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DRAFT MEMORANDUM VERSION 2

DATE: December 2, 2020

TO: Groundfish Committee

FROM: Groundfish Plan Development Team

SUBJECT: **Draft Environmental Impacts Analysis for Framework Adjustment 61**

This draft memorandum (version 2) includes the following draft environmental impacts analysis:

- *Attachment 1* - Biological impacts– status determination criteria, white hake rebuilding, and specifications;
- *Attachment 2*- Economic impacts – status determination criteria, white hake rebuilding, and specifications; and
- *Attachment 3*- Scallop Plan Development Team (PDT) memo to Groundfish PDT on groundfish bycatch in the scallop fishery.

Version 2 updates and replaces version 1, dated November 27, 2020.

6.2 Impacts on Regulated Groundfish and Other Species – Biological

Biological impacts discussed below focus on expected changes in fishing mortality for regulated multispecies stocks. Changes in fishing mortality may result in changes in stock size. Impacts on essential fish habitat and endangered or threatened species are discussed in separate sections. Impacts are discussed in relation to impacts on regulated multispecies (groundfish) and other species. The impacts associated with the measures are anticipated to not be significant in comparison to the No Action alternatives.

Throughout this section, impacts are often evaluated using an analytic technique that projects future stock size based on a recent age-based assessment. These projections are known to capture only part of the uncertainties that are associated with the assessment projections. There is evidence, that in the case of multispecies stocks, that the projections tend to be overly optimistic when they extend beyond a short-term period (i.e., 1-3 years). This means that the projections tend to over-estimate future stock sizes and under- estimate future fishing mortality. These uncertainties in the projection methodology should be considered when reviewing impacts that use this tool. Long term projections (greater than 3 years) should not be over interpreted since they are imprecise and are often overly optimistic. The uncertainty estimates (90% confidence intervals on SSB) from the projections do not cover the true uncertainty in the population. This is the justification for why the SSC did not use the projection uncertainty estimates to determine the scientific uncertainty buffer between the ABC and the OFL.

6.2.1 Action 1 – Status Determination Criteria

A management track assessment for GB winter flounder and SNE/MA winter flounder, along with seven other groundfish stocks, was completed in September 2020. The assessment determined that GB winter flounder and SNE/MA winter flounder are both overfished and overfishing is not occurring (Table XX in Affected Environment). The peer review accepted both the GB winter flounder age-structured VPA assessment model, and the SNE/MA winter flounder age-structured ASAP assessment model. The peer review recommended updating biological references points for both GB winter flounder and SNE/MA winter flounder.

For GB winter flounder, the assessment and the peer review recommended updating the current MSY biological reference points (calculated from the stock-recruitment relationship) to proxy-based biological reference points (F40%, SSB40%) as recommended by the panel review in the 2019 assessment. Similarly, for SNE/MA winter flounder, the assessment and the peer review recommended updating the MSY biological reference points calculated in previous assessments (based on the stock-recruitment relationship) to proxy-based biological reference points (F40%, SSB40%), from SSC concerns with recent recruitment being estimated below predicted values from the stock recruitment relationship, and from recommendations by the 2018 peer review panel in considering an F40%proxy. There was concern that the estimate F_{MSY} from the stock recruitment relationship could be too high relative to the estimate of F40%

6.2.1.1 Alternative 1 - No Action

Impacts on regulated groundfish

Under Alternative 1 (No Action), there would be no revisions to the status determination criteria (SDC) for GB winter flounder and SNE/MA winter flounder (Table 2 in Draft Alternatives), and numerical estimates for these two stocks would not change (Table 3 in Draft Alternatives) since the 2018 and 2019 groundfish stock assessments. 2020 management track assessments were completed for GB winter

flounder and SNE /MA winter flounder, and so the use of values from the previous assessment would conflict with using information from the most recent assessment. Previous 2018 and 2019 assessments used MSY biological reference points (calculated from the stock-recruitment relationship). The 2020 assessment peer review recommended updating to proxy-based biological reference points (F40%, SSB40%) for both GB winter flounder and SNE/MA winter flounder, as most groundfish stock assessments use proxy-based reference points.

Alternative/No Action would not be expected to have direct or indirect impacts on groundfish species in the short-term. This measure is primarily administrative in that it establishes the criteria used to determine if overfishing is occurring or the stock is overfished. For these reasons when comparing Alternative 1/No Action to Alternative 2, the likely impacts on regulated groundfish species are neutral, since this alternative will not directly change the estimated OFLs, ABCs, or ACLs. However, the projected estimates of OFLs and their respective ABCs and ACLs will no longer be consistent with the SDCs. Over the long-term, impacts of Alternative 1/No Action may be negative, as biomass targets would be based on outdated information, increasing the risk of overfishing over the long-term.

Impacts on other species

Alternative 1/No Action would not be expected to have direct or indirect impacts on non-groundfish species such as monkfish, dogfish, skates, and Atlantic sea scallops. This measure is primarily administrative in that it establishes the criteria used to determine if overfishing is occurring or the stock is overfished. For these reasons when comparing Alternative 1/No Action to Alternative 2, the likely impacts on other species are neutral.

6.2.1.2 Alternative 2 – Updated Status Determination Criteria

Impacts on regulated groundfish

Alternative 2 would adopt revised SDCs for GB winter flounder and SNE/MA winter flounder (Table 4 in Draft Alternatives). The NEFSC conducted management track assessments in 2020 for several stocks, including GB winter flounder and SNE/MA winter flounder. This option updates the SDCs and numerical estimates of the SDCs for these stocks (Table 4 and Table 5 in the Draft Alternatives), based on the peer review recommendations. Previous 2018 and 2019 assessments used MSY biological reference points (calculated from the stock-recruitment relationship). The 2020 assessment peer review recommended updating to proxy-based biological reference points (F40%, SSB40%) for both GB winter flounder and SNE/MA winter flounder, as most groundfish stock assessments use proxy-based reference points.

Alternative 2 would not be expected to have direct or indirect impacts on groundfish species in the short-term. This measure is primarily administrative in that it establishes the criteria used to determine if overfishing is occurring or the stock is overfished. For these reasons when comparing Alternative 1/No Action to Alternative 2, the likely impacts on regulated groundfish species are neutral. Over the long-term, impacts of Alternative 2 may be positive, since updating SDCs for both stocks according to the most recent assessments decreases the risk of overfishing over the long-term. Alternative 2 would make the SDCs consistent with the updated OFLs being proposed.

Impacts on other species

Alternative 2 would not be expected to have direct or indirect impacts on non-groundfish species such as monkfish, dogfish, skates, and Atlantic sea scallops. This measure is primarily administrative in that it establishes the criteria used to determine if overfishing is occurring or the stock is overfished. For these

reasons when comparing Alternative 1/No Action to Alternative 2, the likely impacts on other species are neutral.

6.2.2 Action 2 – Formal Rebuilding Program

6.2.2.1 Alternative 1 – No Action

Impacts on regulated groundfish

Under Alternative 1/No Action, fishing mortality (set at 75% F_{MSY}) would be maintained. The current rebuilding plan for white hake ended in 2014, with the stock not achieving rebuilt status. The stock would still be expected to experience rebuilding under Alternative 1/No Action, as the current management strategy would continue. Alternative 1/No Action would result in a fishing mortality that would be higher than that under Alternative 2, Option A and Option B, and thus Alternative 1/No Action would be expected to result in slower rebuilding of the stock. Alternative 1/No Action would result in the same fishing mortality as that under Option C, and therefore would result in similar impacts to Alternative 2, Option C.

Impacts on other species

Alternative 1/No Action would result in a fishing mortality for white hake that would be higher than that under Alternative 2, Option A and Option B, and thus Alternative 1/No Action would be expected to result in slower rebuilding of the stock. Relative to Alternative 2, Option A and Option B, Alternative 1/No Action might indirectly increase interactions between the groundfish fishery and other species that are caught as target and bycatch on groundfish fishing trips, because it would likely not lead to fewer groundfish fishing trips in the white hake stock area. ACL and AM systems for other stocks, however, should prevent overfishing from occurring and so the possible impacts would not be expected to compromise mortality targets. Alternative 1/No Action would result in the same fishing mortality as that under Option C, and therefore would result in similar impacts to Alternative 2, Option C.

6.2.2.2 Alternative 2 – Revised Rebuilding Strategy for White Hake

Based on the 2019 peer review, white hake is overfished but overfishing is not occurring (NEFSC 2020). This was a change in status, as the 2017 assessment concluded the stock was not overfished. Retrospective adjustments were made to the model results in the terminal year and the retrospective pattern appears to be worsening. White hake is under a rebuilding plan, but the stock did not rebuild by 2014 as planned.

The Council would select from one of the options below: Option A, Option B, or Option C.

The $F_{rebuild}$ would be in place for the 10 years of the plan, unless the Council was notified by NMFS that white hake is rebuilt, or the rebuilding plan was modified.

Options - *T_{target} = T_{max}, which is 10 years (2031).*

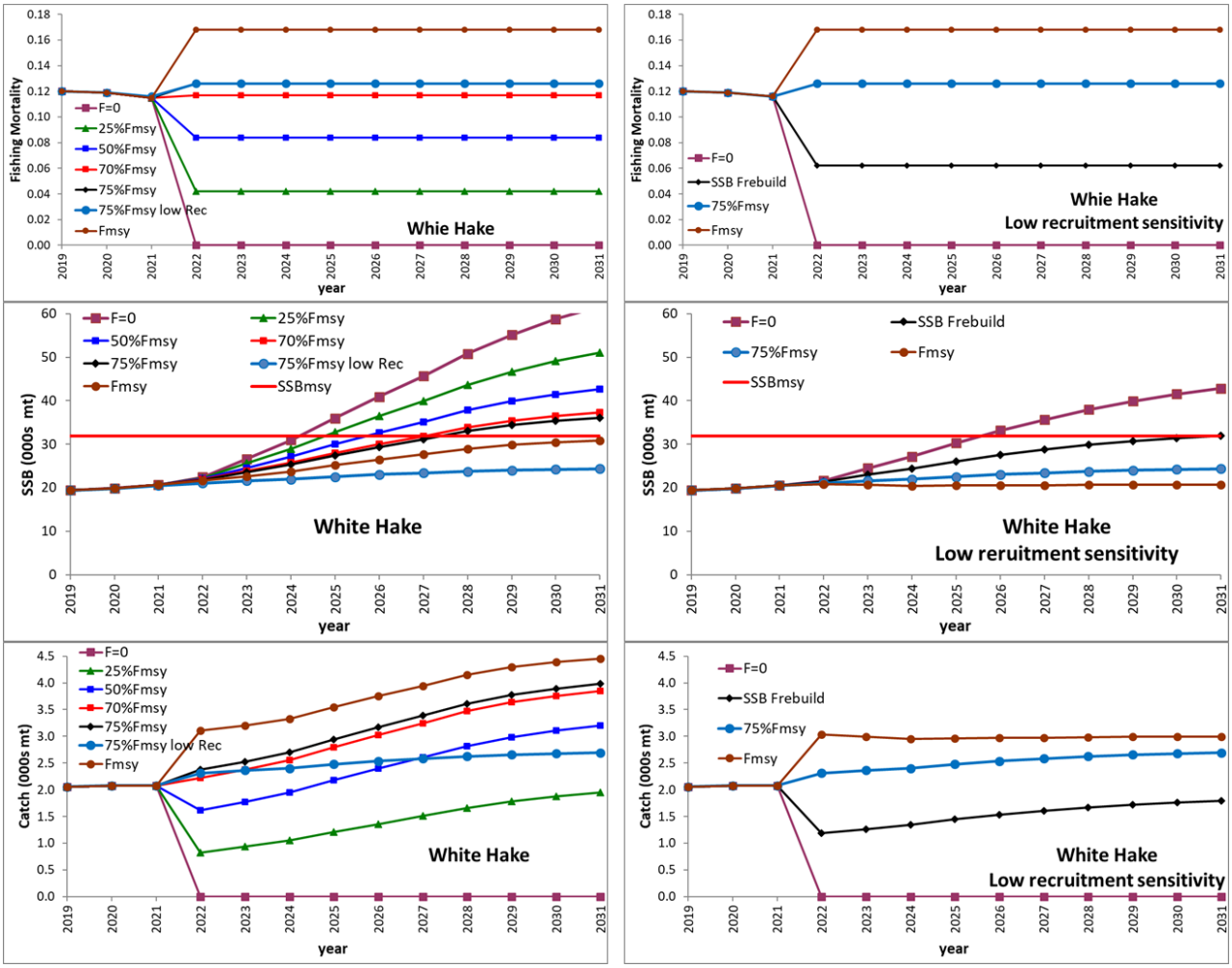
A. T_{target} of 10 years, rebuilding by 2031, at $F_{rebuild}$ of 50%F_{MSY} = 0.084, which results in a 98.6% probability of achieving B_{MSY},
B. T_{target} of 10 years, rebuilding by 2031, at $F_{rebuild}$ of 70%F_{MSY}= 0.117, which results in a 87.4% probability of achieving B_{MSY}, or

C. T_{target} of 10 years, rebuilding by 2031, at $F_{rebuild}$ of 75%F_{MSY} = 0.126, which results in a 81.7% probability of achieving B_{MSY}.

Analysis

Rebuilding projections (left side of Figure 1) were developed for white hake using projections that resample recruitment from the entire times series (1963-2016) of the assessment which is consistent with the projections used to estimate SSB_{MSY}. Projections were done assuming an updated PDT estimated bridge year catch in CY-2019, assumed ACLs plus the Canadian catch assumption in 2020 and 2021, and F_{MSY} (F40% overfishing definition), 75%F_{MSY}, 70%F_{MSY}, 50%F_{MSY}, 25%F_{MSY}, and F=0 for T-min from 2022-2031. The revised rebuilding plan is assumed to start in 2021 but there is no plan to revise the OFL and ABCs already in place for 2021. Short term catch advice for estimating ABCs and OFLs are made using projections that assume a more recent time series (1995-2016) of lower estimates of recruitment in the near term (right side in Figure 1). Rebuilding projections which used the recent low recruitment assumption were also run as a sensitivity to show the implication of recruitment not increasing to the time series mean in 2019. It is not known when recruitment will approach the time series mean but the sensitivity projections suggest that rebuilding will not occur quickly unless there is a rapid increase in recruitment from recent levels. This may suggest that rebuilding projections which use the full time series of recruitment are likely overly optimistic. It is possible to rebuild the stock under the low recruitment sensitivity but the projection suggests 37%F_{MSY} (SSB Frebuild run sensitivity plot) would be needed to rebuild the stock. This suggests that a rebuilding plan closer to a T-max of 10 years may be more realistic rather than a projection closer to a T-min of 4 years.

Figure 1- White Hake rebuilding projection assuming the cumulative distribution function (CDF) of the full times series of recruitment on the left compared to sensitivity projections that assume a CDF of lower recent recruitment on the right. Top plot is the fishing mortality, middle plot is for SSB with the red line indicating the SSBMSY to achieve the rebuilding target, and the bottom plot showing the catches given the fishing mortality rates.



Impacts on regulated groundfish

For white hake, Alternative 2, Option A would result in lower fishing mortality at 50%F_{MSY} and therefore more rapid rebuilding than Option B or Option C at 70%F_{MSY} and 75%F_{MSY}, respectively. If fishing mortality were set at 50%F_{MSY}, this action may also reduce mortality on other regulated groundfish stocks, if white hake quota became limiting to the groundfish fishery. Alternative 2, Option B would result in a fishing mortality that would be slightly lower than that under Alternative 1/No Action, and thus Option B would be expected to result in more rapid rebuilding of the stock. Option C would result in the same fishing mortality as that under Alternative 1/No Action, and therefore would result in similar impacts to Alternative 2, Option C.

Impacts on other species

Alternative 2, Option A would result in lower fishing mortality for white hake at 50%F_{MSY} and therefore more rapid rebuilding than Option B or Option C at 70%F_{MSY} and 75%F_{MSY}, respectively. If fishing mortality were set at 50%F_{MSY}, interactions between the groundfish fishery and other species that are caught as target and bycatch on groundfish fishing trips could be reduced, if white hake quota became limiting to the groundfish fishery. Relative to Alternative 1/No Action, Alternative 2, Option B might indirectly reduce interactions between the groundfish fishery and other species that are caught as target and bycatch on groundfish fishing trips, because it would likely lead to fewer groundfish fishing trips in the white hake stock area. ACL and AM systems for other stocks, however, should prevent overfishing from occurring and so the possible impacts of Alternative 1/ No Action would not be expected to compromise mortality targets. Option C would result in the same fishing mortality as that under Alternative 1/No Action, and therefore would result in similar impacts to Alternative 2, Option C.

6.2.3 Action 3 – Specifications

6.2.3.1 Alternative 1 – No Action

Impacts on regulated groundfish

Under Alternative 1/No Action, the ACLs specified for FY2021 would be unchanged from those adopted through FW59. There would be no changes to the specifications for FY2021 and default specifications would be set for Eastern GB cod, Eastern GB haddock, GOM winter flounder, SNE/MA winter flounder, redfish, ocean pout, and wolffish for the first three months of FY2021. Under Alternative 1/No Action, there would be no new FY2021 quotas specified for the transboundary Georges Bank stocks of GB cod, GB haddock and GB yellowtail flounder, which are managed through the US/CA Resource Sharing Understanding. These quotas are specified annually.

Under Alternative 1/No Action, the directed groundfish fishery would be expected to operate in all broad stock areas through July 31, 2021. As of August 1, 2021, Eastern GB cod, Eastern GB haddock, GOM winter flounder, SNE/MA winter flounder, redfish, ocean pout, and wolffish would not have ACLs specified. In the absence of these specifications, commercial groundfish vessels would not be allowed to fish in all broad stock areas without an allocation. It is anticipated that Alternative 1/No Action would result in minimal changes in fishing effort during the first three months of the fishing year. After July 31, 2021, Alternative 1/No Action would be expected to halt commercial groundfish fishing effort in all broad stock areas. Without specification of an ACL, a catch would not be allocated to the commercial groundfish fishery (sectors or common pool vessels) and targeted groundfish fishing activity would not occur for these stocks. Catches would not be eliminated because there would probably be incidental catches or bycatch from other fisheries. AMs in the multispecies fishery would be maintained but are expected to have a low probability of being triggered without allocations.

In addition to the lack of targeted groundfish fishing activity in all broad stock areas, certain provisions of the sector management system probably would constrain fishing even for stocks with an ACL within the fishing season. For example, current management measures require that a sector stop fishing in a stock area if it does not have ACE for a stock. Fishing can continue on stocks for which the sector continues to have ACE only if the sector can demonstrate it would not catch the ACE-limited stock. What these provisions mean is that in most cases there would be little opportunity for sector vessels to fish on stocks in all broad stock areas that have an ACL under Alternative 1/No Action, and so most commercial groundfish fishing activity would not occur.

The default specifications for Eastern GB cod, Eastern GB haddock, GOM winter flounder, SNE/MA winter flounder, redfish, ocean pout, and wolffish would continue to allow fishing for the first three

months of the fishing year, but after that, fishing on groundfish trips would stop and biological impacts on regulated groundfish species would decline for stocks managed or located in each broad stock area. As a result, in general Alternative 1/No Action would be expected to result in positive biological impacts compared to Alternative 2.

An age-based assessment was used to assess the following stocks in 2022:

- GB winter flounder
- SNE/MA winter flounder
- Redfish

These models project the estimated median stock sizes expected to result by limiting catches to the ABC. In general, recent experience suggests that the projections tend to be biased high, predicting stocks sizes that are larger than realized and fishing mortality rates that are higher than expected (Groundfish Plan Development Team, pers. comm.). A preliminary analysis for four groundfish stocks suggests recent projections performed reasonably well for American plaice, GOM haddock and pollock., The analysis also suggests GB haddock did not perform as well (see Section 5.2.23 of FW59 for additional details).

There may be catches of these stocks by the groundfish fishery under default specifications through July 31, 2021 and by other fisheries throughout the year under Alternative 1/No Action. An estimate of these catches was used to approximate the catches that might occur and was compared to ABCs under Alternative 2 (Table 1 and Table 2). Using this information, a qualitative comparison of impacts on SSB by stock under Alternative 1/No Action and Alternative 2 is provided. In this section, SSB is used as a proxy for impact designation. Generally, lower fishing mortality under Alternative 1/No Action leads to increases in SSB, relative to Alternative 2 and is considered a positive impact on stocks that are not rebuilding sufficiently. For stocks that have a rebuilt status, Alternative 1/No Action may reduce fishing effort to levels substantially less than the F_{MSY}, however this is considered to be a negligible impact on the stock depending on the uncertainties in the stock projections.

Table 1- Estimated catches (mt) that may occur in FY2021 under Alternative 1/No Action. The "No Action Estimated Catch" used to compare to the Alternative 1/No Action 2021 ABC (mt). [to be completed]

Stock	Estimated Catch (Alt. 1- No Action)						ABC (Alt. 1)
	Commercial Groundfish Fishery - Sectors	Commercial Groundfish Fishery - Common Pool	Recreational Groundfish Fishery	Other Fisheries	Canadian Fisheries	Total	
GB winter flounder							
SNE/MA winter flounder							
Redfish							

Notes:
Groundfish Fishery Assumed Catch:

- Commercial - Quota Change Model results under Alternative 1/No Action (see Table X) for sectors and three-year average catch (FY2017-FY2019) for common pool.

Other Assumed Catch:

- Other Fisheries - includes the state waters and other sub-components for FY2021 (see Table X), with exceptions:
- Includes the Scallop PDT's estimate of catches of SNE/MA yellowtail flounder (X mt) for FY2021, and
- Uses three-year average recreational catches (FY2017-FY2019) for SNE/MA winter flounder (old MRIP)
- Canadian fisheries - includes estimated Canadian catches were added for GB winter flounder (XX) based on Appendix II.

Table 2- Estimated catches (mt) that may occur in FY2021 under Alternative 2. The "Alternative 2 Estimated Catch" used to compare to the proposed 2021 ABC (mt) used in Alternative 2 stock projections. [to be completed]

Stock	Estimated Catch (Alt. 2)						ABC (Alt. 2)
	Commercial Groundfish Fishery - Sectors	Commercial Groundfish Fishery - Common Pool	Recreational Groundfish Fishery	Other Fisheries	Canadian Fisheries	Total	
GB winter flounder							
SNE/MA winter flounder							
Redfish							

Notes:
Groundfish Fishery Assumed Catch:

- Commercial - Quota Change Model results under Alternative 2 (see Table X) for sectors and three-year average catch (FY2017-FY2019) for common pool.

Other Assumed Catch:

- Other Fisheries - includes the state waters and other sub-components for FY2021 (see Table X), with exceptions:
- Includes the Scallop PDT's estimate of catches of SNE/MA yellowtail flounder (X mt) for FY2021, and
- Uses three-year average recreational catches (FY2017-FY2019) for SNE/MA winter flounder (old MRIP)
- Canadian fisheries - includes estimated Canadian catches were added for GB winter flounder (XX) based on Appendix II.

Georges Bank Winter Flounder- Under Alternative 1/No Action the estimated catch in FY2021 is XX mt versus XX mt under Option 2 (Table 1 and Table 2). Therefore, SSB increases are expected to be greater under Alternative 1/No Action than Alternative 2.

Southern New England/Mid-Atlantic Winter Flounder- Under Alternative 1/No Action the estimated catch in FY2021 is XX mt versus XX mt under Option 2 (Table 1 and Table 2). Therefore, SSB increases are expected to be greater under Alternative 1/No Action than Alternative 2.

Redfish- Under Alternative 1/No Action the estimated catch in FY2021 is XX mt versus XX mt under Option 2 (Table 1 and Table 2). Therefore, SSB increases are expected to be greater under Alternative 1/No Action than Alternative 2.

Is not possible to project stock sizes for the following stocks:

- GB Yellowtail Flounder
- GOM Winter Flounder
- Northern Windowpane Flounder
- Southern Windowpane Flounder
- Ocean Pout
- Atlantic Halibut
- Wolffish

For index-assessed stocks an estimate of the probability of overfishing cannot be determined but the proposed ABC is based on the default control rule applied at 75% of F_{MSY}, an exploitation rate (such as the ratio of catch to a survey index), or an alternative approach applied to the most recent estimate of stock size. Because the proposed ABCs for stocks with an empirical assessment are determined using control rules, the proposed ABCs are not expected to lead to declines in biomass for these stocks.

For stocks without projections and in some cases for stocks with projections, the SSC has recommended constant ABCs and the Council adopted these recommendations. An overview of the history of the SSC's use of constant ABCs is found in Appendix IV of FW59.

Impacts on other species

Alternative 1/No Action is expected to have low positive indirect effects on non-groundfish species such as monkfish, dogfish, skates, and Atlantic sea scallops that are captured incidentally during groundfish trips. Indirect effects are generally likely to be beneficial given the expected reduced groundfish fishing activity. Catches of other species that occur on groundfish trips would decline as a result. There are only limited opportunities for groundfish vessels to target other stocks in other fisheries, so the shifting of effort into other fisheries is not likely to occur on a large scale. These other fisheries will also have ACLs and AMs so while such effort shifts may have economic effects the biological impacts should not be negative. Considering the differences between the ACLs of Alternative 1/No Action and Alternative 2, the fishing mortality on other stocks that are caught incidentally during groundfish trips would probably be lower under Alternative 1/No Action.

Lastly, sub-ACLs are designed to limit the incidental catch of GOM and GB haddock by mid-water trawl (MWT) herring fisheries, and exceeding the allocations results in triggering AMs in-season. No Action for GOM haddock and GB haddock would maintain the current sub-ACLs. Sub-ACLs for GOM haddock would remain unchanged and for GB haddock would decrease under Alternative 2. Since the No Action sub-ACL for GB haddock is slightly higher than Alternative 2, this increases the likelihood that the sub-ACL for GB haddock would be exceeded under Alternative 2, and the in-season AM would be triggered.

An in-season closure of the herring fishery would reduce fishing mortality of Atlantic herring, which would have low positive biological benefits for the Atlantic herring stock.

6.2.3.2 Alternative 2 – Revised Specifications

Impacts on regulated groundfish

Alternative 2 would reflect the results of the 2020 management track assessments, and the 2020 Transboundary Resource Assessment Committee stock assessments for U.S./Canada stocks. Alternative 2 would adopt new ABC's that are consistent with the most recent science. Option 2 would also specify total allowable catches (TACs) for the U.S./Canada Management Area for FY2021. Details on the SSC's recommendations are located in Appendix TBD.

Because this alternative would adopt FY2021 – FY2023 ABCs for all stocks that had assessments in 2020, short-term projections can be used to estimate the probability of overfishing and short-term changes in stock size for those stocks listed. These projections use catches equal to the ABCs that would be adopted if this alternative is selected. Since the management goal is to keep catches at or below ACLs, and ACLs are always less than the ABC, the projection results would be expected to slightly over-estimate the risk of overfishing and under-estimate future stock size. However, experience demonstrates that projections tend to be overly optimistic, and therefore, concerns about over-estimating the risk of overfishing and under-estimating future stock size are expected to be minimal.

Projected stock sizes are provided in Table 3 to Table 5 for these stocks and the probability of overfishing is listed in Table 6. This table compares projected future stock size. A comparison of probability of overfishing between the two alternatives is difficult as Alternative 1/No Action has no OFLs defined for some stocks.

Relative to FY2020, FY2021 ACLs under Alternative 2 would increase for several stocks including XX. There would also be decreases in the ACLs for XX, while others (XX) would remain unchanged.

Georges Bank Winter Flounder- SSB increases are expected to be greater under Alternative 1/No Action than Alternative 2.

Table 3-Projection results for Georges Bank winter flounder.

Year	OFL	ABC	F	SSB
2021	865	634	0.25	2,405
2022	974	634	0.22	2,404
2023	1,431	634	0.15	3,980

Southern New England/Mid Atlantic Winter Flounder - SSB increases are expected to be greater under Alternative 1/No Action than Alternative 2.

Table 4-Projection results for SNE/MA winter flounder [to be updated with F and SSB].

Year	OFL	ABC	F	SSB
2021	1,438	456		
2022	1,438	456		
2023	1,438	456		

Redfish- SSB increases are expected to be greater under Alternative 1/No Action than Alternative 2.

Table 5-Projection results for redfish.

Year	OFL	ABC	F	SSB
2021	13,519	10,186	0.029	354,027
2022	13,354	10,062	0.029	352,630
2023	13,229	9,967	0.029	349,907

Table 6- Estimated probability of overfishing if catch is equal to ABC. Note these results are from the projection output alone. Uncertainty comes from the model and projections; therefore, these probabilities do not account for the true uncertainty and therefore should not be considered as absolutes. These estimates are likely an underestimate of the true uncertainty based on experience with model and projection results. [to be completed]

		Probability of Overfishing		
Species	Stock	2021	2022	2023
Winter Flounder	GB			
Winter Flounder	SNE/MA			
Redfish				

It is not possible to project stock sizes for the following stocks, because these stocks do not have an accepted analytical assessment model:

- GB Yellowtail Flounder
- GOM Winter Flounder
- Northern Windowpane Flounder
- Southern Windowpane Flounder
- Ocean Pout
- Atlantic Halibut
- Wolffish

For index-assessed stocks an estimate of the probability of overfishing cannot be determined but the proposed ABC is based on an exploitation rate (e.g., GB yellowtail flounder and GOM winter flounder) or an alternative Plan-B smooth approach (e.g., Atlantic halibut) or 75% of FMSY (remaining stocks on the above list) applied to the most recent estimate of stock size. Empirical approaches are simple approaches that do not implicitly account for population dynamics. Nevertheless, ABCs set from empirical approaches are not expected to lead to further declines in biomass. Details on the SSC's recommendations are located in Appendix I.

Georges Bank yellowtail flounder- The ABC is recommended to remain constant for each year of the specification period (Table 7).

Table 7- OFLs and ABCs (mt) for Georges Bank yellowtail flounder based on recommendations from the SSC.

Year	OFL	ABC
2021	Unknown	125
2022	Unknown	125

Gulf of Maine Winter Flounder - The OFL and ABC is recommended to remain constant for each year of the specification period (Table 8).

Table 8- OFLs and ABCs (mt) for Gulf of Maine winter flounder based on recommendations from the SSC.

Year	OFL	ABC
2021	662	497
2022	662	497
2023	662	497

Northern windowpane flounder- The OFL and ABC is recommended to remain constant for each year of the specification period (Table 9).

Table 9- OFLs and ABCs (mt) for Northern windowpane flounder based on recommendations from the SSC.

Year	OFL	ABC
2021	Unknown	160
2022	Unknown	160
2023	Unknown	160

Southern windowpane flounder- The OFL and ABC is recommended to remain constant for each year of the specification period (Table 10).

Table 10- OFLs and ABCs (mt) for Southern windowpane flounder based on recommendations from the SSC.

Year	OFL	ABC
2021	513	384
2022	513	384
2023	513	384

Ocean Pout- The OFL and ABC is recommended to remain constant for each year of the specification period (Table 11).

Table 11- OFLs and ABCs (mt) for ocean pout based on recommendations from the SSC.

Year	OFL	ABC
2021	125	87
2022	125	87
2023	125	87

Atlantic halibut - The ABC is recommended to remain constant for each year of the specification period (Table 12).

Table 12- OFLs and ABCs (mt) for Atlantic halibut based on recommendations from the SSC.

Year	OFL	ABC
2021	Unknown	150
2022	Unknown	150
2023	Unknown	150

Wolffish- The OFL and ABC is recommended to remain constant for each year of the specification period (Table 13).

Table 13- OFLs and ABCs (mt) for wolffish based on recommendations from the SSC.

Year	OFL	ABC
2021	122	92
2022	122	92
2023	122	92

Sub-ACLs for Other Fisheries

An analysis of groundfish bycatch in other fisheries with groundfish sub-ACLs is provided in Appendix TBD, which includes examining Atlantic sea scallop fishery catches of yellowtail flounder and windowpane flounder.

The ABCs and ACLs under Alternative 2 include specification of sub-ACLs for other fisheries. Sub-ACLs are designed to limit the incidental catch of yellowtail flounder and windowpane flounder by the scallop fishery. Exceeding catch limits may trigger accountability measures for the scallop fishery. A comparison of the Alternative 2 specifications and the Scallop PDT's estimates of projected catch by the scallop fishery indicates that scallop fishery catches of SNE/MA yellowtail flounder, GB yellowtail flounder, southern windowpane flounder, and northern windowpane flounder are lower, similar to, or greater than the respective sub-ACLs, depending on the specification chosen in draft Scallop FW33 (projections not yet available for FY2021, expected to be updated in January). Summaries of recent catches of GB yellowtail flounder, SNE/MA yellowtail flounder, northern windowpane flounder, and southern windowpane flounder in the scallop and groundfish fisheries are provided (Table 14 to Table 18). Therefore, the overall impact of Alternative 2 ABCs and ACLs are likely to be low positive, neutral, or low negative with respect to the Atlantic sea scallop resource.

Table 14- Recent GB yellowtail flounder TACs, groundfish fishery sub-ACLs, and catches for fishing years 2015 through in-season 2020, November 24, 2020. Values shown in metric tons (mt). Source: GARFO year-end catch reports.

	Groundfish Fishery- GB Yellowtail Flounder						
Fishing Year	Total Shared TAC – US & CA (mt)	US % Share	US TAC (mt)	% US TAC Caught	Groundfish sub-ACL (mt)	Groundfish catch (mt)	Percent Groundfish ACL Caught (%)
2015	354	70%	248	27.5%	202.9	38.4	18.9%
2016	354	76%	269	11.4%	250.8	23.9	9.5%
2017	300	69%	207	40.6%	162.6	31.4	19.1%
2018	300	71%	213	18.9%	187.9	27.6	14.7%
2019	140	76%	106	4.6%	99.8	3.1	3.1%
In-season 2020	162	74%	120	n/a	95.4	6.8	7.2%

Table 15- Recent GB yellowtail TACs and scallop fishery sub-ACLs and catches for fishing years 2015 through 2019. Values shown in metric tons (mt). Source: GARFO year-end catch reports. FY2019 underlined sub-ACL accounts for mid-year transfer from scallop fishery to groundfish fishery of 15.2mt.

	Scallop Fishery- GB Yellowtail Flounder						
Groundfish Fishing Year	Total Shared TAC	US % Share	US TAC	% US TAC Caught	Scallop sub-ACL	Scallop catch	%Scallop sub-ACL Caught
FY2015*	354	70%	248	28%	38	29.7	78%
FY2016*	354	76%	269	12%	42	2.1	5%
FY2017*	300	69%	207	44%	32	52.6	164%
FY2018*	300	71%	213	19%	15	12.7	87.5%
FY2019*	140	76%	106	4.6%	1.8	1.7	96%
FY2020*	162	74%	120	n/a	19	n/a	n/a

* retention of GB yellowtail prohibited for scallop fishery
n/a = data not yet finalized.

Table 16- Recent SNE/MA yellowtail flounder ACLs, scallop fishery sub-ACLs and catches, and groundfish fishery sub-ACLs and catches. Values shown in metric tons (mt). FY2019 underlined accounts for mid-year transfer from scallop fishery to groundfish fishery of 13.1mt.

	Scallop and Groundfish Fishery—SNE/MA Yellowtail Flounder								
Groundfish Fishing Year	Total ACL (mt)	Total Catch (mt)	Percent Total ACL Caught	Scallop sub-ACL (mt)	Scallop Catch (mt)	Percent Scallop ACL Caught	Groundfish sub-ACL (mt)	Groundfish Catch (mt)	Percent Groundfish ACL Caught
FY2015*	666	326.6	49%	44	34.6	79.1%	579	283.5	48.9%
FY2016*	256	85.2	33.3%	17	10.7	63.9%	204	62.5	30.6%
FY2017*	256	24.4	9.6%	4	4.3	104.1	187.5	14.5	6.7%
FY2018*	66	14.7	22.3%	3	2.6	79.7%	43	8.5	19.6%
FY2019*	66	6.9	10.4%	2	2.1	112.6%	45	2.8	6.3%
* Indicates that retention of SNE/MA YT was prohibited for scallop fishery									

Table 17- Final year-end catch data (mt) for northern windowpane flounder. Sources: FY2015 – FY2019 final year-end multispecies catch reports, GARFO. *In FY2017 a scallop-specific AM was created, in previous years scallop landings were part of the 'other' fisheries catch, reflected here.

			Northern Windowpane Flounder Catch (mt)				
			Groundfish Fishery		**Sub-Components**		
FY	**ACL**	**Total Catch**	**Sector**	**Common Pool**	**Scallop Fishery**	**State Waters**	**Other**
2015	144	189.8	73.6	0	*114.6*	1.3	114.9
2016	177	83.7	45.0	0	*31.8*	.7	37.9
2017*	170	87.4	33.9	1.2	44.1	.5	7.7
2018	86	56.7	33	.3	22.3	.4	.7
2019	86	68.0	21.7	0	25.4	.2	20.7

Table 18- Final year-end catch data (mt) for southern windowpane flounder. Sources: FY2015 – FY2019 final year-end multispecies catch reports, GARFO.

			Southern Windowpane Flounder Catch (mt)				
			Groundfish Fishery		Sub-Components with AMs		
FY	**ACL**	**Total Catch**	**Sector**	**Common Pool**	**Scallop Fishery**	**State Waters**	**Other**
2015	527	22.7	-	.2	-	22.1	0.5
2016	599	417.2	45	0	84.4	28	178.1
2017	599	440.9	33.9	1.2	44.1	0.5	7.7
2018	457	454.7	49.7	16.8	157.1	26.1	205
2019	457	350.0	30.0	2.7	57.7	15.9	243.6

In addition, sub-ACLs are designed to limit the incidental catch of GB yellowtail flounder by small-mesh fisheries, and exceeding the allocations results in triggering AMs in subsequent years. A summary of recent catches by the small-mesh fisheries is provided (Table 19). The accountability measure requires vessels to fish an approved selective trawl gear that reduces the catch of flatfish in the GB yellowtail flounder stock area. As small-mesh species can be effectively prosecuted using modified trawl gear, it is difficult to predict if groundfish sub-ACLs may affect fishing mortality and stock size of small-mesh species (e.g., whiting and squid). The overall impact of Alternative 2 ABCs and ACLs are likely to be low positive to negligible with respect to the squid and whiting resource on Georges Bank.

Table 19- Recent GB yellowtail flounder small-mesh fisheries sub-ACLs and catches (mt) for fishing years 2015 through 2019. Values shown in metric tons (mt). Source: GARFO year-end catch reports. Sources: FY2015 – FY2019 final year-end multispecies catch reports, GARFO.

	Small Mesh Fishery- GB Yellowtail Flounder		
Groundfish Fishing Year	Small-mesh fisheries sub-ACL (mt)	Small-mesh fisheries (mt)	Percent small-mesh fisheries Caught (%)
FY2015	5	0.1	1.0%
FY2016	5	4.8	95.2%
FY2017	4	0.4	9.7%
FY2018	4	0.1	2.5%
FY2019	2	0.0	0.0%

Sub-ACLs are designed to limit the incidental catch of GOM and GB haddock by mid-water trawl (MWT) herring fisheries, and exceeding the allocations results in triggering AMs in-season. A summary of recent catches in the midwater trawl Atlantic herring fishery is provided for GOM haddock (Table 20) and GB haddock (Table 21). Option 2 for GOM and GB haddock may reduce fishing mortality of Atlantic herring which would have positive biological benefits for the Atlantic herring stock.

Table 20- Summary of recent catches (mt) of GOM haddock by the commercial midwater trawl herring fishery, groundfish FY2015-FY2019. Sources: FY2015 – FY2019 final year-end multispecies catch reports, GARFO.

	Midwater Trawl Atlantic Herring Fishery- Gulf of Maine Haddock				
Groundfish Fishing Year	**Sub-ACL**	**Landings**	**Discards**	**Catch**	**Percentage of sub-ACL**
2015	14	-	-	-	-
2016	34	1.9	-	1.9	5.7%
2017	42	-	-	-	-
2018	122	-	-	0.0	-
2019	116	0.1	-	0.1	0.1%

Table 21- Summary of recent catches (mt) of Georges Bank haddock by the midwater trawl Atlantic herring fishery, groundfish FY2015- FY2019. Source: Groundfish FY2015 – FY2019 final year-end catch reports, GARFO.

	Midwater Trawl- Georges Bank Haddock				
Groundfish Fishing Year	**Sub-ACL**	**Landings**	**Discards**	**Catch**	**Percentage of sub-ACL**
2015	227	235.0	0.6	235.5	103.9%
2016	512	115.3	3.6	118.9	23.2%
2017	801	47.9	0	47.9	6.0%
2018	680	43.9	0	43.9	6.5%
2019	811	0.2	0	0.2	0.0%

Lastly, the other sub-component of Southern windowpane flounder is used to evaluate if an AM would be triggered for large-mesh non-groundfish fisheries (e.g., summer flounder and scup trawl fisheries). Exceeding the component and the overall ACL results in triggering AMs in a future year. AMs are GRAs designed to reduce catches of flatfish, which would have positive biological benefits for summer flounder and to a lesser extent scup by reducing fishing mortality. A summary of recent catches for other sub-components is found in Table XX (see economic impacts). Under Alternative 2, the ABC for Southern windowpane flounder would decrease and would have low positive impacts when compared with Alternative 1/No Action.

6.5 IMPACTS ON HUMAN COMMUNITIES- ECONOMICS

Introduction

Consideration of the economic impacts of the changes made in this framework is required pursuant to the National Environmental Policy Act (NEPA) of 1969 and the Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1976. NEPA requires that before any federal agency may take "actions significantly affecting the quality of the human environment," that agency must prepare an Environmental Assessment (EA) or Environmental Impact Statement (EIS) that includes the integrated use of the social sciences (NEPA Section 102(2) (C)). The MSA stipulates that the social and economic impacts to all fishery stakeholders should be analyzed for each proposed fishery management measure to provide advice to the Council when making regulatory decisions (Magnuson-Stevens Section 1010627, 109-47).

The National Marine Fisheries Service (NMFS) provides guidelines to use when performing economic reviews of regulatory actions. The key dimensions for this analysis are expected changes in net benefits to fishery stakeholders, the distribution of benefits and costs within the industry, and changes in income and employment (NMFS 2007). Where possible, cumulative effects of regulations are identified and discussed. Non-economic social concerns are discussed in Section 6.6. The economic impacts presented here consist of both qualitative and quantitative analyses dependent on available data, resources, and the measurability of predicted outcomes. It is assumed throughout this analysis that changes in revenues would have downstream impacts on income levels and employment; however, these are only mentioned if directly quantifiable.

6.5.1 Action 1 – Status Determination Criteria

6.5.1.1 Alternative 1 - No Action

Economic Impacts

Under Alternative 1/No Action there would be no revisions to the SDCs for GB winter flounder and SNE/MA winter flounder, the numerical estimates for these stocks would not change since the 2018 and 2019 groundfish stock assessments.

Under Alternative 1, there would not be any immediate economic impacts, since it does not alter the current methodology used for setting the ABC for each species. Long term impacts of Alternative 1 would be that biomass targets would be based on outdated information, increasing the risk of overfishing over the long run, and eroding long-run fishery profits as a result.

Overall, Alternative 1 is expected to have negative economic impacts. Compared to Alternative 2, impacts would be positive in the short run but negative in the long run.

6.5.1.2 Alternative 2 – Updated Status Determination Criteria

Economic Impacts

Under Alternative 2, SDCs for GB winter flounder and SNE/MA winter flounder would be changed following the outcome of the 2020 management track assessments. This would result in a lower MSY for each stock, and consequently, lower ACLs, compared to No Action/Alternative 1. In the short run, the lower ACLs for these species may result in fishermen experiencing lower net revenues as a result of anticipated catch reductions.

Alternative 2 is expected to have positive long run economic impacts relative to Alternative 1, since updating SDCs for both stocks according to the most recent scientific assessments ensures decreases the

likelihood of overfishing or the stock becoming overfished over the long run which allows for maximized fishery revenues.

Overall, Alternative 2 is expected to have low negative economic impacts. Compared to Alternative 1, short run economic impacts are expected to be negative and long run economic impacts would be positive.

6.5.2 Action 2 – Formal Rebuilding Program

6.5.2.1 Alternative 1 - No Action

Commercial Groundfish Fishery Economic Impacts

Maintaining quotas under No Action would provide neutral or positive economic impacts relative to Alternative 2. The impacts of No Action relative to Alternative 2, Option C would be similar if quotas were set at 75%FMSY under No Action. Under Alternative 2, Options A and B, reducing quotas would negatively affect the groundfish fishery, but largely to the extent that catches could constrain the harvest of other targeted species, which would decrease total groundfish revenue and potentially increase variable costs to the extent that avoiding bycatch of white hake would shift fishing practices away from those that are cost minimizing and revenue maximizing. Recent catches of white hake in the commercial groundfish fishery have increased somewhat from around 1,500 mt in FY2015 and FY2016 to over 2,000 mt in FYs 2018 and 2019. This increased catch is despite declining commercial groundfish ACLs which decreased from 4,343 mt in FY 2015 to 2,735 mt in FY 2019. Because of increased catch and a decreasing ACL, utilization has increased as a result from 37% in FY 2015 to 76% in FY 2019. Utilization was similarly high in FY 2018 at 77%. Similar to other groundfish stocks, average prices declined from a high of $2.14 in FY2014 to a low of $1.26 in FY2018.

6.5.2.2 Alternative 2 – Revised Rebuilding Strategy for White Hake

Commercial Groundfish Fishery Economic Impacts

There are no differences in economic impacts between Alternative 2 and the No Action alternative in FY 2021. There are differences in impacts along the rest of the 10-year rebuilding time horizon outlined in each of the Options (A, B or C), and each of the Options may have neutral to negative economic impacts relative to a No Action alternative. The impacts of No Action relative to Option C would be similar if quotas were set at 75%F_{MSY} under No Action.

If we assume that quotas as projected in each rebuilding scenario remain in place for the duration of the rebuilding time frame and also that the fishing industry is able to capture 100% of the allocated quota, it is possible to compare the net-present value (NPV) of the different rebuilding scenarios in 2020 dollars. To compare alternative benefit streams over time, discount rates of 0%, 3%, and 7% were selected to convert all benefit streams to a present value. For this purpose, a discount rate of 3% was selected as recommended by NOAA to reflect the Social Rate of Time Preference (SRTP) (NOAA 2003). In addition, the Executive Branch's Office of Management and Budget recommends a discount rate of 7% to estimate the rate of return on average investments. Both discount rates (3% and 7%) are included here for the purpose of comparison with a 0% discount rate as a baseline. NPVs are calculated through 2031, the selected T_{target} and T_{max} timeframe for rebuilding this stock.

This analysis assumes all allocated fish of particular stock are caught in each year, varying by fishing mortality target in each Option and reduced by a discount rate. Here, Alternative 1 (the No Action alternative) is the same as Alternative 2/Option C, but zero landings after 2021 (F=0) are included in the analysis for the sake of comparison. Total value is calculated in each year by applying an average price

from historical price and landings information for white hake (2006-2020). Average price from all years because there was not a significant relationship between price and quantity data across all years needed to predict prices. This analysis does not account for the potential revenue changes associated with other stocks. Because the analysis occurs at the species level, it does not account for catch of other grades or stocks in each scenario, changes in price are a lower bound on price changes since it assumes catch of other stocks are zero. Therefore, estimates should be compared in relative terms and not by absolute values.

Results illustrate that if mortality targets specified in each Option are maintained through the entire rebuilding period (T_{max}, or 10 years), that NPV is directly related to the proportion of allowable catch permitted in any Option (Table 1). Therefore, regardless of discount rate (0%, 3% or 7%, Alternative 1/No Action and Alternative 2/Option C allows the largest fishing mortality rate (75%F_{MSY}), results in the largest NPV relative to the other options, while Option A would confer the lowest value over time. Comparing across options under Alternative 2, Option C would increase NPV by 22% compared to Option A and, regardless of choice of discount rate, while there is roughly only a 4% increase between Options B and C. Therefore, impacts of the Options, when compared against each other, show that Option A likely has negative impacts relative to the status-quo Option (Option C and No Action), while Option B has relatively low negative impacts.

However, because all the Options under Alternative 2 have the same T_{target}, but have different probabilities of attaining the target, this analysis does not consider likely rebuilding dates (>50% probability of SSB_{MSY}) if the stock rebuilds sooner than the target rebuilding date of 10 years. Mortality rates could be increased in subsequent years, which would further decrease the differences in NPV between the three Options.

Table 1- Net Present Value of white hake 10 year projected catches (millions of $2018) for different rebuilding options (Alternative 2/ Option A, B, C), F=0, and F_{MSY} , a low recruitment scenario of 75% F_{MSY} and discount rates (0%, 3%, and 7%).

	NPV by Rebuilding Option (millions of $2020)					
Discount rate	F=0	**2.A**(50%F_{MSY})	**2.B**(70%F_{MSY})	**2.C**(75%F_{MSY})	75%F_{MSY} (low recruitment)	F_{MSY}
0	*4.59*	*58.87*	*72.77*	*75.95*	*60.44*	*88.75*
3	*4.59*	*50.04*	*61.85*	*64.58*	*52.03*	*75.62*
7	*4.59*	*41.10*	*50.80*	*53.06*	*43.43*	*62.28*

6.5.3 Action 3 – Specifications

The Quota Change Model (QCM) was used to analyze the impacts of changes in Annual Catch Limits (ACLs) to the sector portion of the groundfish fishery for fishing year 2021 (FY2021). The model was developed during FY2011 to make predictions for FW47 (FY2012) and has since been used in analyzing the impacts of all subsequent groundfish management actions that included ACL changes in the fishery. To predict FY2021 fishery revenue, a sample pool of trips was first constructed using data from FY2019. During FY2019, 99% of commercial groundfish landings and revenues were associated with sectors. Each trip in the sample pool then received a probability score of being selected into the synthetic 2021 fishing year. Probability scores were based on the trip's net revenue divided by catch, with net revenue calculated as gross revenue – (operating cost[1] + sector cost + quota cost). The model was run to form 250 synthetic fishing years, and mean or median values (indicated in table captions) are presented. By running simulations based on actual fishing trips, the model implicitly includes the following assumptions:

- Stock conditions, fishing practices and harvest technologies existing during the data period are representative;
- Trips are repeatable;
- Demand for groundfish is constant, noting that fish prices do vary between the reference population and the sample population, but this variability is consistent with the underlying price/quantity relationship observed during the reference period;
- Quota opportunity costs and operating costs are both constant;
- ACE flows seamlessly from lesser to lessee such that fishery-wide caps can be met without leaving ACE for constraining stocks stranded; and,
- At-sea monitoring (ASM) is fully subsidized. The condition of a trip being observed has no explicit effect on its ability to be chosen into the selection pool.

In selecting trips from FY2019, the redfish exemption area from that year was unmodified. The implications are that some trips that were selected for the synthetic 2021 fishing year may not be possible under an exemption area that differs from the FY2019 area. Predicted FY2021 revenue under the proposed universal redfish exemption area, as well as under the FY2020 redfish exemption area, will be presented at the January Council meeting.

To understand the QCM's ability to predict groundfish fishery catch and revenues, we offer a retrospective look at the models' performance since FY2016 (Table 2). Information on the performance of the QCM during earlier years (FY2011-FY2015) can be found in Groundfish FW58. Groundfish revenues have been over-predicted in recent years, with annual realized values being 8-16% lower than predicted values during FY2016-2019. A downward trend in ex-vessel prices, which is discussed in further detail under the Alternative 2 impacts, is a contributing factor in these recent overestimations. Since the prediction year is two years after the input year in the QCM, a decline in price over that two year period will increase the likelihood of the model overestimating revenues. Predictions for operating profit, have generally been closer to realized values. The greatest deviation occurred for FY2017, in which realized operating profit was 10.2% lower than the predicted value from FW56. Realized operating profit for FY2019 was 7.1% lower than the predicted value from FW58. The realized value of 50.1 million may have been higher, and closer to the predicted value of 53.9 million, in the absence of the COVID-19 pandemic. At the end of FY2019, fleetwide commercial groundfish revenue was

[1] Operating costs are trip-level costs, such as fuel, oil, bait, ice, and fuel. Information on these costs are collected by at-sea observers in both the NEFOP and ASM programs.

approximately $2.4 million less than the average from the past three fishing years and groundfish prices generally dropped in March and April, especially for cod, winter flounder, and yellowtail flounder.[2]

[2] GF PDT memo to the GF Committee dated June 17th, 2020. https://s3.amazonaws.com/nefmc.org/3c_200617-GF-PDT-memo-to-GF-Committee-re-COVID-19-carryover-requests-for-commercial-fishery_Final.pdf

Table 2- QCM predictions (median values) and realized revenues and costs for FY2016-2020, 2019 dollars (millions).

	FY2016		FY2017		FY2018		FY2019		FY2020
	Predicted[3]	Realized	Predicted[4]	Realized	Predicted[5]	Realized	Predicted[6]	Realized	Predicted[7]
Groundfish Revenue	56.4	51.8	50.9	46.7	58.9	49.4	54.7	48.0	49.0
Total Revenue	74.3	78.3	73.5	70.1	83.9	72.1	78.0	66.1	70.1
Operating Cost	17.9	14.1	13.5	13.0	15.6	12.5	14.6	10.7	12.5
Sector Cost	2.0	1.7	1.7	1.8	1.7	2.0	1.9	1.8	1.9
Quota Cost	6.1	10.2	7.1	9.4	12.0	5.4	7.5	3.5	5.4
Operating Profit	48.4	52.4	51.2	46.0	54.5	52.2	53.9	50.1	50.3

[3] FW55, reference pool=FY2014-15 (full year FY2014, FY2015 through Oct. 2015)
[4] FW56, reference pool=FY2015-16 (full year FY2015, FY2016 through Nov. 2016) ; FY2017 prediction incorporating Sector NEFS IX stranded quota
[5] FW57, reference pool=FY2016
[6] FW58, reference pool=FY2017
[7] FW59, reference pool=FY2019

6.5.3.1 Alternative 1 – No Action

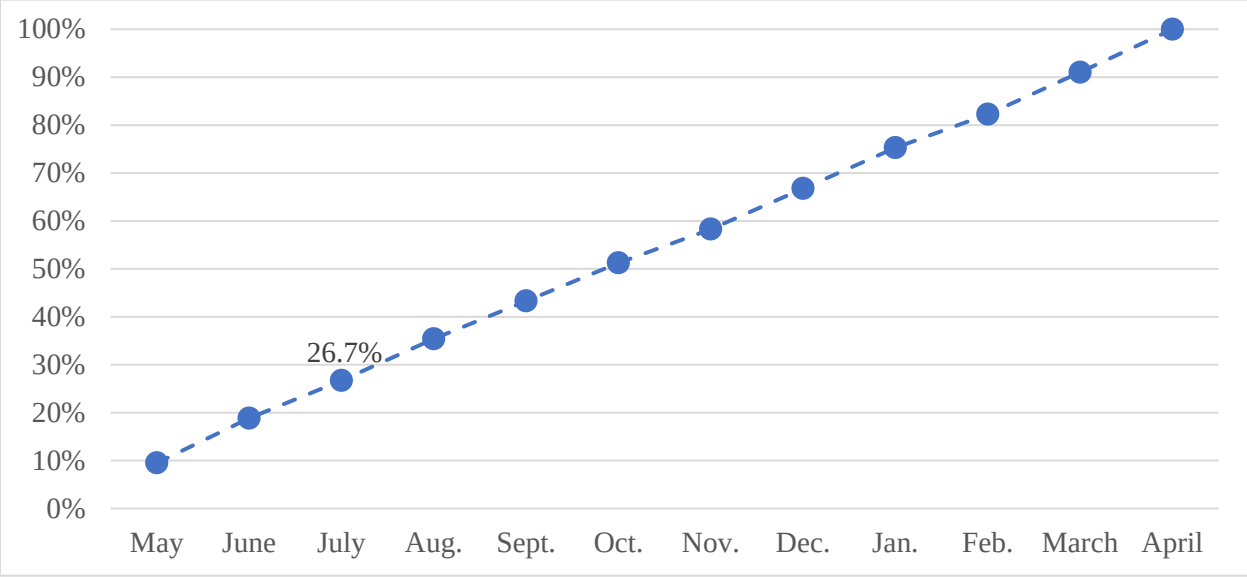
Impacts of No Action ACLs on the sector component of the commercial groundfish fishery

Under Alternative 1/No Action, default specifications for FY2021 would remain in place until July 31, 2021. Following that date, commercial groundfish ACLs for Eastern GB cod, Eastern GB haddock, GOM winter flounder, SNE/MA winter flounder, redfish, ocean pout, and wolffish would go to 0 lbs. Collectively, these stocks cover all broadstock areas in the groundfish fishery. The QCM runs until full utilization is achieved for a stock in each broadstock area, or until a unit stock is fully utilized. Since meeting these conditions over the course of three months was considered an unrealistic scenario, the QCM results were instead pro-rated based on recent fishery performance. During fishing years 2015-2019, 26.7% of groundfish revenue was generated during the months of May – July (Figure 1).

Alternative1/No Action would yield negative impacts to the commercial groundfish fishery relative to FY2019. Predicted groundfish revenue for FY2021 is $11.4M, representing a $37.6M decrease from the FY2020 prediction in FW59, and a $36.6M decrease from the FY2019 realized value of $48.0M (Table 5). Predicted total gross revenues from groundfish trips for FY2021 under No Action is $16.0M. This represents a $54.1M decrease from the FY2020 (FW59 preferred alternative) prediction of $70.1M, and a $50.1M decrease from the FY2019 realized value of $66.1M.

Relative to Alternative 2, No Action would result in negative impacts to the sector component of the groundfish fishery for FY2021. Predicted groundfish revenue is $34.9M lower under No Action ($11.4M) relative to Alternative 2 ($46.3M), and total revenue from groundfish trips is $48.1M lower under No Action ($16.0M under No Action; $64.1M under Alternative 2).

Figure 1- Cumulative percentage of groundfish revenues by month, fishing years 2015-2019.



Commercial Fishery - Common Pool

Alternative 1/No Action would have a range of low negative, neutral, to low positive impacts on the common pool fishery relative to FY 2020 and negative impacts relative to Alternative 2.

The following changes from the non-sector FY2020 sub-ACL would go into place for FY2021 under No Action/Alternative 1: GB cod sub-ACL would decrease by 6 mt, GB haddock would decrease by 503 mt, GOM haddock would increase by 89 mt, CC/GOM yellowtail flounder would decrease by 5 mt, American Plaice would increase by 8 mt, white hake would increase by 8 mt, pollock would increase by 31 mt. For Eastern GB cod, Eastern GB haddock, GOM winter, SNE/MA winter flounder, redfish, ocean pout, and wolffish, default specifications would be in effect from May 1, 2021, to July 31, 2021, and would equal 35% of the FY2020 catch limits. After July 31st, quotas would go to 0.

The absence of allocations after July 31st for several stocks would have strong negative economic impacts on the common pool fishery both relative to FY 2020 and Alternative 2, since stocks with 0 quotas would exist across all broad stock areas and not allow for common pool groundfish fishing.

Recreational Groundfish Fishery

Impacts on the recreational groundfish fishery Alternative 1/No Action would be neutral relative to FY2020 and Alternative 2 (no change from the 193 mt. GOM cod sub-ACL). The recreational sub-ACL for GOM haddock would decrease under No Action and Alternative 2 (from 6,210 mt in FY2020 to 5,295 in FY2021 and 3,634 in FY2022, as set in FW 59) but access to this stock is limited by incidental catch of GOM cod so the impact of this decrease is expected to be neutral.

Impacts on other fisheries

Atlantic Sea Scallop Fishery

Under Alternative 1/No Action, the following sub-ACLs would be allocated to the scallop fishery during FY2021: 19 mt of GB yellowtail flounder, 2 mt of SNE/MA yellowtail flounder, 143 mt of SNE/MA windowpane flounder, and 12 mt of GOM/GB windowpane flounder.

Under Alternative 1/No Action, the FY2021 sub-ACLs for GB yellowtail and SNE/MA yellowtail would be unchanged from FY2020 levels. Alternative 1/No Action could have negative impacts to the scallop fishery relative to FY2020 since the sub-ACLs for GB yellowtail and SNE/MA yellowtail would be smaller than the projected catch for FY2020 year (projections not yet available for FY2021, expected to be updated in January). Compared to Alternative 2, No Action/Alternative 1 could potentially have a positive impact on the scallop fishery since the sub-ACL for GB yellowtail flounder would be 7 mt higher under No Action/Alternative 1, while neutral with respect to SNE/MA yellowtail flounder since the sub-ACL would remain at 2 mt.

Under Alternative 1/No Action the sub-ACL for GOM/GB windowpane flounder would be 19 mt less than under Alternative 2, potentially having negative economic impacts since FY2020 projected catch by the scallop fishery is estimated to be around 31-32 mt (projections not yet available for FY2021, expected to be updated in January), which could trigger AMs for the scallop fishery if No Action is selected. By contrast, economic impacts under No Action/Alternative 1 for SNE/MA windowpane flounder could be positive relative to Alternative 2, since the sub-ACL would be 14 mt higher and FY2020 bycatch projections estimated between 135 mt and 143 mt, which would be less likely to trigger AMs.

Midwater trawl directed Atlantic herring fishery

Alternative 1/No Action would have neutral impacts on the midwater trawl herring fishery. Sub-ACLs for GB haddock and GOM haddock between FY2020 and FY2021 would decrease from 2,447 mt to 1,424 mt for GB haddock and decrease from 183 mt to 156 mt for GOM haddock. However, GB haddock catches by the herring fishery have been low in recent years— less than 50 mt in FY2017 and FY2018, and 0.2 mt in FY 2019 due to lower herring ACLs. If trends continue, decreases in the GB haddock sub-ACL are unlikely to confer negative economic benefits in FY20201 and beyond, either with respect to status quo or Alternative 2 sub-ACLs. Alternative 2 sub-ACLs for the MWT directed herring fishery would be higher for GB haddock (1,539 mt) and the same for GOM haddock, but impacts of No

Action/Alternative 1 relative to Alternative 2 are expected to be neutral to due low utilization by the MWT directed herring fishery. In FY2017 and FY2018 GOM haddock catch by the midwater trawl herring fishery was less than 0.1 mt, and approximately 0.1 mt of catch in FY 2019, so unless effort shifts considerably, neutral economic impacts would be expected. Atlantic herring quotas for 2020 and 2021 were lower than for 2019, and substantially lower than in prior years (NEFMC, Atlantic Herring FW6).

Small-mesh fisheries

Under Alternative 1/No Action the sub-ACL for GB yellowtail flounder for the small mesh fisheries (e.g., whiting and squid) would remain the same as FY2020 levels at 2 mt in FY2020, but decrease for FY2021 to 1.5 mt under Alternative 2 which would have neutral economic impacts on the small mesh fishery since catches in recent years have been low (less than 1 mt in FY2017 and FY2018, 0 mt in FY2019). If effort remains similar to recent fishing years, it is unlikely that this change in the sub-ACL will be constraining for the fishery. According to the FY2019 SAFE report for the small-mesh multispecies fishery, effort has decreased in the fishery since 2012 and the number of vessels with landings in the fishery hit a historical low in 2019.

Large-mesh non-groundfish fisheries

The southern windowpane flounder "other fisheries" sub-component is used to evaluate when an AM could be triggered for large-mesh non-groundfish fisheries (e.g., summer flounder and scup trawl fisheries). Under Alternative 1/No Action, the other sub-component would remain at the FY 2020 level of 196 mt in FY2021. In FY 2019, the sub-ACL of 218 mt was exceeded (total catch in the other subcomponent was 243.6 mt), but the total ACL was not exceeded (total utilization was 76.6%), so the AM was not triggered. In FY 2020, however, both the sub-ACL and total ACL decreased, which may increase the odds of triggering the AM since average total catch between FY2016 and FY 2019 was greater than the FY2020/FY2021 ACL of 412 mt. Therefore, economic impacts of Alternative 1/No Action are expected to be neutral to negative with respect to status quo, and negative with respect to Alternative 2 since the sub-ACL would decrease to 177 mt and further increase the likelihood of triggering the AM.

6.5.3.2 Alternative 2 – Revised Specifications

Comparison between FY2020 and proposed FY2021 commercial sub-ACLs, recreational sub-ACLs, and other fisheries sub-ACLs for groundfish are provide in Table 3 and Table 4.

Table 3- Comparison of commercial (sector and common pool) groundfish sub-ACLs (mt) for FY2020 and proposed FY2021, including the percent change between years. Proposed FY2021 sub-ACLs as indicated under Alternative 2/Revised Specifications.

		Commercial groundfish sub-ACL		
	Stock	**FY2020**	**FY2021**	**% Change**
Allocated Stocks	GB Cod	1,073	1,093	2%
	GOM Cod	275	270	-2%
	GB Haddock	121,864	76,622	-37%
	GOM Haddock	10,281	10,281	0%
	GB Yellowtail Flounder	95	64	-33%
	SNE/MA Yellowtail Flounder	15	16	4%
	CC/GOM Yellowtail Flounder	688	692	1%
	American Plaice	2,937	2,682	-9%
	Witch Flounder	1310	1,317	1%
	GB Winter Flounder	522	563	8%
	GOM Winter Flounder	287	281	-2%
	SNE/MA Winter Flounder	539	288	-47%
	Redfish	11,231	9,677	-14%
	White Hake	2,019	2,019	0%
	Pollock	23,989	18,549	-23%
Non-allocated Stocks	GOM/GB Windowpane Flounder	38	108	184%
	SNE/MA Windowpane Flounder	48	43	-11%
	Ocean Pout	92	50	-46%
	Atlantic Halibut	77	73	-5%
	Atlantic Wolffish	82	86	4%

Table 4- Comparison of other fisheries sub-ACLs (mt) for FY2020 and proposed FY2021, including the percent change between years. Proposed FY2021 sub-ACLs as indicated under Alternative 2/Revised Specifications.

Fishery	Stock	FY2020	FY2021	% Change
Recreational Groundfish	GOM Cod	193	193	0%
	GOM Haddock	6,210	5,295	-15%
Sea Scallop	GB Yellowtail Flounder	19	12	-35%
	SNE/MA Yellowtail Flounder	2	2	0%
	GOM/GB Windowpane Flounder	12	31	160%
	SNE/MA Windowpane Flounder	143	129	-10%
Midwater Trawl	GB Haddock	2447	1,539	-37%
	GOM Haddock	183	156	-15%
Small-Mesh	GB Yellowtail Flounder	2	1.5	-26%
Other Sub-components – Large-Mesh Non-Groundfish[1]	SNE/MA Windowpane Flounder	196	177	-10%

[1]The value for Other Sub-components for SNE/MA Windowpane Flounder includes the other sub-component value for Large-Mesh Non-Groundfish Trawl Fisheries.

Impacts of Alternative 2 ACLs on the sector component of the commercial groundfish fishery

Predicted groundfish revenue for FY2021 under Alternative 2 is $46.3M, representing a $2.7M decrease from the FY2020 prediction in FW59, and a $1.7M decrease from the FY2019 realized value of $48.0M (Table 5). Total gross revenues from groundfish trips for FY2021 is $64.1M. This value represents a $6.0M decrease from the FY2020 prediction of $70.1M, and a $2.0M decrease from the FY2019 realized value of $66.1M. Operating profit predictions for FY2021 are lower than predictions from the previous two years, as well as the realized FY2019 value.

Relative to No Action, Alternative 2 would result in positive impacts to the sector component of the groundfish fishery for FY2021. Predicted groundfish revenue is $34.9M higher under Alternative 2 ($46.3M) relative to No Action ($11.4M), and total revenue from groundfish trips is $48.1M higher under Alternative 2 ($16.0M under No Action; $64.1M under Alternative 2).

At the stock-level, GB haddock and GOM haddock are predicted to be the two highest revenue generating stocks in FY2021 (Table 6). White hake is predicted to be a constraining stock, with full (100%) utilization of the sector sub-ACL of 1,995mt. Since white hake is a unit stock, the QCM does not allow any more groundfish fishing to occur once the sector sub-ACL is reached. A constraining unit stock generally increases the variability in the QCM estimates relative to a situation in which there are constraining stocks in each broadstock area. FY2021 revenue predictions from GB cod and GB winter flounder are lower than in previous years, though realized revenues may exceed these predictions if white hake is not as constraining as the model predicts. The other stock with a high predicted utilization rate is GOM cod (98.4%). Predicted utilization rates for all other stocks are below 70%. The predicted top four revenue-generating stocks (GB haddock, GOM haddock, pollock, and redfish) all have predicted

utilization rates below 50%. Combined ex-vessel revenue from these four stocks is predicted to be $27.7M, which amounts to roughly 60% of total groundfish fishery revenue.

At the port-level (Table 7), many of the major groundfish ports have lower predicted values for FY2021 than were predicted for FY2019 or FY2020. Gloucester is predicted to continue to be the top groundfish port ($11.9M), accounting for ~25% of ex-vessel value in the sector groundfish fishery. Boston is predicted to be the second highest grossing port ($11.0M), followed by New Bedford ($9.1M), and Portland ($3.8M).

By vessel length (Table 8), vessels >75'+ are predicted to generate $27.7M in FY2021, accounting for over 50% of sector groundfish revenue. Vessels in the 50 to <75' category are predicted to generate ~30% of sector groundfish revenue ($14.7M), and vessels in the 30' to <50' category are predicted to generate ~12% of sector groundfish revenue ($5.8M).

Continued low ex-vessel prices are a contributor to predicted revenues for FY2021 (Table 9). For example, prices for American plaice hit a 5 year low in FY2019, resulting in a decline in predicted revenue generated from that stock (Table 6). Low prices across groundfish species may be the product of a multitude of factors, such as changes in landings, changes in the size of fish being landed, and a shift in consumer demand. The COVID-19 pandemic may also continue to affect demand and regional supply chains in hard to predict ways into FY2021.

Table 5- Summary of realized FY2019 and predicted FY2020 and FY2021 revenues and costs (median values) for the sector portion of the commercial groundfish fishery, real dollars (millions, 2019).

Option	Groundfish Gross Revenues	Total Gross Revenues	Operating Cost	Sector Cost	Quota Cost	Operating Profit	Days Absent
FY2019 Realized	48.0	66.1	10.7	1.8	3.5	50.1	9,749
FY2019 Prediction (FW58)	54.7	78.0	14.6	1.9	7.5	53.9	13,900
FY2020 Prediction (FW59)	49.0	70.1	12.5	1.9	5.4	50.3	10,919
FY2021 Prediction (No Action)	11.4	16.0	2.8	0.4	0.9	11.8	1,780
FY2021 Prediction (Option 2)	46.3	64.1	10.9	1.8	3.6	47.7	9,942
FY2021 Prediction - FY2019 Realized	*-1.7*	*-2.0*	*0.2*	*-0.0*	*0.1*	*-2.4*	*193*

Table 6- Alternative 2 stock-level catch and revenue predictions (median values) with 5% and 95% confidence intervals, nominal dollars (millions). Stocks are presented in order of FY2021 predicted ex-vessel value.

	Sub-ACL (mt)	Predicted Catch (mt)	Predicted Utilization	FY2021 Prediction	p (5%) Revenue	p (95% Revenue)	FY2020 Predicted Revenue	FY2019 Predicted Revenue	FY2019 Realized Revenue
GB Haddock West	68,724	4,425	6.4%	9.0	7.2	16.5	7.6	7.1	9.2
GOM Haddock	10,022	3,312	33.0%	7.7	7.3	8.2	6.1	6.8	8.2
Pollock	18,366	3,034	16.5%	5.5	4.9	6.1	4.6	6.0	5.5
Redfish	9,550	4,634	48.5%	5.5	4.8	6.1	5.4	5.9	5.8
White Hake	1,995	1,995	100.0%	4.0	3.9	4.1	4.0	5.9	4.2
Plaice	2,611	818	31.3%	3.0	2.8	3.3	5.0	7.3	3.1
Witch Flounder	1,282	716	55.8%	2.7	2.5	3.2	2.9	2.9	2.8
GB Cod West	876	468	53.4%	2.4	2.0	3.8	3.5	2.5	2.3
GB Winter Flounder	541	292	54.0%	1.9	1.4	3.8	3.6	3.5	2.0
GOM Cod	262	258	98.4%	1.5	1.3	1.5	1.4	1.8	1.6
SNE Winter Flounder	254	163	64.4%	0.9	0.7	1.4	1.7	2.7	0.8
GB Haddock East	6,355	481	7.6%	0.9	0.6	1.5	1.2	0.7	1.2
CC/GOM Yellowtail Flounder	660	124	18.8%	0.3	0.3	0.3	0.4	0.8	0.3
GOM Winter Flounder	267	48	18.1%	0.3	0.2	0.3	0.5	0.9	0.3
GB Cod East	185	40	21.6%	0.2	0.1	0.4	0.6	0.3	0.3
SNE/MA Yellowtail Flounder	13	3	25.0%	0.0	0.0	0.0	0.0	0.1	0.0
GB Yellowtail Flounder	61	2	3.6%	0.0	0.0	0.0	0.1	0.1	0.0

Table 7- Alternative 2 groundfish species revenue prediction (mean values) by port, with 5% and 95% confidence intervals and average fish prices on groundfish trips, nominal dollars.

State/Port	FY2021 Prediction	p (5%) Revenue	p (95% Revenue)	Avg. Price	FY2020 Prediction	FY2019 Prediction
Massachusetts						
Gloucester	11.9	10.6	13.1	$0.81	12.5	14.6
Boston	11.0	9.5	12.7	$1.02	11.6	13.5
New Bedford	9.1	5.9	15.1	$1.20	8.0	8.1
Chatham	0.4	0.2	0.6	$1.43	0.5	0.6
Other MA ports	4.4	3.1	6.3	$1.18	3.7	4.3
Maine						
Portland	3.8	3.0	4.7	$0.98	7.4	9.2
Other ME ports	2.9	2.4	3.5	$1.28	1.8	2.1
Rhode Island						
Point Judith	0.7	0.4	1.4	$1.75	1.2	1.4
Other RI ports	0.2	0.0	0.4	$1.52	0.4	0.3
New Hampshire (all ports)	1.7	1.5	1.9	$1.11	1.4	1.6
Other Northeast Ports	2.3	1.6	3.1	$0.76	0.5	0.2

Table 8- Alternative 2 groundfish species revenue prediction (mean values) by size class, with 5% and 95% confidence intervals, nominal dollars (millions).

	FY2021 Prediction	p (5%) Revenue	p (95% Revenue)	FY2020 Prediction
75'+	27.7	22.2	37.5	25.3
50'to<75'	14.7	13.2	16.0	16.8
30'to<50'	5.8	5.3	6.3	6.7
<30'	0.1	0.0	0.1	0.0

Table 9- Average ex-vessel price by groundfish species, fishing years 2015-2019 (2019 dollars).

	2015	2016	2017	2018	2019
Cod	2.18	2.94	2.92	2.47	2.78
Haddock	1.32	1.41	1.12	1.05	1.12
Plaice	2.05	2.69	2.54	2.19	1.75
Pollock	1.30	1.14	1.01	0.83	0.94
Redfish	0.61	0.63	0.56	0.51	0.54
White Hake	2.02	1.98	1.39	1.28	1.24
Winter Flounder	2.23	3.39	3.16	3.08	2.75
Witch Flounder	2.71	3.38	2.29	1.70	1.77
Yellowtail Flounder	1.73	2.07	1.67	1.30	1.16

Commercial Fishery - Common Pool

Alternative 2 would have a range of low negative, neutral, to low positive impacts on the common pool fishery relative to FY 2020 and positive impacts relative to Alternative 1/No Action.

The following changes from the non-sector FY2020 sub-ACL would go into place for FY2021 under Alternative 2: GB cod sub-ACL would decrease by 5 mt, GOM cod would increase by 0.6 mt, GB haddock would decrease by 388 mt, GOM haddock would increase by 119 mt, GB yellowtail flounder would decrease by 0.7 mt, SNE/MA yellowtail flounder would decrease by 0.1 mt, CC/GOM yellowtail flounder would decrease by 5 mt, American Plaice would increase by 8 mt, witch flounder would increase by 1 mt, GB winter flounder would increase by 1 mt, GOM winter flounder would decrease by 1 mt, SNE/MA winter flounder would decrease by 43 mt, redfish would increase by 67 mt, white hake would increase by 8 mt, pollock would increase by 31 mt. All other stocks would remain the same as FY 2020. Under No Action/Alternative 1, for Eastern GB cod, Eastern GB haddock, GOM winter, SNE/MA winter flounder, redfish, ocean pout, and wolffish, default specifications would be in effect from May 1, 2021, to July 31, 2021, and would equal 35% of the FY2020 catch limits. After July 31st, quotas would go to 0.

The presence of allocations after July 31st for several stocks would have strong positive economic impacts on the common pool fishery both relative to Alternative 1, since stocks with 0 quotas would exist across all broad stock areas and not allow for common pool groundfish fishing.

Impacts on the recreational groundfish fishery

Impacts on the recreational groundfish fishery Alternative 2 would be neutral relative to FY2020 and Alternative 1/No Action (no change from the 193 mt. GOM cod sub-ACL). The recreational sub-ACL for GOM haddock would decrease under No Action and Alternative 2 (from 6,210 mt in FY2020 to 5,295 in FY2021 and 3,634 in FY2022) but access to this stock is limited by incidental catch of GOM cod so the impact of this decrease is expected to be neutral.

Impacts on other fisheries

Atlantic Sea Scallop Fishery

Under Alternative 2, the following sub-ACLs would be allocated to the scallop fishery during FY2021: 12 mt of GB yellowtail flounder, 2 mt of SNE/MA yellowtail flounder, 129 mt of SNE/MA windowpane flounder, and 31 mt of GOM/GB windowpane flounder.

Under Alternative 2, the FY2021 sub-ACL for SNE/MA yellowtail would be unchanged from FY2020 levels conferring neutral economic impacts for the scallop fishery relative to No Action, but potentially

negative impacts overall if projected bycatch is greater than the sub-ACL, potentially triggering the AM. The sub-ACL for GB yellowtail flounder under Alternative 2 would decrease by 35% relative to FY 2020 levels and compared to No Action/Alternative 1 (decreasing from 19 mt to 12 mt), having negative impacts relative to Alternative 1/No Action. Changes in sub-ACLs for both stocks could have overall negative impacts to the scallop fishery since the sub-ACLs for GB yellowtail and SNE/MA yellowtail would smaller than the projected catch for FY2020 year (projections not yet available for FY2021, expected to be updated in January).

Under Alternative 2 the sub-ACL for GOM/GB windowpane flounder would be 19 mt greater than under Alternative 1/No Action, potentially having positive economic impacts since FY2020 projected catch by the scallop fishery is estimated to be around 31-32 mt (projections not yet available for FY2021, expected to be updated in January), AMs for the scallop fishery could be more likely to be triggered if No Action/Alternative 1 is selected, therefore having positive economic impacts relative to No Action/Alternative 1. By contrast, economic impacts under Alternative 2 for SNE/MA windowpane flounder could be negative relative to No Action/Alternative 1, since the sub-ACL would be 129 (14 mt less than No Action/Alternative 1) and FY2020 bycatch projections estimated between 135 mt and 143 mt, which would be more likely to trigger AMs. Overall economic impacts for the scallop fishery are positive for GOM/GB windowpane flounder and negative for SNE/MA windowpane flounder.

Midwater trawl directed Atlantic herring fishery

The midwater trawl herring fishery will have negative changes in sub-ACL values. Under Alternative 2, the GB haddock sub-ACL is proposed to decrease by 37% between FY2020 and FY2021 (from 2,447 mt to 1,539 mt), and GOM haddock would decrease by 15% (from 183 mt to 156 mt). Impacts are expected to be neutral both in respect to Alternative 1 (where quotas would remain higher) and status quo given recent low catches of both haddock stocks, relative to the sub-ACLs. In FY2017 and FY2018 there were no recorded catch or discards of GOM haddock by the midwater trawl herring fishery, and approximately 0.1 mt of catch in FY 2019, so unless effort shifts considerably, neutral economic impacts would be expected. Atlantic herring quotas for 2020 and 2021 were lower than for 2019, and substantially lower than in prior years (NEFMC, Atlantic Herring FW6).

Small-mesh fisheries

Under Alternative 2 the sub-ACL for GB yellowtail flounder for the small mesh fisheries (e.g., whiting and squid) would decrease from FY 2020 levels from 2 mt to 1.5 mt in FY 2021. This is expected to have neutral economic impacts on the small mesh fishery since catches in recent years have been low (less than 1 mt in FY2017 and FY2018, 0 mt in FY2019). If effort remains similar to recent fishing years, it is unlikely that this change in the sub-ACL will be constraining for the fishery. According to the FY2019 SAFE report for the small-mesh multispecies fishery, effort has decreased in the fishery since 2012 and the number of vessels with landings in the fishery hit a historical low in 2019. Overall economic impacts are expected to be neutral both in respect to status quo and with respect to Alternative 1/No Action, since neither the Alternative 2 sub-ACL of 1.5 mt or the Alternative 1/No Action sub-ACL of 2 mt are expected to be constraining.

Large Mesh non-groundfish fisheries

The southern windowpane flounder “other fisheries” sub-component is used to evaluate when an AM could be triggered for large-mesh non-groundfish fisheries (e.g., summer flounder and scup trawl fisheries). Under Alternative 2, the other sub-component would reduce from 196 mt in FY2020 to 177 mt in FY2021, a decrease of 10%. The triggering of an AM implements gear-restricted areas (GRAs) to

reduce incidental catch of windowpane flounder. The conditions for triggering an AM in the large-mesh non-groundfish fisheries are as described below: The AM for southern windowpane for large-mesh non-groundfish fisheries is implemented if the total ACL is exceeded by more than the management uncertainty buffer (currently set at approximately 5%), and if the large-mesh non-groundfish fishery also exceeds its sub-ACL (evaluated using the "other sub-component"). Table 10 and Table 11 show "other" sub-component and total catch and utilization rates for SNE/MA windowpane flounder in recent years. The "other" sub-component ACL exceeded the Alternative 2 FY2021 sub-ACL in all five of the previous FYs for which complete data are available. Likewise, the total ACL for SNE/MA windowpane would have been exceeded by >5% in at least three FYs. This recent catch history suggests the possibility of an AM being triggered from windowpane catch in FY2021.

FW57 made a few adjustments to the size and timing of the AM areas to limit potential impacts to large mesh non-groundfish fisheries. The impacts of these smaller AM areas have not been quantified, but revenue generated from these areas in recent years should be lower than those previously estimated for summer flounder and scup. Furthermore, the impacts of AMs may be more cost-driven than revenue driven if fishermen elect to continue fishing for these species outside of the AM areas, potentially increasing operating costs. A more detailed analysis of the economic impacts of AMs on the large-mesh non-groundfish fisheries can be found in FW57 (NEFMC, 2018).

The expected impacts of Alternative 2 relative to Alternative 1/No Action for the large-mesh non-groundfish fisheries are neutral to negative, depending on whether or not an AM is triggered in future FYs.

Table 10- SNE/MA windowpane flounder other sub-component limits and catch (mt) and utilization rates, fishing years 2015-2020.

FY	S. Windowpane sub-ACL (mt)	S. Windowpane "other" catch (mt)	Utilization
2015	186	256.1	137.5%
2016	249	178.1	71.5%
2017	249	201	80.7%
2018	218	205	94.0%
2019	218	243.6	111.7%
2020	196		

Table 11- SNE/MA windowpane flounder total ACLs and catch (mt) and utilization rates, fishing years 2015-2020.

FY	S. Windowpane Total ACL	S. Windowpane Total catch	Utilization
2015	527	643.4	122.1%
2016	599	417.2	69.7%
2017	599	440.9	73.6%
2018	457	454.7	99.5%
2019	457	350	76.6%
2020	412		

Attachment 3

New England Fishery Management Council
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John F. Quinn, J.D., Ph.D., *Chairman* | Thomas A. Nies, *Executive Director*

MEMORANDUM

DATE: November 24, 2020

TO: Groundfish PDT

FROM: Scallop PDT

SUBJECT: **Scallop Fishery Bycatch Outlook for FY 2021**

Due to delays in the 2020 scallop surveys as a result of COVID-19, the Scallop PDT has not calculated bycatch projections yet. In lieu of updated bycatch projections for the four flatfish stocks with scallop sub-ACLs at this time, the Scallop PDT has compiled the recommendations from the recent Scallop Committee meeting on November 12, 2020, and available data from scallop surveys and observer records. The Scallop PDT plans to send another memo in January 2021 after projections are completed.

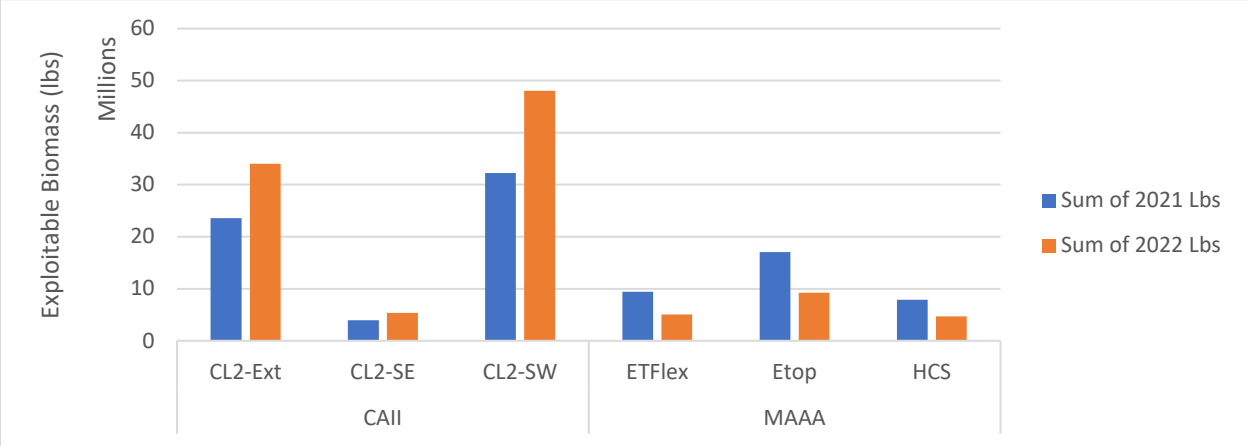
Framework 33 Overview:
Framework 33 will set fishery allocations for FY2021 and FY2022 (default). All specification alternatives that are currently being developed would allocate a mix of four access area trips across the following areas: Closed Area II Access Area (CAII-Southwest and/or CAII-Extension), the Mid-Atlantic Access Area (MAAA), and the Nantucket Lightship South (NLS-South) (see Table 2 for details). The Council is also considering allowing a limited amount of LAGC IFQ access area fishing in Closed Area I. FW33 will also consider closures on eastern Georges Bank to protect a large number of pre-recruits observed in CAII-Southeast access area. In addition to scallop conservation, this closure is also expected to proactively mitigate impacts to Georges Bank yellowtail flounder and northern Windowpane.

Table 1 - Overview of FY2020 projected scallop fishery bycatch estimates for the preferred alternative in FW32, including the anticipated FY2020 scallop sub-ACL for each stock.

Alternative	Scenario		GB YT	SNE/MA YT	GOM/GB WP	SNE/MA WP
Anticipated 2021 sub-ACL		GB Closure	*~12 mt*	*~2 mt*	*~31 mt*	*~129 mt*
FW32 Preferred	2 MAAA: 18k 1 CAII East: 18k 1 NLS-S-Deep: 18k ½ CAI: 9k ½ NLS-N: 9k 24 DAS	CAII-Southwest closed (area = 1,525 nmi^2)	23.2 – 23.3	2.06-2.3	31.2-32.91	135.17-142.92
Notes: See 2019 memo for bycatch methodology: https://s3.amazonaws.com/nefmc.org/3e_191115-MEMO-Scallop-Bycatch-Estimates-to-GF-PDT.pdf						

Scallop Fishery Projections for 2021 and 2022: The 2020 scallop surveys found that the majority of the resource is now concentrated on eastern Georges Bank. This is a shift from recent years in which most of the biomass has been concentrated in the Nantucket Lightship region and in the Mid-Atlantic Access area. Preliminary projections for the Closed Area II (CAII) region estimated exploitable biomass at 60 million pounds in 2021 and 87 million pounds in 2022 (assuming ~6 million lbs of landings during 2021)(Figure 1). Exploitable biomass in the Mid-Atlantic Access Area (MAAA) for 2022 is estimated to be around 19 million pounds across all three management areas after fishing the area in 2021. While recent projections have been overly optimistic, the fishery wide outlook is that the majority of potential access area fishing in 2022 will likely be in the Closed Area II region. The PDT predicts that CAII area may be able to support multiple access area trips in 2022 based on current projections.

Figure 1 - Predicted exploitable scallop biomass in the Closed Area II region and Mid-Atlantic Access Area for 2021 and 2022, assuming some fishing in both areas in 2021.



Scallop PDT Discussion To-Date:

1. Based on the range of fishery allocations under consideration in Framework 33, last year's bycatch estimates are a reasonable approximation of what is likely to be estimated for FY 2021 (see Table 1). Bycatch in CAII may be lower for yellowtail flounder based on the spatial distribution of scallops in the area. If the fishery focuses effort in the CAII-SW, tow times will likely be short due to the high densities of scallops observed in this area (Figure 3).
2. The FY2021 specifications will not be implemented until May or June of 2021. This is likely to change some fishing behavior and will amount to the continued closure of some access areas until the new specifications are in place, including the majority of Closed Area II (i.e., CAII-SW and CAII-Ext). The fishery is not going to start until May or June which may reduce impacts on yellowtail and windowpane because observed catch rates of the flatfish species have tended to decline in the late spring/early summer relative to the start of the scallop fishing year (April 1).
3. Through FW32, the Council extended the August 15 – November 15 seasonal closure of Closed Area II by two weeks for FY2020. The Council may evaluate the closure periods of CAII in the development of FW33. We expect this to come up at the December 12, 2020 Committee meeting.
4. Bycatch projections are based on the most recent available observer records for a strata (i.e. in this case, SAMS area). Since no new observer data is available in CAII for

FY2020, bycatch projections for CAII will be based on observer records from FY2017, the last time the scallop fishery was fishing in this access area. Projecting future bycatch based on time-lagged data increases the uncertainty of the estimates, and the PDT notes that FY2021 projections may be over- or under-estimated.

5. The PDT notes that flatfish bycatch projections are forecasts (with error) and should not be interpreted as precise estimates. In general, the PDT feels that estimates represent a reasonable approximation of catch that may occur. Review of past estimates has shown that projections have been both over-estimated and under-estimated relative to realized catches. It is important to note that the methods and underlying assumptions used for in-season catch accounting may vary from the methods used by the Scallop PDT to project catch. To capture some of this uncertainty, the PDT plans to develop a range of flatfish bycatch estimates using varying methods. In addition to the standard d:K method (see 2019 memo for bycatch projections methodology), the PDT discussed using observed flatfish catch per dredge hour applied to projected dredge hours by SAMS area for FY2021. Both approaches would produce bycatch estimates by SAMS area (i.e., not CAII as a whole), meaning differences in bycatch trends will be captured on a finer spatial scale and allow for comparisons to be made between varying spatial management configurations that are being developed for CAII through FW33.
6. In light of there being no updated observer data to inform bycatch trends in CAII, the PDT will be conducting a suite of sensitivity analyses using other data sources to scale observed flatfish catch rates from FY2017 to what might be considered a more realistic rate for FY2021. The sensitivity analyses will consider 1) recent TRAC reports, 2) VIMS survey dredge flatfish catch per tow from CAII between 2017 and 2020, and 3) flatfish catch data from the CFF seasonal dredge survey in Closed Area II from 2017 to 2020. The PDT acknowledges that there are caveats associated with these data sets, but also notes that using these time series' may help managers better understand the potential impacts of scallop fishing in CAII in FY2021 in addition to projections based on FY2017 observer data.
7. If the 2021 bycatch projections are similar to projections for FY2020, it is worth noting that projected bycatch is roughly equivalent to the scallop fishery sub-ACLs for SNE/MA yellowtail and GOM/GB windowpane, but greater than the sub-ACLs for GB yellowtail and SNE windowpane flounder (Table 1). Bycatch projections for the preferred alternative in FW32 exceeded the FY2020 sub-ACL for GB yellowtail by roughly 4 mt.
8. Alternatives under consideration in Framework 33 would allocate access area trips to rotational areas with high densities of scallops, meaning tow times and associated bycatch are expected to be reduced in access areas.
9. The fishery interacts with GB yellowtail and GOM/GB windowpane at a higher rate when fishing in CAII relative to other parts of the resource. All FW33 specifications options are considering allocations to Closed Area II, along with spatial closures that are anticipated to mitigate impacts to the GB yellowtail and GOM/GB windowpane flounder stocks. For example, the area that is being fished in FY2020 (CAII-SE) is likely to close in FY2021 and FY2022 to protect pre-recruits that were observed in this area, which would also relieve fishing pressure in an area that overlaps with GB yellowtail and GOM/GB windowpane.
10. Aside from possible fishery access to the CAII Access Area, access area effort will be directed to the MAAA, where scallops are currently found in high densities. The remainder of rotational harvest is likely to come from the NLS-South, with some potential for limited LAGC fishing in CAI. Recent bycatch estimates of SNE/MA

yellowtail have been very low in the MAAA and the NLS-South. CAI bisects the GB and CC/GOM yellowtail stock areas; however, yellowtail bycatch is anticipated to be low in CAI overall. The PDT does not anticipate much fishing in CAI if it is open based on the 2019 and 2020 surveys, and fishing behavior in 2020.

11. The PDT acknowledges that there will continue to be some additional uncertainty around the SNE/MA windowpane projections due to anticipated access to high densities of scallops in the NLS-South. This area has not been targeted in the past by the scallop fishery, meaning observer data are limited and the associated bycatch rates are uncertain (i.e. projections for the NLS-South use the NLS-North d/K considering these areas are adjacent to each other). Observers were not deployed on scallop vessels until August of FY2020 due to public health concerns stemming from the COVID-19 pandemic, meaning there is a very limited amount of new data to inform bycatch rates for FY2020. Realized SNE/MA windowpane bycatch could swing upwards or downwards from the range presented in Table 1 depending on fishing practices in the NLS-South. For example, should vessels fish in the areas of extraordinarily high-density, overall bycatch could be expected to decrease relative to the values provided in Table 1 if scallop catch rates are higher than projected. Conversely, should vessels target the lower density "edges" of the concentrated scallop aggregation, scallop catch rates could be lower, thereby increasing bycatch above the values presented in Table 1. As in the 2019 memo on bycatch, the PDT notes that the range of SNE/MA windowpane bycatch projections from Framework 32 for FY2020 (Table 1) are a realistic representation of a mix of these fishing practices (i.e. some vessels fishing high densities, others fishing lower densities).
12. The scallop fishery continues to use rotational management as a way to improve yield-per-recruit. In practice, *F* is reduced to zero in the years prior to an opening of an area. On the temporal scale of fishing years, effort in Closed Area II Access Area is periodic and is reflected by intermittently high catches of GB yellowtail, GOM/GB windowpane, and scallops in the stock area. In years when CAII AA is not fished, bycatch of GB yellowtail and GOM/GB windowpane decreases considerably, and scallops are caught elsewhere.

Figure 2 – Example spatial management configuration for FY2021 being analyzed through FW33.

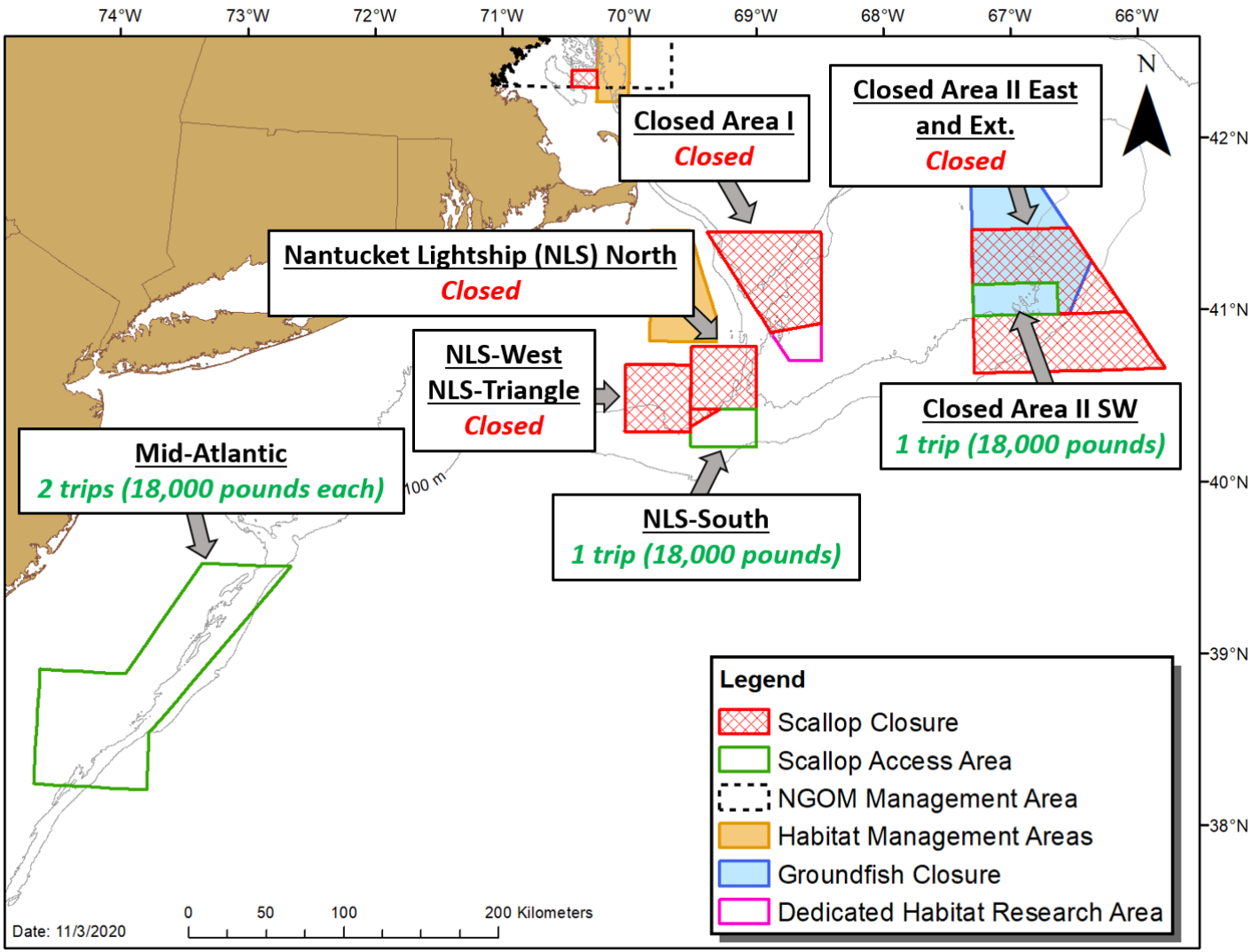


Table 2 - Range of Scallop Committee tasking for possible rotational management configurations in FW33 (Nov. 12, 2020).

	Required	Comparison	PDT Rec.	NEW RUN	NEW RUN	NEW RUN	NEW RUN	NEW RUN
	Default	Status Quo	PDT BASE Run 1	CTE 1 (AP1)	CTE 2 (AP2)	CTE 3 (AP 4)	CTE 4 (AP 5)	CTE 5 (AP 6)
Open area F	TBD, 18 DAS	F=0.33	24 DAS	24 DAS w/ CAI open	20 DAS	22 DAS	26 DAS	28 DAS
Open area LPUE			1,799	1,799	1,799	1,799	1,799	1,799
FT LA trip limit	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000
Total AA Pounds			*72,000*	*72,000*	*72,000*	*72,000*	*72,000*	*72,000*
CL1-Access	CLOSED	1/2 Trip (Flex)	CLOSED	OPEN BOTTOM	CLOSED	285 LAGC Trips (171,000 lbs)	571 LAGC Trips (342,000 lbs)	CLOSED
CL1-Sliver	CLOSED		CLOSED	OPEN BOTTOM	CLOSED			CLOSED
CL1-South	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED
CL2-North (HAPC)	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED
CL2-SE	CLOSED	1 AA Trip	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED
CL2-SW	CLOSED	CLOSED	1 AA trip	1 AA trip	1 AA trip	1 AA trip (SW & EXT as 1 area)	1/2 trip	1 AA Trip
CL2-Ext	CLOSED	CLOSED	CLOSED	CLOSED	1/2 FLEX to MAAA		1/2 trip	1 FLEX to MAAA
NLS-North	CLOSED	1/2 Trip	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED
NLS-South-Deep	CLOSED	1 AA Trip	1 AA Trip	1 AA Trip	1 AA Trip	1.5 AA Trips	1 AA Trip	1 AA Trip
NLS-West	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM
NF	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM
GSC	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM
SF	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM
BI	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM
LI	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM
NYB	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM
MAB-Nearshore	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM
HCS	1 trip MAAA	2 AA trips MAAA	2 AA trips MAAA	1.5 AA trips MAAA, 1/2 FLEX to NLS-S	1.5 AA trips MAAA	1.5 AA trips MAAA	2 AA trips MAAA	1 AA trip MAAA
ET Open								
ET Flex								
DMV	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM	OPEN BOTTOM
				CAI open bottom with 24 DAS		1/2 trip equivalent of LAGC IFQ trips @600lbs a day in CAI	1 trip equivalent of LAGC IFQ trips @600lbs a day in CAI.	
							We can run another DAS (26) or we can juggle this around to have 22 or 28 DAS with CAI open bottom.	

Figure 3 – Predicted biomass (mt per km^2) from the 2020 HabCam survey of eastern Georges Bank relative to FY2020 scallop management boundaries (black) and SAMS areas (red).