if the fishery achieves a RH/S encounter ***rate*** lower than the median of what occurred from 2005-2012, then the fishery should be able to catch the mackerel quota.

Co-landings of mackerel and other species (mostly Atlantic herring) are considered. The total landings of all species on a cap trip are combined with the in-season RH/S rate to calculate cap usage through each year[1]. While the cap was set to account for the mixed nature of the fishery, such accounting is approximate because the species mixing varies from year to year. At the current RH/S cap (129 MT[2]), if typical mixing of mackerel and other species occurs, the fishery should be able to catch the mackerel quota if the RH/S encounter rate on cap trips stays below ***half a percent*** (0.50%) of total retained catch.

As the mackerel quota has varied, so has the RH/S cap amount (it was originally 236 MT in 2014), theoretically preserving a similar incentive to avoid RH/S each year. Besides fleet behavior, the level of interaction is also dependent on RH/S abundance trends, which are not accounted for so far. So if RH/S abundances were to substantially decline then it would be easier to stay within the cap, and if RH/S abundances were to substantially increase then it would be harder to stay within the cap.

The implementation of the RH/S caps coincides with reduced RH/S catch estimates. The average/median catches from the 2005-2012 mackerel base years were 535 MT/483 MT while the average/median catches since the cap implementation with available estimates (2014-2018) were 281 MT/255 MT (https://www.mafmc.org/s/Tab11_RHS-Update_2019-08.pdf). It is not clear if this relationship (a reduction by nearly half) is coincidental or causal. The reduction

[1] NMFS recommended during cap development that extrapolating based on total kept fish had less potential for bias than using just a targeted species' landings.
[2] One metric ton (MT) equals about 2204.6 pounds.

could be due to fleet avoidance behavior and closures, or it could be due to changing RH/S abundances/availabilities.

If there were quantitative coastwide assessments for all four RH/S species, then the trends in RH/S populations from 2005 to current could be examined and inform the setting of the RH/S cap. However, the assessments take a river-level approach given the species' stock structures (and there is no hickory shad assessment).

During 2020 Mackerel, Squid, and Butterfish (MSB) Monitoring Committee work, Council staff considered if there might be sufficient survey information available to inform the RH/S cap even if no quantitative coastwide information was available. The most representative single survey for coastwide abundance is the NEFSC spring trawl survey. While there does appear to be an upward trend in combined river herring and American Shad indices, Council staff, after consulting with Kiersten Curti of the NEFSC (who has been the NEFSC lead on both mackerel and RH/S issues), recommends against scaling the RH/S cap based just on the trend of the NEFSC survey. Given the pelagic and diadromous life history of these species, the assumption of constant RH/S catchability/availability necessary to interpret temporal trends is likely violated. However, staff does think that analyses to combine Bigelow, NEAMAP, and possibly state coastal surveys, may be fruitful, and the VAST (Vector Autoregressive Spatio-Temporal) models being developed by the NEFSC could potentially be applied to such an analysis. Staff thus recommends that the Council request that the NEFSC investigate whether the VAST model approach could be brought to bear to consider whether a series of combined RH/S indices could provide information on combined RH/S abundance trends, which could then inform RH/S cap setting.