2023 Spiny Dogfish Specifications

Spiny Dogfish Fishery Management Plan (FMP)

Environmental Assessment (EA)

Prepared by the

Mid-Atlantic Fishery Management Council (MAFMC) in collaboration with the

National Marine Fisheries Service (NMFS)

MAFMC Address

Mid-Atlantic Fishery Management Council

800 North State Street, Suite 201

Dover, DE 19901

NMFS Address

NMFS Greater Atlantic Regional Fisheries Office

55 Great Republic Drive

Gloucester, MA 01930

First submission: 1/13/2023, Final Draft: 3/31/2023

1.0 EXECUTIVE SUMMARY AND TABLE OF CONTENTS

The 2022 spiny dogfish (*squalus acanthias*) Research Track Assessment (RTA – NEFSC 2022c) was ongoing at the time of Council action, but preliminary indications suggested that stock biomass and productivity have been declining in recent years. After evaluating trends in survey abundance and other information, the MAFMC's Scientific and Statistical Committee (SSC) recommended a reduced Acceptable Biological Catch (ABC) for 2023[1] of 7,788 MT[2] (17.2 million pounds). Alternative 2, preferred by the Councils, uses that new 2023 ABC with a 5,449 MT (12.0 million pounds) quota[3]. No other changes are proposed for this fishery for 2023.

Summary of Impacts

Target Species Impact Summary (Preferred Alternative - #2)

Based on the best scientific information available, the SSC determined that a 7,788 MT ABC should be sustainable. By maintaining a sustainable population, impacts on spiny dogfish are expected to be ongoing slightly positive.

Non-Target Species Impact Summary (Preferred Alternative - #2)

The quota resulting from the preferred alternative is a reduction from status-quo/no action. However, non-target interactions in the spiny dogfish fishery are relatively low and no changes to conditions of relevant species are expected among any alternatives – impacts would remain slight negative to slight positive.

Habitat Impact Summary (Preferred Alternative - #2)

The quota resulting from the preferred alternative is a reduction from status-quo/no action but not expected to cause substantial changes to effort or habitat impacts from fishing in the region. Especially given the lower habitat impacts used for most spiny dogfish fishing, impacts on habitat are expected to remain similar as recent, i.e. negligible to slight negative.

Protected Resources Impact Summary (Preferred Alternative - #2)

The quota resulting from the preferred alternative should be less than or equal to status quo conditions. If effort does decrease, the risk of an interaction between fishing gear and protected species also has the potential to decrease. Although this may provide some benefit to protected species, as interactions can still occur under a reduced effort scenario, some level of negative impacts is still expected to those protected species in poor condition (i.e., ESA listed; MMPA protected with PBR levels exceeded). Based on this, impacts of Alternative 2 on protected species are expected to range from slight negative to low-moderate positive, with slight negative to negligible impacts expected for ESA-listed species and non-ESA listed marine mammal species whose PBR levels have been exceeded, and slight to low-moderate positive impacts for non-ESA listed marine mammal species whose PBR levels have not been exceeded (as the change could slightly further reduce removals below PBR).

[1] The fishing year is May 1 through April 30, so the 2023 fishing year is May 2023 through April 2024.
[2] One metric ton (MT) approximately equals 2,204.62 pounds.
[3] The 2022 ABC was 17,498 MT (38.6 million pounds) with a 13,408 MT (29.6-million pounds) quota.

Human Communities Impact Summary (Preferred Alternative - #2)

The potential revenue reduction means that the socioeconomic impact would be negative. Given the relatively small potential reduction in revenues and because the preferred alternative should allow a continuation of sustainable landings, these impacts would be slight overall. For an individual vessel or processor however, spiny dogfish may be an important part of their annual operations.

TABLE OF CONTENTS

2.0 LIST OF COMMON ACRONYMS AND ABBREVIATIONS

ABC	**Acceptable Biological Catch**
ACL	**Annual Catch Limit**
ASMFC	**Atlantic States Marine Fisheries Commission or Commission**
B	**Biomass**
CFR	**Code of Federal Regulations**
CV	**coefficient of variation**
DAH	**Domestic Annual Harvest**
DAP	**Domestic Annual Processing**
EA	**Environmental Assessment**
EEZ	**Exclusive Economic Zone**
EFH	**Essential Fish Habitat**
EIS	**Environmental Impact Statement**
ESA	**Endangered Species Act of 1973**
F	**Fishing Mortality Rate**
FMP	**Fishery Management Plan**
FR	**Federal Register**
GOM	**Gulf of Maine**
M	**Natural Mortality Rate**
MAFMC	**Mid-Atlantic Fishery Management Council**
MMPA	**Marine Mammal Protection Act**
MSA	**Magnuson-Stevens Fishery Conservation and Management Act**
MSY	**Maximum Sustainable Yield**
MT (or mt)	**Metric Tons (1 mt equals about 2,204.62 pounds)**
MTA	**Management Track Assessment (for Spiny Dogfish unless otherwise noted)**
NE	**Northeast**
NEFMC	**New England Fishery Management Council**

NEFSC	**Northeast Fisheries Science Center**
NEPA	**National Environmental Policy Act**
NMFS	**National Marine Fisheries Service (NOAA Fisheries)**
NOAA	**National Oceanic and Atmospheric Administration**
OFL	**Overfishing Level**
OY	**Optimum Yield**
PBR	**Potential Biological Removal**
RTA	**Research Track Assessment (for Spiny Dogfish unless otherwise noted)**
SSC	**Scientific and Statistical Committee**
U.S.	**United States**
VTR	**Vessel Trip Report**

3.0 LISTS OF TABLES, AND FIGURES

3.1 List of Tables

3.2 List of Figures

THIS SPACE LEFT BLANK FOR FORMATTING PURPOSES

4.0 INTRODUCTION, BACKGROUND, AND PROCESS

4.1 Introduction and Background

Spiny dogfish are jointly managed in federal waters by the Mid-Atlantic Fishery Management Council (MAFMC) and the New England Fishery Management Council (NEFMC). The MAFMC is the lead Council. For specifications, NMFS may modify the Councils' recommendations to ensure that catch limits are not exceeded using any measures that were not rejected by both Councils. Such modifications have been used to address instances where the Councils disagree, but for this action the Councils' preferred alternatives are identical. The Atlantic States Marine Fisheries Commission (ASMFC) coordinates management among the states, and states have developed regional and/or state quotas and trip limits through the ASMFC process. Management is best described as complementary between the Councils and the ASMFC, though at times in the past the ASMFC has allowed higher quotas. In such cases state waters harvest may continue after federal waters close due to federal quota closures.

The 2022 Spiny Dogfish Research Track Assessment

The 2022 spiny dogfish Research Track Assessment (RTA) was ongoing at the time of Council action but suggested that stock biomass and productivity have been in decline. Based on the RTA the stock was not below the overfished threshold in 2019. The peer review for the RTA was early December 2022 (the RTA passed its peer review), and then a Management Track Assessment (MTA) will be conducted in mid-2023, utilizing the methods identified as acceptable by the peer review. The 2023 MTA will be used to inform stock status determinations and specifications for 2024 and beyond fishing years. The trends in the RTA suggest that sustainable catches may be similar or lower in coming years compared to the specifications proposed in this action.

The MAFMC's Risk Policy

The risk policy specifies the MAFMC's acceptable tolerance of risk for overfishing. The risk policy works in conjunction with the Scientific and Statistical Committee's (SSC's) application of the MAFMC's acceptable biological catch (ABC) control rule to account for scientific uncertainty to determine an ABC for a specific stock. For a stock like spiny dogfish where an overfishing level (OFL) is not currently quantified, the relevant regulations[4] state that "An ABC for stocks with an OFL that cannot be specified will be determined by using control rules based on biomass and catch history and application of the MAFMC's risk policy found in § 648.21(a) through (d)." § 648.21(d) applies for a "Stock without an OFL or OFL proxy." In such cases, "ABC levels may not be increased until such time that an OFL has been identified." The SSC may deviate from the risk policy if appropriate justification is provided. In the report from the September 2022 SSC meeting, the SSC noted that "the spawning stock estimate for females is the lowest in the time series since 1982 and pup abundance was low. Survey estimates show a

[4] https://www.ecfr.gov/current/title-50/chapter-VI/part-648#648.20

downward trend since 2016 despite catches that have been lower than the total allowable landings (TAL) since 2011. Preliminary analyses of new ageing data suggest lower productivity than previously thought." Regarding a 2023 ABC for spiny dogfish, the SSC concluded:

> "In absence of a stock assessment, the SSC developed an ad hoc approach that addresses the apparent recent decline in abundance pending confirmation in the upcoming assessment. The method reduced the previous ABC (defined in 2018) by first adjusting it to be consistent with the current Council Risk Policy. The adjusted ABC was then multiplied by the ratio of current average female spawning stock abundance (2021 and 2022) to the average for 2016 to 2018. **The SSC recommended an ABC of 7,788 mt for the 2023 fishing year.** This represents a 55% decrease from the 2022 ABC of 17,498 mt (MAFMC SSC 2022)."

Current Management Measures

Management measures are designed to ensure that the ABC is not exceeded and that optimum yield is caught. The fishery operates under open access (vessels must have a federal spiny dogfish permit to possess spiny dogfish in federal waters), with a May 1-April 30 fishing year.

Analyses in Section 6.2 use a definition of possession of a federal permit and landings of at least 10,000 pounds of spiny dogfish to estimate the number of, and trends in, vessels active in the spiny dogfish fishery. During the initial rebuilding from 2001-2005, these vessels numbered from 29-68. As abundance increased and fishing measures were liberalized, participation increased to a peak of 282 vessels in 2012. Participation has been declining since 2012, and 79 such vessels participated in the 2021 fishing year.

There is a 7,500-pound trip limit for vessels with federal permits, but some states have higher trip limits and some vessels have temporarily dropped their federal permit to take advantage of the higher trip limit in states' waters. Once the federal commercial quota is harvested, no possession is allowed in federal waters, but there have been no such federal closures since the 2012 fishing year. NMFS evaluates Annual Catch Limit (ACL) performance based on a single-year examination of total catch (including both landings and dead discards) to determine if the ACL has been exceeded. In this fishery ACL = ABC. In the event that the ACL has been exceeded in a given fishing year, the weight by which the ACL was exceeded is deducted, as soon as possible, from a subsequent single fishing year ACL.

Various other regulations are summarized at NOAA Fisheries' website: https://www.fisheries.noaa.gov/species/atlantic-spiny-dogfish, and relevant fishery regulations are described in full at https://www.ecfr.gov/current/title-50/chapter-VI. The following table summarizes the quota and trip limit history since federal management began in 2000.

Table 1. History of spiny dogfish quotas and trip limits since 2000 as implemented by NMFS.
States can also set their own trip limits for state waters.

Fishing Year	NMFS Commercial quota (mt)	Federal Trip Limit (pounds)	Notes
2000	1,814	600/300	Initially two seasonal quotas and trip limits. 5/1-10/31 and 11/1-4/30
2001	1,814	600/300	
2002	1,814	600/300	
2003	1,814	600/300	
2004	1,814	600/300	
2005	1,814	600/300	
2006	1,814	600	Trip limits for both periods or just annual hereafter
2007	1,814	600	
2008	1,814	600	
2009	5,443	3,000	Closed 9/26-10/31, 2009, and 1/26-4/30, 2010. ASMFC removes seasonal quotas
2010	6,803	3,000	Closed 8/27-10/31, 2010, and April 2011
2011	9,072	3,000	Closed 8/26-10/ 31, 2011, and 1/13-4/30, 2012
2012	16,191	3,000	
2013	18,526	4,000	New trip limit effective May 3, 2013
2014	22,243	5,000	New trip limit effective Sept 8; federal seasonal allocation ends Aug 2014
2015	22,957	5,000	
2016	18,307	6,000	New trip limit effective Aug 15, 2016
2017	17,735	6,000	
2018	17,325	6,000	
2019	9,309	6,000	
2020	10,521	6,000	
2021	13,408	6,000	
2022	13,408	7,500	New trip limit effective May 1, 2022

4.2 Process

The specifications process is detailed in the FMP's implementing regulations, but generally begins with fishery performance input from the Spiny Dogfish Advisory Panel and a review of assessment findings by the MAFMC's SSC, which sets an ABC. This took place at the SSC's September 2022 meeting - https://www.mafmc.org/ssc-meetings/2022/sept13-14. The Spiny Dogfish Monitoring Committee then made additional recommendations for the specifications later in September 2022 - https://www.mafmc.org/council-events/2022/spiny-dogfish-mc-2022. The joint Spiny Dogfish Committee made recommendations for the Councils on September 20, 2022: https://www.mafmc.org/council-events/2022/spiny-dogfish-committee-meeting. The MAFMC adopted 2023 specifications at its October 2022 meeting: https://www.mafmc.org/briefing/october-2022. The NEFMC adopted 2023 specifications at its December 2022 meeting: https://www.nefmc.org/calendar/december-2022-council-meeting. Public comments were taken at these meetings. NOAA Fisheries will publish a proposed rule for these specifications, which will also solicit public comments. After reviewing and appropriately addressing any comments, NOAA Fisheries will publish a final rule.

This EA is being prepared using the 2020 CEQ NEPA Regulations as modified by the Phase I 2022 revisions. The effective date of the 2022 revisions was May 20, 2022 and reviews begun after this date are required to apply the 2020 regulations as modified by the Phase I revisions unless there is a clear and fundamental conflict with an applicable statute. This EA began in late 2022 and accordingly proceeds under the 2020 regulations as modified by the Phase I revisions. .

4.3 Purpose and Need

The purpose of this action is to set specifications for the 2023 spiny dogfish fishery. This action is needed to prevent overfishing and achieve optimum yield. Per the Magnuson-Stevens Fishery Conservation and Management Act (MSA), optimum yield is defined as the amount of fish that will provide the greatest overall benefit to the nation based on the stock's maximum sustainable yield as reduced by relevant economic, social, and/or ecological factors.

4.4 Regulatory Authority

The MSA states that FMPs shall "contain the conservation and management measures… necessary and appropriate for the conservation and management of the fishery to prevent overfishing and rebuild overfished stocks, and to protect, restore, and promote the long-term health and stability of the fishery." As discretionary provisions of FMPs, the MSA also allows restriction of fishing by gear/area/time/season. Seasonal management based on attainment of quotas has been previously incorporated into the FMP.

4.5 Management Unit and Geographic Scope

The management unit (fish stock definition) includes all spiny dogfish under U.S. jurisdiction in the Northwest Atlantic, with a core fishery management area from Maine to North Carolina. Canadian landings are also accounted for as part of setting annual specifications.

4.6 FMP History and Management Objectives

Federal management of the spiny dogfish fishery began in 2000. Over time a variety of management issues have been addressed including stock rebuilding. The history of the plan and its amendments can be found at https://www.mafmc.org/dogfish. The overall goal of this FMP is to conserve spiny dogfish in order to achieve optimum yield from this resource. To meet the overall goal, the following objectives were adopted in the original FMP and remain in effect:

1. Reduce fishing mortality to ensure that overfishing does not occur.
2. Promote compatible management regulations between state and Council jurisdictions and the US and Canada.
3. Promote uniform and effective enforcement of regulations.
4. Minimize regulations while achieving the management objectives stated above.
5. Manage the spiny dogfish fishery so as to minimize the impact of the regulations on the prosecution of other fisheries, to the extent practicable.
6. Contribute to the protection of biodiversity and ecosystem structure and function

5.0 WHAT ALTERNATIVES ARE CONSIDERED IN THIS DOCUMENT?

All alternatives except for "no action" (which is Alternative 1) begin with the relevant ABC recommended by the SSC. Alternative 1 utilizes the ABC recommended previously for 2022, which rolls-over if no action is taken. For Alternatives 2-4, those ABCs are as recommended for 2023 by the SSC. In addition to being a reasonable range of ABCs, an ABC higher than the SSC-recommended 7,788 MT could not be legally recommended by the Councils per the MSA, and there is not current scientific information to support other higher or lower ABCs. The SSC's rationale for the reduction for 2023 included observations of declining trends in several indicators including: survey abundance, catch per unit of effort (CPUE), pup production, and dogfish growth (MAFMC SSC 2022).

5.1 ALTERNATIVE 1: NO ACTION, STATUS QUO

Table 2. Alternative 1 - No Action and Status Quo

Specifications	2022 (pounds)	2022 (mt)	Basis (for 2022)
OFL (from SSC)	na	na	na
ABC (from SSC)	38,576,487	17,498	SSC, Revised Council Risk Policy
Canadian Landings	99,208	45	= 2018 estimate
Domestic ABC	38,477,279	17,453	= ABC – Canadian Landings
ACL	38,477,279	17,453	= Domestic ABC
Mgmt Uncert Buffer[5]	0	0	Ave pct overage since 2011
ACT	38,477,279	17,453	= ACL - mgmt uncert buffer
U.S. Discards	8,800,854	3,992	= 3 year average 2016-17-18
TAL	29,676,425	13,461	ACT – Discards
U.S. Rec Landings	116,845	53	= 2019 estimate
Comm Quota	29,559,580	13,408	TAL – Rec Landings

This FMP provides that the current specifications roll-over into the next fishing year until new specifications are implemented. This means that no-action results in the above 2022 specifications persisting until replaced.

[5] Mgmt Uncert Buffer = Management Uncertainty Buffer

5.2 ALTERNATIVE 2: NEW 7,788 MT SSC ABC RECOMMENATION WITH 0% MANAGEMENT UNCERTAINTY BUFFER (PREFERRED)

Table 3. Alternative 2 - 7,788 MT ABC with 0% Uncertainty Buffer

Specifications	2023 (pounds)	2023 (mt)	**Basis for 2023 Specifications**
OFL (from SSC)	na	na	na
ABC (from SSC)	17,169,581	7,788	SSC
Canadian Landings	81,571	37	= 2019 estimate, most recent
Domestic ABC	17,088,010	7,751	= ABC – Canadian Landings
ACL	17,088,010	7,751	= Domestic ABC
Mgmt Uncert Buffer	0.0%	0.0%	Higher risk of ACL overages but minimizes potential disruption to industry
Amount of buffer	0	0	
ACT	17,088,010	7,751	= ACL - mgmt uncert buffer
U.S. Discards	4,603,247	2,088	scaled down from 2017-2019 average
TAL	12,484,763	5,663	ACT – Discards
U.S. Rec Landings	471,789	214	= 2021 estimate
Comm Quota	12,012,974	5,449	TAL – Rec Landings

These specifications start with the ABC from the SSC, and then deducts expected Canadian landings, expected discards, and expected U.S. recreational landings to calculate the U.S. commercial quota. The Spiny Dogfish Monitoring Committee recommended the reductions for Canadian landings, U.S. discards, and U.S. recreational landings based on the best available information at the time. Of particular note, the deduction for discards takes recent average (2016-2018) discards and then scales those down as the SSC scaled the ABC down based on the trends in abundance – if abundance has truly declined then so should discards. MAFMC staff analyses for the SSC also indicated a very strong correlation between the relevant abundance index (NEFSC spring trawl) and bottom trawl discards, which make up most discards (MAFMC SSC 2022). The Spiny Dogfish Monitoring Committee noted that "While this approach seems reasonable given the available information, 2,088 MT involves substantial uncertainty and would be less discards than estimated for any time in the time series…1989-2019…"

Alternative 2, which is preferred, does not use a management uncertainty buffer (there is not a history of ACL overages in this fishery). The Councils discussed that without a management

uncertainty buffer, these specifications involve a higher risk of substantial ACL overages (up to about 1,200 MT given recent year-to-year discard estimate patterns[6], but if spiny dogfish abundance increased, discards and overages could be even higher) given the uncertainty about expected discards, but industry input indicated they were willing to risk future paybacks because a 2023 quota below 12 million pounds could lead to the closure of the last remaining spiny dogfish processor and disrupt the entire fishery. The Council also noted that the current regional/state allocations (set at the ASMFC) mean that the full quota will probably not be utilized. While states have improved their abilities to transfer unused quota in one state to another state that could use more quota, the transferring system is likely not agile enough to completely use the full quota. So while ACL overages are not expected under this alternative, they are more likely under this alternative than Alternatives 3 or 4. From a biological perspective, the effect of overages is likely to be negligible – because any ACL overages are deducted from catches within several years, the net effect on spiny dogfish biomass trends would be small (especially given the long lifespan of spiny dogfish).

5.3 ALTERNATIVE 3: NEW 7,788 MT SSC ABC RECOMMENATION WITH 5% MANAGEMENT UNCERTAINTY BUFFER

Table 4. Alternative 3 – 7,788 MT ABC with 5% Uncertainty Buffer

Specifications	2023 (pounds)	2023 (mt)	**Basis for 2023 Specifications**
OFL (from SSC)	na	na	na
ABC (from SSC)	17,169,581	7,788	SSC
Canadian Landings	81,571	37	= 2019 estimate, most recent
Domestic ABC	17,088,010	7,751	= ABC – Canadian Landings
ACL	17,088,010	7,751	= Domestic ABC
Mgmt Uncert Buffer	5.0%	5.0%	Reduces chance of large ACL overages due to discard prediction error
Amount of buffer	854,400	388	
ACT	16,233,609	7,363	= ACL – 14gmt. uncert buffer
U.S. Discards	4,603,247	2,088	scaled down from 2017-2019 average
TAL	11,630,363	5,275	ACT – Discards

[6] The 2022 research track assessment included data through 2019, and the highest discards in the last 5 years of assessment data was about 3,300 MT. 3,300-2,088 = about 1,200 MT)

U.S. Rec Landings	471,789	214	= 2021 estimate
Comm Quota	11,158,574	5,061	TAL – Rec Landings

Like Alternatives 2 and 4, these specifications start with the ABC from the SSC, and then deducts expected Canadian landings, expected discards, and expected U.S. recreational landings as recommended by the Spiny Dogfish Monitoring Committee to calculate the U.S. commercial quota. See Alternative 2 for additional discussion about the rationale for those deductions.

This Alternative also uses a 5% management uncertainty buffer. A management uncertainty buffer is designed to reduce the chance of ACL overages, or reduce the magnitude of any ACL overages that do occur. Given the uncertainty about the set-aside for discards and variability in discard estimates, substantial ACL overages (up to about 800 MT given recent year-to-year discard estimate patterns[7], but if spiny dogfish abundance increased, discards and overages could be even higher) could still occur with a 5% management uncertainty buffer, but would be less likely and would be reduced with this buffer (compared to a zero buffer) should an overage occur. While ACL overages are not expected under this alternative, they are more likely under this alternative than Alternative 4 and less likely than under Alternative 2.

5.4 ALTERNATIVE 4: NEW 7,788 MT SSC ABC RECOMMENATION WITH 13% MANAGEMENT UNCERTAINTY BUFFER

Table 5. Alternative 4 – 7,788 MT ABC with 13% Uncertainty Buffer

Specifications	2023 (pounds)	2023 (mt)	**Basis for 2023 Specifications**
OFL (from SSC)	na	na	na
ABC (from SSC)	17,169,581	7,788	SSC
Canadian Landings	81,571	37	= 2019 estimate, most recent
Domestic ABC	17,088,010	7,751	= ABC – Canadian Landings
ACL	17,088,010	7,751	= Domestic ABC
Mgmt Uncert Buffer	13.0%	13.0%	Should minimize chance of large ACL overages due to discard prediction error

[7] The 2022 research track assessment included data through 2019, and the highest discards in the last 5 years of assessment data was about 3,300 MT. 3,300-2,088 (set aside) – 388 (buffer) = about 800 MT)

Amount of buffer	2,221,441	1,008	
ACT	14,866,568	6,743	= ACL – 16gmt. uncert buffer
U.S. Discards	4,603,247	2,088	scaled down from 2017-2019 average
TAL	10,263,322	4,655	ACT – Discards
U.S. Rec Landings	471,789	214	= 2021 estimate
Comm Quota	9,791,533	4,441	TAL – Rec Landings

Like Alternatives 2 and 3, these specifications start with the ABC recommended by the MAFMC's SSC, and then deducts expected Canadian landings, expected discards, and expected U.S. recreational landings as recommended by the Spiny Dogfish Monitoring Committee to calculate the U.S. commercial quota. See Alternative 2 for additional discussion about the rationale for those deductions.

This Alternative also uses a 13% management uncertainty buffer. A management uncertainty buffer is designed to reduce the chance of ACL overages, or reduce the magnitude of any ACL overages that do occur. Given the uncertainty about the set-aside for discards and variability in discard estimates, ACL overages (up to about 200 MT given recent year-to-year discard estimate patterns[8], but if spiny dogfish abundance increased, discards and overages could be even higher) could still occur with a 13% management uncertainty buffer, but would be less likely and should be substantially reduced with this buffer should an overage occur. While ACL overages are not expected under this alternative, they could still occur, but would be less likely than under Alternatives 2 or 3.

THIS SPACE LEFT BLANK FOR FORMATTING PURPOSES

[8] The 2022 research track assessment included data through 2019, and the highest discards in the last 5 years of assessment data was about 3,300 MT. 3,300-2,088 (set aside) – 1008 (buffer) = about 200 MT)

6.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT AND FISHERIES

6.1 Description of the Managed Resource and Non-Target Species

Spiny Dogfish

Atlantic spiny dogfish (*Squalus acanthias*) is a long-lived (up to 50 years) schooling shark that is widely distributed across both sides of the North Atlantic. The Northwest Atlantic population is treated as one stock – substantial migration is not believed to occur across the two sides of the Atlantic (though tagging studies do find occasional long-distance migrators (e.g. Hjertenes 1980, Templeman 1954). Spiny dogfish are considered one of the most migratory shark species in the northwest Atlantic (Compagno 1984). In the northwest Atlantic, spiny dogfish occur from Florida to Canada, with highest concentrations from Cape Hatteras to Nova Scotia. In the winter and spring, they are found primarily in Mid-Atlantic waters, and tend to migrate north in the summer and fall, with concentrations in southern New England, Georges Bank, and the Gulf of Maine (though a recent study has created some uncertainty regarding the established migration paradigm, Carlson 2014).

Spiny dogfish have a wide-ranging diet consisting of fish, such as herring, mackerel and sand lance, as well as invertebrates including ctenophores, squid, crustaceans and bivalves. Spiny dogfish are live bearers with a very long gestation period (18-24 months), and are slow growing with late maturation. These reproductive characteristics generally make a stock more vulnerable to overfishing (https://www.fisheries.noaa.gov/international-affairs/shark-conservation, NOAA 2001). Females grow larger than males and as a result, the fishery primarily targets females.

A research track assessment (RTA) (NEFSC 2022c) using data through 2019 utilized the Stock Synthesis 3 program to develop a new model for spiny dogfish in the Northwest Atlantic, and found that the stock was not overfished, but overfishing was occurring in 2019 (Figures 1 and 2). While above the overfished threshold (50% of the target), the stock was less than 70% of the target and declining in the terminal years. Official stock status determinations will be made based on a management track assessment (MTA) conducted in 2023 using the methods developed and reviewed in the RTA, which successfully passed peer review. Stock status is determined based on spawning output, which is tied to mature female biomass. Per Figures 1-2, the stock is still believed to have become overfished in the 1990s, then was rebuilt by 2012, but it appears that misestimation of the stocks productivity by assessments preceding the recent 2022 assessment again led to overfishing after 2012 – the stock declined from 2012-2019, though the decline appeared to be slowing by 2019. Male exploitable biomass has generally increased since

2001– as discussed above males are not targeted by the fishery. The 2022 RTA suggested that the stock could increase after 2019, but survey trends since 2019 that are used by the assessment model have been declining (MAFMC 2022). The 2023 management track assessment will integrate all new data, but a quick substantial rebound in the stock is not currently expected.

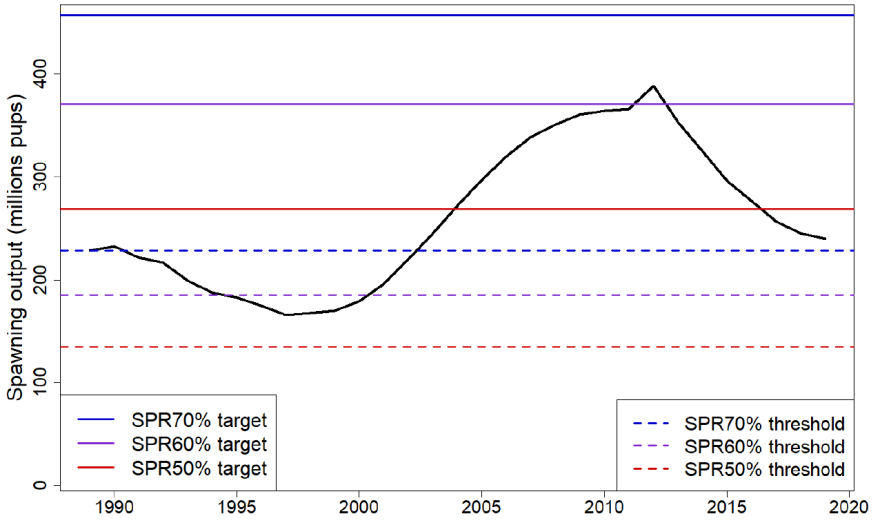


Figure 1. Time series of spawning output from the SS3 base model, together with biomass reference points at SPR50%, SPR60% and SPR70%.

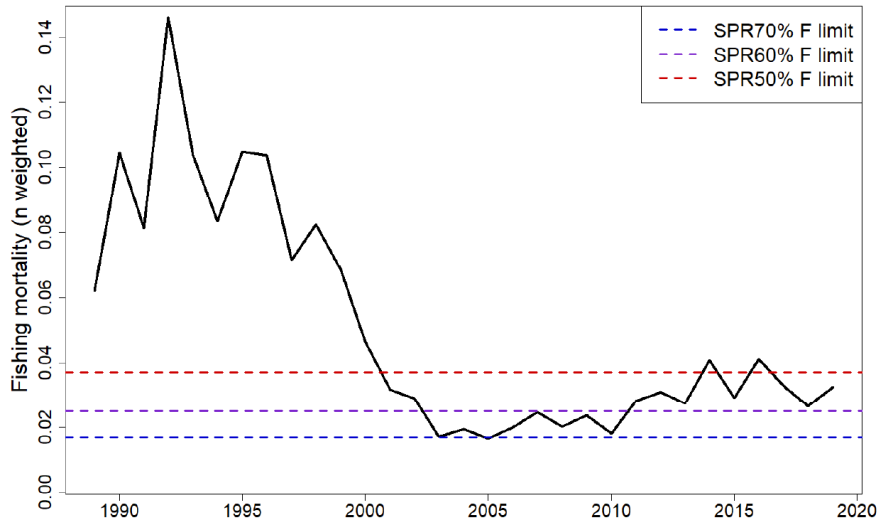


Figure 2. Time series of fishing mortality from the SS3 base model, together with fishing mortality reference points at SPR50%, SPR60% and SPR70%.

Non-Target Species

A) Other Species Caught in Directed Spiny Dogfish Fishing

Due to reduced observer coverage in 2020 and 2021 due to Covid-19, observer data from 2017-2019 still best describe incidental catch in the spiny dogfish fishery. The primary database used to assess discarding is the NMFS Observer Program database, which includes data from trips that had trained observers onboard to document discards. One critical aspect of using this database to describe discards is to correctly define the trips that constitute a given directed fishery. A flexible criteria of what captains initially intend to target, how they may adjust targeting over the course of a trip, and what they actually catch would be ideal but is impracticable.

From 2017-2019, gill net gear accounted for 66%-74% of annual landings. Bottom long line gear accounted for 18-27% of annual landings. All other gears, including bottom trawl, accounted for only 7-8% of annual landings and are not expected to have involved substantial targeting of spiny dogfish given current trip limits (substantial trawling for spiny dogfish would only be expected at higher trip limits given the price of spiny dogfish) and very similar intensity of bottom trawling in the region would be expected to occur even with a complete prohibition on spiny dogfish retention.

From 2017-2019 there were on average 235 observed sink gill net trips (gear # = 100) annually where spiny dogfish accounted for at least 40% of retained catch, and those trips form the basis of the following analysis to determine which other species the directed spiny dogfish fishery interacts with. These trips made 2,540 hauls of which 86% were observed. Hauls may be unobserved for a variety of reasons, for example transfer to another vessel without an observer, observer not on station, haul slipped (dumped) in the water before observing, etc. These observed hauls had a 5% discard rate, most of which was spiny dogfish.

The other species to exceed 1,000 pounds of observed catch per year (used as an ad-hoc minimum indication threshold of potentially more than negligible catch) included (annual observed catch rounded to nearest 1,000 pounds): winter/big skate (83,000 pounds), little skate (8,000 pounds), unknown skates (7,000 pounds), monkfish (6,000 pounds), smooth dogfish (4,000 pounds), cod (3,000 pounds), lobster (3,000 pounds), pollock (3,000 pounds), menhaden (2,000 pounds), haddock (1,000 pounds), and striped bass (1,000 pounds). Of these, only cod is overfished while the Southern New England lobster stock is "depleted with poor prospects of recovery" (https://media.fisheries.noaa.gov/2022-05/2021_SOS_FSSI_and_nonFSSI_Stock_Status_Tables.pdf, http://www.asmfc.org/species/american-lobster).

From 2017-2019 there were on average 36 observed bottom longline trips (gear # = 010) annually where spiny dogfish accounted for at least 40% of retained catch, and those trips form the basis of the following analysis to determine which other species the directed spiny dogfish fishery interacts with. These trips made 438 hauls of which 99% were observed. Hauls may be

unobserved for a variety of reasons, for example transfer to another vessel without an observer, observer not on station, haul slipped (dumped) in the water before observing, etc. These observed hauls had a 10% discard rate, most of which was spiny dogfish.

The other species to exceed 1,000 pounds of observed catch per year (used as an ad-hoc minimum indication threshold of potentially more than negligible catch) included (annual observed catch rounded to nearest 1,000 pounds): golden tilefish (7,000 pounds), barndoor skate (4,000 pounds), smooth dogfish (3,000 pounds), and winter/big skate (2,000 pounds). Of these, none is overfished (https://media.fisheries.noaa.gov/2022-05/2021_SOS_FSSI_and_nonFSSI_Stock_Status_Tables.pdf).

While not extrapolations, the above amounts appear very small relative to annual catch limits for these species, and management of these species already accounts for both landings and discards. Given the apparent low level of interactions with non-target species and ongoing management of those species, their conditions are affected predominantly by other fisheries/issues and should not be affected by this action or the operation of the spiny dogfish fishery more generally.

B. Other Managed Fisheries with Non-directed Spiny Dogfish Catch

Per NMFS' 2020 report on Discard Estimation, Precision, and Sample Size Analyses for 14 Federally Managed Species Groups in the Waters off the Northeastern United States (NMFS 2020), a wide variety of gear types discard spiny dogfish beyond the gear types mentioned above that are responsible for most landings. These other gear types catch most of the species that exist in the region, some of which are in good condition and some of which are in an overfished condition. While this indicates that incidental spiny dogfish catch occurs across a wide variety of other managed fisheries, outside of the directed spiny dogfish fishery, spiny dogfish is often seen as a pest species (e.g. see MAFMC 2017 MSB Fishery Performance Report at http://www.mafmc.org/s/2017-MSB-Fishery-Performance-Report.pdf), and is often entirely discarded (e.g. longfin squid fishery – see MAFMC 2020). As such, changes in spiny dogfish regulations are not expected to change fishing patterns for other fisheries that catch (and mostly discard) spiny dogfish, or affect any of those managed species in a meaningful way. Further details about the many other managed species in the region and their current stock statuses can be found in their relevant FMPs.

6.2 Human Communities and Economic Environment

This section describes the performance of the spiny dogfish fishery to allow the reader to understand its socio-economic importance. Also see NMFS' communities page at: https://www.fisheries.noaa.gov/new-england-mid-atlantic/socioeconomics/socioeconomic-cultural-and-policy-research-northeast.

The most obvious way that human communities are affected by the fishery is from the revenues generated, and the jobs created. The affected communities include both individuals directly involved in harvesting and processing as well as indirect support services (e.g. vessel maintenance, insurance, ice, etc.). While the direct data points that are most available are landings and revenues, it is important to keep in mind that by contributing to the overall functioning of and employment in coastal communities, the fishery has indirect social impacts as well. Social impacts are strongly aligned with changes to fishing opportunities and while difficult to measure can include impacts to families from income changes/volatility, safety-at-sea (related to changes in fishery operations due to regulation changes), job satisfaction, and/or frustration by individuals due to management's impacts (especially if they perceive management actions to be unreasonable or ill-informed).

Recent Fishery Performance

This section establishes a descriptive baseline for the fishery with which to compare actual and predicted future socio-economic changes that result from management actions. The 2022 spiny dogfish Fishery Information Document and 2022 Spiny Dogfish Fishery Performance Report have details on recent commercial fishing activity, summarized below. These are available at https://www.mafmc.org/dogfish. There is negligible directed recreational catch.

Figure 3 below, from the 2022 Assessment, describes spiny dogfish landings 1962-2019 and highlights the early foreign fishery and then domestication of the fishery in the 1990s. Figures 4-6 describe domestic landings, ex-vessel revenues, and prices (inflation adjusted) 1996-2021. Data since 1996 is more reliable than previous data due to improvements in reporting requirements. The Gross Domestic Product Implicit Price Deflator was used to report ex-vessel prices as "2021 dollars." Figure 7 illustrates preliminary weekly 2021 (yellow-orange) and 2022 (blue) landings through the year. Figure 8 displays locations of 2010-2021 NEFSC survey catches and VTR landings.

Most recent landings are from gill net gear (Table 8) and in MA, VA, and NJ (in that order) (Table 9). There has been a recent decline in the number of federally-permitted vessels participating (Table 10).

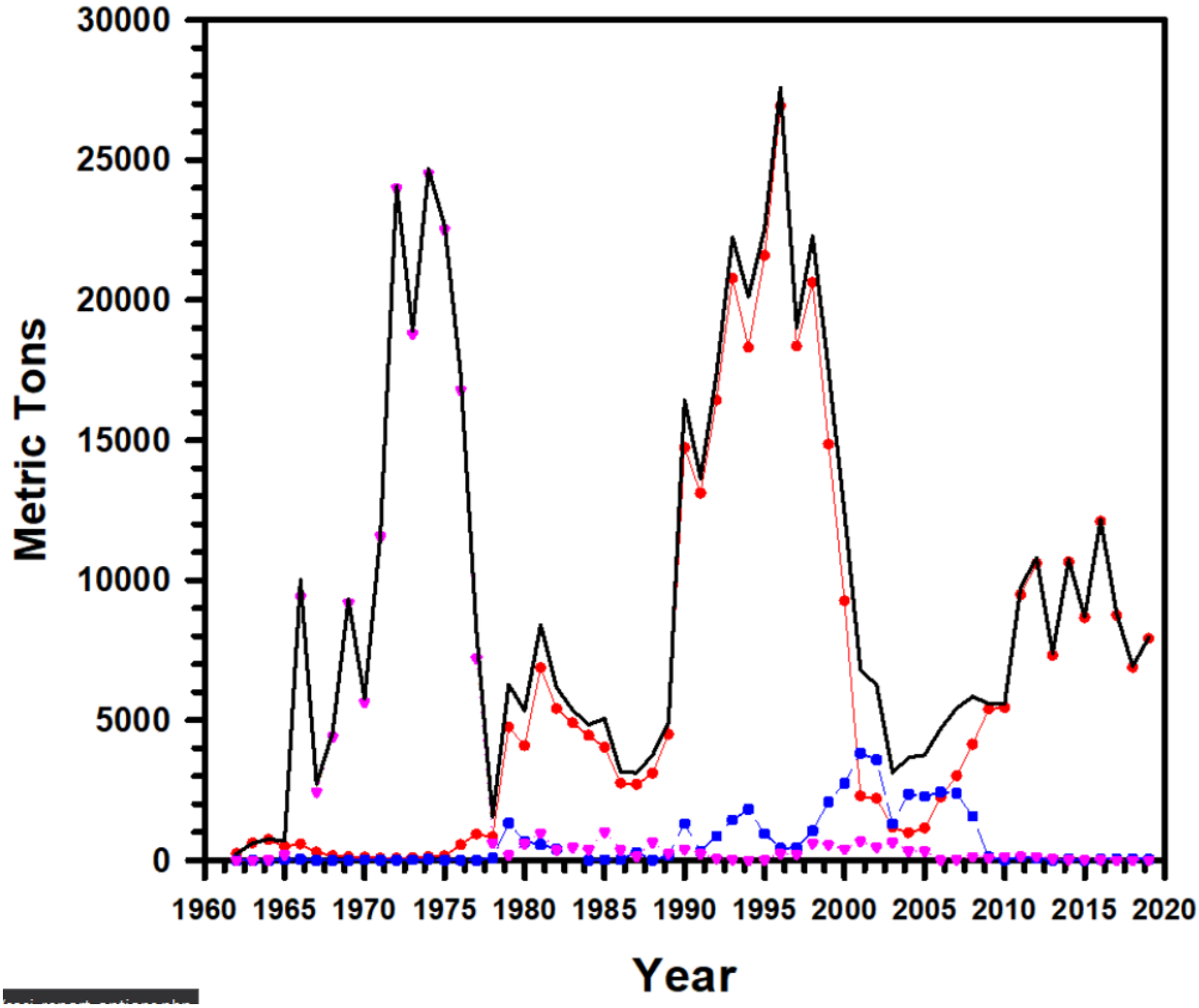


Figure 3. Commercial landings (metric tons) from the United States (red circles), Canada (blue squares) and other foreign (pink triangles) and total (black solid line) in NAFO Subareas 2-7 from 1962-2019.
Sources: 2022 Spiny Dogfish Research Track Assessment, available at https://apps-nefsc.fisheries.noaa.gov/saw/sasi.php.

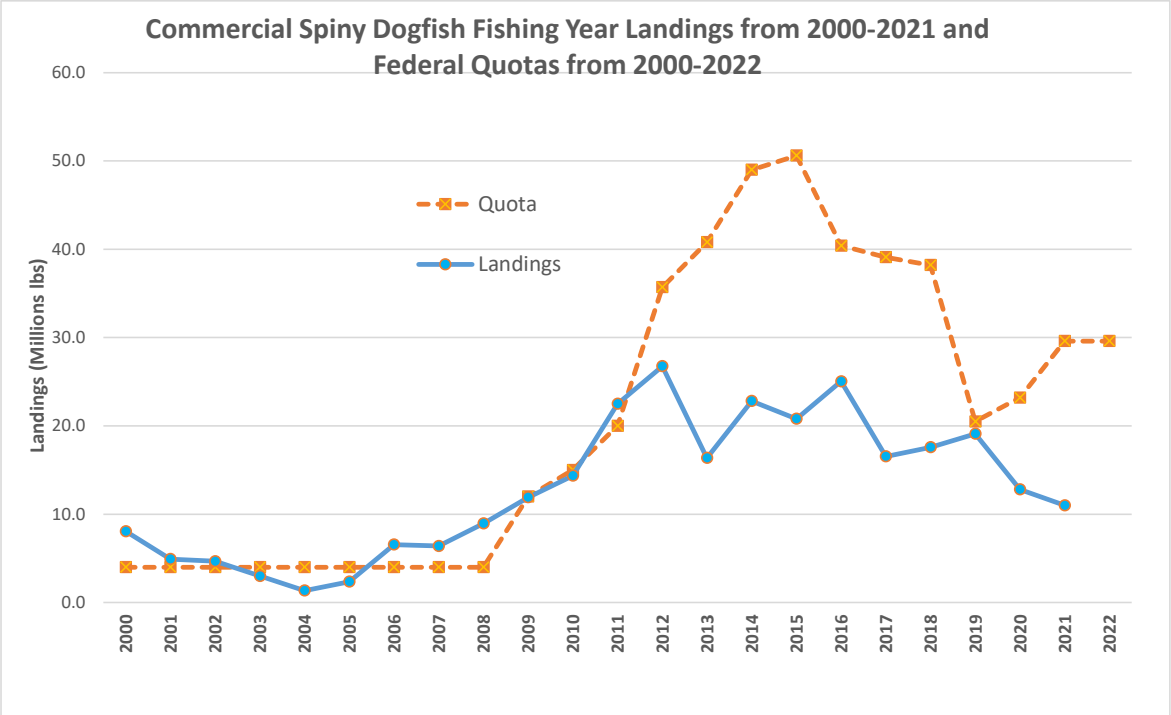


Figure 4. U.S. Spiny Dogfish Landings and Quotas 2000-2021 fishing years.
Source: NMFS unpublished dealer data.

THIS SPACE LEFT BLANK FOR FORMATTING PURPOSES

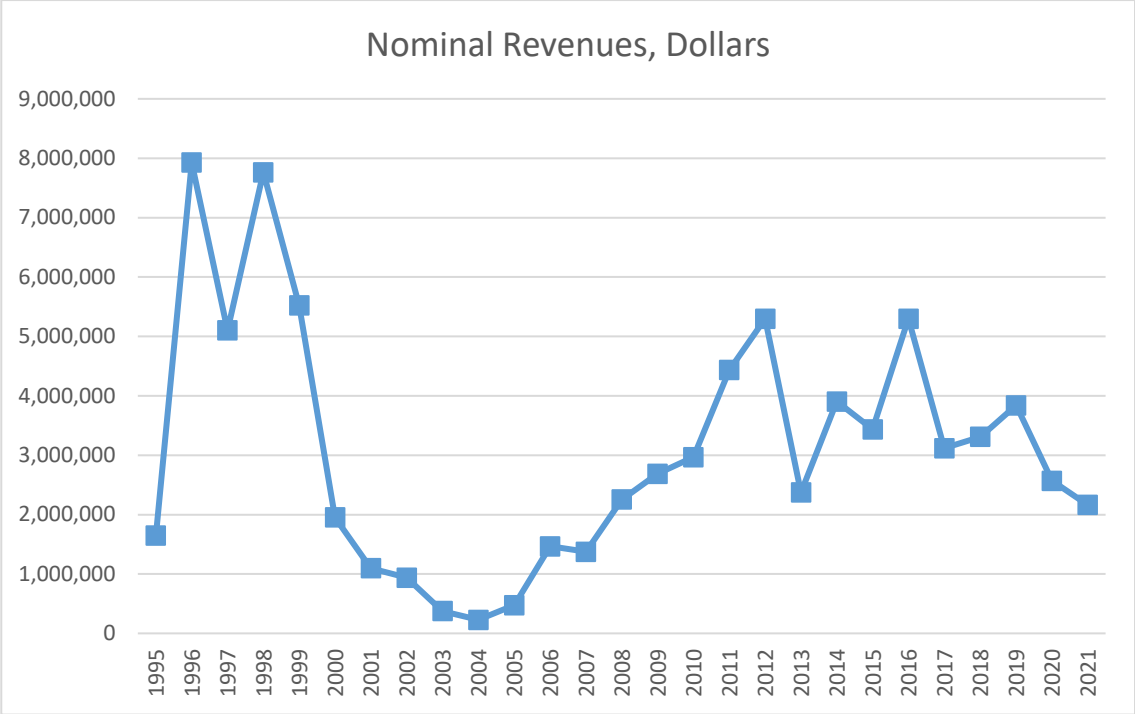


Figure 5. Spiny Dogfish Ex-Vessel Revenues 1995-2021 fishing years, Nominal Dollars
Source: Unpublished NMFS landings data

THIS SPACE LEFT BLANK FOR FORMATTING PURPOSES

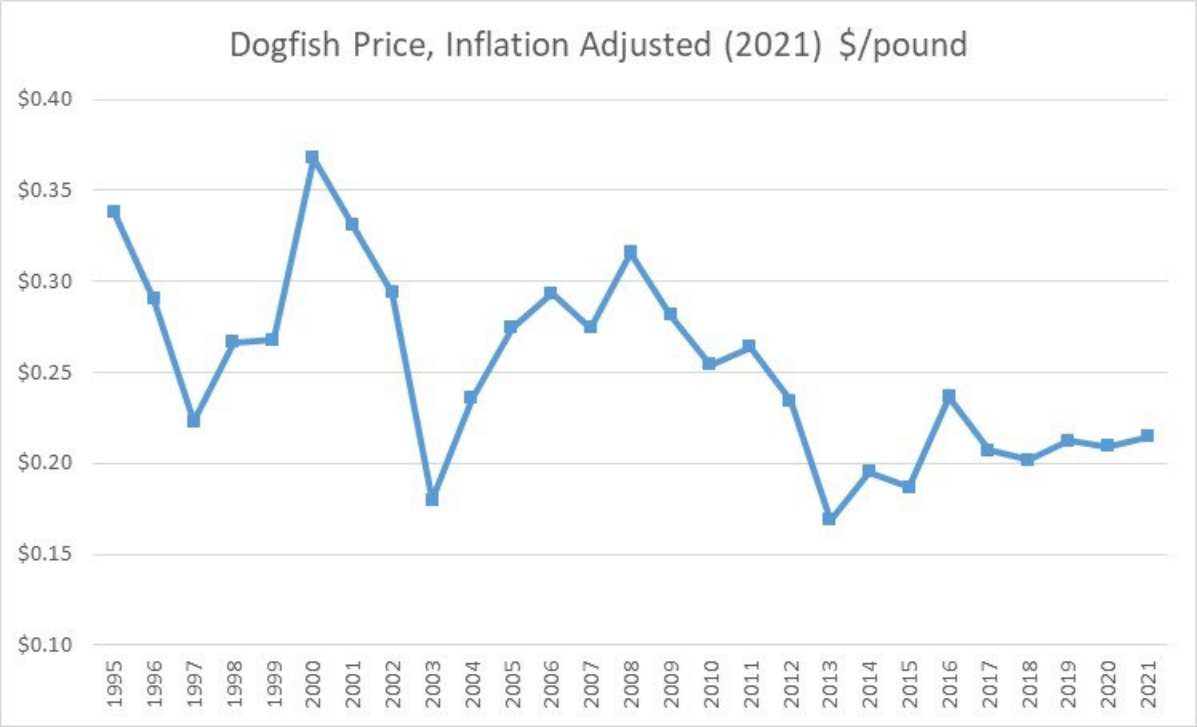


Figure 6. Ex-Vessel Spiny Dogfish Prices 1995-2021 Adjusted to 2021 Dollars
Source: NMFS unpublished dealer data.

THIS SPACE LEFT BLANK FOR FORMATTING PURPOSES

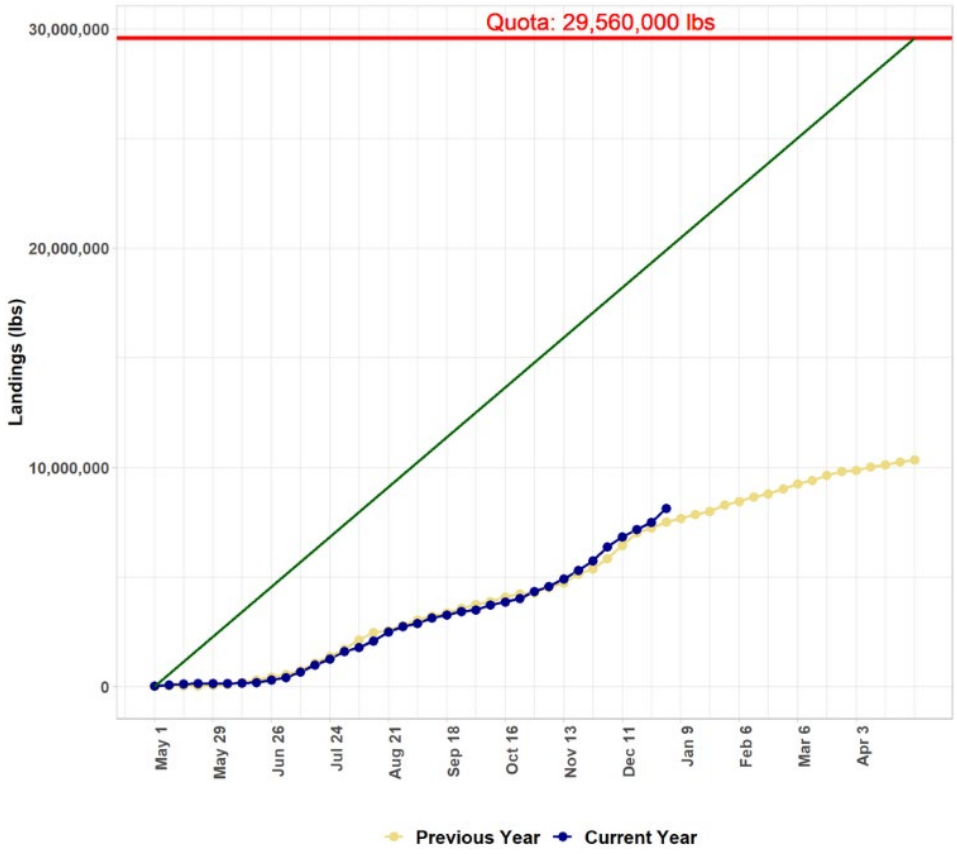


Figure 7. U.S. Preliminary spiny dogfish landings; 2022 fishing year in dark blue, 2021 in yellow-orange.
Source: https://www.fisheries.noaa.gov/new-england-mid-atlantic/commercial-fishing/quota-monitoring-greater-atlantic-region

Table 6. Commercial spiny dogfish landings (live weight – millions of pounds) by gear 2019-2021.
Source: NMFS unpublished dealer data.

fishyear	GILL_NET_SINK__OTHER	UNKNOWN	LONGLINE__BOTTOM	GILL_NET_SET__STAKE__SEA_BASS	HAND_LINE__OTHER	TRAWL_OTTER_BOTTOM_FISH	Other	Total
2019	12.1	3.0	1.3	1.5	0.5	0.5	0.3	19.1
2020	9.1	1.3	1.8	0.1	0.0	0.4	0.0	12.8
2021	8.7	0.2	0.5	0.1	0.1	0.3	0.2	10.1

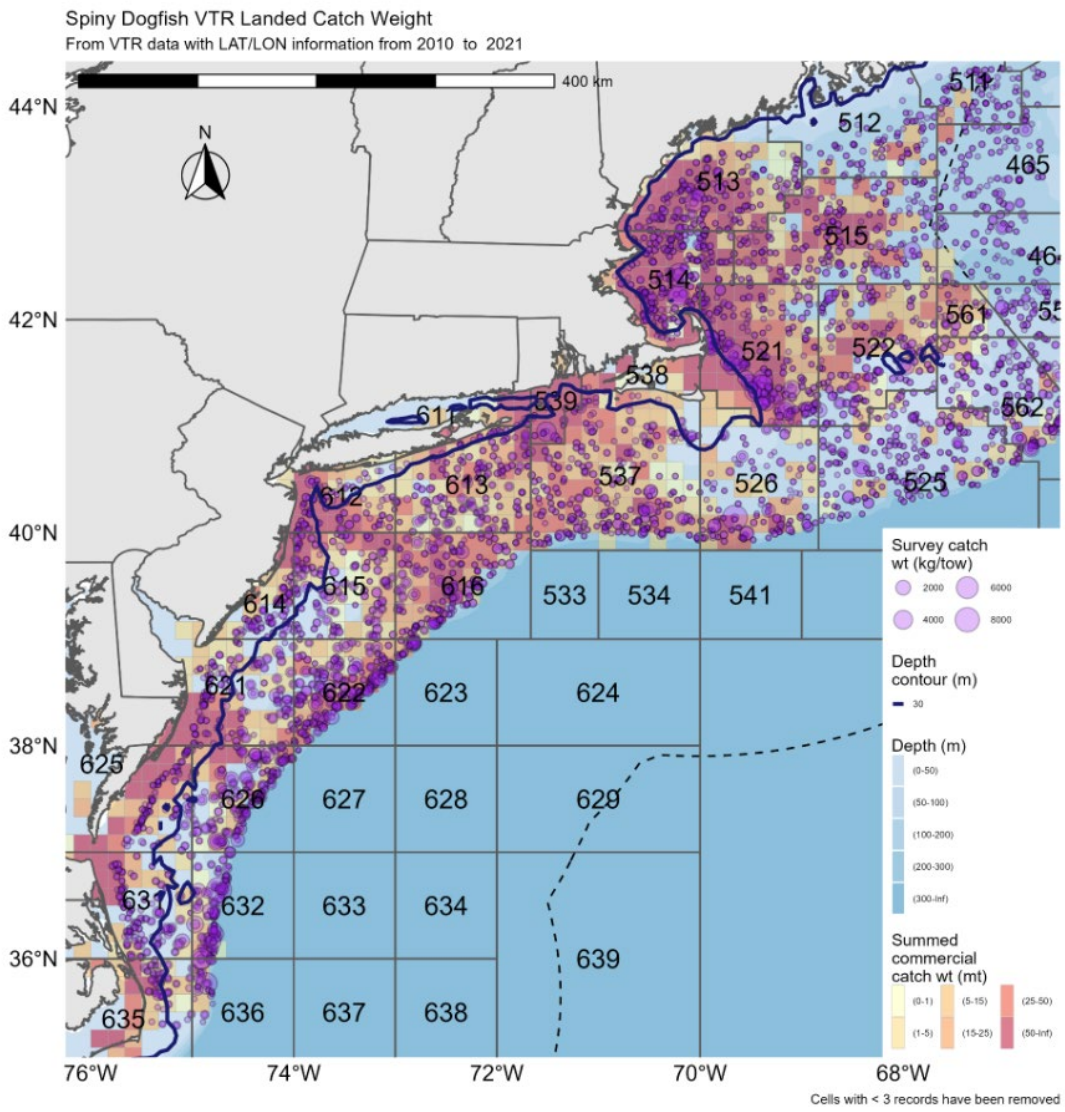


Figure 8. Survey and VTR Spiny Dogfish Catches 2010-2021 – Assessment – Jones 2022 Working Paper available at https://apps-nefsc.fisheries.noaa.gov/saw/sasi.php.

Table 7. Commercial Spiny Dogfish landings (live weight – millions of pounds) by state for 2019-2021 fishing years.
Source: NMFS unpublished dealer data.

fishyear	MA	VA	NJ	Other (NC,NH, MD, RI,CT, NY)	Total
2019	6.6	7.4	1.9	3.1	19.1
2020	6.6	2.9	2.0	1.4	12.8
2021	3.8	3.5	1.6	1.2	10.1

Table 8. Vessel participation over time in the Spiny Dogfish Fishery based on annual landings (pounds).
State-only vessels are not included. Source: NMFS unpublished dealer data.

YEAR	Vessels 200,000+	Vessels 100,000 - 199,999	Vessels 50,000 - 99,999	Vessels 10,000 - 49,999	Total with at least 10,000 pounds landings
2000	16	10	8	43	77
2001	4	12	10	33	59
2002	2	14	8	31	55
2003	4	5	3	17	29
2004	0	0	0	42	42
2005	0	0	1	67	68
2006	0	4	11	114	129
2007	1	2	21	72	96
2008	0	5	20	119	144
2009	0	11	42	166	219
2010	0	26	54	124	204
2011	1	48	73	135	257
2012	25	55	56	146	282
2013	10	27	45	87	169
2014	27	38	38	81	184
2015	31	33	36	59	159
2016	52	26	14	45	137
2017	28	27	24	32	111
2018	28	26	20	35	109
2019	29	25	21	29	104
2020	23	27	15	22	87
2021	15	27	11	26	79

6.3 Habitat, Including Essential Fish Habitat (EFH)

A description of the habitat associated with the spiny dogfish fishery is presented in Section 6.2 of Amendment 3 to the FMP (MAFMC 2014), and a brief summary of that information is given here. The impact of fishing on spiny dogfish habitat (and EFH) as well as the impact of the fishery on other species' habitats and EFH can also be found in Section 6.2 of Amendment 3. Potential impacts on habitat (including EFH) associated with the actions proposed in this specifications document are discussed in Section 7.

6.3.1 PHYSICAL ENVIRONMENT

A report entitled "Characterization of Fishing Practices and the Marine Benthic Ecosystems of the Northeast U.S. Shelf, and an Evaluation of the Potential Effects of Fishing on Essential Fish Habitat" was developed by NMFS (Stevenson et al. 2004). The document provides additional information on the physical and biological features of habitats in the Northeast Shelf Ecosystem. It also includes a description of fishing gears used in the NMFS Northeast region, maps showing the regional distribution of fishing activity by different gear types during 1995-2001, and a summary of gear impact studies published prior to 2002 that indicate how and to what degree fishing practices used in the NMFS Northeast region affect benthic habitats and species managed by the New England and Mid-Atlantic fishery management councils. It is available by request through GARFO or electronically at: http://www.nefsc.noaa.gov/nefsc/publications.

The Northeast Shelf Ecosystem has been described as 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 Gulf of Maine, Georges Bank, and Mid-Atlantic Bight are distinct subsystems within this region. The Gulf of Maine is an enclosed coastal sea, characterized by relatively cold waters and deep basins, with a patchwork of sediment types. Georges Bank is a relatively shallow coastal plateau that slopes gently from north to south and has steep submarine canyons on its eastern and southeastern edge. It is characterized by highly productive, well-mixed waters and fast-moving currents. The Mid-Atlantic Bight is comprised of the sandy, relatively flat, gently sloping continental shelf from southern New England to Cape Hatteras, NC.

6.3.2 ESSENTIAL FISH HABITAT (EFH)

Additional information on spiny dogfish habitat requirements can be found in the documents titled, "Essential Fish Habitat Source Document: Spiny Dogfish, *Squalus acanthias*, Life History and Habitat Characteristics" (Stehlik 2007). Electronic versions of these source documents are available at the following website: http://www.nefsc.noaa.gov/nefsc/habitat/efh/.
The current EFH designations by life history stage for spiny dogfish are:

Juveniles (male and female, <36 cm):
Pelagic and epibenthic habitats, primarily in deep water on the outer continental shelf and slope between Cape Hatteras and Georges Bank and in the Gulf of Maine, as depicted in Figure 5 [*in Amendment 3*[9]]. Young are born mostly on the offshore wintering grounds from November to January, but newborns (neonates or "pups") are sometimes taken in the Gulf of Maine or southern New England in early summer.

Female Sub-Adults (36-79 cm):
Pelagic and epibenthic habitats throughout the region, as depicted in Figure 6 [*in Amendment 3*]. Sub-adult females are found over a wide depth range in full salinity seawater (32-35 ppt) where bottom temperatures range from 7 to 15°C. Sub-adult females are widely distributed throughout the region in the winter and spring when water temperatures are lower, but very few remain in the Mid-Atlantic area in the summer and fall after water temperatures rise above 15°C.

Male Sub-Adults (36-59 cm):
Pelagic and epibenthic habitats, primarily in the Gulf of Maine and on the outer continental shelf from Georges Bank to Cape Hatteras, as depicted in Figure 7 [*in Amendment 3*]. Sub-adult males are found over a wide depth range in full salinity seawater (32-35 ppt) where bottom temperatures range from 7 to 15°C. Sub-adult males are not as widely distributed over the continental shelf as the females and are generally found in deeper water. They are widely distributed throughout the region in the winter and spring when water temperatures are lower, but very few remain in the Mid-Atlantic area in the summer and fall after water temperatures rise above 15°C.

Female Adults:
Pelagic and epibenthic habitats throughout the region, as depicted in Figure 8 [*in Amendment 3*]. Adult females are found over a wide depth range in full salinity seawater (32-35 ppt) where bottom temperatures range from 7 to 15°C. They are widely distributed throughout the region in the winter and spring when water temperatures are lower, but very few remain in the Mid-Atlantic area in the summer and fall after water temperatures rise above 15°C.

Male Adults:
Pelagic and epibenthic habitats throughout the region, as depicted in Figure 9 [*in Amendment 3*]. Adult males are found over a wide depth range in full salinity seawater (32-35 ppt) where bottom temperatures range from 7 to 15°C. They are widely distributed throughout the region in the winter and spring when water temperatures are lower, but very few remain in the Mid-Atlantic area in the summer and fall after water temperatures rise above 15°C.

[9] Available at http://www.mafmc.org/fisheries/fmp/dogfish

6.3.3 FISHERY IMPACT CONSIDERATIONS

A baseline fishing effects analysis is provided in Amendment 3 to the FMP (MAFMC 2014). The evaluation of the habitat impacts of gillnets, longlines, and to a lesser degree bottom otter trawls used in the commercial spiny dogfish fishery indicated that the baseline impact of the fishery was minimal and/or temporary in nature. Consequently, adverse effects of the spiny dogfish fishery on EFH do not need to be minimized further. Potential impacts on EFH of the proposed 2023 commercial quotas are evaluated in Section 7 of this EA but are also expected to be minimal given regional fishing effort is not expected to change substantially under and alternative in this action. Most directed fishing for spiny dogfish takes place with gillnet or bottom long line gear that should not have substantial habitat impacts. Most dogfish that are caught in directed trawl fisheries are discarded. For example, analyses of the longfin squid fishery indicate that 99.7 percent of spiny dogfish landed in that fishery are discarded (MAFMC 2020). However, there is some retained catch of spiny dogfish in trawl fisheries. Bottom trawling can negatively impact habitat, and the Council has enacted a variety of area closures to protect habitat including for golden tilefish and deep-water corals. Other EAs that focus on directed trawl fisheries can be reviewed for more details on habitat considerations regarding trawling (e.g. MAFMC 2020); while this action could reduce spiny dogfish quotas, it is not expected to noticeably impact trawling effort.

THIS SPACE LEFT BLANK FOR FORMATTING PURPOSES

6.4 Protected Species

Section 6.4.1 Protected Species Present in the Area

Numerous protected species occur in the affected environment of the Spiny dogfish FMP (Table 9) and have the potential to be impacted by the proposed action (i.e., there have been observed/documented interactions in the fisheries or with gear types similar to those used in the fisheries (bottom trawl, 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.

Cusk are a 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. As a result, cusk will not be discussed further in this and the following sections; 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 can be found at: https://www.fisheries.noaa.gov/species/cusk.

THIS SPACE LEFT BLANK FOR FORMATTING PURPOSES

Table 9. Species Protected Under the ESA and/or MMPA that may occur in the Affected Environment of the FMP. Marine mammal species italicized and in bold are considered MMPA strategic stocks.[1]

Species	Status	Potentially impacted by this action?
Cetaceans		
North Atlantic right whale (Eubalaena glacialis)	***Endangered***	***Yes***
Humpback whale, West Indies DPS (*Megaptera novaeangliae)*	Protected (MMPA)	Yes
Fin whale (Balaenoptera physalus)	***Endangered***	***Yes***
Sei whale (Balaenoptera borealis)	***Endangered***	***Yes***
Blue whale (Balaenoptera musculus)	***Endangered***	***No***
Sperm whale (Physeter macrocephalus	***Endangered***	***Yes***
Minke whale (*Balaenoptera acutorostrata*)	Protected (MMPA)	Yes
Pilot whale (Globicephala spp.)[2]	Protected (MMPA)	Yes
Pygmy sperm whale (*Kogia breviceps*)	Protected (MMPA)	No
Dwarf sperm whale (*Kogia sima*)	Protected (MMPA)	No
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
Atlantic Spotted dolphin (*Stenella frontalis*)	Protected (MMPA)	No
Striped dolphin (*Stenella coeruleoalba*)	Protected (MMPA)	No
Bottlenose dolphin (Tursiops truncatus)[3]	***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 Ocean DPS	Threatened	Yes
Hawksbill sea turtle (*Eretmochelys imbricate*)	Endangered	No
Fish		
Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered	No
Giant manta ray (*Manta birostris)*	Threatened	Yes
Oceanic whitetip shark (*Carcharhinus longimanus*)	Threatened	No
Atlantic salmon (*Salmo salar*)	Endangered	Yes
Atlantic sturgeon: *(Acipenser oxyrinchus) Gulf of Maine DPS*	Threatened	Yes
Atlantic sturgeon: NY Bight, Ches. Bay, Carolina, and South Atlantic DPSs	Endangered	Yes
Cusk (*Brosme brosme)*	Candidate	Yes
Pinnipeds		
Harbor seal (*Phoca vitulina*), Gray seal (Halichoerus grypus), Harp seal (Phoca groenlandicus), Hooded seal (Cystophora cristata)	Protected (MMPA)	Yes
Critical Habitat		
North Atlantic Right Whale	ESA Designated	No
Northwest Atlantic DPS of Loggerhead Sea Turtle	ESA Designated	No

[1] An MMPA strategic stock is 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

Species	Status	Potentially impacted by this action?
as a threatened or endangered species under the ESA, or is designated as depleted under the MMPA (Section 3 of the MMPA of 1972).		
[2] There are 2 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*.		
[3] Includes the Western N. Atlantic Offshore, Northern Migratory Coastal, and Southern Migratory Coastal Stocks of Bottlenose Dolphins. See NMFS Marine Mammal Stock Assessment Reports (SARs) for the Atlantic Region.		

Section 6.4.2 Species and Critical Habitat Not Likely to be 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 MMPA protected species or any designated critical habitat (Table 10). 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 been no observed or documented interactions between the species and the primary gear type (i.e., bottom trawl and gillnet) used to prosecute the spiny dogfish fishery (Greater Atlantic Region (GAR)[10] Marine Animal Incident Database, unpublished data; NMFS Marine Mammal Stock Assessment Reports (SARs) for the Atlantic Region; NMFS NEFSC observer/sea sampling database, unpublished data; NMFS NEFSC marine mammal (small cetacean, pinniped, baleen whale) serious injury and mortality Reference Documents, Publications, or Technical Memoranda; MMPA List of Fisheries (LOF); NMFS 2021a).[11] In the case of critical habitat, this determination has been made because the action will not affect the essential physical and biological features of critical habitat identified in Table 10 and therefore, will not result in the destruction or adverse modification of any species critical habitat (NMFS 2021a).

Section 6.4.3 Species Potentially Impacted by the Proposed Action

Table 10 provides a list of protected species of sea turtle, marine mammal, and fish species present in the affected environment of the spiny dogfish 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, NMFS Marine Mammal SARs for the Atlantic Region, MMPA List of Fisheries (LOF), NMFS (2021b), NMFS NEFSC observer/sea sampling

[10] The Greater Atlantic Region (GAR) encompasses large marine ecosystem of the Northwest Atlantic from Maine to Cape Hatteras, North Carolina (e.g., the Gulf of Maine, Mid-Atlantic).

[11] 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 2010-2019. For ESA listed species, information on observer or documented interactions with fishing gear is from 2010-2019.

database (unpublished data), and NMFS NEFSC marine mammal (small cetacean, pinniped, baleen whale) serious injury and mortality Reference Documents, Publications, or Technical Memoranda were referenced.

To help identify ESA listed species potentially impacted by the action, we queried the NMFS NEFSC observer/sea sampling (2010-2019), Sea Turtle Disentanglement Network (2010-2019), and the GAR Marine Animal Incident (2010-2019) databases for interactions, as well as reviewed the May 27, 2021, Biological Opinion (Opinion)[12] issued by NMFS. The 2021 Opinion considered the effects of the NMFS' authorization of ten fishery management plans (FMP),[13] including the Spiny dogfish FMP on ESA-listed species and designated critical habitat. The Opinion determined that the authorization of ten FMPs: 1) 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; GOM DPS Atlantic salmon; or giant manta rays; and, 2) 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, in order to understand the potential risk of an interaction. Information on species occurrence in the affected environment of the spiny dogfish fishery and on protected species interactions with specific fishery gear is provided below.

6.4.3.1 Sea Turtles

Below is a brief summary of the status and trends, as well as the occurrence and distribution of sea turtles in the affected environment of the spiny dogfish fishery. Additional background information on the range-wide status of affected sea turtles species, as well as a description and life history of each of these species, can be found in a number of published documents, including

[12] 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

[13] 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.

NMFS (2021a); sea turtle status reviews and biological reports (NMFS and USFWS 1995; Hirth 1997; Turtle Expert Working Group [TEWG] 1998, 2000, 2007, 2009; NMFS and USFWS 2007a, 2007b; Conant et al. 2009; NMFS and USFWS 2013), and recovery plans for the loggerhead (Northwest Atlantic DPS) sea turtle (NMFS and USFWS 2008), leatherback sea turtle (NMFS and USFWS 1992, 1998a, 2020), Kemp's ridley sea turtle (NMFS et al. 2011), and green sea turtle (NMFS and USFWS 1991, 1998b).

Status and Trends

Four sea turtle species have 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 (Table 10). Although stock assessments and similar reviews have been completed for sea turtles none have been able to develop a reliable estimate of absolute population size. As a result, nest counts are used to inform population trends for sea turtle species.

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, Florida index nesting beaches comprise most of the nesting in the DPS (https://myfwc.com/research/wildlife/sea-turtles/nesting/beach-survey-totals/). 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 (NMFS 2021a).

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). In 2019, there were 11,090 nests, a 37.61% decrease from 2018 and a 54.89% decrease from 2017, which had the highest number (24,587) of nests; the reason for this recent decline is uncertain (see NMFS 2021a). Given this and continued anthropogenic threats to the species, according to NMFS (2021a), the species resilience to future perturbation is low.

The North Atlantic DPS of green sea turtle, overall, 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). While anthropogenic threats to this species continue, taking into consideration the best available information on the species, NMFS (2021a), concluded that the North Atlantic DPS appears to be somewhat resilient to future perturbations.

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). The leatherback status review in 2020 concluded

that leatherbacks are exhibiting an overall decreasing trend in annual nesting activity (NMFS and USFWS, 2020). Given continued anthropogenic threats to the species, according to NMFS (2021a), the species' resilience to additional perturbation both within the Northwest Atlantic and worldwide is low.

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, MA, although their presence varies with the seasons due to changes in water temperature (Braun-McNeill et al. 2008; Braun & Epperly 1996; Epperly et al. 1995a,b; Mitchell et al. 2003; Shoop & Kenney 1992; TEWG 2009; Blumenthal et al. 2006; Braun-McNeill & Epperly 2002; Griffin et al. 2013; Hawkes et al. 2006; Hawkes et al. 2011; Mansfield et al. 2009; McClellan & Read 2007; Mitchell et al. 2003; Morreale & Standora 2005). 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 (Braun-McNeill & Epperly 2002; Epperly et al. 1995a,b,c; Griffin et al. 2013; Morreale & Standora 2005), occurring in Virginia foraging areas as early as late April and on the most northern foraging grounds in the GOM in June (Shoop & Kenney 1992). The trend is reversed in the fall as water temperatures cool. The large majority leave the GOM by September, but some remain in Mid-Atlantic and Northeast areas until late fall (i.e., November). By December, sea turtles have migrated south to waters offshore of North Carolina, particularly south of Cape Hatteras, and further south, although it should be noted that hard-shelled sea turtles can occur year-round in waters off Cape Hatteras and south (Epperly et al. 1995b; Griffin et al. 2013; Hawkes et al. 2011; Shoop & Kenney 1992).

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., GOM) 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).

6.4.3.2 Marine Mammals

6.4.3.2.1 Large Whales

Status and Trends

Six large whale species have the potential to be impacted by the proposed action: humpback, North Atlantic right, fin, sei, sperm, and minke whales (Table 10). Review of large whale stock assessment reports covering the period of 2010 through 2019, indicate a decreasing trend for the North Atlantic right whale population; however, for fin, humpback, minke, sperm, and sei

whales, it is unknown what the population trajectory is as a trend analysis has not been conducted. For additional information on the status of humpback, North Atlantic right, fin, sei, sperm, and minke whales, refer to the NMFS Marine Mammal SARs for the Atlantic Region.

Occurrence and Distribution

As provided in Table 10, North Atlantic right, humpback, fin, sei, sperm, and minke whales occur in the Northwest Atlantic Ocean. As large whales may be present in these waters throughout the year, the spiny dogfish fishery and large whales are likely to co-occur in the affected area. To further assist in understanding how the spiny dogfish fishery overlaps in time and space with the occurrence of large whales, Table 11 provides an overview of species occurrence and distribution in the affected environment of the fishery. For additional information on North Atlantic right, humpback, fin, sei, sperm, and minke whales refer to: NMFS Marine Mammal SARs for the Atlantic Region.

Table 10. Large whale occurrence, distribution, and habitat use in the affected environment of the spiny dogfish 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	● Predominantly occupy waters of the continental shelf, but based on passive acoustic and telemetry data, are also known to make lengthy excursions into deep waters off the shelf. ● Visual and acoustic data demonstrate broad scale, year round presence along the U.S. eastern seaboard (e.g., GOM, New Jersey, and Virginia). ● Surveys have demonstrated the existence of several areas where North Atlantic right whales congregate seasonally, including Cape Cod Bay; Massachusetts Bay; and the continental shelf south of New England. Although whales can be found consistently in particular locations throughout their range, there is a high inter-annual variability in right whale use of some habitats. Since 2010, acoustic and visual surveys indicate a shift in habitat use patterns, including: > Fewer individuals are detected in the Great South Channel; > increase in the number of individuals using Cape Cod Bay (i.e., during the expected late winter and early spring foraging period and during the 'off season' period of summer and fall); > apparent abandonment of central GOM in the winter; and, > Large increase in the numbers of whales detected in a region south of Martha's Vineyard and Nantucket Islands (i.e., during the expected late winter and early spring foraging period and during the 'off season' period of summer and fall). > Passive acoustic monitoring suggests a shift to a year round presence in the Mid-Atlantic, including year round detections in the New York Bight with the highest presence between late February and mid-May in the shelf zone and nearshore habitat).
Humpback	• Distributed throughout all continental shelf waters of the Mid-Atlantic (SNE included), GOM, and GB throughout the year.

Species	Occurrence/Distribution/Habitat Use in the Affected Environment
	• New England waters (GOM and GB) = Foraging Grounds (~March- November); however, acoustic detections of humpbacks indicate year-round presence in New England waters, including the waters of Stellwagen Bank. • Mid-Atlantic waters: 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. • 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; • 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 30ºN. • New England waters (GOM and GB) = Major Foraging Ground
Sei	• Primarily found in deep waters along the shelf edge, shelf break, and ocean basins between banks.; however incursions into shallower, shelf waters do occur (e.g., Stellwagen Bank, Great South Channel, waters south of Nantucket, Georges Bank). • Spring through summer, 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. • Recent acoustic detections peaked in northern latitudes in the summer, indicating feeding grounds ranging from Southern New England through the Scotian Shelf. • Persistent year-round detections in Southern New England and the New York Bight indicate this area to be an important region for sei whales. • 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).
Sperm	• Distributed on the continental shelf edge, over the continental slope, and into mid-ocean regions. • Seasonal Occurrence in the U.S. EEZ: >**Winter**: concentrated east and northeast of Cape Hatteras; >**Spring**: center of distribution shifts northward to east of Delaware and Virginia, and is widespread throughout the central portion of the mid-Atlantic bight and the southern portion of Georges Bank; >**Summer**: similar distribution to spring, but also includes the area east and north of Georges Bank and into the Northeast Channel region, as well as the continental shelf (inshore of the 100-m isobath) south of New England; and, >**Fall**: occur in high levels south of New England, on the continental shelf. Also occur along continental shelf edge in the mid-Atlantic bight.
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; Charif et al. 2020; Cholewiak et al. 2018; Clapham *et al*. 1993; Clark and Clapham 2004; Cole *et al*. 2013; Davis *et al.* 2017, 2020; Ganley et al. 2019; Good 2008; Hain *et al.* 1992; Hamilton and Mayo 1990; Hayes *et al*. 2017, 2018, 2019, 2020, 2021, 2022; Kenney *et al.* 1986, 1995; Khan *et al*. 2009, 2010, 2011, 2012; Kraus et al. 2016; Leiter *et al*. 2017; Mate *et al*. 1997; Mayo et al. 2018; McLellan *et al*. 2004; Moore et al. 2021; Morano et al. 2012; Muirhead et al. 2018; Murray et al. 2013; NMFS 1991, 2005, 2010, 2011, 2012; 2015, 2021a,b; 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; Stone et al. 2017; Swingle *et al*. 1993; Vu *et al*. 2012; Watkins and Schevill 1982; Whitt et al. 2013; Winn *et al.* 1986; 81 FR 4837 (January 27, 2016); 86 FR 51970 (September 17, 2021).	

6.4.3.2.2 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 the abundance estimates (Hayes et al 2022). 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. 2021).

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 NMFS Marine Mammal SARs for the Atlantic Region). Within this range, however, there are seasonal shifts in species distribution and abundance. To further assist in understanding how the spiny dogfish fishery overlaps in time and space with the occurrence of small cetaceans, Table 12 provides an overview of species occurrence and distribution in the affected environment of the fishery. For additional information

on small cetacean occurrence and distribution in the Northwest Atlantic, refer to NMFS Marine Mammal SARs for the Atlantic Region.

Table 11. Small cetacean occurrence and distribution in the affected environment of the spiny dogfish fishery

Species	Occurrence ad Distribution in the Affected Environment
Atlantic White Sided Dolphin	• Distributed throughout the continental shelf waters (primarily to 100 m) of the Mid-Atlantic (north of 35°N), SNE, GB, and GOM; however, most common in continental shelf waters from Hudson Canyon (~ 39°N) 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 (35° to 42°N). • **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. • **April-June**: widely dispersed from NJ to ME; seen from the coastline to deep waters (>1,800 meters).

Species	Occurrence ad Distribution in the Affected Environment
	• Passive acoustic monitoring indicates regular presence from January through May offshore of Maryland.
Bottlenose Dolphin	**Western North Atlantic Offshore Stock** • Distributed primarily along the outer continental shelf and continental slope in the Northwest Atlantic from GB to Florida (FL). • Depths of occurrence: ≥40 meters **Western North Atlantic Northern Migratory Coastal Stock** • 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. **Western North Atlantic Southern Migratory Coastal Stock** • 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*	**Short- Finned Pilot Whales** • Except for area of overlap (see below), primarily occur south of 40°N (Mid-Atlantic and SNE waters); although low numbers have been found along the southern flank of GB, but no further than 41°N. • Distributed primarily near the continental shelf break of the Mid-Atlantic and SNE (i.e., off Nantucket Shoals). **Long-Finned Pilot Whales** • Except for area of overlap (see below), primarily occur north of 42°N. • Winter to early spring: distributed principally along the continental shelf edge off the northeastern U.S. coast. • Late spring through fall: movements and distribution shift onto GB and into the GOM and more northern waters. • Species tends to occupy areas of high relief or submerged banks.

Species	Occurrence ad Distribution in the Affected Environment
	Area of Species Overlap: along the mid-Atlantic shelf break between Delaware and the southern flank of GB.

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 ; Hayes et al. 2022 ; Payne and Heinemann 1993 ; Payne *et al.* 1984 ; Jefferson *et al*. 2009.

THIS SPACE LEFT BLANK FOR FORMATTING PURPOSES

6.4.3.2.3 Pinnipeds

Status and Trends

Harbor, gray, harp and hooded seals are identified as having the potential to be impacted by the proposed action (Table 13). Based on Hayes et al. (2019) and Hayes et al. (2022), the status of the:

- Western North Atlantic harbor seal and hooded seal, relative to Optimum Sustainable Population (OSP), in the U.S. Atlantic EEZ is unknown;
- gray seal population relative to OSP in U.S. Atlantic EEZ waters is unknown, but the stock's abundance appears to be increasing in Canadian and U.S. waters; and,
- harp seal stock, relative to OSP, in the U.S. Atlantic EEZ is unknown, but the stock's abundance appears to have stabilized.

Occurrence and Distribution

Harbor, gray, harp, and hooded seals are found in the nearshore, coastal waters of the Northwest Atlantic Ocean. Depending on species, they may be present year round or seasonally in some portion of the affected environment of the spiny dogfish fishery. To further assist in understanding how the spiny dogfish fishery overlaps in time and space with the occurrence of pinnipeds, Table 13 provides an overview of species occurrence and distribution in the affected environment of the fishery. For additional information on pinniped occurrence and distribution in the Northwest Atlantic, refer to NMFS Marine Mammal SARs for the Atlantic Region.

Table 12. Pinniped occurrence and distribution in the affected environment of the spiny dogfish fishery.

Species	Occurrence and Distribution in the Affected Environment
Harbor Seal	• Year-round inhabitants of Maine; • **September through late May**: occur seasonally along the coasts from southern New England to Virginia.
Gray Seal	• Ranges from New Jersey to Labrador, Canada.
Harp Seal	• Winter-Spring (44ntrodu.January-May): Can occur in the U.S. Atlantic Exclusive Economic Zone. • Sightings and strandings have been increasing off the east coast of the United States from Maine to New Jersey.
Hooded Seal	• Highly migratory and can occur in waters from Maine to Florida. These appearances usually occur between January and May in New England waters, and in summer and autumn off the southeast U.S. coast and in the Caribbean.
***Sources*:** Hayes et al. 2019 (for hooded seals); Hayes *et al.* 2022.	

6.4.3.3 Atlantic sturgeon

Status and Trends

As provided in Table 10, Atlantic sturgeon (all five DPSs) have the potential to be impacted by the proposed action. 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; NMFS 2021a).

Occurrence and Distribution

Status and Trends
As provided in Table 10, Atlantic sturgeon (all five DPSs) have the potential to be impacted by the proposed action. 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; NMFS 2021a).

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 (Altenritter et al. 2017; ASMFC 2017b; ASSRT 2007; Breece et al. 2016, 2018; Dovel and Berggren 1983; Dadswell et al. 1984; Dadswell 2006; Dunton et al. 2010, 2015; Erickson et al. 2011; Hilton et al. 2016; Ingram et al. 2019; Kynard et al. 2000; Laney et al. 2007; Novak et al. 2017; O'Leary et al. 2014; Rothermel et al. 2020; Stein et al. 2004a; Waldman et al. 2013; Wippelhauser et al. 2017; Wirgin et al. 2012, 2015a,b).

Based on fishery-independent and dependent surveys, as well as data collected from genetic, tracking, and/or tagging studies in the marine environment, Atlantic sturgeon appear to primarily occur inshore of the 50 meter depth contour; however, Atlantic sturgeon are not restricted to these depths, as excursions into deeper continental shelf waters have been documented (Altenritter et al. 2017; Breece et al. 2016; 2018; Collins and Smith 1997; Dunton et al. 2010; Erickson et al. 2011; Ingram et al. 2019; Novak et al. 2017; Rothermel et al. 2020; Stein et al. 2004a,b; Wippelhauser et al. 2017). Data from fishery-independent and dependent surveys, as well as data collected from genetic, tracking, and/or tagging studies also indicate that Atlantic sturgeon make seasonal coastal movements from marine waters to river estuaries in the spring and from river estuaries to marine waters in the fall; 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 (Altenritter et al. 2017; Dunton et al. 2010; Erickson et al. 2011; Ingram et al. 2019; Novak et al. 2017; Rothermel et al. 2020; Wipplehauser 2012; Wippelhauser et al. 2017).

For additional information on the biology and range wide distribution of each DPS of Atlantic sturgeon refer to: 77 FR 5880 and 77 FR 5914, the Atlantic Sturgeon Status Review Team's (ASSRT) 2007 status review of Atlantic sturgeon (ASSRT 2007); the ASMFC 2017 Atlantic Sturgeon Benchmark Stock Assessment and Peer Review Report (ASMFC 2017), and NMFS (2021a).

6.4.3.4 Atlantic salmon

Status and Trends

As provided in Table 10, Atlantic salmon (GOM DPS) have the potential to be impacted by the proposed action. There is no population growth rate available for GOM DPS Atlantic salmon; however, the consensus is that the DPS exhibits a continuing declining trend (NOAA 2016; USFWS and NMFS 2018; NMFS 2021a).

Occurrence and Distribution

The wild populations of Atlantic salmon are listed as endangered under the ESA. Their freshwater range occurs in the watersheds from 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 (NMFS and USFWS 2005, 2016; Fay et al. 2006). 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; USASAC 2013; Hyvarinen et al. 2006; Lacroix and McCurdy 1996; Lacroix et al. 2004, 2005; Reddin 1985; Reddin and Short 1991; Reddin and Friedland 1993; Sheehan et al. 2012; NMFS and USFWS 2005, 2016; Fay et al. 2006). For additional information on the on the biology and range wide distribution of the GOM DPS of Atlantic salmon, refer to NMFS and USFWS (2005, 2016); Fay et al. (2006); and NMFS (2021a).

6.4.3.5 Giant Manta Ray

Status and Trends

As provided in Table 10, giant manta rays have the potential to be impacted by the proposed action. While there is considerable uncertainty regarding the giant manta ray's current abundance throughout its range, the best available information indicates that in areas where the species is not subject to fishing, populations may be stable (NMFS 2021a). However, in regions where giant manta rays are (or were) actively targeted or caught as bycatch populations appear to be decreasing (Miller and Klimovich 2017).

Occurrence and Distribution

Based on the giant manta ray's distribution, the species 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°C (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).

Section 6.4.4 Gear Interactions and Protected Species

Protected species are at risk of interacting (e.g. bycaught or entangled) 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 (NMFS Marine Mammal SARs for the Atlantic Region; NMFS 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, the most recent 10 years of observer, stranding, and/or marine mammal serious injury and mortality reports are from 2010-2019[14]. For ESA listed species, the most recent 10 years of data on observed or documented interactions is available from 2010-2019[15]. 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 spiny dogfish fishery (i.e., sink gillnet, followed by bottom longline and bottom trawl gear).

[14] GAR Marine Animal Incident Database, unpublished data; Waring et al. 2016; Hayes et al. 2017; Hayes et al. 2018; Hayes et al. 2019; Hayes et al. 2020; Hayes et al. 2021; Hayes et al. 2022; Cole and Henry 2013; Henry et al. 2016; Henry et al. 2017; Henry et al. 2019; Henry et al. 2020; Henry et al. 2021; Henry et al. 2022.

[15] ASMFC 2017; Kocik et al. 2014; NMFS 2021a; GAR Marine Animal Incident Database, unpublished data; NMFS Marine Mammal SARs for the Atlantic Region; NMFS NEFSC protected species serious injury and mortality Reference Documents, Publications, or Technical Memoranda; NMFS NEFSC observer/sea sampling database, unpublished data; GAR Sea Turtle and Disentanglement Network, unpublished data; NMFS Sea Turtle Stranding and Salvage Network, unpublished data.

6.4.4.1 Recreational Fisheries Interactions

Given the negligible directed recreational fishery, there is little to no recreational fishing effort associated with spiny dogfish. As a result, overlap, and therefore interaction risks with protected species are not expected in this component of the fishery. As a result, information on potential interactions with recreational fishing gear will not be provided.

6.4.4.2 Commercial Fisheries Interactions

6.4.4.2.1 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 GOM, Georges Bank, and/or the Mid-Atlantic; however, most of the observed interactions have been observed south of the GOM (Murray 2008; Murray 2015; Murray 2020; NMFS NEFSC observer/sea sampling database, unpublished data; NMFS 2021a; Warden 2011a,b). As few sea turtle interactions have been observed in the GOM, 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.

Murray (2015) estimated that from 2009-2013, the total average annual loggerhead interactions in bottom trawl gear in the Mid-Atlantic was 231 (CV=0.13, 95% CI=182-298); this equates to approximately 33 adult equivalents (Murray 2015). Most recently, Murray (2020) provided information on sea turtle interaction rates from 2014-2018 (the most recent five-year period that has been statistically analyzed for trawls). Interaction rates were stratified by region, latitude zone, season, and depth. The highest loggerhead interaction rate (0.43 turtles/day fished) was in waters south of 37º N during November to June in waters greater than 50 meters deep. The greatest number of estimated interactions occurred in the Mid-Atlantic region north of 39º N, during July to October in waters less than 50 meters deep. Within each stratum, interaction rates for non-loggerhead species were lower than rates for loggerheads (Murray 2020).

Based on Murray (2020)[16], 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

[16] Murray (2020) estimated interaction rates for each sea turtle species with stratified ratio estimators. This method differs from previous approaches (Murray 2008; Murray 2015; Warden 2011a,b), where rates were estimated using generalized additive models (GAMs). Ratio estimator results may be similar to those using GAM or generalized

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).

Gillnet Gear:

Interactions between sink gillnet gear and green, Kemp's ridley, loggerhead, and leatherback sea turtles have been observed in the GAR since 1989 (NMFS NEFSC observer/sea sampling database, unpublished data). Specifically, sea turtle interactions with gillnet gear have been observed in the GOM, Georges Bank, and/or the Mid-Atlantic; however, most of the observed interactions have been observed south of the GOM (Murray 2009a,b; Murray 2013; Murray 2018; NMFS NEFSC observer/sea sampling database, unpublished data; NMFS 2021a). As few sea turtle interactions have been observed in the GOM, 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).[17] 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

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).

[17] 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 GAMs. Ratio estimator results may be similar to those using GAM or 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).

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.

Bottom Longline Gear:

The spiny dogfish fishery is a component of bottom longline fisheries operating in the Northwest Atlantic, specifically the Gulf of Maine (Northeast) and the Mid-Atlantic (Southern New England included). Review of the most recent 10 years (2010-2019) of NEFSC observer program data show that there have been no documented interactions of sea turtles recorded in the commercial Northeast/Mid-Atlantic bottom longline fisheries (NMFS 2021a; NMFS NEFSC observer/sea sampling database, unpublished data). Due to the lack of observed interactions in Northeast/Mid-Atlantic bottom longline fisheries, and because bottom longline gear accounts for a small portion of recent (2019 to 2021) effort and landings in the spiny dogfish fishery[18], we anticipate that interactions between this gear type and sea turtles are unlikely.

6.4.4.2.2 Atlantic Sturgeon

Sink gillnet and Bottom Trawl Gear:

Review of the ASMFC (2017), Miller and Shepard 2011; NMFS (2021a), as well as the most recent 10 years of NMFS observer data (i.e., 2010-2019; NMFS NEFSC observer/sea sampling database, unpublished data) show that there have been observed or documented interactions between Atlantic sturgeon and bottom trawl and gillnet gear in the GAR. 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 (ASMFC 2017).

[18] Between 2019 to 2021, bottom longline accounted for 5% to 14% of the total landings in the spiny dogfish fishery (NMFS, unpublished dealer data).

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,[19] 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.

On September 26, 2022, NOAA Fisheries released a final Action Plan to reduce Atlantic sturgeon bycatch in Federal large mesh gillnet fisheries. Based on an extensive literature review, the Action Plan provides a suite of recommendations to NOAA Fisheries, the New England Fishery Management Council, and the Mid-Atlantic Fishery Management Councils that should be considered, refined, and implemented in order to reduce Atlantic sturgeon bycatch in subject fisheries. The Councils are developing a related action in 2023.

Bottom Longline Gear:

The spiny dogfish fishery is a component of bottom longline fisheries operating in the Northwest Atlantic, specifically the Gulf of Maine (Northeast) and the Mid-Atlantic (Southern New England included). Review of the most recent 10 years (2010-2019) of NEFSC observer program data show that there have been no documented interactions of Atlantic sturgeon recorded in the commercial Northeast/Mid-Atlantic bottom longline fisheries (NMFS 2021a; NMFS NEFSC observer/sea sampling database, unpublished data). Due to the lack of observed interactions in Northeast/Mid-Atlantic bottom longline fisheries, and because bottom longline gear accounts for a small portion of recent (2019 to 2021) effort and landings in the spiny dogfish fishery[20], we anticipate that interactions between this gear type and Atlantic sturgeon are unlikely.

6.4.4.2.3 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). Northeast Fisheries Observer Program (NEFOP) data from 1989-2019 show records of incidental bycatch of Atlantic

[19] 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.

[20] Between 2019 to 2021, bottom longline accounted for 5% to 14% of the total landings in the spiny dogfish fishery (NMFS, unpublished dealer data).

salmon in seven of the 31 years, with a total of 15 individuals caught, nearly half of which (seven) occurred in 1992 (NMFS NEFSC observer/sea sampling database, unpublished data).[21] 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 GAR.

Bottom Longline Gear:

Review of the most recent 10 years (2010-2019) of data on observed or documented interactions The spiny dogfish fishery is a component of bottom longline fisheries operating in the Northwest Atlantic, specifically the Gulf of Maine (Northeast) and the Mid-Atlantic (Southern New England included). Review of the most recent 10 years (2010-2019) of NEFSC observer program data show that there have been no documented interactions of Atlantic salmon recorded in the commercial Northeast/Mid-Atlantic bottom longline fisheries (NMFS 2021a; NMFS NEFSC observer/sea sampling database, unpublished data). Due to the lack of observed interactions in Northeast/Mid-Atlantic bottom longline fisheries, and because bottom longline gear accounts for a small portion of recent (2019 to 2021) effort and landings in the spiny dogfish fishery[22], we anticipate that interactions between this gear type and Atlantic salmon to be unlikely.

6.4.4.2.4 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 (NMFS 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 (NMFS NEFSC observer/sea sampling database, unpublished data). Additionally, all of the giant manta ray interactions in gillnet or

[21] 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.

[22] Between 2019 to 2021, bottom longline accounted for 5% to 14% of the total landings in the spiny dogfish fishery (NMFS, unpublished dealer data).

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 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).

Bottom Longline Gear:

In the Atlantic Ocean, bycatch of giant manta rays has been observed in bottom longline fisheries, but they do not appear to be a significant component of the bycatch (Miller and Klimovich 2017). In the U.S. bottom longline fisheries operating in the western Atlantic specifically, giant manta rays are a very rare occurrence and available records of observed captures in U.S fisheries indicate that the vast majority of giant manta rays are released alive (NMFS 2021a). From 2008 through 2016, Southeast fisheries observers documented three giant manta rays in bottom longline fisheries (one in the Gulf of Mexico reef fish fishery and two in the South Atlantic shark bottom longline research fishery). Two of these giant manta rays are thought to have been released alive, and one was kept. Since 1989, the date of our earliest observer records for Federally managed fisheries, Northeast fisheries observers have never observed an interaction between bottom longline gear and giant manta rays (NMFS NEFSC observer/sea sampling database, unpublished data). Based on this information, although giant manta ray interactions with bottom longline gear are possible, the risk of an interaction is likely low in the GAR.

6.4.4.2.5 Marine Mammals

Depending on species, marine mammals have been observed seriously injured or killed in bottom trawl and/or pot/trap gear; however, there have been no observed or documented interactions with bottom longline 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 2022 LOF (87 FR 23122, April 19, 2022) categorizes commercial sink gillnet fisheries (Northeast and Mid-Atlantic) as a Category I fishery; bottom trawl fisheries (Northeast or Mid-Atlantic) as a Category II fishery; and, Northeast/Mid-Atlantic bottom longline/hook-and-line fisheries as a Category III fishery.

Large Whales

Bottom Trawl Gear

Review of the most recent 10 years of observer, stranding, and/or baleen whale serious injury and mortality determinations from 2010-2019, and querying the GAR Marine Animal Incident database (which contains data for 2019), showed that there have been no observed or confirmed documented interactions with large whales and bottom trawl gear.[23] Based on this information, large whale interactions with bottom trawl gear are not expected.

Sink Gillnet Gear

Large whale interactions (entanglements) with fishing gear have been observed and documented in the waters of the Northwest Atlantic.[24] Information available on all interactions (e.g., entanglement, vessel strike, unknown cause) with large whales comes from reports documented in the GAR Marine Animal Incident Database (unpublished data). The level of information collected for each case varies, but may include details on the animal, gear, and any other information about the interaction (e.g., location, description, etc.). Each case is evaluated using defined criteria to assign the case to an injury/information category using all available information and scientific judgement. In this way, the injury severity and cause of injury/death for the event is evaluated, with serious injury and mortality determinations issued by the NEFSC.[25]

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; Cole and Henry 2013; 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 2021a,b; 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; Henry et al. 2022; Sharp et al. 2019; Pace et al. 2021; see NMFS Marine Mammal SARs for the Atlantic Region). 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; Cole and Henry 2013; Hamilton and Kraus 2019; Hartley et al. 2003; Henry et al. 2014; Henry et al. 2015; Henry

---

[23] GAR Marine Animal Incident Database (unpublished data); **NMFS Marine Mammal Stock Assessment Reports for the Atlantic Region**; NMFS NEFSC observer/sea sampling database, unpublished data ; MMPA List of Fisheries (LOF); Cole and Henry 2013; Henry et al. 2016; Henry et al. 2017; Henry et al. 2019; Henry et al. 2020; Henry et al. 2021; Henry et al. 2022.

[24] **NMFS Atlantic Large Whale Entanglement Reports**: 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 Stock Assessment Reports for the Atlantic Region**; NMFS NEFSC Baleen Whale Serious Injury and Morality Determinations Reference Documents, Publications, or Technical Memoranda; **MMPA List of Fisheries; NMFS 2021a,b.**

[25] NMFS NEFSC Baleen Whale Serious Injury and Morality Determinations Reference Documents, Publications, or Technical Memoranda

et al. 2016; Henry et al. 2017; Henry et al. 2019; Henry et al. 2020; Henry et al. 2021; Henry et al. 2022; Johnson et al. 2005; Kenney and Hartley 2001; Knowlton and Kraus 2001;Knowlton et al. 2012; NMFS 2021a,b; Whittingham et al. 2005a,b; see NMFS Marine Mammal SARs for the Atlantic Region).[26] 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; Cole and Henry 2013; 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; Henry et al. 2022; Knowlton and Kraus 2001, Knowlton et al. 2012; Moore and Van der Hoop 2012; NMFS 2014; NMFS 2021a,b; Pettis et al. 2021; Sharp et al. 2019; van der Hoop et al. 2016; van der Hoop et al. 2017). In fact, review of Atlantic coast-wide causes of large whale human interaction incidents between 2010 and 2019 shows that entanglement is the highest cause of mortality and serious injury for North Atlantic right, humpback, fin, and minke whales in those instances when cause of death could be determined (NMFS 2021b). 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; NMFS 2021a,b; Pace et al. 2017; Robbins 2009).

As noted above, pursuant to the MMPA, NMFS publishes a LOF annually, classifying U.S. commercial fisheries into one of three categories based on the relative frequency of incidental serious injurious and mortalities of marine mammals in each fishery. Large whales, in particular, humpback, fin, minke, and North Atlantic right whales, are known to interact with Category I and II fisheries in the Northwest Atlantic Ocean. As fin, and North Atlantic right whales are listed as endangered under the ESA, these species are considered strategic stocks under the MMPA. Section 118(f)(1) of the MMPA requires the preparation and implementation of a Take Reduction Plan for any strategic marine mammal stock that interacts with Category I or II fisheries. In response to its obligations under the MMPA, in 1996, NMFS established the Atlantic Large Whale Take Reduction Team (ALWTRT) to develop a plan (Atlantic Large Whale Take Reduction Plan (ALWTRP)) to reduce serious injury to, or mortality of large whales, specifically, humpback, fin, and North Atlantic right whales, due to incidental entanglement in U.S. commercial fishing gear.[27] In 1997, the ALWTRP was implemented. The ALWTRP consists of regulatory (e.g., universal gear requirements, modifications, and requirements; area-and season- specific gear modification requirements and restrictions; time/area closures) and non-regulatory measures (e.g., gear research and development, disentanglement, education and outreach) that, in combination, seek to assist in the recovery of North Atlantic right, humpback, and fin whales by addressing and mitigating the risk of

[26] 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. ALWTRP regulations currently in effect are summarized online.

[27] The measures identified in the ALWTRP are also beneficial to the survival of the minke whale, which are also known to be incidentally taken in commercial fishing gear.

entanglement in gear employed by commercial fisheries, specifically trap/pot and gillnet fisheries. The ALWTRP recognizes trap/pot and gillnet Management Areas in Northeast, Mid-Atlantic, and Southeast regions of the U.S, and identifies gear modification requirements and restrictions for Category I and II gillnet and trap/pot fisheries in these regions; these Category I and II fisheries must comply with all regulations of the Plan.[28]For further details on the Plan, please refer to the ALWTRP.

Since 1997, the ALWTRP has been modified as NMFS and the ALWTRT learn more about why whales become entangled and how fishing practices might be modified to reduce the risk of entanglement. In 2021, adjustments to Plan were implemented and in 2022, NOAA fisheries issued a notice of its intent to begin a rulemaking process to amend the ALWTRP to further reduce the risk of mortalities and serious injuries of NARW and other large whales caused by incidental entanglement in commercial trap/pot and gillnet fisheries along the U.S. East Coast. These recent ALWTRP actions are summarized online.

Bottom Longline Gear:

Review of the most recent 10 years (2010-2019) of data on observed or documented interactions between large whales and fishing gear show that there have been no observed/documented interactions between species of large whales and bottom longline gear (NMFS 2022; NMFS 2021a; GAR Marine Animal Incident databases for interactions; NMFS Marine Mammal SARs for the Atlantic Region; MMPA List of Fisheries (LOF), and NMFS NEFSC marine mammal (baleen whale) serious injury and mortality Reference Documents, Publications, or Technical Memoranda). Based on this information, and the fact that MMPA LOF categorizes the Northeast/Mid-Atlantic bottom longline/hook-and-line fisheries as a Category III fishery[29], interactions between bottom longline gear and large whales are unlikely, and therefore, are not expected to be source of injury or mortality to these marine mammal species.

Small Cetaceans and Pinnipeds

Sink Gillnet and Bottom Trawl Gear

[28] The fisheries currently regulated under the ALWTRP include: Northeast/Mid-Atlantic American lobster trap/pot; Atlantic blue crab trap/pot; Atlantic mixed species trap/pot; Northeast sink gillnet; Northeast anchored float gillnet; Northeast drift gillnet; Mid-Atlantic gillnet; Southeastern U.S. Atlantic shark gillnet; and Southeast Atlantic gillnet .

[29] Pursuant to the MMPA LOF, a Category III fishery is defined as a fishery with "Remote likelihood of/no known incidental death or serious injury of marine mammals."

Small cetaceans and pinnipeds are vulnerable to interactions with sink gillnet and bottom trawl gear.[30] Reviewing marine mammal stock assessment and serious injury reports that cover the most recent 10 years data (i.e., 2010-2019), as well as the MMPA LOF's covering this time frame (i.e., issued between 2017 and 2022), Table 14 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 spiny dogfish fishery. Of the species in Table 14, 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 GAR (Hatch and Orphanides 2014, 2015, 2016; Orphanides and Hatch 2017; Orphanides 2019, 2020). 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 (Chavez-Rosales *et al.* 2017; Lyssikatos 2015; Lyssikatos et al. 2020; Lyssikatos et al. 2021).

Table 13. Small cetacean and pinniped species observed seriously injured and/or killed by Category II Mid-Water or Bottom Trawl Fisheries in the affected environment of the FMP.

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
		Long-finned pilot whales
		Harbor seal
		Hooded seal

[30] For additional information on small cetacean and pinniped interactions, see: NMFS NEFSC marine mammal serious injury and mortality Reference Documents, Publications, or Technical Memoranda; NMFS Marine Mammal SARs for the Atlantic Region; MMPA LOF.

		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
		Harbor seal
		Harp seal
		Gray seal

THIS SPACE LEFT BLANK FOR FORMATTING PURPOSES

Northeast Bottom Trawl	II	Harp seal
		Harbor seal
		Gray seal
		Long-finned pilot whales
		Short-beaked common dolphin
		Atlantic white-sided dolphin
		Harbor porpoise
		Bottlenose dolphin (offshore)
		Risso's dolphin
Mid-Atlantic Bottom Trawl	II	White-sided dolphin
		Short-beaked common dolphin
		Risso's dolphin
		Bottlenose dolphin (offshore)
		Gray seal
		Harbor seal
Source: MMPA 2017-2022 LOFs at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-list-fisheries		

To address the high levels of incidental take of harbor porpoise and bottlenose dolphins in sink gillnet fisheries, pursuant to section MMPA Section 118(f)(1), the Harbor Porpoise Take Reduction Plan (HPTRP) and the Bottlenose Dolphin Take Reduction Plan (BDTRP) were developed and implemented for these species.[31] Also, due to the incidental mortality and serious injury of small cetaceans, incidental to bottom and midwater trawl fisheries operating

[31] Although the most recent U.S. Atlantic and Gulf of Mexico Marine Mammal SARs (Hayes et al. 2022) no longer designates harbor porpoise as a strategic stock, HPTRP regulations are still in place per the mandates provided in Section 118(f)(1).

in both the Northeast and Mid- Atlantic regions, the Atlantic Trawl Gear Take Reduction Strategy was implemented. Refer to NMFS HPTRP, NMFS BDTRP, or NMFS Atlantic Trawl Gear Take Reduction Strategy for addition information on each take reduction plan or strategy.

Bottom Longline Gear:

Review of the most recent 10 years (2010-2019) of data on observed or documented interactions between fishing gear and small cetaceans or pinnipeds show that there have been no observed/documented interactions between small cetacean or pinnipeds species and bottom longline gear (NMFS 2022; NMFS 2021a; GAR Marine Animal Incident databases for interactions; NMFS Marine Mammal SARs for the Atlantic Region; MMPA List of Fisheries (LOF), and NMFS NEFSC marine mammal (baleen whale) serious injury and mortality Reference Documents, Publications, or Technical Memoranda). Based on this information, and the fact that MMPA LOF categorizes the Northeast/Mid-Atlantic bottom longline/hook-and-line fisheries as a Category III fishery[32], interactions between bottom longline gear and small cetaceans or pinnipeds are unlikely, and therefore, are not expected to be source of injury or mortality to these marine mammal species.

THIS SPACE LEFT BLANK FOR FORMATTING PURPOSES

[32] Pursuant to the MMPA LOF, a Category III fishery is defined as a fishery with "Remote likelihood of/no known incidental death or serious injury of marine mammals."

7.0 WHAT ARE THE IMPACTS (Biological and Human Community) FROM THE ALTERNATIVES CONSIDERED IN THIS DOCUMENT?.[33]

Related to this action and its alternatives (see Section 5 for details on alternatives), the key determinant of biological impacts on spiny dogfish is how much fish are caught, and how that catch might impact stock status.

For habitat and non-target species impacts, the key determinant is the amount and character of the related effort, and the impact of that effort on the non-target's stock status and the quality/quantity of habitat. The availability of the target species can drive effort as much as any quota change, and as effort changes so would impacts on habitat, protected resources, and non-target species. Since limits on catch do cap effort however, measures that limit catch to varying degrees are a factor related to effort. For protected resources listed under the ESA or have catch above potential biological removal (PBR), the situation is slightly more complex. While lower effort will reduce impacts, any interactions on ESA-listed species or species above PBR is still a negative effect even if resulting impacts are lower than no action. The table below summarizes the guidelines used for each VEC to determine the magnitude and direction of the impacts described in this section.

THIS SPACE LEFT BLANK FOR FORMATTING PURPOSES

[33] National Oceanic and Atmospheric Administration Administrative Order 216-6A and the Companion Manual contains criteria for determining the significance of the impacts of a proposed action and it includes the possibility of introducing or spreading a nonindigenous species. This potential impact does not fit into the sections below so it is addressed in this introduction. There is no evidence or indication that these fisheries have ever resulted or would ever result in the introduction or spread of nonindigenous species.

Table 14. General definitions for impacts and qualifiers relative to resource condition baselines

General Definitions				
VEC	**Resource Condition**	**Impact of Action**		
		Positive (+)	Negative (-)	No Impact (0)
Target and non-target Species	Overfished status defined by the MSA	Alternatives that maintain or are projected to result in a stock status above an overfished condition*	Alternatives that 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 (i.e., no take)	Alternatives that result in interactions/take of listed species, 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 maintain takes below PBR and approaching the Zero Mortality Rate Goal	Alternatives that result in interactions with/take of marine mammals 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	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), as in slight positive or slight negative	To a lesser degree / minor		
	Moderate (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.

7.1 Biological Impacts on the Managed Resource – Spiny Dogfish

Baseline condition: The most recent stock assessment used for status determination, the 2018 assessment found that the stock was not overfished nor subject to overfishing (NEFSC 2018c). The 2022 spiny dogfish Research Track Assessment (RTA) was ongoing at the time of Council action but suggested that stock biomass and productivity have been in decline. The peer review for the RTA was early December 2022, and then a Management Track Assessment (MTA) will be conducted in mid-2023, utilizing the methods identified as acceptable by the peer review. The 2023 MTA will be used to inform stock status determinations and specifications for 2024 and beyond fishing years. In 2019, the terminal year of the RTA (which passed peer review), the stock was less than 70% of its target and declining, though the decline appeared to be slowing. See Section 6.1 above for additional detail. Given management has responded to stock conditions and rebuilt this stock once since management began in 2000, and the stock is likely below its target, the overall baseline condition is likely slightly positive. **However given the stock is probably not that far from the overfished threshold developed in the research track assessment, a simple positive/negative impact determination based on stock status is not appropriate – instead any catch beyond the SSC's new ABC is likely to have a negative impact on the spiny dogfish stock.**

Under all alternatives, the current regional/state allocations (set at the ASMFC, not federally) mean that the full quota will probably not be utilized. While states have improved their abilities to transfer unused quota in one state to another state that could use more quota, the transferring system is likely not agile enough to completely use 100% of the quota. This creates a de-facto buffer between likely realized landings and the quota, but it applies across all alternatives and in terms of spiny dogfish fishing mortality, the effect may be small relative to other factors such as the overall ABC/ACL.

7.1.1 ALTERNTAIVE 1: NO ACTION AND STATUS QUO (17,498 MT ABC)

Alternative 1, which maintains the current catch constraints, could lead to overages of the SSC's most recent ABC recommendation, which could cause additional overfishing to a stock in recent decline (even if not overfished). Because recent catches have been well below this ABC without being constrained by the relevant quotas, the impact would be slightly negative. Based on recent history, the stock could experience some degree of overfishing but fully catching the ABC, which would cause more substantial overfishing, appears unlikely. Because the potential catches could similarly be higher under Alternative 1 than the other alternatives, impacts would be slightly negative compared to Alternatives 2-4. While the ABCs of Alternative 1 versus Alternatives 2-4's ABCs may be moderately different, given recent fishery performance only relatively small changes in fishing mortality and stock biomass are expected across any of the alternatives - the differential impacts are therefore only slight.

7.1.2 ALTERNATIVE 2: NEW 7,788 MT SSC ABC RECOMMENATION WITH 0% MANAGEMENT UNCERTAINTY BUFFER (PREFERRED)

Alternative 2 would constrain catch to lower limits than the current fishery and should restrict catch within the SSC-recommended ABC, thus maintaining the baseline condition in an approximately similar fashion (SSC recommendations are designed by the MAFMC's risk policy to avoid overfishing and thus avoid development of an overfished condition). As such, Alternative 2 should have a slightly positive, if unquantifiable, impact on the spiny dogfish stock by maintaining the current condition. The quota (12.0 million pounds) under this alternative would be higher than the most recent (2021) landings, but only slightly higher. A 12.0 million-pound quota would be 15% lower than the 2019-2021 average landings of 14.1 million pounds (see Figure 4 above) so some actual catch reduction is possible versus what might otherwise be expected under no action (and its non-limiting quota), contributing to the slight positive impact.

Because the potential catches with Alternative 2 could be slightly lower than Alternative 1, the impacts are slightly more positive with Alternative 2 than Alternative 1.

Because catches could be slightly higher under Alternative 2 than Alternatives 3-4, the impacts of Alternatives 3-4 are slightly more positive than Alternative 2.

The scale of possible catches differ between alternatives 2-4 due to the varying uncertainty buffers designed to avoid ABC/ACL overages. Because any overage must be repaid in future years, the effect of an overage itself on the stock should be minimal and self-correcting (that is the general purpose of overage repayments). Buffers may reduce potential future quota instability from paybacks as more or less catch is set aside and not available to catch each year. That variation in the amount that can likely be caught due to the different buffers is the primary different effect among Alternatives 2-4 (not the possibility of overages, due to the payback provisions). The likely realized total catches across all alternatives and effects on fishing mortality and stock biomass are likely to be only slightly different, so the differential impacts among alternatives are also only slight.

7.1.3 ALTERNATIVE 3: NEW 7,788 MT SSC ABC RECOMMENATION WITH 5% MANAGEMENT UNCERTAINTY BUFFER

Alternative 3 would constrain catch to lower limits than the current fishery and should restrict catch within the SSC-recommended ABC, thus maintaining the baseline condition in an approximately similar fashion (SSC recommendations are designed by the MAFMC's risk policy to avoid overfishing and thus avoid development of an overfished condition). As such,

Alternative 3 should have a slightly positive, if unquantifiable, impact on the spiny dogfish stock by maintaining the current condition. The quota (11.2 million pounds) under this alternative would be similar to the most recent (2021) landings. An 11.2 million-pound quota would be 21% lower than the 2019-2021 average landings of 14.1 million pounds (see Figure 4 above) so some actual catch reduction is possible versus what might otherwise be expected under no action (and its non-limiting quota), contributing to the slight positive impact.

Because the potential catches with Alternative 3 could be slightly lower than Alternative 1, the impacts are slightly more positive with Alternative 3 than Alternative 1.

Because catches could be slightly higher under Alternative 3 than Alternative 4, the impacts of Alternative 3 are slightly less positive than Alternative 4. Because catches could be slightly lower under this alternative than Alternative 2, the impacts of Alternative 3 are slightly more positive than Alternative 2.

The scale of possible catches differ between alternatives 2-4 due to the varying uncertainty buffers designed to avoid ABC/ACL overages. Because any overage must be repaid in future years, the effect of an overage itself on the stock should be minimal and self-correcting (that is the general purpose of overage repayments). Buffers may reduce potential future quota instability from paybacks as more or less catch is set aside and not available to catch each year. That variation in the amount that can likely be caught due to the different buffers is the primary different effect among Alternatives 2-4 (not the possibility of overages, due to the payback provisions). The likely realized total catches across all alternatives and effects on fishing mortality and stock biomass are likely to be only slightly different, so the differential impacts among alternatives are also only slight.

7.1.4 ALTERNATIVE 4: NEW 7,788 MT SSC ABC RECOMMENATION WITH 13% MANAGEMENT UNCERTAINTY BUFFER

Alternative 4, would constrain catch to lower limits than the current fishery, and should restrict catch within the SSC-recommended ABC, thus maintaining the baseline condition in an approximately similar fashion (SSC recommendations are designed by the MAFMC's risk policy to avoid overfishing and thus avoid development of an overfished condition). As such, Alternative 4 should have a slightly positive, if unquantifiable, impact on the spiny dogfish stock by maintaining the current condition. The quota (9.8 million pounds) under this alternative would be lower than the most recent (2021) landings. A 9.8 million-pound quota would be 30%

lower than the 2019-2021 average landings of 14.1 million pounds (see Figure 4 above) so some actual catch reduction is possible versus what might otherwise be expected under no action (and its non-limiting quota), contributing to the slight positive impact.

Because the potential catches with Alternative 4 could be lower than Alternatives 1-3, the impacts for Alternative 4 are slightly more positive than Alternatives 1-3.

The scale of possible catches differ between alternatives 2-4 due to the varying uncertainty buffers designed to avoid ABC/ACL overages. Because any overage must be repaid in future years, the effect of an overage itself on the stock should be minimal and self-correcting (that is the general purpose of overage repayments). Buffers may reduce potential future quota instability from paybacks as more or less catch is set aside and not available to catch each year. That variation in the amount that can likely be caught due to the different buffers is the primary different effect among Alternatives 2-4 (not the possibility of overages, due to the payback provisions). The likely realized total catches across all alternatives and effects on fishing mortality and stock biomass are likely to be only slightly different, so the differential impacts among alternatives are also only slight.

7.2 Habitat Impacts

Here the word “habitat” encompasses essential fish habitat (EFH) for the purposes of this analysis. The gears most commonly used in directed fishing for spiny dogfish are gillnets and bottom longline, and these gear types are not generally associated with substantial negative habitat impacts (Stevenson et al. 2004 p 125). Bottom trawling is a very small component of the fishery, as discussed in more detail above, and is not likely to be different among the alternatives given very little bottom trawling occurs directed on spiny dogfish. Accordingly, there would be negligible to slight negative habitat impacts expected from no action/the status quo (Alternative 1). If the quota is decreased with Alternatives 2-4 compared to no action/the status quo, then it is possible that there could be some decrease in the extent of directed dogfish fishing. However, since the habitat effects of current fishing are negligible (due to the gear types that are involved in most directed fishing) to slight negative (due to the small trawl component), and the same is likely to remain true under all the alternatives, the difference between all alternatives would be negligible as far as habitat is concerned. Thus the negligible to slight negative current impacts should continue in a very similar fashion under any alternative, without substantial differences between alternatives.

7.3 Protected Resources Impacts

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 condition (i.e., marine mammal stocks that have exceeded or are near exceeding their PBR level). For ESA-listed species, any action that results in interactions or take is expected to have 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 (impacts are negligible for species without interactions and not repeated for every alternative – the focus here is on species where there are interactions as described in Section 6.4). 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, 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 may have positive impacts by maintaining takes below the PBR level and approaching the zero mortality rate goal.

In addition to taking into account the resource condition of ESA-listed and/or MMPA protected species, factors associated with the risk of an interaction between gear and protected species are also considered in assessing impacts of the alternatives proposed. Specifically, the risk of an interaction is strongly associated with the type of gear, amount of gear in the water, duration of time the gear is in the water (e.g., soak or tow duration), and the presence of protected species in the same area and time as the gear, with risk of an interaction potentially changing with changes in these factors. Minimal trawling effort toward spiny dogfish occurs, so trawling effort in general is likely to continue similarly under all alternatives.

Section 7.3.1 No Action/Status Quo

General No-action: MMPA (Non-ESA Listed) Species Impacts

Aside from several stocks of bottlenose dolphin, there has been no indication that takes of non-ESA listed marine mammals in commercial fisheries have gone beyond levels which would result in the inability of the populations to sustain themselves. Specifically, aside from several stocks of bottlenose dolphin, the PBR level has not been exceeded for any of the non-ESA listed

marine mammal species in the affected environment (section 6.4). 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; section 6.4). These efforts are still in place and are continuing to assist in decreasing bycatch levels for these stocks.

Taking into consideration the above information, and the fact that there are non-listed marine mammal stocks/species whose populations may or may not be at optimum sustainable levels, impacts of the No Action Alternative on non-ESA listed species of marine mammals are likely to range from slight negative to slight positive. As noted above, there are some bottlenose dolphin stocks 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, are at risk. As a result, any potential for an interaction is a detriment to the species/stocks ability to recover from this condition. As provided above, the risk of an interaction is strongly associated with the amount of gear in the water, the duration of time the gear is in the water (e.g., soak or tow duration), 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. The No Action Alternative 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, gear tow or soak duration, and the overlap between protected species and fishing gear (i.e., sink gillnet, bottom longline, and bottom trawl), in space and time, is not expected to change relative to current conditions. Given this information, and the information provided in section 6.4.3, the No Action Alternative 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 and types 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 slight 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 positive impacts would remain. Given this, and the fact that the potential risk of interacting with gear types used in the fishery varies between non-ESA listed marine mammal species in good condition (see section 6.4), the impacts of no action on these non-ESA listed species of marine mammals in

good condition 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).

Based on the information above, the overall impacts of the No Action Alternative on non-ESA listed species of marine mammals are expected to be slight negative to slight positive .

General No-action: ESA Listed Species Impacts

Directed spiny dogfish fishing is primarily prosecuted with sink gill nets and bottom longline. Some harvest occurs with bottom trawl, but most of that catch is expected to be incidental to other fishing that would not be affected by this action. As provided in section 6.4, reviewing the most recent 10 years (2010-2019) of observer data, Sea Turtle Disentanglement Network and GAR Marine Animal Incident database, and NMFS (2021a), interactions between bottom longline gear and ESA-listed species of whales, sea turtles, Atlantic sturgeon, and Atlantic salmon have not been observed or documented. In terms of sink gill net and bottom trawl gear, interactions with ESA-listed species of whales, sea turtles, Atlantic sturgeon, Atlantic salmon, and/or giant manta rays have been observed/documented in these gear types. Based on this, the spiny dogfish fishery is likely to result in some level some level of negative impacts to ESA listed species. Under the No Action, the amount of gear fished, gear tow or soak duration, and area fished are not expected change substantially from recent operating conditions. As interactions risks with protected species are strongly associated with amount, time, and location of gear in the water, continuation of "status quo" fishing behavior/effort is not expected to change any of these operating conditions.

Based on this information, the impacts of the No Action Alternatives on ESA listed species is expected to be negligible to slight negative.

Overall Impacts to Protected Species

Based on the above protected species (i.e., ESA-listed and MMPA protected) impact analysis, overall impacts of the No Action Alternative on protected species are expected to be slight negative to slight positive

As described in Section 7.1, landings may be constrained by Alternatives 2-4 compared to Alternative 1 (i.e. status-quo/no-action) considering recent fishery operation (2019-2021). This could also constrain effort in a similar fashion. Relatively speaking, due to different quotas, one would expect the ranking of effort amounts from most to least to be Alternative 1 (most), then

Alternative 2, then Alternative 3, then Alternative 4 (least). Given the scale of the fishery relative to overall regional fishing effort and the scale of the differences among alternatives, one would expect slight differences in impacts among the alternatives in the same relative fashion. Alternative 1 would be the most negative/least positive depending on the protected species, then Alternative 2, then Alternative 3, then Alternative 4 (least negative/most positive depending on the protected species). Minimal trawling effort toward spiny dogfish occurs, so trawling effort in general is likely to continue similarly under all alternatives.

7.3.2 ALTERNATIVE 2: NEW 7,788 MT SSC ABC RECOMMENATION WITH 0% MANAGEMENT UNCERTAINTY BUFFER (PREFERRED)

Alternative 2 could reduce landings by 15% compared to 2019-2021 landings. At the trip limit of 7,500 pounds, this could result in about 278 fewer annual directed trips (each at the trip limit, which is a frequent landing amount). While not particularly substantial compared to the annual number of even just federally-permitted trips that must submit VTRs in the region[34], this does represent a more than negligible portion of reported federal VTR gill net and bottom longline trips (the most relevant gear types and most likely to be affected): 4% of 7,738 trips.

As described above, interaction risks with protected species (ESA-listed and/or MMPA protected) are strongly associated with the amount of gear in the water, the time the gear is in the water, and the presence of listed protected species in the same area and time as the gear, with risk of an interaction increasing or decreasing with changes in of any of these factors. Reduced effort may consist of some fewer vessels participating in the fishery and/or some vessels decreasing the days they participate in the fishery due to quota closures, but the types of vessels, types of gears, soak times, and/or tow durations are not expected to substantially differ from previous years. Quota closures would be most likely in the second half of the fishing year as quota gets used (Nov-April), so reductions in effort would be most likely to occur in that period. Minimal trawling effort toward spiny dogfish occurs, so trawling effort in general is likely to continue similarly under all alternatives.

Given the above information, effort under Alternative 2 should be less than or equal to status quo conditions, which is also Alternative 1. If effort does decrease, the risk of an interaction between fishing gear and protected species also has the potential to decrease. Although this may provide some benefit to protected species, as interactions can still occur under a reduced effort scenario,

[34] For July 2020 through June 2021 (most recent SBRM data available), there were over 70,000 total trips reported on VTRs across all gear types, and other state waters trips as well.

some level of negative impacts is still expected to those protected species in poor condition (i.e., ESA listed; MMPA protected with PBR levels exceeded). Based on this, impacts of Alternative 2 on protected species are expected to range from slight negative to low-moderate positive, with slight negative to negligible impacts expected for ESA-listed species and non-ESA listed marine mammal species whose PBR levels have been exceeded, and slight to low-moderate positive impacts for non-ESA listed marine mammal species whose PBR levels have not been exceeded (as the change could slightly further reduce removals below PBR).

Relatively speaking, due to different quotas, one would expect the ranking of effort amounts from most to least to be Alternative 1 (most), then Alternative 2, then Alternative 3, then Alternative 4 (least). Given the scale of the fishery relative to overall regional fishing effort and the scale of the differences among alternatives, one would expect slight differences in impacts among the alternatives in the same relative fashion. Alternative 1 would be the most negative/least positive depending on the protected species, then Alternative 2, then Alternative 3, then Alternative 4 (least negative/most positive depending on the protected species).

7.3.3 ALTERNATIVE 3: NEW 7,788 MT SSC ABC RECOMMENATION WITH 5% MANAGEMENT UNCERTAINTY BUFFER

Alternative 3 could reduce landings by 21% compared to 2019-2021 landings. At the trip limit of 7,500 pounds, this could result in about 392 fewer annual directed trips (each at the trip limit, which is a frequent landing amount). While not particularly substantial compared to the annual number of even just federally-permitted trips that must submit VTRs in the region[35], this does represent a more than negligible portion of reported federal VTR gill net and bottom longline trips (the most relevant gear types and most likely to be affected): 5% of 7,738 trips.

As described above, interaction risks with protected species (ESA-listed and/or MMPA protected) are strongly associated with the amount of gear in the water, the time the gear is in the water, and the presence of listed protected species in the same area and time as the gear, with risk of an interaction increasing or decreasing with changes in of any of these factors. Reduced effort may consist of some fewer vessels participating in the fishery and/or some vessels decreasing the days they participate in the fishery due to quota closures, but the types of vessels, types of gears, soak times, and/or tow durations are not expected to substantially differ from previous years. Quota closures would be most likely in the second half of the fishing year as quota gets used (Nov-April), so reductions in effort would be most likely to occur in that time period. Minimal trawling effort toward spiny dogfish occurs, so trawling effort in general is likely to continue similarly under all alternatives.

[35] For July 2020 through June 2021 (most recent SBRM data available), there were over 70,000 total trips reported on VTRs across all gear types and other state waters trips as well.

Given the above information, effort under Alternative 3 should be less than or equal to status quo conditions, which is also Alternative 1. If effort does decrease, the risk of an interaction between fishing gear and protected species also has the potential to decrease. Although this may provide some benefit to protected species, as interactions can still occur under a reduced effort scenario, some level of negative impacts is still expected to those protected species in poor condition (i.e., ESA listed; MMPA protected with PBR levels exceeded). Based on this, impacts of Alternative 3 on protected species are expected to range from slight negative to moderate positive, with slight negative to negligible impacts expected for ESA-listed species and non-ESA listed marine mammal species whose PBR levels have been exceeded, and slight to low moderate positive impacts for non-ESA listed marine mammal species whose PBR levels have not been exceeded (as the change could slightly further reduce removals below PBR).

Relatively speaking, due to different quotas, one would expect the ranking of effort amounts from most to least to be Alternative 1 (most), then Alternative 2, then Alternative 3, then Alternative 4 (least). Given the scale of the fishery relative to overall regional fishing effort and the scale of the differences among alternatives, one would expect slight differences in impacts among the alternatives in the same relative fashion. Alternative 1 would be the most negative/least positive depending on the protected species, then Alternative 2, then Alternative 3, then Alternative 4 (least negative/most positive depending on the protected species).

7.3.4 ALTERNATIVE 4: NEW 7,788 MT SSC ABC RECOMMENATION WITH 13% MANAGEMENT UNCERTAINTY BUFFER

Alternative 4 could reduce landings by 31% compared to 2019-2021 landings. At the trip limit of 7,500 pounds, this could result in about 574 fewer annual directed trips (each at the trip limit, which is a frequent landing amount). While not particularly substantial compared to the annual number of even just federally-permitted trips that must submit VTRs in the region[36], this does represent a more than negligible portion of reported federal VTR gill net and bottom longline trips (the most relevant gear types and most likely to be affected): 7% of 7,738 trips.

As described above, interaction risks with protected species (ESA-listed and/or MMPA protected) are strongly associated with the amount of gear in the water, the time the gear is in the water, and the presence of listed protected species in the same area and time as the gear, with risk of an interaction increasing or decreasing with changes in of any of these factors. Reduced effort may consist of some fewer vessels participating in the fishery and/or some vessels decreasing the days they participate in the fishery due to quota closures, but the types of vessels, types of gears, soak times, and/or tow durations are not expected to substantially differ from previous years.

[36] For July 2020 through June 2021 (most recent SBRM data available), there were over 70,000 total trips reported on VTRs across all gear types and other state waters trips as well.

Quota closures would be most likely in the second half of the fishing year as quota gets used (Nov-April), so reductions in effort would be most likely to occur in that time period. Minimal trawling effort toward spiny dogfish occurs, so trawling effort in general is likely to continue similarly under all alternatives.

Given the above information, effort under Alternative 4 should be less than or equal to status quo conditions, which is also Alternative 1. If effort does decrease, the risk of an interaction between fishing gear and protected species also has the potential to decrease. Although this may provide some benefit to protected species, as interactions can still occur under a reduced effort scenario, some level of negative impacts is still expected to those protected species in poor condition (i.e., ESA listed; MMPA protected with PBR levels exceeded). Based on this, impacts of Alternative 4 on protected species are expected to range from slight negative to moderate positive, with slight negative to negligible impacts expected for ESA-listed species and non-ESA listed marine mammal species whose PBR levels have been exceeded, and slight to low moderate positive impacts for non-ESA listed marine mammal species whose PBR levels have not been exceeded (as the change could slightly further reduce removals below PBR).

Relatively speaking, due to different quotas, one would expect the ranking of effort amounts from most to least to be Alternative 1 (most), then Alternative 2, then Alternative 3, then Alternative 4 (least). Given the scale of the fishery relative to overall regional fishing effort and the scale of the differences among alternatives, one would expect slight differences in impacts among the alternatives in the same relative fashion. Alternative 1 would be the most negative/least positive depending on the protected species, then Alternative 2, then Alternative 3, then Alternative 4 (least negative/most positive depending on the protected species).

7.4 Socioeconomic Impacts

Directed recreational fishing for spiny dogfish is believed to be negligible (anecdotal reports indicate that there is some directed fishing for spiny dogfish but many anglers consider them a nuisance), so the focus in this section is on commercial impacts. As discussed above, the availability of the targeted species, market conditions, and input costs (especially fuel and labor) may drive effort (and catch and revenues) as much as any regulations.

Spiny Dogfish Fishery Baseline Condition for Socioeconomic Impacts:

Where possible, effects on ex-vessel revenues are described. Although ex-vessel revenues are a useful indicator of relative importance for various fisheries, we note that the true economic importance of fisheries comes from the overall economic activity, jobs, and community vitality that are supported by the ex-vessel revenues. In fact, when related impact multipliers are considered, the actual economic impact is several times larger than mere ex-vessel revenues. This concept applies to each alternative and is not repeated for each alternative. The

socioeconomic contributions of spiny dogfish have been slightly positive in recent years. Due to the year-to-year variation in catch and effort in the fishery, it is difficult to fully quantify human community impacts but the current fishery supports a number of vessels (though declining in recent years), as described in Section 6.2, and provides a variety of jobs related directly to fishing and also in associated support services. 79 vessels landed over 10,000 pounds of spiny dogfish in the 2021 fishing year, with total spiny dogfish landings ex-vessel revenues of $2.2 million. From 2019-2021spiny dogfish ex-vessel revenues varied from $2.2-$3.8 million, averaging $2.9 million (Figure 5, unpublished NMFS dealer data). These ex-vessel amounts are smaller than most Council-managed species, leading to the "slight" qualifier noted above (see www.mafmc.org and the Fishery Information Documents under the Fishery Management Plans section of the website for details on other species). For an individual vessel or processor however, spiny dogfish may be an important part of their annual operations.

7.4.1 ALTERNTAIVE 1: NO ACTION/STATUS QUO

Alternative 1 initially appears that is might maintain the current condition whereby relevant communities benefit from similar spiny dogfish fishing and associated economic activity as has recently occurred, which could result in a short-term slight positive impact based on the criteria provided in Table 14. 2019-2021 ex-vessel revenues averaged $2.9 million. However, Alternative 1 could allow catches higher than the SSC-recommended ABC, which could contribute to overfishing and a long-term reduction in sustainable catch/revenues. That said, the trend in landings suggests that much of this higher ABC would go uncaught, with the amount of potential catch higher than the current SSC ABC recommendation likely to be slight. Therefore given the risk of slight overages relative to the current (lower) SSC-recommended ABC, the overall human community impacts would be slight negative, related to potential slight negative impacts to long term sustainable catches/revenues. In a similar fashion, the impacts would be slight negative compared to all the other alternatives due to the same potential slight negative impacts on sustainability.

7.4.2 ALTERNATIVE 2: NEW 7,788 MT SSC ABC RECOMMENATION WITH 0% MANAGEMENT UNCERTAINTY BUFFER (PREFERRED)

The commercial quota under this alternative would be 12.0 million pounds. 2021 landings were slightly over 10 million pounds, and 2019-2021 landings averaged 14.1 million pounds. Depending on the intrinsic variability in this fishery, this alternative might not be a constraint or could be a constraint relative to 2019-2021 average landings (a 12.0 million pound quota would be 15% less than 2019-2021 average landings). 15% less revenues for the same period amount to about $0.4 million. Given the criteria in Table 14, the potential landings/revenue reduction means that the socioeconomic impact would be negative. Given the relatively small potential

reduction in revenues and because this alternative should allow a continuation of sustainable landings, these impacts would be slight. For an individual vessel or processor however, spiny dogfish may be an important part of their annual operations.

While there is more of a risk of ABC overages and paybacks with a smaller buffer (or no buffer), the socioeconomic impacts may ultimately approach negligible related to overages and paybacks (catches and revenues are primarily shifted among several close years).

In the long term, impacts would be slightly more positive compared to Alternative 1/no action because Alternative 2 should result in sustainable catches, and, while differences in catch are likely to be small, there is a possibility that Alternative 1 could compromise long-term sustainability and opportunity in the fishery. And, in the long term, Alternative 2 would be similar to or slightly less positive than Alternatives 3 or 4. This is because while all the action alternatives would be expected to result in long-term sustainability, Alternatives 3 and 4 take a slightly more conservative approach to buffers and therefore provide somewhat more certainty around supporting long-term sustainability and opportunity/revenue for fishery participants.

However, in terms of short-term revenues, impacts from Alternative 2 would be slightly more positive compared to Alternatives 3-4 because their management uncertainty buffers would reduce revenues (slight because of the relatively small effects on revenues). In the short-term, Alternative 2 would be slightly negative relative to no action, given the revenue constraints relative to current conditions as discussed above.

Industry reports that Alternative 2 may have an added socioeconomic benefit versus Alternatives 3-4 (with 4 worst) by decreasing the likelihood of dealers and/or processors exiting the industry and disrupting the overall fishery, compared to if the lower quotas under Alternatives 3-4 are used.

7.4.3 ALTERNATIVE 3: NEW 7,788 MT SSC ABC RECOMMENATION WITH 5% MANAGEMENT UNCERTAINTY BUFFER

The commercial quota under this alternative would be 11.2 million pounds. 2021 landings were slightly over 10 million pounds, and 2019-2021 landings averaged 14.1 million pounds. Depending on the intrinsic variability in this fishery, this alternative might not be a constraint or could be a constraint relative to 2019-2021 average landings (a 12.0 million pound quota would be 21% less than 2019-2021 average landings). 21% less revenues for the same period amount to about $0.6 million. Given the criteria in Table 14, the potential landings/revenue reduction means that the socioeconomic impact would be negative. Given the relatively small potential reduction in revenues and because this alternative should allow a continuation of sustainable landings, these impacts would be slight. For an individual vessel or processor however, spiny dogfish may be an important part of their annual operations.

While there is more of a risk of ABC overages and paybacks with a smaller buffer (or no buffer), the socioeconomic impacts should ultimately approach negligible related to overages and paybacks (catches and revenues are primarily shifted among several close years).

In the long term, impacts would be slightly more positive compared to Alternative 1/no action because while differences in catch are likely to be small, Alternative 3 should result in sustainable catches while Alternative 1 could potentially compromise long-term sustainability and opportunity in the fishery. And, in the long-term, Alternative 3 would be similar to or slightly more positive than Alternative 2, and similar to or slightly less positive than Alternative 4. This is because while all the action alternatives would be expected to result in long-term sustainability, Alternatives 2, 3, and 4 take increasingly conservative approaches to buffers respectively, and alternatives with higher buffers can provide somewhat more certainty around supporting long-term sustainability and opportunity/revenue for fishery participants.

However, in terms of short-term revenues, impacts from Alternative 3 would be slightly more positive compared to Alternative 4 because Alternative's 4 management uncertainty buffer would further reduce revenues (slight because of the relatively small effects on revenues). Immediate revenue impacts from Alternative 3 would be slightly more negative compared to Alternative 2 or No Action, because Alternative 3's management uncertainty buffer would further reduce revenues (slight because of the relatively small effects on revenues).

Industry reports that Alternative 2 may have an added socioeconomic benefit versus Alternatives 3-4 (with 4 worst) by decreasing the likelihood of dealers and/or processors exiting the industry and disrupting the overall fishery, compared to if the lower quotas under Alternatives 3-4 are used.

7.4.4 ALTERNATIVE 4: NEW 7,788 MT SSC ABC RECOMMENATION WITH 13% MANAGEMENT UNCERTAINTY BUFFER

The commercial quota under this alternative would be 9.8 million pounds. 2021 landings were slightly over 10 million pounds, and 2019-2021 landings averaged 14.1 million pounds. Depending on the intrinsic variability in this fishery, this alternative might not be a constraint or could be a constraint relative to 2019-2021 average landings (a 12.0 million pound quota would be 30% less than 2019-2021 average landings). 30% less revenues for the same period amount to about $0.9 million. Given the criteria in Table 14, the potential revenue reduction means that the socioeconomic impact would be negative. Given the relatively small potential reduction in revenues and because this alternative should allow a continuation of sustainable landings, these impacts would be slight. For an individual vessel or processor however, spiny dogfish may be an important part of their annual operations.

While there is less of a risk of ABC overages and paybacks with a larger buffer, the socioeconomic impacts should ultimately approach negligible related to overages and paybacks (catches and revenues are primarily shifted among several close years).

In terms of long-term sustainability and opportunity in the fishery, while differences in catch are likely to be small, impacts would be slightly more positive compared to Alternative 1/no action, because Alternative 4 should result in sustainable catches while Alternative 1 could compromise long-term sustainability. And, in the long-term, Alternative 4 would be similar to or slightly more positive than Alternatives 2 or 3. This is because while all the action alternatives would be expected to result in long-term sustainability, Alternative 4 takes the most conservative approach to a buffer, and alternatives with higher buffers can provide somewhat more certainty around supporting long-term sustainability and opportunity for fishery participants.

However, short-term revenue impacts from Alternative 4 would be slightly more negative compared to No Action or Alternatives 2-3 because Alternative 4's management uncertainty buffers would reduce revenues (slight because of the relatively small effects on revenues).

Industry reports that Alternative 2 may have an added socioeconomic benefit versus Alternatives 3-4 (with 4 worst) by decreasing the likelihood of dealers and/or processors exiting the industry and disrupting the overall fishery, compared to if the lower quotas under Alternatives 3-4 are used.

7.5 Non-Target Fish Species Impacts

As discussed in Section 6.1, non-target interactions in the spiny dogfish fishery are unlikely to affect the status of any of the species that have been observed to be incidentally caught in more than a negligible fashion. The observed amounts appear small relative to annual catch limits for the relevant species, and management of those species already accounts for both landings and discards. The apparent low level of interactions with non-target species in the directed fishery, and ongoing management of those species should mean that their conditions should not be changed by this action. While spiny dogfish are caught in many different gears/fisheries, they are generally not a target species that is retained when incidentally caught in other fisheries, and changing levels of dogfish quotas are not expected to change effort in other directed fisheries. Accordingly, for all managed species that do overlap with spiny dogfish effort, similar levels of dogfish effort or potential slight decreases in effort due to the possible constraints of lower quotas would be expected to result in continuation of the current status of all of those non-target species. As such, the current spiny dogfish fishery, and any of the action alternatives, are likely to have very similar slight negative to slight positive impacts on relevant non-target fish species, depending on their current status (other than sturgeon, which is considered as a protected resource). Catches of cod and lobster, the only relevant non-target species in poor condition, would be the only species that might qualify as slightly negative, but negligible is more likely given the quantities involved.

7.6 Cumulative Effects

7.6.1 Introduction

The purpose of the Cumulative Effects Analysis (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. It is not practical to analyze the cumulative effects of an action from every conceivable perspective. Rather, the focus on those effects that are truly meaningful. A cumulative effects assessment ideally 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.

7.6.1.1 Consideration of Valued Ecosystem Components (VECs)

The valued ecosystem components for the MAFMC-managed fisheries are generally the "place" where the impacts of management actions occur, and are identified in section 6.0.

- Managed resources
- Physical habitat
- Protected species
- Non-target species
- Human 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.

7.6.1.2 Geographic Boundaries

The geographic scope of the analysis of impacts to fish species and habitat for this action is the range of the fisheries in the Western Atlantic Ocean, as described in the Affected Environment section of the document. For endangered and protected species the geographic range is the total range of each species. The geographic range for socioeconomic impacts is defined as those U.S. fishing communities bordering the range of the fisheries for spiny dogfish which occur primarily from Massachusetts to Virginia, although the management unit includes all the coastal states from Maine to Florida.

7.6.1.3 Temporal Boundaries

The temporal scope of this analysis is focused on actions that have taken place since 1976, when federal fisheries management commenced under the MSA, though the spiny dogfish FMP was only began in 2000. For endangered and other protected species, the context is largely focused since the 1980s and 1990s, when NMFS began generating stock assessments for marine mammals and turtles that inhabit waters of the U.S. EEZ. The temporal scope of this analysis does not extend beyond 2028 because, the FMP and the issues facing these fisheries may change in ways that can't be effectively predicted beyond 2028. An assessment using this timeframe demonstrates the changes to resources and the human environment that have resulted through management under the MAFMC process and through U.S. prosecution of the fishery. The impacts discussed herein are focused on the cumulative effects of the proposed action (i.e., the preferred alternative) in combination with the relevant other past, present, and reasonably foreseeable future actions over these time scales.

7.6.2 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.

7.6.2.1 Fishery Management Actions

The historical management practices of the Council have generally resulted in positive impacts on the health of the managed resources. Numerous actions have been taken to manage relevant commercial and recreational fisheries through FMP amendment and FMP framework adjustment actions. The annual (or multi-year) specifications process is intended to provide the opportunity for the Council and NMFS to regularly assess the status of the fisheries and to make necessary adjustments to ensure that there is a reasonable expectation of meeting the objectives of each FMP and the targets associated with any rebuilding programs under the FMP.

The earliest management actions implemented under the Council's FMPs involved the sequential phasing out of foreign fishing for these species in US waters and the development of domestic fisheries. All Council-managed species are considered to be fully utilized by the US domestic fishery to the extent that sufficient availability will result in a full harvest of the various quotas. More recent actions have focused on stock rebuilding, reducing non-target catch and discards, reducing habitat impacts, and reducing protected species impacts. Either permitting or forms of

limited access have been established in Council-managed fisheries to monitor and/or control capacity. All Council-managed fisheries have a variety of reporting and monitoring requirements to document catch and facilitate regulatory compliance with a focus on timely and reliable electronic reporting methods. Based on the 2007 MSA reauthorization and the Council's ACL/AM Omnibus Amendment, the SSC now sets an upper limit (ABCs) on catches to avoid overfishing. There is also a Standardized Bycatch Reporting Methodology (SBRM) to evaluate discards and allocate observer coverage. A full list of Council FMPs and their amendments is available at http://www.mafmc.org/fishery-management-plans.

Specific actions from this FMP (https://www.mafmc.org/dogfish) which had substantial impacts on the spiny dogfish fishery included: rebuilding via the initial FMP, the implementation of ABCs/ACLs in 2011 (Amendment 2), and the 2020 revisions to the Council's risk policy to reduce the probability of overfishing as stock size falls below the target biomass while allowing for increased risk and greater economic benefit under higher stock biomass conditions (Framework 5). Past annual specifications have also limited catches to avoid overfishing. The Council is also planning on revising EFH for all species and considering the impacts of fishing on EFH by 2025.

The NEFMC's omnibus habitat amendment revised EFH and habitat area of particular concern designations for NEFMC-managed species; revised or created habitat management areas, including gear restrictions to protect vulnerable habitat from fishing gear impacts; and established dedicated habitat research areas. This action is expected to have overall positive impacts on habitat and EFH, with expected long-term positive implications for target and non-target species, while having mixed socioeconomic impacts on various user groups. There are many other FMPs and associated fishery management actions for other species that impacted these VECs over the temporal scale described in Section 7.6.1.3. 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 generally included (but are not limited to) measures to regulate fishing effort for other species, measures to protect habitat and forage species, and fishery monitoring and reporting requirements.

Fishery management actions within the next five years should generally maintain or restore the sustainability of the stocks and fisheries under management. An action affecting the monkfish and spiny dogfish fisheries should reduce sturgeon catch by 2025, but the degree of impacts is

uncertain. Measures for fisheries using vertical lines should also reduce impacts on large whales over the next several years, but likewise the degree of impacts is currently uncertain.

As with all the managed resource FMP actions described above, other FMP actions have had positive long-term cumulative impacts on managed and non-target species because they constrain fishing effort and manage stocks at sustainable levels (or rebuild when necessary). As previously stated, constraining fishing effort can have negative short-term socioeconomic impacts and long-term positive impacts. These actions have typically had slight negative impacts on habitat, due to continued fishing operations preventing impacted habitats from recovering; however, some actions had long-term positive impacts through designating or protecting important habitats. FMP actions have also had a range of impacts on protected species, generally slight negative to slight positive, depending on the species and interaction levels as detailed elsewhere in this document.

7.6.2.2 Non-Fishing Impacts

7.6.2.2.1 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)[37], which ensures that agency actions do not jeopardize the continued existence of endangered species and their critical habitat.

[37] "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."

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[38]. 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 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)[39] (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[40] and ecological monitoring surveys. Disruption of such scientific surveys could increase scientific uncertainty in survey results and may 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),

[38] See NMFS Ocean Noise Strategy Roadmap: https://cetsound.noaa.gov/Assets/cetsound/documents/Roadmap/ONS_Roadmap_Final_Complete.pdf

[39] See NMFS Ocean Noise Strategy Roadmap (footnote #2)

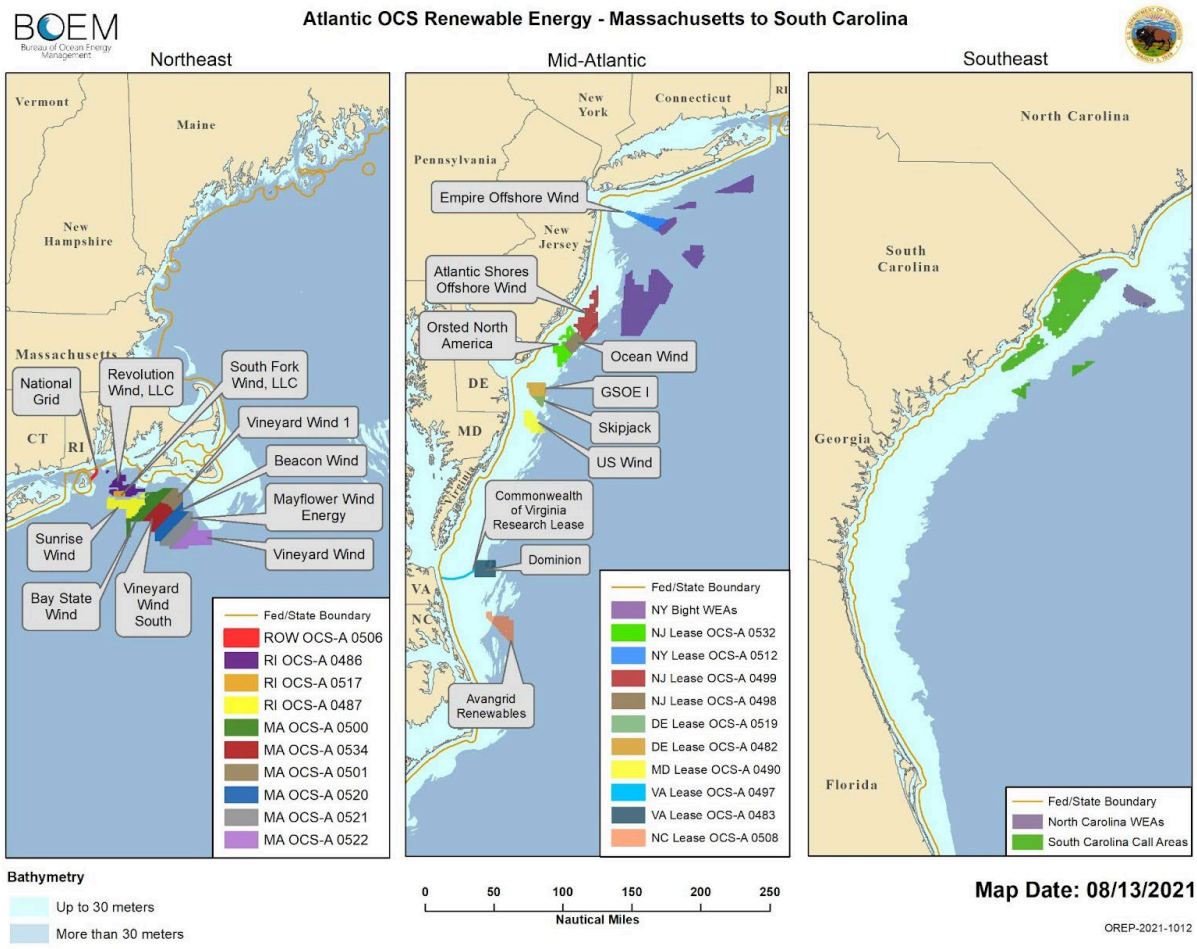
[40] Changes in required flight altitudes due to proposed turbine height would affect aerial survey design and protocols (BOEM 2020a).

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 federal waters in 2020**.** Two more projects were approved in 2021. More than 20 leases have been issued for future wind energy development in federal waters from Massachusetts to North Carolina (see leasing map below – Figure 9. BOEM has a goal of deploying 30 gigawatts of wind energy production capacity in Federal waters by 2030. Currently, the majority of that proposed development is reasonably foreseeable along the Atlantic coast. 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 nearly all MAFMC-managed resources. Recent habitat modeling work by the NEFSC and presented as part of the 2020 Mid-Atlantic State of the Ecosystem Report found that summer flounder, butterfish, longfin squid, and spiny dogfish are highly likely to occupy wind lease areas throughout the region (NEFSC 2020). Habitat conditions for those species are projected to become more favorable over time within the lease areas, potentially leading to increased interactions and impacts over time. Fisheries for the managed resources have been active in many of the lease areas at present and are expected to be for the near future (section 6.0). The social and economic impacts of offshore wind energy on fisheries could be generally negative due to the substantial overlap of wind energy areas with productive fishing grounds for many MAFMC-managed fisheries. Impacts may vary by species and by year depending upon habitat overlap, species availability, and any area-based regulations that define the amount and type of fishing access with the lease area. 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.

Figure 9. BOEM approved renewable energy lease areas in federal waters in the Atlantic Ocean off the Mid-Atlantic and New England
(source: BOEM Map Book of Outer Continental Shelf Renewable Energy Lease Areas, https://www.boem.gov/sites/default/files/renewable-energy-program/Mapping-and-Data/Renewable_Energy_Leases_Map_Book_March_2019.pdf)



BOEM's Supplemental Draft Environmental Impact Statement (SEIS) for the Vineyard Wind project, an 800 megawatt wind farm southeast of Martha's Vineyard, Massachusetts (BOEM 2020) evaluated the revenue exposure (defined as the dockside value of the fish caught within individual lease areas) of various Mid-Atlantic and New England commercial fisheries found within future wind energy lease areas. For most Council-managed fisheries, less than 3 percent of the total revenue would be exposed to future offshore wind development (see table 3.11.-3, section B-78). The analysis noted that the Atlantic surfclam and ocean quahog fisheries represented the largest combined percent exposure and dollar value (BOEM 2020). The SEIS concluded that the impacts associated with future offshore wind activities in the geographic analysis area would result in major adverse impacts on commercial fisheries and moderate adverse impacts on for-hire recreational fishing due to the presence of structures.

It's also worth noting, that turbine structures could increase the presence of and fishing for structure affiliated Council-managed species, such as black sea bass. Many recreational fishing trips in this region target a combination of species. For example, recreational trips which catch black sea bass often also catch tautog, scup, summer flounder, and Atlantic croaker (NEFSC 2017). For this reason, increased recreational fishing effort focusing on species such as black sea bass in wind farms could also lead to increased recreational catches of other species. This could 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.[41] 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 and negative for various managed resources. Fishing within wind farms could lead to increased catch rates, decreased steaming searching for concentrations of fish and different size availability (e.g., larger fish found within a wind farm) which would result in positive effects. However negative effects could occur due to the potential for reduced catch and associated revenue, user conflicts, gear damage/loss, and increased risk of allision or collision.

[41] 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).

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.

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 timelines and 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.

7.6.2.2.2 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 Council-managed species to the changing environment (Hare et al. 2016).

Based on this assessment, all Council-managed species, including spiny dogfish (high), have a high or very high exposure to climate change (Figure 29). Biological sensitivity varied by species, with spiny dogfish rated as low. Directional effects also varied, with spiny dogfish rated as neutral. (See Figures 11 and 12 below)

A vast majority of Council-managed species, including spiny dogfish, had a high or very high potential for changes in distribution (12 of 13 species managed at time of analysis); only golden tilefish had a low potential for a change in distribution. Overall, the impacts of climate change are expected to be negative for three Council-managed species (Atlantic mackerel, Atlantic surfclam, and ocean quahog), whereas the impacts are expected to be positive for six species (black sea bass, scup, butterfish, longfin inshore squid, Northern shortfin squid (*Illex*), and bluefish; Figure 30). The effects of climate change are expected to be neutral for the remainder of Council-managed species

Overall vulnerability results for additional Greater Atlantic species, including many non-target species identified in this action, are shown in Figure 29 (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.

THIS SPACE LEFT BLANK FOR FORMATTING PURPOSES

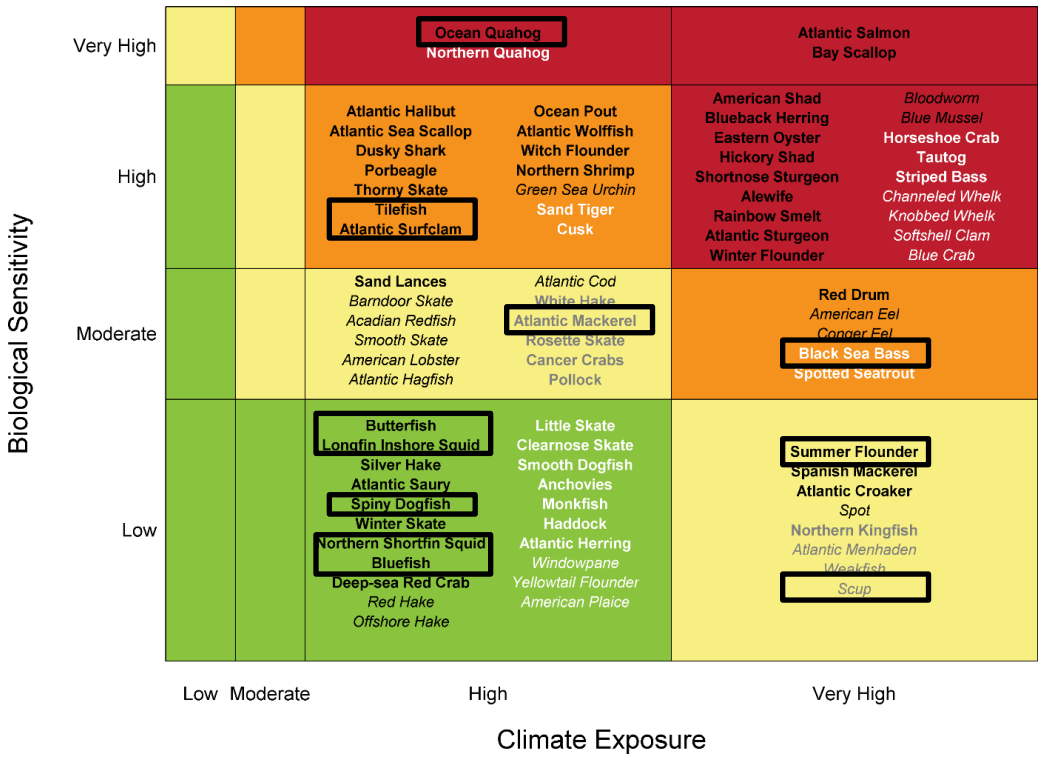


Figure 10: Overall climate vulnerability score for Greater Atlantic species, with Mid-Atlantic Council managed species highlighted with black boxes.

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.

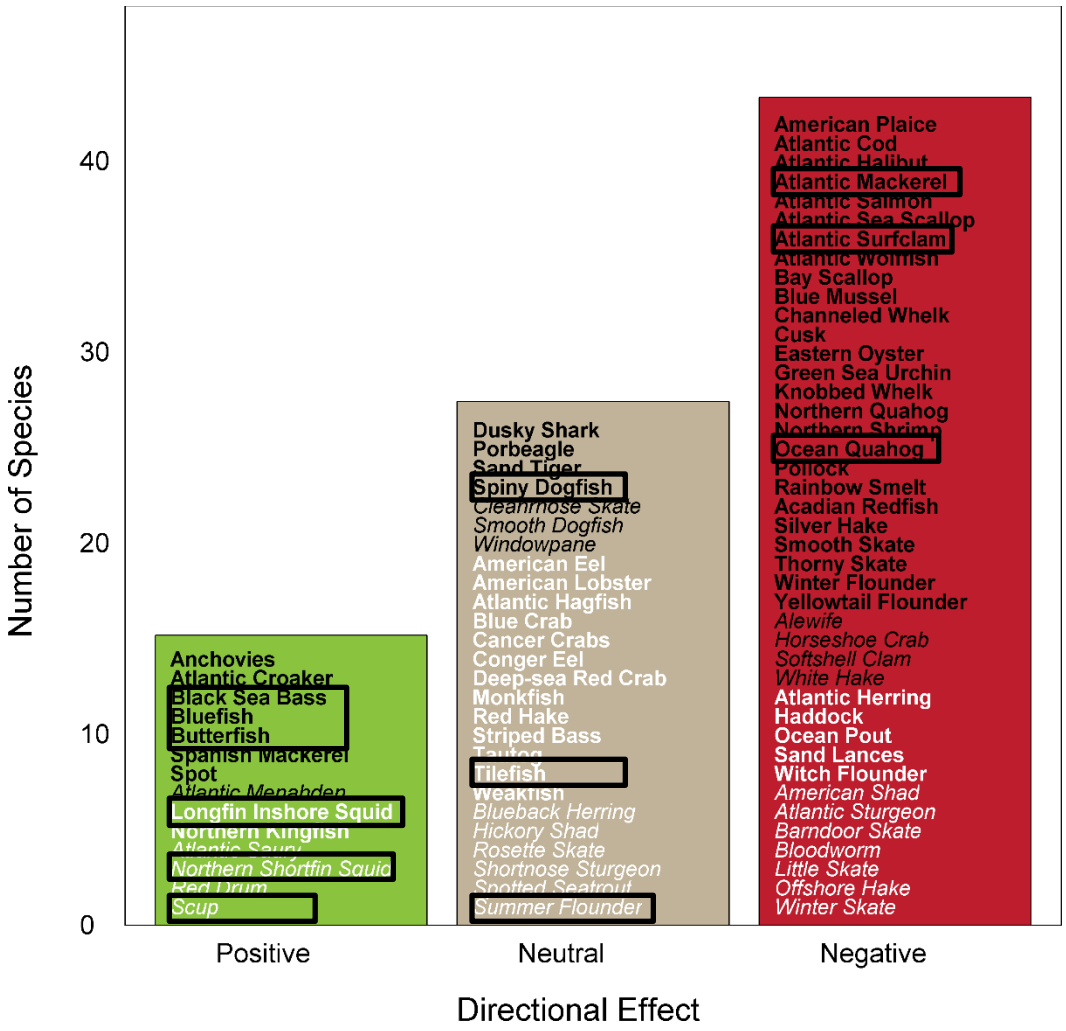


Figure 11: Directional effect of climate change for Council-managed species highlighted with black boxes.
Colors represent expected negative (red), neutral (tan), and positive (green) effects. Certainty in score is denoted by text font and text color: very high certainty (>95%, black, bold font), high 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.

7.6.3 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. Those past, present, and reasonably foreseeable future actions which may impact the VECs, and the direction of those potential impacts, are summarized in section 7.6.2. 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 7.6.2, non-fishing impacts on the VECs generally range from slight positive to slight negative.

7.6.3.1 Magnitude and Significance of Cumulative Effects on Managed Resource of this FMP (Spiny Dogfish)

Past fishery management actions taken through all Council-managed resource FMPs and the annual specifications process such as catch limits and commercial quotas for the managed resource ensure that stocks are managed sustainably and that measures are consistent with the objectives of the FMP under the guidance of the MSA. While species have been designated as overfished, rebuilding measures have been subsequently implemented. 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 (e.g., gear restricted areas, limited access, minimum mesh sizes etc.) are effective; however, these actions have generally had a positive cumulative effect on the managed resources. It is anticipated that future management actions 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 above, the preferred alternatives are expected to maintain a sustainable spiny dogfish stock. Therefore, the proposed actions described in this document would positively reinforce the

past and anticipated positive cumulative effects on all managed resources by achieving the objectives specified in the FMP. When the effects of the preferred 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 the Council-managed resources.*

7.6.3.2 Magnitude and Significance of Cumulative Effects on Physical Environment

Past fishery management actions taken through the federal fisheries management process have had positive cumulative effects on habitat but fishery activities still likely have slight negative habitat impacts. Actions have constrained fishing effort both at a large scale and locally which may reduce impacts on habitat. As required under these FMP actions, EFH was designated for the managed stocks. It is anticipated that future management actions 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 in section 7.6.2, 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 and non-target species productivity, and associated fishery yields should be considered. For habitat, there are direct and indirect negative effects from actions which may be localized or broad in scope; however, positive actions that have broad implications have been, and will likely continue to be, taken to improve the condition of habitat. Some actions, such as coastal population growth and climate change may impact habitat and ecosystem productivity; however, these actions are beyond the scope of NMFS and Council management. The Council will be reviewing EFH designations and re-considering impacts from fishing on habitat in 2023.

As noted above, the preferred alternative is not expected to result in substantially changed levels of fishing effort or changes to the character of that effort relative to current conditions. The preferred actions are thus expected to have no significant impact (direct or indirect) on habitat. 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 in a slightly negative manner (but most directed fishing for spiny dogfish occurs with gears that minimally affect habitat). 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., negligible to slight negative for physical environment related to this fishery given the predominant gear types used for directed fishing).

Overall, the relevant past, present, and reasonably foreseeable future actions, including the proposed actions, *the cumulative effects are expected to yield non-significant impacts on habitat that are slight negative.*

7.6.3.3 Magnitude and Significance of Cumulative Effects on Protected Resources

Given their life history, 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 MMPA and ESA were implemented through the present).

Taking into consideration the above information and information provided in section 6.4, 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 7.6 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 generally allow existing fishing effort to continue or slightly reduce effort. As described in section 7.3, the proposed action is expected to have slight negative to slight positive impacts on protected resources depending on the species.

When the direct and indirect effects of the proposed action 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 impacts on protected resources that range from slight negative to slight positive.

7.6.3.4 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. Decreased effort and reduced catch of non-target species continue, though some stocks are in poor status and to some degree that status is worsened by bycatch, which can vary among directed fisheries. Therefore the effect to date of federal fishery management actions is overall slight negative. Current regulations continue to manage for sustainable stocks, thus controlling effort on direct and discard/bycatch species and accounting for all catch. Future actions are anticipated to continue rebuilding non-target species stocks if needed and limit the take of incidental/bycatch in Council-managed fisheries, particularly through mitigation measures like sub-ACLs, accountability measures, spatial-temporal measures, and bycatch caps. Continued management of directed stocks will also control catch of non-target species. Therefore, impacts on non-target species (slight negative) are not expected to change relative to the current condition under the preferred alternatives. The proposed actions in this document would positively reinforce past and anticipated cumulative effects as they should minimally affect overall fishing effort and bycatch is relatively low in the spiny dogfish fishery.

When the effects of the preferred 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 ongoing slight negative impacts to non-target species overall.*

7.6.3.5 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 commercial quotas have had both positive and negative cumulative effects on human communities. They have benefitted domestic fisheries through sustainable fishery management and/or rebuilding, 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 such as seasons and trip/possession limits are effective.

National Standard 8 requires that management measures take into account fishing communities. Communities from Maine to North Carolina are involved in the harvesting related to this FMP. Through implementation of the FMP for these species the Council seeks to achieve the primary objective of the Magnuson-Stevens Act which is to achieve optimum yield from these fisheries. It is important to keep in mind that by contributing to the overall functioning of and employment in coastal communities, this fishery has indirect social impacts as well. Social impacts are

strongly aligned with changes to fishing opportunities and while difficult to measure can include impacts to families from income changes/volatility, safety-at-sea (related to changes in fishery operations due to regulation changes), job satisfaction and stability, and general frustration by individuals due to management's impacts especially if they perceive the management actions to be unreasonable or ill-informed. Unless otherwise noted, expanded fishing opportunities or less burdensome regulations that result in increased revenue for more individuals will have concomitant (i.e. naturally accompanying) positive social impacts. Likewise, reduced fishing opportunities or more burdensome regulations that result in lower revenue to fewer individuals will have concomitant negative social impacts.

The first cumulative human community effect of the FMP has been to guide the development of the domestic harvest and processing fishery infrastructure. Part of this fishery rationalization process included the development of limited access programs in most fisheries (but not spiny dogfish) to control capitalization while maintaining harvest levels that are sustainable. In addition, by meeting the National Standards prescribed in the MSA, the Council has strived to meet one of the primary objectives of the act – to achieve optimum yield in each fishery. The preferred measures could force slightly lower harvests than have occurred in recent years but are unlikely to result in significant changes to levels of effort or the character of that effort relative to the status quo. The preferred measures should also lead to higher sustainable landings than the status quo, which could induce overfishing.

The indirectly affecting actions and activities described above have both positive and negative human community affects. For example agricultural pollution may negatively impact marine resources negatively affecting human communities, but there are also benefits to human communities from the food and jobs created during agricultural operations. The same tradeoff will exist for each of the indirectly affecting activities, resulting on overall indirect negative impacts on human communities by reducing marine resource availability; however, this effect is not quantifiable. NMFS has several means under which it can review non-fishing actions of other Federal or state agencies prior to permitting or implementation of those projects. This serves to minimize the extent and magnitude of indirect negative impacts those actions could have on human communities.

It is anticipated that future management actions 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, if temporarily. 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, Council-managed fisheries have both direct and indirect positive social impacts. As previously described in this section, the preferred alternatives are unlikely to result in significant changes to levels of fishing effort or the character of that effort relative to current conditions.

Overall, the relevant past, present, and reasonably foreseeable future actions, including the proposed action, *the cumulative effects are expected to yield non-significant slight positive impacts.*

7.6.4 Proposed Action on all the VECs

The Council's preferred alternatives (i.e. the proposed actions) are described in section 5.0. The direct and indirect impacts of the proposed action on the VECs are described in sections 7.6.3.1 – 7.6.3.5. 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 7.6.3).

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. They should generally reinforce existing impacts.

The magnitudes and directions of impacts on each VEC from the proposed alternatives are summarized below and detailed in Sections 7.1-7.5 and the non-significant cumulative effects are described in Section 7.6. The proposed action is anticipated to generally maintain the current status of the VECs

Summary of Impacts

Target Species Impact Summary (Preferred Alternative - #2)

Based on the best scientific information available, the SSC determined that a 7,788 MT ABC should be sustainable. By maintaining a sustainable population, impacts on spiny dogfish are expected to be ongoing slightly positive.

Non-Target Species Impact Summary (Preferred Alternative - #2)

The quota resulting from the preferred alternative is a reduction from status-quo/no action. However, non-target interactions in the spiny dogfish fishery are relatively low and no changes to conditions of relevant species are expected among any alternatives – impacts would remain slight negative to slight positive, depending on current status.

Habitat Impact Summary (Preferred Alternative - #2)

The quota resulting from the preferred alternative is a reduction from status-quo/no action but not expected to cause substantial changes to effort or habitat impacts from fishing in the region. Especially given the lower habitat impacts used for most spiny dogfish fishing, impacts on habitat are expected to remain similar as recent, i.e. negligible to slight negative.

Protected Resources Impact Summary (Preferred Alternative - #2)

The quota resulting from the preferred alternative should be less than or equal to status quo conditions. If effort does decrease, the risk of an interaction between fishing gear and protected species also has the potential to decrease. Although this may provide some benefit to protected species, as interactions can still occur under a reduced effort scenario, some level of negative impacts is still expected to those protected species in poor condition (i.e., ESA listed; MMPA protected with PBR levels exceeded). Based on this, impacts of Alternative 2 on protected species are expected to range from slight negative to low-moderate positive, with slight negative to negligible impacts expected for ESA-listed species and non-ESA listed marine mammal species whose PBR levels have been exceeded, and slight to low-moderate positive impacts for non-ESA listed marine mammal species whose PBR levels have not been exceeded (as the change could slightly further reduce removals below PBR).

Human Communities Impact Summary (Preferred Alternative - #2)

The potential revenue reduction means that the socioeconomic impact would be negative. Given the relatively small potential reduction in revenues and because the preferred alternative should allow a continuation of sustainable landings, these impacts would be slight.

8.0 WHAT LAWS APPLY TO THE ACTIONS CONSIDERED IN THIS DOCUMENT?

8.1 Magnuson-Stevens Fishery Conservation and Management Act

8.1.1 NATIONAL STANDARDS

Section 301 of the Magnuson-Stevens Fishery Conservation and Management Act requires that fishery management plans contain conservation and management measures that are consistent with the ten National Standards:

In General. – Any fishery management plan prepared, and any regulation promulgated to implement any such plan, pursuant to this title shall be consistent with the…national standards for fishery conservation and management.

(1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

The proposed measures adhere to the SSC's ABC recommendation so should avoid overfishing and achieve optimum yield.

(2) Conservation and management measures shall be based upon the best scientific information available.

The data sources considered and evaluated during the development of this action include, but are not limited to: permit data, landings data from vessel trip reports, information from resource trawl surveys, sea sampling (observer) data, data from the dealer weighout purchase reports, peer-reviewed assessments, original literature, and descriptive information provided by fishery participants and the public. To the best of the Council's knowledge these data sources constitute the best scientific information available. All analyses based on these data have been reviewed by National Marine Fisheries Service and the public. The projections for rebuilding and ABCs were also reviewed by the Council's SSC and determined to constitute best available scientific information.

(3) To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

The fishery management plan addresses management of the spiny dogfish stock throughout the range of the species in U.S. waters.

(4) Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B)

reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

None of the proposed measures would discriminate between residents of different States or assign/allocate fishing privileges among U.S. fishermen.

(5) Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.

There is no allocation proposed. The proposed actions are efficient in that they should facilitate full utilization of the relevant quotas.

(6) Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

Changes in fisheries occur continuously, both as the result of human activity (for example, new technologies or shifting market demand) and natural variation (for example, oceanographic perturbations). In order to provide the greatest flexibility possible for future management decisions, the fishery management plan includes a framework adjustment mechanism with an extensive list of possible framework adjustment measures that can be used to quickly adjust the plan as conditions in the fishery change. Specifications are also reviewed annually and can be amended as appropriate.

(7) Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

As always, the Council considered the costs and benefits associated with the management measures proposed in the action when developing this action. This action should not create any duplications related to managing relevant resources and is taken to utilize updated stock information. Substantial coordination occurs via state participation in the Council process as well as at the ASMFC when appropriate.

(8) 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.

The human community impacts of the action are described above in Section 7.5 (the proposed measures would likely maintain or slightly decrease yield and revenues to human communities).

(9) Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

The MSA defines "bycatch" as fish that are harvested in a fishery, but are not retained (sold, transferred, or kept for personal use), including economic discards and regulatory discards. Incidentally landed catch are fish, other than the target species, that are harvested while fishing for a target species and retained and/or sold. Bycatch is relatively low in this fishery, and the proposed measures should not induce additional bycatch.

(10) Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

Fishing is a dangerous occupation; participants must constantly balance the risks imposed by weather against the economic benefits. According to the National Standard guidelines, the safety of the fishing vessel and the protection from injury of persons aboard the vessel are considered the same as "safety of human life at sea." The safety of a vessel and the people aboard is ultimately the responsibility of the master of that vessel. Each master makes many decisions about vessel maintenance and loading and about the capabilities of the vessel and crew to operate safely in a variety of weather and sea conditions. This national standard does not replace the judgment or relieve the responsibility of the vessel master related to vessel safety. No measures in this action are expected to negatively impact safety at sea.

8.1.2 Other Required Provisions of the Magnuson-Stevens Act

Section 303 of the MSA contains 15 additional required provisions for FMPs, which are listed and discussed below. Nothing in this action is expected to contravene any of these required provisions.

(1) contain the conservation and management measures, applicable to foreign fishing and fishing by vessels of the United States, which are-- (A) necessary and appropriate for the conservation and management of the fishery to prevent overfishing and rebuild overfished stocks, and to protect, restore, and promote the long-term health and stability of the fishery; (B) described in this subsection or subsection (b), or both; and (C) consistent with the National Standards, the other provisions of this Act, regulations implementing recommendations by international organizations in which the United States

participates (including but not limited to closed areas, quotas, and size limits), and any other applicable law

The Spiny Dogfish FMP has evolved over time through Amendments and Framework Adjustments and currently uses Acceptable Biological Catch recommendations from the Council's Scientific and Statistical Committee to sustainably manage the fishery. Under the umbrella of limiting catch to the Acceptable Biological Catch, a variety of other management and conservation measures have been developed to meet the goals of the fishery management plan and remain consistent with the National Standards. The current measures are codified in the Code of Federal Regulations: https://www.ecfr.gov/current/title-50/part-648. This action proposes measures that should continue to promote the long-term health and stability of the fisheries, consistent with the MSA.

(2) contain a description of the fishery, including, but not limited to, the number of vessels involved, the type and quantity of fishing gear used, the species of fish involved and their location, the cost likely to be incurred in management, actual and potential revenues from the fishery, any recreational interest in the fishery, and the nature and extent of foreign fishing and Indian treaty fishing rights, if any

Every Amendment to this FMP provides this information. This document updates relevant information as appropriate in Section 6.

(3) assess and specify the present and probable future condition of, and the maximum sustainable yield and optimum yield from, the fishery, and include a summary of the information utilized in making such specification

Full assessment reports are available at: https://www.fisheries.noaa.gov/about/resource-evaluation-and-assessment-northeast or by contacting Council staff. The preferred measures use the most recent assessments, which combine biological, fishery, and other data to estimate resource productivity.

(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); (B) the portion of such optimum yield which, on an annual basis, will not be harvested by fishing vessels of the United States and can be made available for foreign fishing; and (C) the capacity and extent to which United States fish processors, on an annual basis, will process that portion of such optimum yield that will be harvested by fishing vessels of the United States

Based on past performance, if spiny dogfish are sufficiently abundant and available, the domestic fishery has the desire and ability to fully harvest the available quotas, and domestic processors can process the fish.

(5) specify the pertinent data which shall be submitted to the Secretary with respect to commercial, recreational, and charter fishing in the fishery, including, but not limited to, information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, number of hauls, and the estimated processing capacity of, and the actual processing capacity utilized by, United States fish processors

Previous Amendments have specified the data that must be submitted to NMFS, primarily in the form of vessel trip reports and dealer reports.

(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 affecting the safe conduct of the fishery; except that the adjustment shall not adversely affect conservation efforts in other fisheries or discriminate among participants in the affected fishery

There are no such requests pending, but the plan contains provisions for framework actions to make modifications regarding access/permitting if necessary.

(7) describe and identify essential fish habitat for the fishery based on the guidelines established by the Secretary under section 305(b)(1)(A), minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat

Section 6.3 of this document summarizes essential fish habitat (EFH) for this species. Amendment 16 implemented measures to protect deep-sea corals. An upcoming review of EFH will review EFH designations and potential adverse impacts to EFH from Council-managed fisheries. Given the gears used to target spiny dogfish, negligible habitat impacts are expected.

(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) (including any plan for which an amendment is submitted to the Secretary for such review) or is prepared by the Secretary, assess and specify the nature and extent of scientific data which is needed for effective implementation of the plan

The preparation of this action included a review of the scientific data available to assess the impacts of all alternatives considered. No additional data was deemed needed for effective implementation of the plan at this time.

(9) include a fishery impact statement for the plan or amendment (in the case of a plan or amendment thereto submitted to or prepared by the Secretary after October 1, 1990) which shall assess, specify, and describe the likely effects, if any, of the conservation and management measures on-- (A) participants in the fisheries and fishing communities affected by the plan or amendment; and (B) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants;

Section 7.5 of this document provides an assessment of the likely effects on fishery participants and communities from the considered actions.

(10) specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which the Council or the Secretary has determined is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery

Previous actions have provided for automatic incorporation of new overfished/overfishing reference points once accepted through a peer-review process.

(11) establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority-- (A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided

NMFS has implemented an omnibus amendment to implement a revised standardized reporting methodology since the previous methodology was invalidated by court order. See

http://www.greateratlantic.fisheries.noaa.gov/mediacenter/2013/09/draftsbrmamendment.html for details.

(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, and include conservation and management measures that, to the extent practicable, minimize mortality and ensure the extended survival of such fish

The spiny dogfish fishery is primarily commercial. There are no size limits that would lead to regulatory recreational discarding. There are no specific catch and release fishery management programs.

(13) include a description of the commercial, recreational, and charter fishing sectors which participate in the fishery and, to the extent practicable, quantify trends in landings of the managed fishery resource by the commercial, recreational, and charter fishing sectors

This document updates this information as appropriate in Section 6.

(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 fishery is primarily commercial, especially for directed fishing.

(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 annual specifications process addresses this requirement. Acceptable Biological Catch recommendations from the Council's Scientific and Statistical Committee are designed to avoid overfishing and form the upper bounds on catches. There are a variety of proactive and reactive accountability measures for this fishery, fully described in the Code of Federal Regulations.

8.1.3 Discretionary Provisions of the Magnuson-Stevens Act

Section 303b of the MSA contains 14 additional discretionary provisions for Fishery Management Plans. See https://www.fisheries.noaa.gov/topic/laws-policies#magnuson-stevens-act. Of import for this action, these discretionary provisions allow seasons, fishery closures, and trip limits (but only the quota is potentially being changed).

8.1.4 Essential Fish Habitat Assessment

The measures under the preferred alternatives proposed in this action are not expected to result in substantial changes in effort that impact habitat, as described in Section 7. Therefore, the Council concluded in section 7 of this document that the proposed measures will have no additional adverse impacts on EFH that are more than minimal or temporary. Thus no mitigation is necessary.

8.2 Marine Mammal Protection Act

The various species of marine mammals occurring in the management unit of this FMP that are afforded protection under the Marine Mammal Protection Act of 1972 (MMPA) are described in Section 6.4. As provided in section 6.4, various MMPA protected species have the potential to interact with the gear types used in the FMP. None of the proposed measures are expected to significantly alter fishing methods or activities or substantially change effort relative to current operating conditions in the fishery. The Council has reviewed the impacts of the proposed measures on marine mammals and concluded that the management actions proposed are consistent with the provisions of the MMPA and would not alter existing measures to protect the species likely to occur in management unit of this FMP. A final determination of consistency with the MMPA will be made by the agency when this action is approved. For further information on the potential marine mammal impacts of the fishery and the proposed management action, see Sections 6 and 7 of this Environmental Assessment.

8.3 Endangered Species Act

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 (ISFMP) issued under the authority of the Atlantic Coastal Fisheries Cooperative Management Act (ACA), 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 NMFS' authorization of ten FMPs, NMFS' North Atlantic Right Whale Conservation Framework, and the New England Fishery Management Council's Omnibus Essential Fish Habitat Amendment 2: 1) 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; and, 2)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.

Given the information provided above, it has been determined that the proposed action is within the scope of the FMPs considered in the 2021 Opinion and will not create impacts to ESA-listed species or critical habitat that go above and beyond those considered in the 2021 Opinion completed by NMFS.

8.4 Administrative Procedures Act

Section 553 of the Administrative Procedure Act establishes procedural requirements applicable to informal rulemaking by Federal agencies. The purpose of these requirements is to ensure public access to the Federal rulemaking process, and to give the public adequate notice and opportunity for comment. At this time, there is no request for any abridgement of the rulemaking process for this action.

8.5 Paperwork Reduction Act

The purpose of the Paperwork Reduction Act (PRA) is to control and, to the extent possible, minimize the paperwork burden for individuals, small businesses, nonprofit institutions, and other persons resulting from the collection of information by or for the Federal Government. No required paperwork or reporting changes should occur as a result of this action.

8.6 Coastal Zone Management Act

Section 307(c)(1) of the Federal Coastal Zone Management Act of 1972 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. Pursuant to the Coastal Zone Management Act regulations at 15 CFR 930.35, a negative determination may be made if there are no coastal effects and the subject action: (1) Is identified by a state agency on its list, as described in ' 930.34(b), or through case-by-case monitoring of unlisted activities; or (2) which is the same as or is similar to activities for which consistency determinations have been prepared in the past; or (3) for which the Federal agency undertook a thorough consistency assessment and developed initial findings on the coastal effects of the activity. NMFS is reviewing applicable coastal policies of affected states and will make an appropriate determination as part of the rulemaking process.

8.7 Section 515 (Data Quality Act)

Pursuant to NOAA guidelines implementing section 515 of Public Law 106-554 (the Data Quality Act), all information products released to the public must first undergo a Pre-Dissemination Review to ensure and maximize the quality, objectivity, utility, and integrity of

the information (including statistical information) disseminated by or for Federal agencies. The following section addresses these requirements.

Utility

The information presented in this document should be 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 in Section 5 so that intended users may have a full understanding of the proposed action, its implications, and the Council's rationale.

Until a proposed rule is prepared and published, this document is the principal means by which the information contained herein is available to the public. The information provided in this document is based on the most recent available information from the relevant data sources. The development of this document and the decisions made by the Council to propose this action are the result of a multi-stage public process. Thus, the information pertaining to management measures contained in this document has been improved based on comments from the public, the fishing industry, members of the Council, and NMFS.

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, and through the Regulations.gov website. The *Federal Register* documents will provide metric conversions for all measurements.

Integrity

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 NOAA Fisheries 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 MSA; and NOAA Administrative Order 216-100, Protection of Confidential Fisheries Statistics.

Objectivity

For purposes of the Pre-Dissemination Review, this document is considered to be a Natural Resource Plan. Accordingly, the document adheres to the published standards of the MSA; the Operational Guidelines, FMP Process; the EFH Guidelines; the National Standard Guidelines; and NOAA Administrative Order 216-6A, Compliance with the National Environmental Policy Act and its Companion Manual.

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 herein are based on assessments subject to appropriate peer-review through established practices of NMFS' Northeast Fisheries Science Center. 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 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 NMFS staff with expertise on the subject matter.

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 proposed action were conducted using information from the most recent complete calendar or fishing years, generally through the 2021 fishing year except as noted and explained. The data used in the analyses provide the best available information on the number of seafood dealers operating in the northeast, the number, amount, and value of fish purchases made by these dealers (28 federal dealers purchased at least 50,000 pounds of spiny dogfish over the 2019-2021 fishing years and additional state-only seafood dealers also purchase from state-only vessels). 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 these fisheries.

The policy choices are clearly articulated in Section 5 of this document as well as the management alternatives considered in this action. The supporting science and impact analyses, upon which the policy choices are based, are described in Sections 6 and 7. 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 review process used in preparation of this document will involve the responsible Council, the Northeast Fisheries Science Center, the Greater Atlantic Regional Fisheries Office, and NOAA Fisheries Headquarters. The Center's technical review is conducted by senior level scientists with specialties in population dynamics, stock assessment methods, demersal resources, population biology, and the social sciences. The Council review process involves public meetings at which affected stakeholders have opportunity to provide comments on the document. Review by staff at the Regional Office is conducted by those with expertise in fisheries management and policy, habitat conservation, protected species, and compliance with the applicable law. 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 Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget.

8.8 Regulatory Flexibility Analysis

The Regulatory Flexibility Act (RFA), first enacted in 1980, and codified at 5 U.S.C. 600-611, was designed to place the burden on the government to review all regulations to ensure that, while accomplishing their intended purposes, they do not unduly inhibit the ability of small entities to compete. The RFA recognizes that the size of a business, unit of government, or nonprofit organization frequently has a bearing on its ability to comply with a Federal regulation. Major goals of the RFA are: 1) to increase agency awareness and understanding of the impact of their regulations on small business; 2) to require that agencies communicate and explain their findings to the public; and 3) to encourage agencies to use flexibility and to provide regulatory relief to small entities.

For RFA purposes, a business primarily engaged in fishing 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 RFA emphasizes predicting significant adverse impacts on small entities as a group distinct from other entities and on the consideration of alternatives that may minimize the impacts, while still achieving the stated objective of the action. When an agency publishes a proposed rule, it must either, (1)"certify" that the action will not have a significant adverse impact on a substantial

number of small entities, and support such a certification declaration with a “factual basis”, demonstrating this outcome, or, (2) if such a certification cannot be supported by a factual basis, prepare and make available for public review an Initial Regulatory Flexibility Analysis (IRFA) that describes the impact of the proposed rule on small entities.

This document provides the factual basis supporting a certification that the proposed regulations will not have a “significant impact on a substantial number of small entities” and that an IRFA is not needed in this case. Certifying an action must include the following elements, and each element is subsequently elaborated upon below:

A. A statement of basis and purpose of the rule

B. A description and estimate of the number of small entities to which the rule applies

C. Description and estimate of economic impacts on small entities, by entity size and industry

D. An explanation of the criteria used to evaluate whether the rule would impose significant economic impacts

E. An explanation of the criteria used to evaluate whether the rule would impose impacts on a substantial number of small entities

F. A description of, and an explanation of the basis for, assumptions used

A – Basis and purpose of the rule

The basis of the rules proposed in this action are the provisions of the MSA for federal fishery management. This action is needed to effectively manage the spiny dogfish fishery. The purpose and need for this action is further detailed in Section 4, while a full description of all alternatives is provided in Section 5. To assist with further evaluation of the measures proposed in this document, the following is a brief summary of the preferred alternative selected by the Council for this action:

This action would set spiny dogfish specifications for the 2023 fishing year (May 2023-April 2024) consistent with the Council's SSC's ABC recommendation to avoid overfishing. The commercial quota would be 12.0 million pounds, which is higher than the most recent (2021) fishing year landings of 10.3 million pounds but 15% lower than the 2019-2021 average landings of 14.1 million pounds. No other measures would be changed.

B – Description and estimate of the number of small entities to which the rule applies

The measures proposed in this action apply to vessels that hold commercial federal permits for spiny dogfish. Some small entities own multiple vessels with relevant permits. Staff queried ownership data provided by the Social Science Branch of NMFS' Northeast Fisheries Science Center to estimate the number of relevant small entities.

Commercial

The analysis found that in 2021, there were 1,785 vessels with federal commercial spiny dogfish permits. 1,584 vessels were listed as commercial fishing operations or had no revenue in 2021. These vessels were owned by 1,126 entities, 1,115 of which qualified as small businesses under SBA definitions (11 were classified as large entities).

C – Description and estimate of economic impacts on small entities

Given the preferred alternative should only minimally constrain the fishery compared to recent performance, only minimal impacts are expected. Compared to the 2021 fishery, the proposed quota would be higher than 2021 landings and not constraining. Compared to 2019-2021 average landings, the proposed quota would be about 2.1 million pounds (15%) lower. At the 2021 price of about $0.21 per pound, this could translate into about $0.4 million in reduced ex-vessel revenues. Spread over the potentially affected entities this would be less than $400/entity.

Viewed slightly differently in terms of the 79 federally-permitted vessels that were active in the spiny dogfish fishery in 2021 (at least 10,000 pounds of spiny dogfish landed – see Table 8 above), the total potential reduced revenue translates into less than $6,000 in reduced revenues per active vessel for a year. Those vessels averaged about $135,000 in revenues in the NMFS dealer database for 2001, so less than 5% of their revenues would be impacted, on average. If vessels take fewer trips for spiny dogfish as a result of a closure, they may also be able to target other species instead, further mitigating potential lost revenues.

D/E – An explanation of the criteria used to evaluate whether the rule would impose significant economic impacts / An explanation of the criteria used to evaluate whether the rule would impose impacts on a substantial number of small entities

The criteria used to evaluate whether the rule would impose significant economic impacts was whether the landings (and therefore ex-vessel revenues) from the preferred alternatives would be constraining beyond recent landings history, and the relative importance of potential lost revenues for the entities and/or vessels owned by those entities. As described above in "C," the impacts do not appear significant from an RFA perspective.

F – A description of, and an explanation of the basis for, assumptions

Other than those described directly in the above analyses, the primary assumption utilized in the above analyses is that comparing upcoming fishery operation to how the fishery operated over 2019-2021 is appropriate. Using the most recent three years of fishery operation is standard practice for Regulatory Flexibility Analysis and there is no indication that such an approach is contraindicated in this case since doing so captures what the industry has recently experienced versus potential impacts going forward from implementation of the proposed specifications.

8.9 Executive Order (E.O.) 12866 (Regulatory Planning and Review)

These specifications are exempt from EO 12866 because there are no implementing regulations associated with this action (i.e. no potential changes to the text of the Code of Federal Regulations).

8.10 Executive Order (E.O.) 13132 (Federalism)

This Executive Order established nine fundamental federalism principles for Federal agencies to follow when developing and implementing actions with federalism implications. The Executive

Order also lists a series of policy making criteria to which Federal agencies must adhere when formulating and implementing policies that have federalism implications. However, no federalism issues or implications have been identified relative to the proposed measures. This action does not contain policies with federalism implications sufficient to warrant preparation of an assessment under Executive Order 13132. The affected states have been closely involved in the development of the proposed management measures 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.

8.11 Executive Order (E.O.) 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). NOAA guidance NAO 216-6A, Companion Manual, Section 10(A) requires the consideration of EO 12898 in NEPA documents. 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. The public comment process is an opportunity to identify issues that may be related to environmental justice, but none have been raised relative to this action. The public has never requested translations of documents pertinent to this FMP. With respect to subsistence consumption of fish and wildlife, federal agencies are required to collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and(or) wildlife for subsistence. GARFO tracks these issues, but there are no federally recognized tribal agreements for subsistence fishing of the species relevant for this action.

9.0 LITERATURE CITED AND SELECTED BACKGROUND DOCUMENTS

Altenritter, M. N., G. B. Zydlewski, M. T. Kinnison, and G. S. Wippelhauser. 2017. Atlantic sturgeon use of the Penobscot River and marine movements within and beyond the Gulf of Maine. Marine and Coastal Fisheries 9:216-230.

Atlantic States Marine Fisheries Commission (ASMFC). 2007b. 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 Sturgeon Status Review Team (ASSRT). 2007. Status review of Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus). Report to National Marine Fisheries Service, Northeast Regional Office. February 23, 2007. 174 pp.

Atlantic States Marine Fisheries Commission (ASMFC). 2017. 2017 Atlantic sturgeon benchmark stock assessment and peer review report. October 18, 2017. 456 pp.

Bain, M. B., N . Haley, D. Peterson, J. R. Waldman, and K. Arend. 2000. Harvest and habitats of Atlantic sturgeon Acipenser oxyrinchus Mitchill, 1815, in the Hudson River Estuary: Lessonsfor Sturgeon Conservation. Instituto Espanol de Oceanografia. Boletin 16: 43-53.

Baum, E.T. 1997. Maine Atlantic Salmon - A National Treasure. Atlantic Salmon Unlimited, Hermon, Maine.

Beanlands, G.E. and Duinker, P.N. (1984) 'An Ecological Framework for Environmental Impact Assessment', Journal of Environmental Management, 18: 267-277.

Beardsall, J.W., M. F. McLean, S. J. Cooke, B. C. Wilson, M. J. Dadswell, A. M. Redden, and M. J. W. Stokesbury. 2013. Consequences of Incidental Otter Trawl Capture on Survival and Physiological Condition of Threatened Atlantic Sturgeon. Transactions of the American Fisheries Society 142:1202–1214.

Blumenthal, J.M., J.L. Solomon, C.D. Bell, T.J. Austin, G. Ebanks-Petrie, M.S. Coyne, A.C.

Broderick, and B.J. Godley. 2006. Satellite tracking highlights the need for international cooperation in marine turtle management. Endangered Species Research 2:51-61.

Branch et. al. 2006. Fleet dynamics and fishermen behavior: lessons for fisheries managers. Canadian Journal of Fisheries and Aquatic Sciences, 2006, Vol. 63, No. 7 : pp. 1647-1668.

Breece, M. W., D. A. Fox, K. J. Dunton, M. G. Frisk, A. Jordaan, and M. J. Oliver. 2016. Dynamic seascapes predict the marine occurrence of an endangered species: Atlantic sturgeon Acipenser oxyrinchus oxyrinchus. Methods in Ecology and Evolution 7:725-733.

Breece, M. W., D. A. Fox, D. E. Haulsee, I. I. Wirgin, and M. J. Oliver. 2018. Satellite driven distribution models of endangered Atlantic sturgeon occurrence in the mid-Atlantic Bight. ICES Journal of Marine Science, 75:562-571.

Boletzky Sv, Hanlon RT. 1983. A review of the laboratory maintenance, rearing and culture of cephalopod molluscs. Mem Natl Mus Vic 44:147–187

Bolten, A.B., L.B. Crowder, M. G. Dodd, A.M. Lauritsen, J. A. Musick, B. A. Schroeder, and B. E. Witherington (2019). Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (Caretta caretta) Second Revision (2008); Assessment of Progress Toward Recovery. Issued December 2019; https://media.fisheries.noaa.gov/dam-migration/final_nw_atl_cc_recovery_team_progress_review_report_508.pdf.

Braun, J., and S.P. Epperly. 1996. Aerial surveys for sea turtles in southern Georgia waters, June 1991. Gulf of Mexico Science 1996(1):39-44.

Braun-McNeill, J., and S.P. Epperly. 2002. Spatial and temporal distribution of sea turtles in the western North Atlantic and the U.S. Gulf of Mexico from Marine Recreational Fishery Statistics Survey (MRFSS). Marine Fisheries Review 64(4):50-56.

Braun-McNeill, J., C.R. Sasso, S.P.Epperly, C. Rivero. 2008. Feasibility of using sea surface temperature imagery to mitigate cheloniid sea turtle–fishery interactions off the coast of northeastern USA. Endangered Species Research: Vol. 5: 257–266, 2008.

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 2014. 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.

Cetacean and Turtle Assessment Program (CeTAP). 1982. Final report or the cetacean and turtle assessment program, University of Rhode Island, to Bureau of Land Management, U.S. Department of the Interior. Ref. No. AA551-CT8-48. 568 pp.

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/

Charif, R.A., Y. Shiu., C. A. Muirhead, C, W. Clark, S. E. Parks, and A. N. Rice. 2020. Phenological changes in North Atlantic right whale habitat use in Massachusetts Bay. *Glob Change Biol.* 26:734–745.

Clark, W. G. 1993. The effect of recruitment variability on the choice of a target level of spawning biomass per recruit. Pages 233–246 in G. Kruse, R. J. Marasco, C. Pautzke, and T. J. Quinn II, editors. Proceedings of the international symposium on management strategies for exploited fish populations. University of Alaska, Alaska Sea Grant College Program Report 93-02, Fairbanks.

Clark 2002. F35% Revisited Ten Years Later. North American Journal of Fisheries Management 22:251–257, 2002.

Clapham, P.J., L.S. Baraff, C.A. Carlson, M.A. Christian, D.K. Mattila, C.A. Mayo, M.A. Murphy and S. Pittman. 1993. Seasonal occurrence and annual return of humpback whales, Megaptera novaeangliae, in the southern Gulf of Maine. Can. J. Zool. 71: 440-443.

Collins, M. R. and T. I. J. Smith. 1997. Distribution of shortnose and Atlantic sturgeons in SouthCarolina. North American Journal of Fisheries Management. 17: 995-1000.

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.

Curry, B. E. and Smith, J. 1997. Phylogeographic structure of the bottlenose dolphin (Tursiops truncatus): stock identification and implications for management. In: A. E. Dizon, S. J. Chivers and W. F. Perrin (eds), Molecular genetics of marine mammals, pp. 227-247. The Society of Marine Mammalogy, Allen Press, Lawrence.

Dadswell, M. 2006. A review of the status of Atlantic sturgeon in Canada, with comparisons topopulations in the United States and Europe. Fisheries 31: 218-229.

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.

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.

Dodd, C.K., Jr. 1988. Synopsis of the biological data on the loggerhead sea turtle Caretta caretta (Linnaeus 1758). Fish and Wildlife Service Biological Report 88(14). 110pp. Available at: http://www.seaturtle.org/documents/Dodd_1988_Loggerhead.pdf.

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.J. Frisk. 2010. Abundance and distribution of Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus) within the Northwest Atlantic Ocean, determined from five fishery-independent surveys. Fishery Bulletin 108:450-465.

Dunton, K.J., D. Chapman, A. Jordaan, K. Feldheim, S. J. O'Leary, K. A. McKown, and M. G. Frisk. 2012. Brief Communications: Genetic mixed-stock analysis of Atlantic sturgeon Acipenser oxyrinchus oxyrinchus in a heavily exploited marine habitat indicates the need for routine genetic monitoring. Journal of Fish Biology 80: 207–217.

Dunton, K.J., A. Jordaan, D. O. Conover, K.A. McKown, L. A. Bonacci, and M. G. Frisk. 2015. Marine Distribution and Habitat Use of Atlantic Sturgeon in New York Lead to Fisheries Interactions and Bycatch. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 7:18–32.

Eckert, S.A., D. Bagley, S. Kubis, L. Ehrhart, C. Johnson, K. Stewart, and D. DeFreese. 2006. Internesting and postnesting movements of foraging habitats of leatherback sea turtles (Dermochelys coriacea) nesting in Florida. Chel. Cons. Biol. 5(2): 239-248.

Ecosystem Assessment Program (EAP). 2009. Ecosystem Assessment Report for the Northeast U.S. Continental Shelf Large Marine Ecosystem. U.S. Dept Commer, Northeast Fish Sci Cent Ref Doc. 09-11; 61 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://www.nefsc.noaa.gov/publications/crd/crd0911/crd0911.pdf.

Epperly, S.P., J. Braun, and A.J. Chester. 1995a. Aerial surveys for sea turtles in North Carolina inshore waters. Fishery Bulletin 93:254-261.

Epperly, S.P., J. Braun, A.J. Chester, F.A. Cross, J.V. Merriner, and P.A. Tester. 1995b. 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.

Epperly, S.P., J. Braun, and A. Veishlow. 1995c. Sea turtles in North Carolina waters. Conservation Biology 9(2):384-394.

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.

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.

Fujita, R. & Bonzon, K. Rev Fish Biol Fisheries (2005) 15: 309. Kluwer Academic Publishers

Gabriel, W. L., Mace, P. M. (1999). A review of biological reference points in the context of the precautionary approach. In Proceedings of the 5th annual NMFS National Stock Assessment Workshop. NOAA Tech Memo. NMFS-F/SPO-40.

Ganley, L.C., S. Brault and C.A. Mayo. 2019 What we see is not what there is: Estimating North Atlantic right whale Eubalaena glacialis local abundance. Endang. Species Res. 38:101–113.

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 used by a recovering subpopulation of adult female loggerhead sea turtles: implications for conservation. Mar. Biol. 160: 3071–3086.

Haas, H.L. 2010. Using observed interactions between sea turtles and commercial bottom-trawling vessels to evaluate the conservation value of trawl gear modifications. Mar. Coast. Fish. 2, 263-276.

Hain, J.H.W., M.J. Ratnaswamy, R.D. Kenney, and H.E. Winn. 1992. The fin whale, Balaenoptera physalus, in waters of the northeastern United States continental shelf. Reports of the International Whaling Commission 42: 653-669.

Hawkes, L.A., A.C. Broderick, M.S. Coyne, M.H. Godfrey, L.-F. Lopez-Jurado, P. Lopez-Suarez, S.E. Merino, N. Varo-Cruz, and B.J. Godley. 2006. Phenotypically linked dichotomy in sea turtle foraging requires multiple conservation approaches. Current Biology 16: 990-995.

Hawkes, L.A., M.J. Witt, A.C. Broderick, J.W. Coker, M.S. Coyne, M. Dodd, M.G. Frick, M.H. Godfrey, D.B. Griffin, S.R. Murphy, T.M. Murphy, K.L. Williams, and B.J. Godley. 2011. Home on the range: spatial ecology of loggerhead turtles in Atlantic waters of the USA. Diversity and Distributions 17:624–640.

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. Rosel. 2019. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessment-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, P. E. Rosel, and J. Turek. 2021. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2020. NOAA Technical Memorandum NMFS-NE-271.

Henry AG, Cole TVN, Hall L, Ledwell W, Morin D, Reid A. 2015. Mortality and serious injury determinations for baleen whale stocks along the Gulf of Mexico, United States east coast and Atlantic Canadian provinces, 2009-2013. U.S. Dept Commer, Northeast Fish Sci Cent Ref Doc. 15-10; 45 p. doi: 10.7289/V5C53HTB

Henry A.; M. Garron; D. Morin; A. Smith; A. Reid; W. Ledwell; T.V.N. Cole. 2022. Serious Injury and Mortality Determinations for Baleen Whale Stocks along the Gulf of Mexico, United States East Coast, and Atlantic Canadian Provinces, 2015-2019. US Dept Commer Northeast Fish Sci Cent Tech Memo 280. 65 p. Accessible at: https://doi.org/10.25923/nfr5-7r84

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.

Hilborn, R. (2007), Managing fisheries is managing people: what has been learned?. Fish and Fisheries, 8: 285–296.

Hilborn et al 2017. When does fishing forage species affect their predators? Fisheries Research. Volume 191, July 2017, Pages 211-221

Hilton, E. J., B. Kynard, M.T. Balazik, and C.B. Dillman. 2016. Review of the biology, fisheries, and conservation status of the Atlantic sturgeon, (Acipenser oxyrinchus oxyrinchus Mitchell, 1815). Journal of Applied Ichthyology 32:30-66.

Hirth, H.F. 1997. Synopsis of the biological data of the green turtle, Chelonia mydas (Linnaeus 1758). USFWS Biological Report 97(1):1-120.

Hjertenes, P.O. 1980. The spurdogs in the North Sea area; the Norwegian fishery and observations on changes inmigration pattern. ICES CM 1980/H:60. 13 pp.Holland, Daniel and Ginter, Jay. 2001. Common property institutions in the Alaskan groundfish fisheries. Marine Policy 25 (2001) 33-42.

Hutchinson et al 2020. The Interaction Between Resource Species and Electromagnetic Fields Associated with Electricity Production by Offshore Wind Farms. SPECIAL ISSUE ON UNDERSTANDING THE EFFECTS OF OFFSHORE WIND ENERGY DEVELOPMENT ON FISHERIES. Available at https://tethys.pnnl.gov/sites/default/files/publications/Hutchison-et-al-2020-EMFs.pdf.

Hutt and Silva 2019. Economic Contributions of Atlantic Highly Migratory Species Anglers and Tournaments, 2016. Available at https://repository.library.noaa.gov/

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.

Iglesias, José, Fuentes, Lidia, Villanueva, Roger, Editors. 2014. Cephalopod Culture. Springer Netherlands. Chapter: Vidal, Erica et al. Loligo vulgaris and Doryteuthis opalescens.

Ingram, E. C., R. M. Cerrato, K. J. Dunton, and M. G. Frisk. 2019. Endangered Atlantic sturgeon in the New York Wind Energy Area: Implications of future development in an offshore wind energy site. Scientific Reports 9(1):1–13.

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.

Jefferson, T.A., D. Fertl, J. Bolanos-Jimenez and A.N. Zerbini. 2009. Distribution of common dolphins (Delphinus spp.) in the western North Atlantic: a critical re-examination. Mar. Biol. 156:1109-1124.

Johnson, M.R., C. Boelke, L.A. Chiarella, P.D. Colosi, K. Greene, K. Lellis-Dibble, H. Ludemann, M. Ludwig, S. McDermott, J. Ortiz, D. Rusanowsky, M. Scott, J. Smith 2008.

Impacts to marine fisheries habitat from nonfishing activities in the Northeastern United States. NOAA Tech. Memo. NMFS-NE-209, 328 p.

Kocik. J.F., S.E. Wigley, and D. Kircheis. 2014. Annual Bycatch Update Atlantic Salmon 2013 U.S. Atlantic Salmon Assessment Committee Working Paper 2014:05. Old Lyme, CT. 6 pp.(cited with permission of authors).

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.

Lacroix, G.L. and McCurdy, P. 1996. Migratory behavior of post-smolt Atlantic salmon during initial stages of seaward migration. J. Fish Biol. 49, 1086-1101.

Lacroix, G. L, McCurdy, P., Knox, D. 2004. Migration of Atlantic salmon post smolts in relation to habitat use in a coastal system. Trans. Am. Fish. Soc. 133(6): pp. 1455-1471.

Lacroix, G.L. and D. Knox. 2005. Distribution of Atlantic salmon (Salmo salar) postsmolts of different origins in the Bay of Fundy and Gulf of Maine and evaluation of factors affecting migration, growth, and survival. Can. J. Fish. Aquat. Sci. 62: 1363–1376.

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. Pages 167-182. In: J. Munro, D. Hatin, J. E. Hightower, K. McKown, K. J. Sulak, A. W. Kahnle, and F. Caron, (editors), Anadromous sturgeons: Habitats, threats, and management. Am. Fish. Soc. Symp. 56, Bethesda, MD.

Legault and Brooks 2013. Can stock–recruitment points determine which spawning potential ratio is the best proxy for maximum sustainable yield reference points? ICES Journal of Marine Science, Volume 70, Issue 6, September 2013, Pages 1075–1080, https://doi.org/10.1093/icesjms/fst105

Lenfest 2012. Pikitch, E. et al. 2012. Little Fish, Big Impact: Managing a Crucial Link in Ocean Food Webs. Lenfest Ocean Program. Washington, DC. 108 pp. Available at: http://www.oceanconservationscience.org/foragefish/.

Lovell et al 2020. The Economic Contribution of Marine Angler Expenditures on Fishing Trips in the United States, 2017. NOAA Technical Memorandum NMFS-F/SPO-201. March 2020. Available at https://spo.nmfs.noaa.gov/sites/default/files/TM201.pdf.

Lyssikatos MC. 2015. Estimates of cetacean and pinniped bycatch in Northeast and mid-Atlantic bottom trawl fisheries, 2008-2013. U.S. Dept Commer, Northeast Fish Sci Cent Ref Doc. 15-19.

Mace 1994. Relationships between Common Biological Reference Points Used as Thresholds and Targets of Fisheries Management Strategies. January 1994. Canadian Journal of Fisheries and Aquatic Sciences 51(1):110-122 DOI:10.1139/f94-013

Macy, W.K., and J.K.T. Brodziak. 2001. Seasonal maturity and size at age of Loligo pealeii in waters of southern New England. ICES J. Mar. Sci. 58: 852-864.

MAFMC 2020. Environmental Assessment for the 2021-2023 Mackerel, Squid, and Butterfish Specifications, available at www.mafmc.org.

MAFMC 2022. Spiny Dogfish Fishery Information Document. Available at https://www.mafmc.org/ssc-meetings/2022/sept13-14.

MAFMC SSC 2022. September 2022 Report of the MAFMC's SSC. Available at https://www.mafmc.org/ssc.

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.

Mayo, C.A, L. Ganley, C.A. Hudak, S. Brault, M.K. Marx, E. Burke and M.W. Brown. 2018. Distribution, demography, and behavior of North Atlantic right whales (*Eubalaena glacialis*) in Cape Cod Bay, Massachusetts, 1998–2013. Mar. Mamm. Sci. 34(4):979–996.

McClellan, C.M., and A.J. Read. 2007. Complexity and variation in loggerhead sea turtle life history. Biology Letters 3:592-594

Miller T., Adams, C., and Rago, P. 2013. Feasible Bounds on Historic Butterfish Stock Size and Fishing Mortality Rates from Survey and Catch Data. Report to the MAFMC SSC. Available at: http://www.mafmc.org/ssc-meetings/2013/april-may.

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.

Mitchell, G.H., R.D. Kenney, A.M. Farak, and R.J. Campbell. 2003. Evaluation of occurrence 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. March 2003. 113 pp.

Moore, M. J., T. K. Rowles, D. A. Fauquier, J. D. Baker, I. Biedron, J. W. Durban, P. K. Hamilton, A.G. Henry, A. R. Knowlton, W. A. McLellan, C. A. Miller, R. M. Pace III, H. M. Pettis, S. Raverty, R. M. Rolland, R. S. Schick, S. M. Sharp, C. R. Smith, L. Thomas, J. M. van der Hoop, M. H. Ziccardi. 2021. Assessing North Atlantic right whale health: threats, and development of tools critical for conservation of the species. Dis Aquat Org 143: 205–226.

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.

Muirhead, C.A., A. M. Warde, I. S. Biedron, A. N. Mihnovets, C.W. Clark, and A. N. Rice. 2018. Seasonal acoustic occurrence of blue, fin, and North Atlantic right whales in the New York Bight. *Aquatic Conserv: Mar Freshw Ecosyst*. 28:744–753

Murphy, T.M., S.R. Murphy, D.B. Griffin, and C. P. Hope. 2006. Recent occurrence, spatial Distribution, and temporal variability of leatherback turtles (Dermochelys coriacea) in nearshore waters of South Carolina, USA. Chel. Cons. Biol. 5(2): 216-224.

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, second ed. U.S. Dep. Commer., Northeast Fish Sci. Cent. Ref. Doc. 08-20, p. 32. <http://www.nefsc.noaa.gov/publications/crd/crd0820>.

Murray, K.T. 2015. The importance of location and operational fishing factors in estimating and reducing loggerhead turtle (Caretta caretta)interactions in U.S. bottom trawl gear. Fisheries Research 172: 440–451.

NEFSC 2004. Northeast Fisheries Science Center. 2004. Report of the 38th Northeast Regional Stock

Assessment Workshop (38th SAW): advisory report. Northeast Fish. Sci. Cent. Ref. Doc. 04-04; 24 p. Available at: http://www.nefsc.noaa.gov/nefsc/publications/.

NEFSC 2005. 42nd Northeast Regional Stock Assessment Workshop (42nd SAW): 42nd SAW assessment summary report. U.S. Dep Commer, Northeast Fish Sci Cent Ref Doc. 06-01; 61 p. Available at: http://www.nefsc.noaa.gov/publications/crd/crd0601/.

NEFSC 2010. Northeast Fisheries Science Center. 2010. 49th Northeast Regional Stock Assessment Workshop (49th SAW) Assessment Report. U.S. Dept Commer, Northeast Fish Sci Cent Ref Doc. 10-01; 383 p. Available at: http://www.nefsc.noaa.gov/nefsc/publications/

NEFSC 2011. 51st Northeast Regional Stock Assessment Workshop (51st SAW) Assessment Report. U.S. Dept Commer, Northeast Fish. Sci. Cent. Ref. Doc. 11-01; 70 p. Available from:

National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://nefsc.noaa.gov/publications/

NEFSC 2011b. Ecosystem Status Report for the Northeast Shelf Large Marine Ecosystem – 2011. Northeast Fisheries Science Center Reference Document 12-07. Available at https://www.nefsc.noaa.gov/publications/crd/crd1207/crd1207.pdf.

NEFSC. 2014. 58th Northeast Regional Stock Assessment Workshop (58th SAW) Assessment Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 14-04; 784 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://nefsc.noaa.gov/publications/crd/crd1404/.

NEFSC. 2017. Butterfish Assessment Update. Available at http://www.mafmc.org/ssc-meetings/2017/may-17-18.

NEFSC 2018. 64th Northeast Regional Stock Assessment Workshop (64th SAW) Assessment Summary Report. U.S. Dept Commer, Northeast Fish Sci Cent Ref Doc. 18-03; 27 p.

NEFSC 2018b. 65th Northeast Regional Stock Assessment Workshop (64th SAW) Assessment Summary Report. U.S. Dept Commer, Northeast Fish Sci Cent Ref Doc. 18-08; 38 p.

NEFSC 2018c. Update of the Spiny Dogfish Assessment. Available at https://www.mafmc.org/ssc-meetings/2018/sept-11.

NEFSC 2020c. State of the Ecosystem Reports for the Northeast U.S. Shelf. Available at https://www.fisheries.noaa.gov/new-england-mid-atlantic/ecosystems/state-ecosystem-reports-northeast-us-shelf.

NEFSC 2020d. 2020 Discard Estimation, Precision, and Sample Size Analyses for 14 Federally Managed Species Groups in the Waters off the Northeastern United States. By SE Wigley and C Tholke. Available at https://www.fisheries.noaa.gov/new-england-mid-atlantic/northeast-fisheries-science-center-publications.

NEFSC 2022a. Mid-Atlantic Bight State of the Ecosystem Report. Available at https://www.fisheries.noaa.gov/new-england-mid-atlantic/ecosystems/state-ecosystem-reports-northeast-us-shelf.

NEFSC 2022b. New England Shelf State of the Ecosystem Report. Available at https://www.fisheries.noaa.gov/new-england-mid-atlantic/ecosystems/state-ecosystem-reports-northeast-us-shelf.

NEFSC 2022c. Spiny Dogfish Research Track Assessment. Available at https://apps-nefsc.fisheries.noaa.gov/saw/sasi.php.

Network (WIDECAST). WIDECAST Technical Report No. 16. Godfrey, Illinois. 36 pp.

NMFS 1991. Final recovery plan for the humpback whale (Megaptera novaeangliae). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring,MD. 105 pp.

NMFS. 1994. Report of 17th NEFSC Stock Assessment Workshop. NEFSC, Woods Hole Lab. Ref. Doc. 94-03.

NMFS. 1996. Draft Report of the 20th Northeast Regional Stock Assessment Workshop, Northeast Fishery Science Center. Woods Hole, MA.

NMFS. 1996. Report of the 21th Northeast Regional Stock Assessment Workshop, Northeast Fishery Science Center. Woods Hole, MA. June 1996.

NMFS. 1998. Guidelines for Regulatory Analysis of Fishery Management Actions. Office of Sustainable Fisheries, National Marine Fisheries Service, Silver Spring, Maryland 20910. Revised April 15, 1998.

NMFS 2001. UNITED STATES NATIONAL PLAN OF ACTION FOR THE CONSERVATION AND MANAGEMENT OF SHARKS. Available at https://www.fisheries.noaa.gov/international-affairs/shark-conservation.

NMFS 2005. Final Environmental Impact Statement for Minimizing Impacts of the Atlantic Herring Fishery on Essential Fish Habitat. NOAA/NMFS NE Regional Office, Gloucester, MA, 273 pp.

NMFS 2010. NMFS Marine Mammal List of Fisheries. 2010. Available at: http://www.nmfs.noaa.gov/pr/interactions/lof/#lof.

NMFS 2010. IMPORTS AND EXPORTS OF FISHERY PRODUCTS ANNUAL SUMMARY, 2010. Available at: http://www.st.nmfs.noaa.gov/st1/trade/documents/TRADE2010.pdf.

NMFS. 2010. 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.

NMFS. 2011. Final recovery plan for the sei whale (Balaenoptera borealis). Prepared by the Office of Protected Resources National Marine Fisheries Service, Silver Spring, MD. 108 pp.

NMFS 2012. Year-end Butterfish Mortality Cap Report for the 2011 Fishing Year. Available at:http://www.mafmc.org/meeting_materials/SSC/2012-05/3-2011-Butterfish-Cap-Report%28May%202012%29.pdf.

NMFS. 2013. NMFS-Greater Atlantic Region 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.

NMFS. 2014. NMFS-Greater Atlantic Region (GARFO). Memo to the record: Determination regarding reinitiation of Endangered Species Act section 7 consultation on 12 GARFO fisheries and two Northeast Fisheries Science Center funded fisheries research surveys due to critical habitat designation for loggerhead sea turtles. Memo issued September 17, 2014.

NMFS 2015. Northeast Fisheries Science Center Fisheries Statistics Branch (NEFSC FSB). 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.

NMFS. 2015a. Endangered Species Act Section 4(b)(2) Report: Critical Habitat for the North Atlantic Right Whale (Eubalaena glacialis). Prepared by National Marine Fisheries Service Greater Atlantic Regional Fisheries Office and Southeast Regional Office, December 2015. http://www.greateratlantic.fisheries.noaa.gov/regs/2016/January/16narwchsection4_b__2_report012616.pdf

NMFS. 2015b. North Atlantic Right Whale (Eubalaena glacialis). Source Document for the Critical Habitat Designation: A review of information pertaining to the definition of "critical habitat" Prepared by National Marine Fisheries Service Greater Atlantic Regional Fisheries Office and Southeast Regional Office, July 2015.

NMFS 2016. Northeast Fisheries Science Center Fisheries Statistics Branch (NEFSC FSB). 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.

NMFS 2017. NMFS NEFSC FSB (Northeast Fisheries Science Center, Fisheries Sampling Branch). Northeast Fisheries Observer Program (NEFOP) and At-Sea Monitoring (ASM) Program: Incidental Take Reports for Sea Turtles, Sturgeon, and Salmon. Omnibus data request + supplemental data from 1989-2016. Data compiled on May 10 and 15, 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

NMFS (National Marine Fisheries Service). 2020. 2020 Discard Estimation, Precision, and Sample Size Analyses for 14 Federally Managed Species Groups in the Waters off the Northeastern United States. SE Wigley and C Tholke. NOAA Technical Memorandum NMFS-NE-261.

NMFS (National Marine Fisheries Service). 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.

NMFS (National Marine Fisheries Service). 2021b. Final Environmental Impact Statement, Regulatory Impact Review, and Final Regulatory Flexibility Analysis for Amending the Atlantic Large Whale Take Reduction Plan: Risk Reduction Rule. Prepared by: NOAA's National Marine Fisheries Service and Industrial Economics, Incorporated; June 2021. https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-mammal-protection/atlantic-large-whale-take-reduction-plan

NMFS and U.S. Fish and Wildlife Service (USFWS). 1991. Recovery plan for U.S. population of Atlantic green turtle (Chelonia mydas). National Marine Fisheries Service, Washington, D.C. 58 pp.

NMFS and U.S. Fish and Wildlife Service (USFWS). 1992. Recovery plan for leatherback turtles (Dermochelys coriacea) in the U.S. Caribbean, Atlantic, and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C. 65 pp.

NMFS and USFWS (U.S. Fish and Wildlife Service). 1995. Status reviews for sea turtles listed under the Endangered Species Act of 1973. Silver Spring, Maryland: National Marine Fisheries Service. 139 pp.

NMFS and USFWS (U.S. Fish and Wildlife Service). 1998a. Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (Dermochelys coriacea). Silver Spring, Maryland: National Marine Fisheries Service. 65 pp.

NMFS USFWS (U.S. Fish and Wildlife Service). 1998b. Recovery Plan for U.S. Pacific Populations of the Green Turtle (Chelonia mydas). Silver Spring, Maryland: National Marine Fisheries Service. 84 pp.

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.

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

NMFS and USFWS (U.S. Fish and Wildlife Service). 2007a. Kemp's ridley sea turtle (Lepidochelys kempii) 5 year review: summary and evaluation. Silver Spring, Maryland: National Marine Fisheries Service. 50 pp.

NMFS and USFWS (U.S. Fish and Wildlife Service). 2007b. Green sea turtle (Chelonia mydas) 5 year review: summary and evaluation. Silver Spring, Maryland: National Marine Fisheries Service. 102 pp.

NMFS and USFWS (U.S. Fish and Wildlife Service). 2008. Recovery plan for the Northwest Atlantic population of the loggerhead turtle (Caretta caretta), Second revision. Washington, D.C.: National Marine Fisheries Service. 325 pp.

NMFS and USFWS (U.S. Fish and Wildlife Service). 2013. Leatherback sea turtle (Dermochelys coriacea) 5 year review: summary and evaluation. Silver Spring, Maryland: National Marine Fisheries Service. 91 pp.

NMFS and USFWS (U.S. Fish and Wildlife Service). 2015. Kemp's ridley sea turtle (Lepidochelys kempii) 5 year review: summary and evaluation. Silver Spring, Maryland: National Marine Fisheries Service. 62 pp.

NMFS and USFWS (U.S. Fish and Wildlife Service). 2016. Draft Recovery Plan for the Gulf of Maine Distinct Population Segment of Atlantic Salmon (Salmo salar). http://www.fisheries.noaa.gov/pr/pdfs/20160329_atlantic_salmon_draft_recovery_plan.pdf

NMFS and USFWS (U.S. Fish and Wildlife Service), and SEMARNAT. 2011. Bi-National Recovery Plan for the Kemp's Ridley Sea Turtle (Lepidochelys kempii), Second Revision. National Marine Fisheries Service. Silver Spring, MD. 156 pp. + appendices.

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

Novak, A. J., A. E. Carlson, C. R. Wheeler, G. S. Wippelhauser, and J. A. Sulikowsk. 2017. Critical foraging habitat of Atlantic sturgeon based on feeding habits, prey distribution, and movement patterns in the Saco River Estuary, Maine. Transactions of the American Fisheries Society 146:308-317

Okutani, T. 1977. Stock assessment of cephalopod resources fished by Japan. U.N. Food and Agriculture Organization Fish. Tech. paper No. 173. 62 p.

Oliver, M.J., M. W. Breece, D. A. Fox, D. E. Haulsee, J. T. Kohut, J. Manderson, and T. Savoy. 2013. Shrinking the Haystack: Using an AUV in an Integrated Ocean Observatory to Map Atlantic Sturgeon in the Coastal Ocean. Fisheries 38(5): 210-216.

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

Pace, R. M., III, P. J. Corkeron, and S. D. Kraus. 2017. State–space mark–recapture estimates reveal a recent decline in abundance of North Atlantic right whales [online]. Ecology and Evolution 2017: 1-12. DOI: 10.1002/ece3.3406.

Patterson, K. (1992). Fisheries for small pelagic species: an empirical approach to management targets. Reviews in Fish and Fisheries 2:321-338.

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.

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.

Pikitch et al 2012. The global contribution of forage fish to marine Fisheries and Ecosystems. Fish and Fisheries. First published: 05 September 2012 https://doi.org/10.1111/faf.12004

Pierce and Guerra 1994. Stock Assessment Methods Used for Cephalopod Fisheries. Fisheries Research. Elsevier.

Read, A.J., P. Drinker, and S. Northridge. 2006. Bycatch of Marine Mammals in the U.S. and Global Fisheries. Conservation Biology 20(1): 163-169.

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.

Risch, D., C. W. Clark, P. J. Dugan, M. Popescu, U. Siebert, and S. M. Van Parijs. 2013. Minke whale acoustic behavior and multi-year seasonal and diel vocalization patterns in Massachusetts Bay, USA. Mar Ecol Prog Ser 489: 279–295.

Rothermel E. R., M. T. Balazik, J. E. Best, M. W. Breece, D. A. Fox, B. I. Gahagan, D. E. Haulsee, A. L. Higgs, M. H. P. O'Brien, M. J. Oliver, I. A. Park, and D. H. Secor. 2020. Comparative migration ecology of striped bass and Atlantic sturgeon in the US Southern mid-Atlantic bight flyway. PLoS ONE 15(6): e0234442. https://doi.org/10.1371/journal.pone.0234442

SARC 34. 2002. Stock Assessment Review Committee Report. Available at: http://www.nefsc.noaa.gov/saw/.

SARC 38. 2004. Stock Assessment Review Committee Report. Available at: http://www.nefsc.noaa.gov/saw/.

SARC 42. 2006. Stock Assessment Review Committee Report. Available at: http://www.nefsc.noaa.gov/saw/.

SARC 49. 2010. Stock Assessment Review Committee Report. Available at: http://www.nefsc.noaa.gov/saw/.

Sasso, C.R., and S.P. Epperly. 2006. Seasonal sea turtle mortality risk from forced submergence in bottom trawls. Fisheries Research 81:86-88.

Savoy, T., and D. Pacileo. 2003. Movements and important habitats of subadult Atlantic sturgeon in Connecticut waters. Transactions of the American Fisheries Society. 132: 1-8.

Schevill, W.E., W.A. Watkins, and K.E. Moore. 1986. Status of Eubalaena glacialis off Cape Cod. Report of the International Whaling Commission, Special Issue 10: 79-82.

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.

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 Technical Memorandum: NOAA-TM-NMFS-SWFSC-539. NMFS Southwest Fisheries Science Center, March 2015.

Sheehan, T.F., D.G. Reddin, G. Chaput and M.D. Renkawitz. 2012. SALSEA North America: A pelagic ecosystem survey targeting Atlantic salmon in the Northwest Atlantic. ICES Journal of Marine Science, doi:10.1093/icesjms/fss052.

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.

Schuller, P. and D. L. Peterson. 2006. Population status and spawning movements of Atlantic sturgeon in the Altamaha River, Georgia. Presentation to the 14th American Fisheries Society Southern Division Meeting, San Antonio, February 8-12th, 2006.

Stein, A. B., K. D. Friedland, and M. Sutherland. 2004a. Atlantic sturgeon marine distribution and habitat use along the northeastern coast of the United States. Transactions of the American Fisheries Society 133: 527-537.

Stein, A. B., K. D. Friedland, and M. Sutherland. 2004b. Atlantic sturgeon marine bycatch and mortality on the continental shelf of the Northeast United States. North American Journal of Fisheries Management 24: 171-183.

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): National Marine Fisheries Service, Northeast Fisheries Science Center, NOAA Technical Memorandum NMFS-NE-181. 179 p.

Stone, K. M., S. M. Leiter, R. D. Kenney, B. C. Wikgren, J. L. Thompson, J. K. D. Taylor, and S. D. Kraus. 2017. Distribution and abundance of cetaceans in a wind energy development area offshore of Massachusetts and Rhode Island. Journal of Coastal Conservation 21:527-543.

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.

B. Taormina et al. 2018 A review of potential impacts of submarine power cables on the marine environment: knowledge gaps, recommendations and future directions. Renew. Sustain. Energy Rev.

B Taormina et al 2020. Impact of magnetic fields generated by AC/DC submarine power cables on the behavior of juvenile European lobster (Homarus gammarus), Aquatic Toxicology, Volume 220, 2020.

Templeman, W. 1954. Migrations of spiny dogfish tagged in Newfoundland waters. Journal of the Fisheries Research Board of Canada, 11(4): 351-354.

TEWG (Turtle Expert Working Group). 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.

TEWG (Turtle Expert Working Group). 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.

TEWG (Turtle Expert Working Group). 2007. An assessment of the leatherback turtle population in the Atlantic Ocean. NOAA Technical Memorandum NMFS-SEFSC-555:1-116.

TEWG (Turtle Expert Working Group). 2009. An assessment of the loggerhead turtle population in the Western North Atlantic Ocean. NOAA Technical Memorandum NMFS-SEFSC-575:1-131.

Timoshkin, V. P. 1968. Atlantic sturgeon (Acipenser sturio L.) caught at sea. Prob. Ichthyol. 8(4):598.

TRAC 2010. Transboundary Resources Assessment Committee (TRAC). TRAC Summary Report (TSR). Available online at: http://www.mar.dfo-mpo.gc.ca/science/trac/tsr.html.

U.S. Atlantic Salmon Assessment Committee (USASAC). 2004.Annual Report of the U.S. Atlantic Salmon Assessment Committee.

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

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., T. King, T. Savoy, L. Maceda, C. Grunwald, and I. Wirgin. 2013. Stock Origins of Subadult and Adult Atlantic Sturgeon, Acipenser oxyrinchus, in a Non-natal Estuary, Long Island Sound. Estuaries and Coasts 36:257–267.

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. NEFSC Reference Document 11-04; 8 pp. http://www.nefsc.noaa.gov/publications/crd/.

Waring, G. T., C. P. Fairfield, C. M. Ruhsam, and M. Sano. 1992. Cetaceans associated with Gulf Stream features off the northeastern USA shelf. ICES C.M. 1992/N:12 29 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, K. Maze-Foley, and P.E. Rosel, editors. 2014a. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments—2013. NOAA Tech Memo NMFS- NE-228. 475 pp.

Waring, G.T, F. Wenzel, E. Josephson, M.C. Lyssikatos. 2014b. Serious Injury Determinations for Small Cetaceans and Pinnipeds Caught in Commercial Fisheries off the Northeast U.S. Coast, 2007-2011. U.S. Dept Commer, Northeast Fish Sci Cent Ref Doc. 14-13; 26 p. doi: 10.7289/V5QN64QH

Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel, editors. 2015. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments 2014. http://www.nmfs.noaa.gov/pr/sars/pdf/atl2014_final.pdf

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. http://www.nmfs.noaa.gov/pr/sars/pdf/atlantic2015_final.pdf

Wigley SE, Rago, PJ, Sosebee, KA and Palka, DL. 2007. The analytic component to the Standardized Bycatch Reporting Methodology Omnibus Amendment: sampling design and estimation of precision and accuracy (2nd edition). U.S. Dep. Commer., NortheastFish. Sci. Cent. Ref. Doc. 07-09; 156 p. Available on-line: http://www.nefsc.noaa.gov/publications/crd/crd0709/index.htm.

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

Wippelhauser, G. S., J. Sulikowsk, G. B. Zydlewski, M. A. Altenritter, M. Kieffer, M. T. Kinnison. 2017. Movements of Atlantic Sturgeon of the Gulf of Maine Inside and Outside of the Geographically Defined Distinct Population Segment Marine and Coastal Fisheries 9:93-107.

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.

10.0 LIST OF AGENCIES AND PERSONS CONSULTED

In preparing this annual specifications analysis the MAFMC consulted with the NMFS, New England and South Atlantic Fishery Management Councils, Fish and Wildlife Service, Department of State, and the states of Maine through Florida through their membership on the Mid-Atlantic, New England and/or South Atlantic Fishery Management Councils. In addition, states that are members within the management unit were consulted through the Coastal Zone Management Program consistency process. Letters were sent to each of the following states within the management unit reviewing the consistency of the proposed action relative to states' Coastal Zone Management Programs: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia and Florida.

11.0 LIST OF PREPARERS AND POINT OF CONTACT

This environmental assessment was prepared by the following member of the MAFMC staff: Jason Didden. Questions about this environmental assessment or additional copies may be obtained by contacting Jason Didden, Mid-Atlantic Fishery Management Council, 800 N. State Street Suite 201, Dover, DE 19901 (302-674-2331). This Environmental Assessment may also be accessed by visiting the MAFMC website at www.mafmc.org.

THIS IS THE END OF THIS DOCUMENT