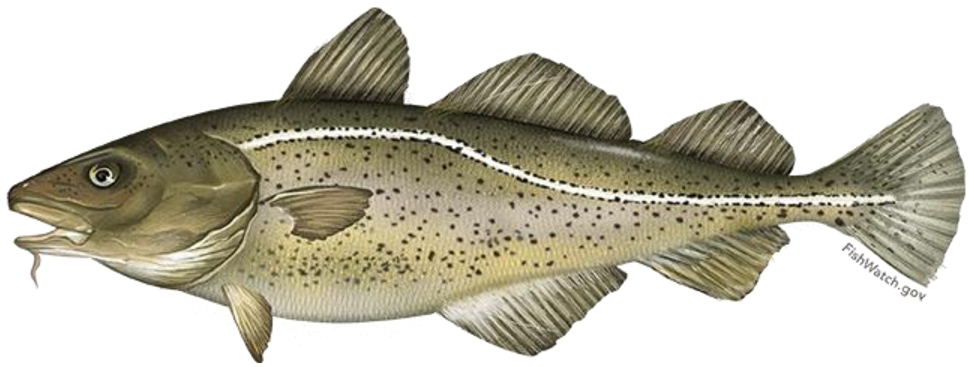
See Affected Environment
Pages 37-188

Northeast Multispecies Fishery Management Plan

Framework Adjustment 63

Including an Environmental Assessment,
Regulatory Flexibility Analysis, and
Stock Assessment and Fishery Evaluation



Final Submission

March 2022

Prepared by the
New England Fishery Management Council
In consultation with the
National Marine Fisheries Service and
Mid-Atlantic Fishery Management Council

Document history

Initial Framework Meeting:	June 23, 2021
Final Framework Meeting:	December 8, 2021
Preliminary Submission:	February 25, 2022
Final Submission:	March 28, 2022

Cover image

Fishwatch.gov [https://www.fishwatch.gov/profiles/atlantic-cod]

FRAMEWORK ADJUSTMENT 63

TO THE NORTHEAST MULTISPECIES FISHERY MANAGEMENT PLAN

Proposed Action:	Propose specifications for groundfish stocks for fishing years 2022-2024.
Responsible Agencies:	New England Fishery Management Council 50 Water Street, Mill #2 Newburyport, MA 01950 National Marine Fisheries Service National Oceanic and Atmospheric Administration U.S. Department of Commerce Washington, D.C. 20235
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Abstract:

The New England Fishery Management Council, in consultation with NOAA's National Marine Fisheries Service, has prepared Framework Adjustment 63 to the Northeast Multispecies Fishery Management Plan, which includes a final environmental assessment that presents the range of alternatives to achieve the goals and objectives of the action. The proposed action focuses on setting specifications for certain groundfish stocks. The document describes the affected environment and valued ecosystem components and analyzes the impacts of the alternatives on both. It addresses the requirements of the National Environmental Policy Act, the Magnuson Stevens Fishery Conservation and Management Act, the Regulatory Flexibility Act, and other applicable laws.

1.0 EXECUTIVE SUMMARY

Purpose and Need

The purpose of Framework Adjustment 63 (FW63) is to set specifications for several groundfish stocks and management units. FW63 incorporates the results of new stock assessments. The need for this action is to prevent overfishing, ensure rebuilding, and help achieve optimum yield in the commercial and recreational groundfish fisheries consistent with the status of stocks and the requirements of the Magnuson-Stevens Fishery Conservation and Management Act.

Proposed Action

The preferred alternatives include:

Action 1- Specifications: Setting fishing year (FY) 2022 total allowable catches for US/Canada management units of Eastern Georges Bank (GB) cod and Eastern GB haddock, and FY2022-FY2023 specifications for the GB yellowtail flounder stock, FY2022 specifications for GB cod and white hake FY2022-FY2024 specifications Gulf of Maine (GOM) cod, establishing a FY2022 GB cod target for the recreational fishery, and changing the current default specification process,

Action 2 - Recreational Fishery Measures for GB cod: Adjusts recreational management measures for GB cod.

Summary of Impacts of the Preferred Alternatives

The following table summarizing the impacts of the preferred alternatives by valued ecosystem component (VEC).

Actions and Alternatives		**Direct and indirect impacts**				
		Managed Resources	**Non-target species**	**Habitat/EFH**	**Protected Resources**	**Human communities (economic and social impacts)**
Action 1: Specifications	**Alt. 2 – Revised Specifications**	Slight +	Slight +	Slight -	Slight – to slight +	Economic: - to + Social: - to +
	Alt. 3 Recreational Catch Target for GB Cod (Option 4 preferred)	Slight +	Slight +	No impacts	Negl. to slight -	Economic: slight – to slight + Social: slight – to slight +
	Alt. 4 Changes to the Default Specifications Process (Option 4 preferred)	Negl. to slight +	Negl. to slight +	Negligible to slight -	Slight – to slight +	Economic: slight – to slight + Social: slight – to slight +
Action 2: Recreational Fishery Measures – Georges Bank Cod	**Alt. 2 – Temporary Administrative Measure to Allow the RA Authority to Adjust the Recreational Measures for GB Cod**	Slight +	Slight +	No impacts	Negl. to slight -	Economic: slight – to slight + Social: slight – to slight +
	Alt. 3 – Recreational Measures for GB Cod (Option 1 preferred)	Slight +	Slight +	No impacts	Negl. to slight -	Economic: slight – to slight + Social: slight – to slight +

2.0 TABLE OF CONTENTS

2.1 TABLES

2.2 FIGURES

2.3 Maps

2.4 Appendices

2.5 Acronyms

ABC	Acceptable Biological Catch
ACL	Annual Catch Limit
AIM	An Index Method of Analysis
ALWTRP	Atlantic Large Whale Take Reduction Plan
AM	Accountability Measure
ANPR	Advanced Notice of Proposed Rulemaking
AP	Advisory Panel
APA	Administrative Procedures Act
ASMFC	Atlantic States Marine Fisheries Commission
B_{MSY}	Biomass that would allow for catches equal to Maximum Sustainable Yield when fished at the overfishing threshold (FMSY)
BiOp, BO	Biological Opinion, a result of a review of potential effects of a fishery on Protected Resource species
CAI	Closed Area I
CAII	Closed Area II
CEQ	Council on Environmental Quality
CPUE	Catch per unit of effort
DAM	Dynamic Area Management
DAS	Day(s)-at-sea
DFO	Department of Fisheries and Oceans (Canada)
DMF	Division of Marine Fisheries (Massachusetts)
DMR	Department of Marine Resources (Maine)
DPWG	Data Poor Working Group
DSEIS	Draft Supplemental Environmental Impact Statement
EA	Environmental Assessment
EEZ	Exclusive economic zone
EFH	Essential fish habitat
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
F	Fishing mortality rate
FEIS	Final Environmental Impact Statement
FMP	Fishery management plan
FW	Framework
FY	Fishing year
GARFO	Greater Atlantic Regional Fisheries Office
GARM	Groundfish Assessment Review Meeting
GB	Georges Bank
GIS	Geographic Information System
GOM	Gulf of Maine
GRT	Gross registered tons/tonnage
HAPC	Habitat area of particular concern
HPTRP	Harbor Porpoise Take Reduction Plan
IFM	Industry-funded monitoring
IFQ	Individual fishing quota
ITQ	Individual transferable quota
IVR	Interactive voice response reporting system
IWC	International Whaling Commission
LOA	Letter of authorization

MA	Mid-Atlantic
MAFAC	Marine Fisheries Advisory Committee
MAFMC	Mid-Atlantic Fishery Management Council
MMPA	Marine Mammal Protection Act
MPA	Marine protected area
MRI	Moratorium Right Identifier
MRIP	Marine Recreational Information Program
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
NEAMAP	Northeast Area Monitoring and Assessment Program
NEFMC	New England Fishery Management Council
NEFOP	Northeast Fisheries Observer Program
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NLSA	Nantucket Lightship closed area
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OBDBS	Observer database system
OLE	Office for Law Enforcement (NMFS)
OY	Optimum yield
PBR	Potential Biological Removal
PDT	Plan Development Team
PRA	Paperwork Reduction Act
RFA	Regulatory Flexibility Act
RMA	Regulated Mesh Area
RPA	Reasonable and Prudent Alternatives
SA	Statistical Area
SAFE	Stock Assessment and Fishery Evaluation
SAP	Special Access Program
SARC	Stock Assessment Review Committee
SAS	Stock Assessment Subcommittee
SAW	Stock Assessment Workshop
SBNMS	Stellwagen Bank National Marine Sanctuary
SIA	Social Impact Assessment
SNE	Southern New England
SNE/MA	Southern New England-Mid-Atlantic
SSB	Spawning stock biomass
SSC	Scientific and Statistical Committee
TAL	Total allowable landings
TED	Turtle excluder device
TEWG	Technical Expert Working Group
TMS	Ten minute square
TRAC	Trans boundary Resources Assessment Committee
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VMS	Vessel monitoring system
VEC	Valued ecosystem component
VPA	Virtual population analysis
VTR	Vessel trip report
WGOM	Western Gulf of Maine
YPR	Yield per recruit

3.0 BACKGROUND AND PURPOSE

3.1 BACKGROUND

The Northeast Multispecies (Groundfish) Fishery Management Plan (FMP) specifies the management measures for thirteen groundfish species, both target (cod, haddock, yellowtail flounder, pollock, American plaice, witch flounder, white hake, winter flounder, redfish and Atlantic halibut) and non-target (windowpane flounder, ocean pout, and Atlantic wolffish) species off the New England and Mid-Atlantic coasts. Some of these species (cod, haddock, yellowtail flounder, winter flounder, and windowpane flounder) are further sub-divided into individual stocks that are attributed to different geographic areas. Two stocks, Georges Bank (GB) cod and GB haddock, also have management units. The FMP therefore consists of 20 stocks and 2 management units. Commercial and recreational fisheries catch these species.

The New England Fishery Management Council (NEFMC or Council) makes proposals, through various management actions, to the National Marine Fisheries Service (NMFS) on the management of the fishery. As such, the FMP has been updated through a series of amendments and framework adjustments. Amendment 16 (A16), which became effective in 2010, adopted a broad suite of management measures to achieve the fishing mortality targets necessary to rebuild overfished stocks and meet other requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Amendment 16 greatly expanded the sector management program and adopted a process for setting annual catch limits (ACLs) that requires catch levels to be set in biennial specifications packages. Amendment 17, effective in 2011, allows for NOAA-sponsored state-operated permit banks to function within the structure of A16. Amendment 18, effective in 2017, addresses fleet diversity and accumulation limits. Seventeen framework adjustments have updated the measures in A16. Amendment 23, which would improve monitoring in the commercial groundfish fishery, is under review by NMFS.

A16 made major changes to the FMP. The management action adopted a system of ACLs and accountability measures (AMs) that are designed to ensure catches remain below desired targets for each stock in the management complex. AMs are management controls to prevent ACLs from being exceeded and to correct or mitigate overages of the ACL if they occur. AMs should address and minimize both the frequency and magnitude of overages and correct the problems that caused the overages in as short a time as possible. AMs can be either in season AMs or AMs for when the ACL is exceeded.

There is no requirement that AMs and ACLs be implemented as hard total allowable catches (TACs) or quotas, but conservation and management measures must prevent the ACL from being exceeded and AMs must apply if the ACL is exceeded (74 FR 3184). While many measures in the management program are intended to control fishing mortality and might be interpreted to be AMs since they are "management controls to prevent the ACL from being exceeded," the term AM is usually applied to specific, automatic measures that are implemented either as an ACL is approached or after an ACL is exceeded.

3.2 PURPOSE AND NEED

The purpose of Framework Adjustment 63 (FW63) is to set specifications for several groundfish stocks and management units. FW63 incorporates the results of new stock assessments.

The need for this action is to prevent overfishing, ensure rebuilding, and help achieve optimum yield in the commercial and recreational groundfish fisheries consistent with the status of stocks and the requirements of MSA.

This framework includes alternatives (Table 1) that would:

- Set 2022 total allowable catches for US/Canada management units of Eastern GB cod and Eastern GB haddock, and 2022-2023 specifications for the GB yellowtail flounder stock,

- Set 2022 specifications for GB cod and 2022-2024 specifications Gulf of Maine (GOM) cod,
- Adjust 2022 specifications for white hake based on the new rebuilding plan,
- Change the current default specifications process, and
- Modify recreational fishery management measures to promote GB cod stock rebuilding.

Table 1- Purpose and need for Framework 63.

Purpose	Need
Measures to adopt ACLs, including relevant sub-ACLs and incidental catch TACs. Measure to adopt TACs for U.S./Canada area. Measures to revise the default specifications	Ensure that groundfish stocks are managed consistent with the status of stocks, and the requirements of the MSA. Ensure that levels of catch for fishing years 2022-2024 are consistent with recent assessments, the ABC control rules in the Northeast Multispecies FMP, the International Fisheries Agreement Clarification Act, and the most recent relevant law. Help prevent overfishing and achieve optimum yield.
Measures to manage the recreational fishery	Promote stock rebuilding of GB cod.

4.0 ALTERNATIVES UNDER CONSIDERATION

4.1 ACTION 1 – REVISED SPECIFICATIONS

4.1.1 Alternative 1 - No Action

Under Alternative 1 (No Action), there would be no changes to the specifications for FY2022 (Table 2). Default specifications for Eastern GB cod and Eastern GB haddock would be in effect from May 1, 2022, to July 31, 2022, and would equal 35% of the FY2021 catch limits, after which no specifications would be in place for these management units. All other stocks have FY2022 specifications. There would not be new FY2022 quotas specified for the transboundary Georges Bank stocks (i.e. GB cod, GB haddock, GB yellowtail flounder), which are managed through the US/CA Resource Sharing Understanding (as provided in Table 3 and Table 4), and therefore updated Canadian quotas would not be accounted for under No Action. These quotas are specified annually.

Rationale*:* The No Action alternative uses OFLs/ABCs/ACLs adopted in FW61. These values are based on previous assessments. However, more recent assessments for several of the groundfish stocks occurred in 2021.

Table 2 - Alternative 1/No Action - Northeast Multispecies OFLs, ABC, ACLs, and other ACL sub-components for FY2022-FY2023 (metric tons, live weight), adjusted for final sector 2021 rosters following the final rule for FW61, published July 27, 2021. Values are rounded to the nearest metric ton or tenth. Underlined stocks are subject to adjustments in 2022 based on US/CA quotas, 2021 CA quotas were used to adjust in the interim. Includes adjustments for Canadian catches (*)

Stock	FY	OFL	US ABC	State-Waters Sub-Component	Other sub-component	Scallops	Groundfish Sub-ACL	Comm. Ground-fish Sub-ACL	Rec Ground-fish Sub-ACL	Preliminary Sectors Sub-ACL	Preliminary Non-sector Groundfish Sub-ACL	MWT or Small mesh Sub-ACL	Total ACL
GB Cod	2022		1,308	20	137		1,093	1,093.1		1,045	48		1,250
GOM Cod	2022	1,150	552	48	12		463	270.4	193	262	8.2		523
GB Haddock	2022	114,925	81,242		406		75,250	75,250.4		72,770	2,481	1,511	77,168
GOM Haddock	2022	14,834	11,526	38	38		10,690	7,055.9	3,634	6,879	177	107	10,873
GB Yellowtail Flounder	2022		80			12	64	63.6		59	5.1	1.5	78
SNE/MA Yellowtail Flounder	2022	184	22	0.2	3.3	2.0	16	15.6		12	3.6		21
CC/GOM Yellowtail Flounder	2022	1,116	823	58	37		692	691.9		651	41		787
American Plaice	2022	3,687	2,825	28	28		2,630	2,630.1		2,542	89		2,687
Witch Flounder	2022		1,483	44	52		1,317	1,317.3		1,273	44		1,414
GB Winter Flounder*	2022	974	608		27		563	563.2		517	47		591
	2023	1,431	608		27		563	563.2		517	47		591
GOM Winter Flounder	2022	662	497	194	7.5		281	280.9		267	14		482
	2023	662	497	194	7.5		281	280.9		267	14		482
SNE/MA Winter Flounder	2022	1,438	456	21	132		288	288.1		247	41		441
	2023	1,438	456	21	132		288	288.1		247	41		441

Stock	FY	OFL	US ABC	State-Waters Sub-Component	Other sub-component	Scallops	Groundfish Sub-ACL	Comm. Ground-fish Sub-ACL	Rec Ground-fish Sub-ACL	Preliminary Sectors Sub-ACL	Preliminary Non-sector Groundfish Sub-ACL	MWT or Small mesh Sub-ACL	Total ACL
Redfish	2022	13,354	10,062				9,559	9,558.9		9,421	138		9,559
	2023	13,229	9,967				9,469	9,468.7		9,332	136		9,469
White Hake*	2022	2,986	2,147	11	11		2,019	2,019.3		1,994	25		2,041
Pollock	2022	21,744	16,812	1,093	841		14,135	14,135		13,988	147		16,068
Northern Windowpane Flounder	2022		160	0.8	10	31	108	107.9			108		150
	2023		160	0.8	10	31	108	107.9			108		150
Southern Windowpane Flounder	2022	513	384	23	177	129	43	42.9			43		371
	2023	513	384	23	177	129	43	42.9			43		371
Ocean Pout	2022	125	87		33		50	49.8			50		83
	2023	125	87		33		50	49.8			50		83
Atlantic Halibut*	2022		101	20	3.5		73	73.4			73		97
	2023		101	20	3.5		73	73.4			73		97
Atlantic Wolffish	2022	122	92				86	85.6			86		86
	2023	122	92				86	85.6			86		86

4.1.2 **Alternative 2 – Revised Specifications (*Preferred Alternative*)**

Under Alternative 2, the annual specifications for FY2022- FY2024 for GOM cod, FY2022 to FY2023 for GB yellowtail flounder, and FY2022 for GB cod, GB haddock, and white hake would be as specified as in Table 5. Specifications previously set for other stocks are not changing. Alternative 2 only includes adjustments to the state waters and other sub-component values for GB cod. The GB cod values incorporate the recreational catch target for GB cod (see Alternative 3). Options under 4.1.3 Alternative 3 for the recreational GB cod catch target shown in the table.

For GB cod, the Council decided to only set specifications for FY2022 in this action. Therefore, FY2023 specifications would be at the default 75% of the FY2022 specifications for 6 months (see Alternative 4/Option 4), unless FY2023 specifications are set through a future action.

U.S./Canada Total Allowable Catches

This alternative would specify total allowable catches (TACs) for the U.S./Canada Management Area for FY2022 for Eastern GB cod, Eastern GB haddock, and GB yellowtail flounder as indicated in Table 3. If NMFS determines that FY2021 catch of GB cod, haddock, or yellowtail flounder from the U.S./Canada Management Area exceeded the respective 2021 TACs, the U.S./Canada Resource Sharing Understanding and the regulations require that the 2022 TAC for each be reduced by the amount of the overage. Any overage reduction would be applied to the components of the fishery that caused the overage of the U.S. TAC in 2021. To minimize any disruption to the fishing industry, NMFS would attempt to make any necessary TAC adjustment in the first quarter of the fishing year.

A comparison of the proposed FY2022 and FY2021 U.S. TACs is shown in Table 4. Changes to the U.S. TACs reflect changes to the percentage shares, stock status, and the Transboundary Management Guidance Committee's (TMGC) recommendations.

In addition, the Council selected Alternative 4 Option 4 as preferred. This option establishes a second-year TAC for the US/CA management units of Eastern GB cod and Eastern GB haddock, such that the TAC set for Year 1 would be held for Year 2. In a situation where the next year's specifications action was delayed beyond the start of the fishing year, the Year 2 TAC would act as a placeholder specification for the full year, until replaced by the updated TMGC recommendations as part of the annual process.

Table 3 - Proposed FY2022 and FY2023 U.S./Canada TACs (mt).

	Eastern GB Cod	Eastern GB Haddock	GB Yellowtail Flounder
Total Shared TAC	571	14,100	200
U.S. TAC	160	6,627	122
Canada TAC	411	7,473	78

Table 4 - Comparison of the Proposed FY2022 U.S. TACs and the FY2021 U.S. TACs (mt).

Stock	U.S. TAC		Percent Change ((FY2022-FY2021) /FY2022)*100
	FY2021	FY2022	
Eastern GB cod	190.5	160	*-16.1%*
Eastern GB haddock	6,486	6,627	+ *2%*
GB yellowtail flounder	80	122	+*53%*

Table 5- Alternative 2 Revised Northeast Multispecies OFLs, ABC, ACLs for FY2022-FY2024 (metric tons, live weight), based on final 2021 sector rosters. Values are rounded to the nearest metric ton or tenth. Underlined stocks are subject to adjustments in 2023 based on US/CA quotas, 2022 CA quotas were used to adjust in the interim. Includes adjustments for Canadian catches (*), and state waters component and other sub-component for GB cod. Specifications in gray are unadjusted from FW61.

Stock	FY	OFL	US ABC	State-Waters Sub-Component	Other sub-component	Scallops	Groundfish Sub-ACL	Comm. Ground-fish Sub-ACL	Rec Ground-fish Sub-ACL	Preliminary Sectors Sub-ACL	Preliminary Non-sector Groundfish Sub-ACL	MWT or Small mesh Sub-ACL	Total ACL
GB Cod Alt 3./Option 1: 138mt	2022		343	17.5	131.6		184.1	184.1		176.0	8.1		333
GB Cod Alt 3./Option 2: 43mt	2022		343	8.0	46.1		274.3	274.3		262.3	12.0		328
GB Cod Alt 3./Option 3: 71mt	2022		343	10.8	71.3		247.7	247.7		236.9	10.9		330
GB Cod Alt 3./Option 4: 75 mt ***(Preferred)***	2022		343	11.2	74.9		243.9	243.9		233.2	10.7		330
GOM Cod	2022	724	551	48	12		462	270	192	262	8		522
	2023	853	551	48	12		462	270	192	262	8		522
	2024	980	551	48	12		462	270	192	262	8		522
GB Haddock	2022	114,925	81,383		406		75,381	75,381		72,896	2,485	1,514	77,302
GOM Haddock	2022	14,834	11,526	38	38		10,690	7,055.9	3,634	6,879	177	107	10,873
GB Yellowtail Flounder	2022		122			19	97	97		89	7.8	2.3	118
	2023		122			19	97	97		89	7.8	2.3	118
SNE/MA Yellowtail Flounder	2022	184	22	0.2	3.3	2.0	16	15.6		12	3.6		21
CC/GOM Yellowtail Flounder	2022	1,116	823	58	37		692	691.9		651	41		787
American Plaice	2022	3,687	2,825	28	28		2,630	2,630.1		2,542	89		2,687

Stock	FY	OFL	US ABC	State-Waters Sub-Component	Other sub-component	Scallops	Groundfish Sub-ACL	Comm. Ground-fish Sub-ACL	Rec Ground-fish Sub-ACL	Preliminary Sectors Sub-ACL	Preliminary Non-sector Groundfish Sub-ACL	MWT or Small mesh Sub-ACL	Total ACL
Witch Flounder	2022		1,483	44	52		1,317	1,317.3		1,273	44		1,414
GB Winter Flounder*	2022	974	608		27		563	563.2		517	47		591
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	2023	1,438	456	21	132		288	288.1		247	41		441
Redfish	2022	13,354	10,062				9,559	9,558.9		9,421	138		9,559
	2023	13,229	9,967				9,469	9,468.7		9,332	136		9,469
White Hake*	2022	3,022	2,116	11	11		1,990	1,990		1,965	25		2,011
Pollock	2022	21,744	16,812	1,093	841		14,135	14,134.7		13,988	147		16,068
Northern Windowpane Flounder	2022		160	0.8	10	31	108	107.9			108		150
	2023		160	0.8	10	31	108	107.9			108		150
Southern Windowpane Flounder	2022	513	384	23	177	129	43	42.9			43		371
	2023	513	384	23	177	129	43	42.9			43		371
Ocean Pout	2022	125	87		33		50	49.8			50		83
	2023	125	87		33		50	49.8			50		83
Atlantic Halibut*	2022		101	20	3.5		73	73.4			73		97

Stock	FY	OFL	US ABC	State-Waters Sub-Component	Other sub-component	Scallops	Groundfish Sub-ACL	Comm. Ground-fish Sub-ACL	Rec Ground-fish Sub-ACL	Preliminary Sectors Sub-ACL	Preliminary Non-sector Groundfish Sub-ACL	MWT or Small mesh Sub-ACL	Total ACL
	2023		101	20	3.5		73	73.4			73		97
Atlantic Wolffish	2022	122	92				86	85.6			86		86
	2023	122	92				86	85.6			86		86

Rationale: This measure would adopt new specifications for GB cod (FY2022), GOM cod (FY2022-2024), and GB yellowtail flounder (FY2022-FY2023) stocks consistent with the most recent stock assessment information and for white hake (FY2022) following the new rebuilding plan. The U.S. and Canada coordinate management of three management units that overlap the boundary between the two countries on Georges Bank. Agreement on the amount to be caught is reached each year by the TMGC. This framework includes the recommendations of the TMGC, which are consistent with the most recent Transboundary Resource Assessment Committee (TRAC) assessments.

4.1.3 **Alternative 3 – Recreational Catch Target for Georges Bank Cod (*Preferred Alternative*)**

4.1.3.1 *Option 1* – No Action

Under No Action, the current recreational fishery GB cod catch target would remain at 138 mt through FY2022. The catch target does not account for the revised MRIP data in the 2019 or 2021 stock assessments of GB cod. As the catch target is not a sub-ACL, the catch target is apportioned into the state waters and other sub-components for FY2022.

Rationale: The development of a recreational fishery GB cod catch target in Framework 57 used information from the 2017 stock assessment. The catch target formed the basis for the development of the current GB cod recreational fishery management measures, which have been in place since fishing year 2019. Maintaining the catch target of 138 mt through FY2022 allows a portion of the total ACL to be set aside for recreational catch, while maximizing the quota available to the commercial fishery. If the recreational fishery catch exceeds the amount set aside and contributes to an overage of the ACL, the commercial groundfish fishery would be responsible for paying back the overage, based on evaluating a 3-year average of recreational catch.

4.1.3.2 *Option 2* – Revised Recreational GB Cod Catch Target Based on Recent Catches

The GB cod recreational catch target would be revised and set for fishing year 2022 using the method as follows:

- The 3-year (CY2018-CY2020) average of recreational catch (163mt), reduced by the percent change between FY2021 US ABC to the proposed FY2022 US ABC (73.8%).
- Under a 754 mt ABC, this results in a GB cod recreational catch target of 43 mt.

Decline in US ABC from FY2021 to FY2022:
Total ABC = 754 mt
Canadian TAC = 411 mt
US ABC 2022= 343mt
US ABC 2021 = 1,308 mt
73.8% decline

The catch target calculation uses the most recent MRIP data in the 2021 stock assessment of GB cod. As the catch target is not a sub-ACL, the catch target is apportioned into the state waters and other sub-components for fishing year 2022.

Rationale: Revising the catch target for FY2022 allows a portion of the total ACL to be set aside for recreational catch, while maximizing the quota available to the commercial fishery. If the recreational fishery catch exceeds the amount set aside and contributes to an overage of the ACL, the commercial groundfish fishery would be responsible for paying back the overage, based on evaluating a 3-year average of recreational catch. The data to evaluate a possible revised catch target comes from the recent 2021 stock assessment for GB cod and does not rely on information in year-end fishery catch reports. This is in part because the stock assessment includes the new Marine Recreational Information Program (MRIP) data for the entire time series. The 3-year average catch approach would consider more recent improvements in the MRIP data and more representative sample sizes than in the past.

4.1.3.3 *Option 3* – Revised Recreational GB Cod Catch Target Based on Recent Percentage of US Fisheries Catches

The GB cod recreational catch target would be revised and set for fishing year 2022 using the method as follows:

- The 3-year (CY2018-CY2020) average percentage of recreational catches relative to US fisheries total catches (20.6%) applied to the proposed FY2022 US ABC (343mt).
- Under a 754 mt ABC, this results in a GB cod recreational catch target of 71 mt.

The catch target calculation uses the most recent MRIP data in the 2021 stock assessment of GB cod. As the catch target is not a sub-ACL, the catch target is apportioned into the state waters and other sub-components for fishing year 2022.

Rationale: Revising the catch target for FY2022 allows a portion of the total ACL to be set aside for recreational catch, while maximizing the quota available to the commercial fishery. If the recreational fishery catch exceeds the amount set aside and contributes to an overage of the ACL, the commercial groundfish fishery would be responsible for paying back the overage, based on evaluating a 3-year average of recreational catch. The data to evaluate a possible revised catch target comes from the recent 2021 stock assessment for GB cod and does not rely on information in year-end fishery catch reports. This is in part because the stock assessment includes the new Marine Recreational Information Program (MRIP) data for the entire time series. The 3-year average catch approach would consider more recent improvements in the MRIP data and more representative sample sizes than in the past.

4.1.3.4 *Option 4* – Revised Recreational GB Cod Catch Target Based on a Reduction from Recent Catches (*Preferred Option*)

The GB cod recreational catch target would be revised and set for fishing years 2022 as 75 mt. After reviewing the range of options under consideration which could result in a catch target of 43 mt to 138mt, the Council selected as its preferred alternative a GB cod recreational catch target of 75 mt for fishing year 2022. 75 mt represents 54% reduction from the recent 3-year (CY2018-CY2020) average of recreational catch (163mt).

The catch target calculation uses the most recent MRIP data in the 2021 stock assessment of GB cod. As the catch target is not a sub-ACL, the catch target is apportioned into the state waters and other sub-components for fishing years 2022.

Rationale: Revising the catch target for FY2022 allows a portion of the total ACL to be set aside for recreational catch, while maximizing the quota available to the commercial fishery. If the recreational fishery catch exceeds the amount set aside and contributes to an overage of the ACL, the commercial groundfish fishery would be responsible for paying back the overage, based on evaluating a 3-year average of recreational catch. The data to evaluate a possible revised catch target comes from the recent 2021 stock assessment for GB cod and does not rely on information in year-end fishery catch reports. This is in part because the stock assessment includes the new Marine Recreational Information Program (MRIP) data for the entire time series. The 3-year average catch approach would consider more recent improvements in the MRIP data and more representative sample sizes than in the past.

4.1.4 Alternative 4 – Changes to the Default Specifications Process (*Preferred Alternative*)

4.1.4.1 *Option 1* – No Action

Under No Action, the current default specifications process applies to each groundfish stock or management unit that lacks a full year of specifications. For those that lack specifications, 35 percent of the prior year's OFL, ABC, and ACL is specified for the first three months (May 1 to July 31) of an upcoming fishing year.

The default specifications may not exceed the anticipated ABCs for the upcoming fishing year. If the default specification does exceed the anticipated ABC, the default specification would be set equal to the ABC for the upcoming fishing year.

The default specifications are in place from May 1 up to July 31. Starting on August 1, fishing for stocks without specifications in place would cease, along with fishing for other groundfish stocks that share the BSAs as stocks with no specifications.

Default specifications are replaced by the anticipated OFL, ABC, and ACL values after they are approved and implemented upon rulemaking. All catches occurring while default specifications are in place (after May 1 through final rulemaking) are counted against each component's allocation and the updated ACL for the fishing year. Northeast groundfish sectors are not subject to a 20% holdback of the prior year's Sector ACE while default specifications are in place.

Rationale: This measure allows the directed groundfish fishery to begin on-time (May 1) if full year specifications are not in place for the start of the fishing year. A percentage less than 100% of the prior year's OFL, ABC, and ACL, not to exceed the next year's ABC, reflects a more precautionary approach than carrying forward 100% of the prior year's specifications, reflecting variation in stock statuses within the multispecies complex. Reducing the allowable catch in the fishery by 65% builds in precaution to protect stocks whose stock status may have changed. Allowing the fishing year to begin on time accommodates fishing businesses that prosecute the fishery early on the fishing year. Delays in specifications actions have persisted in the past four out of five fishing years, but the August 1 deadline has not been missed to-date.

4.1.4.2 *Option 2* - 4 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs

Under Option 2, the default specifications process applies to each groundfish stock or management unit that lacks a full year of specifications. For those that lack specifications, 75 percent of the prior year's

OFL, ABC, and ACL is specified for the first four months (May 1 to August 31) of an upcoming fishing year.

The default specifications may not exceed the anticipated ABCs for the upcoming fishing year. If the default specification does exceed the anticipated ABC, the default specification would be set equal to the ABC for the upcoming fishing year.

The default specifications are in place from May 1 up to August 31. Starting on September 1, fishing for stocks without specifications in place would cease, along with fishing for other groundfish stocks that share the same BSAs as stocks with no specifications.

Default specifications are replaced by the anticipated OFL, ABC, and ACL values after they are approved and implemented upon rulemaking. All catches occurring while default specifications are in place (after May 1 through final rulemaking) are counted against each component's allocation and the updated ACL for the fishing year. Northeast groundfish sectors are not subject to a 20% holdback of the prior year's Sector ACE while default specifications are in place.

This option establishes a second-year TAC for the US/CA management units of Eastern GB cod and Eastern GB haddock, such that the TAC set for Year 1 would be held for Year 2. The Year 2 TAC would remain in place for the full year, unless replaced.

Rationale: This measure allows the directed groundfish fishery to begin on-time (May 1) if full year specifications are not in place for the start of the fishing year. A percentage less than 100% of the prior year's OFL, ABC, and ACL, not to exceed the next year's ABC, reflects a more precautionary approach than carrying forward 100% of the prior year's specifications, reflecting variation in stock statuses within the multispecies complex. Reducing the allowable catch in the fishery by 25% builds in some precaution to protect stocks whose stock status may have changed. Allowing the fishing year to begin on time accommodates fishing businesses that prosecute the fishery early on the fishing year. Delays in specifications actions have persisted in the past four out of five fishing years. The addition of one month to the current expiration date of default specifications (August 31 vs. July 31) retains a timeline for rulemaking and slightly reduces the likelihood of having specifications for groundfish stocks expire. Transboundary stocks/management units are managed through the US/CA Resource Sharing Understanding and the quotas are specified annually. Setting a second year TAC for Eastern GB cod and Eastern GB haddock as a placeholder would eliminate disruptions to the fishery from these two stocks consistently requiring default specifications.

4.1.4.3 *Option 3* - 5 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs

Under Option 3, the default specifications process applies to each groundfish stock or management unit that lacks a full year of specifications. For those that lack specifications, 75 percent of the prior year's OFL, ABC, and ACL is specified for the first five months (May 1 to September 30) of an upcoming fishing year.

The default specifications may not exceed the anticipated ABCs for the upcoming fishing year. If the default specification does exceed the anticipated ABC, the default specification would be set equal to the ABC for the upcoming fishing year.

The default specifications are in place from May 1 up to September 30. Starting on October 1, fishing for stocks without specifications in place would cease, along with fishing for other groundfish stocks that share the BSAs as stocks with no specifications.

Default specifications are replaced by the anticipated OFL, ABC, and ACL values after they are approved and implemented upon rulemaking. All catches occurring while default specifications are in place (after May 1 through final rulemaking) are counted against each component's allocation and the updated ACL for the fishing year. Northeast groundfish sectors are not subject to a 20% holdback of the prior year's Sector ACE while default specifications are in place.

This option establishes a second-year TAC for the US/CA management units of Eastern GB cod and Eastern GB haddock, such that the TAC set for Year 1 would be held for Year 2. The Year 2 TAC would remain in place for the full year, unless replaced.

Rationale: This measure allows the directed groundfish fishery to begin on-time (May 1) if full year specifications are not in place for the start of the fishing year. A percentage less than 100% of the prior year's OFL, ABC, and ACL, not to exceed the next year's ABC, reflects a more precautionary approach than carrying forward 100% of the prior year's specifications, reflecting variation in stock statuses within the multispecies complex. Reducing the allowable catch in the fishery by 25% builds in some precaution to protect stocks whose stock status may have changed. Allowing the fishing year to begin on time accommodates fishing businesses that prosecute the fishery early on the fishing year. Delays in specifications actions have persisted in the past four out of five fishing years. The addition of two months to the current expiration date of default specifications (September 30 vs. July 31) retains a timeline for rulemaking and moderately reduces the likelihood of having specifications for groundfish stocks expire. Transboundary stocks/management units are managed through the US/CA Resource Sharing Understanding and the quotas are specified annually. Setting a second year TAC for Eastern GB cod and Eastern GB haddock as a placeholder would eliminate disruptions to the fishery from these two stocks consistently requiring default specifications.

4.1.4.4 *Option 4* - 6 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs (*Preferred Option*)

Under Option 4, the default specifications process applies to each groundfish stock or management unit that lacks a full year of specifications. For those that lack specifications, 75 percent of the prior year's OFL, ABC, and ACL is specified for the first six months (May 1 to October 31) of an upcoming fishing year.

The default specifications may not exceed the anticipated ABCs for the upcoming fishing year. If the default specification does exceed the anticipated ABC, the default specification would be set equal to the ABC for the upcoming fishing year.

The default specifications are in place from May 1 up to October 31. Starting on November 1, fishing for stocks without specifications in place would cease, along with fishing for other groundfish stocks that share the same BSAs as stocks with no specifications.

Default specifications are replaced by the anticipated OFL, ABC, and ACL values after they are approved and implemented upon rulemaking. All catches occurring while default specifications are in place (after May 1 through final rulemaking) are counted against each component's allocation and the updated ACL for the fishing year. Northeast groundfish sectors are not subject to a 20% holdback of the prior year's Sector ACE while default specifications are in place.

This option establishes a second-year TAC for the US/CA management units of Eastern GB cod and Eastern GB haddock, such that the TAC set for Year 1 would be held for Year 2. The Year 2 TAC would remain in place for the full year, unless replaced.

Rationale: This measure allows the directed groundfish fishery to begin on-time (May 1) if full year specifications are not in place in time for the start of the fishing year. A percentage less than 100% of the prior year's OFL, ABC, and ACL, not to exceed the next year's ABC, reflects a more precautionary approach than carrying forward 100% of the prior year's specifications because of the variation in stock statuses within the multispecies complex. Reducing the allowable catch in the fishery by 25% builds in some precaution to protect stocks whose stock status may have changed. Allowing the fishing year to begin on time accommodates fishing businesses that prosecute the fishery early on the fishing year. Delays in specifications actions have persisted in the past four out of five fishing years. The addition of three months to the current expiration date of default specifications (October 31 vs. July 31) retains a timeline for rulemaking and significantly reduces the likelihood of having specifications for groundfish stocks expire. Transboundary stocks/management units are managed through the US/CA Resource Sharing Understanding and the quotas are specified annually. Setting a second year TAC for Eastern GB cod and Eastern GB haddock as a placeholder would eliminate disruptions to the fishery from these two stocks consistently requiring default specifications.

4.2 Action 2 – Recreational Fishery Measures- Georges Bank Cod

4.2.1 Alternative 1 – No Action

No Action would maintain the existing management measures currently in place for GB cod for the recreational fishery.

Minimum Fish Size- The minimum size for Georges Bank cod is 21 inches (53.34 cm.), total length for the recreational fishery (private, party, and charter).

Possession Limit- Party, charter, and private vessels in the recreational fishery are permitted to land 10 legal sized GB cod per angler, per day.

Management Measures- Changes to existing management measures would require a Council action. Currently, the recreational fishery does not have an allocation for GB cod. Amendment 16 outlined the process for determining when and how an allocation of certain regulated groundfish stocks be made to the recreational component of the fishery. The process would require Council action and that certain standards be met (e.g., the fishery components are fully utilizing their ACL, and the recreational harvest, after accounting for state waters catches outside the management plans, is five percent or greater of the removals).

Rationale: This approach would maintain the current GB cod recreational measures and continue to allow the Council to adjust these measures through management actions as needed.

4.2.2 Alternative 2 – Temporary Administrative Measure to Allow the Regional Administrator Authority to Adjust the Recreational Measures for Georges Bank Cod (*Preferred Alternative*)

Under Alternative 2, the Regional Administrator would have authority, in consultation with the Council, to adjust the recreational measures for Georges Bank cod for FY2023 and FY2024 to stay below the catch target selected by the Council. The consultation with the Council would allow for review of any measures under consideration. If time permits, the Recreational Advisory Panel and the Groundfish Committee would review the measures and make recommendations to the Council. The recreational measures would remain in place until changed.

Rationale: This approach would allow for temporary flexibility for the Regional Administrator in adjusting recreational measures for Georges Bank cod without requiring Council action, while still including consultation with the Council to allow for review of any measures under consideration.

4.2.3 Alternative 3 – Recreational Measures for Georges Bank Cod (*Preferred Alternative*)

The Council selected Option 1 as preferred.

Under Alternative 3, the recreational measures for GB cod would be in place for the start of FY2022 and would remain in place until changed. These measures were developed to reduce mortality on GB cod and allow for the promotion of GB cod stock rebuilding. The following summarizes the measures that would be expected to reduce mortality to stay below the FY2022 GB cod catch target selected by the Council of 75 mt, compared to other options considered.

	Recreational Measures for GB Cod			
	No Action	**Option 1 (*Preferred*)**	**Option 2**	**Option 3**
Average of CY2018-CY2020 catches	163mt			
Percent Reduction	0%	-63%	-65%	-52%
Estimated Mortality	163 mt	60.3 mt	57 mt	78 mt
Within GB Cod Catch Target Option?				
Option 1: 138 mt		Yes	Yes	Yes
Option 2: If 43mt				
Option 3: If 71 mt		Yes	Yes	
Option 4: 75 mt ***(Preferred)***		Yes	Yes	

4.2.3.1 *Option 1* – Recreational measures to reduce mortality from recent catches (CY2018-CY2020) by 63% (*Preferred Option*)

Slot Limit- The minimum size for GB cod would be 22 inches (55.88 cm.) and the maximum size would 28 inches (71.12 cm), total length for the recreational fishery (private, party, and charter)

Possession Limit- Party, charter, and private vessels in the recreational fishery would be permitted to land 5 legal sized GB cod per angler, per day.

Season- Party, charter, and private vessels in the recreational fishery would be prohibited from retaining GB cod from May 1 to July 31. No possession would be in place during this time.

4.2.3.2 *Option 2* – Recreational measures to reduce mortality from recent catches (CY2018-CY2020) by 65%

Slot Limit- The minimum size for GB cod would be 22 inches (55.88 cm.) and the maximum size would 28 inches (71.12 cm), total length for the recreational fishery (private, party, and charter)

Possession Limit- Party, charter, and private vessels in the recreational fishery would be permitted to land 5 legal sized GB cod per angler, per day.

Season- Party, charter, and private vessels in the recreational fishery would be prohibited from retaining GB cod from July 1 to August 31. No possession would be in place during this time.

4.2.3.3 *Option 3* – Recreational measures to reduce mortality from recent catches (CY2018-CY2020) by 52%

Minimum Fish Size- The minimum size for GB cod would be 23 inches (58.42 cm.), total length for the recreational fishery (private, party, and charter)

Possession Limit- Party, charter, and private vessels in the recreational fishery would be permitted to land 5 legal sized GB cod per angler, per day.

Season- Party, charter, and private vessels in the recreational fishery would be prohibited from retaining GB cod fishing from March 1 to June 30. No possession would be in place during this time.

Rationale: These measures were developed to reduce mortality on GB cod and allow for the promotion of GB cod stock rebuilding. These options would reduce recreational fishing mortality from recent catches (CY2018 – CY2020) by 63% (Option 1), 65% (Option 2) or 52% (Option 3) to stay under the GB cod catch target options.

5.0 AFFECTED ENVIRONMENT

5.1 INTRODUCTION

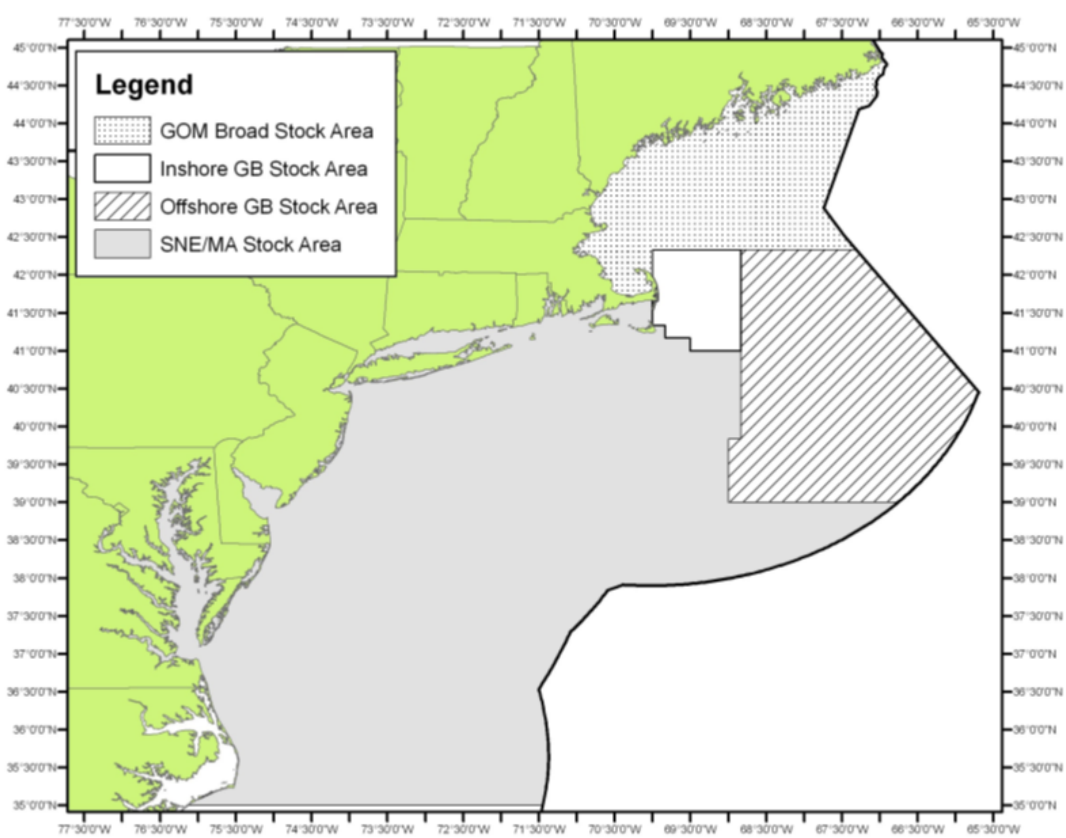
The Affected Environment is described in this action based on valued ecosystem components (VECs), including: regulated groundfish species, non-groundfish species/bycatch, the physical environment and Essential Fish Habitat (EFH), protected resources, and human communities. VECs represent the resources, areas and human communities that may be affected by the alternatives under consideration in this amendment. VECs are the focus, since they are the "place" where the impacts of management actions occur.

5.2 REGULATED GROUNDFISH SPECIES

This section describes the life history and stock population status for each allocated fish stock harvested under the Northeast Multispecies FMP. Map 1 identifies the four broad stock areas used in the fishery. Further information on life history and habitat characteristics of the stocks managed in this FMP can be found in the EFH Source Documents at http://www.nefsc.noaa.gov/nefsc/habitat/efh/.

The allocated target stocks for the Northeast Multispecies FMP are: GOM cod, GB cod, GOM haddock, GB haddock, American Plaice, witch flounder, GOM winter flounder, GB winter flounder, SNE/MA winter flounder, CC/GOM yellowtail flounder, GB yellowtail flounder, SNE/MA yellowtail flounder, redfish, pollock and white hake. These species are discussed in Sections 5.2.1 - 5.2.15.

Map 1 - Northeast Multispecies Broad Stock Areas.



The Northeast Multispecies FMP also manages Atlantic halibut, ocean pout, windowpane flounder (GB/GOM- northern and SNE/MA- southern stocks), and wolffish. While OFLs, ABCs, and ACLs are specified for these stocks, they were not allocated to sectors through Amendment 16. These species are discussed in Sections 5.2.16 - 5.2.20.

Discussions have been adapted from the most recent stock assessment reports (NEFSC 2020b and NEFSC 2021b, in prep).

Additional information following the most recent stock assessments is also provided in Sections 5.2.21-5.2.22.

5.2.1 Gulf of Maine Cod

Life History. The Atlantic cod, *Gadus morhua*, is a demersal gadoid species found on both sides of the North Atlantic. In the western North Atlantic, cod occur from Greenland to North Carolina. In U.S. waters, cod are assessed and managed as two stocks: Gulf of Maine (GOM) and Georges Bank (GB). GOM cod attain sexual maturity at a later age than GB cod due to different growth rates between the two stocks. The greatest concentrations of cod off the U.S. Northeast coast are on rough bottoms 33 - 492 ft (10 - 150 m) deep and at 32 - 50°F (0 - 10°C). Spawning occurs year-round near the ocean bottom, with a peak in winter and spring. Peak spawning corresponds to 41 - 45°F (5 - 7°C) water. It is delayed until spring when winters are severe, and peaks in the winter when winters are mild. Eggs are pelagic, buoyant, spherical, and transparent. They drift for 2 - 3 weeks before hatching. The larvae are pelagic for about three months until reaching 1.6 - 2.3 in (4 - 6 cm), when they descend to the seafloor. Most remain on the bottom, and there is no evidence of a subsequent diel, vertical migration. Adults tend to move in schools, usually near the bottom, but also occur in the water column (NEFSC 2011c).

Population Status. The inshore GOM stock appears to be relatively distinct from the offshore cod stocks on the banks of the Scotian Shelf and Georges Bank based on tagging studies. GOM cod spawning stock biomass is estimated to have been just over 22,000 mt in 1982. After a period of decline in the 1980's, SSB returned to roughly 20,000 mt in 1990 before decreasing again in the 1990's. The use of separate assessment models (M=0.2 and M-ramp) in the last three assessments yield two estimates for SSB in recent years, though both indicate a sharp decline in SSB since 2010, when SSB was estimated at 8,638 mt and 10,645 mt (respectively). The stock remains low relative to historic levels and is subject to a formal stock rebuilding plan. The 2019 SSB estimates (M=0.2 and M-ramp models) are 1,969 mt and 3,223 mt (respectively), which is 5% and 5% (respectively) of the biomass target. The 2019 fully selected fishing mortality was estimated to be 0.249 and 0.172 (respectively), which is 144% and 98% of the F_{MSY} proxy (respectively) (NEFSC 2021b, in prep). Based on the updated assessment, the GOM cod stock is overfished and overfishing is occurring for the M=0.2 model, and overfished and overfishing is not occurring for the M-ramp model (NEFSC 2021b, in prep). Recreational catch estimates for 2017 and 2018 were updated due to a change in the MRIP code, which resulted in a small (<3%) change to the recreational catch estimates in those years. The stock shows a truncated size and age structure, consistent with a population experiencing high mortality. Additionally, there are only limited signs of incoming recruitment, continued low survey indices, and the current spatial distribution of the stock is considerably less than its historical range within the Gulf of Maine (NEFSC 2021b, in prep).

5.2.2 Georges Bank Cod

Life History. Georges Bank cod, *Gadus morhua*, is currently the most southerly cod stock in the world, however, recent work by the Atlantic Cod Stock Structure Working Group proposes a new stock structure which includes a Southern New England stock (McBride and Smedbol). The greatest concentrations off the Northeast coast of the U.S. are on rough bottoms in waters between 33 and 492 ft (10 - 150 m) and at temperatures between 32 and 50° F (0 - 10°C). Spawning occurs year-round, near the ocean bottom, with a peak in winter and spring. Peak spawning corresponds to water temperatures between 41 and 45°F (5 - 7°C). It is delayed until spring when winters are severe, and peaks in the winter when winters are mild. Eggs are pelagic, buoyant, spherical, and transparent. They drift for 2 to 3 weeks before hatching. The larvae are pelagic for about 3 months until reaching 1.6 to 2.3 in (4 - 6 cm), at which point they descend to the seafloor. Afterwards, most remain on the bottom, and there is no evidence of a subsequent diel, vertical migration. Adults tend to move in schools, usually near the bottom, but also occur in the water column (NEFSC 2011c).

Population Status. GB cod is a transboundary stock co-managed by the U.S. and Canada. The GB cod stock underwent a benchmark assessment in 2012 (SAW55, NEFSC 2013a), which indicated that the stock is overfished and overfishing is occurring. The 2015 peer review concluded that the GB cod model was not acceptable as a scientific basis for catch advice, and that stock status and catch advice should be based an alternative approach, but did conclude that the stock was qualitatively determined to be overfished based on poor stock condition. The update to the ASAP model was rejected, not the underlying benchmark formulation from SAW 55. Because a stock assessment model framework is lacking, no historical estimates of biomass, fishing mortality rate, or recruitment can be calculated. Status determination relative to reference points is not possible because reference points cannot be defined. Overfishing status is considered unknown and the peer review concluded that evidence suggests this stock should still be considered overfished due to poor stock condition (NEFSC 2017b). NMFS determined that the stock status for GB cod will remain overfished, with overfishing occurring, consistent with the determination from the 2013 GB cod benchmark assessment. Based on the 2021 assessment, overfishing status is considered unknown and stock status remains overfished based on a qualitative evaluation of poor stock condition (NEFSC 2021b, in prep). The US catches were estimated by the Groundfish Plan Development Team for the 2021 assessment and could not be broken down by catch disposition as has been done in past assessment. The GB cod stock continues to show a truncated age structure. The most recent survey values remain below the mean of their time series. The 2013 year class was larger than recent year classes, but has not continued to be large as it ages and is below the average from the 1970s at every age in both surveys (NEFSC 2021b, in prep).

5.2.3 Gulf of Maine Haddock

Life History. Haddock, *Melanogrammus aeglefinus*, is a demersal gadoid species found in the North Atlantic Ocean, occurring from Cape May, New Jersey to the Strait of Belle Isle, Newfoundland. Six distinct haddock stocks have been identified, and the two which occur in U.S. waters are associated with Georges Bank and the Gulf of Maine. Haddock are highly fecund broadcast spawners, spawning over various substrates including rocks, gravel, smooth sand, and mud. In the Gulf of Maine, spawning occurs from early February to May, usually peaking in February to April. Haddock release their eggs near the ocean bottom in batches where a courting male then fertilizes them. Fertilized eggs become buoyant and rise to the surface water layer and remain in the water column to development. Larvae metamorphose into juveniles in roughly 30 to 42 days at lengths of 0.8 to 1.1 in (2 - 3 cm). Juveniles initially live in the epipelagic zone and remain in the upper water column for 3 - 5 months, but they visit the seafloor in search of food. They settle into a demersal existence once they locate suitable habitat. Haddock do not make extensive migrations, but prefer deeper waters in the winter and tend to move shoreward in summer. The GOM haddock have lower weights at age than the GB stock and the age at 50% maturity was also lower for GOM haddock than GB haddock (NEFSC 2011c).

Population Status. The GOM haddock underwent a benchmark assessment in 2014 at SAW 59, which indicated that the stock was not overfished and overfishing was not occurring. The 2013 SSB was estimated at 4,153 mt, above the <2,452 mt overfishing threshold, a change from the 2012 assessment update when the stock was experiencing overfishing (NEFSC 2014). As of the 2019 groundfish operational assessments, the stock is not overfished and overfishing is not occurring, with 2018 SSB estimated to be at 82,763 mt, which is 1,035% of the biomass target (NEFSC 2020b). Recreational catch estimates were re-estimated in this update by using the re-calibrated MRIP data. In general, inclusion of the re-calibrated data resulted in an increase in SSB, F, and recruitment. The GOM haddock stock has experienced several large recruitment events since 2010. The population biomass is currently at an all time high and overall, the population is experiencing low mortality (NEFSC 2020b).

5.2.4 Georges Bank Haddock

Life History. The life history of GB haddock, *Melanogrammus aeglefinus*, is comparable to the GOM haddock (Section 5.2.3). On Georges Bank, spawning occurs from January to June, usually peaking from February to early-April. This is the principal haddock spawning area in the Northeast U.S. Shelf Ecosystem, concentrating on the northeast peak of Georges Bank. Median age and size of maturity differ slightly between the GB and GOM haddock stocks (NEFSC 2011c).

Population Status. The GB haddock stock is a transboundary stock co-managed by the U.S. and Canada. The stock is not overfished and overfishing is not occurring (NEFSC 2020b). There has been a steady increase in SSB from ~15,000 mt in the early 1990s, to about 252,000 mt in 2007. The dramatic increase 2005 - 2007 is due to the exceptionally large 2003 year class reaching maturity. From 2007 - 2010, SSB decreased 35% as that 2003 year class decreased due to natural and fishing mortality. The fishing mortality rate for this stock has been low in recent years. The retrospective adjusted 2018 SSB was estimated to be at 507,130 mt, which is 365% of the biomass target (NEFSC 2020b). The GB haddock stock shows a broad age structure, and broad spatial distribution. This stock has produced several exceptionally strong year classes in the last 15 years, leading to record high SSB in recent years. Catches in recent years have been well below the total quota (US+Canada). While all survey indices support the finding that this stock reached an all-time high, weights at age have been declining since the large 2003 year class, and show further declines with the most recent data (NEFSC 2020b).

5.2.5 American Plaice

Life History. American plaice, *Hippoglossoides platessoides*, is an arctic-boreal to temperate-marine pleuronectid (righteye) flounder that inhabits the continental shelves of the North Atlantic. Off the U.S. coast, American plaice are managed as a single stock in the Gulf of Maine and Georges Bank regions. American plaice are batch spawners, releasing eggs in batches every few days over the spawning period. Adults spawn and fertilize their eggs at or near the bottom. Buoyant eggs lack oil globules and drift into the upper water column. Eggs hatch at the surface and the time between fertilization and hatching varies with water temperature. Transformation of the larvae and migration of the left eye begins when the larvae are ~0.8 in (20 mm). Dramatic physiological transformations occur during the juvenile stage; the body shape flattens and widens. As the migration of the left eye across the top of the head to the right side reaches completion, descent towards the seafloor begins. In U.S. and Canadian waters, adult American plaice are sedentary, migrating only for spawning and feeding (NEFSC 2011c).

Population Status. In the Gulf of Maine and Georges Bank, the American plaice is not overfished and overfishing is not occurring (NEFSC 2020b). The stock was in a rebuilding plan, but based on the 2019 assessment, the stock is now considered rebuilt (NEFMC 2020b). The retrospective adjusted spawning stock biomass in 2018 was estimated to be at 17,748 mt, which is 116% of the biomass target The 2018 fully selected fishing mortality was estimated to be 0.089, which is 34% of the FMSY proxy (NEFSC 2020b). The current fishing mortality rate is relatively low, and so recent above average recruitment has resulted in an increase in SSB. SSB is projected to decrease in the short term, however, even at current fishing rates (NEFSC 2020b).

5.2.6 **Witch Flounder**

Life History. Witch flounder, *Glyptocephalus cynoglossus*, is a demersal flatfish distributed on both sides of the North Atlantic. In the western North Atlantic, the species ranges from Labrador southward, and closely associates with mud or sand-mud bottom. In U.S. waters, witch flounder are common throughout the Gulf of Maine, in deeper areas on and adjacent to Georges Bank, and along the shelf edge as far south as Cape Hatteras, North Carolina. Witch flounder is managed as a unit stock. Spawning occurs at or near the bottom; however, the buoyant eggs rise into the water column where subsequent egg and larval development occurs. The pelagic stage of witch flounder is the longest among the species of the family *Pleuronectidae*. Descent to the bottom occurs when metamorphosis is complete, at 4 - 12 months of age. There has been a decrease in both the age and size of sexual maturity in recent years. Witch flounder spawn from March to November, with peak spawning occurring in summer. The general trend is for spawning to occur progressively later from south to north. In the Gulf of Maine-Georges Bank region, spawning occurs from April to November, and peaks from May to August. Spawning occurs in dense aggregations that are associated with areas of cold water. Witch flounder spawn at 32 - 50 °F (0 – 10 °C) (NEFSC 2011c).

Population Status. Witch flounder is overfished and overfishing status is unknown (NEFSC 2020b). The 2016 benchmark assessment (SARC 62) peer review panel did not accept the analytical assessment models for witch flounder (NEFSC 2017a). Because a stock assessment model framework is lacking, no historical estimates of biomass, fishing mortality rate, or recruitment can be calculated. Status determination relative to reference points is not possible because reference points cannot be defined. An area-swept empirical approach indicates the stock condition remains poor (NEFSC 2020b). NMFS determined that the stock status for witch flounder will remain overfished, with overfishing unknown, consistent with the 2016 benchmark assessment for this stock. Based on the 2017 peer review, witch flounder was overfished and overfishing was unknown (NESFC 2017b). The 2019 assessment did not recommend a change to the stock status. The fishery landings and survey catch by age indicate a truncation of age structure and a reduction in the number of older fish in the population. NEFSC relative indices of abundance and biomass remain below their time series average (NEFSC 2020b).

5.2.7 **Gulf of Maine Winter Flounder**

Life History. Winter flounder, *Pseudopleuronectes americanus*, is a demersal flatfish distributed in the western North Atlantic from Labrador to Georgia. Important U.S. commercial and recreational fisheries exist from the Gulf of Maine to the Mid-Atlantic Bight. Winter flounder is managed and assessed in U.S. waters as three stocks: Gulf of Maine, southern New England/Mid-Atlantic, and Georges Bank. Adult GOM winter flounder migrate inshore in the fall and early winter and spawn in late winter and early spring. Peak spawning occurs in Massachusetts Bay and south of Cape Cod during February and March, and somewhat later along the coast of Maine, continuing into May. After spawning, adults typically leave inshore areas when water temperatures exceed 59°F (15°C), although some remain inshore year-round. Winter flounder eggs are demersal, adhesive, and cluster together. Larvae are initially planktonic, but 5 - 6 weeks after hatching become increasingly bottom-oriented with metamorphosis, as the left eye migrates to the right side of the body and the larvae become “flounder-like.” This finishes by the time the larvae are 0.3 - 0.4 in (8 - 9 mm) long at ~8 weeks old. Newly metamorphosed young-of-the-year winter flounder reside in shallow water where individuals may grow to ~4 in (100 mm) within the first year (NEFSC 2011c).

Population Status. Based on the recommendation of the 2020 Peer Review Panel, overfishing is not occurring for GOM winter flounder, but the overfished status is unknown (NEFSC 2020). The survey area-swept biomass estimate is calculated from three separate trawl fall surveys. The 2020 Peer Review Panel recommended using a revised average catchability estimate (0.71) from the recent cooperative research project survey catchability experiment which decreased from 0.87 in 2017 (Miller et al 2020). A moving average approach to estimating catch advice (rather than based on a single year) was considered in this assessment to stabilize catch advice and to use a greater amount of the available updated information. The Peer Review Panel agrees that catch advice be based on 75% of E40% (75% EMSY proxy) using the most recent two years of information from fall surveys for the biomass estimate and catch advice.

5.2.8 Georges Bank Winter Flounder

Life History: The life history of Georges Bank winter flounder, *Pseudopleuronectes americanus*, is comparable to the Gulf of Maine winter flounder life history, which is described in Section 5.2.7. GB winter flounder growth is different than either GOM or SNE winter flounder stocks, with winter flounder on Georges Bank growing larger in size than the inshore stocks of winter flounder.

Population Status: Based on the 2020 Peer Review Panel, GB winter flounder is overfished and overfishing is not occurring. Biomass in 2019 was estimated to be 2,587 mt, which is 38% of the biomass target (NEFSC 2020b). GB winter flounder is in a rebuilding plan with $F_{Rebuild}$ rate defined as 70%FMSY with an end date of 2029. A retrospective adjustment was applied to the terminal year of the assessment. The 2020 peer review panel accepted biological reference points based on F40% proxy due to concerns with a residual pattern based with the SARC 52 stock recruitment relationship. The 2020 Peer Review Panel notes that recruitment from the 2019 year class is likely to be underestimated. The index for GB winter flounder has high variation and does not provide enough information to estimate this year class. The panel also notes that alternative projections should be considered that assume future recruitment will be similar to recent recruitment. Sensitivity analyses were conducted and presented at the peer review to evaluate various recruitment scenarios which suggests that increases in the projections are attributed to the assumption of incoming relative higher recruitment from using the entire times series of recruitment in the projections.

5.2.9 Southern New England/Mid-Atlantic Winter Flounder

Life History: The life history of SNE/MA winter flounder, *Pseudopleuronectes americanus*, is comparable to the Gulf of Maine winter flounder life history, which is described in Section 5.2.7.

Population Status: Based on the recommendations of the 2020 Peer Review Panel, SNE/MA winter flounder is overfished, but overfishing is not occurring. SNE/MA winter flounder is in a rebuilding plan with a rebuild by date of 2023. In 2019, SSB is at 30% of the SSBMSY target (NEFSC 2020b). A projection using assumed catch in 2020 and F = 0 through 2023 indicated a less than a 5% chance of reaching the SSB target. The SSB trends appear to be declining over the time series with a continued declining trend in recruitment. There are no signs of stock rebuilding. The 2020 Peer Review Panel accepted biological reference points based on a F40% proxy due to concerns with a residual pattern based on the SARC 52 stock recruitment relationship. The panel also accepted a change in selectivity from a dome shaped pattern to flat-top with the catch.

5.2.10 Cape Cod/Gulf of Maine Yellowtail Flounder

Life History: The yellowtail flounder, *Limanda ferruginea*, is a demersal flatfish that occurs from Labrador to Chesapeake Bay. It generally inhabits depths between 131 to 230 ft. (40 and 70 m). NMFS manages three stocks off the U.S. coast including the CC/GOM, GB, and SNE/MA stocks. Spawning occurs in the western North Atlantic from March through August at temperatures of 41 to 54 °F (5 to 12°C). Spawning takes place along continental shelf waters northwest of Cape Cod. Yellowtail flounder spawn buoyant, spherical, pelagic eggs that lack an oil globule. Pelagic larvae are brief residents in the water column with transformation to the juvenile stage occurring at 0.5 to 0.6 in (11.6 to 16 mm) standard length. There are high concentrations of adults around Cape Cod in both spring and autumn. The median age at maturity for females is 2.6 years off Cape Cod.

Population Status: Based on the 2019 operational assessment, the CC/GOM yellowtail flounder stock is not overfished and overfishing is not occurring. This is a change from the 2017 assessment update when the stock was overfished and was experiencing overfishing (NEFSC 2017b). The retrospective adjusted 2018 spawning stock biomass was estimated to be 2,125 mt, which is 62% of the biomass target. The 2018 fully selected fishing mortality was estimated to be 0.092, which is 29% of the F_{MSY} proxy (NEFSC 2020b). The change in status is supported by an above average estimated 2016 incoming year class coupled with very low exploitation of the fishery resource. The estimated 2018 catch was the lowest in the time series. There is an above average estimated 2016 incoming year class which has contributed to the increase in total biomass. The reductions in fishing mortality and above average 2016 year class has resulted in the stock biomass to increase. However, SSB is projected to decrease in the short-term if fished at $F_{40\%}$ (NEFSC 2020b).

5.2.11 Georges Bank Yellowtail Flounder

Life History: The general life history of the GB yellowtail flounder, *Limanda ferruginea*, is comparable to the CC/GOM yellowtail described in Section 5.2.10. The median age at maturity for females is 1.8 years on Georges Bank. Spawning takes place along continental shelf.

Population Status: The GB yellowtail flounder stock is a transboundary stock co-managed by the U.S. and Canada. The GB yellowtail flounder stock status is unknown due to a lack of biological reference points. Because a stock assessment model framework is lacking, no historical estimates of biomass, fishing mortality rate, or recruitment can be calculated. Status determination relative to reference points is not possible because reference points cannot be defined. In the absence of an assessment model, an empirical approach based on survey catches indicates stock condition is poor, given a declining trend in survey biomass despite reductions in catch to historical low levels. 2020 stock assessment results for GB yellowtail flounder continue to indicate low stock biomass and poor productivity (TRAC 2020). Recent catches are at historic low amounts, with combined catches for Canada and USA at 9 mt for 2019. NMFS determined that the stock status for GB yellowtail flounder is overfished, with overfishing occurring.

5.2.12 Southern New England Yellowtail Flounder

Life History: The general life history of the SNE/MA yellowtail flounder, *Limanda ferruginea*, is comparable to the Cape Cod/GOM yellowtail described in Section 5.2.10. The median age at maturity for females is 1.6 years in southern New England.

Population: Based on the 2019 operational assessment, the SNE/MA yellowtail flounder stock is overfished and overfishing is not occurring (NEFSC 2020b). This is a change from the 2017 assessment update when the stock was experiencing overfishing (NEFSC 2017). The retrospective adjusted 2018 spawning stock biomass was estimated to be 90 mt, which is 5% of the biomass target. The 2018 fully selected fishing mortality was estimated to be 0.259, which is 73% of the F_{MSY} proxy (NEFSC 2020b). The 2018 total catch for SNE/MA yellowtail flounder was estimated to be the lowest on record. In 2017, the relatively strong incoming year class has resulted in a moderate increase in SSB in 2018, but remains well below SSB_{MSY}. In the short term, SSB is projected to increase due to another estimated incoming year class in 2018, but the projected increase is still below the biomass reference point (NEFSC 2020b).

5.2.13 Acadian Redfish

Life History: The Acadian redfish, *Sebastes fasciatus Storer*, and the deepwater redfish, *S. mentella Travin*, are virtually indistinguishable from each other based on external characteristics. Deepwater redfish are less prominent in the more southerly regions of the Scotian Shelf and appear to be virtually absent from the Gulf of Maine, where Acadian redfish appear to be the primary representative of the genus Sebastes. NMFS manages Acadian redfish inhabiting the U.S. waters of the Gulf of Maine and deeper portions of Georges Bank and the Great South Channel as a unit stock. The redfish are a slow growing, long-lived, ovoviviparous species with an extremely low natural mortality rate. Redfish fertilize their eggs internally. The eggs develop into larvae within the oviduct, and are released near the end of the yolk sac phase. The release of larvae lasts for 3 to 4 months with a peak in late May to early June. Newly spawned larvae occur in the upper 10 m of the water column; at 0.4 to 1.0 in (10 to 25 mm). The post-larvae descend below the thermocline when about 1 in (25 mm) in length. Young-of-the-year are pelagic until reaching 1.6 to 2.0 in (40 to 50 mm) at 4 to 5 months old. Therefore, young-of-the-year typically move to the bottom by early fall of their first year. Redfish of 9 in (22 cm) or greater are considered adults. In general, the size of landed redfish positively correlates with depth. This may be due to a combination of differential growth rates of stocks, confused species identification, size-specific migration, or gender-specific migration (females are larger). Redfish make diurnal vertical migrations linked to their primary euphausiid prey.

Population Status: Based on the recommendation of the 2020 Peer Review Panel, redfish is not overfished and overfishing is not occurring. Redfish is rebuilt. A retrospective adjustment was applied to the terminal year of the assessment. The 2020 Peer Review Panel stated: *The first review by Peer Review Panel observed that the two stock size indices used in the ASAP model had been declining more steeply than the estimated biomass in the assessment. The Peer Review Panel considered rejecting the assessment on that basis, but given that the ASAP modelling did not show other problems, the analyst was asked to explore ways to better fit recent survey indices. The analyst found that altering the weighting of the various data sources provided a better fit to recent indices and improved the retrospective pattern. The Peer Review Panel accepted the base case assessment but cautioned that it may overestimate stock size as indicated by the sensitivity run where a different weighting scheme was used* (NEFSC 2020b). Total removals of redfish increased starting in the early 2000s and have been relatively constant since the early 2010s. Fall survey data suggests the existence of relatively strong year classes in 2007/2008 and 2013, and suggests that older fish have begun to reappear in the stock since the 1990s (NEFSC 2020b).

5.2.14 Pollock

Life History: Pollock, *Pollachius virens*, occur on both sides of the North Atlantic. In the western North Atlantic, the species is most abundant on the western Scotian Shelf and in the Gulf of Maine. There is considerable movement of pollock between the Scotian Shelf, Georges Bank, and the Gulf of Maine. Although some differences in meristic and morphometric characters exist, there are no significant genetic differences among areas. As a result, pollock are assessed as a single unit. The principal pollock spawning sites in the western North Atlantic are in the western Gulf of Maine, Great South Channel, Georges Bank, and on the Scotian Shelf. Spawning takes place from September to April. Spawning time is more variable in northern sites than in southern sites. Spawning occurs over hard, stony, or rocky bottom. Spawning activity begins when the water column cools to near 46 °F (8°C) and peaks when temperatures are approximately 40 to 43 °F (4.5 to 6°C). Thus, most spawning occurs within a comparatively narrow range of temperatures. Pollock eggs are buoyant and rise into the water column after fertilization. The pelagic larval stage lasts for 3 to 4 months. At this time the small juveniles or "harbor pollock" migrate inshore to inhabit rocky subtidal and intertidal zones. Pollock then undergo a series of inshore-offshore movements linked to temperature until near the end of their second year. At this point, the juveniles move offshore where the pollock remain throughout the adult stage. Pollock are a schooling species and occur throughout the water column. With the exception of short migrations due to temperature changes and north-south movements for spawning, adult pollock are fairly stationary in the Gulf of Maine and along the Nova Scotian coast. Male pollock reach sexual maturity at a larger size and older age than females.

Population Status: Based on the 2019 operational assessment, the pollock stock is not overfished and overfishing is not occurring. There are two population assessment models brought forward from the 2017 operational assessment: the base model (dome-shaped survey selectivity), which is used to provide management advice; and the flat sel sensitivity model (flat-topped survey selectivity), which is included for the sole purpose of demonstrating the sensitivity of assessment results to survey selectivity assumptions. The retrospective adjusted spawning stock biomass in 2018 was estimated to be 212,416 mt under the base model and 71,322 under the flat sel sensitivity model (respectively), which are 170% and 101% (respectively) of the biomass target (NEFSC 2020b). Total removals of pollock have declined since 2008. Fishery and survey data suggests the existence of a relatively strong 2013 year class, which has just begun to enter the commercial fishery. Survey data suggests that older fish have begun to reappear in the stock since the 1990s (NEFSC 2020b).

5.2.15 White Hake

Life History: The white hake, *Urophycis tenuis*, occurs from Newfoundland to southern New England and is common on muddy bottom throughout the Gulf of Maine. The depth distribution of white hake varies by age and season. Juvenile white hake typically occupy shallower areas than adults, but individuals of all ages tend to move inshore or shoalward in summer and disperse to deeper areas in winter. The northern spawning group of white hake spawns in late summer (August-September) in the southern Gulf of St. Lawrence and on the Scotian Shelf. The timing and extent of spawning in the Georges Bank - Middle Atlantic spawning group has not been clearly determined. The eggs, larvae, and early juveniles are pelagic. Older juvenile and adult white hake are demersal. The eggs are buoyant. Pelagic juveniles become demersal at 2.0 to 2.4 in (50 - 60 mm) total length. The pelagic juvenile stage lasts about two months. White hake attain a maximum length of 53 in (135 cm) and weigh up to 49 lbs (22 kg). Female white hake are larger than males (NEFSC 2013b).

Population Status: Based on the 2019 operational assessment, the white hake stock is overfished and overfishing is not occurring. This is a change from the 2017 operational assessment, in which white hake was not overfished (NEFSC 2017b). The retrospective adjusted 2018 spawning stock biomass is estimated to be 15,891 mt, which is 50% of the biomass target. The 2018 fully selected fishing mortality was estimated to be 0.129, which is 77% of the F_{MSY} proxy (NEFSC 2020b). The stock shows no truncation of age structure. Estimates of commercial landings and discards have decreased over time. The rebuilding deadline for this stock was 2014, and the stock is not yet rebuilt and is now likely overfished. (NEFSC 2020b).

5.2.16 Gulf of Maine/Georges Bank Windowpane Flounder

Life History: Windowpane flounder or sand dab, *Scophthalmus aquosus*, is a left-eyed, flatfish species that occurs in the northwest Atlantic from the Gulf of St. Lawrence to Florida (Collette & Klein-MacPhee 2002). Windowpane prefer sandy bottom habitats and occur at depths from the high water mark to 656 ft (200 m), with the greatest abundance at depths < 180 ft (55 m), and at temperatures of 32º-80ºF (0º-26.8ºC) (Moore 1947). On Georges Bank, it is most abundant at depths < 60 m during late spring through autumn but overwintering occurs in deeper waters to 366 m (Chang et al. 1999). Windowpane flounders are assessed and managed as two stocks: Gulf of Maine-Georges Bank (GOM/GB or northern) and Southern New England-Mid-Atlantic Bight (SNE/MA or southern) due to differences in growth rates, size at maturity, and relative abundance trends. Windowpane generally reach sexual maturity between ages 3 and 4 (Moore 1947), though males can mature at age 2 (Grosslein & Azarovitz 1982). On Georges

Bank, median length at maturity is nearly the same for males (8.7 in, 22.2 cm) and females (8.9 in, 22.5 cm) (O'Brien et al. 1993). Spawning occurs on Georges Bank during July and August and peaks again between October and November at temperatures of 55º- 61ºF (13º-16ºC) (Morse & Able 1995). Eggs incubate for 8 days at 50º-55ºF (10º-13ºC) and eye migration occurs approximately 17- 26 days after hatching (Collette & Klein-MacPhee 2002). During the first year of life, spring-spawned fish have significantly faster growth rates than autumn-spawned fish, which may result in differential natural mortality rates between the two cohorts (Neuman et al. 2001). Young windowpanes settle inshore and then move offshore to deeper waters as they grow. Windowpane on Georges Bank aggregate in shallow water during summer and early fall and move offshore in the winter and early spring (Grosslein & Azarovitz 1982).

Population Status: Based on the recommendations of the 2020 Peer Review Panel, northern windowpane flounder stock status is unknown (NEFSC 2020b). The NOAA current official status is that the stock is overfished and overfishing is not occurring. Northern windowpane flounder is in a rebuilding plan with an end date of 2029. The rebuilding plan specifies a fishing mortality rate of 70%Fmsy. The peer review panel rejected the AIM model due to a lack of a relationship between the catch and the survey index. The updated assessment is based on a survey area swept assessment. Biological reference points are not specified under this approach. However, the Peer Review Panel did not recommend continued use of the AIM-based FMSY proxy due to the mismatch in assessment methods and time series of exploitation rates exceeding the proxy in nearly all years. Without a FMSY proxy, 70%Fmsy cannot be directly calculated.

5.2.17 Southern New England/Mid-Atlantic Windowpane Flounder

Life History: The life history of Southern New-England/Mid-Atlantic Bight (southern) windowpane flounder, *Scophthalmus aquosus*, is comparable to Northern Windowpane Flounder (Section 5.2.16). In Southern New England, median length at maturity is nearly the same for males (8.5 in, 21.5 cm) and females (8.3 in, 21.2 cm) (O'Brien, et al. 1993). A split spawning season occurs between Virginia and Long Island with peaks in spring and fall (Chang, et al. 1999). Spawning occurs in the southern Mid-Atlantic during April and May and then peaks again in October or November (Morse & Able 1995).

Population Status: Based on the recommendations of the 2020 Peer Review Panel, Southern windowpane flounder is not overfished and overfishing is not occurring (status has not changed from the 2018 assessment) (NEFSC 2020b). Southern windowpane flounder is rebuilt as of 2012.

5.2.18 Ocean Pout

Life History: Ocean pout, *Zoarces americanus*, is a demersal eel-like species found in the northwest Atlantic from Labrador to Delaware. Ocean pout are most common on sand and gravel bottom (Orach-Meza 1975) at depths of 49-262 ft (15-80 m) and temperatures of 43º-48º F (6º-9º C) (Scott 1982). In US waters, ocean pout are assessed and managed as a unit stock from the Gulf of Maine to Delaware. In the Gulf of Maine, median length at maturity for males and females is 11.9 in (30.3 cm) and 10.3in (26.2 cm), respectively. Median length at maturity for males and females from Southern New England is 12.6 in (31.9 cm) and 12.3in (31.3 cm), respectively (O'Brien, et al. 1993). According to tagging studies conducted in Southern New England, ocean pout appear not to migrate, but do move between different substrates seasonally. In Southern New England-Georges Bank they occupy cooler rocky areas in summer, returning in late fall (Orach-Meza 1975). In the Gulf of Maine, they move out of inshore areas in the late summer and then return in the spring. Spawning occurs between September and October in Southern New England (Olsen & Merriman 1946) and in August and September in Newfoundland (Keats et al. 1985). Adults aggregate in rocky areas prior to spawning. Eggs are internally fertilized (Mercer et al. 1993; Yao & Crim 1995) and females lay egg masses encased in a gelatinous matrix that they then guard during the incubation period of 2.5-3 months (Keats, et al. 1985). Ocean pout hatch as juveniles on the bottom and are believed to remain there throughout their lives (Methven & Brown 1991; Yao & Crim 1995).

Population Status: Based on the 2020 assessment, ocean pout is overfished but overfishing is not occurring. The stock is not rebuilding as expected, despite low catch. Discards comprise most of the catch since the no possession regulation was implemented in May 2010. The NEFSC survey indices remain at near-record low levels; there are few large fish in the population. The ocean pout stock remains in poor condition (NEFSC 2020b).

5.2.19 Atlantic Halibut

Life History: Atlantic halibut, *Hippoglossus hippoglossus*, is the largest species of flatfish in the northwest Atlantic Ocean. This long-lived, late-maturing flatfish is distributed from Labrador to southern New England (Collette & Klein-MacPhee 2002). They prefer sand, gravel, or clay substrates at depths up to 1000 m (Miller et al. 1991; Scott & Scott 1988). Along the coastal Gulf of Maine, halibut move to deeper water in winter and shallower water in summer (Collette & Klein-MacPhee 2002). Atlantic halibut reach sexual maturity between 5 to 15 years and the median female age of maturity in the Gulf of Maine-Georges Bank region is 7 years (Sigourney et al. 2006). In general, Atlantic halibut spawn once per year in synchronous groups during late winter through early spring (Neilson et al. 1993) and females can produce up to 7 million eggs per year depending on size (Haug & Gulliksen 1988). Spawning is believed to occur in waters of the upper continental slope at depths below 200 m (Scott & Scott 1988). Halibut eggs are buoyant but drift suspended at water depths of 54 - 90 m (Taning 1936). Incubation times are 13 - 20 days depending on temperature (Blaxter et al. 1983); how long halibut live in the plankton after hatching is not known.

Population Status: Halibut is assessed using a data-poor method (First Second Derivative model), and projections are not possible using this method. Biological reference points are unknown for halibut, but the stock is considered overfished. Halibut is currently in a rebuilding plan with an end date of 2056. Catch advice for halibut is derived by multiplying the recent catch by the rate of change in 3 indices (NEFSC fall survey, trawl D:K, gillnet D:K). The rate of change has decreased to 0.83 in the 2020 assessment. The 2020 stock assessment report states: *Stock status cannot be determined and remains unchanged. Rago in his 2018 report argued that because the catch multiplier estimated in the FSD model had been greater than one for several years, that overfishing was unlikely. Because the catch multiplier is now less than one, overfishing may be the more likely determination in 2020. There is however, no way to credibly determine stock status without reference points* (NEFSC 2020b).

5.2.20 Atlantic Wolffish

Life History: Atlantic wolffish, *Anarhichas lupus*, is a benthic fish distributed on both sides of the North Atlantic Ocean. In the northwest Atlantic, the species occurs from Davis Straits off of Greenland to Cape Cod and sometimes in southern New England and New Jersey waters (Collette & Klein-MacPhee 2002). In the Georges Bank-Gulf of Maine region, abundance is highest in the southwestern portion at depths of 263 - 394 ft (80 - 120 m), but wolffish are also found in waters from 131 - 787 ft (40 - 240 m) (Nelson & Ross 1992) and at temperatures of 29.7º - 50.4º F (-1.3º - 10.2º C) (Collette & Klein-MacPhee 2002). They prefer complex benthic habitats with large stones and rocks (Pavlov & Novikov 1993). Atlantic wolffish are mostly sedentary and solitary, except during mating season. There is some evidence of a weak seasonal shift in depth between shallow water in spring and deeper water in fall (Nelson & Ross 1992). Most individuals mature by age 5-6 when they reach ~18.5 in (47 cm) total length (Nelson & Ross

1992; Templeman 1986). Northern wolffish mature at smaller sizes than faster growing southern fish. Peak spawning is believed to occur from September to October for Gulf of Maine-Georges Bank wolffish (Collette & Klein-MacPhee 2002), though laboratory studies have shown that wolffish can spawn most of the year (Pavlov & Moksness 1994). Eggs are laid in masses, and males are thought to brood for several months. Incubation time is dependent on water temperature and may be 3 - 9 months. Larvae and early juveniles are pelagic between 20 - 40 mm TL, with settlement beginning by 50 mm TL (Falk-Petersen & Hansen 1991).

Population Status: Based on the recommendations of the 2020 Peer Review Panel, wolffish is overfished but overfishing is not occurring. Wolffish is in a rebuilding plan but the end date in not defined. In 2019, biomass is at 44% of the SSB_{MSY} target (NEFSC 2020b).

5.2.21 Summary of Stock Status

Table 6 summarizes the status of the northeast groundfish stocks as determined by NOAA Fisheries, noting which groundfish stocks are overfished or are experiencing overfishing.

Table 6 - Current status of groundfish stocks, determined by NOAA Fisheries.

	Status	
Stock	Overfishing?	Overfished?
Georges Bank Cod	Yes	Yes
Gulf of Maine Cod	Yes	Yes
Georges Bank Haddock	No	No
Gulf of Maine Haddock	No	No
Georges Bank Yellowtail Flounder	Yes	Yes
Southern New England/Mid-Atlantic Yellowtail Flounder	No	Yes
Cape Cod/Gulf of Maine Yellowtail Flounder	No	No
American Plaice	No	No
Witch Flounder	Unknown	Yes
Georges Bank Winter Flounder	No	Yes
Gulf of Maine Winter Flounder	No	Unknown
Southern New England/Mid-Atlantic Winter Flounder	No	Yes
Acadian Redfish	No	No
White Hake	No	Yes
Pollock	No	No
Northern Windowpane Flounder	No	Yes
Southern Windowpane Flounder	No	No
Ocean Pout	No	Yes
Atlantic Halibut	No	Yes
Atlantic Wolffish	No	Yes

Table 7 provides the status determination criteria (SDC) and Table 8 summaries the updated numerical estimates of the SDCs for all groundfish stocks, based on most resent assessment – either the 2019 operational assessments, or the 2020 or 2021 management track assessments. The MSA requires that every fishery management plan specify "objective and measurable criteria for identifying when the fishery to which the plan applies is overfished." Guidance on this requirement identifies two elements that must be specified: a maximum fishing mortality threshold (or reasonable proxy) and a minimum stock size threshold.

The MSA also requires that FMPs specify the maximum sustainable yield and optimum yield for the fishery. The Northeast Fisheries Science Center (NEFSC) conducted assessments for two groundfish stocks in 2021. The peer review recommended updated numerical values are provided in Table 8.

Table 7 – Current status determination criteria.

Stock	Biomass Target (SSB_{MSY} or proxy)	Minimum Biomass Threshold	Maximum Fishing Mortality Threshold (F_{MSY} or proxy)
Georges Bank Cod	SSBMSY: SSB/R (40% MSP)	½ Btarget	F40% MSP
Gulf of Maine Cod	SSBMSY: SSB/R (40% MSP)	½ Btarget	F40% MSP
Georges Bank Haddock	SSBMSY: SSB/R (40% MSP)	½ Btarget	F40% MSP
Gulf of Maine Haddock	SSBMSY: SSB/R (40% MSP)	½ Btarget	F40% MSP
Georges Bank Yellowtail Flounder	Unknown	Unknown	Unknown
Southern New England/Mid-Atlantic Yellowtail Flounder	SSBMSY: SSB/R (40% MSP)	½ Btarget	F40% MSP
Cape Cod/Gulf of Maine Yellowtail Flounder	SSBMSY: SSB/R (40% MSP)	½ Btarget	F40% MSP
American Plaice	SSBMSY: SSB/R (40% MSP)	½ Btarget	F40% MSP
Witch Flounder	SSBMSY: SSB/R (40% MSP)	½ Btarget	F40% MSP
Georges Bank Winter Flounder	SSBMSY	½ Btarget	F_{MSY}
Gulf of Maine Winter Flounder	Unknown	Unknown	F40% MSP
Southern New England/Mid-Atlantic Winter Flounder	SSBMSY	½ Btarget	F_{MSY}
Acadian Redfish	SSBMSY: SSB/R (50% MSP)	½ Btarget	F50% MSP
White Hake	SSBMSY: SSB/R (40% MSP)	½ Btarget	F40% MSP
Pollock	SSBMSY: SSB/R (40% MSP)	½ Btarget	F40% MSP
Northern Windowpane Flounder	External	½ Btarget	Rel F at replacement
Southern Windowpane Flounder	External	½ Btarget	Rel F at replacement
Ocean Pout	External	½ Btarget	Rel F at replacement
Atlantic Halibut	Internal	½ Btarget	$F_{0.1}$
Atlantic Wolffish	SSBMSY: SSB/R (40% MSP)	½ Btarget	F40% MSP

Table 8 - Current numerical estimates of Status Determination Criteria, based on 2019, 2020, or 2021 assessments.

Stock	Model/ Approach	B_{MSY} or Proxy (mt)	F_{MSY} or Proxy	MSY (mt)
Georges Bank Cod	empirical	NA	NA	NA
Gulf of Maine Cod	ASAP M=0.2	39,912	0.173	7,171
	ASAP M-ramp	60,010	0.175	10,873
Georges Bank Haddock	VPA	138,924	0.33	30,489
Gulf of Maine Haddock	ASAP	7,993	0.369	1,597
Georges Bank Yellowtail Flounder	empirical	NA	NA	NA
Southern New England/Mid-Atlantic Yellowtail Flounder	ASAP	1,779	0.355	492
Cape Cod/Gulf of Maine Yellowtail Flounder	VPA	3,439	0.32	1,138
American Plaice	VPA	15,293	0.258	3,301
Witch Flounder	empirical area swept	NA	NA	NA
Georges Bank Winter Flounder	VPA	8,910	0.519	4,260
Gulf of Maine Winter Flounder	empirical area swept	NA	0.23 (exploitation rate)	NA
Southern New England/Mid-Atlantic Winter Flounder	ASAP	24,687	0.34	7,532
Acadian Redfish	ASAP	247,918	0.038	9,318
White Hake	ASAP	31,828	0.1677	4,601
Pollock	ASAP	124,639	0.272	19,856
Northern Windowpane Flounder	AIM	3.489 kg/tow	0.185 c/i	647
Southern Windowpane Flounder	AIM	0.187 kg/tow	1.780 c/i	333
Ocean Pout	index	4.94 kg/tow	0.76 c/i	3,754
Atlantic Halibut	FSD	NA	NA	NA
Atlantic Wolffish	SCALE	1,612	0.222	232

5.2.22 Rebuilding Plan Status for Groundfish Stocks in Formal Rebuilding Plans

Table 9 summarizes the rebuilding status for each groundfish stock in a formal rebuilding plan.

Table 9- Summary of rebuilding status for groundfish stocks in a formal rebuilding plan based on the most recent assessment in 2019, 2020, or 2021

Groundfish Stock	Rebuilding Plan Start of the Current Plan	Planned Rebuilding Date	Years Remaining in Plan, starting with FY2022	Total ACLs exceeded within past three completed FYs? *If yes, identify the FYs.*	Has the original rebuilding F been achieved? Or is this unknown? *Indicate the current F estimate relative to F rebuild at the start of the plan.*	What is current SSB estimate relative to SSBMSY? Or is this unknown?
Georges Bank cod	5/1/2004	2026	5	No	Unknown	Unknown
Gulf of Maine cod	5/1/2014	2024	3	No.	F rebuild (plan start) = 0.161 (m=0.2 model) and 0.177 (m-ramp model) F2019full = 0.249 (m=0.2 model with retrospective adjustment) and 0.172 (m-ramp model)	SSB2019 = 1,969 mt (m=0.2 model with retrospective adjustment) and 3,223 mt (m-ramp model) 5% and 5%, respectively of SSBMSY proxy 39,912 mt (m=0.2 model) and 60,010 mt (m-ramp model)
Georges Bank yellowtail flounder	11/22/2006	2032	11	No	Unknown	Unknown
Southern New England/Mid-Atlantic	7/18/2019	2029	8	No	F rebuild (plan start) = 0.243	SSB2018 = 90 mt

yellowtail flounder					F2018 = 0.259	5% of SSBMSY
Cape Cod/Gulf of Maine yellowtail flounder	5/1/2004	2023	2	No	F rebuild (plan start) = 0.26 F2018 = 0.092	SSB2018 = 2,125 mt 62% of SSBMSY
Witch Flounder	7/18/2019	2043	22	No	Unknown	Unknown
Georges Bank winter flounder	7/18/2019	2029	8	No	F rebuild (plan start) = 0.365 F2019 = 0.133	SSB2019 = 2,587 mt 36% SSBMSY
Southern New England/Mid-Atlantic winter flounder	5/1/2004	2023	2	No	F rebuild (plan start) = 0.175 F2019 = 0.077	SSB2019 = 3,638 mt 30% of SSBMSY
White hake	5/1/2004	2031	9	No	F rebuild (plan start) = 0.117 F2018full = 0.129	SSB2018 = 15,891 mt 50% of SSBMSY
Northern windowpane flounder	7/18/2019	2029	8	No	Unknown	Unknown
Ocean pout	7/18/2019	2029	8	No	Unknown	Unknown
Atlantic halibut	5/1/2004	2055	34	Yes: [103.5% of the total ACL in FY2018 and 102.9% of the total ACL in FY 2019]	Unknown	Unknown

Atlantic wolffish	5/1/2010	Undefined	n/a	No	Unknown	Unknown

5.3 Non-Groundfish Species

The following are non-groundfish species routinely caught by the commercial groundfish fishery.

5.3.1 Spiny Dogfish

Life History. Spiny dogfish, *Squalus acanthias*, occurs in the northwest Atlantic from Labrador to Florida. Spiny dogfish is considered to be a unit stock in the northwest Atlantic. In summer, dogfish migrate northward to the Gulf of Maine-Georges Bank region and into Canadian waters. They return southward in autumn and winter. Recent research has suggested that migratory patterns may be more complex (Carlson et al 2014). Spiny dogfish tend to school by size and, when mature, by sex. The species bears live young, with a gestation period of 18 – 22 months, and produce 2 - 15 pups (average of 6). Size at maturity for females is ~31 in (80 cm), but can vary from 31 - 33 in (78 - 85 cm) depending on the abundance of females (NEFSC 2013h).

Population and Management Status. The NEFMC and MAFMC jointly manage spiny dogfish FMP for federal waters and the Atlantic States Marine Fisheries Commission (ASMFC) has a state waters plan. Spawning stock biomass of spiny dogfish declined rapidly in response to a directed fishery during the 1990's. NFMS initially implemented management measures adopted by the Councils for spiny dogfish in 2001. These measures have been effective in reducing landings and fishing mortality. At the 2010 TRAC, managers agreed to determine stock status using the model from SAW 43 (2006) and NEFSC spring survey data through 2009. NMFS declared the spiny dogfish stock rebuilt for the purposes of federal management in May 2010 (TRAC 2010). As of the 2018 update, the stock was not overfished, and overfishing was not occurring, but the population declined to 67% of the target (Sosebee and Rago 2018) so quotas were lowered from 2018 to 2019 but then are scheduled to increase somewhat in 2020 and 2021. A research track assessment is expected in 2022.

5.3.2 Skates

Life History. There are seven species in the Northeast Region skate complex: little skate (*Leucoraja erinacea*), winter skate (*L. ocellata*), barndoor skate (*Dipturus laevis*), thorny skate (*Amblyraja radiata*), smooth skate (*Malacoraja senta*), clearnose skate (*Raja eglanteria*), and rosette skate (*L. garmani*). Barndoor skate is the most common skate in the Gulf of Maine, on Georges Bank, and in southern New England. Georges Bank and southern New England is the center of distribution for little and winter skates in the Northeast Region. Thorny and smooth skates typically occur in the Gulf of Maine. Clearnose and rosette skates have a more southern distribution, and occur primarily in southern New England and the Chesapeake Bight. Skates are not known to undertake large-scale migrations, but move seasonally with changing water temperature; they move offshore in summer and early autumn and then return inshore during winter and spring. Skates lay eggs enclosed in a hard, leathery case commonly called a mermaid's purse. Incubation time is 6 - 12 months, with the young having the adult form at the time of hatching. Catches of these species are largely interrelated with the NE multispecies, monkfish, and scallop fisheries (NEFSC 2011c).

Population and Management Status. NMFS implemented the Northeast Skate Complex Fishery Management Plan (Skate FMP) in September 2003. The FMP required both dealers and vessels to report skate landings by species. Framework Adjustment 2 modified the VTR and dealer reporting codes to further improve species specific landing reports. Possession prohibitions of barndoor, thorny, and smooth skates in the Gulf of Maine were also provisions of the FMP. The FMP implemented a trip limit of 10,000 lbs (4,536 kg) for winter skate, and required fishermen to obtain a Letter of Authorization to exceed trip limits for the little skate bait fishery. In 2010, Amendment 3 to the Skate FMP implemented a rebuilding plan for smooth skate and established an ACL and annual catch target for the skate complex, total allowable landings for the skate wing and bait fisheries, and seasonal quotas for the bait fishery. Possession limits were reduced, in-season possession limit triggers were implemented, as well as other measures to improve management of the skate fisheries. Due to insufficient information about the population dynamics of skates, there remains considerable uncertainty about the status of skate stocks. Based on NEFSC bottom trawl survey data through autumn 2018/spring 2019, one skate species remains overfished (thorny) and overfishing is not occurring in any of the seven skate species. Barndoor skate is considered to be rebuilt for the purposes of federal management as of August 2016. Smooth skate is also considered rebuilt. Recent skate landings have fluctuated between approximately 30 and 45 million pounds. The landings and catch limits proposed by Amendment 3 have an acceptable probability of promoting biomass growth and achieving the rebuilding (biomass) targets for thorny skates. A stabilization of total catch below the median relative exploitation ratio should cause skate biomass and future yield to increase.

5.3.3 Monkfish

Life History. Monkfish, *Lophius americanus*, (i.e., “goosefish”), occur in the western North Atlantic from the Grand Banks and northern Gulf of St. Lawrence south to Cape Hatteras, North Carolina. Monkfish occur from inshore areas to depths of at least 2,953 ft (900 m). Monkfish undergo seasonal onshore-offshore migrations, which may relate to spawning or possibly to food availability. Female monkfish begin to mature at age 4 with 50% of females maturing by age 5 (~17 in [43 cm]). Males generally mature at slightly younger ages and smaller sizes (50% maturity at age 4.2 or 14 in [36 cm]). Spawning takes place from spring through early autumn. It progresses from south to north, with most spawning occurring during the spring and early summer. Females lay a buoyant egg raft or veil that can be as large as 39 ft (12 m) long and 5 ft (1.5 m) wide, and only a few mm thick. The larvae hatch after 1 - 3 weeks, depending on water temperature. The larvae and juveniles spend several months in a pelagic phase before settling to a benthic existence at a size of ~3 in (8 cm; NEFSC 2011c).

Population and Management Status. NMFS implemented the Monkfish FMP in 1999 (NEFMC 1998) and the fishery is jointly managed by the NEFMC and MAFMC. The FMP included measures to stop overfishing and rebuild the stocks through a number of measures. These measures included:

- Limiting the number of vessels with access to the fishery and allocating DAS to those vessels;
- Setting trip limits for vessels fishing for monkfish; minimum fish size limits;
- Gear restrictions;
- Mandatory time out of the fishery during the spawning season; and
- A framework adjustment process.

The Monkfish FMP defines two management areas for monkfish (northern and southern), divided roughly by an east-west line bisecting Georges Bank. As of 2013 data, monkfish in both management areas are not overfished and overfishing is not occurring (NEFSC 2013c). Operational assessments for monkfish were conducted in 2016 and 2019, but it was recommended that stock status not be updated during these data updates due to a lack of biological reference points (Richards 2016, NEFSC 2020). According to the 2019 assessment, strong recruitment in 2015 fueled an increase in stock biomass in 2016-2018, though abundance has since declined as recruitment returned to average levels. Biomass increases were greater in the northern area than in the southern area, and biomass has declined somewhat in the south, as abundance of the 2015 year class declined. In the north, landings and catch have fluctuated around a steady level since 2009, but increased after 2015, with discards increasing only slightly. In the south, landings and catch had been declining since around 2000, but catch increased after 2015 due to discarding of a strong 2015 year class, with almost a doubling of the discard rate.

5.3.4 Summer Flounder

Life History. Summer flounder, *Paralichthys dentatus,* occur in the western North Atlantic from the southern Gulf of Maine to South Carolina. Summer flounder are concentrated in bays and estuaries from late spring though early autumn, when an offshore migration to the outer continental shelf is undertaken. Spawning occurs during autumn and early winter, and the larvae are transported toward coastal areas by prevailing water currents. Development of post larvae and juveniles occurs primarily within bays and estuarine areas. Most fish are sexually mature by age 2. The largest fish are females, which can attain lengths over 90 cm (36 in) and weights up to 11.8 kg (26 lbs.; NEFSC 2011c). Recent NEFSC trawl survey data indicate that while female summer flounder grow faster (reaching a larger size at the same age), the sexes attain about the same maximum age (currently age 15 at 56 cm for males, and age 14 at 76 cm for females). Unsexed commercial fishery samples currently indicate a maximum age of 20 for a 57 cm fish (NEFSC 2019b).

Population and Management Status. The FMP was developed by the MAFMC in 1988, and scup and black sea bass were later incorporated into the FMP. Amendment 2, implemented in 1993, established a commercial quota allocated to the states, a recreational harvest limit, minimum size limits, gear restrictions, permit and reporting requirements, and an annual review process to establish specifications for the coming fishing year. In 1999, Amendment 12 revised the overfishing definitions for all three species, established rebuilding programs, addressed bycatch and habitat issues and established a framework adjustment procedure for the FMP to allow for a streamlined process for relatively minor changes to management measures. Results from the 2021 Management Track Assessment indicate that the summer flounder stock was not overfished, and overfishing was not occurring in 2019 relative to the updated biological reference points (NEFSC 2021 In prep). The estimated SSB in 2019 was 47,397 mt, which is 86% of the updated biomass target reference point of 55,217 mt. Fully selected fishing mortality was estimated to be 0.340 in 2019, which is 81% of the updated FMSY proxy of 0.422 (NEFSC 2021 In prep.).

5.3.5 American Lobster

Life History. American lobster, *Homarus americanus*, occurs in continental shelf waters from Maine to North Carolina. There are two biological stock units: the Gulf of Maine/Georges Bank stock, and Southern New England stock. The American lobster is long-lived and known to reach more than 40 pounds in body weight (Wolff 1978). Lobsters are encased in a hard exoskeleton that is periodically cast off (molted) for growth and mating to occur. Eggs are carried under the female's abdomen during a 9 - 11 month incubation period. Larger lobsters produce eggs with greater energy content and thus, may produce larvae with higher survival rates (Attard & Hudon 1987). Seasonal timing of egg extrusion and larval hatching is somewhat variable among areas and may also vary due to seasonal weather patterns. Hatching tends to occur over a five month period from May – September, occurring earlier and over a longer period in the southern part of the range. The pelagic larvae molt four times before they resemble adults and settle to the bottom. Lobsters molt more than 20 times over 5 - 8 years before they reach the minimum legal harvest size.

Population and Management Status. The states, in cooperation with NMFS, manage the American lobster resource through the ASMFC under the provisions of the Atlantic Coastal Fisheries Cooperative

Management Act (ACFCMA). States have jurisdiction for implementing measures in state waters, while NMFS implements complementary regulations in federal waters. Over the last four decades, landings in the lobster fishery have exponentially increased, with 41.1 million pounds landed in 1982 and 144.8 million pounds landed in 2018. Most of this increase in landings can be attributed to the Gulf of Maine, which has accounted for over 90% of coastwide landings since 2006. Total Gulf of Maine/Georges Bank (GOM/GBK) landings increased from the late 1980s from approximately 35 million pounds through the 2000s, exceeding 100 million pounds for the first time in 2010. Landings since 2012 have been relatively stable at the highest levels on record, averaging 145 million pounds. In contrast, landings in the Southern New England (SNE) stock have declined in conjunction with a decrease in stock health to the lowest on record in 2018, at 2.7 million pounds, accounting for only 2% of the U.S. landings. The fishery has also shifted to a predominantly offshore fishery as inshore abundance has declined. Results of the 2020 benchmark stock assessment showed a mixed picture, with increasing abundance in the GOM/GBK stock and a sharp decline in abundance for the SNE stock to record low levels. In particular, the 2020 stock assessment concluded that the abundance indicators for the SNE stock reflect the stock's very poor condition and continuing recruitment failure (ASMFC 2020). Overall, the SNE stock is considered significantly depleted but overfishing is not occurring; the GOM/GBK unit is not depleted, and overfishing is not occurring, though abundances of young-of-year in the GOM/GBK stock have been neutral to negative since the 2015 assessment (ASMFC 2020).

5.3.6 Whiting (Silver Hake)

Life History. Silver hake, also known as whiting, *Merluccius bilinearis*, range primarily from Newfoundland to South Carolina. Silver hake are fast swimmers with sharp teeth, and are important fish predators that also feed heavily on crustaceans and squid (Lock & Packer 2004). In U.S. waters, two stocks have been identified based on differences of head and fin lengths (Almeida 1987), otolith morphometrics (Bolles & Begg 2000), otolith growth differences, and seasonal distribution patterns (Lock & Packer 2004). The northern silver hake stock inhabits Gulf of Maine - Northern Georges Bank waters, and the southern silver hake stock inhabits Southern Georges Bank - Middle Atlantic Bight waters. Silver hake migrate in response to seasonal changes in water temperatures, moving toward shallow, warmer waters in the spring. They spawn in these shallow waters during late spring and early summer and then return to deeper waters in the autumn (Brodziak et al. 2001). The older, larger silver hake especially prefer deeper waters. During the summer, portions of both stocks can be found on Georges Bank, whereas during the winter fish in the northern stock move to deep basins in the Gulf of Maine, while fish in the southern stock move to outer continental shelf and slope waters. Silver hake are widely distributed, and have been observed at temperature ranges of 2-17° C (36-63° F) and depth ranges of 11-500 m (36-1,640 ft). However, they are most commonly found between 7-10º C (45-50º F) (Lock & Packer 2004).

Population and Management Status. Due to their abundance and availability, silver hake have supported important U.S. and Canadian fisheries as well as distant-water fleets. Landings increased to 137,000 mt in 1973 and then declined sharply with increased restrictions on distant-water fleet effort and implementation of the Magnuson Fishery Conservation and Management Act (MFCMA) in 1977. U.S. landings during 1987-1996 were relatively stable, averaging 16,000 mt per year, but have gradually declined to a historic low of 6,035 mt in fishing year 2017. The small-mesh otter trawl remains the principal gear used in the U.S. fishery, and recreational catches have been low since 1985. Fishing in the Gulf of Maine and Georges Bank regulated mesh areas are managed via six exemption areas, each having specific specifications for gear, possession limits for incidental species, and boundaries (see NEFMC 2017 for details). In the northern management area, all but the Cultivator Shoals Area require vessels to use a more selective raised footrope trawl when using small-mesh trawls.

Silver hake are managed under the NEFMC's Northeast Multispecies FMP ("non-regulated multispecies" category). In 2000, the NEFMC implemented Amendment 12 to this FMP, and placed silver hake into the "small mesh multispecies" management unit, along with red hake and offshore hake. This amendment established retention limits based on net mesh size, adopted overfishing definitions for northern and southern stocks, identified essential fish habitat for all life stages, and set requirements for fishing gear (NEFMC 2000). As of the last assessment in 2020, silver hake is not overfished and overfishing is not occurring in the northern or southern management area (NEFSC 2020). Biomass in the northern management area has increased in recent years and trends continue to indicate that the stock is in good condition. Biomass in the southern management area continues to show a steady increase though recruitment is more sporadic compared to the northern management area; however, the survey indicates a strong 2019 incoming year class. As a result, the Council proposed to adjust the annual catch specifications for 2021-2023, decreasing by 32% in the northern area and increasing by 94% in the southern area (NEFMC 2021), reflecting changes in the three-year average survey biomass estimate which is a major component of the specification-setting procedures.

5.3.7 **Loligo Squid**

Life History. Longfin inshore squid (*Doryteuthis (Amerigo) pealeii*) are distributed primarily in continental shelf waters located between Newfoundland and the Gulf of Venezuela (Cohen 1976; Roper et al. 1984). In the northwest Atlantic Ocean, longfin squid are most abundant in the waters between Georges Bank and Cape Hatteras where the species is commercially exploited. The management unit is all longfin squid under U.S. jurisdiction (i.e. U.S. east coast). Distribution varies seasonally. North of Cape Hatteras, squid migrate offshore during autumn to overwinter in warmer waters along the shelf edge and slope, and then return inshore during the spring where they remain until late autumn (Jacobson 2005). The species lives for 6-8 months, grows rapidly, and spawns year-round with peaks during late spring and autumn. Individuals hatched in summer grow more rapidly than those hatched in winter and males grow faster and attain larger sizes than females (Brodziak & Macy III 1996).

Population and Management Status. The longfin squid stock was last assessed in 2020 with 2019 data and is not overfished and overfishing is unknown because there are no fishing mortality reference points for this stock (though the previous benchmark assessment did describe the stock as "lightly exploited") (NEFSC 2020). The domestic fishery occurs primarily in Southern New England and Mid-Atlantic waters, but some fishing also occurs along the edge of Georges Bank. Fishing patterns reflect seasonal distribution patterns and effort is generally directed offshore during October through April and inshore during May through September. The fishery is dominated by small-mesh otter trawlers, but some near-shore pound net and fish trap fisheries occur during spring and summer. Summer or winter landings may dominate in any given year. The stock is managed by the MAFMC under the Atlantic Mackerel, Squid, and Butterfish FMP. Management measures include annual TACs, which have been partitioned into 3 four-month seasonal trimesters since 2007. There is a moratorium on directed and incidental fishery permits (an open access permit with a low trip limit may still be acquired for free). A minimum codend mesh size of 2 1/8 inches applies from September-April and 1 7/8 inches from May-August. The fishery can also be closed if butterfish discards exceed a discard cap (via in-season monitoring).

5.3.8 **Atlantic Sea Scallops**

Life History. Sea scallops, *Placopecten magellanicus,* are distributed in the northwest Atlantic Ocean from Newfoundland to North Carolina, mainly on sand and gravel sediments where bottom temperatures remain below 20º C (68º F). North of Cape Cod, concentrations generally occur in shallow water <40 m (22 fathoms) deep. South of Cape Cod and on Georges Bank, sea scallops typically occur at depths 25 - 200 m (14 - 110 fathoms), with commercial concentrations generally 35 - 100 m (19 - 55 fathoms). Sea scallops are filter feeders, feeding primarily on phytoplankton, but also on microzooplankton and detritus

(Hart & Chute 2004). Sea scallops grow rapidly during the first several years of life. Between ages 3 and 5, they commonly increase 50 - 80% in shell height and quadruple their meat weight. Sea scallops have been known to live more than 20 years. They usually become sexually mature at age 2, but individuals younger than age 4 probably contribute little to total egg production. Sexes are separate and fertilization is external. Spawning usually occurs in late summer and early autumn; spring spawning may also occur, especially in the Mid-Atlantic Bight. Sea scallops are highly fecund; a single large female can release hundreds of millions of eggs annually. Larvae remain in the water column for four to seven weeks before settling to the bottom. Sea scallops attain commercial size at about four to five years old, though historically, three year olds were often exploited. Sea scallops have a somewhat uncommon combination of life-history attributes: low mobility, rapid growth, and low natural mortality (NEFSC 2011c).

Population and Management Status. The commercial fishery for sea scallops is conducted year round, primarily using New Bedford style and turtle deflector scallop dredges. A small percentage of the fishery employs otter trawls, mostly in the Mid-Atlantic. The principal U.S. commercial fisheries are in the Mid-Atlantic (from Virginia to Long Island, New York) and on Georges Bank and neighboring areas, such as the Great South Channel and Nantucket Shoals. There is also a small, primarily inshore fishery for sea scallops in the Gulf of Maine. The NEFMC established the Scallop FMP in 1982. The scallop resource was last assessed through a management track assessment in 2020, and it was not overfished, and overfishing was not occurring (NEFSC 2020).

5.3.9 Scup

Life History. Scup are found in a variety of habitats in the Mid-Atlantic. Essential fish habitat (EFH) for scup includes demersal waters, areas with sandy or muddy bottoms, mussel beds, and sea grass beds from the Gulf of Maine through Cape Hatteras, North Carolina. Scup undertake extensive seasonal migrations between coastal and offshore waters. They are mostly found in estuaries and coastal waters during the spring and summer. In the fall and winter, they move offshore and to the south, to outer continental shelf waters south of New Jersey. Scup spawn once annually over weedy or sandy areas, mostly off of southern New England. Spawning takes place from May through August and usually peaks in June and July (Steimle et al. 1999). About 50% of scup are sexually mature at two years of age and about 17 cm (about 7 inches) total length. Nearly all scup older than three years of age are sexually mature. Scup reach a maximum age of at least 14 years. They may live as long as 20 years; however few scup older than age 7 are caught in the Mid-Atlantic (DPSWG 2009, NEFSC 2015).

Population and Management Status. The scup fishery is cooperatively managed by the MAFMC and the ASMFC under the Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan (FMP). The primary commercial fishery management measure is a quota that is distributed to three trimester periods and to individual states. Other federal regulations include minimum mesh size, gear restricted areas, and a minimum fish size. States typically restrict harvest to their quota using seasons and trip limits. Scup were under a formal rebuilding plan from 2005 through 2009. NMFS declared the scup stock rebuilt in 2009 based on the findings of the Data Poor Stocks Working Group (DPSWG 2009). The most recent stock assessment update indicates that scup was not overfished, and overfishing was not occurring in 2019, relative to the updated biological reference points (NEFSC 2021 In prep.). SSB has declined since its peak in 2013 but remains very high. Estimated SSB in 2019 was 389 million pounds (176,404 mt), 2 times SSB at maximum sustainable yield (SSBMSY = 198 million pounds, or 90,019 mt). The fishing mortality rate in 2019 was 0.136, which is 32% below the fishing mortality threshold reference point ($F_{MSY\ PROXY}$ = F40%) of 0.200. Fishing mortality has been below the $F_{MSY\ PROXY}$ reference point for the last 19 years. The average recruitment from 1984 to 2019 is 136 million fish at age 0. The 2015 year class is estimated to be 415 million fish, the largest on record, while the 2019 year class is estimated to be the smallest on record at 34 million fish (NEFSC 2021 In prep.).

5.3.10 Atlantic Herring

Life History. Atlantic herring is widely distributed in continental shelf waters of the Northeast Atlantic, from Labrador to Cape Hatteras. Herring is in every major estuary from the northern Gulf of Maine to the Chesapeake Bay. They are most abundant north of Cape Cod and become increasingly scarce south of New Jersey (Kelly & Moring 1986). Spawning occurs in the summer and fall, starting earlier along the eastern Maine coast and southwest Nova Scotia (August – September) than in the southwestern GOM (early to mid-October in the Jeffreys Ledge area) and GB (as late as November - December; Reid et al. 1999). In general, GOM herring migrate from summer feeding grounds along the Maine coast and on GB to SNE/MA areas during winter, with larger individuals tending to migrate farther distances. Atlantic herring play an important role as forage in the Northeast U.S. shelf ecosystem. They are eaten by a wide variety of fish, marine mammals, birds, and (historically) by humans in the region.

Population and Management Status. The Atlantic herring fishery is cooperatively managed by both the NEFMC and ASMFC. Presently, herring from the GOM (inshore) and GB (offshore) stock components are combined for assessment purposes into a single coastal stock complex. The fishery uses quotas by area and season. Prosecuted primarily by mid water trawls (single and paired), purse seines, and a lesser degree bottom trawls, management measures include restrictions on the incidental catch of haddock and other regulated groundfish. Mid-water trawls are allowed access to the groundfish closed areas as an exempted fishery but their use of the areas is subject to numerous regulatory restrictions. The Atlantic herring stock was last assessed in 2020 and is overfished and overfishing is not occurring through 2019 (NEFSC 2020). This is a change in stock status from the previous assessment, in which the stock was not overfished (NEFSC 2018). Continued poor recruitment is the main issue driving stock status. Management decisions that reduced US catches had the effect of avoiding overfishing (NEFSC 2020). According to the 2020 stock assessment, SSB in 2019 was estimated to be 77,883 mt. Catch limits are expected to continue to be much lower in 2021-2023 compared to levels set in the previous specification packages. For example, catch limits proposed for 2021 are under 5,000 mt compared to catch limits of below 15,000 mt that were in place for 2019-2020, and over 100,000 mt that were in place for the handful of years before.

5.3.11 Bycatch

The MSA defines bycatch as fish which are harvested in a fishery, but which are not sold or kept for personal use, including economic discards and regulatory discards. Fish released alive under a recreational catch and release fishery management program are not included. The MSA requires that, to the extent practicable, bycatch and the mortality of bycatch that cannot be avoided should both be minimized. To consider whether these objectives are being met, bycatch must be reported and assessed. To this end, the MSA requires that a standardized reporting methodology assess the amount and type of bycatch occurring in a fishery. The primary tools used to report bycatch in the multispecies fishery are the Vessel Trip Report system (VTR), the NEFSC Observer Program (NEFOP), and the groundfish sector At-Sea Monitoring Program (ASM). Each federally permitted groundfish vessel is required to report discards and landings on every trip from each statistical area they fish in. The sea sampling/observer program places personnel on boats to observe and estimate the amount of discards on a haul-by-haul basis. More information on bycatch may be found at: http://www.greateratlantic.fisheries.noaa.gov/

5.4 ASSEMBLAGES OF FISH SPECIES

Georges Bank and the Gulf of Maine have historically had high levels of fish production. Several studies have identified demersal fish assemblages over large spatial scales. Overholtz and Tyler (1985) found five depth-related groundfish assemblages for Georges Bank and the Gulf of Maine that were persistent temporally and spatially. The study identified depth and salinity as major physical influences explaining assemblage structure. Table 10 compares the six assemblages identified in Gabriel (1992) with the five assemblages from Overholtz and Tyler (1985). This EA considers these assemblages and relationships to be relatively consistent. Therefore, these descriptions generally describe the affected area. The assemblages include allocated target species, as well as non-allocated target species and bycatch. The terminology and definitions of habitat types in Table 10 vary slightly between the two studies. For further information on fish habitat relationships, see Table 11.

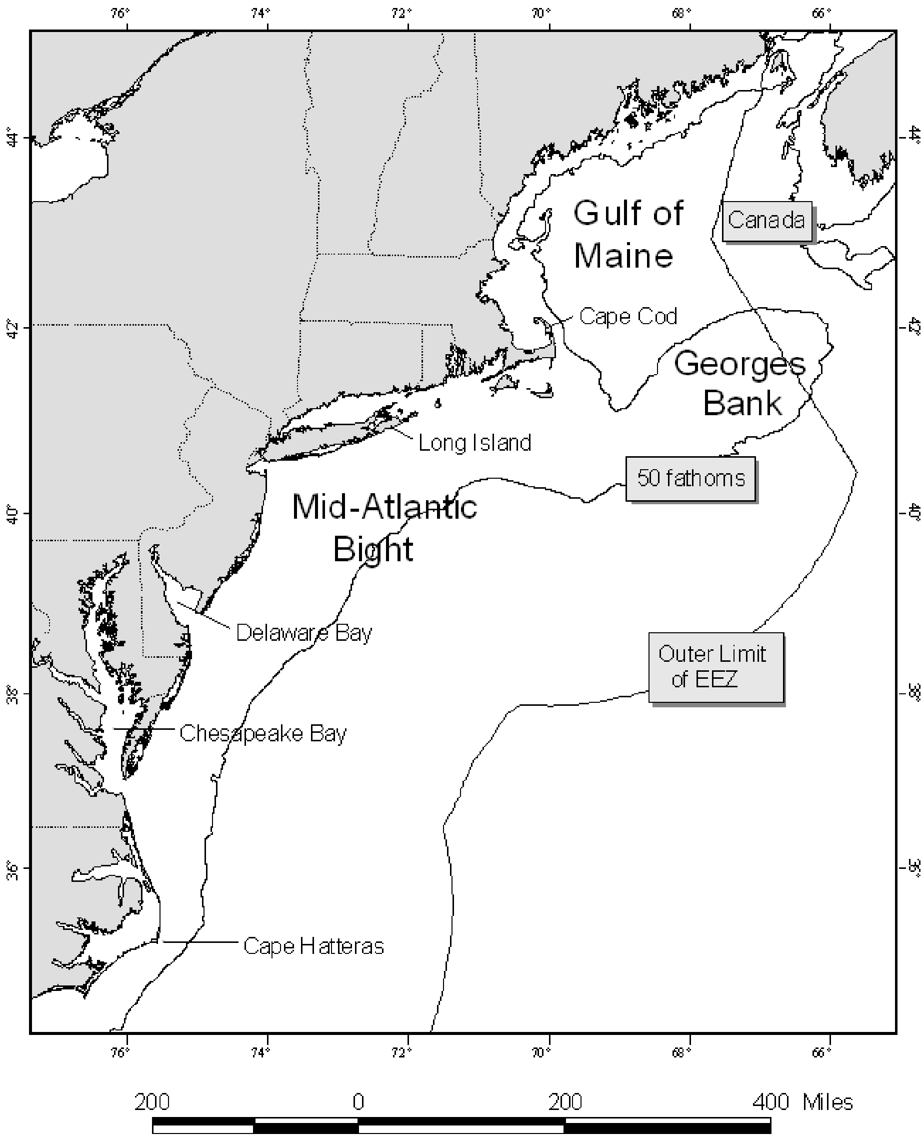
Table 10 - Comparison of Demersal Fish Assemblages of Georges Bank and the Gulf of Maine.

Overholtz and Tyler (1985)		Gabriel (1992)	
Assemblage	Species	Species	Assemblage
Slope and Canyon	offshore hake, blackbelly rosefish, Gulf stream flounder, fourspot flounder, goosefish, silver hake, white hake, red hake	offshore hake, blackbelly rosefish, Gulf stream flounder, fawn cusk-eel, longfin hake, armored sea robin	Deepwater
Intermediate	silver hake, red hake, goosefish, Atlantic cod, haddock, ocean pout, yellowtail flounder, winter skate, little skate, sea raven, longhorn sculpin	silver hake, red hake, goosefish, northern shortfin squid, spiny dogfish, cusk	Combination of Deepwater Gulf of Maine/Georges Bank and Gulf of Maine-Georges Bank Transition
Shallow	Atlantic cod, haddock, pollock, silver hake, white hake, red hake, goosefish, ocean pout	Atlantic cod, haddock, pollock	Gulf of Maine-Georges Bank Transition Zone
	yellowtail flounder, windowpane, winter flounder, winter skate, little skate, longhorn sculpin, summer flounder, sea raven, sand lance	yellowtail flounder, windowpane, winter flounder, winter skate, little skate, longhorn sculpin	Shallow Water Georges Bank-southern New England
Gulf of Maine-Deep	white hake, American plaice, witch flounder, thorny skate, silver hake, Atlantic cod, haddock, cusk, Atlantic wolffish	white hake, American plaice, witch flounder, thorny skate, redfish	Deepwater Gulf of Maine-Georges Bank
Northeast Peak	Atlantic cod, haddock, pollock, ocean pout, winter flounder, white hake, thorny skate, longhorn sculpin	Atlantic cod, haddock, pollock	Gulf of Maine-Georges Bank Transition Zone

5.5 PHYSICAL ENVIRONMENT AND ESSENTIAL FISH HABITAT

The Northeast U.S. Shelf Ecosystem (Map 2) includes the area from the Gulf of Maine south to Cape Hatteras, extending from the coast seaward to the edge of the continental shelf, including the slope sea offshore to the Gulf Stream (Sherman et al. 1996). The continental slope includes the area east of the shelf, out to a depth of 6,562 ft (2,000 m). Four distinct sub-regions are identified, including the Gulf of Maine, Georges Bank, the Mid-Atlantic Bight, and the continental slope. The groundfish fishery primarily occurs in the inshore and offshore waters of the Gulf of Maine, Georges Bank, and the Southern New England/Mid-Atlantic areas. Therefore, the description of the physical environment focuses on these sub-regions. The distinctive features of Southern New England are included in the sections describing Georges Bank and the Mid-Atlantic Bight.

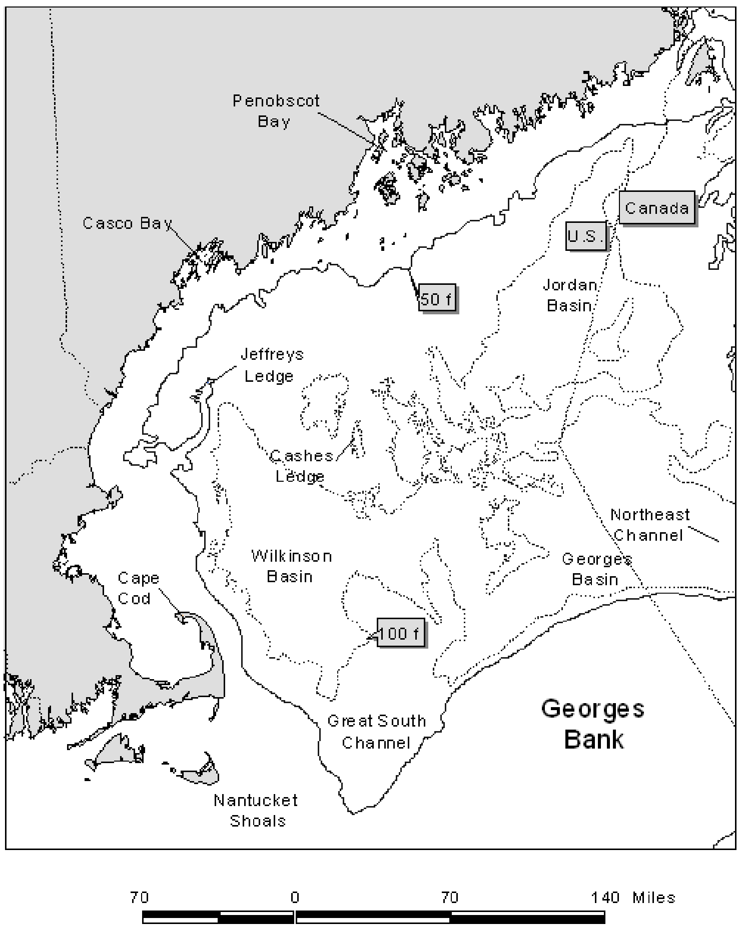
Map 2 - Northeast U.S. Shelf Ecosystem. Source: Stevenson et al. (2004).



5.5.1 **Gulf of Maine**

The Gulf of Maine is an enclosed coastal sea, glacially derived, bounded on the east by Browns Bank, on the north by the Nova Scotia (Scotian) Shelf, on the west by the New England states, and on the south by Cape Cod and Georges Bank (Map 3). The Gulf of Maine is a boreal environment characterized by relatively cold waters and deep basins, with a patchwork of various sediment types, topographically diverse from the rest of the continental border along the U.S. Atlantic coast. There are 21 distinct basins separated by ridges, banks, and swells. Depths in the basins exceed 820 ft. (250 m), with a maximum depth of 1,148 ft (350 m) in Georges Basin, just north of Georges Bank. High points within the Gulf of Maine include irregular ridges, such as Cashes Ledge, which peaks at 30 ft (9 m) below the surface.

Map 3 - Gulf of Maine Source: Stevenson et al. (2004).



Very fine sediment particles created and eroded by the glaciers have collected in thick deposits over much of the seafloor of the Gulf of Maine, particularly in its deep basins. In the basins, these mud deposits blanket and obscure the irregularities of the underlying bedrock, forming topographically smooth terrains, although localized rocky features are present, for example in Jordan Basin (see the Council's Draft Deep-Sea Coral Amendment). In the rises between the basins, other materials are usually at the surface.

Unsorted glacial till covers some morainal areas, sand predominates on some high areas, and gravel,[1] sometimes with boulders, predominates others. Bedrock is the predominant substrate along the western edge of the Gulf of Maine, north of Cape Cod in a narrow band out to a water depth of about 197 ft. (60 m). Mud predominates in coastal valleys and basins that often abruptly border rocky substrates. Gravel, often mixed with shell, is common adjacent to bedrock outcrops and in fractures in the rock. Gravel is most abundant at depths of 66 - 131 ft. (20 - 40 m), except off eastern Maine where a gravel-covered plain exists to depths of at least 328 ft. (100 m). Sandy areas are relatively rare along the inner shelf of the western Gulf of Maine, but are more common south of Casco Bay, especially offshore of sandy beaches (Stevenson, et al. 2004). Stellwagen Bank offshore Massachusetts includes large areas of sand sediment, in addition to gravel sediments and boulder ridges (Valentine et al. 2005, Valentine and Gallea 2015).

The geologic features of the Gulf of Maine, coupled with the vertical variation in water properties (e.g., salinity, depth, temperature), provide a great diversity of habitat types that support a rich biological community. A brief description of benthic invertebrates and demersal (i.e., bottom-dwelling) fish that occupy the Gulf of Maine is provided below. Additional information is provided in Stevenson et al. (2004), which is incorporated by reference.

The most common groups of benthic invertebrates in the Gulf of Maine reported by Theroux and Wigley (1998) in terms of numbers collected were annelid worms, bivalve mollusks, and amphipod crustaceans. Bivalves, sea cucumbers, sand dollars, annelids, and sea anemones dominated biomass. Watling (1998) identified seven different bottom assemblages that occur on the following habitat types:

1. Sandy offshore banks: fauna are characteristically sand dwellers with an abundant interstitial component;
2. Rocky offshore ledges: fauna are predominantly sponges, tunicates, bryozoans, hydroids, and other hard bottom dwellers;
3. Shallow [<197 ft. (60 m)] temperate bottoms with mixed substrate: fauna population is rich and diverse, primarily comprised of polychaetes and crustaceans;
4. Primarily fine muds at depths of 197 - 459 ft. (60 - 140 m) within cold Gulf of Maine Intermediate Water:[2] fauna are dominated by polychaetes, shrimp, and cerianthid anemones;
5. Cold deep water, muddy bottom: fauna include species with wide temperature tolerances which are sparsely distributed, diversity low, dominated by a few polychaetes, with brittle stars, sea pens, shrimp, and cerianthids also present;
6. Deep basin, muddy bottom, overlaying water usually 45 - 46°F (7 - 8°C): fauna densities are not high, dominated by brittle stars and sea pens, and sporadically by tube-making amphipods; and
7. Upper slope, mixed sediment of either fine muds or mixture of mud and gravel, water temperatures always >46°F (8°C): upper slope fauna extending into the Northeast Channel.

Two studies (Gabriel 1992; Overholtz & Tyler 1985) reported common[3] demersal fish species by assemblages in the Gulf of Maine and Georges Bank:

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[1] The term "gravel," as used in this analysis, is a collective term that includes granules, pebbles, cobbles, and boulders in order of increasing size. Therefore, the term "gravel" refers to particles larger than sand and generally denotes a variety of "hard bottom" substrates.

[2] Maine Intermediate Water is described as a mid-depth layer of water that preserves winter salinity and temperatures, and is located between more saline Maine bottom water and the warmer, stratified Maine surface water. The stratified surface layer is most pronounced in the deep portions of the western GOM.

[3] Other species were listed as found in these assemblages, but only the species common to both studies are listed.

- Deepwater/Slope and Canyon: offshore hake, blackbelly rosefish, Gulf stream flounder;
- Intermediate/Combination of Deepwater Gulf of Maine-Georges Bank and Gulf of Maine-Georges Bank Transition: silver hake, red hake, goosefish (monkfish);
- Shallow/Gulf of Maine-Georges Bank Transition Zone: Atlantic cod, haddock, pollock;
- Shallow water Georges Bank-southern New England: yellowtail flounder, windowpane flounder, winter flounder, winter skate, little skate, longhorn sculpin;
- Deepwater Gulf of Maine-Georges Bank: white hake, American plaice, witch flounder, thorny skate; and
- Northeast Peak/Gulf of Maine-Georges Bank Transition: Atlantic cod, haddock, pollock.

5.5.2 **Georges Bank**

Georges Bank is a shallow (10 - 492 ft. [3 - 150 m depth]), elongated (100 mi.(161 km) wide by 20 mi (322 km) long) extension of the continental shelf that was formed during the Wisconsinian glacial episode (Map 2). It has a steep slope on its northern edge, a broad, flat, gently sloping southern flank, and steep submarine canyons on its eastern and southeastern edges. It has highly productive, well-mixed waters and strong currents. The Great South Channel lies to the west. Natural processes continue to erode and rework the sediments on Georges Bank. Erosion and reworking of sediments by the action of rising sea level as well as tidal and storm currents may reduce the amount of sand and cause an overall coarsening of the bottom sediments (Valentine & Lough 1991).

Bottom topography on eastern Georges Bank consists of linear ridges in the western shoal areas; a relatively smooth, gently dipping seafloor on the deeper, easternmost part; a highly energetic peak in the north with sand ridges up to 30 m high and extensive gravel pavement; and steeper and smoother topography incised by submarine canyons on the southeastern margin. The central region of Georges Bank is shallow, and the bottom has shoals and troughs, with sand dunes superimposed within. The area west of the Great South Channel, known as Nantucket Shoals, is similar in nature to the central region of Georges Bank. Currents in these areas are strongest where water depth is shallower than 164 ft. (50 m). Sediments in this region include gravel pavement and mounds, some scattered boulders, sand with storm-generated ripples, and scattered shell and mussel beds. Tidal and storm currents range from moderate to strong, depending upon location and storm activity.

Oceanographic frontal systems separate the water masses of the Gulf of Maine and Georges Bank from oceanic waters south of Georges Bank. These water masses differ in temperature, salinity, nutrient concentration, and planktonic communities. These differences influence productivity and may influence fish abundance and distribution.

Georges Bank has historically had high levels of both phytoplankton and fish production. Common demersal fish species in Georges Bank are offshore hake, blackbelly rosefish, Gulf Stream flounder, silver hake, red hake, goosefish (monkfish), Atlantic cod, haddock, pollock, yellowtail flounder, windowpane flounder, winter flounder, winter skate, little skate, longhorn sculpin, white hake, American plaice, witch flounder, and thorny skate. In terms of benthic invertebrates, the most common groups in terms of numbers collected were amphipod crustaceans and annelid worms, while sand dollars and bivalves dominated the overall biomass (Theroux & Wigley 1998). Using Theroux and Wigley database, Theroux and Grosslein (1987) identified four macrobenthic invertebrate assemblages that occur on similar habitat type:

1. The Western Basin assemblage is found in comparatively deep water (492 - 656 ft. [150 - 200 m]) with relatively slow currents and fine bottom sediments of silt, clay, and muddy sand. Fauna are comprised mainly of small burrowing detritivores and deposit feeders, and carnivorous scavengers.
2. The Northeast Peak assemblage is found in variable depths and current strength and includes coarse sediments, consisting mainly of gravel and coarse sand with interspersed boulders, cobbles, and pebbles. Fauna tend to be sessile (coelenterates, brachiopods, barnacles, and tubiferous annelids) or free-living (brittle stars, crustaceans, and polychaetes), with a characteristic absence of burrowing forms.
3. The Central Georges Bank assemblage occupies the greatest area, including the central and northern portions of Georges Bank in depths <328 ft. (100 m). Medium-grained shifting sands predominate this dynamic area of strong currents. Organisms tend to be small to moderately large with burrowing or motile habits. Sand dollars are most characteristic of this assemblage.
4. The Southern Georges Bank assemblage is found on the southern and southwestern flanks at depths from 262 - 656 ft. (80 - 200 m), where fine-grained sands and moderate currents predominate. Many southern species exist here at the northern limits of their range. Dominant fauna include amphipods, copepods, euphausiids, and starfish.

5.5.3 Southern New England/Mid-Atlantic Bight

The Mid-Atlantic Bight includes the shelf and slope waters from Georges Bank south to Cape Hatteras, and east to the Gulf Stream (Map 2). The northern portion of the Mid-Atlantic Bight is sometimes referred to as southern New England. It generally includes the area of the continental shelf south of Cape Cod from the Great South Channel to Hudson Canyon. The Mid-Atlantic Bight consists of the sandy, relatively flat, gently sloping continental shelf from southern New England to Cape Hatteras, North Carolina. The shelf slopes gently from shore out to 62 - 124 ft (100 - 200 km) offshore, where it transforms to the slope (328 - 656 ft. [100 - 200 m water depth]) at the shelf break. In both the Mid-Atlantic Bight and on Georges Bank, numerous canyons incise the slope, and some cut up onto the shelf itself (Stevenson, et al. 2004). Like the rest of the continental shelf, sea level fluctuations during past ice ages largely shaped the topography of the Mid-Atlantic Bight. Since that time, currents and waves have modified this basic structure.

The sediment type covering most of the shelf in the Mid-Atlantic Bight is sand, with some relatively small, localized areas of sand-shell and sand-gravel. Silty sand, silt, and clay predominate on the slope. Permanent sand ridges occur in groups with heights of about 33 ft. (10 m), lengths of 6 - 31 mi (10 - 50 km), and spacing of 1 mi (2 km). The sand ridges are usually oriented at a slight angle towards shore, running in length from northeast to southwest. Sand ridges are often covered with smaller similar forms such as sand waves, megaripples, and ripples. Sand waves are usually found in patches of 5 - 10 with heights of about 7 ft. (2 m), lengths of 164 - 328 ft. (50 - 100 m), and 0.6 - 1 mi (1 - 2 km) between patches. Sand waves are temporary features that form and re-form in different locations. They usually occur on the inner shelf. Because tidal currents southwest of Nantucket Shoals and southeast of Long Island and Rhode Island slow significantly, there is a large mud patch on the seafloor where silts and clays settle out.

Artificial reefs are another important Mid-Atlantic Bight habitat. These localized areas of hard structure have been formed more recently than other seabed types by shipwrecks, lost cargoes, disposed solid materials, shoreline jetties and groins, submerged pipelines, cables, and other materials (Steimle & Zetlin 2000). In general, reefs are important for attachment sites, shelter, and food for many species. In addition, fish predators, such as tunas, may be drawn by prey aggregations or may be behaviorally attracted to the reef structure. Estuarine reefs, such as blue mussel beds or oyster reefs, are dominated by epibenthic organisms, as well as crabs, lobsters, and sea stars. These reefs are hosts to a multitude of fish, including gobies, spot, bass (black sea and striped), perch, toadfish, and croaker. Coastal reefs consist of exposed rock, wrecks, kelp, or other hard material. Boring mollusks, algae, sponges, anemones, hydroids, and coral generally dominate these coastal reefs. These reef types also host lobsters, crabs, sea stars, and urchins, as well as a multitude of fish, including; black sea bass, pinfish, scup, cunner, red hake, gray triggerfish, black grouper, smooth dogfish, and summer flounder. These epibenthic organisms and fish assemblages are similar to the reefs farther offshore, which generally consist of rocks and boulders, wrecks, and other types of artificial reefs. There is less information available for reefs on the outer shelf, but the fish species associated with these reefs include tilefish, white hake, and conger eel.

While substrate is the primary factor influencing demersal species distribution in the Gulf of Maine and Georges Bank, latitude and water depth are the primary influence in the Mid-Atlantic Bight area. In terms of numbers, amphipod crustaceans and bivalve mollusks dominate the benthic fauna of this primarily sandy environment. Mollusks (70%) dominate the biomass (Stevenson, et al. 2004). Pratt (1973) identified three broad faunal zones related to water depth and sediment type:

1. The "sand fauna" zone is dominated by polychaetes and was defined for sandy sediments (≤1% silt) that are at least occasionally disturbed by waves, from shore out to a depth of about 164 ft. (50 m).
2. The "silty sand fauna" zone is dominated by amphipods and polychaetes and occurs immediately offshore from the sand fauna zone, in stable sands containing a small amount of silt and organic material.
3. Silts and clays become predominant at the shelf break and line the Hudson Shelf Valley supporting the "silt-clay fauna."

Colvocoresses and Musick (1984) identified the following assemblages in the Mid-Atlantic sub region during spring and fall.[4]

- Northern (boreal) portions: hake (white, silver, red), goosefish (monkfish), longhorn sculpin, winter flounder, little skate, and spiny dogfish;
- Warm temperate portions: black sea bass, summer flounder, butterfish, scup, spotted hake, and northern sea robin;
- Water of the inner shelf: windowpane flounder;
- Water of the outer shelf: fourspot flounder; and
- Water of the continental slope: shortnose greeneye, offshore hake, blackbelly rosefish, and white hake.

5.5.4 **Essential Fish Habitat Designations**

The Sustainable Fisheries Act defines EFH as "[t]hose waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The proposed action could potentially affect EFH for benthic life stages of species that are managed under the Northeast Multispecies FMP; as well as EFH for species managed under the Atlantic Sea Scallop; Monkfish; Northeast Skate Complex; Atlantic

[4] Other species were listed as found in these assemblages, but only the species common to both spring and fall seasons are listed.

Herring; Summer Flounder, Scup, and Black Sea Bass; Golden Tilefish; Atlantic Mackerel, Squid, and Butterfish; and Atlantic Surfclam and Ocean Quahog FMPs. EFH for deep-sea red crab is designated beyond the operating depths of the multispecies fishery. EFH for the species managed under these FMPs includes a wide variety of benthic habitats in state and federal waters throughout the Northeast U.S. shelf ecosystem.

Table 11 - Summary of Geographic distributions and habitat characteristics of Essential Fish Habitat designations for benthic fish and shellfish species managed by the New England and Mid-Atlantic fishery management councils in the Greater Atlantic region, as of October 2019.

Species	Life Stage	Geographic Area	Depth (meters)	Habitat Type and Description
Acadian redfish	Juveniles	Gulf of Maine and the continental slope north of 37°38'N	50-200 in Gulf of Maine, to 600 on slope	Sub-tidal coastal and offshore rocky reef substrates with associated structure-forming epifauna (e.g., sponges, corals), and soft sediments with cerianthid anemones
	Adults	Gulf of Maine and the continental slope north of 37°38'N	140-300 in Gulf of Maine, to 600 on slope	Offshore benthic habitats on finer grained sediments and on variable deposits of gravel, silt, clay, and boulders
American plaice	Juveniles	Gulf of Maine and bays and estuaries from Passamaquoddy Bay to Saco Bay, Maine and from Massachusetts Bay to Cape Cod Bay, Massachusetts Bay	40-180	Sub-tidal benthic habitats on mud and sand, also found on gravel and sandy substrates bordering bedrock
	Adults	Gulf of Maine, Georges Bank and bays and estuaries from Passamaquoddy Bay to Saco Bay, Maine and from Massachusetts Bay to Cape Cod Bay, Massachusetts Bay	40-300	Sub-tidal benthic habitats on mud and sand, also gravel and sandy substrates bordering bedrock
Atlantic cod	Juveniles	Gulf of Maine, Georges Bank, and Southern New England, including nearshore waters from eastern Maine to Rhode Island and the following estuaries: Passamaquoddy Bay to Saco Bay; Massachusetts Bay, Boston Harbor, Cape Cod Bay, and Buzzards Bay	Mean high water-120	Structurally-complex intertidal and sub-tidal habitats, including eelgrass, mixed sand and gravel, and rocky habitats (gravel pavements, cobble, and boulder) with and without attached macroalgae and emergent epifauna
	Adults	Gulf of Maine, Georges Bank, Southern New England, and the Mid-Atlantic to Delaware Bay, including the following estuaries: Passamaquoddy Bay to Saco Bay; Massachusetts Bay, Boston Harbor, Cape Cod Bay, and Buzzards Bay	30-160	Structurally complex sub-tidal hard bottom habitats with gravel, cobble, and boulder substrates with and without emergent epifauna and macroalgae, also sandy substrates and along deeper slopes of ledges
Atlantic halibut	Juveniles & Adults	Gulf of Maine, Georges Bank, and continental slope south of Georges Bank	60-140 and 400-700 on slope	Benthic habitats on sand, gravel, or clay substrates
Atlantic wolffish	Eggs	U.S. waters north of 41˚N latitude and east of 71˚W longitude	<100	Sub-tidal benthic habitats under rocks and boulders in nests
	Juveniles	U.S. waters north of 41˚N latitude and east of 71˚W longitude	70-184	Sub-tidal benthic habitats
	Adults	U.S. waters north of 41˚N latitude and east of 71˚W longitude	<173	A wide variety of sub-tidal sand and gravel substrates once they leave rocky spawning habitats, but not on muddy bottom

Species	Life Stage	Geographic Area	Depth (meters)	Habitat Type and Description
Haddock	Juveniles	Inshore and offshore waters in the Gulf of Maine, on Georges Bank, and on the continental shelf in the Mid-Atlantic region	40-140 and as shallow as 20 in coastal Gulf of Maine	Sub-tidal benthic habitats on hard sand (particularly smooth patches between rocks), mixed sand and shell, gravelly sand, and gravel
	Adults	Offshore waters in the Gulf of Maine, on Georges Bank, and on the continental shelf in Southern New England	50-160	Sub-tidal benthic habitats on hard sand (particularly smooth patches between rocks), mixed sand and shell, gravelly sand, and gravel and adjacent to boulders and cobbles along the margins of rocky reefs
Ocean pout	Eggs	Georges Bank, Gulf of Maine, and the Mid-Atlantic, including certain bays and estuaries in the Gulf of Maine	<100	Sub-tidal hard bottom habitats in sheltered nests, holes, or rocky crevices
	Juveniles	Gulf of Maine, on the continental shelf north of Cape May, New Jersey, on the southern portion of Georges Bank, and including certain bays and estuaries in the Gulf of Maine	Mean high water-120	Intertidal and sub-tidal benthic habitats on a wide variety of substrates, including shells, rocks, algae, soft sediments, sand, and gravel
	Adults	Gulf of Maine, Georges Bank, on the continental shelf north of Cape May, New Jersey, and including certain bays and estuaries in the Gulf of Maine	20-140	Sub-tidal benthic habitats on mud and sand, particularly in association with structure forming habitat types; i.e. shells, gravel, or boulders
Pollock	Juveniles	Inshore and offshore waters in the Gulf of Maine (including bays and estuaries in the Gulf of Maine), the Great South Channel, Long Island Sound, and Narragansett Bay, Rhode Island	Mean high water-180 in Gulf of Maine, Long Island Sound, and Narragansett Bay; 40-180 on Georges Bank	Intertidal and sub-tidal pelagic and benthic rocky bottom habitats with attached macroalgae, small juveniles in eelgrass beds, older juveniles move into deeper water habitats also occupied by adults
	Adults	Offshore Gulf of Maine waters, Massachusetts Bay and Cape Cod Bay, on the southern edge of Georges Bank, and in Long Island Sound	80-300 in Gulf of Maine and on Georges Bank; <80 in Long Island Sound, Cape Cod Bay, and Narragansett Bay	Pelagic and benthic habitats on the tops and edges of offshore banks and shoals with mixed rocky substrates, often with attached macro algae
White hake	Juveniles	Gulf of Maine, Georges Bank, and Southern New England, including bays and estuaries in the Gulf of Maine	Mean high water - 300	Intertidal and sub-tidal estuarine and marine habitats on fine-grained, sandy substrates in eelgrass, macroalgae, and un-vegetated habitats
	Adults	Gulf of Maine, including coastal bays and estuaries, and the outer continental shelf and slope	100-400 offshore Gulf of Maine, >25 inshore Gulf of Maine, to 900 on slope	Sub-tidal benthic habitats on fine-grained, muddy substrates and in mixed soft and rocky habitats
Windowpane flounder	Juveniles	Estuarine, coastal, and continental shelf waters from the Gulf of Maine to	Mean high water - 60	Intertidal and sub-tidal benthic habitats on mud and sand substrates

Species	Life Stage	Geographic Area	Depth (meters)	Habitat Type and Description
		northern Florida, including bays and estuaries from Maine to Maryland		
	Adults	Estuarine, coastal, and continental shelf waters from the Gulf of Maine to Cape Hatteras, North Carolina, including bays and estuaries from Maine to Maryland	Mean high water - 70	Intertidal and sub-tidal benthic habitats on mud and sand substrates
Winter flounder	Eggs	Eastern Maine to Absecon Inlet, New Jersey (39° 22´N) and Georges Bank	0-5 south of Cape Cod, 0-70 Gulf of Maine and Georges Bank	Sub-tidal estuarine and coastal benthic habitats on mud, muddy sand, sand, gravel, submerged aquatic vegetation, and macroalgae
	Juveniles	Coastal Gulf of Maine, Georges Bank, and continental shelf in Southern New England and Mid-Atlantic to Absecon Inlet, New Jersey, including bays and estuaries from eastern Maine to northern New Jersey	Mean high water - 60	Intertidal and sub-tidal benthic habitats on a variety of bottom types, such as mud, sand, rocky substrates with attached macro algae, tidal wetlands, and eelgrass; young-of-the-year juveniles on muddy and sandy sediments in and adjacent to eelgrass and macroalgae, in bottom debris, and in marsh creeks
	Adults	Coastal Gulf of Maine, Georges Bank, and continental shelf in Southern New England and Mid-Atlantic to Absecon Inlet, New Jersey, including bays and estuaries from eastern Maine to northern New Jersey	Mean high water - 70	Intertidal and sub-tidal benthic habitats on muddy and sandy substrates, and on hard bottom on offshore banks; for spawning adults, also see eggs
Witch flounder	Juveniles	Gulf of Maine and outer continental shelf and slope	50-400 and to 1500 on slope	Sub-tidal benthic habitats with mud and muddy sand substrates
	Adults	Gulf of Maine and outer continental shelf and slope	35-400 and to 1500 on slope	Sub-tidal benthic habitats with mud and muddy sand substrates
Yellowtail flounder	Juveniles	Gulf of Maine, Georges Bank, and the Mid-Atlantic, including certain bays and estuaries in the Gulf of Maine	20-80	Sub-tidal benthic habitats on sand and muddy sand
	Adults	Gulf of Maine, Georges Bank, and the Mid-Atlantic, including certain bays and estuaries in the Gulf of Maine	25-90	Sub-tidal benthic habitats on sand and sand with mud, shell hash, gravel, and rocks
Silver hake	Juveniles	Gulf of Maine, including certain bays and estuaries, and on the continental shelf as far south as Cape May, New Jersey	40-400 in Gulf of Maine, >10 in Mid-Atlantic	Pelagic and sandy sub-tidal benthic habitats in association with sand-waves, flat sand with amphipod tubes, shells, and in biogenic depressions
	Adults	Gulf of Maine, including certain bays and estuaries, the southern portion of Georges Bank, and the outer continental shelf and some shallower coastal locations in the Mid-Atlantic	>35 in Gulf of Maine, 70-400 on Georges Bank and in the Mid-Atlantic	Pelagic and sandy sub-tidal benthic habitats, often in bottom depressions or in association with sand waves and shell fragments, also in mud habitats bordering deep boulder reefs, on over deep boulder reefs in the southwest Gulf of Maine
Offshore hake	Juveniles	Outer continental shelf and slope from Georges Bank to 34° 40'N	160-750	Pelagic and benthic habitats
	Adults	Outer continental shelf and slope from Georges Bank to 34° 40'N	200-750	Pelagic and benthic habitats

Species	Life Stage	Geographic Area	Depth (meters)	Habitat Type and Description
Red hake	Juveniles	Gulf of Maine, Georges Bank, and the Mid-Atlantic, including Passamaquoddy Bay to Cape Cod Bay in the Gulf of Maine, Buzzards Bay and Narragansett Bay, Long Island Sound, Raritan Bay and the Hudson River, and lower Chesapeake Bay	Mean high water-80	Intertidal and sub-tidal soft bottom habitats, especially those that that provide shelter, such as depressions in muddy substrates, eelgrass, macroalgae, shells, anemone and polychaete tubes, on artificial reefs, and in live bivalves (e.g., scallops)
	Adults	In the Gulf of Maine, the Great South Channel, and on the outer continental shelf and slope from Georges Bank to North Carolina, including inshore bays and estuaries as far south as Chesapeake Bay	50-750 on shelf and slope, as shallow as 20 inshore	Sub-tidal benthic habitats in shell beds, on soft sediments (usually in depressions), also found on gravel and hard bottom and artificial reefs
Monkfish	Juveniles	Gulf of Maine, outer continental shelf in the Mid-Atlantic, and the continental slope	50-400 in the Mid-Atlantic, 20-400 in the Gulf of Maine, and to 1000 on the slope	Sub-tidal benthic habitats on a variety of habitats, including hard sand, pebbles, gravel, broken shells, and soft mud, also seek shelter among rocks with attached algae
	Adults	Gulf of Maine, outer continental shelf in the Mid-Atlantic, and the continental slope	50-400 in the Mid-Atlantic, 20-400 in the Gulf of Maine, and to 1000 on the slope	Sub-tidal benthic habitats on hard sand, pebbles, gravel, broken shells, and soft mud, but seem to prefer soft sediments, and, like juveniles, utilize the edges of rocky areas for feeding
Smooth skate	Juveniles	Offshore Gulf of Maine, some coastal bays in Maine and New Hampshire, and on the continental slope from Georges Bank to North Carolina	100-400 offshore Gulf of Maine, <100 inshore Gulf of Maine, to 900 on slope	Benthic habitats, mostly on soft mud in deeper areas, but also on sand, broken shells, gravel, and pebbles on offshore banks in the Gulf of Maine
	Adults	Offshore Gulf of Maine and the continental slope from Georges Bank to North Carolina	100-400 offshore Gulf of Maine, to 900 on slope	Benthic habitats, mostly on soft mud in deeper areas, but also on sand, broken shells, gravel, and pebbles on offshore banks in the Gulf of Maine
Thorny skate	Juveniles	Offshore Gulf of Maine, some coastal bays in the Gulf of Maine, and on the continental slope from Georges Bank to North Carolina	35-400 offshore Gulf of Maine, <35 inshore Gulf of Maine, to 900 on the slope	Benthic habitats on a wide variety of bottom types, including sand, gravel, broken shells, pebbles, and soft mud
	Adults	Offshore Gulf of Maine and on the continental slope from Georges Bank to North Carolina	35-400 offshore Gulf of Maine, <35 inshore Gulf of Maine, to 900 on the slope	Benthic habitats on a wide variety of bottom types, including sand, gravel, broken shells, pebbles, and soft mud
Little skate	Juveniles	Coastal waters in the Gulf of Maine, Georges Bank, and the continental shelf in the Mid-Atlantic region as far south as Delaware Bay, including certain bays and estuaries in the Gulf of Maine	Mean high water-80	Intertidal and sub-tidal benthic habitats on sand and gravel, also found on mud
	Adults	Coastal waters in the Gulf of Maine, Georges Bank, and the continental shelf in the Mid-Atlantic region as far	Mean high water-100	Intertidal and sub-tidal benthic habitats on sand and gravel, also found on mud

Species	Life Stage	Geographic Area	Depth (meters)	Habitat Type and Description
		south as Delaware Bay, including certain bays and estuaries in the Gulf of Maine		
Winter skate	Juveniles	Coastal waters from eastern Maine to Delaware Bay, including certain bays and estuaries from eastern Maine to Chincoteague Bay, Virginia, and on Georges Bank and the continental shelf in Southern New England and the Mid-Atlantic	0-90	Sub-tidal benthic habitats on sand and gravel substrates, are also found on mud
	Adults	Coastal waters from eastern Maine to Delaware Bay, including certain bays and estuaries in Maine and New Hampshire, and on Georges Bank and the continental shelf in Southern New England and the Mid-Atlantic	0-80	Sub-tidal benthic habitats on sand and gravel substrates, are also found on mud
Barndoor skate	Juveniles and adults	Primarily on Georges Bank and in Southern New England and on the continental slope	40-400 on shelf and to 750 on slope	Sub-tidal benthic habitats on mud, sand, and gravel substrates
Clearnose skate	Juveniles	Inner continental shelf from New Jersey to the St. Johns River in Florida and certain bays and certain estuaries including Raritan Bay, inland New Jersey bays, Chesapeake Bay, and Delaware Bays	0-30	Sub-tidal benthic habitats on mud and sand, but also on gravelly and rocky bottom
	Adults	Inner continental shelf from New Jersey to the St. Johns River in Florida and certain bays and certain estuaries including Raritan Bay, inland New Jersey bays, Chesapeake Bay, and Delaware Bays	0-40	Sub-tidal benthic habitats on mud and sand, but also on gravelly and rocky bottom
Rosette skate	Juveniles and adults	Outer continental shelf from approximately 40˚N to Cape Hatteras, North Carolina	80-400	Benthic habitats with mud and sand substrates
Atlantic herring	Eggs	Coastal Gulf of Maine, Georges Bank, and Southern New England	5-90	Sub-tidal benthic habitats on coarse sand, pebbles, cobbles, and boulders and/or macroalgae
Atlantic sea scallop	Eggs	Gulf of Maine coastal waters and offshore banks, Georges Bank, and the Mid-Atlantic, including the following estuaries: Passamaquoddy Bay to Sheepscot River; Casco Bay, Massachusetts Bay, and Cape Cod Bay	18-110	Inshore and offshore benthic habitats (see adults)
	Larvae	Gulf of Maine coastal waters and offshore banks, Georges Bank, and the Mid-Atlantic, including the following estuaries: Passamaquoddy Bay to Sheepscot River; Casco Bay, Massachusetts Bay, and Cape Cod Bay	No information	Inshore and offshore pelagic and benthic habitats: pelagic larvae ("spat"), settle on variety of hard surfaces, including shells, pebbles, and gravel and to macroalgae and other benthic organisms such as hydroids
	Juveniles	Gulf of Maine coastal waters and offshore banks, Georges Bank, and the Mid-Atlantic, including the following estuaries: Passamaquoddy Bay to	18-110	Benthic habitats initially attached to shells, gravel, and small rocks (pebble, cobble), later free-swimming juveniles found in same habitats as adults

Species	Life Stage	Geographic Area	Depth (meters)	Habitat Type and Description
		Sheepscot River; Casco Bay, Great Bay, Massachusetts Bay, and Cape Cod Bay		
	Adults	Gulf of Maine coastal waters and offshore banks, Georges Bank, and the Mid-Atlantic, including the following estuaries: Passamaquoddy Bay to Sheepscot River; Casco Bay, Great Bay, Massachusetts Bay, and Cape Cod Bay	18-110	Benthic habitats with sand and gravel substrates
Deep-sea red crab	Eggs	Outer continental shelf and slope throughout the region, including two seamounts	320-640	Benthic habitats attached to female crabs
	Juveniles	Outer continental shelf and slope throughout the region, including two seamounts	320-1300 on slope and to 2000 on seamounts	Benthic habitats with unconsolidated and consolidated silt-clay sediments
	Adults	Outer continental shelf and slope throughout the region, including two seamounts	320-900 on slope and up to 2000 m on seamounts	Benthic habitats with unconsolidated and consolidated silt-clay sediments
Summer flounder	Juveniles	Continental shelf and estuaries from Cape Cod, Massachusetts, to Cape Canaveral, Florida	To maximum 152	Benthic habitats, including inshore estuaries, salt marsh creeks, seagrass beds, mudflats, and open bay areas
	Adults	Continental shelf from Cape Cod, Massachusetts, to Cape Canaveral, Florida, including shallow coastal and estuarine waters during warmer months	To maximum 152 in colder months	Benthic habitats
Scup	Juveniles	Continental shelf between southwestern Gulf of Maine and Cape Hatteras, North Carolina and in nearshore and estuarine waters between Massachusetts and Virginia	No information	Benthic habitats, in association with inshore sand and mud substrates, mussel and eelgrass beds
	Adults	Continental shelf and nearshore and estuarine waters between southwestern Gulf of Maine and Cape Hatteras, North Carolina	No information, generally overwinter offshore	Benthic habitats
Black sea bass	Juveniles and adults	Continental shelf and estuarine waters from the southwestern Gulf of Maine and Cape Hatteras, North Carolina	Inshore in summer and spring	Benthic habitats with rough bottom, shellfish and eelgrass beds, man-made structures in sandy-shelly areas, also offshore clam beds and shell patches in winter
Golden tilefish	Juveniles and adults	Outer continental shelf and slope from U.S.-Canada boundary to the Virginia-North Carolina boundary	100-300	Burrows in semi-lithified clay substrate, may also utilize rocks, boulders, scour depressions beneath boulders, and exposed rock ledges as shelter
Blueline tilefish	Juveniles and adults	Outer continental shelf from eastern Georges Bank to the Virginia / North Carolina boundary	46 to 256	Horizontal or vertical burrows in sediments composed of silt, clay, and sand
Longfin inshore squid	Eggs	Inshore and offshore waters from Georges Bank southward to Cape Hatteras	Generally <50	Bottom habitats attached to variety of hard bottom types, macroalgae, sand, and mud

Species	Life Stage	Geographic Area	Depth (meters)	Habitat Type and Description
Spiny dogfish	Juveniles	Primarily the outer continental shelf and slope between Cape Hatteras and Georges Bank and in the Gulf of Maine	Deep water	Pelagic and epibenthic habitats
	Female sub-adults	Throughout the region	Wide depth range	Pelagic and epibenthic habitats
	Male sub-adults	Primarily in the Gulf of Maine and on the outer continental shelf from Georges Bank to Cape Hatteras	Wide depth range	Pelagic and epibenthic habitats
	Female adults	Throughout the region	Wide depth range	Pelagic and epibenthic habitats
	Male adults	Throughout the region	Wide depth range	Pelagic and epibenthic habitats
Atlantic surfclam	Juveniles and adults	Continental shelf from southwestern Gulf of Maine to Cape Hatteras, North Carolina	Surf zone to about 61, abundance low >38	In substrate to depth of 3 ft
Ocean quahog	Juveniles and adults	Continental shelf from southern New England and Georges Bank to Virginia	9-244	In substrate to depth of 3 ft

5.5.5 Gear Types and Interaction with Habitat

A variety of gears are used in the multispecies fishery. Groundfish vessels fish for target species with: trawl, gillnet, and hook and line gear (including jigs, handline, and non-automated demersal longlines). This section discusses the characteristics of each of the gear types, as well as the typical impacts to the physical habitat associated with each of these gear types. In general, EFH for species and life stages that rely on the seafloor for shelter (e.g., from predators), reproduction, or food is vulnerable to disturbance by bottom tending gear. The most vulnerable habitat is more likely to be hard or rough bottom with attached epifauna. The Council's recently published Omnibus Habitat Amendment 2 includes an assessment of relative habitat vulnerability to the gear types used in the northeast region. This analysis was recently updated (NEFMC 2019).

5.5.5.1 Trawl Gear

Trawls are classified by their function, bag construction, or method of maintaining the mouth opening. Function may be defined by the part of the water column where the trawl operates (e.g., bottom) or by the species that it targets (Hayes 1983). Mid-water trawls are designed to catch pelagic species in the water column and do not normally contact the bottom; however, mid-water trawls are prohibited in the Northeast multispecies fishery. Bottom trawls are designed to be towed along the seafloor and to catch a variety of demersal fish and invertebrate species.

Bottom otter trawls account for nearly all commercial bottom trawling activity. A wide range of otter trawls are used in the northeast due to the diversity of fisheries and bottom types encountered in the region (NEFSC 2002c). The specific gear design is often a result of the target species (whether found on or off the bottom) as well as the composition of the bottom (smooth versus rough and soft versus hard). Fishermen tow bottom trawls at a variety of speeds, but average about 5.6 km/hour (3 knots). Several federal FMPs manage the use of this gear. Bottom trawling is also subject to a variety of state regulations throughout the region.

A flatfish trawl is a type of bottom otter trawl designed with a low net opening between the headrope and the footrope and more ground rigging on the sweep. This type of trawl is designed so that the sweep follows the contours of the bottom. As flounders lie in contact with the seafloor, these animals respond to the bottom-tending sweep by swimming up off the bottom where they can be entrained into net. Flatfish trawls are used on smooth mud and sand bottoms. In contrast, a high-rise or fly net with larger mesh has a wide net opening and is used to catch demersal fish that tend to rise higher off the bottom than flatfish (NEFSC 2002).

Bottom otter trawls are rigged with rockhopper gear for use on "hard" bottom (i.e., gravel or rocky bottom), or on mud or sand bottom with occasional boulders. This type of gear seeks to sweep over irregularities in the bottom without damaging the net. The sweep in trawls rigged for fishing on smooth bottoms looks to herd fish into the path of the net (Mirarchi 1998).

The raised-footrope trawl was designed to provide vessels with a means of continuing to fish for small-mesh species without catching groundfish. Raised-footrope trawls fish about 1.6 - 2.0 ft. (0.5 - 0.6 m) above the bottom. Although the doors of the trawl still ride on the bottom, underwater video and observations in flume tanks have confirmed that the sweep in the raised-footrope trawl has much less contact with the seafloor than the traditional cookie sweep (Carr & Milliken 1998).

The haddock separator trawl and Ruhle trawl (bottom trawls) are used to minimize the catch of cod. The design of these gears considers the behavior of fish in response to gear. A haddock separator trawl is a groundfish trawl modified to a vertically oriented trouser trawl configuration. It has two extensions arranged one over the other. A codend is attached to the upper extension and the bottom extension is left open with no codend attached. A horizontal large mesh separating panel constructed with a minimum of 6-inch diamond mesh must be installed between the selvedges joining the upper and lower panels [648.85(a)(3)(iii)(A)]. Haddock generally swim to the upper part of a net and cod swim to the lower part of the net. By inserting a mesh panel in the net, and using two codends, the net effectively divides the catch. The cod can escape if the codend on the lower part of the net is left open (NEFMC 2003). Overall, the haddock separator trawl has had mixed results in commercial fishing operations. The expected ratios of haddock to cod have not been realized. Catches of other demersal species, such as flounders, skates, and monkfish, have also been higher than expected. However, the separator trawl has reduced catches of these species compared to normal fishing practices (NEFMC 2009b).

The Ruhle trawl (previously known as the haddock rope trawl or eliminator trawl) is a four-seam bottom groundfish trawl with a rockhopper. It is designed to reduce the bycatch of cod while retaining or increasing the catch of haddock and other healthy stocks [648.85(b)(6)(iv)(J)(3)]. NMFS approved the Ruhle trawl for use in the DAS program and in the Eastern U.S./Canada Haddock SAP on July 14, 2008 (73 FR 40186) after nearly two years of testing to determine efficacy. Experiments comparing traditional and the new trawl gear showed that the Ruhle trawl reduced bycatch of cod and flounders, while simultaneously retaining the catch of healthier stocks, primarily haddock. The large, 8-foot mesh in the forward end (the wings) of the Ruhle trawl net allows cod and other fish to escape because of their body shapes and unique behavior around the netting.

5.5.5.2 Gillnet Gear

In addition to trawl gear, the fishery is also prosecuted using gillnets. A bottom gillnet is a large wall of netting equipped with floats at the top and lead weights along the bottom. Bottom gillnets are anchored or staked in position. Fish are caught while trying to pass through the net mesh. The meshes of individual gillnets are uniform in size and shape, and therefore are highly selective for a particular size of fish (Jennings et al. 2001). Bottom gillnets are fished in two different ways, as "standup" and "tiedown" nets (Williamson 1998). Standup nets typically catch Atlantic cod, haddock, pollock, and hake and are soaked (duration of time the gear is set) for 12 - 24 hours. Tiedown nets are set with the floatline tied to the leadline at 6-ft (1.8 m) intervals, so that the floatline is close to the bottom and the net forms a limp bag between each tie. They are left in the water for 3-4 days, and are used to catch flounders and monkfish.

Individual sink/anchor gillnets are about 295 ft. (90 m) long. They are usually fished as a series of 5 - 15 nets attached end-to-end. A vast majority of “strings” consist of 10 gillnets. Gillnets typically have three components: the leadline, webbing, and floatline. In New England, leadlines are approximately 66 lbs/net (30 kg/net). Webs are monofilament, with the mesh size depending on the species of interest. Nets are anchored at each end using materials such as pieces of railroad track, sash weights, or Danforth anchors, depending on currents. Anchors and leadlines have the most contact with the bottom. For Northeast groundfish, gillnets are tended daily to semiweekly (NEFSC 2002c).

5.5.5.3 Fish Traps and Pots

Fish traps, pots, and lobster pots are similar. A non-lobster trap could be a trap that is configured with small mesh or small entrances that effectively exclude lobsters, or a floating trap that is fished off the bottom. If a fish pot or trap is configured in such a way that it is not capable of catching lobster, then NMFS would not consider it to be a lobster trap, and the vessel would not be subject to the lobster trap gear specifications. NMFS has determined that the floating Norwegian fish pots are not lobster traps.

The Norwegian-design pots are collapsible two-chamber rectangular pots made of netting, with a single bridle with anchor along the short end of the pot, allowing it to float and to turn with the current, adapted from Furevik et al. (2008). They have one entrance at the opposite end as the bridle, and are made of 50 mm black poly mesh for the trap body and 50 mm white poly for the entrances (into the pot and between chambers). Three frames per pot are constructed of 2 cm diam. PVC electrical conduit, with 13 cm radius corners, glued with cement. The frame sizes are approx. 1.5 m x 1 m (4.79 ft x 3.28 ft), hung 0.7 m (2.3 ft) apart forming two chambers with a widemouth entrance in between. The bridles are anchored with >5 kg links of chain. The PVC pipes are then perforated and 11 deep-water gillnet floats are added along the upper frame to achieve proper orientation. During a tank study (Furevik et al. 2008), the top of the Norwegian pot was measured to be 3 m off bottom; the bottom of the pot was 1.5 m off-bottom.

5.5.5.4 Hook and Line Gear

5.5.5.4.1 Hand Lines/Rod and Reel

Fishermen use hand lines as well as rods and reels in the Northeast Region to catch a variety of demersal species. Handlines are the simplest form of hook and line fishing. It may be fished using a rod and reel or simply “by hand.” The gear consists of a line, sinker (weight), gangion, and at least one hook. The line is typically stored on a small spool and rack and varies in length. The sinkers vary from stones to cast lead. The hooks can vary from single to multiple arrangements in “umbrella” rigs. Fishermen use an attraction device such as natural bait or an artificial lure with the hook. Handlines can be carried by currents until retrieved or fished in such a manner as to hit bottom and bounce (Stevenson, et al. 2004).

5.5.5.4.2 Mechanized Line Fishing

Mechanized line-hauling systems use electrical or hydraulic power to work the lines on the spools. They allow smaller fishing crews to work more lines. Fishermen mount the reels, also called “bandits,” on the vessel bulwarks with the mainline wound around a spool. They take the line from the spool over a block at the end of a flexible arm. Each line may have a number of branches and baited hooks.

Fishermen use jigging machines to jerk a line with several unbaited hooks up in the water to attract a fish. Fishermen generally use fish jigging machine lines in waters up to 1,970 ft. (600 m) deep. Hooks and sinkers can contact the bottom. Depending upon the way the gear is used, it may catch a variety of demersal species.

5.5.5.4.3 **Bottom Long Lines**

This gear consists of a long length of line to which gangions carrying baited hooks are attached. Longlining is undertaken for a wide range of bottom species. Bottom longlines typically have up to six individual longlines strung together for a total length of more than 1,476 ft. (450 m) and are deployed with 20 - 24 lbs (9 - 11 kg) anchors. The mainline is a parachute cord. Gangions are typically 16 in (40 cm) long and 3 - 6 ft (1 - 1.8 m) apart and are made of shrimp twine. These bottom longlines are usually set for a few hours at a time (NEFSC 2002c).

All hooks must be 12/0, or larger, circle hooks. A circle hook is a hook with the point turned back towards the shank. The barbed end of the hook may be displaced (offset) relative to the parallel plane of the eyed-end or shank of the hook when laid on its side or may be in-line. Habitat impacts from bottom long lines are negligible.

5.5.5.5 Gear Interaction with Habitat

The Council has included habitat impacts assessments in its fishery management plans since the early 2000s. Amendment 13 (NEFMC 2003) included a comprehensive evaluation of gear effects on habitat. The amendment described the general effects of bottom trawls on benthic marine habitats. This analysis primarily used an advisory report prepared for the International Council for the Exploration of the Seas (ICES 2000). The report generally concluded that: (1) low-energy environments are more affected by bottom trawling; and (2) bottom trawling affects the potential for habitat recovery (i.e., after trawling ceases, benthic communities and habitats may not always return to their original pre- impacted state).

The Committee on Ecosystem Effects of Fishing for the National Research Council’s Ocean Studies Board (NRC 2002) prepared an evaluation of the habitat effects of trawling and dredging that was also evaluated during Amendment 13. This report identified four general conclusions regarding the types of habitat modifications caused by bottom trawls:

- Trawling reduces habitat complexity;
- Repeated trawling results in discernible changes in benthic communities;
- Bottom trawling reduces the productivity of benthic habitats; and
- Fauna that live in low natural disturbance regimes are generally more vulnerable to fishing gear disturbance.

In 2002, NEFMC and MAMFC convened a regional workshop to evaluate the existing scientific research on the effects of fishing gear on benthic habitats; determine the degree of impact from various Northeast gear types; specify the type of evidence that is available to support the conclusions made about the degree of impact; rank the relative importance of gear impacts to various habitat types; and provide recommendations on measures to minimize those adverse impacts. The panel was provided with a summary of available research studies relating to the effects of bottom otter trawls, bottom gillnets, and bottom longlines. Relying on this information plus professional judgment, the panel identified the effects and the degree of impact of these gears on mud, sand, and gravel/rock habitats.

In general, the panel determined that impacts from trawling are greater in gravel/rock habitats with attached epifauna. The panel ranked impacts to biological structure higher than impacts to physical structure. Effects of trawls on major physical features in mud (deep water clay-bottom habitats) and gravel bottom were described as permanent. Impacts to biological and physical structure were given recovery times of months to years in mud and gravel. Impacts of trawling on physical structure in sand were estimated to be of shorter duration (days to months) given the exposure of most continental shelf sand habitats to strong bottom currents and/or frequent storms. Impacts of sink gillnets and bottom longlines on sand and gravel habitats were estimated to be less than bottom trawl impacts. The duration of impacts to physical structures from these gear types would be expected to last days to months on soft mud, but could be permanent on hard bottom clay structures along the continental slope. Impacts to mud would be caused by gillnet lead lines and anchors. Physical habitat impacts from sink gillnets and bottom longlines on sand would not be expected. The workshop report (NEFSC 2002c) noted that factors such as frequency of disturbance from fishing and from natural events are important when evaluating impacts.

The Council's Omnibus Essential Fish Habitat Amendment 2 (OHA2) evaluated existing habitat management areas and developed new habitat management areas. To assist with this effort, the Council developed an analytical approach to characterize and map habitats and to assess the extent to which different habitat types are vulnerable to different types of fishing activities. This body of work, termed the Swept Area Seabed Impact approach, includes a quantitative, spatially-referenced model that overlays fishing activities on habitat through time to estimate both potential and realized adverse effects to EFH. The approach is summarized in Volume 1 of the FEIS and detailed in Appendix D. Both documents are available at http://www.nefmc.org/library/omnibus-habitat-amendment-2. The SASI approach builds on previous fishing impacts assessments including the 2002 workshop, and reached similar conclusions, but made the assessment more explicitly spatial. This spatial approach facilitated the use of the assessment when developing management areas. In 2018-2019, the Council updated SASI with additional years of fishing effort data and sediment data, and some changes to the structure of the model. The updated analysis is referred to the Fishing Effects Model, or FE Model. A version of the FE Model was previously developed for the North Pacific region of the U.S. (Smeltz et al. 2019). The FE model includes many elements of SASI as well as elements from another model developed for the North Pacific region (Fujioka 2006). The FE Model report is available at https://www.nefmc.org/library/fishing-effects-model. The discussion below summarizes both the SASI and FE models.

The spatial domain of the models is U.S. waters from Cape Hatteras to the U.S.-Canada border. SASI included federal waters (3-200 miles) only, but FE includes state waters as well. Within this region, habitats were defined based on natural disturbance regime and dominant substrate, given previous assessments that natural disturbance may mask or interact with human-caused disturbance. Energy at the seabed was inferred from an oceanography model (flow) and a coastal relief model (depth) and was binned into two categories, either high or low energy. Substrate type is an important determinant of habitat because it influences the distribution of managed species, structure-forming epifauna, and prey species by providing spatially discrete resources such as media for burrowing organisms, attachment points for vertical epifauna, etc. The dominant substrate map used in SASI/FE was composed of thousands of visual and grab-sample observations, with grid size based on the spacing of the observations. The underlying spatial resolution of the substrate grid is much higher on Georges Bank and on the tops of banks and ledges in the Gulf of Maine than it is in deeper waters. Habitat definitions for both SASI and FE are based on five sediment grain sizes, mud, sand, pebble, cobble, and boulder. The FE model adds a steep and deep habitat category to account for areas of high relief where deep-sea coral ecosystems occur.

One of the outputs of the model is habitat vulnerability, which is related in part to the characteristics of the habitat itself, and part to the quality of the impact. Because of a general need for attachment sites, epifauna that provided a sheltering function for managed species tend to be more diverse and abundant in habitats containing larger grain sized substrates. Consistent with previous findings, the literature review completed to support the SASI and FE models found that structurally complex and/or long-lived epifaunal species are more susceptible to gear damage and slower to recover to impacts from mobile gears, including trawls and dredges. Recovery rates were assumed to be slower in low energy areas, such that overall vulnerability (susceptibility + recovery) of low energy areas is greater than high energy areas, other factors being equal. Of the mobile gears, hydraulic dredges were estimated to have the greatest per unit area impact, with lower and similar per unit area impacts associated with bottom otter trawls and scallop dredges. Although the literature on fixed gear impacts is relatively sparse, it was estimated that mobile gears have a greater per-unit area swept impact than fixed gears. Again, this was consistent with previous findings. Combining the SASI/FE vulnerability assessment and spatial model, gravel habitats on Georges Bank and in the Gulf of Maine were identified as vulnerability hotspots for all gear types, with moderate vulnerability in deeper, low energy habitats in the Gulf of Maine and along the continental margin, and lower vulnerability in sand habitats on Georges Bank, in Southern New England, and in the Mid-Atlantic Bight. Steep and deep habitats are also more vulnerable to impact.

The FE model in particular emphasizes the realized impacts of fishing by modeling how the magnitude of fishing in different locations across the model domain influences patterns of habitat disturbance. Habitat impacts are expressed as percent disturbance in 5 km by 5 km grid cells. The model is run continuously over time, with monthly changes in fishing effort by gear type. As time progresses and habitats begin to recover from previous impacts, new fishing impacts can continue to affect the condition of the seabed. Thus, the percent disturbance at a given time and location represents a combination of current and prior habitat impacts.

5.6 Protected Species

5.6.1 Species Present in the Area

Numerous protected species inhabit the environment within the Northeast multispecies FMP management unit (Table 12) and have the potential to be impacted by the proposed action (i.e., there have been observed/documented interactions in the fishery or with gear type(s) similar to those used in the fishery (bottom trawl or gillnet gear)). These species are under NMFS jurisdiction and are afforded protection under the Endangered Species Act (ESA) of 1973 and/or the Marine Mammal Protection Act (MMPA) of 1972.

Table 12 - Species protected under the ESA and/or MMPA that may occur in the affected environment of the Northeast multispecies fishery. Marine mammal species (cetaceans and pinnipeds) italicized and in bold are considered MMPA strategic stocks.[1]

Species	Status[2]	Potentially impacted by this action?
Cetaceans		
North Atlantic right whale (Eubalaena glacialis)	***Endangered***	***Yes***
Humpback whale, West Indies DPS (*Megaptera novaeangliae*)[3]	Protected (MMPA)	Yes
Fin whale (Balaenoptera physalus)	***Endangered***	***Yes***
Sei whale (Balaenoptera borealis)	***Endangered***	***Yes***
Blue whale (Balaenoptera musculus)	***Endangered***	***No***
Sperm whale (Physeter microcephalus)	***Endangered***	***No***
Minke whale (*Balaenoptera acutorostrata*)	Protected (MMPA)	Yes
Pilot whale (Globicephala spp.)[3]	Protected (MMPA)	Yes
Risso's dolphin (*Grampus griseus*)	Protected (MMPA)	Yes
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	Protected (MMPA)	Yes
Short Beaked Common dolphin (*Delphinus delphis*)	Protected (MMPA)	Yes
Spotted dolphin (*Stenella frontalis*)	Protected (MMPA)	No
Bottlenose dolphin (Tursiops truncatus)[4]	***Protected (MMPA)***	***Yes***
Harbor porpoise (*Phocoena phocoena*)	Protected (MMPA)	Yes
Sea Turtles		
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	Yes
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered	Yes
Green sea turtle, North Atlantic DPS (*Chelonia mydas*)	Threatened	Yes
Loggerhead sea turtle (*Caretta caretta*), Northwest Atlantic	Threatened	Yes

Species	Status[2]	Potentially impacted by this action?
Ocean DPS		
Hawksbill sea turtle (*Eretmochelys imbricate*)	Endangered	No
Fish		
Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered	No
Giant manta ray (*Manta birostris*)	Threatened	Yes
Atlantic salmon (*Salmo salar*)	Endangered	Yes
Atlantic sturgeon *(Acipenser oxyrinchus)*		
Gulf of Maine DPS	Threatened	Yes
New York Bight DPS, Chesapeake Bay DPS,	Endangered	Yes
Carolina DPS & South Atlantic DPS		
Cusk (*Brosme brosme)*	Candidate	Yes
Pinnipeds		
Harbor seal (*Phoca vitulina*)	Protected (MMPA)	Yes
Gray seal (*Halichoerus grypus*)	Protected (MMPA)	Yes
Harp seal (*Phoca groenlandicus*)	Protected (MMPA)	Yes
Hooded seal (*Cystophora cristata*)	Protected (MMPA)	Yes
Critical Habitat		
North Atlantic Right Whale	ESA (Protected)	No
Northwest Atlantic DPS of Loggerhead Sea Turtle	ESA (Protected)	No

Notes:
[1] A strategic stock is defined under the MMPA as a marine mammal stock for which: (1) the level of direct human-caused mortality exceeds the potential biological removal level; (2) based on the best available scientific information, is declining and is likely to be listed as a threatened species under the ESA within the foreseeable future; and/or (3) is listed as a threatened or endangered species under the ESA, or is designated as depleted under the MMPA (Section 3, 1972) (Hayes et al. 2020).

[2] The status of the species is defined by whether the species is listed under the ESA as endangered (species are at risk of extinction) or threatened (species at risk of endangerment), or protected under the MMPA. Note, marine mammals listed under the ESA are also protected under the MMPA. Candidate species are those species in which ESA listing may be warranted.

[3] There are two species of pilot whales: short finned (*G. melas melas*) and long finned (*G. macrorhynchus*). Due to the difficulties in identifying the species at sea, they are often just referred to as *Globicephala spp*.

[4] This includes the following Stocks of Bottlenose Dolphins: Western North Atlantic Offshore, Northern Migratory Coastal (strategic stock), and Southern Migratory Coastal (strategic stock).

Cusk are NMFS "candidate species" under the ESA. Candidate species are those petitioned species for which NMFS has determined that listing may be warranted under the ESA and those species for which

NMFS has initiated an ESA status review through an announcement in the Federal Register. If a species is proposed for listing the conference provisions under Section 7 of the ESA apply (see 50 CFR 402.10); however, candidate species receive no substantive or procedural protection under the ESA. Thus, this species will not be discussed further in this action; however, NMFS recommends that project proponents consider implementing conservation actions to limit the potential for adverse effects on candidate species from any proposed action. Additional information on cusk is at: https://www.fisheries.noaa.gov/endangered-species-conservation/candidate-species-under-endangered-species-act.

5.6.2 Species and Critical Habitat Not Likely Impacted by the Proposed Action

Based on available information, it has been determined that this action is not likely to impact multiple ESA listed and/or marine mammal protected species or any designated critical habitat (Table 12). This determination has been made because either the occurrence of the species is not known to overlap with the area primarily affected by the action and/or, based on the most recent 10 years of observer, stranding, and/or marine mammal serious injury and mortality reports, there have never been documented interactions between the species and the primary gear type (i.e., gillnet and bottom trawl) used to prosecute the multispecies fishery (Greater Atlantic Region (GAR) Marine Animal Incident Database, unpublished data; Marine Mammal Stock Assessment Reports (SAR) for the Atlantic Region: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region; NEFSC observer/sea sampling database, unpublished data; NMFS NEFSC reference documents (marina mammal serious injury and mortality reports): https://apps-nefsc.fisheries.noaa.gov/rcb/publications/center-reference-documents.html; MMPA List of Fisheries (LOF): https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-list-fisheries).[5] In the case of critical habitat, this determination has been made, because the action will not impact the essential physical and biological features of North Atlantic right whale or loggerhead (NWA DPS) critical habitat and therefore, will not result in the destruction or adverse modification of any species critical habitat (NMFS 2014a, NMFS 2015a,b).

5.6.3 Species Potentially Impacted by the Proposed Action

Table 12 has a list of protected species of sea turtle, marine mammal, and fish species present in the affected environment of the multispecies fishery, and that may also be impacted by the operation of this fishery; that is, have the potential to become entangled or bycaught in the fishing gear used to prosecute the fishery. To aid in the identification of MMPA protected species potentially impacted by the action, the MMPA LOFs and marine mammal SARs and serious injury and mortality reports were referenced (see Marine Mammal SARs for the Atlantic Region: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region; MMPA LOF: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-list-fisheries; NEFSC observer/sea sampling database, unpublished data; NMFS NEFSC reference documents (marine mammal serious injury and mortality reports): https://apps-nefsc.fisheries.noaa.gov/rcb/publications/center-reference-documents.html).

[5] For marine mammals protected under the MMPA the most recent 10 years of observer, stranding, and/or marine mammal serious injury and mortality reports are from 2009-2018; however, confirmed large whale entanglement data is available through 2019. For ESA listed species, the most recent 10 years of information on observed or documented interactions with fishing gear is from 2010-2019.

To help identify ESA listed species potentially impacted by the action, the Northeast Fisheries Observer Program (2010-2019), Sea Turtle Disentanglement Network (2010-2019), and the Marine Animal Incident (2010-2018) databases were queried for interactions, and the May 27, 2021, Biological Opinion (Opinion)[6] issued by NMFS was reviewed. The 2021 Opinion considered the effects of the NMFS' authorization of ten fishery management plans (FMP),[7] NMFS' North Atlantic Right Whale Conservation Framework, and the New England Fishery Management Council's Omnibus Essential Fish Habitat Amendment 2, on ESA-listed species and designated critical habitat. The Opinion determined that the proposed action may adversely affect, but is not likely to jeopardize, the continued existence of North Atlantic right, fin, sei, or sperm whales; the Northwest Atlantic Ocean distinct population segment (DPS) of loggerhead, leatherback, Kemp's ridley, or North Atlantic DPS of green sea turtles; any of the five DPSs of Atlantic sturgeon; Gulf of Maine DPS Atlantic salmon; or giant manta rays. The Opinion also concluded that the proposed action is not likely to adversely affect designated critical habitat for North Atlantic right whales, the Northwest Atlantic Ocean DPS of loggerhead sea turtles, U.S. DPS of smalltooth sawfish, Johnson's seagrass, or elkhorn and staghorn corals. An Incidental Take Statement (ITS) was issued in the Opinion. The ITS includes reasonable and prudent measures and their implementing terms and conditions, which NMFS determined are necessary or appropriate to minimize impacts of the incidental take in the fisheries assessed in this Opinion.

As the primary concern for both MMPA protected and ESA listed species is the potential for the fishery to interact (e.g., bycatch, entanglement) with these species it is necessary to consider (1) species occurrence in the affected environment of the fishery and how the fishery will overlap in time and space with this occurrence; and (2) data and observed records of protected species interaction with particular fishing gear types, to understand the potential risk of an interaction. Information on species occurrence in the affected environment of the multispecies fishery is below, information on protected species interactions with specific fishery gear is in Section 5.6.3.5.

5.6.3.1 Sea Turtles

This section contains a brief summary of the status and trends, and occurrence and distribution of leatherback and hard-shelled sea turtles (i.e., green (North Atlantic DPS), loggerhead (Northwest Atlantic Ocean DPS), Kemp's ridley) in the affected environment of the Northeast multispecies fishery. Additional background information on the range-wide status of the other four species, as well as a description and life history of the species, is in several published documents, including sea turtle status reviews and biological reports (NMFS and USFWS 1995; Turtle Expert Working Group [TEWG] 1998, 2000, 2007, 2009; Conant *et al*. 2009; NMFS and USFWS 2013; NMFS and USFWS 2015; Seminoff *et al*. 2015), and recovery plans for the loggerhead sea turtle (Northwest Atlantic DPS; NMFS and USFWS 2008), leatherback sea turtle (NMFS and USFWS 1992), Kemp's ridley sea turtle (NMFS *et al.* 2011), and green sea turtle (NMFS and USFWS 1991).

Status and Trends

As provided in Table 12, four sea turtle species were identified as having the potential to be impacted by the proposed action: Northwest Atlantic Ocean DPS of loggerhead, Kemp's ridley, North Atlantic DPS of green, and leatherback sea turtles. Nest counts inform population trends for sea turtle species. For the

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[6] NMFS' May 27, 2021, Biological Opinion on the 10 FMPs is found at: https://www.fisheries.noaa.gov/resource/document/biological-opinion-10-fishery-management-plans

[7] The ten FMPs considered in the May 27, 2021, Biological Opinion include the: (1) American lobster; (2) Atlantic bluefish; (3) Atlantic deep-sea red crab; (4) mackerel/squid/butterfish; (5) monkfish; (6) Northeast multispecies; (7) Northeast skate complex; (8) spiny dogfish; (9) summer flounder/scup/black sea bass; and (10) Jonah crab FMPs.

Northwest Atlantic Ocean DPS of loggerhead sea turtles, there are five unique recovery units that comprise the DPS. Nesting trends for each of these recovery units are variable; however, recent data from Florida index nesting beaches, which comprise most of the nesting in the DPS, indicate a 19% increase in nesting from 1989 to 2018 (https://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trends/). Overall, short-term trends for loggerhead sea turtles (Northwest Atlantic Ocean DPS) have shown increases; however, over the long-term the DPS is considered stable. For Kemp's ridley sea turtles, from 1980 through 2003, the number of nests at three primary nesting beaches (Rancho Nuevo, Tepehuajes, and Playa Dos) increased 15 percent annually (Heppell et al. 2005); however, due to recent declines in nest counts, decreased survival of immature and adult sea turtles, and updated population modeling, this rate is not expected to continue and therefore, the overall trend is unclear (NMFS and USFWS 2015; Caillouett et al. 2018). The North Atlantic DPS of green sea turtle is showing a positive trend in nesting; however, increases in nester abundance for the North Atlantic DPS in recent years must be viewed cautiously as the datasets represent a fraction of a green sea turtle generation which is between 30 and 40 years (Seminoff et al. 2015). Leatherback turtle nesting in the Northwest Atlantic is showing an overall negative trend, with the most notable decrease occurring during the most recent time frame of 2008 to 2017 (NW Atlantic Leatherback Working Group 2018).

Occurrence and Distribution

Hard-shelled sea turtles

In U.S. Northwest Atlantic waters, hard-shelled turtles commonly occur throughout the continental shelf from Florida to Cape Cod, Massachusetts, although their presence varies with the seasons due to changes in water temperature (Shoop and Kenney 1992; Epperly *et al.* 1995a, 1995b; Braun and Epperly 1996; Mitchell *et al.* 2003; Braun-McNeill *et al.* 2008; TEWG 2009). While hard-shelled turtles are most common south of Cape Cod, MA, they are known to occur in the Gulf of Maine. Loggerheads, the most common hard-shelled sea turtle in the Greater Atlantic Region, feed as far north as southern Canada. Loggerheads have been observed in waters with surface temperatures of 7 °C to 30 °C, but water temperatures ≥11 °C are most favorable (Shoop and Kenney 1992; Epperly *et al.* 1995b). Sea turtle presence in U.S. Atlantic waters is also influenced by water depth. While hard-shelled turtles occur in waters from the beach to beyond the continental shelf, they are most commonly found in neritic waters of the inner continental shelf (Mitchell *et al.* 2003; Braun-McNeill and Epperly 2002; Morreale and Standora 2005; Blumenthal *et al.* 2006; Hawkes *et al.* 2006; McClellan and Read 2007; Mansfield *et al.* 2009; Hawkes *et al.* 2011; Griffin *et al.* 2013).

Hard-shelled sea turtles occur year-round in waters off Cape Hatteras, North Carolina and south. As coastal water temperatures warm in the spring, loggerheads begin to migrate to inshore waters of the southeast United States and also move up the Atlantic Coast (Epperly *et al.* 1995a, 1995b, 1995c; Braun-McNeill and Epperly 2002; Morreale and Standora 2005; Griffin *et al.* 2013), occurring in Virginia foraging areas as early as late April and on the most northern foraging grounds in the Gulf of Maine in June (Shoop and Kenney 1992). The trend is reversed in the fall as water temperatures cool. The large majority leave the Gulf of Maine by September, but some remain in Mid-Atlantic and Northeast areas until late fall. By December, sea turtles have migrated south to waters offshore of NC, particularly south of Cape Hatteras, and further south (Shoop and Kenney 1992; Epperly *et al.* 1995b; Hawkes *et al.* 2011; Griffin *et al.* 2013).

Leatherback sea turtles

Leatherbacks, a pelagic species, are known to use coastal waters of the U.S. continental shelf and to have a greater tolerance for colder water than hard-shelled sea turtles (James *et al.* 2005; Eckert *et al.* 2006; Murphy *et al.* 2006; NMFS and USFWS 2013b; Dodge *et al.* 2014). Leatherback sea turtles engage in routine migrations between northern temperate and tropical waters (NMFS and USFWS 1992; James *et al.* 2005; James *et al*. 2006; Dodge *et al.* 2014). They are found in more northern waters (i.e., Gulf of Maine) later in the year (i.e., similar time frame as hard-shelled sea turtles), with most leaving the Northwest Atlantic shelves by mid-November (James *et al.* 2005; James *et al*. 2006; Dodge *et al.* 2014). Leatherback sea turtles also engage in routine migrations between northern temperate and tropical waters (NMFS and USFWS 1992; James *et al*. 2005; James *et al*. 2006; Dodge *et al*. 2014).

5.6.3.2 Marine Mammals

This section contains a summary of the status and trends, and occurrence and distribution of large whales, small cetaceans, and pinnipeds in the affected environment of the multispecies fishery.

5.6.3.2.1 Large Whales

Status and Trends

As provided in Table 12, North Atlantic right, fin, sei, minke, and humpback whales have the potential to be impacted by the proposed action. Review of the most recent NMFS Marine Mammal (Atlantic Ocean) SARs (Hayes *et al.* 2021) indicates that, as a trend analysis has not been conducted, the population trajectory for fin, sei, and minke whales are unknown.[8] North Atlantic right whales; however, are showing a declining trend, likely since 2011, and are considered critically endangered (Hayes et al. 2020; Hayes et al. 2021). In regards to humpback whales, abundance estimates between the years 2000-2016 suggest an increasing population trend; however, there are some uncertainties with this assessment and therefore, the level of increase is unclear (Hayes *et al.* 2020).

Occurrence and Distribution

North Atlantic right, humpback, fin, sei, and minke whales are found throughout the waters of the Northwest Atlantic Ocean. In general, these species follow an annual pattern of migration between low latitude (south of 35°N) wintering/calving grounds and high latitude spring/summer foraging grounds (primarily north of 41°N; see marine mammal (Atlantic Ocean) SARs: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region). This, however, is a simplification of whale movements, particularly as it relates to winter movements. It remains unknown if all individuals of a population migrate to low latitudes in the winter, although, increasing evidence suggests that for some species (e.g., right and humpback whales), some portion of the population remains in higher latitudes throughout the winter (Hayes *et al.* 2020; Khan *et al*. 2009, 2010, 2011, 2012; Brown *et al*. 2002; NOAA 2008; Cole *et al*. 2013; Clapham *et al*. 1993; Swingle *et al*. 1993; Vu *et al*. 2012; Davis *et al.* 2017; Davis *et al*. 2020).Although further research is needed to provide a clearer understanding of large whale movements and distribution in the winter, the distribution and movements of large whales to foraging grounds in the spring/summer is well understood. Movements of whales into higher latitudes coincide with peak productivity in these waters. As a result, the distribution of large whales in higher latitudes is strongly governed by prey availability and distribution, with large numbers of whales coinciding with dense patches of preferred forage (Mayo and Marx 1990; Kenney *et al*. 1986, 1995; Baumgartner *et al*. 2003; Baumgartner and Mate 2003; Payne *et al*.1986, 1990; Brown *et al.* 2002; Kenney and Hartley 2001; Schilling *et al.* 1992; Davis *et al.* 2017; Davis *et al.* 2020). For additional information on North Atlantic right, humpback, fin, sei, and minke whales, refer to the marine mammal (Atlantic Ocean) SARs provided at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region.

[8] https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region

To further assist in understanding how the multispecies fishery may overlaps in time and space with the occurrence of large whales, a general overview on species occurrence and distribution in the area of operation for the multispecies fishery is in Table 13.

Table 13 - Large whale occurrence, distribution, and habitat use in the affected environment of the multispecies fishery (SNE=Southern New England; GOM=Gulf of Maine; GB=Georges Bank).

Species	Occurrence/Distribution/Habitat Use in the Affected Environment
North Atlantic Right Whale	Occur and are distributed throughout all continental shelf waters along the U.S. eastern seaboard throughout the year. Although whales can be found consistently in particular locations throughout their range, there is a high interannual variability in right whale use of some habitats. ● Visual and acoustic surveys demonstrate areas of the Greater Atlantic Region where North Atlantic right whales aggregate seasonally: the Great South Channel; Jordan Basin; Georges Basin (along the northeastern edge of Georges Bank); Cape Cod and Massachusetts Bays. Although whales are consistently found in these areas, there is high interannual use of these habitats. ● Since 2010, acoustic and visual surveys indicate a shift in habitat use patterns. Fewer individuals are detected in the Great South Channel, use of Cape Cod and Massachusetts Bays seems to have increased, and a large portion of the right whale population is using an area south of Nantucket and Martha's Vineyard from late winter through early spring. ● Passive acoustic studies of right whales have demonstrated their year-round presence in the Gulf of Maine, New Jersey, and Virginia. ● Mid-Atlantic waters: Migratory corridor to/from northern (high latitude) foraging and southern calving grounds. Can be present in these waters year round. ● Passive acoustic and telemetry data shows excursions into deeper water off the continental shelf (e.g., shelf edge along southern Georges Bank and Mid-Atlantic) ● Location of much of the population unknown in winter; however, increasing evidence of wintering areas (~November – January) in: › Cape Cod Bay; › Jeffreys and Cashes Ledges; › Jordan Basin; and › Massachusetts Bay (e.g., Stellwagen Bank).
Humpback Whale	• Distributed throughout all continental shelf waters of the Mid-Atlantic (SNE included), GOM, and GB throughout the year. • New England waters (GOM and GB regions) = Foraging Grounds (~March-November). • Mid-Atlantic waters: Migratory pathway to/from northern (high latitude) foraging and southern (West Indies) calving grounds. Increasing evidence that mid-Atlantic areas are becoming an important habitat for juvenile humpback whales. • Since 2011, increased sightings of humpback whales in the New York-New Jersey Harbor Estuary, in waters off Long Island, and along the shelf break east of New York and New Jersey.

Species	Occurrence/Distribution/Habitat Use in the Affected Environment
	• Increasing visual and acoustic evidence of whales remaining in mid- and high-latitudes throughout the winter (e.g., Mid- Atlantic: waters near Chesapeake and Delaware Bays, peak presence about January through March; Massachusetts Bay: peak presence about March-May and September-December).
Fin	• Distributed throughout all continental shelf waters of the Mid-Atlantic (SNE included), GOM, and GB throughout the year; recent review of sighting data shows evidence that, while densities vary seasonally, fin whales are present in every season throughout most of the EEZ north of 35ºN. • Mid-Atlantic waters: › Migratory pathway to/from northern (high latitude) foraging and southern (low latitude) calving grounds; and › Possible calving area (October-January). • New England waters = Foraging Grounds (greatest densities March-August; lower densities September-November). Important foraging grounds include, but are not limited to: > Massachusetts Bay (esp. Stellwagen Bank); > Great South Channel; > Waters off Cape Cod (~40-50 meter contour); > GOM; > Perimeter (primarily eastern) of GB; and > Mid-shelf area off the east end of Long Island. • Evidence of wintering areas in mid-shelf areas east of New Jersey (NJ), Stellwagen Bank; and eastern perimeter of GB.
Sei	• General pattern of offshore distribution, although occasional incursions into shallower inshore waters during peak prey availability and abundance. • Primarily found in deep waters along the shelf edge, shelf break, and ocean basins between banks. • Spring through summer, found in greatest densities in the Gulf of Maine and Georges Bank.Sightings concentrated along the northern, eastern (into Northeast Channel) and southwestern (in the area of Hydrographer Canyon) edge of Georges Bank, and south of Nantucket, MA. • The wintering habitat remains largely unknown. Passive acoustic monitoring conducted in 2015-2016 off Georges Bank detected sei whales calls from late fall through the winter along the southern Georges Bank region (off Heezen and Oceanographer Canyons).
Minke	• Widely distributed within the U.S. EEZ. • Spring to Fall: widespread (acoustic) occurrence on the continental shelf; most abundant in New England waters during this period of time. • September to April: high (acoustic) occurrence in deep-ocean waters.

Species	Occurrence/Distribution/Habitat Use in the Affected Environment
Sources: Baumgartner *et al*. 2007; Baumgartner *et al*. 2011; Baumgartner and Mate 2005; Bort *et al*. 2015; Brown *et al*. 2002, 2017; CETAP 1982; Cholewiak et al. 2018; Clapham *et al*. 1993; Clark and Clapham 2004; Cole *et al*. 2013; Davis *et al.* 2017; Good 2008; Hain *et al.* 1992; Hamilton and Mayo 1990; Hayes *et al*. 2017, 2018, 2019, 2020; Kenney *et al.* 1986, 1995; Khan *et al*. 2009, 2010, 2011, 2012; Kraus et al. 2016; Leiter *et al.* 2017; Mate *et al*. 1997; McLellan *et al*. 2004; Morano et al. 2012; Murray et al. 2013; NMFS 1991, 2005, 2010, 2011, 2012; 2015; NOAA 2008; Pace and Merrick 2008; Palka et al. 2017; Palka 2020;Payne *et al*. 1984; Payne *et al*.1990; Pendleton *et al*. 2009; Record *et al*. 2019; Risch *et al*. 2013; Robbins 2007; Roberts et al. 2016; Salisbury et al. 2016; Schevill *et al*. 1986; Stanistreet et al. 2018; Swingle *et al*. 1993; Vu *et al*. 2012; Watkins and Schevill 1982; Whitt et al. 2013; Winn *et al.* 1986; 50 CFR 224.105; 81 FR 4837 (January 27, 2016).	

5.6.3.2.2 **Small Cetaceans**

Status and Trends

Risso's, white-sided, short beaked common, and bottlenose dolphins (Western North Atlantic Offshore, Northern Migratory Coastal, and Southern Migratory Coastal stocks); long and short –finned pilot whales; and, harbor porpoise are identified as having the potential to be impacted by the proposed action (Table 12). Review of the most recent stock assessment (Hayes *et al*. 2021) indicates that as a trend analysis has not been conducted for Risso's, white-sided, short-beaked common dolphins; long-finned pilot whales; or harbor porpoise, the population trajectory for these species is unknown. For short-finned pilot whales a generalized linear model indicated no significant trend in these abundance estimates (Hayes *et al* 2020). For the Western North Atlantic Offshore stock, review of the most recent information on the stock shows no statistically significant trend in population size for this species; however, the high level of uncertainty in the estimates limits the ability to detect a statistically significant trend (Hayes *et al.* 2021). In regards to the Northern and Southern Migratory Coastal stocks (both considered a strategic stock under the MMPA), the most recent analysis of trends in abundance suggests a probable decline in stock size between 2010– 2011 and 2016, concurrent with a large UME in the area; however, there is limited power to evaluate trends given uncertainty in stock distribution, lack of precision in abundance estimates, and a limited number of surveys (Hayes et al. 2018).

Occurrence and Distribution

Atlantic white sided dolphins, short and long finned pilot whales, Risso's dolphins, short beaked common dolphins, harbor porpoise, and several stocks of bottlenose dolphins are found throughout the year in the Northwest Atlantic Ocean (see Marine Mammal (Atlantic Ocean) SARs at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region). Within this range, however, there are seasonal shifts in species distribution and abundance. To further assist in understanding how fisheries may overlap in time and space with the occurrence of small cetaceans, a general overview of species occurrence and distribution in the area of operation for the multispecies fishery is in Table 14

Table 14. For additional information on the biology and range wide distribution of each species of small cetacean refer to the marine mammal (Atlantic Ocean) SARs provided at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region

Table 14 - Small cetacean occurrence in the area of operation of the multispecies fishery.

Species	**Prevalence and Month of Occurrence**
Atlantic White Sided Dolphin	• Distributed throughout the continental shelf waters (primarily to 100 m) of the Mid-Atlantic (north of 35ºN), SNE, GB, and GOM; however, most common in continental shelf waters from Hudson Canyon (~ 39ºN) to GB, and into the GOM. • **January-May**: low densities found from GB to Jeffreys Ledge. • **June-September**: Large densities found from GB, through the GOM. • **October-December**: intermediate densities found from southern GB to southern GOM. • South of GB (SNE and Mid-Atlantic), particularly around Hudson Canyon, low densities found year-round, • Virginia (VA) and North Carolina (NC) waters represent southern extent of species range during winter months.
Short Beaked Common Dolphin	• Regularly found throughout the continental shelf-edge-slope waters (primarily between the 100-2,000 m isobaths) of the Mid-Atlantic, SNE, and GB (esp. in Oceanographer, Hydrographer, Block, and Hudson Canyons). • Less common south of Cape Hatteras, NC, although schools have been reported as far south as the Georgia/South Carolina border. • **January-May**: occur from waters off Cape Hatteras, NC, to GB (35º to 42ºN). • **Mid-summer-autumn**: Occur in the GOM and on GB; *Peak abundance* found on GB in the autumn.
Risso's Dolphin	• **Spring through fall**: Distributed along the continental shelf edge from Cape Hatteras, NC, to GB. • **Winter**: distributed in the Mid-Atlantic Bight, extending into oceanic waters. • Rarely seen in the GOM; primarily a Mid-Atlantic continental shelf edge species (can be found year-round).
Harbor Porpoise	• Distributed throughout the continental shelf waters of the Mid-Atlantic, SNE, GB, and GOM. • **July-September**: Concentrated in the northern GOM (waters <150 meters); low numbers can be found on GB. • **October-December**: widely dispersed in waters from New Jersey (NJ) to Maine (ME); seen from the coastline to deep waters (>1,800 meters). • **January-March**: intermediate densities in waters off NJ to NC; low densities found in waters off New York (NY) to GOM.

Species	Prevalence and Month of Occurrence
	• **April-June**: widely dispersed from NJ to ME; seen from the coastline to deep waters (>1,800 meters).
Bottlenose Dolphin	**<u>Western North Atlantic Offshore Stock</u>** • Distributed primarily along the outer continental shelf and continental slope in the Northwest Atlantic from GB to Florida (FL). • Depths of occurrence: ≥40 meters **<u>Western North Atlantic Northern Migratory Coastal Stock</u>** • Most common in coastal waters <20 m deep. • Warm water months (e.g., July-August): distributed from the coastal waters from the shoreline to about 25-m isobaths between the mouth of the Chesapeake Bay and Long Island, NY. • Cold water months (e.g., January-March): stock occupies coastal waters from Cape Lookout, NC, to the NC/VA border. **<u>Western North Atlantic Southern Migratory Coastal Stock</u>** • Most common in coastal waters <20 m deep. • **October-December**: appears stock occupies waters of southern NC (south of Cape Lookout) • **January-March**: appears stock moves as far south as northern FL. • **April-June**: stock moves north to waters of NC. • **July-August**: stock is presumed to occupy coastal waters north of Cape Lookout, NC, to the eastern shore of VA (as far north as Assateague).
Pilot Whales: *Short- and Long-Finned*	**<u>Short- Finned Pilot Whales</u>** • Except for area of overlap (see below), primarily occur south of 40ºN (Mid-Atlantic and SNE waters); although low numbers have been found along the southern flank of GB, but no further than 41ºN. • May through December (about): distributed primarily near the continental shelf break of the Mid-Atlantic and SNE (i.e., off Nantucket Shoals); individuals begin shifting to southern waters (i.e., 35ºN and south) beginning in the fall. **<u>Long-Finned Pilot Whales</u>** • Except for area of overlap (see below), primarily occur north of 42ºN.

Species	Prevalence and Month of Occurrence
	• Winter to early spring (November - April): primarily distributed along the continental shelf edge-slope of the Mid-Atlantic, SNE, and GB. • Late spring through fall (May - October): movements and distribution shift onto/within GB, the Great South Channel, and the GOM. **Area of Species Overlap:** between approximately 38°N and 40°N.
Notes: Information is representative of small cetacean occurrence in the Northwest Atlantic continental shelf waters out to 2,000 m depth ***Sources*:** Hayes *et al*. 2017; Hayes *et al.* 2018; Hayes *et al.* 2019; Hayes *et al*. 2020; Payne and Heinemann 1993; Payne *et al.* 1984; Jefferson *et al*. 2009.	

5.6.3.2.3 Pinnipeds

Status and Trends

Harbor, gray, harp and hooded seals are identified as having the potential to be impacted by the proposed action (Table 12). Review of the most recent stock assessment (Hayes *et al.* 2021) indicates that as a trend analysis has not been conducted for harbor seals, the population trajectory for this species is unknown. The status of the gray, harp, and hooded seal population relative to optimum sustainable population (OSP)[9] in U.S. Atlantic EEZ waters is unknown; however, gray seal stock's abundance appears to be increasing in Canadian and U.S. waters, harp seal stock abundance appears to have stabilized, and hooded seal stock abundance is uncertain (Hayes *et al.* 2019; Hayes *et al.* 2020).

Occurrence and Distribution

Harbor, gray, harp, and hooded seals are found in the nearshore, coastal waters of the Northwest Atlantic Ocean. They are primarily found throughout the year or seasonally from New Jersey to Maine; however, increasing evidence indicates that some species (e.g., harbor seals) may be extending their range seasonally into waters as far south as Cape Hatteras, North Carolina (35°N). For additional information on the biology and range wide distribution of each pinniped species refer to the marine mammal (Atlantic Ocean) SARs provided at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region.

[9] *OSP is "the number of animals which will result in the maximum productivity of the population or the species, keeping in mind the carrying capacity of the habitat and the health of the ecosystem of which they form a constituent element." 16 U.S.C. § 1362(9).*

To help understand how the multispecies fishery may overlap in time and space with the occurrence of pinnipeds, a general overview of species occurrence and distribution in the area of operation of the multispecies fishery is provided in the following table (Table 15).

Table 15 - Pinniped occurrence in the area of operation of the multispecies fishery.

Species	Prevalence
Harbor Seal	• Primarily distributed in waters from New Jersey to Maine; however, increasing evidence indicates that their range is extending into waters as far south as Cape Hatteras, NC (35ºN). • **Year Round**: Waters north of 42.5ºN • **September-May**: Waters from MA to NJ.
Gray Seal	• **Year Round**: Waters from Maine to just south of Cape Cod, MA. • **September-May**: Waters from southern MA to NJ. • Stranding records: Southern NJ to Cape Hatteras, NC
Harp Seal	• Winter-Spring (approx.. January-May): Waters from New Jersey to Maine.
Hooded Seal	• Winter-Spring (approx. January-May): Waters of New England.
Sources**:** Waring *et al*. 2007 (for hooded seals); Hayes *et al.* 2019; Hayes *et al.* 2020.	

5.6.3.3 Atlantic Sturgeon

This section contains a summary of the status and trends, and occurrence and distribution of Atlantic sturgeon (5 DPSs) in the affected environment of the multispecies fishery.

Status and Trends

Atlantic sturgeon, from any DPS, are identified as having the potential to be impacted by the proposed action (Table 12). The ASMFC released a new benchmark stock assessment for Atlantic sturgeon in October 2017 (ASMFC 2017). Based on historic removals and estimated effective population size, the 2017 stock assessment concluded that all five Atlantic sturgeon DPSs are depleted relative to historical levels. However, the 2017 stock assessment does provide some evidence of population recovery at the coastwide scale, and mixed population recovery at the DPS scale (ASMFC 2017). The 2017 stock assessment also concluded that a variety of factors (i.e., bycatch, habitat loss, and ship strikes) continue to impede the recovery rate of Atlantic sturgeon (ASMFC 2017).

Occurrence and Distribution

The marine range of U.S. Atlantic sturgeon extends from Labrador, Canada, to Cape Canaveral, Florida. All five DPSs of Atlantic sturgeon have the potential to be located anywhere in this marine range; in fact, results from genetic studies show that, regardless of location, multiple DPSs can be found at any one location along the Northwest Atlantic coast (ASSRT 2007; Dovel and Berggren 1983; Dadswell *et al*. 1984; Kynard *et al*. 2000; Stein *et al*. 2004a; Dadswell 2006; Laney *et al*. 2007; Dunton *et al*. 2010; Dunton *et al*. 2012; Dunton *et al*. 2015; Erickson *et al*. 2011; Wirgin *et al*. 2012; O'Leary *et al*. 2014; Waldman *et al.* 2013; Wirgin *et al*. 2015a,b; ASMFC 2017).

Based on fishery-independent and -dependent data, as well as data collected from tracking and tagging studies, in the marine environment, Atlantic sturgeon appear to primarily occur inshore of the 50 meter depth contour (Stein *et al*. 2004 a,b; Erickson *et al*. 2011; Dunton *et al*. 2010); however, Atlantic sturgeon are not restricted to these depths, as excursions into deeper continental shelf waters have been documented (Timoshkin 1968; Collins and Smith 1997; Stein *et al*. 2004a,b; Dunton *et al*. 2010; Erickson *et al*. 2011). Data from fishery-independent surveys and tagging and tracking studies also indicate that some Atlantic sturgeon may undertake seasonal movements along the coast (Erickson *et al.* 2011; Dunton *et al*. 2010; Wipplehauser 2012); however, there is no evidence to date that all Atlantic sturgeon make these seasonal movements and therefore, may be present throughout the marine environment throughout the year.

Within the marine range of Atlantic sturgeon, several marine aggregation areas have been identified adjacent to estuaries and/or coastal features formed by bay mouths and inlets along the U.S. eastern seaboard (i.e., waters off North Carolina, Chesapeake Bay; Delaware Bay; New York Bight; Massachusetts Bay; Long Island Sound; and Connecticut and Kennebec River Estuaries); depths in these areas are generally no greater than 25 meters (Bain *et al.* 2000; Savoy and Pacileo 2003; Stein *et al*. 2004a; Laney *et al*. 2007; Dunton *et al*. 2010; Erickson *et al*. 2011; Oliver *et al*. 2013; Waldman *et al.* 2013; O'Leary *et al*. 2014; Wipplehauser 2012; Wipplehauser and Squiers 2015). Although additional studies are still needed to clarify why these sites are chosen by Atlantic sturgeon, there is some indication that they may serve as thermal refuge, wintering sites, or marine foraging areas (Stein *et al*. 2004a; Dunton *et al*. 2010; Erickson *et al*. 2011).

For additional information on the biology and range wide distribution of each distinct population segment (DPS) of Atlantic sturgeon please refer to 77 FR 5880 and 77 FR 5914, as well as the Atlantic Sturgeon Status Review Team's (ASSRT) 2007 status review of Atlantic sturgeon (ASSRT 2007) and the Atlantic States Marine Fisheries Commission 2017 Atlantic Sturgeon Benchmark Stock Assessment and Peer Review Report (ASMFC 2017).

5.6.3.4 Atlantic Salmon (Gulf of Maine DPS)

This section contains a summary of the status and trends, and occurrence and distribution of Atlantic salmon (Gulf of Maine (GOM) DPS) in the affected environment of the multispecies fishery

Status and Trends

Atlantic salmon (GOM DPS) are identified as having the potential to be impacted by the proposed action (Table 12). The GOM DPS of Atlantic salmon currently exhibits critically low spawner abundance and poor marine survival (USASAC 2020). The abundance of GOM DPS Atlantic salmon has been low and either stable or declining over the past several decades and the proportion of fish that are of natural origin is small and displays no sign of growth (USASAC 2020).

The freshwater range of Atlantic salmon (GOM DPS) occurs from the watersheds of the Androscoggin River northward along the Maine coast to the Dennys River, while the marine range of the GOM DPS extends from the GOM (primarily northern portion of the GOM), to the coast of Greenland (Fay *et al.* 2006; NMFS & USFWS 2005, 2016). In general, smolts, post- smolts, and adult Atlantic salmon may be present in the GOM and coastal waters of Maine in the spring (beginning in April), and adults may be present throughout the summer and fall months (Baum 1997; Fay *et al.* 2006; Hyvarinen *et al.* 2006; Lacroix & Knox 2005; Lacroix & McCurdy 1996; Lacroix *et al.* 2004; NMFS & USFWS 2005; Reddin 1985; Reddin & Friedland 1993; Reddin & Short 1991). For additional information on the on the biology, status, and range wide distribution of the GOM DPS of Atlantic salmon, refer to NMFS and USFWS

(2005, 2016); and Fay et al. (2006). Thus, as the multispecies fishery operates throughout the year, and operates in the GOM, the fishery could overlap in time and space with Atlantic salmon migrating northeasterly between U.S. and Canadian waters.

5.6.3.5 Giant Manta Ray

This section contains a summary of the status and trends, and occurrence and distribution of giant manta rays in the affected environment of the multispecies fishery.

Status and Trends

Giant Manta Rays may be impacted by the proposed action (Table 12). While there is considerable uncertainty regarding the species' current abundance throughout its range, the best available information indicates that the species has experienced population declines of potentially significant magnitude within areas of the Indo-Pacific and eastern Pacific portions of its range (Miller and Klimovich 2017). Yet, larger subpopulations of the species still exist, including off Mozambique, Ecuador, and potentially Thailand. While we assume that declining populations within the Indo-Pacific and eastern Pacific will likely translate to overall declines in the species throughout its entire range, there is very little information on the abundance, and thus, population trends in the Atlantic portion of its range (Miller and Klimovich 2017).

Occurrence and Distribution

Giant manta rays may occur in coastal, nearshore, and pelagic waters off the U.S. east coast (Miller and Klimovich 2017). Along the U.S. East Coast, giant manta rays are usually found in water temperatures between 19 and 22 degrees Celsius (Miller and Klimovich 2017) and have been observed as far north as New Jersey. Given that the species is rarely identified in the fisheries data in the Atlantic, it may be assumed that populations within the Atlantic are small and sparsely distributed (Miller and Klimovich 2017).

5.6.4 Interactions Between Gear and Protected Species

Protected species are at risk of interacting with various types of fishing gear, with interaction risks associated with gear type, quantity, soak or tow duration, and degree of overlap between gear and protected species. Information on observed or documented interactions between gear and protected species is available from as early as 1989 (Marine Mammal (Atlantic Ocean) SARs: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region; NEFSC observer/sea sampling database, unpublished data). As the distribution and occurrence of protected species and the operation of fisheries (and, thus, risk to protected species) have changed over the last 30 years, we use the most recent 10 years of available information to best capture the current risk to protected species from fishing gear. For marine mammals protected under the MMPA, this primarily covers the period from 2008-2017[10]; however, the Greater Atlantic Region (GAR) Marine Animal Incident Database (unpublished data) contains confirmed large whale entanglement reports

[10] Waring et al. 2015a; Waring et al. 2016; Hayes et al. 2017; Hayes et al. 2018; Hayes et al. 2019; Hayes et al. 2020; MMPA List of Fisheries (LOF): https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-list-fisheries; NMFS NEFSC reference documents (marine mammal serious injury and mortality reports): https://nefsc.noaa.gov/publications/crd/.

through 2018. For ESA listed species, the most recent 10 years of data on observed or documented interactions is available from 2010-2019[11].

Available information on gear interactions with a given species (or species group) is provided in the sections below. The sections to follow are not a comprehensive review of all fishing gear types known to interact with a given species; emphasis is only being placed on the primary gear types used to prosecute the multispecies fishery (i.e., recreational: hook and line; commercial: sink gillnet and bottom trawl gear).

5.6.4.1 Recreational Fisheries Interactions

The recreational multispecies fishery is primarily prosecuted with rod and reel and handline (i.e., hook and line gear). In the absence of an observer program for recreational fisheries, records of recreational hook and line interactions with protected resources are limited. However, as a dedicated observer program exists for all commercial fisheries, there is a wealth of information on observed protected species interactions with all fishing gear types and years of data assessing resultant population level effects of these interactions. Other sources of information, such as state fishing records, stranding databases, and marine mammal stock assessment reports, provide additional information that can assist in better understanding hook and line interaction risks to protected species.

Large Whales

Large whales have been documented entangled with hook and line gear or monofilament line (GAR Marine Animal Incident Database, unpublished data; marine mammal (Atlantic Ocean) SARs: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region). Review of mortality and serious injury determinations for baleen whales between 2009-2018 shows that there have been 58 confirmed cases of hook and line and/or monofilament gear around or trailing from portions of the whale's body (Cole and Henry 2013; Henry *et al.* 2015; Henry *et al.* 2016; Henry *et al.* 2017; Henry *et al.* 2019; Henry *et al.* 2020; Henry *et al.* 2021). Of the 58 cases documented, the majority of them did not result in serious injury to the animal, and none of them resulted in mortality to the whale (86.0 % observed/reported whales had a serious injury value of 0; 14.0 % had a serious injury value of 0.75 ; Cole and Henry 2013; Henry *et al.* 2017; Henry *et al.* 2020; Henry *et al.* 2021). In fact, 79.0 % of the whales observed or reported with hook/line or monofilament were resighted gear free and healthy; confirmation of the health of the other remaining whales remain unknown as no resightings had been made over the timeframe of the assessment (Cole and Henry 2013; Henry *et al.* 2015; Henry *et al.* 2016; Henry *et al.* 2017; Henry *et al.* 2019; Henry *et al.* 2020; Henry *et al.* 2021). Based on this information, while large whale interactions with hook and line gear are possible, there is a low probability that an interaction will result in serious injury or mortality to any large whale species. Therefore, relative to other gear types, such as fixed gear, hook and line gear represents a low source of serious injury or mortality to any large whale (Cole and Henry 2013; Henry *et al*. 2017; Henry *et al.* 2019; Henry *et al.* 2020; Henry *et al.* 2021).

Small Cetaceans and Pinnipeds

Table 12 provides a list of small cetaceans and pinnipeds that will occur in the affected environment of the multispecies fisheries. Reviewing the most recent 10 years of data provided in the marine mammal

[11] ASMFC 2017; GAR Marine Animal Incident Database, unpublished data; Kocik et al. 2014; Marine Mammal (Atlantic Ocean) SARs: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region; Miller and Shepard 2011; Murray 2015; Murray 2018; Murray 2020; NMFS NEFSC reference documents (marine mammal serious injury and mortality reports): https://nefsc.noaa.gov/publications/crd/; NEFSC observer/sea sampling database, unpublished data.

(Atlantic Ocean) SARs (i.e., 2009-2018), of these species, only bottlenose dolphin stocks and short finned pilot whales have been documented with hook and line gear (see Marine Mammal SARs for the Atlantic Region[12]). As there is no systematic observer program for rod and reel (hook and line) fisheries, most data on hook and line interactions come from stranding data and as such, mean serious injury or mortality estimates are not available; however, a minimum known count of interactions with this gear type is provided in the Marine Mammal SARs for the Atlantic Region16. Between 2009-2018, there have been a total of 65 bottlenose dolphin stranding cases for which hook and line gear was documented on the animal (i.e., hook and/or line was wrapped or ingested); in most instances, it could not be determined if the death or serious injury was caused by hook and line gear.[13] Over this timeframe, there were also two cases in which interactions with hook and line gear were observed or self-reported at sea with a short finned pilot whale and a bottlenose dolphin; in both cases the animal was released alive, but with serious injuries. Based on this, although interactions with hook and line gear are possible, relative to other gear types, such as trawl gear, hook and line gear represents a low source of serious injury or mortality to bottlenose dolphin stocks along the Atlantic coast and short finned pilot whales.

Sea Turtles

Interactions between ESA listed species of sea turtles and hook and line gear have been documented, particularly in nearshore waters of the Mid-Atlantic (e.g., GAR Sea Turtle and Disentanglement Network, unpublished data; NMFS Sea Turtle Stranding and Salvage Network, unpublished data; Palmer 2017; NMFS 2021a). Sea turtles are known to ingest baited hooks or have their appendages snagged by hooks, both of which have been recorded in the STSSN database. Although, it is assumed that most sea turtles hooked by recreational fishermen are released alive, deceased sea turtles with hooks in their digestive tract have been reported (NMFS 2021a). Some turtles will break free on their own and escape with embedded/ingested hooks and/or trailing line, while others may be cut free by fishermen and intentionally released (NMFS 2021a). These sea turtles will escape with embedded or swallowed hooks or trailing varying amounts of monofilament fishing line, which may cause post-release injury or death (e.g., constriction and strangulation of internal digestive organs; wrapped line results in limb amputation; NMFS 2021a). Given the above, hook and line gear does pose an interaction risk to sea turtles; however, the extent to which these interactions are impacting sea turtle populations is still under investigation, and therefore, no conclusions can currently be made on the impact of hook and line gear on the continued survival of sea turtle populations (NMFS 2021a).

Atlantic Sturgeon

Interactions between ESA-listed species of Atlantic sturgeon and hook and line gear have been documented, particularly in nearshore waters (ASMFC 2017). Interactions with hook and line gear have resulted in Atlantic sturgeon injury and mortality and therefore, poses an interaction risk to these species. However, the extent to which these interactions are impacting Atlantic sturgeon DPSs is still under investigation and therefore, no conclusions can currently be made on the impact of hook and line gear on the continued survival of Atlantic sturgeon DPSs (NMFS 2011b; ASMFC 2017; NMFS 2021a).

Atlantic Salmon

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[12] https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region

[13] Marine Mammal SARs for the Atlantic Region reviewed for the period between 2009-2018 are as follows: Waring et al. 2016; and, Hayes et al. 2017, 2018, 2019, 2020, 2021. All bottlenose dolphin stocks along the Atlantic coast were reviewed. Counts of interactions were summed across all stocks to get the total number of documented stranding cases in which the animal had hook and line on the animal.

Review of NMFS (2021a), as well as the most recent 10 years of data on observed or documented interactions between Atlantic salmon and fishing gear indicates there have been no observed/documented interactions between Atlantic salmon and hook and line gear (NEFSC observer/sea sampling database, unpublished data). Based on this information, hook and line gear is not expected to pose an interaction risk to any Atlantic salmon and therefore, is not expected to be source of injury or mortality to this species.

Giant Manta Rays

Review of NMFS (2021a), as well as the most recent 10 years of data on observed or documented interactions between giant manta rays and fishing gear, there have been no observed/documented interactions between giant manta rays and hook and line gear (NEFSC observer/sea sampling database, unpublished data). Based on this information, hook and line gear is not expected to pose an interaction risk to giant manta rays and therefore, is not expected to be source of injury or mortality to this species

5.6.4.2 Commercial Fisheries Interactions

5.6.4.2.1 Marine Mammals

Depending on species, marine mammals have been observed seriously injured or killed in bottom trawl and/or sink gillnet gear. Pursuant to the MMPA, NMFS publishes a List of Fisheries (LOF) annually, classifying U.S. commercial fisheries into one of three categories based on the relative frequency of incidental serious injuries and/or mortalities of marine mammals in each fishery (i.e., Category I=frequent; Category II=occasional; Category III=remote likelihood or no known interactions). In the Northwest Atlantic, the 2021 LOF (86 FR 3028, January 14, 2021) categorizes commercial gillnet fisheries (Northeast or Mid-Atlantic) as Category I fisheries and commercial bottom trawl fisheries (Northeast or Mid-Atlantic) as Category II fisheries.

5.6.4.2.1.1 Large Whales

Bottom Trawl Gear

Review of the most recent 10 years of observer, stranding, and/or marine mammal serious injury and mortality reports from 2009-2018, and querying the GAR Marine Animal Incident database (which contains data for 2019), showed that there have been no observed or documented interactions with large whales and bottom trawl gear[14]. Based on this information, large whale interactions with bottom trawl gear are not expected.

[14] Refer to: Greater Atlantic Region (GAR) Marine Animal Incident Database (unpublished data); Marine Mammal SARs for the Atlantic Region: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region; NMFS NEFSC observer/sea sampling database, unpublished data ; MMPA LOF: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-list-fisheries; NMFS NEFSC reference documents (marine mammal serious injury and mortality reports): https://apps-nefsc.fisheries.noaa.gov/rcb/publications/center-reference-documents.html

Fixed Fishing Gear (e.g., Sink Gillnet Gear)

Large whale interactions (entanglements) with fishing gear have been documented in the waters of the Northwest Atlantic.[15] Information available on interactions with large whales comes from NMFS (2021a,b), reports documented in the GAR Marine Animal Incident Database (unpublished data), as well as the NMFS NEFSC's baleen whale serious injury and mortality reports (https://apps-nefsc.fisheries.noaa.gov/rcb/publications/center-reference-documents.html). Review of the most recent ten years (i.e., 2010-2019) of data indicates that, in terms of confirmed incidences of human interactions (e.g., ship strike, entanglement), entanglement in fishing gear accounts for the majority of all large whale interactions reported and documented for humpback, North Atlantic right, fin, and minke whales. Albeit to a lesser extent, the best available data also shows that sei whales have been reported and documented entangled in fishing gear. The best available data also shows that fin, minke, humpback, and to a lesser extent, sei whales, have also been observed and documented entangled in fishing gear.

Based on the best available information, the greatest entanglement risk to large whales is posed by fixed gear used in trap/pot or sink gillnet fisheries (Angliss and Demaster 1998; Cassoff et al. 2011; Kenney and Hartley 2001; Knowlton and Kraus 2001; Hartley et al. 2003; Johnson et al. 2005;Whittingham et al. 2005a,b; Knowlton et al. 2012; NMFS 2014; Hamilton and Kraus 2019; Henry et al. 2014; Henry et al. 2015; Henry et al. 2016; Henry et al. 2017; Henry et al. 2019; Henry et al. 2020; Henry et al. 2021; Sharp et al. 2019; Marine Mammal SARs for the Atlantic Region[16]. Specifically, while foraging or transiting, large whales are at risk of becoming entangled in vertical endlines, buoy lines, or groundlines of gillnet and pot/trap gear, as well as the net panels of gillnet gear that rise into the water column (Baumgartner et al. 2017; Cassoff et al. 2011; Hamilton and Kraus 2019; Hartley et al. 2003; Henry et al. 2014; Henry et al. 2015; Henry et al. 2016; Henry et al. 2017; Henry et al. 2019; Henry et al. 2020; Johnson et al. 2005; Kenney and Hartley 2001; Knowlton and Kraus 2001;Knowlton et al. 2012; NMFS 2014; Whittingham et al. 2005a,b; NMFS Marine Mammal SARs for the Atlantic Region[17]).[18] Large whale interactions (entanglements) with these features of trap/pot and/or sink gillnet gear often result in the serious injury or mortality to the whale (Angliss and Demaster 1998; Cassoff et al. 2011; Henry et al. 2014, Henry et al. 2015, Henry et al. 2016; Henry et al. 2017; Henry et al. 2019; Henry et al. 2020; Henry et al. 2021; Knowlton and Kraus 2001, Knowlton et al. 2012; Moore and Van der Hoop 2012; NMFS 2014; Pettis et

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[15] NMFS Atlantic Large Whale Entanglement Reports: https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-mammal-protection/atlantic-large-whale-take-reduction-plan (for years prior to 2014, contact David Morin, Large Whale Disentanglement Coordinator, David.Morin@NOAA.gov; GAR Marine Animal Incident Database (unpublished data); NMFS Marine Mammal (Atlantic Ocean) SARs: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region; NMFS NEFSC Marine Mammal Serious Injury and Morality Reference Documents: https://apps-nefsc.fisheries.noaa.gov/rcb/publications/center-reference-documents.html; MMPA List of Fisheries: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-list-fisheries

[16] https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region

[17] https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region

[18] Through the ALWTRP, regulations have been implemented to reduce the risk of entanglement in in vertical endlines, buoy lines, or groundlines of gillnet and pot/trap gear, as well as the net panels of gillnet gear. For ALWTRP regulations currently implemented: see https://www.fisheries.noaa.gov/action/atlantic-large-whale-take-reduction-plan-regulations-1997-2015.

al. 2019; Sharp et al. 2019; van der Hoop et al. 2016; van der Hoop et al. 2017). As many entanglements, and therefore, serious injury or mortality events, go unobserved, and because the gear type, fishery, and/or country of origin for reported entanglement events are often not traceable, the rate of large whale entanglement, and thus, rate of serious injury and mortality due to entanglement, are likely underestimated (Hamilton et al. 2018; Hamilton et al. 2019; Knowlton et al. 2012; Pace et al. 2017; Robbins 2009; NMFS 2021a,b).

Due to the incidences of interactions with vertical lines associated with gillnet and trap/pot gear, in addition to the endangered status of the species being affected most by these gear types (i.e., North Atlantic right and fin whales), pursuant to the MMPA, these large whale species were designated as strategic stocks. Section 118(f)(1) of the MMPA requires the preparation and implementation of a Take Reduction Plan (TRP) for any strategic marine mammal stock that interacts with Category I or II fisheries. As a result, to address and mitigate the risk of large whale entanglement in fixed fishing gear comprised of vertical lines, including gillnet gear, the Atlantic Large Whale Take Reduction Plan (ALWTRP or Plan) was implemented. The ALWTRP identifies gear modification requirements and restrictions for Category I and II gillnet fisheries in the Northeast, Mid-Atlantic, and Southeast regions of the U.S. (designated management areas); these fisheries must comply with all regulations of the Plan. For further details on the ALWTRP, specifically gear modification requirements, restrictions, and management areas under the ALWTRP, see: https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-mammal-protection/atlantic-large-whale-take-reduction-plan.

5.6.4.2.1.2 Small Cetaceans and Pinnipeds

Sink Gillnet and Bottom Trawl Gear

Small cetaceans and pinnipeds are vulnerable to interactions with sink gillnet and bottom trawl gear.[19] Reviewing marine mammal stock assessment and serious injury reports that cover the most recent 10 years data (i.e., 2009-2018), as well as the MMPA LOF's covering this time frame (i.e., issued between 2016 and 2021), Table 16 provides a list of species that have been observed (incidentally) seriously injured and/or killed by MMPA LOF Category I (frequent interactions) gillnet and/or Category II (occasional interactions) bottom trawl fisheries that operate in the affected environment of the multispecies fishery . Of the species provided in Table 16, gray seals, followed by harbor seals, harbor porpoises, short beaked common dolphins, and harps seals are the most frequently bycaught small cetacean and pinnipeds in sink gillnet gear in the Greater Atlantic Region (GAR; Hatch and Orphanides 2014, 2015, 2016, Orphanides and Hatch 2017; Orphanides 2019, 2020, 2021). In terms of bottom trawl gear, short-beaked common dolphins, Risso's dolphins, and Atlantic white-sided dolphins are the most frequently observed bycaught marine mammal species in the GAR, followed by gray seals, long-finned pilot whales, bottlenose dolphin (offshore), harbor porpoise, harbor seals, and harp seals (Lyssikatos 2015; Chavez-Rosales et al. 2017; Lyssikatos et al. 2020; Lyssikatos et al. 2021).

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[19] For additional information on small cetacean and pinniped interactions, see: Chavez-Rosales et al. 2017; Hatch and Orphanides 2014, 2015, 2016, 2019; Josephson et al. 2017; Josephson et al. 2019; Lyssikatos 2015; Lyssikatos et al. 2020; Orphanides 2020; Read *et al*. 2006; Waring et al. 2015b; Marine Mammal (Atlantic Ocean) SARS: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region; MMPA LOF at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-list-fisheries

Table 16 - Small cetacean and pinniped species observed seriously injured and/or killed by Category I and II sink gillnet or bottom trawl fisheries in the affected environment of the multispecies fisheries.

Fishery	Category	Species Observed or reported Injured/Killed
Northeast Sink Gillnet	I	Bottlenose dolphin (offshore)
		Harbor porpoise
		Atlantic white sided dolphin
		Short-beaked common dolphin
		Risso's dolphin
		Pilot whales
		Harbor seal
		Hooded seal
		Gray seal
		Harp seal
Mid-Atlantic Gillnet	I	Bottlenose dolphin (Northern Migratory coastal)
		Bottlenose dolphin (Southern Migratory coastal)
		Bottlenose dolphin (offshore)
		Harbor porpoise
		Short-beaked common dolphin
		Pilot whale
		Atlantic white-sided dolphin
		Risso's dolphin
		Harbor seal
		Harp seal
		Gray seal
Northeast Bottom Trawl	II	Harp seal
		Harbor seal
		Gray seal
		Pilot whales
		Short-beaked common dolphin
		Atlantic white-sided dolphin
		Harbor porpoise
		Bottlenose dolphin (offshore)
		Risso's dolphin
Mid-Atlantic Bottom Trawl	II	Atlantic white-sided dolphin
		Short-beaked common dolphin
		Risso's dolphin
		Pilot whale
		Bottlenose dolphin (offshore)
		Gray seal

		Harbor seal
Source: MMPA 2016-2021 LOFs at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-list-fisheries.		

As noted above, numerous species of small cetaceans and pinnipeds interact with Category I and II fisheries in the GAR; however, several species (Table 16) have experienced such great losses to their populations due to interactions with Category I and/or II fisheries that they are now considered strategic stocks under the MMPA (Table 12). MMPA Section 118(f)(1) requires the preparation and implementation of a TRP for any strategic marine mammal stock that interacts with Category I or II fisheries. Thus, the Harbor Porpoise TRP (HPTRP) and the Bottlenose Dolphin TRP (BDTRP) were developed and implemented for these species.[20] Also, due to the incidental mortality and serious injury of small cetaceans, incidental to bottom and midwater trawl fisheries operating in both the Northeast and Mid- Atlantic regions, the Atlantic Trawl Gear Take Reduction Strategy (ATGTRS) was implemented. Additional information on each TRP or Strategy is at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-take-reduction-plans-and-teams.

5.6.4.2.2 Sea Turtles

Bottom Trawl Gear

Bottom trawl gear poses an injury and mortality risk to sea turtles (Sasso and Epperly 2006; NMFS Observer Program, unpublished data). Since 1989, the date of our earliest observer records for federally managed fisheries, sea turtle interactions with trawl gear have been observed in the Gulf of Maine, Georges Bank, and/or the Mid-Atlantic; however, most of the observed interactions have been observed south of the Gulf of Maine (Murray 2008; Murray 2015b; Murray 2020; NMFS observer/sea sampling database, unpublished data; Warden 2011 a, b). As few sea turtle interactions have been observed in the Gulf of Maine, there is insufficient data available to conduct a robust model-based analysis and bycatch estimate of sea turtle interactions with trawl gear in this region. As a result, the bycatch estimates and discussion below are for trawl gear in the Mid-Atlantic and Georges Bank.

Based on Murray (2020)[21], from 2014-2018, 571 loggerhead (CV=0.29, 95% CI=318-997), 46 Kemp's ridley (CV=0.45, 95% CI=10-88), 20 leatherback (CV=0.72, 95% CI = 0-50), and 16 green (CV=0.73, 95% CI=0-44) sea turtle interactions were estimated to have occurred in bottom trawl gear in the Mid-Atlantic region over the five-year period. On Georges Bank, 12 loggerheads (CV=0.70, 95% CI=0-31) and 6 leatherback (CV=1.0, 95% CI=0-20) interactions were estimated to have occurred from 2014-2018. An estimated 272 loggerhead, 23 Kemp's ridley, 13 leatherback, and 8 green sea turtle interactions resulted in mortality over this period (Murray 2020).

[20] Although the most recent U.S. Atlantic and Gulf of Mexico Marine Mammal SARs (Hayes et al. 2020) no longer designates harbor porpoise as a strategic stock, HPTRP regulations are still in place per the mandates provided in Section 118(f)(1).

[21] Murray (2020) estimated interaction rates for each sea turtle species with stratified ratio estimators. This method differs from previous approaches (Murray 2008; Murray 2015b; Warden 2011a,b), where rates were estimated using generalized additive models (GAMs). Ratio estimator results may be similar to those using GAM or generalized linear models (GLM) if ratio estimators are stratified based on the same explanatory variables in a GAM or GLM model (Murray 2007, Murray and Orphanides 2013, Orphanides 2010).

Sink Gillnet Gear

Interactions between sink gillnet gear and green, Kemp's ridley, loggerhead, and leatherback sea turtles have been observed in the Greater Atlantic region since 1989 (NEFSC observer/sea sampling database, unpublished data). Specifically, sea turtle interactions with gillnet gear have been observed in the Gulf of Maine, Georges Bank, and/or the Mid-Atlantic; however, most of the observed interactions have been observed south of the Gulf of Maine (Murray 2009a,b; Murray 2013; Murray 2018; NEFSC observer/sea sampling database, unpublished data). As few sea turtle interactions have been observed in the Gulf of Maine, there is insufficient data available to conduct a robust model-based analysis and bycatch estimate of sea turtle interactions with sink gillnet gear in this region. As a result, the bycatch estimates and discussion below are for sink gillnet gear in the Mid-Atlantic and Georges Bank.

From 2012-2016 (the most recent five-year period that has been statistically analyzed for gillnets), Murray (2018) estimated that sink gillnet fisheries in the Mid-Atlantic and Georges Bank bycaught 705 loggerheads (CV=0.29, 95% CI over all years: 335-1116), 145 Kemp's ridleys (CV =0.43, 95% CI over all years: 44-292), 27 leatherbacks (CV =0.71, 95% CI over all years 0-68), and 112 unidentified hard-shelled turtles (CV=0.37, 95% CI over all years (64-321).[22] Of these, mortalities were estimated at 557 loggerheads, 115 Kemp's ridley, 21 leatherbacks, and 88 unidentified hard-shelled sea turtles. Total estimated loggerhead bycatch was equivalent to 19 adults. The highest bycatch rate of loggerheads occurred in the southern Mid-Atlantic stratum in large mesh gear during November to June. Though only one sea turtle was observed in this stratum, observed effort was low, leading to a high bycatch rate. Bycatch rates of all other species were lower relative to loggerheads. Highest estimated loggerhead bycatch occurred in the northern mid-Atlantic from July to October in large mesh gears due to the higher levels of commercial effort in the stratum. Mean loggerhead bycatch rates were ten times those of Kemp's ridley bycatch rates in large mesh gear in the northern Mid-Atlantic from July to October (Murray 2018). Although interactions between sink gillnet gear and green sea turtles have been observed (NEFSC observer/sea sampling database, unpublished data); green sea turtles were excluded from the bycatch rate calculations in Murray (2018) because the observed interaction occurred in waters of North Carolina, and therefore, outside the study region.

5.6.4.2.3 **Atlantic Sturgeon**

Sink Gillnet and Bottom Trawl Gear

Since 1989, Atlantic sturgeon interactions (i.e., bycatch) with sink gillnet and bottom trawl gear have frequently been observed in the Greater Atlantic Region, with most sturgeon observed captured falling within the 100 to 200cm total length range; however, both larger and small individuals have been observed (ASMFC 2007; ASMFC 2017; Miller and Shepard 2011; NEFSC observer/sea sampling database, unpublished data; Stein et al. 2004). For sink gillnets, higher levels of Atlantic sturgeon bycatch have been associated with depths of less than 40 meters, mesh sizes of greater than 10 inches, and the months of April and May (ASMFC 2007). For otter trawl fisheries, the highest incidence of Atlantic sturgeon bycatch have been associated with depths less than 30 meters (ASMFC 2007). More recently, over all gears and observer programs that have encountered Atlantic sturgeon, the distribution of haul depths on observed hauls that caught Atlantic sturgeon was significantly different from those that did not encounter Atlantic surgeon, with Atlantic sturgeon encountered primarily at depths less than 20 meters

[22] Murray (2018) estimated interaction rates for each sea turtle species with stratified ratio estimators. This method differs from previous approaches (Murray 2009, 2013), where rates were estimated using generalized additive models (GAMs). Ratio estimator results may be similar to those using GAM or generalized linear models (GLM) if ratio estimators are stratified based on the same explanatory variables in a GAM or GLM model (Murray 2007, Murray and Orphanides 2013, Orphanides 2010).

(ASMFC 2017).

The ASMFC (2017) Atlantic sturgeon benchmark stock assessment represents the most accurate predictor of annual Atlantic sturgeon interactions in fishing gear (e.g., otter trawl, gillnet). The stock assessment analyzes fishery observer and VTR data to estimate Atlantic sturgeon interactions in fishing gear in the Mid-Atlantic and New England regions from 2000-2015, the timeframe which included the most recent, complete data at the time of the report. The total bycatch of Atlantic sturgeon from bottom otter trawls ranged between 624-1,518 fish over the 2000-2015 time series, while the total bycatch of Atlantic sturgeon from gillnets ranged from 253-2,715 fish. Focusing on the most recent five-year period of data provided in the stock assessment report[23], the estimated average annual bycatch during 2011-2015 of Atlantic sturgeon in bottom otter trawl gear is 777.4 individuals and in gillnet gear is 627.6 individuals.

5.6.4.2.4 Atlantic Salmon

Sink Gillnet and Bottom Trawl Gear

Atlantic salmon are at risk of interacting with bottom trawl or gillnet gear (NEFSC observer/sea sampling database, unpublished data; Kocik *et al*. 2014, NMFS 2021a). NEFOP data from 1989-2019 show records of incidental bycatch of Atlantic salmon in seven of the 31 years, with a total of 15 individuals caught, nearly half of which (seven) occurred in 1992 (NEFSC observer/sea sampling database, unpublished data).[24] Of the observed incidentally caught Atlantic salmon, ten were listed as "discarded," which is assumed to be a live discard (Kocik, pers comm.; February 11, 2013). Five of the 15 were documented as lethal interactions. The incidental takes of Atlantic salmon occurred in bottom otter trawls (4) and gillnets (11). Observed captures occurred in March (2), April (2), May (1), June (3), August (1), and November (6). Given the very low number of observed Atlantic salmon interactions in gillnet and bottom trawl gear, interactions with these gear types are believed to be rare in the Greater Atlantic Region.

5.6.4.2.5 Giant Manta Ray

Sink Gillnet and Bottom Trawl Gear

Giant manta rays are potentially susceptible to capture by bottom trawl and gillnet gear based on records of their capture in fisheries using these gear types (NEFSC observer/sea sampling database, unpublished data, NMFS 2021a). Review of the most recent 10 years of NEFOP data showed that between 2010-2019, two (unidentified) Giant Manta Rays were observed in bottom trawl gear and two were observed in gillnet gear (NEFSC observer/sea sampling database, unpublished data). Additionally, all of the giant manta ray interactions in gillnet or trawl gear recorded in the NEFOP database (13 between 2001 and 2019) indicate the animals were encountered alive and released alive. However, details about specific conditions such as injuries, damage, time out of water, how the animal was moved or released, or behavior on release is not always recorded. While there is currently no information on post-release survival, NMFS Southeast Gillnet Observer Program observed a range of 0 to 16 giant manta rays captured per year between 1998

[23] The period of 2011-2015 was chosen as it is the period within the stock assessment that most accurately resembles the current trawl fisheries in the region.

[24] There is no information available on the genetics of these bycaught Atlantic salmon, so it is not known how many of them were part of the GOM DPS. It is likely that some of these salmon, particularly those caught south of Cape Cod, may have originated from the stocking program in the Connecticut River. Those Atlantic salmon caught north of Cape Cod and/or in the Gulf of Maine are more likely to be from the GOM DPS.

and 2015 and estimated that approximately 89% survived the interaction and release (see NMFS reports available at: http://www.sefsc.noaa.gov/labs/panama/ob/gillnet.htm).

5.7 HUMAN COMMUNITIES

This EA considers and evaluates the effect management alternatives may have on people's way of life, traditions, and community. These economic and social impacts may be driven by changes in fishery flexibility, opportunity, stability, certainty, safety, and/or other factors. While it is possible that these impacts could be solely experienced by individual fishermen, it is more likely that impacts would be experienced across communities, gear types, and/or vessel size classes. This section reviews the Northeast multispecies fishery and describes the human communities potentially impacted by the Proposed Action. This includes a description of the sector, common pool, and recreational participants' groundfish fishing and the important port communities in the fishery. This section focuses on the groundfish component of fishery participants activities and generally does not report out revenue or landed pounds landed on trips other than groundfish trips. Additional information may be found in the FY2010, FY2011, FY2012, FY2013, and FY2015 performance reports for this fishery by the NEFSC (Kitts et al. 2011; Murphy et al. 2012; Murphy et al. 2014; Murphy et al. 2015; Murphy et al. 2018). Previous groundfish management actions (FW59, FW61, A23) also contain fishery data descriptions from fishing years prior to 2016. Generally, fishery data in this section comes from the Greater Atlantic Regional Office, specifically their Data Matching and Imputation System (DMIS) tables, but other tables may use information from vessel trip reports, permit databases, and dealer landing reports, as noted.

5.7.1 Groundfish Fishery Overview

Sectors are allocated subdivisions of ACLs called Annual Catch Entitlements (ACE) based on each sector's collective catch history.[25] Sectors receive ACE for nine of 13 groundfish species (14 stocks + quotas for Eastern US/Canada cod and haddock; 16 ACEs) in the FMP and are exempt from many of the effort controls previously used to manage the fishery. Each sector establishes its own rules for using its allocations. As of FY2020, 56% of the limited access groundfish permitted vessels are in a sector, and 44% are in the common pool (Table 17) [26]. Common pool vessels act independently of one another, with each vessel constrained by the number of DAS it can fish, by trip limits, and by all of the time and area closures. These restrictions help ensure that the groundfish catch of common pool vessels does not exceed the common pool's portion of the commercial groundfish sub- ACL for all stocks (about 1% in recent fishing years) before the end of the fishing year. In this section, "groundfish trips", unless otherwise stated, are defined as vessels with a limited access groundfish permit that landed at least 1 pound of any stock on a trip that declared into the groundfish fishery. Groundfish landings only refer to landing stocks that are allocated species in the Northeast Multispecies plan (cod, haddock, pollock, redfish, yellowtail flounder, witch flounder, American plaice, etc.), but may have been caught on either sector or common pool trips. Non-groundfish landings include all other species caught, including whiting, lobster, skates, dogfish, and any other federally reported catch.

[25] To determine the ACE, the sum of all of the sector members' potential sector contributions (PSCs) (a percentage of the ACL) are multiplied by the ACL.

[26] The number of LA permits overall has changed relatively little since the beginning of the sector program, the decline in number of vessels is due to the number of permits not currently affiliated with a vessel, but is eligible for renewal based on the previous vessels' fishing and permit history (i.e., Confirmation of Permit History, or CPH, see 50 CFR 648.4).

Table 17- Number of eligibilities (MRIs), eligibilities in CPH, permitted vessels, and active vessels (landing on groundfish trips) by fishing year from FY2016 to FY2020.

fishing year	group	MRIs	CPH	elig. vessels	not renewed	permitted vessels	Any revenue	GF revenue	No landings	% inactive
2016	sector	840	298	575	12	563	394	198	169	30%
2016	common	502	101	425	19	406	293	60	113	28%
2017	sector	834	313	546	11	535	377	188	158	30%
2017	common	499	102	419	15	404	297	50	107	26%
2018	sector	833	321	529	7	522	359	169	163	31%
2018	common	492	103	410	14	396	279	53	117	30%
2019	sector	827	325	543	15	528	349	157	179	34%
2019	common	490	98	401	24	377	272	43	105	28%
2020	sector	820	346	504	12	492	337	161	155	32%
2020	common	493	101	412	28	384	253	36	131	34%

Total MRIs = MRIs not in CPH + those in CPH

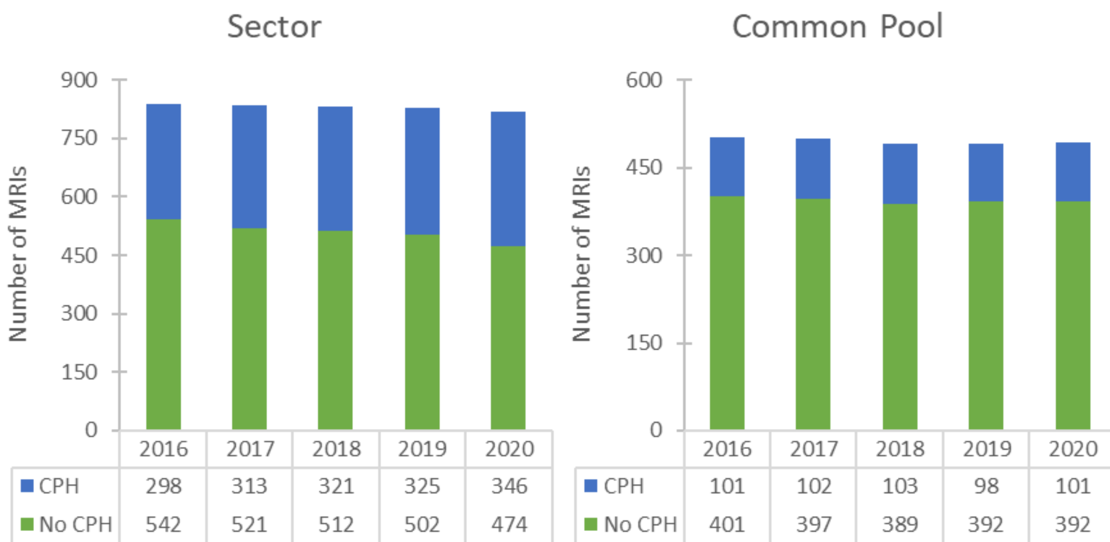
Total MRIs and those in CPH represent the number of MRIs not in CPH and those in CPH as of May 1st of the fishing year, while the total number of eligible vessels reflects the number of non-CPH eligible permits at any point in the fishing year. Over time the number of vessels will differ from the number of eligibilities since eligibilities can be transferred from vessel to vessel during the fishing year. Amendment 16 authorized CPH owners to join sectors and to lease DAS.

Source: NMFS Greater Atlantic Regional Fisheries Office, Summary tables for FY2020 Northeast Multispecies Fishery. Accessed November 2021.

5.7.2 **Fleet Characteristics**

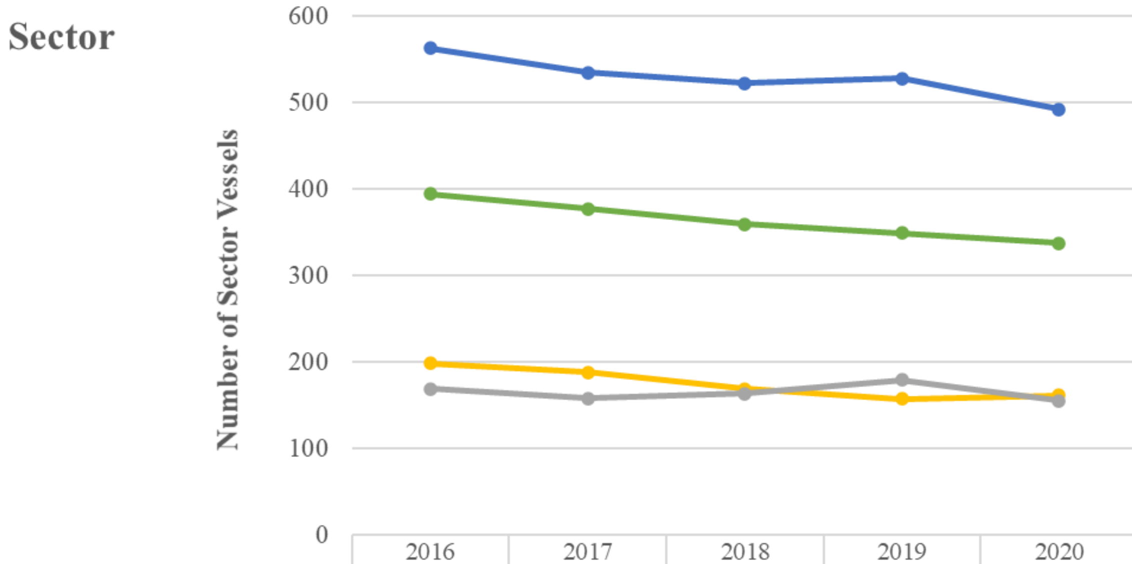
Over the past five fishing years, there has been limited variability in the number of groundfish eligibilities (Moratorium Right Identifiers, MRIs), shown in Table 17. This represents the number of individual fishing privileges and catch histories associated with each Northeast multispecies permit, through which Potential Sector Contributions (PSC) are calculated. While a given set of privileges may move from one vessel to another, and change permit numbers, the MRI always stays the same. Over time, the number of sector eligibilities in CPH (Confirmation of Permit History) has increased from 298 in at the start of FY2016 to 346 in FY2020 (Figure 1). The increase of eligibilities in CPH represents a decline in the number of permits associated with vessels, but because eligibilities in CPH may still join sectors, the number of eligibilities in CPH does not necessarily change individuals' PSC, nor the ability for participants to passively obtain income from the groundfish fishery by leasing their ACE. Eligibilities may also move out of CPH during the fishing year, allowing the number of Limited Access permitted vessels to exceed the number of eligible permits at the start of the FY. Overall, there has been a decline in the number of permitted vessels in any year, from 969 in FY2016 to 876 in FY2020. About 33% of permitted vessels were inactive in FY2020, and the number of sector vessels that were inactive was nearly equal to the number of vessels landing allocated groundfish stocks (Figure 2). A key aspect of Amendment 16 is the ability of a sector to jointly decide how its ACE will be harvested, through redistribution within a sector and/or transferring ACE between sectors. Because inactive sector vessels may benefit if they lease their allocation, changes in the number of inactive vessels may result from a transfer of allocation and not necessarily vessels exiting the fishery.

Figure 1- Number of eligibilities (MRIs) not in Confirmation of Permit History (CPH) and in CPH as of May 1 of each year.

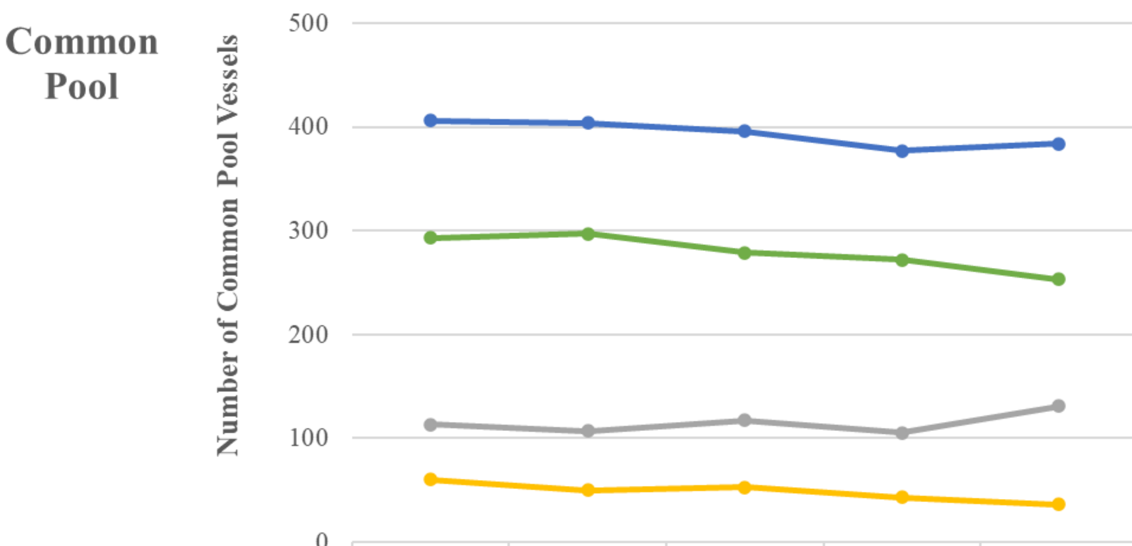


Source: NMFS Greater Atlantic Regional Fisheries Office, Summary tables for Northeast Multispecies Fishery. Accessed November 2021.

Figure 2- At any time in the fishing year, the total number of permitted groundfish vessels, those with revenue from any species, those with no landings, and those with revenue from allocated groundfish.



	2016	2017	2018	2019	2020
All permitted vessels	563	535	522	528	492
Revenue from any species	394	377	359	349	337
Revenue from groundfish	198	188	169	157	161
No landings	169	158	163	179	155



	2016	2017	2018	2019	2020
All permitted vessels	406	404	396	377	384
Revenue from any species	293	297	279	272	253
Revenue from groundfish	60	50	53	43	36
No landings	113	107	117	105	131

Source: NMFS Greater Atlantic Regional Fisheries Office, Summary tables for Northeast Multispecies Fishery. Accessed November 2021.

5.7.3 **Effort**

The groundfish fishery has traditionally been made up of a diverse fleet, comprised of a range of vessel sizes and gear types. The number of active vessels has declined somewhat since FY2016 across size classes (Table 18). From FY2016 to FY2020, the 30’ to < 50’ vessel size category declined from 97 to 86 active sector vessels. 38 vessels in the same size class were active in the common pool in 2016 while only 24 were active in 2020. No vessels in the <30’ vessel size category have participated in sectors between 2016-2020, while common pool vessels declined from 12 to 9 vessels. Active vessels in the 50’ to <75’ vessel size category and 75’ and above vessel size category have also declined, from a maximum of 69 50’-75’ vessels in 2016 to 43 in 2019. The number of sector vessels 75 feet in length or greater has declined from a high of 43 vessels in 2016 to 28 in 2019 and increased somewhat to 35 vessels in 2020[27]. Figure 3 shows for each vessel size class, total landed pounds (groundfish and non-groundfish), total gross ex-vessel revenue, total number of days absent on groundfish trips, and total number of groundfish trips. Total pounds landed (groundfish and non-groundfish) on groundfish trips increased to a five-year high in 2020. Total gross revenue (groundfish and non-groundfish) from groundfish trips in 2020 was the highest since 2016. The increase in revenues from 2019 was driven almost entirely by vessels in the 75’+ vessel size class. Primary gear types in the groundfish fishery are trawls (primarily otter trawls) and gillnet, but several other gear types including handline, longline, and pot gear may be used on groundfish trips, even if not used primarily to target groundfish stocks (Table 19).

Table 18- Number of active permitted vessels by length class, group and fishing year.

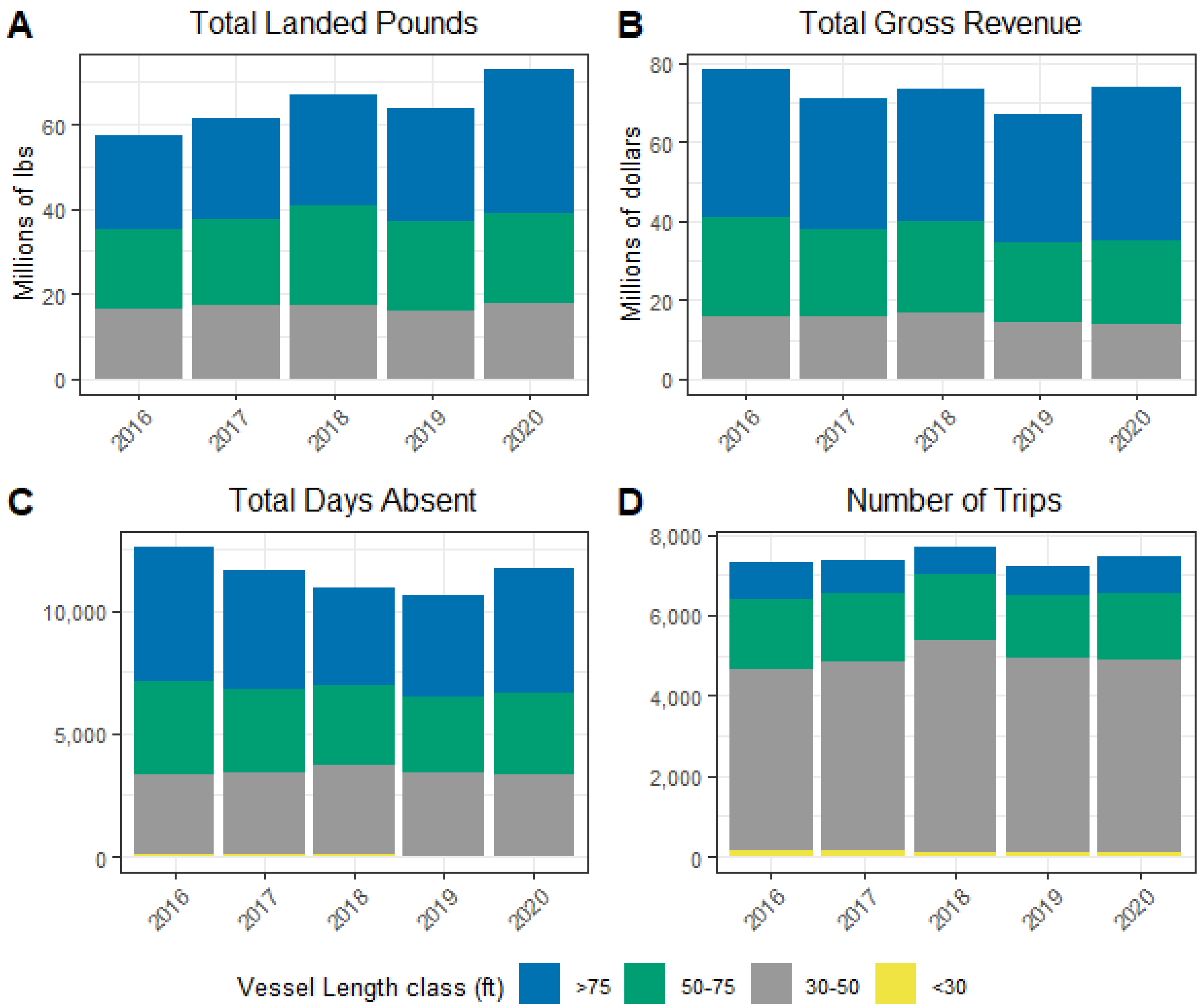
fishing year	group	<30 ft	>=30 <50 ft	>=50 <75 ft	>= 75 ft
2016	common pool	12	38	8	C
2016	sector	0	97	69	43
2017	common pool	9	37	7	C
2017	sector	0	98	59	41
2018	common pool	9	33	11	C
2018	sector	0	100	51	28
2019	common pool	10	28	4	0
2019	sector	0	96	43	28
2020	common pool	9	24	3	0
2020	sector	0	86	50	35

“C” indicates confidential data.

Source: GARFO DMIS tables. Accessed November 2021.

[27] The decline in active vessels in the >=75 ft size class for the 2018 and 2019 fishing years can be partially attributed to the forfeiture of groundfish vessels by Carlos Rafael in 2017. These vessels have since been purchased and reentered the groundfish fishery in 2020.

Figure 3- For vessel length category- (A) Total landed pounds (groundfish and non-groundfish); (B) Total gross ex-vessel revenue (millions of $2020); (C) Total number of days absent on groundfish trips; and (D) Total number of groundfish trips.



Source: GARFO DMIS data. Accessed November 2021.

Table 19- Number of groundfish trips by permitted vessels and gear type used.

fishing year	group	Trawl	Gillnet	ELM	Handline	Longline	Pot	Other
2016	common pool	460	40	58	253	0	5	0
2016	sector	3399	1779	2076	98	151	3	0
2017	common pool	413	38	15	126	C	3	0
2017	sector	3551	1380	2254	269	126	8	0
2018	common pool	346	57	73	92	0	C	0
2018	sector	3761	1432	2282	226	159	13	0
2019	common pool	273	71	78	89	C	C	0
2019	sector	3716	1379	2031	129	142	26	C
2020	common pool	360	37	37	88	C	0	0
2020	sector	4183	1266	1933	80	142	18	0

"C" indicates confidential data.

Source: GARFO DMIS data. Accessed November 2021.

5.7.4 Dealer Activity

All federally permitted groundfish vessels are required to sell to a federally permitted dealer. Federally permitted dealers are required to report all purchases of seafood, regardless of whether the vessels held a Federal or state-waters only permit. Dealers may obtain product from many other sources, so the groundfish activity levels are likely to capture only a portion of business activity by seafood wholesalers. Since 2016, the number of registered dealers that reported buying allocated groundfish decreased from around 80 in 2016, down to 59 dealers in 2020. The number of dealers buying any species on groundfish trips has decreased from 121 dealers in 2016, to 99 dealers in 2020 (Figure 4).

Where the dealer is registered, similar to homeport, may better represent where revenue ultimately flows in the country, while the location of sale best represents where fish is landed, either to a truck, an auction, or a processing facility (see landings and revenue section). Table 20 shows the number of dealers by registered state, specifically those buying any allocated groundfish species from groundfish trips. Massachusetts has the most registered dealers in any year, but that number has declined since 2016.

Figure 4- Number of registered dealers buying groundfish or any species from groundfish trips between fishing years 2016 and 2020.

Source: GARFO DMIS data and dealer data. Accessed November 2021.

Table 20- Number of Registered Dealers reporting buying allocated groundfish by registered state and fishing year. Total by state may not be accurate since registrations may vary by calendar year.

Registered Dealer State	2016	2017	2018	2019	2020
MA	34	31	27	22	20
ME	5	8	10	9	7
NH	4	5	4	5	5
NY	20	16	16	11	13
RI	8	5	6	5	5
OTHER	9	13	12	12	9

Source: GARFO DMIS data and dealer data. Accessed November 2021.

5.7.5 **Landings and Revenue**

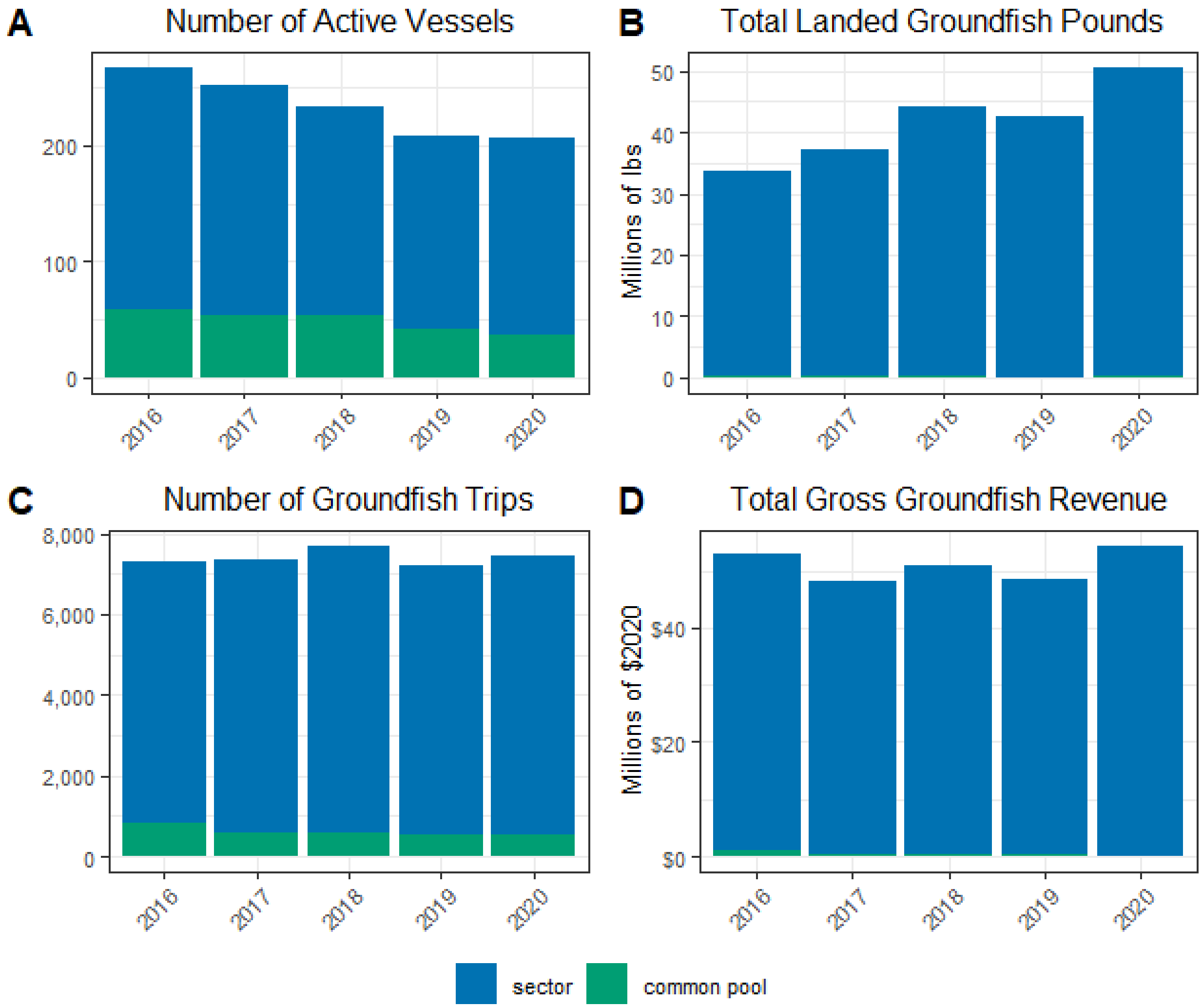
Table 21 and Figure 5 - Figure 6 summarize major landings and revenues trends for the groundfish fishery over the last five fishing years. Landed pounds of groundfish have increased over this period, while revenues have shown less variability. Both groundfish revenues and landed pounds were the highest in 2020 over the last five fishing years. The average price of regulated groundfish landed on groundfish trips has decreased fairly sharply, hitting a five-year low for sector vessels in 2020. The COVID-19 pandemic may have been a significant factor in driving low 2020 ex-vessel prices. High landing volumes, particularly of lower value stocks such as redfish and pollock, likely contributed to the decrease in groundfish ex-vessel prices. Despite this, groundfish revenues and landed pounds were the highest in 2020 over the last five fishing years.

Table 21- Summary of major trends in the Northeast multispecies fishery by fishing year and group ($2020). Pounds and revenue reflect total landings (landed lbs.) on groundfish trips in millions of pounds/dollars.

FY	group	GF pounds	GF revenue	GF price	NGF pounds	NGF revenue	NGF price	vessels	trips	days absent
2016	common pool	0.32	0.86	2.67	2.56	1.08	0.42	59	816	536
2016	sector	33.49	52.13	1.56	21.13	24.65	1.17	209	6,507	12,083
2017	common pool	0.18	0.46	2.50	1.97	0.78	0.40	54	594	377
2017	sector	37.05	47.64	1.29	22.11	22.42	1.01	198	6,757	11,269
2018	common pool	0.14	0.30	2.10	1.98	0.85	0.43	54	564	368
2018	sector	44.14	50.42	1.14	20.57	21.76	1.06	179	7,136	10,551
2019	common pool	0.10	0.23	2.19	1.63	0.94	0.58	42	514	310
2019	sector	42.56	48.18	1.13	19.29	17.92	0.93	167	6,705	10,327
2020	common pool	0.11	0.16	1.43	2.08	0.90	0.43	36	521	329
2020	sector	50.55	54.18	1.07	20.31	18.70	0.92	171	6,907	11,435

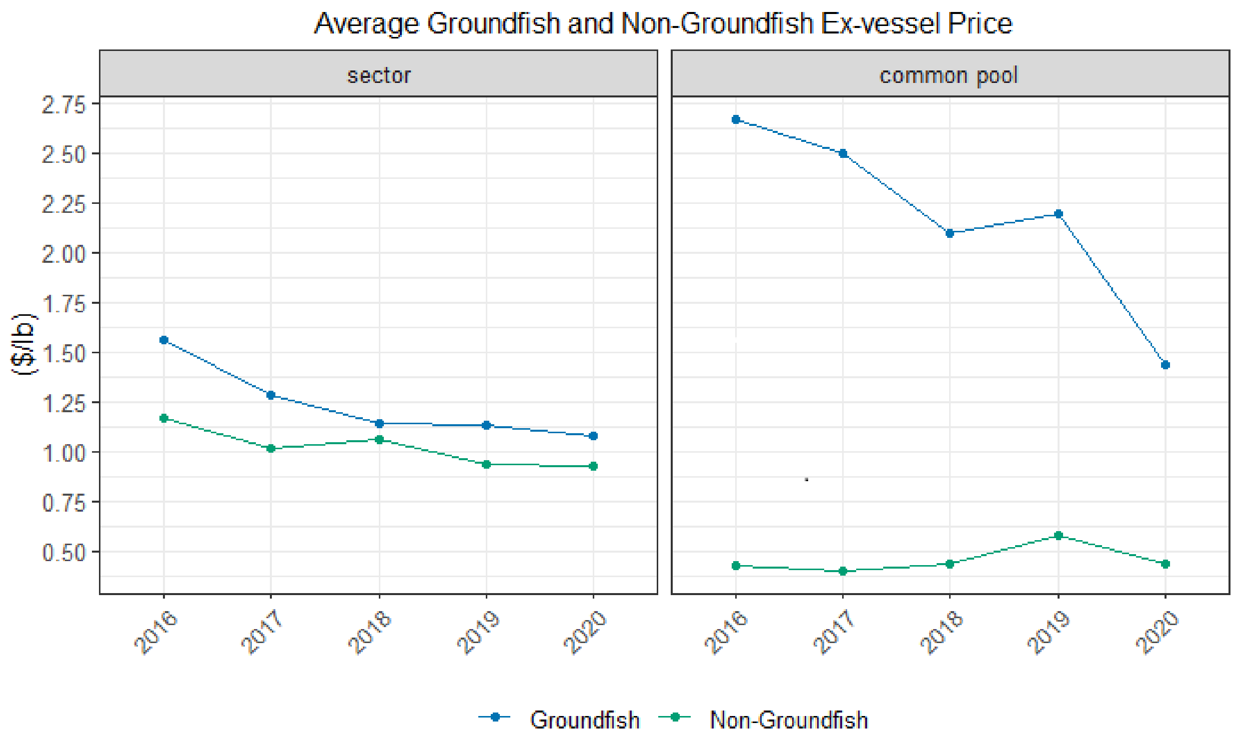
Source: GARFO DMIS data. Accessed November 2021.

Figure 5- (A) Number of active (at least one groundfish trip) vessels by fishing year and group; (B) Total landed pounds of allocated groundfish stocks; (C)Number of groundfish trips with >1 lb landed of any species ; (D) Total ex-vessel revenue from allocated groundfish stocks ($2020).



Source: GARFO DMIS data. Accessed November 2021.

Figure 6- Average groundfish and non-groundfish price by fishing year.



Source: GARFO DMIS data. Accessed November 2021.

Table 22 shows the distribution of groundfish landings by dealer state. Over FY2016-FY2020, Massachusetts by far made up the majority share of groundfish landings, followed by Maine, and New Hampshire. Similar distributions are shown for groundfish revenue by dealer state (Table 23). More detailed information on groundfish landings and revenue by state is provided in Section 5.7.7.

Table 22- Share of allocated groundfish landings by dealer sale state FY2016-2020.

Dealer Sale State	2016	2017	2018	2019	2020
MA	0.91	0.92	0.92	0.95	0.96
ME	0.07	0.06	0.05	0.04	0.02
NH	0.01	0.01	0.01	0.01	0.02
NY	0	0	0	0	0
RI	0.01	0.01	0.01	0	0
OTHER	0	0	0.01	0	0

Source: GARFO DMIS data and dealer data. Accessed November 2021.

Table 23- Share of allocated groundfish revenue by dealer sale state FY2016-2020.

Dealer Sale State	2016	2017	2018	2019	2020
MA	0.86	0.88	0.88	0.92	0.94
ME	0.09	0.08	0.08	0.05	0.03
NH	0.01	0.02	0.02	0.02	0.02
NY	0.01	0	0	0	0
RI	0.03	0.02	0.01	0.01	0
OTHER	0.01	0	0.01	0	0

Source: GARFO DMIS data and dealer data. Accessed November 2021.

Recent ex-vessel prices by stock are shown in Table 24 and by revenue by stock in Table 25. Table 26 shows the distribution of groundfish revenue by area among the four largest groundfish ports.

Table 24- Stock-level commercial (sector and common pool) ex-vessel prices (2020$/lb.), FY2016-2020. Averages represent total value divided by total landings over the five-year period.

Stock	2016	2017	2018	2019	2020	Avg.
GB Cod East	$2.70	$2.92	$2.52	$2.31	$2.18	*$2.52*
GB Cod West	$2.92	$2.85	$2.36	$2.73	$2.47	*$2.64*
GOM Cod	$3.24	$3.14	$2.89	$3.17	$2.84	*$3.06*
GB Winter Flounder	$3.75	$3.40	$3.37	$2.97	$2.07	*$3.19*
GOM Winter Flounder	$3.03	$2.93	$2.77	$2.36	$2.17	*$2.75*
SNE Winter Flounder	$3.28	$3.10	$2.86	$2.71	$2.00	*$2.99*
GB Haddock East	$1.38	$1.00	$0.96	$0.97	$0.98	*$1.04*
GB Haddock West	$1.34	$1.05	$0.99	$1.08	$1.10	*$1.10*
GOM Haddock	$1.63	$1.29	$1.19	$1.24	$1.25	*$1.28*
Atlantic Halibut	$9.09	$8.02	$7.31	$6.56	$6.05	*$7.26*
White Hake	$2.02	$1.41	$1.30	$1.26	$1.46	*$1.46*
American Plaice	$2.75	$2.58	$2.23	$1.78	$1.70	*$2.29*
Pollock	$1.16	$1.02	$0.85	$0.96	$1.13	*$1.02*
Redfish	$0.64	$0.57	$0.52	$0.54	$0.54	*$0.56*
Witch Flounder	$3.45	$2.33	$1.72	$1.80	$1.60	*$1.96*
CC/GOM Yellowtail Flounder	$1.92	$1.59	$1.21	$1.15	$0.91	*$1.43*
GB Yellowtail Flounder	$2.37	$1.86	$1.73	$1.96	$1.34	*$1.93*
SNE Yellowtail Flounder	$2.75	$2.78	$2.19	$1.81	$1.37	*$2.67*

Table 25 - Stock-level commercial (sector and common pool) revenue (millions of 2020$), FY2016-2020.

Stock	2016	2017	2018	2019	2020	Avg.
GB Cod East	0.4	0.2	0.5	0.3	0.2	0.4
GB Cod West	2.7	2.1	3.2	2.3	1.6	2.7
GOM Cod	1.6	1.5	1.7	1.6	1.1	1.6
GB Winter Flounder	3.5	2.8	3.1	2	1.3	3.5
GOM Winter Flounder	0.7	0.7	0.5	0.3	0.2	0.7
SNE Winter Flounder	3.2	2.7	1.5	0.8	0.4	3.2
GB Haddock East	1.2	0.6	1	1.2	1	1.2
GB Haddock West	7.8	6.5	7.9	9.2	12.3	7.8
GOM Haddock	4.7	5.4	6.4	8.3	9.6	4.7
Atlantic Halibut	0.4	0.4	0.3	0.4	0.3	0.4
White Hake	4.8	4.7	4.5	4.3	4.3	4.8
American Plaice	6.3	5.7	5	3.1	2	6.3
Pollock	6.6	5.9	5.6	5.6	8.4	6.6
Redfish	5.6	5.8	6.1	5.9	7.9	5.6
Witch Flounder	2.2	2.3	2.9	2.9	3	2.2
CC/GOM Yellowtail Flounder	1	0.7	0.4	0.3	0.3	1
GB Yellowtail Flounder	0.1	0.1	0.1	0	0	0.1
SNE Yellowtail Flounder	0.4	0.1	0	0	0	0.4

Table 26- Commercial (sector and common pool) groundfish landings and revenue and total landings and revenue (on groundfish trips) in Georges Bank and Southern New England/Mid-Atlantic and the Gulf of Maine. FY2016-2020. Landings in millions of lbs.; revenue in millions of 2020 dollars.

GB and SNE/MA	2016	2017	2018	2019	2020	Avg.	Avg. % of Total
Boston	2.8	2.6	2.7	2.2	3.3	2.7	12.2%
Gloucester	3.4	2.2	3.0	2.8	2.9	2.8	12.8%
New Bedford	12.8	8.7	9.9	10.1	9.7	10.3	46.0%
Portland	2.9	2.6	2.5	1.6	2.4	2.4	10.7%
Other	4.2	3.7	3.7	3.7	5.0	4.1	18.3%
Total	***26.1***	***19.8***	***21.8***	***20.3***	***23.4***	***22.3***	

GOM	2016	2017	2018	2019	2020	Avg.	Avg. % of Total
Boston	5.4	5.6	6.7	6.8	6.5	6.2	21.6%
Gloucester	8.0	9.9	9.7	9.8	10.0	9.5	33.1%
New Bedford	1.6	0.8	0.3	0.1	2.0	1.0	3.3%
Portland	6.9	6.9	6.4	5.6	6.3	6.4	22.4%
Other	5.0	5.0	5.9	5.9	6.1	5.6	19.5%
Total	***26.9***	***28.3***	***28.9***	***28.1***	***31.0***	***28.6***	

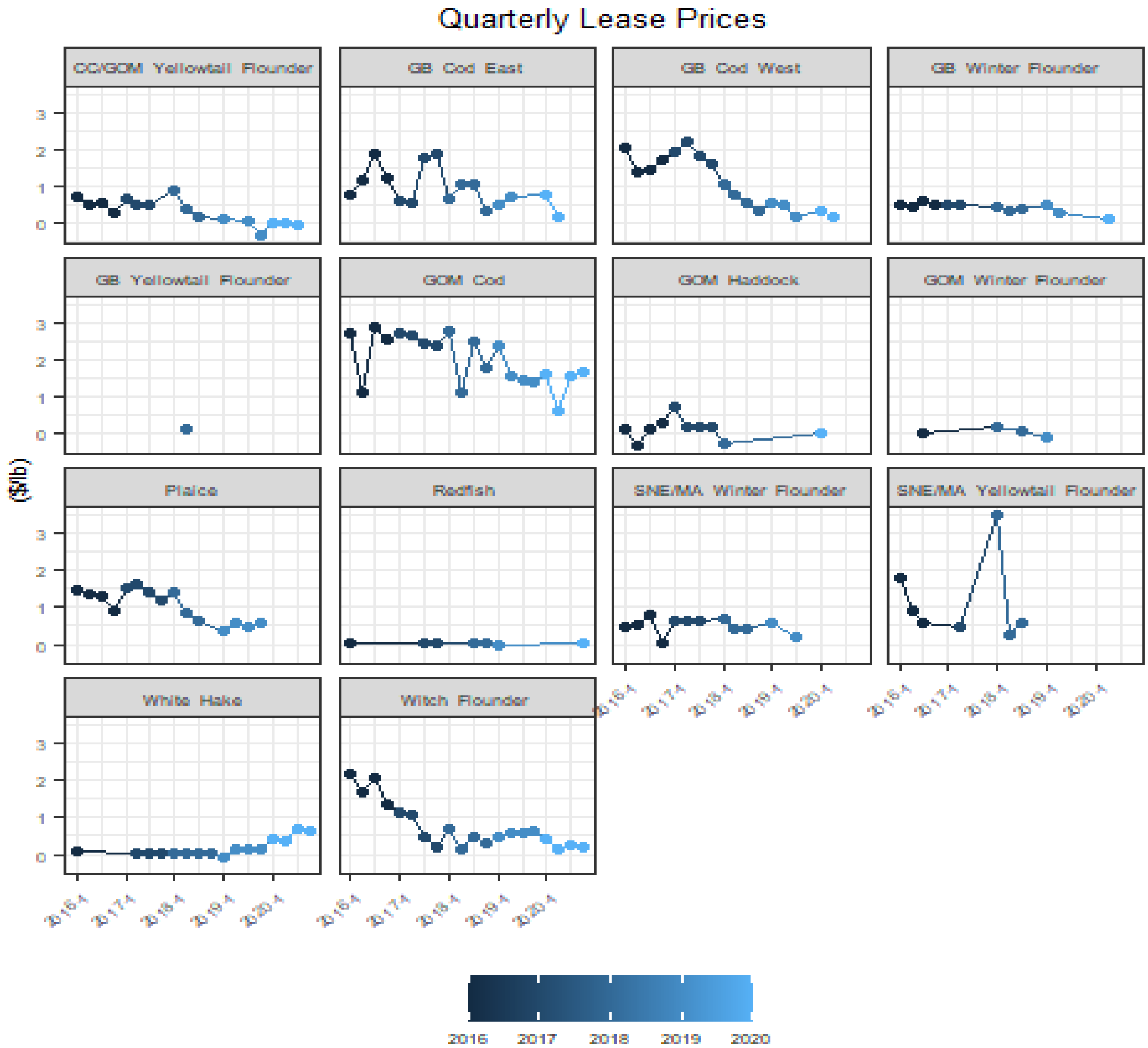
5.7.6 ACE Leasing

Starting with allocations in FY2010, each sector was given an initial ACE determined by the pooled potential sector contribution (PSC) from each entity joining that sector. Every limited access groundfish permit also has a tracking identification number called a Moratorium Right Identifier (MRI). PSC is technically allocated to MRIs, which are subsequently linked to vessels through Northeast Multispecies limited access fishing permits. A vessel's PSC is a percentage share of the total allocation for each allocated groundfish stock based on that vessel's fishing history. Once a sector roster and associated PSC is set at the beginning of a fishing year, each sector is then able to distribute its ACE among its members. By regulation, ACE is pooled within sectors, however most sectors seem to follow the practice of assigning catch allowances to member vessels based on PSC allocations. This is an important assumption because vessels catching more than their allocation of PSC must have leased additional quota, either as PSC from within the sector or as ACE from another sector.

For information on ACE leasing in earlier years of the sector program, see the 2015 groundfish fishery performance report (Murphy, et al. 2015).

A hedonic price model of reported inter- and intra-sector ACE leases between FY 2016 and FY 2020 shows quarterly price trends in ace leasing over time (Figure 7). Several stocks do not have many reported trades, or are not associated with prices greater than $0, such as haddock, redfish, and in most periods, pollock. Other stocks show dramatic changes in price over time. GOM cod ACE lease prices have generally been among the highest of any groundfish stock.

Figure 7- Hedonic model of quarterly ACE lease prices FY 2010 to FY 2018 for allocated groundfish stocks.



Source: SSB model, data from GARFO inter-sector trade tables and sector year end reports.

5.7.7 **Fishing Communities**

A large number of communities have been the homeport or landing port to one or more Northeast groundfish fishing vessels since 2016. These ports occur throughout the New England and Mid-Atlantic. Consideration of the economic and social impacts on these communities from proposed fishery regulations is required by the National Environmental Policy Act (NEPA 1970) and the M-S Act. Before any agency of the federal government may take "actions significantly affecting the quality of the human environment," that agency must prepare an Environmental Assessment (EA) that "utilizes a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision making which may have an impact on man's environment." National Standard 8 of the MSA stipulates that "conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities" (16 U.S.C. § 1851(a)(8)).

A "fishing community" is defined in the M-S Act as "a community which is substantially dependent on or substantially engaged in the harvesting or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community" (16 U.S.C. § 1802(17)). Determining which fishing communities are "substantially dependent" on and "substantially engaged" in the groundfish fishery can be difficult. Although it is useful to narrow the focus to individual communities in the analysis of fishing dependence, there are a number of potential issues with the confidential nature of the information. There are privacy concerns with presenting the data in such a way that proprietary information (landings, revenue, etc.) can be attributed to an individual vessel or a small group of vessels. This is particularly difficult when presenting information on ports that may only have a small number of active vessels. Table 27 - Table 33 summarize trends by community, when possible, showing the number of dealers, vessels, trips landing in that community or state, as well as the associated groundfish and non-groundfish volume and revenue.

As discussed in Section 5.7.4, Massachusetts has the largest share of groundfish landings and revenue in the region in every year 2016 to 2020, and has several communities that each have high levels of groundfish landings and revenue. New Bedford and Gloucester each have been the highest grossing communities over the years (Table 27). Gloucester has experienced limited annual variability in groundfish revenue over the last five years, with a low of $18.23 million, and a high of $19.04 million. Gloucester was the highest grossing port during 2016-2019, but was surpassed by New Bedford in 2020. The $19.18 million mark in groundfish revenues for New Bedford in 2020 represents the highest value for the port over the last five years. Boston is consistently the third highest grossing port in the region, grossing between $9.05 and $13.28 million dollars annually. Boston has relatively fewer dealers (3-4 annually) purchasing from vessels taking groundfish trips, as compared to some of the other major ports in Massachusetts. Chatham is another highly engaged groundfish port, within the state, although groundfish trips landing in Chatham tend to land mainly non-groundfish stocks (species not managed under the groundfish FMP). In 2020, vessels landing in Chatham earned 27.5 times as much from non-groundfish stocks than groundfish stocks (Table 27). This trend has been apparent throughout the 2016-2020 period.

Maine has the second largest share of groundfish landings and revenue, though these numbers have been declining over the last five years (Table 28). Portland, the largest groundfish port in Maine, experienced a decline in groundfish revenue from $4.08 million in 2016 to $1.56 million in 2020. All other ports in Maine, in aggregate, also experienced a decline in groundfish revenue, from $0.54 million in 2016 to $0.10 million in 2020.

New Hampshire has the third largest share of groundfish landings and revenue, despite not being home to any ports that are considered "highly engaged" in the fishery (Table 29). In 2020, New Hampshire experienced a five-year high in groundfish revenue, at $1.25 million. Participation in the fishery, in terms of the number of vessels taking at least one groundfish trip, has been steady over the last five years. The low occurred in 2020 (15 vessels) and high occurred in 2018 (18 vessels).

Rhode Island has the fourth largest share of groundfish landings and revenue, though, as with Maine, these numbers have been in decline (Table 30). Point Judith, the largest groundfish port in Rhode Island, experienced a decline in groundfish revenue from $1.34 million in 2016 to $0.19 million in 2020. The number of vessels taking at least one groundfish trip also declined over the same time period from 43 vessels in 2016, down to 23 vessels in 2020.

Connecticut (Table 31) and New York (Table 32) generally have limited participation in the groundfish fishery, with combined annual groundfish revenues between these two states equaling <$1.0 million over the 2016-2020 period. Connecticut's five-year high in revenues occurred in 2018 ($0.4 million), while New York's occurred in 2016 ($0.31 million). New York does contain two ports, Hampton Bays and Montauk, that are considered highly engaged in the groundfish fishery. Hampton Bays had at least 7 vessels take at least one groundfish trip, on an annual basis, over the last five years. Montauk has had at least 11 vessels each year, with a high of 20 vessels in 2016.

Finally, groundfish landings and revenue from groundfish trips in other port areas south of New York, from New Jersey to North Carolina, has been minimal (Table 32-Table 33).

Over the last five years, these areas have not exceeded $10,000 in groundfish revenue in any year. For many groundfish trips in these Mid-Atlantic states, landing non-groundfish is more common, with annual non-groundfish revenue ranging from $0.45 million in 2020 to $2.25 million in 2016.

Table 27- Massachusetts Communities. Highly engaged communities separated, when data confidentiality allows. Landings and revenue represents total groundfish and non-groundfish revenue landed on groundfish trips, by dealer location (Millions of pounds/millions of $2020).

Dealer Sale Port/State	Metric	2016	2017	2018	2019	2020
BOSTON	GF Revenue	9.05	10.68	12.6	12.02	13.28
	GF Landings	6.37	9.23	12.9	11.63	11.84
	Dealers	3	3	4	4	3
	Trips	367	425	461	508	714
	Vessels	20	19	21	22	21
	NGF Revenue	2.52	2.72	2.7	2.44	2.04
	NGF Landings	0.94	1.23	1.24	1.41	1.39
CHATHAM	GF Revenue	0.24	0.49	0.38	0.29	0.13
	GF Landings	0.1	0.2	0.17	0.15	0.06
	Dealers	8	9	6	8	9
	Trips	1,488	1,501	1,780	1,388	1,588
	Vessels	25	29	27	26	24
	NGF Revenue	3.53	3.49	4.36	2.94	3.57
	NGF Landings	8.42	8.21	8.33	6.31	8.53
GLOUCESTER	GF Revenue	18.64	18.23	18.82	19.04	18.23
	GF Landings	14.69	17.38	19.34	19.47	17.57
	Dealers	26	30	35	30	18
	Trips	1,692	1,852	1,950	2,060	2,093
	Vessels	67	65	63	60	58
	NGF Revenue	4.97	5.36	4.54	3.91	3.78
	NGF Landings	2.32	2.7	2.02	2.39	1.7
OTHER MA	GF Revenue	0.19	0.52	0.3	0.44	0.24
	GF Landings	0.08	0.21	0.14	0.2	0.1
	Dealers	22	20	19	21	11

Dealer Sale Port/State	Metric	2016	2017	2018	2019	2020
	Trips	336	339	340	374	331
	Vessels	49	40	30	33	27
	NGF Revenue	1.39	0.9	1.24	0.99	1.1
	NGF Landings	0.75	0.27	0.6	0.71	0.86
NEW BEDFORD	GF Revenue	16.87	11.75	12.06	12.13	19.18
	GF Landings	9.26	7.07	7.95	8.73	19.01
	Dealers	21	24	19	20	15
	Trips	1,002	757	471	561	730
	Vessels	59	52	28	32	38
	NGF Revenue	7.46	5.35	4.45	3.79	5.06
	NGF Landings	3.71	3.51	2.41	2.64	2.93
SCITUATE	GF Revenue	0.77	0.73	0.76	0.59	0.07
	GF Landings	0.29	0.32	0.4	0.37	0.05
	Dealers	9	9	8	10	12
	Trips	368	388	406	457	178
	Vessels	10	6	11	10	7
	NGF Revenue	0.55	0.57	0.45	0.46	0.24
	NGF Landings	0.38	0.25	0.21	0.24	0.15
MA TOTAL	GF Revenue	45.76	42.4	44.92	44.51	51.13
	GF Landings	30.79	34.41	40.9	40.55	48.63
	Dealers	89	95	91	93	68
	Trips	5,253	5,262	5,408	5,348	5,634
	Vessels	220	205	169	173	168
	NGF Revenue	20.42	18.39	17.74	14.53	15.79
	NGF Landings	16.52	16.17	14.81	13.7	15.56

Source: GARFO DMIS data. Accessed November 2021.

Table 28- Maine Communities. Highly engaged communities separated, when data confidentiality allows. Landings and revenue represents total groundfish and non-groundfish revenue landed on groundfish trips, by dealer location (Millions of pounds/millions of $2020).

Dealer Sale Port/State	Metric	2016	2017	2018	2019	2020
OTHER ME	GF Revenue	0.54	0.54	0.74	0.39	0.1
	GF Landings	0.2	0.21	0.34	0.22	0.05
	Dealers	11	12	10	8	9
	Trips	158	173	226	158	79
	Vessels	9	11	8	10	9
	NGF Revenue	0.07	0.1	0.14	0.11	0.08
OTHER ME	NGF Landings	0.02	0.04	0.06	0.06	0.04
PORTLAND	GF Revenue	4.08	3.17	2.93	2.16	1.56
	GF Landings	1.91	1.86	1.97	1.29	0.99
	Dealers	5	7	7	8	4
	Trips	367	400	425	422	225
	Vessels	28	23	29	25	26
	NGF Revenue	0.49	0.67	0.61	0.68	0.28
	NGF Landings	0.22	0.41	0.42	0.58	0.23
ME TOTAL	GF Revenue	4.62	3.71	3.67	2.55	1.66
	GF Landings	2.11	2.07	2.31	1.51	1.04
	Dealers	16	19	17	16	13
	Trips	525	573	651	580	304
	Vessels	37	34	37	35	35
	NGF Revenue	0.56	0.77	0.75	0.79	0.36
	NGF Landings	0.24	0.45	0.48	0.64	0.27

Source: GARFO DMIS data. Accessed November 2021.

Table 29- New Hampshire Communities. Highly engaged communities separated, when data confidentiality allows. Landings and revenue represents total groundfish and non-groundfish revenue landed on groundfish trips, by dealer location (Millions of pounds/millions of $2020).

Dealer Sale Port/State	Metric	2016	2017	2018	2019	2020
NH	GF Revenue	0.73	0.73	0.99	0.87	1.25
	GF Landings	0.29	0.32	0.51	0.46	0.8
	Dealers	11	13	13	10	12
	Trips	487	554	641	600	695
	Vessels	16	17	18	17	15
	NGF Revenue	0.5	0.65	0.71	0.66	0.43
	NGF Landings	0.83	0.86	0.84	1.05	0.83

Source: GARFO DMIS data. Accessed November 2021.

Table 30- Rhode Island Communities. Highly engaged communities separated, when data confidentiality allows. Landings and revenue represents total groundfish and non-groundfish revenue landed on groundfish trips, by dealer location (Millions of pounds/millions of $2020).

Dealer Sale Port/State	Metric	2016	2017	2018	2019	2020
POINT JUDITH	GF Revenue	1.34	0.99	0.67	0.35	0.19
	GF Landings	0.43	0.33	0.28	0.11	0.1
	Dealers	19	14	15	14	13
	Trips	828	785	772	667	615
	Vessels	43	35	31	24	23
	NGF Revenue	1.56	1.26	1.38	1.29	1.39
	NGF Landings	3.47	4.87	4.58	4	3.7
OTHER RI	GF Revenue	0.01	<0.01	0.02	0.01	<0.01
	GF Landings	<0.01	<0.01	0.01	<0.01	<0.01
	Dealers	4	5	7	5	6
	Trips	58	35	42	38	47
	Vessels	3	3	9	5	5
	NGF Revenue	0.16	0.12	0.08	0.12	0.17
	NGF Landings	0.21	0.12	0.16	0.31	0.68

Source: GARFO DMIS data. Accessed November 2021.

Table 31- Connecticut Communities. Highly engaged communities separated, when data confidentiality allows. Landings and revenue represents total groundfish and non-groundfish revenue landed on groundfish trips, by dealer location (Millions of pounds/millions of $2020).

Dealer Sale Port/State	Metric	2016	2017	2018	2019	2020
CT	GF Revenue	0.21	0.14	0.4	0.1	0.1
	GF Landings	0.08	0.05	0.23	0.04	0.07
	Dealers	13	11	12	12	10
	Trips	196	162	186	140	187
	Vessels	14	11	10	12	9
	NGF Revenue	0.56	0.43	0.59	0.48	0.48
	NGF Landings	1.77	1.19	1.21	0.84	1.03

Source: GARFO DMIS data. Accessed November 2021.

Table 32- New York Communities. Highly engaged communities separated, when data confidentiality allows. Landings and revenue represents total groundfish and non-groundfish revenue landed on groundfish trips, by dealer location (Millions of pounds/millions of $2020).

Dealer Sale Port/State	Metric	2016	2017	2018	2019	2020
HAMPTON BAYS	GF Revenue	0.11	0.05	0.02	<0.01	<0.01
	GF Landings	0.04	0.02	0.01	<0.01	<0.01
	Dealers	13	12	10	13	13
	Trips	210	255	222	142	242
	Vessels	9	9	8	7	8
	NGF Revenue	0.63	0.81	0.69	0.47	0.89
	NGF Landings	0.16	0.14	0.11	0.07	0.12
MONTAUK	GF Revenue	0.2	0.06	0.01	0.01	0.01
	GF Landings	0.06	0.02	<0.01	<0.01	<0.01
	Dealers	17	14	14	16	9
	Trips	153	84	92	79	81
	Vessels	20	16	11	12	12
	NGF Revenue	0.22	0.15	0.16	0.16	0.13
	NGF Landings	0.14	0.09	0.17	0.12	0.12
OTHER NY	GF Revenue	<0.01	<0.01	0	0	<0.01
	GF Landings	<0.01	<0.01	0	0	<0.01
	Dealers	C	C	ND	C	C
	Trips	C	3	ND	8	8
	Vessels	C	C	ND	C	C
	NGF Revenue	0.01	<0.01	0	<0.01	<0.01
	NGF Landings	<0.01	<0.01	0	<0.01	<0.01
NY TOTAL	GF Revenue	0.31	0.11	0.03	0.01	0.01
	GF Landings	0.1	0.04	0.01	<0.01	<0.01
	Dealers	32	28	24	30	23
	Trips	365	342	314	229	331
	Vessels	31	27	19	20	21
	NGF Revenue	0.86	0.96	0.85	0.63	1.02
	NGF Landings	0.3	0.23	0.28	0.19	0.24

"c" indicates confidential data while "ND" represents no data were available for a given year/location.
Source: GARFO DMIS data. Accessed November 2021.

Table 33- New Jersey/North Carolina/Virginia Communities. Highly engaged communities separated, when data confidentiality allows. Landings and revenue represents total groundfish and non-groundfish revenue landed on groundfish trips, by dealer location (Millions of pounds/millions of $2020).

Dealer Sale Port/State	Metric	2016	2017	2018	2019	2020
NJ/NC/VA	GF Revenue	0.01	0	0.01	0	0
	GF Landings	0	0	0	0	0
	Dealers	20	18	28	17	8
	Trips	41	30	35	14	13
	Vessels	23	18	18	8	8
	NGF Revenue	2.25	2.61	1.11	0.84	0.45
	NGF Landings	0.68	0.76	0.4	0.42	0.2

Source: GARFO DMIS data. Accessed November 2021.

5.7.7.1 Community Fishing Engagement and Social Vulnerability Indicators

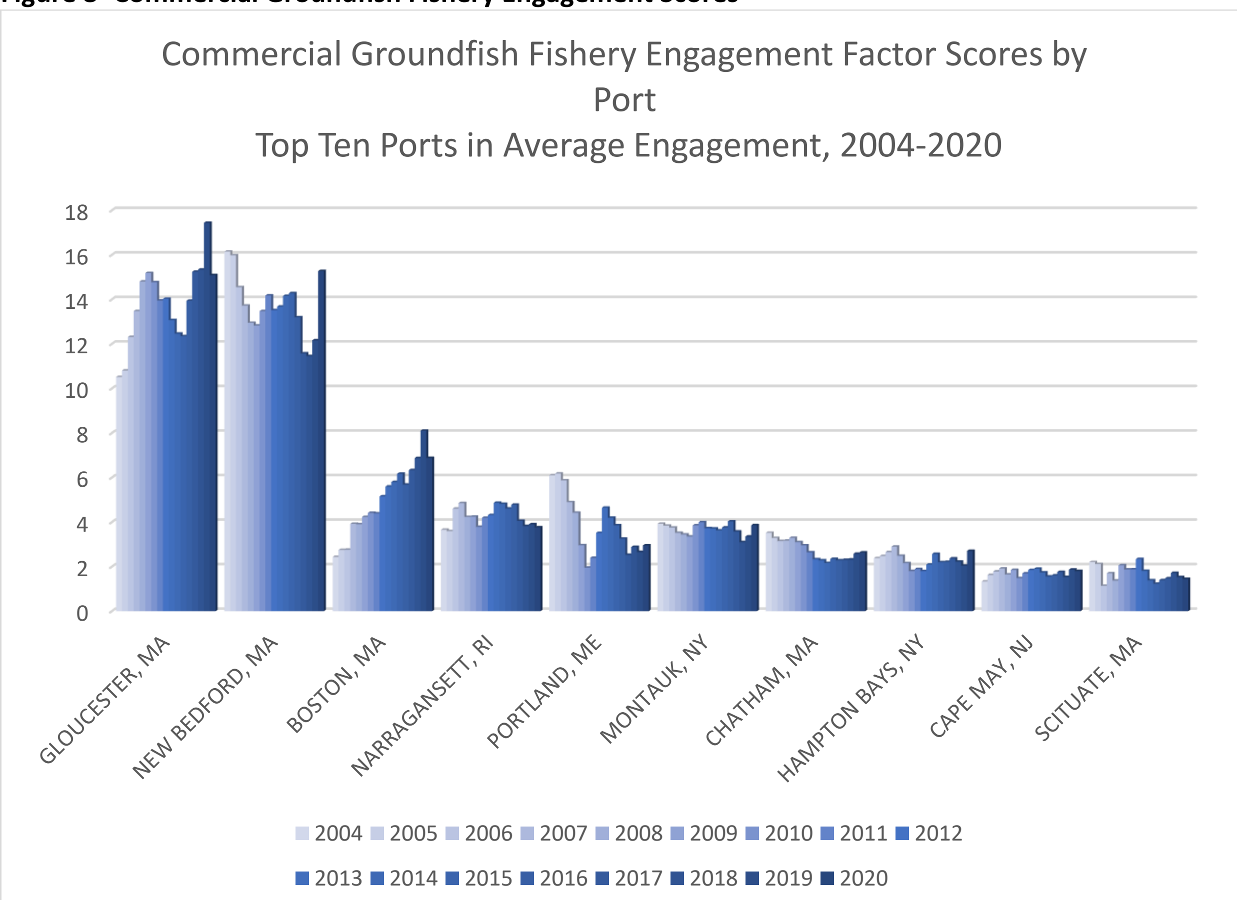
In addition to primary and secondary port classifications for groundfish landings and revenue, fishing communities can also be understood in terms of overall engagement in the commercial groundfish fishery and other social and economic community conditions. NOAA Fisheries social scientists produce indicators of commercial fishing engagement, reliance, and other community characteristics for virtually all fishing communities throughout United States, referred to as the Social Indicators of Fishing Community Vulnerability and Resilience (Colburn and Jepson 2012). The Social Indicators are composite indices of factors that comprise community-level latent constructs, such as commercial fishing engagement or social vulnerability. The strength of these indicators is that they provide greater depth and contextualization to our understanding of fishing communities than the more commonly utilized landings and revenue statistics. The Social Indicators provide a more comprehensive view of fishing communities by including social and economic conditions that can influence the viability of commercial fishing activities, such as gentrification pressure, poverty, and housing characteristics, among other factors.

5.7.7.1.1 2004-2020 Groundfish-Specific Commercial Engagement

The Groundfish-Specific Engagement Indicator is a numerical index that reflect the level of a community's engagement in the groundfish fishery relative to other communities in the Northeast. This index was generated using a principal components factor analysis (PCFA) of variables related to groundfish fishing activity from NOAA Fisheries regional datasets. PCFA is a common statistical technique used to identify factors that are related, yet linearly independent, and likely represent a latent or unobservable concept when considered together, such as factors that contribute to the level of a community's social vulnerability or engagement in commercial fishing. The variables that were identified to best reflect community engagement in the groundfish fishery were the value of groundfish landings (in dollars), the groundfish pounds landed, the number of federally permitted dealers that purchased at least one pound of groundfish, and the number of vessels with at least one category of large mesh groundfish permit (multiple permits on one vessel in a given year are not double counted). It should be noted that a high engagement score does not necessarily mean that a community or its fishery participants are solely dependent upon commercial groundfish fishing activities. There may be other commercial fishing or economic activities that may sustain the livelihoods of individuals or entities within these communities that have relied on groundfish historically.

Figure 8 displays the factor scores for the Groundfish-Specific Commercial Engagement Indicator for the ten communities that have the highest average commercial engagement with groundfish between 2004 and 2020. The index factor scores are commonly categorized from low to high based on the number of standard deviations from the mean, which is set at zero. Categories rank from 0.00 or below as "low", 0.00 – 0.49 as "medium," and 0.50 – 0.99 as "medium-high," and 1 standard deviation or above as "high." All of the ports displayed in Figure 8 have "high" commercial groundfish engagement, but New Bedford and Gloucester have had dramatically higher levels of engagement in commercial groundfish than other highly engaged ports over the last seventeen years. These two communities had more than twice the level of engagement in commercial groundfish than the third most highly engaged community, Boston, MA. The remaining seven highly engaged communities included, in order of their levels of engagement: Narragansett/Point Judith, RI, Portland, ME, Montauk, NY, Chatham, MA, Hampton Bays/Shinnecock, NY, Scituate, MA, and Cape May, NJ. Most of these communities have fluctuated in engagement over time, but New Bedford, Portland, and Chatham have displayed a clear trend of declining engagement over the fifteen-year period from 2004 to 2020. Boston has been the only community with a clear trend of increasing engagement over this period.

Figure 8- Commercial Groundfish Fishery Engagement Scores



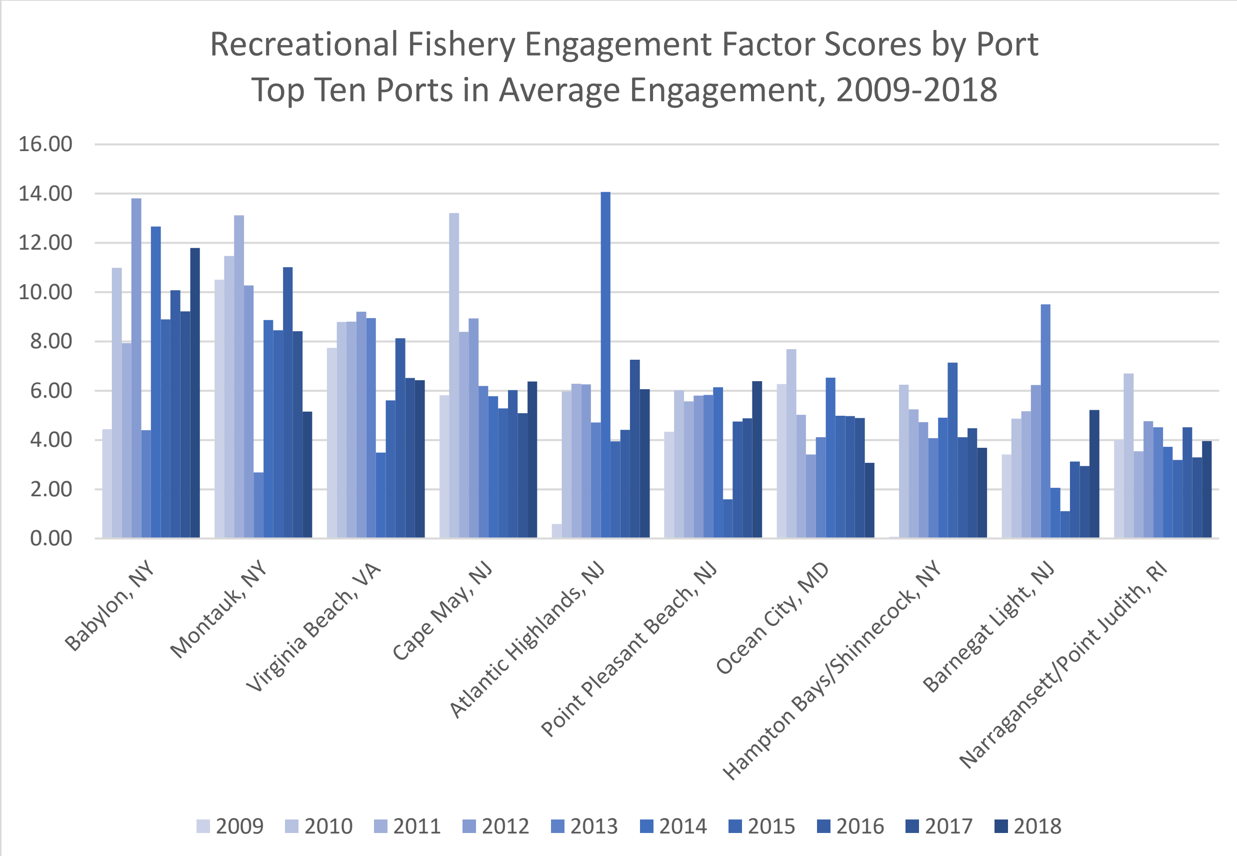
5.7.7.1.2 **2009-2018 Recreational Engagement**

The Recreational Engagement Indicator is a numerical index that reflects the level of a community's engagement in all recreational fisheries relative to other communities in the Northeast. Similar to the commercial engagement indicator, the recreational indicator was calculated using PCFA. The recreational indicator, however, uses variables relating to recreational fishing activity for all recreational fisheries in the Northeast region from the NOAA Marine Recreational Information Program (MRIP) site survey for recreational fishing, and therefore are not specific to the groundfish fishery. Estimates of fishing pressure by mode were used in order to derive a recreational engagement index. Fishing mode refers to the type of recreational activity, such as charter/party boats or shore fishing. MRIP survey sites are associated with the community they fall within and site estimates for all modes were summed for each community in order to derive a community-level estimate of recreational fishing engagement.

Figure 9 displays recreational engagement factor scores by year for the ten communities that have the highest average engagement across all recreational fisheries for the period of 2009 to 2018. The index factor scores are commonly categorized from low to high based on the number of standard deviations from the mean, which is set at zero. Categories rank from 0.00 or below as "low", 0.00 – 0.49 as "medium," and 0.50 – 0.99 as "medium-high," and 1 standard deviation or above as "high." While all of the communities in Figure 9 have had high average engagement in recreational fisheries over the ten year period, there has been considerable annual variability in the index scores. For example, Atlantic Highlands, NJ, boasted the highest individual year score among these communities in 2013, but for all other years in the time series this community has had more modest recreational engagement relative to other communities and falls in the middle of the pack overall in terms of the ten-year average. The other communities among the top ten in average engagement include Babylon, NY, Montauk, NY, Virginia Beach, VA, Cape May, NJ, Point Pleasant Beach, NJ, Ocean City, MD, Hampton Bays/Shinnecock, NY, Barnegat Light, NJ, and Narragansett/Point Judith, RI. Most of the top communities in recreational engagement in the Northeast are in the Mid-Atlantic region, except for Narragansett/Point Judith, RI. Recreational fishermen in these communities are unlikely to rely on Northeast Multispecies, though some fishermen in these ports may seasonally target GB cod.

When expanding out to the top 20 communities in recreational engagement in the Northeast, several additional New England communities are included: Newburyport, MA and Barnstable, MA, which have each seen increased recreational engagement in recent years (not shown in Figure 9). Other ports of interest with relatively high engagement (i.e., ranking somewhere outside the top 20) in the last five years include Gloucester, MA, Waterford, CT, East Lyme/Niantic, CT, and Old Saybrook, CT.

Figure 9- Recreational Fishery Engagement Scores



5.7.7.1.3 **2012-2016 Community Social Vulnerability and Gentrification Pressure Indicators**

The Community Social Vulnerability Indicators include indices of labor force structure, housing characteristics, poverty, population composition, and personal disruption. The labor force structure index measures the makeup of the labor force and is reversed scored so that a higher factor score represents fewer employment opportunities and greater labor force vulnerability. The housing characteristics index measures vulnerability related to infrastructure and home and rental values. It is also reversed score so that a higher score represents more vulnerable housing infrastructure. The poverty index captures multiple different factors that contribute to an overall level of poverty in a given area. A higher poverty index score would indicate a greater level of vulnerability due to a higher proportion of residents receiving public assistance and below federal poverty limits. The population composition index measures the presence of vulnerable populations (i.e., children, racial/ethnic minorities, and/or single-parent, female-headed households) and a higher score would indicate that a community's population is composed of more vulnerable individuals. Finally, the personal disruption index considers variables that affect individual-level vulnerability primarily and include factors such as low individual-level educational attainment or unemployment. Higher scores of personal disruption likely indicate greater levels of individual vulnerability within a community, which can in turn impact the overall level of community social vulnerability.

Gentrification Pressure Indicators include housing disruption, urban sprawl, and retiree migration. The Housing Disruption Index combines factors that correspond to unstable or shifting housing markets in which home values and rental prices may cause residents to become displaced. The Urban Sprawl Index indicates the extent of population increase due to migration from urban centers to suburban and rural areas, which often results in cost of living increases and gentrification in the destination communities. The Retiree Migration Index characterizes communities by the concentration of retirees or individuals above retirement age whose presence often raises the home values and rental rates, as well as increase the need for health care and other services.

Data used to develop these indices come from multiple secondary data sources, but primarily the U.S. Census American Community Survey (ACS) at the place level (Census Designated Place (CDP) and Minor Civil Division (MCD)). More information about the data sources, methods, and other background details can be found online at https://www.st.nmfs.noaa.gov/humandimensions/social-indicators/.

Table 34- Community Social Vulnerability Indicator Categorical Scores

Community	Total Population	Poverty	Labor Force	Housing Characteristics	Population Composition	Personal Disruption
New Bedford, MA	94,988	High	Low	Med-High	Med-High	Med-High
Gloucester, MA	29,546	Low	Low	Medium	Low	Low
Boston, MA	658,279	Med-High	Low	Low	Med-High	Medium
Narragansett, RI	15,672	Low	Medium	Low	Low	Low
Portland, ME	66,649	Med-High	Low	Medium	Low	Low
Montauk, NY	3,510	Low	Medium	Low	Low	Low
Chatham, MA	1,429	Medium	Med-High	Medium	Low	Low
Hampton Bays, NY	13,040	Low	Low	Low	Low	Low
Scituate, MA	18,390	Low	Low	Low	Low	Low
Cape May, NJ	3,529	Low	High	Medium	Low	Low

Table 35- Community Gentrification Pressure Indicator Categorical Scores

Community	Housing Disruption	Retiree Migration	Urban Sprawl
New Bedford, MA	Medium	Low	Med-High
Gloucester, MA	Medium	Low	Medium
Boston, MA	Med-High	Low	High
Narragansett, RI	Med-High	Medium	Low
Portland, ME	Med-High	Low	Medium
Montauk, NY	High	Med-High	Med-High
Chatham, MA	Medium	High	Medium
Hampton Bays, NY	High	Medium	Med-High
Scituate, MA	Med-High	Low	Med-High
Cape May, NJ	High	High	Low

5.7.7.2 Employment

Throughout the Northeast, many communities benefit indirectly from the multispecies fishery, but these benefits are often difficult to attribute. The direct benefit from employment in the fishery can be estimated by the number of crew positions. However, crew positions do not equate to the number of jobs in the fishery and do not make the distinction between full and part-time positions. Crew positions here are measured as the average number of crew taken by each limited access permitted groundfish vessel on declared groundfish trips by fishing year, multiplied by the number of active groundfish vessels. During the 2020 fishing year, vessels with limited access groundfish permits, on declared groundfish trips, provided 702 crew positions, with 62% of these positions coming from trips landing in Massachusetts (Table 36). Over the 2016-2020 period, the total number of crew positions in the groundfish fishery has reduced by 20%.

A crew day[28] is a measure of employment that incorporates information about the time spent at sea earning a share of the revenue. Conversely, crew days can be viewed as an indicator of time invested in the pursuit of "crew share" (the share of trip revenues received at the end of a trip). The time spent at sea has an opportunity cost. For example, if crew earnings remain constant, a decline in crew days would reveal a benefit to crew in that less time was forgone for the same amount of earnings. During the 2020 fishing year, vessels with limited access groundfish permits, on declared groundfish trips, used 44,014 crew days, with 88% coming from trips landing in Massachusetts (Table 36). Over the 2016-2020 period, the total number of crew days in the groundfish fishery has reduced by 6%. The number of crew positions and crew days give some indication of the direct benefit to communities from the multispecies fishery through employment. But these measures, by themselves, do not show the benefit or lack thereof at the individual level. Many groundfish captains and crew are second- or third-generation fishermen who hope to pass the tradition on to their children. This occupational transfer is an important component of community continuity as fishing represents a valued occupation in many of the smaller port areas.

[28] Similar to a "man-hour," a "crew day" is calculated by multiplying a vessel's crew size by the days absent from port. Since the number of trips affects the crew-days indicator, the indicator is also a measure of work opportunity.

Table 36- Number of crew positions and crew days on active groundfish vessels by state of landing (dealer state) and fishing year.

		2016	2017	2018	2019	2020
CT	positions	33	28	26	30	24
	days	527	368	772	420	440
MA	positions	477	470	407	409	432
	days	38,634	35,802	32,827	34,140	38,586
ME	positions	97	90	103	88	81
	days	4,680	3,853	3,174	2,804	2,041
NH	positions	31	38	40	39	29
	days	611	864	1,165	1,030	1,031
NY	positions	62	51	44	43	45
	days	405	378	482	362	627
RI	positions	118	103	98	61	66
	days	1,486	1,356	1,292	993	1,151
Other	positions	55	61	53	26	25
	days	512	306	212	225	140
Total	**Total crew positions**	874	841	770	696	702
	Total crew days	46,855	42,925	39,923	39,975	44,014

Source: GARFO DMIS tables. Accessed January 2022.

5.7.8 **Consolidation and Redirection**

The multiple regulatory constraints placed on common pool groundfish fishermen are intended to control their effort and catch per unit effort (CPUE) as a means to limit mortality. Exemptions from many of these controls, which have been granted to sectors, may increase the CPUE of sector participants. As a result, sector fishermen may have additional time that they could direct towards non-groundfish stocks, resulting in redirection of effort into other fisheries. Additionally, to maximize efficiency, fishermen within a single sector may be more likely to allocate fishing efforts such that some vessels do not fish at all. This is referred to as fleet consolidation.

Both redirection and consolidation have been observed when management regimes for fisheries outside the Northeast US shifted toward a catch share management regime such as sectors. For example, research following the rationalization of the halibut and sablefish fisheries by the North Pacific Fishery Management Council found individuals who received enough quota shares were able to continue fishing with less competition, greater economic certainty, and over a longer fishing season (Matulich & Clark 2001). However, individuals who did not receive enough of a catch share either bought or leased catch shares from other fishermen or sold their quota. Similarly, one year after implementation of the Bering Sea-Aleutian Island crab fishery Individual Transferable Quota (ITQ), a study found that about half of the vessels that fished the 2004/2005 Bering Sea Snow Crab fishery did not fish the following year. However, research on the ITQ plan for the British Columbia halibut fishery found efficiency gains were greatest during the first round of consolidation, and little incentive to increase efficiency (or continue consolidation) existed afterward (Pinkerton & Edwards 2009).

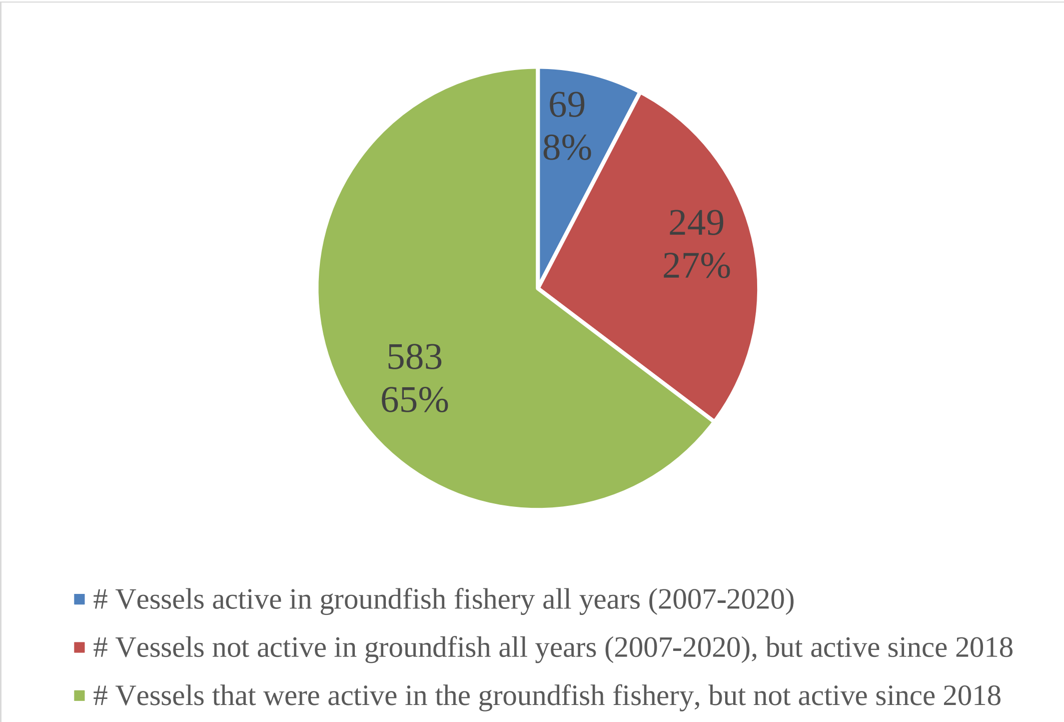
Table 37 shows the change in participation in the groundfish fishery over time. All years in the time series show a decline in the number of active vessels, relative to the previous year. Entry is defined as a vessel being active in a given year, after being inactive in the previous year. Similarly, exit is defined as a vessel being inactive in a given year, after being active in the previous year. Figure 10 provides a breakdown of vessel-level activity over the course of the full time series. A total of 69 vessels were active in the groundfish fishery every year, while 253 vessels have been intermittently active, but have been active in at least one recent fishing year (2018-2020). A total of 583 vessels were active in some point in the time series, but have not been active in recent fishing years (2018-2020). Among those 583 vessels that have not been active in the groundfish fishery in recent years, 345 vessels continued to fish commercially for other (non-groundfish) species in subsequent years. Table 38 shows the highest revenue-generating fisheries for these 345 vessels after they stopped participating in the groundfish fishery. Importantly, the participation in other fisheries outside of groundfish varies greatly among these vessels.

Table 37- Change in participation in the groundfish fishery, fishing years 2007-2020. Participation is defined as taking at least one declared groundfish trip in which >0 lbs. of groundfish were landed.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
# Active	620	571	527	393	374	362	311	278	270	261	243	223	203	200
Entry		58	60	38	60	55	31	34	47	46	37	38	29	33
Exit		107	104	172	79	67	82	67	55	55	55	58	49	36
Change		*-49*	*-44*	*-134*	*-19*	*-12*	*-51*	*-33*	*-8*	*-9*	*-18*	*-20*	*-20*	*-3*

Source: GARFO DMIS tables. Accessed January 2022.

Figure 10- Activity of vessels that have been active in the groundfish fishery, for at least one fishing year, 2007-2020.



Source: GARFO DMIS tables. Accessed January 2022.

Table 38- Distribution of fishery revenue for vessels that had been active in the groundfish fishery, but have not been active since 2018 (583 vessels). Revenue includes all years following the most recent year in which the vessel was active in the groundfish fishery.

Fishery	% Revenue
Sea Scallop	34.0%
Squid/Mackerel/Butterfish	21.8%
Summer Flounder/Scup/Black Sea Bass	13.8%
American Lobster	11.5%
Shrimp	4.4%
Whiting	3.6%
Monkfish	1.9%
Other	9.0%

Source: GARFO DMIS tables. Accessed January 2022

5.7.9 Regulated Groundfish Stock Catch

The Northeast Multispecies FMP specifies Annual Catch Limits (ACLs) for 20 stocks. Exceeding an ACL for a stock results in the implementation of Accountability Measures (AMs) to prevent overfishing.

The ACL is sub-divided into different components. Those components that are subject to AMs are referred to as sub-ACLs. There are also components of the fishery that are not subject to AMs. These include state waters catches that are outside of federal jurisdiction, and a category referred to as "other sub-components" that combines small catches from various fisheries. Table 39 - Table 41 in this section summarize the most recent completed fishing year (2020) catches.

Table 39- FY2020 Northeast Multispecies Percent of Annual Catch Limit Caught (%)

Stock	Components with ACLs and sub-ACLs: With Accountability Measures (AMs)								Sub-components: No AMs	
	Total	Groundfish Fishery	Sector	Common Pool	Recreational	Midwater Trawl Herring Fishery	Scallop Fishery	Small Mesh Fisheries	State Water	Other
	A to H	A+B+C	A	B	C	D	E	F	G	H
GB Cod	59.3	39.6	40.5	10.6					776.1	111.6
GOM Cod	81.5	87.3	83.2	36.4	95.3				31.4	29.9
GB Haddock	5.2	5.3	5.4	0.0		0.4			NA	1.9
GOM Haddock	28.6	28.8	34.2	11.9	19.4	0.0			79.5	9.8
GB Yellowtail Flounder	8.3	6.7	6.9	-			7.9	82.2	NA	NA
SNE Yellowtail Flounder	15.6	6.2	6.9	2.9			31.1		NA	39.8
CC/GOM Yellowtail Flounder	31.2	27.5	27.8	21.2					56.8	58.4
Plaice	21.0	20.4	20.7	10.4					32.5	57.9
Witch Flounder	66.8	68.2	70.0	4.0					41.1	55.3
GB Winter Flounder	56.6	55.5	57.8	-					NA	83.6
GOM Winter Flounder	25.6	20.8	20.3	30.0					33.3	69.4
SNE/MA Winter Flounder	33.4	19.2	20.5	9.1					28.7	96.7
Redfish	59.2	59.8	60.5	0.3					3.4	1.6
White Hake	90.2	90.2	91.3	1.1					4.1	174.9
Pollock	21.5	16.4	16.6	0.5					114.6	39.2
Northern Windowpane	107.2	26.9	NA	NA			290.0		6.0	277.5
Southern Windowpane	81.5	51.2	NA	NA			60.2		51.8	107.9
Ocean Pout	46.2	21.9	NA	NA					43.3	129.0
Halibut	64.6	67.5	NA	NA					60.9	27.7
Wolffish	1.3	1.2	NA	NA					2.0	4.9

Source: NMFS Greater Atlantic Regional Fisheries Office, November 15, 2021, run date of September 15, 2021.

Table 40- FY 2020 Northeast Multispecies Total Catch (mt)

Stock	**Total Catch**	Groundfish Fishery	Sector	Common Pool	Recreational	Midwater Trawl Herring Fishery	Scallop Fishery[1]	Small Mesh Fisheries	State Water	Other
	A to H	A+B+C	A	B	C	D	E	F	G	H
GB Cod	731.2	425.3	421.9	3.3					147.5	158.5
GOM Cod	426.2	409.0	221.8	3.2	184.0				15.1	2.1
GB Haddock	6513.3	6489.4	6488.7	0.6		10.0			1.3	12.6
GOM Haddock	5320.5	5262.4	4023.9	36.2	1202.3	0.1			51.7	6.4
GB Yellowtail Flounder	9.7	6.4	6.4	-			1.5	1.8	-	0.0
SNE/MA Yellowtail Flounder	3.3	1.0	0.9	0.1			0.6		0.1	1.6
CC/GOM Yellowtail Flounder	245.8	188.9	182.2	6.7					33.0	24.0
Plaice	629.3	600.4	592.3	8.1					10.4	18.5
Witch Flounder	944.9	894.2	892.7	1.4					18.1	32.7
GB Winter Flounder	308.3	289.9	289.9	-					-	18.4
GOM Winter Flounder	110.8	59.6	55.3	4.3					46.3	4.9
SNE/MA Winter Flounder	233.4	103.2	97.4	5.8					10.3	119.9
Redfish	6715.1	6712.1	6711.6	0.5					2.0	0.9
White Hake	1840.3	1820.6	1820.3	0.3					0.5	19.2
Pollock	5626.6	3937.2	3936.1	1.1					1258.7	430.8
Northern Windowpane	58.97	10.2	10.2	0.0			34.8		0.1	13.9
Southern Windowpane	335.6	24.6	22.3	2.3			86.0		13.5	211.5
Ocean Pout	55.4	20.1	20.0	0.2					0.4	34.8
Halibut	65.8	51.9	49.4	2.6					12.8	1.1
Wolffish	1.1	1.0	1.0	0.0					0.0	0.0

[1] Based on scallop fishing year April 2020 through March 2021
Values in metric tons of live weight
Sector and common pool include estimate of missing dealer reports
Source: NMFS Greater Atlantic Regional Fisheries Office, November 15, 2021, run date of September 15, 2021.

Any value for a non-allocated species may include landings of that stock or misreporting of species and/or stock area. These are northern windowpane, southern windowpane, ocean pout, halibut, and wolffish.

Table 41- FY2020 Northeast Multispecies Other Sub-Component Catch Detail (mt)

Stock	Total	SCALLOP[1]	FLUKE	HAGFISH	HERRING	LOBSTER/ CRAB[2]	MACKEREL	MENHADEN	MONKFISH	REDCRAB	RESEARCH
GB Cod	158.5	3.2	0.1	-	0.0	0.3	0.0	-	0.1	-	0.5
GOM Cod	2.1	0.3	-	-	0.0	-	0.0	-	-	-	1.1
GB Haddock	12.6	4.6	0.3	-	0.0*	-	0.1	-	0.0	-	2.2
GOM Haddock	6.4	-	0.0	-	0.9*	-	0.0	-	-	-	1.1
GB Yellowtail Flounder	0.0	-*	-	-	-*	-	-	-	-	-	-
SNE Yellowtail Flounder	1.6	-*	0.2	-	0.0	-	0.0	-	0.0	-	0.0
CC/GOM Yellowtail Flounder	24.0	8.8	0.0	-	1.0	-	-	-	0.0	-	2.2
American Plaice	18.5	8.2	0.2	-	0.1	-	0.2	-	0.0	-	1.8
Witch Flounder	32.7	15.2	1.3	0.0	0.1	-	0.3	-	0.0	0.0	0.4
GB Winter Flounder	18.4	18.4	-	-	0.0	-	-	-	-	-	-
GOM Winter Flounder	4.9	3.2	0.0	-	0.1	-	-	-	-	-	0.0
SNE Winter Flounder	119.9	34.6	6.3	-	0.4	0.0	1.6	0.0	0.1	-	0.1
Redfish	0.9	0.0	0.1	-	0.0	-	0.0	-	-	-	0.0
White Hake	19.2	1.5	0.2	0.0	0.1	0.0	0.4	-	0.0	0.0	0.8
Pollock	430.8	-	0.0	-	0.0	-	0.0	-	0.0	-	0.1
Northern Windowpane	13.9	-*	0.0	-	0.3	-	0.0	-	0.0	-	-
Southern Windowpane	211.5	-*	44.6	-	0.5	-	1.9	0.0	0.4	-	0.0
Ocean Pout	34.8	2.5	0.2	-	0.3	-	0.7	-	0.0	-	0.0
Halibut	1.1	0.3	-	-	-	0.5	-	-	0.0	-	0.0
Wolffish	0.0	0.0	0.0	-	-	-	0.0	-	-	-	-

¹ Based on scallop fishing year April 2020 through March 2021

² Landings only. Discard estimates not applicable. Lobster/crab discards were not attributed to the ACL, consistent with the most recent assessments for these stocks used to set the respective quotas.

*Some or all catch attributed to separate sub-ACL, and so is not included above.

Values in metric tons of live weight

Source: NMFS Greater Atlantic Regional Fisheries Office, November 15, 2021, run date of Oct. 27, 2021.

Table 41 Continued.

Stock	Total	SCUP	SHRIMP	SQUID	SQUID/ WHITING	SURFCLAM	WHELK/ CONCH	WHITING	UNCATEGORIZED	RECREATIONAL
GB Cod	158.5	0.0	0.0	0.9	0.1	0.0	-	0.0	0.7	152.6
GOM Cod	2.1	-	-	-	0.0	0.0	0.0	-	0.6	-*
GB Haddock	12.6	0.2	0.0	4.2	0.4	0.1	-	0.0	0.5	
GOM Haddock	6.4	-	-	-	1.0	0.8	0.0	-	2.5	-*
GB Yellowtail Flounder	0.0	-	-*	0.0*	0.0	-	-	-	0.0*	
SNE Yellowtail Flounder	1.6	0.1	0.0	1.0	0.1	0.0	-	0.0	0.2	
CC/GOM Yellowtail Flounder	24.0	-	-	1.3	8.4	0.9	-	-	1.3	
American Plaice	18.5	0.2	0.0	6.0	0.7	0.2	0.0	0.0	0.9	
Witch Flounder	32.7	0.7	0.1	11.4	1.1	0.5	0.0	0.0	1.5	
GB Winter Flounder	18.4	-	-	0.0	0.0	-	-	-	0.0	
GOM Winter Flounder	4.9	-	-	-	0.1	0.1	0.0	-	0.9	0.4
SNE Winter Flounder	119.9	3.3	0.4	57.2	4.8	2.4	-	0.1	7.0	1.6
Redfish	0.9	-	0.0	0.6	0.1	0.0	-	0.0	0.0	
White Hake	19.2	0.1	0.1	13.2	1.3	0.5	0.0	0.0	1.0	
Pollock	430.8	-	0.0	0.7	0.1	0.0	0.0	0.0	0.1	429.7
Northern Windowpane	13.9	-	-	7.7	5.1	0.3	-	-	0.5	
Southern Windowpane	211.5	26.2	0.5	93.3	7.0	5.9	-	0.1	31.2	
Ocean Pout	34.8	0.1	0.2	25.5	2.5	0.9	-	0.0	1.9	
Halibut	1.1	-	-	0.1	0.1	-	0.0	-	0.1	
Wolffish	0.0	-	0.0	0.0	-	0.0	-	-	0.0	

Values in metric tons of live weight
*Some or all catch attributed to separate sub-ACL, and so is not included above.
Values in metric tons of live weight
Source: NMFS Greater Atlantic Regional Fisheries Office, November 15, 2021, run date of Oct. 27, 2021.

5.7.10 Fishery Sub-Components

5.7.10.1 Commercial Harvesting Component

Commercial Groundfish Fishery In-season Utilization

Figure 11-Figure 32 display in-season utilization for the commercial groundfish fishery (sectors and common pool) by stock/management unit for FY2017-FY2020 and partial year FY2021.

Figure 11- Commercial groundfish fishery in-season utilization of Eastern GB cod.

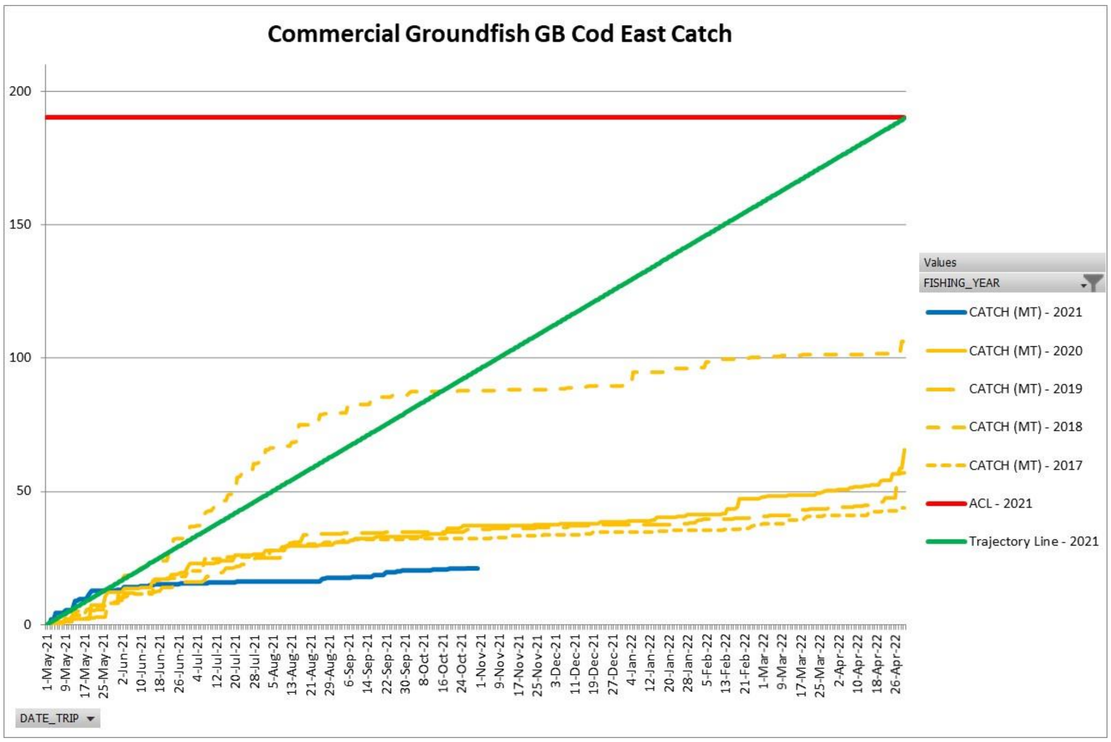


Figure 12- Commercial groundfish fishery in-season utilization of Western GB cod.

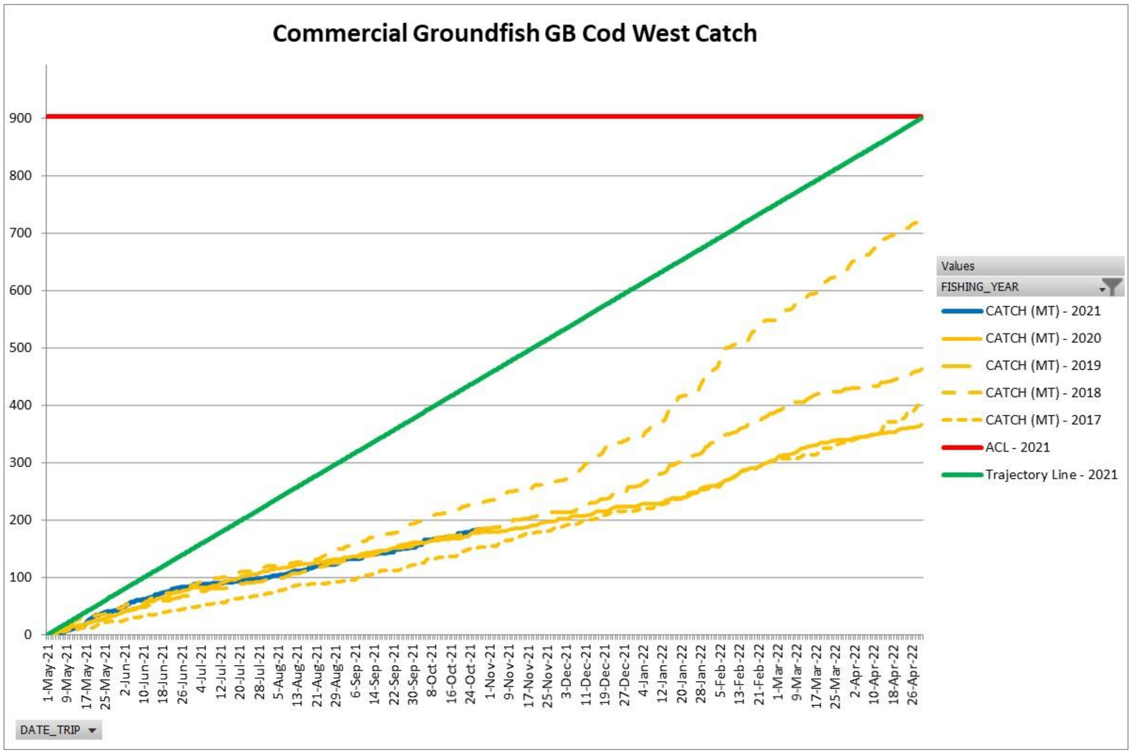


Figure 13- Commercial groundfish fishery in-season utilization of GOM cod.

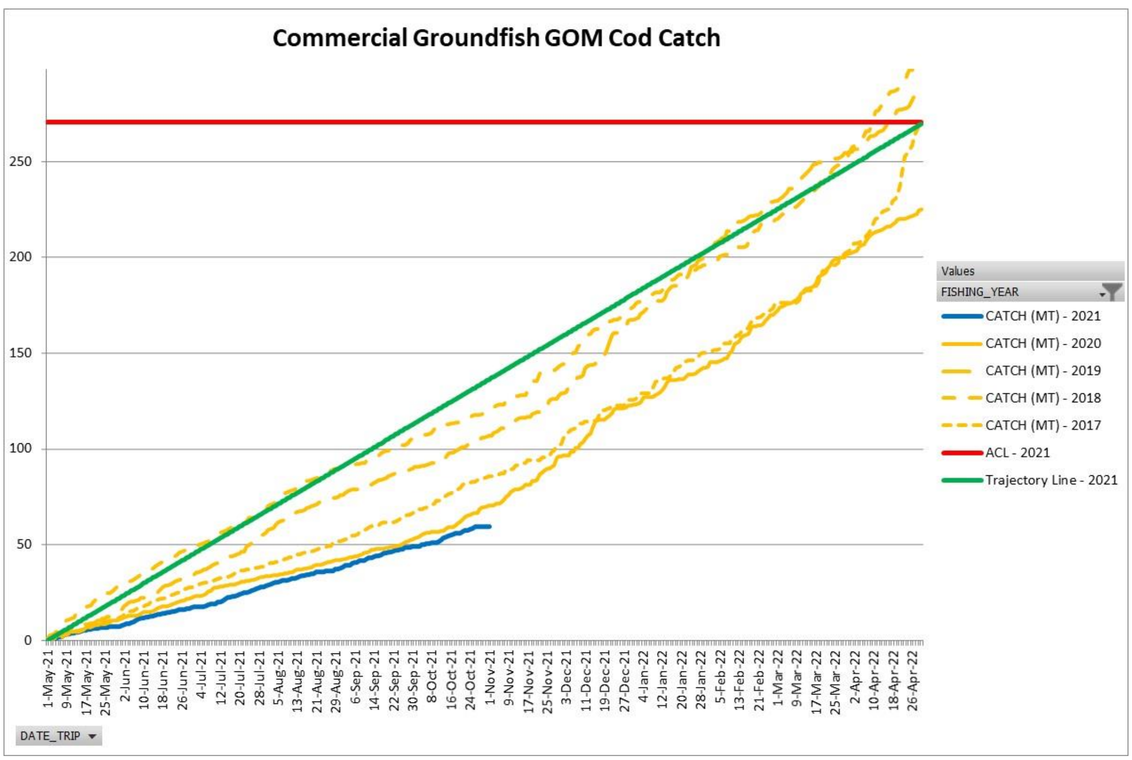


Figure 14- Commercial groundfish fishery in-season utilization of Eastern GB haddock.

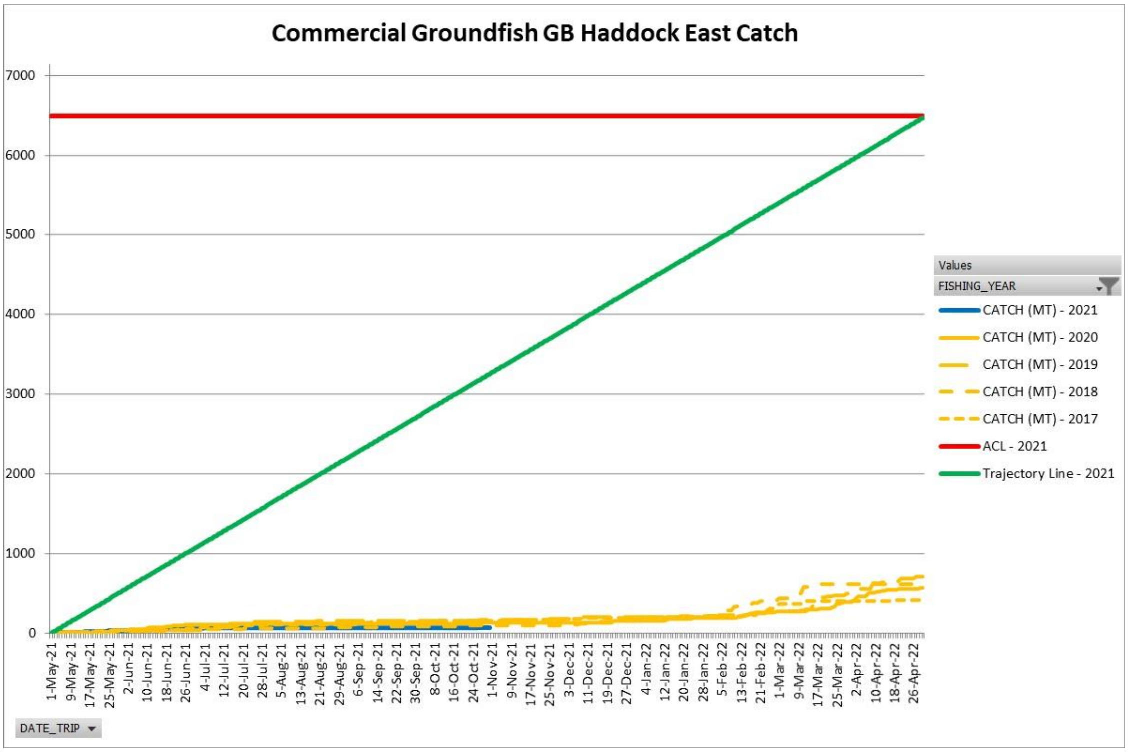


Figure 15- Commercial groundfish fishery in-season utilization of Western GB haddock.

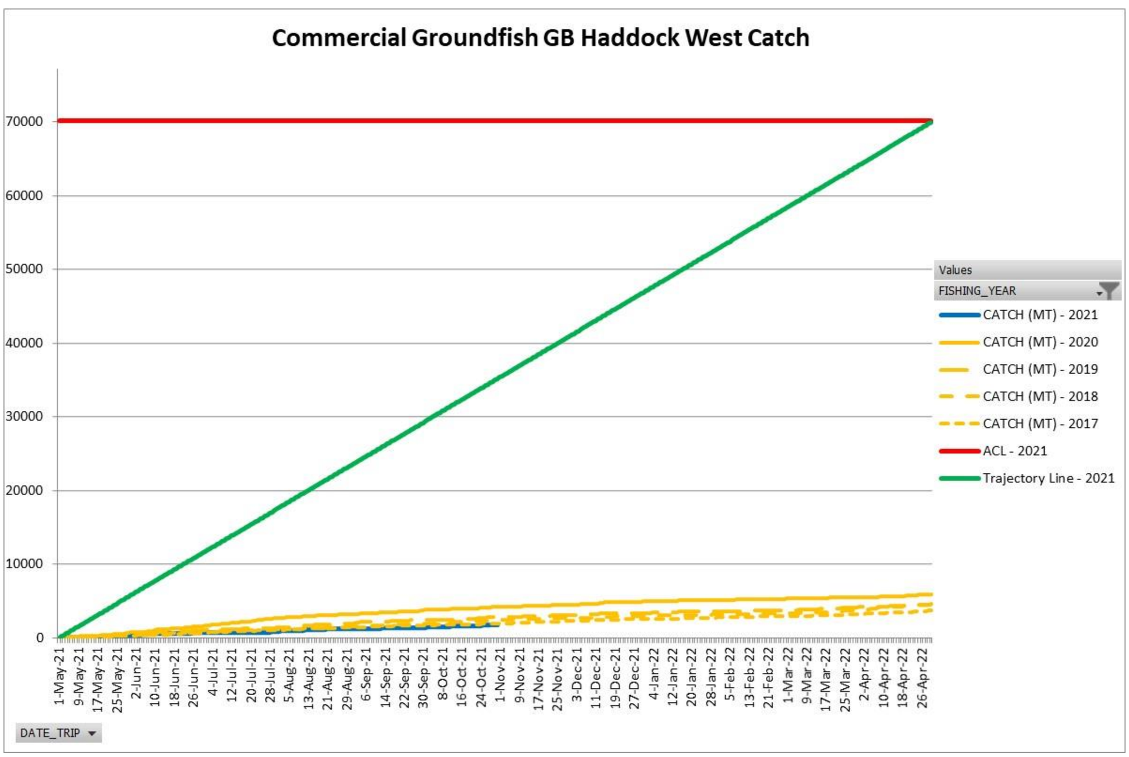


Figure 16- Commercial groundfish fishery in-season utilization of GOM haddock.

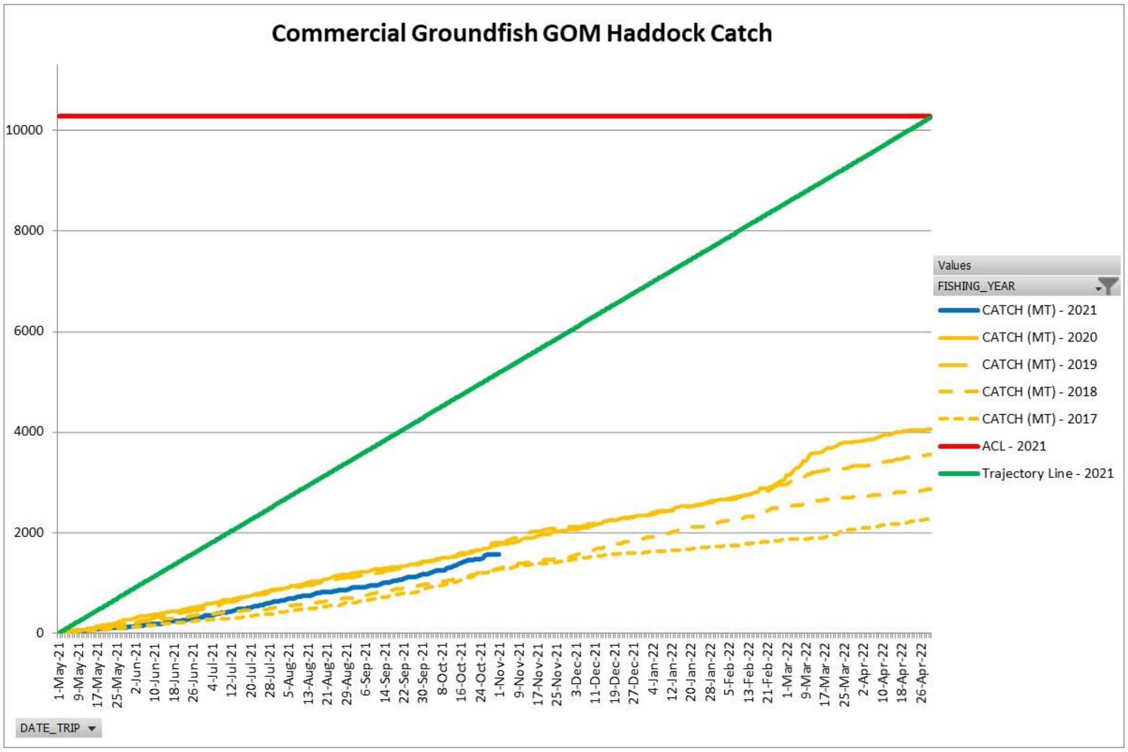


Figure 17- Commercial groundfish fishery in-season utilization of GB yellowtail flounder.

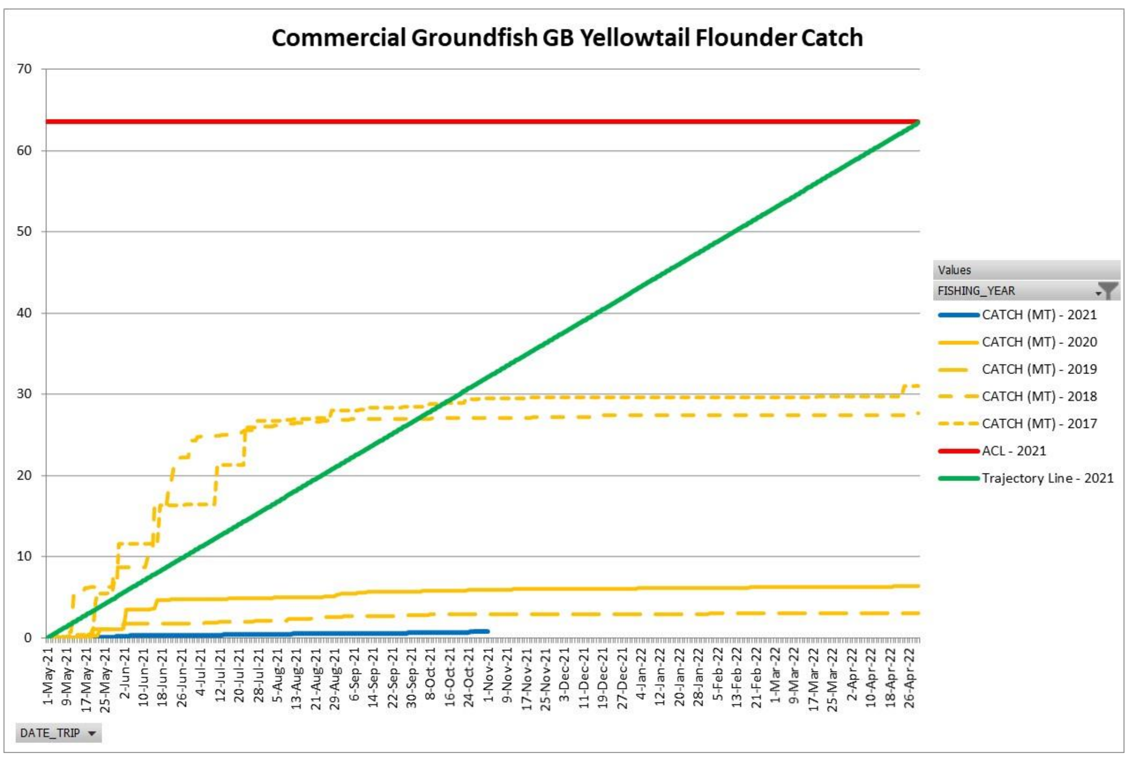


Figure 18- Commercial groundfish fishery in-season utilization of SNE/MA yellowtail flounder.

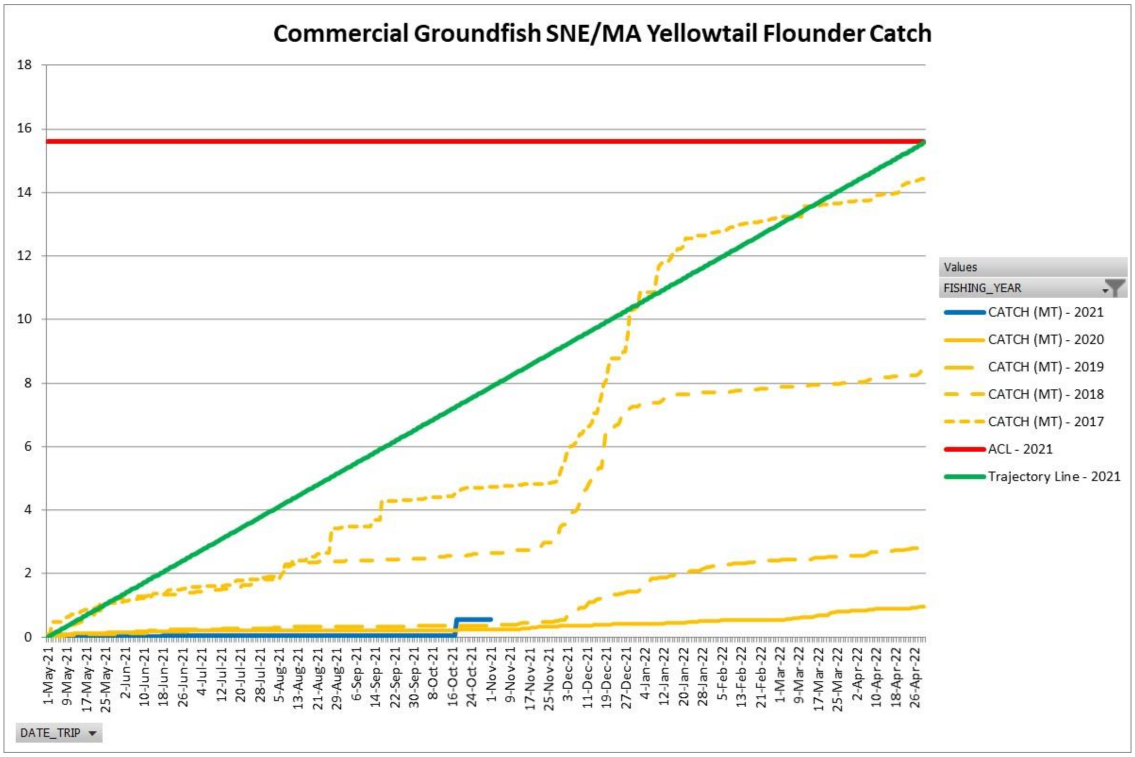


Figure 19- Commercial groundfish fishery in-season utilization of CC/GOM yellowtail flounder.

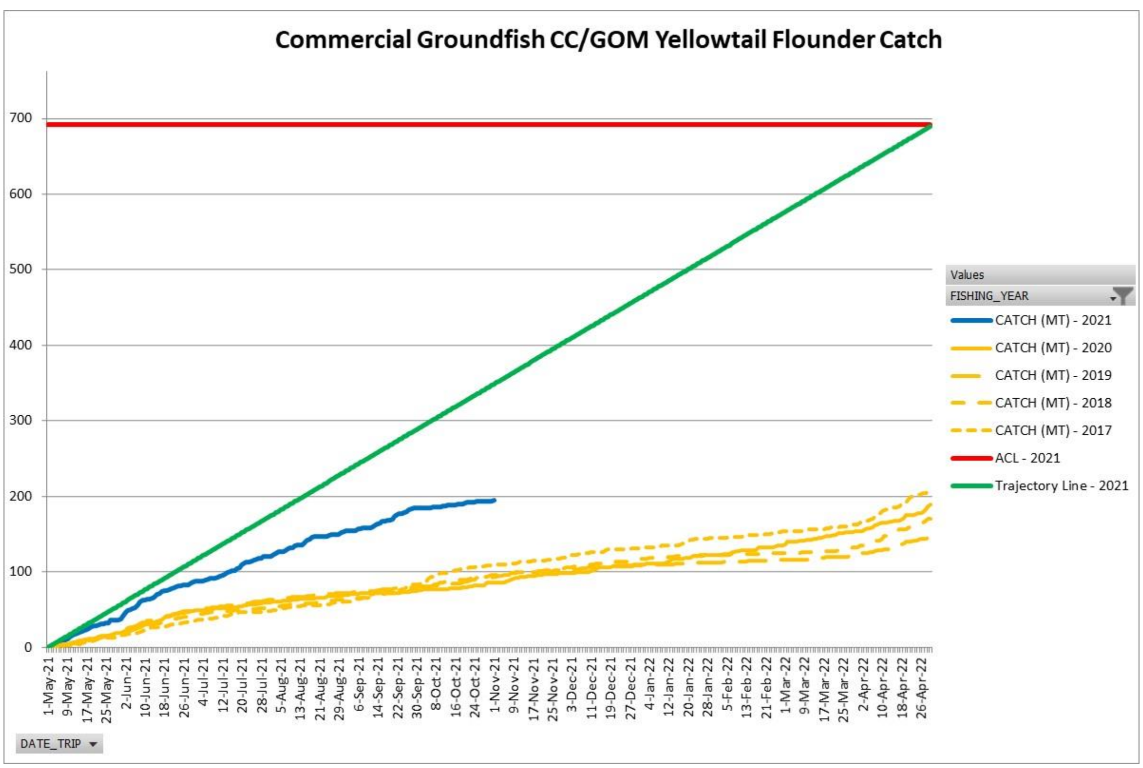


Figure 20- Commercial groundfish fishery in-season utilization American plaice.

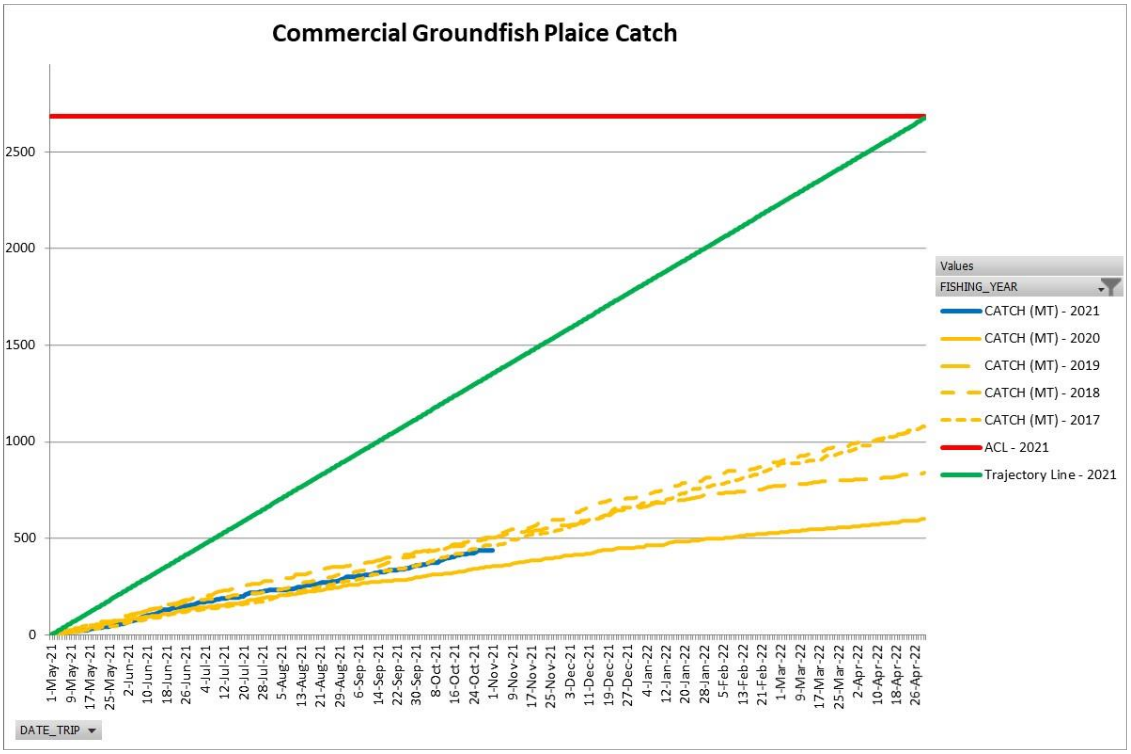


Figure 21- Commercial groundfish fishery in-season utilization of witch flounder.

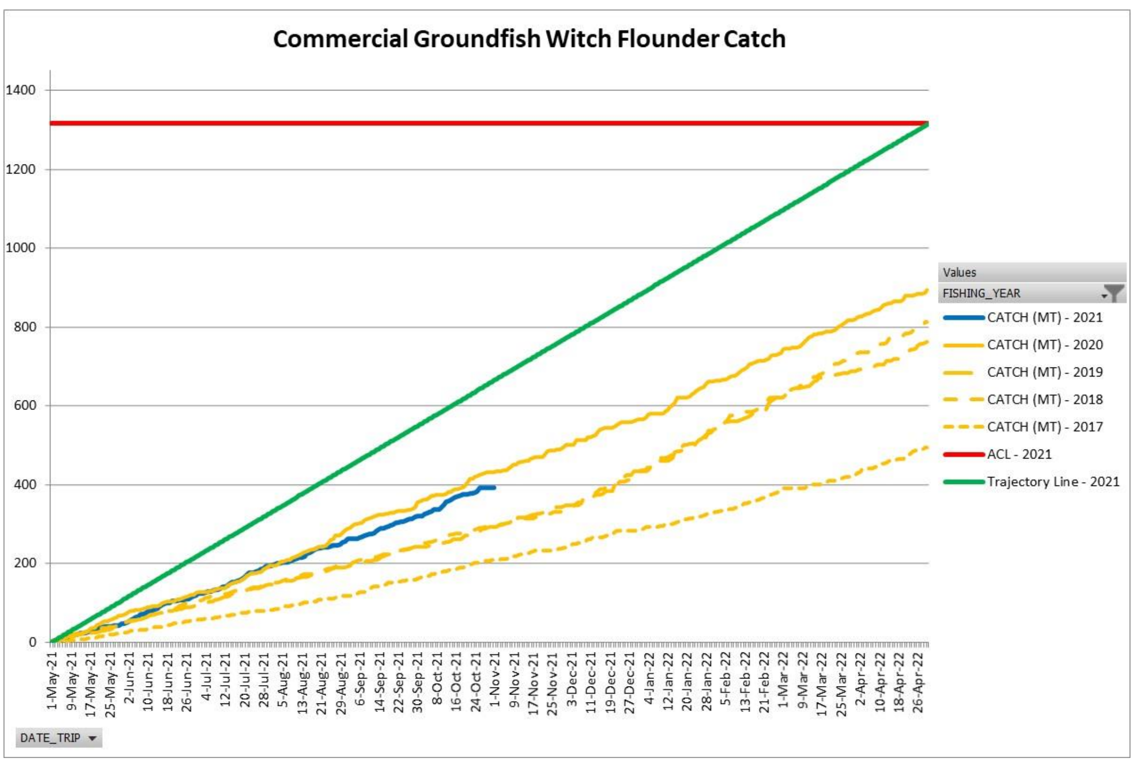


Figure 22- Commercial groundfish fishery in-season utilization of GB winter flounder.

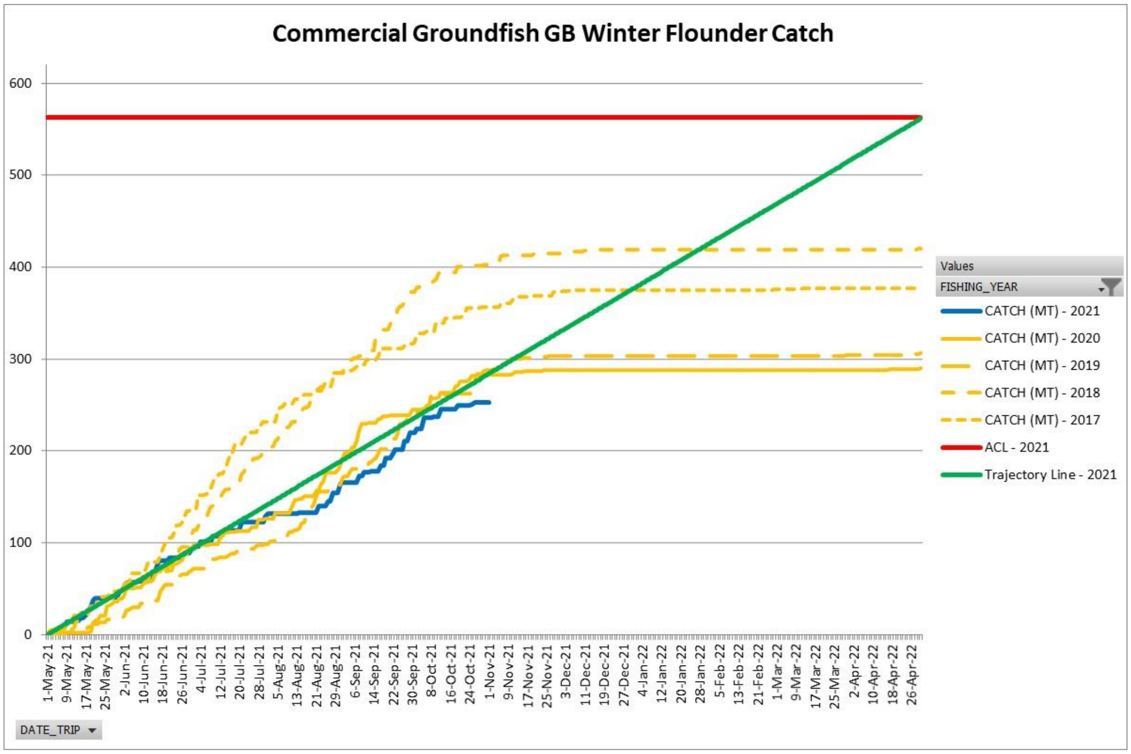


Figure 23- Commercial groundfish fishery in-season utilization of GOM winter flounder.

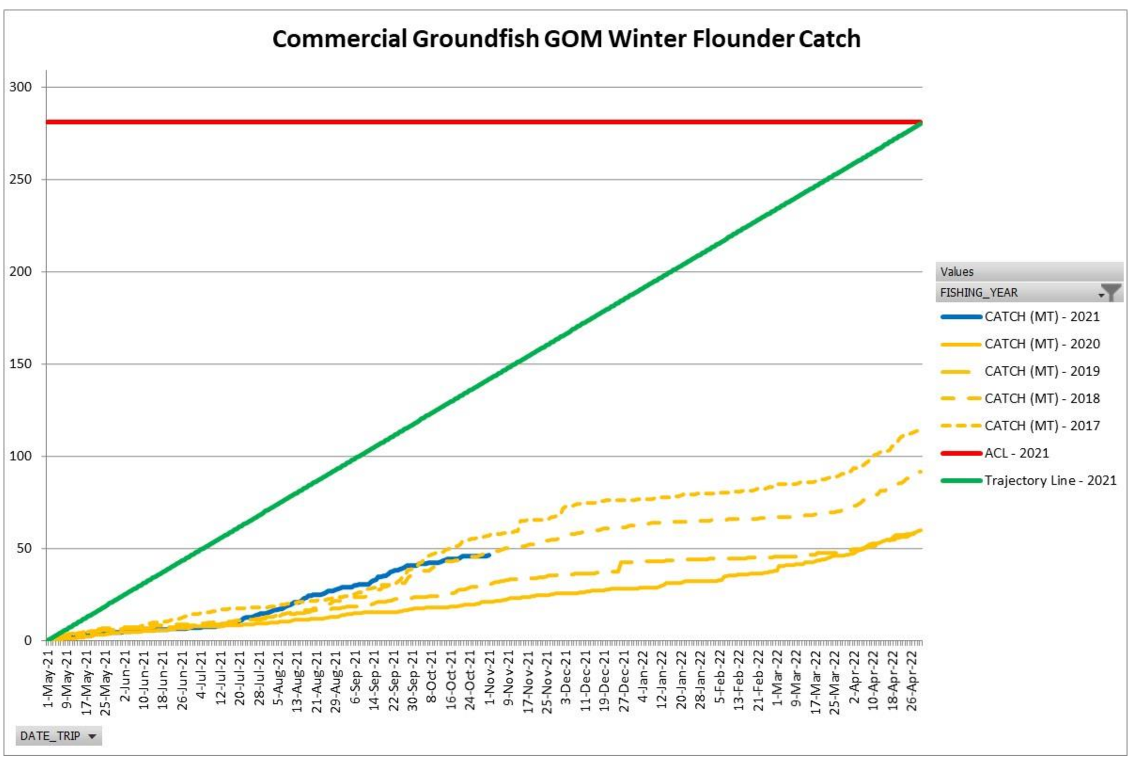


Figure 24- Commercial groundfish fishery in-season utilization of SNE/MA winter flounder.

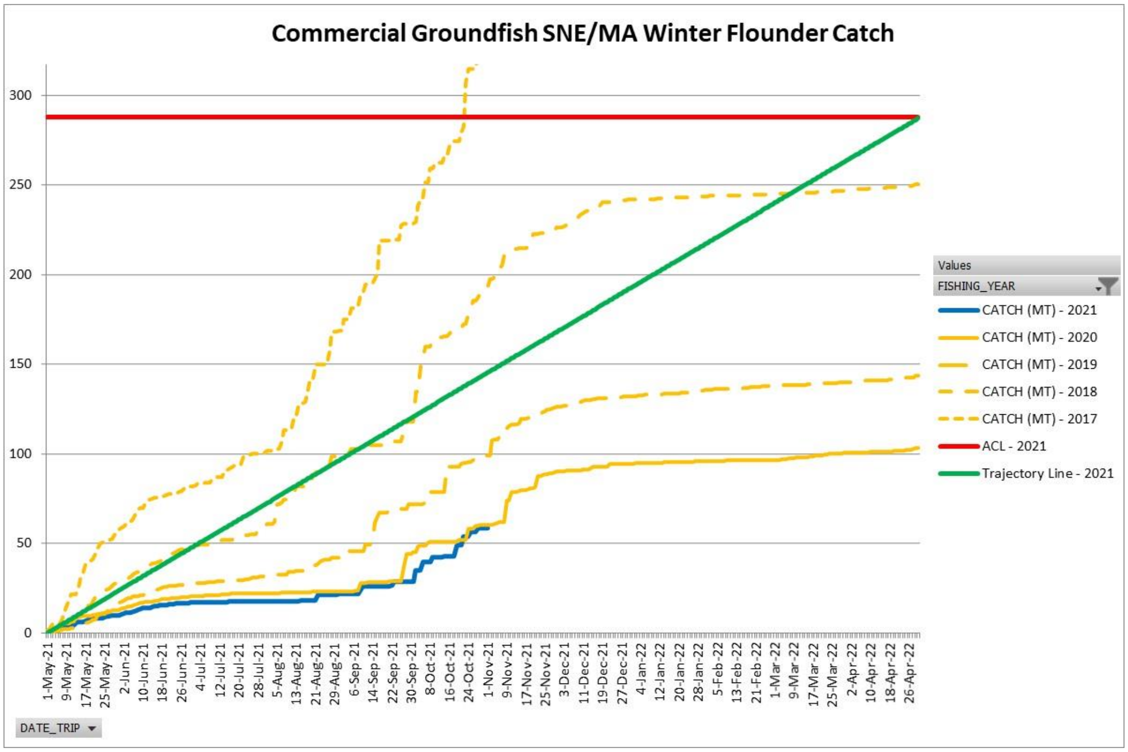


Figure 25- Commercial groundfish fishery in-season utilization of redfish.

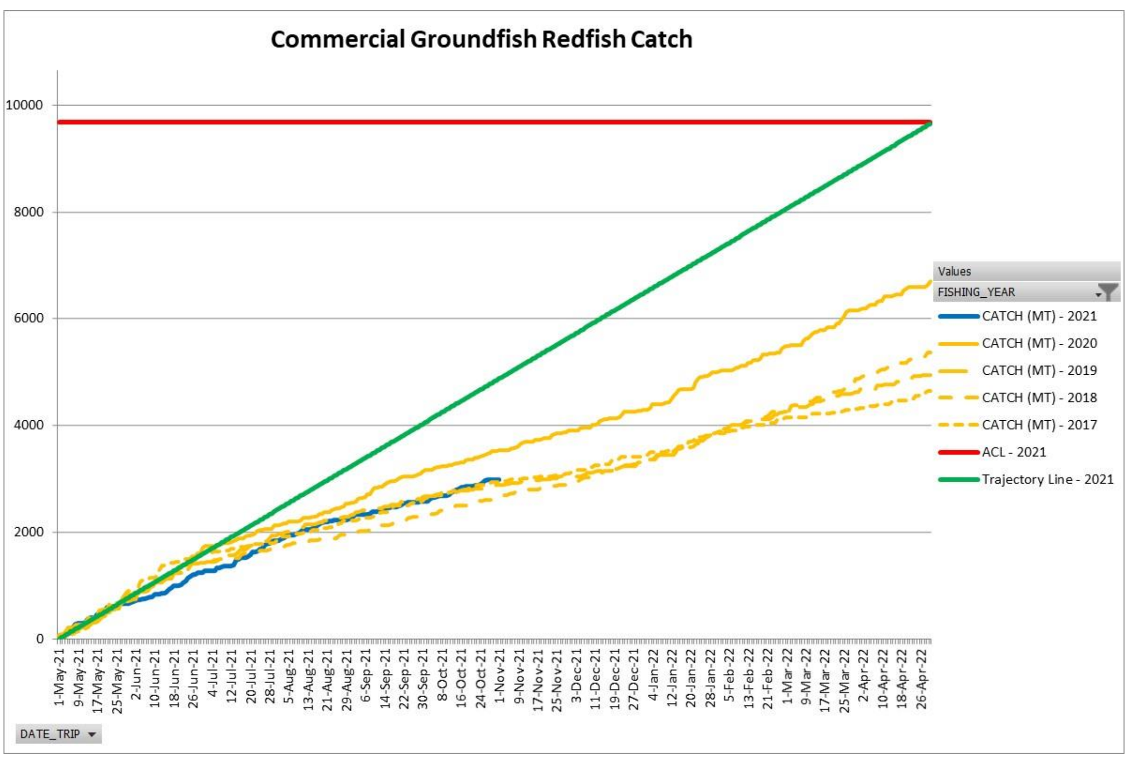


Figure 26- Commercial groundfish fishery in-season utilization of white hake.

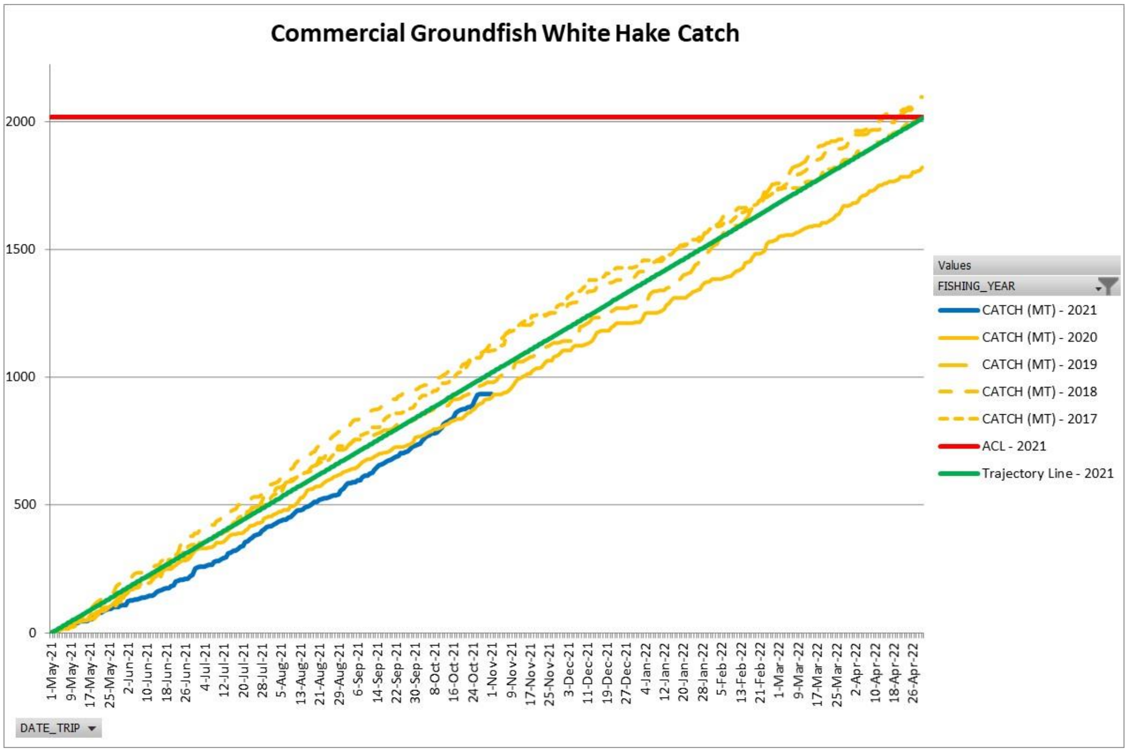


Figure 27- Commercial groundfish fishery in-season utilization of pollock.

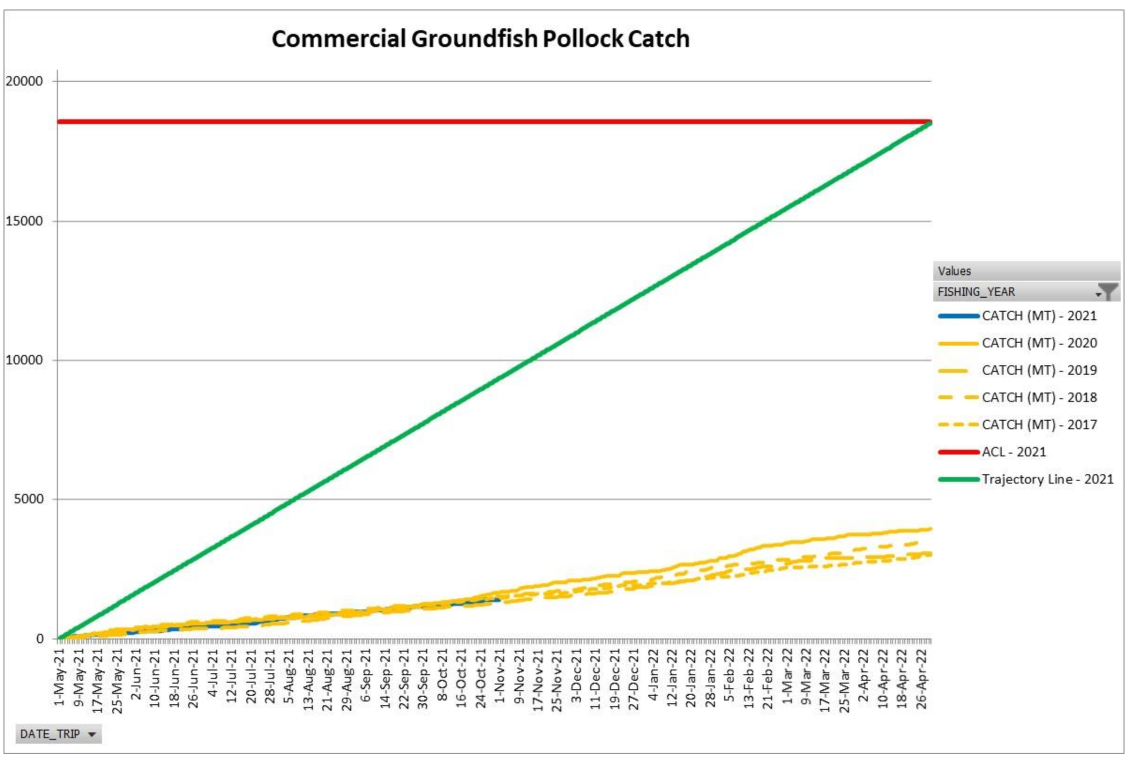


Figure 28- Commercial groundfish fishery in-season utilization of Atlantic halibut.

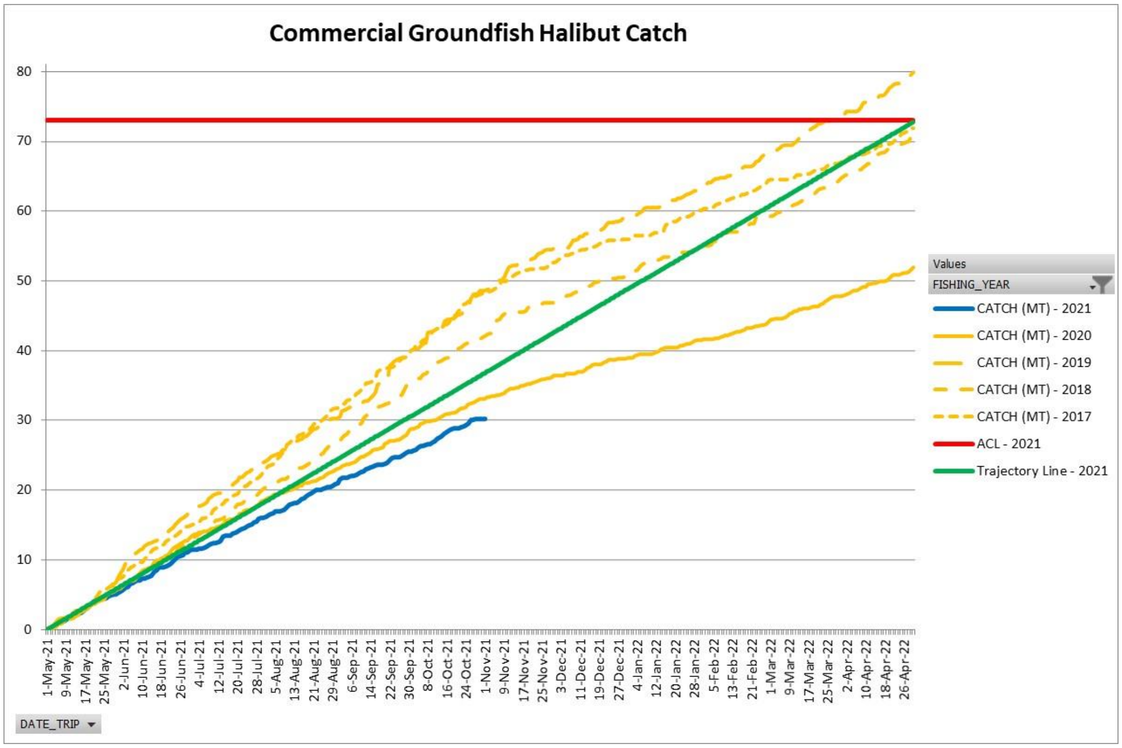


Figure 29- Commercial groundfish fishery in-season utilization of northern windowpane flounder.

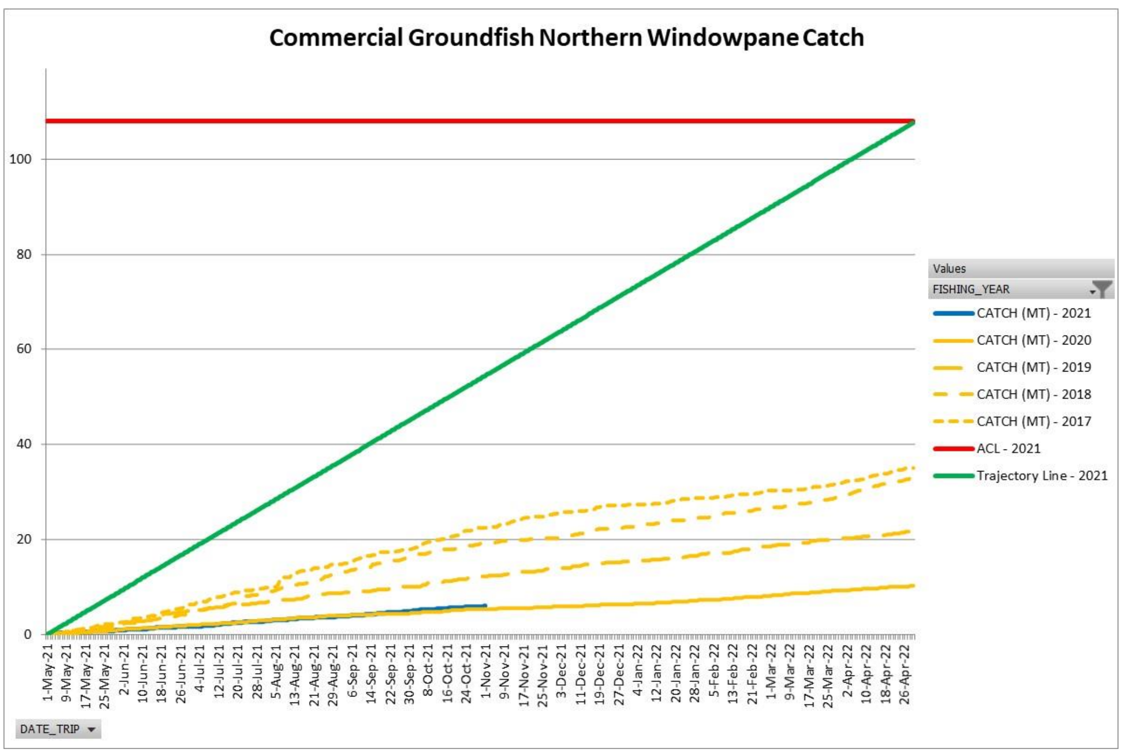


Figure 30- Commercial groundfish fishery in-season utilization of southern windowpane flounder.

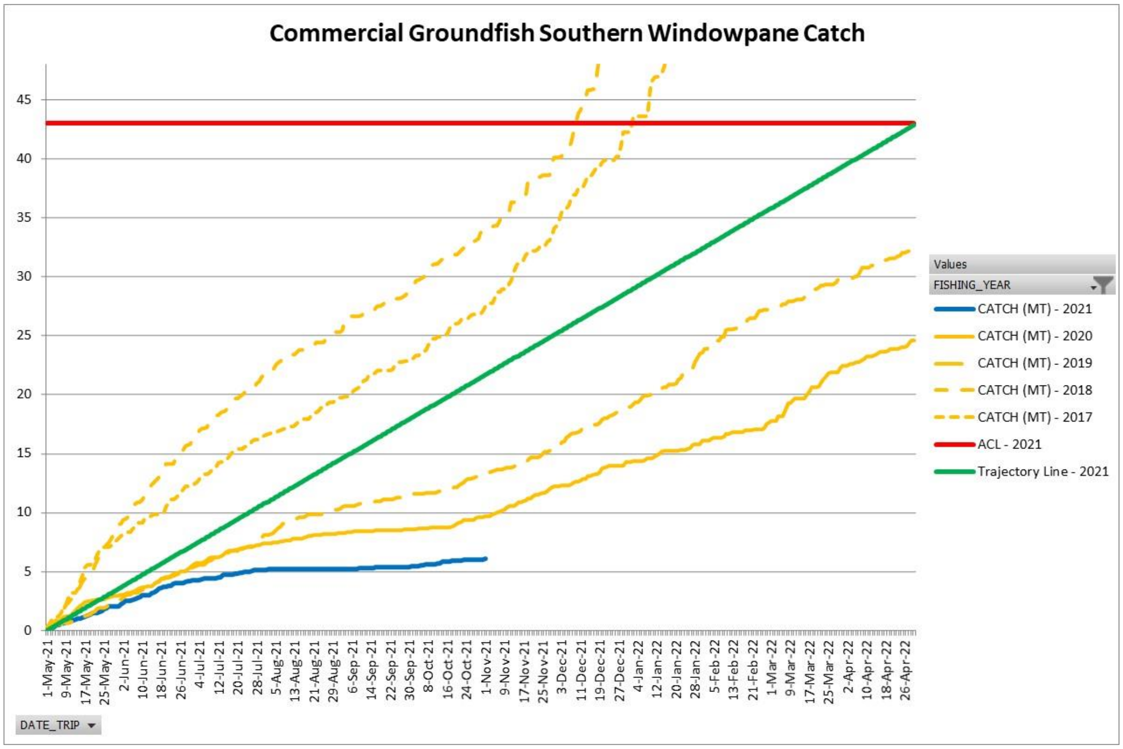


Figure 31- Commercial groundfish fishery in-season utilization of ocean pout.

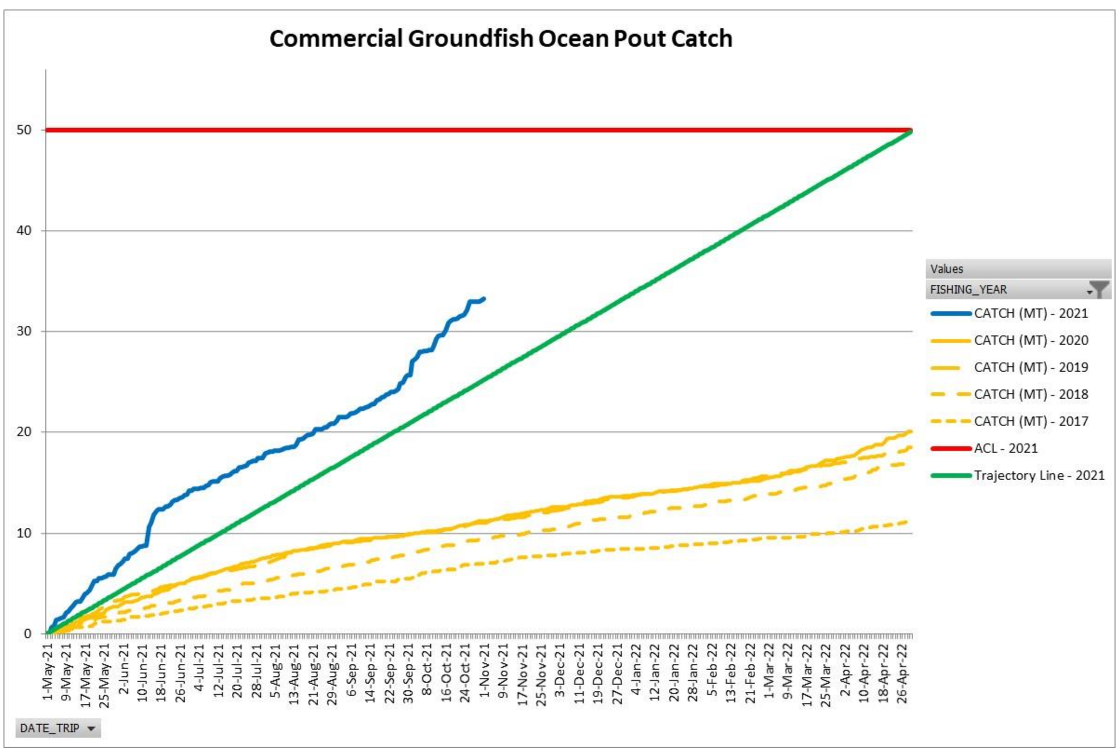
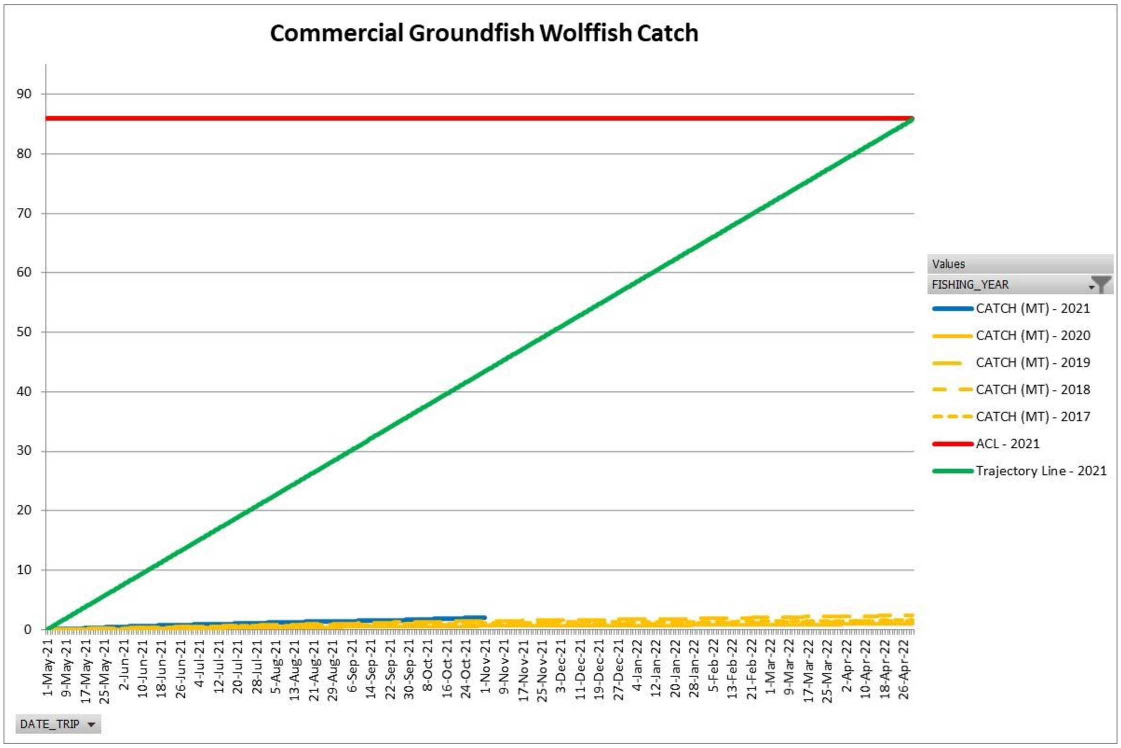


Figure 32- Commercial groundfish fishery in-season utilization of wolffish.



5.7.10.1.1 Sector Harvesting Component

In all years, the sector vessels landed the overwhelming majority of groundfish landed (Table 21). Each sector receives a total amount of fish it can harvest for each stock, its Annual Catch Entitlement (ACE). Since the ACE is dependent on the amount of the ACL in a given fishing year, the ACE may be higher or lower from year to year even if the sector's membership remains the same. There have been large shifts in commercial groundfish sub-ACLs for various stocks between FY2016 and FY2020. There has been a general decrease in trips, and catch for sector vessels, and there has been a shift in effort out of the groundfish fishery into other fisheries. However, these changes may correlate to a certain extent with the decrease in ACL.

Of the 16 ACEs allocated to sectors in 2020, two stocks approached or exceeded the catch limit (>80% conversion) set by the total allocated ACE (Table 42). This is similar to previous years (FY2016-FY2019). In FY2020, as has been the case in previous years, Georges Bank haddock, particularly East GB haddock, accounted for a majority of the unrealized landings.

Table 42– Annual sector catch entitlement (ACE), catch, and utilization (metric tons)

	2016			2017			2018		
	Allocated ACE*	Sector Catch	% Caught	Allocated ACE*	Sector Catch	% Caught	Allocated ACE*	Sector Catch	% Caught
GB Cod East	135.4	82	60.6%	143.3	43.7	30.5%	251.8	106.4	42.3%
GB Cod West	596.6	582.3	97.6%	520.9	439.5	84.4%	1,170.1	831.6	71.1%
GOM Cod	271.1	260.4	96%	271.1	260.6	96.1%	356.7	309.2	86.7%
GB Haddock East	15,063	549	3.6%	29,287.6	407.3	1.4%	15,487.8	623.1	4%
GB Haddock West	51,327.7	4,390.30	8.6%	52,253.1	4,090.20	7.8%	44,339.9	5,139.20	11.6%
GOM Haddock	2,390.4	1,576.10	65.9%	2,984.5	2,250.90	75.4%	8,640.8	2,837.10	32.8%
GB Yellowtail Flounder	247.1	23.9	9.7%	160.1	31	19.4%	185.1	27.6	14.9%
SNE/MA Yellowtail	169.1	44.5	26.3%	175.5	10.5	6%	34.9	7	19.9%
CC/GOM Yellowtail	326.5	248.8	76.2%	325.7	196.3	60.3%	381.1	164.8	43.3%
American Plaice	1,162.9	1,121.90	96.5%	1,195.7	1,068.90	89.4%	1,551.7	1,064.70	68.6%
Witch Flounder	362.1	351.4	97%	717.6	486.5	67.8%	811.5	794.1	97.9%
GB Winter Flounder	585.3	422.6	72.2%	614.6	377.6	61.4%	724.7	419.9	57.9%
GOM Winter Flounder	606.8	109.2	18%	607.1	111	18.3%	339.1	90.6	26.7%
SNE Winter Flounder	523.1	396.6	75.8%	515.1	372	72.2%	456.2	228.7	50.1%
Redfish	9474	4,077.60	43%	10,126.5	4,646.50	45.9%	10,704.7	5,360.90	50.1%
White Hake	3,432.8	1,471.50	42.9%	3,331.1	2,022.90	60.7%	2,714.7	2,095.40	77.2%
Atlantic Pollock	17,704.2	3,070.10	16.7%	17,703.9	2,990.00	16.9%	37,170.2	3,475.80	9.4%

*Does not include Sector Carryover or Overages.

Table 42 cont.

	2019			2020		
	Allocated ACE*	Sector Catch	% Caught	Allocated ACE*	Sector Catch	% Caught
GB Cod East	182.5	65.8	36%	183	57.0	31.2%
GB Cod West	1,514.4	530.5	35%	1,041.3	421.9	40.5%
GOM Cod	349.6	280.9	80.3%	266.6	221.8	83.2%
GB Haddock East	14,762.3	715.6	4.8%	15,861.4	562.8	3.5%
GB Haddock West	52,431.7	5,293.50	10.1%	119,409.5	6,488.7	5.4%
GOM Haddock	8,215.7	3,544.40	43.1%	11,754.2	4,023.9	34.2%
GB Yellowtail Flounder	96.9	3.1	3.2%	92	6.4	6.9%
SNE/MA Yellowtail	36.2	2.5	7%	12.5	0.9	6.9%
CC/GOM Yellowtail	376.7	141.1	37.4%	656.4	182.2	27.8%
American Plaice	1,436	836.1	58.2%	2,859.4	592.3	20.7%
Witch Flounder	830.6	761	91.6%	1,274.8	892.7	70%
GB Winter Flounder	742.1	306.2	41.3%	501.6	289.9	57.8%
GOM Winter Flounder	336.5	56.9	16.9%	272.1	55.3	20.3%
SNE Winter Flounder	444.1	135.1	30.4%	475.3	97.4	20.5%
Redfish	10,914.6	4,956.90	45.4%	11,084.7	6,711.60	60.5%
White Hake	2,714.2	2,057.40	75.8%	1,994.8	1,820.30	91.3%
Atlantic Pollock	37,152	3,070.10	8.3%	23,752.3	3,936.10	16.6%

*Does not include Sector Carryover or Overages.

Source: NMFS Greater Atlantic Regional Fisheries Office, Summary Tables for Northeast Multispecies Fishery, Accessed November 2021.

5.7.10.1.2 Common Pool Harvesting Component

With the adoption of Amendment 16, most commercial groundfish fishing activity occurs under sector management regulations. Some vessels have elected to not join sectors, and continue to fish under the effort control system. Collectively, this part of the fishery is referred to as the "common pool." These vessels fish under both limited access and open access groundfish fishing permits. Common pool vessels accounted for only a small amount of groundfish catch in FY2020 (Table 21).

Groundfish landings and revenue from common pool vessels have fluctuated over time (Table 21). Common pool vessels with limited access permits landed 0.32M lbs. of regulated groundfish in FY2016, worth $0.86M in ex-vessel revenues (Table 21). Landings declined each year to 0.10M lbs. in FY2019, worth about $0.23M and increased slightly in FY2020 to 0.11M lbs. lbs., worth $0.16M. Groundfish catch declined more rapidly during this time period relative to total catch (Table 43).

In FY2020, zero stocks approached or exceeded the catch limit as set by the sub-ACL allocated to the common pool; all were <40% conversion (Table 44). This pattern is similar to that in FY2019 and is a decrease from previous years when the common pool caught over 80% of the allocation for one stock in FY2018, two in FY2017, and five in FY2020. In FY2020, as in previous years, Georges Bank haddock, both Eastern GB haddock and Western GB haddock, accounted for a majority of the unrealized landings.

Table 43- Common Pool catch (live pounds), gross revenues, and average fish prices (2020$/landed pound) on groundfish trips.

FY	Total Catch (mt)	Groundfish Catch (mt)	Total Gross Revenues	Groundfish Gross Revenues	Average Price, All Species	Average Price, Groundfish
2016	1,506	152	1.9	0.9	$0.67	$2.67
2017	1,123	86	1.2	0.5	$0.58	$2.50
2018	1,121	68	1.2	0.3	$0.54	$2.10
2019	916	52	1.2	0.2	$0.68	$2.19
2020	1,110	55	1.1	0.2	$0.49	$1.43

Source: GARFO DMIS data. Accessed November 2021.

Table 44- Annual common pool sub-ACL, catch, and utilization (metric tons).

	2016			2017			2018		
	Sub-ACL	Catch	% Caught	Sub-ACL	Catch	% Caught	Sub-ACL	Catch	% Caught
GB Cod East	2.6	0	0%	2.7	0	0%	5.2	0	0%
GB Cod West	11.4	14.3	124.8%	7	6.4	92.5%	24.2	6.3	26%
GOM Cod	8.9	6.1	68.8%	9.2	8.2	89.9%	11.9	5.8	48.8%
GB Haddock East	99.6	0	0%	205.5	0	0%	111.3	0	0%
GB Haddock West	339.3	1	0.3%	366.5	0.3	0.1%	318.7	4.4	1.4%
GOM Haddock	25.6	10.4	40.4%	32.8	14.1	43%	97.6	33	33.8%
GB Yellowtail Flounder	3.7	0	0%	2.5	0	0%	2.9	0	0%
SNE/MA Yellowtail	35.1	18	51.3%	41.9	4	9.5%	8.4	1.5	18.1%
CC/GOM Yellowtail	14.5	12.1	83.7%	15	9.4	62.6%	17	5.5	32.3%
American Plaice	20.1	17.4	86.6%	22.7	9.3	41.1%	27.9	13.7	49.1%
Witch Flounder	7.9	7.4	94.2%	16.4	8.2	49.9%	18.3	17.7	96.7%
GB Winter Flounder	4.7	0	0%	5.1	0	0%	6	0	0%
GOM Winter Flounder	32.2	2.7	8.4%	31.6	2.8	8.9%	17.6	1.1	6.4%
SNE Winter Flounder	61.9	56.7	91.6%	70.3	37.2	53%	61.8	22	35.6%
Redfish	52	0.4	0.9%	56.1	1	1.9%	50.2	1.2	2.3%
White Hake	26.2	0.7	2.7%	26.8	0.5	2%	20.6	1.7	8.1%
Atlantic Pollock	112.8	23.6	20.9%	112.9	18.4	16.3%	229.9	5	2.2%

Table 44 cont.

	2019			2020		
	Sub-ACL	Catch	% Caught	Sub-ACL	Catch	% Caught
GB Cod East	6.5	0	0%	5.5	0	0%
GB Cod West	53.8	1.9	3.5%	31.4	3.3	10.6%
GOM Cod	10.9	5.8	53.3%	8.7	3.2	36.4%
GB Haddock East	237.7	0	0%	326.3	0	0%
GB Haddock West	844.3	0.6	0.1%	2,454.40	0.6	0%
GOM Haddock	96.1	13.1	13.7%	303.1	36.2	11.9%
GB Yellowtail Flounder	2.9	0	0%	3.4	0	0%
SNE/MA Yellowtail	9	0.3	3.2%	2.9	0.1	2.9%
CC/GOM Yellowtail	21.4	5.1	23.9%	31.6	6.7	21.2%
American Plaice	31.4	4.5	14.2%	77.9	8.1	10.4%
Witch Flounder	23.1	2.9	12.7%	35.4	1.4	4%
GB Winter Flounder	31.8	0	0%	20.8	0	0%
GOM Winter Flounder	18.1	1.8	9.9%	14.5	4.3	30%
SNE Winter Flounder	73.9	8.7	11.8%	63.4	5.8	9.1%
Redfish	57.2	0.4	0.7%	146.8	0.5	0.3%
White Hake	21.1	6.8	32.3%	24.5	0.3	1.1%
Atlantic Pollock	248.1	15.6	6.3%	236.4	1.1	0.5%

Source: NMFS Greater Atlantic Regional Fisheries Office, Summary Tables for Northeast Multispecies Fishery, Accessed November 2021.

5.7.10.2 Recreational Harvesting Component

The recreational fishery includes private anglers, party boat operators, and charter vessel operators. Several groundfish stocks are targeted by the recreational fishery, including GOM cod, GOM haddock, pollock, GOM winter flounder, and GB cod. GB haddock is targeted as well, but to a lesser extent. SNE/MA winter flounder and redfish are also target species. Wolffish was occasionally caught in the past. A16 (Section 6.2.5, NEFMC 2009) included a detailed overview of recreational fishing activity.

This section provides data on trends in landings, permits, and effort over the last five years. Table 45 provides a summary of groundfish and non-groundfish landings (fish kept, not pounds) by state and year. Table 46 provides information on active party/charter permits by state and year. Table 47 provides information on the number of party/charter trips by state and year.

Table 45- Number of fish kept for groundfish and non-groundfish by state for groundfish party and charter permitted vessels, for fishing years (FY) 2016 to 2020. *Other includes CT, DE, MD, NC, PA, SC, and VA.

Year	2016	2017	2018	2019	2020
Groundfish	284,322	269,453	296,356	262,525	254,575
MA	126,234	107,932	91,882	61,843	79,906
ME	30,718	26,546	27,306	29,142	30,444
NH	99,621	118,472	158,829	155,317	133,201
NJ	6,140	6,809	7,769	8,006	4,530
NY	13,449	6,714	8,413	5,550	2,980
OTHER*	1,311	867	795	514	634
RI	6,849	2,113	1,362	2,153	2,880
Non-Groundfish	1,965,444	2,027,110	2,013,385	2,256,898	1,877,104
MA	96,487	119,477	118,901	112,583	72,554
ME	15,375	11,438	9,375	12,143	7,196
NH	107,424	128,786	74,035	98,349	76,577
NJ	440,695	534,985	545,819	655,067	550,560
NY	841,437	870,941	807,041	840,532	765,378
OTHER*	375,130	298,174	376,226	460,852	333,615
RI	88,896	63,309	81,988	77,372	71,224
Grand Total	2,249,766	2,296,563	2,309,741	2,519,423	2,131,679

Source: Vessel Trip Reports (VTRs), FY2016 through FY2020. For VTRs that did not include state of landing, homeport state from permit was utilized.

Table 46- Count of the number of active party and charter groundfish permits by homeport state, FY 2016 to 2020. Other includes DE, FL, NC, PA, and WV. "Active" is defined as taking any party or charter trip among those groundfish party or charter permit holders, independent of what was caught.

Year	CT	MA	MD	ME	NH	NJ	NY	OTHER	RI	VA	Grand Total
2016	11	51	10	19	16	78	84	25	31	12	337
2017	13	53	12	17	14	73	83	24	29	13	331
2018	13	57	5	20	16	90	82	29	32	12	356
2019	16	64	7	20	13	84	81	30	35	11	361
2020	10	63	10	13	15	78	72	25	40	11	337

Source: VTRs and permit database. A vessel is included if they: 1) have a groundfish party or charter permit (Category I) and 2) took at least one party or charter trip, as indicated on the VTR.

Table 47- Number of trips that kept groundfish by state for groundfish party and charter permitted vessels, for FY 2010 to 2020. *Other includes CT, DE, FL, MD, NC, PA, and VA.

State	2016	2017	2018	2019	2020
MA	1,389	1,101	934	804	847
ME	563	439	467	500	396
NH	981	870	1,026	1,008	971
NJ	421	420	462	505	551
NY	504	344	386	392	385
OTHER*	42	58	70	51	66
RI	224	186	96	214	294
Grand Total	4,124	3,418	3,441	3,474	3,510

Source: VTRs, FY 2010 to FY 2020. For VTRs that did not include state of landing, homeport state from permit data was utilized.

5.7.10.2.1 Gulf of Maine Cod and Gulf of Maine Haddock Recreational Effort and Catch

Table 48 provides a breakdown of the number of vessels active in the for-hire component of the recreational fishery for FY 2016 to FY 2020. An overview of the management history and recreational fishery performance is provided for GOM cod and GOM haddock (see Table 49 and Table 50).

Table 48- For-hire recreational vessels catching cod or haddock from the Gulf of Maine

Fishing Year	Party	Charter	Total*
2016	37	69	86
2017	52	59	91
2018	43	90	96
2019	20	81	87
2020	17	72	79

Notes: *Total may not sum due to vessels taking both categories of trips during the fishing year. Based on vessel reporting via vessel log book.
Vessels landing or discarding cod or haddock from Gulf of Maine (464 - 519) statistical areas based on vessel log book.
Source: NMFS Greater Atlantic Regional Fisheries Office, November 2021.

Table 49- Summary of Gulf of Maine cod recreational catch performance and federal management (fishing years 2010–2021).

Fishing Year	Sub-Annual Catch Limit (mt)	Catch (mt)	Percent of catch limit taken (%)	Minimum Size (inches)	Bag Limit Fish per angler - daily	Season Open	Season Closed	Additional Measures/Notes
2010	2,673	1506.9	56.4	24	10	5/1/10 to 10/31/10 and 4/16/11 to 4/30/11	11/1/10 to 4/15/11	First year of sub-ACL 33.7% of ACL Groundfish Regulations: Only one line per angler, and Fillets landed by private recreational and charter/party vessels must have at least 2 sq. inches (5.08 sq. cm) of contiguous skin that allows for the ready identification of the fish species. Such fillets are required to be from legal-sized fish, but the fillets themselves would not need to meet the minimum size requirements in the regulations.
2011	2,824	1640.3	58.1	24	10	5/1/11 to 10/31/11 and 4/16/12 to 4/30/12	11/1/11 to 4/15/12	First Year: Gulf of Maine (Whaleback) Cod Spawning Protection Area: From April 1 through June 30 of each year, all recreational vessels, including private recreational and charter/party vessels, may only use pelagic hook-and-line gear, as defined below, when

Fishing Year	Sub-Annual Catch Limit (mt)	Catch (mt)	Percent of catch limit taken (%)	Minimum Size (inches)	Bag Limit Fish per angler - daily	Season Open	Season Closed	Additional Measures/Notes
								fishing in the Whaleback Cod Spawning Protection Area.[29]
2012	2,215	937.4	42.3	19	9	5/1/12 to 10/31/12 and 4/16/13 to 4/30/13	11/1/12 to 4/15/13	
2013	486	639.3	131.5	19	9	5/1/13 to 10/31/13 and 4/16/14 to 4/30/14	11/1/13 to 4/15/14	
2014	486			21	9	5/1/14 to 8/31/14 and 4/15/14 to 4/30/14	9/1/14 to 4/14/15	Replaced by interim action on 11/15/14
		623.3	128.3	n/a	0	closed	11/15/14 to 4/30/15	2014 interim action: Seasonal 30-minute block closures, no recreational gear capable of catching groundfish in closures

[29] **Pelagic hook-and-line gear** is defined as handline or rod and reel gear that is designed to fish for, or that is being used to fish for, pelagic species. No portion of this gear may be operated in contact with the bottom at any time.

Possession Restrictions: Any vessel fishing in the Gulf of Maine Whaleback Cod Spawning Protection Area, or the Winter Massachusetts Bay Spawning Protection Area, including pelagic hook-and-line gear by recreational vessels, is prohibited from possessing or retaining regulated species or ocean pout from April 1 through June 30 of each year.

Transiting: Recreational vessels are allowed to transit the Gulf of Maine Cod Spawning Protection Area, and Winter Massachusetts Bay Spawning Protection Area provided all gear is stowed in accordance with the regulations.

Fishing Year	Sub-Annual Catch Limit (mt)	Catch (mt)	Percent of catch limit taken (%)	Minimum Size (inches)	Bag Limit Fish per angler - daily	Season Open	Season Closed	Additional Measures/Notes
2015	121	84.5	69.8	n/a	0	Closed year-round		Interim action Seasonal closures removed on 5/1/16
2016	157	280.9	178.9	24	1	8/1/16 to 9/30/16	5/1/16 to 7/31/16 and 10/1/16 to 4/30/17	
2017	157			24	1	8/1/17 to 9/30/17	5/1/17 to 7/31/17 and 10/1/18 to 4/30/18	Replaced by final rule effective on 7/27/17
		245.4	156.3	n/a	0	Closed year-round		
2018	220	146.9	66.8	n/a	0	Closed year-round		First Year: Winter Massachusetts Bay Spawning Protection Area: From November 1 through January 31 of each year, all recreational vessels, including private recreational and charter/party vessels, may only use pelagic hook-and-line gear, as defined below, when fishing in the Winter Massachusetts Bay Spawning Protection Area.[1]
2019	220	79.8	36.3	21	1	9/15/19 to 9/30/19	5/1/19 to 9/14/19 and	Previous year's regulations were in effect until July 5, 2019, when these measures were implemented. Based

Fishing Year	Sub-Annual Catch Limit (mt)	Catch (mt)	Percent of catch limit taken (%)	Minimum Size (inches)	Bag Limit Fish per angler - daily	Season Open	Season Closed	Additional Measures/Notes
							10/1/19 to 4/30/20	on comments received on the proposed rule there will not be an open season in April 2020.
2020	193	184	95.3	21	1	9/15/20-9/30/20 and 4/1/21-4/14/21 (Private) 9/8/20-10/7/20 and 4/1/21-4/14/21 (Charter/Party)	5/1/20-9/14/20 and 10/1/20-3/31/21 (Private) 5/1/20-9/7/20 and 10/8/20-3/31/21 (Charter/Party)	
2021	193			21	1	9/15/21-9/30/21 and 4/1/22-4/14/22 (Private) 9/8/21-10/7/21 and 4/1/22-4/14/22 (Charter/Party)	5/1/21-9/14/21 and 10/1/21-3/31/22 (Private) 5/1/21-9/7/21 and 10/8/21-3/31/22 (Charter/Party)	

Table 50- Summary of Gulf of Maine haddock recreational catch performance and federal management (fishing years 2010–2021).

Fishing Year	Sub-Annual Catch Limit (mt)	Catch (mt)	Percent of catch limit taken (%)	Minimum Size (inches)	Bag Limit Fish per angler - daily	Season Open	Season Closed	Additional Measures/Notes
2010	324	297.4	91.8	18	no limit		n/a	First year of sub-ACL 27.5% of ACL Groundfish Regulations: Only one line per angler, and Fillets landed by private recreational and charter/party vessels must have at least 2 sq. inches (5.08 sq. cm) of contiguous skin that allows for the ready identification of the fish species. Such fillets are required to be from legal-sized fish, but the fillets themselves would not need to meet the minimum size requirements in the regulations.
2011	308			18	no limit	5/1/11 to 1/5/12	n/a	First Year: Gulf of Maine (Whaleback) Cod Spawning Protection Area: From April 1 through June 30 of each year, all recreational vessels, including private recreational and charter/party vessels, may only use pelagic hook-and-line gear, as defined below, when fishing in the Whaleback Cod Spawning Protection Area.[1]
				19	9	1/6/12 to 4/19/12	n/a	Accountability Measure (AM) for 2010 overage

Fishing Year	Sub-Annual Catch Limit (mt)	Catch (mt)	Percent of catch limit taken (%)	Minimum Size (inches)	Bag Limit Fish per angler - daily	Season Open	Season Closed	Additional Measures/Notes
		238.5	77.4	18	no limit	4/20/12 to 4/30/12	n/a	AM lifted after re-evaluation of data showing no 2010 overage
2012	259	280.7	108.4	18	no limit		n/a	
2013	74	231.5	312.2	21	no limit		n/a	
2014	173	658.6	380.7	21	3	5/1/14 to 8/31/14 and 11/1/14 to 2/28/15	9/1/14 to 10/31/14 and 3/1/15 to 4/30/15	*See Cod interim action*
2015	372	381.9	102.7	17	3	5/1/15 to 8/31/15 and 11/1/15 to 2/29/16	9/1/15 to 10/31/15 and 3/1/16 to 4/30/16	
2016	928	887.0	95.6	17	15	5/1/16 to 2/28/17 and 4/15/17 to 4/30/17	3/1/17 to 4/14/17	

Fishing Year	Sub-Annual Catch Limit (mt)	Catch (mt)	Percent of catch limit taken (%)	Minimum Size (inches)	Bag Limit Fish per angler - daily	Season Open	Season Closed	Additional Measures/Notes
2017	1,160			17	15	5/1/17 to 2/28/18 and 4/15/18 to 4/30/18	3/1/18 to 4/14/18	Replaced by final rule effective 7/27/17
		795.0	68.5	17	12	5/1/17 to 9/16/17 and 11/1/17 to 2/28/18 and 4/15/18 to 4/30/18	9/17/17 to 10/31/17 and 3/1/18 to 4/14/18	
2018	3,358	595.0	17.7	17	12	5/1/18 to 9/16/18 and 11/1/18 to 2/28/19 and 4/15/19 to 4/30/19	9/17/18 to 10/31/18 and 3/1/19 to 4/14/19	First Year: Winter Massachusetts Bay Spawning Protection Area: From November 1 through January 31 of each year, all recreational vessels, including private recreational and charter/party vessels, may only use pelagic hook-and-line gear, as defined below, when fishing in the Winter Massachusetts Bay Spawning Protection Area.[1]

Fishing Year	Sub-Annual Catch Limit (mt)	Catch (mt)	Percent of catch limit taken (%)	Minimum Size (inches)	Bag Limit Fish per angler - daily	Season Open	Season Closed	Additional Measures/Notes
2019	3,194	423.2	13.3	17	15	5/1/19 to 2/29/20 and 4/15/20 to 4/30/20	3/1/20 to 4/14/20	Previous year's regulations were in effect until July 5, 2019, when these measures were implemented. The possession limit increased from 12-15 fish, and the fall closure has been removed to increase access to this healthy stock.
2020	6,210	1202.3	19.4	17	15	5/1/20-2/28/21 and 4/1/21-4/30/21	3/1/21-3/31/21	
2021	5,295			17	15	5/1/21-2/28/22 and 4/1/22-4/30/22	3/1/22-3/31/22	

5.7.10.2.2 Georges Bank Cod Recreational Effort

Table 51 provides a breakdown of the number of vessels active in the for-hire component of the recreational fishery for FY 2016 to FY 2020.

Table 51- For-hire recreational vessels catching cod or haddock from Georges Bank

Fishing Year	Party	Charter	Total*
2016	48	53	93
2017	47	49	91
2018	44	72	94
2019	36	68	97
2020	43	77	114

Notes: *Total may not sum due to vessels taking both categories of trips during the fishing year. Based on vessel reporting via vessel log book.
Vessels landing or discarding cod or haddock from Georges Bank statistical areas (520 - 699) based on vessel log book.
Source: NMFS Greater Atlantic Regional Fisheries Office, November 2021.

5.7.10.2.3 Georges Bank Cod Recreational Catch Target

An overview of the management history is provided for GB cod below.

Summary of changes in federal recreational management measures for GB cod:

- Prior to Framework Adjustment 57,
  - 10 fish bag limit for private anglers
  - No bag limit for-hire (party/charter)
  - 22" minimum fish size
- May 1, 2018 - Framework 57
  - Set 138 mt GB cod recreational fishery catch target for FY2018-FY2020, and
  - Granted the Regional Administrator the authority to adjust measures following consultation with the Council for FY2018 and FY2019
- May 1, 2018 - FY2018 Recreational Groundfish Rule
  - 10 fish limit for private angler and for-hire (party/charter), and
  - 23" minimum fish size
- July 9, 2019 - FY2019 Recreational Groundfish Rule
  - 10 fish limit for private angler and for-hire (party/charter),
  - 21" minimum size
- July 30, 2020 - Framework Adjustment 59
  - Extended the 138 mt GB cod recreational fishery catch target for FY2020-FY2022 and made no changes to the management measures from FY2019

Table 52 summarizes recent catches of GB cod by the US commercial groundfish fishery and in-season FY2021 catches.

Table 52- Summary of recent catches (mt) of Georges Bank cod by the US commercial groundfish fishery, FY2015-FY2020, and in-season FY2021.

Commercial Groundfish Fishery- Georges Bank Cod					
Fishing Year	Sub-ACL	Landings	Discards	Catch	Percentage of sub-ACL
2015	1,787	1,608.5	28.3	1,636.8	92%
2016	608	571.9	24.6	596.6	98%
2017	531	432.8	13.1	446	84%
2018	1,519	833.2	4.7	837.9	62%
2019	1,568	524.5	7.9	532.4	34%
2020	1,072.7	417.4	7.8	425.3	39.6%
In-season 2021	1,093.1	199.6	4.6	204.2	18.7%

Sources: FY2015 – FY2020 final year-end multispecies catch reports, GARFO, FY2021 in-season catch report, GARFO, November 4, 2021.

Analysis to Develop a Recreational Fishery Catch Target for GB Cod:

Presently, the Georges Bank catch target is factored into the state waters and other fishery sub-components for GB cod during specifications setting. The catch target is not an allocation to the recreational fishery.

The data to evaluate a possible revised catch target comes from the recent 2021 stock assessment for GB cod and does not rely on information in year-end fishery catch reports. This is in part because the stock assessment includes the new Marine Recreational Information Program (MRIP) data for the entire time series. Data from calendar years 2016 to 2020 was examined to develop approaches for the catch target. Recreational catch for calendar years 2016-2019 came directly from the MRIP data used in the 2021 stock assessment for GB cod. Recreational catch for calendar year 2020 was calculated by the PDT and used in the assessment as a catch estimate. This included recent 3-year (2018-2020) and 5-year (2016-2020) averages of recreational catches and the percentage relative to all US fisheries catches. The calculations are summarized below.

Year	com. land	com. disc	rec. land	rec. disc	Ca. land	Ca. disc	total	Rec. Catches	US Total Catches	Percentage Rec Catch to US Total Catches	Percentage Rec Catch to Total Catches	3-Year Recent Average (2017-2019)	5-Year Recent Average (2015-2019)	3-Year Recent Average (2018-2020)	5-Year Recent Average (2016-2020)	3-Year Recent Average (2018-2020) * percent decline	5-Year Recent Average (2016-2020)* percent decline	3-Year Recent Average Percentage (2018-2020)	5-Year Recent Average Percentage (2016-2020)
1981	33849	775	1796	3	8508	98	45029	1799	36423	4.9%	4.0%								
1982	39333	739	4790	2	17827	71	62762	4792	44864	10.7%	7.6%								
1983	36756	492	2103	7	12131	64	51554	2110	39358	5.4%	4.1%								
1984	32915	74	2501	2	5761	68	41321	2503	35492	7.1%	6.1%								
1985	26828	262	2220	6	10442	103	39861	2226	29316	7.6%	5.6%								
1986	17490	343	976	2	8504	51	27366	978	18811	5.2%	3.6%								
1987	19035	200	2228	12	11844	76	33395	2240	21475	10.4%	6.7%								
1988	26310	242	6445	12	12741	83	45833	6457	33009	19.6%	14.1%								
1989	25056	628	1634	20	7895	76	35309	1654	27338	6.1%	4.7%								
1990	28110	453	758	19	14364	70	43775	777	29340	2.6%	1.8%								
1991	24219	358	1584	7	13467	65	39700	1591	26168	6.1%	4.0%								
1992	16899	515	1103	17	11667	71	30272	1120	18534	6.0%	3.7%								
1993	14590	163	2098	74	8526	63	25513	2172	16925	12.8%	8.5%								
1994	9737	166	717	33	5277	63	15992	750	10653	7.0%	4.7%								
1995	7026	85	1820	62	1102	38	10133	1882	8993	20.9%	18.6%								
1996	7261	114	388	22	1924	56	9765	410	7785	5.3%	4.2%								
1997	7548	107	2127	40	2919	486	13226	2167	9822	22.1%	16.4%								
1998	7041	113	422	64	1907	365	9912	486	7640	6.4%	4.9%								
1999	8313	81	194	26	1818	338	10770	220	8614	2.6%	2.0%								
2000	7600	134	667	57	1572	69	10099	724	8458	8.6%	7.2%								
2001	10749	308	94	20	2143	143	13457	114	11171	1.0%	0.8%								
2002	9472	167	458	37	1278	94	11506	495	10134	4.9%	4.3%								
2003	6852	229	265	35	1317	200	8898	300	7381	4.1%	3.4%								
2004	3508	130	210	6	1112	145	5112	216	3854	5.6%	4.2%								
2005	2754	394	325	7	630	226	4336	332	3480	9.5%	7.7%								

2006	2700	232	36	2	1097	350	4417	38	2970	1.3%	0.9%								
2007	3699	728	23	9	1107	117	5683	32	4459	0.7%	0.6%								
2008	3255	309	208	1	1390	140	5303	209	3773	5.5%	3.9%								
2009	2999	385	142	3	1003	206	4738	145	3529	4.1%	3.1%								
2010	2688	253	195	8	748	94	3986	203	3144	6.5%	5.1%								
2011	3387	122	142	8	702	43	4404	150	3659	4.1%	3.4%								
2012	2007	120	81	1	395	75	2679	82	2209	3.7%	3.1%								
2013	1312	83	7	1	384	39	1827	8	1403	0.6%	0.4%								
2014	1514	19	257	5	430	28	2253	262	1795	14.6%	11.6%								
2015	1300	31	486	21	472	20	2330	507	1838	27.6%	21.8%								
2016	1109	33	1075	10	428	12	2667	1085	2227	48.7%	40.7%								
2017	464	20	785	8	474	14	1765	793	1277	62.1%	44.9%								
2018	574	13	66	2	510	7	1183	68	655	10.4%	5.7%								
2019	682	8	251	6	388	8	1344	257	947	27.1%	19.1%	373	542						
2020	497.6	14.2	148.7	15.7	362	15	1053	164	676	24.3%	16%			163	473	43	124	20.6%	34.5%
																		71	118

Analysis to Develop Recreational Fishery Measures for Georges Bank Cod:

Data on size frequencies and angler trip frequencies of GB cod landings (Figure 33-Figure 35) were examined and used to estimate the reduction in mortality from different possible management measures (Table 53-Table 56).

Figure 33- Size frequencies of GB cod landings pooled over FY2018-FY2020 (numbers of fish).

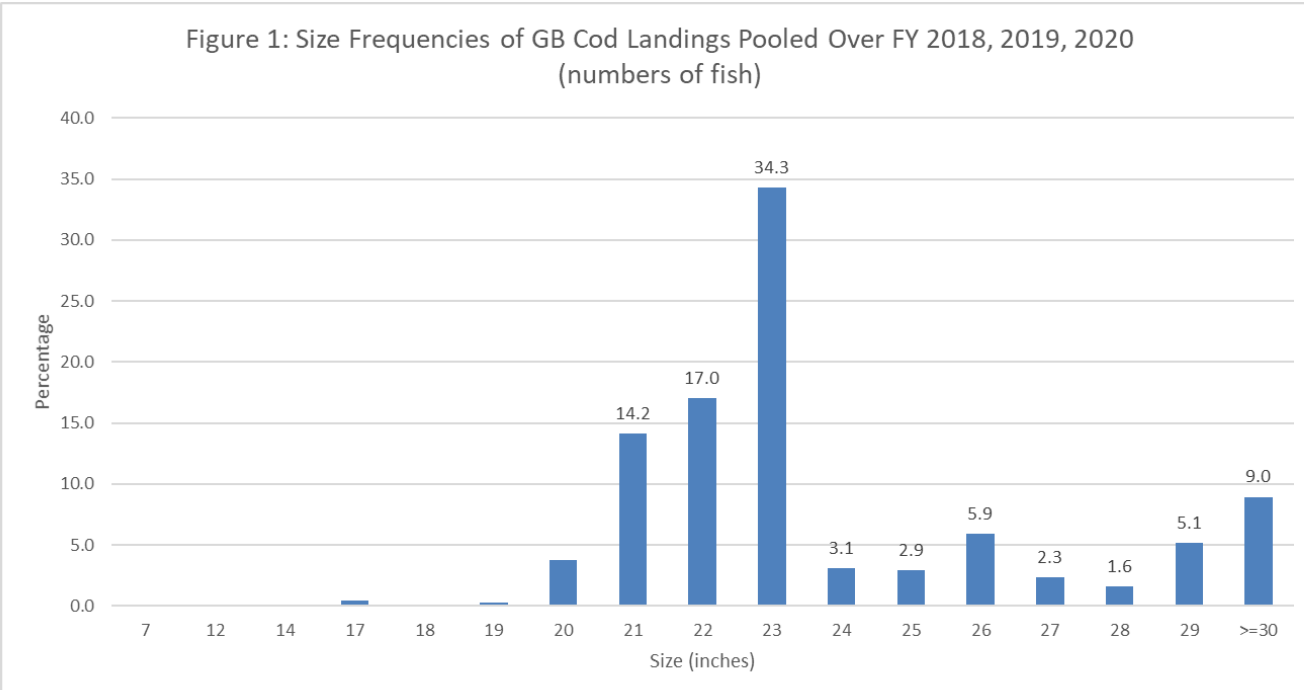


Table 53- Estimated percent reduction in GB cod landings and overall mortality (numbers of fish) under a range of minimum fish size limits.

Minimum size limit increase from 21" to:	Estimated reduction in landings (numbers of fish)	Estimated reduction in overall mortality - accounts for 30% release mortality (numbers of fish)
22"	14%	10%
23"	31%	22%
24"	66%	46%
25"	69%	48%
26"	72%	50%

Figure 34- Size frequencies of GB cod landings pooled over FY2018-FY2020 (mt).

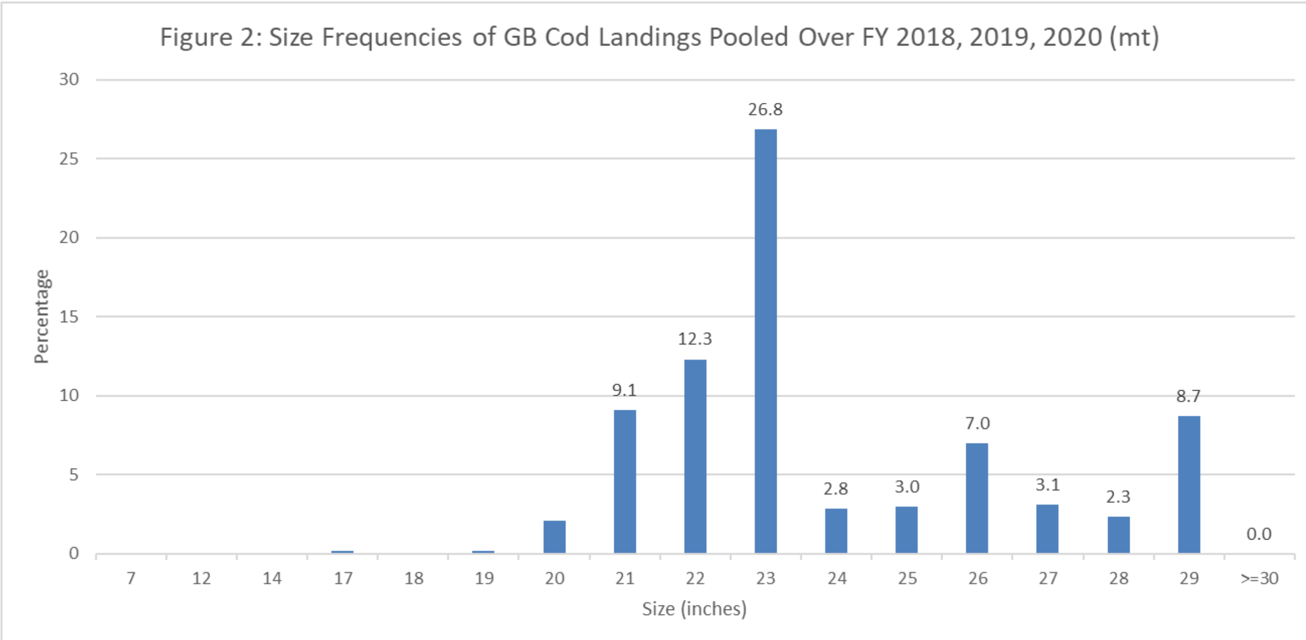


Table 54- Estimated percent reduction in GB cod landings and overall mortality (mt) under a range of minimum fish size limits

Minimum size limit increase from 21" to:	Estimated reduction in landings (mt)	Estimated reduction in overall mortality - accounts for 30% release mortality (mt)
22"	9%	6%
23"	21%	15%
24"	48%	34%
25"	51%	36%
26"	54%	38%
Slot limit of:		
21" to 25"	44%	31%
24" to 28"	79%	56%

Figure 35- Angler trip frequencies by number of cod landed per trip, pooled over FY2018-FY2020.

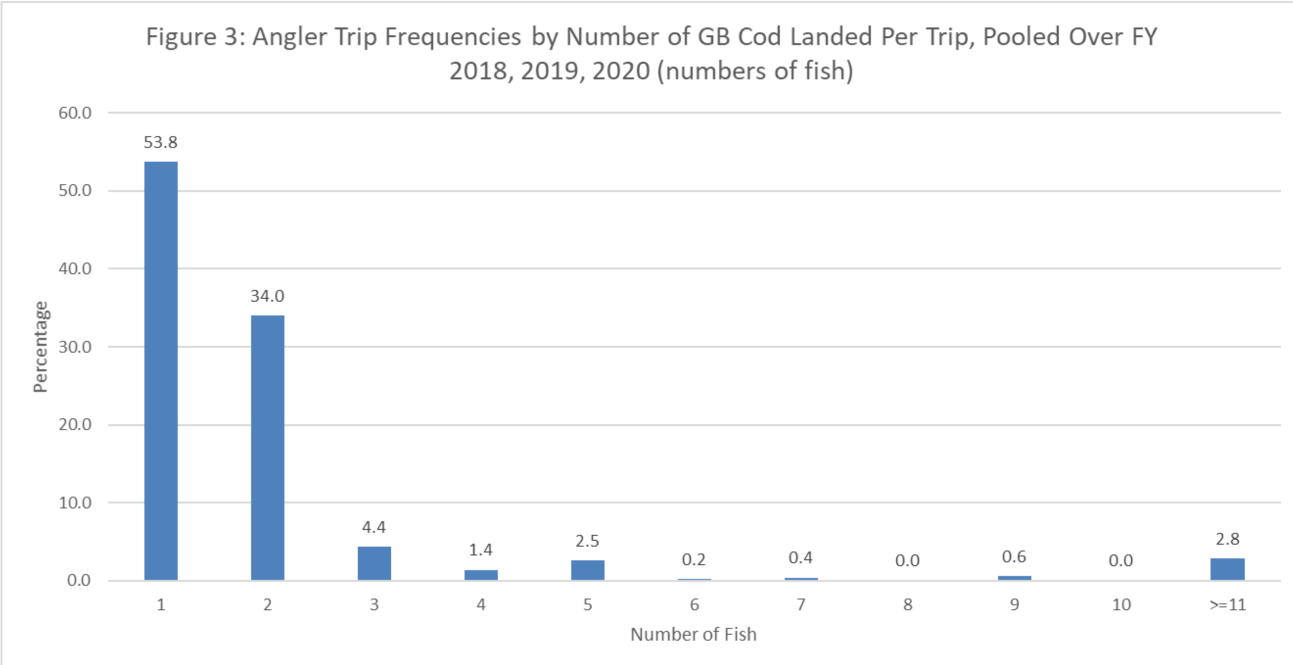


Table 55- Estimated reduction in GB cod landings (numbers of fish) under a range of possession limits.

Posession limit of:	Estimated reduction in landings (numbers of fish)
9	8%
8	9%
7	11%
6	13%
5	15%
4	18%
3	22%
2	28%
1	51%

Table 56- Proportion of GB cod mortality (in terms of weight (mt)) by wave, pooled over FY2018-FY2020.

Table 1. Proportion of GB Cod Mortality (in terms of weight (mt)) by Wave, Pooled Over FY 2018, 2019, 2020

Wave	Landing Proportion	Release Mortality Proportion	Total Mortality Proportion
2	0.19	0.004	0.17
3	0.16	0.07	0.15
4	0.38	0.41	0.39
5	0.17	0.16	0.17
6	0.10	0.36	0.12

5.7.10.3 Evaluation of other fisheries catches of groundfish stocks

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 57 to Table 61). A summary of recent catches by the small-mesh fisheries is provided (Table 62). A summary of recent catches in the midwater trawl Atlantic herring fishery is provided for GOM haddock (Table 63) and GB haddock (Table 64).

Table 57- Recent GB yellowtail flounder TACs, groundfish fishery sub-ACLs, and catches for fishing years 2016 through 2020 and in-season preliminary 2021, as of August 12, 2021.

	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 (%)
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	19.0%	187.9	27.6	14.7%
2019	140	76%	106	4.6%	99.8	3.1	3.1%
2020	162	26%	120	6.7	95.4	6.4	6.7%
In-season 2021	125	64%	80	n/a	63.6	0.7	1.0%

Values shown in metric tons (mt).

Source: GARFO catch reports.

Table 58- Recent GB yellowtail TACs and scallop fishery sub-ACLs and catches for fishing years 2016 through 2020.

Groundfish Fishing Year	*Scallop Fishery- GB Yellowtail Flounder*						
	Total Shared TAC	US % Share	US TAC	% US TAC Caught	Scallop sub-ACL	Scallop catch	%Scallop sub-ACL Caught
FY2016*	354	76%	269	12%	42	2.1	5%
FY2017*	300	69%	207	44%	32	52.6	164%
FY2018*	300	71%	213	20%	33	12.7	38%
FY2019*	140	76%	106	4.6%	1.8	1.7	96%
FY2020*	162	74%	120	7%	18.6	1.5	7.9%

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

Values shown in metric tons (mt).
FY2019 underlined sub-ACL accounts for mid-year transfer from scallop fishery to groundfish fishery of 15.2mt.
Source: GARFO catch reports.

Table 59- Recent SNE/MA yellowtail flounder ACLs, scallop fishery sub-ACLs and catches, and groundfish fishery sub-ACLs and catches.

	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
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%
FY2020*	21	3.3	15.6%	2	0.6	31.1%	15	1.0	6.2%

Values shown in metric tons (mt).
* Indicates that retention of SNE/MA YT was prohibited for scallop fishery
FY2019 underlined accounts for mid-year transfer from scallop fishery to groundfish fishery of 13.1mt.
Source: GARFO catch reports.

Table 60- Final year-end catch data (mt) for northern windowpane flounder.

			Northern Windowpane Flounder Catch (mt)				
			Groundfish Fishery		Sub-Components		
FY	**ACL**	**Total Catch**	**Sector**	**Common Pool**	**Scallop Fishery**	**State Waters**	**Other**
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
2020	55	58.97	10.2	0	34.8	.1	13.9

Values shown in metric tons (mt).
*In FY2017 a scallop-specific AM was created, in previous years scallop landings were part of the ‘other’ fisheries catch, reflected here.
Sources: FY2016 – FY2020 final year-end multispecies catch reports, GARFO.

Table 61- Final year-end catch data (mt) for southern windowpane flounder.

			Southern Windowpane Flounder Catch (mt)				
			Groundfish Fishery		Sub-Components with AMs		
FY	**ACL**	**Total Catch**	**Sector**	**Common Pool**	**Scallop Fishery**	**State Waters**	**Other**
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
2020	412	335.6	22.3	2.3	86.0	13.5	211.5

Values shown in metric tons (mt).
Sources: FY2016 – FY2020 final year-end multispecies catch reports, GARFO.

Table 62- Recent GB yellowtail flounder small-mesh fisheries sub-ACLs and catches (mt) for fishing years 2016 through 2020.

	Small Mesh Fishery- GB Yellowtail Flounder		
Groundfish Fishing Year	Small-mesh fisheries sub-ACL (mt)	Small-mesh fisheries (mt)	Percent small-mesh fisheries Caught (%)
FY2016	5	4.8	95.2%
FY2017	4	0.4	9.7%
FY2018	4	0.1	2.5%
FY2019	2	0.0	0.0%
FY2020	2	1.8	82.2%
FY2021	1.5		

Values shown in metric tons (mt).
Source: GARFO year-end catch reports.

Table 63- Summary of recent catches (mt) of GOM haddock by the commercial midwater trawl herring fishery, groundfish FY2016-FY2020.

	Midwater Trawl Atlantic Herring Fishery- Gulf of Maine Haddock				
Groundfish Fishing Year	**Sub-ACL**	**Landings**	**Discards**	**Catch**	**Percentage of sub-ACL**
2016	34	1.9	-	1.9	5.7%
2017	42	-	-	-	-
2018	122	-	-	0.0	-
2019	116	0.1	-	0.1	0.1%
2020	183	0.1	-	0.1	0.0%

Sources: FY2016 – FY2020 final year-end multispecies catch reports, GARFO.

Table 64- Summary of recent catches (mt) of Georges Bank haddock by the midwater trawl Atlantic herring fishery, groundfish FY2016- FY2020.

	Midwater Trawl- Georges Bank Haddock				
Groundfish Fishing Year	**Sub-ACL**	**Landings**	**Discards**	**Catch**	**Percentage of sub-ACL**
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%
2020	2,447	10.0	0	10.0	0.4%

Source: Groundfish FY2016 – FY2020 final year-end catch reports, GARFO.

5.7.11 Relevant Analyses – Default Specifications Process

This section includes analyses used in the development of FW63 alternatives, specifically, alternatives in Section 4.1.4 for the default specifications process.

Table 65 summarizes the timelines of recent specifications actions and usage of default specifications since establishment through FW53.

Table 65- Summary of timelines for recent framework adjustments which included specifications. Gray indicates default specifications were necessary.

Action	Council Final Action	Preliminary Submission	GARFO Correction Letter	Final Submission	Effective Date	Default Specifications	Default Specifications
FW55	January 27, 2016	February 19, 2016	March 28, 2016	April 8, 2016	May 1, 2016	No	n/a
FW56	November 16, 2016 and January 25, 2017	April 13, 2017	June 14, 2017	June 29, 2017	August 1, 2017	Yes: May 1-July 31	Split final action
FW57	December 6, 2017	January 22, 2018	February 21, 2018	March 2, 2018	May 1, 2018	No	Government Shut Down: Saturday, January 20, 2018 to Monday, January 22, 2018 (3 days)
FW58	December 5, 2018	February 1, 2019	March 8, 2019	March 19, 2019	July 18, 2019	Yes: May 1 to July 17	Government Shut Down: midnight December 22, 2018 to Monday, January 25, 2019 (35 days)
FW59	December 4, 2019	March 10, 2020	April 9, 2020	April 10, 2020	July 28, 2020	Yes: May 1 to July 27	COVID-19; Council remand to SSC at December meeting
FW61	December 2, 2020 and January 26, 2021	March 29, 2021	May 27, 2021	June 14, 2021	July 27, 2021	Yes: May 1 to July 26	COVID-19; Split final action, addition of redfish exemption after FW was initiated

Table 66 shows commercial fishery catch utilization by stock for FY2018-FY2021, to explore seasonal fishery trends and how these relate to the default percentage options under evaluation. Default specifications were not in place in FY2018, while they were for FY2019, FY2020, and FY2021 for certain stocks (highlighted in Table 66). Changes in ACLs from year to year may influence the percentage caught among the different stocks in the multispecies fishery, which may make it difficult to detect patterns in utilization related to default specifications.

Table 66- Groundfish ACL percent caught (sectors and common pool) by quarter by stock from FY2018–FY2021. Highlighting indicates stocks and years for which default specifications were in place.

Allocated Stocks		Fishing Year	Quarter 1 (through July 31st)	Quarter 2 (through Oct. 31st)	Quarter 3 (through Jan. 31st)	Quarter 4 (through Apr. 30th)	Total
	GB Cod East	2018	23.6%	10.6%	3.3%	3.8%	41.3%
		2019	13.2%	5.7%	1.3%	14.6%	34.8%
		2020	14.0%	5.8%	2.2%	8.3%	30.3%
		2021*	8.6%	0.6%			9.2%
	GB Cod	2018	15.0%	11.9%	18.7%	24.5%	70.1%
		2019	7.6%	6.5%	9.2%	10.4%	33.7%
		2020	12.8%	7.4%	7.7%	11.7%	39.6%
		2021*	10.6%	3.1%			13.6%
	GOM Cod	2018	18.5%	14.3%	20.5%	32.0%	85.2%
		2019	15.6%	13.9%	26.8%	23.2%	79.5%
		2020	12.1%	13.3%	26.5%	29.9%	81.7%
		2021*	10.7%	4.4%			15.0%
	GB Haddock East	2018	0.4%	0.2%	0.8%	2.7%	4.0%
		2019	1.0%	0.2%	0.3%	3.3%	4.8%
		2020	0.7%	0.0%	0.4%	2.3%	3.5%
		2021*	1.0%	0.0%			1.0%
	GB Haddock	2018	2.8%	2.8%	2.0%	3.9%	11.5%
		2019	2.8%	2.7%	1.6%	2.8%	9.9%
		2020	2.3%	1.3%	0.9%	0.9%	5.3%

		2021*	1.2%	0.6%			1.7%
	GOM Haddock	2018	5.9%	8.6%	10.6%	7.7%	32.8%
		2019	10.3%	11.3%	9.9%	11.2%	42.8%
		2020	7.2%	7.2%	7.4%	11.8%	33.7%
		2021*	6.3%	2.8%			9.1%
	GB Yellowtail Flounder	2018	13.8%	0.6%	0.2%	0.1%	14.7%
		2019	2.1%	0.8%	0.0%	0.1%	3.1%
		2020	5.2%	1.1%	0.2%	0.2%	6.7%
		2021*	0.8%	0.1%			0.9%
	CC/GOM Yellowtail Flounder	2018	13.3%	10.8%	6.6%	11.9%	42.6%
		2019	15.9%	7.3%	5.1%	8.3%	36.6%
		2020	8.7%	3.8%	5.3%	9.7%	27.5%
		2021*	17.2%	4.8%			22.0%
	SNE/MA Yellowtail Flounder	2018	4.3%	1.8%	11.7%	1.6%	19.4%
		2019	0.6%	0.2%	4.1%	1.4%	6.3%
		2020	1.4%	0.2%	1.8%	2.8%	6.2%
		2021*	1.0%	2.6%			3.6%
	American Plaice	2018	14.3%	17.9%	19.4%	16.6%	68.2%
		2019	19.1%	15.2%	15.1%	7.8%	57.2%
		2020	6.7%	5.4%	4.9%	3.5%	20.4%
		2021*	8.7%	2.7%			11.4%
	Witch Flounder	2018	18.1%	17.6%	29.0%	33.2%	97.8%
		2019	17.2%	17.1%	28.7%	26.3%	89.3%
		2020	14.9%	18.2%	17.5%	17.7%	68.2%
		2021*	14.7%	5.0%			19.7%
	GB Winter Flounder	2018	27.6%	27.5%	2.2%	0.1%	57.4%
		2019	12.8%	24.4%	2.1%	0.4%	39.6%
		2020	24.1%	30.0%	1.1%	0.3%	55.5%

		2021*	23.0%	6.4%			29.4%
	GOM Winter Flounder	2018	3.3%	10.1%	4.8%	7.4%	25.6%
		2019	3.6%	4.9%	4.0%	4.0%	16.4%
		2020	3.3%	4.0%	4.0%	9.5%	20.8%
		2021*	5.0%	4.3%			9.3%
	SNE/MA Winter Flounder	2018	11.2%	25.9%	10.0%	1.2%	48.3%
		2019	6.1%	13.0%	7.1%	1.6%	27.7%
		2020	4.1%	7.0%	6.7%	1.3%	19.2%
		2021*	6.3%	3.4%			9.6%
	Redfish	2018	15.9%	8.9%	10.9%	14.1%	49.9%
		2019	17.7%	8.5%	9.0%	9.9%	45.1%
		2020	19.0%	12.4%	13.1%	15.3%	59.8%
		2021*	19.1%	5.1%			24.2%
	White Hake	2018	21.2%	19.9%	16.1%	19.5%	76.7%
		2019	19.8%	16.1%	18.7%	20.7%	75.4%
		2020	22.6%	22.7%	22.8%	22.1%	90.2%
		2021*	20.8%	8.4%			29.3%
	Pollock	2018	2.2%	1.8%	2.8%	2.5%	9.3%
		2019	1.5%	2.0%	2.7%	2.0%	8.2%
		2020	3.1%	3.9%	4.8%	4.7%	16.4%
		2021*	3.9%	1.4%			5.3%
Non-Allocated Stocks	Halibut	2018	26.3%	28.0%	16.8%	20.4%	91.6%
		2019	32.0%	32.8%	19.8%	21.9%	106.5%
		2020	24.0%	18.9%	11.0%	13.5%	67.5%
		2021*	21.7%	9.4%			31.1%
	Northern Windowpane Flounder	2018	13.9%	16.5%	8.6%	13.6%	52.5%
		2019	10.7%	8.7%	7.4%	7.8%	34.5%
		2020	7.8%	6.4%	4.8%	7.9%	26.9%

		2021*	2.8%	1.2%			4.0%
	Southern Windowpane Flounder	2018	41.0%	23.2%	39.6%	22.6%	126.4%
		2019	15.3%	9.4%	19.8%	16.9%	61.4%
		2020	15.4%	4.8%	13.5%	17.5%	51.2%
		2021*	14.3%	0.7%			15.0%
	Ocean Pout	2018	5.6%	4.4%	3.6%	4.7%	18.3%
		2019	7.5%	4.3%	3.9%	4.2%	19.7%
		2020	8.2%	4.0%	3.7%	6.0%	21.9%
		2021*	43.2%	14.2%			57.4%
	Wolffish	2018	0.6%	0.5%	0.3%	0.5%	1.8%
		2019	0.9%	0.9%	0.5%	0.7%	3.0%
		2020	0.4%	0.3%	0.2%	0.3%	1.2%
		2021*	1.4%	0.5%			1.9%

Based on final quota of the fishing year
* Based on DMIS data as of August 18, 2021
Source: GARFO, September 8, 2021

Table 67 shows commercial fishing effort by quarter from FY2018-FY2021, to compare effort in years under default specifications to those in which default specifications were not in place. Default specifications were not in place in FY2018, while they were in FY2019 for Eastern GB cod, in FY2020 for Eastern GB cod and Eastern GB haddock, and in FY2021 for Eastern GB cod, Eastern GB haddock, GOM winter flounder, SNE/MA winter flounder, redfish, ocean pout, and wolffish. Table 69 shows fishing effort in Eastern Georges Bank to explore seasonality patterns and potential impacts of default specifications, which were in place for most of Quarter 1 in FY2019, FY2020, and FY2021. Fishing effort was lower for Quarter 1 in FY2019 and FY2020 compared to FY2018. Table 70 shows fishing effort under the redfish sector exemption by quarter in FY2020 and FY2021, to explore any differences in effort between the years possibly attributed to the default specifications in place for redfish in FY2021.

Table 67- Commercial groundfish (sectors and common pool) fishing effort by quarter as number of trips and by percentage of total trips, allocated groundfish trips only, from FY2018-FY2021.

Fishing Year	Quarter 1 (through July 31st)		Quarter 2 (through Oct. 31st)		Quarter 3 (through Jan. 31st)		Quarter 4 (through Apr. 30th)		Total	
2018	2,072	34.1%	1,588	26.1%	1,274	20.9%	1,150	18.9%	6,084	100.0%
2019	1,957	33.3%	1,583	26.9%	1,179	20.1%	1,157	19.7%	5,876	100.0%
2020	2,022	34.7%	1,485	25.5%	1,078	18.5%	1,239	21.3%	5,824	100.0%
2021*	1808		341						2,149	

* Based on DMIS data as of August 18, 2021
Source: GARFO, September 8, 2021

Table 68- Commercial groundfish (sectors and common pool) fishing effort by quarter as number of trips and by percentage of total trips by Broad Stock Area, allocated groundfish trips only, from FY2018-FY2021.

Fishing Year	Broad Stock Area	Quarter 1 (through July 31st)		Quarter 2 (through Oct. 31st)		Quarter 3 (through Jan. 31st)		Quarter 4 (through Apr. 30th)		Total	
2018	GB	117	26.7%	111	25.3%	85	19.4%	126	28.7%	439	100.0%
	GOM	1,451	35.0%	1,131	27.3%	733	17.7%	830	20.0%	4,145	100.0%
	IGB	282	27.7%	301	29.5%	239	23.5%	197	19.3%	1,019	100.0%
	SNE	366	33.3%	164	14.9%	392	35.6%	178	16.2%	1,100	100.0%
2019	GB	107	24.8%	109	25.2%	90	20.8%	126	29.2%	432	100.0%
	GOM	1,468	35.0%	1,182	28.2%	698	16.6%	850	20.2%	4,198	100.0%
	IGB	236	26.5%	292	32.8%	208	23.4%	154	17.3%	890	100.0%
	SNE	258	29.4%	137	15.6%	320	36.4%	164	18.7%	879	100.0%
2020	GB	156	27.7%	155	27.5%	122	21.7%	130	23.1%	563	100.0%
	GOM	1,398	33.8%	1,102	26.6%	705	17.0%	937	22.6%	4,142	100.0%
	IGB	283	27.1%	322	30.9%	226	21.7%	212	20.3%	1,043	100.0%
	SNE	334	42.1%	97	12.2%	216	27.2%	147	18.5%	794	100.0%
2021*	GB	148		18						166	
	GOM	1,310		260						1,570	
	IGB	248		72						320	
	SNE	256		13						269	

* Based on DMIS data as of August 18, 2021
Area counts are by sub-trip
Source: GARFO, September 8, 2021

Table 69- Eastern Georges Bank commercial groundfish (sectors and common pool) fishing effort by quarter as number of trips and by percentage of total trips, allocated groundfish sub-trips only, from FY2018-FY2021.

Fishing Year	Quarter 1 (through July 31st)		Quarter 2 (through Oct. 31st)		Quarter 3 (through Jan. 31st)		Quarter 4 (through Apr. 30th)		Total	
2018	75	51.7%	24	16.6%	16	11.0%	30	20.7%	145	100.0%
2019	53	35.6%	25	16.8%	16	10.7%	55	36.9%	149	100.0%
2020	53	28.2%	46	24.5%	27	14.4%	62	33.0%	188	100.0%
2021*	63		6						69	

* Based on DMIS data as of August 18, 2021
Source: GARFO, September 8, 2021

Table 70- Redfish sector exemption fishing effort by quarter as number of trips and by percentage of total trips from FY2020-FY2021.

Fishing Year	Quarter 1 (through July 31st)		Quarter 2 (through Oct. 31st)		Quarter 3 (through Jan. 31st)		Quarter 4 (through Apr. 30th)		Total	
2020	45	33.3%	38	28.1%	28	20.7%	24	17.8%	135	100.0%
2021*	30								30	

* Based on DMIS data as of August 18, 2021

Source: GARFO, September 8, 2021

6.0 ENVIRONMENTAL IMPACTS OF ALTERNATIVES

6.1 Introduction

The impacts of the alternatives under consideration are evaluated herein relative to the valued ecosystem components (VECs) described in the Affected Environment (Section 5.0) and to each other.

6.1.1 Evaluation Criteria

This action evaluates the potential impacts of alternatives using the criteria in Table 71.

Table 71- General definitions for impacts and qualifiers relative to resource condition (i.e., baseline).

VEC	**Resource Condition**	**Impact of Action**		
		Positive (+)	Negative (-)	No Impact (0)
Target and Non-target Species	Overfished status defined by the MSA	Alternatives that would maintain or are projected to result in a stock status above an overfished condition*	Alternatives that would maintain or are projected to result in a stock status below an overfished condition*	Alternatives that do not impact stock / populations
ESA-listed Protected Species (endangered or threatened)	Populations at risk of extinction (endangered) or endangerment (threatened)	Alternatives that contain specific measures to ensure no interactions with protected species (e.g., no take)	Alternatives that result in interactions/take of listed resources, including actions that reduce interactions	Alternatives that do not impact ESA listed species
MMPA Protected Species (not also ESA listed)	Stock health may vary but populations remain impacted	Alternatives that will maintain takes below PBR and approaching the Zero Mortality Rate Goal	Alternatives that result in interactions with/take of marine mammal species that could result in takes above PBR	Alternatives that do not impact MMPA Protected Species
Physical Environment / Habitat / EFH	Many habitats degraded from historical effort and slow recovery time (see condition of the resources table for details)	Alternatives that improve the quality or quantity of habitat	Alternatives that degrade the quality, quantity or increase disturbance of habitat	Alternatives that do not impact habitat quality
Human Communities (Socioeconomic)	Highly variable but generally stable in recent years (see condition of the resources table for details)	Alternatives that increase revenue and social well-being of fishermen and/or communities	Alternatives that decrease revenue and social well-being of fishermen and/or communities	Alternatives that do not impact revenue and social well-being of fishermen and/or communities

Impact Qualifiers		
A range of impact qualifiers is used to indicate any existing uncertainty	Negligible	To such a small degree to be indistinguishable from no impact
	Slight (sl) or low (L), as in slight/low positive or slight negative	To a lesser degree / minor
	Moderately (M) positive or negative	To an average degree (i.e., more than "slight", but not "high")
	High (H), as in high positive or high negative	To a substantial degree (not significant unless stated)
	Significant (in the case of an EIS)	Affecting the resource condition to a great degree, see 40 CFR 1508.27.
	Likely	Some degree of uncertainty associated with the impact
*Actions that will substantially increase or decrease stock size, but do not change a stock status may have different impacts depending on the particular action and stock. Meaningful differences between alternatives may be illustrated by using another resource attribute aside from the MSA status, but this must be justified within the impact analysis.		

6.1.2 Approach to Impacts Analysis

The specific approach to impacts analysis is described under each of the VECs – regulated groundfish and other species (Section 6.2), essential fish habitat (Section 6.3) endangered and other protected species (Section 6.3), human communities – economic (Section 6.4), and human communities – social (Section 6.6). Cumulative effects analysis is also provided (Section 0). The Council's preferred alternatives and options are identified in the impacts sections.

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), although recent work suggests some improvements. This means, generally, 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. In addition, for stocks in rebuilding plans, see the overview in the Affected Environment (Section 5.2.22) for additional information.

6.2.1 Action 1 – Specifications

6.2.1.1 Alternative 1 - No Action

Impacts on regulated groundfish

Under Alternative 1/No Action, the ACLs specified for FY2022 would be unchanged from those adopted through FW61. Default specifications for Eastern GB cod and Eastern GB haddock would be in place for the first three months of FY2022. Under Alternative 1/No Action, there would be no new FY2022 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, 2022. As of August 1, 2022, Eastern GB cod and Eastern GB haddock would not have ACLs specified. In the absence of these specifications, commercial groundfish vessels would not be allowed to fish in the Eastern Georges Bank management area 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, 2022, Alternative 1/No Action would be expected to halt commercial groundfish fishing effort in the Eastern Georges Bank management area. 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 the Eastern Georges Bank management area, 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 the Eastern Georges Bank management area 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 and Eastern GB haddock 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 slight positive impacts on managed stocks in the Eastern Georges Bank management area. Considering the differences between the ACLs of Alternative 1/No Action and Alternative 2, the overall fishing mortality on regulated groundfish stocks would likely be lower under Alternative 2.

Impacts on other species

Alternative 1/No Action is expected to have slight 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 2.

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 for GB haddock under Alternative 2. The sub-ACL for GB haddock is slightly less than in FY2021, this increases the likelihood that the sub-ACL for GB haddock would be exceeded under Alternative 1/No Action or 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 slight positive biological benefits for the Atlantic herring stock.

6.2.1.2 Alternative 2 – Revised Specifications (*Preferred Alternative*)

Impacts on regulated groundfish

Alternative 2 would reflect the results of the 2021 management track assessments, and the 2021 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. Alternative 2 would also specify total allowable catches (TACs) for the U.S./Canada Management Area for FY2022. Details on the SSC’s recommendations are located in Appendix I. For stocks in formal rebuilding plans, a summary is provided in the Affected Environment. This summary incorporates the assessment results from the most recent stock assessments – 2019, 2020, or 2021, as appropriate.

Relative to FY2021, FY2022 ACLs under Alternative 2 would increase for GB yellowtail flounder. There would also be decreases in the ACLs for GB cod, GOM cod, GB haddock, GOM haddock, redfish, white hake and pollock. There would be no change in the ACLs for SNE/MA yellowtail flounder, CC/GOM yellowtail flounder, witch flounder, GB winter flounder, GOM winter flounder, SNE/MA winter flounder, northern windowpane flounder, southern windowpane flounder, ocean pout, Atlantic halibut, and Atlantic wolffish.

Considering the differences between the ACLs of Alternative 1/No Action and Alternative 2, the overall fishing mortality on regulated groundfish stocks would likely be lower under Alternative 2

Georges Bank Cod- A formal estimation of reference points and status of the GB cod stock is not possible under the empirical approach. The OFL remains unknown for GB cod. The FY2022 GB cod ABC is based on the continued use of an empirical approach, with imputed data values for missing 2020 surveys. The ABC represents an approximate 57% decrease from the ABC value for GB cod in the previous three years and would represent a 37% decrease from the most recent three-year average catch for GB cod. The large reduction in the ABC for GB cod is anticipated to increase the probability of stock rebuilding.

Table 72- OFLs and ABCs (mt) for Georges Bank cod for FY2022

Year	OFL	ABC
2022	unknown	754

Gulf of Maine Cod - GOM cod is overfished with the overfishing status differing between models (overfishing is occurring based on the M=0.2 model, overfishing is not occurring based on the M-ramp model). NOAA Fisheries determined GOM cod is overfished and overfishing is occurring. The ASAP model was used to develop OFLs and ABCs through model averaging approach. Specifically, the projections from the rho-adjusted M = 0.2 model and the M-ramp (M = 0.4) model with a single bridge year (CY2020) were averaged to generate a constant ABC (Table 73). This ABC is aimed at reducing the likelihood of overfishing and promoting rebuilding for this stock. The OFL is based on the projections of fishing at F_{MSY}, averaged for the two models, and set dynamically (i.e., not held constant) for the three-year period.

Table 73- OFLs and ABCs (mt) for Gulf of Maine cod for FY2022-FY2024.

Year	OFL	ABC
2022	724	551
2023	853	551
2024	980	551

Georges Bank Yellowtail Flounder - A formal estimation of reference points and status of the stock is not possible under the empirical approach. Therefore, the OFL for GB yellowtail flounder therefore remains unknown. The ABC of 200 mt reflects the latest assessment advice (Table 74). The approach to setting catch advice takes into account the survey information which continues to indicate a downward trend with little sign of recovery. There are also uncertainties due to missing NEFSC trawl surveys in 2020, therefore the survey information was generated with two surveys rather than three (with the use of all three surveys being the standard approach).

The fishery does not appear to be limiting stock recovery in GB yellowtail flounder. Generally, yellowtail flounder recruitment is subject to environmental factors (Miller et al. 2016); however, the specific mechanism governing the recruitment of GB yellowtail flounder remains to be determined, though Tableau et al (2019) presented evidence of declining productivity of GB yellowtail flounder. Furthermore, Hare et al. (2016) estimated a negative directional effect of changing climate on yellowtail flounder. Regardless, the continued low stock biomass and poor recruitment for this stock warrant the maintenance of low catch levels. The ABC is believed to be low enough to prevent overfishing and allow for rebuilding should environmental conditions become favorable for recruitment of yellowtail flounder on Georges Bank.

Table 74- OFLs and ABCs (mt) for Georges Bank yellowtail flounder for FY2022-FY2023.

Year	OFL	ABC
2021	unknown	200
2022	unknown	200

White Hake- The ABC is set at $F_{rebuild}$ for white hake which uses projections at 70%F_{MSY}. 70%F_{MSY} in 2022 results in a 31 mt decrease to 2,155 mt (Table 75). Modifying the previous catch advice based on projections at 75%F_{MSY} to projections based on $F_{rebuild}$ (70%F_{MSY}) is appropriate given the overfished stock status of white hake and establishment of a new rebuilding plan for white hake in 2021. Sources of uncertainty include a significant retrospective pattern in the white hake assessment that appears to be worsening. Rho adjustments were made for the determination of stock status and for initializing the projections (i.e., 2020) but not carried throughout the projections. The white hake stock is in year-one of a new rebuilding plan and this change is consistent with the new rebuilding plan, which is expected to rebuild the stock within the rebuilding timeframe.

Table 75- OFL and ABC (mt) for white hake for FY2022.

Year	OFL	ABC
2022	3,022	2,155

Probability of Overfishing Summary

The probability of overfishing is summarized for stocks with analytical models (**Table 76**).

Table 76- Probability of overfishing by fishing year for stocks with analytical models.

		Probability of Overfishing		
Stock	Model	2022	2023	2024
GOM Cod*	m=0.2	0.252	0.074	0.027
GOM Cod*	M-ramp	0.042	0.02	0.016
White Hake		0		

**The probabilities for GOM cod assume 2021 is 2022, based on the SSC's use of one bridge year in the projections.*

Sub-ACLs for Other Fisheries

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. The overall impact of Alternative 2 ABCs and ACLs are likely to be slight positive, neutral, or slight negative with respect to the Atlantic sea scallop resource.

Scallop Framework 34 Overview:

Scallop Framework 34 will set fishery allocations for FY2022 and FY2023 (default). **Table 77** summarizes the projected scallop fishery groundfish bycatch. There are uncertainties in the bycatch projection estimates and the scallop fishery may realize values greater than or less than those projected. Generally based on these projections, the scallop fishery in FY2022 may exceed its sub-ACLs for SNE/MA yellowtail flounder (2 mt) and Northern windowpane flounder (31 mt), while staying under its sub-ACLs for GB yellowtail flounder (19 mt) and Southern windowpane flounder (129 mt).

Table 77- Overview of FY2022 projected scallop fishery bycatch estimates for the Council's scallop specifications proposal under FW34, including the anticipated FY2022 scallop sub-ACL for each stock.

		GBYT (mt)	SYT (mt)	NWP (mt)	SWP (mt)
Scallop FW 34 Alternative 3 Option 3 (Preferred)	2 trips to CAII AA at 15,000 per trip (30K total) 1 trip to NLS-South at 15,000 pounds 24 DAS New York Bight Closed	17	3	99	77

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 (in the Affected Environment). 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 slight positive to negligible with respect to the squid and whiting resource on Georges Bank.

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 and GB haddock in the Affected Environment)). Alternative 2 for GOM and GB haddock may reduce fishing mortality of Atlantic herring which would have positive biological benefits for the Atlantic herring stock.

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 in the Affected Environment. Under Alternative 2, the ABC for Southern windowpane flounder would remain unchanged and would have neutral impacts when compared with Alternative 1/No Action.

6.2.1.3 Alternative 3 - Recreational Catch Target for Georges Bank Cod (*Preferred Alternative)*

6.2.1.3.1 *Option 1* – No Action

Impacts on regulated groundfish

Option 1/No Action would maintain the current recreational catch target for GB cod of 138mt. Option 1/No Action would have positive impacts on GB cod if complementary management measures kept catches less than the catch target. Recent three-year (CY2018-CY2020) average catches have been 163 mt. The catch target itself is not expected to have direct impacts, positive or negative, on regulated groundfish species or other species because the total catch is constrained by the overall ACL. Indirectly, the catch target serves as a marker for developing recreational measures that are evaluated later. If the catch target is higher, it shifts more of the ACL from a direct control (the sector ACE) into less certain controls of the recreational measures. Option 1/No Action compared to Option 2 and Option 3 would be neutral.

Impacts on other species

Option 1/No Action would not be expected to have any direct biological impacts on other species.

6.2.1.3.2 *Option 2* - Revised Recreational GB Cod Catch Target Based on Recent Catches

Impacts on regulated groundfish

Option 2 would set the recreational catch target for GB cod at 43 mt. Option 2 would have positive impacts on GB cod if complementary management measures reduced catches to not exceed the catch target. Recent three-year (CY2018-CY2020) average catches have been 163 mt. The catch target itself is not expected to have direct impacts, positive or negative, on regulated groundfish species or other species because the total catch is constrained by the overall ACL. Indirectly, the catch target serves as a marker for developing recreational measures that are evaluated later. If the catch target is higher, it shifts more of the ACL from a direct control (the sector ACE) into less certain controls of the recreational measures. Option 2 compared to Option 1/No Action, Option 3 and Option 4 would be neutral.

Impacts on other species

Option 2 would not be expected to have any direct biological impacts on other species.

6.2.1.3.3 *Option 3* - Revised Recreational GB Cod Catch Target Based on Recent Percentage of US Fisheries Catches

Impacts on regulated groundfish

Option 3 would set the recreational catch target for GB cod at 71 mt. Option 3 would have positive impacts on GB cod if complementary management measures reduced catches to not exceed the catch target. Recent three-year (CY2018-CY2020) average catches have been 163 mt. The catch target itself is not expected to have direct impacts, positive or negative, on regulated groundfish species or other species because the total catch is constrained by the overall ACL. Indirectly, the catch target serves as a marker for developing recreational measures that are evaluated later. If the catch target is higher, it shifts more of the ACL from a direct control (the sector ACE) into less certain controls of the recreational measures. Option 3 compared to Option 1/No Action, Option 2 and Option 4 would be neutral.

Impacts on other species

Option 3 would not be expected to have any direct biological impacts on other species.

6.2.1.3.4 ***Option 4*** **- Revised Recreational GB Cod Catch Target Based on a Reduction from Recent Catches (*Preferred Option*)**

Impacts on regulated groundfish

Option 3 would set the recreational catch target for GB cod at 75 mt. Option 4 would have positive impacts on GB cod if complementary management measures reduced catches to not exceed the catch target. Recent three-year (CY2018-CY2020) average catches have been 163 mt. The catch target itself is not expected to have direct impacts, positive or negative, on regulated groundfish species or other species because the total catch is constrained by the overall ACL. Indirectly, the catch target serves as a marker for developing recreational measures that are evaluated later. If the catch target is higher, it shifts more of the ACL from a direct control (the sector ACE) into less certain controls of the recreational measures. Option 4 compared to Option 1/No Action, Option 2, and Option 3 would be neutral.

Impacts on other species

Option 3 would not be expected to have any direct biological impacts on other species.

6.2.1.4 Alternative 4 - Changes to the Default Specifications Process (*Preferred Alternative*)

6.2.1.4.1 ***Option 1*** **– No Action**

Impacts on regulated groundfish

No Action/Option 1 is an administrative measure and not expected to have biological impacts, unless the specifications expire and commercial groundfish fishing ceases as a result. To date, this has not occurred. This measure is not expected to impact fishing effort or behavior over the course of an entire fishing year. However, the default percentage allows varying levels of fishing effort – and subsequent fishing mortality – in the event of a delay in the specifications action. Fishing effort may potentially be lower under the default percentage of 35%, particularly for stocks with a seasonal component (e.g., eastern GB management units of cod and haddock, GB winter flounder) in which most effort occurs early in the fishing year when default specifications are in place (see Table 66). Option 1, therefore, may have slight positive impacts on regulated groundfish. Option 1 is more conservative than Options 2-4 which all would have a default percentage of 75% and, therefore, is expected to have slight positive impacts on regulated groundfish when compared to Options 2-4.

Impacts on other species

Option 1/No Action would not be expected to have any direct biological impacts on other species. However, fishing effort could be slightly lower under the default percentage. Option 1, therefore, may have slight positive impacts on other species. Option 1 is more conservative than Options 2-4 which all would have a default percentage of 75% and, therefore, is expected to have slight positive impacts on other species when compared to Options 2-4.

6.2.1.4.2 ***Option 2*** **- 4 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs**

Impacts on regulated groundfish

Option 2 is an administrative measure and not expected to have biological impacts, unless the specifications expire and commercial groundfish fishing ceases as a result. To date, this has not occurred. This measure is not expected to impact fishing effort or behavior over the course of an entire fishing year. However, the default percentage allows varying levels of fishing effort – and subsequent fishing mortality – in the event of a delay in the specifications action. Fishing effort may potentially be slightly lower under the default percentage of 75%, particularly for stocks with a seasonal component (e.g., eastern GB management units of cod and haddock, GB winter flounder) in which most effort occurs early in the fishing year when default specifications are in place (see Table 66). Option 2, therefore, may have slight positive impacts on regulated groundfish. This option establishes a second-year TAC for the US/CA management units of Eastern GB cod and Eastern GB haddock, such that the TAC set for Year 1 would be held for Year 2. The Year 2 TAC would remain in place for the full year, unless replaced. Negative impacts could occur if the anticipated TAC is much lower than the Year 2 TAC or if catch exceeds the anticipated TAC while the Year 2 TAC is in place. Option 2 is less conservative than Option 1 which has a default percentage of 35% and, therefore, is expected to have slight negative impacts on regulated groundfish when compared to Option 1.

Impacts on other species

Option 2 would not be expected to have any direct biological impacts on other species. However, fishing effort could be slightly lower under the default percentage. Option 2, therefore, may have slight positive impacts on other species. Option 2 is less conservative than Option 1 which has a default percentage of 35% and, therefore, is expected to have slight negative impacts on other species when compared to Option 1.

6.2.1.4.3 ***Option 3*** **- 5 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs**

Impacts on regulated groundfish

Option 3 is an administrative measure and not expected to have biological impacts, unless the specifications expire and commercial groundfish fishing ceases as a result. To date, this has not occurred. This measure is not expected to impact fishing effort or behavior over the course of an entire fishing year. However, the default percentage allows varying levels of fishing effort – and subsequent fishing mortality – in the event of a delay in the specifications action. Fishing effort may potentially be slightly lower under the default percentage of 75%, particularly for stocks with a seasonal component (e.g., eastern GB management units of cod and haddock, GB winter flounder) in which most effort occurs early in the fishing year when default specifications are in place (see Table 66). Option 3, therefore, may have slight positive impacts on regulated groundfish. This option establishes a second-year TAC for the US/CA management units of Eastern GB cod and Eastern GB haddock, such that the TAC set for Year 1 would be held for Year 2. The Year 2 TAC would remain in place for the full year, unless replaced. Negative impacts could occur if the anticipated TAC is much lower than the Year 2 TAC or if catch exceeds the anticipated TAC while the Year 2 TAC is in place. Option 3 is less conservative than Option 1 which has a default percentage of 35% and, therefore, is expected to have slight negative impacts on regulated groundfish when compared to Option 1.

Impacts on other species

Option 3 would not be expected to have any direct biological impacts on other species. However, fishing effort could be slightly lower under the default percentage. Option 3, therefore, may have slight positive impacts on other species. Option 3 is less conservative than Option 1 which has a default percentage of 35% and, therefore, is expected to have slight negative impacts on other species when compared to Option 1.

6.2.1.4.4 ***Option 4*** **- 6 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs (*Preferred Option*)**

Impacts on regulated groundfish

Option 4 is an administrative measure and not expected to have biological impacts, unless the specifications expire and commercial groundfish fishing ceases as a result. To date, this has not occurred. This measure is not expected to impact fishing effort or behavior over the course of an entire fishing year. However, the default percentage allows varying levels of fishing effort – and subsequent fishing mortality – in the event of a delay in the specifications action. Fishing effort may potentially be slightly lower under the default percentage of 75%, particularly for stocks with a seasonal component (e.g., eastern GB management units of cod and haddock, GB winter flounder) in which most effort occurs early in the fishing year when default specifications are in place (see Table 66). Option 4, therefore, may have slight positive impacts on regulated groundfish. This option establishes a second-year TAC for the US/CA management units of Eastern GB cod and Eastern GB haddock, such that the TAC set for Year 1 would be held for Year 2. The Year 2 TAC would remain in place for the full year, unless replaced. Negative impacts could occur if the anticipated TAC is much lower than the Year 2 TAC or if catch exceeds the anticipated TAC while the Year 2 TAC is in place. Option 4 is less conservative than Option 1 which has a default percentage of 35% and, therefore, is expected to have slight negative impacts on regulated groundfish when compared to Option 1.

Impacts on other species

Option 4 would not be expected to have any direct biological impacts on other species. However, fishing effort could be slightly lower under the default percentage. Option 4, therefore, may have slight positive impacts on other species. Option 4 is less conservative than Option 1 which has a default percentage of 35% and, therefore, is expected to have slight negative impacts on other species when compared to Option 1.

6.2.2 Action 2 – Recreational Fishery Measures- Georges Bank Cod

6.2.2.1 Alternative 1 - No Action

Impacts on regulated groundfish

If the ABCs in Alternative 2 under Action 1 are adopted, the US ABC would decline by greater than 70%. In addition, recreational catches account for greater than 20% of total U.S. catches in fishing years 2018 through 2020. Current measures in the recreational fishery are a minimum fish size of 21 inches and a 10-fish bag limit on party, charter, and private modes. Changes to the recreational management measures require a Council action. Alternative 1/No Action would not create any additional measures to constrain the recreational harvest of GB cod, and under Alternative 1/No Action there is an increased likelihood that recreational catches could exceed the recreational catch target of 138 mt as new MRIP data would be used to evaluate the recreational catches, and therefore there is a higher risk of exceeding the ACL or ABC. If the measures remain unchanged, recreational catches would likely exceed the GB cod catch target under any of the options under Action 1 Alternative 3. Therefore, relative to Alternative 1/No Action would likely have a negative biological impact for GB cod.

Impacts on other species

Alternative 1/No Action would not be expected to have any direct biological impacts on other species.

6.2.2.2 Alternative 2 – Temporary Administrative Measure to Allow the Regional Administrator Authority to Adjust the Recreational Measures for Georges Bank Cod (*Preferred Alternative*)

Impacts on regulated groundfish

Alternative 2 would allow for recreational management measures to be adjusted in FY2022 through FY2024 by the Regional Administrator to stay below a catch target selected by the Council. Alternative 2 would likely lead to positive impacts relative to Alternative 1/No Action for the regulated groundfish species, mainly GB cod. Measures to date under consideration include adjusting the minimum fish size, setting a 5-fish bag limit for all anglers – party, charter, and private modes, and closing certain seasons.

Impacts on other species

Alternative 2 would not be expected to have any direct biological impacts on other species.

6.2.2.3 Alternative 3 - Recreational Measures for Georges Bank Cod (*Preferred Alternative*)

Impacts on regulated groundfish

All three options are anticipated to have positive biological impacts on GB cod. Positive biological impacts on GB cod are expected to be the greatest under Option 2 (65% reduction in mortality), followed by Option 1 (63% reduction in mortality), the Council's preferred option. Option 3 (52% reduction in mortality) is expected to have the least positive impact of the three options. The main difference between these options is the closed season that would be in place followed by size restrictions. A slot limit (Option

1 or Option 2) may provide additional positive biological impacts for GB cod if it leads to larger and more fecund cod being released live and allow for future potential spawning.

Impacts on other species

Alternative 3 would not be expected to have any direct biological impacts on other species.

6.3 IMPACTS ON PHYSICAL ENVIRONMENT AND ESSENTIAL FISH HABITAT

The Essential Fish Habitat (EFH) impacts discussion below focuses on changes in the amount or location of fishing that might occur as a result of the implementation of the various alternatives. This approach to evaluating adverse effects to EFH is based on two principles: (1) seabed habitat vulnerability to fishing effects varies spatially, due to variations in seabed substrates, energy regimes, living and non-living seabed structural features, etc., between areas and (2) the magnitude of habitat impacts is based on the amount of time that fishing gear spends in contact with the seabed. This seabed area swept (seabed contact time) is grossly related to the amount of time spent fishing, although it will of course vary depending on catch efficiency, gear type used, and other factors.

The area that is potentially affected by the proposed alternatives includes EFH for species managed under the following Fishery Management Plans: NE Multispecies; Atlantic Sea Scallop; Monkfish; Atlantic Herring; Summer Flounder, Scup and Black Sea Bass; Atlantic Mackerel, Squid, and Butterfish; Spiny Dogfish; Tilefish; Deep-Sea Red Crab; Atlantic Surfclam and Ocean Quahog; Atlantic Bluefish; Northeast Skates; and Atlantic Highly Migratory Species.

6.3.1 **Action 1 – Specifications**

Action 1 considers specifications for FY 2022.

6.3.1.1 Alternative 1 – No Action

Alternative 1/No Action maintains default specifications for Eastern GB cod and Eastern GB haddock. The default values are in effect through July 31, 2022, and equal 35% of the FY 2021 limits. Under Alternative 1/No Action all other stocks in the fishery already have specifications set for the full 2022 fishing year. Table 2 summarizes both the default and the full-year 2021 specifications set in Framework 61.

After July 31, 2022, ACLs would not be defined for the EGB management units. Without specification of these ACLs, catches would not be allocated to the groundfish fishery (sectors or common pool vessels) and targeted groundfish fishing activity would not occur for these stocks. In addition to the lack of targeted groundfish fishing activity for these stocks, certain provisions of the sector management system would probably constrain fishing even for stocks with an ACL. Regulations require that a sector stop fishing in a stock area if it does not have ACE for a stock. Fishing can continue on other stocks only if the sector can demonstrate it would not catch the ACE-limited stock. Thus, there would be little opportunity for sector vessels to fish on Eastern Georges Bank once these quotas go to zero. Other broad stock areas would not be affected since specifications for other resources are already in place.

Alternative 1 would result in slight negative impacts on EFH as fishing activity, mainly bottom-trawl gears which have adverse impacts to EFH, would continue for the first three months of the fishing year. After that, effort and impacts to EFH would decline substantially on Eastern Georges Bank, unless sectors can demonstrate that they would be able to fish there without catching the ACE-limited stock.

6.3.1.2 Alternative 2 – Revised Specifications (*Preferred Alternative*)

Alternative 2 revises specifications for GOM cod, GB yellowtail flounder, GB cod, GB haddock, and white hake, as well as the EGB cod and haddock management units. Table 5 summarizes these updated specifications as well as existing full-year specifications for other stocks, set in Framework 61.

Alternative 2 would also result in slight negative impacts on EFH as fishing activity, mainly bottom-trawl gears, which have adverse impacts to EFH, would continue throughout the fishing year.

Comparing Alternatives 1 and 2, biological and economic analyses suggest that effort in the groundfish fishery would be lower under Alternative 2 as compared to Alternative 1, despite full-year allocations for the Eastern Georges Bank stocks under Alternative 2. This is in large part due to lower GB cod ACLs under Alternative 2 which are expected to constrain landings of associated stocks including GB haddock, redfish, and pollock (Table 79). Thus, while both alternatives are expected to have similar slight negative impacts to EFH, it is expected that the negative impacts of the revised specification under Alternative 2 would be reduced relative to the negative impacts of Alternative 1.

6.3.1.3 Alternative 3 - Recreational Catch Target for Georges Bank Cod (*Preferred Alternative*)

This catch target informs the development of recreational fishery management measures; without one there is a risk that the overall catch limit on the stock could be exceeded.

- *Option 1 (No Action)* – the recreational catch target for Georges Bank cod would remain in place for FY 2022
- *Option 2* – the current target would be revised based on recent catches
- *Option 3* – the target would be revised based on a recent percentage of US fishery catches
- *Option 4* – the catch target would be revised based on a reduction relative to recent catches (*Preferred Option*)

While the specification of a target may have positive impacts on the GB cod stock, recreational fishing gears do not have adverse effects on EFH, and therefore possible changes to the recreational fishery under the four different options will not affect the magnitude of the groundfish fishery's impacts on EFH. All four options are expected to have no adverse impacts on EFH.

6.3.1.4 Alternative 4 - Changes to the Default Specifications Process (*Preferred Alternative*)

The default specifications process allows the fishery to continue to operate even if the regulations implementing the revised specifications are not yet implemented. Default specifications are a percentage of the prior year's specifications to minimize the risk of overfishing and may not exceed the anticipated ABC for the upcoming year. The alternatives are as follows:

- *Option 1 (No Action)* – 3 months duration, 35% of the previous year's specifications, no holdback provision
- *Option 2* – 4 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs
- *Option 3* - 5 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs
- *Option 4* - 6 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs (*Preferred Option*)

Note that 'holdback' refers to a portion of a groundfish sector's ACE that is not allocated while GARFO determines if overages or other catch accounting issues occurred in the prior fishing year. Holdback cannot occur under default specifications, for any of the four options.

The different options under this alternative provide increasing certainty that the fishery can continue to be prosecuted despite any delays in implementation of this framework or future specifications actions. Additionally, authorizing 2-year specifications for US/CA stocks allows the fishery on eastern Georges Bank to continue for longer if implementation is delayed, since currently the US/CA stocks are specified annually and Eastern Georges Bank closes to groundfishing when the default specifications expire. All four options would result in slight negative impacts on EFH as fishing activity, mainly bottom-trawl gears, which have adverse impacts to EFH, would continue until specifications are implemented.

While fishing opportunities early in the season are improved, especially under the action alternatives, total specifications do not increase because of these alternatives. Therefore, a large increase in effort on an annual basis is not expected to result from the options with the 75% default. Because the spring and early summer months are important fishing times for certain vessels, there could be slight increases in overall annual effort if additional allocations are available at the beginning of the fishing year. This means that Options 2-4 could have slightly more negative impacts to EFH as compared to Option 1.

In practice, specifications have been implemented by August 1 for the past few years, suggesting that there is not likely to be a different in fishing opportunities or fishing effort between Options 2, 3, and 4. Therefore, these options are expected to have very similar impacts to EFH.

6.3.2 Action 2 – Recreational Fishery Measures- Georges Bank Cod

Under Alternative 1 (No Action), the Regional Administrator would not have the temporary authority to adjust recreational management measures for Georges Bank cod, and Council action would be needed to adjust the management measures. Alternative 2 (*preferred*) would grant the Regional Administrator temporary flexibility to adjust the recreational management measures for Georges Bank cod without requiring action by the Council. Alternative 3 (*preferred*) recommends three different options for reducing mortality as compared to CY2018-CY2020 catches: Option 1 - 63% (*preferred option*), Option 2 - 65%, or Option 3 - 52%.

Recreational fishing gears do not have adverse effects on EFH, and therefore possible changes to the recreational fishery under Alternative 2 and Alternative 3 as compared to Alternative 1 will not affect the magnitude of the groundfish fishery's impacts on EFH. All three alternatives are expected to have no adverse impacts on EFH.

6.4 IMPACTS ON ENDANGERED AND OTHER PROTECTED SPECIES

The FW63 alternatives are evaluated for their impacts on species protected under the Endangered Species Act (ESA) of 1973 and/or the Marine Mammal Protection Act (MMPA) of 1972. The current conditions of the protected species VEC is summarized in Table 12 and described in more detail in section 5.6. Impacts to protected species are described both in terms of their direction (negative, positive, or no impact) and their magnitude (slight, moderate, or high) based on the guidelines shown in Table 71.

The following impact analysis considers how the fishery may overlap with protected species in time and space, as well as records of protected species interaction with particular gear types (e.g., commercial: primarily gillnet and bottom otter trawl; recreational: rod and reel/hook and line gear). In addition, the impacts of the alternatives on protected species take into account impacts to ESA-listed species, as well as impacts to MMPA protected species in good condition (i.e., marine mammal stocks whose PBR level have not been exceeded) or poor (i.e., marine mammal stocks that have exceeded or are near exceeding their PBR level) condition. For ESA-listed species, any action that results in interactions or take is expected to have some level of negative impacts, including actions that reduce interactions. Actions expected to result in positive impacts on ESA-listed species include only those that contain specific measures to ensure no interactions (i.e., no take). By definition, all ESA-listed species are in poor condition and any take can negatively impact that species' recovery. The stock conditions for marine mammals not listed under the ESA varies by species; however, all are in need of protection. For marine mammal stocks that have their PBR level reached or exceeded, some level of negative impacts would be expected from alternatives that result in the potential for interactions between fisheries and those stocks. For species that are at more sustainable levels (i.e., PBR levels have not been exceeded), alternatives not expected to change fishing behavior or effort relative to current operating conditions in the fishery may have some level of positive impacts by maintaining takes below the PBR level and approaching the zero mortality rate goal (Table 71).

6.4.1 Action 1 – Specifications

Action 1 encompasses adjustments to ACLs for certain stocks (Alternative 2), adjustments to the GB cod recreational catch target (Alternative 3), and changes to the default specifications process (Alternative 4).

6.4.1.1 Alternative 1 - No Action

Under Alternative 1/No Action, the ACLs specified for FY2022 would be unchanged from those adopted through FW61. There would be no changes to the specifications for FY2022 and default specifications would be set for Eastern GB cod and Eastern GB haddock for the first three months of FY2022. Under Alternative 1/No Action, there would be no new FY2022 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.

See biological impacts (section 6.2.1.1) for an overview of Alternative 1/No Action. Under Alternative 1/No Action, the directed groundfish fishery would be expected to operate in all broad stock areas through July 31, 2022; during this timeframe, minimal changes in fishing effort, relative to current operating conditions, are anticipated. However, on August 1, 2022, EGB cod and EGB haddock would not have ACLs specified. In the absence of stock specific specifications, commercial groundfish vessels would not be allowed to fish in the EGB management area without an allocation. As a result, after July 31, 2022, commercial groundfish fishing effort in the EGB management area is expected to be reduced. As all other stocks would have specifications that would not expire on July 31, 2022, and these specifications are not significantly different from those authorized over the last 5 or more years, significant changes in fishing effort would not be expected in all other broadstock areas though FY2022. Based on this information, fishing effort and behavior under Alternative 1/No Action is expected to remain similar to current operating conditions with the potential for effort to decline in the EGB management area after July 31, 2022.

Understanding expected fishing behavior/effort in a fishery informs potential interaction risks with protected species (ESA listed and MMPA protected species). Specifically, interaction risks with protected species are strongly associated with the amount of gear in the water, gear soak or tow time, as well as the area of overlap, either in space or time, of the gear and a protected species (with risk of an interaction increasing with increases in of any or all of these factors). Taking into consideration the latter, as well as fishing behavior/effort under the Alternative 1/No Action, impacts of Alternative 1/No Action to protected species are provided below.

MMPA (Non-ESA listed) Protected Species Impacts

The potential impacts of Alternative 1/No Action on non-ESA listed MMPA protected species have not been analyzed quantitatively. This is largely due to the fact that these potential impacts are dependent upon fishing behavior and effort, which although expected to remain similar to current conditions, are not possible to predict for quantitative analysis. In order to best classify the potential impacts of Alternative 1/No Action on MMPA protected species, we have reviewed marine mammal serious injury and mortality reports, as well as the US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments that cover that most recent 10 years of data (Waring et al. 2015a; Waring et al. 2016; Hayes et al. 2017; Hayes et al. 2018; Hayes et al. 2019; Hayes et al. 2020; Hayes et al. 2021).

Aside from several stocks of bottlenose dolphin, there has been no indication that takes of non-ESA listed species of marine mammals in commercial fisheries has gone above and beyond levels which would result in the inability of each species population to sustain itself. Specifically, aside from MMPA strategic stocks identified in Table 12 in section 5.6.1 (i.e., several stocks of bottlenose dolphin), potential biological removal (PBR) levels have not been exceeded for any of the non-ESA listed marine mammal species identified in section 5.6.1. Although several stocks of bottlenose dolphin have experienced levels of take that have resulted in the exceedance of each species PBR level, take reduction strategies and/or plans have been implemented and are currently in place to reduce bycatch in the fisheries affecting these species (Atlantic Trawl Gear Take Reduction Strategy, Bottlenose Dolphin Take Reduction Plan; see sections 5.6.4.2.1.1 and 5.6.4.2.1.2 for additional information). Although the most recent information presented in Hayes et al. (2021) is a collective representation of commercial fisheries interactions with non-ESA listed species of marine mammals, and does not address the effects of the groundfish fishery specifically, the information does demonstrate that thus far, current management measures are keeping most marine mammal species below their PBR level; exceptions include marine mammal strategic stocks of bottlenose dolphin stocks.

Taking into consideration the above information, and the fact that there are non-ESA listed marine mammal stocks/species whose populations may or may not be at optimum sustainable levels, the impacts of Alternative 1/No Action on non-ESA listed species of marine mammals are likely to range from slight negative to slight positive, depending on the species/stock. As provided above, some bottlenose dolphin stocks are experiencing levels of interactions that have resulted in exceedance of their PBR levels. These stocks/populations are not at an optimum sustainable level and therefore, the continued existence of these stocks/species is at risk. As a result, any potential for an interaction is a detriment to the species/stocks ability to recover from this condition. As previously noted, the risk of an interaction is strongly associated with the amount of gear in the water, the time the gear is in the water (e.g., soak or tow time), and the presence of protected species in the same area and time as the gear, with risk of an interaction increasing with increases in of any of these factors. As commercial fishing effort under Alternative 1 is expected to remain unchanged from current operating conditions, Alternative 1 is not expected to introduce new or elevated interaction risks to these non-ESA listed marine mammal stocks in poor condition. Specifically, the amount of gear in the water, tow times, and overlap between protected species and fishing gear is expected to remain unchanged relative to current conditions. Given this information, and the information provided in section 5.6, Alternative 1/No Action is likely to result in slight negative impacts to non-ESA listed marine mammal stocks/species in poor condition (i.e., bottlenose dolphin stocks).

Alternatively, there are also many non-ESA listed marine mammals that, even with continued fishery interactions, are maintaining an optimum sustainable level (i.e., PBR levels have not been exceeded) over the last several years. For these stocks/species, it appears that the fishery management measures that have been in place over this timeframe have resulted in levels of effort that result in interaction levels that are not expected to impair the stocks/species ability to remain at an optimum sustainable level. These fishery management measures, therefore, have resulted in indirect low positive impacts to these non-ESA listed marine mammal species/stocks. Should future fishery management actions maintain similar operating condition as they have over the past several years, it is expected that these low positive impacts would remain. As provided above, Alternative 1/No Action is expected to result in *status quo* commercial fishing effort relative to recent levels. Given this, the impacts of Alternative 1 on these non-ESA listed species of marine mammals are expected to be negligible to slight positive (i.e., continuation of current operating conditions is not expected to result in exceedance of any of these stocks/species PBR level), with negligible impacts are associated with those species in which interactions with gear types used in the groundfish fishery have never been observed or documented (i.e., hook and line: small cetaceans (except for bottlenose dolphin stocks); bottom trawl gear: humpback whale; see section 5.6.4).

Based on the above information, information provided in sections 5.6 and 6.4, and the fact that the groundfish fishery must comply with specific take reduction plans (i.e., HPTRP, the BDTRP, ALWTRP; see sections 5.6.4.2.1.1 and 5.6.4.2.1.2); and that voluntary measures exist that reduce serious injury and mortality to marine mammal species incidentally caught in trawl fisheries (see the Atlantic Trawl Gear Take Reduction Team in section 5.6.4.2.1.1), Alternative 1/No Action is expected to have slight negative to slight positive impacts on non-ESA listed species of marine mammals.

ESA Listed Species

The commercial groundfish fishery is prosecuted primarily with bottom otter trawl and gillnet gear; the recreational component primarily uses hook and line gear. As provided in section 5.6.1, ESA listed species of whales, sea turtles, Atlantic sturgeon, Atlantic salmon, and giant manta rays are at risk of interacting with all or some of these gear types, with interactions often resulting in injury or mortality to the species. Based on this, the groundfish fishery is likely to result in some level of negative impacts to ESA listed species. Taking into consideration fishing behavior/effort under Alternative 1/No Action, as well the fact that interaction risks with protected species are strongly associated with the amount of gear in the water, the time the gear is in the water (e.g., soak time, tow time), and the presence of protected species in the same area and time as the gear, with risk of an interaction increasing with increases of any or all of these factors, we determined the level of negative impacts to ESA listed species to be slight. Below, we provide support for this determination.

As provided above, Alternative 1/No Action will set specifications for FY2022 - FY2024; these specifications would remain unchanged from those adopted in FW61. As specifications under Alternative 1/No Action are no greater than those authorized over the last 5 or more years, resultant fishing behavior and effort in the groundfish fishery is expected to remain similar to what has been observed in the fishery over this timeframe. Specifically, the amount of gear (i.e., bottom trawls gillnets, hook and line), tow or soak times, and area fished are not expected to change significantly from current operating conditions. As noted above, interaction risks with protected species are strongly associated with the amount of gear in the water, the time the gear is in the water (e.g., soak time, tow time), and the presence of protected species in the same area and time as the gear, with risk of an interaction increasing with increases of any or all of these factors. Continuation of "status quo" fishing behavior/effort is not expected to change any of these operating conditions. Based on this, the information provided in sections 5.6 and 6.4, and the fact that the groundfish fishery must comply with the ALWTRP, the impacts of Alternative 1/No Action alternative on ESA listed species is expected to be negligible to slight negative. Negligible impacts are associated with those species in which interactions with gear types used in the groundfish fishery have never been observed or documented (i.e., bottom trawl gear: North Atlantic right, sei, and fin whales), and slight negative impacts are associated with those species in which interactions (based on observed or documented take) are possible with gillnet, bottom trawl, and/or hook and line gear (see section 5.6.4).

Overall Impacts to Protected Species

Based on the above protected species (i.e., ESA-listed and MMPA protected) impact analysis, overall impacts of Alternative 1/No Action on protected species are expected to be slight negative to slight positive. Relative to Alternative 2, Alternative 1/No Action may result in slightly negative to slightly positive impacts to protected species. Although the total ACLs between Alternative 1/No Action and Alternative 2 do vary, all proposed ACLs are within the range of ACLs authorized within the fishery over the last 5 (or more) years. As a result, any changes in fishing effort or behavior between either Alternative are not expected to be significant. However, as Alternative 1/No Action will not have specifications specified for Eastern GB cod and Eastern GB haddock after July 31, 2022, some reduction in effort is possible in this management area. The latter potentially equates to less fishing time, and therefore, less gear being present in the water. As protected species (ESA listed and MMPA protected species) interactions with gear, regardless of listing status, is greatly influenced by the amount of gear, the time the gear is in the water (e.g., soak time, tow time), and the presence of protected species in the same area and time as the gear, any decrease in either of these factors will reduce the potential for protected species interactions with gear. Based on this information, Alternative 1/No Action may provide benefit to protected species relative to Alternative 2. However, the ACL specified for GB cod under Alternative 2 is a substantial decline from that in previous years and that under Alternative 1/No Action. This could result in less fishing effort in the Georges Bank broadstock area if this low ACL becomes constraining and as such, Alternative 1/No Action may have slightly negative impacts on protected species relative to Alternative 2.

6.4.1.2 Alternative 2 – Revised Specifications (*Preferred Alternative*)

In general, relative to Alternative 1/No Action, the new specifications adopted under Alternative 2 will result in 7 of the stocks (all allocated) experiencing a decrease in the total ACL, 1 stock (allocated) experiencing some increase in the total ACL, and 12 stocks (7 allocated and all 5 non-allocated) experiencing no change in ACL (see Table 84).

Annual catch limits can be considered a proxy for relative fishing effort. Information on fishing effort in turn informs potential interaction risks to protected species. Specifically, interaction risks to protected species (i.e., ESA-listed and MMPA protected) are associated with the amount of gear in the water, the time the gear is in the water (e.g., soak time, tow time), and the presence of protected species in the same area and time as the gear, (i.e., components of fishing effort); however, this information is often unavailable. As a result, assessments of protected species interaction with an associated fishery are often dependent on looking at changes (if any) in ACL as a means to identify potential changes in fishing behavior/effort from one year to the next, and therefore, identification of new or additional interaction risks to a protected species. As Alternative 2 will result in an increase in the ACL for one stock, some slight increase in effort is possible under Alternative 2. However, any potential increase in effort is expected to be tempered by constraining stocks that are spread out across broad stock areas (see biological impacts (section 6.2.1.2). Based on this, and the fact that the proposed specifications under Alternative 2 are no greater than or are within the range of the specifications that have been authorized by the fishery over the last 5 or more years, resultant fishing behavior and effort in the groundfish fishery is expected to remain similar to what has been observed in the fishery over this timeframe. Specifically, the amount of gear (hook and line, bottom trawls and gillnets), tow or soak times, and areas fished are not expected to change significantly from current operating conditions.

As noted above, interaction risks with protected species are strongly associated with amount of gear in the water, the time the gear is in the water (e.g., soak time, tow time), and the presence of protected species in the same area and time as the gear, with risk of an interaction increasing with increases of any or all these factors. As Alternative 2 is not expected to change any of these operating conditions, and is not expected to result in significant changes in effort, increased interaction risks with protected species are not expected. Based on this, the information provided in sections 5.6 and 6.4, and the fact that the groundfish fishery must comply with the take reduction plans (i.e., HPTRP, the BDTRP, ALWTRP; see sections 5.6.4.2.1.1 and 5.6.4.2.1.2), impacts of Alternative 2 on protected species (i.e., ESA listed and MMPA protected) are expected to be slight negative to slight positive (see Alternative 1/No Action for rationale behind negligible vs slight negative determination). Relative to Alternative 1/No Action, Alternative 2 is likely to result in slight negative to slight positive impacts to protected species (ESA-listed and MMPA protected). Slight negative to negligible impacts to protected species are expected compared to Alternative 1/No Action, as there is the potential for a slight increase in effort relative to Alternative 1/No Action. Any potential increase in effort is expected to be tempered by constraining stocks that are spread out across broad stock areas. Additionally, under Alternative 1/No Action, after July 31, 2022, Eastern GB cod and Eastern GB haddock would not have ACLs specified and so commercial groundfish fishing effort in the EGB management area is expected to be reduced after July 31, 2022. However, under Alternative 2 there is a substantial decline in the ACL for GB cod, which may result in reduced fishing effort in the Georges Bank broadstock area if this low ACL becomes constraining. Based on this, Alternative 2 could potentially have slight positive impacts on protected species compared to Alternative 1/No Action.

6.4.1.3 Alternative 3 - Recreational Catch Target for Georges Bank Cod (*Preferred Alternative*)

6.4.1.3.1 *Option 1* – No Action

This option would maintain the recreational catch target for GB cod of 138 mt established in FW59. This catch target for GB cod informs the development of recreational fishery management measures, and is intended to prevent the catch limit for the stock from being exceeded. Option 1/No Action is not expected to result in any significant changes in fishing behavior or effort relative to current operating conditions. As fishing behavior and effort are not expected to change significantly from status quo conditions, the presence, quantity, or degree of recreational gear (e.g., hook and line) used in the groundfish broadstock area are also not expected to change significantly. As provided above, interaction risks with protected species are strongly associated with amount of gear in the water, the time the gear is in the water (e.g., soak time, tow time), and the presence of protected species in the same area and time as the gear, with risk of an interaction increasing with increases of any or all of these factors. Continuation of "status quo" fishing behavior/effort is not expected to change any of these operating conditions and therefore, relative to current conditions, new or elevated (e.g., more gear) interaction risks to protected species (MMPA protected and ESA listed) are not expected. For these, and the reasons provided in section 5.6.1 for MMPA protected (non-ESA listed) and ESA listed species, expected impacts of Option 1/No Action on protected species are likely negligible to slight negative. Compared to Options 2-4, Option 1/No Action is expected to have negligible to slight negative impacts on protected species (i.e., ESA-listed and MMPA protected) , particularly for protected species with documented interactions with recreational gear (e.g., hook and line) (see section 5.6.4.1), since the catch target under Option 1/No Action is higher than that under either Option 2, Option 3, or Option 4, and so may not constrain recreational fishing effort as much.

6.4.1.3.2 *Option 2* - Revised Recreational GB Cod Catch Target Based on Recent Catches

Option 2 would set a revised GB cod recreational catch target for FY2022 based on recent catches. Under a 754 mt ABC, this option results in a GB cod recreational catch target of 43 mt. Same as all of the options under Alternative 3, this catch target for GB cod would inform the development of recreational fishery management measures, and is intended to prevent the catch limit for the stock from being exceeded. Option 2 will provide no incentive for effort to increase in the recreational fishery and in fact, effort is not expected to be any greater than that under Option 1/No Action. It is possible that because of the lower catch target for GB cod recreational fishing effort could shift to other species within the region, but effort would not be expected to increase beyond what has occurred under Option 1/No Action. Based on this, overall impacts to protected species (i.e., ESA-listed and MMPA protected) are expected to be similar to those provided above for Option 1/No Action, negligible to slight negative; for rationale to support this determination see Option 1/No Action, section 6.4.1.3.1. Compared to Option 1/No Action, Option 2 is expected to have negligible to slight positive impacts on protected species, since the catch target under Option 2 is lower than that under Option 1/No Action, and so may constrain recreational fishing effort more. The catch target under Option 2 is lower than that under either Option 3 or Option 4, and as such, impacts to protected species are expected to be negligible to slight positive, relative to these options.

6.4.1.3.3 Option 3 - Revised Recreational GB Cod Catch Target Based on Recent Percentage of US Fisheries Catches

Option 3 would set a revised GB cod recreational catch target for FY2022 based on the recent percentage of US fisheries catches. Under a 754 mt ABC, this option results in a GB cod recreational catch target of 71 mt. Same as all of the options under Alternative 3, this catch target for GB cod would inform the development of recreational fishery management measures, and is intended to prevent the catch limit for the stock from being exceeded. Option 3 will provide no incentive for effort to increase in the recreational fishery and in fact, effort is not expected to be any greater than that under Option 1/No Action. It is possible that because of the lower catch target for GB cod recreational fishing effort could shift to other species within the region, but effort would not be expected to increase beyond what has occurred under Option 1/No Action. Based on this, overall impacts to protected species (i.e., ESA-listed and MMPA protected) are expected to be similar to those provided above for Option 1/No Action, negligible to slight negative; for rationale to support this determination see Option 1/No Action, section 6.4.1.3.1. Compared to Option 1/No Action, Option 3 is expected to have negligible to slight positive impacts on protected species impacts, since the catch target under Option 3 is lower than that under Option 1/No Action, and so may constrain recreational fishing effort more. The catch target under Option 3 is higher than that under Option 2, and as such, impacts to protected species are expected to be negligible to slight negative, relative to this option, and is similar to the catch target under Option 4, and so is expected to have negligible impacts, relative to this option.

6.4.1.3.4 Option 4 - Revised Recreational GB Cod Catch Target Based on a Reduction from Recent Catches (*Preferred Option*)

Option 4 would set a revised GB cod recreational catch target for FY2022 based on a reduction from recent catches. This option would set a GB cod recreational catch target of 75 mt. Same as all of the options under Alternative 3, this catch target for GB cod would inform the development of recreational fishery management measures, and is intended to prevent the catch limit for the stock from being exceeded. Option 4 will provide no incentive for effort to increase in the recreational fishery and in fact, effort is not expected to be any greater than that under Option 1/No Action. It is possible that because of the lower catch target for GB cod recreational fishing effort could shift to other species within the region, but effort would not be expected to increase beyond what has occurred under Option 1/No Action. Based on this, overall impacts to protected species (i.e., ESA-listed and MMPA protected) are expected to be similar to those provided above for Option 1/No Action, negligible to slight negative; for rationale to support this determination see Option 1/No Action, section 6.4.1.3.1. Compared to Option 1/No Action, Option 4 is expected to have negligible to slight positive impacts on protected species impacts, since the catch target under Option 4 is lower than that under Option 1/No Action, and so may constrain recreational fishing effort more. Relative to Option 2, the higher catch target under Option 4 is expected to have negligible to slight negative impacts to protected species. Relative to Option 3, the similar catch target under Option 4 (a 73 mt catch target under Option 3 vs. 75mt catch target under Option 4) is expected to have negligible impacts to protected species.

6.4.1.4 Alternative 4 - Changes to the Default Specifications Process (*Preferred Alternative*)

6.4.1.4.1 *Option 1* – No Action

Option 1/No Action is an administrative measure, closing Eastern Georges Bank to commercial groundfishing when the default specifications expire and setting a default specifications percentage of 35% to allow varying levels of fishing effort in the event of a delay in the specifications action. The default specifications process allows the fishery to continue to operate even if the regulations implementing the revised specifications are not yet implemented. The 35% default specifications are a percentage of the prior year's specifications expected to minimize the risk of overfishing and may not exceed the anticipated ABC for the upcoming year. Under Option 1/No Action, fishing effort may potentially be lower under the default percentage of 35%, particularly for stocks with a seasonal component (e.g., eastern GB management units of cod and haddock, GB winter flounder) in which most effort occurs early in the fishing year when default specifications are in place (see Table 66). While fishing opportunities early in the season are improved, total specifications do not increase, therefore, a large increase in effort on an annual basis is not expected to result from the default percentage of 35% and this measure is not expected to impact fishing effort or behavior over the course of an entire fishing year. Under a potentially lower default percentage of 35%, impacts are expected to be slight negative for protected species (ESA-listed and MMPA protected). However, should the default specifications expire and commercial groundfish fishing ceases as a result, impacts on protected species could potentially be slight positive. To date, this has not occurred. Therefore, Option 1/No Action is expected to have slight negative to slight positive impacts on protected species (ESA-listed and MMPA protected). Option 1/No Action is more conservative than Options 2-4, which all would have a default percentage of 75% and, therefore, is expected to have negligible to slight positive impacts on protected species (i.e., ESA-listed and MMPA protected) when compared to Options 2-4.

6.4.1.4.2 *Option 2* - 4 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs

Option 2 is an administrative measure, setting a default specifications percentage of 75% to allow varying levels of fishing effort in the event of a delay in the specifications action. The default specifications process allows the fishery to continue to operate even if the regulations implementing the revised specifications are not yet implemented. The 75% default specifications are a percentage of the prior year's specifications expected to minimize the risk of overfishing and may not exceed the anticipated ABC for the upcoming year. Under Option 2, fishing effort may potentially be slightly lower under the default percentage of 75%, particularly for stocks with a seasonal component (e.g., eastern GB management units of cod and haddock, GB winter flounder) in which most effort occurs early in the fishing year when default specifications are in place (see Table 66). While fishing opportunities early in the season are improved, total specifications do not increase, therefore, a large increase in effort on an annual basis is not expected to result from the default percentage of 75% and this measure is not expected to impact fishing effort or behavior over the course of an entire fishing year. Under a potentially lower default percentage of 75%, impacts are expected to be negligible to slight negative for protected species (ESA-listed and MMPA protected) since interaction risk still exists. However, should the default specifications expire and commercial groundfish fishing ceases as a result, impacts on protected species could potentially be slight positive. To date, this has not occurred. Therefore, Option 2 is expected to have slight negative to slight positive impacts on protected species.

Option 2 is less conservative than Option 1/No Action, which has default percentage of 35% and, therefore, is expected to have negligible to slight negative impacts on protected species (i.e., ESA-listed and MMPA protected) when compared to Option 1/No Action. Option 2 has the same default percentage as Options 3 and 4, but the potential for slightly lower fishing effort that could occur under the default specifications percentage of 75% would occur for a shorter duration (4 months vs. 5 or 6 months). However, if the shorter duration of default specifications under Option 2 results in specifications expiring and a subsequent decrease in commercial groundfish fishing, impacts on protected species could be slightly positive compared to Option 3 and 4 due to decreased interaction risk. Therefore, relative to Option 3 and 4, Option 2 is expected to have slight negative (due to a shorter duration in slightly lower fishing effort under default specifications) to slight positive impacts (due to decrease in fishing effort following specifications expiring) to protected species (ESA-listed and MMPA protected).

While setting two-year US/CA TACs is an administrative measure, because this would allow the fishery on Eastern Georges Bank to continue operating if there is a delay in the specifications action, since currently the US/CA are specified annually, impacts on protected species could be slight negative. Additionally, the no holdback provision is an administrative measure that is expected to have no impact on protected species.

6.4.1.4.3 ***Option 3*** **- 5 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs**

Option 3 is an administrative, setting a default specifications percentage of 75% to allow varying levels of fishing effort in the event of a delay in the specifications action. The default specifications process allows the fishery to continue to operate even if the regulations implementing the revised specifications are not yet implemented. The 75% default specifications are a percentage of the prior year's specifications expected to minimize the risk of overfishing and may not exceed the anticipated ABC for the upcoming year. Under Option 3, fishing effort may potentially be slightly lower under the default percentage of 75%, particularly for stocks with a seasonal component (e.g., eastern GB management units of cod and haddock, GB winter flounder) in which most effort occurs early in the fishing year when default specifications are in place (see Table 66). While fishing opportunities early in the season are improved, total specifications do not increase, therefore, a large increase in effort on an annual basis is not expected to result from the default percentage of 75% and this measure is not expected to impact fishing effort or behavior over the course of an entire fishing year. Under a potentially lower default percentage of 75%, impacts are expected to be negligible to slight negative for protected species (ESA-listed and MMPA protected), since interaction risk still exists. However, should the default specifications expire and commercial groundfish fishing ceases as a result, impacts on protected species could potentially be slight positive. To date, this has not occurred. Therefore, Option 3 is expected to have slight negative to slight positive impacts on protected species.

Option 3 is less conservative than Option 1/No Action, which has default percentage of 35% and, therefore, is expected to have negligible to slight negative impacts on protected species (i.e., ESA-listed and MMPA protected) when compared to Option 1/No Action. Option 3 has the same default percentage as Options 2 and 4, but the potential for slightly lower fishing effort that could occur under the default specifications percentage of 75% would occur for a shorter or longer duration (5 months vs. 4 or 6 months). . However, if the duration of default specifications under Option 3 results in specifications expiring and a subsequent decrease in commercial groundfish fishing, impacts on protected species could be slightly negative compared to Option 2 and slightly positive compared to Option 4 due to decreased interaction risk. Therefore, relative to Option 2, Option 3 is expected to have slight negative impacts (due to decrease in fishing effort following specifications expiring) to slight positive impacts (due to a longer duration in slightly lower fishing effort under default specifications) to protected species (ESA-listed and MMPA protected). Relative to Option 4, Option 3 is expected to have slight negative impacts (due to a shorter duration in slightly lower fishing effort under default specifications) to slight positive impacts (due to decrease in fishing effort following specifications expiring) to protected species (ESA-listed and MMPA protected).

While setting two-year US/CA TACs is an administrative measure, because this would allow the fishery on Eastern Georges Bank to continue operating if there is a delay in the specifications action, since currently the US/CA are specified annually, impacts on protected species could be slight negative. Additionally, the no holdback provision is an administrative measure that is expected to have no impact on protected species.

6.4.1.4.4 ***Option 4*** **- 6 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs (*Preferred Option*)**

Option 4 is an administrative, setting a default specifications percentage of 75% to allow varying levels of fishing effort in the event of a delay in the specifications action. The default specifications process allows the fishery to continue to operate even if the regulations implementing the revised specifications are not yet implemented. The 75% default specifications are a percentage of the prior year's specifications expected to minimize the risk of overfishing and may not exceed the anticipated ABC for the upcoming year. Under Option 4, fishing effort may potentially be slightly lower under the default percentage of 75%, particularly for stocks with a seasonal component (e.g., eastern GB management units of cod and haddock, GB winter flounder) in which most effort occurs early in the fishing year when default specifications are in place (see Table 66). While fishing opportunities early in the season are improved, total specifications do not increase, therefore, a large increase in effort on an annual basis is not expected to result from the default percentage of 75% and this measure is not expected to impact fishing effort or behavior over the course of an entire fishing year. Under a potentially lower default percentage of 75%, impacts are expected to be negligible to slight negative for protected species (ESA-listed and MMPA protected), since interaction risk still exists. However, should the default specifications expire and commercial groundfish fishing ceases as a result, impacts on protected species could potentially be slight positive. To date, this has not occurred. Therefore, Option 4 is expected to have slight negative to slight positive impacts on protected species.

Option 4 is less conservative than Option 1/No Action, which has default percentage of 35% and, therefore, is expected to have slight negative impacts on protected species (i.e., ESA-listed and MMPA protected) when compared to Option 1/No Action. Option 4 has the same default percentage as Options 2 and 3, but the potential for slightly lower fishing effort that could occur under the default specifications percentage of 75% would occur for a longer duration (6 months vs. 4 or 5 months). However, if the longer duration of default specifications under Option 4 is less likely to result in specifications expiring and a subsequent decrease in commercial groundfish fishing, impacts on protected species could be slightly negative compared to Options 2 and 3 due to decreased interaction risk. Therefore, relative to Option 2 and 3, Option 4 is expected to have slight negative (due to decrease in fishing effort following specifications expiring) to slight positive impacts (due to a longer duration in slightly lower fishing effort under default specifications) to protected species (ESA-listed and MMPA protected).

While setting two-year US/CA TACs is an administrative measure, because this would allow the fishery on Eastern Georges Bank to continue operating if there is a delay in the specifications action, since currently the US/CA are specified annually, impacts on protected species could be slight negative. Additionally, the no holdback provision is an administrative measure that is expected to have no impact on protected species.

6.4.2 Action 2 – Recreational Fishery Measures- Georges Bank Cod

Action 2 encompasses a temporary administrative measure to allow the regional administrator authority to adjust the recreational measures for GB cod (Alternative 2) and recreational measures for GB cod (Alternative 3).

6.4.2.1 Alternative 1 – No Action

Under Alternative 1/No Action, the GB cod management measures that are currently in place for the recreational fishery would remain, and Council action would be needed to adjust the management measures. As a result, Alternative 1/No Action is not expected to result in any significant changes in fishing behavior or effort relative to current operating conditions. As fishing behavior and effort are not expected to change significantly from status quo conditions, the presence, quantity, or degree of recreational gear (e.g., hook and line) used in the groundfish broadstock area are also not expected to change significantly. As provided above, interaction risks with protected species are strongly associated with amount of gear in the water, the time the gear is in the water (e.g., soak time, tow time), and the presence of protected species in the same area and time as the gear, with risk of an interaction increasing with increases of any or all of these factors. Continuation of "status quo" fishing behavior/effort is not expected to change any of these operating conditions and therefore, relative to current conditions, new or elevated (e.g., more gear) interaction risks to protected species (MMPA protected and ESA listed) are not expected. For these, and the reasons provided in section 5.6.1 for MMPA protected (non-ESA listed) and ESA listed species, impacts of Alternative 1/No Action on protected species are expected to be negligible to slight negative. Relative to Alternative 2, Alternative 1/No Action will result in negligible to slight negative impacts to protected species, particularly for protected species (i.e., ESA-listed and MMPA protected) with documented interactions with recreational gear (e.g., hook and line) (see section 5.6.4.1), since under Alternative 2 the Regional Administrator would have temporary authority to adjust the recreational management measures for GB cod without requiring action by the Council in FY2023 and FY2024 to stay below the catch target selected by the Council, which is expected to require additional measures to constrain the recreational harvest of GB cod. Relative to Alternative 3, Alternative 1/No Action will result in negligible to slight negative impacts on protected species, because the options considered under Alternative 3 all consider more restrictive management measures intended to reduce recreational fishing effort for GB cod.

6.4.2.2 Alternative 2 - Temporary Administrative Measure to Allow the Regional Administrator Authority to Adjust the Recreational Measures for Georges Bank Cod (*Preferred Alternative*)

Alternative 2 would grant the Regional Administrator with temporary authority to adjust the recreational management measures for GB cod without requiring action by the Council. Alternative 2 would allow for the recreational management measures for GB cod to be adjusted in FY2023 and FY2024 by the Regional Administrator to stay below the catch target selected by the Council. Alternative 2 will provide no incentive for effort to increase in the recreational fishery and in fact, effort is not expected to be any greater than that under Alternative 1/No Action. Based on this, overall impacts to protected species (i.e., ESA-listed and MMPA protected) are expected to be similar to those provided above for Alternative 1/No Action, negligible to slight negative; for rationale to support this determination see Alternative 1/No Action, section 6.4.2.1. Alternative 2 will result in negligible to slight positive impacts to protected species relative to Alternative 1/No Action, as allowing the RA to adjust the measures as needed could reduce recreational fishery effort, and is expected to have negligible to uncertain impacts compared to the options under Alternative 3, since it is not known what measures may be adjusted by the RA.

6.4.2.3 Alternative 3 - Recreational Measures for Georges Bank Cod (*Preferred Alternative*)

All three of the options under Alternative 3 would implement recreational measures intended to constrain recreational harvest of GB cod. Since these options would likely result in changes in fishing behavior and a decrease in recreational fishing effort from status quo conditions, the options under Alternative 3 will provide no incentive for effort to increase in the recreational fishery and in fact, effort is not expected to be any greater than that under Alternative 1/No Action and would likely be lower. Based on this, overall impacts to protected species (i.e., ESA-listed and MMPA protected) are expected to be similar to those provided above for Alternative 1/No Action, negligible to slight negative; for rationale to support this determination see Alternative 1/No Action, section s. A reduction in fishing effort is expected to be the greatest under Option 2 (65% reduction in mortality), followed by Option 1 (63% reduction in mortality), which is the Council's preferred option, and Option 3 (52% reduction in mortality). Alternative 3 is expected to result in negligible to slight positive impacts to protected species relative to Alternative 1/No Action, since the options under Alternative 3 are expected to constrain recreational fishing effort for GB cod, and is expected to have negligible to uncertain impacts compared Alternative 2, since it is not known what measures may be adjusted by the RA.

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.

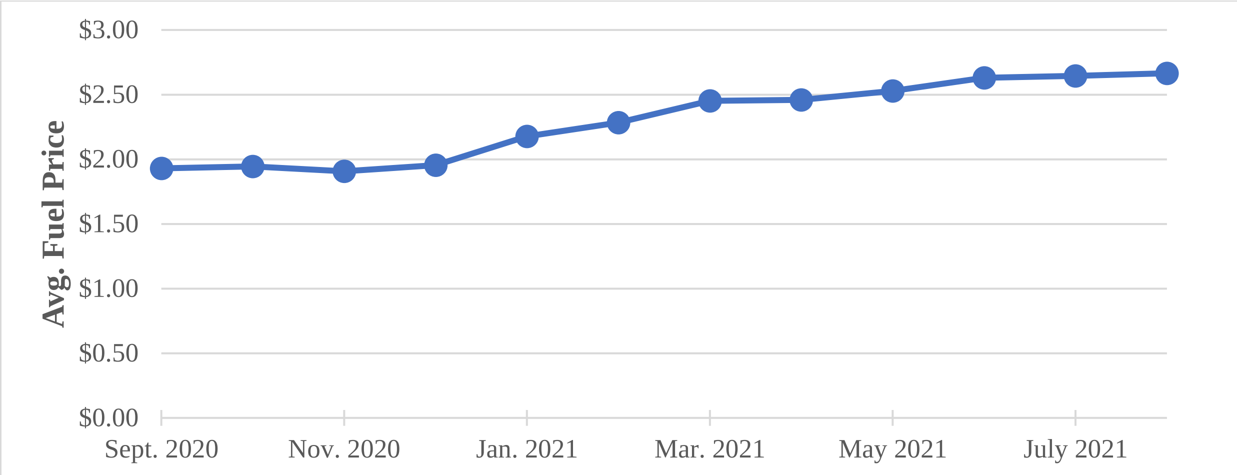
6.5.1 Action 1 – Specifications

Methods

The Quota Change Model (QCM) is used to analyze the impacts of each combination of measures on the sector portion of the groundfish fishery, which has comprised 99% of commercial groundfish revenues over the last five fishing years (see Table 21). The QCM is a Monte Carlo simulation model that selects from existing records the trips most likely to take place under new regulatory conditions. To do this, a large pool of actual trips is created from a reference data set. The composition of this pool is conditioned on each trip’s utilization of allocated Annual Catch Entitlement (ACE), under the assumption that the most likely trips to take place in the FY being analyzed are those fishing efficiently under the new sector sub-ACLs. The more efficiently a trip uses its ACE, the more likely that trip is to be drawn into the sample pool. ACE efficiency is determined by the ratio of ACE expended to net revenues on a trip, iterated over each of the 17 allocated stocks. Operating profits are calculated as gross revenues minus trip costs minus the opportunity cost of quota, where trip costs are estimated using observer data and quota opportunity costs are estimated from a model of inter-sector lease price and quantity data.

In previous management actions (FW59, FW61), the sample pool has been constructed from the most recent completed fishing year. A slight modification is used for this management action. Rather than utilizing trips from strictly FY2020 (May 2020 – April 2021), the sample pool uses trips from September 2020 – August 2021. This change was made with the assumption that more recent fishing activity would better represent behavior during FY2022, noting the early months of the Covid-19 pandemic in spring/summer 2020. Average fuel prices, for example, have increased substantially over the past year (Figure 36).

Figure 36- Monthly average fuel prices (nominal $) during sample pool period. Data Source: NEFOP and ASM observers.



Once the sample pool is constructed, trips are pulled from the pool at random, summing the ACE expended for the 17 allocated stocks as each trip is drawn. When one stock's ACE reaches the sector sub-ACL limit, no further trips from that broad stock area are selected. The model continues selecting trips until sector sub-ACLs are achieved for all three broad stock areas or, alternatively, if sub-ACLs are reached for one of the unit stocks. Because the fishery is modeled as a whole, allocations to individual sectors are not considered. Included in the Alternative 2 sector sub-ACLs is an assumption that GB cod quota will be transferred from the "east" (US/CA area) to the "west" allocations based on fishing activity over the last five fishing years, resulting in 87.5% of the quota belonging to the west area, and 12.5% belonging to the east.

This selection process forms a synthetic fishing year. A total of 500 synthetic years are constructed, and median values and confidence intervals are reported. By running simulations based on actual fishing trips, the model implicitly assumes that:

- 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;
- At-Sea Monitoring (ASM) costs are fully subsidized; and
- the condition of a trip being observed has no explicit effect on its ability to be chosen into the selection pool.

These assumptions will surely not hold—fishermen will continue to develop their technology and fishing practices to increase their efficiency, market conditions will induce additional behavioral changes, and fishery stock conditions are highly dynamic.

The net effect of the constraints imposed by these assumptions is unclear. The selection algorithm draws mainly from efficient trips[30]—if fishermen make relatively less efficient trips the model estimates will be biased high. Fishermen, however, are generally good at their job, and through a combination of technological improvement (gear rigging, equipment upgrades, etc.) or behavioral modifications, they are likely to improve on their ability to avoid constraining stocks. If fishermen are able to make these adjustments, the model predictions will be biased low. Furthermore, the model will under-predict true landings and/or revenues if stock conditions for non-constraining stocks improve, if demand for groundfish rises, or if fishing practices change and fishermen become more efficient at maximizing the value of their ACE. Conversely, the model will over-predict true landings and/or revenues if stock conditions of non-constraining stocks decline, markets deteriorate, or fishing costs increase. Importantly, the model will over-predict landings and revenues if stock conditions for constraining stocks improve and/or fishermen are unable to avoid the stock—in this circumstance, better than expected stock conditions could lead to worse than anticipated fishery performance. The opposite is also true—if a stock predicted to be constraining to the fishery becomes easier to avoid due to technological or behavioral modifications, the model will under-predict revenues.

The model is intended to capture fishery-wide behavioral changes with respect to groundfish sub-ACL changes, and groundfish catch is maximized by the constrained optimization algorithm. Catch of non-groundfish stocks on groundfish trips are captured in the model, but not explicitly modeled, such that constraints on other fisheries are not incorporated. As GB cod represents the largest sector sub-ACL change (decline) under Alternative 2, the catch composition on sample pool trips with at least 500 lbs. of GB cod catch is presented in Table 78. QCM predictions and realized fishery values in recent years are shown in Table 79. For FY2017- FY2019, the QCM over-predicted groundfish revenue and operating profit, while the model under-estimated both values for FY2020. The over-predictions can be explained in part by recent downward trends in groundfish ex-vessel prices (Figure 6 and Table 24). Since the sample pool for the QCM is typically constructed from data two years prior to the prediction year, revenues are over-predicted even if predicted and realized landings are close. While FY2020 continued the downward trend in prices, a substantial increase in groundfish landings (Table 21) led to an under-prediction in revenue. A decrease in quota costs also contributed to realized operating profit exceeding the predicted value for FY2020.

[30] Since the prediction for FY2015 (FW55), a parameter has been added to the QCM to select a small number of inefficient (often negative net revenue) groundfish trips. In general, model predictions of effort (trips and days absent) have been closer to realized effort since the addition of this parameter.

Table 78- Catch composition on groundfish trips during sample pool period (Sept. 2020 – Aug. 2021) in which at least 500 lbs. of GB cod was caught (landings+discards). A total of 487 of such trips occurred; catch from the entire trip (all sub-trips) is included.

Stock	Catch	% of Total
GB Haddock West	5,968,945	27.7%
Non-Groundfish Stocks	5,206,737	24.2%
Redfish	2,887,350	13.4%
Pollock	2,357,780	11.0%
GOM Haddock	916,681	4.3%
White Hake	834,103	3.9%
GB Haddock East	805,065	3.7%
GB Cod West	673,629	3.1%
Witch Flounder	592,621	2.8%
GB Winter Flounder	481,518	2.2%
Plaice	420,616	2.0%
SNE Winter Flounder	144,949	0.7%
GB Cod East	91,762	0.4%
Halibut	37,728	0.2%
GOM Cod	32,006	0.1%
Ocean Pout	31,323	0.1%
CC/GOM Yellowtail Flounder	22,835	0.1%
Other Groundfish Stocks	17,776	0.0%
Total	***21,523,424***	

Table 79- QCM predictions, FY2017-2021, 2020 dollars (millions).

	FY2017		FY2018		FY2019		FY2020		FY2021
	Predicted[31]	Realized	Predicted[32]	Realized	Predicted[33]	Realized	Predicted[34]	Realized	Predicted[35]
Groundfish Revenue	54.9	47.6	62.2	50.4	56.4	48.2	49.6	54.2	46.3
Total Revenue	79.3	70.1	88.6	72.2	80.4	66.1	71.0	72.9	64.1
Operating Cost	14.6	14.0	16.5	13.2	15.1	11.0	12.7	11.4	10.9
Sector Cost	1.8	1.9	1.8	2.1	2.0	1.9	1.9	2.2	1.8
Quota Cost	7.7	10.1	12.7	5.7	7.7	3.6	5.5	2.4	3.6
Operating Profit	55.2	44.0	57.5	51.2	55.6	49.6	50.9	56.7	47.7

[31] FW56, reference pool=FY2015-16 (full year FY2015, FY2016 through Nov. 2016) ; FY2017 prediction incorporating Sector NEFS IX stranded quota

[32] FW57, reference pool=FY2016

[33] FW58, reference pool=FY2017

[34] FW59, reference pool=FY2018

[35] FW61, reference pool=FY2019

6.5.1.1 Alternative 1 - No Action

Impacts on the sector component of the commercial groundfish fishery

Under No Action, predicted groundfish revenue for FY2022 is $55.1M, representing an increase of $0.9M relative to the realized value in FY2020 (Table 80). Predicted total gross revenues from groundfish trips for FY2022 is $75.5M, a $2.6M increase relative to the FY2020 realized value.

At the stock-level (Table 81), white hake and GOM cod are predicted to be the most constraining groundfish stocks under No Action ACLs. Other stocks with high utilization rates include witch flounder, GB cod east, and GB winter flounder. The four stocks with the highest predicted ex-vessel value are GOM haddock, GB haddock west, pollock, and redfish; these stocks are predicted to have low to moderate rates of utilization. Importantly, the predicted catch for GB cod is 451mt (401mt west; 50mt east), far exceeding the sector sub-ACL under Alternative 2.

At the port-level (Table 82), many of the major groundfish ports have comparable predicted values for FY2022 to FY2020 and FY2021. Boston is predicted to be the top groundfish port ($12.4M). Gloucester is predicted to be the second highest grossing port ($12.0M), followed by New Bedford ($9.0M), and Portland ($4.4M).

By vessel length (Table 83), vessels >75'+ are predicted to generate ~50% of sector groundfish revenue ($28.5M) in FY2022. Vessels in the 50 to <75' category are predicted to generate ~33% of sector groundfish revenue ($17.7M), and vessels in the 30' to <50' category are predicted to generate ~17% of sector groundfish revenue ($9.1M).

Table 80- Summary of realized FY2020 and predicted FY2021 and FY2022 revenues and costs for the sector portion of the commercial groundfish fishery; median values; nominal dollars.

Option	Groundfish Gross Revenues	Total Gross Revenues	Operating Cost	Sector Cost	Quota Cost	Operating Profit	Days Absent
FY2020 Realized	54.2	72.9	11.4	2.2	2.4	56.7	11,435
FY2020 Prediction (FW59)	49.0	70.1	12.5	1.9	5.4	50.3	10,919
FY2021 Prediction (FW61)	46.3	64.1	10.9	1.8	3.6	47.7	9,942
FY2022 Prediction (Alt 1/No Action)	55.1	75.5	12.0	1.9	3.0	59.7	11,838
FY2022 Prediction (Alt 2; GB Cod=176mt)	47.9	67.5	9.8	1.7	2.5	55.0	10,593
FY2022 Prediction (Alt 2; GB Cod=262mt)	52.7	74.2	11.2	1.8	2.7	59.9	11,493
FY2022 Prediction (Alt 2; GB Cod=237mt)	52.5	74.1	11.0	1.8	2.7	59.9	11,506
FY2022 Prediction (Alt 2; GB Cod=233mt) **(Preferred)**	51.9	73.3	10.9	1.8	2.7	59.4	11,448

Table 81- Alternative 1/No Action stock-level catch and revenue predictions with 5% and 95% confidence intervals, nominal dollars (millions). Stocks are presented in order of FY2022 predicted ex-vessel value.

Stock	Sub-ACL (mt)	Predicted Catch (mt)	Predicted Utilization	FY22 Predicted Revenue	*p(5%) Revenue*	*p(95% Revenue)*	FY21 Predicted Revenue	FY20 Predicted Revenue	FY20 Realized Revenue
GOM Haddock	6,879	4,374	63.6%	11.9	*11.1*	*12.6*	7.7	6.1	9.7
GB Haddock West	70,575	3,275	4.6%	8.3	*7.4*	*9.9*	9	7.6	12.4
Pollock	13,988	2,761	19.7%	7.4	*6.9*	*7.9*	5.5	4.6	8.6
Redfish	9,421	5,456	57.9%	6.7	*5.9*	*7.5*	5.5	5.4	8.0
White Hake	1,994	1,984	99.5%	5.6	*5.5*	*5.7*	4	4	4.4
Witch Flounder	1,273	1,022	80.3%	3.8	*3.5*	*4.1*	2.7	2.9	3.0
American Plaice	2,542	786	30.9%	2.8	*2.6*	*3.2*	3	5	2.1
GB Winter Flounder	517	351	67.8%	2.0	*1.5*	*2.8*	1.9	3.6	1.3
GB Cod West	981	401	40.8%	1.8	*1.7*	*2.2*	2.4	3.5	1.7
GOM Cod	262	258	98.6%	1.4	*1.3*	*1.4*	1.5	1.4	1.2
GB Haddock East	2,195	404	18.4%	0.9	*0.7*	*1.2*	0.9	1.2	1.0
SNE/MA Winter Flounder	247	156	63.1%	0.8	*0.6*	*1.1*	0.9	1.7	0.4
CC/GOM Yellowtail Flounder	651	337	51.8%	0.6	*0.5*	*0.6*	0.3	0.4	0.3
GOM Winter Flounder	267	87	32.5%	0.4	*0.4*	*0.5*	0.3	0.5	0.3
GB Cod East	64	50	78.1%	0.2	*0.1*	*0.3*	0.2	0.6	0.2
SNE/MA Yellowtail Flounder	12	1	8.3%	0.0	*0.0*	*0.0*	0	0	0.0
GB Yellowtail Flounder	59	2	2.9%	0.0	*0.0*	*0.0*	0	0.1	0.0

Table 82- Alternative 1/No Action groundfish species revenue prediction by port, with 5% and 95% confidence intervals and average fish prices on groundfish trips, nominal dollars (millions).

State/Port	FY22 Prediction	*p(5%) Revenue*	*p(95% Revenue)*	Avg. Price	FY21 Prediction	FY20 Prediction	FY20 Revenue
Massachusetts							
Gloucester	12.0	*10.9*	*13.1*	1.07	11.9	12.5	18.2
Boston	12.4	*11.2*	*13.5*	1.09	11.0	11.6	13.3
New Bedford	9.0	*7.5*	*11.5*	1.24	9.1	8	19.2
Chatham	0.2	*0.2*	*0.3*	1.58	0.4	0.5	0.1
Other MA ports	4.2	*3.5*	*4.9*	1.49	4.4	3.7	0.2
Maine							
Portland	4.4	*3.7*	*5.2*	0.98	3.8	7.4	1.6
Other ME ports	3.5	*3.0*	*4.1*	1.42	2.9	1.8	0.1
New Hampshire (all ports)	3.4	*3.1*	*3.7*	1.36	1.7	1.4	
Rhode Island							
Point Judith	1.8	*1.4*	*2.2*	1.34	0.7	1.2	0.2
Other RI ports	0	*0*	*0.1*	1.19	0.2	0.4	<0.01
Other Northeast	4.5	*3.5*	*5.6*	0.85	2.3	0.5	0.1

FY20 realized revenue reflects groundfish revenues by dealer location, while revenue predictions reflect revenues by home port.

Table 83- Alternative 1/No Action groundfish species revenue predictions by vessel size category, with 5% and 95% confidence intervals, nominal dollars (millions).

Vessel Length Category	FY22 Prediction	*p(5%) Revenue*	*p(95% Revenue)*
75'+	28.5	*26.3*	*31.5*
50'to<75'	17.7	*16.4*	*19.2*
30'to<50'	9.1	*8.5*	*9.6*
<30'	0.0	*0.0*	*0.0*

Commercial Fishery - Common Pool

Alternative 1/No Action would likely have negative to neutral impacts on the common pool fishery relative to FY 2021 and low negative to neutral to positive impacts relative to Alternative 2.

The following changes from the non-sector FY2021 sub-ACL would go into place for FY2022 under No Action/Alternative 1: GB haddock would decrease by 45 mt, GOM haddock would decrease by 81 mt, redfish would decrease by 1.4 mt, and pollock would decrease by 46 mt. For Eastern GB cod and Eastern GB haddock, default specifications would be in effect from May 1, 2022, to July 31, 2022, and would equal 35% of the FY2021 catch limits. After July 31st, quotas would go to 0.

Recreational Groundfish Fishery
Impacts on the recreational groundfish fishery Alternative 1/No Action would be neutral relative to FY2021 (same as the 193 mt GOM cod sub-ACL) and Alternative 2 (only a 1 mt decline from the 193 mt GOM cod sub-ACL). The recreational sub-ACL for GOM haddock would decrease under No Action and Alternative 2 (from 5,295 mt in FY2021 to 3,634 mt in FY2022, as set in FW 61) 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 FY2022: 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 1/No Action, the FY2022 sub-ACLs for SNE/MA yellowtail, GOM/GB windowpane flounder, and SNE/MA windowpane flounder would be unchanged from FY2021 levels. Alternative 1/No Action could have negative impacts to the scallop fishery relative to FY2021 since the sub-ACL for GOM/GB windowpane flounder would be less than the projected catch for FY2022 year (see Scallop PDT memo). Projected catch for GOM/GB windowpane flounder could be high enough to trigger the AM. Currently, the AMs for windowpane flounder stocks are triggered if either the sub-ACL is exceeded by over 50% or if the total ACL is exceeded. Under No Action, the total ACL would be 55 mt for GOM/GB windowpane flounder. If total catches across all fisheries are similar to FY2020, it is possible that the total ACL could be exceeded for GOM/GB windowpane flounder, since total catch has exceeded 55 mt in every year between FY2016 and FY2020 (Table 54). The GOM/GB windowpane sub-ACL was exceeded in FY2020 by 290%. As a result of this overage, the reactive large accountability measure for GOM/GB windowpane will be triggered for FY2022, meaning a gear restriction will be required for all fishing occurring in Closed Area II for the entirety of FY2022. FY2022 will be the first year that the modified gear is required on Georges Bank, and this is expected to reduce bycatch of GOM/GB windowpane flounder, along with GB yellowtail flounder, which may reduce the likelihood of the FY2022 GOM/GB windowpane flounder sub-ACL being exceeded, reducing potential negative impacts. Projected catch of SNE/MA yellowtail flounder and SNE/MA windowpane flounder is less likely to trigger the AM (less than 50% over the sub-ACL). Compared to Alternative 2, No Action/Alternative 1 would have a neutral impact on the scallop fishery since the sub-ACLs for SNE/MA yellowtail, GOM/GB windowpane flounder, and SNE/MA windowpane flounder would remain the same.

Under Alternative 1/No Action the sub-ACL for GB yellowtail flounder would be 7 mt less than under Alternative 2 (12 mt compared to 19 mt), potentially having negative economic impacts since FY2022 projected catch by the scallop fishery is estimated to be 15-19 mt (see Scallop PDT memo). However, this is not high enough to trigger an AM under the No Action sub-ACL (>50% of the sub-ACL). It is unlikely that the total ACL would be exceeded for this stock since total utilization of the ACL has been very low in recent years. Impacts on the scallop fishery are likely neutral, but possibly negative, for GB yellowtail flounder under No Action/Alternative 1 compared to Alternative 2.

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 FY2021 and FY2022 would decrease from 1,539 mt to 1,511 mt for GB haddock and decrease from 156 mt to 107 mt for GOM haddock. However, GB haddock catches by the herring fishery have been low in recent years - 0.2 mt in FY 2019 and 10 mt in FY 2020 due to lower herring ACLs (Table 58). If trends continue, decreases in the GB haddock sub-ACL are unlikely to confer negative economic impacts in FY2022 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 slightly higher for GB haddock (1,514 mt) and the same for GOM haddock but impacts of No Action/Alternative 1 relative to Alternative 2 are expected to be neutral due to low utilization by the MWT directed herring fishery. In FY 2019 and FY 2020 GOM haddock catch by the midwater trawl herring fishery was approximately 0.1 mt (Table 56). Unless effort shifts considerably, neutral economic impacts would be expected. Atlantic herring quotas for 2020 and 2021 were 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 FY2021 levels at 1.5 mt in FY2022. Under Alternative 2, the sub-ACL for FY2022 would increase to 2.3 mt. Economic impacts on the small mesh fishery are expected to be negative to neutral since catches in recent years have generally been low (0 mt in FY2019), though they were slightly higher in FY2020 at 1.8 mt (Table 56). If catches in FY2022 are the same as those in FY2020, the sub-ACL would be exceeded, triggering the AMs.

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 FY2021 level of 177 mt in FY2022. The other sub-component for FY2022 under Alternative 2 would be the same as that under No Action. There would be neutral economic impacts of the sub-ACL under No Action/Alternative 1 compared to Alternative 2.

The AM for southern windowpane for large-mesh non- groundfish fisheries is implemented if the large-mesh non-groundfish fishery exceeds its sub-ACL (evaluated using the "other sub-component"), and if the total ACL is exceeded by more than the management uncertainty buffer (currently set at approximately 5%).

Based on recent catches (Table 90), the other sub-component of 177mt is likely to be exceeded. From FY2016-FY2020, annual catches of S. Windowpane by large-mesh non-groundfish fisheries ranged from 178.1 - 243.6mt.

The total ACL for S. Windowpane under No Action would be 371mt. Based on recent catches (Table 91) this number may be exceeded in FY2022. From FY2016-FY2020, total annual catches of S. Windowpane ranged from 335.6 - 454.7mt.

6.5.1.2 Alternative 2 – Revised Specifications (*Preferred Alternative*)

Comparison between FY2021 and proposed FY2022 commercial sub-ACLs, recreational sub-ACLs, and other fisheries sub-ACLs for groundfish are provide in Table 84 and Table 85.

Table 84- Comparison of commercial (sector and common pool) groundfish sub-ACLs (mt) for FY20201 and proposed FY2022, including the percent change between years. Proposed FY2022 sub-ACLs as indicated under Alternative 2/Revised Specifications and includes the Council's proposal for the GB cod recreational catch target.

Stock		Commercial groundfish sub-ACL		
		FY2021	Draft FY2022	% Change
Allocated Stocks	GB Cod	1,093	244	-78%
	GOM Cod	270	270	0%
	GB Haddock	76,622	75,381	-2%
	GOM Haddock	10,281	7,056	-31%
	GB Yellowtail Flounder	64	97	52%
	SNE/MA Yellowtail Flounder	16	16	0%
	CC/GOM Yellowtail Flounder	692	692	0%
	American Plaice	2,682	2,630	-2%
	Witch Flounder	1,317	1,317	0%
	GB Winter Flounder	563	563	0%
	GOM Winter Flounder	281	281	0%
	SNE/MA Winter Flounder	288	288	0%
	Redfish	9,677	9,559	-1%
	White Hake	2,019	1,990	-1%
	Pollock	18,549	14,135	-24%
Non-allocated Stocks	GOM/GB Windowpane Flounder	108	108	0%
	SNE/MA Windowpane Flounder	43	43	0%
	Ocean Pout	50	50	0%
	Atlantic Halibut	73	73	0%
	Atlantic Wolffish	86	86	0%

Table 85- Comparison of other fisheries sub-ACLs (mt) for FY2021 and proposed FY2022, including the percent change between years. Proposed FY2022 sub-ACLs as indicated under Alternative 2/Revised Specifications.

Fishery	Stock	FY2021	Draft FY2022	% Change
Recreational Groundfish	GOM Cod	193	192	-1%
	GOM Haddock	5,295	3,634	-31%
Sea Scallop	GB Yellowtail Flounder	12	19	58%
	SNE/MA Yellowtail Flounder	2	2	0%
	GOM/GB Windowpane Flounder	31	31	0%
	SNE/MA Windowpane Flounder	129	129	0%
Midwater Trawl	GB Haddock	1,539	1,514	-2%
	GOM Haddock	156	107	-31%
Small-Mesh	GB Yellowtail Flounder	1.5	2.3	53%
Other Sub-components – Large-Mesh Non-Groundfish[1]	SNE/MA Windowpane Flounder	177	177	0%

[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

Depending on the recreational catch target for GB cod, the sector sub-ACL will vary. The options can be found within Table 5. As mentioned in the methods above, the assumed quota allocation, based on sector activity in recent fishing years, is 87.5% for GB Cod West and 12.5% for GB Cod East.

Under Option 1 for the GB cod catch target, the FY2022 sector sub-ACL is 176mt. In this scenario, predicted groundfish revenue for FY2022 is $47.9M, representing a $6.3M (12%) decrease from the FY2020 realized value of $54.2M, and a $7.2M (13%) decrease relative to No Action (Table 80). Total predicted gross revenues from groundfish trips for FY2022 is $67.5M. This represents a $5.4M decrease from the FY2020 realized value ($72.9M), and an $8.0M decrease compared to No Action.

Under Option 4 (preferred alternative) for the GB cod catch target, the GB cod sector sub-ACL is 233mt. In this scenario, groundfish revenues are predicted to be $4.0M higher than under a sub-ACL of 176mt. However, relative to No Action, groundfish revenues still decrease by $3.2 million.

Operating profit predictions for FY2022 under the various GB cod sector sub-ACL scenarios are included in Table 80. Under a sub-ACL of 177mt, predicted operating profit is $55.0M, representing a $4.7M decrease relative to No Action. Under a sub-ACL of 233mt, predicted operating profit is $59.4M, a slight reduction from the No Action prediction of $59.7M. Importantly, the increasing trend in fuel prices (Figure 36) increases the likelihood of overestimation for all FY2022 predictions. Furthermore, predicted quota costs, are lower than both predicted and realized values from FY2017-2019 (Table 79). An increase in quota prices to pre-FY2020 levels could further lead to an overestimation of operating profits.

At the stock-level (Table 86 and Table 87), the most constraining stocks are predicted to be GOM cod, GB cod west, and white hake. The four stocks with highest predicted ex-vessel values are GOM haddock, pollock, GB haddock west, and redfish, though notably some of these stocks yield considerably less revenue relative to No Action. For example, GB haddock west revenue is $6.9 million under a GB cod sector sub-ACL of 176mt, compared $8.3 million under No Action. The more constraining GB cod quota limits access to certain groundfish stocks, such as GB haddock. Revenue from GB cod west also decreases from $1.8 million under No Action to $0.7 million, under the GB cod sub-ACL of 176mt. Under a sub-ACL of 233mt, these stock-level revenue decreases relative to No Action are lessened. For example, GB haddock west revenue is $7.7 million and GB cod west revenue is $1.0 million.

At the port-level (Table 88), Gloucester, Boston, and New Bedford all are predicted to experience groundfish revenue decreases of ~1.0M under a GB cod sub-ACL of 176mt relative to 233mt. Relative to No Action, New Bedford is even more negatively impacted, with groundfish revenue predicted to decrease by nearly $2.6M ($9.0M under No Action; $6.4M under a 176mt sub-ACL). Under the preferred GB cod sub-ACL of 233mt, predicted groundfish revenue for New Bedford is $7.6 million, $1.4 million less than under No Action. Other major groundfish ports, such as Boston and Portland, also would be negatively impacted relative to No Action.

By vessel length (Table 89), larger vessels are predicted to be most substantially impacted by reductions in the GB cod sector sub-ACL. For example, under No Action, vessels in the 75'+ size class are predicted to generate $28.5M in groundfish revenue; this number falls to $23.2M under a 176mt GB cod sub-ACL. Negative impacts for larger vessels would still occur under a 233mt sub-ACL, but the magnitude of these impacts would be reduced. Smaller vessels, in the 30' to <50' size class are predicted to have a slight increase in revenues under Alternative 2 relative to No Action. A possible explanation would be a shift in quota towards smaller vessels as offshore trips become more constrained by GB cod. The 50' to <75' size class is predicted to be most positively impacted from a GB sector sub-ACL of 233mt, relative to a sub-ACL of 176mt.

Table 86- Alternative 2 (GB Cod sector sub-ACL of 176mt) stock-level catch and revenue predictions with 5% and 95% confidence intervals, nominal dollars (millions). Stocks are presented in order of FY2022 predicted ex-vessel value. Sub-ACLs for GB Cod East/West are based on proportion of catch over the last five fishing years.

Stock	Sub-ACL (mt)	Predicted Catch (mt)	Predicted Utilization	FY22 Prediction	*p(5%) Revenue*	*p(95% Revenue)*	FY21 Predicted Revenue	FY20 Predicted Revenue	FY20 Realized Revenue
GOM Haddock	6,879	4,285	62.3%	11.6	*10.7*	*12.5*	7.7	6.1	9.7
Pollock	13,988	2,569	18.4%	7.0	*6.4*	*7.6*	9.0	7.6	12.4
GB Haddock West	68,670	2,747	4.0%	6.9	*6.3*	*7.6*	5.5	4.6	8.6
Redfish	9,421	4,899	52.0%	6.0	*5.2*	*6.7*	5.5	5.4	8.0
White Hake	1,965	1,772	90.2%	5.1	*4.7*	*5.5*	4.0	4.0	4.4
Witch Flounder	1,273	831	65.3%	3.1	*2.9*	*3.3*	2.7	2.9	3.0
American Plaice	2,542	646	25.4%	2.3	*2.2*	*2.5*	3.0	5.0	2.1
GOM Cod	262	262	100.0%	1.4	*1.4*	*1.4*	1.9	3.6	1.3
GB Winter Flounder	517	155	29.9%	1.1	*0.8*	*1.4*	2.4	3.5	1.7
GB Cod West	154	150	97.6%	0.7	*0.7*	*0.8*	1.5	1.4	1.2
SNE/MA Winter Flounder	247	125	50.4%	0.7	*0.5*	*0.9*	0.9	1.7	0.4
GB Haddock East	6,409	285	4.4%	0.6	*0.5*	*0.8*	0.9	1.2	1.0
CC/GOM Yellowtail Flounder	651	343	52.6%	0.6	*0.6*	*0.7*	0.3	0.4	0.3
GOM Winter Flounder	267	87	32.4%	0.4	*0.4*	*0.5*	0.3	0.5	0.3
GB Cod East	22	14	64.8%	0.1	*0.0*	*0.1*	0.2	0.6	0.2
SNE/MA Yellowtail Flounder	12	1	7.6%	0.0	*0.0*	*0.0*	0.0	0.1	0.0
GB Yellowtail Flounder	89	1	1.2%	0.0	*0.0*	*0.0*	0.0	0.0	0.0

Table 87- Alternative 2 (GB Cod sector sub-ACL of 233mt) stock-level catch and revenue predictions with 5% and 95% confidence intervals, nominal dollars (millions). Stocks are presented in order of FY2022 predicted ex-vessel value. Sub-ACLs for GB Cod East/West are based on proportion of catch over the last five fishing years.

Stock	Sub-ACL (mt)	Predicted Catch (mt)	Predicted Utilization	FY22 Prediction	*p(5%) Revenue*	*p(95% Revenue)*	FY21 Predicted Revenue	FY20 Predicted Revenue	FY20 Realized Revenue
GOM Haddock	6,879	4,420	64.2%	12.0	*11.2*	*12.7*	7.7	6.1	9.7
GB Haddock West	68,670	3,001	4.4%	7.7	*7.0*	*8.7*	9.0	7.6	12.4
Pollock	13,988	2,644	18.9%	7.2	*6.7*	*7.7*	5.5	4.6	8.6
Redfish	9,421	5,267	55.9%	6.4	*5.7*	*7.2*	5.5	5.4	8.0
White Hake	1,965	1,906	97.0%	5.5	*5.1*	*5.7*	4.0	4.0	4.4
Witch Flounder	1,273	919	72.2%	3.4	*3.2*	*3.6*	2.7	2.9	3.0
American Plaice	2,542	719	28.3%	2.6	*2.4*	*2.8*	3.0	5.0	2.1
GB Winter Flounder	517	236	45.7%	1.5	*1.1*	*2*	2.4	3.5	1.7
GOM Cod	262	262	99.9%	1.4	*1.4*	*1.4*	1.9	3.6	1.3
GB Cod West	204	200	97.9%	1.0	*0.9*	*1*	1.5	1.4	1.2
GB Haddock East	6,409	381	6.0%	0.9	*0.6*	*1.1*	0.9	1.2	1.0
SNE/MA Winter Flounder	247	131	52.9%	0.7	*0.4*	*0.9*	0.9	1.7	0.4
CC/GOM Yellowtail Flounder	651	344	52.8%	0.6	*0.6*	*0.7*	0.3	0.4	0.3
GOM Winter Flounder	267	87	32.7%	0.4	*0.4*	*0.5*	0.3	0.5	0.3
GB Cod East	29	24	83.1%	0.1	*0.1*	*0.1*	0.2	0.6	0.2
SNE/MA Yellowtail Flounder	12	1	9.1%	0.0	*0.0*	*0.0*	0.0	0.1	0.0
GB Yellowtail Flounder	89	1	1.6%	0.0	*0.0*	*0.0*	0.0	0.0	0.0

Table 88- Alternative 2 groundfish species revenue prediction by port, with 5% and 95% confidence intervals and average fish prices on groundfish trips, nominal dollars.

	GB Cod sub-ACL = 176mt			GB Cod sub-ACL = 233mt (*Preferred Option*)		
State/Port	FY22 Prediction	*p(5%) Revenue*	*p(95% Revenue)*	FY22 Prediction	*p(5%) Revenue*	*p(95% Revenue)*
Massachusetts						
Gloucester	11.6	*10.5*	*12.7*	12.3	*11.2*	*13.4*
Boston	11	*9.7*	*12.2*	12.1	*11.0*	*13.3*
New Bedford	6.4	*5.5*	*7.3*	7.6	*6.4*	*9.0*
Chatham	0.1	*0.1*	*0.1*	0.1	*0.1*	*0.1*
Other MA ports	2.4	*2.0*	*2.9*	3.0	*2.5*	*3.6*
Maine						
Portland	4.0	*3.3*	*4.7*	3.8	*3.1*	*4.4*
Other ME ports	4.0	*3.3*	*4.8*	3.7	*3.1*	*4.4*
Rhode Island						
Point Judith	1.6	*1.3*	*2.0*	1.7	*1.3*	*2.1*
Other RI ports	0.0	*0.0*	*0.0*	0.0	*0.0*	*0.0*
New Hampshire	3.6	*3.3*	*4.0*	3.6	*3.3*	*3.9*
Other Northeast	3.3	*2.3*	*4.3*	4.0	*3.0*	*5.0*

Table 89- Alternative 2 groundfish species revenue prediction by size class, with 5% and 95% confidence intervals, nominal dollars (millions).

	GB Cod sub-ACL = 176mt			GB Cod sub-ACL = 233mt (*Preferred Option*)		
Vessel Length Category	FY22 Prediction	*p (5%) Revenue*	*p(95%) Revenue*	FY22 Prediction	*p(5%) Revenue*	*p(95%) Revenue*
75'+	23.2	*21.4*	*24.9*	24.9	*23.3*	*26.8*
50'to<75'	15.3	*14*	*16.6*	17.5	*16.2*	*18.8*
30'to<50'	9.4	*8.7*	*10.1*	9.3	*8.8*	*9.9*
<30'	0.0	*0.0*	*0.0*	0.0	*0.0*	*0.0*

Commercial Fishery - Common Pool

Alternative 2 would have a range of negative, neutral, to low positive impacts on the common pool fishery relative to FY 2021 and negative, neutral, to low positive impacts relative to Alternative 1/No Action.

The following changes from the non-sector FY2021 sub-ACL would go into place for FY2022 under Alternative 2: GB cod sub-ACL would decrease by 36 to 40 mt depending on the option for a recreational GB cod catch target (decrease by 37 mt under the preferred option), GOM cod would decrease by 0.2 mt, GB haddock would decrease by 41 mt, GOM haddock would decrease by 81 mt, GB yellowtail flounder would increase by 2.7 mt, and pollock would decrease by 46 mt. All other stocks would remain the same as FY 2021. Under No Action/Alternative 1, for Eastern GB cod and Eastern GB haddock, default specifications would be in effect from May 1, 2022, to July 31, 2022, and would equal 35% of the FY2021 catch limits. After July 31st, quotas would go to 0.

In recent years, common pool catches of GB cod have been ~2-3 mt, though in FY2018 catches were around 6 mt (three-year average from FY2018-FY2020 of ~3.8 mt) (Table 42). The large decline in the FY2021 GB cod sub-ACL (48 mt) to that for FY2022 under Alternative 2 (8 to 12 mt depending on the option, ~11 mt under the preferred catch target option) is likely to have negative impacts on the common pool fishery, since catches could approach the sub-ACL. Common pool catches in the eastern GB area have been less than 0.1 mt in recent years (Table 44).

Impacts on the recreational groundfish fishery

Impacts on the recreational groundfish fishery Alternative 2 would be neutral relative to FY2021 (same as the 193 mt GOM cod sub-ACL) and Alternative 1/No Action (a 1mt decline from the 193 mt GOM cod sub-ACL). The recreational sub-ACL for GOM haddock would decrease under No Action and Alternative 2 (from 5,295 mt in FY2021 to 3,634 mt 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 FY2022: 19 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 FY2022 sub-ACL for SNE/MA yellowtail, GOM/GB windowpane flounder, and SNE/MA windowpane flounder would be unchanged from FY2021 levels conferring neutral economic impacts for the scallop fishery relative to FY2021, since the sub-ACL for GOM/GB windowpane flounder would be smaller than the projected catch for FY2022 year (see Scallop PDT memo). Projected catch for GOM/GB windowpane flounder could be high enough to trigger the AM (50% over the sub-ACL). Under Alternative 2, the total ACL would be 55 mt for GOM/GB windowpane flounder. If total catches across all fisheries are similar to FY2020, it is possible that the total ACL could be exceeded for GOM/GB windowpane flounder since total catch has exceeded 55 mt in every year between FY2016 and FY2020 (Table 54). The GOM/GB windowpane sub-ACL was exceeded in FY2020 by 290%. As a result of this overage, the reactive large accountability measure for GOM/GB windowpane will be triggered for FY2022, meaning a gear restriction will be required for all fishing occurring in Closed Area II for the entirety of FY2022. FY2022 will be the first year that the modified gear is required on Georges Bank, and this is expected to reduce bycatch of GOM/GB windowpane flounder, along with GB yellowtail flounder, which may reduce the likelihood of the FY2022 GOM/GB windowpane flounder sub-ACL being exceeded, reducing potential negative impacts. Projected catch of SNE/MA yellowtail flounder and SNE/MA windowpane flounder is less likely to trigger the AM (less than 50% over the sub-ACL).

Compared to No Action/Alternative 1, Alternative 2 would have a neutral impact on the scallop fishery since the sub-ACLs for SNE/MA yellowtail, GOM/GB windowpane flounder, and SNE/MA windowpane flounder would remain the same.

The sub-ACL for GB yellowtail flounder under Alternative 2 would increase by 58% relative to FY 2021 levels and compared to No Action/Alternative 1 (increasing from 12 mt to 19 mt), potentially having positive economic impacts since FY2022 projected catch by the scallop fishery is estimated to be 15-19 mt (see Scallop PDT memo). However, this is not high enough to trigger an AM under the No Action sub-ACL (>50% of the sub-ACL). It is unlikely that the total ACL would be exceeded for this stock since total utilization of the ACL has been very low in recent years. Overall economic impacts for the scallop fishery are neutral to positive for GB yellowtail flounder under Alternative 2 compared to No Action/Alternative 1.

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 2% between FY2021 and FY2022 (from 1,539 mt to 1,514 mt), and GOM haddock would decrease by 31% (from 156 mt to 107mt). Impacts are expected to be neutral both in respect to Alternative 1 (where quotas would also decrease for GB haddock and GOM haddock) and status quo given recent low catches of both haddock stocks, relative to the sub-ACLs. GB haddock catches by the herring fishery have been low in recent years - 0.2 mt in FY 2019 and 10 mt in FY 2020 due to lower herring ACLs (Table 64). If trends continue, decreases in the GB haddock sub-ACL are unlikely to confer negative economic impacts in FY2022 and beyond, either with respect to status quo or Alternative 2 sub-ACLs. In FY 2019 and FY 2020 GOM haddock catch by the midwater trawl herring fishery was approximately 0.1 mt (Table 63), so unless effort shifts considerably, neutral economic impacts would be expected. Atlantic herring quotas for 2020 and 2021 were 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 increase from FY 2021 levels, from 1.5 mt to 2.3 mt in FY 2022. This is expected to have neutral to positive economic impacts on the small mesh fishery since catches in recent years have been low (0 mt in FY2019), though they were slightly higher in FY2020 at 1.8 mt (Table 62). If effort in FY2022 remains similar to that in FY2020, this sub-ACL will potentially be less constraining for the fishery than that under No Action, as catches of 1.8 mt would exceed the No Action sub-ACL of 1.5 mt, triggering the AMs, but not the sub-ACL of 2.3 mt under Alternative 2. Overall economic impacts are expected to be neutral to positive both in respect to status quo and with respect to Alternative 1/No Action.

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 remain at the FY 2021 levels of 177 mt in FY2022. The triggering of an AM implements gear-restricted areas (GRAs) to reduce incidental catch of windowpane flounder. If bycatch of southern windowpane flounder is low in FY2022, there would be neutral economic impacts of the sub-ACL under Alternative 2 compared to FY2021. However, if bycatch of southern windowpane flounder is in line with recent fishery performance, AMs may be triggered. Relative to No Action, impacts will be neutral, as the sub-ACL would be 177mt under either alternative.

The AM for southern windowpane for large-mesh non- groundfish fisheries is implemented if the large-mesh non-groundfish fishery exceeds its sub-ACL (evaluated using the “other sub-component”), and if the total ACL is exceeded by more than the management uncertainty buffer (currently set at approximately 5%).

Based on recent catches (Table 90), the other sub-component of 177mt is likely to be exceeded. From FY2016-FY2020, annual catches of S. Windowpane by large-mesh non-groundfish fisheries ranged from 178.1 - 243.6mt.

The total ACL for S. Windowpane under No Action would be 371mt. Based on recent catches (Table 91), this number may be exceeded in FY2022. From FY2016-FY2020, total annual catches of S. Windowpane ranged from 335.6 - 454.7mt.

Table 90- SNE/MA windowpane flounder other sub-component limits and catch (mt) and utilization rates, fishing years 2016-2020.

FY	S. Windowpane sub-ACL	S. Windowpane "other" catch	Utilization
2016	249	178.1	71.5%
2017	249	201	80.7%
2018	218	205	94.0%
2019	218	243.6	111.7%
2020	196	211.5	107.9%

Table 91- SNE/MA windowpane flounder total ACLs and catch (mt) and utilization rates, fishing years 2016-2020.

FY	S. Windowpane total ACL	S. Windowpane total catch	Utilization
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	335.6	81.5%

6.5.1.3 Alternative 3 - Recreational Catch Target for Georges Bank Cod (*Preferred Alternative*)

6.5.1.3.1 *Option 1* – No Action

Option 1 would maintain the current recreational catch target for GB cod of 138mt for FY2022.

Impacts to the commercial groundfish fishery

Option 1/No Action is expected to have likely negative economic impacts on the commercial fishery, relative to Options 2-4, because this alternative will retain the previous recreational catch target for GB cod which was based on the MRIP data in the 2017 stock assessment. Unless recreational management measures are made considerably more constraining, incoming recreational catch data may easily exceed the catch target and possibly lead to overages in the fishery, which may directly affect commercial allocations in subsequent fishing years. A higher recreational catch target under Option 1/No Action, relative to Options 2-4, would result in a decreased commercial sub-ACL for GB cod for FY2022.

Impacts to the recreational groundfish fishery

Option 1/No Action is expected to have neutral to negative economic impacts on the recreational fishery, relative to Options 2-4, because this alternative will retain the recreational catch target for Georges Bank cod and management measures will attempt to constrain fishing effort within the target which is based on MRIP data in the 2017 stock assessment, while fishing effort in those years will be calculated using recalibrated estimates. Short term positive economic impacts would be incurred if management measures are less restrictive under Option 1/No Action compared to Options 2-4, as Options 2-4 may limit recreational fishing revenue and private angler welfare.

6.5.1.3.2 ***Option 2*** **- Revised Recreational GB Cod Catch Target Based on Recent Catches**

Option 2 would revise current recreational catch target for GB cod to be 43 mt for FY2022.

Impacts to the commercial groundfish fishery

Option 2 is expected to have positive economic impacts on the commercial fishery, relative to Option 1/No Action, Option 3, and Option 4, because this alternative will decrease the recreational GB cod catch target to 43 mt, which was based on the MRIP data in the 2021 stock assessment. This change would result in a greater commercial fishery quota relative to No Action. Unless recreational management measures are made considerably more constraining, incoming recreational catch data may easily exceed the catch target and possibly lead to overages in the fishery, which may directly affect commercial allocations in subsequent fishing years.

Impacts to the recreational groundfish fishery

Option 2 is expected to have negative economic impacts on the recreational fishery, relative to Option 1/No Action, Option 3, and Option 4, because this alternative will decrease the recreational catch target for Georges Bank cod and management measures will attempt to constrain fishing effort within the target, which is based on the MRIP data in the 2021 stock assessment. Negative economic impacts would be incurred if management measures are more restrictive under Option 2 compared with Option 1/No Action, as both for-hire fishery revenues and private angler welfare would be expected to decrease.

6.5.1.3.3 ***Option 3*** **- Revised Recreational GB Cod Catch Target Based on Recent Percentage of US Fisheries Catches**

Option 3 would revise current recreational catch target for GB cod to be 71 mt for FY2022.

Impacts to the commercial groundfish fishery

Option 3 is expected to have positive economic impacts on the commercial fishery, relative to Option 1/No Action, negative economic impacts relative to Option 2, and neutral impacts relative to Option 4, because this alternative will decrease the recreational GB cod catch target to 71 mt, which was based on the MRIP data in the 2021 stock assessment. This change would result in a greater commercial fishery quota relative to No Action. Unless recreational management measures are made considerably more constraining, incoming recreational catch data may easily exceed the catch target and possibly lead to overages in the fishery, which may directly affect commercial allocations in subsequent fishing years.

Impacts to the recreational groundfish fishery

Option 3 is expected to have negative economic impacts on the recreational fishery, relative to Option 1/No Action, positive impacts relative to Option 2, and neutral impacts relative to Option 4, because this alternative will decrease the recreational catch target for Georges Bank cod and management measures will attempt to constrain fishing effort within the target, which is based on the MRIP data in the 2021 stock assessment. Negative economic impacts would be incurred if management measures are more restrictive under Option 3 compared with Option 1/No Action as both for-hire fishery revenues and private angler welfare would be expected to decrease.

6.5.1.3.4 Option 4 - Revised Recreational GB Cod Catch Target Based on a Reduction from Recent Catches (*Preferred Option*)

Option 4 would revise current recreational catch target for GB cod to be 75 mt for FY2022.

Impacts to the commercial groundfish fishery

Option 4 is expected to have positive economic impacts on the commercial fishery, relative to Option 1/No Action, negative economic impacts relative to Option 2, and neutral impacts relative to Option 3, because this alternative will decrease the recreational GB cod catch target to 71 mt, which was based on the MRIP data in the 2021 stock assessment. This change would result in a greater commercial fishery quota relative to No Action. Unless recreational management measures are made considerably more constraining, incoming recreational catch data may easily exceed the catch target and possibly lead to overages in the fishery, which may directly affect commercial allocations in subsequent fishing years.

Impacts to the recreational groundfish fishery

Option 4 is expected to have negative economic impacts on the recreational fishery, relative to Option 1/No Action, positive impacts relative to Option 2, and neutral impacts relative to Option 3, because this alternative will decrease the recreational catch target for Georges Bank cod and management measures will attempt to constrain fishing effort within the target, which is based on the MRIP data in the 2021 stock assessment. Negative economic impacts would be incurred if management measures are more restrictive under Option 4 compared with Option 1/No Action as both for-hire fishery revenues and private angler welfare would be expected to decrease.

6.5.1.4 Alternative 4 - Changes to the Default Specifications Process (*Preferred Alternative*)

6.5.1.4.1 *Option 1* – No Action

Impacts on the commercial groundfish fishery

Under Option 1/No Action, the current default specifications process applies to each groundfish stock or management unit that lacks a full year of specifications. For those that lack specifications, 35 percent of the prior year's OFL, ABC, and ACL is specified for the first three months (May 1 to July 31) of an upcoming fishing year. The default specifications may not exceed the anticipated ABCs for the upcoming fishing year. If the default specification does exceed the anticipated ABC, the default specification would be set equal to the ABC for the upcoming fishing year. The default specifications are replaced by new approved specifications upon rulemaking, and expire on July 31. Starting on August 1, fishing for stocks without specifications in place would cease, along with fishing for other groundfish stocks that share the same broad stock area (BSA) as stocks with no specifications. Catches occurring while default specifications may be in place (after May 1 through final rulemaking) are counted against the updated ACL for the fishing year. Northeast groundfish sectors are not subject to the 20% holdback of the prior year's Sector ACE while default specifications are in place. Option 1/No Action allows the directed groundfish fishery to begin on-time if specifications are not in place for the start of the fishing year. A percentage of 35% of the prior year's ACL, not to exceed the next year's ABC, reflects a more precautionary approach to default specifications provisions than carrying forward 100% of the prior year's specifications (as is done in other FMPs), reflecting the variation in stock statuses within the multispecies complex. Reducing the allowable catch in the fishery by 65% builds in precaution to protect stocks whose stock status may have changed while allowing the fishing year to begin on time and accommodates fishing businesses that prosecute the fishery early in the fishing year. Default specifications of less than 100% also provide an incentive to maintain specifications timelines.

Although less than 100% of the anticipated fishing year's ACL would be available under default specifications, sectors would be expected to plan operations as if final specifications would be in place. However, fishing effort may potentially be lower under the default percentage of 35%, particularly for stocks with a seasonal component (e.g., eastern GB management units of cod and haddock, GB winter flounder) in which most effort occurs early in the fishing year when default specifications would be in place (see Table 66). This is especially the case for the segment of the fishery operating on eastern Georges Bank (see Table 69). The common pool fishery would have lower trip limits under the default percentage of 35% and therefore fishing effort would be lower. Option 1, therefore, may have negative economic impacts. Option 1 is more conservative than Options 2-4 which all would have a default percentage of 75% and, therefore, is expected to have negative economic impacts when compared to Options 2-4.

Additionally, Option 1 has a shorter duration for default specifications than Options 2-4. Option 1 would have potentially moderate to highly negative economic impacts when compared to Options 2-4 if the shorter duration in Option 1 resulted in default specifications expiring and a reduction in fishing activity in certain BSAs. To date the July 31 default specifications deadline has not been missed, though it has been close in some years (see Table 65).

Even if default specifications do not expire, there may potentially be disruptions to the fishery from the deadline being approached in terms of disruptions to business planning and confusion over what the expiring specifications mean for fishery operations, which have direct and indirect negative economic impacts. This was observed particularly in FY2020 when default specifications were in place for several stocks including redfish, which as a unit stock would result in no directed fishing allowed in all BSAs if default specifications expired. In the weeks leading up the default specifications deadline, sector managers noted questions from sector members about what would happen should the default specifications expire. For example, vessel operators asked if a trip were underway prior to July 31 whether the trip would be allowed to be completed after the deadline. These types of questions stem from economic impact concerns related to trip planning. Disruptions to the ACE leasing market are also possible, whether the default specifications do expire or the deadline is approached. However, the extent to which the current default specifications process has impacted ACE lease prices is difficult to assess. In those years in which default specifications were in place, there is the potential for quota scarcity with a 35% default ACL. However, first quarter quota prices may also be high because of anticipated quota scarcity later in the fishing year, after final quotas are implemented.

The no holdback provision has positive economic impacts for the sector fishery, as this allows the full amount of ACE under the default specifications to be available at the start of the fishing year.

Impacts on the recreational groundfish fishery

Impacts to the recreational fishery are possible if either of the two stocks with recreational sub-ACLs, GOM cod and GOM haddock, were under default specifications. However, the recreational fishery would still operate under the measures in place while under default specifications, and therefore impacts on the recreational fishery are expected to be neutral.

Impacts on other fisheries

Impacts to other fisheries with groundfish sub-ACLs are possible should those stocks have default specifications. Other fisheries would receive less than 100% of the anticipated fishing year's sub-ACL under default specifications. This is not expected to negatively impact fisheries with AMs in a subsequent year (e.g., sea scallop fishery with sub-ACLs for yellowtail flounder and windowpane flounder stocks, small-mesh multispecies fishery with sub-ACLs for yellowtail flounder). Fisheries with in-season AMs (i.e., MWT Atlantic herring fishery with sub-ACLs for haddock stocks) may be negatively impacted if the reduced sub-ACL leads to triggering an AM in-season. However, final specifications would be expected to be in place in time before such an event, and therefore impacts are expected to be neutral. To date the July 31 default specifications deadline has not been missed, though it has been close in some years. Should the default specifications expire, impacts to other fisheries with groundfish sub-ACLs would be negative. Since Option 1 has a lower default percentage and a shorter duration than Options 2-4, impacts on other fisheries would be slightly negative compared to Options 2-4.

6.5.1.4.2 ***Option 2*** **- 4 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs**

Impacts on the commercial groundfish fishery

Under Option 2, the default specification percentage would be 75%, and the default specifications would be in place from May 1 to August 31. Although less than 100% of the anticipated fishing year's ACL would be available, sectors would be expected to plan operations as if final specifications would be in place. However, fishing effort may be slightly lower under the 75% default percentage in Option 2, particularly for stocks with a seasonal component (e.g., eastern GB management units of cod and haddock, GB winter flounder) in which most effort occurs early in the fishing year when default specifications would be in place (see Table 66). This is especially the case for the segment of the fishery operating on eastern Georges Bank (see Table 69). The common pool fishery would have lower trip limits under the default percentage of 75% and therefore fishing effort would be lower. Economic impacts from Option 2, therefore, could potentially be slightly negative. However, impacts would be positive compared to Option 1 as the default percentage of 75% is more likely to allow the fishery to operate at the beginning of the fishing year than 35%. Since FY2018, five stocks have exceeded 75% ACL utilization over the entire fishing year at least once – GOM cod, witch flounder, white hake, Atlantic halibut, and southern windowpane flounder. Some of these stocks exceeded 75% utilization only once or twice since FY2018. GOM cod consistently exceeds 75%, and white hake to a lesser extent (see Table 66).

Option 2 has the same default percentage as Options 3 and 4, but the options differ in duration of default specifications. Option 2 has a shorter duration for default specifications than Options 3 and 4. Option 2 would have potentially slightly negative economic impacts when compared to Option 3 and moderately negative impacts compared to Option 4 if the shorter duration in Option 2 resulted in default specifications expiring and a reduction in fishing activity in certain BSAs. To date the July 31 default specifications deadline has not been missed, though it has been close in some years (see Table 65). The slightly longer duration of default specifications under Option 2 may also be more likely to avoid disruptions to the fishery seen as the default specifications deadline is approached (see above under Option 1/No Action).

This option would maintain the no holdback provision, which would have positive economic impacts for the sector fishery, as this allows the full amount of ACE under the default specifications to be available at the start of the fishing year.

This option would also establish two-year TACs for Eastern GB cod and Eastern GB haddock, such that the TAC set for Year 1 would be held for Year 2. The Year 2 TAC would be a default specification for the full year. Transboundary stocks/management units are managed through the US/CA Resource Sharing Understanding and the quotas are specified annually. Setting two-year TACs for Eastern GB cod and Eastern GB haddock would eliminate disruptions to the fishery from these two stocks consistently requiring default specifications, and from the quotas for these stocks going to zero when default specifications expire. This measure could have both direct economic impacts as well as help facilitate business planning for segments of the fishery that target these stocks, and is expected to have positive economic impacts compared to the current process of setting these TACs for only one year.

Impacts on the recreational groundfish fishery

Impacts to the recreational fishery are possible if either of the two stocks with recreational sub-ACLs, GOM cod and GOM haddock, were under default specifications. However, the recreational fishery would still operate under the measures in place while under default specifications, and therefore impacts on the recreational fishery are expected to be neutral.

Impacts on other fisheries

Other fisheries would receive less than 100% of the anticipated fishing year's sub-ACL under default specifications. This is not expected to negatively impact fisheries with AMs in a subsequent year (e g., sea scallop fishery with sub-ACLs for yellowtail flounder and windowpane flounder stocks, small-mesh multispecies fishery with sub-ACL for yellowtail flounder). Fisheries with in-season AMs (i.e., MWT Atlantic herring fishery with sub-ACLs for haddock stocks) may be negatively impacted if the reduced sub-ACL leads to trigging an AM in-season. However, final specifications would be expected to be in place in time before such an event, and therefore impacts are expected to be neutral. To date the July 31 default specifications deadline has not been missed, though it has been close in some years. Should the default specifications expire, impacts to other fisheries with groundfish sub-ACLs would be negative. The addition of one month to the current expiration date of default specifications slightly reduces the likelihood of having specifications for groundfish stocks expire. Since Option 2 has a higher default percentage and a slightly longer duration than Option 1, impacts on other fisheries would be positive compared to Option 1.

6.5.1.4.3 ***Option 3*** **- 5 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs**

Impacts on the commercial groundfish fishery

Under Option 3, the default specification percentage would be 75%, and the default specifications would be in place from May 1 to September 30. Although less than 100% of the anticipated fishing year's ACL would be available, sectors would be expected to plan operation as if final specifications would be in place. However, fishing effort may be slightly lower under the 75% default percentage in Option 3, particularly for stocks with a seasonal component (e.g., eastern GB management units of cod and haddock, GB winter flounder) in which most effort occurs early in the fishing year when default specifications would be in place (see Table 66). This is especially the case for the segment of the fishery operating on eastern Georges Bank (see Table 69). The common pool fishery would have lower trip limits under the default percentage of 75% and therefore fishing effort would be lower. Economic impacts from Option 3, therefore, could potentially be slightly negative. However, impacts would be positive compared to Option 1 as the 75% default percentage is more likely to allow the fishery to operate at the beginning of the fishing year than 35%. Since FY2018, five stocks have exceeded 75% ACL utilization over the entire fishing year at least once – GOM cod, witch flounder, white hake, halibut, and southern windowpane flounder. Some of these stocks exceeded 75% utilization only once or twice since FY2018. GOM cod consistently exceeds 75%, and white hake to a lesser extent (see Table 66).

Option 3 has the same default percentage as Options 2 and 4, but the options differ in duration of default specifications. Option 3 has a longer duration for default specifications than Option 2 and a shorter duration than Option 4. Option 3 would have potentially slightly positive economic impacts when compared to Option 2 if the shorter duration in Option 2 resulted in default specifications expiring and a reduction in fishing activity in certain BSAs, and slightly negative impacts compared to Option 4. To date the July 31 default specifications deadline has not been missed, though it has been close in some years (see Table 65).

Maintaining the no holdback provision would have positive economic impacts for the sector fishery, as this allows the full amount of ACE under the default specifications to be available at the start of the fishing year.

Setting two-year TACs for Eastern GB cod and Eastern GB haddock would eliminate disruptions to the fishery from these two stocks consistently requiring default specifications, and from the quotas for these stocks going to zero when default specifications expire. This measure could have both direct economic impacts as well as help facilitate business planning for segments of the fishery that target these stocks, and is expected to have positive economic impacts compared to the current process of setting these TACs for only one year.

Impacts on the recreational groundfish fishery

Impacts to the recreational fishery are possible if either of the two stocks with recreational sub-ACLs, GOM cod and GOM haddock, were under default specifications. However, the recreational fishery would still operate under the measures in place while under default specifications, and therefore impacts on the recreational fishery are expected to be neutral.

Impacts on other fisheries

Other fisheries would receive less than 100% of the anticipated fishing year's sub-ACL under default specifications. This is not expected to negatively impact fisheries with AMs in a subsequent year (e g., sea scallop fishery with sub-ACLs for yellowtail flounder and windowpane flounder stocks, small-mesh multispecies fishery with sub-ACL for yellowtail flounder). Fisheries with in-season AMs (i.e., MWT Atlantic herring fishery with sub-ACLs for haddock stocks) may be negatively impacted if the reduced sub-ACL leads to trigging an AM in-season. However, final specifications would be expected to be in place in time before such an event, and therefore impacts are expected to be neutral. To date the July 31 default specifications deadline has not been missed, though it has been close in some years. Should the default specifications expire, impacts to other fisheries with groundfish sub-ACLs would be negative. The addition of two months to the current expiration date of default specifications moderately reduces the likelihood of having specifications for groundfish stocks expire. Since Option 3 has a higher default percentage and a longer duration than Option 1, impacts on other fisheries would be positive compared to Option 1.

6.5.1.4.4 ***Option 4*** **- 6 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs (*Preferred Option*)**

Impacts on the commercial groundfish fishery

Under Option 4, the default specification percentage would be 75%, and the default specifications would be in place from May 1 to October 31. Although less than 100% of the anticipated fishing year's ACL would be available, sectors would be expected to plan operation as if final specifications would be in place. However, fishing effort may be slightly lower under the 75% default percentage in Option 4, particularly for stocks with a seasonal component (e.g., eastern Georges Bank management units of cod and haddock, Georges Bank winter flounder) in which most effort occurs early in the fishing year when default specifications would be in place (see Table 66). This is especially the case for the segment of the fishery operating on eastern Georges Bank (see Table 69). The common pool fishery would have lower trip limits under the default percentage of 75% and therefore fishing effort would be lower. Economic impacts from Option 4, therefore, could potentially be slightly negative. However, impacts would be positive compared to Option 1 as the 75% default percentage is more likely to allow the fishery to operate at the beginning of the fishing year than 35%. Since FY2018, five stocks have exceeded 75% ACL utilization over the entire fishing year at least once – GOM cod, witch flounder, white hake, halibut, and southern windowpane flounder. Some of these stocks exceeded 75% utilization only once or twice since FY2018. GOM cod consistently exceeds 75%, and white hake to a lesser extent (see Table 66).

Option 4 has the same default percentage as Options 2 and 3, but they differ in duration of default specifications. Option 4 has a longer duration for default specifications than Options 2 and 3 and would have potentially slightly positive economic impacts when compared to Options 2 and 3 if the shorter durations in Options 2 and 3 resulted in default specifications expiring and a reduction in fishing activity in certain BSAs. To date the July 31 default specifications deadline has not been missed, though it has been close in some years (see Table 65).

Maintaining the no holdback provision would have positive economic impacts for the sector fishery, as this allows the full amount of ACE under the default specifications to be available at the start of the fishing year.

Setting two-year TACs for Eastern GB cod and Eastern GB haddock would eliminate disruptions to the fishery from these two stocks consistently requiring default specifications, and from the quotas for these stocks going to zero when default specifications expire. This measure could have both direct economic impacts as well as help facilitate business planning for segments of the fishery that target these stocks, and is expected to have positive economic impacts compared to the current process of setting these TACs for only one year.

Impacts on the recreational groundfish fishery

Impacts to the recreational fishery are possible if either of the two stocks with recreational sub-ACLs, GOM cod and GOM haddock, were under default specifications. However, the recreational fishery would still operate under the measures in place while under default specifications, and therefore impacts on the recreational fishery are expected to be neutral.

Impacts on other fisheries

Other fisheries would receive less than 100% of the anticipated fishing year's sub-ACL under default specifications. This is not expected to negatively impact fisheries with AMs in a subsequent year (e.g., sea scallop fishery with sub-ACLs for yellowtail flounder and windowpane flounder stocks, small-mesh multispecies fishery with sub-ACL for yellowtail flounder). Fisheries with in-season AMs (i.e., MWT Atlantic herring fishery with sub-ACLs for haddock stocks) may be negatively impacted if the reduced sub-ACL leads to trigging an AM in-season. However, final specifications would be expected to be in place in time before such an event, and therefore impacts are expected to be neutral. To date the July 31 default specifications deadline has not been missed, though it has been close in some years. Should the default specifications expire, impacts to other fisheries with groundfish sub-ACLs would be negative. The addition of three months to the current expiration date of default specifications greatly reduces the likelihood of having specifications for groundfish stocks expire. Since Option 4 has a higher default percentage and a longer duration than Option 1, impacts on other fisheries would be positive compared to Option 1.

6.5.2 Action 2 – Recreational Fishery Measures- Georges Bank Cod

6.5.2.1 Alternative 1 - No Action

Alternative 1/No Action 1 would maintain the current recreational management measures for GB cod.

Impacts to the commercial groundfish fishery

Unless recreational management measures are made considerably more constraining, incoming recreational catch data may easily exceed the catch target and possibly lead to overages in the fishery, which may directly affect commercial allocations in subsequent fishing years. Alternative 1/No Action would have negative economic impacts on the commercial groundfish fishery compared with Alternative 2 or Alternative 3.

Impacts to the recreational groundfish fishery

Positive economic impacts would be incurred as management measures would be less restrictive under Alternative 1/No Action compared to Alternative 2 or Alternative 3, as Alternatives 2 and 3 may limit recreational fishing revenue and private angler welfare.

6.5.2.2 Alternative 2 –Temporary Administrative Measure to Allow the Regional Administrator Authority to Adjust the Recreational Measures for Georges Bank Cod (*Preferred Alternative*)

Alternative 2 would allow for adjustment of recreational management measures for GB cod by the Regional Administrator in consultation with the Council, for FY2023 and FY2024, to stay within the recreational GB cod catch target selected by the Council.

Impacts to the commercial groundfish fishery

Unless recreational management measures are made considerably more constraining, incoming recreational catch data may easily exceed the catch target and possibly lead to overages in the fishery, which may directly affect commercial allocations in subsequent fishing years. Alternative 2 would have positive economic impacts on the commercial groundfish fishery compared with Alternative 1/No Action and uncertain impacts compared with Alternative 3.

Impacts to the recreational groundfish fishery

More restrictive measures would limit recreational fishing revenue and private angler benefits. Negative economic impacts would be incurred as management measures would be more restrictive under Alternative 2 compared with Alternative 1/No Action. The impacts of Alternative 2 relative to Alternative 3 are uncertain, as it is not known what measures ultimately may be adjusted by the Regional Administrator, if they choose to do so.

6.5.2.3 Alternative 3 - Recreational Measures for Georges Bank Cod (*Preferred Alternative*)

Under Alternative 3, recreational measures would be in place for FY2022 and remain in place until changed. The Council considered three different options.

Impacts to the commercial groundfish fishery

Unless recreational management measures are made considerably more constraining, incoming recreational catch data may easily exceed the catch target and possibly lead to overages in the fishery, which may directly affect commercial allocations in subsequent fishing years. Alternative 3 would have positive economic impacts on the commercial groundfish fishery compared with Alternative 1/No Action and uncertain impacts compared with Alternative 2. Option 2 would be expected to have the most positive economic impacts for the commercial groundfish fishery, followed by Option 1 (the Council's preferred option), and Option 3.

Impacts to the recreational groundfish fishery

More restrictive measure would limit recreational fishing revenue and private angler benefits. Negative short-term economic impacts would be incurred as management measures would be more restrictive under Alternative 3 compared with Alternative 1/No Action. The impacts of Alternative 3 relative to

Alternative 2 are uncertain, as it is not known what measures ultimately may be adjusted by the Regional Administrator, if they choose to do so. Economic impacts are expected to be the greatest under Option 2, followed by Option 1 (the Council's preferred option). Option 3 is expected to have the least negative impact of the three options. The main difference between these options in the closed season that would be in place followed by size restrictions.

6.6 IMPACTS ON HUMAN COMMUNITIES- SOCIAL

Introduction

National Standard 8 (NS8) requires the Council to consider the importance of fishery resources to affected communities and provide those communities with continuing access to fishery resources, but it does not allow the Council to compromise the conservation objectives of the management measures. FW59 provides an overview of type of social change.

Social Impact Factors. The social impact factors outlined below can be used to describe the Northeast multispecies (groundfish) fishery, its sociocultural and community context, and its participants. These factors or variables are considered relative to the management alternatives and used as a basis for comparison between alternatives. Use of these kinds of factors in social impact assessment is based on NMFS guidance (NMFS 2007a) and other texts (e.g., Burdge 1998). Longitudinal data describing these social factors region-wide and in comparable terms is limited. Qualitative discussion of the potential changes to the factors characterizes the likely direction and magnitude of the impacts.

The social impact factors fit into five categories:

1. *Size and Demographic Characteristics* of the fishery-related workforce residing in the area; these determine demographic, income, and employment effects in relation to the workforce as a whole, by community and region.
2. The *Attitudes, Beliefs, and Values* of fishermen, fishery-related workers, other stakeholders and their communities; these are central to understanding the behavior of fishermen on the fishing grounds and in their communities.
3. The *Social Structure and Organization;* that is, changes in the fishery's ability to provide necessary social support and services to families and communities, as well as effects on the community's social structure, politics, etc.
4. The *Non-Economic Social Aspects* of the fishery; these include lifestyle, health, and safety issues, and the non-consumptive and recreational uses of living marine resources and their habitats.
5. The *Historical Dependence on and Participation in* the fishery by fishermen and communities, reflected in the structure of fishing practices, income distribution, and rights (NMFS 2007a).

Data utilized to inform the social impact factors include the 2004-2020 Groundfish-Specific Commercial Engagement Indicators, the 2009-2018 Recreational Engagement Indicators, the 2012-2016 Community Social Vulnerability Indicators (CSVI), and results from both the 2012-13 and 2018-19 Socio-Economic Surveys of Hired Captains and Crew in New England and Mid-Atlantic Commercial Fisheries (Crew Survey). More information about these data can be found at https://www.fisheries.noaa.gov/new-england-mid-atlantic/socioeconomics/northeast-socioeconomic-data-products.

6.6.1 Action 1 – Specifications

6.6.1.1 Alternative 1 - No Action

Commercial Groundfish Fishery Social Impacts

Alternative 1/No Action is anticipated to have positive social impacts on the commercial groundfish fishery compared to the revised specifications under Alternative 2. According to results presented in the Economic Impacts section, groundfish revenue in FY2022 under Alternative 1/No Action is predicted to increase to $55.1 million, which is an increase of $0.9 million from FY2020. Additionally, predicted total gross revenue from all groundfish trips is $75.5 million in FY2022, which is a $2.6 million increase from realized gross revenues in FY2020. While many of the most highly engaged ports in commercial groundfish will see positive social impacts from increased revenues under Alternative 1/No Action compared to Alternative 2, Boston in particular is predicted to eclipse Gloucester as the highest earning groundfish port at $12.4 million in FY22. Other places that may see positive social impacts include all New Hampshire ports at $3.4 million, Portland, ME, at $4.4 million, and Point Judith, RI, at $1.8 million, all of which constitute increases in revenue over the FY20 and FY21 predicted outcomes. Boston, Portland, and Narragansett/Point Judith, RI, are among the top ten communities in average engagement in commercial groundfish activities over the period of 2004 to 2020, but still have relatively much less engagement than the top two ports, Gloucester and New Bedford (Figure 8). Given the predicted increases to revenues in these ports, Boston, Portland, and Point Judith may become more competitive as ports in the New England region for commercial groundfish activity and this could have cascading positive impacts on the *Size and Demographic Characteristic*s of the fishery-related workforce and the *Historical Dependence and Participation* of these communities in the commercial groundfish fishery. While overall impacts of Alternative 1/No Action are expected to be positive compared to Alternative 2, there are likely negative social impacts in terms of the *Size and Demographic Characteristics* and *Historical Dependence on and Participation* of the commercial groundfish fishery due to reductions in fishing opportunity and resultant losses in employment and income in the Eastern Georges Bank management area. After July 31, 2020, ACLs would not be defined for EGB cod or haddock in the multispecies groundfish fishery. Without specification of these ACLs, catches would not be allocated to the 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 likely be incidental catches in other fisheries. This would likely precipitate a reduction in income for vessels and possible loss of employment opportunities for crew members typically employed on vessels that target those groundfish stocks.

Despite anticipated positive impacts related to predicted revenues, Alternative 1/No Action may also have negative impacts in terms of the *Attitudes, Beliefs, and Values* of all resource users because catch limits would be based on outdated information, which would not constitute the use of the best available scientific information to manage the fishery.

Recreational Groundfish Fishery

Recreational Fishery social impacts of Alternative 1/ No Action are expected to be neutral relative to Alternative 2. As the Economic Impacts section describes, recreational access to GOM haddock is already limited by incidental catch of GOM cod. Therefore, the impact of the decreases under the No Action alternative would likely be neutral. However, this may also depend upon the option that is selected under Alternative 3 for setting the recreational catch target of GB cod.

Atlantic Sea Scallop Fishery

Relative to Alternative 2, Alternative 1/ No Action is anticipated to have neutral to low negative social impacts on the scallop fishery because the scallop sub-ACLs for SNE/MA yellowtail flounder, northern windowpane flounder, and southern windowpane flounder will remain low across both No Action and Alternative 2, while the scallop sub-ACL for GB yellowtail flounder will be slightly lower under No Action than the revised specifications under Alternative 2.

Midwater trawl directed Atlantic herring fishery

Alternative 1/ No Action alternative is anticipated to have neutral social impacts on the herring fishery. Catches of haddock stocks by herring fishery vessels have been low in recent years and are trending downward. Reductions in GOM/GB haddock sub-ACLs would therefore not make a substantial difference to the herring fishery, especially on Georges Bank.

Small-mesh fisheries

Under Alternative 1/ No Action, the social impacts to the small-mesh fisheries are anticipated to be neutral given relatively low catches of GB yellowtail flounder in recent years, and as such these fisheries are unlikely to be constrained. Impacts could potentially be negative if catches remain the same as those in FY2020, as the sub-ACL under Alternative 1/No Action could potentially be exceeded, triggering the AMs.

Large-mesh non-groundfish fisheries

Under Alternative 1/No Action, social impacts on the large-mesh non-groundfish trawl (i.e., summer flounder and scup) fisheries are anticipated to be neutral given that the southern windowpane flounder other sub-component will remain the same in FY2022 and assuming catches of southern windowpane flounder are low in FY2022, and potentially negative because of the possibility of an AM being triggered and implemented in a future fishing year.

6.6.1.2 Alternative 2 – Revised Specifications (*Preferred Alternative*)

Commercial Groundfish Fishery Social Impacts

Under Alternative 2, the sub-ACLs would be revised for the commercial, recreational, and other fisheries for FY22. According to results presented in the Economic Impacts section, overall commercial groundfish revenues under Alternative 2 and the preferred option for the GB cod catch target are predicted to be $51.9 million, which would be a $2.3 million decrease from the FY2020 realized amount and a $3.2 million decrease relative to the No Action alternative. Alternative 2 is anticipated to have negative social impacts on the sector component of the fishery relative to Alternative 1/No Action.

Port-level results revealed that revenues are predicted to decrease across the board for all major, highly engaged commercial groundfish ports, but the most impacted is predicted to be New Bedford, MA, which is predicted to see groundfish revenues decrease by up to $1.4 million in FY2022, relative to No Action. The community of New Bedford is particularly at risk from substantial decreases in commercial groundfish revenues and accompanying loss of employment opportunities given the high poverty and moderately high vulnerabilities in housing, population composition and personal disruption (Table 34). Despite potential negative consequences at the port level, Alternative 2 may have positive impacts with respect to the *Attitudes, Beliefs, and Values* of all resource users relative to No Action/Alternative 1 because the catch limits would be revised based on the best available scientific information, which is also mandated by the Magnuson-Stevens Act (MSA).

Recreational Groundfish Fishery Social Impacts
Alternative 2 is expected to have neutral social impacts on the recreational fishery relative to Alternative 1/No Action. Access to GOM haddock for the recreational fishery is already limited by the incidental catch of GOM cod. From the preferred option under Alternative 3 to set the recreational catch target for GB cod there is likely to be even greater constraints placed on the recreational fishery.

Atlantic Sea Scallop Fishery
Social impacts of Alternative 2 relative to Alternative 1/No Action alternative for the scallop fishery are anticipated to be neutral to low positive given the slight increase in sub-ACL for GB yellowtail flounder under the revised specifications. The sub-ACLs for SNE/MA yellowtail flounder, northern windowpane flounder, and southern windowpane flounder will remain the same under Alternative 2.

Midwater trawl directed Atlantic herring fishery
The GB haddock sub-ACL will remain roughly the same in FY22 for the midwater trawl directed Atlantic herring fishery, and the GOM haddock sub-ACL will decrease. Therefore, the social impacts of Alternative 2 are anticipated to be neutral to the herring fishery because the midwater trawl vessels in this fishery had very little-to-no catch of these stocks in FY18 through FY20 and the limits on the catch of haddock under the revised specifications are not expected to be constrain the herring fishery.

Small-mesh fisheries
Similar to the midwater trawl herring fishery, the small-mesh fisheries (e.g., squid and whiting) are unlikely to see substantial impacts, either positive or negative, from Alternative 2 versus Alternative 1/No Action. If the low catches of GB yellowtail flounder continue into FY2022 then the impacts of Alternative 2 relative to No Action would likely be neutral. However, if catches remain at the same level as those in FY2020, the sub-ACL under No Action could potentially be exceeded, and so impacts of Alternative 2 would be positive relative to No Action.

Large Mesh non-groundfish fisheries
Alternative 2 is likely to have neutral social impacts on the other large mesh non-groundfish fisheries. Under Alternative 2, the other sub-component would remain at from 177 mt in FY2022. Assuming catches of southern windowpane flounder are low in FY2022, there would be neutral economic impacts of the sub-ACL remaining the same under Alternative 2. Therefore, the social impacts of Alternative 2 relative to Alternative 1/No Action could be neutral and potentially negative for the large mesh non-groundfish fisheries because of the possibility of an AM being triggered and implemented in a future fishing year.

6.6.1.3 Alternative 3 - Recreational Catch Target for Georges Bank Cod (*Preferred Alternative*)

6.6.1.3.1 ***Option 1*** **– No Action**

Option 1/No Action would maintain the existing catch target for GB cod. This may have negligible to low positive social impacts, relative to Options 2-4, on human communities and stakeholders linked to the recreational fishery. Recreational fishery participants may undergo challenging business seasons as their cod catch target may become limiting over time, assuming the stock does not substantially rebound to levels that place it outside the categories of overfished and overfishing occurring.

On the other hand, Option 1/No Action may have negligible to low negative social impacts, relative to Options 2-4, on the commercial groundfish fishery relative to the *Attitudes, Beliefs, and Values* of participants and community members. If the catch target successfully maintains catches at or below the target, the continuation of the cod catch target for the recreational fishery will instill faith in the process among commercial stakeholders and renew trust among these participants that management will continue to manage the stocks equitably across industries participating in the groundfish fishery. Negative social impacts may result if the catch target is seen as too high and reduces the ability of the commercial fishery to maximize revenues under the overall ACL. Additionally, No Action/Option 1 could have negative impacts on the *Attitudes, Beliefs, and Values* of all resource users, but particularly the commercial fishery, because it would be based on outdated information from the 2017 stock assessment, which uses old MRIP data.

6.6.1.3.2 ***Option 2*** **- Revised Recreational GB Cod Catch Target Based on Recent Catches**

Option 2 would set the recreational catch target for Georges Bank cod for FY2022 based on recent catches. This target is based on the 3-year recent average of recreational catches (163mt) reduced by the percentage change in US ABC from FY2021 to FY2022 (73.8%). Under a 754 mt ABC, this option results in a GB cod recreational catch target of 43 mt. Option 2 is anticipated to have neutral to low negative social impacts on the recreational fishery due to the substantial decrease in the catch target and the accompanying limitations this may place on their business planning and practices over time. Narragansett/Point Judith, RI, is the only New England port that ranks consistently high in recreational fishing engagement over the period 2009-2018 (Figure 9), and could see substantial impacts from Option 2 due to the reduction in the GB cod catch target. However, Option 2 may have neutral to low positive social impacts on the commercial fishery because it could improve ability of commercial vessels to maximize revenues under the overall ACL with recreational catch limited based on the best available data. By using new MRIP data from the 2021 stock assessment, Option 2 could have positive impacts on the *Attitudes, Beliefs, and Values* of all resource users, but particularly the commercial fishery, because these measures would be based on the latest and best available scientific information.

6.6.1.3.3 ***Option 3*** **- Revised Recreational GB Cod Catch Target Based on Recent Percentage of US Fisheries Catches**

Option 3 would set the recreational catch target for Georges Bank cod for FY2022 based on the recent percentage of US fisheries catches. This target is based on the 3-year recent average of recreational catches relative to US fisheries total catches (20.6%) applied to the proposed FY2022 US ABC (343mt). Under a 754 mt ABC, this option results in a GB cod recreational catch target of 71 mt. Similar to Option 2, Option 3 is anticipated to have neutral to low negative social impacts on the recreational fishery due to the substantial decrease in the catch target and the accompanying limitations this may place on their business planning and practices over time. Narragansett/Point Judith, RI, is the only New England port that ranks consistently high in recreational fishing engagement over the period 2009-2018 (Figure 9), and could see substantial impacts from Option 2 due to the reduction in the GB cod catch target. However, Option 2 may have neutral to low positive social impacts on the commercial fishery because it could improve ability of commercial vessels to maximize revenues under the overall ACL with recreational catch limited based on the best available data. By using new MRIP data from the 2021 stock assessment, Option 3 could have positive impacts on the *Attitudes, Beliefs, and Values* of all resource users, but particularly the commercial fishery, because these measures would be based on the latest and best available scientific information.

6.6.1.3.4 *Option 4* - Revised Recreational GB Cod Catch Target Based on a Reduction from Recent Catches (*Preferred Option*)

Option 4 would set the recreational catch target for Georges Bank cod for FY2022 based on a reduction from recent catches. This option would set a GB cod recreational catch target of 75 mt. Similar to Option 2 and 3, Option 4 is anticipated to have neutral to low negative social impacts on the recreational fishery due to the substantial decrease in the catch target and the accompanying limitations this may place on their business planning and practices over time. Narragansett/Point Judith, RI, is the only New England port that ranks consistently high in recreational fishing engagement over the period 2009-2018 (Figure 9), and could see substantial impacts from Option 2 due to the reduction in the GB cod catch target. However, Option 4 may have neutral to low positive social impacts on the commercial fishery because it could improve ability of commercial vessels to maximize revenues under the overall ACL with recreational catch limited based on the best available data. By using new MRIP data from the 2021 stock assessment, Option 4 could have positive impacts on the *Attitudes, Beliefs, and Values* of all resource users, but particularly the commercial fishery, because these measures would be based on the latest and best available scientific information.

6.6.1.4 Alternative 4 - Changes to the Default Specifications Process (*Preferred Alternative*)

6.6.1.4.1 *Option 1* – No Action

Commercial Groundfish Fishery Social Impacts

Under Option 1/No Action, the current default specifications process applies to each groundfish stock or management unit that lacks a full year of specifications. For those that lack specifications, 35 percent of the prior year's OFL, ABC, and ACL is specified for the first three months (May 1 to July 31) of an upcoming fishing year. The default specifications may not exceed the anticipated ABCs for the upcoming fishing year. If the default specification does exceed the anticipated ABC, the default specification would be set equal to the ABC for the upcoming fishing year. The default specifications are replaced by new approved specifications upon rulemaking, and expire on July 31. Starting on August 1, fishing for stocks without specifications in place would cease, along with fishing for other groundfish stocks that share the same broad stock area (BSA) as stocks with no specifications. Catches occurring while default specifications are in place (after May 1 through final rulemaking) are counted against the updated ACL for the fishing year. Northeast groundfish sectors are not subject to the 20% holdback of the prior year's Sector ACE while default specifications are in place.

If Option 1 is selected, the fishing year would be able to start on time if there is a delay in the annual specifications process, which would result in positive social impacts for the commercial groundfish fishery. The fishery would be allowed to continue operations with less disruption, a positive impact in terms of the *Size and Demographic Characteristics* of the fishery, as well as the *Historical Dependence on and Participation* in the fishery. Because most of the other federal fisheries in the Northeast have a default specifications percentage of 100%, having a default percentage of 35% may lead to perceptions of inequity between fishery participants, a slightly negative impact on the *Non-Economic Social Aspects* of fishing. Additionally, fishing effort may potentially be lower under the default percentage of 35%, particularly for stocks with a seasonal component (e.g., eastern GB management units of cod and haddock, GB winter flounder) in which most effort occurs early in the fishing year when default specifications are in place, which could have negative impacts in terms of the *Size and Demographic Characteristics* of the segment of the fishery that relies on fishing during those months.

Option 1 would also improve the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management and the regulatory process, unless the annual specifications process became chronically delayed. Then, stakeholders may perceive that the default specifications process may be an excuse for delay in the assessment, management, and regulatory processes. Delays in the final Council decision, the submission of the framework to the Agency and the rulemaking for specifications actions have persisted in the past four out of five fishing years, though the July 31 deadline has not been missed to-date. These routine delays in the specifications actions may have negative impacts on the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management and the regulatory process.

Option 1/No Action is more conservative than Options 2-4 with a default percentage of 35% compared to 75%, and so Option 1 likely has negative impacts on the *Non-Economic Social Aspects* of fishing relative to Options 2-4. The duration of default specifications is the shortest compared to that under Options 2-4. This may result in more positive impacts on the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management, as the options for longer default specifications durations may be viewed negatively as causing continued delays in the annual specifications process. However, the longer durations considered under Option 2-4 may be less likely to result in default specifications expiring, and so the shorter duration under Option 1/No Action may also have negative impacts for the fishermen and fishing communities that rely on fishing in those BSAs that would be closed to directed fishing once the default specifications expired.

Even if default specifications do not expire, there may potentially be disruptions to the fishery from the deadline being approached in terms of disruptions to business planning and confusion over what the expiring specifications mean for fishery operations, which also have negative impacts on the *Non-Economic Social Aspects* of fishing. This was observed particularly in FY2020 when default specifications were in place for several stocks including redfish, which as a unit stock would result in no directed fishing allowed in all BSAs if default specifications expired. In the weeks leading up the default specifications deadline, sector managers noted questions from sector members about what would happen should the default specifications expire. For example, vessel operators asked if a trip were underway prior to July 31 would the trip be allowed to be completed after the deadline. These questions stem from concerns about uncertainty for fishery operations and reflect negative impacts on the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management and the regulatory process.

The no holdback provision likely has positive impacts on the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management, as otherwise not allowing the full amount of ACE to be available to fish under default specifications may be viewed as excessively punitive.

Recreational Groundfish Fishery Social Impacts

Impacts to the recreational fishery are possible if either of the two stocks with recreational sub-ACLs, GOM cod and GOM haddock, were under default specifications. However, the recreational fishery would still operate under the measures in place while under default specifications, and therefore social impacts on the recreational fishery are expected to be neutral.

Other Fisheries Social Impacts

Other fisheries would receive less than 100% of the anticipated fishing year's sub-ACL under default specifications. This is not expected to negatively impact fisheries with AMs in a subsequent year (e g., sea scallop fishery with sub-ACLs for yellowtail flounder and windowpane flounder stocks, small-mesh multispecies fishery with sub-ACL for yellowtail flounder). Fisheries with in-season AMs (i.e., MWT Atlantic herring fishery with sub-ACLs for haddock stocks) may be negatively impacted if the reduced sub-ACL leads to trigging an AM in-season. However, final specifications would be expected to be in place in time before such as event, and therefore social impacts are expected to be neutral. To date the July 31 default specifications deadline has not been missed, though it has been close in some years. Should the default specifications expire, social impacts to other fisheries with groundfish sub-ACLs would be negative. Since Option 1 has a lower default percentage and a shorter duration than Options 2-4, impacts on other fisheries would be slightly to moderately to highly negative compared to Options 2-4.

6.6.1.4.2 ***Option 2*** **- 4 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs**

Commercial Groundfish Fishery Social Impacts

Under Option 2, the default specification percentage would be 75%, and the default specifications would be in place from May 1 to August 31. If Option 2 is selected, the fishing year would be able to start on time if there is a delay in the annual specifications process, which would result in positive social impacts for the commercial groundfish fishery. The fishery would be allowed to continue operations with less disruption, a positive impact in terms of the *Size and Demographic Characteristics* of the fishery, as well as the *Historical Dependence on and Participation* in the fishery. Because most of the other federal fisheries in the Northeast have a default specifications percentage of 100%, having a default percentage of 75% may improve perceptions of equity between fishery participants when compared to the current default percentage of 35%, a slightly positive impact on the *Non-Economic Social Aspects* of fishing. Additionally, fishing effort may potentially be slightly lower under the default percentage of 75%, particularly for stocks with a seasonal component (e.g., eastern GB management units of cod and haddock, GB winter flounder) in which most effort occurs early in the fishing year when default specifications are in place, which could have slightly negative impacts in terms of the *Size and Demographic Characteristics* of the segment of the fishery that relies on fishing during those months.

Option 2 would also improve the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management, unless the annual specifications process became chronically delayed. Then, stakeholders may perceive that a default provision may be an excuse for delay in the assessment, management, and regulatory processes. Delays in the final Council decision, the submission of the framework to the Agency and the rulemaking for specifications actions have persisted in the past four out of five fishing years. Delays can be caused from the onset of the action too, such as changes to the measures to be included in the action. These routine delays in the specifications actions may have negative impacts on the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management. The addition of one month to the current expiration date of default specifications (September 1 vs. August 1) retains a timeline for rulemaking, allows the fishing year to begin on May 1 without interruption, and slightly reduces the likelihood of having specifications for groundfish stocks expire.

Option 2 offers more flexibility compared to Option 1/No Action with a default percentage of 75% compared to 35%, and so Option 2 likely has positive social impacts relative to Option 1/No Action. Option 3-4 also have a default percentage of 75% and so impacts would be neutral. Option 2 would add one month to the current default specifications timeline. This may result in improvements to the *Attitudes,* *Beliefs, and Values* of fishermen and other stakeholders about management, as the additional month slightly reduces the likelihood of having specifications for groundfish stocks expire, and so social impacts for Option 2 may be slightly positive compared to Option 1, and slightly negative compared to Options 3 and 4. However, longer default specifications durations may be viewed negatively as causing continued delays in the annual specifications process, and so Option 2 may have slight negative impacts compared to Option 1.

Maintaining the no holdback provision likely has positive impacts on the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management, as otherwise not allowing the full amount of ACE to be available to fish under default specifications may be viewed as excessively punitive.

This option would also establish two-year TACs for Eastern GB cod and Eastern GB haddock, such that the TAC set for Year 1 would be held for Year 2. The Year 2 TAC would be a default specification for the full year. Transboundary stocks/management units are managed through the US/CA Resource Sharing Understanding and the quotas are specified annually. With two-year TACs for these stocks the fishery would be allowed to continue operations with less disruption, a positive impact in terms of the *Size and Demographic Characteristics* of the fishery, as well as the *Historical Dependence on and Participation* in the fishery. This would likely also improve the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management.

Recreational Groundfish Fishery Social Impacts

Impacts to the recreational fishery are possible if either of the two stocks with recreational sub-ACLs, GOM cod and GOM haddock, were under default specifications. However, the recreational fishery would still operate under the measures in place while under default specifications, and therefore social impacts on the recreational fishery are expected to be neutral.

Other Fisheries Social Impacts

Other fisheries would receive less than 100% of the anticipated fishing year's sub-ACL under default specifications. This is not expected to negatively impact fisheries with AMs in a subsequent year (e g., sea scallop fishery with sub-ACLs for yellowtail flounder and windowpane flounder stocks, small-mesh multispecies fishery with sub-ACL for yellowtail flounder). Fisheries with in-season AMs (i.e., MWT Atlantic herring fishery with sub-ACLs for haddock stocks) may be negatively impacted if the reduced sub-ACL leads to trigging an AM in-season. However, final specifications would be expected to be in place in time before such as event, and therefore social impacts are expected to be neutral. To date the July 31 default specifications deadline has not been missed, though it has been close in some years. Should the default specifications expire, social impacts to other fisheries with groundfish sub-ACLs would be negative. The addition of one month to the current expiration date of default specifications slightly reduces the likelihood of having specifications for groundfish stocks expire. Since Option 2 has a higher default percentage and a slightly longer duration than Option 1, impacts on other fisheries would be slightly positive.

6.6.1.4.3 ***Option 3*** **- 5 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs**

Commercial Groundfish Fishery Social Impacts

Under Option 3, the default specification percentage would be 75%, and the default specifications would be in place from May 1 to September 30. If Option 3 is selected, the fishing year would be able to start on time if there is a delay in rule making, which would result in positive social impacts. The fishery would be allowed to continue operations with less disruption, a positive impact in terms of the *Size and Demographic Characteristics* of the fishery, as well as the *Historical Dependence on and Participation* in the fishery. Because most of the other federal fisheries in the Northeast have a default specifications percentage of 100%, having a default percentage of 75% may improve perceptions of equity between fishery participants, a slightly negative impact on the *Non-Economic Social Aspects* of fishing. Additionally, fishing effort may potentially be slightly lower under the default percentage of 75%, particularly for stocks with a seasonal component (e.g., eastern GB management units of cod and haddock, GB winter flounder) in which most effort occurs early in the fishing year when default specifications are in place, which could have slightly negative impacts in terms of the *Size and Demographic Characteristics* of the segment of the fishery that relies on fishing during those months.

Option 3 would also improve the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management, unless the annual specifications process became chronically delayed. Then, stakeholders may perceive that a default provision may be an excuse for delay in the assessment, management, and regulatory processes. Delays in the final Council decision, the submission of the framework to the Agency and the rulemaking for specifications actions have persisted in the past four out of five fishing years. Delays can be caused from the onset of the action too, such as when changes or additions to the measures to be included in the action are made after initiation. These routine delays in the specifications actions may have negative impacts on the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management. The addition of two months to the current expiration date of default specifications (October 1st vs. August 1st) retains a timeline for rulemaking, allows the fishing year to begin on May 1st without interruption, and moderately reduces the likelihood of having specifications for groundfish stocks expire.

Option 3 offers more flexibility compared to Option 1/No Action with a default percentage of 75% compared to 35%, and so Option 3 likely has positive social impacts relative to Option 1. Options 2 and 4 also have a default percentage of 75% and so impacts would be neutral. Option 3 would add two months to the current default specifications timeline. This may result in improvements to the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management, and as the additional month slightly reduces the likelihood of having specifications for groundfish stocks expire, and so social impacts for Option 3 may be slightly positive compared to Option 1 and Option 2, and slightly negative compared to Option 4. However, longer default specifications durations may be viewed negatively as causing continued delays in the annual specifications process, and so Option 3 may have slight negative impacts compared to Option 1 and Option 2.

Maintaining the no holdback provision likely has positive impacts on the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management, as otherwise not allowing the full amount of ACE to be available to fish under default specifications may be viewed as excessively punitive.

Setting two-year TACs for Eastern GB cod and Eastern GB haddock would allow the segment of the fishery targeting these stocks to continue operations with less disruption, a positive impact in terms of the *Size and Demographic Characteristics* of the fishery, as well as the *Historical Dependence on and*

Participation in the fishery. This would likely also improve the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management.

Recreational Groundfish Fishery Social Impacts

Impacts to the recreational fishery are possible if either of the two stocks with recreational sub-ACLs, GOM cod and GOM haddock, were under default specifications. However, the recreational fishery would still operate under the measures in place while under default specifications, and therefore social impacts on the recreational fishery are expected to be neutral.

Other Fisheries Social Impacts

Other fisheries would receive less than 100% of the anticipated fishing year's sub-ACL under default specifications. This is not expected to negatively impact fisheries with AMs in a subsequent year (e g., sea scallop fishery with sub-ACLs for yellowtail flounder and windowpane flounder stocks, small-mesh multispecies fishery with sub-ACL for yellowtail flounder). Fisheries with in-season AMs (i.e., MWT Atlantic herring fishery with sub-ACLs for haddock stocks) may be negatively impacted if the reduced sub-ACL leads to trigging an AM in-season. However, final specifications would be expected to be in place in time before such as event, and therefore social impacts are expected to be neutral. To date the July 31 default specifications deadline has not been missed, though it has been close in some years. Should the default specifications expire, social impacts to other fisheries with groundfish sub-ACLs would be negative. The addition of two months to the current expiration date of default specifications moderately reduces the likelihood of having specifications for groundfish stocks expire. Since Option 3 has a higher default percentage and a longer duration than Option 1, impacts on other fisheries would be positive.

6.6.1.4.4 ***Option 4*** **- 6 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs (*Preferred Option*)**

Commercial Groundfish Fishery Social Impacts

Under Option 4, the default specification percentage would be 75%, and the default specifications would be in place from May 1 to October 31. If Option 4 is selected, the fishing year would be able to start on time if there is a delay in rule making, which would result in positive social impacts. The fishery would be allowed to continue operations with less disruption, a positive impact in terms of the *Size and Demographic Characteristics* of the fishery, as well as the *Historical Dependence on and Participation* in the fishery. Because most of the other federal fisheries in the Northeast have a default specifications percentage of 100%, having a default percentage of 75% may improve perceptions of equity between fishery participants, a slightly negative impact on the *Non-Economic Social Aspects* of fishing. Additionally, fishing effort may potentially be slightly lower under the default percentage of 75%, particularly for stocks with a seasonal component (e.g., eastern GB management units of cod and haddock, GB winter flounder) in which most effort occurs early in the fishing year when default specifications are in place, which could have slightly negative impacts in terms of the *Size and Demographic Characteristics* of the segment of the fishery that relies on fishing during those months.

Option 4 would also improve the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management, unless the annual specifications process became chronically delayed. Then, stakeholders may perceive that a default provision may be an excuse for delay in the assessment, management, and regulatory processes. Delays in the final Council decision, the submission of the framework to the

Agency and the rulemaking for specifications actions have persisted in the past four out of five fishing years. Delays can be caused from the onset of the action too, such as changes to the measures to be included in the action. These routine delays in the specifications actions may have negative impacts on the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management. The addition of three months to the current expiration date of default specifications (November 1st vs. August 1st) retains a timeline for rulemaking, allows the fishing year to begin on May 1st without interruption, and greatly reduces the likelihood of having specifications for groundfish stocks expire.

Option 4 offers more flexibility compared to Option 1/No Action with a default percentage of 75% compared to 35%, and so Option 4 likely has positive social impacts relative to Option 1. Options 2 and 3 also have a default percentage of 75% and so impacts would be neutral. Option 4 would add three months to the current default specifications timeline. This may result in improvements to the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management, and as the addition of three months significantly reduces the likelihood of having specifications for groundfish stocks expire, and so social impacts for Option 4 may be positive compared to Option 1 and Options 2 and 3. However, longer default specifications durations may be viewed negatively as causing continued delays in the annual specifications process, and so Option 4 may have slight negative impacts compared to Option 1 and Options 2 and 3.

Maintaining the no holdback provision likely has positive impacts on the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management, as otherwise not allowing the full amount of ACE to be available to fish under default specifications may be viewed as excessively punitive.

Setting two-year TACs for Eastern GB cod and Eastern GB haddock would allow the segment of the fishery targeting these stocks to continue operations with less disruption, a positive impact in terms of the *Size and Demographic Characteristics* of the fishery, as well as the *Historical Dependence on and Participation* in the fishery. This would likely also improve the *Attitudes, Beliefs, and Values* of fishermen and other stakeholders about management.

Recreational Groundfish Fishery Social Impacts

Impacts to the recreational fishery are possible if either of the two stocks with recreational sub-ACLs, GOM cod and GOM haddock, were under default specifications. However, the recreational fishery would still operate under the measures in place while under default specifications, and therefore social impacts on the recreational fishery are expected to be neutral.

Other Fisheries Social Impacts

Other fisheries would receive less than 100% of the anticipated fishing year's sub-ACL under default specifications. This is not expected to negatively impact fisheries with AMs in a subsequent year (e. g., sea scallop fishery with sub-ACLs for yellowtail flounder and windowpane flounder stocks, small-mesh multispecies fishery with sub-ACL for yellowtail flounder). Fisheries with in-season AMs (i.e., MWT Atlantic herring fishery with sub-ACLs for haddock stocks) may be negatively impacted if the reduced sub-ACL leads to trigging an AM in-season. However, final specifications would be expected to be in place in time before such as event, and therefore social impacts are expected to be neutral. To date the July 31 default specifications deadline has not been missed, though it has been close in some years. Should the default specifications expire, social impacts to other fisheries with groundfish sub-ACLs would be negative. The addition of three months to the current expiration date of default specifications greatly reduces the likelihood of having specifications for groundfish stocks expire. Since Option 4 has a higher default percentage and a longer duration than Option 1, impacts on other fisheries would be positive.

6.6.2 **Action 2 Recreational Fishery Measures- Georges Bank Cod**

6.6.2.1 Alternative 1 - No Action

No Action would maintain the current minimum fish size (21 inches) and the possession limit (10 legal sized per day) for GB cod for the recreational fishery (private, party, and charter). Council action would still be required to adjust measures as needed. No Action is anticipated to have positive social impacts on the *Size and Demographic Characteristics* of the recreational fishery relative to Alternatives 2 and 3, respectively. Changes to the allowable fish sizes and possession limits would lead to reduced opportunities to fish for businesses (party, charter, private vessels) in the recreational fishery if they continue to encounter GB cod that are outside of the legal limits. For the New England region, Narragansett/Point Judith, RI, has the highest level of engagement in recreational fishing activities and ranks among the top ten fishing ports for recreational activities in the entire Northeast (Figure 9). Charter, party, and private vessels operating out of Narragansett and Point Judith, RI, may experience particularly positive impacts of No Action with respect to rebuilding measures for GB cod. However, there may be negative social impacts in terms of the *Attitudes, Beliefs, and Values* of the commercial groundfish fishery if GB cod catch in the recreational fishery is perceived to be contributing to poor stock assessments or reduced opportunities to fish.

6.6.2.2 Alternative 2 – Temporary Administrative Measure to Allow the Regional Administrator Authority to Adjust the Recreational Measures for Georges Bank Cod (*Preferred Alternative*)

Alternative 2 would allow the Regional Administrator to adjust the recreational measures for GB cod, in consultation with the Council, for FY2023 and 2024 in order to stay below the catch target selected by the Council above. Relative to No Action, Alternative 2 is anticipated to have neutral to low negative social impacts on the recreational fishery, but possibly low positive social impacts on the commercial fishery. Allowing the RA to adjust measures as needed could reduce fishing opportunities for recreational vessels (party, charter, private), but may also improve perceptions among the commercial fishery that the GB cod stock is being managed sustainably and in an equitable manner for all resource users.

6.6.2.3 Alternative 3 - Recreational Measures for Georges Bank Cod (*Preferred Alternative*)

6.6.2.3.1 ***Option 1*** **- Recreational measures to reduce mortality from recent catches (CY2018-CY2020) by 63% (*Preferred Option*)**

Option 1 under Alternative 3 would set the minimum fish size for GB cod at 22 inches and the maximum size at 28 inches for recreational fishery (party, charter, private). Additionally, party, charter, and private vessels would be restricted to landing 5 legal sized GB cod per angler per day and would be prohibited from retaining GB cod altogether from May 1 to July 31. These recreational measures for GB cod would be in place for the start of FY2022 and would remain in place until changed.

Option 1 is anticipated to have negative social impacts relative to No Action/Alternative 1 on the recreational fishery, but possibly neutral to low positive impacts on the recreational fishery relative to Option 2 and neutral to low negative impacts relative to Option 3. Option 1 is a moderate approach between Options 2 and 3, which offer higher or lower reductions in recreational mortality by comparison. The changes to minimum and maximum fish size, along with reduced possession limits and no possession from May through July may have negative impacts on recreational businesses. For the New England region, Narragansett/Point Judith, RI, has the highest level of engagement in recreational fishing activities and ranks among the top ten fishing ports for recreational activities in the entire Northeast (Figure 9). Charter, party, and private vessels operating out of Narragansett and Point Judith, RI, may experience particularly negative impacts of these new rebuilding measures. There may be low positive social impacts on the commercial fishery if Option 1 helps to rebuild GB stock in an equitable manner for all resource users.

6.6.2.3.2 *Option 2* - Recreational measures to reduce mortality from recent catches (CY2018-CY2020) by 65%

Option 2 under Alternative 3 would set the minimum fish size for GB cod at 22 inches and the maximum size at 28 inches for recreational fishery (party, charter, private). Additionally, party, charter, and private vessels would be restricted to landing 5 legal sized GB cod per angler per day and would be prohibited from retaining GB cod altogether from July 1 to August 31. These recreational measures for GB cod would be in place for the start of FY2022 and would remain in place until changed.

Option 2 is anticipated to have negative social impacts relative to No Action/Alternative 1 on the recreational fishery, and possibly neutral to low negative impacts on the recreational fishery relative to Option 1 and neutral to low negative impacts relative to Option 3. Option 2 is the most aggressive rebuilding approach in comparison to Options 1 and 3, which offer lower reductions in recreational mortality for the purposes of rebuilding the stock. The changes to minimum and maximum fish size, along with reduced possession limits and no possession from July through August may have negative impacts on recreational businesses. For the New England region, Narragansett/Point Judith, RI, has the highest level of engagement in recreational fishing activities and ranks among the top ten fishing ports for recreational activities in the entire Northeast (Figure 9). Charter, party, and private vessels operating out of Narragansett and Point Judith, RI, may experience particularly negative impacts of these new rebuilding measures. There may be positive social impacts on the commercial fishery if Option 2 helps to rebuild GB stock the most efficaciously, quickly, and in an equitable manner for all resource users.

6.6.2.3.3 *Option 3* - Recreational measures to reduce mortality from recent catches (CY2018-CY2020) by 52%

Option 3 under Alternative 3 would set the minimum fish size for GB cod at 23 inches and the maximum size at 28 inches for recreational fishery (party, charter, private). Additionally, party, charter, and private vessels would be restricted to landing 5 legal sized GB cod per angler per day and would be prohibited from retaining GB cod altogether from March 1 to June 31. These recreational measures for GB cod would be in place for the start of FY2022 and would remain in place until changed.

Option 3 is anticipated to have negative social impacts relative to No Action/Alternative 1 on the recreational fishery, and possibly neutral impacts on the recreational fishery relative to Option 1 and Option 2. Option 3 is the least aggressive rebuilding approach in comparison to Options 1 and 2, which offer higher reductions in recreational mortality for the purposes of rebuilding the stock. The changes to minimum and maximum fish size, along with reduced possession limits and no possession from March through June may have negative impacts on recreational businesses. Option 3 may have less of an impact than would Options 1 and 2 given the slightly larger minimum fish size and the placement of no possession restrictions in perhaps a less active period during the year for the fishery. For the New England region, Narragansett/Point Judith, RI, has the highest level of engagement in recreational fishing activities and ranks among the top ten fishing ports for recreational activities in the entire Northeast (Figure 9). Charter, party, and private vessels operating out of Narragansett and Point Judith, RI, may experience particularly negative impacts of these new rebuilding measures. There may be low positive social impacts on the commercial fishery if Option 3 helps to rebuild GB stock, but perhaps less of a positive impact if this Option is perceived to rebuild more slowly or not as effectively as Options 1 and 2.

6.7 CUMULATIVE EFFECTS

6.7.1 Introduction

The purpose of the CEA is to consider the combined effects of many actions on the human environment over time that would be missed if each action were evaluated separately. The intent is to focus on those effects that are truly meaningful. The following remarks address the significance of the expected cumulative impacts as they relate to the federally managed Northeast multispecies (groundfish) fishery.

A cumulative effects assessment makes effect determinations based on a combination of: 1) impacts from past, present, and reasonably foreseeable future actions; 2) the baseline conditions of the VECs (the combined effects from past, present, and reasonably foreseeable future actions plus the present condition of the VEC); and 3) impacts of the alternatives under consideration for this action.

Valued Ecosystem Components (VEC)

The valued ecosystem components for the groundfish fishery are generally the "place" where the impacts of management actions occur, and are identified as noted in Section 5.0:

1. Regulated groundfish stocks (target and non-target);
2. Non-groundfish species (incidental catch and bycatch);
3. Endangered and other protected species;
4. Habitat, including non-fishing effects; and
5. Human Communities (including economic and social effects on the fishery and fishing communities).

The CEA identifies and characterizes the impact on the VECs by the alternatives under consideration when analyzed in the context of other past, present, and reasonably foreseeable future actions. To enhance clarity and maintain consistency, terms are as defined in Table 71.

Temporal Scope of the VECs

While the effects of historical fisheries are considered, the temporal scope of past and present actions for regulated groundfish stocks, non-groundfish species, habitat and the human environment is primarily focused on actions that have taken place since implementation of the initial NE Multispecies FMP in 1977. An assessment using this timeframe demonstrates the changes to resources and the human environment that have resulted through management under the Council process and through U.S. prosecution of the fishery, rather than foreign fleets. For ESA-listed and MMPA protected species, the context is largely focused on the 1980s and 1990s, when NMFS began generating stock assessments for marine mammals and turtles that inhabit waters of the U.S. EEZ. For future actions, this analysis examines the period between the expected implementation of this action (May 2022) and 2027.

Geographic Scope of the VECs

The geographic scope of the analysis of impacts to regulated groundfish stocks, non-groundfish species and habitat for this action is the total range of these VECs in the Western Atlantic Ocean, as described in the Affected Environment section of the document (Section 5.1). However, the analyses of impacts presented in this framework focuses primarily on actions related to the harvest of the managed resources. The result is a more limited geographic area used to define the core geographic scope within which the majority of harvest effort for the managed resources occurs. For ESA-listed and MMPA protected species, the geographic range is the total range of each species (Section 5.6).

Because the potential exists for far-reaching sociological or economic impacts on U.S. citizens who may not be directly involved in fishing for the managed resources, the overall geographic scope for human communities is defined as all U.S. human communities. Limitations on the availability of information needed to measure sociological and economic impacts at such a broad level necessitate the delineation of core boundaries for the human communities. Therefore, the geographic range for the human environment is defined as those primary and secondary ports bordering the range of the groundfish fishery (Section 5.6.4.2.5) from the U.S.-Canada border to, and including, North Carolina.

Analysis of Total Cumulative Effects

A cumulative effects assessment ideally makes effect determinations based on the combination of: 1) impacts from past, present and reasonably foreseeable future actions; 2) the baseline condition of the VECs (the combined effects from past, present and reasonably foreseeable future actions plus the present condition of the VEC; and 3) impacts of the alternatives under consideration for this action.

6.7.1.1 Consideration of the Valued Ecosystem Components (VECs)

The valued ecosystem components for the groundfish fishery are generally the "place" where the impacts of management actions occur, and are identified in section 5.0.

- *Regulated groundfish stocks (target and non-target);*
- *Non-groundfish species (incidental catch and bycatch);*
- *Endangered and other protected species;*
- *Habitat, including non-fishing effects; and*
- *Human Communities (including economic and social effects on the fishery and fishing communities).*

The CEA identifies and characterizes the impacts on the VECs by the alternatives under consideration when analyzed in the context of other past, present, and reasonably foreseeable future actions.

6.7.1.2 Geographic Boundaries

The analysis of impacts focuses on actions related to the commercial and recreational harvest of regulated groundfish. The Western Atlantic Ocean is the core geographic scope for each of the VECs. The core geographic scope for the managed species is the management unit (Section 5.5). For non-groundfish species, that range may be expanded and would depend on the range of each species in the Western Atlantic Ocean. For habitat, the core geographic scope is focused on EFH within the EEZ but includes all habitat utilized by regulated groundfish, and non-groundfish species in the Western Atlantic Ocean. The core geographic scope for protected species is their range in the Western Atlantic Ocean. For human communities, the core geographic boundaries are defined as those U.S. fishing communities from the U.S.-Canada border to, and including, North Carolina directly involved in the harvest or processing of regulated groundfish (section 5.7).

6.7.1.3 Temporal Boundaries

Overall, while the effects of the historical groundfish fishery are important and considered in the analysis, the temporal scope of past and present actions for regulated groundfish stocks, non-groundfish species and other fisheries, the physical environment and EFH, and human communities is primarily focused on actions that occurred after FMP implementation (1977). An assessment using this timeframe demonstrates the changes to resources and the human environment that have resulted through management under the Council process and through U.S. prosecution of the fishery. For protected species, the scope of past and present actions is focused on the 1980s and 1990s (when NMFS began generating stock assessments for marine mammals and sea turtles that inhabit waters of the U.S. EEZ) through the present.

The temporal scope of future actions for all VECs extends about five years (2021-2026) into the future beyond the implementation of this action. The dynamic nature of resource management for these species and lack of information on projects that may occur in the future make it difficult to predict impacts beyond this timeframe with any certainty. The impacts discussed in Section 6.7.4 are focused on the cumulative effects of the proposed action (i.e, the suite of preferred alternatives) in combination with the relevant past, present, and reasonably foreseeable future actions over these time scales.

6.7.2 Relevant Actions Other Than Those Proposed in this Document

This section summarizes the past, present, and reasonably foreseeable future actions and effects that are relevant for this cumulative effects assessment. Some past actions are still relevant to the present and/or future actions.

6.7.2.1 Fishery Management Actions

6.7.2.1.1 Managed Resources (Regulated Groundfish)

Past, present, and reasonably foreseeable future actions for regulated groundfish management include the establishment of the original FMP, all subsequent amendments and frameworks, and the setting of annual specifications (annual catch limits and measures to constrain catch and harvest). Key actions are described below.

Past and Present Actions: Groundfish stocks were managed under the M-S Act beginning with the adoption of a groundfish plan for cod, haddock, and yellowtail flounder in 1977. This plan relied on hard quotas (total allowable catches, or TACs), and proved unworkable. The quota system was terminated in 1982 with the adoption of the Interim Groundfish Plan, which used minimum fish sizes and codend mesh regulations for the Gulf of Maine and Georges Bank to control fishing mortality. The interim plan was replaced by the Northeast Multispecies FMP in 1986, which established biological targets in terms of maximum spawning potential and continued to rely on gear restrictions and minimum mesh size to control fishing mortality. A detailed discussion of the history of the FMP up to 2009 can be found in Amendment 16 (NEFMC 2009b).

Amendment 16, which became effective on May 1, 2010, adopted a broad suite of management measures in order to achieve the fishing mortality targets necessary to rebuild overfished stocks and meet other requirements of the M-S Act. Amendment 16 made major changes to the FMP. It greatly expanded the sector management program and adopted a process for setting ACLs to be set in biennial specifications packages. The Amendment adopted a system of ACLs and AMs that are designed to ensure catches remain below desired targets for each stock in the management complex. There were a host of mortality reduction measures for “common pool” (i.e. non-sector) vessels and the recreational component of the fishery. In 2011, the Council also approved Amendment 17, which allowed for NOAA-sponsored state-operated permit banks to function within the structure of Amendment 16.

Fifteen framework adjustments have updated the measures in Amendment 16. A subset are described below.

Framework 45 (May 1, 2011) adopted further modifications to the sector program and fishery specifications. Framework 47 (May 1, 2012, set specifications for some groundfish stocks for FY 2012 – 2014, modified AMs for the groundfish fishery and the administration of the scallop fishery AMs, and revised common pool management measures; modification of the Ruhle trawl definition and clarification of regulations for charter/party and recreational groundfish vessels fishing in groundfish closed areas were proposed under the RA authority.

Framework 48 (May 1, 2013) revised status determination criteria for several stocks, modified the sub-ACL system, adjusted monitoring measures for the groundfish fishery, and changed several accountability measures (AMs). Framework 49 (May 20, 2013) is a joint Northeast Multispecies/Atlantic Sea Scallop action that modified the dates for scallop vessel access to the year-round groundfish closed areas.

Framework 51 (May 1, 2014) modified rebuilding programs for GOM cod and American plaice, set specifications for FY2014-2016 and modified management measures in order to ensure that overfishing does not occur including, additional management measures related to U.S./Canada shared stocks and yellowtail flounder in the groundfish and scallop fisheries. Framework 53 (May 1, 2015) updated changes to the status determination criteria, set specifications for FY2015-2017, adopted U.S./ Canada Total Allowable Catches (TACs), established management measures for GOM cod that revise rolling closures and possession limits to enable GOM cod protection while providing opportunity for the groundfish fishery to prosecute healthy stocks in other times and areas, implemented default specifications, and revised regulations governing Sector Annual Catch Entitlement (ACE) carryover. Monkfish FW 9 was a joint action with the groundfish plan (FW 54), and modified regulations for vessels in the DAS program.

Framework 55 incorporated stock status changes for groundfish stocks, set specifications for all groundfish stocks for FY 2017- FY 2019, adopted an additional sector and modified the sector approval process, modified the definition of a haddock separator trawl so that the separator panel is easily identifiable, made changes to the groundfish monitoring program, made changes to the management measures for U.S./Canada TACs in order to move GB cod quota from the eastern management area to the western management area and modified the Gulf of Maine Cod Protection Measures so that the recreational possession limit for GOM cod can once again be modified by the Regional Administrator.

Amendment 18, which became effective on May 1 and May 22, 2017, addressed fleet diversity and accumulation limits.

Framework 59 (July 20, 2020) revised the allocation between commercial and recreational fisheries for GOM cod and GOM haddock based on new data from the Marine Recreational Information Program (MRIP), along with setting specifications for some groundfish stocks for 2020-2022, and several other minor changes to management measures.

Framework 61 (July 25, 2021) established a universal sector exemption for redfish, along with setting specifications for roughly half of the groundfish stocks for 2021-2023 and revising the rebuilding plan for white hake.

Reasonably Foreseeable Future Actions: The Council took final action on Amendment 23 to the Northeast Multispecies FMP in September 2020. This action will adjust the groundfish monitoring program to improve reliability and accountability of catch reporting and to ensure a precise and accurate representation of catch (landings and discards). Amendment 23 is expected to become effective May 1, 2022.

6.7.2.1.2 **Non-target Species (Non-groundfish)**

There are Management Plans in place for non-target, non-groundfish species, including the Skate FMP, Herring FMP (jointly managed with ASMFC), Scallop FMP, Summer Flounder, Black Sea Bass, and Scup FMP (managed by the MAFMC), Monkfish FMP (jointly managed with the MAFMC), and Spiny Dogfish FMP (jointly managed with the MAFMC).

6.7.2.1.3 **Physical Habitat/EFH**

The EFH Omnibus Amendment 2 (April 2018) reviewed and updated EFH designations, identified Habitat Areas of Particular Concern, and updated the status of current knowledge of gear impacts. It also implemented new spatial management measures throughout New England for minimizing the adverse impact of fishing on EFH that affect all species managed by the NEFMC. The Council developed a related omnibus framework (Clam Dredge Framework, June 2020) that designated three exemption areas within the Great South Channel Habitat Management Area where clam and mussel dredges are allowed. The Council also recently developed a deep-sea coral amendment to protect deep-sea coral habitats throughout New England from the negative impacts of fishing gears. NMFS approved the amendment on November 20, 2019 and the final rule is pending. Once implemented, the amendment will designate the Georges Bank Deep-Sea Coral Protection Zone between the US/Canada EEZ boundary, the boundary between the NEFMC and MAFMC regions, and the seaward boundary of the US EEZ, with the landward boundary at the 600 m contour. The zone will be a closure to all bottom-tending gears, with an exemption for the red crab pot fishery. Two mobile bottom-tending gear closures will also be implemented in federal waters in eastern Maine.

6.7.2.1.4 Protected Resources

Protected species impacted by the groundfish fishery include large whales, small cetaceans, pinnipeds, sea turtles, Atlantic sturgeon, Atlantic salmon, and giant manta rays. There are several Take Reduction Plans (TRPs) in place to reduce serious injury to, or mortality, of protected species, including the Atlantic Large Whale Take Reduction Plan (ALWTRP) for gillnet and pot/trap fisheries, the Bottlenose Dolphin Take Reduction Plan (BDTRP) for gillnet fisheries, and the Harbor Porpoise Take Reduction Plan (HPTRP) for gillnet fisheries.

6.7.2.1.5 Human communities

All actions taken under the Northeast Multispecies FMP have had effects on human communities. Many actions have included specific measures designed to improve flexibility and increase efficiency. Amendment 18 addressed fleet diversity and accumulation limits. Amendment 23 proposes to adjust the groundfish monitoring program, including establishing target coverage levels up to 100 percent, and is expected to have distributional impacts on individuals and ports participating in the fishery.

6.7.2.1.6 Other Fishery Management Actions

In addition to the Northeast Multispecies FMP, there are many other FMPs and associated fishery management actions for other species that impacted these VECs over the temporal scale described in Section 6.7.1.3. These include FMPs managed by the Mid-Atlantic Fishery Management Council, New England Fishery Management Council, Atlantic States Marine Fisheries Commission, and to a lesser extent the South Atlantic Fishery Management Council. Omnibus amendments are also frequently developed to amend multiple FMPs at once. Actions associated with other FMPs and omnibus amendments have included measures to regulate fishing effort for other species, measures to protect habitat and forage species, and fishery monitoring and reporting requirements.

6.7.2.1.7 Fishery Management Action Summary

The Council has taken many actions to manage the associated commercial fisheries in its jurisdiction. Actions taken in other FMPs, and some Omnibus Actions are described in Section 6.7.2.1. The MSA is the statutory basis for federal fisheries management. The cumulative impacts on the VECs of past, present, and reasonably foreseeable future federal fishery management actions under the MSA should generally be associated with positive long-term outcomes because they constrain fishing effort and manage stocks at sustainable levels. Constraining fishing effort through regulatory actions can have negative short-term socioeconomic impacts. These impacts are sometimes necessary to bring about long-term sustainability of a resource, and as such should promote positive effects on human communities in the long-term. A summary of the cumulative impacts of past, present, and reasonably foreseeable future actions on each VEC is provided in Table 92.

Table 92- Summary effects of past, present, and reasonably foreseeable future actions on the VECs identified for Framework Adjustment 63.

VEC	Past Actions	Present Actions	Reasonably Foreseeable Future Actions	Combined Effects of Past, Present, Future Actions
Regulated Groundfish Stocks	**Mixed** Combined effects of past actions have decreased effort, improved habitat protection, and implemented rebuilding plans when necessary. However, some stocks remain overfished	**Positive** Current regulations continue to manage for sustainable stocks	**Positive** Future actions are anticipated to continue rebuilding and strive to maintain sustainable stocks	**Short-term Negative** Several stocks are currently overfished, have overfishing occurring, or both **Long-Term Positive** Stocks are being managed to attain rebuilt status
Non-Groundfish Species	**Positive** Combined effects of past actions have decreased effort and improved habitat protection	**Positive** Current regulations continue to manage for sustainable stocks, thus controlling effort on direct and discard/bycatch species	**Positive** Future actions are anticipated to continue rebuilding and target healthy stocks, thus limiting the take of discards/bycatch	**Positive** Continued management of directed stocks will also control incidental catch/bycatch
Endangered and Other Protected Species	**Slight Positive** Combined effects of past fishery actions have reduced effort and thus interactions with protected resources	**Slight Positive** Current regulations continue to control effort, thus reducing opportunities for interactions	**Mixed** Future regulations will likely control effort and thus protected species interactions, but as stocks improve, effort will likely increase, possibly increasing interactions	**Slight Positive** Continued catch and effort controls are likely to reduce gear encounters through effort reductions. Additional management actions taken under ESA/MMPA should also help mitigate the risk of gear interaction
Habitat	**Mixed** Combined effects of effort reductions and better control of non-fishing activities have been positive but fishing activities and non-fishing activities continue to reduce habitat quality	**Mixed** Effort reductions and better control of non-fishing activities have been positive but fishing activities and non-fishing activities continue to reduce habitat quality	**Mixed** Future regulations will likely control effort and thus habitat impacts but as stocks improve, effort will likely increase along with additional non-fishing activities	**Mixed** Continued fisheries management will likely control effort and thus fishery related habitat impacts but fishery and non-fishery related activities will continue to reduce habitat quality
Human Communities	**Mixed** Fishery resources have supported profitable industries and communities but increasing effort and catch limit controls have curtailed fishing opportunities	**Mixed** Fishery resources continue to support communities but increasing effort and catch limit controls combined with non-fishing impacts such as high fuel costs have had a negative economic impact	**Short-term Negative** As effort controls are maintained or strengthened, economic impacts will be negative **Long-term Positive** As stocks improve, effort will likely increase which would have a positive impact	**Short-term Negative** Revenues would likely decline dramatically in the short term and may remain low until stocks are fully rebuilt **Long-term Positive** Sustainable resources should support viable communities and economies

Impact Definitions:
-Regulated Groundfish Stocks, Non-groundfish species, Endangered and Other Protected Species: positive=actions that increase stock size and negative=actions that decrease stock size
-Habitat: positive=actions that improve or reduce disturbance of habitat and negative=actions that degrade or increase disturbance of habitat
-Human Communities: positive=actions that increase revenue and well-being of fishermen and/or associated businesses and negative=actions that decrease revenue and well-being of fishermen and/or associated businesses

6.7.2.2 Non-Fishing Impacts

6.7.2.2.1 Other Human Activities

Non-fishing activities that occur in the marine nearshore and offshore environments and connected watersheds can cause the loss or degradation of habitat and/or affect the fish and protected species that utilize those areas. The impacts of most nearshore, human-induced, non-fishing activities tend to be localized in the areas where they occur, although effects on species could be felt throughout their populations since many marine organisms are highly mobile. For offshore projects, some impacts may be localized while others may have regional influence, especially for larger projects. The following discussion of impacts is based on past assessments of activities and assumes these activities will continue as projects are proposed.

Examples of non-fishing activities include point source and non-point source pollution, shipping, dredging/deepening, wind energy development, oil and gas development, construction, and other activities. Specific examples include at-sea disposal areas, oil and mineral resource exploration, aquaculture, construction of offshore wind farms, and bulk transportation of petrochemicals. Episodic storm events and the restoration activities that follow can also cause impacts. The impacts from these activities primarily stem from habitat loss due to human interaction and alteration or natural disturbances. These activities are widespread and can have localized impacts on habitat related to accretion of sediments, pollutants, habitat conversion, and shifting currents and thermoclines. For protected species, primary concerns associated with non-fishing activities include vessel strikes, dredge interactions (especially for sea turtles and sturgeon), and underwater noise. These activities have both direct and indirect impacts on protected species. Wherever these activities co-occur, they are likely to work additively or synergistically to decrease habitat quality and as such may indirectly constrain the productivity of managed species, non-target species, and protected species. Decreased habitat suitability tends to reduce the tolerance of these VECs to the impacts of fishing effort. Non-fishing activities can cause target, non-target, and protected species to shift their distributions away from preferred areas, and may also lead to decreased reproductive ability and success (from current changes, spawning disruptions, and behavior changes), disrupted or modified food web interactions, and increased disease. While localized impacts may be more severe, the overall impact on the affected species and their habitats on a population level is unknown, but likely to have impacts that mostly range from no impact to slight negative, depending on the species and activity.

Non-fishing activities permitted by other Federal agencies (e.g. beach nourishment, offshore wind facilities) require examinations of potential impacts on the VECs. The MSA imposes an obligation on other Federal agencies to consult with the Secretary of Commerce on actions that may adversely affect EFH (50 CFR 600.930). NMFS and the eight regional fishery management councils engage in this review process by making comments and recommendations on federal or state actions that may affect habitat for their managed species. Agencies need to respond to, but do not necessarily need to adopt these recommendations. Habitat conservation measures serve to potentially minimize the extent and magnitude of indirect negative impacts federally-permitted activities could have on resources under NMFS' jurisdiction. In addition to guidelines mandated by the MSA, NMFS evaluates non-fishing effects during the review processes required by Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act for certain activities that are regulated by Federal, state, and local authorities. Non-fishing activities must also meet the mandates under the ESA, specifically Section 7(a)(2)[36], which ensures that agency actions do not jeopardize the continued existence of endangered species and their critical habitat.

In recent years, offshore wind energy and oil and gas exploration have become more relevant activities in the Greater Atlantic region. They are expected to impact all VECs, as described below.

Impacts of offshore wind energy development on Biological Resources (Target species, Non-target species, Protected Species) and the Physical Environment

Construction activities may have both direct and indirect impacts on marine resources, ranging from temporary changes in distribution to injury and mortality. Impacts could occur from changes to habitat in the areas of wind turbines and cable corridors and increased vessel traffic to and from these areas. Species that reside in affected wind farms year round may experience different impacts than species that seasonally reside in or migrate through these areas. Species that typically reside in areas where wind turbines are installed may return to the area and adapt to habitat changes after construction is complete. Inter-array and electricity export cables will generate electromagnetic fields, which can affect patterns of movement, spawning, and recruitment success for various species. Effects will depend on cable type, transmission capacity, burial depth, and proximity to other cables. Substantial structural changes in habitats associated with cables are not expected unless cables are left unburied (see below). However, the cable burial process may alter sediment composition along the corridor, thereby affecting infauna and emergent biota. Taormina et al. (2018) provide a recent review of various cable impacts, and Hutchinson et al. (2020) and Taormina et al. (2020) examine the effects of electromagnetic fields in particular.

The full build out of offshore wind farms will result in broad habitat alteration. The wind turbines will alter hydrodynamics of the area, which may affect primary productivity and physically change the distribution of prey and larvae. It is not clear how these changes will affect the reproductive success of marine resources. Scour and sedimentation could have negative effects on egg masses that attach to the bottom. Benthic habitat will be altered due to the placement of scour protection at wind turbine foundations, and over cables that are not buried to target depth in the sediment, converting soft substrates into hard substrates. This could alter species composition and predator/prey relationships by increasing favorable habitat for some species and decreasing habitat for others. The placement of wind turbines will also establish new vertical structure in the water column, which could serve as reefs for bottom species, fish aggregating devices for pelagic species, and substrate for the colonization of other species, e.g. mussels. Various authors have studied these types of effects (e.g. Bergström et al. 2013, Dannheim et al. 2019, Degraer et al. 2019, Langhamer 2012, Methratta and Dardick 2019, Stenberg et al. 2015).

Elevated levels of sound produced during site assessment activities, construction, and operation of offshore wind facilities will impact the soundscape[37]. Temporary, acute, noise impacts from construction activity could impact reproductive behavior and migration patterns; the long-term impact of operational noise from turbines may also affect behavior of fish and prey species, through both vibrations in the immediate area surrounding them in the water column, and through the foundation into the substrate. Depending on the sound frequency and source level, noise impacts to species may be direct or indirect (Finneran 2015; Finneran 2016; Nowacek et al. 2007; NRC 2000; NRC 2003; NRC 2005; Madsen et al. 2006; Piniak 2012; Popper et al. 2014; Richardson et al. 1995; Thomsen et al. 2006). Exposure to underwater noise can directly

36 "Each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency (hereinafter in this section referred to as an "agency action") is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat."

37 See NMFS Ocean Noise Strategy Roadmap: https://cetsound.noaa.gov/Assets/cetsound/documents/Roadmap/ONS_Roadmap_Final_Complete.pdf

affect species via behavioral modification (avoidance, startle, spawning) or injury (sound exposure resulting in internal damage to hearing structures or internal organs) (Bailey et al. 2010; Bailey et al. 2014;Bergström et al. 2014; Ellison et al. 2011; Ellison et al. 2018; Forney et al. 2017; Madsen et al. 2006; Nowacek et al. 2007; NRC 2003; NRC 2005; Richardson et al. 1995; Romano et al. 2004; Slabbekoorn et al. 2010; Thomsen et al. 2006; Wright et al. 2007). Indirect effects are likely to result from changes to the acoustic environment of the species, which may affect the completion of essential life functions (e.g., migrating, breeding, communicating, resting, foraging)[38] (Forney et al. 2017; Richardson et al. 1995; Slabbekoorn et al. 2010; Thomsen et al. 2006).

Wind farm survey and construction activities and turbine/cable placement will substantially affect NMFS scientific research surveys, including stock assessment surveys for fisheries and protected species[39] and ecological monitoring surveys. Disruption of such scientific surveys could increase scientific uncertainty in survey results and may significantly affect NMFS' ability to monitor the health, status, and behavior of marine resources and protected species and their habitat use within this region. Based on existing regional Fishery Management Councils' acceptable biological catch control rule processes and risk policies (e.g., 50 CFR §§ 648.20 and 21), increased assessment uncertainty could result in lower commercial quotas and recreational harvest limits that may reduce the likelihood of overharvesting and mitigate associated biological impacts on fish stocks. However, this would also result in lower associated fishing revenue and reduced recreational fishing opportunities, which could result in indirect negative impacts on fishing communities.

Impacts of Offshore Wind Energy Development on Socioeconomic Resources
One offshore wind pilot project off Virginia installed two turbines in 2020**.** Several potential offshore wind energy sites have been leased or identified for future wind energy development in federal waters from Massachusetts to North Carolina (see leasing map Figure 37). According to BOEM, approximately 22 gigawatts (close to 2,000 wind turbines based on current technology) of Atlantic offshore wind development via 17 projects are reasonably foreseeable along the east coast (BOEM 2020a). BOEM has recently begun a planning process for the Gulf of Maine via a regional intergovernmental renewable energy task force (https://www.boem.gov/Gulf-of-Maine). It is not clear at this time where development might occur in the Gulf of Maine. Given the water depth in the region, floating turbines will likely be the primary type of wind turbine foundations to be deployed in the area. As the number of wind farms increases, so too would the level and scope of impacts to affected habitats, marine resources, and human communities.

Offshore wind energy development is being considered in parts of the outer continental shelf that overlap with a small portion of the groundfish resource, specifically with the active lease areas off of Rhode Island. The groundfish fishery has been active in the areas of the lease areas at present and is expected to be for the near future (Map 4). The social and economic impacts of offshore wind energy on fisheries could be generally negative due to the overlap of wind energy areas with productive groundfish fishing grounds. Impacts may vary by year based on species availability.

It is worth noting that this analysis represents only a rough approximation of potential effects from the lease areas; however, because this productive region of the resource would be expected to support groundfish fishing in the future in the absence of offshore wind energy development, any restriction of fishing access to this region as a result of offshore wind energy development would be perceived as a negative overall

38 See NMFS Ocean Noise Strategy Roadmap (footnote #2)

39 Changes in required flight altitudes due to proposed turbine height would affect aerial survey design and protocols (BOEM 2020a).

effect to the fishery. In some cases, effort could be displaced to another area, which could compensate for potential economic losses if vessel operators choose not to operate in the wind energy areas.

Turbine structures could increase the presence of and recreational fishing for structure affiliated species, including some groundfish species such as cod. This could potentially lead to socioeconomic benefits in terms of increased for-hire fishing revenues and angler satisfaction in certain wind development areas.

There could also be social and economic benefits in the form of jobs associated with construction and maintenance, and replacement of some electricity generated using fossil fuels with renewable sources (AWEA 2020).

It remains unclear how fishing or transiting to and from fishing grounds (whether or not those grounds are within a wind farm) might be affected by the presence of a wind farm. While no offshore wind developers have expressed an intent to exclude fishing vessels from wind turbine arrays once construction is complete, it could be difficult for operators to tow bottom-tending mobile gear or transit amongst the wind turbines, depending on the spacing and orientation of the array and weather conditions.[40] If vessel operators choose to avoid fishing or transiting within wind farms, effort displacement and additional steaming time could result in negative socioeconomic impacts to affected communities, including increased user conflicts, decreased catch and associated revenue, safety concerns, and increased fuel costs. If vessels elect to fish within wind farms, effects could be both positive due to potential increased recreational catch and negative due to reduced commercial fishery catch and associated revenue, user conflicts, gear damage/loss, and increased risk of allision or collision.

Impacts of Oil and Gas Development on Biological and Socioeconomic Resources

For oil and gas, this timeframe could include leasing and possible surveys, depending on the direction of BOEM's 5-year planning process in the North and Mid-Atlantic regions. (Note that there are fewer oil and gas development activities in the region than offshore wind; therefore, the non-fishing impacts focus more heavily on offshore wind.) Seismic surveys to detect and quantify mineral resources in the seabed impact marine species and the acoustic environment within which marine species live. These surveys have uncertain impacts on fish behaviors that could cumulatively lead to negative population level impacts. For protected species (sea turtle, fish, small cetacean, pinniped, large whale), the severity of these behavioral or physiological impacts is based on the species' hearing threshold , the overlap of this threshold with the frequencies emitted by the survey, as well as the duration of time the surveys would operate, as these factors influence exposure rate (Ellison et al. 2011; Ellison et al. 2018; Finneran 2015; Finneran 2016; Madsen et al. 2006; Nelms et al. 2016;Nowacek et al. 2007; Nowacek et al. 2015; NRC 2000; NRC 2003; NRC 2005; Piniak 2012; Popper et al. 2014; Richardson et al. 1995; Thomsen et al. 2006; Weilgart 2013). If fishery resources are affected by seismic surveys, then so in turn the fishermen targeting these resources would be affected. However, such surveys could increase jobs, which may provide some positive effects on human communities (BOEM 2020b). It is important to understand that seismic surveys for mineral resources are different from surveys used to characterize submarine geology for offshore wind installations, and thus these two types of activities are expected to have different impacts on marine species.

40 The United States Coast Guard has considered transit and safety issues related to the Massachusetts and Rhode Island lease areas in a recent port access route study, and has recommended uniform 1 mile spacing in east-west and north-south directions between turbines to facilitate access for fishing, transit, and search and rescue operations. Future studies in other regions could result in different spacing recommendations (UCSG 2020).

Offshore Energy Summary

The overall impact of offshore wind energy and oil and gas exploration on the affected species and their habitats at a population level is unknown, but likely to range from no impact to moderate negative, depending on the number and locations of projects that occur. The individual project phases (site assessment, construction, operation, and decommissioning) as well as different aspects of the technology (foundations, cables/pipelines, turbines) will have varying impacts on resources. Mitigation efforts, such as habitat conservation measures, time of year construction restrictions, layout modifications, and fishery compensation funds could lessen the magnitude of negative impacts as well. The overall impact on socioeconomic resources is likely slight positive to moderate negative; potentially positive due to a potential increase in jobs and recreational fishing opportunities, but negative due to displacement and disruption of commercial fishing effort.

Map 4- Northeast Multispecies FMP revenues (2017) relative to wind energy active lease areas and planning areas.

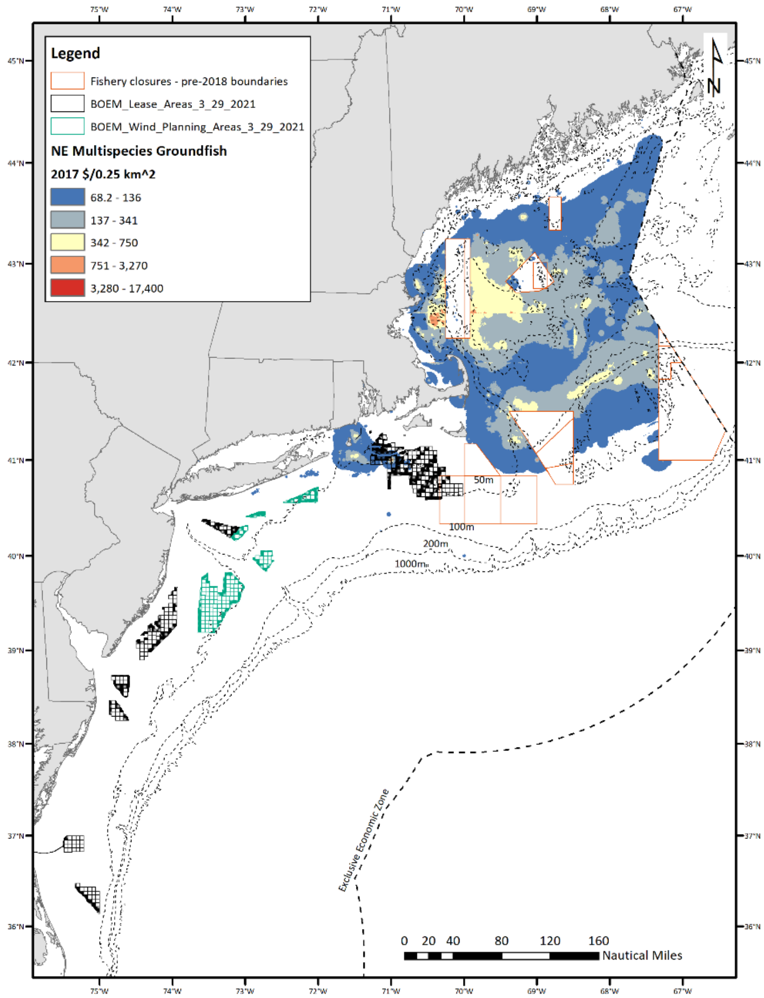
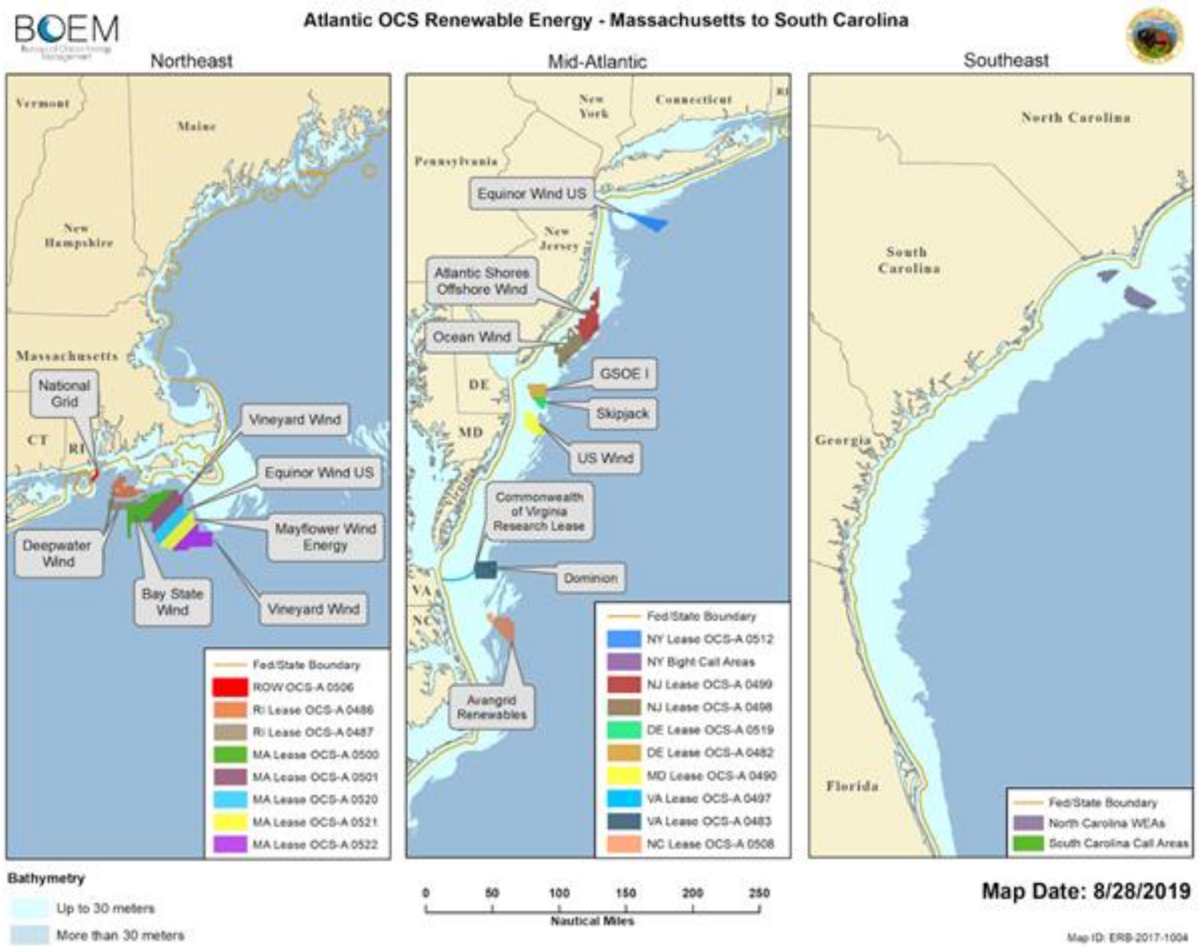


Figure 37- Map of BOEM Wind Planning areas, Wind Energy Areas, and Wind Leasing Areas on the Atlantic Outer Continental Shelf.



6.7.2.2.2 **Global Climate Change**

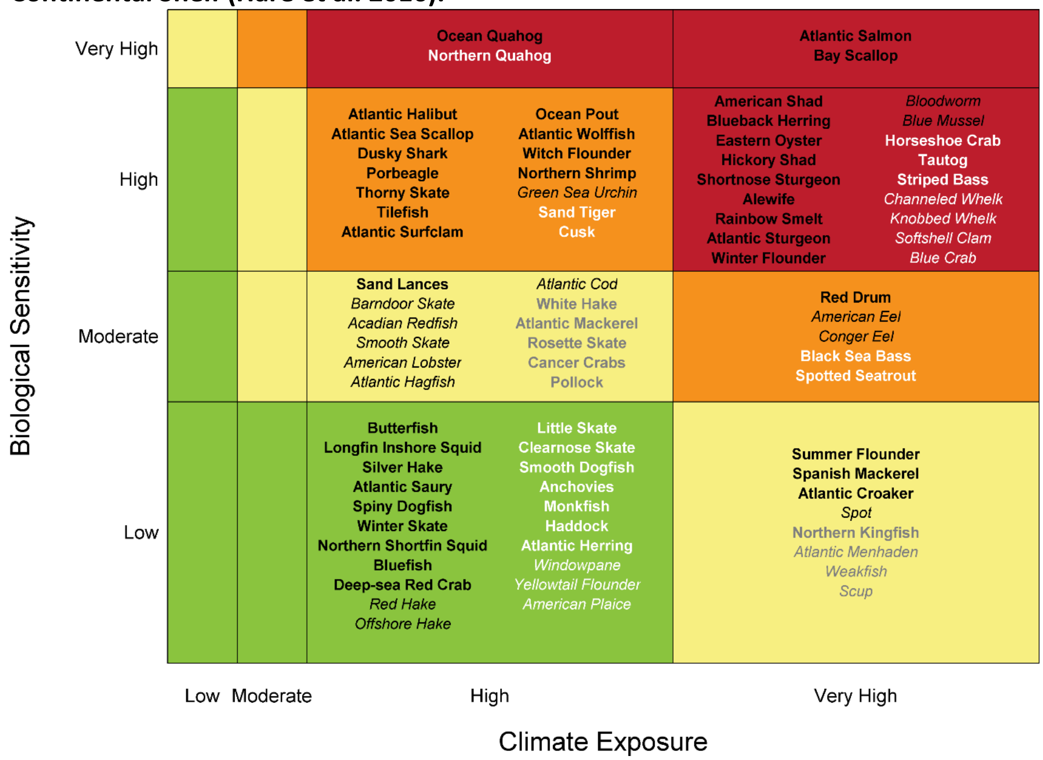
Global climate change affects all components of marine ecosystems, including human communities. Physical changes that are occurring and will continue to occur to these systems include sea-level rise, changes in sediment deposition; changes in ocean circulation; increased frequency, intensity and duration of extreme climate events; changing ocean chemistry; and warming ocean temperatures. The rates of physical and chemical changes in marine ecosystems have been most rapid in recent decades (Johnson et al. 2019). Emerging evidence demonstrates that these physical changes are resulting in direct and indirect ecological responses within marine ecosystems, which may alter the fundamental production characteristics of marine systems (Stenseth et al. 2002). The general trend of changes can be explained by warming causing increased ocean stratification, which reduces primary production, lowering energy supply for higher trophic levels and changing metabolic rates. Different responses to warming can lead to altered food-web structures and ecosystem-level changes. Shifts in spatial distribution are generally to higher latitudes (i.e., poleward) and to deeper waters as species seek cooler waters within their normal temperature preferences. Climate change will also potentially exacerbate the stresses imposed by fishing and other non-fishing human activities and stressors. Survival of marine resources under a changing climate depends on their ability to adapt to change, but also how and to what degree those other human activities influence their natural adaptive capacity.

Results from the Northeast Fisheries Climate Vulnerability Assessment indicate that climate change could have impacts on Council-managed species that range from negative to positive, depending on the adaptability of each species to the changing environment (Hare et al. 2016).

Based on this assessment, groundfish species were scored as having a range of climate vulnerability. Winter flounder were scored as having very high climate vulnerability with very high certainty (Hare et al. 2016). Witch flounder, Atlantic halibut, ocean pout, and Atlantic wolfish were scored as having high climate vulnerability with very high certainty (Hare et al. 2016). Atlantic cod and Acadian redfish were scored as having moderate climate vulnerability with high certainty, while white hake and pollock were scored as having moderate climate vulnerability with moderate certainty (Hare et al. 2016). Haddock were scored as having low climate vulnerability with moderate certainty (Hare et al. 2016). And finally, witch flounder, American plaice, and windowpane flounder were scored as having low climate vulnerability with low certainty (Hare et al. 2016).

Overall vulnerability results for additional Greater Atlantic species, including most of the non-target species identified in this action, are shown in Figure 38 (Hare et al. 2016). While the effects of climate change may benefit some habitats and the populations of species through increased availability of food and nutrients, reduced energetic costs, or decreased competition and predation, a shift in environmental conditions outside the normal range can result in negative impacts for those habitats and species unable to adapt. This, in turn, may lead to higher mortality, reduced growth, smaller size, and reduced reproduction or populations. Thus, already stressed populations are expected to be less resilient and more vulnerable to climate impacts. Climate change is expected to have impacts that range from positive to negative depending on the species. However, future mitigation and adaptation strategies to climate change may mitigate some of these impacts. The science of predicting, evaluating, monitoring and categorizing these changes continues to evolve. The social and economic impacts of climate change will depend on stakeholder and community dependence on fisheries, and their capacity to adapt to change. Commercial and recreational fisheries may adapt in different ways, and methods of adaptation will differ among regions. In addition to added scientific uncertainty, climate change will introduce implementation uncertainty and other challenges to effective conservation and management.

Figure 38- Overall climate vulnerability score for fish and invertebrates on the Northeast U.S. Continental Shelf (Hare et al. 2016).



Overall climate vulnerability is denoted by color: low (green), moderate (yellow), high (orange), and very high (red). Certainty in score is denoted by text font and text color: very high certainty (>95%, black, bold font), high certainty (90–95%, black, italic font), moderate certainty (66–90%, white or gray, bold font), low certainty (<66%, white or gray, italic font). Figure source: Hare et al. 2016.

Baseline Condition for the Resources, Ecosystems, and Human Communities

Table 93 and Table 94 summarize the added effects of the condition of the VECs (i.e., status/trends/stresses from Affected environment and impacts) and the sum effect of the past, present, and reasonably foreseeable future actions (from previous summary table or Past, present, reasonably foreseeable future action section above). The resulting CEA baseline for each VEC is exhibited in the last column of Table 93 and Table 94. As mentioned above, the CEA Baseline is then used to assess cumulative effects of the proposed management actions.

Table 93- Cumulative effects assessment baseline conditions of regulated groundfish stocks.

VEC		Status/Trends, Overfishing	Status/Trends, Overfished	Combined Effects of Past, Present Reasonably Foreseeable Future Actions	Combined CEA Baseline Conditions
Regulated Groundfish Stocks	GB Cod	***Yes***	***Yes***	**Negative** – short term: Several stocks are currently overfished, have overfishing occurring, or both; **Positive** – long term: Stocks are being managed to attain rebuilt status	**Negative** – short term: Overharvesting in the past contributed to several stocks being overfished or where overfishing is occurring; **Positive –** long term: Regulatory actions taken over time have reduced fishing effort and with the addition of Amendment 16, stocks are expected to rebuild in the future
	GOM Cod	***Yes***	***Yes***		
	GB Haddock	No	No, Rebuilt		
	GOM Haddock	No	No, Rebuilt		
	GB Yellowtail Flounder	***Yes***	***Yes***		
	SNE/MA Yellowtail Flounder	No	***Yes***		
	CC/GOM Yellowtail Flounder	No	No		
	American Plaice	No	No, Rebuilt		
	Witch Flounder	Unknown	***Yes***		
	GB Winter Flounder	No	***Yes***		
	GOM Winter Flounder	No	Unknown		
	SNE/MA Winter Flounder	No	***Yes***		
	Acadian Redfish	No	No, Rebuilt		
	White Hake	No	***Yes***		
	Pollock	No	No, Rebuilt		
	Northern (GOM-GB) Windowpane Flounder	No	***Yes***		
	Southern (SNE-MA) Windowpane Flounder	No	No		
	Ocean Pout	No	***Yes***		
	Atlantic Halibut	No	***Yes***		
	Atlantic Wolffish	No	***Yes***		

Table 94– Cumulative effects assessment baseline conditions of non-groundfish species, habitat, protected resources, and human communities.

<table>
<tr><th colspan="2">VEC</th><th>Status/Trends</th><th>Combined Effects of Past, Present Reasonably Foreseeable Future Actions</th><th>Combined CEA Baseline Conditions</th></tr>
<tr><td rowspan="3">Non-groundfish Species (principal species)</td><td>Monkfish</td><td>Not overfished and overfishing is not occurring.</td><td rowspan="3">Positive – Continued management of directed stocks will also control incidental catch/bycatch.</td><td rowspan="3">Positive – Although prior groundfish management measures likely contributed to redirecting effort onto non-groundfish species, as groundfish rebuild this pressure should lessen and all of these species are also managed through their own FMP.</td></tr>
<tr><td>Dogfish</td><td>Not overfished and overfishing is not occurring.</td></tr>
<tr><td>Skates</td><td>Thorny skate is overfished and overfishing is not occurring. All other skate species are not overfished and overfishing is not occurring.</td></tr>
<tr><td colspan="2">Habitat</td><td>Fishing impacts are complex and variable and typically adverse. (Non-fishing activities had historically negative but site-specific effects on habitat quality.</td><td>Mixed – Future regulations will likely control effort and thus habitat impacts but as stocks improve, effort will likely increase along with additional non-fishing activities. An omnibus amendment to the FMP with mitigating habitat measures is under development.</td><td>Mixed – reduced habitat disturbance by fishing gear but impacts from non-fishing actions, such as climate change, could increase and have a negative impact.</td></tr>
<tr><td rowspan="3">Protected Resources</td><td>Sea Turtles</td><td>Leatherback and Kemp's ridley sea turtles are classified as endangered under the ESA; loggerhead (NW Atlantic DPS) and green (North Atlantic DPS) sea turtles are classified as threatened.</td><td rowspan="3">Slight Positive – reduced gear encounters through effort reductions and management actions taken under the ESA/MMPA should also help mitigate the risk of gear interactions</td><td rowspan="3">Slight Positive – Continued catch and effort controls, is likely to reduce gear encounters through effort reductions. Additional management actions taken under ESA/MMPA should also help mitigate the risk of gear interactions
.</td></tr>
<tr><td>Fish</td><td>Atlantic salmon (Gulf of Maine DPS): threatened under ESA
Atlantic sturgeon: New York Bight, Chesapeake, Carolina, and South Atlantic DPSs are endangered under ESA; Gulf of Maine DPS is listed as threatened under the ESA
Giant manta ray: threatened under ESA</td></tr>
<tr><td>Large Cetaceans</td><td>All large whales in the Northwest Atlantic are protected under the MMPA. Of these large whales, North Atlantic right, fin, blue, sei, and sperm whales are also listed as endangered under the ESA.</td></tr>
</table>

VEC		Status/Trends	Combined Effects of Past, Present Reasonably Foreseeable Future Actions	Combined CEA Baseline Conditions
Protected Resources	**Small Cetaceans**	All are protected under the MMPA	**Slight Positive** – reduced gear encounters through effort reductions and management actions taken under the ESA and MMPA have had a positive impact	**Slight Positive** – reduced gear encounters through effort reductions and additional management actions taken under the ESA and MMPA.
	Pinnipeds	All are protected under the MMPA		
Human Communities		Complex and variable. Although there are exceptions, generally groundfish landings have decreased for most New England states since 2001. Declines in groundfish revenues since 2001 have also generally occurred.	**Negative** – Although future sustainable resources should support viable communities and economies, continued effort reductions over the past several years have had negative impacts on communities	**Negative –** short term: lower revenues would continue until stocks are sustainable **Positive** – long term: sustainable resources should support viable communities and economies

6.7.3 Summary of Effects of the Proposed Actions

Framework 63 would set specifications and adjust management measures for the groundfish fishery to achieve the objectives of the fishery management plan (FMP). The preferred alternatives in this action are described in Section 4.0 The impacts of the proposed actions are described in Section 6.0 and summarized in Table 95 below.

Table 95- Summary of Impacts for Valued Ecosystem Components (VECs) in Framework 63 (preferred in gray).

Actions and Alternatives		**Direct and indirect impacts**				
		Managed Resources	**Non-target species**	**Habitat/EFH**	**Protected Resources**	**Human communities (economic and social impacts)**
Action 1: Specifications	**Alt. 1 – No Action**	Slight +	Slight +	Slight -	Slight – to slight +	Economic - Social: -
	Alt. 2 – Revised Specifications	Slight +	Slight +	Slight -	Slight – to slight +	Economic: - to + Social: - to +
	Alt. 3 Recreational Catch Target for GB Cod (Option 4 preferred)	Slight +	Slight +	No impacts	Negl. to slight -	Economic: slight – to slight + Social: slight – to slight +
	Alt. 4 Changes to the Default Specifications Process (Option 4 preferred)	Negl. to slight +	Negl. to slight +	Negligible to slight -	Slight – to slight +	Economic: slight – to slight + Social: slight – to slight +
Action 2: Recreational Fishery Measures – Georges Bank Cod	**Alt. 1 – No Action**	Slight +	Slight +	No impacts	Negl. to slight -	Economic: slight – to slight + Social: slight – to slight +
	Alt. 2 – Temporary Administrative Measure to Allow the RA Authority to Adjust the Recreational Measures for GB Cod	Slight +	Slight +	No impacts	Negl. to slight -	Economic: slight – to slight + Social: slight – to slight +
	Alt. 3 – Recreational Measures for GB Cod (Option 1 preferred)	Slight +	Slight +	No impacts	Negl. to slight -	Economic: slight – to slight + Social: slight – to slight +

6.7.4 Magnitude and Significance of Cumulative Effects

In determining the magnitude and significance of the cumulative impacts of the preferred alternatives, the incremental impacts of the direct and indirect impacts should be considered, on a VEC-by-VEC basis, in addition to the effects of all actions (those identified and discussed relative to the past, present, and reasonably foreseeable future actions of both fishing and non-fishing actions). Table 95 provides a summary of likely impacts found in the various groups of management alternatives contained in this action. The CEA baseline that, as described above in Table 93 and Table 94 represents the sum of past, present, and reasonably foreseeable future actions and conditions of each VEC. When an alternative has a positive impact on the VEC, for example, reduced fishing mortality on a managed species, it has a positive cumulative effect on the stock size of the species when combined with "other" actions that were also designed to increase stock size. In contrast, when an alternative has negative effects on a VEC, such as increased mortality, the cumulative effect on the VEC would be negative and tend to reduce the positive effects of the other actions. The resultant positive and negative cumulative effects are described below for each VEC. As seen above in section 6.7.2.2, non-fishing impacts on the VECs generally range from no impact to slight negative.

6.7.4.1 Magnitude and Significance of Cumulative Effects on Managed Resources

Past fishery management actions taken through the Northeast Multispecies FMP and the annual specifications process such as catch limits and allocations ensure that stocks are managed sustainably and that measures are consistent with the objectives of the FMP under the guidance of the MSA. The impacts of annual specification of management measures are largely dependent on how effective those measures are in meeting the objectives of preventing overfishing and achieving optimum yield, and on the extent to which mitigating measures, such as accountability measures, are effective; however, these actions have generally had a positive cumulative effect on groundfish. It is anticipated that the future management actions described in Section 6.7.2.1 will have additional indirect positive effects on the target species through actions which reduce and monitor bycatch, protect habitat, and protect the ecosystem services on which the productivity of the target species depends.

As noted previously Section 6.2, none of the preferred alternatives are expected to result in significantly increased levels of fishing effort or changes to the character of that effort relative to current conditions. Therefore, impacts of the fisheries on target species are not expected to change relative to current conditions under the preferred alternatives (i.e., generally positive for target species). The proposed actions described in this document would positively reinforce the past and anticipated positive cumulative effects on target species by achieving the objectives specified in the FMP.

When the direct and indirect effects of the FW63 alternatives are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield non-significant positive impacts on regulated groundfish resource.*

6.7.4.2 Magnitude and Significance of Cumulative Effects on Non-target Species

The combined impacts of past federal fishery management actions on non-target species have been mixed, as decreased effort and reduced catch of non-target species continue, though some stocks are in poor status. Current regulations continue to manage for sustainable stocks, thus controlling effort on direct and discard/bycatch species. As noted in section 6.7.2.1, the actions proposed by Framework 63 would likely continue this trend. Future actions are anticipated to continue rebuilding non-target species stocks and limit the take of incidental/bycatch in the groundfish fishery, particularly through mitigation measures like sub-ACLs and AMs. The other measures proposed in this action would likely have some impacts on non-target species, since fishing activity is expected to overlap with non-target species of interest. Continued management of directed stocks will also control catch of non-target species.

As noted previously in Section 6.2, none of the preferred alternatives are expected to result in significantly increased levels of fishing effort or changes to the character of that effort relative to current conditions. Therefore, impacts of the fishery on non-target species are not expected to change relative to the current condition under the preferred alternatives (i.e., slight positive for non-target species). The proposed actions in this document would positively reinforce past and anticipated cumulative effects on non-target species by achieving the objectives in the FMP.

When the direct and indirect effects of Framework 63 alternatives are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield non-significant positive impacts on non-target species.*

6.7.4.3 Magnitude and Significance of Cumulative Effects on Physical Environment

Past fishery management actions taken through the Habitat amendments, the Northeast Multispecies FMP and annual specifications process have had negligible to slightly positive cumulative effects on habitat. The actions have constrained fishing effort both at a large scale and locally and have implemented gear requirements which may reduce impacts on habitat. As required under Omnibus Habitat Amendment 2, EFH and Habitat Areas of Particular Concern were designated for the managed resources. It is anticipated that the future management actions described in Section 6.7.2.1 will result in additional direct or indirect positive effects on habitat through actions which protect EFH and protect ecosystem services on which these species' productivity depends.

Many additional non-fishing activities, as described above 6.7.2.2 are concentrated near-shore and likely work either additively or synergistically to decrease habitat quality. The effects of these actions, combined with impacts resulting from years of commercial fishing activity, have negatively affected habitat. These impacts could be broad in scope. All the VECs are interrelated; therefore, the linkages among habitat quality, managed resources and non-target species productivity, and associated fishery yields should be considered. Some actions, such as coastal population growth and climate change may indirectly impact habitat and ecosystem productivity; however, these actions are beyond the scope of NMFS and Council management. Reductions in overall fishing effort and protection of sensitive habitats have mitigated some negative effects.

As noted previously in Section 6.3, none of the preferred alternatives are expected to result in significantly increased levels of fishing effort or changes to the character of that effort relative to current conditions. Although the impacted areas have been fished for many years with many different gear types and therefore will not likely be further impacted by these measures, continued fishing effort will continue to impact habitats. Therefore, the impacts of the fishery on the physical environment are not expected to change relative to the current condition under the preferred alternatives (i.e., slight negative for physical environment).

When the direct and indirect effects of the Framework 63 alternatives are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield non-significant slight negative impacts on the physical environment and EFH.*

6.7.4.4 Magnitude and Significance of Cumulative Effects on Protected Species

Given their life history dynamics, large changes in protected species abundance over long time periods, and the multiple and wide-ranging fisheries management actions that have occurred, the cumulative impacts on protected species were evaluated over a long-time frame (i.e., from the early 1970s when the Marine Mammal Protection Act and Endangered Species Act were implemented through the present).

Numerous protected species (ESA listed and/or MMPA protected) occur in the Northwest Atlantic. The distribution and status of those species in the region are described in Section 5.6. Depending on species and status, the population trends for these protected resources are variable, and as follows:

Sea Turtles

Nest counts inform population trends for sea turtle species. In the affected environment (see Section 5.6), four sea turtle species were identified in the region: Northwest Atlantic Ocean DPS of loggerhead, Kemp's ridley, North Atlantic DPS of green, and leatherback sea turtles. For the Northwest Atlantic Ocean DPS of loggerhead sea turtles, there are five unique recovery units that comprise the DPS. Nesting trends for each of these recovery units are variable; however, recent data from Florida index nesting beaches, which comprise most of the nesting in the DPS, indicate a 19% increase in nesting from 1989 to 2018 (https://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trends/). For Kemp's ridley sea turtles, from 1980 through 2003, the number of nests at three primary nesting beaches (Rancho Nuevo, Tepehuajes, and Playa Dos) increased 15 percent annually (Heppell et al. 2005); however, due to recent declines in nest counts, decreased survival of immature and adult sea turtles, and updated population modeling, this rate is not expected to continue and the overall trend is unclear (NMFS and USFWS 2015; Caillouett et al. 2018). The North Atlantic DPS of green sea turtle is showing a positive trend in nesting (Seminoff et al. 2015). Leatherback turtle nesting in the Northwest Atlantic is showing an overall negative trend, with the most notable decrease occurring during the most recent time frame of 2008 to 2017 (NW Atlantic Leatherback Working Group 2018).

Large Whales

Large whale assessments indicate that for some species there is a decreasing (i.e., North Atlantic right whales) trend in the population, while for other species, as a trend analysis has not been conducted, it is unknown what the population trajectory is.[41]

Small Cetaceans and Pinnipeds

For most small cetaceans and pinniped populations, it is unknown what the population trajectory is as a trend analysis has not been conducted for these populations.[42] However, in the most recent stock assessment reports, population trends were provided for common bottlenose dolphin stocks and gray seals; the analysis indicated a declining trend in population size for all common bottlenose dolphin stocks and an increasing trend for the gray seal population (Hayes et al. 2018; Hayes et al. 2019).

Atlantic Sturgeon

Population trends for Atlantic sturgeon are difficult to discern; however, the most recent stock assessment report concludes that Atlantic sturgeon, at both coastwide and DPS level, are depleted relative to historical levels (ASSRT 2007; ASMFC 2017).

Atlantic Salmon

41 https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region

42 https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region

There is no population growth rate available for Gulf of Maine DPS Atlantic salmon; however, the consensus is that the DPS exhibits a continuing declining trend (NOAA 2016; USFWS and NMFS 2018).

Taking into consideration the above information, past fishery management actions taken through the respective FMPs and annual specifications process have had slight indirect positive cumulative effects on protected species. The actions have constrained fishing effort both at a large scale and locally, and have implemented, pursuant to the ESA, MMPA, or MSA, gear modifications, requirements, and management areas. These measures and/or actions have served to reduce interactions between protected species and fishing gear. It is anticipated that future management actions, described in Section 6.7.2.1 will result in additional indirect positive effects on protected species. These impacts could be broad in scope.

The preferred alternatives would not substantially modify current levels of fishing effort in terms of the overall amount of effort, timing, and location. They would allow existing fishing effort to continue. As described in Section 1.1, the proposed action is expected to have impacts on protected species that range from slight negative to slight positive, depending on the species.

When the direct and indirect effects of the Framework 63 alternatives are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield non-significant slight negative impacts to slight positive impacts.*

6.7.4.5 Magnitude and Significance of Cumulative Effects on Human Communities

Past fishery management actions taken through the respective FMPs and annual specifications process such as catch limits and allocations have had both positive and negative cumulative effects on human communities. They have benefitted domestic fisheries through sustainable fishery management, but can also reduce participation in fisheries. The impacts from annual specification of management measures are largely dependent on how effective those measures are in meeting their intended objectives and the extent to which mitigating measures like AMs are effective. Quota overages may alter the timing of commercial fishery revenues such that revenues can be realized a year earlier. Fishermen may be impacted by reduced revenues in years which the overages are deducted. Similarly, recreational fisheries may have decreased harvest opportunities due to reduced harvest limits as a result of overages and more restrictive management measures (e.g. minimum fish size, possession limits, fishing seasons) implemented to address overages.

It is anticipated that the future management actions described in Section 6.7.2.1 will result in positive effects for human communities due to sustainable management practices, although additional indirect negative effects on some human communities could occur if management actions result in reduced revenues. Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to human communities have had overall positive cumulative effects. Despite the potential for negative short-term effects on human communities due to reduced revenue, positive long-term effects are expected due to the long-term sustainability of the managed stocks.

By providing revenues and contributing to the overall functioning of and employment in coastal communities, the groundfish fishery has both direct and indirect positive social impacts. As previously described in Section 1.1 and Section 6.6, the preferred alternatives are unlikely to result in substantial changes to levels of fishing effort or the character of that effort relative to current conditions. Through implementation of this action, the Council seeks to achieve the primary objective of the MSA, which is to achieve OY from the managed fisheries.

When the direct and indirect effects of the Framework 63 alternatives are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are* *expected to yield non-significant positive impacts.* However, the overall combination of impacts thus far has been consistently negative for human communities.

6.7.5 Proposed Action on all the VECs

The Council's preferred alternatives (i.e. the proposed action) are described in Section 4.0. The direct and indirect impacts of the proposed action on the VECs are described in Section 5.7.11 and are summarized in the Executive Summary in Section 1.0. The magnitude and significance of the cumulative effects, including additive and synergistic effects of the proposed actions, as well as past, present, and future actions, have been taken into account (Section 6.7.4).

When considered in conjunction with all other pressures placed on the fisheries by past, present, and reasonably foreseeable future actions, the preferred alternatives are not expected to result in any significant impacts, positive or negative. For the 2022-2024 specifications, the preferred alternative is expected to have slight positive impacts on the managed resource, slight positive impacts on non-target species, slight negative impacts on the physical environment, slight negative to slight positive impacts on protected resources, and negative to positive economic and social impacts on human communities. The preferred action for setting a recreational catch target for GB cod is expected to have slight positive impacts on the managed resource, slight positive impacts on non-target species, no impacts on the physical environment, negligible to slight negative impacts on protected resources, and slight negative to slight positive economic and social impacts on human communities. The preferred alternative for changes to the default specifications process is expected to have slight positive impacts on the managed resource, slight positive impacts on non-target species, slight negative to negligible impacts on the physical environment, slight negative to slight positive impacts on protected resources, and slight negative to positive economic and social impacts on human communities. The preferred alternative for GB cod recreational fishery measures is expected to have slight positive impacts on the managed resource, slight positive impacts on non-target species, no impacts on the physical environment, negligible to slight negative impacts on protected resources, and slight negative to slight positive economic and social impacts on human communities.

The preferred alternatives are consistent with other management measures that have been implemented in the past for the fishery. These measures are part of a broader management scheme for the groundfish fishery. This management scheme has helped to rebuild stocks and ensure long-term sustainability, while minimizing environmental impacts.

The regulatory atmosphere within which federal fishery management operates requires that management actions be taken in a manner that will optimize the conditions of managed species, habitat, and human communities. Consistent with NEPA, the MSA requires that management actions be taken only after consideration of impacts to the biological, physical, economic, and social dimensions of the human environment. Given this regulatory environment, and because fishery management actions must strive to create and maintain sustainable resources, impacts on all VECs from past, present and reasonably foreseeable future actions have generally been positive and are expected to continue in that manner for the foreseeable future. This is not to say that some aspects of the VECs are not experiencing negative impacts, but rather that when considered as a whole and as a result of the management measure implemented in these fisheries, the overall long-term trend is positive.

There are no significant cumulative effects associated with the preferred alternatives based on the information and analyses presented in this document and in past FMP documents (Table 96). Cumulatively, through 2027 it is anticipated that the preferred alternatives will result in non-significant impacts on all VECs, ranging from slight negative to positive.

Table 96- Summary of Cumulative Effects of the Preferred Alternatives.

	Managed Resource	***Non-Target Species***	***Habitat***	***Protected Resources***	***Human Communities***
Direct/Indirect Impacts of Preferred Alternative	*Mixed (positive, negligible, and slight negative)*	*Mixed (positive, negligible, and slight negative)*	*Slight negative to slight positive*	*Slight negative to slight positive*	*Negative to positive*
Combined Cumulative Effects Assessment Baseline Conditions	*Negative (short-term), positive (long-term)*	*Positive*	*Mixed*	*Slight positive*	*Negative*
Cumulative Effects	*Slight positive*	*Slight positive*	*Slight positive*	*Slight positive*	*Negative (short-term), positive (long-term)*

7.0 APPLICABLE LAWS/EXECUTIVE ORDERS

7.1 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT – NATIONAL STANDARDS

7.1.1 National Standards

Section 301 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires regulations implementing any fishery management plan or amendment be consistent with ten national standards. Below is a summary of how this action is consistent with the National Standards and other required provisions of the MSA.

National Standard 1 - The Northeast Multispecies FMP includes measures to end overfishing on the groundfish stocks. This action adjusts those measures to maximize optimum yield while preventing overfishing and continuing rebuilding plans. For overfished fisheries, the MSA defines optimum yield as the amount of fish which provides for rebuilding to a level consistent with producing the maximum sustainable yield from the fishery. The measures are designed to achieve the fishing mortality rates, and yields, necessary to rebuild the overfished stocks as well as to keep fishing mortality below overfishing levels for stocks that are not in a rebuilding program. The measures in Section 4.0 set controls on catch to ensure the appropriate fishing mortality rates are implemented by adjusting OFLs, ABCs, and ACLs for several stocks, establishing a GB cod catch target for the recreational fishery, modifying the default specifications process, and increasing recreational fishery restrictions for GB cod..

National Standard 2 - The Preferred Alternatives are based on the most recent information on stock status available for all stocks in the Northeast multispecies complex, which is provided by the Northeast Fisheries Science Center in the 2021 TRAC and Integrated Peer Review and the 2019, 2020 and 2021 Groundfish Management Track Assessments. Additionally, the mortality limits were determined based on the scientific advice of the SSC, which recommends ABCs to the Council.

With respect to bycatch information, the action uses bycatch information from the most recent assessments. While additional observer data has been collected since the most recent assessments were completed, it has not been analyzed or reviewed through the stock assessment process and thus cannot be used.

The economic analyses in this document are based primarily on landings, revenue, and effort information collected through the NMFS data collection systems used for this fishery.

National Standard 3 - The Preferred Alternatives manage each individual groundfish stock as a unit throughout its range. Management measures specifically designed for one stock are applied to the entire range of the stock. In addition, the groundfish complex management measures are designed and evaluated for their impact on the fishery as a whole.

National Standard 4 - The Preferred Alternatives do not discriminate between residents of different states. They apply equally to all permit holders, regardless of homeport or location. While the measures do not discriminate between permit holders, they have different impacts on different participants because of the differences in the distribution of fish and the varying stock levels in the complex. Some of these impacts may be localized, as often communities near a fish stock may have developed small boat fisheries that target it and these distributive impacts are difficult to avoid given the requirement to rebuild overfished stocks. These distributive impacts are difficult to avoid given the requirement to rebuild overfished stocks. Even if management measures are designed to treat all permit holders the same, the uneven geographical distribution of fish stocks and the targeting of different stocks by individual vessels makes distributive impacts unavoidable.

National Standard 5 - The Preferred Alternatives are not expected to significantly reduce the efficiency of fishing vessels. These measures are considered practicable since they allow rebuilding of depleted groundfish stocks and have considered efficiency to the greatest extent possible. None of the measures in this action have economic allocation as their sole purpose; all are designed to contribute to the control of fishing mortality.

National Standard 6 - The primary controls used in this management plan - effort controls and sectors - allow each vessel operator to fish when and how it best suits his or her business. Vessels can make short or long trips, and can fish in any open area at any time of the year. The measures allow for the use of different gear, vessel size, and fishing practices. The specific measures adopted in this action do not reduce this flexibility.

While some of the measures used in the management plan, tend to increase costs, those measures are necessary for achieving the plan's objectives. As an example, measures that reduce the efficiency of fishing vessels, including time area closures, tend to increase the costs of fishing vessels since fishing catches are reduced. These measures accomplish other goals, however, by allowing groundfish stocks to rebuild. The measures do not duplicate other regulatory efforts. Management of multispecies stocks in federal waters is not subject to coordinated regulation by any other management body. Absent Council action, a coordinated rebuilding effort to restore the health of the overfished stocks would not occur.

National Standard 7 **-** The Council considered the costs and benefits of a range of alternatives to achieve the goals and objectives of this FMP. It considered the costs to the industry of taking no action relative to adopting the measures herein. The expected benefits are greater in the long-term if stocks are rebuilt. Under these proposed measures short-term losses in revenue and possible increases in costs can be expected as several stock ACLs would decrease.

National Standard 8 - Consistent with the requirements of the MSA to prevent overfishing and rebuild overfished stocks, the Preferred Alternatives may restrict fishing activity through the implementation of low ACLs for several groundfish stocks to achieve rebuilding targets. Analyses of the impacts of these measures show that landings and revenues are likely to decline for many participants in upcoming years due to the rebuilding programs in place for many stocks. In the short-term, these declines will probably have negative impacts on fishing communities throughout the region, but particularly on those ports that rely heavily on groundfish; however, they are needed for the long-term sustainability and benefit of these communities.

National Standard 9 - Many measures limit the discards of both groundfish and some other species, including the sector management program, and this action is expected to continue those benefits with no substantial changes. The proposed action is necessary to minimize bycatch. Changes that permit annual catch limits to adjust to changing fish stock abundance levels are needed to prevent wasteful bycatch compared to taking no action.

National Standard 10 - The flexibility in sector management and the ability to use common pool DAS at any time promote safety by not incentivizing vessels to fish in dangerous conditions. The Preferred Alternative, in conjunction with Amendment 16 measures, is the best option for achieving the necessary mortality reductions while having the least impact on vessel safety.

7.1.2 Other MSA Requirements

This action is also consistent with the fourteen additional required provisions for FMPs. Section 303 (a) of MSA contains required provisions for FMPs.

1. *Contain the conservation and management measures, applicable to foreign fishing …*

   Foreign fishing is not allowed under this management plan or this action and so specific measures are not included to specify and control allowable foreign catch.

2. *Contain a description of the fishery …*

   Amendment 16 included a thorough description of the multispecies fishery from 2001 through 2008, including the gears used, number of vessels, landings and revenues, and effort used in the fishery. This information was updated for Amendment 18. This action provides a summary of that information and additional relevant information about the fishery in Section 5.7.

3. *Assess and specify the present and probable future condition of, and the maximum sustainable yield and optimum yield from the fishery …*

   The present biological status of the fishery is described in Section 5.2.21. Likely future conditions of the resource are described in Section 6.7. Impacts resulting from other measures in the management plan other than the measures included here can be found in Amendment 16. The maximum sustainable yield for each stock in the fishery is defined in Amendment 16 and optimum yield for the fishery is defined in Amendment 9.

4. *Assess and specify-- (A) the capacity and the extent to which fishing vessels of the United States, on an annual basis, will harvest the optimum yield specified under paragraph (3); etc.*

   U.S. fishing vessels are capable of, and expected to, harvest the optimum yield from this fishery as specified in Amendment 16 and Frameworks 44, 45, 47, 49, 50, 51, 53, 55, 56, 57, 58, 59, 61 and this action FW63. U.S. processors are also expected to process the harvest of U.S. fishing vessels. None of the optimum yield from this fishery is available to foreign fishing.

5. *Specify the pertinent data which shall be submitted to the Secretary with respect to commercial, recreational, and charter fishing in the fishery …*

   Current reporting requirements for this fishery have been in effect since 1994 and were originally specified in Amendment 5. They were slightly modified in Amendments 13 and 16, and VMS requirements were adopted in FW42. The requirements include Vessel Trip Reports (VTRs) that are submitted by each fishing vessel. Dealers are also required to submit reports on the purchases of regulated groundfish from permitted vessels. Sector vessels are also required to contract with service providers for ASM or EM services. ASM and EM provide catch and bycatch data that vessels are required to submit. Current reporting requirements are detailed in 50 CFR 648.7.

6. *Consider and provide for temporary adjustments, after consultation with the Coast Guard and persons utilizing the fishery, regarding access to the fishery for vessels otherwise prevented from harvesting because of weather or other ocean conditions …*

   Provisions in accordance with this requirement were implemented in earlier actions, and continue with this action. For common pool vessels, the carry-over of a small number of DAS is allowed from one fishing year to the next. If a fisherman is unable to use all of his DAS because of weather or other conditions, this measure allows his available fishing time to be used in the subsequent fishing year. Sectors will also be allowed to carry forward a small amount of ACE into the next fishing year. This will help sectors react should adverse weather interfere with harvesting the entire ACE before the end of the year. Neither of these practices requires consultation with the Coast Guard.

7. *Describe and identify essential fish habitat for the fishery …*

   A summary of the EFH can be found in Section 5.5.

8. *In the case of a fishery management plan that, after January 1, 1991, is submitted to the Secretary for review under section 304(a) assess and specify the nature and extent of scientific data which is needed for effective implementation of the plan;*

   Scientific and research needs are not required for a framework adjustment action.

9. *Include a fishery impact statement for the plan or amendment*

   Impacts of this framework on fishing communities directly affected by this action and adjacent areas can be found in Sections 6.5 and 6.6.

10. *Specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished …*

    Objective and measurable status determination criteria for all stocks in the management plan have been updated in framework actions, including framework adjustments 48, 51, 53, 55, 56, and 61.

11. *Establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery …*

    None of the measures in this framework are expected to increase bycatch beyond what was considered in Amendment 16.

12. *Assess the type and amount of fish caught and released alive during recreational fishing under catch and release fishery management programs and the mortality of such fish …*

    This management plan does not include a catch and release recreational fishery management program and thus does not address this requirement.

13. *Include a description of the commercial, recreational, and charter fishing sectors which participate in the fishery …*

    As noted above, the description of the commercial, recreational, and charter fishing sectors is updated and summarized in this document (Section 5.7.10).

14. *To the extent that rebuilding plans or other conservation and management measures which reduce the overall harvest in a fishery are necessary, allocate any harvest restrictions or recovery benefits fairly and equitably among the commercial, recreational, and charter fishing sectors in the fishery.*

    This preferred alternative does not allocate harvest restrictions or stock benefits to the fishery. Such allocations were adopted in Amendment 16, while this action adjusts management measures for some stocks within the existing allocation structure in a fair and equitable manner.

15. *Establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability.*

    The FMP already contains a mechanism for establishing annual catch limits and this action uses that mechanism to specify ACLs for future fishing years.

7.2 National Environmental Policy Act

The National Environmental Policy Act (NEPA) provides a mechanism for identifying and evaluating the full spectrum of environmental issues associated with federal actions and for considering a reasonable range of alternatives to avoid or minimize adverse environmental impacts. The Council on Environmental Quality has issued regulations specifying the requirements for NEPA documents (40 CFR 1500 – 1508), as has NOAA in its policy and procedures for NEPA (NAO 216-6A). This EA is being prepared using the 2020 CEQ NEPA Regulations. The effective date of the 2020 CEQ NEPA Regulations was September 14, 2020, and reviews begun after this date are required to apply the 2020 regulations unless there is a clear and fundamental conflict with an applicable statute. 85 Fed. Reg. at 43372-73 (§§ 1506.13, 1507.3(a)). This EA began on June 23, 2021 and accordingly proceeds under the 2020 regulations.

7.2.1 Environmental Assessment

The required elements of an Environmental Assessment (EA) are specified in 40 CFR 1508.9(b). They are included in this document as follows:

- The need for this action is in Section 3.2;
- The alternatives that were considered are in Section 4.0;
- The environmental impacts of the proposed action are in Section 6.0;
- A determination of significance is in Section 7.2; and,
- The agencies and persons consulted on this action are in Sections 7.2.3 and 7.2.4.

While not required for the preparation of an EA, this document includes the following additional sections that are based on requirements for an Environmental Impact Statement (EIS).

- An executive summary is in Section 1.0;
- A table of contents is in Section 2.0;
- Background and purpose are in Section 3.0;
- A summary of the document is in the executive summary, Section 1.0;
- A description of the affected environment is in Section 5.0;
- Cumulative effects of the proposed action are in Section 6.7;
- A list of preparers is in Section 7.2.4.

7.2.2 Point of Contact

Questions concerning this document may be addressed to:

Mr. Thomas A. Nies, Executive Director
New England Fishery Management Council
50 Water Street, Mill 2
Newburyport, MA 01950 (978) 465-0492

7.2.3 Agencies Consulted

The following agencies, in alphabetical order, were consulted in preparing this document:

- Mid-Atlantic Fishery Management Council
- National Marine Fisheries Service, NOAA, Department of Commerce
- New England Fishery Management Council, including representatives from:
  - Connecticut Department of Environmental Protection
  - Maine Department of Marine Resources
  - Massachusetts Division of Marine Fisheries
  - New Hampshire Fish and Game
  - Rhode Island Department of Environmental Management

- United States Coast Guard, Department of Homeland Security

7.2.4 List of Preparers

The following personnel participated in preparing this document:

- ***New England Fishery Management Council***. Dr. Jamie Cournane (Groundfish Plan Coordinator), Robin Frede, Michelle Bachman, Sam Asci, Jonathon Peros, Chris Kellogg, Thomas Nies, Woneta Cloutier, and Angela Forristall
- ***National Marine Fisheries Service.*** Liz Sullivan, Mark Grant, Timothy Cardiasmenos, Alicia Schuler, Glenn Chamberlain, Paul Nitschke, Dr. Matt Cutler, Greg Ardini, Scott Steinback, Spencer Talmage, and Kyle Molton.
- ***State Agencies.*** Rebecca Peters (Maine DMR), Matt Ayer (MA DMF), Renee Zobel (NHF&G), Rich Balouskus (RIDMR)
- ***Mid-Atlantic Fishery Management Council***. Jason Didden

7.2.5 Opportunity for Public Comment

This action was developed from June 2021 through December 2021, and there were several public meetings related to this action (Table 97). Opportunities for public comment occurred at Advisory Panel, Committee, and Council meetings. There were more limited opportunities to comment at PDT meetings. Meeting discussion documents and summaries are available at www.nefmc.org.

Table 97- Public meetings related to Framework Adjustment 63.

Date	Meeting Type	Location
2021		
6/22-24/2021	Council Meeting	Webinar
7/20/2021	PDT	Webinar
8/2/2021	PDT	Webinar
8/6/2021	Committee	Webinar
8/10/2021	PDT	Webinar
8/18/2021	Committee	Webinar
8/19/2021	PDT	Webinar
9/9/2021	PDT	Webinar
9/22/2021	Recreational Advisory	Webinar
9/22/2021	Advisory Panel	Webinar
9/23/2021	Committee	Webinar
9/28-30/2021	Council Meeting	Webinar
10/13/2021	PDT	Webinar
10/20/2021	PDT	Webinar
11/01/2021	PDT	Webinar
11/10/2021	PDT	Webinar
11/22/2021	Advisory Panel	Webinar
11/29/2021	Recreational Advisory	Webinar
11/30/2021	Committee	Webinar

12/7-9/2021	Council Meeting	Webinar

7.3 MARINE MAMMAL PROTECTION ACT (MMPA)

The proposed action is not expected to alter fishing methods or activities. Therefore, this action is not expected to impact marine mammals in any manner not considered in previous consultations on the fisheries. Section 5.6 of this action describes the marine mammals potentially impacted by the groundfish fishery and Section 6.4summarizes the impacts of the proposed action. A final determination of consistency with the MMPA will be made by the agency when this action is approved.

7.4 ENDANGERED SPECIES ACT (ESA)

Pursuant to section 7 of the Endangered Species Act (ESA), NOAA's National Marine Fisheries Service (NMFS) issued a Biological Opinion (Opinion) on May 27, 2021, that considered the effects of the NMFS' authorization of ten fishery management plans (FMP), NMFS' North Atlantic Right Whale Conservation Framework, and the New England Fishery Management Council's Omnibus Essential Fish Habitat Amendment 2, on ESA-listed species and designated critical habitat. The ten FMPs considered in the Opinion include the: (1) American Lobster; (2) Atlantic Bluefish; (3) Atlantic Deep-Sea Red Crab; (4) Mackerel, Squid, Butterfish; (5) Monkfish; (6) Northeast Multispecies; (7) Northeast Skate Complex; (8) Spiny Dogfish; (9) Summer Flounder, Scup, Black Sea Bass; and (10) Jonah Crab FMPs. The American Lobster and Jonah Crab FMPs are permitted and operated through implementing regulations compatible with the interstate fishery management plans issued under the authority of the Atlantic Coastal Fisheries Cooperative Management Act, the other eight FMPs are issued under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (MSA).

The 2021 Opinion determined that the proposed action may adversely affect, but is not likely to jeopardize, the continued existence of North Atlantic right, fin, sei, or sperm whales; the Northwest Atlantic Ocean distinct population segment (DPS) of loggerhead, leatherback, Kemp's ridley, or North Atlantic DPS of green sea turtles; any of the five DPSs of Atlantic sturgeon; Gulf of Maine DPS Atlantic salmon; or giant manta rays. The Opinion also concluded that the proposed action is not likely to adversely affect designated critical habitat for North Atlantic right whales, the Northwest Atlantic Ocean DPS of loggerhead sea turtles, U.S. DPS of smalltooth sawfish, Johnson's seagrass, or elkhorn and staghorn corals. An Incidental Take Statement (ITS) was issued in the Opinion. The ITS includes reasonable and prudent measures and their implementing terms and conditions, which NMFS determined are necessary or appropriate to minimize impacts of the incidental take in the fisheries assessed in this Opinion.

7.5 ADMINISTRATIVE PROCEDURE ACT (APA)

Sections 551-553 of the Administrative Procedure Act established procedural requirements applicable to informal rulemaking by federal agencies. The purpose is to ensure public access to the federal rulemaking process, and to give public notice and opportunity for comment. The Council did not request relief from notice and comment rule making for this action and expects that NOAA Fisheries will publish proposed and final rule making for this action.

7.6 PAPERWORK REDUCTION ACT

The purpose of the Paperwork Reduction Act is to minimize paperwork burden for individuals, small businesses, nonprofit institutions, and other persons resulting from the collection of information by or for the Federal Government. It also ensures that the Government is not overly burdening the public with information requests. This action does not include any revisions to the current PRA collection requirements; therefore, no review under the Paperwork Reduction Act is necessary.

7.7 COASTAL ZONE MANAGEMENT ACT (CZMA)

Section 307(c)(1) of the Coastal Zone Management Act (CZMA) of 1972, as amended, requires that all Federal activities that directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. The CZMA includes measures for ensuring stability of productive fishery habitat while striving to balance development pressures with social, economic, cultural, and other impacts on the coastal zone. It is recognized that responsible management of both coastal zones and fish stocks must involve mutually supportive goals. The Council has developed this action and will submit it to NMFS; NMFS must determine whether this action is consistent, to the maximum extent practicable, with the CZM programs for each state (Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina). Letters documenting NMFS' determination will be sent to the coastal zone management program offices of each state.

7.8 INFORMATION QUALITY ACT (IQA)

Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Public Law 106-554, also known as the Data Quality Act or Information Quality Act) directed the Office of Management and Budget (OMB) to issue government-wide guidelines that "provide policy and procedural guidance to federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by federal agencies." OMB directed each federal agency to issue its own guidelines, establish administrative mechanisms allowing affected persons to seek and obtain correction of information that does not comply with the OMB guidelines, and report periodically to OMB on the number and nature of complaints. The NOAA Section 515 Information Quality Guidelines require a series of actions for each new information product subject to the Data Quality Act. Information must meet standards of utility, integrity and objectivity. This section provides information required to address these requirements.

Utility of Information Product

Framework Adjustment 63 and the proposed 2022-2024 fishery specifications include: a description of the management issues to be addressed, statement of goals and objectives, a description of the proposed action and other alternatives/options considered, analyses of the impacts of the proposed specifications and other alternatives/options on the affected environment, and the reasons for selecting the preferred specifications. These proposed modifications implement the FMP's conservation and management goals consistent with the Magnuson-Stevens Fishery Conservation and Management Act as well as all other existing applicable laws.

Utility means that disseminated information is useful to its intended users. "Useful" means that the content of the information is helpful, beneficial, or serviceable to its intended users, or that the information supports the usefulness of other disseminated information by making it more accessible or easier to read, see, understand, obtain or use. The information presented in this document is helpful to the intended users (the affected public) by presenting a clear description of the purpose and need of the proposed action, the measures proposed, and the impacts of those measures. A discussion of the reasons for selecting the proposed action is included so that intended users may have a full understanding of the proposed action and its implications. The intended users of the information contained in this document are participants in the groundfish fishery and other interested parties and members of the general public. The information contained in this document may be useful to owners of vessels holding a groundfish permit as well as groundfish dealers and processors since it serves to notify these individuals of any potential changes to management measures for the fishery. This information will enable these individuals to adjust their fishing practices and make appropriate business decisions based on the new management measures and corresponding regulations.

The information being provided in the 2022-2024 specifications concerning the status of the groundfish fishery is updated based on landings and effort information through the 2020 and 2021 fishing years when possible. Information presented in this document is intended to support Framework Adjustment 63 and the proposed specifications for the 2022-2024 fishing years, which have been developed through a multi-stage process involving all interested members of the public. Consequently, the information pertaining to management measures contained in this document has been improved based on comments from the public, fishing industry, members of the Council, and NOAA Fisheries.

Until a proposed rule is prepared and published, this document is the principal means by which the information herein is publicly available. The information provided in this document is based on the most recent available information from the relevant data sources, including detailed and relatively recent information on the herring resource and, therefore, represents an improvement over previously available information. This document will be subject to public comment through proposed rulemaking, as required under the Administrative Procedure Act and, therefore, may be improved based on comments received.

This document is available in several formats, including printed publication, and online through the NEFMC's web page (www.nefmc.org). The *Federal Register* notice that announces the proposed rule and the final rule and implementing regulations will be made available in printed publication, on the website for the Greater Atlantic Regional Fisheries Office (www.greateratlantic.fisheries.noaa.gov), and through the Regulations.gov website. The *Federal Register* documents will provide metric conversions for all measurements.

Integrity of Information Product

Integrity refers to security – the protection of information from unauthorized access or revision, to ensure that the information is not compromised through corruption or falsification. Prior to dissemination, information associated with this action, independent of the specific intended distribution mechanism, is safeguarded from improper access, modification, or destruction, to a degree commensurate with the risk and magnitude of harm that could result from the loss, misuse, or unauthorized access to or modification of such information. All electronic information disseminated by NMFS adheres to the standards set out in Appendix III, "Security of Automated Information Resources," of OMB Circular A-130; the Computer Security Act; and the Government Information Security Act. All confidential information (e.g. dealer purchase reports) is safeguarded pursuant to the Privacy Act; Titles 13, 15, and 22 of the U.S. Code (confidentiality of census, business, and financial information); the Confidentiality of Statistics provisions of the Magnuson-Stevens Act; and NOAA Administrative Order 216-100, Protection of Confidential Fisheries Statistics.

Objectivity of Information Product

Objective information is presented in an accurate, clear, complete, and unbiased manner, and in proper context. The substance of the information is accurate, reliable, and unbiased; in the scientific, financial, or statistical context, original and supporting data are generated and the analytical results are developed using sound, commonly accepted scientific and research methods. "Accurate" means that information is within an acceptable degree of imprecision or error appropriate to the *kind* of information at issue and otherwise meets commonly accepted scientific, financial, and statistical standards.

For purposes of the Pre-Dissemination Review, this document is a "Natural Resource Plan." Accordingly, the document adheres to the published standards of the MSA; the Operational Guidelines, Fishery Management Plan Process; the Essential Fish Habitat Guidelines; the National Standard Guidelines; and NOAA Administrative Order 216-6, Environmental Review Procedures for Implementing NEPA.

This information product uses information of known quality from sources acceptable to the relevant scientific and technical communities. Stock status (including estimates of biomass and fishing mortality) reported in this product are based on either assessments subject to peer-review through the Stock Assessment Review Committee or on updates of those assessments prepared by scientists of the Northeast Fisheries Science Center. These update assessments were reviewed for TRAC by the Integrated Peer Review which included participation by independent stock assessment scientists. Landing and revenue information is based on information collected through the Vessel Trip Report and Commercial Dealer databases. Information on catch composition, by tow, is based on reports collected by the NOAA Fisheries Service observer program and incorporated into the sea sampling or observer database systems. These reports are developed using an approved, scientifically valid sampling process. In addition to these sources, additional information is presented that has been accepted and published in peer-reviewed journals or by scientific organizations. Original analyses in this document were prepared using data from accepted sources, and the analyses have been reviewed by members of the Groundfish Plan Development Team.

Despite current data limitations, the conservation and management measures proposed for this action were selected based upon the best scientific information available. The analyses conducted in support of the Preferred Alternative were conducted using information from the most recent complete calendar years, through 2020, and in some cases includes information that was collected during the first eight months of calendar year 2021. Complete data were not available for calendar year 2021. The data used in the analyses provide the best available information on the number of harvesters in the fishery, the catch (including landings and discards) by those harvesters, the sales and revenue of those landings to dealers, the type of permits held by vessels, the number of DAS used by those vessels, the catch of recreational fishermen and the location of those catches, and the catches and revenues from various special management programs. Specialists (including professional members of plan development teams, technical teams, committees, and Council staff) who worked with these data are familiar with the most current analytical techniques and with the available data and information relevant to the groundfish fishery.

The policy choices are clearly articulated, in Section 4.0 of this document, as the management alternatives considered in this action. The supporting science and analyses, upon which the policy choices are based, are summarized and described in Section 5.7.11 of this document. All supporting materials, information, data, and analyses within this document have been, to the maximum extent practicable, properly referenced according to commonly accepted standards for scientific literature to ensure transparency.

The Council review process involves public meetings at which affected stakeholders have opportunity to comment on the document. Review by staff at GARFO is conducted by those with expertise in fisheries management and policy, habitat conservation, protected species, and compliance with the applicable law. The Council also uses its SSC to review the background science and assessment to approve the Overfishing Limits (OFLs) and Allocable Biological Catch (ABCs), including the effects those limits would have on other specifications in this document. The SSC is the primary scientific and technical advisory body to the Council and is made up of scientists that are independent of the Council. A list of current committee members can be found at https://www.nefmc.org/committees/scientific-and-statistical-committee.

Final approval of the action proposed in this document and clearance of any rules prepared to implement resulting regulations is conducted by staff at NOAA Fisheries Service Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget. In preparing this action, NMFS, the Administrative Procedure Act, the Paperwork Reduction Act, the Coastal Zone Management Act, the Endangered Species Act, the Marine Mammal Protection Act, the Information Quality Act, and Executive Orders 12630 (Property Rights), 12866 (Regulatory Planning), 13132 (Federalism), and 13158 (Marine Protected Areas). The Council has determined that the proposed action is consistent with the National Standards of the MSA and all other applicable laws.

7.9 Executive Order 13158 (Marine Protected Areas)

Executive Order (EO) 13158 on Marine Protected Areas (MPAs) requires each federal agency whose actions affect the natural or cultural resources that are protected by an MPA to identify such actions, and, to the extent permitted by law and to the maximum extent practicable, in taking such actions, avoid harm to the natural and cultural resources that are protected by an MPA. The EO directs federal agencies to refer to the MPAs identified in a list of MPAs that meet the definition of MPA for the purposes of the EO. The EO requires that the Departments of Commerce and the Interior jointly publish and maintain such a list of MPAs. A list of MPA sites has been developed and is available at: http://marineprotectedareas.noaa.gov/nationalsystem/nationalsystemlist/. No further guidance related to this EO is available at this time.

In the Northeast U.S., the only MPAs are the Stellwagen Bank National Marine Sanctuary (SBNMS), the Tilefish Gear Restricted Areas in the canyons of Georges Bank, and the National Estuarine Research Reserves and other coastal sites. The only MPA that overlaps the groundfish fishery footprint is the SBNMS.

This action is not expected to more than minimally affect the biological/habitat resources of the SBNMS MPA, which was comprehensively analyzed in the Omnibus Habitat Amendment 2 (NEFMC 2016). Fishing gears regulated by the Northeast Multispecies FMP are unlikely to damage shipwrecks and other cultural artifacts because fishing vessel operators avoid contact with cultural resources on the seafloor to minimize costly gear losses and interruptions to fishing.

7.10 Executive Order 13132 (Federalism)

Executive Order 131321 on federalism established nine fundamental federalism principles for Federal agencies to follow when developing and implementing actions with federalism implications. However, no federalism issues or implications have been identified relative to the measures proposed in this action, thus preparation of an assessment under EO 13132 is unwarranted. The affected states have been closely involved in the development of the proposed action through their representation on the Council (all affected states are represented as voting members of at least one Regional Fishery Management Council). No comments were received from any state officials relative to any federalism implications that may be associated with this action.

7.11 Executive Order 12898 (Environmental Justice)

Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations provides guidelines to ensure that potential impacts on these populations are identified and mitigated, and that these populations can participate effectively in the NEPA process (EO 12898 1994). The NOAA NAO 216-6, at Section 7.02, states that “consideration of E.O. 12898 should be specifically included in the NEPA documents for decision-making purposes.” Agencies should also encourage public participation, especially by affected communities, during scoping, as part of a broader strategy to address environmental justice issues. Minority and low-income individuals or populations must not be excluded from participation in, denied the benefits of, or subjected to discrimination because of their race, color, or national origin.

Although the impacts of this action may affect communities with environmental justice concerns, the proposed actions should not have disproportionately high effects on low income or minority populations. The proposed actions would apply to all participants in the affected area, regardless of minority status or income level.

7.12 Regulatory Impact Review

This Regulatory Impact Review (RIR) is framed around the preferred alternatives for this action.

7.12.1 Regulatory Flexibility Act – Initial Regulatory Flexibility Analysis

The purpose of the Regulatory Flexibility Analysis (RFA) is to reduce the impacts of burdensome regulations and record-keeping requirements on small businesses. To achieve this goal, the RFA requires government agencies to describe and analyze the effects of regulations and possible alternatives on small business entities. Based on this information, the Regulatory Flexibility Analysis determines whether the preferred alternative would have a "significant economic impact on a substantial number of small entities."

The Chief Counsel for Regulation of the Department of Commerce certified to the Chief Counsel for Advocacy of the Small Business Administration (SBA) that this proposed rule, if adopted, would not have a significant economic impact on a substantial number of small entities.

Description and estimate of the number of small entities to which the rule applies

As of June 1, 2021, NMFS had issued 721 commercial limited-access groundfish permits associated with vessels (including those in confirmation of permit history, CPH), 649 party/charter groundfish permits, 705 limited access and general category Atlantic sea scallop permits, 734 small-mesh multispecies permits, 80 Atlantic herring permits, and 802 large-mesh non-groundfish permits (limited access summer flounder and scup permits). Therefore, 3,691 permits are potentially regulated by this action. When accounting for overlaps between fisheries, this number falls to 2,126 permitted vessels. Each vessel may be individually owned or part of a larger corporate ownership structure, and for RFA purposes, it is the ownership entity that is ultimately regulated by the proposed action. Ownership entities are identified on June 1st of each year based on the list of all permit numbers, for the most recent complete calendar year, that have applied for any type of Northeast Federal fishing permit. The current ownership data set is based on calendar year 2020 permits and contains gross sales associated with those permits for calendar years 2018 through 2020.

For RFA purposes only, NMFS has established a small business size standard for businesses, including their affiliates, whose primary industry is commercial fishing (see 50 CFR § 200.2). A business primarily engaged in commercial fishing (NAICS code 11411) is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and has combined annual receipts not in excess of $11 million for all its affiliated operations worldwide. The determination as to whether the entity is large or small is based on the average annual revenue for the three years from 2018 through 2020. The Small Business Administration (SBA) has established size standards for all other major industry sectors in the U.S., including for-hire fishing (NAICS code 487210). These entities are classified as small businesses if combined annual receipts are not in excess of $8.0 million for all its affiliated operations. As with commercial fishing businesses, the annual average of the three most recent years (2018-2020) is utilized in determining annual receipts for businesses primarily engaged in for-hire fishing.

Ownership data collected from permit holders indicates that there are 1,696 distinct business entities that hold at least one permit regulated by the proposed action. All 1,696 business entities identified could be directly regulated by this proposed action. Of these 1,696 entities, 976 are commercial fishing entities, 281 are for-hire entities, and 439 did not have revenues (were inactive in 2020). Of the 976 commercial fishing entities, 967 are categorized as small entities and 9 are categorized as large entities, per the NMFS guidelines. Furthermore, 579 of these commercial fishing entities held limited access groundfish permits, with 577 of these entities being classified as small businesses and 2 of these entities being classified as large businesses. All 281 for-hire entities are categorized as small businesses.

Summary of the Proposed Action and significant alternatives

As outlined in Section 3.0, the purpose of this action is to implement FW 63 to the Northeast Multispecies FMP. Framework 63 would revise groundfish fishery specifications for five groundfish stocks for fishing year 2022 (May 1, 2022, through April 30, 2023). Specifications for shared U.S./Canada groundfish stocks would also be updated for fishing year 2022. The recreational groundfish, Atlantic sea scallop, small-mesh multispecies, Atlantic herring, and large-mesh non-groundfish fisheries would be impacted by the setting of specifications and sub-allocations of various groundfish stocks including: GOM cod for the recreational groundfish fishery, GB yellowtail flounder for the Atlantic sea scallop fishery, GB yellowtail flounder for the small-mesh groundfish fishery, and GB haddock for the Atlantic herring midwater trawl fishery. FW 63 would revise the recreational catch target for GB cod and make changes to the default specifications process, increasing both the duration of the default specifications period and the percentage of the previous year's specifications that can be caught during the default period. Lastly, FW 63 would make changes to the recreational fishery measures for GB cod, modifying the slot limit, possession limit, and season for the stock, in addition to granting temporary authority to the regional administrator to adjust recreational measures for GB cod.

Description and estimate of economic impacts on small entities, by entity size and industry

The proposed action, under all the preferred alternatives in Section 4.0, is estimated to generate $51.9 million in sector revenue from the catch of Multispecies groundfish, $73.3 million in total revenue from all fish caught on sector groundfish trips, and $59.4 million in operating profit from sector groundfish trips during FY2022. Under No Action, estimated sector revenue from the catch of Multispecies groundfish is $55.1 million, revenue from all fish caught on sector groundfish trips is $75.5 million, and operating profit from sector groundfish trips is $59.7 million. As described above, the overwhelming majority of entities with limited access groundfish permits are classified as small business. Small entities engaged in the commercial sector groundfish fishery will therefore be negatively impacted by the proposed action, relative to No Action. However, the predicted revenues fall within the recent historical range, and the predicted decrease is not considered significant. The number of small entities that are significantly impacted is not substantial, and small entities will not be disproportionately impacted relative to large entities. Sectors comprised 99% of commercial groundfish landings and revenue in recent fishing years. Small entities engaged in the common pool component of the commercial groundfish fishery may also be negatively impacted by the proposed action. However, the direction of impacts to the common pool fleet are more uncertain than for the sector component of the groundfish fishery as GB cod, the stock with the greatest reduction in quota under FW 63, is harvested almost exclusively by sector vessels.

While the overall proposed action is predicted to result in negative impacts to the commercial groundfish fishery relative to No Action, the changes to the default specifications process does offer some potential positive impacts in FY2022 and beyond. The longer default specifications period, and increased default catch allowance, reduces the risk of the fishery being unable to operate in the event of framework implementation occurring after the start of the new fishing year. While the commercial groundfish fishery has never been shut down due to lack of specifications in place, there have been a few fishing years in which specifications were implemented shortly before the expiration date (see Table 59).

The proposed action also will impact the recreational groundfish fishery through a revised catch target for GB cod and revised management measures. These new measures are expected to decrease fishing opportunities and negatively impact small groundfish party/charter entities during FY2022, relative to No Action. In the long term, however, these measures are expected to promote rebuilding of the GB cod stock and allow for more fishing opportunities in the future.

For other fisheries (Atlantic herring, Atlantic sea scallop, small-mesh multispecies, and large-mesh non-groundfish), the proposed measures when compared to No Action have a range of impacts (see Section 7.12.2 for a summary of the economic impacts). The proposed action results in larger allocations to the sea scallop fishery for GB yellowtail flounder and the same allocation for southern windowpane flounder, northern windowpane flounder, and SNE/MA yellowtail flounder relative to No Action. Small entities engaged in the sea scallop fishery could be positively impacted by these changes if Accountability Measures (AMs) are less likely to be triggered or if behavioral modifications are less necessary to avoid exceeding the allocation. Projected catch of GB yellowtail flounder in the sea scallop fishery is 15-19mt for FY2022 (Scallop PDT memo to Groundfish PDT, 11/24/2021), meaning the sub-ACL of 19mt may be reached. However, per the AM policy adopted in groundfish FW47, AMs are only implemented if the scallop fishery exceeds its sub-ACL by 50 percent or more, or if the scallop fishery exceeds its sub-ACL and the overall ACL is also exceeded. Since utilization of GB yellowtail in the groundfish fishery has been low in recent years, neither of these conditions is expected for FY2022. The proposed action reduces the allocation of GOM haddock and GB haddock to the midwater trawl fishery. Utilization rates of both haddock stocks by the midwater trawl fishery has been low in recent years, and small entities participating in the midwater trawl fishery are not expected to be negatively impacted by the proposed action. The allocation of GB yellowtail flounder to the small-mesh multispecies fishery will be slightly increased under the proposed action, potentially positively impacting small entities participating in the fishery. The allocation of southern windowpane flounder to the large-mesh non-groundfish trawl fisheries would remain unchanged, at 177mt, under the proposed action. Based on recent catch data, catch of southern windowpane may exceed the sub-ACL, and AMs may be triggered. AMs would negatively impact small entities engaged in the large-mesh non-groundfish fisheries, though the likelihood of AMs being implemented are not increased (or decreased) by the proposed action, relative to No Action.

Summary and Conclusions

The purpose of this action is to implement FW 63 to the Northeast Multispecies FMP. Framework 63 would revise groundfish fishery specifications for fishing year 2022 (May 1, 2022, through April 30, 2023) for five groundfish stocks. The setting of specifications can potentially impact other fisheries in the region that have sub-ACLs for groundfish stocks. FW 63 would make changes to the default specifications process, extending the default specifications period to six months (ending October 31) and allowing catch of 75% of the previous year's ACL for groundfish stocks. Additionally, this action would modify recreational fishery measures for GB cod.

The proposed action is estimated to generate $51.9 million in sector revenue from the catch of Multispecies groundfish, $73.3 million in total revenue from all fish caught on sector groundfish trips, and $59.4 million in operating profit from sector groundfish trips during FY2022. Under No Action, estimated sector revenue from the catch of Multispecies groundfish is $55.1 million, revenue from all fish caught on sector groundfish trips is $75.5 million, and operating profit from sector groundfish trips is $59.7 million. Small entities engaged in the commercial sector groundfish fishery will therefore be negatively impacted by the proposed action, relative to No Action. Small entities engaged in common pool groundfish fishing may be negatively impacted by the proposed action as well. Likewise, small entities engaged in the recreational groundfish fishery are also likely to be negatively impacted. These negative impacts for both commercial and recreational groundfish entities are driven primarily by a substantial decline in the ACL for GB cod For FY2022. While this decline is expected to result in short-term negative impacts, decreased GB cod catch in FY2022 is expected to yield long-term positive impacts through stock rebuilding. Other commercial fisheries that have sub-ACLs for groundfish stocks (Atlantic sea scallop, Atlantic herring, small-mesh multispecies, large-mesh non-groundfish), are not expected to be negatively impacted by the proposed action.

7.12.2 E.O. 12866 (Regulatory Planning and Review)

<u>Determination of significance under E.O. 12866</u>

The purpose of E.O. 12866 is to enhance planning and coordination with respect to new and existing regulations. This E.O. requires the Office of Management and Budget (OMB) to review regulatory programs that are considered to be "significant." Section 7.12 of this document represents the RIR, which includes an assessment of the costs and benefits of the Proposed Action in accordance with the guidelines established by E.O. 12866. NMFS guidelines provide criteria to be used to evaluate whether a proposed action is significant.

E.O. 12866 requires a review of proposed regulations to determine whether or not the expected effects would be significant, where a "significant regulatory action" means any regulatory action that is likely to result in a rule that may:

(1) Have an annual effect on the economy of $100 million or more[43]*, or adversely effect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local or tribal governments or communities;*

(2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Section 6.5 presents detailed economic analyses for the proposed action alternatives. These analyses are summarized below, with references to relevant tables in Section 6.5. Together, the economic analysis included in Section 6.5 and this RIR demonstrate that the proposed action is not significant under E.O. 12866, as it will not have an annual effect on the economy of $100 million or more, or adversely affect in

[43] All monetary values are reported in 2020 dollars using the GDP deflator.

a material way the economy or a sector of the economy, productivity, jobs, the environment, public health, or safety, or State, local, or tribal governments or communities.

Objectives

The goals and objectives of Framework 63 to the Northeast Multispecies FMP are consistent with the goals of the original FMP, which are as follows:

Goal 1: *Consistent with the National Standards and other required provisions of the Magnuson-Stevens Fishery Conservation and Management Act and other applicable law, manage the northeast multispecies complex at sustainable levels.*

Goal 2: *Create a management system so that fleet capacity will be commensurate with resource status so as to achieve goals of economic efficiency and biological conservation and that encourages diversity within the fishery.*

Goal 3: *Maintain a directed commercial and recreational fishery for northeast multispecies.*

Goal 4: *Minimize, to the extent practicable, adverse impacts on fishing communities and shore-side infrastructure.*

Goal 5: *Provide reasonable and regulated access to the groundfish species covered in this plan to all members of the public of the United States for seafood consumption and recreational purposes during the stock rebuilding period without compromising the Amendment 13 objectives or timetable. If necessary, management measures could be modified in the future to insure that the overall plan objectives are met.*

Goal 6: *To promote stewardship within the fishery.*

Objective 1: *Achieve, on a continuing basis, optimum yield (OY) for the U.S. fishing industry.*

Objective 2: *Clarify the status determination criteria (biological reference points and control rules) for groundfish stocks so they are consistent with the National Standard guidelines and applicable law.*

Objective 3: *Adopt fishery management measures that constrain fishing mortality to levels that are compliant with the Sustainable Fisheries Act.*

Objective 4: *Implement rebuilding schedules for overfished stocks, and prevent overfishing.*

Objective 5: *Adopt measures as appropriate to support international trans-boundary management of resources.*

Objective 6: *Promote research and improve the collection of information to better understand groundfish population dynamics, biology and ecology, and to improve assessment procedures in cooperation with the industry.*

Objective 7: *To the extent possible, maintain a diverse groundfish fishery, including different gear types, vessel sizes, geographic locations, and levels of participation.*

Objective 8: *Develop biological, economic and social measures of success for the groundfish fishery and resource that insure accountability in achieving fishery management objectives.*

Objective 9: *Adopt measures consistent with the habitat provisions of the M-S Act, including identification of EFH and minimizing impacts on habitat to the extent practicable.*

Objective 10: *Identify and minimize bycatch, which include regulatory discards, to the extent practicable, and to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.*

Description

This Framework Adjustment will affect entities engaged in the following fisheries: commercial groundfish (sector and common pool), recreational groundfish, Atlantic sea scallop, small-mesh multispecies, Atlantic herring, and large-mesh non-groundfish (summer flounder and scup). Entities affected are defined here as individual permits engaged in these fisheries.

Problem Statement

The need and purpose of the actions proposed in this Framework Adjustment are explained in Section 3.2 of this document and are incorporated herein by reference.

Analysis of Alternatives

This section provides an analysis of each proposed alternative of FW63 as mandated by E.O. 12866. The focus will be on the expected changes 1) in net benefits and costs to entities engaged in the groundfish fishery, 2) changes to the distribution of benefits and costs within the industry, 3) changes in income and employment, 4) cumulative impacts of the regulation, and 5) changes in other social concerns. Much of this information is captured already in the detailed economic impacts and social impacts analyses of Section 6.5 and Section 6.6 of this document.

This RIR will summarize and highlight the major findings of the economic impacts analysis provided in Section 6.5 of this document, as mandated by E.O. 12866. When assessing net benefits and costs of the proposed FY2022 specifications, it is important to note that the analysis will focus on impacts to producers and fishing businesses. Consumer surplus is not expected to be substantially affected by any of the regulatory changes proposed in FW63.

Impacts on entities engaged in the sector and common pool components of the commercial groundfish fishery, the recreational groundfish fishery, the Atlantic sea scallop fishery, the Atlantic herring fishery, the small-mesh multispecies fishery and the large-mesh non-groundfish fisheries are analyzed separately where appropriate.

A detailed description of the alternatives under consideration can be found in Section 4.0 of this document.

Action #1: Revised Specifications

Preferred Alternative- Alternative 2: Revised Specifications

Preferred Alternative- Alternative 3: Recreational Catch Target for Georges Bank Cod
(Option 4- Revised Recreational GB Cod Catch Target Based on a Reduction from Recent Catches)

Preferred Alternative- Alternative 4: Changes to the Default Specifications Process
(Option 4- 6 months duration, 75% of the previous year's specifications, no holdback provision, and 2-year US/CA TACs)

Entities engaged in the sector component of the commercial groundfish fishery

Under the preferred alternatives for specifications and the GB cod catch target, predicted sector groundfish revenues for FY2022 are $51.9M. This represents an increase of $4.0M relative to revised specifications and no change to the GB cod recreational catch target. However, relative to No Action specifications, sector groundfish revenues are predicted to decrease by $3.2 million.

Under the preferred alternatives, predicted operating profit is $59.4M, an increase of $4.4 million relative to revised specifications and no change to the GB cod recreational catch target. Relative to No Action specifications, the preferred alternatives result in a slight reduction in operating profit ($59.7M under No Action). Due to the increasing trend in fuel prices (Figure 36), operating profits for FY2022 may be overestimated. Furthermore, predicted quota costs for FY2022 under the preferred alternatives, are lower than both predicted and realized values from FY2017-2019 (Table 80). An increase in quota prices to pre-FY2020 levels could further lead to an overestimation of operating profits. The possibility of costs being underestimated should be consistent across prediction scenarios. The same fuel and quota prices are applied throughout the analyses and should not bias the results in favor of any particular alternative.

By vessel length (Table 89), larger vessels are predicted to be most substantially impacted by the preferred alternatives, due to their relative reliance on GB cod. Vessels in the 75'+ size class are predicted to generate $24.9M in groundfish revenue, compared to $28.5M under No Action. Smaller vessels, in the 30' to <50' size class may experience some slight positive impacts, with predicted revenue under the preferred alternatives of $9.3M, relative to $9.1M under No Action.

The changes to the default specifications process offers some potential positive impacts to the sector groundfish fishery in FY2022 and beyond. The longer default specifications period, and increased default catch allowance, reduces the risk of the fishery being unable to operate in the event of framework implementation occurring after the start of the new fishing year.

Entities engaged in the common pool component of the commercial groundfish fishery

The preferred alternatives would result in the following non-sector sub-ACL changes in FY2022 relative to FY2021: GB cod would decrease by 37 mt, GOM cod would decrease by 0.2 mt, GB haddock would decrease by 41 mt, GOM haddock would decrease by 81 mt, GB yellowtail flounder would increase by 2.7 mt, and pollock would decrease by 46 mt. All other stocks would remain the same as FY 2021. Under No Action/Alternative 1, for Eastern GB cod and Eastern GB haddock, default specifications would be in effect from May 1, 2022, to July 31, 2022, and would equal 35% of the FY2021 catch limits. After July 31st, quotas would go to 0.

In recent years, common pool catches of GB cod have been ~2-3 mt, though in FY2018 catches were around 6 mt (three-year average from FY2018-FY2020 of ~3.8 mt) (Table 42). The large decline in the FY2021 GB cod sub-ACL (48 mt) to that for FY2022 (11 mt) will have potentially negative impacts on the common pool fishery, since catches could approach the sub-ACL. Common pool catches in the eastern GB area have been less than 0.1 mt in recent years (Table 42).

Entities engaged in the recreational groundfish fishery

Impacts on the recreational groundfish fishery would be negative under the preferred alternatives, as the state-waters and "other" sub-component for GB cod would be reduced relative to No Action. Groundfish party/charter vessels that have historically targeted GB cod will likely have reduced opportunities to do so in FY2022.

Entities engaged in the Atlantic sea scallop fishery

Under the preferred alternatives, the following sub-ACLs would be allocated to the scallop fishery during FY2022: 19 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. The FY2022 sub-ACL for SNE/MA yellowtail, GOM/GB windowpane flounder, and SNE/MA windowpane flounder would be unchanged from FY2021 levels conferring neutral economic impacts for the scallop fishery relative to FY2021.

The sub-ACL for GB yellowtail flounder would increase by 58% relative to No Action (increasing from 12 mt to 19 mt), potentially having positive economic impacts to the scallop fishery. FY2022 projected catch by the scallop fishery is estimated to be 15-19 mt (see Scallop PDT memo). However, this is not high enough to trigger an AM under the No Action sub-ACL (>50% of the sub-ACL). It is unlikely that the total ACL would be exceeded for this stock since total utilization of the ACL has been very low in recent years. Overall economic impacts for the scallop fishery are neutral to positive for GB yellowtail flounder under the preferred alternatives compared to No Action.

Entities engaged in the midwater trawl directed Atlantic herring fishery

The preferred alternatives will have negative changes in sub-ACL values, with the GB haddock sub-ACL decreasing by 2% between FY2021 and FY2022 (from 1,539 mt to 1,514 mt), and GOM haddock decreasing by 31% (from 156 mt to 107mt). Impacts are expected to be neutral relative to No Action given recent low catches of both haddock stocks. GB haddock catches by the herring fishery have been low in recent years - 0.2 mt in FY 2019 and 10 mt in FY 2020 due to lower herring ACLs (Table 58). If trends continue, decreases in the GB haddock sub-ACL are unlikely to confer negative economic impacts in FY2022 and beyond, either with respect to status quo or Alternative 2 sub-ACLs. In FY 2019 and FY 2020 GOM haddock catch by the midwater trawl herring fishery was approximately 0.1 mt (Table 56), so unless effort shifts considerably, neutral economic impacts would be expected. Atlantic herring quotas for 2020 and 2021 were substantially lower than in prior years (NEFMC, Atlantic Herring FW6).

Entities engaged in the small-mesh multispecies fishery

Under the preferred alternatives, the sub-ACL for GB yellowtail flounder for the small mesh fisheries would increase from FY 2021 levels, from 1.5 mt to 2.3 mt in FY 2022. This is expected to have neutral to positive economic impacts on the small mesh fishery since catches in recent years have been low (0 mt in FY2019), though they were slightly higher in FY2020 at 1.8 mt (Table 56). If effort in FY2022 remains similar to that in FY2020, this sub-ACL will potentially be less constraining for the fishery than that under No Action, as catches of 1.8 mt would exceed the No Action sub-ACL of 1.5 mt, triggering the AMs, but not the sub-ACL of 2.3 mt under Alternative 2. Overall economic impacts are expected to be neutral to positive both in respect to status quo and with respect to Alternative 1/No Action.

Entities engaged in the large-mesh non-groundfish trawl fisheries (included within the 'other' sub-component)

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 the preferred alternatives, the other sub-component would remain at the FY 2021 levels of 177 mt in FY2022. If bycatch of southern windowpane flounder is low in FY2022, there would be neutral economic impacts of the sub-ACL under Alternative 2 compared to FY2021. However, if bycatch of southern windowpane flounder is in line with recent fishery performance, AMs may be triggered. Relative to No Action, impacts will be neutral, as the sub-ACL would be 177mt under either alternative.

The AM for southern windowpane for large-mesh non- groundfish fisheries is implemented if the large-mesh non-groundfish fishery exceeds its sub-ACL (evaluated using the "other sub-component"), and if the total ACL is exceeded by more than the management uncertainty buffer (currently set at approximately 5%).

Based on recent catches (Table 90), the other sub-component of 177mt is likely to be exceeded. From FY2016-FY2020, annual catches of S. Windowpane by large-mesh non-groundfish fisheries ranged from 178.1 - 243.6mt. The total ACL for S. Windowpane under No Action would be 371mt. Based on recent catches (Table 91), this number may be exceeded in FY2022. From FY2016-FY2020, total annual catches of S. Windowpane ranged from 335.6 - 454.7mt.

Action #2: Recreational Fishery Measures- Georges Bank Cod

Preferred Alternative- Alternative 2: Temporary Administrative Measure to Allow the Regional Administrator Authority to Adjust the Recreational Measures for Georges Bank Cod

Preferred Alternative- Alternative 3: Recreational Measures for Georges Bank Cod
(Option 1- Recreational measures to reduce mortality from recent catches (CY2018-2020 by 63%)

Entities engaged in the commercial groundfish fishery

The preferred alternatives are expected to positively impact groundfish commercial fishery participants. The modification of recreational measures for GB cod will help constrain catch of the stock. These measures will help promote rebuilding of the stock, benefitting the commercial fishery in the long-term. Furthermore, granting the Regional Administrator the authority to make changes to the recreational measures in-season will increase the likelihood of constraining catch to the recreational catch target.

Entities engaged in the recreational groundfish fishery

The preferred alternatives are expected to negatively impact the recreational groundfish fishery. More restrictive measures on GB cod are expected to limit recreational fishing revenue and private angler benefits in FY2022. Option 3 for Recreational Measures for Georges Bank Cod is predicted to yield more fishing opportunities for recreational groundfish participants. However, that Option is also less likely to constrain catch to the recreational catch target and promote stock rebuilding. The measures in this action are expected to increase the likelihood of stock rebuilding, offering potentially long-term benefits to the recreational fishery.

Summary of expected economic impacts from implementation of FW63 proposed action

The Proposed Action for Framework 63 includes: 1) Revised specifications for five groundfish stocks for fishing year 2022; 2) Revised recreational catch target for Georges Bank Cod for fishing year 2022; 3) Changes to the default specifications process; 4) Granting of temporary authority to allow the Regional Administrator to adjust the recreational measures for Georges Bank cod; and 5) Changes to the recreational measures for Georges Band cod for fishing year 2022.

The regulations proposed in FW63 are expected to have a negative impact on gross revenues and operating profits for entities engaged in the commercial sector groundfish fishery relative to No Action. Predicted sector groundfish revenue under the revised specifications for FY2022 is $51.9 million. Under No Action, predicted sector groundfish revenue is $55.1 million. Compared to the 2020 fishing year, gross revenues in FY2022 are expected to be negatively impacted as well; realized sector groundfish revenue was $54.2 million in FY2020. For common pool vessels, which comprise a very small portion of groundfish revenue, the proposed action may also yield negative impacts relative to No Action.

Economic impacts on entities engaged in the recreational groundfish are also expected to be negative. Management measures for GB cod in FY2022 would be stricter than in previous years. These measures are expected to decrease revenues for party/charter vessels that have traditionally targeted GB cod.

Economic impacts on entities engaged in the Atlantic sea scallop, Atlantic herring, small-mesh multispecies, large-mesh non-groundfish fisheries, are expected to generally be neutral to positive, driven by the directionality of changes in sub-ACLs for incidentally caught groundfish stocks. The proposed action results in a larger sub-allocation for one groundfish stocks for the sea scallop fishery. The Atlantic herring and small-mesh multispecies fisheries are not expected to be adversely impacted by the FW63 proposed alternatives. Lastly, the large-mesh non-groundfish fisheries would have an unchanged allocation of southern windowpane flounder, relative to No Action.

If implemented, the proposed action is predicted to generate $73.3 million in gross revenues for the sector portion of the commercial groundfish trips, compared to $75.5 million under No Action. Fishery-wide operating profits are predicted to be slightly lower ($0.3 million) under the proposed action relative to No Action.

Determination of Significance

The proposed action does not constitute a significant regulatory action under EO 12866 for the following reasons: the proposed action will not have an annual effect on the economy of more than $100 million. Adverse impacts on fisherman and fishing businesses, ports, recreational anglers, and operators of party/charter businesses are not expected to be substantial.

In addition, there should be no interactions with activities of other agencies and no impacts on entitlements, grants, user fees, or loan programs. The proposed action does not raise novel legal or policy issues. As such, the Proposed Action is not considered significant as defined by EO 12866.

8.0 GLOSSARY

Adult stage: One of several marked phases or periods in the development and growth of many animals. In vertebrates, the life history stage where the animal is capable of reproducing, as opposed to the juvenile stage.

Adverse effect: Any impact that reduces quality and/or quantity of EFH. May include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include sites-specific of habitat wide impacts, including individual, cumulative, or synergistic consequences of actions.

Aggregation: A group of animals or plants occurring together in a particular location or region.

Anadromous species: fish that spawn in fresh or estuarine waters and migrate to ocean waters

Amphipods: A small crustacean of the order Amphipoda, such as the beach flea, having a laterally compressed body with no carapace.

Anaerobic sediment: Sediment characterized by the absence of free oxygen.

Anemones: Any of numerous flowerlike marine coelenterates of the class Anthozoa, having a flexible cylindrical body and tentacles surrounding a central mouth.

Annual Catch Entitlement (ACE): Pounds of available catch that can be harvested by a particular sector. Based on the total PSC for the permits that join the sector.

Annual total mortality: Rate of death expressed as the fraction of a cohort dying over a period compared to the number alive at the beginning of the period (# total deaths during year / numbers alive at the beginning of the year). Optimists convert death rates into annual survival rate using the relationship S=1-A.

ASPIC (A Surplus Production Model Incorporating Covariates): A non-equilibrium surplus production model developed by Prager (1995). ASPIC was frequently used by the Overfishing Definition Panel to define BMSY and FMSY reference points. The model output was also used to estimate rebuilding timeframes for the Amendment 9 control rules.

Bay: An inlet of the sea or other body of water usually smaller than a gulf; a small body of water set off from the main body; e.g. Ipswich Bay in the Gulf of Maine.

Benthic community: Benthic means the bottom habitat of the ocean, and can mean anything as shallow as a salt marsh or the intertidal zone, to areas of the bottom that are several miles deep in the ocean. Benthic community refers to those organisms that live in and on the bottom. (In meaning they live within the substrate; e.g., within the sand or mud found on the bottom. See Benthic infauna, below)

Benthic infauna: See Benthic community, above. Those organisms that live in the bottom sediments (sand, mud, gravel, etc.) of the ocean. As opposed to benthic epifauna, that live on the surface of the bottom sediments.

Benthivore: Usually refers to fish that feed on benthic or bottom dwelling organisms.

Berm: A narrow ledge typically at the top or bottom of a slope; e.g. a berm paralleling the shoreline caused by wave action on a sloping beach; also an elongated mound or wall of earth.

Biogenic habitats: Ocean habitats whose physical structure is created or produced by the animals themselves; e.g., coral reefs.

Biomass: The total mass of living matter in a given unit area or the weight of a fish stock or portion thereof. Biomass can be listed for beginning of year (Jan-1), Mid-Year, or mean (average during the entire year). In addition, biomass can be listed by age group (numbers at age * average weight at age) or summarized by groupings (e.g., age 1+, ages 4+ 5, etc.). See also spawning stock biomass, exploitable biomass, and mean biomass.

BMSY: The stock biomass that would produce MSY when fished at a fishing mortality rate equal to FMSY. For most stocks, BMSY is about ½ of the carrying capacity. The proposed overfishing definition control rules call for action when biomass is below ¼ or ½ BMSY, depending on the species.

Bthreshold: 1) A limit reference point for biomass that defines an unacceptably low biomass i.e., puts a stock at high risk (recruitment failure, depensation, collapse, reduced long term yields, etc.). 2) A biomass threshold that the SFA requires for defining when a stock is overfished. A stock is overfished if its biomass is below Bthreshold. A determination of overfished triggers the SFA requirement for a rebuilding plan to achieve Btarget as soon as possible, usually not to exceed 10 years except certain requirements are met. In Amendment 9 control rules, Bthreshold is often defined as either 1/2BMSY or 1/4 BMSY. Bthreshold is also known as Bminimum.

Btarget: A desirable biomass to maintain fishery stocks. This is usually synonymous with BMSY or its proxy.

Biomass weighted F: A measure of fishing mortality that is defined as an average of fishing mortality at age weighted by biomass at age for a ranges of ages within the stock (e.g., ages 1+ biomass weighted F is a weighted average of the mortality for ages 1 and older, age 3+ biomass weighted is a weighted average for ages 3 and older). Biomass weighted F can also be calculated using catch in weight over mean biomass. See also fully-recruited F.

Biota: All the plant and animal life of a particular region.

Bivalve: A class of mollusks having a soft body with platelike gills enclosed within two shells hinged together; e.g., clams, mussels.

Bottom roughness: The inequalities, ridges, or projections on the surface of the seabed that are caused by the presence of bedforms, sedimentary structures, sedimentary particles, excavations, attached and unattached organisms, or other objects; generally small scale features.

Bottom tending mobile gear: All fishing gear that operates on or near the ocean bottom that is actively worked in order to capture fish or other marine species. Some examples of bottom tending mobile gear are otter trawls and dredges.

Bottom tending static gear: All fishing gear that operates on or near the ocean bottom that I snot actively worked; instead, the effectiveness of this gear depends on species moving to the gear which is set in a particular manner by a vessel, and later retrieved. Some examples of bottom tending static gear are gillnets, traps, and pots.

Boulder reef: An elongated feature (a chain) of rocks (generally piled boulders) on the seabed.

Bryozoans: Phylum aquatic organisms, living for the most part in colonies of interconnected individuals. A few to many millions of these individuals may form one colony. Some bryozoans encrust rocky surfaces, shells, or algae others form lacy or fan-like colonies that in some regions may form an abundant component of limestones. Bryozoan colonies range from millimeters to meters in size, but the individuals that make up the colonies are rarely larger than a millimeter. Colonies may be mistaken for hydroids, corals or seaweed.

Burrow: A hole or excavation in the sea floor made by an animal (as a crab, lobster, fish, burrowing anemone) for shelter and habitation.

Bycatch: (v.) the capture of nontarget species in directed fisheries which occurs because fishing gear and methods are not selective enough to catch only target species; (n.) fish which are harvested in a fishery but are not sold or kept for personal use, including economic discards and regulatory discards but not fish released alive under a recreational catch and release fishery management program.

Capacity: the level of output a fishing fleet is able to produce given specified conditions and constraints. Maximum fishing capacity results when all fishing capital is applied over the maximum amount of available (or permitted) fishing time, assuming that all variable inputs are utilized efficiently.

Catch: The sum total of fish killed in a fishery in a given period. Catch is given in either weight or number of fish and may include landings, unreported landings, discards, and incidental deaths.

Closed Area Model: A General Algebraic Modeling System (GAMS) model used to evaluate the effectiveness of effort controls used in the Northeast Multispecies Fishery. Using catch data from vessels in the fishery, the model estimates changes in exploitation that may result from changes in DAS, closed areas, and possession limits. These changes in exploitation are then converted to changes in fishing mortality to evaluate proposed measures.

Coarse sediment: Sediment generally of the sand and gravel classes; not sediment composed primarily of mud; but the meaning depends on the context, e.g. within the mud class, silt is coarser than clay.

Commensalism: See Mutualism. An interactive association of two species where one benefits in some way, while the other species is in no way affected by the association.

Continental shelf waters: The waters overlying the continental shelf, which extends seaward from the shoreline and deepens gradually to the point where the sea floor begins a slightly steeper descent to the deep ocean floor; the depth of the shelf edge varies, but is approximately 200 meters in many regions.

Control rule: A pre-determined method for determining fishing mortality rates based on the relationship of current stock biomass to a biomass target. Amendment 9 overfishing control rules define a target biomass (BMSY or proxy) as a management objective. The biomass threshold (Bthreshold or Bmin) defines a minimum biomass below which a stock is considered overfished.

Cohort: see yearclass.

Crustaceans: Invertebrates characterized by a hard outer shell and jointed appendages and bodies. They usually live in water and breathe through gills. Higher forms of this class include lobsters, shrimp and crawfish; lower forms include barnacles.

Days absent: an estimate by port agents of trip length. This data was collected as part of the NMFS weighout system prior to May 1, 1994.

Days-at-sea (DAS): the total days, including steaming time that a boat spends at sea to fish. Amendment 13 categorized DAS for the multispecies fishery into three categories, based on each individual vessel's fishing history during the period fishing year 1996 through 2001. The three categories are: Category A: can be used to target any groundfish stock; Category B: can only be used to target healthy stocks; Category C: cannot be used until some point in the future. Category B DAS are further divided equally into Category B (regular) and Category B (reserve).

DAS "flip": A practice in the Multispecies FMP that occurs when a vessel fishing on a Category B (regular) DAS must change ("flip") its DAS to a Category A DAS because it has exceeded a catch limit for a stock of concern.

Demersal species: Most often refers to fish that live on or near the ocean bottom. They are often called benthic fish, groundfish, or bottom fish.

Diatoms: Small mobile plants (algæ) with silicified (silica, sand, quartz) skeletons. They are among the most abundant phytoplankton in cold waters, and an important part of the food chain.

Discards: animals returned to sea after being caught; see Bycatch (n.)

Dissolved nutrients: Non-solid nutrients found in a liquid.

Echinoderms: A member of the Phylum Echinodermata. Marine animals usually characterized by a five-fold symmetry, and possessing an internal skeleton of calcite plates, and a complex water vascular system. Includes echinoids (sea urchins), crinoids (sea lillies) and asteroids (starfish).

Ecosystem-based management: a management approach that takes major ecosystem components and services—both structural and functional—into account, often with a multispecies or habitat perspective

Egg stage: One of several marked phases or periods in the development and growth of many animals. The life history stage of an animal that occurs after reproduction and refers to the developing embryo, its food store, and sometimes jelly or albumen, all surrounded by an outer shell or membrane. Occurs before the larval or juvenile stage.

Elasmobranch: Any of numerous fishes of the class Chondrichthyes characterized by a cartilaginous skeleton and placoid scales: sharks; rays; skates.

Embayment: A bay or an indentation in a coastline resembling a bay.

Emergent epifauna: See Epifauna. Animals living upon the bottom that extend a certain distance above the surface.

Epifauna: See Benthic infauna. Epifauna are animals that live on the surface of the substrate, and are often associated with surface structures such as rocks, shells, vegetation, or colonies of other animals.

Essential Fish Habitat (EFH): Those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. The EFH designation for most managed species in this region is based on a legal text definition and geographical area that are described in the Habitat Omnibus Amendment (1998).

Estuarine area: The area of an estuary and its margins; an area characterized by environments resulting from the mixing of river and sea water.

Estuary: A water passage where the tide meets a river current; especially an arm of the sea at the lower end of a river; characterized by an environment where the mixing of river and seawater causes marked variations in salinity and temperature in a relatively small area.

Eutrophication: A set of physical, chemical, and biological changes brought about when excessive nutrients are released into the water.

Euphotic zone: The zone in the water column where at least 1% of the incident light at the surface penetrates.

Exclusive Economic Zone (EEZ): a zone in which the inner boundary is a line coterminous with the seaward boundary of each of the coastal States and the outer boundary is line 200 miles away and parallel to the inner boundary

Exempt fisheries: Any fishery determined by the Regional Director to have less than 5 percent regulated species as a bycatch (by weight) of total catch according to 50 CFR 648.80(a)(7).

Exploitable biomass: The biomass of fish in the portion of the population that is vulnerable to fishing.

Exploitation pattern: Describes the fishing mortality at age as a proportion of fully recruited F (full vulnerability to the fishery). Ages that are fully vulnerable experience 100% of the fully recruited F and are termed fully recruited. Ages that are only partially vulnerable experience a fraction of the fully recruited F and are termed partially recruited. Ages that are not vulnerable to the fishery (including discards) experience no mortality and are considered pre-recruits. Also known as the partial recruitment pattern, partial recruitment vector or fishery selectivity.

Exploitation rate (u): The fraction of fish in the exploitable population killed during the year by fishing. This is an annual rate compared to F, which is an instantaneous rate. For example, if a population has 1,000,000 fish large enough to be caught and 550,000 are caught (landed and discarded) then the exploitation rate is 55%.

Fathom: A measure of length, containing six feet; the space to which a man can extend his arms; used chiefly in measuring cables, cordage, and the depth of navigable water by soundings.

Fishing mortality (F): A measurement of the rate of removal of fish from a population caused by fishing. This is usually expressed as an instantaneous rate (F) and is the rate at which fish are harvested at any given point in a year. Instantaneous fishing mortality rates can be either fully recruited or biomass weighted. Fishing mortality can also be expressed as an exploitation rate (see exploitation rate) or less commonly, as a conditional rate of fishing mortality (m, fraction of fish removed during the year if no other competing sources of mortality occurred. Lower case m should not be confused with upper case M, the instantaneous rate of natural mortality).

F0.1: a conservative fishing mortality rate calculated as the F associated with 10 percent of the slope at origin of the yield-per-recruit curve.

FMAX: a fishing mortality rate that maximizes yield per recruit. FMAX is less conservative than F0.1.

FMSY: a fishing mortality rate that would produce MSY when the stock biomass is sufficient for producing MSY on a continuing basis.

Fthreshold: 1) The maximum fishing mortality rate allowed on a stock and used to define overfishing for status determination. Amendment 9 frequently uses FMSY or FMSY proxy for Fthreshold. 2) The maximum fishing mortality rate allowed for a given biomass as defined by a control rule.

Fishing effort: the amount of time and fishing power used to harvest fish. Fishing power is a function of gear size, boat size and horsepower.

Framework adjustments: adjustments within a range of measures previously specified in a fishery management plan (FMP). A change usually can be made more quickly and easily by a framework adjustment than through an amendment. For plans developed by the New England Council, the procedure requires at least two Council meetings including at least one public hearing and an evaluation of environmental impacts not already analyzed as part of the FMP.

Furrow: A trench in the earth made by a plow; something that resembles the track of a plow, as a marked narrow depression; a groove with raised edges.

Glacial moraine: A sedimentary feature deposited from glacial ice; characteristically composed of unsorted clay, sand, and gravel. Moraines typically are hummocky or ridge-shaped and are located along the sides and at the fronts of glaciers.

Glacial till: Unsorted sediment (clay, sand, and gravel mixtures) deposited from glacial ice.

Grain size: the size of individual sediment particles that form a sediment deposit; particles are separated into size classes (e.g. very fine sand, fine sand, medium sand, among others); the classes are combined into broader categories of mud, sand, and gravel; a sediment deposit can be composed of few to many different grain sizes.

Growth overfishing: Fishing at an exploitation rate or at an age at entry that reduces potential yields from a cohort but does not reduce reproductive output (see recruitment overfishing).

Halocline: The zone of the ocean in which salinity increases rapidly with depth.

Habitat complexity: Describes or measures a habitat in terms of the variability of its characteristics and its functions, which can be biological, geological, or physical in nature. Refers to how complex the physical structure of the habitat is. A bottom habitat with structure-forming organisms, along with other three dimensional objects such as boulders, is more complex than a flat, featureless, bottom.

Highly migratory species: tuna species, marlin, oceanic sharks, sailfishes, and swordfish

Hydroids: Generally, animals of the Phylum Cnidaria, Class Hydrozoa; most hydroids are bush- like polyps growing on the bottom and feed on plankton, they reproduce asexually and sexually.

Immobile epifaunal species: See epifauna. Animals living on the surface of the bottom substrate that, for the most part, remain in one place.

Individual Fishing Quota (IFQ): federal permit under a limited access system to harvest a quantity of fish, expressed by a unit or units representing a percentage of the total allowable catch of a fishery that may be received or held for exclusive use by an individual person or entity

Juvenile stage: One of several marked phases or periods in the development and growth of many animals. The life history stage of an animal that comes between the egg or larval stage and the adult stage; juveniles are considered immature in the sense that they are not yet capable of reproducing, yet they differ from the larval stage because they look like smaller versions of the adults.

Landings: The portion of the catch that is harvested for personal use or sold.

Land runoff: The part of precipitation, snowmelt, or irrigation water that reaches streams (and thence the sea) by flowing over the ground, or the portion of rain or snow that does not percolate into the ground and is discharged into streams instead.

Larvae stage: One of several marked phases or periods in the development and growth of many animals. The first stage of development after hatching from the egg for many fish and invertebrates. This life stage looks fundamentally different than the juvenile and adult stages, and is incapable of reproduction; it must undergo metamorphosis into the juvenile or adult shape or form.

Lethrinids: Fish of the genus Lethrinus, commonly called emperors or nor'west snapper, are found mainly in Australia's northern tropical waters. Distinctive features of Lethrinids include thick lips, robust canine teeth at the front of the jaws, molar-like teeth at the side of the jaws and cheeks without scales. Lethrinids are carnivorous bottom-feeding fish with large, strong jaws.

Limited-access permits: permits issued to vessels that met certain qualification criteria by a specified date (the "control date").

Lutjanids: Fish of the genus of the Lutjanidae: snappers. Marine; rarely estuarine. Some species do enter freshwater for feeding. Tropical and subtropical: Atlantic, Indian and Pacific Oceans.

Macrobenthos: See Benthic community and Benthic infauna. Benthic organisms whose shortest dimension is greater than or equal to 0.5 mm.

Maturity ogive: A mathematical model used to describe the proportion mature at age for the entire population. A50 is the age where 50% of the fish are mature.

Mean biomass: The average number of fish within an age group alive during a year multiplied by average weight at age of that age group. The average number of fish during the year is a function of starting stock size and mortality rate occurring during the year. Mean biomass can be aggregated over several ages to describe mean biomass for the stock. For example the mean biomass summed for ages 1 and over is the 1+ mean biomass; mean biomass summed across ages 3 and over is 3+ mean biomass.

Megafaunal species: The component of the fauna of a region that comprises the larger animals, sometimes defined as those weighing more than 100 pounds.

Mesh selectivity ogive: A mathematical model used to describe the selectivity of a mesh size (proportion of fish at a specific length retained by mesh) for the entire population. L25 is the length where 25% of the fish encountered are retained by the mesh. L50 is the length where 50% of the fish encountered are retained by the mesh.

Meter: A measure of length, equal to 39.37 English inches, the standard of linear measure in the metric system of weights and measures. It was intended to be, and is very nearly, the ten millionth part of the distance from the equator to the north pole, as ascertained by actual measurement of an arc of a meridian.

Metric ton: A unit of weight equal to a thousand kilograms (1kgs = 2.2 lbs.). A metric ton is equivalent to 2,205 lbs. A thousand metric tons is equivalent to 2.2 million lbs.

Microalgal: Small microscopic types of algae such as the green algae.

Microbial: Microbial means of or relating to microorganisms.

Minimum spawning stock threshold: the minimum spawning stock size (or biomass) below which there is a significantly lower chance that the stock will produce enough new fish to sustain itself over the long term.

Mobile organisms: organisms that are not confined or attached to one area or place, that can move on their own, are capable of movement, or are moved (often passively) by the action of the physical environment (waves, currents, etc.).

Molluscs: Common term for animals of the phylum Mollusca. Includes groups such as the bivalves (mussels, oysters etc.), cephalopods (squid, octopus etc.) and gastropods (abalone, snails). Over 80,000 species in total with fossils back to the Cambrian period.

Mortality: see Annual total mortality (A), Exploitation rate (u), Fishing mortality (F), Natural mortality (M), and instantaneous total mortality (Z).

Motile: Capable of self-propelled movement. A term that is sometimes used to distinguish between certain types of organisms found in water.

Multispecies: the group of species managed under the Northeast Multispecies Fishery Management Plan. This group includes whiting, red hake and ocean pout plus the regulated species (cod, haddock, pollock, yellowtail flounder, winter flounder, witch flounder, American plaice, windowpane flounder, white hake and redfish).

Mutualism: See Commensalism. A symbiotic interaction between two species in which both derive some benefit.

Natural disturbance: A change caused by natural processes; e.g. in the case of the seabed, changes can be caused by the removal or deposition of sediment by currents; such natural processes can be common or rare at a particular site.

Natural mortality: A measurement of the rate of death from all causes other than fishing such as predation, disease, starvation, and pollution. Commonly expressed as an instantaneous rate (M). The rate of natural mortality varies from species to species, but is assumed to be M=0.2 for the five critical stocks. The natural mortality rate can also be expressed as a conditional rate (termed n and not additive with competing sources of mortality such as fishing) or as annual expectation of natural death (termed v and additive with other annual expectations of death).

Nearshore area: The area extending outward an indefinite but usually short distance from shore; an area commonly affected by tides and tidal and storm currents, and shoreline processes.

Nematodes: a group of elongated, cylindrical worms belonging to the phylum Nematoidea, also called thread-worms or eel-worms. Some non-marine species attack roots or leaves of plants, others are parasites on animals or insects.

Nemerteans: Proboscis worms belonging to the phylum Nemertea, and are soft unsegmented marine worms that have a threadlike proboscis and the ability to stretch and contract.

Nemipterids: Fishes of the Family Nemipteridae, the threadfin breams or whiptail breams. Distribution: Tropical and sub-tropical Indo-West Pacific.

Northeast Shelf Ecosystem: The Northeast U.S. Shelf Ecosystem has been described as including the area from the Gulf of Maine south to Cape Hatteras, extending from the coast seaward to the edge of the continental shelf, including the slope sea offshore to the Gulf Stream.

Northwest Atlantic Analysis Area (NAAA): A spatial area developed for analysis purposes only. The boundaries of this the area are within the 500 fathom line to the east, the coastline to the west, the Hague line to the north, and the North Carolina/ South Carolina border to the south. The area is approximately 83,550 square nautical miles, and is used as the denominator in the EFH analysis to determine the percent of sediment, EFH, and biomass contained in an area, as compared to the total NAAA.

Nutrient budgets: An accounting of nutrient inputs to and production by a defined ecosystem (e.g., salt marsh, estuary) versus utilization within and export from the ecosystem.

Observer: any person required or authorized to be carried on a vessel for conservation and management purposes by regulations or permits under this Act

Oligochaetes: See Polychaetes. Oligochaetes are worms in the phylum Annelida having bristles borne singly along the length of the body.

Open access: describes a fishery or permit for which there is no qualification criteria to participate. Open-access permits may be issued with restrictions on fishing (for example, the type of gear that may be used or the amount of fish that may be caught).

Opportunistic species: Species that colonize disturbed or polluted sediments. These species are often small, grow rapidly, have short life spans, and produce many offspring.

Optimum Yield (OY): the amount of fish which A) will provide the greatest overall benefit to the nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems; B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery

Organic matter: Material of, relating to, or derived from living organisms.

Overfished: A conditioned defined when stock biomass is below minimum biomass threshold and the probability of successful spawning production is low.

Overfishing: A level or rate of fishing mortality that jeopardizes the long-term capacity of a stock or stock complex to produce MSY on a continuing basis.

Peat bank: A bank feature composed of partially carbonized, decomposed vegetable tissue formed by partial decomposition of various plants in water; may occur along shorelines.

Pelagic gear: Mobile or static fishing gear that is not fixed, and is used within the water column, not on the ocean bottom. Some examples are mid-water trawls and pelagic longlines.

Phytoplankton: Microscopic marine plants (mostly algae and diatoms) which are responsible for most of the photosynthetic activity in the oceans.

Piscivore: A species feeding preferably on fish.

Planktivore: An animal that feeds on plankton.

Polychaetes: Polychaetes are segmented worms in the phylum Annelida. Polychaetes (poly-chaetae = many-setae) differ from other annelids in having many setae (small bristles held in tight bundles) on each segment.

Porosity: The amount of free space in a volume of a material; e.g. the space that is filled by water between sediment particles in a cubic centimeter of seabed sediment.

Possession-limit-only permit: an open-access permit (see above) that restricts the amount of multispecies a vessel may retain (currently 500 pounds of "regulated species").

Potential Sector Contribution (PSC): The percentage of the available catch a limited access permit is entitled to after joining a sector. Based on landings history as defined in Amendment 16. The sum of the PSC's in a sector is multiplied by the groundfish sub-ACL to get the ACE for the sector.

Pre-recruits: Fish in size or age groups that are not vulnerable to the fishery (including discards).

Prey availability: The availability or accessibility of prey (food) to a predator. Important for growth and survival.

Primary production: The synthesis of organic materials from inorganic substances by photosynthesis.

Recovery time: The period of time required for something (e.g. a habitat) to achieve its former state after being disturbed.

Recruitment: the amount of fish added to the fishery each year due to growth and/or migration into the fishing area. For example, the number of fish that grow to become vulnerable to fishing gear in one year would be the recruitment to the fishery. "Recruitment" also refers to new year classes entering the population (prior to recruiting to the fishery).

Recruitment overfishing: fishing at an exploitation rate that reduces the population biomass to a point where recruitment is substantially reduced.

Regulated groundfish species: cod, haddock, yellowtail flounder, winter flounder, witch flounder, American plaice, white hake, pollock, redfish, Atlantic halibut, windowpane flounder, ocean pout, and wolffish. These species are usually targeted with large-mesh net gear.

Relative exploitation: an index of exploitation derived by dividing landings by trawl survey biomass. This measure does not provide an absolute magnitude of exploitation but allows for general statements about trends in exploitation.

Retrospective pattern: A pattern of systematic over-estimation or underestimation of terminal year estimates of stock size, biomass or fishing mortality compared to that estimate for that same year when it occurs in pre-terminal years.

Riverine area: The area of a river and its banks.

Saurids: Fish of the family Scomberesocidae, the sauries or needlefishes. Distribution: tropical and temperate waters.

Scavenging species: An animal that consumes dead organic material.

Sea whips: A coral that forms long flexible structures with few or no branches and is common on Atlantic reefs.

Sea pens: An animal related to corals and sea anemones with a featherlike form.

Sediment: Material deposited by water, wind, or glaciers.

Sediment suspension: The process by which sediments are suspended in water as a result of disturbance.

Sedentary: See Motile and Mobile organisms. Not moving. Organisms that spend the majority of their lives in one place.

Sedimentary bedforms: Wave-like structures of sediment characterized by crests and troughs that are formed on the seabed or land surface by the erosion, transport, and deposition of particles by water and wind currents; e.g. ripples, dunes.

Sedimentary structures: Structures of sediment formed on the seabed or land surface by the erosion, transport, and deposition of particles by water and wind currents; e.g. ripples, dunes, buildups around boulders, among others.

Sediment types: Major combinations of sediment grain sizes that form a sediment deposit, e.g. mud, sand, gravel, sandy gravel, muddy sand, among others.

Spawning adult stage: See adult stage. Adults that are currently producing or depositing eggs.

Spawning stock biomass (SSB): the total weight of fish in a stock that sexually mature, i.e., are old enough to reproduce.

Species assemblage: Several species occurring together in a particular location or region

Species composition: A term relating the relative abundance of one species to another using a common measurement; the proportion (percentage) of various species in relation to the total on a given area.

Species diversity: The number of different species in an area and their relative abundance

Species richness: See Species diversity. A measurement or expression of the number of species present in an area; the more species present, the higher the degree of species richness.

Species with vulnerable EFH: If a species was determined to be "highly" or "moderately" vulnerable to bottom tending gears (otter trawls, scallop dredges, or clam dredges) then it was included in the list of species with vulnerable EFH. Currently there are 23 species and life stages that are considered to have vulnerable EFH for this analysis.

Status Determination: A determination of stock status relative to Bthreshold (defines overfished) and Fthreshold (defines overfishing). A determination of either overfished or overfishing triggers a SFA requirement for rebuilding plan (overfished), ending overfishing (overfishing) or both.

Stock: A grouping of fish usually based on genetic relationship, geographic distribution and movement patterns. A region may have more than one stock of a species (for example, Gulf of Maine cod and Georges Bank cod). A species, subspecies, geographical grouping, or other category of fish capable of management as a unit.

Stock assessment: determining the number (abundance/biomass) and status (life-history characteristics, including age distribution, natural mortality rate, age at maturity, fecundity as a function of age) of individuals in a stock

Stock of concern: a regulated groundfish stock that is overfished, or subject to overfishing.

Structure-forming organisms: Organisms, such as corals, colonial bryozoans, hydroids, sponges, mussel beds, oyster beds, and seagrass that by their presence create a three-dimensional physical structure on the bottom. See biogenic habitats.

Submerged aquatic vegetation: Rooted aquatic vegetation, such as seagrasses, that cannot withstand excessive drying and therefore live with their leaves at or below the water surface in shallow areas of estuaries where light can penetrate to the bottom sediments. SAV provides an important habitat for young fish and other aquatic organisms.

Surficial sediment: Sediment forming the sea floor or land surface; thickness of the surficial layer may vary.

Surplus production: Production of new stock biomass defined by recruitment plus somatic growth minus biomass loss due to natural deaths. The rate of surplus production is directly proportional to stock biomass and its relative distance from the maximum stock size at carrying capacity (K). BMSY is often defined as the biomass that maximizes surplus production rate.

Surplus production models: A family of analytical models used to describe stock dynamics based on catch in weight and CPUE time series (fishery dependent or survey) to construct stock biomass history. These models do not require catch at age information. Model outputs may include stock biomass history, biomass weighted fishing mortality rates, MSY, FMSY, BMSY, K, (maximum population biomass where stock growth and natural deaths are balanced) and r (intrinsic rate of increase).

Survival rate (S): Rate of survival expressed as the fraction of a cohort surviving the a period compared to number alive at the beginning of the period (# survivors at the end of the year / numbers alive at the beginning of the year). Pessimists convert survival rates into annual total mortality rate using the relationship A=1-S.

Survival ratio (R/SSB): an index of the survivability from egg to age-of-recruitment. Declining ratios suggest that the survival rate from egg to age-of-recruitment is declining.

TAC: Total allowable catch. This value is calculated by applying a target fishing mortality rate to exploitable biomass.

Taxa: The plural of taxon. Taxon is a named group or organisms of any rank, such as a particular species, family, or class.

Ten-minute- "squares" of latitude and longitude (TMS): Are a measure of geographic space. The actual size of a ten-minute-square varies depending on where it is on the surface of the earth, but in general each square is approximately 70-80 square nautical miles in this region. This is the spatial area that EFH designations, biomass data, and some of the effort data have been binned into for analysis purposes in various sections of this document.

Topography: The depiction of the shape and elevation of land and sea floor surfaces.

Total Allowable Catch (TAC): The amount (in metric tons) of a stock that is permitted to be caught during a fishing year. In the Multispecies FMP, TACs can either be "hard" (fishing ceases when the TAC is caught) or a “target” (the TAC is merely used as an indicator to monitor effectiveness of management measures, but does not trigger a closure of the fishery).

Total mortality: The rate of mortality from all sources (fishing, natural, pollution) Total mortality can be expressed as an instantaneous rate (called Z and equal to F + M) or Annual rate (called A and calculated as the ratio of total deaths in a year divided by number alive at the beginning of the year)

Trophic guild: Trophic is defined as the feeding level within a system that an organism occupies; e.g., predator, herbivore. A guild is defined as a group of species that exploit the same class of environmental resources in a similar way. The trophic guild is a utilitarian concept covering both structure and organization that exists between the structural categories of trophic groups and species.

Turbidity: Relative water clarity; a measurement of the extent to which light passing through water is reduced due to suspended materials.

Two-bin (displacement) model: a model used to estimate the effects of area closures. This model assumes that effort from the closed areas (first bin) is displaced to the open areas (second bin). The total effort in the system is then applied to the landings-per-unit-effort (LPUE) in open areas to obtain a projected catch. The percent reduction in catch is calculated as a net result.

Vulnerability: In order to evaluate the potential adverse effects of fishing on EFH, the vulnerability of each species EFH was determined. This analysis defines vulnerability as the likelihood that the functional value of EFH would be adversely affected as a result of fishing with different gear types. A number of criteria were considered in the evaluation of the vulnerability of EFH for each life stage including factors like the function of habitat for shelter, food and/or reproduction.

Yield-per-recruit (YPR): the expected yield (weight) of individual fish calculated for a given fishing mortality rate and exploitation pattern and incorporating the growth characteristics and natural mortality.

Yearclass: also called cohort. Fish that were spawned in the same year. By convention, the “birth date” is set to January 1st and a fish must experience a summer before turning 1. For example, winter flounder that were spawned in February-April 1997 are all part of the 1997 cohort (or year-class). They would be considered age 0 in 1997, age 1 in 1998, etc. A summer flounder spawned in October 1997 would have its birth date set to the following January 1 and would be considered age 0 in 1998, age 1 in 1999, etc.

Z: instantaneous rate of total mortality. The components of Z are additive (i.e., Z = F+M)

Zooplankton: See Phytoplankton. Small, often microscopic animals that drift in currents. They feed on detritus, phytoplankton, and other zooplankton. They are preyed upon by fish, shellfish, whales, and other zooplankton.

9.0 REFERENCES

American Wind Energy Association (AWEA). 2020. *U.S. Offshore Wind Power Economic Impact Assessment*. https://supportoffshorewind.org/wp-content/uploads/sites/6/2020/03/AWEA_Offshore-Wind-Economic-ImpactsV3.pdf. 19 pp.

Angliss, R. P. and D. P. DeMaster. 1998. Differentiating serious and non-serious injury of marine mammals taken incidental to commerical fishing operations: Report of the serious injury workshop, 1-2 April 1997, Silver Spring, Maryland. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-OPR-13.

Atlantic States Marine Fisheries Commission (ASMFC). 2007. Special Report to the Atlantic Sturgeon Management Board: Estimation of Atlantic sturgeon bycatch in coastal Atlantic commercial fisheries of New England and the Mid-Atlantic. August 2007. 95 pp.

Atlantic States Marine Fisheries Commission (ASMFC). 2017. 2017 Atlantic sturgeon benchmark stock assessment and peer review report. October 18, 2017. 456 pp.

Atlantic States Marine Fisheries Commission. October 2020. American Lobster Benchmark Stock Assessment and Peer Review Report. 548 pp. Available at: http://www.asmfc.org/

Atlantic Sturgeon Status Review Team (ASSRT). 2007. Status review of Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus). National Marine Fisheries Service. February 23, 2007. 188 pp.

Bailey, H., B. Senior, D. Simmons, J. Rusin, G. Picken , and P. M. Thompson. 2010. Assessing underwater noise levels during pile-driving at an offshore windfarm and its potential effects on marine mammals. *Marine Pollution Bulletin* 60: 888–897.

Bailey, H., K. L Brookes, and P. M. Thompson. 2014. Assessing environmental impacts of offshore wind farms: lessons learned and recommendations for the future. *Aquatic Biosystems* 10(8): 1-13.

Baumgartner, M.F., T.V.N. Cole, R.G. Campbell, G.J. Teegarden and E.G. Durbin. 2003. Associations between North Atlantic right whales and their prey, Calanus finmarchicus, over dieand tidal time scales. Mar. Ecol. Prog. Ser. 264: 155–166.

Baumgartner, M.F. and B.R. Mate. 2003. Summertime foraging ecology of North Atlantic right whales. Mar. Ecol. Prog. Ser. 264: 123–135.

Bergström, L., L. Kautsky, T. Malm, R. Rosenberg, M. Wahlberg, N. Å. Capetillo, and D. Wilhelmsson. 2014. Effects of offshore wind farms on marine wildlife—a generalized impact assessment. *Environmental Research Letters* 9(3): 1-12.

Bergström, L., F. Sundqvist and U. Bergström (2013). Effects of an offshore wind farm on temporal and spatial patterns in the demersal fish community. *Marine Ecology Progress Series* 485: 199-210.

Blaxter, J.H.S., D. Danielssen, E. Moksness, and V. Oiestad. 1983. Description of the early development of the halibut, Hippoglossus hippoglossus and attempts to rear the larvae past first feeding. Marine Biology 73: 99 – 107.

Bolles, K.L., and G.A. Begg. 2000. Distinction between silver hake (Merluccius bilinearis) stocks in US waters of the northwest Atlantic based on whole otolith morphometrics. Fishery Bulletin 98:3.

Bowen, B.W., A.L. Bass, S.-M. Chow, M. Bostrom, K.A. Bjorndal, A.B. Bolten, T. Okuyama, B.M. Bolker., S. Epperly, E. Lacasella, D. Shaver, M. Dodd, S.R. Hopkins-Murphy, J.A. Musick, M. Swingle, K. Rankin-Baransky, W. Teas, W.N. Witzell, and P.H. Dutton. 2004. Natal homing in juvenile loggerhead turtles (Caretta caretta). Molecular Ecology 13:3797-3808.

Braun J & Epperly SP. (1996). Aerial surveys for sea turtles in southern Georgia waters, June 1991. Gulf of Mexico Science. 1996(1): 39-44.

Braun-McNeill J., Epperly, S.P., Avens, L., Snover, M.L. and Taylor, J.C. 2008. Life stage duration and variation in growth rates of loggerhead (Caretta caretta) sea turtles from the western north Atlantic. Herpetological Conservation and Biology 3(2): 273-281.

Brodziak, J.K.T., and W.K. Macy III. 1996. Growth of long-finned squid, Loligo pealei, in the northwest Atlantic. Fishery Bulletin 94 (2): 212 – 236.

Brown, M.B., O.C. Nichols, M.K. Marx, and J.N. Ciano. 2002. Surveillance of North Atlantic right whales in Cape Cod Bay and adjacent waters. 2002. Final report to the Division of Marine Fisheries, Commonwealth of Massachusetts. 29 pp., September 2002.

Bureau of Ocean and Energy Management (BOEM). 2020a. *Vineyard Wind 1 Offshore Wind Energy Project Supplement to the Draft Environmental Impact Statement.* Appendix A.

BOEM. 2020b. *Oil and Gas Energy Fact Sheet*. https://www.boem.gov/sites/default/files/documents/oil-gas-energy/BOEM_FactSheet-Oil%26amp%3BGas-2-26-2020.pdf. 2 pp.

Caillouet, C.W., S. W. Raborn, D. J. Shaver, N. F. Putman, B. J. Gallaway, and K. L. Mansfield. 2018. Did Declining Carrying Capacity for the Kemp's Ridley Sea Turtle Population Within the Gulf of Mexico Contribute to the Nesting Setback in 2010−2017? Chelonian Conservation and Biology 17 (1): 123–133.

Carlson AE, Hoffmayer ER, Tribuzio CA, Sulikowski JA (2014) The Use of Satellite Tags to Redefine Movement Patterns of Spiny Dogfish (Squalus acanthias) along the U.S. East Coast: Implications for Fisheries Management. PLoS ONE 9(7): e103384. https://doi.org/10.1371/journal.pone.0103384

Carr, H.A. and H.O. Milliken. 1998. Conservation engineering: options to minimize fishing's impacts to the sea floor. Pp. 100–103 in E.M. Dorsey and J. Pederson, eds. Effects of Fishing Gear on the Sea Floor of New England. Conservation Law Foundation, Boston, MA. 160 pp.

Census. State and County QuickFacts. U.S. Census Bureau, Retrieved from: http://quickfacts.census.gov/qfd/index.html.

Chang, S., P. L. Berrien, et al. 1999. Essential Fish Habitat Source Document: Windowpane, Scophthalmus aquosus, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS-NE-137. 40pp.

Chavez-Rosales S, Lyssikatos MC, Hatch J. 2017. Estimates of cetacean and pinniped bycatch in Northeast and Mid-Atlantic bottom trawl fisheries, 2011-2015. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-16; 18 p. Available from: http://www.nefsc.noaa.gov/publications/

Clapham, P.J., S.B. Young, R.L. Brownell, Jr. 1999. Baleen whales: conservation issues and the status of the most endangered populations. Mammal Review 29(1): 35-60.

Clay, P.M., L.L Colburn, J. Olson, P. Pinto da Silva. 2008. Community Profiles for the Northeast US Fisheries. Available at: http://www.nefsc.noaa.gov/read/socialsci/community_profiles/.

Clay PM, Colburn LL, Olson J, Pinto da Silva P, Smith SL, Westwood A, Ekstrom J. Community Profiles for the Northeast US Fisheries. August 22, 2012. Woods Hole (MA): Northeast Fisheries Science Center; Available from: http://www.nefsc.noaa.gov/read/socialsci/communityProfiles.html.

Cohen, A.C. 1976. The systematics and distribution of Loligo (Cephalopoda, Myopsida) in the western North Atlantic, with descriptions of two new species. Institute of Malacology.

Cole, T. V. N., P. Hamilton, A. G. Henry, P. Duley, R. M. Pace III, B. N. White, T. Frasier. 2013. Evidence of a North Atlantic right whale Eubalaena glacialis mating ground. Endang Species Res 21: 55–64.

Cole TVN, Henry AG. 2013. Serious injury determinations for baleen whale stocks along the Gulf of Mexico, United States East Coast and Atlantic Canadian Provinces, 2007-2011. Northeast Fish Sci Cent Ref Doc. 13-24; 14 p. Online at: https://repository.library.noaa.gov/view/noaa/4561

Collette, B.B. and G. Klein-MacPhee. 2002. Bigelow and Schroeder's Fishes of the Gulf of Maine, Smithsonian Books, Washington, D.C.

Colvocoresses, J.A. and J.A. Musik. 1984. Species associations and community composition of middle Atlantic bight continental shelf demersal fishes. U.S. Fisheries Bulletin 82(2):295-313.

Conant, T.A., P.H. Dutton, T. Eguchi, S.P. Epperly, C.C. Fahy, M.H. Godfrey, S.L. MacPherson, E.E. Possardt, B.A. Schroeder, J.A. Seminoff, M.L. Snover, C.M. Upite, and B.E. Witherington. 2009. Loggerhead sea turtle (Caretta caretta) 2009 status review under the U.S. Endangered Species Act. Report of the Loggerhead Biological Review Team to the National Marine Fisheries Service, August 2009. 222 pp.

Dadswell, M. J., B. D. Taubert, T. S. Squiers, D. Marchette, and J. Buckley. 1984. Synopsis of Biological Data on Shortnose Sturgeon, Acipenser brevirostrum, LeSuer 1818.

Dadswell, M. 2006. A review of the status of Atlantic sturgeon in Canada, with comparisons to populations in the United States and Europe. Fisheries 31: 218-229.

Damon-Randall, K., M. Colligan, and J. Crocker. 2013. Composition of Atlantic Sturgeon in Rivers, Estuaries, and Marine Waters. National Marine Fisheries Service, NERO, Unpublished Report. February 2013. 33 pp.

Dannheim, J., L. Bergström, S. N. R. Birchenough, R. Brzana, A. R. Boon, J. W. P. Coolen, J.-C. Dauvin, I. De Mesel, J. Derweduwen, A. B. Gill, Z. L. Hutchison, A. C. Jackson, U. Janas, G. Martin, A. Raoux, J. Reubens, L. Rostin, J. Vanaverbeke, T. A. Wilding, D. Wilhelmsson, S. Degraer and J. Norkko (2019). Benthic effects of offshore renewables: identification of knowledge gaps and urgently needed research. *ICES Journal of Marine Science.*

Davis, G.E., M.F. Baumgartner, J.M. Bonnell, J. Bell, C. Berchok, J.B. Thornton, S. Brault, G. Buchanan, R.A. Charif, D. Cholewiak, C.W. Clark, P. Corkeron, J. Delarue, K. Dudzinski, L. Hatch, J. Hildebrand, L. Hodge, H. Klinck, S. Kraus, B. Martin, D.K. Mellinger, H. Moors-Murphy, S. Nieukirk, D.P. Nowacek, S. Parks, A.J. Read, A.N. Rice, D. Risch, A. Širović, M. Soldevilla, K. Stafford, J.E. Stanistreet, E. Summers, S. Todd, A. Warde and S.M. Van Parijs. 2017. Long-term passive acoustic recordings track the changing distribution of North Atlantic right whales (Eubalaena glacialis) from 2004 to 2014. Sci. Rep. 7:13460.

Davis, G. E., M. F. Baumgartner, P. J. Corkeron, J. Bell, C. Berchok, J. M. Bonnell, J. B. Thornton, S. Brault, G. A. Buchanan, D. M. Cholewiak, C. W. Clark, J. Delarue, L. T. Hatch, H. Klinck, S. D. Kraus, B. Martin, D. K. Mellinger, H. Moors-Murphy, S. Nieukirk, D. P. Nowacek, S. E. Parks, D. Parry, N. Pegg, A. J. Read, A. N. Rice, D. Risch, A. Scott, M. S. Soldevilla, K. M. Stafford, J. E. Stanistreet, E. Summers, S. Todd, S. M. Van Parijs. 2020. Exploring movement patterns and changing distributions of baleen whales in the western North Atlantic using a decade of passive acoustic data. Glob. Change. Biol. 26: 4812-4840.

Degraer, S., R. Brabant, B. Rumes and L. Vigin (2019). Environmental Impacts of Offshore Wind Farms in the Belgian Part of the North Sea: Marking a Decade of Monitoring, Research, and Innovation. Memoirs on the Marine Environment, Royal Belgian Institute of Natural Sciences, OD Natural Environment, Marine Ecology and Management: 134.

Deroba J. 2015. Atlantic herring operational assessment report 2015. NEFSC Ref Doc 15-16; 30 p. doi: 10.7289/V5CN71WS

Dodge, K.L., B. Galuardi, T. J. Miller, and M. E. Lutcavage. 2014. Leatherback Turtle Movements, Dive Behavior, and Habitat Characteristics in Ecoregions of the Northwest Atlantic Ocean. PLOS ONE 9 (3) e91726: 1-17.

Dovel, W. L. and T. J. Berggren. 1983. Atlantic sturgeon of the Hudson River estuary, New York. New York Fish and Game Journal 30: 140-172.

Dunton, K.J., A. Jordaan, K.A. McKown, D.O. Conover, and M.G. Frisk. 2010. Abundance and distribution of Atlantic sturgeon (Acipenser oxyrinchus) within the Northwest Atlantic Ocean determined from five fishery-independent surveys. Fish. Bull. 108:450-465.

Ellison, W.T., B.L. Southall, C.W. Clark, and A.S. Frankel. 2011. A new context-based approach to assess marine mammal behavioral responses to anthropogenic sounds. *Conservation Biology* 26: 21-28.

Ellison, W.T., B. L. Southall, A. S. Frankel, K. Vigness-Raposa, and C. W. Clark. 2018. Short Note: An Acoustic Scene Perspective on Spatial, Temporal, and Spectral Aspects of Marine Mammal Behavioral Responses to Noise. *Aquatic Mammals* 44(3): 239-243.

Epperly, S.P., J. Braun, A.J. Chester, F.A. Cross, J.V. Merriner, and P.A. Tester. 1995. Winter distribution of sea turtles in the vicinity of Cape Hatteras and their interactions with the summer flounder trawl fishery. Bulletin of Marine Science 56(2):547-568.

Erickson, D. L., A. Kahnle, M. J. Millard, E. A. Mora, M. Bryja, A. Higgs, J. Mohler, M. DuFour, G. Kenney, J. Sweka, and E. K. Pikitch. 2011. Use of pop-up satellite archival tags to identify oceanic-migratory patterns for adult Atlantic Sturgeon, Acipenser oxyrinchus oxyrinchus Mitchell, 1815. J. Appl. Ichthyol. 27: 356–365.

Falk-Petersen, I.R., and T.K. Hasen. 1991. Reproductive biology of wolffish Anarhichas lupus from north-Norwegian waters. Int. Coun. Explor. Mer., Demersal Fish. Comm. ICES CM 1991/G:14:17.

Fay, C., M. Bartron, S. Craig, A. Hecht, J. Pruden, R. Saunders, T. Sheehan, and J. Trial. 2006. Status Review for Anadromous Atlantic Salmon (Salmo salar) in the United States. Report to the National Marine Fisheries Service and U.S. Fish and Wildlife Service. 294 pages.

Federal Register, 2017. Fisheries of the Northeastern United States; Northeast Groundfish Fishery; Fishing Year 2017; Emergency Removal of Southern Windowpane Accountability Measures. FR 41564, Vol. 82, No. 169 (September 1, 2017), pp.41564-67. Available online at https://www.govinfo.gov/content/pkg/FR-2017-09-01/pdf/2017-18495.pdf

Finneran, J. J. 2015. Noise-induced hearing loss in marine mammals: a review of temporary threshold shift studies from 1996 to 2015. *J. Acoust. Soc. Am.* 138, 1702–1726. doi: 10.1121/1.4927418

Finneran, J.J. 2016. Auditory Weighting Functions and TTS/PTS Exposure Functions for Marine Mammals Exposed to Underwater Noise, Technical Report 3026, December 2016. San Diego: Systems Center Pacific.

Forney, K.A., B. L. Southall, E. Slooten, S. Dawson, A. J. Read, R. W. Baird, and R. L. Brownell Jr. 2017. Nowhere to go: noise impact assessments for marine mammal populations with high site fidelity. *Endang. Species. Res.* 32: 391–413

Furevik D, Humborstad O-B, Jorgensen T & Lokkeborg S. (2008). Floated fish pot eliminates bycatch of red king crab and maintains target catch of cod. Fisheries Research. 92: 23-27.

Gabriel W. (1992). Persistence of demersal fish assemblages between Cape Hatteras and Nova Scotia, northwest Atlantic. Journal of Northwest Atlantic Fisheries. 14: 29-46.

Graham, N., M. Lyssikatos, C. Orphanides. in review. A comparative analysis of two fishery observer sampling programs and the impact of pooling on bycatch mortality estimation of marine mammals in the Northeast multispecies groundfish fishery.

Griffin, D.B., S. R. Murphy, M. G. Frick, A. C. Broderick, J. W. Coker, M. S. Coyne, M. G. Dodd, M. H. Godfrey, B. J. Godley, L. A. Hawkes, T. M. Murphy, K. L. Williams, and M. J. Witt. 2013. Foraging habitats and migration corridors utilized by a recovering subpopulation of adult female loggerhead sea turtles: implications for conservation. Mar. Biol. 160: 3071–3086.

Grosslein, M.D., and T.R. Azarovitz. 1982. Fish distribution. Monograph 15. MESA New York Bight Atlas. New York Sea Grant Institute, Albany, New York.

Harden Jones, F.R., Margetts, A.R., Greer Walker, M., Arnold, G.P., 1977. The efficiency of the Granton otter trawl determined by sector-scanning sonar and acoustic transponding tags. Rapports et procès verbaux desréunions—Commission internationale pour l'exploration de la mer 170,45–51.

Hare JA, Morrison WE, Nelson MW, Stachura MM, Teeters EJ, Griffis RB, et al. (2016) A Vulnerability Assessment of Fish and Invertebrates to Climate Change on the Northeast U.S. Continental Shelf. PLoS ONE 11(2): e0146756. https://doi.org/10.1371/journal.pone.0146756

Hartley D, Whittingham A, Kenney JF, Cole TVN & Pomfret E. (2003). Large Whale Entanglement Report. Gloucester, MA: U.S. Department of Commerce. National Marine Fisheries Service Northeast Regional Office.

Hatch, J. and C. Orphanides. 2015. Estimates of cetacean and pinniped bycatch in the 2013 New England sink and Mid-Atlantic gillnet fisheries. US Dept Commer, Northeast Fish. Sci. Cent. Ref. Doc. 15-15; 26p. Available at http://www.nefsc.noaa.gov/publications/

Haug, T., and B. Gulliksen. 1988. Fecundity and oocyte sizes in ovaries of female Atlantic halibut, Hippoglossus hippoglossus (L.). Sarsia 73: 259 – 261.

Hayes, M.L. 1983. Active fish capture methods in Nielson, L.A.; Johnson, D.L., eds. Fisheries techniques. Bethesda, MD: Am. Fish. Soc.; p. 123-145.

Hayes, S.A., E. Josephson , K. Maze-Foley , and P. E. Rosel. 2017. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments 2016. NOAA Technical Memorandum NMFS-NE-241.

Hayes, S.A, E. Josephson, K. Maze-Foley, and P. Rosel. 2018. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessment-2017. NOAA Technical Memorandum NMFS-NE-245.

Hayes, S.A., E. Josephson, K. Maze-Foley, and P. E. Rosel. 2019. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2018. NOAA Technical Memorandum NMFS-NE-258.

Hayes, S.A, E. Josephson, K. Maze-Foley, and P. Rosel. 2020. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessment-2019. NOAA Technical Memorandum NMFS-NE-264.

Hayes, S.A., E. Josephson, K. Maze-Foley, and P. E. Rosel. 2021. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2020. NOAA Technical Memorandum NMFS-NE-271.

Henry, A.G., T.V.N. Cole, M. Garron, W. Ledwell, D. Morin, and A. Reid A. 2017. Serious injury and mortality determinations for baleen whale stocks along the Gulf of Mexico, United States East Coast, and Atlantic Canadian Provinces, 2011-2015. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-19; 57 p.

Henry AG, Garron M, Morin D, Reid A, Ledwell W, Cole TVN. 2020. Serious injury and mortality determinations for baleen whale stocks along the Gulf of Mexico, United States East Coast, and

Atlantic Canadian provinces, 2013-2017. Northeast Fish Sci Cent Ref Doc. 20-06; 53 p. Online at: https://doi.org/10.25923/fbc7-ky15

Henry AG, Garron M, Morin D, Smith A, Reid A, Ledwell W, Cole TVN. 2021. Serious injury and mortality determinations for baleen whale stocks along the Gulf of Mexico, United States East Coast, and Atlantic Canadian Provinces, 2014-2018. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 21-07; 56 p

Heppell, S.S., D.T. Crouse, L.B. Crowder, S.P. Epperly, W. Gabriel, T. Henwood, R. Marquez, and N.B. Thompson. 2005. A population model to estimate recovery time, population size, and management impacts on Kemp's ridley sea turtles. Chelonian Conservation and Biology 4 (4): 767-773.

Holland, Daniel S., Pinto da Silva, Patricia, and Kitts, Andrew W. 2015. "Evolution of Social Capital and Economic Performance in New England Harvest Cooperatives." Marine Resource Economics. 30(4): 371-392.

Hutchison, Z.L., A.B. Gill, P. Sigray, H. He, and J.W. King. 2020. Anthropogenic Electromagnetic Fields (EMF) Influence the Behaviour of Bottom-Dwelling Marine Species. Scientific Reports 10 (1): 4219.

Hyvarinen, P., P. Suuronen and T. Laaksonen. 2006. Short-term movement of wild and reared Atlantic salmon smolts in brackish water estuary – preliminary study. Fish. Mgmt. Eco. 13(6): 399 -401.

International Council for the Exploration of the Seas (ICES). 2000. Effects of Different Types of Fisheries on North Sea and Irish Sea Benthic Ecosystems. Report of the ICES Advisory Committee on the Marine Environment 2000. ICES Coop. Res. Rep. No. 241, 27 pp.

Jacobson, L. 2005. Essential fish habitat source document: longfin inshore squid, Loligo pealeii, life history and habitat characteristics, Second Edition. NOAA Tech. Memo. NMFS-NE- 193, 42 p. http://www.nefsc.noaa.gov/nefsc/publications/tm/tm193/

James, M.C., R.A. Myers, and C.A. Ottenmeyer. 2005. Behaviour of leatherback sea turtles, Dermochelys coriacea, during the migratory cycle. Proc. R. Soc. B, 272: 1547-1555.

James, M.C., S.A. Sherrill-Mix, K. Martin, and R. A. Myers. 2006. Canadian waters provide critical foraging habitat for leatherback sea turtles. Biological Conservation 133: 347-357.

Jennings, S., M.J. Kaiser, and J.D. Reynolds. 2001. Marine Fisheries Ecology. Blackwell Science, Oxford.

Johnson AJ, Salvador GS, Kenney JF, Robbins J, Krauss SD, Landry SC & Clapham PJ. (2005). Fishing gear involved in entanglements of right and humpback whales. Marine Mammal Science. 21(4): 635-645.

Johnson, M.R., Boelke, C., Chiarella, L.A., and Greene, K. 2019. Guidance for Integrating Climate Change Information in Greater Atlantic Region Habitat Conservation Division Consultation Processes. Greater Atlantic Region Policy Series 19-01. 235p. https://www.greateratlantic.fisheries.noaa.gov/policyseries/index.php/GARPS/article/view/3

Keats, D.W., G.R. Smith, and D.H. Steele. 1985. Reproduction and egg guarding by Atlantic wolffish (Anarchichas lupus: Anarhichidae) and ocean pout (Macrozoarces americanus: Zoarcidae) in Newfoundland waters. Can. J. Zool. 63: 2565 – 2568.

Kelly, K.H. and J.R. Moring. (1986). Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates - Atlantic Herring. U.S. Fish and Wildlife Service. Biological Report 82 (11.38) TR EL-82-4. 22 p.

Kenney, R.D., M.A.M. Hyman, R.E. Owen, G.P. Scott and H.E. Winn. 1986. Estimation of prey densities required by western North Atlantic right whales. Mar. Mamm. Sci. 2: 1–13.

Kenney, R.D., H.E. Winn and M.C. Macaulay 1995. Cetaceans in the Great South Channel, 1979-1989: right whale (Eubalaena glacialis). Cont. Shelf Res. 15: 385–414.

Kenney, R.D. 2002. North Atlantic, North Pacific and Southern Right Whales. pp. 806-813, In: W.F. Perrin, B. Würsig, and J.G.M. Thewissen (eds.). Encyclopedia of Marine Mammals. Academic Press, San Diego, CA.

Khan, C., T.V.N. Cole, P. Duley, A. Glass, M. Niemeyer, and C. Christman. 2009. North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2008 Results Summary. NEFSC Reference Document 09-05. 7 pp.

Khan, C., T. Cole, P. Duley, A. Glass, and J. Gatzke. 2010. North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2009 Results Summary. NEFSC Reference Document 10-07. 7 pp.

Khan, C., T. Cole, P. Duley, A. Glass, and J. Gatzke. 2011. North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2010 Results Summary. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 11-05. 6 pp.

Khan C., T. Cole, P. Duley, A. Glass, and J. Gatzke, J. Corkeron. 2012. North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2011 Results Summary. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 12-09; 6 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://nefsc.noaa.gov/publications/

King, D. and J. G. Sutinen. 2010. Rational Compliance and the liquidation of Northeast groundfish resources. Marine Policy, 34(1), 7-21.

Kitts A, Bing-Sawyer E, McPherson M, Olson J, Walden J. 2011. Report for Fishing Year 2010 on the Performance of the Northeast Multispecies (Groundfish) Fishery (May 2010 - April 2011). December 2011. Woods Hole (MA): NOAA Fisheries Northeast Fisheries Science Center. 11-12. 44 p.

Kocik, J.F, and T.F. Sheehan. 2006. Atlantic Salmon. http://www.nefsc.noaa.gov/sos/spsyn/af/salmon/archives/41_AtlanticSalmon_2006.pdf

Kocik, J., Lipsky, C., Miller, T., Rago, P., & Shepherd, G. 2013. An Atlantic Sturgeon Population Index for ESA Management Analysis. U.S. Dept Commer, Northeast Fish Sci Cent Ref Doc. 13-06; 36 p. Available at: www.nefsc.noaa.gov/nefsc/publications/.

Kynard, B., M. Horgan, M. Kieffer, and D. Seibel. 2000. Habitat used by shortnose sturgeon in two Massachusetts rivers, with notes on estuarine Atlantic sturgeon: A hierarchical approach. Transactions of the American Fisheries Society 129: 487-503.

Kynard, B. and M. Horgan. 2002. Ontogenetic behavior and migration of Atlantic sturgeon, Acipenser oxyrinchus oxyrinchus, and shortnose sturgeon, A. brevirostrum, with notes on social behavior. Environmental Behavior of Fishes 63: 137-150.

Lacroix GL and McCurdy P. 1996. Migratory behavoir of post-smolt Atlantic salmon during initial stages of seaward migration. Journal of Fish Biology. 49: 1086-1101.

Lacroix GL, McCurdy P and Knox D. 2004. Migration of Atlantic salmon post smolts in relation to habitat use in a coastal system. Transactions of the American Fisheries Society. 133(6): 1455-1471.

Lacroix, G.L., D. Knox and M.J.W. Stokesbury. 2005. Survival and behavior of post-smolt Atlantic salmon in coastal habitat with extreme tides. Journal of Fish Biology. 66(2): 485 – 498.

Laney, R.W., J.E. Hightower, B.R. Versak, M.F. Mangold, W.W. Cole Jr., and S.E. Winslow. 2007. Distribution, habitat use, and size of Atlantic sturgeon captured during cooperative winter tagging cruises, 1988-2006. In Anadromous sturgeons: habitats, threats, and management (J. Munro, D. Hatin, J.E. Hightower, K. McKown, K.J. Sulak, A.W. Kahnle, and F. Caron (eds.)), p. 167-182. Am. Fish. Soc. Symp. 56, Bethesda, MD.

Langhamer, O. (2012). Artificial Reef Effect in relation to Offshore Renewable Energy Conversion: State of the Art. *The Scientific World Journal*: 8.

Lindeboom HJ & de Groot SJ. (1998). Impact II - The Effects of Different Types of Fisheries on the North Sea and Irish Sea Benthic Ecosystems. NIOZ Report. 1998-1. 404 p.

Lock, M.C. and D.B. Packer. 2004. Essential Fish Habitat Source Document: Silver Hake, Merluccius bilinearis, Life History and Habitat Characteristics, Second Edition. NOAA Technical Memorandum NMFS-NE-186. http://www.nefsc.noaa.gov/nefsc/pulications/tm/tm186/tm186.pdf

Lyssikatos MC, Chavez-Rosales S, Hatch J. 2020. Estimates of cetacean and pinniped bycatch in Northeast and Mid-Atlantic bottom trawl fisheries, 2013-2017. Northeast Fish Sci Cent Ref Doc. 20-04; 11 p. Online at: https://doi.org/10.25923/5we2-g460

Lyssikatos MC, Chavez-Rosales S, Hatch J. 2021. Estimates of Cetacean and Pinniped Bycatch in Northeast and Mid-Atlantic Bottom Trawl Fisheries, 2014-2018. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 21-02; 12 p.

Madsen, P.T., M. Wahlberg, J. Tougaard, K. Lucke, and P. Tyack. 2006. Wind turbine underwater noise and marine mammals: implications of current knowledge and data needs. *Mar. Ecol. Prog. Ser.* 309: 279–295.

Mansfield, K.L., V.S. Saba, J. Keinath, and J.A. Musick. 2009. Satellite telemetry reveals a dichotomy in migration strategies among juvenile loggerhead sea turtles in the northwest Atlantic. Marine Biology 156:2555-2570.

Matulich, S., and Clark, M. 2001. Efficiency and Equity Choices in Fishery Rationalization Policy Design: An examination of the North Pacific and Sablefish IFQ policy impacts on processor. State of Alaska, Alaska Department of Fish and Game, Washington State University.

Mayo, C.A. and M.K. Marx. 1990. Surface foraging behaviour of the North Atlantic right whale, Eubalaena glacialis, and associated zooplankton characteristics. Can. J. Zool. 68: 2214–2220.

McBride, R.S. and R. K. Smedbol. An Interdisciplinary Review of Atlantic Cod (Gadus morhua) Stock Structure in the Western North Atlantic Ocean. NOAA Technical Memorandum NMFS-NE-XXX.

McClellan CM & Read AJ. (2007). Complexity and variation in loggerhead sea turtle life history. Biology Letters. 3: 592-594.

Mercer, S., G. E. Brown, S. Clearwater and Z. Yao. 1993. Observations of the copulatory behavior of the ocean pout, Macrozoarces americanus. Can. Field Nat. 107:243-244.

Methratta, E. and W. Dardick (2019). Meta-Analysis of Finfish Abundance at Offshore Wind Farms. *Reviews in Fisheries Science and Aquaculture* 27(2): 242-260.

Methven, D.A. and J.A. Brown. 1991. Time of hatching affects development, size, yolk volume and mortality of newly hatched Macrozoarces americanus (Pisces: Zoarcidae). Canadian Journal of Zoology 69(8): 2161 – 2167.

Mid-Atlantic Fishery Management Council (MAFMC). 2017a. 2017 Summer Flounder Fishery Information Document. Available at: http://www.mafmc.org/sf-s-bsb/

Mid-Atlantic Fishery Management Council (MAFMC). 2017b. 2017 Scup Fishery Information Document. Available at: http://www.mafmc.org/sf-s-bsb/

Miller, J.M., Burke, J.S., Fitzhugh, G.R., 1991. Early life history patterns of Atlantic North American flatfish: likely (and unlikely) factors controlling recruitment. Neth. J. Sea Res. 27, 261–275.

Miller, T. and G. Shepard. 2011. Summary of Discard Estimates for Atlantic Sturgeon. Northeast Fisheries Science Center, Population Dynamics Branch, August 2011

Miller, M.H. and C. Klimovich. 2017. Endangered Species Act Status Review Report: Giant Manta Ray (Manta birostris) and Reef Manta Ray (Manta alfredi). Report to National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD. September 2017. 128 pp.

Miller, T. J., Hare, J. A., & Alade, L. A. (2016). A state-space approach to incorporating environmental effects on recruitment in an age-structured assessment model with an application to southern New England yellowtail flounder. Canadian Journal of Fisheries and Aquatic Sciences, 73(8), 1261-1270.

Mirarchi, F. 1998. Bottom trawling on soft substrates in E.M. Dorsey; J. Pederson, eds. Effects of fishing gear on the sea floor of New England. MIT Sea Grant Pub. 98-4.

Mitchell GH, Kenney RD, Farak AM & Campbell RJ. (2003). Evaluation of Ocurrence of Endangered and Threatened Marine Species in Naval Ship Trial Areas and Transit Lanes in the Gulf of Maine and Offshore of Georges Bank. NUWC-NPT Technical Memo 02-121A. 113 p.

Moore, E. 1947. Studies on the marine resources of southern New England. VI. The sand flounder, Lophopsetta aquosa (Mitchill): a general study of the species with special emphasis on age determination by means of scales and otoliths. Bull. Bingham Oceanogr. Collect. 11(3): 1 – 79.

Moore MJ & van der Hoop JM. 2012. The painful side of trap and fixed net fisheries: Chronic entanglement of large whales. Journal of Marine Biology. 2012(Article ID 230653): 4.

Morgan, L.E. and R. Chuenpagdee. 2003. Shifting Gears: Addressing the collateral impacts of fishing methods in U.S. waters, Pew Science Series on Conservation and the Environment, Washington D.C., Island Press, 41 p.

Morreale, S.J. and E.A. Standora. 2005. Western North Atlantic waters: Crucial developmental habitat for Kemp's ridley and loggerhead sea turtles. Chel. Conserv. Biol. 4(4):872-882.

Morse, W.W., Able, K.W., 1995. Distribution and life history of windowpane, Scophthalmus aquosos, off the Northeastern United States. Fishery Bulletin 93, 674-693.

Murphy, T., Kitts, A., Records, D., Demarest, C., McPherson, M., Walden, J., et al. 2012. 2011 Final Report on the Performance of the Northeast Multispecies (Groundfish) Fishery (May 2011 – April 2012). Woods Hole: NEFSC.

Murphy, T., Kitts, A., Records, D., Demarest, C., Caless, D., Walden, J., and Benjamin, S. 2014. 2012 Final Report on the Performance of the Northeast Multispecies (Groundfish) Fishery (May 2012 – April 2013). Woods Hole: NEFSC. NOAA Fisheries Northeast Fisheries Science Center. 14-01. 121 p. or online at http://www.nefsc.noaa.gov/nefsc/publications/.

Murphy, T., Kitts, A., Demarest, C., and Walden, J. 2015. 2013 Final Report on the Performance of the Northeast Multispecies (Groundfish) Fishery (May 2013 - April 2014). Woods Hole: NEFSC. NOAA Fisheries Northeast Fisheries Science Center. 15-01. 121 pp.

Murphy, T., Ardini, G., Vasta, M., Kitts, A., Demarest, C., Walden, J., and Caless, D. 2018. 2015 Final Report on the Performance of the Northeast Multispecies (Groundfish) Fishery (May 2007 - April 2016). Woods Hole: NEFSC. NOAA Fisheries Northeast Fisheries Science Center. 18-13. 128 pp.

Murray, K.T. 2006. Estimated average annual bycatch of loggerhead sea turtles (Caretta caretta) in U.S. Mid-Atlantic bottom otter trawl gear, 1996-2004. U.S. Dep. Commer., Northeast Fish. Sci. Cent. Ref. Doc. 06-19, 26pp.

Murray, K. T. 2007. Estimated bycatch of loggerhead sea turtles (Caretta caretta) in U.S. mid-Atlantic scallop trawl gear, 2004-2005, and in scallop dredge gear, 2005. National Marine Fisheries Service, Northeast Fisheries Science Center, 166 Water Street, Woods Hole, Massachusetts 02543, February 2007. Northeast Fisheries Science Center Reference Document No. 07-04. Report No. 07-04

Murray K.T. (2008). Estimated Average Annual Bycatch of Loggerhead Sea Turtles (Caretta caretta) in U.S. Mid-Atlantic Bottom Otter Trawl Gear, 1996–2004. Woods Hole, MA: U.S. Department of Commerce. NEFSC Reference Document 08-20. 32 p.

Murray, K.T. 2009. Characteristics and magnitude of sea turtle bycatch in U.S. Mid-Atlantic gillnet gear. Endangered Species Research 8:211-224.

Murray, K.T. 2013. Estimated loggerhead and unidentified hard-shelled turtle interactions in Mid-Atlantic sink gillnet gear, 2007-2011. US Dept Commer, Tech. Memorandum NMFS-NE 225; 20p. Available at: http://www.nefsc.noaa.gov/publications/

Murray, K.T. and Orphanides, C.D. 2013. Estimating the risk of loggerhead turtle Caretta caretta bycatch in the US mid-Atlantic using fishery-independent and -dependent data. Mar.Ecol. Prog. Ser. 477:259-270.

Murray K.T. (2015). The importance of location and operational fishing factors in estimating and reducing loggerhead turtle (Caretta caretta) interactions in US bottom trawl gear. Fisheries Research. 172: 440-451.

Murray, K. 2018. Estimated bycatch of sea turtles in sink gillnet gear. NOAA Technical Memorandum. NMFS-NE-242. 20p.

Murray, K. 2020. Estimated magnitude of sea turtle interactions and mortality in US bottom trawl gear, 2014-2018. NOAA Tech Memo NMFS NE. 260; 19 p.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1991. Recovery plan for U.S. population of Atlantic green turtle Chelonia mydas. Washington, D.C.: National Marine Fisheries Service. 58 pp.

National Marine Fisheries Service (NMFS). 1991b. Final recovery plan for the humpback whale (Megaptera novaeangliae). Prepared by the Humpback Whale Recovery Team for the national Marine Fisheries Service, Silver Spring, Maryland. 105 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1992a. Recovery plan for the Kemp's ridley sea turtle. National Marine Fisheries Service, Washington, D.C. 40 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1992b. Recovery plan for leatherback turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C. 65 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1993. Recovery plan for the Hawksbill turtle (Eretmochelys imbricate) in the U.S. Caribbean, Atlantic, and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C. 58 pp

National Marine Fisheries Service (NMFS) Southeast Fisheries Science Center (SEFSC). 2001. Stock assessments of loggerhead and leatherback sea turtles and an assessment of the impact of the pelagic longline fishery on the loggerhead and leatherback sea turtles of the Western North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-455. 343 pp.

National Marine Fisheries Service (NMFS). 2002. Biological Opinion. Implementation of the Deep-Sea Red Crab, Chaceon quinquedens, Fishery Management Plan. February 6, 2002. Available at: http://www.greateratlantic.fisheries.noaa.gov/prot_res/section7/NMFS-signedBOs/RedCrab2002signedBO.pdf

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 2005. Recovery plan for the Gulf of Maine distinct population segment of the Atlantic salmon (Salmo salar). National Marine Fisheries Service, Silver Spring, MD.

National Marine Fisheries Service (NMFS). 2005b. Revision- recovery plan for the North Atlantic right whale (Eubalaena glacialis). Prepared by the Office of Protected Resources National Marine Fisheries Service, Silver Spring, MD. 137 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 2007a. Loggerhead sea turtle (Caretta caretta) 5 year review: summary and evaluation. National Marine Fisheries Service, Silver Spring, Maryland. 65 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 2007b. Leatherback sea turtle (Dermochelys coriacea) 5 year review: summary and evaluation. National Marine Fisheries Service, Silver Spring, Maryland. 79 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 2007c. Kemp's ridley sea turtle (Lepidochelys kempii) 5 year review: summary and evaluation. Silver Spring, Maryland: National Marine Fisheries Service. 50 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 2007d. Green sea turtle (Chelonia mydas) 5 year review: summary and evaluation. Silver Spring, Maryland: National Marine Fisheries Service. 102 pp.

National Marine Fisheries Service (NMFS). 2007. Guidelines for Assessment of the Social Impact of Fishery Management Actions. In: NMFS Council Operational Guidelines - Fishery Management Process. Silver Spring (MD): National Oceanic and Atmospheric Administration. 39 p.

National Marine Fisheries Service (NMFS). 2010a. Biological Assessment of Shortnose Sturgeon (Acipenser brevirostrum). Prepared by the Shortnose Sturgeon Status Review Team for the National Marine Fisheries Service, Gloucester MA. 417pp.

National Marine Fisheries Service (NMFS). 2010b. Final recovery plan for the fin whale (Balaenoptera physalus). Prepared by the Office of Protected Resources National Marine Fisheries Service, Silver Spring, MD. 121 pp.

National Marine Fisheries Service (NMFS). 2010c. Interactive Fisheries Economic Impacts Tool. Available at: https://www.st.nmfs.noaa.gov/pls/apex32/f?p=160:7:3415449084930703.

National Marine Fisheries Service (NMFS). 2012. Endangered Species Act Section 7 Consultation for the Atlantic Sea Scallop Fishery Management Plan. Biological Opinion. July 12, 2012. Available at: http://www.greateratlantic.fisheries.noaa.gov/prot_res/section7/NMFS signedBOs/2012ScallopBiOp071212.pdf

National Marine Fisheries Service (NMFS). 2013. Endangered Species Act Section 7 Consultation on the Continued Implementation of Management Measures for the Northeast Multispecies, Monkfish, Spiny Dogfish, Atlantic Bluefish, Northeast Skate Complex, Mackerel/Squid/Butterfish, and Summer Flounder/Scup/Black Sea Bass Fisheries. Available at: http://www.greateratlantic.fisheries.noaa.gov/protected/section7/bo/actbiops/batchedfisheriesopinionfinal121613.pdf

National Marine Fisheries Service (NMFS). 2014. Endangered Species Act Section 7 Consultation on the Continued Implementation of Management Measures for the American Lobster Fishery. July 31, 2014. Available at:

National Marine Fisheries Service (NMFS) (2014a). Endangered Species Act Section 7 Consultation Biological Opinion. Junneau, AK: National Marine Fisheries Service. 283 p. https://alaskafisheries.noaa.gov/sites/default/files/final0414.pdf.

National Marine Fisheries Service (NMFS) (2014b). Endangered Species Act Section 7 Review of Framework Adjustment 4 for the Atlantic Herring Fishery Management Plan. Gloucester, MA: U.S. Department of Commerce. NMFS issuance date: September 17, 2014.

National Marine Fisheries Service (NMFS) Northeast Fisheries Science Center Fisheries Statistics Branch (NEFSC FSB). 2015. Northeast Fisheries Observer Program: Incidental Take Reports. Omnibus data request + supplemental data for 2014 from: http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html

National Marine Fisheries Service (NMFS) Northeast Fisheries Science Center Fisheries Statistics Branch (NEFSC FSB). 2016. Northeast Fisheries Observer Program: Incidental Take Reports. Omnibus data request + supplemental data for 2014 from: http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html

National Marine Fisheries Service (NMFS) Northeast Fisheries Science Center Fisheries Statistics Branch (NEFSC FSB). 2016. Northeast Fisheries Observer Program: Incidental Take Reports. Omnibus data request + supplemental data for 2015 from: http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) (2015). Kemp's Ridley Sea Turtle (Lepidochelys kempii) 5-year Review: Summary and Evaluation. National Marine Fisheries Service and United States Fish and Wildlife Service, Silver Spring, Maryland.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 2016. Draft recovery plan for the Gulf of Maine distinct population segment of the Atlantic Salmon (Salmo salar). http://www.fisheries.noaa.gov/pr/pdfs/20160329_atlantic_salmon_draft_recovery_plan.pdf

National Marine Fisheries Service (NMFS) Northeast Fisheries Science Center Fisheries Statistics Branch (NEFSC FSB). 2017. Northeast Fisheries Observer Program: Incidental Take Reports. Omnibus data request + supplemental data for 2016 from http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html.

National Marine Fisheries Service. 2017. Memo: Reinitiating Section 7 Consultation on the Batched Fisheries, American Lobster, and Atlantic Deep-Sea Red Crab Biological Opinions and associated Fishery Management Plans. NMFS GARFO, October 17, 2017.

National Marine Fisheries Service (NMFS) Northeast Fisheries Science Center Fisheries Statistics Branch (NEFSC FSB). 2018. Northeast Fisheries Observer Program: Incidental Take Reports. Omnibus data request + supplemental data for 2017 from http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html

National Marine Fisheries Service (NMFS). 2021a. Endangered Species Act Section 7 Consultation on the: (a) Authorization of the American Lobster, Atlantic Bluefish, Atlantic Deep-Sea Red Crab, Mackerel/Squid/Butterfish, Monkfish, Northeast Multispecies, Northeast Skate Complex, Spiny Dogfish, Summer Flounder/Scup/Black Sea Bass, and Jonah Crab Fisheries and (b) Implementation of the New England Fishery Management Council's Omnibus Essential Fish Habitat Amendment 2. National Marine Fisheries Service, Greater Atlantic Regional Fisheries Office, Gloucester, Massachusetts; May 2021.

National Marine Fisheries Service (NMFS). 2021b. Final Rule to Amend the Atlantic Large Whale Take Reduction Plan to Reduce Risk of Serious Injury and Mortality to North Atlantic Right Whales Caused by Entanglement in Northeast Crab and Lobster Trap/Pot Fisheries

National Oceanic and Atmospheric Administration (NOAA). 2007a. Status of Fishery Resources off the Northeastern US Aggregate Resource and Landings Trends. Available at: http://www.nefsc.noaa.gov/sos/agtt/.

National Oceanic and Atmospheric Administration (NOAA). 2007b. An Assessment of the Leatherback Turtle Population in the Atlantic Ocean. A Report of the Turtle Expert Working Group. NOAA Tech Memo NMFS-SEFSC- 555, Miami, Fl. 116pp.

National Oceanic and Atmospheric Administration (NOAA). 2009. Small Entity Compliance Guide. June 24, 2009.

National Oceanic and Atmospheric Administration (NOAA). 2010. NOAA Catch Share Policy. Washington, DC: National Oceanic and Atmospheric Administration. 25 p.

National Oceanic and Atmospheric Administration (NOAA). 2016. Species in the Spotlight Priority Actions: 2016-2020 Atlantic Salmon (*Salmo salar*). Atlantic Salmon Five Year Action Plan.

National Research Council (NRC). 2000. *Marine Mammals and Low-Frequency Sound: Progress Since 1994*. Washington, DC: National Academies Press.

National Research Council (NRC). 2002. Effects of Trawling and Dredging on Seafloor Habitat. National Academy Press. 126 p.

National Research Council. 2003. *Ocean Noise and Marine Mammals*. Washington, DC: National Academies Press.

National Research Council. 2005. *Marine Mammal Populations and Ocean Noise: Determining When Noise Causes Biologically Significant Effects*. Washington, DC: National Academies Press.

Neilson,J.D., J.F. Kearney, P.Perley, and H. Sampson. 1993. Reproductive biology of Atlantic halibut (Hippoglossus hippoglossus) in Canadian waters. Canadian Journal of Fisheries and Aquatic Sciences 50: 551 – 563.

Nelms, S. E., Piniak, W. E., Weir, C. R., and Godley, B. J. 2016. Seismic surveys and marine turtles: an underestimated global threat? *Biol. Conserv.* 193, 49–65. doi: 10.1016/j.biocon.2015.10.020

Nelson, G.A., and M.R. Ross. 1992. Distribution, growth and food habits of the Atlantic wolfish (Anarhichas lupus) from the Gulf of Maine-Georges Bank region. Journal of Northwest Atlantic Fishery Science 13: 53 – 61.

New England Fishery Management Council (NEFMC). 1994. Amendment 5 to the Northeast Multispecies Fishery Management Plan.

New England Fishery Management Council (NEFMC). 1996. Amendment 7 to the Northeast Multispecies Fishery Management Plan.

New England Fishery Management Council (NEFMC). 2000. Amendment 12 to the Northeast Multispecies Fishery Management Plan. http://www.nefmc.org/mesh/index.html

New England Fishery Management Council (NEFMC). 2003. Final Amendment 13 to the Northeast Multispecies Fishery Management Plan Including a Final Supplemental Environmental Impact Statement and an Initial Regulatory Flexibility Analysis. Newburyport, MA. Available at: http://www.nefmc.org/nemulti/index.html.

New England Fishery Management Council (NEFMC). 2009a. Final Amendment 3 to the Fishery Management Plan (FMP) for the Northeast Skate Complex and Final Environmental Impact Statement (FEIS). Newburyport, MA. 459 pp. Available at: http://www.nefmc.org/skates/index.html.

New England Fishery Management Council (NEFMC). 2009b. Final Amendment 16 to the Northeast Multispecies Fishery Management Plan Including a Final Supplemental Environmental Impact Statement and an Initial Regulatory Flexibility Analysis. Newburyport, MA. Available at: http://www.nefmc.org/nemulti/index.html.

New England Fishery Management Council. 2011. Final Framework 23 to the Scallop Fishery Management Plan. Final Environmental Assessment, November 30, 2011. http://s3.amazonaws.com/nefmc.org/Final_FW23_submission.nov2011.FINAL.pdf

New England Fishery Management Council.2014. Framework 25 to the Scallop FMP. Final Environmental Assessment, April 17, 2014. http://s3.amazonaws.com/nefmc.org/Final_USE_fw_25_with_correct_maps.pdf

New England Fishery Management Council. 2015. Final Framework 26 to the Scallop FMP. Final Environmental Assessment, February 17, 2015. http://s3.amazonaws.com/nefmc.org/Final-FW26_submission_150217.pdf

New England Fishery Management Council. 2016. Atlantic Herring Fishery Specifications for the 2016-2018 Fishing Years (January 1, 2016 – December 31, 2018). Environmental Assessment. Formal submission: March 1, 2016. http://s3.amazonaws.com/nefmc.org/160301-2016-2018-Herring-Specs-Formal-Submission.pdf

New England Fishery Management Council. 2016. Final Framework 27 to the Scallop FMP. Environmental Assessment, March 14, 2016. http://s3.amazonaws.com/nefmc.org/0.1_USE.Final_submission-of-FW27.March14.pdf

New England Fishery Management Council. 2017. Small-Mesh Multispecies Fishery Management Plan Annual Monitoring Report for Fishing Year 2016, September 2017, https://s3.amazonaws.com/nefmc.org/2_-Revised_Annual-Monitoring-Report-SAFE-Report-for-2016.pdf

New England Fishery Management Council. 2018. Small-Mesh Multispecies Fishery Management Plan Annual Monitoring Report for Fishing Year 2017, September 2018, https://s3.amazonaws.com/nefmc.org/5_Annual-Monitoring-Report-for-Fishing-Year-2017_180919_150658.pdf

New England Fishery Management Council. 2018. Final Framework 29 to the Scallop FMP. Environmental Assessment, April 19, 2018. https://s3.amazonaws.com/nefmc.org/Scallop-FW29-for-final-submission.pdf

New England Fishery Management Council. 2018. Framework 57 to the Northeast Multispecies FMP. Final Submission, March 2, 2018. https://s3.amazonaws.com/nefmc.org/180302_Groundfish_FW57__EA_formal_sub.pdf

New England Fishery Management Council. 2019. Framework 6 to the Atlantic Herring FMP. Final Submission, October 8, 2019. https://s3.amazonaws.com/nefmc.org/Herring-FW6-DRAFT-final-submission.pdf

New England Fishery Management Council. 2019. Atlantic Herring Fishery Management Plan Amendment 8. Environmental Impact Statement. Final submission: May 2019. https://s3.amazonaws.com/nefmc.org/Herring-A8-FEIS.FINAL_191007_135918.pdf

Neuman, M.J., D.A. Witting, and K.W. Able. 2001. Relationships between otolith microstructure, otolith growth, somatic growth and ontogenetic transitions in two cohorts of windowpane. Journal of fish Biology 58: 967 – 984

Northeast Data Poor Stocks Working Group (DPSWG). 2009. The northeast data poor stocks working group report, part A: skate species complex, deep sea red crab, Atlantic wolffish, scup, and black sea bass. Northeast Fish Science Center Reference Document 09-02. Available at:http://www.nefsc.noaa.gov/publications/crd/crd0902/.

Northeast Fisheries Science Center (NEFSC). (2002). Workshop on the Effects of Fishing Gear on Marine Habitats off the Northeastern United States, October 23-25, 2001, Boston, Massachusetts. Woods Hole, MA: U.S. Department of Commerce. NEFSC Reference Document 02-01. 86 p.

Northeast Fisheries Science Center (NEFSC). 2002c. Workshop on the Effects of Fishing Gear on Marine Habitats off the Northeastern United States, October 23-25, 2001, Boston, Massachusetts. Woods Hole (MA): US Department of Commerce. Northeast Fisheries Science Center Reference Document 02-01. 86 p.

Northeast Fisheries Science Center (NEFSC). 2010. 50th Northeast Regional Stock Assessment Workshop (50th SAW): Assessment Report. U.S. Dept. Commer., Northeast Fish. Sci. Cent. Ref. Doc. 10-17; 844 pp. Available at: http://www.nefsc.noaa.gov/publications/crd/crd1017/crd1017.pdf.

Northeast Fisheries Science Center (NEFSC). 2011c. EFH Source Documents: Life History and Habitat Characteristics. 2011. Woods Hole, MA: U.S. Department of Commerce; Retrieved from: http://www.nefsc.noaa.gov/nefsc/habitat/efh/.

Northeast Fisheries Science Center (NEFSC). 2011a. 51st Northeast Regional Stock Assessment Workshop (51st SAW) Assessment Report. U.S. Dept. Commer, Northeast Fish. Sci. Cent. Ref. Doc. 11-02; 856 pp. Available at: http://www.nefsc.noaa.gov/publications/crd/crd1102/1102.pdf.

Northeast Fisheries Science Center (NEFSC). 2011b. 52nd Northeast Regional Stock Assessment Workshop (52nd SAW): Assessment Report. U.S. Dept. Commer., Northeast Fish. Sci. Cent. Ref. Doc. 11-17; 968 pp. Available at: http://www.nefsc.noaa.gov/saw/saw52/crd1117.pdf.

Northeast Fisheries Science Center (NEFSC). 2012b. 54th Northeast Regional Stock Assessment Workshop (54th SAW): Assessment Summary Report. U.S. Dept. Commer., Northeast Fish. Sci. Cent. Ref. Doc. 12-14; 45 pp. Available at: http://www.nefsc.noaa.gov/saw/saw52/crd1214.pdf

Northeast Fisheries Science Center (NEFSC). 2013d. Social Sciences Branch. Woods Hole (MA): NMFS Northeast Fisheries Science Center; Available from: http://www.nefsc.noaa.gov/read/socialsci/index.html.

Northeast Fisheries Science Center (NEFSC). 2013a. 55th Northeast Regional Stock Assessment Workshop (55th SAW): Assessment Report. U.S. Dept. Commer., Northeast Fish. Sci. Cent. Ref Doc. Available at: http://www.nefsc.noaa.gov/saw/reports.html.

Northeast Fisheries Science Center (NEFSC). 2013b. 56th Northeast Regional Stock Assessment Workshop (56th SAW) Assessment Summary Report. Woods Hole (MA): U.S. Department of Commerce. Northeast Fisheries Science Center Ref. Doc. 13-04. 42 p.

Northeast Fisheries Science Center (NEFSC). 2013c. 2013 monkfish operational assessment. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 13-23; 116 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://nefsc.noaa.gov/publications/

Northeast Fisheries Science Center (NEFSC). 2014. 59th Northeast Regional Stock Assessment Workshop (59th SAW) Assessment Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 14-09; 782 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://nefsc.noaa.gov/publications/

Northeast Fisheries Science Center (NEFSC). 2015b. 60th Northeast Regional Stock Assessment Workshop (60th SAW) Assessment Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 15-08; 870 p. doi: 10.7289/V5W37T9T

Northeast Fisheries Science Center (NEFSC). 2015. Operational Assessment of 20 Northeast Groundfish Stocks, Updated Through 2014. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 15-24; 251 p.

Northeast Fisheries Science Center (NEFSC). 2016. Scup Data Update for 2016. Available at: http://www.mafmc.org/council-events/2016/ssc-3.

Northeast Fisheries Science Center. 2017. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-17; 259 p. doi: 10.7289/V5/RD-NEFSC-17-17.

Northeast Fisheries Science Center (NEFSC). 2017. Scup Data Update for 2017. Available at: : http://www.mafmc.org/s/5Scup_2017_Assesssment_Update.pdf

Northeast Fisheries Science Center 9NEFSC). 2017. 62nd Northeast Regional Stock Assessment Workshop (62nd SAW) Assessment Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-03; 822 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://nefsc.noaa.gov/publications/.

Northeast Fisheries Science Center. 2018. 65th Northeast Regional Stock Assessment Workshop (65th SAW) assessment report. Northeast Fish Sci Cent Ref Doc. 18-11; 659 p. Online at: https://doi.org/10.25923/zapm-ga75

Northeast Fisheries Science Center. 2020. Operational assessment of the black sea bass, scup, bluefish, and monkfish stocks, updated through 2018. Northeast Fish Sci Cent Ref Doc. 20-01; 160 p. Online at: https://doi.org/10.25923/0wh1-6s87

Northwest Atlantic Leatherback Working Group. 2018. Northwest Atlantic Leatherback Turtle (Dermochelys coriacea) Status Assessment (Bryan Wallace and Karen Eckert, Compilers and Editors). Conservation Science Partners and the Wider Caribbean Sea Turtle Conservation Network (WIDECAST). WIDECAST Technical Report No. 16. Godfrey, Illinois. 36 pp.

Nowacek, D. P., Thorne, L. H., Johnston, D. W., and Tyack, P. L. 2007. Responses of cetaceans to anthropogenic noise. *Mamm. Rev.* 37, 81–115. doi: 10.1111/j.1365-2907.2007.00104.x

Nowacek, D.P., C. W. Clark, D. Mann, P. JO. Miller, H. C. Rosenbaum, J. S. Golden, M. Jasny, J. Kraska, and B. L. Southall. 2015. Marine seismic surveys and ocean noise: time for coordinated and prudent planning. *Front. Ecol. Environ*. 13(7): 378–386. doi:10.1890/130286

O'Brien, L. J. Burnett, and R.K. Mayo. 1993. Maturation of nineteen species of finfish off the northeast coast of the United States, 1985 – 1990. US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

O'Leary, S.J., K. J. Dunton, T. L. King, M. G. Frisk, and D.D. Chapman. 2014. Genetic diversity and effective size of Atlantic sturgeon, Acipenser oxyrhinchus oxyrhinchus, river spawning populations estimated from the microsatellite genotypes of marine-captured juveniles. Conserv Genet: DOI 10.1007/s10592-014-0609-9; ISSN 1566-0621.

Olsen, Y.H., and D. Merriman. 1946. Studies on the marine resource of Southern New England. IV. The biology and economic importance of the ocean pout, Macrozoarces americanus (Bloch and Schneider). Bull. Bing. Oceanogr. Collect. 9(4): 1 – 184.

Olson J, Clay PM. 2001. An Overview of the Social and Economic Survey Administered during Round II of the Northeast Multispecies Fishery Disaster Assistance Program." Reference: US Dep. Commer., NOAA Tech. Memo. NMFS NE 164; 69 p.

Olson, Julia and Pinto da Silva, Patricia. 2014. "Changing boundaries and institutions in environmental governance: perspectives on sector management of the Northeast US groundfish fishery." Maritime Studies.13(3):1-20.

Orach-Meza, F.L. 1975. Distribution and abundance of Ocean Pout, Macrozoarces americanus (Bloch and Schneider) 1801 in the western North Atlantic Ocean. MS thesis. University of Rhode Island.

Orphanides, C.D. 2009. Protected species bycatch estimating approaches: estimating harbor porpoise bycatch in U. S. northwestern Atlantic gillnet fisheries. J. Northw. Atl. Fish. Sci., 42: 55–76. doi: 10.2960/J.v42.m647

Orphanides, C. 2010. Protected species bycatch estimating approaches: Estimating harbor porpoise bycatch in U.S. Northwestern Atlantic gillnet fisheries. Fish. Sci 42: 55-76

Orphanides CD, Hatch JM. 2017. Estimates of cetacean and pinniped bycatch in the 2015 New England sink and mid-Atlantic gillnet fisheries. Northeast Fish Sci Cent Ref Doc. 17-18; 21 p. Online at: https://doi.org/10.7289/V5/RD-NEFSC-17-18

Orphanides CD. 2019. Estimates of cetacean and pinniped bycatch in the 2016 New England sink and Mid-Atlantic gillnet fisheries. Northeast Fish Sci Cent Ref Doc. 19-04; 12 p. Online at: https://doi.org/10.25923/jp8y-sv79

Orphanides CD. 2020. Estimates of cetacean and pinniped bycatch in the 2017 New England sink and Mid-Atlantic gillnet fisheries. Northeast Fish Sci Cent Ref Doc. 20-03; 16 p. Online at: https://doi.org/10.25923/fkbm-jr56

Orphanides CD. 2021. Estimates of cetacean and pinniped bycatch in the 2018 New England sink and Mid-Atlantic gillnet fisheries. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 21-01; 16 p.

Overholtz WJ & Tyler AV. (1985). Long-term responses of the demersal fish assemblages of Georges Bank. Fisheries Bulletin. 83: 507-520.

Palmer, D. (2017). Developing the Protected Resources Affected Environment for Environmental Assessments and Environmental Impact Statements. Greater Atlantic Region Policy Series 17-01. NOAA Fisheries Greater Atlantic Regional Fisheries Office - www.greateratlantic.fisheries.noaa.gov/policyseries/. 74p.

Pavlov, D.A. and G.G. Novikov. 1993. Life history and peculiarities of common wolffish (Anarhichas lupus) in the White Sea. ICES Journal of Marine Science 50(3): 271 – 277.

Pavlov, D.A. and E. Moksness. 1994. Production and quality of eggs obtained from wolffish (Anarhichas lupus) reared in captivity. Aquaculture 122(4): 295 – 312.

Payne, P.M., L. A. Selzer, and A. R. Knowlton. 1984. Distribution and density of cetaceans, marine turtles, and seabirds in the shelf waters of the northeastern United States, June 1980 - December 1983, based on shipboard observations. National Marine Fisheries Service-NEFSC, Woods Hole, MA. 294pp.

Payne, P.M., J.R. Nicholas, L. O'Brien and K.D. Powers 1986. The distribution of the humpback whale, Megaptera novaeangliae, on Georges Bank and in the Gulf of Maine in relation to densities of the sand eel, Ammodytes americanus. Fish. Bull. 84: 271-277.

Payne, P.M., D.N. Wiley, S.B. Young, S. Pittman, P.J. Clapham and J.W. Jossi 1990. Recent fluctuations in the abundance of baleen whales in the southern Gulf of Maine in relation to changes in selected prey. Fish. Bull. 88: 687-696.

Payne, P.M. and D.W. Heinemann. 1993. The distribution of pilot whales (Globicephala sp.) in shelf/shelf edge and slope waters of the northeastern United States, 1978-1988. Rep. Int. Whal. Comm. (Special Issue) 14: 51- 68.

Piniak, W. E. D. 2012. *Acoustic Ecology of Sea Turtles: Implications for Conservation*. Ph.D., Duke University.

Pinkerton, E., and Edwards, D.N. 2009. The elephant in the room: the hidden costs of leasing individual transferable fishing quotas. Marine Policy, 33, 707-713.

Popper, A., Hawkins, A., Fay, R., Mann, D., Bartol, S., Carlson, T., et al. 2014. Sound exposure guidelines for fishes and sea turtles: a technical report prepared by ANSI-accredited standards committee S3/SC1 and registered with ANSI. *ASA S3/SC1* 4.

Pratt, S. 1973. Benthic fauna. Pp. 5-1 to 5-70 in: Coastal and offshore environmental inventory, Cape Hatteras to Nantucket Shoals. University of Rhode Island, Marine Publication Series No. 2. Kingston, RI.

Rago PJ and KA Sosebee. 2015. Update on the Status of Spiny Dogfish in 2015 and Projected Harvests at the Fmsy Proxy and Pstar of 40%. Report to MAFMC SSC September 2015. Available at: http://www.mafmc.org/council-events/2015/ssc-meeting-2.

Reddin, D.G. 1985. Atlantic salmon (Salmo salar) on and east of the Grand Bank. J. Northwest Atl. Fish. Soc. 6(2):157-164.

Reddin, D.G and P.B. Short. 1991. Postsmolt Atlantic salmon (Salmo salar) in the Labrador Sea. Can. J. Fish Aquat. Sci. 48:2-6.

Reddin, D.G and K.D. Friedland. 1993. Marine environmental factors influencing the movement and survival of Atlantic salmon. 4th Int. Atlantic Salmon Symposium. St. Andrews, N.B. Canada.

Reid RN, Cargnelli LM, Griesbach SJ, Packer DB, Johnson DL, Zetlin CA, Morse WW & Berrien PL.

(1999). Essential Fish Habitat Source Document: Atlantic Herring, Culpea Harengus L., Life History and Habitat Characteristics. Highlands, NJ: USDo Commerce.

Richards RA. 2016. 2016 Monkfish Operational Assessment. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 16-09; 109 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://www.nefsc.noaa.gov/publications/.

Richardson, W. J., Greene, C. R. Jr., Malme, C. I., and Thomson, D. H. 1995. *Marine Mammals and Noise*. San Diego, CA: Academic Press.

Robbins, J. 2009. Scar-based inference into Gulf of Maine Humpback whale entanglement: 2003-2006. Report to the Northeast Fisheries Science Center, National Marine Fisheries Service, Woods Hole, Massachusetts, USA.

Romano, T., Keogh, M., Kelly, C., Feng, P., Berk, L., Schlundt, C., et al. 2004. Anthropogenic sound and marine mammal health: measures of the nervous and immune systems before and after intense sound exposure. *Can. J. Fish. Aquat. Sci.* 61, 1124–1134. doi: 10.1139/f04-055

Roper, C.F.E., M.J. Sweeney, and C.E. Nauen. 1984. Cephalopods of the World. An annotated and illustrated catalogue of species of interest to fisheries. FAO Fisheries Synopsis. 125, 227 pp.

Sainsbury JC. (1996). Commercial Fishing Methods: An Introduction to Vessels and Gears. 3rd ed. England: Fishing New Books Ltd. 119 p.

Sasso, C.R., and S.P. Epperly. 2006. Seasonal sea turtle mortality risk from forced submergence in bottom trawls. Fisheries Research 81:86-88.

Schilling, M. R., I. Seipt, M. T. Weinrich, S. E. Frohock, A. E. Kuhlberg, and P. J. Clapham. 1992. Behavior of individually-identified sei whales Balaenoptera borealis during an episodic influx into the southern Gulf of Maine in 1986. Fishery Bulletin 90:749–755.

Scott, J.S. 1982. Depth, temperature and salinity preferences of common fishes of the Scotian Shelf. J. Northwest Atl. Fish. Sci. 3: 29-39.

Scott, W.B. and M.G. Scott. 1988. Atlantic Fishes of Canada. Can. Bull. Fish. Aquat. Sci. 219, 731 pp.

Seminoff, J. A., C. D. Allen, G. H. Balazs, P. H. Dutton, T. Eguchi, H. L. Hass, S. A. Hargrove, M. Jensen, D. L. Klemm, A. M. Lauritsen, S. L. MacPherson, P. Opay, E. E. Possardt, S. Pultz, E. Seney, K. S. Van Houtan and R. S. Waples (2015). Status review of the Green Turtle (Chelonia mydas) under the Endangered Species Act. NOAA Tech. Memo. NOAATM-NFMS-SWFSC-539, NMFS Southwest Fisheries Science Center, Miami, Florida.

Sherman K, Jaworski NA & Smayda TJ eds. (1996). The Northeastern Shelf Ecosystem - Assessment, Sustainability, and Management. Cambridge, MA: Blackwell Science. 564 p.

Shoop, C.R., and R.D. Kenney. 1992. Seasonal distributions and abundance of loggerhead and leatherback sea turtles in waters of the northeastern United States. Herpetological Monographs 6:43-67.

Sigourney, D.B., M.R. Ross, J. Brodziak, and J. Burnett. 2006. Length at age, sexual maturity and distribution of Atlantic halibut, Hippoglossus hippoglossus L., off the Northeast USA. NW Atl Fish Sci 36: 81 – 90.

Slabbekoorn, H., Bouton, N., van Opzeeland, I., Coers, A., ten Cate, C., and Popper, A. N. 2010. A noisy spring: the impact of globally rising underwater sound levels on fish. *Trends Ecol. Evol. (Amst).* 25, 419–427. doi: 10.1016/j.tree.2010.04.005

Somerton, D.A., Munro, P.T., Weinberg, K.L., 2007. Whole-gear efficiency of a benthic survey trawl for flatfish. Fish. Bull. 105, 278–291

Sosebee K. and P. Rago. 2018. Status Report for Spiny Dogfish in 2018. Draft Working Paper for Predissemination Peer Review. http://www.mafmc.org/s/2018-Status-Report-for-spiny-dogfish.pdf

Steimle, F.W, C. A. Zetlin, P. L. Berrien, D. L. Johnson, and S. Chang. (1999). Essential Fish Habitat source document: Scup, Stenotomus chrysops, life history and habitat characteristics. NOAA Technical Memorandum NMFS-NE-149. Available at: http://www.nefsc.noaa.gov/publications/tm/.

Sea Turtle Disentanglement Network (STDN). 2019. Northeast Region Sea Turtle Disentanglement Network Summary of Entanglement/Disentanglement Data from 2002-2018. Unpublished report compiled by NMFS NERO.

Steimle FW & Zetlin C. (2000). Reef habitats in the Middle Atlantic Bight: Abundance, distribution, associated biological communities, and fishery resource use. Marine Fisheries Review. 62: 24-42.

Stein, A. B., K. D. Friedland, and M. Sutherland. 2004a. Atlantic sturgeon marine bycatch and mortality on the continental shelf of the Northeast United States. North American Journal of Fisheries Management 24: 171-183.

Stein, A.B., K. D. Friedland, and M. Sutherland. 2004b. Atlantic sturgeon marine distribution and habitat use along the northeastern coast of the United States. Transaction of the American Fisheries Society 133:527-537.

Stenberg, C., J. G. Støttrup, M. van Deurs, C. W. Berg, G. E. Dinesen, H. Mosegaard, T. M. Grome and S. B. Leonhard (2015). Long-term effects of an offshore wind farm in the North Sea on fish communities. *Marine Ecology Progress Series* 528: 257-265.

Stenseth, N.C., Mysterud, A., Ottersen, G., Hurrell, J.W., Chan, K.-S. & Lima, M. (2002) Ecological effects of climate fluctuations. Science, 297, 1292–1296.

Stevenson D, Chiarella L, Stephan D, Reid R, Wilhelm K, McCarthy J & Pentony M. (2004). Characterization of the Fishing Practices and Marine Benthic Ecosystems of the Northeast U.S. Shelf, and an Evaluation of the Potential Effects of Fishing on Essential Fish Habitat. Woods Hole, MA: U.S. Dept. of Commerce. NEFSC Technical Memo NMFS-NE-181. 179 p.

Swingle, W.M., S.G. Barco, T.D. Pitchford, W.A. McLellan, and D.A. Pabst. 1993. Appearance of juvenile humpback whales feeding in the nearshore waters of Virginia. Mar. Mamm. Sci. 9: 309-315.

Tableau, A., Collie, J.S., Bell, R.B. and Minto, C. (2019). Decadal changes in the productivity of New England fish populations. Canadian Journal of Fisheries and Aquatic Sciences 76(9): 1528-1540. https://doi.org/10.1139/cjfas-2018-0255

Taning, A. V. 1936. On the eggs and young stages of the halibut. Medd. Fra Kom. For Havundersokelser, Serie Fiskeri, Vol IO 4: 1 – 23.

Taormina, B., J. Bald, A. Want, G. Thouzeau, M. Lejart, N. Desroy, and A. Carlier. 2018. A Review of Potential Impacts of Submarine Power Cables on the Marine Environment: Knowledge Gaps, Recommendations and Future Directions. Renewable and Sustainable Energy Reviews 96: 380–91.

Taormina, B., C. Di Poi, A. Agnalt, A. Carlier, N. Desroy, R. H. Escobar-Lux, J. D'eu, F. Freytet, and C.M.F. Durif. 2020. Impact of Magnetic Fields Generated by AC/DC Submarine Power Cables on the Behavior of Juvenile European Lobster (*Homarus Gammarus*). Aquatic Toxicology 220: 105401.

Templeman, W. 1986. Some biological aspects of Atlantic wolffish (Anarhichas lupus) in the Northwest Atlantic. Journal of Northwest Atlantic Fishery Science. 7(7): 57 – 65.

Terceiro M. 2015. Stock assessment update of summer flounder for 2015. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 15-13; 18 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.

Terceiro M. 2016. Stock Assessment of Summer Flounder for 2016. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 16-15; 117 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://www.nefsc.noaa.gov/publications/.

Thomsen, F., Lüdemann, K., Kafemann, R. and Piper, W. 2006. Effects of offshore wind farm noise on marine mammals and fish, biola, Hamburg, Germany on behalf of COWRIE Ltd. https://tethys.pnnl.gov/sites/default/files/publications/Effects_of_offshore_wind_farm_noise_on_marine-mammals_and_fish-1-.pdf

Turtle Expert Working Group (TEWG). 1998. An assessment of the Kemp's ridley (Lepidochelys kempii) and loggerhead (Caretta caretta) sea turtle populations in the Western North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-409:1-96.

Turtle Expert Working Group (TEWG). 2000. Assessment update for the Kemp's ridley and loggerhead sea turtle populations in the western North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-444:1-115.

Turtle Expert Working Group (TEWG). 2007. An assessment of the leatherback turtle population in the Atlantic Ocean. NOAA Technical Memorandum NMFS-SEFSC-555, 116 pp.

Turtle Expert Working Group (TEWG). 2009. An assessment of the loggerhead turtle population in the Western North Atlantic Ocean. NOAA Technical Memorandum NMFS-SEFSC-575:1-131.

Theroux RB & Grosslein MD. (1987). Benthic fauna. In: Georges Bank. Cambridge, MA: MIT Press. p. 283-295.

Theroux RB & Wigley RL. (1998). Quantitative Composition and Distribution of the Macrobenthic Invertebrate Fauna of the Continental Shelf Ecosystems of the Northeastern United States. Woods Hole, MA: U.S. Department of Commerce. NOAA Technical Report NMFS 140. 240 p.

Thunberg, E.M. 2007. Demographic and economic trends in the Northeastern United States lobster (Homarus americanus) fishery, 1970–2005. U.S. Dep. Commer., Northeast Fish. Sci. Cent. Ref. Doc. 07-17; 64 p.

U. S. Atlantic Salmon Assessment Committee. 2020. Annual Report of the U.S. Atlantic Salmon Assessment Committee. Report Number 32 - 2019 activities. Portland, Maine 161 pp

United States Coast Guard (UCSG). 2020. *The Areas Offshore of Massachusetts and Rhode Island Port Access Route Study.* https://www.navcen.uscg.gov/pdf/PARS/FINAL_REPORT_PARS_May_14_2020.pdf. 199 pp.

USFWS and NMFS. 2018. Recovery plan for the Gulf of Maine Distinct Population Segment of Atlantic salmon (Salmo salar). 74 pp.

Valentine PC & Lough RG. (1991). The Sea Floor Environment and the Fishery of Eastern Georges Bank. Woods Hole, MA: U.S. Department of the Interior and U.S. Geological Survey. Open File Report 91-439. 25 p.

Vu, E., D. Risch, C. Clark, S. Gaylord, L. Hatch, M. Thompson, D. Wiley, and S. Van Parijs.2012. Humpback whale song occurs extensively on feeding grounds in the western North Atlantic Ocean. Aq. Biol.14(2):175–183.

Waldman, J. R., J. T. Hart, and I. I. Wirgin. 1996. Stock composition of the New York Bight Atlantic sturgeon fishery based on analysis of mitochondrial DNA. Transactions of the American Fisheries Society 125: 364-371.

Warden M.L. (2011a). Modeling loggerhead sea turtle (Caretta caretta) interactions with U.S. Mid-Atlantic bottom trawl gear for fish and scallops, 2005-2008. Biological Conservation. 144: 2202-2212.

Warden M.L. (2011b). Proration of Loggerhead Sea Turtle (Caretta caretta) Interactions in U.S. Mid-Atlantic bottom otter trawls for fish and scallops, 2005-2008, by managed species landed. Woods Hole, MA: U.S. Department of Commerce. NEFSC Reference Document 11-04. 8 p.

Waring, G.T., J. M. Quintal and C. P. Fairfield. 2002. U. S. Atlantic and Gulf of Mexico marine mammal stock assessments - 2002. NOAA Tech. Memo. NMFS-NE-169, 318 pp.

Waring G.T.,E. Josephson, C.P. Fairfield-Walsh , K. Maze-Foley K, editors. 2007. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2007. NOAA Tech Memo NMFS-NE- 205. 415 pp.

Waring, G.T., E. Josephson, C.P. Fairfield, and K. Maze-Foley. 2007. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2006. NOAA Technical Memorandum NMFS-NE-201

Waring, G.T., E. Josephson, K. Maze-Foley, Rosel, P.E. (eds). 2010. US Atlantic and Gulf of Mexico marine mammal stock assessments -- 2010. NOAA Tech Memo NMFS NE 219; 598 pp.

Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel, editors. 2014. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments—2013. NOAA Tech Memo NMFS- NE-228. 475 pp.

Waring, G.T., E. Josephson, K. Maze-Foley, P.E. Rosel, editors. 2015. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2014. NOAA Tech Memo NMFS NE 231; 361 p. doi: 10.7289/V5TQ5ZH0

Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel, editors. 2015a. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments 2014.

Waring, G.T. , E. Josephson , K. Maze-Foley , and P. E. Rosel. 2016. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments 2015. NOAA Technical Memorandum NMFS-NE-238.

Watling, L. 1998. Benthic fauna of soft substrates in the Gulf of Maine. Pp. 20-29 in: Effects of fishing gear on the sea floor of New England, E.M. Dorsey and J. Pederson (eds.). MIT Sea Grant Pub. 98-4.

Whittingham A, Garron M, Kenney JF & Hartley D. (2005). Large Whale Entanglement Report 2003 updated June 2005. Gloucester, MA: U.S. Department of Commerce. National Marine Fisheries Service Northeast Regional Office. 137 p.

Whittingham A, Hartley D, Kenney JF, Cole TVN & Pomfret E. (2005). Large Whale Entanglement Report 2002 updated March 2005. Gloucester, MA: U.S. Department of Commerce. National Marine Fisheries Service Northeast Regional Office. 93 p.

Williamson, J. 1998. Gillnet fishing in E.M. Dorsey, J. Pederson, eds. Effects of fishing gear on the sea floor of New England. MIT Sea Grant Pub. 98-4:87-89.

Wippelhauser, G.S. 2012. A Regional Conservation Plan For Atlantic Sturgeon in the U. S. Gulf of Maine. Prepared on behalf of Maine Department of Marine Resources, Bureau of Science. NOAA Species of Concern Grant Program Award #NA06NMF4720249A.

Wippelhauser, G.S., and T.S. Squiers. 2015. Shortnose Sturgeon and Atlantic Sturgeon in the Kennebec River System, Maine: a 1977–2001 Retrospective of Abundance and Important Habitat. Transactions of the American Fisheries Society 144:591–601

Wirgin, I., L. Maceda, J.R. Waldman, S. Wehrell, M. Dadswell, and T. King. 2012. Stock origin of migratory Atlantic sturgeon in the Minas Basin, Inner Bay of Fundy, Canada, determined by microsatellite and mitochondrial DNA analyses.

Wirgin, I., M. W. Breece , D. A. Fox , L. Maceda , K. W. Wark, and T. King. 2015a. Origin of Atlantic Sturgeon Collected off the Delaware Coast during Spring Months. North American Journal of Fisheries Management 35: 20–30.

Wirgin, I., L. Maceda, C. Grunwald, and T. L. King. 2015b. Population origin of Atlantic sturgeon Acipenser oxyrinchus oxyrinchus by-catch in U.S. Atlantic coast fisheries. Journal of Fish Biology 86(4):1251–1270.

Wright, A. J., Soto, N. A., Baldwin, A. L., Bateson, M., Beale, C. M., Clark, C., et al. 2007. Do Marine mammals experience stress related to anthropogenic noise? *Int. J. Comp. Psychol.* 20, 274–316.

Yao, Z. and L.W. Crim. 1995. Copulation, spawning and parental care in captive ocean pout. Journal of Fish Biology 47: 171 – 173.

10.0 INDEX