SQUID AMENDMENT
ATLANTIC MACKEREL, SQUID, AND BUTTERFISH FISHERY MANAGEMENT PLAN

Measures to Reduce Latent Squid Fishery Permits and

Modify Trimester 2 (T2) Longfin Squid Management

Includes Draft Environmental Assessment and

Initial Regulatory Flexibility Analysis

Prepared by the

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

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1.0 EXECUTIVE SUMMARY AND TABLE OF CONTENTS

In this Amendment to the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan (MSB FMP) the Council considers measures to reduce latent (unused or minimally used) longfin and *Illex* squid permits, and also measures to modify how Trimester 2 (T2) (May-August) of the longfin squid fishery is managed.

The objectives of this action are to:

A. Consider the appropriate number of vessels in the directed and incidental longfin squid and *Illex* squid fisheries and design appropriate management measures for permitted vessels to avoid more frequent and disruptive fishery closures due to additional effort from vessels that have not substantively participated in the fishery in recent history.

   The Council is considering this objective because there is considerable latent effort in both fisheries - a relatively small portion of vessels with limited access ("moratorium") squid permits account for the majority of landings in most years, and the Council is concerned that activation of latent permits in the squid fisheries could lead to shortened seasons on these semelparous, sub-annual species, as well as increased catch of non-target species if racing to fish increases. Further restricting access will help to ensure access to the quota for participants that have participated on a regular basis and therefore have some degree of dependency. Additional effort could also increase daily landings, making it difficult to close the fishery in a timely fashion, which could negatively impact the longfin squid stock.

B. Re-evaluate the management of longfin squid in T2.

   The Council is considering this objective because the productivity of the longfin squid stock might be negatively impacted by fishing effort in T2, which occurs on the inshore spawning grounds and likely increases the mortality of squid larvae by disturbing egg mops (clusters). A split quota for the Trimester was considered to address concerns about the pace of landings in some years.

After a scoping period (April-May 2015) and reviewing Advisory Panel and other public comments, the Council developed a range of alternatives and associated analyses. The Council held hearings and accepted comments in April and May 2017 and selected preferred alternatives to recommend to NOAA Fisheries for approval and implementation at its June 2017 Council meeting. NOAA Fisheries will publish a proposed rule along with this Environmental Assessment for public comment. After considering public comments on the proposed rule, NOAA Fisheries will publish a final rule with implementation details as long as the Amendment is ultimately approved by NOAA Fisheries.

This document explains the potential actions and examines their potential impacts. All actions are potential until implemented by NOAA Fisheries. The proposed alternatives are expected to result in positive benefits to the nation by maintaining the sustainability of the resources and achieving optimum yield (i.e., fully harvesting available quotas). This action should not result in significant impacts on valued ecological components. Because none of the preferred alternatives are associated with significant impacts to the biological, social, economic, or physical environment, a "Finding of No Significant Impact" (FONSI) has been made and this document constitutes an Environmental Assessment (EA) to satisfy the

impact analysis requirements of the National Environmental Policy Act (NEPA). A qualitative summary of the expected impacts relative to the no action/status quo for the preferred alternatives is provided in Table 1 (below). A summary of the preferred alternatives follows; details of all alternatives are in Section 5. To facilitate clarity and analysis the alternatives have been reorganized somewhat from the public hearing document that Council motions referred to, but the preferred alternatives are the same as were approved by the Council.

Preferred Alternatives Overview (see Section 5 for full description of all alternatives)

Alternative 1C (PREFERRED). This alternative would requalify current longfin squid/butterfish permits for a moratorium longfin squid permit if they landed at least 10,000 pounds of longfin squid in any year from 1997-2013. Permits in "Confirmation of Permit History" (CPH) could requalify if they have the required landings. All current moratorium longfin squid/butterfish permits would retain a butterfish moratorium permit regardless (the longfin and butterfish moratorium permits would be separated and access to butterfish would not be changed). If a vessel that currently has a moratorium longfin squid/butterfish permit does not re-qualify it would receive a new and separate moratorium permit allowing a 5,000-pound longfin squid trip limit.

Alternative 2B (PREFERRED). This alternative would allow an entity that was issued more than one longfin squid/butterfish moratorium permit as of May 26, 2017 to use a one-time opportunity when re-qualifying to swap active re-qualifying and non-requalifying longfin squid moratorium permits among vessels owned by the same owner(s) of record. Permits in confirmation of permit history (CPH) as of May 26, 2017 could not participate.

Alternative 3C and 3C1 (PREFERRED). These alternatives would create a new limited-access incidental longfin squid permit that cannot be reacquired if dropped, and reduce the open access incidental permit trip limit to 250 pounds per trip. Qualification years would be from 1997-2013 and require landings of at least 5,000 pounds in any one year. Possession of a federal commercial squid permit at some point during the qualification period would also be required. The initial limited-access incidental trip limit would be 2,500 pounds, adjustable via the specifications process.

Alternative 4A. No action (PREFERRED). Selection of 4A means that the trimester allocations and rollover provisions would remain as current.

Alternative 5B (PREFERRED). This Alternative would implement a reduced 250-pound trip limit for all longfin squid permits when the directed T2 fishery closes (applies regardless of rollover in any year).

Alternative 6A. No action (PREFERRED). Selection of 6A means no changes would be made to *Illex* moratorium permits; the existing system of *Illex* moratorium permits and incidental permits would remain in place.

Table 1. Expected impacts of preferred alternatives compared to status quo [1]

Preferred Alternatives	Valued Ecosystem Components/Environmental Dimensions				
	Managed Resource	Non-target Species	Human Communi-ties	Protected Resources	Essential Fish Habitat
1C - Requalify current longfin squid/butterfish permits for a moratorium longfin squid permit if they landed at least 10,000 pounds of longfin squid in any year from 1997-2013.	neutral to low positive	low positive	Mixed	neutral	negligible
2B - allow an entity that was issued more than one longfin squid/butterfish moratorium permit as of May 26, 2017 to use a one-time opportunity when re-qualifying to swap active re-qualifying and non-requalifying longfin squid moratorium permits among vessels owned by the same owner(s) of record.	neutral to low positive	low positive	low positive	neutral	negligible
3C and 3C1 - create a new limited-access incidental longfin squid permit with qualification years from 1997-2013 and require landings of at least 5,000 pounds in any one year; make the open access trip limit 250 pounds	slightly positive	slightly positive	Mixed	slightly positive	slightly positive
4A - the trimester allocations and rollover provisions would remain as current.	neutral to slightly negative	neutral	neutral	neutral	neutral
5B - implement a reduced 250-pound trip limit for all longfin squid permits when the directed T2 fishery closes.	low positive	low positive	Mixed	slightly positive	low positive
6A - no changes would be made to Illex moratorium permits; the existing system of Illex moratorium permits and incidental permits would remain in place.	neutral	neutral	neutral	neutral	neutral

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[1] Some alternatives may be combined with other alternatives, as detailed in Section 5.

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2.0 LIST OF ACRONYMS AND ABBREVIATIONS

ABC	**Acceptable Biological Catch**
ACL	**Annual Catch Limit**
ACT	**Annual Catch Target**
ASMFC	**Atlantic States Marine Fisheries Commission or Commission**
B	**Biomass**
CFR	**Code of Federal Regulations**
CPH	**Confirmation of Permit History**
CV	**coefficient of variation**
DAH	**Domestic Annual Harvest**
DAP	**Domestic Annual Processing**
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**
GB	**Georges Bank**
GOM	**Gulf of Maine**
IOY	**Initial Optimum Yield**
M	**Natural Mortality Rate**
MAFMC	**Mid-Atlantic Fishery Management Council**
MMPA	**Marine Mammal Protection Act**
MSA	**Magnuson-Stevens Fishery Conservation and Management Act (as currently amended)**
MSB	**Atlantic Mackerel, Squid, Butterfish**
MSY	**Maximum Sustainable Yield**
MT (or mt)	**Metric Tons (1 mt equals about 2,204.62 pounds)**
NE	**Northeast**
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**
PBR	**Potential Biological Removal**
SARC	**Stock Assessment Review Committee**
SAW	**Stock Assessment Workshop**
SNE	**Southern New England**
SSC	**Scientific and Statistical Committee**
US	**United States**
T1, T2, T3	**Trimesters 1, 2, and/or 3 of the Longfin Squid Fishery**
VTR	**Vessel Trip Report**

Notes: "Mackerel" refers to "Atlantic mackerel" unless otherwise noted. Longfin refers to "longfin squid."

3.0 LISTS OF TABLES, AND FIGURES

3.1 LIST OF TABLES

3.2 LIST OF FIGURES

4.0 INTRODUCTION, BACKGROUND, AND PROCESS

Both the *Illex* and longfin squid fisheries are managed based on annual quotas, but since 2007, the longfin squid fishery has also been subject to trimester-based quotas of 43% during the January-April Trimester 1 (T1), 17% during the May-August Trimester 2 (T2) and 40% during the September-December Trimester 3 (T3). Landings from the longfin squid (longfin) and *Illex* squid (*Illex*) bottom trawl fisheries are highly variable, but during 2012-2016, landings generated average nominal ex-vessel revenues of $33.0 million for longfin and $5.5 million for *Illex*. On average during these time periods, the longfin fishery landed 59% of its annual quota and the *Illex* fishery landed 29% of its quota. However, seasonal longfin fishery closures suppressed annual landings in 2012, 2014, and 2016.

A relatively small portion of the moratorium permits during 2012-2016 accounted for most of the landings in each squid fishery. Also, during peak landings in 2016 the longfin squid fishery landed up to 3.5 million pounds in a week, which means that the vessels that fished in 2016 alone have the capacity to land the entire annual quota in approximately 14 weeks (though the Trimester allocations would spread catch out temporally). Likewise, in 2011 the *Illex* fishery caught as much as 4.5 million pounds in a week, which means that the vessels that fished in 2011 alone have the capacity to land the entire annual quota in approximately 11 weeks. Most data in this document goes through 2016 since that year was complete when the document was created, but the *Illex* fishery did close early on September 15, 2017 after catching 98% of its quota. The longfin squid fishery did not have any quota closures during 2017.

The T1 and T2 quotas are allowed to roll-over within a year with certain constraints. Since 2010, underages for T1 that are greater than 25% are reallocated to T2 and T3 (split equally between both trimesters) of the same year. However, since 2011 the T2 quota may only be increased by 50% from rollover and the remaining portion of the underage is reallocated to T3. Any underages for T1 that are less than 25% of the T1 quota are applied only to T3 of the same year. Any overages for T1 and T2 are subtracted from T3 (or the annual quota) of the same year. The impact of the rollovers has been that the T2 quota has been in the 11.2-12.6 million pound range since 2011 (the T2 quota when Trimesters began in 2007 was 6.2 million pounds), and landings in two years, 2012 and 2016 were substantially higher than the quotas (40% and 48% above in those year respectively). There have been no annual quota overages.

Based on recent fishery performance, some fishery participants requested that the Council consider removing latent permits from the directed fishery to ensure access to the quota for participants that have been active in the fishery and have come to depend on access to the squid fisheries. This is the focus of most of the alternatives in this action (generally Sets 1, 2, 3 for longfin squid and 6 for *Illex* squid). A smaller fleet would have greater quota access per vessel on average, and racing to fish could be reduced.

Other alternatives (generally Sets 4 and 5) address a concern raised by some fishery participants and other interested parties that the productivity of the longfin squid stock may be negatively impacted if fishing in T2, which occurs on the spawning grounds, does not allow sufficient spawning and/or hatching of longfin squid egg mops, which are attached to the seabed and vegetation. These concerns relate to both overall productivity of the stock and the availability of longfin in localized areas. Related alternatives considered in this action could reduce the rollover (Alternative Set 4) or further restrict landings once the T2 quota is reached (Alternative Set 5).

4.1 OBJECTIVES, PURPOSE, AND NEED

The objectives of this action are to:

A. Consider the appropriate number of vessels in the directed and incidental longfin squid and *Illex* squid fisheries and design appropriate management measures for permitted vessels to avoid more frequent and disruptive fishery closures due to additional effort from vessels that have not substantively participated in the fishery in recent history.

   The Council is considering this objective because there is considerable latent effort in both fisheries - a relatively small portion of vessels with limited access ("moratorium") squid permits account for the majority of landings in most years, and the Council is concerned that activation of latent permits in the squid fisheries could lead to shortened seasons on these semelparous, sub-annual species, as well as increased catch of non-target species if racing to fish increases. Further restricting access will help to ensure access to the quota for participants that have participated on a regular basis and therefore have some degree of dependency. Additional effort could also increase daily landings, making it difficult to close the fishery in a timely fashion, which could negatively impact the longfin squid stock.

B. Re-evaluate the management of longfin squid in T2.

   The Council is considering this objective because the productivity of the longfin squid stock might be negatively impacted by fishing effort in T2, which occurs on the inshore spawning grounds and likely increases the mortality of squid larvae by disturbing egg mops (clusters). A split quota for the Trimester was considered to address concerns about the pace of landings in some years.

This action is needed to 1) prevent future unrestrained increases in fishing effort[2] by having too many vessels in the directed longfin squid fishery and 2) to avoid overharvest during T2 of the longfin squid fishery. The purpose of this action is to consider limited access and seasonal (T2) effort controls or other management measures in the squid fisheries. Racing to fish with additional participants reduces access to quota for all vessels (including those that have become dependent on the squid fisheries) and can lead to frequent closures which negatively impact vessels ability to fish consistently. Racing to fish also reduces the incentive to fish carefully and avoid bycatch and protected species. In this document, negative issues related to "racing to fish" encompasses both of these related issues. Overharvest during T2 may reduce the productivity of the longfin squid stock.

[2] Unrestrained increases in effort lead to a problem in fisheries management commonly referred to as "racing to fish." In this problem, fishery participants expend more and more capital and effort in an increasingly rushed attempt to catch a limited quota before their catch and the catch of other participants causes a closure of the fishery. More racing to fish is likely to lead to higher bycatch given the hyper focus on rapid catches, and if there is less of a race to fish, fishermen may have more time to execute bycatch minimization strategies, such as moving to a new area after a bycatch event, though such gains are generally more strongly associated with rights-based management (see Holland and Ginter 2001, Fujita and Bonzon 2005, Branch et. al. 2006, Hilborn 2007, and Birkenback et al 2017 for a few examples of many discussions of this issue).

4.2 REGULATORY AUTHORITY

As discretionary provisions of FMPs, the Magnuson-Stevens Fishery Conservation and Management Act (MSA) states that any FMP may establish a limited access system for the fishery in order to achieve optimum yield if, in developing such system, the Council and the Secretary take into account—

(A) present participation in the fishery;
(B) historical fishing practices in, and dependence on, the fishery;
(C) the economics of the fishery;
(D) the capability of fishing vessels used in the fishery to engage in other fisheries;
(E) the cultural and social framework relevant to the fishery and any affected fishing communities;
(F) the fair and equitable distribution of access privileges in the fishery; and
(G) any other relevant considerations.

As discretionary provisions of FMPs the MSA also allows restriction of fishing by time/season. Both limited access and seasonal management have been previously incorporated into the MSB FMP and this action could modify the existing provisions regarding limited access and/or seasonal management. In addition, MSA discretionary provisions allow measures that require a permit, implement catch limitations, and lower bycatch.

4.3 FMP HISTORY AND MANAGEMENT OBJECTIVES

Management of the MSB fisheries began through the implementation of three separate FMPs (one each for mackerel, squid, and butterfish) in 1978. The plans were merged in 1983. Over time a wide variety of management issues have been addressed including stock rebuilding, habitat conservation, bycatch minimization, and limiting participation in the fisheries. The history of the plan and its amendments can be found at http://www.mafmc.org/fisheries/fmp/msb.

The management goals and objectives, as described in the current FMP are listed below.

1. Enhance the probability of successful (i.e., the historical average) recruitment to the fisheries.
2. Promote the growth of the U.S. commercial fishery, including the fishery for export.
3. Provide the greatest degree of freedom and flexibility to all harvesters of these resources consistent with the attainment of the other objectives of this FMP.
4. Provide marine recreational fishing opportunities, recognizing the contribution of recreational fishing to the national economy.
5. Increase understanding of the conditions of the stocks and fisheries.
6. Minimize harvesting conflicts among U.S. commercial, U.S. recreational, and foreign fishermen.

4.4 MANAGEMENT UNIT AND GEOGRAPHIC SCOPE

The management unit (fish stock definition) for the MSB FMP is all Atlantic mackerel (*Scomber scombrus*), longfin inshore squid (*Doryteuthis (Amerigo) pealeii*),[3] Northern shortfin squid (*Illex illecebrosus*), and Atlantic butterfish (*Peprilus triacanthus*) under U.S. jurisdiction in the Northwest Atlantic, with a core fishery management area from Maine to North Carolina.

4.5 PROCESS

The process of developing this MSB FMP Amendment began in December 2014 with identification of this action as a priority for the Council's 2015 Implementation Plan (http://www.mafmc.org/s/2015_Implementation-Plan_v2.pdf) at the Council's December 2014 Council Meeting (see Executive Committee materials at http://www.mafmc.org/briefing/december-2014). Scoping occurred in April and May 2015, and the Council reviewed scoping comments at its June 2015 Council meeting (http://www.mafmc.org/briefing/june-2015). The Council, with input from the MSB Advisory Panel, developed alternatives and analyses in 2016, and public hearings (with a written comment period) on the resulting alternatives were held in April and May 2017. The Council selected alternatives to recommend to NOAA Fisheries for implementation in June 2017. NOAA Fisheries will publish a proposed rule along with this Environmental Assessment for public comment. After considering public comments on the proposed rule, NOAA Fisheries will publish a final rule with implementation details as long as the Amendment is ultimately approved by NOAA Fisheries.

[3] For longfin squid there was a scientific name change from *Loligo pealeii* to *Doryteuthis (Amerigo) pealeii*. To avoid confusion, this document will utilize the common name "longfin squid" wherever possible, but this squid is still often referred to as "*Loligo*" by interested parties.

5.0 WHAT ALTERNATIVES ARE CONSIDERED IN THIS DOCUMENT?

5.1 ALTERNATIVE SET 1: LONGFIN SQUID MORATORIUM PERMIT REQUALIFICATION ALTERNATIVES

An alternative in this set could be selected in addition to alternatives in other sets or on its own if no action is selected for other sets. This action would not allow new entrants to qualify for a moratorium permit – a current longfin squid/butterfish moratorium permit is needed to requalify. Only one alternative would be chosen from this Alternative Set.

Alternative 1C was chosen as preferred because the Council decided it represented the best balance of avoiding racing to fish by not allowing too many vessels to direct on the longfin squid quota, while ensuring that enough vessels remain in the fishery to harvest optimum yield. The Council also voted to allow vessels that would not requalify to be issued a new permit that would allow trips at/under a 5,000 pound trip limit in order to recognize their historical participation as original qualifiers, so that has been integrated into the preferred alternative (the Council considered both measures would be implemented as part of requalification). By helping avoiding overfishing and maintaining historical recruitment, minimizing racing to fish also supports the Council's Ecosystem Approach to Fisheries Management goal, "to manage for ecologically sustainable utilization of living marine resources while maintaining ecosystem productivity, structure, and function," where 'ecologically sustainable utilization' is defined as utilization that "accommodates the needs of present and future generations, while maintaining the integrity, health, and diversity of the marine ecosystem" (MAFMC 2016). By requalifying most of the active participants, Alternative 1C also maintains freedom and flexibility of the fishery to the extent practicable consistent with the objectives of this action.

Alternative 1A. No action. No changes would be made to longfin/butterfish moratorium permits. The existing system of longfin squid/butterfish moratorium permits and incidental permits would remain in place. In 2016 there were approximately 286 vessels with active moratorium permits (i.e. currently attached to an existing vessel that could fish) and approximately another 97 that had their permits/histories held in Confirmation of Permit History[4] (CPH). There were approximately 1,500 incidental permits in 2016. A summary of regulations for these permits may be found at https://www.greateratlantic.fisheries.noaa.gov/regs/info.html.

Alternative 1B. Requalify current longfin squid/butterfish permits if they landed at least 10,000 pounds of longfin squid in any year from 1997-2015. Permits in "Confirmation of Permit History" (CPH) could requalify if they have the required landings. All current moratorium longfin squid/butterfish permits would retain a butterfish moratorium permit (the longfin and butterfish moratorium permits would be separated and access to butterfish would not be changed). No VMS requirements would apply to the separate butterfish permit. Current longfin squid/butterfish moratorium permits that do not requalify would get a new permit allowing them 5,000 pounds per trip

[4] A CPH is required when a vessel that has been issued a limited access permit has sunk, been destroyed, or has been sold to another person without its permit history. Possession of a CPH allows maintaining of the landings history of the permit without owning a vessel.

(adjustable via specifications), which is higher than the current incidental trip limit of 2,500 pounds (also adjustable via specifications).

Rational: The general rationale for the longfin squid moratorium permit alternatives is that an influx of entrants may create additional incentive to race to fish, and dilute the amount of quota available to those vessels that have become dependent on longfin squid fishing, so latent permits should be removed. Racing to fish also reduces the incentives to fish carefully and avoid bycatch or protected species. This option would include a long qualifying period and a low threshold to enable more vessels to requalify; only the least active vessels would be impacted by this alternative. For example, 10,000 pounds could be landed in just four trips at the current incidental trip limit, so any vessels that would not re-qualify would have had very low activity during the re-qualification period. 2016 is not included due to the influx of effort in 2016. Catch data is most accurate after 1997 due to permitting and reporting requirements. Allowing non-requalifiers to be issued a new permit that allows a 5,000 pound trip limit recognizes their historic participation that initially qualified them for the longfin squid/butterfish moratorium permit and accordingly provides them a higher level of access than a standard incidental permit. Creating a new butterfish permit and not reducing access to the butterfish fishery recognizes that the butterfish fishery is an underutilized fishery.

Alternative 1C (PREFERRED). Requalify current longfin squid/butterfish moratorium permits for a moratorium longfin squid permit if they landed at least 10,000 pounds of longfin squid in any year from 1997-2013. Permits in "Confirmation of Permit History" (CPH) could requalify if they have the required landings. All current moratorium longfin squid/butterfish permits would retain a butterfish moratorium permit (the longfin and butterfish moratorium permits would be separated and access to butterfish would not be changed). No VMS requirements would apply to the separate butterfish permit. Current longfin squid/butterfish moratorium permits that do not requalify would get a new permit allowing them 5,000 pounds per trip (adjustable via specifications), which is higher than the current incidental trip limit of 2,500 pounds (also adjustable via specifications).

Rational: The general rationale for the longfin squid moratorium permit alternatives is that an influx of entrants may create additional incentive to race to fish, and dilute the amount of quota available to those vessels that have become dependent on longfin squid fishing, so latent permits should be removed. Racing to fish also reduces the incentives to fish carefully and avoid bycatch or protected species. This option would include a relatively long qualifying period and a low threshold to enable more vessels to requalify; only the least active vessels or those entering after the control date[5] year would be impacted by this alternative. For example, 10,000 pounds could be landed in just four trips at the incidental trip limit, so any vessels that would not re-qualify would have had very low activity during the re-qualification period. Using the control date excludes the newest entrants (or re-entrants) into the directed fishery (entry of new participants may dilute quota availability). Catch data is most accurate after 1997 due to permitting and reporting requirements. Allowing non-requalifiers to be issued a new permit that allows a 5,000 pound trip limit recognizes their historic participation that initially qualified them for the longfin squid/butterfish moratorium permit and accordingly provides them a higher level of access than a standard incidental permit. Creating a new butterfish permit and not reducing access to the butterfish fishery recognizes that the butterfish fishery is an underutilized fishery.

[5] The current control date for the longfin squid fishery is May 16, 2013.

Alternative 1D. Requalify current longfin squid/butterfish permits if they landed at least 25,000 pounds of longfin squid in any year from 2003-2013. Permits in "Confirmation of Permit History" (CPH) could requalify if they have the required landings. All current moratorium longfin squid/butterfish permits would retain a butterfish moratorium permit (the longfin and butterfish moratorium permits would be separated and access to butterfish would not be changed). No VMS requirements would apply to the separate butterfish permit. Current longfin squid/butterfish moratorium permits that do not requalify would get a new permit allowing them 5,000 pounds per trip (adjustable via specifications), which is higher than the current incidental trip limit of 2,500 pounds (also adjustable via specifications).

Rational: The general rationale for the longfin squid moratorium permit alternatives is that an influx of entrants may create additional incentive to race to fish, and dilute the amount of quota available to those vessels that have become dependent on longfin squid fishing, so latent permits should be removed. Racing to fish also reduces the incentives to fish carefully and avoid bycatch or protected species. This option would include a more recent qualifying period that ends at the recent control date year and has a moderately low requalifying threshold. For example, 25,000 pounds could be landed in ten trips at the incidental trip limit or 1-2 directed trips, so any vessels that would not re-qualify would have had relatively low activity during the re-qualification period. Beginning in 2003 means qualifying participation would have to be relatively recent. Using the control date excludes the newest entrants (or re-entrants) into the directed fishery (entry of new participants may dilute quota availability). A start date of 2003 was based on 2003 being a break point in the numbers of active vessels and 2003 being a long enough time period to encompass a range of squid fishery conditions (i.e. not going back to 2003 would not encompass a sufficient range of fishery conditions). Allowing non-requalifiers to be issued a new permit that allows a 5,000 pound trip limit recognizes their historic participation that initially qualified them for the longfin squid/butterfish moratorium permit and accordingly provides them a higher level of access than a standard incidental permit. Creating a new butterfish permit and not reducing access to the butterfish fishery recognizes that the butterfish fishery is an underutilized fishery.

Alternative 1E. Requalify current longfin squid/butterfish permits if they landed at least 50,000 pounds of longfin squid on average during 1997-2013. Permits in "Confirmation of Permit History" (CPH) could requalify if they have the required landings. All current moratorium longfin squid/butterfish permits would retain a butterfish moratorium permit (the longfin and butterfish moratorium permits would be separated and access to butterfish would not be changed). No VMS requirements would apply to the separate butterfish permit. Current longfin squid/butterfish moratorium permits that do not requalify would get a new permit allowing them 5,000 pounds per trip (adjustable via specifications), which is higher than the current incidental trip limit of 2,500 pounds (also adjustable via specifications).

Rational: The general rationale for the longfin squid moratorium permit alternatives is that an influx of entrants may create additional incentive to race to fish, and dilute the amount of quota available to those vessels that have become dependent on longfin squid fishing, so latent permits should be removed. Racing to fish also reduces the incentives to fish carefully and avoid bycatch or protected species. This option would include a higher landings threshold for directed fishing, but still considers a relatively long time period. A 50,000-pound average threshold means that qualifying vessels would have spent more effort directing on longfin squid than those that qualify under the lower threshold

options. Using the control date excludes the newest entrants (or re-entrants) into the directed fishery (entry of new participants may dilute quota availability). Catch data is most accurate after 1997 due to permitting and reporting requirements. Allowing non-requalifiers to be issued a new permit that allows a 5,000 pound trip limit recognizes their historic participation that initially qualified them for the longfin squid/butterfish moratorium permit and accordingly provides them a higher level of access than a standard incidental permit. Creating a new butterfish permit and not reducing access to the butterfish fishery recognizes that the butterfish fishery is an underutilized fishery.

5.2 ALTERNATIVE SET 2: PERMIT SWAP SUB-ALTERNATIVE

2B could be selected if an action alternative from Set 1 is selected; if no action alternative is selected from Set 1, then Alternative Set 2 would be set aside completely. Alternatives in this set could also be selected in addition to alternatives from Sets 3, 4, 5, and 6.

Alternative 2B was chosen as preferred because the Council decided it represented a reasonable accommodation for entities that held multiple longfin squid/butterfish moratorium permits and as a result of requalification might effectively lose use of both longfin permits because of the histories and current use of the vessels. 2B also maintains freedom and flexibility in the fishery to the extent practicable consistent with the objectives of this action.

Alternative 2A. No action. No swap option would be selected.

Alternative 2B (PREFERRED). An entity that was issued more than one longfin squid/butterfish moratorium permit as of May 26, 2017, would have a one-time opportunity when re-qualifying to swap active re-qualifying and non-requalifying longfin squid moratorium permits among vessels owned by that same entity (same owner(s) of record). All histories would remain the same for all vessels, and the swap would have to occur between vessels that are within the 10% length - 20% horsepower upgrade restrictions. The swap could only occur during the longfin squid re-qualification implementation period, and the baseline of the vessel from which the re-qualified permit came would be the baseline of the final re-qualified permit. Permits in confirmation of permit history (CPH) as of May 26, 2017 could not participate.

Rational: This would help maximize potential fishing opportunities and associated revenue for entities that have been issued multiple moratorium permits on separate vessels. Allowing a one-time permit swap among vessels would allow an entity to place a moratorium permit on a vessel that would be more likely to target squid based on other permits issued to that vessel. For example, a vessel issued moratorium squid permit and a limited access full-time Atlantic sea scallop permit is likely to concentrate fishing efforts on sea scallops due to the higher potential fishing revenue associated with the scallop fishery. This alternative may also mitigate the loss of a permit for entities that own multiple permits. Ultimately, the same number of permits would be removed from the fishery if 2B is selected, but this option could help entities balance their permit suites across vessels. The May 26, 2017 date was selected so that owners could not arrange permits after Council action to take advantage of this provision beyond its intent, i.e. to address vessels that were already held by common owners

before Council action. The CPH stipulation was added so that only active vessels could participate and to avoid an influx of new vessels participating contrary to the overall goals of the amendment.

5.3 ALTERNATIVE SET 3: LONGFIN SQUID INCIDENTAL AND OPEN ACCESS ALTERNATIVES

Alternatives in this set could be selected in addition to alternatives in other sets or on their own if no action is selected for other sets. Within the action alternatives in this set, sub-alternatives lowering the open access trip limit from 2,500 pounds would only be implemented if a new limited-access incidental permit is established, i.e. if either 3B or 3C is chosen. The Council never contemplated lowering the incidental trip limit for all vessels with incidental permits, only for those with minimal landings, so lowering the open access trip limit only makes sense as sub-alternatives to a limited access incidental permit, which would continue to enable landings up to 2,500 pounds.

Alternatives 3C and 3C1 were chosen as preferred because the Council decided they would effectively create a system where vessels with incidental permits that had substantial longfin squid landings would keep their current trip limit and not be forced to discard longfin squid or abandon their practice of making small directed trips (3C), but vessels without a history of substantial landings would not be able to begin making directed trips at the 2,500 pound trip limit, and would be limited to a smaller trip limit of 250 pounds (3C1). Making the incidental permit limited access also closes a loophole where federal permit holders can drop their federal incidental permit when the federal waters fishery closes, fish in state waters at higher trip limits, and then later reacquire a federal incidental permit to allow landings up to 2,500 pounds of longfin squid from federal waters.

Alternative 3A. No action. The current open access squid/butterfish incidental permit and associated trip limits would remain as they are, which allow 2,500 pounds of longfin squid, 10,000 pounds of *Illex* squid, and 600 pounds of butterfish.

Alternative 3B. Create a new limited-access incidental longfin squid permit that cannot be reacquired if dropped. Qualification years would be from 1997-2013 and require landings of at least 2,500 pounds in any one year. Possession of a commercial squid permit at some point during the qualification period would also be required. The trip limit would be 2,500 pounds, adjustable via the specifications process. **There would be no vessel upgrade baselines associated with this incidental permit.**

Rational: The current open access incidental permit can be dropped and added at any time within a year, allowing vessels to access Federal waters at times with the permit, and fish above Federal limits in some state waters at other times without the permit. Making the permit a limited access permit that could not be dropped and re-issued at any time would eliminate this loophole and help restrict landings after Trimester closures, especially T2. The qualification threshold would be low – the equivalent of only one incidental trip limit so that most vessels would qualify and would be minimally impacted besides closing the loophole. The current incidental possession limit would remain at 2,500 pounds per trip.

Sub-Alternative 3B1. If a limited access incidental permit is created with 3B (with an initial trip limit of 2,500 pounds), reduce the open-access longfin squid incidental trip limit to 250 pounds.

Rational: This option would reduce the current open access incidental trip limit from 2,500 pounds to 250 pounds to reduce incentives to target longfin squid under this incidental permit, while still minimizing discards of bycaught squid. Individuals with a history of more substantial squid landings would likely qualify for the proposed limited access incidental permit and stay at a 2,500 pound trip limit.

Sub-Alternative 3B2. If a limited access incidental permit is created with 3B (with an initial trip limit of 2,500 pounds), reduce the open-access longfin squid incidental trip limit to 500 pounds.

Rational: This option would reduce the current open access incidental trip limit from 2,500 pounds to 500 pounds to reduce incentives to target longfin squid under this incidental permit, while still minimizing discards of bycaught squid. Individuals with a history of more substantial squid landings would likely qualify for the proposed limited access incidental permit and stay at a 2,500 pound trip limit.

Alternative 3C (PREFERRED). Create a new limited-access incidental longfin squid permit that cannot be reacquired if dropped. Qualification years would be from 1997-2013 and require landings of at least 5,000 pounds in any one year. Possession of a commercial squid permit at some point during the qualification period would also be required. The initial trip limit would be 2,500 pounds, adjustable via the specifications process. **There would be no vessel upgrade baselines associated with this incidental permit.**

Rational: The current open access incidental permit can be dropped and added at any time within a year, allowing vessels to access Federal waters at times with the permit, and fish above Federal limits in some state waters at other times without the permit. Making the permit a limited access permit that could not be dropped and re-issued at any time would eliminate this loophole. The qualification threshold would be low – the equivalent of only two incidental trip limits so that most vessels would qualify and would be minimally impacted besides closing the loophole. The current incidental possession limit would remain at 2,500 pounds per trip.

Sub-Alternative 3C1 (PREFERRED). If a limited access incidental permit is created with 3C (with an initial trip limit of 2,500 pounds), reduce the open-access longfin squid incidental trip limit to 250 pounds.

Rational: This option would reduce the current open access incidental trip limit from 2,500 pounds to 250 pounds to reduce incentives to target longfin squid under this incidental permit, while still minimizing discards of bycaught squid. Individuals with a history of more substantial squid landings would likely qualify for the proposed limited access incidental permit and stay at a 2,500 pound trip limit.

Sub-Alternative 3C2. If a limited access incidental permit is created with 3C (with an initial trip limit of 2,500 pounds), reduce the open-access longfin squid incidental trip limit to 500 pounds.

Rational: This option would reduce the current open access incidental trip limit from 2,500 pounds to 500 pounds to reduce incentives to target longfin squid under this incidental permit, while still minimizing discards of bycaught squid. Individuals with a history of more substantial squid landings would likely qualify for the proposed limited access incidental permit and stay at a 2,500 pound trip limit.

5.4 ALTERNATIVE SET 4: LONGFIN SQUID TRIMESTER 2 ("T2") ALLOCATION ALTERNATIVES

Alternatives in this set could be selected in addition to alternatives in other sets or on their own if no action is selected for other sets. Within the action alternatives in this set, 4D could possibly be chosen in combination with 4B or 4C.

The Council chose 4A, no action for changes to Trimester allocations at this time, because longfin catch will be additionally restrained by both the preferred permit alternatives that limit vessel participation (Alternative Sets 1 and 3) as well as the preferred T2 closure alternatives (Alternative Set 5). The Council's decision also considered the precaution suggested by the Council's Ecosystem Approach to Fisheries Management goal, "to manage for ecologically sustainable utilization of living marine resources while maintaining ecosystem productivity, structure, and function," where 'ecologically sustainable utilization' is defined as utilization that "accommodates the needs of present and future generations, while maintaining the integrity, health, and diversity of the marine ecosystem" (MAFMC 2016). While the longfin squid stock appears robust overall, there is concern about impacts from catch in T2. While lowering the quota in T2 (Alternative Set 4) would additionally limit catch in T2, the Council decided that holding the fishery to the quotas resulting from the existing allocation approach (see Alternative Set 5) was sufficiently precautionary. Those additional restraints were deemed sufficient, especially given the recent assessment update finding that the longfin squid stock is well above its biomass target (Hendrickson 2017). A split quota for T2 was considered to address concerns about the pace of landings in some years but was not selected because pausing fishing may reduce landings/revenues without conservation benefits.

Alternative 4A. No action (PREFERRED). The Trimester allocations and rollover provisions would remain as current. The annual quota is divided among three 4-month trimesters, with the initial T2 (May through August) allocation set at 17% of the annual quota (8.4 million pounds in 2017). Trimester 1 (T1) is allocated 43% of the annual quota (21.3 million pounds) and Trimester 3 (T3) is initially allocated 40% of the annual quota (19.8 million pounds). Any underages for T1 that are greater than 25 percent are reallocated to T2 and T3 (split equally between both trimesters) of the same year. The reallocation is limited, such that T2 may only be increased by at most 50 percent (i.e. to a maximum of 12.6 million pounds); the remaining portion of the underage is reallocated to T3. Any underages for T1 that are less than 25 percent of the T1 quota are applied to T3 of the same year. Any overages for T1 and T2 are subtracted from T3 of the same year. Trimester allocations and rollover provisions may be adjusted during the specifications process.

Alternative 4B. Eliminate roll-over of longfin squid quota from T1 to T2 (all un-caught T1 quota would be rolled-over to T3).

Rational: The productivity of the longfin squid stock may be negatively impacted if fishing in T2 does not allow sufficient spawning and/or hatching from the species' egg "mops," which are attached to the seabed. In addition, fishery observer data from the NEFOP indicate that certain other commercial and recreationally fished species, including scup, striped bass, summer flounder, winter flounder, and black sea bass have relatively higher bycatch rates during T2 than during T1 and T3.

Alternative 4C. Reduce the maximum T1 to T2 rollover of longfin squid quota to 25% of the original T2 quota. The initial T2 quota (17% of annual quota) is approximately 8.4 million pounds, so the maximum T2 quota after rollover would be 10.5 million pounds.

Rational: The productivity of the longfin squid stock may be negatively impacted if fishing in T2 does not allow sufficient spawning and/or hatching from egg "mops" that are attached to the seabed. In addition, fishery observer data from the NEFOP indicate that certain other commercial and recreationally fished species, including scup, striped bass, summer flounder, winter flounder, and black sea bass have relatively higher bycatch rates during T2 than during T1 and T3.

Alternative 4D. Split the T2 quota, with half available May 1- June 30, and the additional half available July 1-August 31. Open access incidental and post-closure trip limits would remain as status quo or as specified in other alternatives in this action (see above).

Rational: Rapid landings in some recent years have caused a market glut of squid in T2, which lowers product quality and prices. This alternative would force longfin squid fishing to be spread out over a longer time period in T2.

5.5 ALTERNATIVE SET 5: LONGFIN SQUID TRIMESTER 2 ("T2") CLOSURE ALTERNATIVES

One alternative in this set could be selected in addition to alternatives in other sets or on its own, if no action is selected for other sets.

Alternative 5B was chosen as preferred because the Council decided additional post-closure control of the longfin squid fishery was needed during T2 given several recent substantial T2 quota overages. The Council's decision also considered the precaution suggested by the Council's Ecosystem Approach to Fisheries Management goal, "to manage for ecologically sustainable utilization of living marine resources while maintaining ecosystem productivity, structure, and function," where 'ecologically sustainable utilization' is defined as utilization that "accommodates the needs of present and future generations, while maintaining the integrity, health, and diversity of the marine ecosystem" (MAFMC 2016). While the longfin squid stock appears robust overall, there is concern about impacts from catch in T2. While lowering the quota in T2 (Alternative Set 4) would also limit catch in T2, the Council decided that holding the fishery to the quotas resulting from the existing allocation approach was sufficiently precautionary.

Alternative 5A. No action. The trip limit in Federal waters after a T2 closure would remain at 2,500 pounds.

Alternative 5B (PREFERRED). Implement a reduced 250-pound trip limit for all longfin squid permits when the directed T2 fishery closes (applies regardless of rollover in any particular year).

Rational: Substantial landings have occurred after T2 closures in recent years at the current 2,500 pound trip limit. For example, catch following the closure of T2 in June 2016 resulted in harvest that was about 50% higher than the quota. The productivity of the longfin squid stock may be negatively impacted if fishing in T2 does not allow sufficient spawning and/or hatching from egg "mops" that are attached to the seabed. In addition, fishery observer data from the NEFOP indicate that certain other commercial and recreationally fished species, including scup, striped bass, summer flounder, winter flounder, and black sea bass have relatively higher bycatch rates during T2 than during T1 and T3. Input from the MSB AP indicated that a 250 pound post-closure trip limit will strongly reduce targeting of longfin squid after the directed fishery closes.

Alternative 5C. Implement a reduced 500-pound trip limit for all longfin squid permits when the directed T2 fishery closes (applies regardless of rollover in any particular year).

Rational: Substantial landings have occurred after T2 closures in recent years at the current 2,500 pound trip limit. Catch following the closure of T2 in June 2016 resulted in harvest that was about 50% higher than the quota. The productivity of the longfin squid stock may be negatively impacted if fishing in T2 does not allow sufficient spawning and/or hatching from egg "mops" that are attached to the seabed. In addition, fishery observer data from the NEFOP indicate that certain other commercial and recreationally fished species, including scup, striped bass, summer flounder, winter flounder, and black sea bass have relatively higher bycatch rates during T2 than during T1 and T3. Input from the MSB AP indicated that a 500 pound post-closure trip limit will reduce targeting of longfin squid after the directed fishery closes.

5.6 ALTERNATIVE SET 6: *ILLEX* SQUID MORATORIUM PERMIT REQUALIFICATION ALTERNATIVES

Alternatives in this set could be selected in addition to alternatives in other sets or on their own if no action is selected for other sets. This action would not allow new entrants to qualify for a moratorium permit. The Council would only choose one alternative within this set.

Alternative 6A was chosen as preferred because the Council decided a reduction in the number of vessels with *Illex* moratorium permits was not appropriate at this time given the low *Illex* landings and limited vessel participation in the *Illex* fishery in recent years.

Alternative 6A. No action (PREFERRED). No changes would be made to *Illex* moratorium permits. The existing system of *Illex* moratorium permits and incidental permits would remain in place. In 2016 there were approximately 64 vessels with active moratorium permits (i.e. currently attached to an existing vessel that could fish) and approximately another 15 that had their permits/histories held in Confirmation of Permit History[6] (CPH). There were approximately 1,500 incidental permits in 2016. A summary of regulations for these permits may be found at https://www.greateratlantic.fisheries.noaa.gov/regs/info.html.

Alternative 6B. Requalify current *Illex* moratorium permits if they landed at least 10,000 pounds of *Illex* squid in any year from 1997-2015. Permits in "Confirmation of Permit History" (CPH) could requalify if they have the required landings.

Rational: The general rationale for the *Illex* squid moratorium permit alternatives is that an influx of entrants may dilute the amount of quota available to those vessels that have become dependent on *Illex* squid fishing, so latent permits should be removed. This option would include a long qualifying period and a low threshold to enable more vessels to requalify; only the least active vessels would be impacted by this alternative. For example, 10,000 pounds could be landed in just one trip at the current incidental trip limit, so any vessels that would not re-qualify would have had very low activity during the re-qualification period. Catch data is most accurate after 1997 due to permitting and reporting requirements, and a long qualification period was deemed necessary to capture the range of fishery conditions in the highly variable *Illex* fishery.

Alternative 6C. Requalify current *Illex* moratorium permits if they landed at least 10,000 pounds of *Illex* squid in any year from 1997-2013. Permits in "Confirmation of Permit History" (CPH) could requalify if they have the required landings.

Rational: The general rationale for the *Illex* squid moratorium permit alternatives is that an influx of entrants may dilute the amount of quota available to those vessels that have become dependent on *Illex* squid fishing, so latent permits should be removed. This option would include a relatively long qualifying period that ends at the recent control date[7] year. 10,000 pounds could be landed in just one

[6] A CPH is required when a vessel that has been issued a limited access permit has sunk, been destroyed, or has been sold to another person without its permit history. Possession of a CPH allows maintaining of the landings history of the permit without owning a vessel.

[7] The current control date for the *Illex* fishery is August 2, 2013.

trip at the incidental trip limit, so any vessels that would not re-qualify would have had very low activity during the re-qualification period. Using the control date excludes newest entrants (or re-entrants) into the directed fishery (entry of new participants may dilute quota availability). Catch data is most accurate after 1997 due to permitting and reporting requirements, and a long qualification period was deemed necessary to capture the range of fishery conditions in the highly variable *Illex* fishery.

Alternative 6D. Requalify current *Illex* moratorium permits if they landed at least 50,000 pounds of *Illex* squid in any year from 1997-2013. Permits in "Confirmation of Permit History" (CPH) could requalify if they have the required landings.

Rational: The general rationale for the *Illex* squid moratorium permit alternatives is that an influx of entrants may dilute the amount of quota available to those vessels that have become dependent on *Illex* squid fishing, so latent permits should be removed. This option would include a moderately low qualification threshold to identify vessels that have been somewhat more active in the fishery than the lowest thresholds. Using the control date excludes newest entrants (or re-entrants) into the directed fishery (entry of new participants may dilute quota availability). Catch data is most accurate after 1997 due to permitting and reporting requirements, and a long qualification period was deemed necessary to capture the range of fishery conditions in the highly variable *Illex* fishery.

Alternative 6E. Requalify current *Illex* moratorium permits if they landed at least 100,000 pounds of *Illex* squid in any year from 1997-2013. Permits in "Confirmation of Permit History" (CPH) could requalify if they have the required landings.

Rational: The general rationale for the *Illex* squid moratorium permit alternatives is that an influx of entrants may dilute the amount of quota available to those vessels that have become dependent on *Illex* squid fishing, so latent permits should be removed. This option would include a moderately high qualification threshold to identify vessels that have been more active in the fishery. Using the control date excludes newest entrants (or re-entrants) into the directed fishery (entry of new participants may dilute quota availability). Catch data is most accurate after 1997 due to permitting and reporting requirements, and a long qualification period was deemed necessary to capture the range of fishery conditions in the highly variable *Illex* fishery.

Alternative 6F. Requalify current *Illex* moratorium permits if they landed at least 200,000 pounds of *Illex* squid in any year from 1997-2013. Permits in "Confirmation of Permit History" (CPH) could requalify if they have the required landings.

Rational: The general rationale for the *Illex* squid moratorium permit alternatives is that an influx of entrants may dilute the amount of quota available to those vessels that have become dependent on *Illex* squid fishing, so latent permits should be removed. This option would include a relatively high qualification threshold to identify vessels that have been most active in the fishery. Using the control date excludes newest entrants (or re-entrants) into the directed fishery (entry of new participants may dilute quota availability). Catch data is most accurate after 1997 due to permitting and reporting requirements, and a long qualification period was deemed necessary to capture the range of fishery conditions in the highly variable *Illex* fishery.

5.7 CONSIDERED BUT REJECTED FROM FURTHER ANALYSIS

The Council considered the possibility of granting vessels from Maine new longfin squid permits based on a request from the State of Maine related to a higher abundance of longfin squid off Maine in some recent years. However, the MSA does not allow measures that discriminate against residents of different states, and it does not appear fair to take permits from some current permit holders and give new permits to residents of just one state. Residents from Maine can purchase permits that could allow directed fishing on longfin squid. In addition, adding new participants generally runs counter to the primary latent permit reduction objective of this action.

The Council also considered adding to the scope of the Amendment by looking at buffer areas south of Martha's Vineyard and Nantucket to resolve a user conflict that has developed there due to longfin squid fishing just outside Massachusetts state waters during the T2. Ultimately the Council decided to potentially consider this issue in a separate action, and it was added as a possible additional deliverable in the Council's 2017 Implementation Plan (http://www.mafmc.org/strategic-plan/). The buffer area issue was addressed separately because it is currently understood to primarily be a user conflict issue and not directly related to the issue of overall effort in T2 negatively impacting squid productivity - localized closures would primarily shift effort out of one relatively small area and most likely into other similar areas during T2 rather than affecting overall catch, which is the T2 issue addressed in this action. The Council recently decided to wait until after implementation of this action to re-consider any squid buffer areas.

The Council also considered allowing a permit swap option for *Illex* similar to Alternative 2B for longfin squid, but decided that the public request for a permit swap option was specific to longfin squid and not needed or appropriate for *Illex* squid.

6.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT AND FISHERIES

This section identifies and describes the *valued ecosystem components* (Beanlands and Duinker 1984) that comprise the affected environment and may be affected by the alternatives proposed in this document. The valued ecosystem components are identified and described here as a means of establishing the context for the impact analysis that will be presented in Section 7's "Analysis of Impacts." The significance of the various impacts of the proposed alternatives on the valued ecosystem components are also assessed from a cumulative effects perspective at the end of Section 7. The valued ecosystem components are:

1. Managed resources (Atlantic mackerel, longfin squid and *Illex* squid, and butterfish) and non-target species.
2. Habitat including EFH for the managed resources and non-target species
3. Endangered and other protected resources
4. Human communities

The affected environment consists of those physical, biological, and human components of the environment that are or will be meaningfully connected to commercial longfin and *Illex* fishing operations, and are described below. Overviews of the managed species and of the physical environment are described first, to establish the context for the valued ecosystem components. Impacts of the alternatives on the physical environment are addressed through analysis of impacts on habitat, as most of the impacted physical environment comprises EFH for various species.

6.1 DESCRIPTION OF THE MANAGED RESOURCES AND NON TARGET FISH SPECIES

Mackerel

Atlantic mackerel is a semi-pelagic/semi-demersal (may be found near the bottom or higher in the water column) schooling fish species primarily distributed between Labrador (Newfoundland, Canada) and North Carolina. Additional life history information is detailed in the Essential Fish Habitat (EFH) document for the species, located at: http://www.nefsc.noaa.gov/nefsc/habitat/efh/. The current status of Atlantic mackerel is overfished with overfishing occurring as of data through 2016 based on the results of SAW 64 (NEFSC 2018), and the Council has initiated a rebuilding action. However, because of a strong recruitment year-class (eggs spawned in 2015), the stock is likely to rebuild to target levels relatively quickly based on assessment projections. Projections also indicate there was no overfishing in 2017 and that the stock should have climbed above the overfished threshold in 2017. Additional information on the mackerel fishery can be found in the EA for the 2016-2018 mackerel specifications, available at: https://www.greateratlantic.fisheries.noaa.gov/regs/2016/January/16msb2016specspr.html and in the recent assessment, available at https://www.nefsc.noaa.gov/saw/.

Butterfish

Atlantic butterfish is a semi-pelagic/semi-demersal schooling fish species primarily distributed between Nova Scotia, Canada and Florida. They are most abundant from the Gulf of Maine to Cape Hatteras and are fast-growing, short-lived, and form loose schools. They winter near the edge of the continental shelf in the Middle Atlantic Bight and migrate inshore in the spring into Mid-Atlantic, southern New England, and Gulf of Maine waters. During the summer, butterfish occur over the entire mid-Atlantic shelf from sheltered bays and estuaries out to about 200 m. In late fall, butterfish move southward and offshore in response to falling water temperatures.

Butterfish are short-lived and grow rapidly; few individuals live beyond 3 years and most are sexually mature at 1-2 years of age. The maximum age reported is 6 years. Juvenile butterfish range from 16 mm to about 120 mm. During their first year, they grow to 76-127 mm, or about half their adult size. Early-spawned individuals are 76-102 mm in the fall; late-spawned individuals are 51-76 mm in the fall and 76-127 mm the following spring. Adult butterfish range from about 120 mm to 305mm with an average length of 150-230 mm. Approximately half of 120 mm fish are mature for butterfish collected on the northeast shelf (1986-1989), which corresponds to an age of about 1 year.

Additional life history information is detailed in the EFH document for the species, located at: http://www.nefsc.noaa.gov/nefsc/habitat/efh/.

The status of butterfish is not overfished (above target biomass) with no overfishing occurring according to a recent assessment update (NEFSC 2017a – available at http://www.mafmc.org/ssc-meetings/2017/may-17-18). The assessment update found that butterfish was at 141% of the target biomass in 2016. However, the update integrated recent trawl survey information that indicates recent recruitment has been poor, so biomass is expected to decline to below the SSBmsy target in 2017, but not below the overfished threshold. Fishing mortality appears to have been very low in recent years, so the decline is not a result of overfishing but rather poor recruitment. If recruitment returns to average levels, then the stock is predicted to build above the SSBmsy target by 2020 (http://www.mafmc.org/s/butterfish_projections_2018-2020.xlsx). Butterfish recruitment is variable, and the terminal year recruitment was underestimated the last time the assessment model was run (2014), so it is not unreasonable to expect recruitment to be closer to average levels over the course of the projection.

Longfin Squid

Longfin squid is a neritic (from the shore to the edge of the continental shelf), semi-pelagic schooling cephalopod species primarily distributed between Georges Bank and Cape Hatteras, NC. The squid, and the fishery, generally occur offshore in the winter and inshore during the summer, with mixing and migrations from one to the other in spring and fall.

Spawning/recruitment occurs year-round with seasonal peaks in cohorts. The average lifespan of a cohort is about six months. Individuals hatched inshore during the summer are taken in the winter offshore fishery and those hatched in the winter are taken in the inshore summer fishery (Macy and Brodziak 2001). Age data indicate that NEFSC spring surveys (March-April) capture longfin

squid that were hatched during the previous six months, in the fall, and those caught in the NEFSC fall surveys (September-October) were hatched during the previous spring. Longfin squid attach egg masses to the substrate and fixed objects. Fishing and spawning mortality occur concurrently inshore during late spring through fall, during spawning. The locations of spawning sites offshore at other times of the year are unknown.

Additional life history information is detailed in the EFH document for the species (Jacobson 2005), located at: http://www.nefsc.noaa.gov/nefsc/habitat/efh/. Information about the fishery, management and life history is presented in Arkhipkin et al. (2015). Based on a new biomass reference point from the 2010 stock assessment, the longfin squid stock was not overfished in 2009, but overfishing status was not determined because no overfishing threshold was recommended (though the assessment did describe the stock as "lightly exploited'). The most recent stock assessment document (NEFSC 2011) is available at: http://www.nefsc.noaa.gov/saw/reports.html. Longfin squid relative abundance and biomass indices from the NEFSC fall bottom trawl surveys are highly variable, and are graphed in the "NEFSC Biological Update" that is created as part of the annual quota setting process. These are available at: http://www.mafmc.org/ssc-meeting-documents/ (see May 2016 Meeting Materials). Longfin had a stock assessment update in 2017, which found the stock biomass to be at 174% of the target in 2016, even higher than the 128% of target biomass in 2009 in the 2011 benchmark assessment. The assessment update is available at http://www.mafmc.org/ssc-meetings/2017/may-17-18. ABCs are set by the Council's SSC to avoid overfishing given the best available science. See http://www.mafmc.org/ssc for details on how ABCs are set for this species.

Illex squid

Illex squid is an oceanic, semi-pelagic schooling cephalopod species distributed between Newfoundland and the Florida Straits. Additional life history information is detailed in the EFH document for the species (Hendrickson and Holmes 2004), located at: http://www.nefsc.noaa.gov/nefsc/habitat/efh/. Information about the fishery, management and life history is presented in Arkhipkin et al. (2015). The status of *Illex* is unknown with respect to being overfished and is unknown with respect to overfishing. *Illex* squid relative abundance and biomass indices from the NEFSC fall bottom trawl surveys are highly variable and without trend, and are graphed in the "NEFSC Biological Update" that is created as part of the annual quota setting process. These are available at: http://www.mafmc.org/ssc-meeting-documents/ (see May 2016 Meeting Materials). According to the latest NEFSC "Illex Data Update" provided in April 2017 (available at http://www.mafmc.org/ssc-meetings/2017/may-17-18), relative abundance was near the long-term median during 2014-2016. ABCs are set by the Council's SSC to avoid overfishing given the best available science. See http://www.mafmc.org/ssc for details on how ABCs are set for this species. There has been a downward trend in *Illex* mean body weight in the survey since 1981, but squid size is likely highly influenced by environmental conditions.

Non-Target Species

Longfin Squid Non-Target Species

Various species are caught incidentally by the longfin squid fishery and will be impacted to some degree by the prosecution of the fishery. Non-target interactions and discards in the longfin squid fishery are relatively high compared to the other MSB fisheries. On the longfin squid trips identified in this analysis, the 2014-2016 overall discard rate of finfish was 33%. For every 100 pounds of longfin squid retained, 55 pounds of fish was discarded. For non-target species that are managed under their own FMP, incidental catch/discards are also considered as part of the management of that fishery. This EA reviewed observer data from 2014-2016 to evaluate non-target catches.

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. Presumably some 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. Thus to begin this process, staff first reviewed 2014-2016 trips in the dealer weighout database to see if a certain trip definition could account for most longfin squid landed. Since fisheries evolve over time, a relatively recent, three-year time period was examined.

The result of this review resulted in the following definition for longfin squid trips using landings: All trips that had at least 40% longfin squid by weight for retained species. This definition results in capturing 91% of all longfin squid landings in the dealer weighout database 2014-2016. This definition was applied to the observer database to examine discards in the longfin squid fishery. The resulting set of trips in the observer database included 238 on average for each year 2014-2016. These trips made 6,565 hauls of which 88% 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.

The observed longfin squid kept on these trips accounted for approximately 8% of the total longfin squid landed (this is the overall coverage rate based on weight). While a very rough estimate, especially given the low observer coverage in small mesh fisheries and non-accounting

for spatial and temporal trends, one can use the information in the table immediately following and the fact that about 14,040 mt of longfin squid were caught annually 2014-2016 to generally and roughly estimate annual incidental catch and discards for the species in the table. While this information is provided, readers are strongly cautioned that while this is a reasonable approach for a quick, rough, and relative estimate given the available data, it is highly imprecise and does not follow the protocol used for official discard estimates. A wide variety of species are caught in the longfin squid fishery, and only those estimated to be caught at a level more than 25,000 pounds per year are included (captures 98% of all discards). A full list is included in Appendix A. Note also that even the estimates that can be calculated would only really be valid for the 91% of landings captured by the chosen directed trip definition. It is even more difficult to assess the other 9% because to some degree the longfin squid is being caught incidental to other fisheries in those cases. Nonetheless, the longfin squid-to-other-species ratios were scaled up to the 100% of longfin squid catch to keep calculations relatively simple.

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Table 2. Incidental Catch and Discards in the Longfin Squid Fishery 2014-2016.

NE Fisheries Science Center Common Name	Pounds Observed Caught	Pounds Observed Discarded	Of all discards observed, percent that comes from given species	Percent of given species that was discarded	Pounds of given species caught per mt Longfin Kept	Pounds of given species discarded per mt Longfin Kept	Rough Annual Catch (pounds) based on 3-year (2014-2016) average of longfin landings (14,040 mt)	Rough Annual Discards (pounds) based on 3-year (2014-2016) average of longfin landings (14,040 mt)
SQUID, ATL LONG-FIN	7,597,493	206,738	5.3%	2.7%	2,266	62	31,818,693	865,828
BUTTERFISH	1,014,090	624,005	15.8%	61.5%	302	186	4,247,059	2,613,364
HAKE, SPOTTED	505,537	498,307	12.7%	98.6%	151	149	2,117,213	2,086,935
SCUP	390,352	241,441	6.1%	61.9%	116	72	1,634,814	1,011,169
SQUID, SHORT-FIN	369,753	255,930	6.5%	69.2%	110	76	1,548,546	1,071,848
HAKE, SILVER (WHITING)	348,245	225,638	5.7%	64.8%	104	67	1,458,466	944,982
SKATE, LITTLE	306,699	303,510	7.7%	99.0%	91	91	1,284,469	1,271,115
DOGFISH, SPINY	292,494	290,945	7.4%	99.5%	87	87	1,224,982	1,218,491
HAKE, RED (LING)	159,106	147,468	3.7%	92.7%	47	44	666,344	617,602
FLOUNDER, SUMMER (FLUKE)	141,374	62,096	1.6%	43.9%	42	19	592,082	260,060
DOGFISH, SMOOTH	113,902	101,635	2.6%	89.2%	34	30	477,028	425,651
SEA ROBIN, NORTHERN	112,384	112,308	2.9%	99.9%	34	34	470,669	470,351
SEA BASS, BLACK	91,049	74,753	1.9%	82.1%	27	22	381,316	313,068
SKATE, WINTER (BIG)	71,267	68,447	1.7%	96.0%	21	20	298,470	286,659
FLOUNDER, FOURSPOT	69,755	69,503	1.8%	99.6%	21	21	292,135	291,083
DORY, BUCKLER (JOHN)	47,816	24,573	0.6%	51.4%	14	7	200,258	102,911
MONKFISH (GOOSEFISH)	47,324	34,474	0.9%	72.8%	14	10	198,196	144,379
SCALLOP, SEA	45,928	35,033	0.9%	76.3%	14	10	192,347	146,720
HADDOCK	43,343	43,340	1.1%	100.0%	13	13	181,521	181,509
CRAB, LADY	41,939	41,939	1.1%	100.0%	13	13	175,642	175,642
SKATE, LITTLE/WINTER, NK	41,195	40,194	1.0%	97.6%	12	12	172,528	168,333
FISH, NK	38,363	38,336	1.0%	99.9%	11	11	160,665	160,554
SKATE, NK	34,427	33,472	0.9%	97.2%	10	10	144,182	140,182
BLUEFISH	28,444	9,331	0.2%	32.8%	8	3	119,127	39,080
SEAWEED, NK	24,430	24,430	0.6%	100.0%	7	7	102,313	102,313
SKATE, CLEARNOSE	23,975	23,062	0.6%	96.2%	7	7	100,408	96,583
FLOUNDER, WINTER (BLACKBACK)	19,952	19,687	0.5%	98.7%	6	6	83,560	82,451
ALEWIFE	18,924	18,669	0.5%	98.7%	6	6	79,254	78,186
SEA ROBIN, STRIPED	17,747	17,102	0.4%	96.4%	5	5	74,327	71,622
FLOUNDER, SAND DAB (WINDOWPANE)	17,054	16,780	0.4%	98.4%	5	5	71,422	70,273
BEARDFISH	13,929	13,929	0.4%	100.0%	4	4	58,337	58,337
SQUID EGGS, ATL LONG-FIN	13,855	13,855	0.4%	100.0%	4	4	58,025	58,025
HERRING, ATLANTIC	12,795	5,420	0.1%	42.4%	4	2	53,586	22,701
MACKEREL, CHUB	12,705	11,728	0.3%	92.3%	4	3	53,208	49,117
SKATE, BARNDOOR	12,269	12,269	0.3%	100.0%	4	4	51,382	51,382
DOGFISH, CHAIN	12,156	12,156	0.3%	100.0%	4	4	50,910	50,910
MACKEREL, ATLANTIC	12,130	5,268	0.1%	43.4%	4	2	50,799	22,062
CRAB, ROCK	11,645	11,641	0.3%	100.0%	3	3	48,768	48,753
SKATE, ROSETTE	11,463	11,463	0.3%	100.0%	3	3	48,008	48,008
CRAB, JONAH	10,748	10,381	0.3%	96.6%	3	3	45,014	43,477
BASS, STRIPED	10,596	9,339	0.2%	88.1%	3	3	44,378	39,113
SHAD, AMERICAN	9,763	9,709	0.2%	99.4%	3	3	40,888	40,661
DOGFISH, NK	9,460	9,460	0.2%	100.0%	3	3	39,619	39,619
HAKE, NK	8,562	1,634	0.0%	19.1%	3	0	35,857	6,845
JACK, NK	7,887	314	0.0%	4.0%	2	0	33,031	1,315
HERRING, NK	7,166	7,050	0.2%	98.4%	2	2	30,013	29,527
SEA ROBIN, ARMORED	6,794	6,794	0.2%	100.0%	2	2	28,453	28,453
FLOUNDER, WITCH (GREY SOLE)	6,434	6,391	0.2%	99.3%	2	2	26,946	26,766
LOBSTER, AMERICAN	6,156	4,575	0.1%	74.3%	2	1	25,780	19,160

The observer program creates individual animal records for some fish species of interest, mostly larger pelagics and/or elasmobranchs, as well as tagged fish. Counts of these individual fish records from the same trips are provided in the table below.

Table 3. Total Counts of fish in Individual Animal Records on all observed trips, 2014-2016

COMMON_NAME	count
AMBERJACK, NK	20
BARRACUDA, NK	6
BONITO, ATLANTIC	21
CRAB, HORSESHOE	1
CUTLASSFISH, ATL	5
GROUPER, SNOWY	4
MACKEREL, FRIGATE	102
MOLA, NK	2
MOLA, OCEAN SUNFISH	25
MOLA, SHARPTAIL	1
NEEDLEFISH, ATLANTIC	3
RAY, BUTTERFLY, NK	6
RAY, BUTTERFLY, SMOOTH	7
RAY, BUTTERFLY, SPINY	32
RAY, MANTA, ATLANTIC	1
RAY, NK	5
RAY, TORPEDO	229
SHARK, ATL ANGEL	164
SHARK, BASKING	21
SHARK, BIGNOSE	2
SHARK, BLACK TIP	1
SHARK, BLUE (BLUE DOG)	14
SHARK, CARCHARHINID,NK	68
SHARK, DUSKY	7
SHARK, HAMMERHEAD, SCALLOPED	17
SHARK, HAMMERHEAD,NK	3
SHARK, MAKO, SHORTFIN	2
SHARK, NIGHT	9
SHARK, NK	38
SHARK, PORBEAGLE (MACKEREL SHARK)	7
SHARK, SAND TIGER	21
SHARK, SANDBAR (BROWN SHARK)	143
SHARK, SEVENGILL SHARPNOSE	8
SHARK, SILKY	1
SHARK, THRESHER	10
SHARK, THRESHER, BIGEYE	1
SHARK, TIGER	15
SHARK, WHITE	8
STINGRAY, BLUNTNOSE	6
STINGRAY, NK	28
STINGRAY, PELAGIC	6
STINGRAY, ROUGHTAIL	198
STURGEON, ATLANTIC	33
STURGEON, NK	3
SWORDFISH	125
TUNA, BIG EYE	2
TUNA, BLUEFIN	2
TUNA, LITTLE (FALSE ALBACORE)	103
TUNA, NK	5
TUNA, YELLOWFIN	1
WAHOO	1
WRECKFISH	2

Species with extrapolated catches above 200,000 pounds per year in the longfin squid fishery, which is used as a proxy to highlight species with a potential substantial impact, include butterfish, spotted hake, scup, *Illex* squid, silver hake, little skate, spiny dogfish, red hake, summer flounder, smooth dogfish, northern sea robin, black sea bass, winter (big) skate, fourspot flounder, and john dory buckler. Of these, red hake and summer flounder are experiencing overfishing, and red hake is overfished. There are no assessments for northern sea robin, fourspot flounder, and john dory buckler. Assessment information is available at http://sedarweb.org/species/smooth-dogfish-shark for smooth dogfish, https://www.nefsc.noaa.gov/publications/crd/crd1802/crd1802.pdf for red hake, and at https://www.nefsc.noaa.gov/saw/ for the other species with assessments.

***Illex* Squid Non-Target Species**

Various species are caught incidentally by the *Illex* squid fishery and will be impacted to some degree by the prosecution of the fishery. Non-target interactions and discards in the *Illex* squid fishery are relatively low. On the *Illex* squid trips identified in this analysis, the 2014-2016 overall discard rate of finfish was 1.5%. For every 100 pounds of *Illex* squid retained, less than 2 pounds of fish was discarded. For non-target species that are managed under their own FMP, incidental catch/discards are also considered as part of the management of that fishery. This EA reviewed observer data from 2014-2016 to evaluate non-target catches.

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. Presumably some 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. Thus to begin this process, staff first reviewed 2014-2016 trips in the dealer weighout database to see if a certain trip definition could account for most *Illex* squid landed. Since fisheries evolve over time, a relatively recent, three-year time period was examined.

The result of this review resulted in the following definition for *Illex* squid trips using landings: All trips that had at least 50% *Illex* squid by weight for retained species. This definition results in capturing 97% of all *Illex* squid landings in the dealer weighout database 2014-2016. This definition was applied to the observer database to examine discards in the *Illex* squid fishery.

The resulting set of trips in the observer database included 12 on average for each year 2014-2016. These trips made 604 hauls of which 91% 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.

The observed *Illex* squid kept on these trips accounted for approximately 18% of the total *Illex* squid landed (this is the overall coverage rate based on weight). While a very rough estimate, especially given the low observer coverage in small mesh fisheries and non-accounting for spatial and temporal trends, one can use the information in the table immediately following and the fact that about 5,957 mt of *Illex* squid were caught annually 2014-2016 to generally and roughly estimate annual incidental catch and discards for the species in the table. While this information is provided, readers are strongly cautioned that while this is a reasonable approach for a quick, rough, and relative estimate given the available data, it is highly imprecise and does not follow the protocol used for official discard estimates. A variety of species are caught in the *Illex* squid fishery, and only those estimated to be caught at a level more than 10,000 pounds per year are included (captures 85% of all discards). A full list is included in Appendix A. Note also that even the estimates that can be calculated would only really be valid for the 97% of landings captured by the chosen directed trip definition. It is even more difficult to assess the other 3% because to some degree the *Illex* squid is being caught incidental to other fisheries in those cases. Nonetheless, the *Illex* squid-to-other-species ratios were scaled up to the 100% of *Illex* squid catch to keep calculations relatively simple.

Table 4. Incidental Catch and Discards in the *Illex* Squid Fishery.

NE Fisheries Science Center Common Name	Pounds Observed Caught	Pounds Observed Discarded	Of all discards observed, percent that comes from given species	Percent of given species that was discarded	Pounds of given species caught per mt Illex Kept	Pounds of given species discarded per mt Illex Kept	Rough Annual Catch (pounds) based on 3-year (2014-2016) average of Illex landings (5,957 mt)	Rough Annual Discards (pounds) based on 3-year (2014-2016) average of Illex landings (5,957 mt)
SQUID, SHORT-FIN	7,097,116	16,516	18.0%	0.2%	2,210	5	13,163,555	30,634
MACKEREL, CHUB	376,794	12,359	13.5%	3.3%	117	4	698,868	22,924
SQUID, ATL LONG-FIN	262,484	4,577	5.0%	1.7%	82	1	486,850	8,489
BUTTERFISH	67,180	2,521	2.7%	3.8%	21	1	124,604	4,676
DORY, BUCKLER (JOHN)	61,823	26,571	28.9%	43.0%	19	8	114,668	49,284
BEARDFISH	11,071	10,138	11.0%	91.6%	3	3	20,534	18,804
SQUID, NK	6,500	0	0.0%	0.0%	2	0	12,057	1
FISH, NK	5,778	5,139	5.6%	88.9%	2	2	10,716	9,532

The observer program creates individual animal records for some fish species of interest, mostly larger pelagics and/or elasmobranchs, as well as tagged fish. Counts of these individual fish records from the same trips are provided in the table below.

Table 5. Total Counts of fish in Individual Animal Records on observed trips from 2014-2016

COMMON_NAME	count
AMBERJACK, NK	3
MARLIN, NK	1
MOLA, NK	17
MOLA, OCEAN SUNFISH	40
MOLA, SHARPTAIL	2
RAY, TORPEDO	18
SHARK, BASKING	5
SHARK, CARCHARHINID,NK	1
SHARK, HAMMERHEAD, SCALLOPED	12
SHARK, HAMMERHEAD,NK	4
SHARK, NIGHT	8
SHARK, NK	7
SHARK, SMALLTOOTH SAND TIGER	1
SHARK, SPINNER	3
SHARK, THRESHER	2
SHARK, THRESHER, BIGEYE	3
SHARK, TIGER	1
STINGRAY, ROUGHTAIL	3
SWORDFISH	185
TUNA, BIG EYE	3

Species with extrapolated catches above 200,000 pounds per year in the *Illex* squid fishery, which is used as a proxy to highlight species with a potential substantial impact, include chub mackerel and longfin squid. There is no assessment for chub mackerel. Longfin squid is not overfished and overfishing is not occurring. Assessment information is available at https://www.nefsc.noaa.gov/saw/ for longfin squid and is also summarized above.

Butterfish Non-Target Species

There are very few observed directed butterfish trips due to the low directed effort toward butterfish in recent years. Various species will be caught incidentally to any butterfish fishing and will be impacted to some degree by the prosecution of the fishery. On the butterfish trips identified in this analysis, the 2014-2016 overall discard rate of finfish was 4%. For non-target species that are managed under their own FMP, incidental catch/discards are also considered as part of the management of that fishery. This EA reviewed observer data from 2014-2016 to evaluate non-target catches.

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. Presumably some 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. Thus to begin this process, staff first reviewed 2014-2016 trips in the dealer weighout database to see if a certain trip definition could account for most butterfish landed. Since fisheries evolve over time, a relatively recent, three-year time period was examined.

The result of this review resulted in the following definition for butterfish trips using landings: All trips that had at least 25,000 pounds butterfish by weight for retained species. This definition results in capturing 59% of all butterfish landings in the dealer weighout database 2014-2016. Lowering the poundage threshold to capture a greater proportion of total catch brings in many trips where butterfish was a minority catch. A resurgent directed butterfish fishery would also likely have most landings occur above 25,000 pounds. This definition was applied to the observer database to examine discards in the butterfish fishery. The resulting set of trips in the observer database included 4 on average for each year 2014-2016. These trips made 355 hauls of which 89% 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.

The observed butterfish kept on these trips accounted for approximately 8% of the total butterfish landed (this is the overall coverage rate based on weight). While a very rough estimate, especially given the low observer coverage in small mesh fisheries and non-accounting for spatial and temporal trends, one can use the information in the table immediately following and the fact that about 2,144 mt of butterfish were caught annually 2014-2016 to generally and roughly estimate annual incidental catch and discards for the species in the table. While this information is provided, readers are strongly cautioned that while this is a reasonable approach for a quick, rough, and relative estimate given the available data, it is highly imprecise and does not follow the protocol used for official discard estimates. There is also likely to be substantial overlap with longfin squid trips, so estimates are not additive across fisheries. A variety of

species are caught in the butterfish fishery as defined herein, and only those estimated to be caught at a level more than 10,000 pounds per year are included (captures 95% of all discards). A full list is included in Appendix A. Note also that even the estimates that can be calculated would only really be valid for the 59% of landings captured by the chosen directed trip definition. It is even more difficult to assess the other 41% because to a large degree the butterfish is being caught incidental to other fisheries in those cases. Nonetheless, the butterfish-to-other-species ratios were scaled up to the 100% of butterfish catch to keep calculations relatively simple.

Table 6. Incidental Catch and Discards in the butterfish Fishery.

NE Fisheries Science Center Common Name	Pounds Observed Caught	Pounds Observed Discarded	Of all discards observed, percent that comes from given species	Percent of given species that was discarded	Pounds of given species caught per mt butterfish Kept	Pounds of given species discarded per mt butterfish Kept	Rough Annual Catch (pounds) based on 3-year (2014-2016) average of butterfish landings (2,144 mt)	Rough Annual Discards (pounds) based on 3-year (2014-2016) average of butterfish landings (2,144 mt)
BUTTERFISH	1,168,853	11,165	7.1%	1.0%	2,226	21	4,772,533	45,587
SQUID, ATL LONG-FIN	769,470	2,667	1.7%	0.3%	1,465	5	3,141,815	10,888
SQUID, SHORT-FIN	758,439	19,677	12.5%	2.6%	1,444	37	3,096,775	80,343
MACKEREL, ATLANTIC	637,521	1,136	0.7%	0.2%	1,214	2	2,603,056	4,640
MACKEREL, CHUB	108,381	404	0.3%	0.4%	206	1	442,530	1,650
HAKE, SILVER (WHITING)	29,552	29,271	18.5%	99.0%	56	56	120,665	119,518
HADDOCK	28,621	28,621	18.1%	100.0%	55	55	116,863	116,863
DOGFISH, SPINY	19,084	19,084	12.1%	100.0%	36	36	77,920	77,920
HAKE, RED (LING)	15,828	15,828	10.0%	100.0%	30	30	64,628	64,628
SQUID, NK	14,001	1	0.0%	0.0%	27	0	57,167	4
DORY, BUCKLER (JOHN)	12,403	7,577	4.8%	61.1%	24	14	50,643	30,939
HAKE, SPOTTED	7,061	7,061	4.5%	100.0%	13	13	28,831	28,831
FISH, NK	4,206	4,206	2.7%	100.0%	8	8	17,175	17,175
HERRING, ROUND	3,126	3,126	2.0%	100.0%	6	6	12,762	12,762

The observer program creates individual animal records for some fish species of interest, mostly larger pelagics and/or elasmobranchs, as well as tagged fish. Counts of these individual fish records from the same trips are provided in the table below.

Table 7. Total Counts of fish in Individual Animal Records on all observed trips, 2014-2016

COMMON_NAME	count
MOLA, OCEAN SUNFISH	20
MOLA, SHARPTAIL	2
RAY, MANTA, ATLANTIC	1
RAY, TORPEDO	2
SHARK, BASKING	5
SHARK, BLUE (BLUE DOG)	4
SHARK, CARCHARHINID,NK	9
SHARK, HAMMERHEAD, SCALLOPED	32
SHARK, HAMMERHEAD,NK	1
SHARK, MAKO, SHORTFIN	2
SHARK, NIGHT	9
SHARK, PORBEAGLE (MACKEREL SHARK)	18
SHARK, SANDBAR (BROWN SHARK)	4
SHARK, SILKY	1
SHARK, SMALLTOOTH SAND TIGER	1
SHARK, THRESHER	6
SHARK, THRESHER, BIGEYE	5
SHARK, TIGER	2
STINGRAY, NK	1
STINGRAY, PELAGIC	1
STINGRAY, ROUGHTAIL	1
SWORDFISH	83
TUNA, BLUEFIN	1
TUNA, LITTLE (FALSE ALBACORE)	4
TUNA, YELLOWFIN	1
WAHOO	1

There are no species with extrapolated catches above 200,000 pounds per year in the butterfish fishery, which is used as a proxy to highlight species with a potential substantial impact.

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6.2 PHYSICAL ENVIRONMENT AND HABITAT, INCLUDING ESSENTIAL FISH HABITAT (EFH)

Climate, physiographic, and hydrographic differences separate the Atlantic Ocean from Maine to Florida into the New England-Middle Atlantic Area and the South Atlantic Area (division/mixing at Cape Hatteras, NC). The MSB fisheries are prosecuted in the New England-Middle Atlantic Area. The inshore New England-Middle Atlantic area is relatively uniform physically, and is influenced by many large coastal rivers and estuarine areas. The continental shelf (characterized by water less than 650 ft. in depth) extends seaward approximately 120 miles off Cape Cod, narrows gradually to 70 miles off New Jersey, and is 20 miles wide at Cape Hatteras. Surface circulation is generally southwesterly on the continental shelf during all seasons of the year, although this may be interrupted by coastal indrafting and some reversal of flow at the northern and southern extremities of the area. Water temperatures range from less than 33 ^{o}F from the New York Bight north in the winter to over 80 ^{o}F off Cape Hatteras in summer.

Within the New England-Middle Atlantic Area, the principal area within which the MSB fisheries are prosecuted, is the Northeast Shelf Ecosystem which includes the area from the Gulf of Maine to Cape Hatteras, extending from the coast seaward to the edge of the continental shelf, including the slope sea offshore to the Gulf Stream. A number of distinct subsystems comprise the region. The Gulf of Maine is an enclosed coastal sea, characterized by relatively cold waters and deep basins, with various 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. Detailed information on the affected physical and biological environments inhabited by the managed resources is available in Stevenson et al. (2006).

Ecosystem Considerations

The Council recently adopted an Ecosystem Approach to Fisheries Management (EAFM) Guidance Document, available at http://www.mafmc.org/eafm/. It is anticipated that the EAFM Guidance Document will serve through a transitional period where ecosystem considerations are introduced into Council management in an evolutionary fashion. Some highlights from the EAFM Guidance Document that could apply to MSB management include:

-It is the policy of the Council to support the maintenance of an adequate forage base in the Mid-Atlantic to ensure ecosystem productivity, structure and function and to support sustainable fishing communities.

-The Council could adopt biological reference points (overfishing levels or OFL) for forage stocks that are more conservative than the required MSA standard of F_{MSY}.

-The Council could modify the existing risk policy to accommodate ecosystem level concerns for forage species by reducing the maximum tolerance for risk of overfishing.

-The Council will promote the timely collection of data and development of analyses to support the biological, economic and social evaluation of ecosystem-level connections, tradeoffs, and risks, including those required to establish an optimal forage fish harvest policy.

-Habitat and climate change considerations will be more fully integrated into fishery management decisions.

The NEFSC also produces regular updates on conditions of the Northeast Shelf Ecosystem, which may be accessed via https://www.nefsc.noaa.gov/ecosys/. Highlights from the Spring 2017 Update include:

-Sea surface temperatures (SSTs) in the Northeast Shelf Large Marine Ecosystem during 2016 continue to be above average; in some season/area time series, 2016 was the second warmest year on record.

-The fall bloom on the Northeast Shelf was well developed in the Gulf of Maine, and, though chlorophyll concentrations on Georges Bank were elevated, a distinct bloom was not detected.

-Cool water habitats (5-15°C), which form the core thermal habitats of the Northeast Shelf, were at average levels in 2016, whereas warm habitats (16-27°C) were at high levels reflecting the trend of increasing warm habitat in recent years.

-The variability of daily sea surface temperature has increased over recent decades as indicated by the trends in standard deviation of daily temperature.

-The fall distribution of fish and invertebrate species sampled by the NEFSC shows that most species have moved to the Northeast and into deeper water.

-The strength of temperature fronts has increased over much of the Northeast Shelf; the 2016 frontal magnitudes for Northeast Shelf ecoregions moderated compared to recent years.

Habitat, Including Essential Fish Habitat (EFH)

Pursuant to the Magnuson-Stevens Act / EFH Provisions (50 CFR Part 600.815 (a)(1)), an FMP must describe EFH by life history stage for each of the managed species in the plan. This information was updated via Amendment 11 to the MSB FMP. EFH for the four species managed under this FMP is described using fundamental information on habitat requirements by life history stage that is summarized in a series of EFH source documents produced by NMFS and available at: http://www.nefsc.noaa.gov/nefsc/habitat/efh/. The updated EFH designations (text and maps) are available at http://www.habitat.noaa.gov/protection/efh/efhmapper/. In general, EFH for the MSB species is the water column itself, and the species have temperature and prey preferences/needs that determine the habitat suitability of any particular area/depth, thus fishing activity has minimal impacts. Longfin squid also use hard bottom, submerged vegetation, other natural or artificial structure, and sand or mud to attach/anchor eggs, but there are no known preferences for different types of substrates or indications that fishing activity may negatively impact longfin squid egg EFH. Impacts to EFH are separate from impacts to longfin squid eggs themselves, which are considered in the alternative impact analysis in Section 7.

There are other lifestages of federally-managed species that have designated EFH that may be susceptible to adverse impacts from bottom trawls used in MSB fisheries, depending on the geographic distribution of their essential habitats in relation to the footprint of MSB bottom trawl fishing activity. Most directed fishing for MSB species occurs with bottom trawls. In 2014-2016 NMFS audited northeast dealer data records ("AA tables") that had gear type identified (92% of total landings for longfin squid, almost 100% for *Illex* squid, and 96% for butterfish), standard bottom trawls accounted for 98% of longfin squid landings, almost 100% of *Illex* squid landings, and 98% of butterfish landings. Mackerel fishing uses both bottom trawl and mid-water trawl. EFH for all the federally-managed species in the region that could potentially be affected by MSB bottom trawling activity is described in the following table (see Stevenson et al 2004):

Table 8. EFH descriptions for species vulnerable to trawl gear

Species	Life Stage	Geographic Area	Depth (meters)	Habitat Type and Description
Acadian redfish	Juveniles	Gulf of Maine and the continental slope north of 37°38'N	50-200 in Gulf of Maine, to 600 on slope	Sub-tidal coastal and offshore rocky reef substrates with associated structure-forming epifauna (e.g., sponges, corals) , and soft sediments with cerianthid anemones
Acadian redfish	Adults	Gulf of Maine and the continental slope north of 37°38'N	140-300 in Gulf of Maine, to 600 on slope	Offshore benthic habitats on finer grained sediments and on variable deposits of gravel, silt, clay, and boulders
American plaice	Juveniles	Gulf of Maine and bays and estuaries from Passamaquoddy	40-180	Sub-tidal benthic habitats

Species	Life Stage	Geographic Area	Depth (meters)	Habitat Type and Description
		Bay to Saco Bay, Maine and from Massachusetts Bay to Cape Cod Bay, Massachusetts Bay		on mud and sand, also found on gravel and sandy substrates bordering bedrock
American plaice	Adults	Gulf of Maine, Georges Bank and bays and estuaries from Passamaquoddy Bay to Saco Bay, Maine and from Massachusetts Bay to Cape Cod Bay, Massachusetts Bay	40-300	Sub-tidal benthic habitats on mud and sand, also gravel and sandy substrates bordering bedrock
Atlantic cod	Juveniles	Gulf of Maine, Georges Bank, and Southern New England, including nearshore waters from eastern Maine to Rhode Island and the following estuaries: Passamaquoddy Bay to Saco Bay; Massachusetts Bay, Boston Harbor, Cape Cod Bay, and Buzzards Bay	Mean high water-120	Structurally-complex intertidal and sub-tidal habitats, including eelgrass, mixed sand and gravel, and rocky habitats (gravel pavements, cobble, and boulder) with and without attached macroalgae and emergent epifauna
Atlantic cod	Adults	Gulf of Maine, Georges Bank, Southern New England, and the Mid-Atlantic to Delaware Bay, including the following estuaries: Passamaquoddy Bay to Saco Bay; Massachusetts Bay, Boston Harbor, Cape Cod Bay, and Buzzards Bay	30-160	Structurally complex sub-tidal hard bottom habitats with gravel, cobble, and boulder substrates with and without emergent epifauna and macroalgae, also sandy substrates and along deeper slopes of ledges
Atlantic halibut	Juveniles & Adults	Gulf of Maine, Georges Bank, and continental slope south of Georges Bank	60-140 and 400-700 on slope	Benthic habitats on sand, gravel, or clay substrates
Atlantic herring	Eggs	Coastal Gulf of Maine, Georges Bank, and Southern New England	5-90	Sub-tidal benthic habitats on coarse sand, pebbles, cobbles, and boulders and/or macroalgae
Atlantic sea scallop	Eggs	Gulf of Maine coastal waters and offshore banks, Georges Bank, and the Mid-Atlantic, including the following estuaries: Passamaquoddy Bay to Sheepscot River; Casco Bay, Massachusetts Bay, and Cape Cod Bay	18-110	Inshore and offshore benthic habitats (see adults)
Atlantic sea scallop	Larvae	Gulf of Maine coastal waters and offshore banks, Georges Bank, and the Mid-Atlantic, including the following estuaries: Passamaquoddy Bay to Sheepscot River; Casco Bay, Massachusetts Bay, and Cape Cod Bay	No information	Inshore and offshore pelagic and benthic habitats: pelagic larvae (“spat”), settle on variety of hard surfaces, including shells, pebbles, and gravel and to macroalgae and other benthic organisms such as hydroids
Atlantic sea scallop	Juveniles	Gulf of Maine coastal waters and offshore banks, Georges Bank, and the Mid-Atlantic, including the following estuaries: Passamaquoddy Bay to Sheepscot River; Casco Bay, Great Bay, Massachusetts Bay, and Cape Cod Bay	18-110	Benthic habitats initially attached to shells, gravel, and small rocks (pebble, cobble), later free-swimming juveniles found in same habitats as adults
Atlantic sea scallop	Adults	Gulf of Maine coastal waters and offshore banks, Georges Bank, and the Mid-Atlantic, including the following estuaries: Passamaquoddy Bay to Sheepscot	18-110	Benthic habitats with sand and gravel substrates

Species	Life Stage	Geographic Area	Depth (meters)	Habitat Type and Description
		River; Casco Bay, Great Bay, Massachusetts Bay, and Cape Cod Bay		
Atlantic surfclams	Juveniles and adults	Continental shelf from southwestern Gulf of Maine to Cape Hatteras, North Carolina	Surf zone to about 61, abundance low >38	In substrate to depth of 3 ft
Atlantic wolffish	Eggs	U.S. waters north of 41˚N latitude and east of 71˚W longitude	<100	Sub-tidal benthic habitats under rocks and boulders in nests
Atlantic wolffish	Juveniles	U.S. waters north of 41˚N latitude and east of 71˚W longitude	70-184	Sub-tidal benthic habitats
Atlantic wolffish	Adults	U.S. waters north of 41˚N latitude and east of 71˚W longitude	<173	A wide variety of sub-tidal sand and gravel substrates once they leave rocky spawning habitats, but not on muddy bottom
Barndoor skate	Juveniles and adults	Primarily on Georges Bank and in Southern New England and on the continental slope	40-400 on shelf and to 750 on slope	Sub-tidal benthic habitats on mud, sand, and gravel substrates
Black sea bass	Juveniles and adults	Continental shelf and estuarine waters from the southwestern Gulf of Maine and Cape Hatteras, North Carolina	Inshore in summer and spring	Benthic habitats with rough bottom, shellfish and eelgrass beds, man-made structures in sandy-shelly areas, also offshore clam beds and shell patches in winter
Clearnose skate	Juveniles	Inner continental shelf from New Jersey to the St. Johns River in Florida and certain bays and certain estuaries including Raritan Bay, inland New Jersey bays, Chesapeake Bay, and Delaware Bays	0-30	Sub-tidal benthic habitats on mud and sand, but also on gravelly and rocky bottom
Clearnose skate	Adults	Inner continental shelf from New Jersey to the St. Johns River in Florida and certain bays and certain estuaries including Raritan Bay, inland New Jersey bays, Chesapeake Bay, and Delaware Bays	0-40	Sub-tidal benthic habitats on mud and sand, but also on gravelly and rocky bottom
Deep-sea red crab	Eggs	Outer continental shelf and slope throughout the region, including two seamounts	320-640	Benthic habitats attached to female crabs
Deep-sea red crab	Juveniles	Outer continental shelf and slope throughout the region, including two seamounts	320-1300 on slope and to 2000 on seamounts	Benthic habitats with unconsolidated and consolidated silt-clay sediments
Deep-sea red crab	Adults	Outer continental shelf and slope throughout the region, including two seamounts	320-900 on slope and up to 2000 on seamounts	Benthic habitats with unconsolidated and consolidated silt-clay sediments
Golden tilefish	Juveniles and adults	Outer continental shelf and slope from U.S.-Canada boundary to the Virginia-North Carolina boundary	100-300	Burrows in semi-lithified clay substrate, may also utilize rocks, boulders, scour depressions beneath boulders, and exposed rock ledges as shelter
Haddock	Juveniles	Inshore and offshore waters in the Gulf of Maine, on Georges Bank, and on the continental shelf in the Mid-Atlantic region	40-140 and as shallow as 20 in coastal Gulf of Maine	Sub-tidal benthic habitats on hard sand (particularly smooth patches between rocks), mixed sand and shell, gravelly sand, and gravel

Species	Life Stage	Geographic Area	Depth (meters)	Habitat Type and Description
Haddock	Adults	Offshore waters in the Gulf of Maine, on Georges Bank, and on the continental shelf in Southern New England	50-160	Sub-tidal benthic habitats on hard sand (particularly smooth patches between rocks), mixed sand and shell, gravelly sand, and gravel and adjacent to boulders and cobbles along the margins of rocky reefs
Little skate	Juveniles	Coastal waters in the Gulf of Maine, Georges Bank, and the continental shelf in the Mid-Atlantic region as far south as Delaware Bay, including certain bays and estuaries in the Gulf of Maine	Mean high water-80	Intertidal and sub-tidal benthic habitats on sand and gravel, also found on mud
Little skate	Adults	Coastal waters in the Gulf of Maine, Georges Bank, and the continental shelf in the Mid-Atlantic region as far south as Delaware Bay, including certain bays and estuaries in the Gulf of Maine	Mean high water-100	Intertidal and sub-tidal benthic habitats on sand and gravel, also found on mud
Longfin inshore squid	Eggs	Inshore and offshore waters from Georges Bank southward to Cape Hatteras	Generally <50	Bottom habitats attached to variety of hard bottom types, macroalgae, sand, and mud
Monkfish	Juveniles	Gulf of Maine, outer continental shelf in the Mid-Atlantic, and the continental slope	50-400 in the Mid-Atlantic, 20-400 in the Gulf of Maine, and to 1000 on the slope	Sub-tidal benthic habitats on a variety of habitats, including hard sand, pebbles, gravel, broken shells, and soft mud, also seek shelter among rocks with attached algae
Monkfish	Adults	Gulf of Maine, outer continental shelf in the Mid-Atlantic, and the continental slope	50-400 in the Mid-Atlantic, 20-400 in the Gulf of Maine, and to 1000 on the slope	Sub-tidal benthic habitats on hard sand, pebbles, gravel, broken shells, and soft mud, but seem to prefer soft sediments, and, like juveniles, utilize the edges of rocky areas for feeding
Ocean pout	Eggs	Georges Bank, Gulf of Maine, and the Mid-Atlantic, including certain bays and estuaries in the Gulf of Maine	<100	Sub-tidal hard bottom habitats in sheltered nests, holes, or rocky crevices
Ocean pout	Juveniles	Gulf of Maine, on the continental shelf north of Cape May, New Jersey, on the southern portion of Georges Bank, and including certain bays and estuaries in the Gulf of Maine	Mean high water-120	Intertidal and sub-tidal benthic habitats on a wide variety of substrates, including shells, rocks, algae, soft sediments, sand, and gravel
Ocean pout	Adults	Gulf of Maine, Georges Bank, on the continental shelf north of Cape May, New Jersey, and including certain bays and estuaries in the Gulf of Maine	20-140	Sub-tidal benthic habitats on mud and sand, particularly in association with structure forming habitat types; i.e. shells, gravel, or boulders
Ocean quahogs	Juveniles and adults	Continental shelf from southern New England and Georges Bank to Virginia	9-244	In substrate to depth of 3 ft
Offshore hake	Juveniles	Outer continental shelf and slope from Georges Bank to 34° 40'N	160-750	Pelagic and benthic habitats
Offshore hake	Adults	Outer continental shelf and slope from Georges Bank to 34° 40'N	200-750	Pelagic and benthic habitats
Pollock	Juveniles	Inshore and offshore waters in the Gulf of Maine (including bays	Mean high water-180 in Gulf of	Intertidal and sub-tidal pelagic and benthic rocky bottom habitats with

Species	Life Stage	Geographic Area	Depth (meters)	Habitat Type and Description
		and estuaries in the Gulf of Maine), the Great South Channel, Long Island Sound, and Narragansett Bay, Rhode Island	Maine, Long Island Sound, and Narragansett Bay; 40-180 on Georges Bank	attached macroalgae, small juveniles in eelgrass beds, older juveniles move into deeper water habitats also occupied by adults
Pollock	Adults	Offshore Gulf of Maine waters, Massachusetts Bay and Cape Cod Bay, on the southern edge of Georges Bank, and in Long Island Sound	80-300 in Gulf of Maine and on Georges Bank; <80 in Long Island Sound, Cape Cod Bay, and Narragansett Bay	Pelagic and benthic habitats on the tops and edges of offshore banks and shoals with mixed rocky substrates, often with attached macro algae
Red hake	Juveniles	Gulf of Maine, Georges Bank, and the Mid-Atlantic, including Passamaquoddy Bay to Cape Cod Bay in the Gulf of Maine, Buzzards Bay and Narragansett Bay, Long Island Sound, Raritan Bay and the Hudson River, and lower Chesapeake Bay	Mean high water-80	Intertidal and sub-tidal soft bottom habitats, esp those that that provide shelter, such as depressions in muddy substrates, eelgrass, macroalgae, shells, anemone and polychaete tubes, on artificial reefs, and in live bivalves (e.g., scallops)
Red hake	Adults	In the Gulf of Maine, the Great South Channel, and on the outer continental shelf and slope from Georges Bank to North Carolina , including inshore bays and estuaries as far south as Chesapeake Bay	50-750 on shelf and slope, as shallow as 20 inshore	Sub-tidal benthic habitats in shell beds, on soft sediments (usually in depressions), also found on gravel and hard bottom and artificial reefs
Rosette skate	Juveniles and adults	Outer continental shelf from approximately 40˚N to Cape Hatteras, North Carolina	80-400	Benthic habitats with mud and sand substrates
Scup	Juveniles	Continental shelf between southwestern Gulf of Maine and Cape Hatteras, North Carolina and in nearshore and estuarine waters between Massachusetts and Virginia	No information	Benthic habitats, in association with inshore sand and mud substrates, mussel and eelgrass beds
Scup	Adults	Continental shelf and nearshore and estuarine waters between southwestern Gulf of Maine and Cape Hatteras, North Carolina	No information, generally overwinter offshore	Benthic habitats
Silver hake	Juveniles	Gulf of Maine, including certain bays and estuaries, and on the continental shelf as far south as Cape May, New Jersey	40-400 in Gulf of Maine, >10 in Mid-Atlantic	Pelagic and sandy sub-tidal benthic habitats in association with sand-waves, flat sand with amphipod tubes, shells, and in biogenic depressions
Silver hake	Adults	Gulf of Maine, including certain bays and estuaries, the southern portion of Georges Bank, and the outer continental shelf and some shallower coastal locations in the Mid-Atlantic	>35 in Gulf of Maine, 70-400 on Georges Bank and in the Mid-Atlantic	Pelagic and sandy sub-tidal benthic habitats, often in bottom depressions or in association with sand waves and shell fragments, also in mud habitats bordering deep boulder reefs, on over deep boulder reefs in the southwest Gulf of Maine
Smooth skate	Juveniles	Offshore Gulf of Maine, some coastal bays in Maine and New Hampshire, and on the continental slope from Georges Bank to North Carolina	100-400 offshore Gulf of Maine, <100 inshore Gulf of Maine, to 900 on slope	Benthic habitats, mostly on soft mud in deeper areas, but also on sand, broken shells, gravel, and pebbles on offshore banks in the Gulf of Maine

Species	Life Stage	Geographic Area	Depth (meters)	Habitat Type and Description
Smooth skate	Adults	Offshore Gulf of Maine and the continental slope from Georges Bank to North Carolina	100-400 offshore Gulf of Maine, to 900 on slope	Benthic habitats, mostly on soft mud in deeper areas, but also on sand, broken shells, gravel, and pebbles on offshore banks in the Gulf of Maine
Summer flounder	Juveniles	Continental shelf and estuaries from Cape Cod, Massachusetts, to Cape Canaveral, Florida	To maximum 152	Benthic habitats, including inshore estuaries, salt marsh creeks, seagrass beds, mudflats, and open bay areas
Summer flounder	Adults	Continental shelf from Cape Cod, Massachusetts, to Cape Canaveral, Florida, including shallow coastal and estuarine waters during warmer months	To maximum 152 in colder months	Benthic habitats
Spiny dogfish	Juveniles	Primarily the outer continental shelf and slope between Cape Hatteras and Georges Bank and in the Gulf of Maine	Deep water	Pelagic and epibenthic habitats
Spiny dogfish	Female sub-adults	Throughout the region	Wide depth range	Pelagic and epibenthic habitats
Spiny dogfish	Male sub-adults	Primarily in the Gulf of Maine and on the outer continental shelf from Georges Bank to Cape Hatteras	Wide depth range	Pelagic and epibenthic habitats
Spiny dogfish	Female adults	Throughout the region	Wide depth range	Pelagic and epibenthic habitats
Spiny dogfish	Male adults	Throughout the region	Wide depth range	Pelagic and epibenthic habitats
Thorny skate	Juveniles	Offshore Gulf of Maine, some coastal bays in the Gulf of Maine, and on the continental slope from Georges Bank to North Carolina	35-400 offshore Gulf of Maine, <35 inshore Gulf of Maine, to 900 om slope	Benthic habitats on a wide variety of bottom types, including sand, gravel, broken shells, pebbles, and soft mud
Thorny skate	Adults	Offshore Gulf of Maine and on the continental slope from Georges Bank to North Carolina	35-400 offshore Gulf of Maine, <35 inshore Gulf of Maine, to 900 om slope	Benthic habitats on a wide variety of bottom types, including sand, gravel, broken shells, pebbles, and soft mud
White hake	Juveniles	Gulf of Maine, Georges Bank, and Southern New England, including bays and estuaries in the Gulf of Maine	Mean high water - 300	Intertidal and sub-tidal estuarine and marine habitats on fine-grained, sandy substrates in eelgrass, macroalgae, and un-vegetated habitats
White hake	Adults	Gulf of Maine, including coastal bays and estuaries, and the outer continental shelf and slope	100-400 offshore Gulf of Maine, >25 inshore Gulf of Maine, to 900 on slope	Sub-tidal benthic habitats on fine-grained, muddy substrates and in mixed soft and rocky habitats
Windowpane flounder	Juveniles	Estuarine, coastal, and continental shelf waters from the Gulf of Maine to northern Florida, including bays and estuaries from Maine to Maryland	Mean high water - 60	Intertidal and sub-tidal benthic habitats on mud and sand substrates
Windowpane flounder	Adults	Estuarine, coastal, and continental shelf waters from the Gulf of Maine to Cape Hatteras, North Carolina, including bays and estuaries from Maine to Maryland	Mean high water - 70	Intertidal and sub-tidal benthic habitats on mud and sand substrates

Species	Life Stage	Geographic Area	Depth (meters)	Habitat Type and Description
Winter flounder	Eggs	Eastern Maine to Absecon Inlet, New Jersey (39° 22´N) and Georges Bank	0-5 south of Cape Cod, 0-70 Gulf of Maine and Georges Bank	Sub-tidal estuarine and coastal benthic habitats on mud, muddy sand, sand, gravel, submerged aquatic vegetation, and macroalgae
Winter flounder	Juveniles	Coastal Gulf of Maine, Georges Bank, and continental shelf in Southern New England and Mid-Atlantic to Absecon Inlet, New Jersey, including bays and estuaries from eastern Maine to northern New Jersey	Mean high water - 60	Intertidal and sub-tidal benthic habitats on a variety of bottom types, such as mud, sand, rocky substrates with attached macro algae, tidal wetlands, and eelgrass; young-of-the-year juveniles on muddy and sandy sediments in and adjacent to eelgrass and macroalgae, in bottom debris, and in marsh creeks
Winter flounder	Adults	Coastal Gulf of Maine, Georges Bank, and continental shelf in Southern New England and Mid-Atlantic to Absecon Inlet, New Jersey, including bays and estuaries from eastern Maine to northern New Jersey	Mean high water - 70	Intertidal and sub-tidal benthic habitats on muddy and sandy substrates, and on hard bottom on offshore banks; for spawning adults, also see eggs
Winter skate	Juveniles	Coastal waters from eastern Maine to Delaware Bay, including certain bays and estuaries from eastern Maine to Chincoteague Bay, Virginia, and on Georges Bank and the continental shelf in Southern New England and the Mid-Atlantic	0-90	Sub-tidal benthic habitats on sand and gravel substrates, are also found on mud
Winter skate	Adults	Coastal waters from eastern Maine to Delaware Bay, including certain bays and estuaries in Maine and New Hampshire, and on Georges Bank and the continental shelf in Southern New England and the Mid-Atlantic	0-80	Sub-tidal benthic habitats on sand and gravel substrates, are also found on mud
Witch flounder	Juveniles	Gulf of Maine and outer continental shelf and slope	50-400 and to 1500 on slope	Sub-tidal benthic habitats with mud and muddy sand substrates
Witch flounder	Adults	Gulf of Maine and outer continental shelf and slope	35-400 and to 1500 on slope	Sub-tidal benthic habitats with mud and muddy sand substrates
Yellowtail flounder	Juveniles	Gulf of Maine, Georges Bank, and the Mid-Atlantic, including certain bays and estuaries in the Gulf of Maine	20-80	Sub-tidal benthic habitats on sand and muddy sand
Yellowtail flounder	Adults	Gulf of Maine, Georges Bank, and the Mid-Atlantic, including certain bays and estuaries in the Gulf of Maine	25-90	Sub-tidal benthic habitats on sand and sand with mud, shell hash, gravel, and rocks

Fishery Impact Considerations

Actions implemented that affect species with overlapping EFH were assessed in Amendment 9 to the MSB FMP in 2008 (http://www.mafmc.org/fmp/history/smb-hist.htm). Amendment 9 summarized Stevenson et al. 2004's findings on bottom-trawling's habitat impacts as:

> "In studies examining the effect of bottom otter trawling on a variety of substrate types, it was demonstrated that the physical effects of trawl doors contacting the bottom produced furrows and some shifts in surface sediment composition, although there is a large variation in the duration of these impacts. Typically the more dynamic environment and less structured bottom composition, the shorter the duration of impact. This type of fishing was demonstrated to have some effects on composition and biomass of benthic species in the affected areas, but the directionality and duration of these effects varied by study and substrate types."

Mackerel, longfin squid, *Illex* squid, and butterfish are all caught with mobile bottom-tending gear that does contact the bottom, though in some years most mackerel catch is made with mid-water gear which should not impact the bottom. Industry contacts report that MSB effort is generally over sand/mud bottoms that will not damage nets and that "hangs" or areas with structure have been mapped over the years and are avoided. Amendment 9 included an analysis of the adverse impacts of the MSB fisheries on EFH (per section 303(a)(7) of the MSA). In Amendment 9 the Council determined that bottom trawls used in MSB fisheries do have the potential to adversely affect EFH for some federally-managed fisheries in the region and closed portions of two offshore canyons (Lydonia and Oceanographer) to squid trawling. Subsequent closures were implemented in these and two other canyons (Veatch and Norfolk) to protect tilefish EFH by prohibiting all bottom trawling activity. The Council has also taken action for protections for deep-sea corals on the outer continental shelf and slope via Amendment 16 to the MSB FMP.

Because there have been no significant changes to the manner in which the MSB fisheries are prosecuted, and because none of the alternatives being considered in this document should have more than a minimal adverse impact (see section 7.0), no additional alternatives to minimize adverse effects on EFH are considered as part of this management action.

6.3 HUMAN COMMUNITIES AND ECONOMIC ENVIRONMENT

This section describes the socio-economic importance of the MSB fisheries, with a focus on the squid fisheries. Recent Amendments to the MSB FMP contain additional information about the MSB fisheries, especially demographic information on ports that land MSB species. See Amendments 11 and 14 at http://www.mafmc.org/msb/ for more information or visit NMFS' communities page at: http://www.nefsc.noaa.gov/read/socialsci/community_profiles/. In general, the MSB fisheries saw high foreign landings in the 1970s followed by a domestication of the fishery, and domestic landings have been lower than the peak foreign landings. The current regulations for the MSB fisheries are summarized by NMFS at https://www.greateratlantic.fisheries.noaa.gov/regs/info.html, and detailed in the Federal Register at http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=1e9802ffddb05d0243d9c657fade956c&rgn=div5&view=text&node=50:12.0.1.1.5&idno=50.

6.3.1 Atlantic Mackerel

US commercial landings of mackerel increased steadily from roughly 3,000 metric tons (mt) in the early 1980s to greater than 31,000 mt by 1990. US mackerel landings declined to relatively low levels 1992-2000 before increasing in the early 2000s. The most recent years have seen a significant drop-off in harvest. Additional information on this fishery can be found in the specifications' Environmental Assessment, available at http://www.greateratlantic.fisheries.noaa.gov/regs/2014/November/14msb2015174specspr.html. The most recent Advisory Panel (AP) Fishery Information Document and AP Fishery Performance Report (available at http://www.mafmc.org/council-events/2018/may-2018-ssc-meeting) also have recent details on fishery performance.

6.3.2 *Illex* Squid

International fleets fished *Illex* in U.S. waters prior to elimination of foreign fishing. Development of the domestic *Illex* squid bottom trawl fishery began in 1982, as the U.S. industry developed the appropriate technology to catch and process squid in large quantities, and became solely domestic in 1987. The figure below illustrates the foreign fishery and the development of the domestic fishery relative to the current and recent quotas. The 2016 landings data are preliminary and may be incomplete.

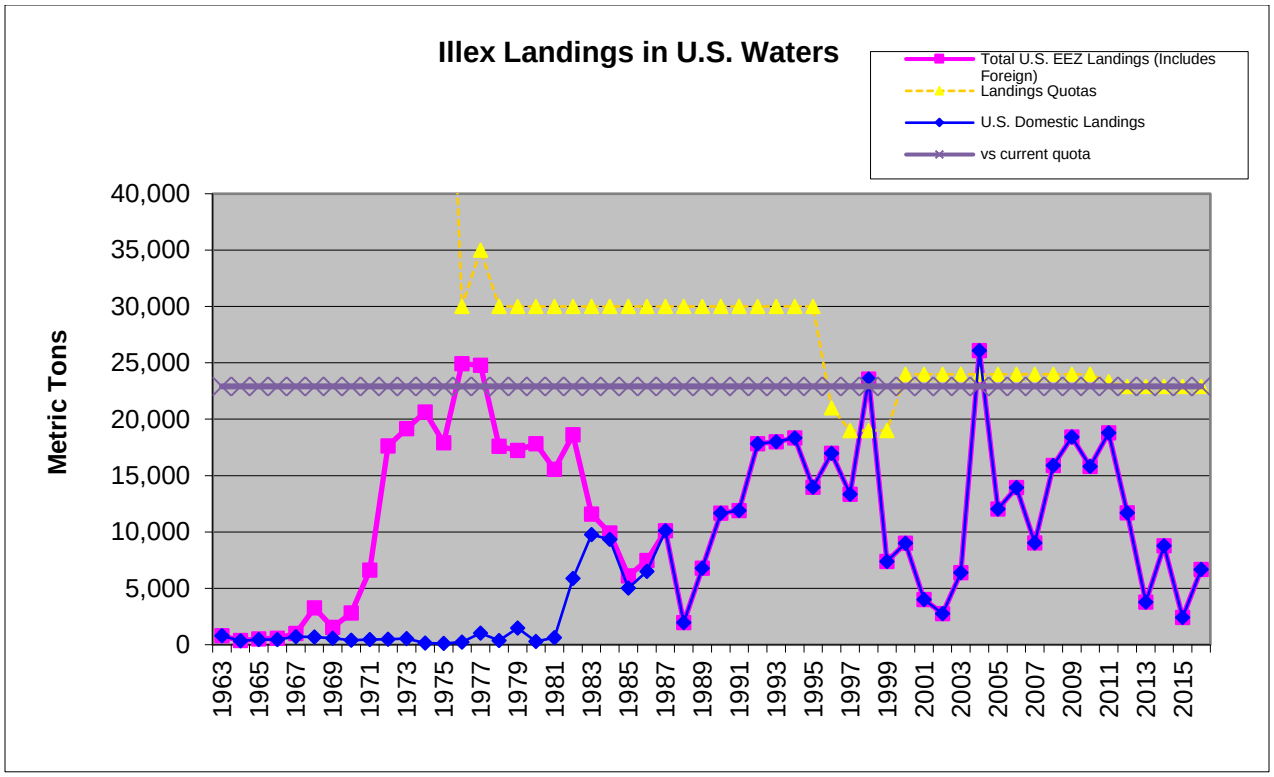

Figure 1. *Illex* squid landings in NAFO Subareas 5 and 6, between the Gulf of Maine and Cape Hatteras, NC during 1963-2016.

The figures below show ex-vessel revenues (nominal) and ex-vessel prices (inflation adjusted) for *Illex* squid from 1982-2016 based on dealer data from the Northeast Commercial Fisheries Database. In 2016 10 federally-permitted dealers purchased at least $1,000 worth of *Illex* squid and 5 dealers purchased more than $50,000 worth of *Illex* squid.

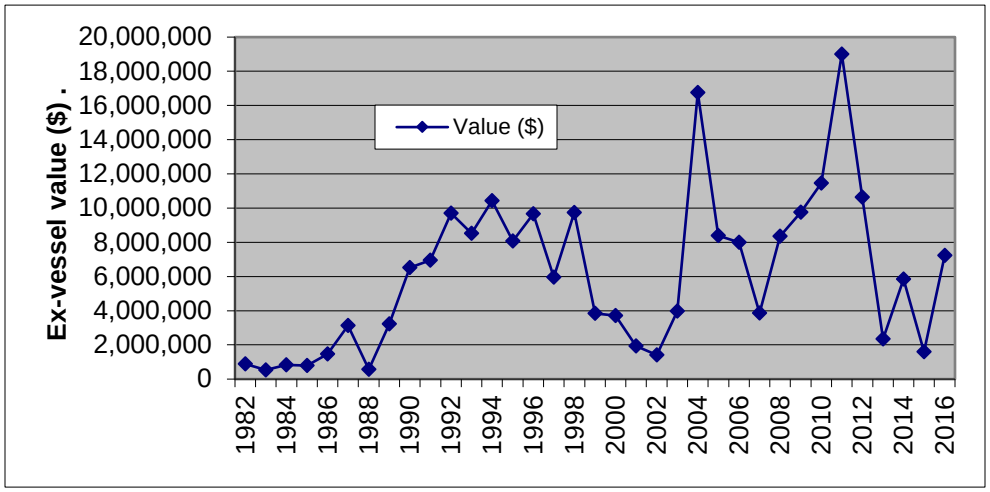

Figure 2. Nominal Ex-Vessel Revenues for *Illex* landings during 1982-2016.

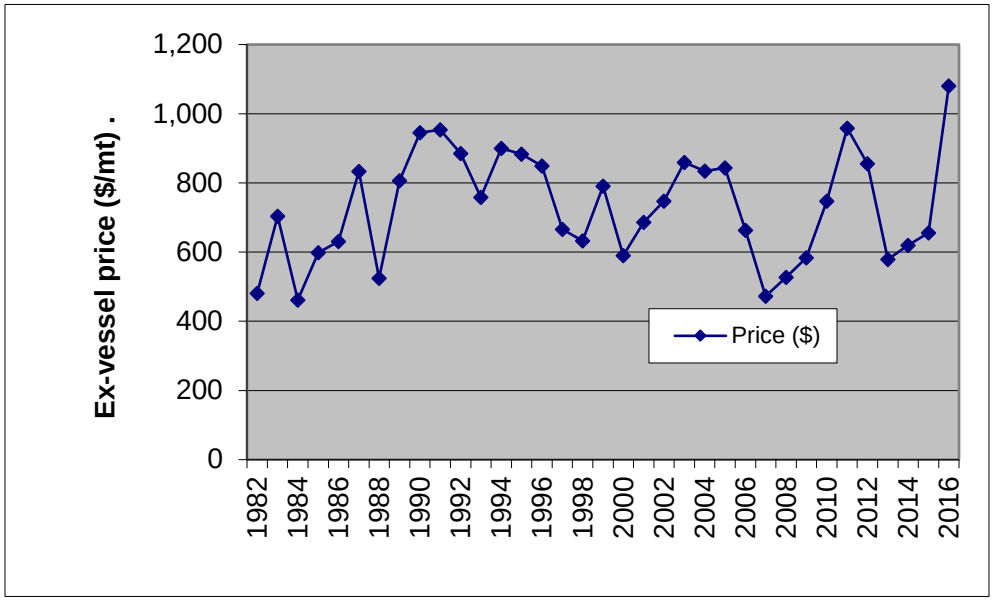

Figure 3. Inflation-adjusted ex-vessel Prices for *Illex* landings during 1982-2016.

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The *Illex* fishery takes place near the shelf break (Fig. 4 from Hendrickson 2016) during June-September/October, when the species is available to the U.S. bottom trawl fishery.

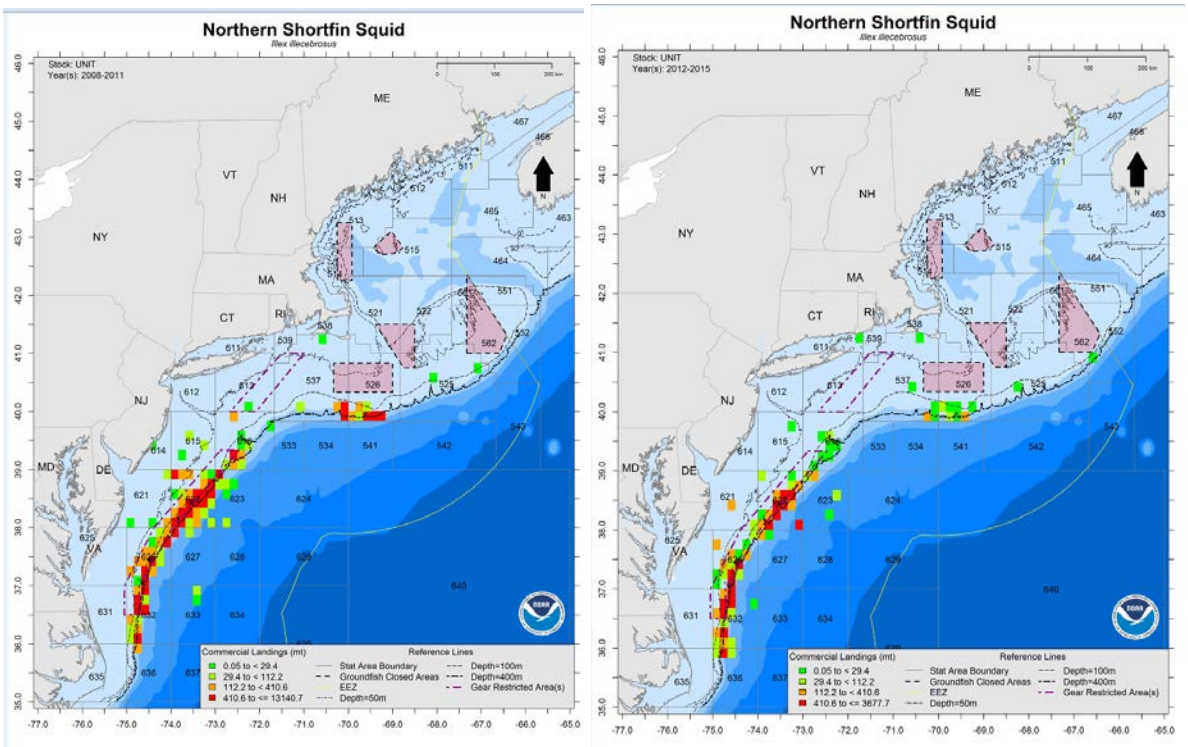

Figure 4. Distribution of landings (mt) from bottom trawl trips with *Illex* landings > 4.536 mt (10,000 lbs), by ten-minute square, during 2008-2011 and 2012-2015.

In recent years most *Illex* landings have occurred in Rhode Island and New Jersey ports (see table below). Further breakdowns of landings by port may violate data confidentiality rules.

Table 9. Recent *Illex* Landings by State (mt)

YEAR	NJ	RI	Other/NA	Total
2014	3,786	4,668	313	8,767
2015	394	2,009	19	2,422
2016	1,757	4,720	208	6,685

There were approximately 79 vessels with *Illex* moratorium permits in 2016, but 15 of them are in Confirmation of Permit History (CPH). Of the 64 vessels with active permits, their principal port states are listed below.

Table 10. Principal Port States (PPST) of Actively-Permitted *Illex* Moratorium Permit Vessels (2016)

PPST	Vessels
NJ	24
MA	12
RI	9
VA	7
NC	4
NY	4
CT	3
MD	1

A key driver for this amendment has been the concern by industry that additional participation by new entrants may reduce the income of vessels that have become dependent on the squid fishery. The table below describes the dependence on the *Illex* squid fishery for federally-permitted vessels in terms of the proportion of ex-vessel revenues from *Illex* squid in 2016 and in 2013 (last squid specifications EA)

Table 11. Numbers of Federally-Permitted Vessels by percent dependence on *Illex* landings during– 2016

Percent Dependence on *Illex*	Number of Vessels in Each Dependency Category in 2016	Number of Vessels in Each Dependency Category in 2013
1%-5%	7	9
5%-25%	4	5
25%-50%	4	2
More than 50%	0	0

(For example, in 2016, 4 vessels relied on *Illex* for between 25%-50% of the ex-vessel revenues.)

Table 12. Numbers of vessels that actively fished for *Illex* squid, by landings (lbs) category, during 1982-2016.

YEAR	Vessels 500,000+	Vessels 100,000 - 500,000	Vessels 50,000 - 100,000	Vessels 10,000 - 50,000	Total
1982	7	7	0	10	24
1983	1	8	7	11	27
1984	4	15	4	6	29
1985	2	6	4	3	15
1986	8	6	4	3	21
1987	7	10	2	1	20
1988	3	3	1	2	9
1989	8	5	1	3	17
1990	12	3	0	1	16
1991	12	1	1	0	14
1992	16	1	0	1	18
1993	19	3	1	3	26
1994	21	7	5	8	41
1995	24	5	2	7	38
1996	24	5	6	4	39
1997	13	9	2	0	24
1998	25	4	1	3	33
1999	6	9	2	10	27
2000	7	7	0	2	16
2001	3	4	1	2	10
2002	2	3	1	1	7
2003	5	6	1	2	14
2004	23	5	2	0	30
2005	10	10	2	2	24
2006	9	8	1	2	20
2007	8	2	1	0	11
2008	12	4	0	0	16
2009	10	3	1	1	15
2010	12	3	0	6	21
2011	17	4	2	0	23
2012	8	3	2	2	15
2013	5	4	3	5	17
2014	5	3	2	2	12
2015	3	0	1	1	5
2016	4	3	3	2	12

6.3.3 Longfin Squid

International fleets fished longfin squid in U.S. waters prior to elimination of foreign fishing. Development of the domestic longfin squid bottom trawl fishery began in the early 1980s as the U.S. industry developed the appropriate technology to catch and process squid in large quantities, and became solely domestic in 1987. The figure below illustrates the foreign fishery and the development of the domestic fishery relative to the current and recent quotas. The 2016 landings data are preliminary and may be incomplete especially for landings from vessels with state-only permits.

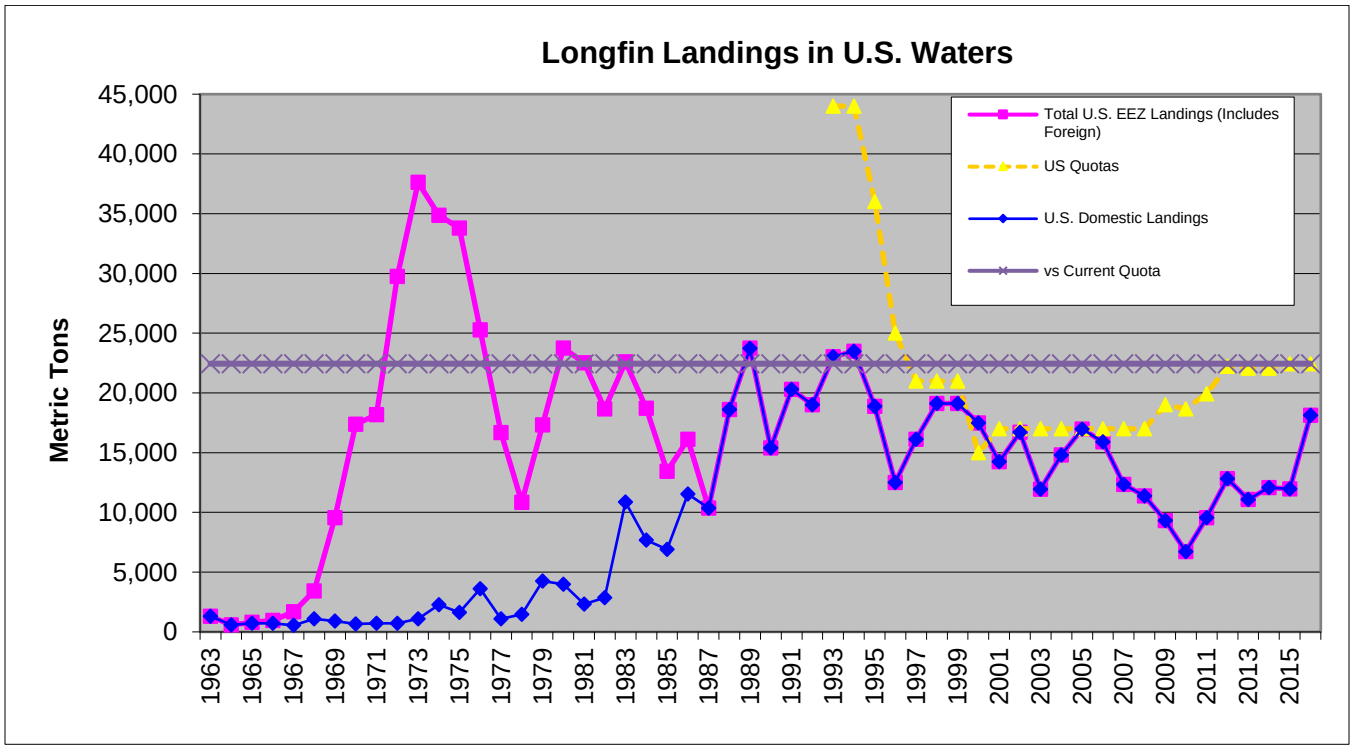

Figure 5. Longfin Squid Landings in NAFO Subareas 5 and 6 during 1963-2016.

The figures below show ex-vessel revenues (nominal) and ex-vessel prices (inflation adjusted) for longfin squid from 1982-2016 based on dealer data from the Northeast Commercial Fisheries Database. In 2016 64 federally-permitted dealers purchased at least $1,000 worth of longfin squid and 14 dealers purchased more than $500,000 worth of longfin squid.

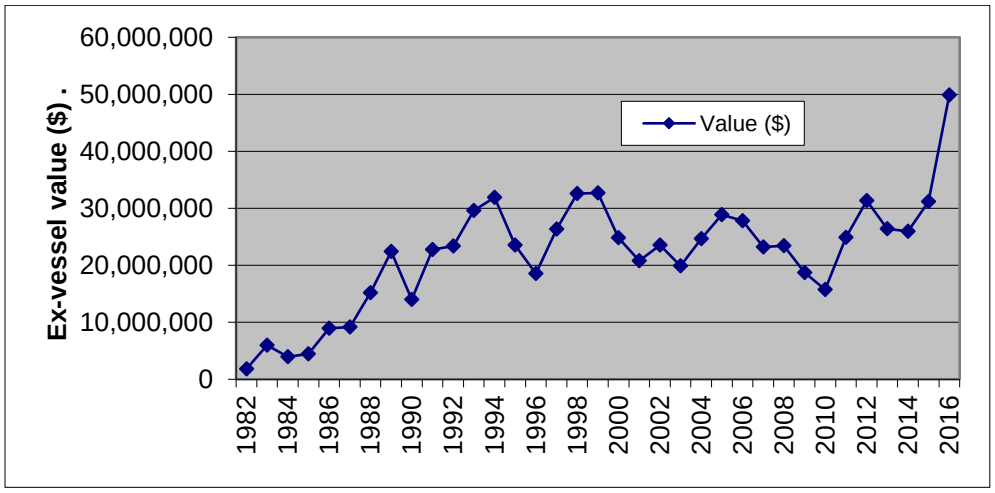

Figure 6. Nominal Longfin Ex-Vessel Revenues Dealer Data

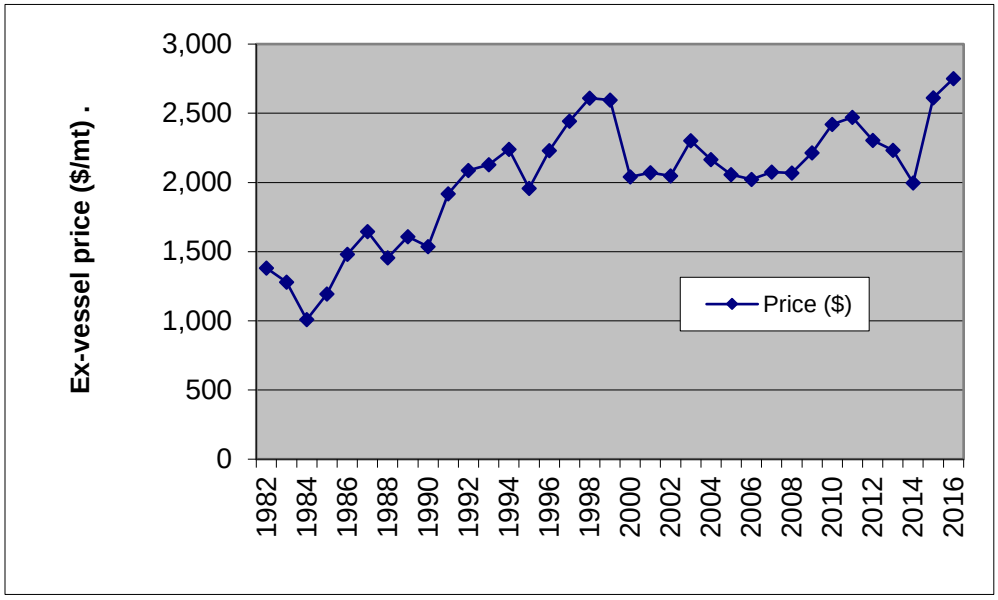

Figure 7. Inflation adjusted Longfin Prices

The bottom trawl fishery for longfin squid follows the species' seasonal inshore/offshore migration patterns; generally offshore during T1 and T3 and inshore during T2 (Figs. 8 and 9 from Hendrickson 2016).

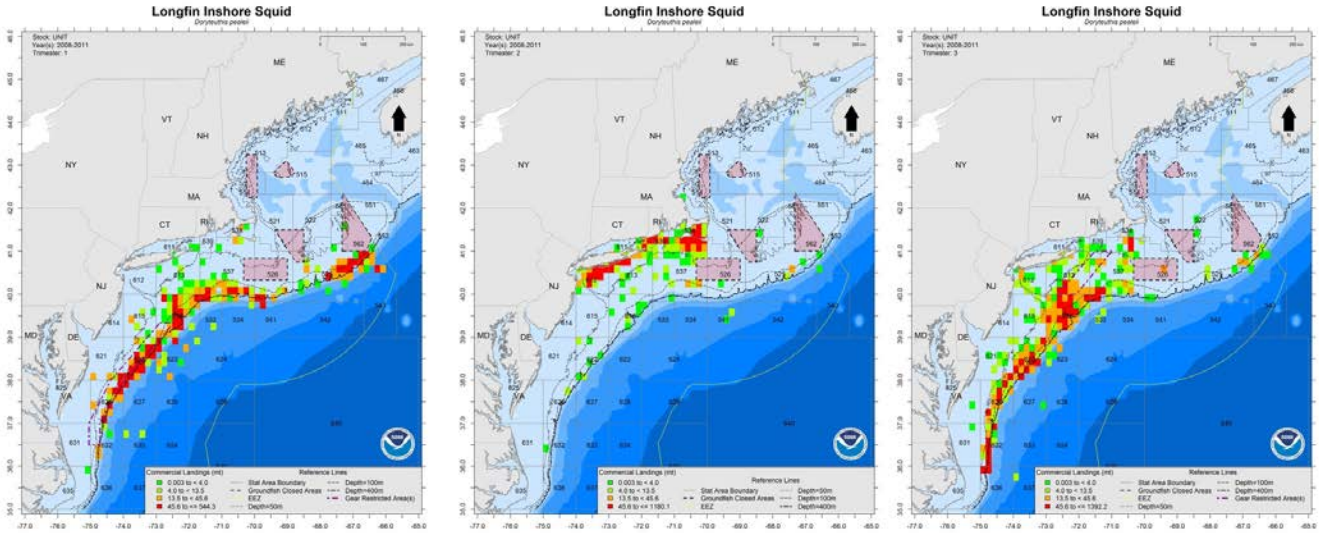

Figure 8. Distribution of landings (mt) from bottom trawl trips with longfin squid landings by trimester and ten-minute square, during 2008-2011.

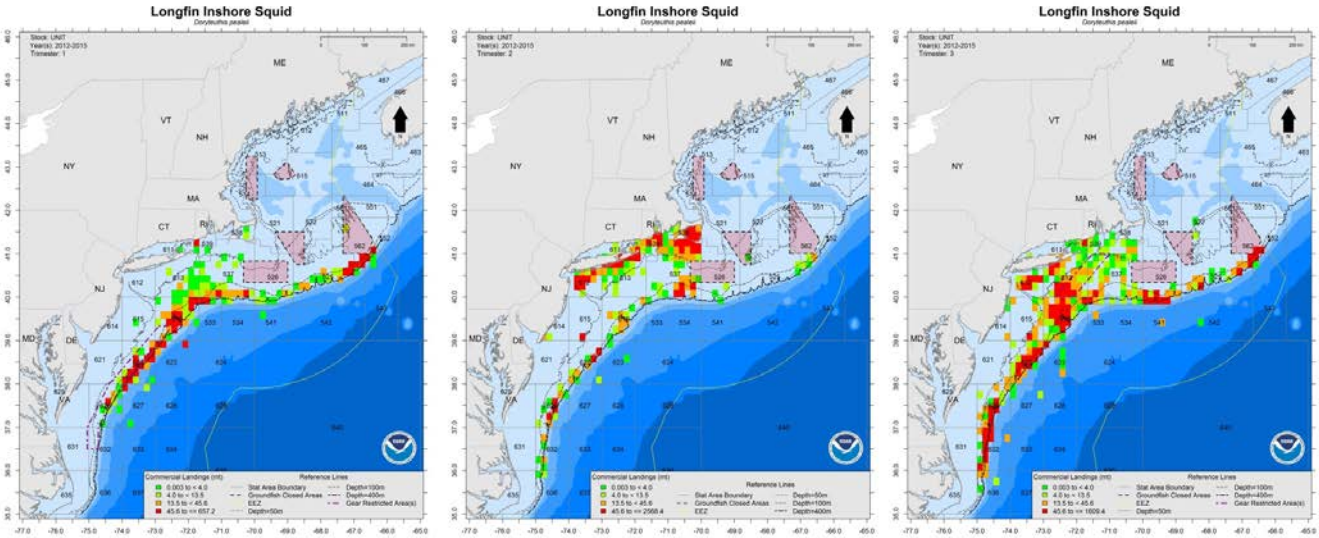

Figure 9. Distribution of landings (mt) from bottom trawl trips with longfin squid landings by trimester and ten-minute square, during 2012-2015.

There is a strong seasonal aspect to longfin squid landings due to changing availability to the inshore and offshore fisheries and due to trimester-based quota allocations. Availability is variable and believed to be strongly impacted by migration and stock responses to changing environmental conditions (NEFSC 2011). Quotas for Trimesters 1-3 are 43%, 17% and 40%, respectively, of the annual quota. Since implementation of trimester-based quota management, in 2007, the fishery has been closed due in-season quota attainment during every year except 2010, 2013 and 2015 (Table 13). The T1 and T2 quotas have been allowed to roll-over within a year with certain constraints. Since 2010, underages for T1 that are greater than 25% are reallocated to Trimesters 2 and 3 (split equally between both trimesters) of the same year. However, since 2011 the T2 quota may only be increased by 50% from rollover and the remaining portion of the underage is reallocated to T3. Any underages for T1 that are less than 25% of the T1 quota are applied only to T3 of the same year. Any overages for T1 and T2 are subtracted from T3 (or the annual quota) of the same year.

Since 2007, T1 has only closed due to attaining the T1 quota during April of 2007[8]. T2 has closed in July of 2008, August of 2009, August of 2011, July of 2012, August of 2014, and June of 2016. While directed fishing at the post-closure trip limit of 2,500 pounds does occur, annual landings are partially suppressed in years when seasonal closures occur. While the Trimester allocations are based on historical catch and were primarily developed to optimize fishery operation and preserve quota for different parts of the year, they do serve a biological purpose of restricting effort on inshore summer spawning squid and spreading catch throughout the year, both of which are important biological considerations given the short lifecycle of longfin squid (NEFSC 2011). Committee discussions when the trimesters were set included considering even lower allocations to T2 given the spawning observed during T2. The squid population is composed of overlapping micro-cohorts and avoiding high mortality on any one cohort reduces the chances of recruitment overfishing. The Trimester with the most landings varies from year to year, but T2 had the most landings in 2014, 2015, and 2016.

Table 13. Longfin Fishery Performance Since 2007, When Trimesters Were Implemented (2007)

Year	Quota (mt)	Quota (pounds)	Commercial Landings (mt)	Commercial Landings (pounds)	% of Quota Landed	T1 Quota	T1 Land	T1%	T2 Quota	T2 Land	T2%	T3 Quota	T3 Land
2007	17,000	37,478,540	12,354	27,235,875	73%	15,632,318	15,487,194	99%	6,225,260	3,332,360	54%	Annual	8,391,050
2008	17,000	37,478,540	11,406	25,145,896	67%	16,093,745	8,405,764	52%	6,180,220	8,097,587	131%		8,595,268
2009	19,000	41,887,780	9,307	20,517,964	49%	17,892,717	7,390,668	41%	7,072,429	7,150,991	101%		5,975,911
2010	18,667	41,153,642	6,913	15,240,538	37%	17,696,506	3,131,395	18%	14,276,968	4,891,607	34%		6,783,709
2011	19,906	43,885,166	9,556	21,067,349	48%	18,871,570	7,887,388	42%	11,190,664	9,798,321	88%		3,377,556
2012	22,220	48,986,656	12,820	28,263,228	58%	21,065,169	5,291,094	25%	12,490,290	17,503,595	140%		5,461,598
2013	22,049	48,609,666	11,183	24,654,265	51%	20,902,027	1,658,898	8%	12,394,388	6,150,773	50%		16,628,444
2014	22,049	48,609,666	12,063	26,594,331	55%	20,674,951	7,331,327	35%	12,262,111	12,766,685	104%		6,488,956
2015	22,445	49,482,696	11,928	26,296,707	53%	21,276,813	5,404,923	25%	12,619,260	10,734,681	85%		10,211,533
2016	22,445	49,482,696	18,127	39,963,925	81%	21,276,813	12,228,889	57%	12,619,260	18,737,013	148%		8,997,660

[8] An April 2012 closure of the longfin squid fishery was due the fishery's attainment of the butterfish bycatch cap. The butterfish bycatch cap is tracked here: https://www.greateratlantic.fisheries.noaa.gov/ro/fso/reports/ButterfishMortalityCapReport/butterfish_cap.htm

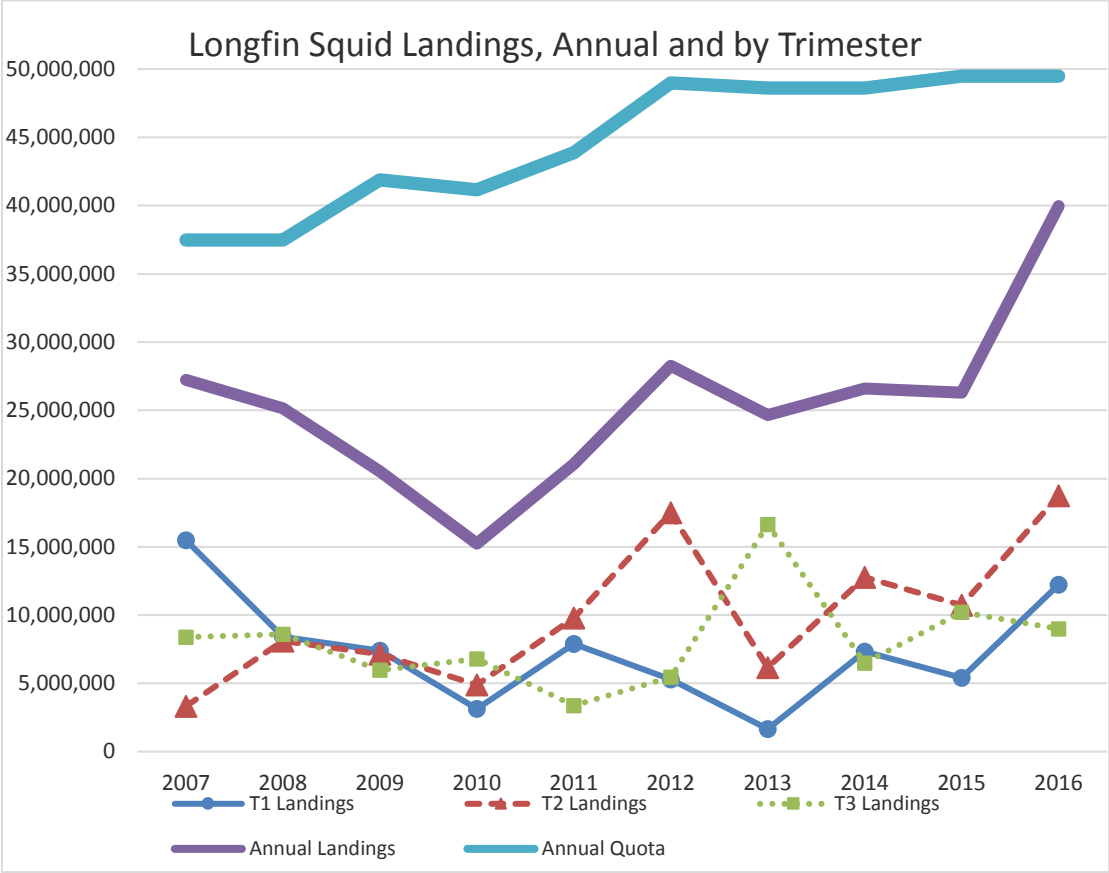

Figure 10. Longfin Squid Fishery Landings by Year and Trimester Since 2007.

In recent years most longfin squid landings have occurred in Rhode Island ports, with New York, New Jersey, Massachusetts, and Connecticut also contributing (Table 14). The top ports are listed in Table 15.

Table 14. Longfin Squid Landings (mt), by State, during 2014-2016.

YEAR	CT	MA	NJ	NY	RI	Other/NA	Total
2014	610	1,104	1,265	2,332	6,650	102	12,063
2015	597	855	1,201	1,932	7,287	56	11,928
2016	758	2,082	1,988	2,839	10,329	132	18,127

Table 15. Top longfin squid ports in rank of descending ex-vessel value, for ports that averaged at least $25,000 in landed longfin squid during 2014-2016.

Port
POINT JUDITH RI
NORTH KINGSTOWN RI
MONTAUK NY
CAPE MAY NJ
HAMPTON BAYS NY
NEW BEDFORD MA
NEW LONDON CT
BARNSTABLE MA
STONINGTON CT
BOSTON MA
SHINNECOCK NY
POINT PLEASANT NJ
FALMOUTH MA
HYANNIS MA
HAMPTON VA
BELFORD NJ
WOODS HOLE MA
POINT LOOKOUT NY
EAST HAVEN CT
BABYLON NY
NEWPORT RI

Approximately 383 vessels had longfin squid/butterfish moratorium permits during 2016, but 97 of them were in Confirmation of Permit History (CPH), leaving 286 active permits for vessels in the following states.

Table 16. Principal Port States (PPST) of Actively-Permitted Longfin Squid/Butterfish Moratorium Permit Vessels (2016)

PPST	Vessels
NJ	74
MA	67
RI	49
NY	36
VA	23
NC	15
CT	10
ME	7
MD	3
AK	1
NH	1

A key driver for this amendment has been the concern by industry that additional participation by new entrants may compromise reduce the income of vessels that have become dependent on the squid fishery. Table 17 describes the dependence on the longfin squid fishery for federally-permitted vessels in terms of the proportion of ex-vessel revenues from longfin squid in 2016 and in 2013 (last squid specifications EA)

Table 17. Dependence on Longfin Squid by Federally-Permitted Vessels – 2016 and 2013

Percent Dependence on Longfin	Number of Vessels in Each Dependency Category in 2016	Number of Vessels in Each Dependency Category in 2013
1%-5%	80	49
5%-25%	79	68
25%-50%	64	35
More than 50%	42	31

(For example, in 2016, 42 vessels relied on longfin squid for more than 50% of the ex-vessel revenues.)

Table 18. Numbers of vessels that actively fished for Longfin squid, by landings (lbs) category, during 1982-2016.

YEAR	Vessels 500,000+	Vessels 100,000 - 500,000	Vessels 50,000 - 100,000	Vessels 10,000 - 50,000	Total
1982	0	14	16	88	118
1983	1	64	36	108	209
1984	1	41	48	111	201
1985	2	44	34	89	169
1986	1	56	44	98	199
1987	3	39	44	103	189
1988	11	65	35	95	206
1989	15	68	51	83	217
1990	11	52	47	108	218
1991	17	54	34	107	212
1992	17	48	31	67	163
1993	21	73	32	92	218
1994	24	74	26	77	201
1995	15	79	40	96	230
1996	8	68	37	93	206
1997	13	87	55	65	220
1998	18	86	46	91	241
1999	18	85	36	119	258
2000	13	96	46	97	252
2001	12	65	44	84	205
2002	13	90	32	69	204
2003	8	64	25	59	156
2004	15	63	27	52	157
2005	19	62	19	46	146
2006	16	76	24	47	163
2007	16	44	30	68	158
2008	10	58	18	78	164
2009	8	52	26	64	150
2010	3	45	22	65	135
2011	7	55	32	46	140
2012	8	75	38	41	162
2013	10	56	20	37	123
2014	12	60	27	55	154
2015	13	49	21	50	133
2016	19	74	35	46	174

6.3.4 Butterfish

Atlantic butterfish were landed exclusively by US fishermen from the late 1800's (when formal record keeping began) until 1962 (Murawski and Waring 1979). Reported landings averaged about 3,000 mt from 1920-1962 (Waring 1975). Beginning in 1963, vessels from Japan, Poland and the Union of Soviet Socialist Republics began to exploit butterfish along the edge of the continental shelf during the late-autumn through early spring (Murawski and Waring 1979). Reported foreign catches of butterfish increased from 750 mt in 1965 to 15,000 mt in 1969, and then to about 32,000 mt in 1973. With the advent of extended jurisdiction in US waters, reported foreign catches declined sharply from 14,000 mt in 1976 to 2,000 mt in 1978. Foreign landings were completely phased out by 1987 (NEFSC 2014).

During the period 1965-1976, US Atlantic butterfish landings averaged 1,840 mt. From 1977-1987, average US landings doubled to 5,137 mt, with a historical peak of slightly less than 12,000 mt landed in 1984 (NEFSC 2014). Low abundance and reductions in Japanese demand for butterfish probably had a negative effect on butterfish landings in the 1990s-early 2000s but regulations kept landings low from 2005-2012. Quotas were increased somewhat in each year 2012-2014 and more substantially in 2015 based on a new assessment. Current fishery participants report the highest demand for large butterfish with high fat content, though there is currently some demand for most sizes of butterfish (pers com Meghan Lapp, Seafreeze Ltd). Through 2016, the fishery had not redeveloped to take full advantage of the higher quotas.

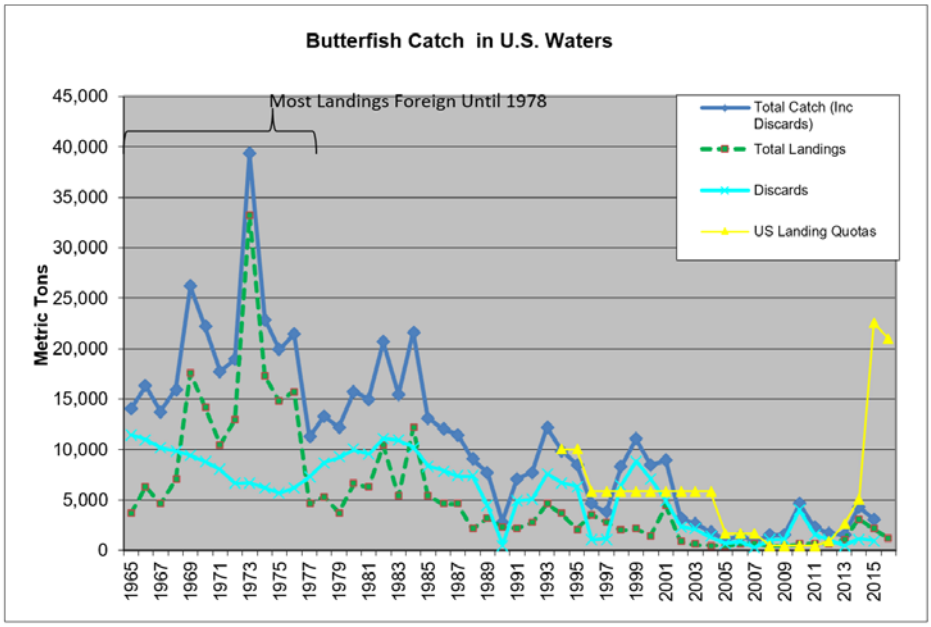

Figure 11. Butterfish Catch in U.S. Waters

Price has generally trended down from 1986 to now – 2016 prices were $1,409/mt. 2016 landings totaled 1,194 mt and generated $1.7 million in ex-vessel revenues. The figures below show ex-vessel revenues (nominal) and ex-vessel prices (inflation adjusted) for butterfish from 1982-2016 based on dealer data from the Northeast Commercial Fisheries Database.

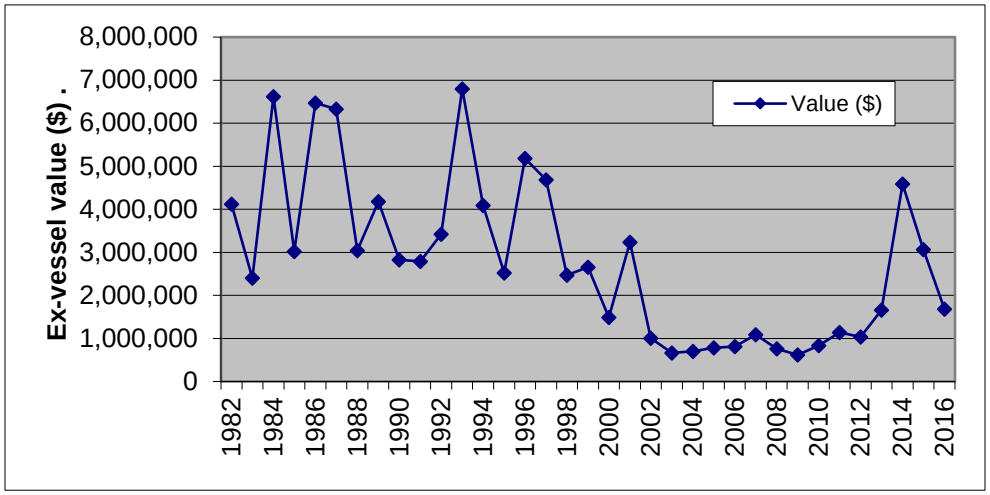

Figure 12. Nominal Ex-Vessel Revenues for butterfish landings during 1982-2016.

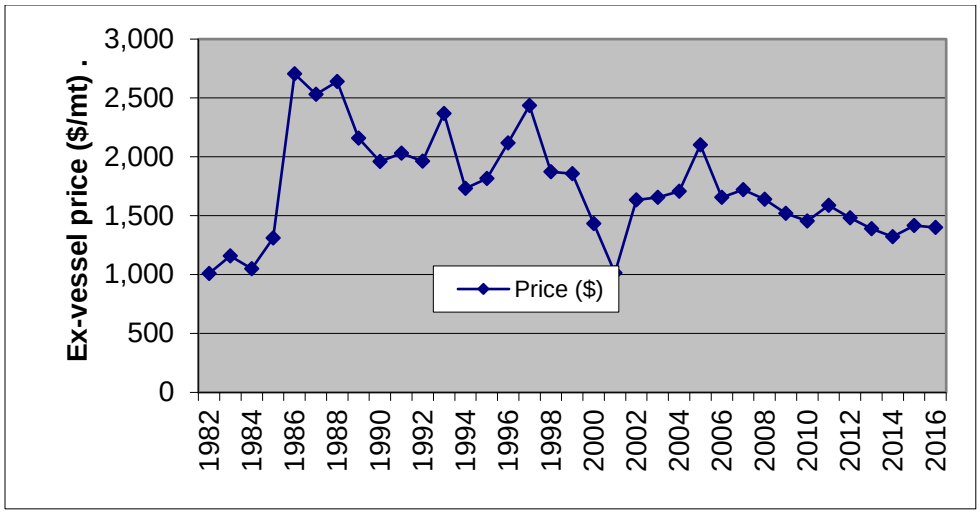

Figure 13. Inflation-adjusted ex-vessel Prices for butterfish landings during 1982-2016.

Butterfish landings track the seasonal distribution of butterfish, with landings more from offshore areas in the winter and extending inshore during summer/fall.

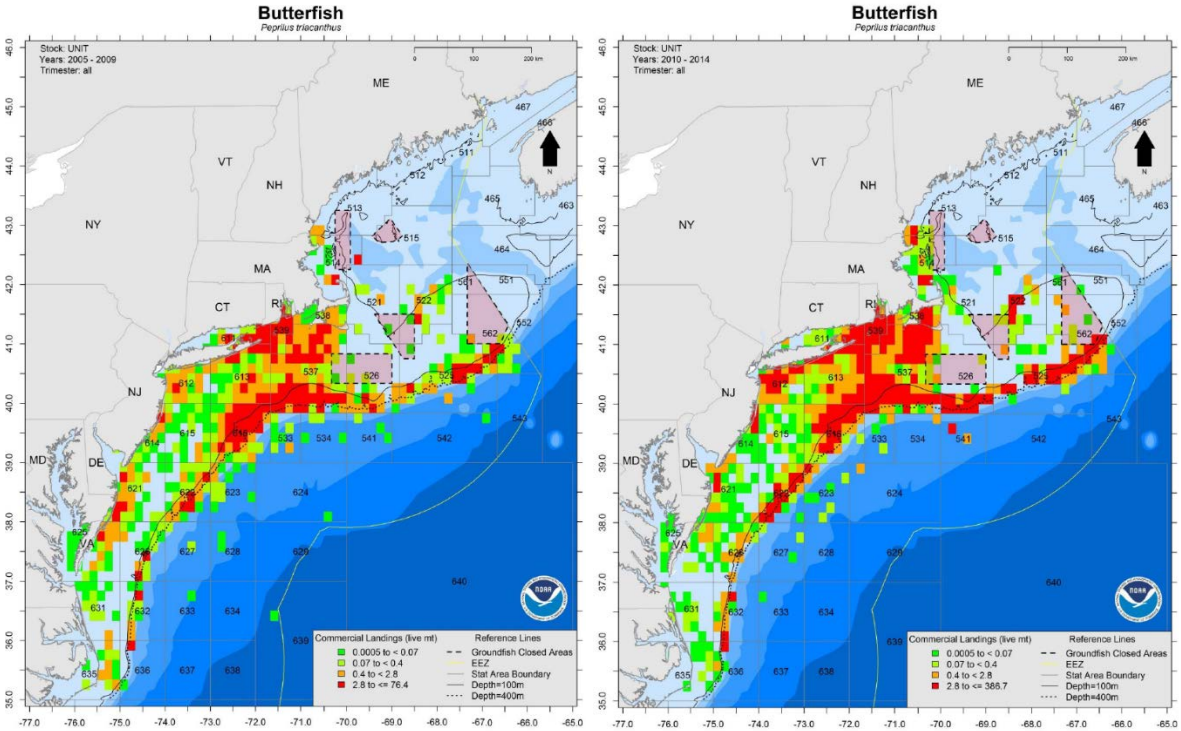

Figure 14. Distribution of butterfish landings (mt) by area 2005-2009 and 2010-2014

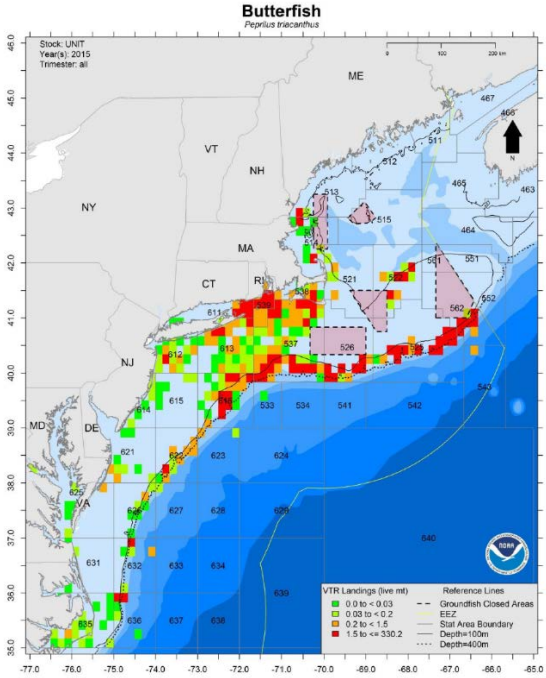

Figure 15. Distribution of butterfish landings (mt) by area 2015.

In recent years most butterfish landings have occurred in Rhode Island, New York, and Massachusetts (see table below). Further breakdowns of landings by port may violate data confidentiality rules.

Table 19. Recent Butterfish Landings by State

YEAR	CT	MA	MD	NJ	NY	RI	VA	Other	Total
2014	46	93	9	58	261	2,653	7	6	3,135
2015	63	293	3	45	176	1,504	13	7	2,104
2016	80	146	2	75	245	630	14	2	1,194

Approximately 383 vessels had longfin squid/butterfish moratorium permits during 2016, but 97 of them were in Confirmation of Permit History (CPH), leaving 286 active permits for vessels in the following states.

Table 20. Principal Port States (PPST) of Actively-Permitted Longfin Squid/Butterfish Moratorium Permit Vessels (2016)

PPST	Vessels
NJ	74
MA	67
RI	49
NY	36
VA	23
NC	15
CT	10
ME	7
MD	3
AK	1
NH	1

Table 21 describes the dependence on butterfish for federally-permitted vessels in terms of the proportion of ex-vessel revenues from butterfish in 2016 and in 2013 (last butterfish specifications EA). Table 22 describes vessel activity related to butterfish landings.

Table 21. Numbers of Federally-Permitted Vessels by percent dependence on butterfish landings during 2016 and 2013.

Percent Dependence on Butterfish	Number of Vessels in Each Dependency Category in 2016	Number of Vessels in Each Dependency Category in 2013
1%-5%	95	108
5%-25%	15	18
25%-50%	1	0
More than 50%	1	0

Table 22. Numbers of vessels that actively fished for butterfish, by landings (lbs) category, during 1982-2016.

YEAR	Vessels 200,000+	Vessels 50,000 - 200,000	Vessels 10,000 - 50,000	Vessels 1,000 - 10,000	Total
1982	29	31	35	107	202
1983	9	33	67	111	220
1984	41	35	47	100	223
1985	11	36	52	122	221
1986	7	14	52	113	186
1987	8	38	40	86	172
1988	4	15	54	86	159
1989	7	29	40	99	175
1990	1	22	58	110	191
1991	5	15	45	96	161
1992	7	25	32	90	154
1993	12	30	36	108	186
1994	6	20	40	124	190
1995	3	11	63	141	218
1996	6	15	86	129	236
1997	6	12	77	169	264
1998	2	14	69	153	238
1999	2	10	72	143	227
2000	1	9	54	159	223
2001	4	6	72	130	212
2002	0	3	46	123	172
2003	0	0	20	115	135
2004	0	0	23	95	118
2005	0	1	11	90	102
2006	0	1	24	86	111
2007	0	3	36	95	134
2008	0	1	22	99	122
2009	0	2	17	83	102
2010	0	1	37	81	119
2011	0	2	36	92	130
2012	0	1	38	87	126
2013	1	1	46	82	130
2014	2	4	47	77	130
2015	3	6	36	83	128
2016	2	9	39	81	131

6.4 Protected Species

Protected species are those afforded protections under the Endangered Species Act (ESA; species listed as threatened or endangered under the ESA) and/or the Marine Mammal Protection Act (MMPA). The table below provides a list of protected species that occur in the affected environment of the MSB fisheries and the potential for the fishery to impact the species, specifically via interactions with MSB fishing gear (i.e., mid-water trawl and bottom trawl gear). Marine mammal species (cetaceans and pinnipeds) italicized and in bold are considered MMPA strategic stocks. Shaded rows indicate species who prefer continental shelf edge/slope waters (i.e., >200 meters). While mid-water gear is not used in the directed squid and/or butterfish fisheries, it is used in the Atlantic mackerel fishery, which is part of this FMP, so information on mid-water trawl gear is included for sake of completeness.

Table 23. Species Protected Under the ESA and/or MMPA that May Occur in the Affected Environment of the MSB FMP

Species	**Status**[2]	***Observed/documented interactions with bottom trawl and/or mid-water trawl gear?***
Cetaceans		
North Atlantic right whale (Eubalaena glacialis)	***Endangered***	***No***
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***	***No***
Minke whale (*Balaenoptera acutorostrata*)	Protected (MMPA)	Yes
Pilot whale (Globicephala spp.)[3]	***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
Beaked whales (*Ziphius and Mesoplodon spp*)[4]	Protected (MMPA)	No
Bottlenose dolphin (Tursiops truncatus)[5]	***Protected (MMPA)***	***Yes***
Harbor porpoise (*Phocoena phocoena*)	Protected (MMPA)	Yes
Pinnipeds		
Harbor seal (*Phoca vitulina*)	Protected (MMPA)	Yes
Gray seal (*Halichoerus grypus*)	Protected (MMPA)	Yes
Harp seal (*Phoca groenlandicus*)	Protected (MMPA)	Yes

Species	**Status**[2]	***Observed/documented interactions with bottom trawl and/or mid-water trawl gear?***
Hooded seal (*Cystophora cristata*)	Protected (MMPA)	No
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		
Atlantic salmon	Endangered	Yes
Atlantic sturgeon *(Acipenser oxyrinchus)*		
Gulf of Maine DPS	Threatened	Yes
New York Bight DPS, Chesapeake Bay DPS, Carolina DPS & South Atlantic DPS	Endangered	Yes
Cusk *(Brosme brosme)*	Candidate	Yes
Alewife *(Alosa pseudoharengus)*	Candidate	Yes
Blueback herring *(Alosa aestivalis)*	Candidate	Yes
Critical Habitat		
Northwest Atlantic DPS of Loggerhead Sea Turtle	ESA (Protected)	No
North Atlantic Right Whale Critical Habitat	ESA (Protected)	No

Notes:

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

[2] Status is defined by whether the species is listed under the ESA as endangered (i.e. at risk of extinction) or threatened (i.e. at risk of endangerment), or protected under the MMPA. Marine mammals listed under the ESA are also protected under the MMPA. Candidate species are those species for which ESA listing may be warranted.

[3] 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 referred to as *Globicephala spp*.

[4] There are multiple species of beaked whales in the Northwest Atlantic. They include the cuvier's (*Ziphius cavirostris*), blainville's (*Mesoplodon densirostris*), gervais' (*Mesoplodon europaeus*), sowerbys' (*Mesoplodon bidens*), and trues' (*Mesoplodon mirus*) beaked whales. Species of *Mesoplodon* are difficult to identify at sea, therefore, much of the available characterization for beaked whales is to the genus level only.

[5] This includes the Western North Atlantic Offshore, Northern Migratory Coastal, and Southern Migratory Coastal Stocks of Bottlenose Dolphins.

Cusk, alewife, and blueback herring are NMFS "candidate species" under the ESA. Candidate species are those petitioned species for which NMFS has determined that listing may be warranted under the ESA and those species for which NMFS has initiated an ESA status review through an announcement in the Federal Register. If a species is proposed for listing the conference provisions under Section 7 of the ESA apply (see 50 CFR 402.10); however, candidate species receive no substantive or procedural protection under the ESA. As a result, these species 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, alewife, and blueback herring can be found at: http://www.nmfs.noaa.gov/pr/species/esa/candidate.htm.

6.4.1. Protected Species and Critical Habitat Not Likely to be Affected (via interactions with gear or destruction of essential features of critical habitat) by the MSB fisheries

Based on available information, it has been determined that this action is not likely to affect (via interactions with gear or destruction of essential features of critical habitat) some ESA listed and/or marine mammal protected species or their designated critical habitat (see Table 23). 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 there have never been documented interactions between the species and the primary gear type used to prosecute the MSB fisheries (i.e., bottom otter and mid-water trawls); Waring *et al*. 2014a, 2015, 2016; Hayes *et al*. 2017; NMFS NEFSC FSB 2015, 2016, 2017; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html). In the case of critical habitat, this determination has been made because operation of the MSB fisheries will not affect the essential physical and biological features of North Atlantic right whale or loggerhead (NWA DPS) critical habitat and therefore, will not result in the destruction or adverse modification of any species critical habitat (NMFS 2014; NMFS 2015a,b).

6.4.2. Protected Species Potentially Affected by the Proposed Action

Table 17 also provides a list of protected species of sea turtle, marine mammal, and fish species present in the affected environment of the MSB fishery, and that may also be affected 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 affected by the action, the MMPA List of Fisheries and marine mammal stock assessment reports for the Atlantic Region were referenced (http://www.nmfs.noaa.gov/pr/sars/region.htm; http://www.nmfs.noaa.gov/pr/interactions/fisheries/lof.html). To aid in identifying ESA listed species potentially affected by the action, the 2013 Biological Opinion issued by NMFS on the operation of seven commercial fisheries, including the MSB FMP, and its impact on ESA listed species was referenced (NMFS 2013) was referenced. The 2013 Opinion, which considered the best available information on ESA listed species and observed or documented ESA listed species

interactions with gear types used to prosecute the 7 FMPs (e.g., gillnet, bottom trawl, and pot/trap), concluded that the seven fisheries may adversely affect, but was not likely to jeopardize the continued existence of any ESA listed species. The Opinion included an incidental take statement (ITS) authorizing the take of specific numbers of ESA listed species of sea turtles, Atlantic salmon, and Atlantic sturgeon. Reasonable and prudent measures and terms and conditions were also issued with the ITS to minimize impacts of any incidental take.

Up until recently, the 2013 Opinion remained in effect; however, new information on North Atlantic right whales has been made available that may reveal effects of the fisheries analyzed in the 2013 Opinion that may not have been previously considered. As a result, per an October 17, 2017, ESA 7(a)(2)/7(d) memo issued by NMFS, the 2013 Opinion has been reinitiated. However, the October 17, 2017, memo concludes that allowing these fisheries to continue during the reinitiation period will not increase the likelihood of interactions with ESA listed species above the amount that would otherwise occur if consultation had not been reinitiated, and therefore, the continuation of these fisheries during the reinitiation period would not be likely to jeopardize the continued existence of any ESA listed species. Until replaced, the MSB FMP is currently covered by the incidental take statement authorized in NMFS 2013 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 MSB FMP is provided below, while information on protected species interactions with specific fishery gear is provided in section 6.4.3.

6.4.2.1. Sea Turtles

This section contains a brief summary of the occurrence and distribution of sea turtles in the affected environment of the MSB fisheries. 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 sea turtle status reviews and biological reports (NMFS and USFWS 1995; Hirth 1997; TEWG 1998, 2000, 2007, 2009; NMFS and USFWS 2007a, 2007b; Conant et al. 2009; NMFS and USFWS 2013), and recovery plans for the loggerhead sea turtle (Northwest Atlantic DPS; NMFS and USFWS 2008), leatherback sea turtle (NMFS and USFWS 1992, 1998a), Kemp's ridley sea turtle (NMFS et al. 2011), and green sea turtle (NMFS and USFWS 1991, 1998b).

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 2004; 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 2004; 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 Gulf of Maine (GOM) in June (Shoop & Kenney 1992). The trend is reversed in the fall as water temperatures cool. The majority leave the Gulf of Maine by September, but some remain in Mid-Atlantic and Northeast areas until November. By December, sea turtles have migrated south to waters offshore of North Carolina, particularly south of Cape Hatteras, and further south, although 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 2013; Dodge *et al.* 2014). Leatherback sea turtles engage in routine migrations between northern temperate and tropical waters (NMFS and USFWS 1992; James *et al.* 2005; James *et al*. 2006; Dodge *et al.* 2014). They are found in more northern waters (i.e., Gulf of Maine) later in the year (i.e., similar time frame as hard-shelled sea turtles), with most leaving the Northwest Atlantic shelves by mid-November (James *et al.* 2005; James *et al*. 2006; Dodge *et al.* 2014).

6.4.2.2. Large Whales

Humpback, fin, sei, and minke whales are found throughout the waters of the Northwest Atlantic Ocean. In general, these species follow an annual pattern of migration between low latitude (south of 35°N) wintering/calving grounds and high latitude spring/summer foraging grounds (primarily north of 41°N; Waring *et al*. 2016; Hayes *et al*. 2017; NMFS 1991, 2010, 2011). This, however, is a simplification of whale movements, particularly as it relates to winter movements. It remains unknown if all individuals of a population migrate to low latitudes in the winter, although, increasing evidence suggests that for some species (e.g., humpback whales), some portion of the population remains in higher latitudes throughout the winter (Waring *et al*. 2016; Hayes *et al*. 2017; Clapham *et al*. 1993; Swingle *et al*. 1993; Vu *et al*. 2012). Although further research is needed to provide a clearer understanding of large whale movements and distribution in the winter, the distribution and movements of large whales to foraging grounds in the spring/summer is well understood. Movements of whales into higher latitudes coincide with peak productivity in these waters. As a result, the distribution of large whales in higher latitudes is strongly governed by prey availability and distribution, with large numbers of whales coinciding with dense patches of preferred forage (Payne *et al*.1986, 1990; Schilling *et al.* 1992; Waring *et al*. 2016; Hayes *et al*. 2017). For additional information on the biology, status, and range wide distribution of each whale species please refer to marine mammal stock assessment reports provided at: http://www.nmfs.noaa.gov/pr/sars/region.htm; and, NMFS (1991, 2010, 2011).

6.4.2.3. Small Cetaceans and Pinnipeds

Table 13 lists the small cetaceans and pinnipeds that may occur in the affected environment of the MSB fisheries. Small cetaceans can be found throughout the year in the Northwest Atlantic Ocean; however, within this range, there are seasonal shifts in species distribution and abundance. Pinnipeds are primarily found throughout the year or seasonally from New Jersey to Maine; however, increasing evidence indicates that some species (e.g., harbor seals) may be extending their range seasonally into waters as far south as Cape Hatteras, North Carolina (35oN). For additional information on the biology and range wide distribution of each species of small cetacean and pinniped provided in Table 23, please refer to the marine mammal stock assessment reports provided at: http://www.nmfs.noaa.gov/pr/sars/region.htm.

6.4.2.4. Atlantic Sturgeon

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 (ASSRT 2007; Dovel and Berggren 1983; Dadswell et al. 1984; Kynard et al. 2000; Stein et al. 2004a; Dadswell 2006; Laney et al. 2007; Dunton et al. 2010, 2015; Erickson et al. 2011; Wirgin et al. 2012; Waldman et al. 2013; O'Leary et al. 2014; Wirgin et al. 2015a,b). Based on fishery-independent and dependent data, as well as data collected from tracking and tagging studies, in the marine environment, Atlantic sturgeon appear to primarily occur inshore of the 50 meter depth contour (Stein et al. 2004 a,b; Erickson et al. 2011; Dunton et al. 2010); however, Atlantic sturgeon are not restricted to these depths, as excursions into deeper continental shelf waters have been documented (Timoshkin 1968; Collins and Smith 1997; Stein et al. 2004a,b; Dunton et al. 2010; Erickson et al. 2011). Data from fishery-independent surveys and tagging and tracking studies also indicate that Atlantic sturgeon may undertake seasonal movements along the coast (Dunton et al. 2010; Erickson et al. 2011; Wipplehauser 2012); however, there is no evidence to date that all Atlantic sturgeon make these seasonal movements and therefore, may be present throughout the marine environment throughout the year. For additional information on the biology, status, and range wide distribution of each distinct population segment (DPS) of Atlantic sturgeon please refer to 77 FR 5880 and 77 FR 5914, as well as the Atlantic Sturgeon Status Review Team's (ASSRT) 2007 status review of Atlantic sturgeon (ASSRT 2007).

6.4.2.5 Atlantic Salmon

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 Gulf of Maine DPS extends from the Gulf of Maine (primarily northern portion of the Gulf of Maine) 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 Gulf of Maine 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 2004; 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, status, and range-wide distribution of the Gulf of Maine DPS of Atlantic salmon please refer to NMFS and USFWS 2005, 2016; Fay *et al*. 2006.

6.4.3. Gear Interactions with Protected Species

Several protected species are vulnerable to interactions with various types of fishing gear. Interaction risks vary by gear type, quantity, and soak or tow time. Available information on gear interactions with a given protected species (or species group) is provided in the sections below. These sections are not a comprehensive review of all fishing gear types known to interact with a given species; focus is placed on interaction risks associated with bottom trawls or midwater trawls, the primary gear types used in the MSB fisheries.

6.4.3.1. Gear Interactions with Sea Turtles

Bottom Otter Trawl

Sea turtle interactions with bottom trawl gear have been observed on Georges Bank, and in the Mid-Atlantic; however, most of the observed interactions have occurred in the Mid-Atlantic (Warden 2011a,b; Murray 2015). As no sea turtle interactions with bottom trawl gear have been observed in the Gulf of Maine, and few sea turtle interactions have been observed on Georges Bank, there is insufficient data available to conduct a robust model-based analysis on sea turtle interactions with bottom trawl gear in these regions or produce a bycatch estimate for these regions. As a result, the bycatch estimates and discussion below are for bottom trawl gear in the Mid-Atlantic.

Bottom trawl gear poses an injury and mortality risk to sea turtles, specifically due to forced submergence (Sasso and Epperly 2006). Green, Kemp's ridley, leatherback, loggerhead, and unidentified sea turtles have been documented interacting (e.g., bycaught) with bottom trawl gear. However, estimates are available only for loggerhead sea turtles. Warden (2011a,b) estimated that from 2005-2008, the average annual loggerhead interactions in bottom trawl gear in the Mid-Atlantic[9] was 292 (CV=0.13, 95% CI=221-369), with an additional 61 loggerheads (CV=0.17, 95% CI=41-83) interacting with trawls, but released through a Turtle Excluder Device (TED).[10] The 292 average annual observable loggerhead interactions equates to approximately 44 adult equivalents (Warden 2011a,b). Most recently, Murray (2015) estimated that from 2009-2013, the total average annual loggerhead interactions in bottom trawl gear in the Mid-Atlantic[11] was 231 (CV=0.13, 95% CI=182-298); this equates to approximately 33 adult

[9] Warden (2011a) defined the Mid-Atlantic as south of Cape Cod, Massachusetts, to approximately the North Carolina/South Carolina border.

[10] TEDs allow sea turtles to escape the trawl net, reducing injury and mortality resulting from capture in the net. Approved TEDs are required in the shrimp and summer trawl fishery. For further information on TEDs see 50 CFR 223.206 and 68 FR 8456 (February 21, 2003).

[11] Murray 2015b defined the Mid-Atlantic as the boundaries of the Mid-Atlantic Ecological Production; roughly waters west of 71ºW to the North Carolina/South Carolina border)

equivalents (Murray 2015). Bycatch estimates provided in Warden (2011a) and Murray (2015) are a decrease from the average annual loggerhead bycatch in bottom otter trawls during 1996-2004, which Murray (2008) estimated at 616 sea turtles (CV=0.23, 95% CI over the nine-year period: 367-890). This decrease is likely due to decreased fishing effort in high-interaction areas (Warden 2011a, b).

Mid-Water Trawl

NEFOP and ASM observer data from 1989 to 2015 show five leatherback sea turtle interactions with mid-water trawl gear; the primary species landed during these interactions was tuna (NMFS NEFSC FSB 2015, 2016, 2017). These takes were in the early 1990s in an experimental HMS fishery that no longer operates. No takes have been documented in other mid-water trawl fisheries operating in the Greater Atlantic Region. Based on this and the best available information, sea turtle interactions in mid-water trawl gear in the Greater Atlantic Region are expected to be rare.

6.4.3.2. Gear Interactions with Atlantic Sturgeon

Bottom Otter Trawl

Atlantic sturgeon interactions (i.e., bycatch) with bottom trawl gear have been observed since 1989; these interactions have the potential to result in the injury or mortality of Atlantic sturgeon (NMFS NEFSC FSB 2015, 2016, 2017). Three documents, covering three time periods, that use data collected by the Northeast Fisheries Observer Program to describe bycatch of Atlantic sturgeon in bottom trawl gear: Stein et al. (2004b) for 1989-2000; ASMFC (2007b) for 2001-2006; and Miller and Shepard (2011) for 2006-2010; none of these documents provide estimates of Atlantic sturgeon bycatch by Distinct Population Segment. Miller and Shepard (2011), the most recent of the three documents, analyzed fishery observer data and VTR data in order to estimate the average annual number of Atlantic sturgeon interactions in otter trawl in the Northeast Atlantic that occurred from 2006 to 2010. This timeframe included the most recent, complete data and as a result, Miller and Shepard (2011) is considered to represent the most accurate predictor of annual Atlantic sturgeon interactions in the Northeast bottom trawl fisheries (NMFS 2013).

Based on the findings of Miller and Shepard (2011), NMFS (2013) estimated that the annual bycatch of Atlantic sturgeon in bottom trawl gear to be 1,342 sturgeon. Miller and Shepard (2011) reported observed Atlantic sturgeon interactions in trawl gear with small (< 5.5 inches) and large (≥ 5.5 inches) mesh sizes and concluded that, based on NEFOP observed sturgeon mortalities, relative to gillnet gear, bottom trawl gear posed less risk of mortality to Atlantic sturgeon. Estimated mortality rates in gillnet gear were 20.0%, while those in otter trawl gear were 5.0% (Miller and Shepard 2011; NMFS 2013). Similar conclusions were reached in Stein *et al*. (2004b) and ASMFC (2007b) reports; after review of observer data from 1989-2000 and 2001-2006, both studies concluded that observed mortality is much higher in gillnet gear than in trawl gear. However, an important consideration to these findings is that observed mortality is

considered a minimum of what actually occurs and therefore, the conclusions reached by Stein *et al*. (2004b), ASMFC (2007b), and Miller and Shepard (2011) are not reflective of the total mortality associated with either gear type. To date, total Atlantic sturgeon mortality associated with gillnet or trawl gear remains uncertain.

Mid-Water Trawl

To date, there have been no observed/documented interactions with Atlantic sturgeon in mid-water trawl gear (NMFS NEFSC FSB 2015, 2016, 2017). Based on this information, mid-water trawl gear is not expected to pose an interaction risk to any Atlantic sturgeon and therefore, is not expected to be source of injury or mortality to this species.

6.4.3.3. Gear Interaction with Atlantic Salmon

Bottom Otter Trawl

Atlantic salmon interactions (i.e., bycatch) with bottom trawl have been observed since 1989; in many instances, these interactions have resulted in the injury and mortality of Atlantic salmon (NMFS NEFSC FSB 2015, 2016, 2017). According to the Biological Opinion issued by NMFS Greater Atlantic Regional Fisheries Office on December 16, 2013, NMFS Northeast Fisheries Science Center's (NEFSC) Northeast Fisheries Observer and At-Sea Monitoring Programs documented a total of 15 individual salmon incidentally caught on more than 60,000 observed commercial fishing trips from 1989 through August 2013 (NMFS 2013; Kocik *et al*. 2014); of those 15 salmon, four were observed caught in bottom trawl gear (Kocik (NEFSC), pers. comm (February 11, 2013) in NMFS 2013).The genetic identity of these captured salmon is unknown; however, the NMFS 2013 Biological Opinion considers all 15 fish to be part of the Gulf of Maine Distinct Population Segment, although some may have originated from the Connecticut River restocking program (i.e., those caught south of Cape Cod, Massachusetts). Since 2013, no additional Atlantic salmon have been observed in bottom trawl gear (NMFS NEFSC FSB 2015, 2016, 2017). Based on the above information, bottom trawl interactions with Atlantic salmon are likely rare (NMFS 2013; Kocik *et al*. 2014).

Mid-Water Trawl

To date, there have been no observed/documented interactions with Atlantic salmon and mid-water trawl gear (NMFS NEFSC FSB 2015, 2016, 2017). Based on this information, mid-water trawls or purse seines are not expected to pose an interaction risk to any Atlantic salmon and therefore, are not expected to be source of injury or mortality to this species.

6.4.3.4. Gear Interactions with Marine Mammals

Depending on species, marine mammal interactions have been observed in bottom trawl, purse seine, and/or mid-water trawl 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 2018 LOF (83 FR 5349 (February 7, 2018)) categorizes the commercial MSB fisheries, which are primarily prosecuted with bottom and mid-water trawl gears, as a Category II bottom trawl (Northeast and Mid-Atlantic) or Category II mi-water (Northeast and Mid-Atlantic) fishery.

Large Whales
Bottom Otter and Mid-Water Trawls

With the exception of one species, there have been no observed interactions with large whales and trawl (bottom or mid-water) gear. The one exception is minke whales, which have been observed seriously injured and killed in both types of trawl gear. Over the past10 years, there have been two (2) observed minke whales incidentally taken in mid-water trawl gear. These occurred in 2009 and 2013, with the 2009 incident resulting from entanglement in NOAA research mid-water trawl gear (whale released alive, but seriously injured), and the 2013 incident resulting from entanglement in a Northeast mid-water trawl (including pair trawl) fishery (whale was dead, moderately decomposed) (see http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html; Waring *et al*. 2016; Henry *et al*. 2015). Based on the latter incident, as provided in Waring *et al*. (2016), the estimated annual average minke whale mortality and serious injury from the Northeast mid-water trawl (including pair trawl) fishery from 2009 to 2013 is 0.2; Hayes *et al*. (2017) provided the same estimated annual average minke whale mortality and serious injury from the Northeast mid-water trawl (including pair trawl) fishery from 2010 to 2014.

In bottom trawl gear, to date, interactions have only been observed in the northeast bottom trawl fisheries. From the period of 2008-2012, the estimated annual mortality attributed to this fishery was 7.8 minke whales for 2008 and zero minke whales from 2009-2012; no serious injuries were reported during this time (Waring *et al*. 2015). Based on this information, from 2008-2012, the estimated annual average minke whale mortality and serious injury attributed to the northeast bottom trawl fishery was 1.6 (CV=0.69) whales (Waring *et al*. 2015). Lyssikatos (2015) estimated that from 2008-2013, mean annual serious injuries and mortalities from the northeast bottom trawl fishery were 1.40 (CV=0.58) minke whales. Serious injury and mortality records for minke whales in U.S. waters from 2010-2014 showed zero interactions with bottom trawl (northeast or Mid-Atlantic) gear (Henry *et al*. 2016; Hayes *et al*. 2017).

Based on above information, trawl gear is likely to pose a low interaction risk to any large whale species. Should an interaction occur, serious injury or mortality to any large whale is possible; however, relative to other gear types, such as fixed gear, trawl gear represents a low source serious injury or mortality to any large whale (Henry *et al*. 2016; Hayes *et al*. 2017).

Small Cetaceans and Pinnipeds

Bottom and Mid-Water Trawl Gear

Small cetaceans and pinnipeds are vulnerable to interactions with bottom and/or mid-water trawl gear (Read *et al*. 2006; Lyssikatos 2015; Waring *et al*. 2014a; Waring *et al*. 2015; Waring *et al*. 2016; Hayes *et al*. 2017; 83 FR 5349 (February 7, 2018)).[12] Based on the most recent five years of observer data (2010-2014), Table 24 provides a list of species that have been observed (incidentally) seriously injured and/or killed by List of Fisheries Category II trawl fisheries that operate in the affected environment of the MSB fisheries (Hayes *et al*. 2017; 83 FR 5349 (February 7, 2018)).

Table 24. Small cetacean and pinniped species observed seriously injured and/or killed by Category II trawl fisheries in the affected environment of the MSB fisheries.

Fishery	Category	Species Observed or reported Injured/Killed
Mid-Atlantic Mid-Water trawl (including pair trawl)	II	Gray seal
		Harbor seal
Northeast Midwater Trawl-Including Pair Trawl	II	Short-beaked common dolphin
		Long-finned pilot whales
		Gray seal
		Harbor seal
Northeast Bottom Trawl	II	Harp seal
		Harbor seal
		Gray seal
		Long-finned pilot whales
		Short-beaked common dolphin
		White-sided dolphin
		Harbor porpoise
		Bottlenose dolphin (offshore)
		Risso's dolphin

[12] For additional information on small cetacean and pinniped interactions prior to those provided in Waring et al. 2014a, see: http://www.nmfs.noaa.gov/pr/sars/region.htm

Mid-Atlantic Bottom Trawl	II	White-sided dolphin
		Short-beaked common dolphin
		Risso's dolphin
		Bottlenose dolphin (offshore)
		Gray seal
		Harbor seal
Sources: Hayes *et al.* (2017); MMPA LOF 83 FR 5349 (February 7, 2018).		

In 2006, based on observed mid-water trawl interactions with long-finned pilot whales, short - finned pilot whales, common dolphins, and white sided dolphins, the Atlantic Trawl Gear Take Reduction Team (ATGTRT) was convened to address the incidental mortality and serious injury of these species incidental to bottom and mid-water trawl fisheries operating in both the New England and Mid-Atlantic regions. Because none of the marine mammal stocks of concern to the ATGTRT are classified as a "strategic stock", nor do they currently interact with a Category I fishery,[13] it was determined that development of a take reduction plan was not necessary. In lieu of a take reduction plan, the ATGTRT agreed to develop an Atlantic Trawl Gear Take Reduction Strategy (ATGTRS). The ATGTRS identifies informational and research tasks, as well as education and outreach needs the ATGTRT believes are necessary to provide the basis for decreasing mortalities and serious injuries of marine mammals to insignificant levels approaching zero. The ATGTRS also identifies several voluntary measures that can be adopted by certain trawl fishing sectors to potentially reduce the incidental capture of marine mammals.[14]

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[13] Category I fisheries have frequent incidental mortality and serious injury of marine mammals.

[14] For additional details on the ATGTRS, visit: http://www.greateratlantic.fisheries.noaa.gov/Protected/mmp/atgtrp/

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

The alternatives considered are fully described in section 5. A descriptive label is included for each alternative below when considering impacts. Related to this action, the key determinant of biological impacts on the FMP's managed resources (mackerel, squid, and butterfish) is how much fish can be caught, i.e. the annual catch limits in the case of butterfish and the ABCs for longfin and *Illex* squid (the squids are exempt from ACLs due to their short lifespan). With the exception of the *Illex* squid fishery in 2017, in recent years the mackerel, squid, and butterfish fisheries have not caught their entire quotas. Thus even the no action/status quo potentially allows an expansion of catch. To the degree that extra effort is used to expand catch, impacts on non-target species, habitat, and protected resources could increase even under the no action. Conversely, for the same reasons that catch has been lower than the quotas, catch and effort, and related impacts, could decrease under the no action. This is especially true for the MSB species as they are subject to sometimes rapid fluctuations in abundance (how many fish are out there) and/or availability (how many fish are out there in places where the fishery can find and target them profitably). Rather than repeat this concept for every resource, this document acknowledges that under any of the proposed alternatives effort and related impacts could increase or decrease based on the species availability to the fishery independent of quota levels or other measures intended to control catch. Accordingly, the analysis focuses on the relative upper limits or other constraints imposed (or removed) by the various alternatives considered in this action (even though effort and catch may not actually change as quotas and other regulations change).

For habitat, protected resource, and non-target species impacts, the key determinant is not so much the catch itself but the amount and character of the related effort. A decrease in effort may result in positive impacts (+) as a result of fewer encounters and/or fewer habitat impacts from fishing gear, while an increase in effort may result in a negative impact (-). Similar effort likely results in neutral impacts (0). The table immediately below illustrates that 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. This is noted for the habitat, protected resource, and non-target species sections since the MSB fisheries often experience large swings in availability and therefore effort, independent of any regulatory changes. Since limits on catch do cap effort, catch limits are a factor related to effort and impacts but many other factors are at least somewhat beyond the control of the Council (such as fish abundance, availability of other opportunities, weather, climate, fish movements/ availability, variable productivity, etc.).

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 25. Changes in effort as a result of adjustments to quota and/or fish availability.

Change in quota	**Fish abundance/availability**		
	Decrease in availability	**No change in availability**	**Increase in availability**
Decrease in quota	Fishing effort may decrease, increase, or stay the same depending on a combination of factors[15].	Effort likely to decrease or stay the same. If per trip catch stays the same, the fishery will be closed earlier with fewer trips taken (reducing effort). However managers may reduce trip limits or adjust regulations that extend the fishing season (keeping effort the same).	Effort likely to decrease or stay the same. A lower quota plus higher catch per unit of effort (CPUE) from higher availability should decrease effort. However, managers may reduce trip limits or adjust regulations that extend the fishing season which may keep effort relatively even.
No change in quota	Effort may increase or decrease. While the quota has not changed, fishermen may try to take more trips to catch the same amount of fish (increasing effort) or may stop targeting a stock of fish if availability is low enough to decrease profitability (decreasing effort).	Fishing effort may remain the same given the quota has not changed and availability is expected to be similar.	Effort should decrease. While the quota has not changed, fishermen should be able to take fewer trips to catch the same amount of fish (decreasing effort).
Increase in quota	Fishing effort likely to increase or stay the same. A higher quota plus lower catch per unit of effort from lower availability should increase effort. However, managers may increase trip limits or adjust regulations to allow more efficient fishing (keeping effort the same).	Effort likely to increase or stay the same. If per trip catch stays the same, the fishery will be closed later with more trips taken (increasing effort). However managers may increase trip limits or adjust regulations to allow more efficient fishing (keeping effort the same).	Fishing effort may decrease, increase, or stay the same depending on a combination of factors.

[15] Factors affecting fishing effort include other species abundance, availability of other opportunities, weather, climate, fish movements/availability, variable productivity, and market forces/price changes.

Environmental impacts are described both in terms of their direction (negative, positive, or no impact) and their magnitude (slight, moderate, or high). The table below summarizes the guidelines used for each VEC to determine the magnitude and direction of the impacts described in this section.

Table 26. General definitions for impacts and qualifiers relative to resource condition (i.e., 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 and slow recovery time (see condition of the resources table)	Alternatives that improve the quality or quantity of habitat or allow for recovery	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.

The table below summarizes the baseline conditions of the VECs considered in this action, as described in Section 6.

Table 27. Summary Baseline conditions of VECs considered in this action

VEC		Baseline Condition	
		Status/Trends, Overfishing?	**Status/Trends, Overfished?**
Target stocks (section 6.1)	**Atl. mackerel**	Yes through 2016, projected to be below overfishing threshold in 2017 and beyond.	Yes in 2016. Projected to be above overfished threshold in 2017 and beyond. A rebuilding program is being developed.
	Butterfish	No	No
	Longfin Squid	Unknown, believed lightly exploited.	No
	***Illex* Squid**	Unknown	Unknown, NEFSC fall bottom trawl surveys are highly variable and without trend
Non-target species (principal species listed in section 6.1)	spotted hake	no	no
	scup	no	no
	silver hake	no	no
	spiny dogfish	no	no
	red hake	yes	yes
	summer flounder	yes	no
	smooth dogfish	no	no
	northern sea robin	Unknown	Unknown
	black sea bass	no	no
	winter (big) skate	no	no
	fourspot flounder	Unknown	Unknown
	john dory buckler	Unknown	Unknown
	chub mackerel	Unknown	Unknown
Habitat (section 6.2)		Commercial fishing impacts are complex and variable and typically adverse; Recreational fishing impacts are typically minimal. Non-fishing activities had historically negative but site-specific effects on habitat quality.	
Protected resources (section 6.4)	**Sea turtles**	Leatherback and Kemp's ridley sea turtles are classified as endangered under the ESA; loggerhead (NW Atlantic DPS) and green (North Atlantic DPS) sea turtles are classified as threatened.	
	Fish	Atlantic salmon, shortnose sturgeon, and the New York Bight, Chesapeake, Carolina, and South Atlantic DPSs of Atlantic sturgeon are classified as endangered under the ESA; the Atlantic sturgeon Gulf of Maine DPS is listed as threatened; cusk, alewife, and blueback herring are candidate species	

	Large whales	All large whales in the Northwest Atlantic are protected under the MMPA. North Atlantic right, fin, blue, sei, and sperm whales are also listed as endangered under the ESA. Pursuant to section 118 of the MMPA, the Large Whale Take Reduction Plan was implemented to reduce humpback, North Atlantic right, and fin whale entanglement in vertical lines associated with fixed fishing gear (sink gillnet and trap/pot) and sinking groundlines.
	Small cetaceans	Pilot whales, dolphins, and harbor porpoise are all protected under the MMPA. Pursuant to section 118 of the MMPA, the HPTRP and BDTRP was implemented to reduce bycatch of harbor porpoise and bottlenose dolphin stocks, respectively, in gillnet gear.
	Pinnipeds	Gray, harbor, hooded, and harp seals are protected under the MMPA.
Human communities (section 6.3)		The MSB stocks support substantial fisheries and related support services.

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7.1 Managed Resources

7.1.1 Impacts on Mackerel

Current resource condition: A recent assessment found the mackerel stock to be overfished with overfishing occurring in the terminal year of the assessment (2016). However, good recruitment in 2016, combined with the already-lowered US and Canadian quotas appear to have set up the mackerel stock for rapid rebuilding. Projections also indicate there was no overfishing in 2017 and that the stock should have climbed above the overfished threshold in 2017. In 2015, the Council set mackerel specifications for 2016-2018. The specifications previously set for 2018 should avoid overfishing in 2018 and allow the mackerel stock to continue rebuilding while a formal rebuilding plan is developed in 2018 for implementation in 2019. This action does not include any changes to the previously set 2018 mackerel specifications.

Some vessels issued a limited access mackerel permit that have limited access longfin permits (approximately 109 in 2016) will not have sufficient longfin squid landings to retain the unlimited longfin squid moratorium permit. If these vessels decided to increase participation in the MSB fisheries in the future, they would not be able to direct on longfin squid so may be more likely to redirect effort into the mackerel fishery. This may increase effort in the mackerel fishery, but would be unlikely to cause landings to exceed sustainable catches, which are set at levels to prevent overfishing. Even if potential additional effort increases mackerel catch, existing regulations require that NMFS close the directed mackerel fishery when 95% of the domestic annual harvest level is landed. Therefore, any potential effort shifts would not impact the mackerel stock or negatively affect the current condition of the resource. Further, because there is minimal mackerel catch in the squid and/or butterfish fisheries, and there is already a set-aside for discards of mackerel in the directed mackerel and other fisheries within the existing mackerel specifications, this action overall should not impact the mackerel resource condition. Mackerel rebuilding will be addressed within the directed mackerel fishery, and will consider incidental catch (primarily in the Atlantic herring fishery) as appropriate.

7.1.2 Impacts on Butterfish

Current resource condition: butterfish are not overfished (141% of target biomass), overfishing is not occurring, and catches are limited to maintain a sustainable fishery. Recent projections suggest a short-term decline (but not to an overfished condition). Butterfish are relatively short-lived and recruitment is variable so substantial year to year populations changes are expected. In general, the Council will seek management that achieves OY, which should be sustainable and maintain the butterfish stock at a non-overfished level. All of the alternatives in this action are expected to produce catches that do not cause overfishing or cause the stock to become overfished, because existing and persisting management measures control, or account for, all landings and discards. Some slight effort changes could occur, and are further described below.

Alternative Set 1

All of the alternatives in Alternative Set 1 would have either a neutral or possibly a positive impact on the butterfish resource condition. Under all alternatives, existing management measures will ensure that butterfish catch stays at or below the ABC, maintaining the butterfish stock size above an overfished condition. The fishing that results from the status quo or any of the action alternatives

should continue to be limited to the Acceptable Biological Catches (ABC) from the Council's Scientific and Statistical Committee per the risk policy of the Council, which mandates the use of the best available scientific information to avoid overfishing.

The longfin squid requalification alternatives create a separate butterfish moratorium permit by splitting butterfish from the current longfin squid/butterfish moratorium permit. Although unlikely based on historic fishing activity, this could theoretically incentivize vessels, particularly those that fail to requalify to retain their current longfin squid moratorium permit under this alternative, to more frequently target butterfish if at some point in the future they decided to pursue MSB species in general. If vessels increase the targeting of butterfish, landings would increase, but still be kept under the ABC because existing measures require NMFS to close the directed fishery when 100% of the butterfish directed fishery closure threshold (domestic annual harvest level minus 1,000 mt) is caught. Therefore, while the action alternatives 1B-1E may result in higher butterfish landings compared to no action, impacts to the butterfish resource condition would be neutral.

There is substantial interaction with butterfish in the longfin squid fishery, but discarding in that fishery is directly limited through a discard cap with in-season management that will not change via this action. It is true that some alternatives could indirectly reduce butterfish discarding in the longfin squid fishery by reducing overall effort. For example, Alternatives 1B, 1C, 1D, and 1E would all reduce the number of latent longfin squid permits and thus reduce the potential discards associated with longfin squid trips. This could theoretically reduce fishing mortality, resulting in low positive impacts to the butterfish condition compared to no action. However if butterfish discards are low, in the short term NMFS can shift the use of butterfish from the longfin squid discard cap to landings, and in the long run the Council may respond to low discards by increasing landings (to achieve OY), so overall mortality would remain approximately the same regardless, and the impact to butterfish resource condition would be neutral compared to no action.

<u>Alternative Sets 2 and 3</u>

Alternative sets 2 and 3 would have negligible impacts on the butterfish resource condition. Compared to the No Action Alternative, Alternative 2B could potentially increase the likelihood of butterfish catch by allowing an owner of multiple longfin permits to move a requalified longfin squid moratorium permit onto a vessel that is more likely to actively target longfin squid and catch butterfish in the process. However, catch would be limited to the overall ABC by a combination of butterfish landings and bycatch limits, as noted above. Alternative 3B and 3C would likely slightly reduce butterfish bycatch in the longfin squid fishery by reducing the number of vessels that would be able to land higher incidental amounts of longfin squid. Alternative 3C would potentially reduce butterfish bycatch more than the other alternatives in the alternative set given that fewer vessels would qualify for the incidental permit. This could theoretically reduce fishing mortality, resulting in low positive impacts to the butterfish condition compared to no action. However if butterfish discards are low, in the short term NMFS can shift the use of butterfish from the longfin squid discard cap to landings, and in the long run the Council may respond to low discards by increasing landings (to achieve OY), so overall mortality would remain approximately the same regardless, and the impact to the butterfish resource condition would be neutral.

Alternative Set 4

Compared to no action (4A), 4B could reduce effort, because no extra longfin squid quota would be rolled over into T2 and available during T2. While that means more quota would be available in T3, there is no guarantee that squid will be available during T3, and over the long term there would likely be some fishing opportunities lost during T2 and not made up for during T3. There also have not been any annual closures restraining fishing during T3 in recent years so adding more quota to T3 is unlikely to result in any additional landings/effort during T3. 4C would have a similar, but lesser effect. If total effort is decreased but some is shifted from T2 to T3, the relative influence of the two effects described above would determine the net impact on butterfish compared to no action because butterfish discards are higher during T3. However, as described above it is not expected that effort would actually increase in T3 and the principal effect would be an overall reduction in longfin squid effort. This could theoretically reduce fishing mortality, resulting in low positive impacts to the butterfish condition compared to no action, more so with 4B then 4C. However if butterfish discards are low, in the short term NMFS can shift the use of butterfish from the longfin squid discard cap to landings, and in the long run the Council may respond to low discards by increasing landings (to achieve OY), so overall mortality would remain approximately the same regardless, and the impact to the butterfish resource condition would be neutral.

Alternative Set 5

Compared to the No Action Alternative, Alternatives 5B and 5C should more effectively curtail squid fishing after T2 closures, lowering overall effort and thereby reducing butterfish discards during T2 in some years (5B more so than 5C). Reducing overages during T2 effectively increases the quota available in T3 due to roll-over of underages or overages into T3. While that means more quota would be available in T3, there is no guarantee that squid will be available during T3, and over the long term there would likely be some fishing opportunities lost during T2 and not made up for during T3. There also have not been any annual closures restraining fishing during T3 in recent years so adding more quota to T3 is unlikely to result in any additional landings/effort during T3. If total effort is decreased but some is shifted from T2 to T3, the relative influence of the two effects described above would determine the net impact on butterfish compared to no action because butterfish discards are higher during T3. However, as described above it is not expected that effort would actually increase in T3 and the principal effect would be an overall reduction in longfin squid effort. This could theoretically reduce fishing mortality, resulting in low positive impacts to the butterfish condition compared to no action, more so with 5B then 5C. However if butterfish discards are low, in the short term NMFS can shift the use of butterfish from the longfin squid discard cap to landings, and in the long run the Council may respond to low discards by increasing landings (to achieve OY), so overall mortality would remain approximately the same regardless, and the impact to the butterfish resource condition would be neutral.

Alternative Set 6

Because the *Illex* squid fishery has minimal overlap with the butterfish fishery, none of these alternatives would affect butterfish catch or the butterfish resource condition

7.1.3 Impacts on Longfin Squid

Current resource condition: longfin squid are not overfished (174% of target biomass). Overfishing status is unknown but likely low according to the most recent assessment, and catches are limited to maintain a sustainable fishery.

Longfin Squid Impacts from Alternative 1A – No action on longfin squid permits.

Under no action, existing measures should generally limit catch to the ABC and maintain the longfin squid resource condition, i.e. not overfished. However, activation of latent effort could make predicting and executing timely seasonal closures more difficult in this high volume fishery, and increase the likelihood that the quota would be exceeded. Exceeding quotas would result in more removals than recommended based on ABC/ACL recommendations. As such, no action (maintaining a large reserve of latent permits) could have low negative impacts for the longfin squid resource condition in the future and more negative impacts compared to the action alternatives, as described below.

Longfin Squid Impacts from Alternative 1B – Longfin squid requalification 10,000 pounds any year 1997-2015.

This Alternative may impact the number of vessels that have access to the longfin squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet. Since racing to fish should be controlled by avoiding additional activation of latent effort, this alternative should help closures continue to occur in a timely fashion. There would be a positive impact to the longfin squid resource condition from being able to effectively close the fishery before quota/ABC overages occur, and the impact is low positive due to the theoretical nature of the impact and NMFS' current ability to project closures. Since the degree of impact would be aligned with the reduction in latent permits, the order of positive impact from less positive to more positive impact would be 1B, 1C, 1D, and then 1E.

Longfin Squid Impacts from Alternative 1C (PREFERRED) – Longfin squid requalification 10,000 pounds any year 1997-2013.

This Alternative may impact the number of vessels that have access to the longfin squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet. Since racing to fish should be controlled by avoiding additional activation of latent effort, this alternative should help closures continue to occur in a timely fashion. There would be a positive impact to the longfin squid resource condition from being able to effectively close the fishery before quota/ABC overages occur, and the impact is low positive due to the theoretical nature of the impact and NMFS' current ability to project closures. Since the degree of impact would be aligned with the reduction in latent permits, the order of positive impact from less positive to more positive impact would be 1B, 1C, 1D, and then 1E.

Longfin Squid Impacts from Alternative 1D – Longfin squid requalification 25,000 pounds any year 2003-2013.

This Alternative may impact the number of vessels that have access to the longfin squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet. Since racing to fish should be controlled by avoiding additional activation of latent effort, this alternative should help closures continue to occur in a timely fashion. There would be a positive impact to the longfin squid resource condition from being able to effectively close the fishery before quota/ABC overages occur, and the impact is low positive due to the theoretical nature of the impact and NMFS' current ability to project closures. Since the degree of impact would be aligned with the reduction in latent permits, the order of positive impact from less positive to more positive impact would be 1B, 1C, 1D, and then 1E.

Longfin Squid Impacts from Alternative 1E – Longfin squid requalification 50,000 pounds average 1997-2013.

This Alternative may impact the number of vessels that have access to the longfin squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet. Since racing to fish should be controlled by avoiding additional activation of latent effort, this alternative should help closures continue to occur in a timely fashion. There would be a positive impact to the longfin squid resource condition from being able to effectively close the fishery before quota/ABC overages occur, and the impact is low positive due to the theoretical nature of the impact and NMFS' current ability to project closures. Since the degree of impact would be aligned with the reduction in latent permits, the order of positive impact from less positive to more positive impact would be 1B, 1C, 1D, and then 1E.

Longfin Squid Impacts from Alternative 2A – No action on permit swap sub-alternative.

Under no action, existing measures should generally limit catch to the ABC and maintain the longfin squid resource condition, i.e. not overfished. However, activation of latent effort by allowing entities to put a less active permit onto an active vessel could make predicting closures more difficult in this high volume fishery, and slightly increase the likelihood that the quota would be exceeded. As such, no action could have low positive impacts for the longfin squid resource condition in the future tied to its role in reducing latent effort as 2A or 2B would be part of the permit reduction discussed for Alternative Set 1. Since 2A would result in fewer directed permits than 2B, 2A's effect is more positive than 2B.

Longfin Squid Impacts from Alternative 2B (PREFERRED) – Allow limited permit swap as part of longfin requalification.

This Alternative may impact the number of vessels that have access to the longfin squid fishery. This alternative would not affect the actual number of requalifiers, but might allow some reshuffling of permits so that some of the requalifiers are more likely to fish. However, those vessels could still potentially fish under overall no action on limited access changes. Regardless, the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, so this alternative is not likely to substantively change the amount or character of effort in the squid fleet. With some more theoretically participating vessels (a technical maximum of about 11 more but the actual number would probably be lower), this alternative might not reduce racing to fish as much as selecting no action for this alternative set. As such, 2B could have low positive impacts for the longfin squid resource condition in the future tied to its role in reducing latent effort as 2A or 2B would be part of the permit reduction discussed for Alternative Set 1. However, since 2B would result in more directed permits than 2A, 2B's effect is less positive than 2A.

Longfin Squid Impacts from Alternative 3A – No action on changes to squid/butterfish incidental permit.

No action regarding longfin squid incidental permits would allow the situation where vessels can drop federal incidental permits and fish in some states' waters with no trip limit after a closure of the squid fishery in federal waters to persist. This could exacerbate quota overages, which could lead to overfishing, which would negatively affect biomass and future recruitment. This situation is responsible for only a small portion of longfin squid landings, but does occur occasionally, so the impact is only slightly negative for 3A and the longfin squid resource condition would likely be maintained. The impact of the no action is also more negative than the impacts of the action alternatives, as described below.

Longfin Squid Impacts from Alternative 3B – New limited access incidental squid permit qualification 2,500 pounds any year 1997-2013.

Vessels with substantial squid landings would qualify for the new incidental permit, and since they would not be able to re-acquire the permit without buying one from another permit-holder, they should be unlikely to cancel their permit to fish in state waters at higher trip limits after a federal waters closure. There would also be fewer vessels that could target longfin squid at a 2,500 pound trip level. This should limit quota overages, avoid overfishing, preserve recruitment, and continue the positive biomass trends documented in recent assessments/updates. This situation is responsible for only a small portion of longfin squid landings, but does occur occasionally, so the impact is slightly positive on the longfin squid resource condition compared to no action, and similar to 3C but maybe slightly less positive than 3C because with more qualifiers the permit under 3B will be less valuable so vessels would be more likely to cancel it. Vessels could also decide to retain only state permits, which would still allow them to fish in state waters after closures, further contributing to the slightness of the impact. Since 3B1 or 3B2 would be part of 3B, they cannot be compared to 3B but would modify 3B's impacts, as described below. Since 3C1 or 3C2 would only be paired with 3C, there is no comparison necessary with 3C1 or 3C2 versus 3B.

Longfin Squid Impacts from sub-Alternative 3B1 – Reduce open-access longfin squid trip limit to 250 pounds.

This alternative should have a negligible direct impact on the longfin squid resource. It maintains vessels' ability to get an open access permit to cover low-level incidental landings, but lowers the amount of longfin squid that can be landed incidentally. Vessels that do not qualify for a limited access incidental catch permit under 3B that are subject to the open access longfin squid trip limit are not very active in the longfin squid fishery. The landings that could occur at a 250-pound trip limit should have a negligible impact on the longfin squid stock because according to the MSB Advisory Panel there will be minimal directed fishing with a 250-pound trip limit compared to a 2,500-pound trip limit due to the costs of operating vessels. Since such a trip limit has not been used before, it is not possible to quantitatively evaluate fleet performance under such a trip limit beyond the input of the MSB Advisory Panel, but the Council will evaluate the performance of this measure on an ongoing basis, and can take additional steps in the future to address any unexpected catch that occurs. Because 3B1 is tied to the creation of a limited access permit as described under 3B, this alternative contributes to the slightly positive impact to the longfin squid resource condition described under 3B. Since 3B1's

trip limit is lower than 3B2's trip limit and would more effectively avoid directed fishing, 3B1's impact is more positive than 3B2. Since 3B1 or 3B2 would only be paired with 3B, there is no comparison necessary with 3C1, 3C2, or 3C. There is not a concern about this alternative causing a substantial amount of discarding, because any vessels that have been catching substantial amounts of longfin squid incidental to their other fishing will qualify for a limited access permit. The Council will evaluate the performance of this measure on an ongoing basis, and can take additional steps in the future to address any regulatory discarding that may occur.

Longfin Squid Impacts from sub-Alternative 3B2 – Reduce open-access longfin squid trip limit to 500 pounds.

This alternative should have a negligible direct impact on the longfin squid condition. It maintains vessels' ability to get an open access permit to cover low-level incidental landings, but lowers the amount of longfin squid that can be landed incidentally. Vessels that do not qualify for a limited access incidental catch permit under 3B that are subject to the open access longfin squid trip limit are not very active in the longfin squid fishery. The landings that could occur at a 500-pound trip limit should have a low impact on the longfin squid stock because according to the MSB Advisory Panel there will be less directed fishing with a 500-pound trip limit compared to a 2,500-pound trip limit due to the costs of operating vessels. Since such a trip limit has not been used before, it is not possible to quantitatively evaluate fleet performance under such a trip limit beyond the input of the MSB Advisory Panel, but the Council could evaluate the performance of this measure on an ongoing basis, and take additional steps in the future to address any unexpected catch that occurs. Because 3B2 is tied to the creation of a limited access permit as described under 3B, this alternative contributes to the slightly positive impact to the longfin squid resource condition described under 3B. Since 3B2's trip limit is higher than 3B1's trip limit and would less effectively avoid directed fishing, 3B2's impact is less positive than 3B1. Since 3B1 or 3B2 would only be paired with 3B, there is no comparison necessary with 3C1, 3C2, or 3C. There is not a concern about this alternative causing a substantial amount of discarding, because any vessels that have been catching substantial amounts of longfin squid incidental to their other fishing will qualify for a limited access permit. The Council will evaluate the performance of this measure on an ongoing basis, and can take additional steps in the future to address any regulatory discarding that may occur.

Longfin Squid Impacts from Alternative 3C (PREFERRED) – New limited access incidental squid permit qualification 5,000 pounds any year 1997-2013.

Vessels with substantial squid landings would qualify for the new incidental permit, and since they would not be able to re-acquire the permit without buying one from another permit-holder, they should be unlikely to cancel their permit to fish in state waters at higher trip limits after a federal waters closure. There would also be fewer vessels that could target longfin squid at a 2,500 pound trip level. This should limit quota overages, avoid overfishing, preserve recruitment, and continue the positive biomass trends documented in recent assessments/updates. This situation is responsible for only a small portion of longfin squid landings, but does occur occasionally, so the impact on the longfin squid resource condition is slightly positive compared to no action, and similar to 3B but maybe slightly more positive than 3B because with less qualifiers the permit under 3C will be more valuable so vessels would be less likely to cancel it. Vessels could also decide to retain only state permits, which would still allow them to fish in state waters after closures, further contributing to the slightness of the

impact. Since 3C1 or 3C2 would be part of 3C, they cannot be compared to 3C but would modify 3C's impacts, as described below. Since 3B1 or 3B2 would only be paired with 3B, there is no comparison necessary with 3B1 or 3B2 versus 3C.

Longfin Squid Impacts from sub-Alternative 3C1 (PREFERRED) – Reduce open-access longfin squid trip limit to 250 pounds.

This alternative should have a negligible direct impact on the longfin squid condition. It maintains vessels' ability to get an open access permit to cover low-level incidental landings, but lowers the amount of longfin squid that can be landed incidentally. Vessels that do not qualify for a limited access incidental catch permit under 3C that are subject to the open access longfin squid trip limit are not very active in the longfin squid fishery. The landings that could occur at a 250-pound trip limit should have a negligible impact on the longfin squid stock because according to the MSB Advisory Panel there will be minimal directed fishing with a 250-pound trip limit compared to a 2,500-pound trip limit due to the costs of operating vessels. Since such a trip limit has not been used before, it is not possible to quantitatively evaluate fleet performance under such a trip limit beyond the input of the MSB Advisory Panel, but the Council will evaluate the performance of this measure on an ongoing basis, and can take additional steps in the future to address any unexpected catch that occurs. Because 3C1 is tied to the creation of a limited access permit as described under 3C, this alternative contributes to the slightly positive impact to the longfin squid resource condition described under 3C. Since 3C1's trip limit is lower than 3C2's trip limit and would more effectively avoid directed fishing, 3C1's impact is more positive than 3C2. Since 3C1 or 3C2 would only be paired with 3C, there is no comparison necessary with 3B1, 3B2, or 3B. There is not a concern about this alternative causing a substantial amount of discarding, because any vessels that have been catching substantial amounts of longfin squid incidental to their other fishing will qualify for a limited access permit. The Council will evaluate the performance of this measure on an ongoing basis, and can take additional steps in the future to address any regulatory discarding that may occur.

Longfin Squid Impacts from sub-Alternative 3C2 – Reduce open-access longfin squid trip limit to 500 pounds.

This alternative should have a negligible direct impact on the longfin squid condition. It maintains vessels' ability to get an open access permit to cover low-level incidental landings, but lowers the amount of longfin squid that can be landed incidentally. Vessels that do not qualify for a limited access incidental catch permit under 3C that are subject to the open access longfin squid trip limit are not very active in the longfin squid fishery. The landings that could occur at a 500-pound trip limit should have a low impact on the longfin squid stock because according to the MSB Advisory Panel there will be less directed fishing with a 500-pound trip limit compared to a 2,500-pound trip limit due to the costs of operating vessels. Since such a trip limit has not been used before, it is not possible to quantitatively evaluate fleet performance under such a trip limit beyond the input of the MSB Advisory Panel, but the Council could evaluate the performance of this measure on an ongoing basis, and take additional steps in the future to address any unexpected catch that occurs. Because 3C2 is tied to the creation of a limited access permit as described under 3C, this alternative contributes to the slightly positive impact to the longfin squid resource condition described under 3C. Since 3C2's trip limit is higher than 3C1's trip limit and would less effectively avoid directed fishing, 3C2's impact is less

positive than 3C1. Since 3C1 or 3C2 would only be paired with 3C, there is no comparison necessary with 3B1, 3B2, or 3B. There is not a concern about this alternative causing a substantial amount of discarding, because any vessels that have been catching substantial amounts of longfin squid incidental to their other fishing will qualify for a limited access permit. The Council will evaluate the performance of this measure on an ongoing basis, and can take additional steps in the future to address any regulatory discarding that may occur.

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Longfin Squid Impacts from Alternative 4A (PREFERRED) – No action on changes to Trimester rollover provisions.

The existing rollover provisions, which would persist under no-action, have been in effect since 2010. The longfin squid stock was assessed to be well over its biomass target in both 2009 and 2016, even with catches in 2011, 2012, 2014, 2015, and 2016 utilizing at least part of the rollover portion of the quota (see Table 13). One would therefore generally expect the longfin squid stock to continue to maintain its current resource condition of not being overfished under the no action, i.e. with not changing the rollover provisions.

There exists some concern however about catches during T2. Analyses conducted by NEFSC staff indicate a highly significant negative correlation ($p = 0.0014$), during 1983-2015, between effort (days fished on trips landing more than 40% longfin squid) during April-September and longfin squid landings-per-unit-effort (LPUE, mt per day fished) during the following October-March (Fig. 10). A similar significant negative correlation ($p < 0.0001$) was found between effort and LPUE for the October-March and April-September fishing periods, respectively. Ageing studies indicate that these two time periods represent the two primary seasonal cohorts; summer-hatched squid are taken in the winter fishery and vice versa (Brodziak and Macy 1996; Macy and Brodziak 2001). The negative relationship between the two seasonal cohorts is especially evident during 1983-1999 when in-season closures and the related trip limits were not in effect.

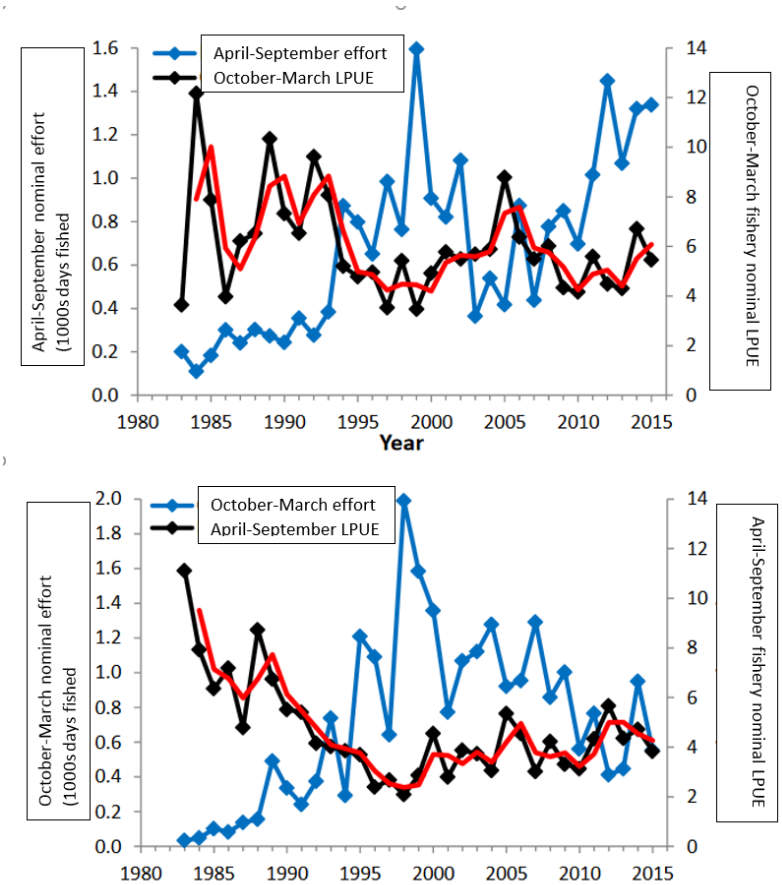

Figure 16. Negative Relationship Between Effort (days fished) in the longfin squid fishery during April-September and October-March LPUE (landings per unit effort) (top) and vice versa (bottom) during 1982-2015.

Additional reasons for considering effort restrictions during T2 related to the life history of squid include:

-The potential susceptibility of squid to recruitment overfishing due to their short-lived (sub-annual), semelparous life history and highly variable interannual abundance levels (Pierce and Guerra 1994);

-The T2 fishery operates on highly aggregated spawning squid (which exhibit complex communal mating and spawning behaviors) (Shashar and Hanlon 2013);

- Females can lay multiple egg clutches over a period of weeks, so harvesting them before they are able to deposit all of their eggs reduces future recruitment;

- Longfin squid egg mops are attached to the seabed (or vegetation, rocks and other fixed surfaces) presumably so that embryonic development occurs in waters with temperatures adequate for normal embryonic development and with adequate food supplies for hatchlings. The T2 fishery dislodges egg mops during bottom trawling and has higher squid egg mop bycatch than during T1 and T2 (see Table 2); and

-Lab studies have demonstrated that squid eggs that hatch prematurely have very high mortality rates due to incomplete absorption of the outer yolk sac and that mechanical disturbance can easily cause premature hatching (Adelman et al. 2013, Boletzky and Hanlon 1983, Hanlon 1990, Jones and McCarthy 2013, Vidal 2002, Vidal 2014).

These reasons, considered together with the NEFSC effort and LPUE analysis, suggest that effort during T2 under no action could have a low negative impact on the relative abundance of the subsequent Oct-March cohort of longfin squid. However, given the overall robust condition of the longfin squid resource based on the most recent assessment update, the overall impact on the longfin squid resource condition would appear likely neutral to slight negative. If such catches were having a serious negative impact the stock would not be in as good shape as it appears to be. There is not sufficient assessment information available to suggest what the optimum amount in each Trimester should be in terms of maximizing productivity. Spawning takes place year round with micro-cohorts, and in some areas that are natural refuges (rocky) or regulatory refuges (e.g. Massachusetts inshore summer small mesh closures), both of which may buffer any impacts from the directed fishery's impacts on eggs. The most recent assessment and a 2017 update considering the stock condition in 2016 found that the longfin squid stock is "lightly exploited" with biomasses substantially over the biomass target, so any slight impacts on longfin squid from existing quotas and catches, including catches under the no action roll-over provisions, would still be expected to maintain the current resource condition of not overfished. The impact of the no action is therefore neutral to slightly more negative than the impacts of the action alternatives, as described below.

Longfin Squid Impacts from Alternative 4B – Eliminate roll-over of longfin squid quota from T1 to T2.

The analysis above for 4A details why catch under the current quotas and roll-over in T2 may have a neutral to slightly negative impact on the longfin squid resource by potentially reducing spawning success and disrupting egg mops. Reducing catch in T2 by eliminating the roll-over may therefore

have a neutral to slightly positive impact compared to no action on the longfin squid resource condition, similar to 4C. These potential benefits step from reducing mortality on spawning squid and the egg masses they produce. Since the resource appears overall robust, the impact would be slight if any. While the longfin stock has withstood recent overages, there is no guarantee that whatever conditions have allowed the stock to flourish will continue (the stock is believed to be sensitive to environmental conditions (NEFSC 2010), and even greater stock productivity should result from controlling effort based on the observed effort to LPUE relationship described above. If there is a benefit, then 4B would have more of a benefit than 4C because it would restrict effort more, but the difference may by negligible given the overall neutral to slight impact. There may be a marginally more positive impact than 4D since 4D may not actually reduce catch and/or effort

Longfin Squid Impacts from Alternative 4C – Reduce the maximum T1 to T2 rollover of longfin squid quota to 25% of the original T2 quota.

The analysis above for 4A details why catch under the current quotas and roll-over in T2 may conceptually have a slightly negative impact on the longfin squid resource by potentially reducing spawning success and disrupting egg mops. Reducing catch in T2 by limiting the roll-over may therefore have a neutral to slightly positive impact on the longfin squid resource compared to no action, similar to 4B. These potential benefits step from reducing mortality on spawning squid and the egg masses they produce. Since the resource appears overall robust, the impact would be slight if any. While the longfin stock has withstood recent overages, there is no guarantee that whatever conditions have allowed the stock to flourish will continue (the stock is believed to be sensitive to environmental conditions (NEFSC 2010), and even greater stock productivity should result from controlling effort based on the observed effort to LPUE relationship described above. If there is a benefit, then 4B would have more of a benefit than 4C because it would restrict effort more, but the difference may by negligible given the overall neutral to slight negative impact. There may be a marginally more positive impact than 4D since 4D may not actually reduce catch and/or effort

Longfin Squid Impacts from Alternative 4D – Split the T2 quota, with half available May 1- June 30, and the additional half available July 1-August 31.

There is no information to suggest that spreading catch and landings out within T2 would have any discernable positive or negative impacts on spawning success or the disruption of egg mops. The current resource condition would be maintained, and impacts would be very similar to no action and marginally less positive than 4B or 4C.

Longfin Squid Impacts from Alternative 5A – No action on changes to T2 closure trip limits.

The analysis above for 4A details why catch under the current quotas and roll-over in T2 may have a neutral to slightly negative impact on the longfin squid resource condition. Landing even more than the current trimester quotas, as can and has happened under the status quo, may therefore also have a slightly negative impact on the longfin squid resource condition even though overall annual quotas have not been exceeded in the past and the overall longfin squid resource appears robust. In addition, Council staff received multiple reports from some fishery participants about high-grade discarding of squid post-closure at the 2,500 pound trip limit during T2 of 2016, which could further reduce future productivity. A disproportionate number of exactly 2,500 pound trips during the closure supports that some amount of high-grade discarding was occurring. Since the longfin squid stock appears robust despite past T2 overages, and substantial trimester quota overages have been relatively infrequent (3 of 10 years 2007-2016 since Trimesters were implemented with 2 minor overages), any negative impacts of the no action, which can let a portion of the directed fishery continue after the T2 quota is caught (i.e., a directed fishery under lower incidental catch limits of 2,500 lb/trip), are likely only slightly negative. While the longfin stock has withstood recent overages, there is no guarantee that whatever conditions have allowed the stock to flourish will continue (the stock is believed to be sensitive to environmental conditions (NEFSC 2010), and even greater stock productivity should result from controlling effort based on the observed effort to LPUE relationship described above. The impact of the no action is more negative than the impacts of the action alternatives, as described below.

Longfin Squid Impacts from Alternative 5B (PREFERRED) – Implement a 250-pound trip when T2 closes.

The analysis above for 4A details why catch under the current quotas and roll-over in T2 may have a neutral to slightly negative impact. Landing even more than the current quotas, as can and has happened under the status quo, may therefore have a low negative impact on the longfin squid resource condition. Reducing catch in T2 by more effectively limiting catch after closures may therefore have a low positive impact and help maintain the current robust longfin squid resource condition. 5B would more effectively limit catches than 5C since 5B's post-closure trip limit is lower, so it would be likely to have a more positive impact than 5C. Since the fishery has not operated under a 250 pound trip limit before, it is not possible to precisely determine potential regulatory discard issues – many trips that were in the 250-2,500 pound range would not occur under a 250 pound trip limit, so it would not be appropriate to simply examine those kinds of trips in recent years to attempt to predict regulatory discarding, especially given the variable nature of longfin squid. The Council will monitor input from its Advisory panel and observer data, and respond appropriately. The *Illex* fishery would maintain its offshore possession limit of up to 15,000 lb of longfin squid when possessing over 10,000 pound of *Illex* squid, which should continue to minimize discarding of longfin squid in the *Illex* fishery.

Longfin Squid Impacts from Alternative 5C – Implement a 500-pound trip when T2 closes.

The analysis above for 4A details why catch under the current quotas and roll-over in T2 may have a neutral to slightly negative impact. Landing even more than the current quotas, as can and has happened under the status quo, may therefore have a low negative impact on the longfin squid resource condition. Reducing catch in T2 by more effectively limiting catch after closures may therefore have a low positive impact and help maintain the current robust longfin squid resource condition. 5C would

less effectively limit catches than 5B since 5C's post-closure trip limit is higher, so it would be likely to have a less positive impact than 5B. Since the fishery has not operated under a 250 pound trip limit before, it is not possible to precisely determine potential regulatory discard issues – many trips that were in the 250-2,500 pound range would not occur under a 250 pound trip limit, so it would not be appropriate to simply examine those kinds of trips in recent years to attempt to predict regulatory discarding, especially given the variable nature of longfin squid. The Council will monitor input from its Advisory panel and observer data, and respond appropriately. The *Illex* fishery would maintain its offshore possession limit of up to 15,000 lb of longfin squid when possessing over 10,000 pound of *Illex* squid, which should continue to minimize discarding of longfin squid in the *Illex* fishery.

7.1.4 Impacts on *Illex* Squid

Current resource condition: while there is no assessment for *Illex* squid, catches have been limited to an amount deemed sustainable by the SSC based on the best available scientific information.

None of the alternatives in this action should impact the *Illex* squid resource because under all alternatives, existing management measures will ensure that *Illex* catch stays at or below the ABC, maintaining the *Illex* stock size above an overfished condition. This is true even if fishing patterns and catch rates in the *Illex* fishery shift as an indirect result of other alternatives considered in this action that are focused on the longfin squid fishery. The fishing that results from the status quo or any of the action alternatives should continue to be limited to the ABC from the Council's Scientific and Statistical Committee per the risk policy of the Council, which mandates the use of the best available scientific information to avoid overfishing. Since all alternatives (no action & action) would restrict *Illex* squid catch to at or below the SSC-recommended ABC, and there is no history of quota overages, the current resource condition of *Illex* should be maintained regardless of any alternatives chosen in this action. The alternatives may impact who can catch *Illex* squid or how much squid is caught, but should not appreciable affect how much *Illex* squid will be caught.

7.2 Habitat

As discussed in Table 25 at the start of Section 7, the availability of the targeted species may drive effort (and habitat impacts) as much as quotas and other regulations. Impacts on the habitat for the managed species (7.2.1) and other species (7.2.2) are addressed separately. The word "habitat" encompasses essential fish habitat (EFH) for the purposes of this analysis. The Council has already minimized to the extent practicable impacts to habitat from the MSB fisheries through closure of several canyon areas in MSB Amendment 9 (http://www.mafmc.org/fmp/history/smb-hist.htm) and Tilefish Amendment 1 (http://www.mafmc.org/fmp/history/tilefish.htm), and protections for Deep Sea Corals via Amendment 16 (http://www.mafmc.org/fmp/history/smb-hist.htm). As an overall current resource condition, many habitats in the area of operation of the MSB fisheries are degraded from historical fishing effort (both MSB and other) and from non-fishing activities (Stevenson et al. 2004). Ongoing fishing, and ongoing and new non-fishing activities may also hinder recovery.

7.2.1 Impacts on Managed Species Habitat

As described in Section 6.2, almost all squid and butterfish fishing takes place with bottom otter trawling on sand/mud substrate. Potential impacts of the alternatives on MSB EFH are discussed below, followed by discussion of impacts on other federally managed species habitat.

Habitat for the managed species (MSB) generally consists of the water column, which is not significantly impacted by fishing activity. The exception to the habitat location being the water column is longfin squid eggs, which are attached to sand, mud, or bottom structure (manmade or natural). However, as determined in Amendment 9, there is no indication that squid eggs are preferentially attached to substrates that are vulnerable to disturbance from fishing/bottom trawling, so no impacts on habitat for longfin squid eggs are expected from any increase or decrease in fishing effort by bottom trawls. This means that squid and butterfish fishing effort, even though almost entirely bottom trawl, is unlikely to further impact MSB habitat regardless of intensity. Bottom trawling won't impact the water column itself and there is no information to suggest that MSB trawling impacts on substrate will degrade it for purposes of longfin squid egg laying or survival.

7.2.2 Impacts on Other Federally Managed Species Habitat (see Table 8)

As described in Section 6.3, almost all squid and butterfish fishing takes place with bottom otter trawling. Potential impacts of the alternatives on other federally-managed species EFH are discussed below.

Habitat Impacts from Alternative 1A – No action on longfin squid permits.

As described in section 6.2 above, bottom trawling can adversely impact some habitat types. However, since the Council has considered habitat impacts in the past and has already restricted MSB fishing to protect sensitive habitats (e.g. Tilefish habitat, coral protections), the impact of no action is best characterized as overall low negative, similar to past years. With effort essentially staying the same under the no action or action alternatives, impacts would also be expected to be similar among alternatives.

Habitat Impacts from Alternative 1B – Longfin squid requalification 10,000 pounds any year 1997-2015.

This Alternative may impact the number of participants in the longfin squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet - fewer participants simply means there is more quota to fish on for each participant. Since racing to fish might be reduced with less participants, there may be some fishermen who are more careful to avoid sensitive habitats (e.g. seagrass or corals), thereby reducing negative impacts, but the effect is not expected to be substantial. With overall effort essentially staying the same and impacts occurring relative to effort, habitat impacts would be similar to no action, i.e. low negative. Since none of the alternatives in this alternative set are likely to substantively change the overall amount or character of effort in the squid fleet, they are all very similar to each other in terms on impacts on habitat.

Habitat Impacts from Alternative 1C (PREFERRED) – Longfin squid requalification 10,000 pounds any year 1997-2013.

This Alternative may impact the number of vessels that have access to the longfin squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet - fewer participants simply means there is more quota to fish on for each participant. Since racing to fish might be reduced with less participants, there may be some fishermen who are more careful to avoid sensitive habitats (e.g. seagrass or corals), thereby reducing negative impacts, but the effect is not expected to be substantial. With overall effort essentially staying the same and impacts occurring relative to effort, habitat impacts would be similar to no action, i.e. low negative. Since none of the alternatives in this alternative set are likely to substantively change the overall amount or character of effort in the squid fleet, they are all very similar to each other in terms on impacts on habitat.

Habitat Impacts from Alternative 1D – Longfin squid requalification 25,000 pounds any year 2003-2013.

This Alternative may impact the number of vessels that have access to the longfin squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet - fewer participants simply means there is more quota to fish on for each participant. Since racing to fish might be reduced with less participants, there may be some fishermen who are more careful to avoid sensitive habitats (e.g. seagrass or corals), thereby reducing negative impacts, but the effect is not expected to be substantial. With overall effort essentially staying the same and impacts occurring relative to effort, habitat impacts would be similar to no action, i.e. low negative. Less racing to fish may allow more timely closures, but again the overall change to effort would be expected to be negligible. Since none of the alternatives in this alternative set are likely to substantively change the overall amount or character of effort in the squid fleet, they are all very similar to each other in terms on impacts on habitat.

Habitat Impacts from Alternative 1E – Longfin squid requalification 50,000 pounds average 1997-2013.

This Alternative may impact the number of vessels that have access to the longfin squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet - fewer participants simply means there is more quota to fish on for each participant. Since racing to fish might be reduced with less participants, there may be some fishermen who are more careful to avoid sensitive habitats (e.g. seagrass or corals), thereby reducing negative impacts, but the effect is not expected to be substantial. With overall effort essentially staying the same and impacts occurring relative to effort, habitat impacts would be similar to no action, i.e. low negative. Less racing to fish may allow more timely closures, but again the overall change to effort would be expected to be negligible. Since none of the alternatives in this alternative set are likely to substantively change the overall amount or character of effort in the squid fleet, they are all very similar to each other in terms on impacts on habitat.

Habitat Impacts from Alternative 2A – No action on permit swap sub-alternative.

As described in section 6.2 above, bottom trawling can adversely impact some habitat types. However, since the Council has considered habitat impacts in the past and has already restricted MSB fishing to protect sensitive habitats (e.g. Tilefish habitat, coral protections), the impact of no action is best characterized as overall low negative, similar to past years. 2A or 2B would only be considered in the context of an alternative being implemented from Alternative Set 1, and 2A's impacts are the same as those from Alternative Set 1, because 2A would not modify those alternatives while 2B would effectively modify those alternatives.

Habitat Impacts from Alternative 2B (PREFERRED) – Allow limited permit swap as part of longfin requalification.

This Alternative may impact the number of vessels that have access to the longfin squid fishery. This alternative would not affect the actual number of requalifiers, but might allow some reshuffling of permits so that some of the requalifiers are more likely to fish. However, those vessels could still potentially fish under no overall action regarding limited access. Regardless, the resulting fleet will likely still have the capacity to harvest the full quota in a manner similar to previous years, so this alternative is not likely to substantively change the amount or character of effort in the squid fleet. With overall effort essentially staying the same and impacts occurring relative to effort, habitat impacts would be similar to no action, i.e. low negative.

With some more theoretically participating vessels (a technical maximum of about 11 but the actual number would probably be lower), this alternative might not reduce racing to fish as much as selecting no action for this alternative set. Racing to fish might be reduced with slightly fewer active participants so this alternative may not reduce racing to fish as much as 2A, but as discussed for Alternative Set 1, in this fishery the effects of changes to incentives to race to fish are not expected to substantively change habitats impacts.

Habitat Impacts from Alternative 3A – No action on changes to squid/butterfish incidental permit.

No action regarding longfin squid incidental permits would allow the situation where vessels can drop federal incidental permits and fish in some states' waters with no trip limit after a closure of the squid fishery in federal waters to persist, exacerbating seasonal quota overages. This would continue the low negative impacts on habitat from longfin squid fishing, as described above, maintaining the current resource condition.

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Habitat Impacts from Alternative 3B – New limited access incidental squid permit qualification 2,500 pounds any year 1997-2013.

Vessels with substantial squid landings would qualify for the new incidental permit, and since they would not be able to re-acquire the permit without buying one from another permit-holder, they should be unlikely to cancel their permit to fish in state waters at higher trip limits after a federal waters closure. This should limit fishing effort. This situation is responsible for only a small portion of longfin squid fishing effort, but does occur occasionally, so the impact is slightly positive for habitat compared to no action, and similar to 3C but maybe slightly less positive than 3C because with more qualifiers the permit under 3B will be less valuable so vessels would be more likely to cancel it. The current resource condition for habitat would remain low negative. Vessels could also decide to retain only state permits, which would still allow them to fish in state waters after closures, further contributing to the slightness of the impact. Since 3B1 or 3B2 would be part of 3B, they cannot be compared to 3B but would modify 3B's impacts, as described below. Since 3C1 or 3C2 would only be paired with 3C, there is no comparison necessary with 3C1 or 3C2 versus 3B.

Habitat Impacts from sub-Alternative 3B1 – Reduce open-access longfin squid trip limit to 250 pounds.

This alternative should have a negligible direct impact. It maintains vessels' ability to get an open access permit to cover low-level incidental landings, but lowers the amount of longfin squid that can be landed incidentally. Vessels that do not qualify for a limited access incidental catch permit under 3B that are subject to the open access longfin squid trip limit are not very active in the longfin squid fishery. The landings that could occur at a 250-pound trip limit would be a small part of longfin squid effort. Because 3B1 is tied to the creation of a limited access permit as described under 3B, this alternative contributes to the slightly positive impact to habitat described under 3B. Since 3B1's trip limit is lower than 3B2's trip limit and would more effectively avoid directed fishing, 3B1's impact is more positive than 3B2. Since 3B1 or 3B2 would only be paired with 3B, there is no comparison necessary with 3C1, 3C2, or 3C. The current resource condition for habitat would remain low negative.

Habitat Impacts from sib-Alternative 3B2 – Reduce open-access longfin squid trip limit to 500 pounds.

This alternative should have a negligible direct impact. It maintains vessels' ability to get an open access permit to cover low-level incidental landings, but lowers the amount of longfin squid that can be landed incidentally. Vessels that do not qualify for a limited access incidental catch permit under 3B that are subject to the open access longfin squid trip limit are not very active in the longfin squid fishery. The landings that could occur at a 500 pound trip limit would be a small part of longfin squid effort. Because 3B2 is tied to the creation of a limited access permit as described under 3B, this alternative contributes to the slightly positive impact to habitat described under 3B. Since 3B2's trip limit is higher than 3B1's trip limit and would less effectively avoid directed fishing, 3B2's impact is less positive than 3B1. Since 3B1 or 3B2 would only be paired with 3B, there is no comparison necessary with 3C1, 3C2, or 3C. The current resource condition for habitat would remain low negative.

Habitat Impacts from Alternative 3C (PREFERRED) – New limited access incidental squid permit qualification 5,000 pounds any year 1997-2013.

Vessels with substantial squid landings would qualify for the new incidental permit, and since they would not be able to re-acquire the permit without buying one from another permit-holder, they should be unlikely to cancel their permit to fish in state waters at higher trip limits after a federal waters closure. This should limit quota overages and effort. This situation is responsible for only a small portion of longfin squid landings, but does occur occasionally, so the impact on habitat is slightly positive compared to no action, and similar to 3B but maybe slightly more positive than 3B because with less qualifiers the permit under 3C will be more valuable so vessels would be less likely to cancel it. The current resource condition for habitat would remain low negative. Vessels could also decide to retain only state permits, which would still allow them to fish in state waters after closures, further contributing to the slightness of the impact. Since 3C1 or 3C2 would be part of 3C, they cannot be compared to 3C but would modify 3C's impacts, as described below. Since 3B1 or 3B2 would only be paired with 3B, there is no comparison necessary with 3B1 or 3B2 versus 3C.

Habitat Impacts from sub-Alternative 3C1 (PREFERRED) – Reduce open-access longfin squid trip limit to 250 pounds.

This alternative should have a negligible direct impact. It maintains vessels' ability to get an open access permit to cover low-level incidental landings, but lowers the amount of longfin squid that can be landed incidentally. Vessels that do not qualify for a limited access incidental catch permit under 3C that are subject to the open access longfin squid trip limit are not very active in the longfin squid fishery. The landings that could occur at a 250-pound trip limit would be a small part of longfin squid effort. Because 3C1 is tied to the creation of a limited access permit as described under 3C, this alternative contributes to the slightly positive impact to habitat described under 3C. Since 3C1's trip limit is lower than 3C2's trip limit and would more effectively avoid directed fishing, 3C1's impact is more positive than 3C2. Since 3C1 or 3C2 would only be paired with 3C, there is no comparison necessary with 3B1, 3B2, or 3B. The current resource condition for habitat would remain low negative.

Habitat Impacts from sub-Alternative 3C2 – Reduce open-access longfin squid trip limit to 500 pounds.

This alternative should have a negligible direct impact. It maintains vessels' ability to get an open access permit to cover low-level incidental landings, but lowers the amount of longfin squid that can be landed incidentally. Vessels that do not qualify for a limited access incidental catch permit under 3C that are subject to the open access longfin squid trip limit are not very active in the longfin squid fishery. The landings that could occur at a 500- pound trip limit would be a small part of longfin squid effort. Because 3C2 is tied to the creation of a limited access permit as described under 3C, this alternative contributes to the slightly positive impact to habitat described under 3C. Since 3C2's trip limit is higher than 3C1's trip limit and would less effectively avoid directed fishing, 3C2's impact is less positive than 3C1. Since 3C1 or 3C2 would only be paired with 3C, there is no comparison necessary with 3B1, 3B2, or 3B. The current resource condition for habitat would remain low negative.

Habitat Impacts from Alternative 4A (PREFERRED) – No action on changes to Trimester rollover provisions.

The existing rollover provisions, which would persist under no-action, have been in effect since 2010. This would continue the low negative impacts on habitat from longfin squid fishing, as described above, maintaining the current resource condition.

Habitat Impacts from Alternative 4B – Eliminate roll-over of longfin squid quota from T1 to T2.

Alternative 4B could reduce fishing effort, because no extra quota would be rolled over into T2 and available during T2. While that means more quota would be available in T3, there is no guarantee that squid will be available during T3, and therefore fishing effort may not necessarily shift. There also have not been any annual closures restraining fishing during T3 in recent years so adding more quota to T3 is unlikely to result in any additional effort during T3. Less effort means less habitat impacts. Since this alternative only impacts a portion of overall squid effort and may not impact some years at all (e.g. if T1 landings are high there is no rollover), impacts are likely low positive compared to no action due to the potential for reduced effort. Given the low positive impact relative to the status quo, the overall impact on habitat is likely still low negative, but less so, maintaining the current resource condition. 4B would have a greater degree of habitat benefit than 4C since 4B would eliminate the T1 to T2 quota rollover and 4C would reduce that rollover.

Habitat Impacts from Alternative 4C – Reduce the maximum T1 to T2 rollover of longfin squid quota to 25% of the original T2 quota.

4C could reduce effort, because less extra quota would be rolled over into T2 and available during T2. While that means more quota would be available in T3, there is no guarantee that squid will be available during T3, and over the long term there would likely be some fishing opportunities lost during T2 and not made up for during T3. There also have not been any annual closures restraining fishing during T3 in recent years so adding more quota to T3 is unlikely to result in any additional landings/effort during T3. Less effort means less habitat impacts. Since this alternative only impacts a portion of overall squid effort and may not impact some years at all (e.g. if T1 landings are high there is no rollover), impacts are likely low positive compared to no action due to the potential for reduced effort. Given the low positive impact relative to the status quo, the overall impact on habitat is likely still low negative, but less so, maintaining the current resource condition. 4C would have a lesser degree of habitat benefit than 4B since 4B eliminates the rollover and 4C reduces the rollover.

Habitat Impacts from Alternative 4D – Split the T2 quota, with half available May 1- June 30, and the additional half available July 1-August 31.

There is no information to suggest that attempting to spread catch and landings out within T2 would have substantial impacts on fishing effort, so the overall impact on habitat is likely still low negative, similar to no action, maintaining the current resource condition.

Habitat Impacts from Alternative 5A – No action on changes to T2 closure trip limits.

The existing closure provisions would persist under no-action. This would continue the low negative impacts on habitat from longfin squid fishing, as described above, maintaining the current resource condition.

Habitat Impacts from Alternative 5B (PREFERRED) – Implement a 250-pound trip when T2 closes.

The Council's MSB Advisory Panel reported that limiting post-closure T2 landings to a 250-pound trip limit would greatly reduce post-closure T2 squid fishing, and during 2016 (a year with substantial post-closure landings), only 1% of post-closure landings occurred on trips landing 250 pounds or less. As such, T2 effort would be reduced in some years. Since Trimesters were implemented in 2007, there have been substantial T2 overages in 3 out of 10 years, so this measure might only have substantial impacts in a low percentage of years. There were also 2 minor overages, so there could be some impacts 50% of the time. While less overages mean more quota would be available in T3, there is no guarantee that squid will be available during T3, and over the long term there would likely be some fishing opportunities lost during T2 and not made up for during T3. There also have not been any annual closures restraining fishing during T3 in recent years so adding more quota to T3 is unlikely to result in any additional landings/effort during T3. Since this alternative also only impacts a portion of overall squid effort and may not impact some years at all, impacts are likely low positive compared to no action due to the potential for reduced effort. Given the low positive impact relative to no action, the overall impact on habitat is likely still low negative, but less so, maintaining the current resource condition. 5B would reduce negative habitat impacts more than 5C since 5Bs trip limit is lower and would result in less directed fishing activity than 5C.

Habitat Impacts from Alternative 5C – Implement a 500-pound trip when T2 closes.

The Council's MSB Advisory Panel reported that limiting post-closure T2 landings to a 500-pound trip limit would reduce post-closure T2 squid fishing, and during 2016 (a year with substantial post-closure landings), only 3% of post-closure landings occurred on trips landing 500 pounds or less. As such, T2 effort would be reduced in some years. Since Trimesters were implemented in 2007, there have been substantial T2 overages in 3 out of 10 years, so this measure might only have substantial impacts in a low percentage of years. There were also 2 minor overages, so there could be some impacts 50% of the time. While less overages mean more quota would be available in T3, there is no guarantee that squid will be available during T3, and over the long term there would likely be some fishing opportunities lost during T2 and not made up for during T3. There also have not been any annual closures restraining fishing during T3 in recent years so adding more quota to T3 is unlikely to result in any additional landings/effort during T3. Since this alternative also only impacts a portion of overall squid effort and may not impact some years at all, impacts are likely low positive compared to no action due to the potential for reduced effort. Given the low positive impact relative to no action, the overall impact on habitat is likely still low negative, but less so, maintaining the current resource condition. 5C would have a relatively larger negative habitat impact than 5B since 5Bs trip limit is lower and would result in less directed fishing than 5C.

Alternative Set 6

Alternative Set 6 may impact the number of vessels that have access to the *Illex* squid fishery, but it is unlikely to have any substantial impact on the amount of squid fishing effort, which is what affects habitat. Most *Illex* squid effort is with bottom tending mobile gear. As described in section 6.2 above, bottom trawling can adversely impact some habitat types. However, since the Council has considered habitat impacts in the past and has already restricted MSB fishing to protect sensitive habitats (e.g. Tilefish habitat, coral protections), the impact of no action or any action alternative in this alternative set is best characterized as overall low negative, similar to past years, because effort is not expected to change as a result of any alternative in this Alternative Set, maintaining the current resource condition.

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7.3 Protected Resources

7.3.1 Introduction

Current resource condition: Affected endangered species and marine mammals (MMPA protected) are described in Section 6.4. How the current MSB fisheries impact these species can be considered as if the no action alternatives were selected for all alternatives (because no action will continue the current regulations) and is further described below. The impacts on protected resources may vary between ESA-listed and MMPA-protected species. For ESA-listed species, any action that has the risk to result in take (including ongoing take) of ESA-listed species is expected to have negative impacts, including actions that reduce interactions (because some take is still occurring and the population is at a critical level). Under the MMPA, the impacts from an action vary based on the stock condition of each marine mammal species and the potential for an action to impact fishing effort. For marine mammal stocks/species that have their potential biological removal (PBR) level reached or exceeded, negative impacts would be expected from any action that has the potential to interact with these species or stocks. For marine mammal stocks/species that are at more sustainable levels (i.e., PBR levels have not been exceeded), any action not expected to change fishing behavior or effort such that interaction risks increase relative to what has been in the fishery previously, may have positive impacts by maintaining takes below the PBR level and approaching the Zero Mortality Rate Goal. Taking the latter into consideration, the overall impacts on the protected resources VEC account for impacts on ESA-listed species, impacts on marine mammal stocks in good condition (i.e., PBR level has not been exceeded), and marine mammal stocks that have reached or exceeded their PBR level.

For no-action and similar to Section 6.4, impacts reference both bottom and mid-water trawl gear since Atlantic mackerel are targeted with both bottom and mid-water trawl gear, but since this action only affects the squid and butterfish fisheries, the alternative analysis will only address bottom-trawl gear, which is the dominant gear used to target squid and butterfish.

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

The MSB FMP fisheries do overlap with the distribution of non-ESA listed species of marine mammals (cetaceans and pinnipeds). As a result, marine mammal (non-ESA listed species) interactions with bottom or mid-water trawl gear are possible (see section 6.4); however, ascertaining the risk of an interaction and the resultant potential impacts of the No Action on cetaceans and pinnipeds (marine mammals) are difficult and somewhat uncertain, as quantitative analysis has not been performed. However, we have considered, to the best of our ability, the most recent (2010-2014) information on marine mammal interactions with commercial fisheries, of which, the MSB FMP is a component (Hayes *et al*. 2017). Aside from pilot whales and several stocks of bottlenose dolphin, there has been no indication that takes of non-ESA listed species of marine mammals in commercial fisheries has

gone above and beyond levels which would result in the inability of each species population to sustain itself (Hayes *et al*. 2017). Specifically, aside from pilot whales and several stocks of bottlenose dolphin, potential biological removal (PBR) has not been exceeded for any of the non-ESA listed marine mammal species identified in section 6.4 (Hayes *et al*. 2017). Although pilot whales and several stocks of bottlenose dolphin have experienced levels of take that have resulted in the exceedance of each species PBR, take reduction strategies and/or plans have been implemented to reduce bycatch in the fisheries affecting these species (Atlantic Trawl Gear Take Reduction Strategy, Pelagic Longline Take Reduction Plan effective May 19, 2009 (74 FR 23349); Bottlenose Dolphin Take Reduction Plan (BDTRP), effective April 26, 2006 (71 FR 24776)). These efforts are still in place and are continuing to assist in decreasing bycatch levels for these species. Although the most recent five years of information presented in Hayes et al. (2017) is a collective representation of commercial fisheries interactions with non-ESA listed species of marine mammals, and does not address the effects of the MSB FMP specifically, the information does demonstrate that thus far, operation of the MSB FMP, or any other fishery, has not resulted in a collective level of take that threatens the continued existence of non-ESA listed marine mammal populations.

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 on non-ESA listed species of marine mammals are likely to range from low negative to slight positive. Impacts would be low negative for pilot whales and bottlenose dolphin because they are experiencing levels of interactions that have resulted in exceedance of their PBR levels. These stocks/populations are not at an optimum sustainable level and therefore, the continued existence of these stocks/species is at risk. As a result, any potential for an interaction is a detriment to the species/stocks ability to recover from this condition.

Alternatively, there are also many non-ESA listed marine mammals that, even with continued fishery interactions, are maintaining an optimum sustainable level (i.e., PBR levels have not been exceeded) over the last several years. For these stocks/species, it appears that the fishery management measures that have been in place over this timeframe have resulted in levels of effort that equate to 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 slight positive impacts would remain. Thus, given that the No Action will not substantially change fishing effort, the impacts of the No Action on these non-ESA listed species of marine mammals (all besides pilot whales and bottlenose dolphin) are expected to be slight positive (i.e., continuation of current operating conditions is not expected to result in exceedance of any of these stocks/species PBR level).

General No-action: ESA Listed Species Impacts

The MSB fishery is prosecuted with bottom and mid-water trawl gear. As provided in section 6.4, these gear types are known to interact with ESA listed species of sea turtles, whales, Atlantic sturgeon, and Atlantic salmon, with interactions often resulting in the serious injury or mortality to the species. The risk of an interaction; however, is strongly associated with the amount of gear in the water, the time the gear is in the water (e.g., soak time, tow time), and the presence of listed species in the same area and time as the gear, with risk of an interaction increasing with increases in of any or all of these factors. Based on this, the MSB fishery is likely to result in some level some level of negative impacts to ESA listed species. Taking into consideration fishing behavior/effort under the No Action, as well as the factors that affect the risk of an interaction with a listed species, we determined the level of negative impacts to ESA listed species to be low. Below, we provide support for this determination.

Under the No Action, fishing behavior and effort in the MSB fishery is expected to remain similar to what has been observed in the fishery over the last 5 or more years. Specifically, the amount of trawl gear, tow times, and area fished are not expected change significantly from current operating conditions. As provided above, interactions risks with ESA listed species are strongly associated with the amount of gear in the water, gear soak or tow time, as well as the area of overlap, either in space or time, of the gear and listed species, with vulnerability of an interaction increasing with increases in any of these factors. Continuation of "status quo" fishing behavior/effort is not expected to change any of these operating conditions and therefore, relative to current conditions, new or elevated (e.g., more gear, longer tow times) interaction risks to listed species are not expected. Based on this, impacts of the No Action on ESA listed species is expected to be low negative.

General Action Alternative Impacts:

Impacts to protected resources (ESA and MMPA species) should generally follow impacts to effort. Interactions with and therefore risks to protected species are strongly associated with amount, time, and location of gear in the water (components of effort), with vulnerability of an interaction increasing with increases in any or all of these factors. These are the components of effort that are considered in making impact determinations for protected species. If there are potential increases in any of these factors, then the potential for interactions will also increase. If none of these factors will be met, then interactions with protected species are not expected to be no greater than status quo. If there are potential decreases in any of these factors, then the potential for interactions will decrease.

Since ESA listed species have negative impacts from any potential interactions, impacts from any alternatives will be negative to some degree because there is risk of some interactions with the MSB fisheries. If interactions are likely to increase then impacts will be even more negative than no action, and if interactions are likely to decrease then impacts will be less negative than no action but still somewhat overall negative.

Since pilot whales and bottlenose dolphins are above PBR and it's not possible to conclusively know whether any measure in this action could reduce them below PBR, the same is true for them as with ESA listed species. If interactions are likely to increase then impacts will be even more negative than

no action, and if interactions are likely to decrease then impacts will be less negative than no action but still somewhat overall negative.

For other MMPA species, they are starting out with slight positive impacts from no action, so if interactions are likely to increase then impacts will be negative compared to no action, and if interactions are likely to decrease then impacts will be more positive. The overall impact will depend on the degree of expected change to interactions. However, since no alternatives are expected to drastically reduce effort, overall impacts when interactions are expected to decrease are still likely to be only slightly positive for these other MMPA species.

7.3.2 Impacts from Specific Alternatives

Note: the concept of racing to fish is mentioned repeatedly in this section – see the footnote in Section 4.1 for an explanation of why racing to fish is generally expected to be correlated to bycatch.

Protected Resource Impacts from Alternative 1A – No action on longfin squid permits.

As detailed in the introduction to this Section (see 7.3.1), no action is expected to have low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species.

Protected Resource Impacts from Alternative 1B – Longfin squid requalification 10,000 pounds any year 1997-2015.

This Alternative may impact the number of vessels that have access to the longfin squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet. Since racing to fish might be reduced with less participants, bycatch, including of protected species may be reduced, but the effect is not expected to be substantial since fishermen already would rather avoid protected resource interactions due to the scrutiny that such interactions can invite. With effort essentially staying the same and impacts occurring relative to effort, impacts would be similar to the no action, i.e. low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species. Since none of the alternatives in this alternative set are likely to substantively change the overall amount or character of effort in the squid fleet, they are all similar to each other in terms on impacts on protected resources.

Protected Resource Impacts from Alternative 1C (PREFERRED) – Longfin squid requalification 10,000 pounds any year 1997-2013.

This Alternative may impact the number of vessels that have access to the longfin squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet. Since racing to fish might be reduced with less participants, bycatch, including of protected species may be reduced, but the effect is not expected to be substantial since fishermen already would rather avoid protected resource interactions due to the scrutiny that such

interactions can invite. With effort essentially staying the same and impacts occurring relative to effort, impacts would be similar to the no action, i.e. low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species. Since none of the alternatives in this alternative set are likely to substantively change the overall amount or character of effort in the squid fleet, they are all similar to each other in terms on impacts on protected resources.

Protected Resource Impacts from Alternative 1D – Longfin squid requalification 25,000 pounds any year 2003-2013.

This Alternative may impact the number of vessels that have access to the longfin squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet. Since racing to fish might be reduced with less participants, bycatch, including of protected species may be reduced, but the effect is not expected to be substantial since fishermen already would rather avoid protected resource interactions due to the scrutiny that such interactions can invite. With effort essentially staying the same and impacts occurring relative to effort, impacts would be similar to the no action, i.e. low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species. Since none of the alternatives in this alternative set are likely to substantively change the overall amount or character of effort in the squid fleet, they are all similar to each other in terms on impacts on protected resources.

Protected Resource Impacts from Alternative 1E – Longfin squid requalification 50,000 pounds average 1997-2013.

This Alternative may impact the number of vessels that have access to the longfin squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet. Since racing to fish might be reduced with less participants, bycatch, including of protected species may be reduced, but the effect is not expected to be substantial since fishermen already would rather avoid protected resource interactions due to the scrutiny that such interactions can invite. With effort essentially staying the same and impacts occurring relative to effort, impacts would be similar to the no action, i.e. low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species. Since none of the alternatives in this alternative set are likely to substantively change the overall amount or character of effort in the squid fleet, they are all similar to each other in terms on impacts on protected resources.

Protected Resource Impacts from Alternative 2A – No action on permit swap sub-alternative.

As detailed in the introduction to this Section (see 7.3.1), no action is expected to have low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species. 2A or 2B would only be considered in the context of an alternative being implemented from Alternative Set 1, and 2A's impacts are the same as those from Alternative Set 1, because 2A would not modify those alternatives while 2B would effectively modify those alternatives.

Protected Resource Impacts from Alternative 2B (PREFERRED) – Allow limited permit swap as part of longfin requalification.

This Alternative may slightly impact the number of vessels that have access to the longfin squid fishery after a requalification. This alternative would not affect the actual number of requalifiers, but might allow some reshuffling of permits so that some of the requalifiers are more likely to fish. However, those vessels could still potentially fish under no action and the number of permits will still be reduced compared to no requalification. The resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years under 2A or 2B, so this alternative is not likely to substantively change the amount or character of effort in the squid fleet. With effort essentially staying the same and impacts occurring relative to effort, impacts would be similar to the no action, i.e. low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species.

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Protected Resource Impacts from Alternative 3A – No action on changes to squid/butterfish incidental permit.

As detailed in the introduction to this Section (see 7.3.1), no action is expected to have low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species.

Protected Resource Impacts from Alternative 3B – New limited access incidental squid permit qualification 2,500 pounds any year 1997-2013.

Vessels with substantial squid landings would qualify for the new incidental permit, and since they would not be able to re-acquire the permit without buying one from another permit-holder, they should be less likely to cancel their permit to fish in state waters at higher trip limits after a federal waters closure. This should limit quota overages by reducing effort after closures. This situation is responsible for only a small portion of longfin squid landings, but does occur occasionally during T2, so there might be some small reduction in effort during T2 in some years.

Because fishing behavior and effort are not expected to change substantially from current operating conditions, the presence, quantity, or degree of bottom trawl gear used in the broad fishing area are also not expected to change substantially but may decrease slightly compared to activities under no action in some years. As such, impacts to ESA listed species, pilot whales, and bottlenose dolphins would be slightly less negative than under no action but still low negative overall, and impacts to other MMPA species would be expected to be slightly more positive than under no action and still slightly positive overall. Impacts would likely be very similar to 3C.

Protected Resource Impacts from sub-Alternative 3B1 – Reduce open-access longfin squid trip limit to 250 pounds.

This alternative would be joined to 3B. This alternative will constrain additional vessels from developing new small-scale directed fisheries, primarily during T2, because lowering the trip limit from 2,500 pounds to 250 pounds will make directed fishing unprofitable. Vessels that are active now would be unaffected. By reducing the chance of more directed squid fishing effort, compared to no action this alternative could somewhat reduce potential future interactions because the presence, quantity, or degree of bottom trawl gear used in the broad fishing area affects the likelihood of interactions and less effort with similar gear should reduce the likelihood of interactions. As such, impacts to ESA listed species, pilot whales, and bottlenose dolphins would be slightly less negative than under no action but still low negative overall, and impacts to other MMPA species would be expected to be slightly more positive than under no action and still slightly positive overall. Impacts would likely be very similar to 3B2, but slightly more beneficial since 3B1's trip limit is lower and would discourage future potential effort more than 3B2.

Protected Resource Impacts from sib-Alternative 3B2 – Reduce open-access longfin squid trip limit to 500 pounds.

This alternative would be joined to 3B. This alternative will constrain additional vessels from developing new small-scale directed fisheries, primarily during T2, because lowering the trip limit from 2,500 pounds to 500 pounds will make directed fishing unprofitable. Vessels that are active now would be unaffected. By reducing the chance of more directed squid fishing effort, compared to no action this alternative could somewhat reduce potential future interactions because the presence, quantity, or degree of bottom trawl gear used in the broad fishing area affects the likelihood of interactions and less effort with similar gear should reduce the likelihood of interactions. As such, impacts to ESA listed species, pilot whales, and bottlenose dolphins would be slightly less negative than under no action but still low negative overall, and impacts to other MMPA species would be expected to be slightly more positive than under no action and still slightly positive overall. Impacts would likely be very similar to 3B1, but slightly less beneficial since 3B1's trip limit is lower and would discourage future potential effort more than 3B2.

Protected Resource Impacts from Alternative 3C (PREFERRED) – New limited access incidental squid permit qualification 5,000 pounds any year 1997-2013.

Vessels with substantial squid landings would qualify for the new incidental permit, and since they would not be able to re-acquire the permit without buying one from another permit-holder, they should be less likely to cancel their permit to fish in state waters at higher trip limits after a federal waters closure. This should limit quota overages by reducing effort after closures. This situation is responsible for only a small portion of longfin squid landings, but does occur occasionally during T2, so there might be some small reduction in effort during T2 in some years.

Because fishing behavior and effort are not expected to change substantially from current operating conditions, the presence, quantity, or degree of bottom trawl gear used in the broad fishing area are also not expected to change substantially but may decrease slightly compared to activities under no action in some years. As such, impacts to ESA listed species, pilot whales, and bottlenose dolphins would be slightly less negative than under no action but still low negative overall, and impacts to other MMPA species would be expected to be slightly more positive than under no action and still slightly positive overall. Impacts would likely be very similar to 3B.

Protected Resource Impacts from sub-Alternative 3C1 (PREFERRED) – Reduce open-access longfin squid trip limit to 250 pounds.

This alternative would be joined to 3C. This alternative will constrain additional vessels from developing new small-scale directed fisheries, primarily during T2, because lowering the trip limit from 2,500 pounds to 250 pounds will make directed fishing unprofitable. Vessels that are active now would be unaffected. By reducing the chance of more directed squid fishing effort, compared to no action this alternative could somewhat reduce potential future interactions because the presence, quantity, or degree of bottom trawl gear used in the broad fishing area affects the likelihood of interactions and less effort with similar gear should reduce the likelihood of interactions. As such, impacts to ESA listed species, pilot whales, and bottlenose dolphins would be slightly less negative than under no action but still low negative overall, and impacts to other MMPA species would be

expected to be slightly more positive than under no action and still slightly positive overall. Impacts would likely be very similar to 3C2, but slightly more beneficial since 3C1's trip limit is lower and would discourage future potential effort more than 3C2.

Protected Resource Impacts from sub-Alternative 3C2 – Reduce open-access longfin squid trip limit to 500 pounds.

This alternative would be joined to 3C. This alternative will constrain additional vessels from developing new small-scale directed fisheries, primarily during T2, because lowering the trip limit from 2,500 pounds to 500 pounds will make directed fishing unprofitable. Vessels that are active now would be unaffected. By reducing the chance of more directed squid fishing effort, compared to no action this alternative could somewhat reduce potential future interactions because the presence, quantity, or degree of bottom trawl gear used in the broad fishing area affects the likelihood of interactions and less effort with similar gear should reduce the likelihood of interactions. As such, impacts to ESA listed species, pilot whales, and bottlenose dolphins would be slightly less negative than under no action but still low negative overall, and impacts to other MMPA species would be expected to be slightly more positive than under no action and still slightly positive overall. Impacts would likely be very similar to 3C1, but slightly less beneficial since 3C1's trip limit is lower and would discourage future potential effort more than 3C2.

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Protected Resource Impacts from Alternative 4A (PREFERRED) – No action on changes to Trimester rollover provisions.

As detailed in the introduction to this Section (see 7.3.1), no action is expected to have low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species.

Protected Resource Impacts from Alternative 4B – Eliminate roll-over of longfin squid quota from T1 to T2.

4B could reduce effort compared to no action, because no extra quota would be rolled over into T2 and available during T2. While that means more quota would be available in T3 (i.e., all uncaught T1 quota rolls over to T3), there is no guarantee that squid will be available during T3, and over the long term there would likely be some fishing opportunities lost during T2 and not made up for during T3. There also have not been any annual closures restraining fishing during T3 in recent years so adding more quota to T3 is unlikely to result in any additional landings/effort during T3.

By reducing squid fishing effort, compared to no action, this alternative could reduce potential future interactions because the presence, quantity, or degree of bottom trawl gear used in the broad fishing area affects the likelihood of interactions and less effort with similar gear should reduce the likelihood of interactions. Since this alternative only impacts a portion of overall squid effort and may not impact some years at all (e.g. if T1 landings are high there is no rollover), changes to effort would likely be relatively low. As such, impacts to ESA listed species, pilot whales, and bottlenose dolphins would be slightly less negative than under no action but still low negative overall, and impacts to other MMPA species would be expected to be slightly more positive than under no action and still slightly positive overall. The impact to protected species would be similar for 4B and 4C, but slightly more beneficial for 4B since 4B would be expected to reduce effort slightly more than 4C . Compared to 4D, this alternative is slightly more beneficial for protected resources. Protected resources that eat longfin squid could also benefit from increased prey availability of longfin squid if productivity is maintained/increased by this alternative, though it is not possible to quantify the benefit.

Protected Resource Impacts from Alternative 4C – Reduce the maximum T1 to T2 rollover of longfin squid quota to 25% of the original T2 quota.

4C could reduce effort compared to no action, because less extra quota would be rolled over into T2 and available during T2. While that means more quota would be available in T3, there is no guarantee that squid will be available during T3, and over the long term there would likely be some fishing opportunities lost during T2 and not made up for during T3. There also have not been any annual closures restraining fishing during T3 in recent years so adding more quota to T3 is unlikely to result in any additional landings/effort during T3.

By reducing squid fishing effort, compared to no action, this alternative could reduce potential future interactions because the presence, quantity, or degree of bottom trawl gear used in the broad fishing area affects the likelihood of interactions and less effort with similar gear should reduce the likelihood of interactions. Since this alternative only impacts a portion of overall squid effort and may not impact some years at all (e.g. if T1 landings are high there is no rollover), changes to effort would likely be

relatively low. As such, impacts to ESA listed species, pilot whales, and bottlenose dolphins would be slightly less negative than under no action but still low negative overall, and impacts to other MMPA species would be expected to be slightly more positive than under no action and still slightly positive overall. The impact to protected species would be similar for 4C and 4B, but slightly more beneficial for 4B since 4B would be expected to reduce effort slightly more than 4C. Compared to 4D, this alternative is slightly more beneficial for protected resources. Protected resources that eat longfin squid could also benefit from increased prey availability of longfin squid if productivity is maintained/increased by this alternative, though it is not possible to quantify the benefit.

Protected Resource Impacts from Alternative 4D – Split the T2 quota, with half available May 1- June 30, and the additional half available July 1-August 31.

There is no information to suggest that attempting to spread catch and landings out within T2 would have substantial impacts on effort or the character of squid fishing effort. As such, protected species impacts would be the same as no action: low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species. Compared to 4B and 4C, this alternative is slightly less beneficial for protected resources.

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Protected Resource Impacts from Alternative 5A – No action on changes to T2 closure trip limits.

As detailed in the introduction to this Section (see 7.3.1), no action is expected to have low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species.

Protected Resource Impacts from Alternative 5B (PREFERRED) – Implement a 250-pound trip limit when T2 closes.

The Council's MSB Advisory Panel reported that limiting post-closure T2 landings to a 250-pound trip limit would greatly reduce post-closure T2 squid fishing. As such, T2 effort would be reduced in some years. Since Trimesters were implemented in 2007, there have been substantial T2 overages in 3 out of 10 years, so this measure might only have substantial impacts in a low percentage of years. While less overages mean more quota would be available in T3, there is no guarantee that squid will be available during T3, and over the long term there would likely be some fishing opportunities lost during T2 and not made up for during T3. There also have not been any annual closures restraining fishing during T3 in recent years so adding more quota to T3 is unlikely to result in any additional landings/effort during T3. Since this alternative also only impacts a portion of overall squid effort and may not impact some years at all, it may only slightly reduce longfin squid fishing effort.

With the potential for squid effort to be reduced slightly under Alternative 5B, compared to no action, this alternative could reduce potential future interactions because the presence, quantity, or degree of bottom trawl gear used in the broad fishing area affects the likelihood of interactions and less effort with similar gear should reduce the likelihood of interactions. Given the possible slight reduction in effort, impacts to ESA listed species, pilot whales, and bottlenose dolphins would be slightly less negative than under no action but still low negative overall, and impacts to other MMPA species would be expected to be slightly more positive than under no action and still slightly positive overall. 5B would have a similar but slightly greater degree of positive protected resources impact than 5C since 5B's trip limit is lower and would result in less directed fishing than 5C.

Protected Resource Impacts from Alternative 5C – Implement a 500-pound trip limit when T2 closes.

The Council's MSB Advisory Panel reported that limiting post-closure T2 landings to a 250-pound trip limit would greatly reduce post-closure T2 squid fishing. As such, T2 effort would be reduced in some years. Since Trimesters were implemented in 2007, there have been substantial T2 overages in 3 out of 10 years, so this measure might only have substantial impacts in a low percentage of years. While less overages mean more quota would be available in T3, there is no guarantee that squid will be available during T3, and over the long term there would likely be some fishing opportunities lost during T2 and not made up for during T3. There also have not been any annual closures restraining fishing during T3 in recent years so adding more quota to T3 is unlikely to result in any additional landings/effort during T3. Since this alternative also only impacts a portion of overall squid effort and may not impact some years at all, it may only slightly reduce longfin squid fishing effort.

With the potential for squid effort to be reduced slightly under Alternative 5C, compared to no action, this alternative could reduce potential future interactions because the presence, quantity, or degree of bottom trawl gear used in the broad fishing area affects the likelihood of interactions and less effort with similar gear should reduce the likelihood of interactions. Given the possible slight reduction in

effort, impacts to ESA listed species, pilot whales, and bottlenose dolphins would be slightly less negative than under no action but still low negative overall, and impacts to other MMPA species would be expected to be slightly more positive than under no action and still slightly positive overall. 5C would have a similar but slightly lesser degree of positive protected resources impact than 5B since 5B's trip limit is lower and would result in less directed fishing than 5C.

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Protected Resource Impacts from Alternative 6A (PREFERRED) – No action on *Illex* squid permits.

As detailed in the introduction to this Section (see 7.3.1), no action is expected to have low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species.

Protected Resource Impacts from Alternative 6B – *Illex* squid requalification 10,000 pounds any year 1997-2015.

This Alternative may impact the number of vessels that have access to the *Illex* squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet. Since racing to fish might be reduced with less participants, bycatch, including of protected species may be reduced, but the effect is not expected to be substantial since fishermen already would rather avoid protected resource interactions due to the scrutiny that such interactions can invite. With effort essentially staying the same and impacts occurring relative to effort, impacts would be similar to the no action, i.e. low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species. Since none of the alternatives in this alternative set are likely to substantively change the overall amount or character of effort in the squid fleet, they are all similar to each other in terms on impacts on protected resources.

Protected Resource Impacts from Alternative 6C – *Illex* squid requalification 10,000 pounds any year 1997-2013.

This Alternative may impact the number of vessels that have access to the *Illex* squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet. Since racing to fish might be reduced with less participants, bycatch, including of protected species may be reduced, but the effect is not expected to be substantial since fishermen already would rather avoid protected resource interactions due to the scrutiny that such interactions can invite. With effort essentially staying the same and impacts occurring relative to effort, impacts would be similar to the no action, i.e. low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species. Since none of the alternatives in this alternative set are likely to substantively change the overall amount or character of effort in the squid fleet, they are all similar to each other in terms on impacts on protected resources.

Protected Resource Impacts from Alternative 6D – *Illex* squid requalification 50,000 pounds any year 1997-2013.

This Alternative may impact the number of vessels that have access to the *Illex* squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet. Since racing to fish might be reduced with less participants, bycatch, including of protected species may be reduced, but the effect is not expected to be substantial since fishermen already would rather avoid protected resource interactions due to the scrutiny that such interactions can

invite. With effort essentially staying the same and impacts occurring relative to effort, impacts would be similar to the no action, i.e. low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species. Since none of the alternatives in this alternative set are likely to substantively change the overall amount or character of effort in the squid fleet, they are all similar to each other in terms on impacts on protected resources.

Protected Resource Impacts from Alternative 6E – *Illex* squid requalification 100,000 pounds any year 1997-2013.

This Alternative may impact the number of vessels that have access to the *Illex* squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet. Since racing to fish might be reduced with less participants, bycatch, including of protected species may be reduced, but the effect is not expected to be substantial since fishermen already would rather avoid protected resource interactions due to the scrutiny that such interactions can invite. With effort essentially staying the same and impacts occurring relative to effort, impacts would be similar to the no action, i.e. low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species. Since none of the alternatives in this alternative set are likely to substantively change the overall amount or character of effort in the squid fleet, they are all similar to each other in terms on impacts on protected resources.

Protected Resource Impacts from Alternative 6F – *Illex* squid requalification 200,000 pounds any year 1997-2013.

This Alternative may impact the number of vessels that have access to the *Illex* squid fishery, but since the resulting fleet will likely still have the capacity to harvest the full quota in a manner not dissimilar to previous years, this alternative is not likely to substantively change the amount or character of effort in the squid fleet. Since racing to fish might be reduced with less participants, bycatch, including of protected species may be reduced, but the effect is not expected to be substantial since fishermen already would rather avoid protected resource interactions due to the scrutiny that such interactions can invite. With effort essentially staying the same and impacts occurring relative to effort, impacts would be similar to the no action, i.e. low negative impacts on ESA listed species, pilot whales, and bottlenose dolphins, and slight positive impacts for other MMPA species. Since none of the alternatives in this alternative set are likely to substantively change the overall amount or character of effort in the squid fleet, they are all similar to each other in terms on impacts on protected resources.

7.4 Non-Target Resources

Current Resource Condition:

Bycatch in the squid and butterfish fisheries is described in Section 6.1. As described in Section 6.1, the non-target species which are caught at annual levels estimated above 200,000 pounds by any of the squid and butterfish fisheries include spotted hake, scup, silver hake, spiny dogfish, red hake, summer flounder, smooth dogfish, northern sea robin, black sea bass, winter (big) skate, fourspot flounder, and john dory bucklers in the longfin squid fishery and chub mackerel in the *Illex* squid fishery. 200,000 pounds of annual estimated catch is used as a proxy to identify species with a potential substantial interaction given there are many species caught incidentally in the longfin squid fishery. Links to relevant assessments are provided in Section 6.1, and as described in that Section, red hake is overfished with overfishing occurring, and summer flounder has overfishing occurring. There are no assessments for northern sea robin, fourspot flounder, john dory bucklers, or chub mackerel, but for the other species listed above, they are not overfished or subject to overfishing.

The *Illex* fishery has relatively low discarding while the longfin squid fishery has relatively high discarding. On the *Illex* squid trips identified in the analysis, the 2014-2016 overall discard rate of finfish was 1.5% while for the longfin squid fishery the overall discard rate was 33%. Also, none of the species that have resource condition problems are substantially caught in the *Illex* fishery.

Because the longfin squid fishery has substantial bycatch, including red hake and summer flounder, the current resource condition for non-target resources is best described as negative for red hake and summer flounder, and low negative for other species that have substantial interactions. Mortality from bycatch is accounted for with species that are managed under a fishery management plan. For unmanaged species, we have no data to indicate the impact that these measures would have on them.

Longfin Squid

Annual bycatch is described in Section 6.1, and the Council also reviewed observer data at a finer level of detail when it made its decisions in June 2017, and those analyses are also provided below because they provide context for impact analyses regarding non-target species. At that point, only data through 2015 was fully available for analysis. Similarly, trips that retained (i.e., the estimated kept weight of longfin squid) greater than 40% longfin squid by weight were used. The longfin squid fishery has had 3%-8% of its landings observed (by weight) and overall discard rates (including longfin squid discards) were approximately 31%-40% by weight during 2007-2015, improving in more recent years. The discard rate is similar across Trimesters, though different species are discarded at different rates in different Trimesters (see tables below). In the 3-year tables below, the “observed catch” and “observed discarded” are not fishery-raised estimates – just cumulative totals of what observers recorded for the particular time period and/or Trimester. Discard ratios from those totals and average landings are used

to produce rough discard estimates for the longfin squid fishery in different time periods for species that had at least 10,000 pounds of annual discards estimated. This is the last column in those tables but again readers are strongly cautioned that while this is a reasonable approach for a quick, rough, and relative estimate given the available data, it is highly imprecise and does not follow the protocol used for official discard estimates. Tables are also provided describing the different discard ratios between trimesters for species with discard ratios of at least 0.1 pounds discarded per 100 pounds longfin squid retained, for data summed from 2007-2015.

Table 28. Coverage and discard summary Longfin Squid Fishery - NEFOP Observer Bottom Trawl Data.

	Trips > 40% Longfin	
	% Landings Observed	% Overall Discarded
2007-2009	3%	40%
2010-2012	8%	34%
2013-2015	7%	31%

Table 29. Approximate Trimester Overall Discard Percentages - NEFOP Observer Trawl Data.

	Overall Discard Percentage 2007-2015
Tri 1	33%
Tri 2	35%
Tri 3	36%

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Table 30. 2007-2009 Discard Data From Trips >40% Longfin. Species with >10,000 pounds estimated annual discards.

NESPP4	Observed Catch	Observed Discarded	% of total discards	Percent of particular species discarded	Common Name	Pounds Discarded per 100 pounds longfin retained	Rough annual discards (pounds) based on 24 million pounds of squid landings (average 2007-2009)
511	295,226	273,885	15%	93%	BUTTERFISH	11.7	2,807,025
3521	179,861	179,418	10%	100%	DOGFISH, SPINY	7.7	1,838,836
8020	169,176	168,533	9%	100%	SQUID, SHORT-FIN	7.2	1,727,281
5090	204,661	165,370	9%	81%	HAKE, SILVER (WHITING)	7.1	1,694,857
1520	147,690	134,196	7%	91%	HAKE, RED (LING)	5.7	1,375,365
6602	122,270	116,333	6%	95%	HAKE, SPOTTED	5.0	1,192,285
3660	102,672	102,189	6%	100%	SKATE, LITTLE	4.4	1,047,324
1270	74,181	74,013	4%	100%	FLOUNDER, FOURSPOT	3.2	758,550
2120	198,423	63,787	4%	32%	MACKEREL, ATLANTIC	2.7	653,744
3295	89,677	62,011	3%	69%	SCUP	2.6	635,544
3670	48,934	48,745	3%	100%	SKATE, WINTER (BIG)	2.1	499,584
8010	2,385,899	44,187	2%	2%	SQUID, ATL LONG-FIN	1.9	452,869
1219	58,136	39,159	2%	67%	FLOUNDER, SUMMER (FLUKE)	1.7	401,339
1685	26,812	26,661	1%	99%	HERRING, ATLANTIC	1.1	273,243
3511	24,808	23,101	1%	93%	DOGFISH, SMOOTH	1.0	236,760
4180	22,715	22,016	1%	97%	BASS, STRIPED	0.9	225,644
8009	24,973	20,379	1%	82%	SCALLOP, SEA	0.9	208,859
1200	17,955	17,434	1%	97%	FLOUNDER, WINTER (BLACKBACK)	0.7	178,681
1670	16,508	16,508	1%	100%	HERRING, NK	0.7	169,189
7010	15,585	15,585	1%	100%	CRAB, LADY	0.7	159,724
8171	13,685	13,685	1%	100%	SEAWEED, NK	0.6	140,257
1539	14,127	13,346	1%	94%	HAKE, WHITE	0.6	136,777
230	31,815	13,256	1%	42%	BLUEFISH	0.6	135,855
3350	14,615	11,167	1%	76%	SEA BASS, BLACK	0.5	114,449
124	18,730	10,110	1%	54%	MONKFISH (GOOSEFISH)	0.4	103,621
3420	10,421	9,964	1%	96%	SEA ROBIN, STRIPED	0.4	102,121
3680	9,007	8,946	0%	99%	SKATE, BARNDOOR	0.4	91,689
3650	8,437	8,437	0%	100%	SKATE, NK	0.4	86,471
1880	10,424	7,272	0%	70%	DORY, BUCKLER (JOHN)	0.3	74,530
3720	6,925	6,868	0%	99%	SKATE, CLEARNOSE	0.3	70,386
6600	11,031	6,524	0%	59%	HAKE, NK	0.3	66,860
7110	5,782	5,775	0%	100%	CRAB, JONAH	0.2	59,185
8030	5,754	4,984	0%	87%	SQUID, NK	0.2	51,082
7270	6,676	4,934	0%	74%	LOBSTER, AMERICAN	0.2	50,563
1250	4,490	4,470	0%	100%	FLOUNDER, SAND DAB (WINDOWPANE)	0.2	45,816
7240	4,494	4,467	0%	99%	CRAB, HORSESHOE	0.2	45,784
3460	4,206	4,206	0%	100%	DOGFISH, CHAIN	0.2	43,103
900	3,850	3,661	0%	95%	CROAKER, ATLANTIC	0.2	37,522
1220	3,557	3,531	0%	99%	FLOUNDER, WITCH (GREY SOLE)	0.2	36,193
3400	3,398	3,394	0%	100%	SEA ROBIN, NORTHERN	0.1	34,783
6867	3,150	3,150	0%	100%	SPONGE, NK	0.1	32,282
6623	2,927	2,927	0%	100%	BOARFISH, DEEPBODY	0.1	29,993
4380	3,189	2,842	0%	89%	TAUTOG (BLACKFISH)	0.1	29,123
5080	2,774	2,596	0%	94%	WHITING, BLACK (HAKE, OFFSHORE)	0.1	26,610
6649	2,438	2,438	0%	100%	MACKEREL, NK	0.1	24,988
5260	1,982	1,939	0%	98%	FISH, NK	0.1	19,870
1477	1,880	1,880	0%	100%	HADDOCK	0.1	19,269
7120	1,761	1,757	0%	100%	CRAB, ROCK	0.1	18,006
8280	1,724	1,710	0%	99%	STARFISH, SEASTAR,NK	0.1	17,529
7150	1,535	1,535	0%	100%	CRAB, SPIDER, NK	0.1	15,734
3640	1,470	1,470	0%	100%	SKATE, ROSETTE	0.1	15,063
3474	1,396	1,329	0%	95%	SHAD, AMERICAN	0.1	13,617
3430	1,318	1,318	0%	100%	SEA ROBIN, ARMORED	0.1	13,506
6865	1,275	1,275	0%	100%	CRAB, SPECKLED, NK	0.1	13,067
1551	1,267	1,267	0%	100%	HAKE, RED/WHITE MIX	0.1	12,982

Table 31. 2010-2012 Discard Data From Trips >40% Longfin. Species with >10,000 pounds estimated annual discards.

NESPP4	Observed Catch	Observed Discarded	% of total discards	Percent of particular species discarded	Common Name	Pounds Discarded per 100 pounds longfin retained	Rough annual discards (pounds) based on 22 million pounds of squid landings (average 2010-2012)
511	664,802	614,920	19%	92%	BUTTERFISH	11.5	2,524,854
3521	469,942	465,140	15%	99%	DOGFISH, SPINY	8.7	1,909,859
6602	331,978	325,371	10%	98%	HAKE, SPOTTED	6.1	1,335,970
5090	492,892	324,927	10%	66%	HAKE, SILVER (WHITING)	6.1	1,334,145
8020	612,187	292,523	9%	48%	SQUID, SHORT-FIN	5.5	1,201,094
3295	229,724	154,620	5%	67%	SCUP	2.9	634,868
3660	152,673	149,586	5%	98%	SKATE, LITTLE	2.8	614,197
8010	5,456,177	98,146	3%	2%	SQUID, ATL LONG-FIN	1.8	402,984
7010	65,299	65,299	2%	100%	CRAB, LADY	1.2	268,115
1520	68,843	63,528	2%	92%	HAKE, RED (LING)	1.2	260,843
1270	60,168	60,168	2%	100%	FLOUNDER, FOURSPOT	1.1	247,049
3400	47,683	47,587	1%	100%	SEA ROBIN, NORTHERN	0.9	195,390
1219	101,108	43,480	1%	43%	FLOUNDER, SUMMER (FLUKE)	0.8	178,529
3511	56,069	39,691	1%	71%	DOGFISH, SMOOTH	0.7	162,969
3670	35,348	33,415	1%	95%	SKATE, WINTER (BIG)	0.6	137,202
4180	27,172	26,551	1%	98%	BASS, STRIPED	0.5	109,020
8009	29,784	26,438	1%	89%	SCALLOP, SEA	0.5	108,553
124	41,740	25,293	1%	61%	MONKFISH (GOOSEFISH)	0.5	103,853
8171	24,568	24,568	1%	100%	SEAWEED, NK	0.5	100,877
1880	51,832	22,429	1%	43%	DORY, BUCKLER (JOHN)	0.4	92,094
1200	20,067	19,720	1%	98%	FLOUNDER, WINTER (BLACKBACK)	0.4	80,969
230	68,399	18,367	1%	27%	BLUEFISH	0.3	75,414
3420	18,231	17,809	1%	98%	SEA ROBIN, STRIPED	0.3	73,124
3350	29,046	17,147	1%	59%	SEA BASS, BLACK	0.3	70,404
3474	16,362	14,098	0%	86%	SHAD, AMERICAN	0.3	57,884
3640	14,051	14,051	0%	100%	SKATE, ROSETTE	0.3	57,692
1670	13,292	11,580	0%	87%	HERRING, NK	0.2	47,549
7270	14,622	10,884	0%	74%	LOBSTER, AMERICAN	0.2	44,690
1477	10,359	10,359	0%	100%	HADDOCK	0.2	42,536
1220	10,384	10,357	0%	100%	FLOUNDER, WITCH (GREY SOLE)	0.2	42,525
3680	9,405	9,405	0%	100%	SKATE, BARNDOOR	0.2	38,616
1685	52,363	8,688	0%	17%	HERRING, ATLANTIC	0.2	35,672
1250	8,593	8,516	0%	99%	FLOUNDER, SAND DAB (WINDOWPANE)	0.2	34,967
3720	8,586	8,488	0%	99%	SKATE, CLEARNOSE	0.2	34,851
3460	8,340	8,340	0%	100%	DOGFISH, CHAIN	0.2	34,244
6600	9,732	8,136	0%	84%	HAKE, NK	0.2	33,406
2120	14,397	6,583	0%	46%	MACKEREL, ATLANTIC	0.1	27,030
6739	6,493	6,493	0%	100%	RAY, BULLNOSE	0.1	26,658
3650	6,421	6,421	0%	100%	SKATE, NK	0.1	26,363
4380	6,296	6,079	0%	97%	TAUTOG (BLACKFISH)	0.1	24,958
7110	6,301	5,988	0%	95%	CRAB, JONAH	0.1	24,588
5260	5,001	4,931	0%	99%	FISH, NK	0.1	20,247
8018	4,663	4,663	0%	100%	SQUID EGGS, ATL LONG-FIN	0.1	19,146
1120	4,657	4,657	0%	100%	HERRING, BLUEBACK	0.1	19,122
10	5,314	4,432	0%	83%	ALEWIFE	0.1	18,197
1551	3,981	3,981	0%	100%	HAKE, RED/WHITE MIX	0.1	16,346
1230	3,655	3,655	0%	100%	FLOUNDER, YELLOWTAIL	0.1	15,007
7120	3,477	3,477	0%	100%	CRAB, ROCK	0.1	14,276
6867	2,839	2,839	0%	100%	SPONGE, NK	0.1	11,658
3430	2,781	2,781	0%	100%	SEA ROBIN, ARMORED	0.1	11,420
6860	2,502	2,502	0%	100%	ANCHOVY, NK	0.0	10,274

Table 32. 2013-2015 Discard Data From Trips >40% Longfin. Species with >10,000 pounds estimated annual discards.

NESPP4	Observed Catch	Observed Discarded	% of total discards	Percent of particular species discarded	Common Name	Pounds Discarded per 100 pounds longfin retained	Rough annual discards (pounds) based on 26 million pounds of squid landings (average 2013-2015)
511	711,378	388,391	14%	55%	BUTTERFISH	7.5	1,961,493
6602	291,774	285,881	10%	98%	HAKE, SPOTTED	5.6	1,443,785
8020	345,605	248,680	9%	72%	SQUID, SHORT-FIN	4.8	1,255,908
3660	215,948	212,661	8%	98%	SKATE, LITTLE	4.1	1,074,003
3521	200,535	199,510	7%	99%	DOGFISH, SPINY	3.9	1,007,585
5090	284,782	172,782	6%	61%	HAKE, SILVER (WHITING)	3.4	872,602
8010	5,294,139	145,931	5%	3%	SQUID, ATL LONG-FIN	2.8	736,997
1520	128,942	120,556	4%	93%	HAKE, RED (LING)	2.3	608,844
3511	87,893	81,839	3%	93%	DOGFISH, SMOOTH	1.6	413,313
3295	191,291	80,550	3%	42%	SCUP	1.6	406,800
3670	76,811	73,796	3%	96%	SKATE, WINTER (BIG)	1.4	372,692
1270	54,519	54,419	2%	100%	FLOUNDER, FOURSPOT	1.1	274,833
8171	52,459	52,459	2%	100%	SEAWEED, NK	1.0	264,934
3400	48,075	47,870	2%	100%	SEA ROBIN, NORTHERN	0.9	241,757
1219	93,060	40,047	1%	43%	FLOUNDER, SUMMER (FLUKE)	0.8	202,251
3730	39,677	39,616	1%	100%	SKATE, LITTLE/WINTER, NK	0.8	200,072
3350	46,672	37,747	1%	81%	SEA BASS, BLACK	0.7	190,636
1477	37,397	37,389	1%	100%	HADDOCK	0.7	188,824
7010	36,173	36,173	1%	100%	CRAB, LADY	0.7	182,683
3650	35,176	34,821	1%	99%	SKATE, NK	0.7	175,856
2150	51,692	32,705	1%	63%	MACKEREL, CHUB	0.6	165,171
8009	27,958	21,605	1%	77%	SCALLOP, SEA	0.4	109,113
3720	18,986	18,188	1%	96%	SKATE, CLEARNOSE	0.4	91,856
124	26,011	17,360	1%	67%	MONKFISH (GOOSEFISH)	0.3	87,671
1880	32,482	15,998	1%	49%	DORY, BUCKLER (JOHN)	0.3	80,795
1200	16,130	15,867	1%	98%	FLOUNDER, WINTER (BLACKBACK)	0.3	80,134
230	24,502	13,583	0%	55%	BLUEFISH	0.3	68,600
1250	12,197	12,165	0%	100%	FLOUNDER, SAND DAB (WINDOWPANE)	0.2	61,437
3420	10,946	10,403	0%	95%	SEA ROBIN, STRIPED	0.2	52,539
3474	9,146	9,113	0%	100%	SHAD, AMERICAN	0.2	46,022
3680	8,992	8,992	0%	100%	SKATE, BARNDOOR	0.2	45,413
3460	8,301	8,301	0%	100%	DOGFISH, CHAIN	0.2	41,923
7120	8,284	8,281	0%	100%	CRAB, ROCK	0.2	41,823
4180	8,633	7,999	0%	93%	BASS, STRIPED	0.2	40,399
1660	7,614	7,614	0%	100%	HERRING, ROUND	0.1	38,450
6626	7,391	7,391	0%	100%	BEARDFISH	0.1	37,327
10	7,183	7,079	0%	99%	ALEWIFE	0.1	35,749
4060	7,013	6,881	0%	98%	SPOT	0.1	34,753
3640	6,670	6,670	0%	100%	SKATE, ROSETTE	0.1	33,687
6867	6,059	6,059	0%	100%	SPONGE, NK	0.1	30,597
7110	5,977	5,621	0%	94%	CRAB, JONAH	0.1	28,386
3430	5,144	5,144	0%	100%	SEA ROBIN, ARMORED	0.1	25,977
6871	4,839	4,839	0%	100%	JELLYFISH, NK	0.1	24,436
2120	10,084	4,490	0%	45%	MACKEREL, ATLANTIC	0.1	22,673
1551	4,837	4,461	0%	92%	HAKE, RED/WHITE MIX	0.1	22,530
1220	4,453	4,445	0%	100%	FLOUNDER, WITCH (GREY SOLE)	0.1	22,450
1670	4,491	4,431	0%	99%	HERRING, NK	0.1	22,378
5260	4,482	4,429	0%	99%	FISH, NK	0.1	22,365
8018	4,397	4,397	0%	100%	SQUID EGGS, ATL LONG-FIN	0.1	22,204
2210	4,311	4,237	0%	98%	MENHADEN, ATLANTIC	0.1	21,396
7270	5,705	4,028	0%	71%	LOBSTER, AMERICAN	0.1	20,345
6739	3,118	3,118	0%	100%	RAY, BULLNOSE	0.1	15,744
7150	3,092	3,092	0%	100%	CRAB, SPIDER, NK	0.1	15,614
7240	3,527	3,039	0%	86%	CRAB, HORSESHOE	0.1	15,345
1230	2,926	2,838	0%	97%	FLOUNDER, YELLOWTAIL	0.1	14,335
1539	2,944	2,097	0%	71%	HAKE, WHITE	0.0	10,588
3310	2,046	1,992	0%	97%	SCAD, ROUGH	0.0	10,058

Table 33. 2007-2015 Data From Trips >40% Longfin – T1. Species with discard ratios ≥ 0.1 pounds discarded for 100 pounds longfin retained.

NESPP4	Observed Catch	Observed Discarded	% of total discards	Percent of particular species discarded	Common Name	Pounds Discarded per 100 pounds longfin retained
3521	510,585	510,135	18%	100%	DOGFISH, SPINY	10.7
511	558,052	488,395	18%	88%	BUTTERFISH	10.2
8020	624,425	347,156	13%	56%	SQUID, SHORT-FIN	7.3
5090	371,955	239,345	9%	64%	HAKE, SILVER (WHITING)	5.0
6602	170,857	161,285	6%	94%	HAKE, SPOTTED	3.4
1520	135,773	122,830	4%	90%	HAKE, RED (LING)	2.6
8010	4,901,760	117,440	4%	2%	SQUID, ATL LONG-FIN	2.5
1270	96,348	96,187	3%	100%	FLOUNDER, FOURSPOT	2.0
3295	203,756	73,089	3%	36%	SCUP	1.5
2120	208,599	66,803	2%	32%	MACKEREL, ATLANTIC	1.4
3400	60,558	60,538	2%	100%	SEA ROBIN, NORTHERN	1.3
8171	55,628	55,628	2%	100%	SEAWEED, NK	1.2
1219	102,543	52,179	2%	51%	FLOUNDER, SUMMER (FLUKE)	1.1
3670	42,676	42,378	2%	99%	SKATE, WINTER (BIG)	0.9
3660	32,961	31,720	1%	96%	SKATE, LITTLE	0.7
124	38,477	27,050	1%	70%	MONKFISH (GOOSEFISH)	0.6
3350	37,078	24,278	1%	65%	SEA BASS, BLACK	0.5
3420	24,225	23,960	1%	99%	SEA ROBIN, STRIPED	0.5
230	65,454	23,881	1%	36%	BLUEFISH	0.5
1880	43,708	23,165	1%	53%	DORY, BUCKLER (JOHN)	0.5
1685	64,032	20,606	1%	32%	HERRING, ATLANTIC	0.4
3511	19,211	18,813	1%	98%	DOGFISH, SMOOTH	0.4
1220	17,052	17,006	1%	100%	FLOUNDER, WITCH (GREY SOLE)	0.4
3680	16,276	16,215	1%	100%	SKATE, BARNDOOR	0.3
1539	12,255	11,356	0%	93%	HAKE, WHITE	0.2
3474	11,357	10,220	0%	90%	SHAD, AMERICAN	0.2
1670	9,233	9,233	0%	100%	HERRING, NK	0.2
3460	9,197	9,197	0%	100%	DOGFISH, CHAIN	0.2
3640	7,723	7,723	0%	100%	SKATE, ROSETTE	0.2
7110	6,939	6,715	0%	97%	CRAB, JONAH	0.1
3430	6,468	6,468	0%	100%	SEA ROBIN, ARMORED	0.1
6600	11,121	4,971	0%	45%	HAKE, NK	0.1
8009	5,126	4,550	0%	89%	SCALLOP, SEA	0.1
1551	3,981	3,981	0%	100%	HAKE, RED/WHITE MIX	0.1
7120	3,246	3,246	0%	100%	CRAB, ROCK	0.1
1477	2,666	2,658	0%	100%	HADDOCK	0.1

Table 34. 2007-2015 Data From Trips >40% Longfin – T2. Species with discard ratios ≥ 0.1 pounds discarded for 100 pounds longfin retained.

NESPP4	Observed Catch	Observed Discarded	% of total discards	Percent of particular species discarded	Common Name	Pounds Discarded per 100 pounds longfin retained
3660	228,422	224,849	13%	98%	SKATE, LITTLE	7.6
3295	248,446	190,212	11%	77%	SCUP	6.4
511	169,514	145,604	9%	86%	BUTTERFISH	4.9
3521	142,253	137,814	8%	97%	DOGFISH, SPINY	4.6
7010	114,113	114,113	7%	100%	CRAB, LADY	3.8
3670	102,599	100,252	6%	98%	SKATE, WINTER (BIG)	3.4
3511	104,187	85,030	5%	82%	DOGFISH, SMOOTH	2.9
5090	96,766	68,538	4%	71%	HAKE, SILVER (WHITING)	2.3
8010	3,019,577	53,231	3%	2%	SQUID, ATL LONG-FIN	1.8
8020	51,249	51,131	3%	100%	SQUID, SHORT-FIN	1.7
4180	52,476	50,565	3%	96%	BASS, STRIPED	1.7
1219	81,696	43,910	3%	54%	FLOUNDER, SUMMER (FLUKE)	1.5
1200	43,051	42,180	2%	98%	FLOUNDER, WINTER (BLACKBACK)	1.4
3730	37,811	37,810	2%	100%	SKATE, LITTLE/WINTER, NK	1.3
8171	34,715	34,715	2%	100%	SEAWEED, NK	1.2
3650	33,851	33,717	2%	100%	SKATE, NK	1.1
3350	39,838	31,565	2%	79%	SEA BASS, BLACK	1.1
3400	27,120	26,889	2%	99%	SEA ROBIN, NORTHERN	0.9
6602	23,315	22,677	1%	97%	HAKE, SPOTTED	0.8
1270	18,318	18,307	1%	100%	FLOUNDER, FOURSPOT	0.6
3720	19,218	18,265	1%	95%	SKATE, CLEARNOSE	0.6
1250	17,623	17,519	1%	99%	FLOUNDER, SAND DAB (WINDOWPANE)	0.6
1520	13,834	11,344	1%	82%	HAKE, RED (LING)	0.4
2150	16,173	10,619	1%	66%	MACKEREL, CHUB	0.4
4380	10,088	9,472	1%	94%	TAUTOG (BLACKFISH)	0.3
3420	9,907	9,429	1%	95%	SEA ROBIN, STRIPED	0.3
8018	8,874	8,874	1%	100%	SQUID EGGS, ATL LONG-FIN	0.3
6867	8,200	8,200	0%	100%	SPONGE, NK	0.3
7120	7,038	7,036	0%	100%	CRAB, ROCK	0.2
7270	9,652	7,013	0%	73%	LOBSTER, AMERICAN	0.2
4060	7,014	6,882	0%	98%	SPOT	0.2
6739	6,876	6,876	0%	100%	RAY, BULLNOSE	0.2
7150	4,988	4,988	0%	100%	CRAB, SPIDER, NK	0.2
2120	6,769	4,024	0%	59%	MACKEREL, ATLANTIC	0.1
7110	3,670	3,670	0%	100%	CRAB, JONAH	0.1
10	3,447	3,347	0%	97%	ALEWIFE	0.1
5260	3,249	3,249	0%	100%	FISH, NK	0.1
230	21,265	3,143	0%	15%	BLUEFISH	0.1
1670	2,997	2,996	0%	100%	HERRING, NK	0.1
1120	2,619	2,595	0%	99%	HERRING, BLUEBACK	0.1
6871	2,317	2,317	0%	100%	JELLYFISH, NK	0.1
6882	2,197	2,197	0%	100%	SHELL, NK	0.1
3474	2,057	2,036	0%	99%	SHAD, AMERICAN	0.1
7240	2,442	1,952	0%	80%	CRAB, HORSESHOE	0.1
8280	1,648	1,648	0%	100%	STARFISH, SEASTAR,NK	0.1
8050	1,603	1,603	0%	100%	SEA URCHIN, NK	0.1
8009	2,656	1,514	0%	57%	SCALLOP, SEA	0.1

Table 35. 2007-2015 Data From Trips >40% Longfin – T3. Species with discard ratios ≥ 0.1 pounds discarded for 100 pounds longfin retained.

NESPP4	Observed Catch	Observed Discarded	% of total discards	Percent of particular species discarded	Common Name	Pounds Discarded per 100 pounds longfin retained
511	943,841	643,197	20%	68%	BUTTERFISH	12.6
6602	551,849	543,623	17%	99%	HAKE, SPOTTED	10.7
5090	513,614	355,195	11%	69%	HAKE, SILVER (WHITING)	7.0
8020	451,294	311,450	10%	69%	SQUID, SHORT-FIN	6.1
3660	209,909	207,866	6%	99%	SKATE, LITTLE	4.1
3521	197,500	196,119	6%	99%	DOGFISH, SPINY	3.8
1520	195,869	184,106	6%	94%	HAKE, RED (LING)	3.6
8010	5,214,879	117,593	4%	2%	SQUID, ATL LONG-FIN	2.3
1270	74,203	74,105	2%	100%	FLOUNDER, FOURSPOT	1.5
8009	74,933	62,358	2%	83%	SCALLOP, SEA	1.2
1477	46,431	46,431	1%	100%	HADDOCK	0.9
3511	45,372	40,788	1%	90%	DOGFISH, SMOOTH	0.8
3295	58,490	33,880	1%	58%	SCUP	0.7
1219	68,065	26,598	1%	39%	FLOUNDER, SUMMER (FLUKE)	0.5
124	42,973	25,268	1%	59%	MONKFISH (GOOSEFISH)	0.5
2150	36,572	23,139	1%	63%	MACKEREL, CHUB	0.5
1880	49,925	21,960	1%	44%	DORY, BUCKLER (JOHN)	0.4
1670	22,061	20,290	1%	92%	HERRING, NK	0.4
230	37,997	18,182	1%	48%	BLUEFISH	0.4
1685	16,218	15,420	0%	95%	HERRING, ATLANTIC	0.3
3650	15,546	15,325	0%	99%	SKATE, NK	0.3
3720	13,956	13,956	0%	100%	SKATE, CLEARNOSE	0.3
3640	13,455	13,455	0%	100%	SKATE, ROSETTE	0.3
3670	15,819	13,326	0%	84%	SKATE, WINTER (BIG)	0.3
7270	16,448	12,612	0%	77%	LOBSTER, AMERICAN	0.2
3474	13,489	12,283	0%	91%	SHAD, AMERICAN	0.2
3400	11,478	11,424	0%	100%	SEA ROBIN, NORTHERN	0.2
3460	10,906	10,906	0%	100%	DOGFISH, CHAIN	0.2
6600	15,919	10,772	0%	68%	HAKE, NK	0.2
1200	10,834	10,722	0%	99%	FLOUNDER, WINTER (BLACKBACK)	0.2
3350	13,417	10,219	0%	76%	SEA BASS, BLACK	0.2
3680	9,730	9,730	0%	100%	SKATE, BARNDOOR	0.2
1660	7,613	7,613	0%	100%	HERRING, ROUND	0.1
7110	7,450	6,999	0%	94%	CRAB, JONAH	0.1
10	7,862	6,976	0%	89%	ALEWIFE	0.1
6626	6,953	6,953	0%	100%	BEARDFISH	0.1
1250	6,968	6,944	0%	100%	FLOUNDER, SAND DAB (WINDOWPANE)	0.1
7240	6,921	6,897	0%	100%	CRAB, HORSESHOE	0.1
8030	15,206	6,881	0%	45%	SQUID, NK	0.1
5260	6,393	6,268	0%	98%	FISH, NK	0.1
1230	6,135	6,032	0%	98%	FLOUNDER, YELLOWTAIL	0.1
1551	6,100	5,724	0%	94%	HAKE, RED/WHITE MIX	0.1
6871	4,942	4,942	0%	100%	JELLYFISH, NK	0.1
3420	5,466	4,788	0%	88%	SEA ROBIN, STRIPED	0.1
1539	5,476	4,684	0%	86%	HAKE, WHITE	0.1
6623	4,604	4,604	0%	100%	BOARFISH, DEEPBODY	0.1
4180	4,492	4,449	0%	99%	BASS, STRIPED	0.1
2120	7,536	4,033	0%	54%	MACKEREL, ATLANTIC	0.1
5080	4,861	3,975	0%	82%	WHITING, BLACK (HAKE, OFFSHORE)	0.1
900	7,852	3,869	0%	49%	CROAKER, ATLANTIC	0.1
2210	3,598	3,383	0%	94%	MENHADEN, ATLANTIC	0.1
7120	3,237	3,233	0%	100%	CRAB, ROCK	0.1
6867	3,194	3,194	0%	100%	SPONGE, NK	0.1
6649	3,211	3,190	0%	99%	MACKEREL, NK	0.1
6739	2,895	2,895	0%	100%	RAY, BULLNOSE	0.1
7010	2,758	2,758	0%	100%	CRAB, LADY	0.1
6860	2,672	2,561	0%	96%	ANCHOVY, NK	0.1

Impact Analyses for Alternatives

Alternative Sets 1 and 2

Alternative Sets 1 and 2 may impact the number of vessels that have access to the longfin squid fishery, but they are unlikely to have any substantial direct impact on the amount of longfin squid fishing effort, which is what affects non-target resources. The various species that are caught incidentally by the longfin squid fishery will be impacted to some degree by the ongoing prosecution of the fishery in the same fashion regardless of the alternatives chosen in Sets 1 and 2. Recent non-target species interactions in the longfin squid fishery are described above. Previous actions (e.g. Amendments 10 and 14 to the MSB FMP) have reduced discards and non-target catch in the FMP to the extent practicable. For non-target species that are managed under their own FMP, incidental catch/discards are also considered as part of the management of that fishery. Also, as discussed at the start of Section 7, the availability of the targeted species may drive effort (and non-target fish species impacts) as much as quotas and other regulations. Accordingly, under any alternatives in these sets including no action, we expect ongoing negative impacts for overfished/overfishing species with substantial interactions (i.e. summer flounder and red hake) and low negative impacts for other species, similar to previous years that result in maintenance of the current resource condition of the affected non-target resources.

Indirect benefits to non-target resources could stem from potentially reducing the “race to fish” for quota by reducing the number of longfin squid permits in the fishery and by providing the remaining permits a greater chance of harvesting more of the available catch. More racing to fish is likely to lead to higher bycatch and if there is less of a race to fish, it is possible that fishermen may have more time to execute bycatch minimization strategies, though such gains are generally more strongly associated with rights-based management (Holland and Ginter 2001, Fujita and Bonzon 2005, Hilborn 2007, Birkenback et al 2017). This could benefit non-target resources to the degree that access is further limited. Further, remaining vessels are likely to have been more active in the fishery, which suggests that these vessels are more capable of reducing bycatch through modified fishing practices compared to vessels that have been less active in the fishery and fail to requalify for moratorium longfin squid permits under this action. Accordingly, no action with Alternative Set 1 would be least beneficial, and most beneficial would be the option that resulted in the fewest remaining vessels (1E). As such, in order of decreasing relative positive impact would be Alternatives 1E, 1D, 1C, 1B, and 1A. Since substantial capacity would remain under all options, any benefit would likely be low because remaining vessels would still be able to fully harvest available quota based on historic landings. 2B, which allows limited swapping of non-requalifying and requalifying permits would also weaken any such positive impact compared to 2A (no swapping) since 2B will likely result in a few additional vessels participating in the fishery even though the total number of qualifying permits would remain the same under 2A or 2B.

Alternative Sets 3, 4, and 5 may have more direct impacts on longfin squid fishing effort and are thus described in more detail below.

Non-target resources Impacts from Alternative 3A – No action on changes to squid/butterfish incidental permit.

No action regarding longfin squid incidental permits would allow the situation where vessels can drop federal incidental permits and fish in some states' waters with no trip limit after a closure of the squid fishery in federal waters to persist. Accordingly, under no action, we expect ongoing negative impacts for overfished/overfishing species with substantial interactions (i.e. summer flounder and red hake) and low negative impacts for other species, similar to previous years that result in maintenance of the current resource condition of the affected non-target resources.

Non-target resources Impacts from Alternative 3B – New limited access incidental squid permit qualification 2,500 pounds any year 1997-2013.

Vessels with substantial squid landings would qualify for the new incidental permit, and since they would not be able to re-acquire the permit without buying one from another permit-holder, they should be unlikely to cancel their permit to fish in state waters at higher trip limits after a federal waters closure. This should limit quota overages and effort. This situation is responsible for only a small portion of longfin squid landings, but does occur occasionally, so the impact is slightly positive for non-target species compared to no action, and similar to 3C but maybe slightly less positive than 3C because with more qualifiers the permit under 3B will be less valuable so vessels would be more likely to cancel it. The current resource condition for non-target species would remain negative to low negative. Vessels could also decide to retain only state permits, which would still allow them to fish in state waters after closures, further contributing to the slightness of the impact. Since 3B1 or 3B2 would be part of 3B, they cannot be compared to 3B but would modify 3B's impacts, as described below. Since 3C1 or 3C2 would only be paired with 3C, there is no comparison necessary with 3C1 or 3C2 versus 3B.

Non-target resources Impacts from Alternative 3B1 – Reduce open-access longfin squid trip limit to 250 pounds.

This alternative should have a negligible direct impact. It maintains vessels' ability to get an open access permit to cover low-level incidental landings, but lowers the amount of longfin squid that can be landed incidentally. Vessels that do not qualify for a limited access incidental catch permit under 3B that are subject to the open access longfin squid trip limit are not very active in the longfin squid fishery. The landings that could occur at a 250-pound trip limit would be a small part of longfin squid effort. Because 3B1 is tied to the creation of a limited access permit as described under 3B, this alternative contributes to the slightly positive impact to non-target species described under 3B. Since 3B1's trip limit is lower than 3B2's trip limit and would more effectively avoid directed fishing, 3B1's impact is more positive than 3B2. Since 3B1 or 3B2 would only be paired with 3B, there is no comparison necessary with 3C1, 3C2, or 3C. The current resource condition for non-target species would remain negative to low negative.

Non-target resources Impacts from Alternative 3B2 – Reduce open-access longfin squid trip limit to 500 pounds.

This alternative should have a negligible direct impact. It maintains vessels' ability to get an open access permit to cover low-level incidental landings, but lowers the amount of longfin squid that can be landed incidentally. Vessels that do not qualify for a limited access incidental catch permit under 3B that are subject to the open access longfin squid trip limit are not very active in the longfin squid fishery. The landings that could occur at a 500 pound trip limit would be a small part of longfin squid effort. Because 3B2 is tied to the creation of a limited access permit as described under 3B, this alternative contributes to the slightly positive impact to non-target species described under 3B. Since 3B2's trip limit is higher than 3B1's trip limit and would less effectively avoid directed fishing, 3B2's impact is less positive than 3B1. Since 3B1 or 3B2 would only be paired with 3B, there is no comparison necessary with 3C1, 3C2, or 3C. The current resource condition for non-target species would remain negative to low negative.

Non-target resources Impacts from Alternative 3C (PREFERRED) – New limited access incidental squid permit qualification 5,000 pounds any year 1997-2013.

Vessels with substantial squid landings would qualify for the new incidental permit, and since they would not be able to re-acquire the permit without buying one from another permit-holder, they should be unlikely to cancel their permit to fish in state waters at higher trip limits after a federal waters closure. This should limit quota overages and effort. This situation is responsible for only a small portion of longfin squid landings, but does occur occasionally, so the impact on non-target species is slightly positive compared to no action, and similar to 3B but maybe slightly more positive than 3B because with less qualifiers the permit under 3C will be more valuable so vessels would be less likely to cancel it. The current resource condition for non-target species would remain negative to low negative. Vessels could also decide to retain only state permits, which would still allow them to fish in state waters after closures, further contributing to the slightness of the impact. Since 3C1 or 3C2 would be part of 3C, they cannot be compared to 3C but would modify 3C's impacts, as described below. Since 3B1 or 3B2 would only be paired with 3B, there is no comparison necessary with 3B1 or 3B2 versus 3C.

Non-target resources Impacts from Alternative 3C1 (PREFERRED) – Reduce open-access longfin squid trip limit to 250 pounds.

This alternative should have a negligible direct impact. It maintains vessels' ability to get an open access permit to cover low-level incidental landings, but lowers the amount of longfin squid that can be landed incidentally. Vessels that do not qualify for a limited access incidental catch permit under 3C that are subject to the open access longfin squid trip limit are not very active in the longfin squid

fishery. The landings that could occur at a 250-pound trip limit would be a small part of longfin squid effort. Because 3C1 is tied to the creation of a limited access permit as described under 3C, this alternative contributes to the slightly positive impact to non-target species described under 3C. Since 3C1's trip limit is lower than 3C2's trip limit and would more effectively avoid directed fishing, 3C1's impact is more positive than 3C2. Since 3C1 or 3C2 would only be paired with 3C, there is no comparison necessary with 3B1, 3B2, or 3B. The current resource condition for non-target species would remain negative to low negative.

Non-target resources Impacts from Alternative 3C2 – Reduce open-access longfin squid trip limit to 500 pounds.

This alternative should have a negligible direct impact. It maintains vessels' ability to get an open access permit to cover low-level incidental landings, but lowers the amount of longfin squid that can be landed incidentally. Vessels that do not qualify for a limited access incidental catch permit under 3C that are subject to the open access longfin squid trip limit are not very active in the longfin squid fishery. The landings that could occur at a 500- pound trip limit would be a small part of longfin squid effort. Because 3C2 is tied to the creation of a limited access permit as described under 3C, this alternative contributes to the slightly positive impact to non-target species described under 3C. Since 3C2's trip limit is higher than 3C1's trip limit and would less effectively avoid directed fishing, 3C2's impact is less positive than 3C1. Since 3C1 or 3C2 would only be paired with 3C, there is no comparison necessary with 3B1, 3B2, or 3B. The current resource condition for non-target species would remain negative to low negative.

Non-target resources Impacts from Alternative 4A (PREFERRED) – No action on changes to Trimester rollover provisions.

The existing rollover provisions, which would persist under no-action, have been in effect since 2010. Accordingly, under no action, we expect ongoing negative impacts for overfished/overfishing species with substantial interactions (i.e. summer flounder and red hake) and low negative impacts for other species, similar to previous years that result in maintenance of the current resource condition of the affected non-target resources.

Non-target resources Impacts from Alternative 4B – Eliminate roll-over of longfin squid quota from T1 to T2.

4B could reduce effort, because no extra quota would be rolled over into T2 and available during T2. While that means more quota would be available in T3, there is no guarantee that squid will be available during T3, and over the long term there would likely be some fishing opportunities lost during T2 and not made up for during T3. There also have not been any annual closures restraining fishing during T3 in recent years so adding more quota to T3 is unlikely to result in any additional landings/effort during T3. Less effort overall due to lower effort in T2 means less non-target resources impacts compared to no action, particularly for principal bycatch species with relatively high T2 interactions, including summer flounder, scup, silver hake, spiny dogfish, smooth dogfish, and winter (big) skates (as discussed above, most are not overfished or subject to overfishing). Since this alternative only impacts a portion of overall squid effort and may not impact some years at all (e.g. if T1 landings are high there is no rollover), impacts are likely low positive compared to no action due to the potential for reduced effort, especially for species caught at high levels during T2. Given the low positive impact relative to the status quo, the overall impact on non-target resources is likely still negative to low negative, but less so, maintaining the current resource condition. 4B would have a greater degree of non-target resources benefit than 4C since 4B eliminates the rollover and 4C reduces the rollover.

Non-target resources Impacts from Alternative 4C – Reduce the maximum T1 to T2 rollover of longfin squid quota to 25% of the original T2 quota.

4C could reduce effort, because less extra quota would be rolled over into T2 and available during T2. While that means more quota would be available in T3, there is no guarantee that squid will be available during T3, and over the long term there would likely be some fishing opportunities lost during T2 and not made up for during T3. There also have not been any annual closures restraining fishing during T3 in recent years so adding more quota to T3 is unlikely to result in any additional landings/effort during T3. Less effort overall due to lower effort in T2 means less non-target resources impacts compared to no action, particularly for principal bycatch species with relatively high T2 interactions, including summer flounder, scup, silver hake, spiny dogfish, smooth dogfish, and winter (big) skates (as discussed above, most are not overfished or subject to overfishing). Since this alternative only impacts a portion of overall squid effort and may not impact some years at all (e.g. if T1 landings are high there is no rollover), impacts are likely low positive compared to no action due to the potential for reduced effort, especially for species caught at high levels during T2. Given the low positive impact relative to the status quo, the overall impact on non-target resources is likely still negative to low negative, but less so, maintaining the current resource condition. 4C would have a lesser degree of non-target resources benefit than 4B since 4B eliminates the rollover and 4C reduces the rollover.

Non-target resources Impacts from Alternative 4D – Split the T2 quota, with half available May 1-June 30, and the additional half available July 1-August 31.

There is no information to suggest that attempting to spread catch and landings out within T2 would have substantial impacts on effort or non-target resources, so the overall impact on non-target resources is likely still low negative, similar to no action, maintaining the current resource condition.

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Non-target resources Impacts from Alternative 5A – No action on changes to T2 closure trip limits.

The existing closure provisions would persist under no-action. Accordingly, under no action, we expect ongoing negative impacts for overfished/overfishing species with substantial interactions (i.e. summer flounder and red hake) and low negative impacts for other species, similar to previous years that result in maintenance of the current resource condition of the affected non-target resources.

Non-target resources Impacts from Alternative 5B (PREFERRED) – Implement a 250-pound trip when T2 closes.

The Council's MSB Advisory Panel reported that limiting post-closure T2 landings to a 250-pound trip limit would greatly reduce post-closure T2 squid fishing, and during 2016 (a year with substantial post-closure landings), only 1% of post-closure landings occurred on trips landing 250 pounds or less.

As such, T2 effort would be reduced in some years. Since Trimesters were implemented in 2007, there have been substantial T2 overages in 3 out of 10 years, so this measure might only have substantial impacts in a low percentage of years. There were also 2 minor overages, so there could be some impacts 50% of the time. While less overages mean more quota would be available in T3, there is no guarantee that squid will be available during T3, and over the long term there would likely be some fishing opportunities lost during T2 and not made up for during T3. There also have not been any annual closures restraining fishing during T3 in recent years so adding more quota to T3 is unlikely to result in any additional landings/effort during T3. Less effort overall due to lower effort in T2 means less non-target resources impacts compared to no action, particularly for principal bycatch species with relatively high T2 interactions, including summer flounder, scup, silver hake, spiny dogfish, smooth dogfish, and winter (big) skates. Since this alternative also only impacts a portion of overall squid effort and may not impact some years at all, impacts are likely low positive. Given the low positive impact relative to no action, the overall impact on non-target resources is likely still negative to low negative, but less so, maintaining the current resource condition. 5B would have a greater degree of positive non-target resources impact than 5C since 5Bs trip limit is lower and would result in less directed fishing than 5C.

Non-target resources Impacts from Alternative 5C – Implement a 500-pound trip when T2 closes.

The Council's MSB Advisory Panel reported that limiting post-closure T2 landings to a 500-pound trip limit would reduce post-closure T2 squid fishing, and during 2016 (a year with substantial post-closure landings), only 3% of post-closure landings occurred on trips landing 500 pounds or less.

As such, T2 effort would be reduced in some years. Since Trimesters were implemented in 2007, there have been substantial T2 overages in 3 out of 10 years, so this measure might only have substantial impacts in a low percentage of years. There were also 2 minor overages, so there could be some impacts 50% of the time. While less overages mean more quota would be available in T3, there is no guarantee that squid will be available during T3, and over the long term there would likely be some fishing opportunities lost during T2 and not made up for during T3. There also have not been any annual closures restraining fishing during T3 in recent years so adding more quota to T3 is unlikely to result in any additional landings/effort during T3. Less effort overall due to lower effort in T2 means less non-target resources impacts compared to no action, particularly for principal bycatch species with relatively high T2 interactions, including summer flounder, scup, silver hake, spiny dogfish, smooth

dogfish, and winter (big) skates. Since this alternative also only impacts a portion of overall squid effort and may not impact some years at all, impacts are likely low positive. Given the low positive impact relative to no action, the overall impact on non-target resources is likely still negative to low negative, but less so, maintaining the current resource condition. 5C would have a lesser degree of positive non-target resources impact than 5B since 5Bs trip limit is lower and would result in less directed fishing than 5C.

Alternative Set 6

Alternative Set 6 alternatives may impact the number of vessels that have access to the *Illex* squid fishery, but they are unlikely to have any substantial impact on the amount of *Illex* squid fishing effort, which is what affects non-target resources. The various species that are caught incidentally by the *Illex* squid fishery (beardfish, chub mackerel, and John Dory) will be impacted to some degree by the ongoing prosecution of the fishery in the same fashion regardless of the alternatives chosen in Set 6. Recent non-target species interactions in the *Illex* squid fishery are described above and are generally minimal. Previous actions (e.g. Amendments 10 and 14 to the MSB FMP) have reduced discards and non-target catch in the FMP to the extent practicable. For non-target species that are managed under their own FMP, incidental catch/discards are also considered as part of the management of that fishery. Also, as discussed above, the availability of the targeted species may drive effort (and non-target fish species impacts) as much as quotas and other regulations. Accordingly, under any alternatives in this set including the no action, we expect ongoing low negative impacts, similar to previous years, that result in maintenance of the current resource condition of the affected non-target resources.

Indirect benefits to non-target resources could stem from potentially reducing the "race to fish" for quota by reducing the number of *Illex* squid permits in the fishery and by providing the remaining permits a greater chance of harvesting more of the available catch. If there is less of a race to fish, it is possible that fishermen may have more time to execute bycatch minimization strategies, though such gains are generally associated with rights-based management (Fujita and Bonzon 2005, Hilborn 2007). This could benefit non-target resources to the degree that access is further limited. Further, remaining vessels are likely to have been more active in the fishery, which suggests that these vessels are more capable of reducing bycatch through modified fishing practices compared to vessels that have been less active in the fishery and fail to requalify for moratorium *Illex* squid permits under this action. Accordingly, no action with Alternative Set 6 would be least beneficial, and most beneficial would be the option that resulted in the fewest remaining vessels (6F). As such, in order of decreasing positive impact would be Alternatives 6F, 6E, 6D, 6C, 6B, and 6A. Since substantial capacity would remain under all options, any benefit would likely be low because racing to fish could still occur, and since discarding is relatively low in the *Illex* squid fishery to begin with.

7.5 Socioeconomic Impacts

Current Condition: This action could affect the longfin squid, butterfish, and *Illex* squid fisheries, and separate summary information of the current condition is provided first for each fishery. The performance of each fishery is further described above in Section 6.3. As discussed above, the availability of the targeted species may drive effort (and catch and revenues) as much as any regulations.

Longfin Squid fishery Current Condition: 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, as described in Section 6.3, and provides a variety of jobs related directly to fishing and also in associated support services. 174 vessels landed over 10,000 pounds of longfin squid in 2016, with total longfin squid landings valued at $49.9 million. While final data is not available for 2017, the fishery was less active in 2017 than 2016 based on preliminary landings information. The current conditions of the fishery should generally be maintained in the short and long run since the ABCs and catch should be sustainable given the Council's risk policy and implementation of that risk policy in specifications.

Illex Squid fishery Current Condition: 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, as described in Section 6.3, and provides a variety of jobs related directly to fishing and also in associated support services. 12 vessels landed over 10,000 pounds of longfin squid in 2016, with total *Illex* squid landings valued at $7.2 million. While final data is not available for 2017, the fishery was more active in 2017 than 2016 based on preliminary landings information. The current conditions of the fishery should generally be maintained in the short and long run since the ABCs and catch should be sustainable given the Council's risk policy and implementation of that risk policy in specifications.

Butterfish fishery Current Condition: 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, as described in Section 6.3, and provides a variety of jobs related directly to fishing and also in associated support services. It is also very difficult to separate directed butterfish trips from other directed trips where butterfish was also retained. 11 vessels landed over 50,000 pounds of longfin squid in 2016, with total butterfish landings valued at $1.7 million. While final data is not available for 2017, the fishery was more active in 2017 than 2016 based on preliminary landings information. The current conditions of the fishery should generally be maintained in the short and long run since the ABCs and catch should be sustainable given the Council's risk policy and implementation of that risk policy in specifications.

Since all of the alternatives have varying degrees of socioeconomic impacts, they are each addressed separately.

7.5.1 ALTERNATIVE SET 1: LONGFIN SQUID MORATORIUM PERMIT REQUALIFICATION ALTERNATIVES

Alternatives in this set could be selected in addition to alternatives in other sets or on their own if no action is selected for other sets. This action would not allow new entrants to qualify for a moratorium permit. The Council would only choose one action alternative within this set.

Socioeconomic impacts from Alternative 1A – No action on longfin squid permits.

Under no action, there would continue to be socioeconomic benefits to those who participate in the longfin squid fishery. Participation in the longfin squid fishery is described in Section 6. It is possible that an influx of effort could occur through the activation of previously inactive permits. This would benefit the new entrants but dilute the amount of quota available to existing participants. In 2016 there were approximately 286 vessels with currently-issued permits and approximately another 97 that had their permits/histories held in CPH. In 2016 there were 106 of these vessels that derived at least 25% of their revenues from longfin and 42 that derived at least 50% of their revenues from longfin, so there are a number of vessels that appear quite dependent on the longfin squid fishery. Additional closures due to higher effort would be most likely to impact those vessels most. The distribution of the 286 currently-permitted vessels by principal port are described in the table below.

From 1997-2015 Federal Moratorium vessels accounted for approximately 74% of longfin squid landings, with the rest caught by vessels with incidental or state-only permits (vessels can be in both categories over the course of a year). In 2016 Federal Moratorium vessels accounted for approximately 92% of longfin squid landings.

Table 36. Principal Port States (PPST) of Currently-Issued Longfin Vessels

PPST	Vessels
NJ	74
MA	67
RI	49
NY	36
VA	23
NC	15
CT	10
ME	7
MD	3
AK	1
NH	1

Socioeconomic impacts from Alternative 1B – Longfin squid requalification 10,000 pounds any year 1997-2015.

Of the 383 moratorium permits that are currently-issued or in CPH, 269 had some landings in the qualifying period, and 224 would requalify, 24 of which are in CPH. The sum of the qualifying vessels best years catches from 1997-2015 equals 62,420,514 pounds. Of the 200 currently-issued requalifying permits, their principal ports are identified in the table below.

Table 37. Principal Port States (PPST) of Requalifying Vessels for 1B.

Principal Port State	Requalifying Vessels	Non-Requalifying Vessels
NJ	57	17
RI	47	2
MA	34	33
NY	33	3
VA	11	12
CT	8	2
NC	5	10
ME	3	4
MD	2	1

The 159 vessels that would not re-qualify would be issued a Tier 2 longfin squid permit and be restricted to 5,000 lb (2,268 kg) of longfin squid per trip. From 2014-2016, 80 percent of these vessels (127) did not land any longfin squid. 32 vessels landed some squid; 6 vessels had trips greater than 5,000 pounds and could be affected by having their permits downgraded to only allow trips up to 5,000 pounds. Coincidentally, 32 such trips on these 6 vessels occurred from 2014-2016, all in 2016. Had such trips been limited to 5,000 pounds, the forgone revenues would have totaled $438,835, or $24,380 per vessel annually averaged over 2014-2016. This was only 2% of their total average annual revenues of $1,042,770 over the same time period. For comparison, the top 20 longfin vessels averaged over $1,000,000 in longfin squid in 2016.

17 of the non-requalifying vessels also had butterfish landings 2014-2016, with 4 vessels landing over 10,000 pounds of butterfish (overall range 31 pounds to 51,353 pounds, or $20-$32,635 based on 2016 prices). However, under this alternative, all current longfin/butterfish moratorium permits would also retain a moratorium butterfish permit so their access to butterfish and associated fishing revenues would not be impacted.

Compared to the no-action, this alternative would have a positive impact on re-qualifiers because they would have more secure access to the squid quota and the value of their permit would likely increase. While the non-qualifying vessels have not landed much relatively in recent years, individual vessels can generally land a substantial amount of squid. In 2016, approximately 20 vessels landed at least 2% of the Trimester 2 quota (closures have only occurred during Trimester 2 in recent years), so the addition of even a few more vessels has the potential to dilute the amount of quota available to active participants. Compared to the no-action, this alternative would have a negative impact on non-re-qualifiers because they would lose some directed fishing access to the squid quota and would lose the value of their permit, though the granting of a 5,000-pound trip permit mitigates the negative impact for most. If a vessel made just two 5,000 pound trips in one year during the qualification period they

would have re-qualified. Permits are generally sold as packages (Federal and state) so it is difficult to determine the value of just the squid permit, but staff's research and discussions with individuals involved in permit transactions suggests the added value of a longfin squid/butterfish moratorium permit may be in the range of $25,000-$75,000 depending on the history associated with the permit.

While difficult to quantify, there are also potential social/community impacts related to losing the flexibility for vessels in different ports to participate in any one particular fishery. The number of permits lost in a state may serve as a proxy for possible reductions in flexibility, which could impact the long-term viability of fishing businesses in communities if in the future they needed to participate in the longfin squid fishery to maintain their profitability. As described in the table above, Massachusetts and New Jersey lose the most permits, and North Carolina, Virginia, Maryland, and Maine also lose a high proportion of their permits. While these permits have not been extensively used in recent years, it is possible that their loss could have negative economic impacts (future lost revenues and jobs from fishing and fishing support businesses) for port communities and individuals. However, given the relatively wide range of years being considered for qualification, non-qualifying vessels have not had substantial involvement in the fishery for quite some time, so potential social/community impacts should be low. Overall the current resource condition of the squid fishery providing positive socioeconomic impacts would be maintained, and limiting latent effort could add stability to the fishery and relevant communities because active vessels would have more secure access to the quota.

At this threshold and year range, there are few vessels that would be impacted in terms of their recent landings pattern, more than 1A, slightly less than 1C and less than 1D or 1E.

Socioeconomic impacts from Alternative 1C (PREFERRED) – Longfin squid requalification 10,000 pounds any year 1997-2013.

Of the 383 moratorium permits that are currently-issued or in CPH, 265 had some landings in the qualifying period, and 214 would requalify, 23 of which are in CPH. The sum of the qualifying vessels best years catches from 1997-2015 equals 61,859,629 pounds. Of the 191 currently-issued requalifying permits, their principal ports are identified in the table below.

Table 38. Principal Port States (PPST) of Requalifying Vessels for 1C.

Principal Port State	Requalifying Vessels	Non-Requalifying Vessels
NJ	54	20
RI	46	3
NY	32	4
MA	31	36
VA	10	13
CT	8	2
NC	5	10
ME	3	4
MD	2	1

The 169 vessels that would not re-qualify would be issued a Tier 2 longfin squid permit and be restricted to 5,000 lb (2,268 kg) of longfin squid per trip. From 2014-2016, 75 percent of these vessels (127) did not land any longfin squid. 42 vessels landed some squid; 15 vessels had trips greater than 5,000 pounds and could be affected by having their permits downgraded to only allow trips up to 5,000 pounds. 132 such trips on these 15 vessels occurred from 2014-2016, most in 2016. Had such trips been limited to 5,000 pounds, the forgone revenues would have totaled $1,262,539, or $ 28,056 per vessel annually averaged over 2014-2016. This was only 3% of their total average annual revenues of $ 816,824 over the same time period. For comparison, the top 20 longfin vessels averaged over $1,000,000 in longfin squid in 2016.

26 of the non-requalifying vessels also had butterfish landings 2014-2016, with 6 vessels landing over 10,000 pounds of butterfish (overall range 6 pounds to 51,353 pounds, or $4-$32,635 based on 2016 prices). However, under this alternative, all current longfin/butterfish moratorium permits would also retain a moratorium butterfish permit so their access to butterfish and associated fishing revenues would not be impacted.

Compared to the no-action, this alternative would have a positive impact on re-qualifiers because they would have more secure access to the squid quota and the value of their permit would likely increase. While the non-qualifying vessels have not landed much relatively in recent years, individual vessels can generally land a substantial amount of squid. In 2016, approximately 20 vessels landed at least 2% of the Trimester 2 quota (closures have only occurred during Trimester 2 in recent years), so the addition of even a few more vessels has the potential to dilute the amount of quota available to active participants. Compared to the no-action, this alternative would have a negative impact on non-re-qualifiers because they would lose some directed fishing access to the squid quota and would lose the

value of their permit, though the granting of a 5,000-pound trip permit mitigates the negative impact for most. If a vessel made just two 5,000 pound trips in one year during the qualification period they would have re-qualified. Permits are generally sold as packages (Federal and state) so it is difficult to determine the value of just the squid permit, but staff's research and discussions with individuals involved in permit transactions suggests the added value of a longfin squid/butterfish moratorium permit may be in the range of $25,000-$75,000 depending on the history associated with the permit.

While difficult to quantify, there are also potential social/community impacts related to losing the flexibility for vessels in different ports to participate in any one particular fishery. The number of permits lost in a state may serve as a proxy for possible reductions in flexibility, which could impact the long-term viability of fishing businesses in communities if in the future they needed to participate in the longfin squid fishery to maintain their profitability. As described in the table above, Massachusetts and New Jersey lose the most permits, and North Carolina, Virginia, Maryland, and Maine also lose a high proportion of their permits. While these permits have not been extensively used in recent years, it is possible that their loss could have negative economic impacts (future lost revenues and jobs from fishing and fishing support businesses) for port communities and individuals. However, given the relatively wide range of years being considered for qualification, non-qualifying vessels have not had substantial involvement in the fishery for quite some time, so potential social/community impacts should be low. Overall the current resource condition of the squid fishery providing positive socioeconomic impacts would be maintained, and limiting latent effort could add stability to the fishery and relevant communities because active vessels would have more secure access to the quota.

At this threshold and year range, there are relatively few vessels that would be impacted in terms of their recent landings pattern, more than 1A, slightly more than 1B and less than 1D or 1E. The Council determined that 1C best balances the needs of vessels that are more active and more dependent on access to the squid quota versus the potential future fishing that could occur by those who have been less dependent on access to the squid quota.

Socioeconomic impacts from Alternative 1D – Longfin squid requalification 25,000 pounds any year 2003-2013.

Of the 383 moratorium permits that are currently-issued or in CPH, 244 had some landings in the qualifying period, and 164 would requalify, 17 of which are in CPH. The sum of the qualifying vessels best years catches from 1997-2015 equals 55,232,223 pounds. Of the 147 currently-issued requalifying permits, their principal ports are identified in the table below.

Table 39. Principal Port States (PPST) of Requalifying Vessels for 1D.

Principal Port State	Requalifying Vessels	Non-Requalifying Vessels
RI	43	6
NJ	35	39
NY	30	6
MA	22	45
CT	7	3
VA	5	18
NC	3	12
ME	2	5
MD	0	3

The 219 vessels that would not re-qualify would be issued a Tier 2 longfin squid permit and be restricted to 5,000 lb (2,268 kg) of longfin squid per trip. From 2014-2016, 68 percent of these vessels (149) did not land any longfin squid. 70 vessels landed some squid; 23 vessels had trips greater than 5,000 pounds and could be affected by having their permits downgraded to only allow trips up to 5,000 pounds. 164 such trips on these 23 vessels occurred from 2014-2016, most in 2016. Had such trips been limited to 5,000 pounds, the forgone revenues would have totaled $1,601,354, or $23,208 per vessel annually averaged over 2014-2016. This was only 2% of their total average annual revenues of $ 976,937 over the same time period. For comparison, the top 20 longfin vessels averaged over $1,000,000 in longfin squid in 2016.

46 of the non-requalifying vessels also had butterfish landings 2014-2016, with 9 vessels landing over 10,000 pounds of butterfish (overall range 1 pounds to 77,538 pounds or $1-$49,275 based on 2016 prices). However, under this alternative, all current longfin/butterfish moratorium permits would also retain a moratorium butterfish permit so their access to butterfish and associated fishing revenues would not be impacted.

Compared to the no-action, this alternative would have a positive impact on re-qualifiers because they would have more secure access to the squid quota and the value of their permit would likely increase. While the non-qualifying vessels have not landed much relatively in recent years, individual vessels can generally land a substantial amount of squid. In 2016, approximately 20 vessels landed at least 2% of the Trimester 2 quota (closures have only occurred during Trimester 2 in recent years), so the addition of even a few more vessels has the potential to dilute the amount of quota available to active participants. Compared to the no-action, this alternative would have a negative impact on non-re-qualifiers because they would lose some directed fishing access to the squid quota and would lose the

value of their permit, though the granting of a 5,000-pound trip permit mitigates the negative impact for most. If a vessel made just two 5,000 pound trips in one year during the qualification period they would have re-qualified. Permits are generally sold as packages (Federal and state) so it is difficult to determine the value of just the squid permit, but staff's research and discussions with individuals involved in permit transactions suggests the added value of a longfin squid/butterfish moratorium permit may be in the range of $25,000-$75,000 depending on the history associated with the permit.

While difficult to quantify, there are also potential social/community impacts related to losing the flexibility for vessels in different ports to participate in any one particular fishery. The number of permits lost in a state may serve as a proxy for possible reductions in flexibility, which could impact the long-term viability of fishing businesses in communities if in the future they needed to participate in the longfin squid fishery to maintain their profitability. As described in the table above, Massachusetts and New Jersey lose the most permits, and North Carolina, Virginia, Maryland, and Maine also lose a high proportion of their permits. While these permits have not been extensively used in recent years, it is possible that their loss could have negative economic impacts (future lost revenues and jobs from fishing and fishing support businesses) for port communities and individuals. However, given the relatively wide range of years being considered for qualification, non-qualifying vessels have not had substantial involvement in the fishery for quite some time, so potential social/community impacts should be low. Overall the current resource condition of the squid fishery providing positive socioeconomic impacts would be maintained, and limiting latent effort could add stability to the fishery and relevant communities because active vessels would have more secure access to the quota.

At this threshold and year range, there are relatively more vessels that would be negatively impacted in terms of their recent landings pattern, more than 1A, 1B, or 1C and less than 1E.

Socioeconomic impacts from Alternative 1E – Longfin squid requalification 50,000 pounds average 1997-2013.

Of the 383 moratorium permits that are currently-issued or in CPH, 265 had some landings in the qualifying period, and 93 would requalify, 5 of which are in CPH. The sum of the qualifying vessels best years catches from 1997-2015 equals 49,154,718 pounds. Of the 88 currently-issued requalifying permits, their principal ports are identified in the table below.

Table 40. Principal Port States (PPST) of Requalifying Vessels for 1E.

Principal Port State	Requalifying Vessels	Non-Requalifying Vessels
RI	33	16
NY	18	18
NJ	16	58
MA	12	55
CT	4	6
VA	3	20
ME	1	6
NC	1	14
MD	0	3

The 290 vessels that would not re-qualify would be issued a Tier 2 longfin squid permit and be restricted to 5,000 lb (2,268 kg) of longfin squid per trip. From 2014-2016, 56 percent of these vessels (162) did not land any longfin squid. 128 vessels landed some squid; 61 vessels had trips greater than 5,000 pounds and could be affected by having their permits downgraded to only allow trips up to 5,000 pounds. 684 such trips on these 23 vessels occurred from 2014-2016. Had such trips been limited to 5,000 pounds, the forgone revenues would have totaled $ 6,496,111, or $ 35,498 per vessel annually averaged over 2014-2016. This was 5% of their total average annual revenues of $ 692,307 over the same time period. For comparison, the top 20 longfin vessels averaged over $1,000,000 in longfin squid in 2016.

101 of the non-requalifying vessels also had butterfish landings 2014-2016, with 32 vessels landing over 10,000 pounds of butterfish (overall range 1 pounds to 95,362 pounds or $1-$60,602 based on 2016 prices). However, under this alternative, all current longfin/butterfish moratorium permits would also retain a moratorium butterfish permit so their access to butterfish and associated fishing revenues would not be impacted.

Compared to the no-action, this alternative would have a positive impact on re-qualifiers because they would have more secure access to the squid quota and the value of their permit would likely increase. While the non-qualifying vessels have not landed much relatively in recent years, individual vessels can generally land a substantial amount of squid. In 2016, approximately 20 vessels landed at least 2% of the Trimester 2 quota (closures have only occurred during Trimester 2 in recent years), so the addition of even a few more vessels has the potential to dilute the amount of quota available to historical participants. Compared to the no-action, this alternative would have a negative impact on non-re-qualifiers because they would lose some directed fishing access to the squid quota and would

lose the value of their permit, though the granting of a 5,000-pound trip permit mitigates the negative impact for most. If a vessel made just two 5,000 pound trips in one year during the qualification period they would have re-qualified. Permits are generally sold as packages (Federal and state) so it is difficult to determine the value of just the squid permit, but staff's research and discussions with individuals involved in permit transactions suggests the added value of a longfin squid/butterfish moratorium permit may be in the range of $25,000-$75,000 depending on the history associated with the permit.

While difficult to quantify, there are also potential social/community impacts related to losing the flexibility for vessels in different ports to participate in any one particular fishery. The number of permits lost in a state may serve as a proxy for possible reductions in flexibility, which could impact the long-term viability of fishing businesses in communities if in the future they needed to participate in the longfin squid fishery to maintain their profitability. As described in the table above, Massachusetts and New Jersey lose the most permits, and North Carolina, Virginia, Maryland, and Maine also lose a high proportion of their permits. While these permits have not been extensively used in recent years, it is possible that their loss could have negative economic impacts (future lost revenues and jobs from fishing and fishing support businesses) for port communities and individuals. However, given the relatively wide range of years being considered for qualification, non-qualifying vessels have not had substantial involvement in the fishery for quite some time, so potential social/community impacts should be low. Overall the current resource condition of the squid fishery providing positive socioeconomic impacts would be maintained, and limiting latent effort could add stability to the fishery and relevant communities because active vessels would have more secure access to the quota.

At this threshold and year range, there are the most vessels that would be impacted in terms of their recent landings pattern, more than 1A, 1B, 1C, or 1D.

7.5.2 ALTERNATIVE SET 2: LONGFIN SQUID MORATORIUM PERMIT SWAP OPTION

An alternative in this set could also be selected in addition to alternatives from Sets 1, 3, 4, 5, and/or 6, and would only be selected if an action alternative from Alternative Set 1 is also selected.

Socioeconomic impacts from Alternative 2A – No action on permit swap sub-alternative.

This would not modify the Alternatives from Alternative Set 1. By not allowing the limited permit swap afforded under 2B, owners of vessels may have a less efficient fleet than under 2B, but the overall impact on the current condition should be negligible.

Socioeconomic impacts from Alternative 2B (PREFERRED) – Allow limited permit swap as part of longfin requalification.

This could apply to at most 11 owners/vessels. Owners of multiple vessels with longfin/butterfish moratorium permits who would not re-qualify all of their existing permits for the directed longfin/butterfish moratorium permit could realize some benefit by being able to somewhat re-balance their permit portfolio on their vessels. Thus there would likely be a low-positive socioeconomic benefit compared to no action for such entities by increasing the efficiency of their remaining longfin squid permit. While 2B would not affect the number of total permits eliminated, there could be more vessels active in the squid fishery because under 2B, permits that may never have been used (e.g. because they are tied to a scallop permitted-vessel) may now be placed on a vessel that was going to be removed as a moratorium permit holder. Because of the limited application (both vessels must have had current moratorium permits on May 26, 2017 [no CPH vessels], they must be owned by the same entity, and permits can only move between vessels with compatible baselines), 2B is unlikely to substantially change overall effort. For this alternative, it was reported that the squid permit would be moved from a vessel already engaged in other fisheries (e.g. scallops and/or monkfish) so there would not be indirect effects related to increasing effort in other fisheries in such cases. This is not possible to confirm and it is theoretically possible that permit rebalancing could lead to additional effort in other fisheries. However, because of the limited instances where permits could be swapped and the baseline limitations, such indirect effects would be expected to be minimal. Overall the current resource condition of the squid fishery providing positive socioeconomic impacts would be maintained.

7.5.3 ALTERNATIVE SET 3: LONGFIN SQUID INCIDENTAL AND OPEN ACCESS ALTERNATIVES

Alternatives in this set could be selected in addition to alternatives in other sets or on their own if no action is selected for other sets. Within the action alternatives in this set, the Council could select either 3B or 3C, combined with a sub-alternative.

Socioeconomic impacts from Alternative 3A – No action on changes to squid/butterfish incidental permit.

Under no action, individuals who switch between having and not having an incidental permit to target longfin squid in Federal or state waters as the optimal case for their situation could continue to do so. Conversely, less restricted fishing in state waters after a Federal closure reduces the available quota later in the season for Federal moratorium permit holders. New participants could also acquire incidental permits to land up to 2,500 pounds of longfin squid without cost. Overall the current resource condition of the squid fishery providing positive socioeconomic impacts would likely be maintained, even if there are some slight negative impacts from additional directed fishing causing quotas to be exceeded. In 2016 there were about 1528 incidental squid/butterfish permit holders. Over 2014-2016, 114 had longfin squid landings, and their total landings average annual revenue was $744,886 (or $6,534/permit), contributing to the overall socioeconomic benefits derived from the longfin squid fishery described elsewhere. However, the high number of incidental permits that can fish after a closure, or drop their permit and fish in some states' waters during closures under no action, means that the overall socioeconomic benefits provided by the longfin squid resource and described in Section 6 could be diminished in the long run if quotas are exceeded, overfishing occurs, and the productivity of the resource is reduced.

Socioeconomic impacts from Alternative 3B – New limited access incidental squid permit qualification 2,500 pounds any year 1997-2013.

During 2016, 1,528 vessels were issued a squid incidental catch permit. Under Alternative 3B, approximately 385 vessels would qualify and be issued a Tier 3 longfin squid moratorium permit, allowing such vessels to continue landing up to 2,500 lb (1,134 kg) of longfin squid per trip. Out of the 1,143 vessels that would not qualify for a Tier 3 permit under Alternative 3B, 755 (66 percent) did not have any longfin squid landings during the qualifying period, while 388 (34 percent) landed some longfin squid but less than 2,500 lb (1,134 kg) during at least one year of the qualification period. As a result of not receiving a Tier 3 permit they would be limited to 250 pounds or 500 pounds per trip/day, the impacts of which are discussed below under the trip limit sub-alternatives (because the impacts are directly dependent on those). While some non-qualifying vessels may be impacted, there is also a benefit from more effective conservation of the resource, because vessels will be unlikely to drop this limited access permit and fish in state waters during closures. This decreases the risks of overfishing

and increases the likelihood of the longfin squid resource continuing to provide long-term socioeconomic benefits to the fishery overall.

Socioeconomic impacts from sub-Alternative 3B1 – Reduce open-access longfin squid trip limit to 250 pounds.

Of the 388 permits with minimal and non-qualifying longfin squid landings, 32 permits took 101 trips between 2014-2016 that landed 250-2,500 lb (113-1,134 kg) of longfin squid, resulting in nearly $108,000 in longfin squid revenue that averaged $1,120 per year for each permit. These are the landings/revenues potentially impacted by going from a 2,500 pound trip limit to a 250 pound trip limit. $1,120 is less than a quarter of 1% of these 32 vessels' average annual total landings revenues of $683,723 from 2014-2016. Having the open-access trip limit be 250 pounds increases the value of the limited access incidental permit compared to 3B2, which should help achieve the goal of not having vessels drop the incidental permit to fish in state waters during closures more than 3B2.

Socioeconomic impacts from sib-Alternative 3B2 – Reduce open-access longfin squid trip limit to 500 pounds.

Of the 388 permits with minimal and non-qualifying longfin squid landings, 21 of these permits took 52 trips between 2014-2016 that landed between 500-2,500 lb (226-1,134 kg) of longfin squid, averaging $1,437 per permit per year or nearly $91,000 total. These are the landings/revenues potentially impacted by going from a 2,500 pound trip limit to a 500 pound trip limit. $1,437 is less than a quarter of 1% of these 32 vessels' average annual total landings revenues of $834,824 from 2014-2016. Having the open-access trip limit be 500 pounds decreases the value of the limited access incidental permit compared to 3B1, which should help achieve the goal of not having vessels drop the incidental permit to fish in state waters during closures less than 3B1.

Socioeconomic impacts from Alternative 3C (PREFERRED) – New limited access incidental squid permit qualification 5,000 pounds any year 1997-2013.

During 2016, 1,528 vessels were issued a squid incidental catch permit. Under Alternative 3C, approximately 346 vessels would qualify and be issued a Tier 3 longfin squid moratorium permit, allowing such vessels to continue landing up to 2,500 lb (1,134 kg) of longfin squid per trip. Out of the 1,182 vessels that would not qualify for a Tier 3 permit under Alternative 3C, 755 (64 percent) did not have any longfin squid landings during the qualifying period, while 427 (36 percent) landed some longfin squid but less than 5,000 lb (1,134 kg) during at least one year of the qualification period. As a result of not receiving a Tier 3 permit they would be limited to 250 pounds or 500 pounds per trip/day, the impacts of which are discussed below under the trip limit sub-alternatives (because the impacts are directly dependent on those). While some non-qualifying vessels may be impacted, there is also a benefit from more effective conservation of the resource, because vessels will be unlikely to drop this limited access permit and fish in state waters during closures. This decreases the risks of overfishing and increases the likelihood of the longfin squid resource continuing to provide long-term socioeconomic benefits to the fishery overall.

Socioeconomic impacts from sub-Alternative 3C1 (PREFERRED) – Reduce open-access longfin squid trip limit to 250 pounds.

Of the 427 permits with minimal and non-qualifying longfin squid landings, 42 permits took 185 trips between 2014-2016 that landed 250-2,500 lb (113-1,134 kg) of longfin squid, resulting in nearly $200,000 in longfin squid revenue that averaged $1,574 per year for each permit. These are the landings/revenues potentially impacted by going from a 2,500 pound trip limit to a 250 pound trip limit. $1,574 is less than a third of 1% of these 42 vessels' average annual total landings revenues of $607,567 from 2014-2016. Having the open-access trip limit be 250 pounds increases the value of the limited access incidental permit compared to 3C2, which should help achieve the goal of not having vessels drop the incidental permit to fish in state waters during closures more than 3C2.

Socioeconomic impacts from sub-Alternative 3C2 – Reduce open-access longfin squid trip limit to 500 pounds.

Of the 427 permits with minimal and non-qualifying longfin squid landings, 27 permits took 98 trips between 2014-2016 that landed between 500-2,500 lb (226-1,134 kg) of longfin squid, averaging $2,034 per permit per year or nearly $165,000 total. These are the landings/revenues potentially impacted by going from a 2,500 pound trip limit to a 500 pound trip limit. $2,034 is less than a third of 1% of these 27 vessels' average annual total landings revenues of $752,072 from 2014-2016. Having the open-access trip limit be 500 pounds decreases the value of the limited access incidental permit compared to 3C1, which should help achieve the goal of not having vessels drop the incidental permit to fish in state waters during closures less than 3C1.

7.5.4 ALTERNATIVE SET 4: LONGFIN SQUID TRIMESTER 2 (T2) ROLLOVER ALTERNATIVES

Alternatives in this set could be selected in addition to alternatives in other sets or on their own if no action is selected for other sets. Within the action alternatives in this set, the Council could select either 4B or 4C, possibly in combination with an Alternatives from Sets 1, 2, 3, 5, and 6.

Socioeconomic impacts from Alternative 4A (PREFERRED) – No action on changes to Trimester rollover provisions.

Not altering the rollover provisions would generally maintain the current condition. Landings vary year to year but in recent years landings have been relatively high in T2, leading to an average fleet-wide revenue of $16.1 million during T2 from 2014-2016. This also benefits related support services in and around ports. See Section 6.3 for additional details. Under no action, one would expect this stream of positive economic impacts to generally continue given the robust status of the squid resource - the current resource condition of the squid fishery providing positive socioeconomic impacts would be maintained. There is some concern that catch in Trimester 2 may negatively impact longfin squid productivity, but recent annual landings have been relatively high so any negative impact of the rollover on the socioeconomic benefits generated from the longfin squid fishery would appear to be only slightly negative.

Socioeconomic impacts from Alternative 4B – Eliminate roll-over of longfin squid quota from T1 to T2.

Compared to the no action, this could reduce the available quota in T2 but increase the available quota in T3. However, squid are highly mobile and availability can be fleeting, so there is no guarantee that squid not caught in T2 would be available for harvest in T3. There have not been T3 closures so adding quota to T3 likely will not increase catch in T3 as the current quota has not been constraining. Based on current quotas, approximately 4.2 million pounds of longfin squid can be rolled over from T1 to T2. If that squid can no longer be rolled-over, at 2016 prices that could amount to approximately $5.2 million in lost revenues in years with roll-over and sufficient T2 squid abundance/availability if the squid cannot be caught later in the year. This is a real possibility due to the variable nature of squid abundance and availability, and landings during T2 exceeded the base quota in 5 of 7 years during 2010-2016. If more squid can be caught later in the year, then this alternative would result in a transfer in revenues from the smaller vessels that tend to fish inshore in the summer to those vessels that are active late in the year, which are generally the larger offshore vessels. If catching less squid in any given T2 leads to increased squid productivity (through there being more squid to spawn or better hatching of eggs due to less bottom trawling on spawning grounds), there could be benefits related to higher future commercial catches, improved recreational opportunities (fishing/whale-watching), or additional ecosystem services via squid's role in the ecosystem. The analyses above regarding negative correlations between squid fishing effort in one time period and catch per unit of effort in the subsequent time period do suggest that limiting catch in T2 will have a general positive effect on future squid abundance in the following winter, and spreading out catch throughout the year to some degree is advisable given the short-lived and overlapping micro-cohort characteristics of longfin squid. There is not sufficient assessment information available however to suggest what the optimum amount in

each Trimester should be in terms of maximizing productivity. Because of the higher encounter rate with squid egg mops in the summer, negative impacts to productivity from fishing may be greater during T2.

Given the lack of constraints currently in T3, the net effect compared to no action is likely to be lower annual and seasonal squid revenues, with an uncertain potential payoff in terms of future productivity. The overall socioeconomic benefits from the squid fishery would continue but would likely be reduced compared to no action. Compared to 4C, this alternative would have more impacts, both in terms of potential immediate lost revenues and potential future gains. Compared to 4D, impacts would appear more negative since the fishery has demonstrated it can catch quota beyond the base quota and 4D may just result in similar landings.

Reducing fishing opportunities for longfin squid could theoretically redirect effort into other fisheries, but such theoretical impacts are very difficult to predict.

The ports described in Section 6.3 as the principal longfin ports could all be impacted, with Point Judith, RI, North Kingston, RI, and Montauk, NY being the top three longfin squid ports.

Socioeconomic impacts from Alternative 4C – Reduce the maximum T1 to T2 rollover of longfin squid quota to 25% of the original T2 quota.

Compared to the no action, this could reduce the available quota in T2 but increase the available quota in T3. However, squid are highly mobile and availability can be fleeting, so there is no guarantee that squid not caught in T2 would be available for harvest in T3. There have not been T3 closures so adding quota to T3 likely will not increase catch in T3 as the current quota has not been constraining. Currently approximately 4.2 million pounds of longfin squid can be rolled over from T1 to T2. If half of that squid can no longer be rolled-over, at 2016 prices that could amount to approximately $2.6 million in lost revenues in years with roll-over and sufficient T2 squid abundance/availability if the squid cannot be caught later in the year. This is a real possibility due to the variable nature of squid abundance and availability, and landings in T2 exceeded the base quota in 5 of 7 years during 2010-2016. If more squid can be caught later in the year, then this alternative would result in a transfer in revenues from the smaller vessels that tend to fish inshore in the summer to those vessels that are active late in the year, which are generally the larger offshore vessels. If catching less squid in any given T2 leads to increased squid productivity (through there being more squid to spawn or better hatching of eggs due to less bottom trawling on spawning grounds), there could be benefits related to higher future commercial catches, improved recreational opportunities (fishing/whale-watching), or additional ecosystem services via squid's role in the ecosystem. The analyses above regarding negative correlations between squid fishing effort in one time period and catch per unit of effort in the subsequent time period do suggest that limiting catch in T2 will have a general positive effect on future squid abundance in the following winter however, and spreading out catch throughout the year to some degree is advisable given the short-lived and overlapping micro-cohort characteristics of longfin squid. There is not sufficient assessment information available however to suggest what the optimum amount in each Trimester should be in terms of maximizing productivity. Because of the higher encounter rate with squid egg mops in the summer, negative impacts to productivity from fishing may be greater during T2.

Given the lack of constraints currently in T3, the net effect compared to no action is likely to be lower squid revenues, with an uncertain potential payoff in terms of future productivity. The overall socioeconomic benefits from the squid fishery would continue but would likely be reduced compared to no action. Compared to 4B, this alternative would have less impacts, both in terms of potential immediate lost revenues and potential future gains. Compared to 4D, impacts would appear more negative since the fishery has demonstrated it can catch quota beyond the base quota and 4D may just result in similar landings.

Reducing fishing opportunities for longfin squid could theoretically redirect effort into other fisheries, but such theoretical impacts are very difficult to predict.

The ports described in Section 6.3 as the principal longfin ports could all be impacted, with Point Judith, RI, North Kingston, RI, and Montauk, NY being the top three longfin squid ports.

Socioeconomic impacts from Alternative 4D – Split the T2 quota, with half available May 1- June 30, and the additional half available July 1-August 31.

Compared to the no action, splitting the T2 quota should not have a substantial impact on overall squid catch since the time frame when catch would be shifted is minimal (perhaps by a month from June to July within T2). However, Council staff received reports from some fishery participants about fish spoilage during the 2016 T2 season because a few processors could not keep up with landings. A split T2 could slow the pace of landings and avoid such spoilage. The amount of spoilage and any possible benefits to avoiding such spoilage cannot be quantified with the available information but there could be some positive benefit. If a T2 split caused negative socioeconomic impacts by disrupting the continuity of operations those impacts could offset the benefits related to avoiding spoilage. It is also possible that splitting the quota just intensifies racing to fish and increases the potential for spoilage because there will be 2 shorter seasons with less quota, and this could create two intense races to fish before a closure instead of just one. Overall, it appears the impacts of this alternative compared to no action would be neutral to low negative and the overall socioeconomic benefits from the squid fishery would continue but possibly be somewhat reduced. 4D could be used instead of or in addition to 4B or 4C. If in addition, the impacts would likely be additive. If instead of 4B or 4C, 4D's impacts would be less negative than those alternatives.

7.5.5 ALTERNATIVE SET 5: LONGFIN SQUID TRIMESTER 2 ("T2") CLOSURE ALTERNATIVES

Socioeconomic impacts from Alternative 5A – No action on changes to T2 closure trip limits.

Not altering the rollover provisions would generally maintain the current condition. Landings vary year to year but in recent years landings have been relatively high in T2, leading to an average fleet-wide revenue of $16.1 million during T2 from 2014-2016. Some of these landings take place after directed-fishery closures. For example, in T2 of 2016 there was a closure, from June 28 to August 31 an additional 5.6 million pounds of longfin squid beyond the quota were caught post-closure when the federal limit was 2,500 pounds, generating approximately $6.4 million in ex-vessel sales. 2016 had the highest T2 landings since Trimesters began in 2007. These landings represented 15% of overall 2016 landings.

This also benefits related support services in and around ports. See Section 6.3 for additional details. Under no action, one would expect this stream of positive economic impacts to generally continue given the robust status of the squid resource. There is some concern that catch in Trimester 2 may negatively impact future longfin squid productivity and if quota overages led to overfishing there could be negative impacts from no action. Because of the higher encounter rate with squid egg mops in the summer, negative impacts to productivity from fishing may be greater during T2. The analyses in Section 7.1 regarding negative correlations between squid fishing effort in one time period and catch per unit of effort in the subsequent time period do suggest that limiting catch in T2 will have a general positive effect on future squid abundance in the following winter, and spreading out catch throughout the year to some degree is advisable given the short-lived and overlapping micro-cohort characteristics of longfin squid. There is not sufficient assessment information available however to suggest what the optimum catch amount in each Trimester should be in terms of maximizing productivity or to quantify the tradeoff between effort in Trimester 2 and catches in the following season. The squid fishery has not caught its annual quota in recent years however.

Compared to 5B and 5C, no action would have greater short-term socioeconomic benefits but also greater risk of quota overages and overfishing, which could diminish long-term productivity.

Socioeconomic impacts from Alternative 5B (PREFERRED) – Implement a 250-pound trip when T2 closes.

Compared to the no action, this alternative would reduce revenues in T2 in some years when T2 closes. Directed fishing at a 2,500 pound trip limit does occur after closures and can lead to substantial T2 quota overages. T2's performance in 2016 provides the best year to illustrate maximum potential impacts because it had the largest overage. In T2 of 2016, from June 28 to August 31 an additional 5.6 million pounds of longfin squid beyond the quota were caught post-closure when the federal limit was 2,500 pounds, generating approximately $6.4 million in ex-vessel sales. Almost all T2 landings in 2016 after the closure date occurred on trips greater than 250 pounds and could be impacted by this

alternative. However, some of the landings are state landings that may be minimally affected by this action. In 2016, after the T2 closure, trips between 250 pounds and 2,500 pounds accounted for 3.5 million pounds yielding $4.1 million. So potentially $4.1 million could be a forgone opportunity in years of high longfin squid abundance during Trimester 2 under this alternative.

In 2016, 129 federal permit holders made landings between 250 pounds and 2,500 pounds from June 28 to August 31- these are the trips most likely to be affected. Their average longfin squid landings value from those trips was $31,444 while, while their total landings for 2016 averaged $649,473. So the affected landings accounted for only 4.8% of averaged total landings value even in a year with very high post-closure landings. In most years there is no closure so these impacts would only be occasional.

However, if current catch in T2 is reducing catch later then that forgone catch may be more of an investment, and the effort and LPUE analyses described in Section 7.1 suggest that lower effort in one season is strongly correlated with higher LPUE in the next season. Unfortunately the exact relationship/tradeoff is not yet known, only the directions.

In addition, Council staff received multiple reports from some fishery participants about high-grade discarding of squid post-closure at the 2,500 pound trip limit during T2 of 2016, which could further reduce future productivity. A disproportionate number of exactly 2,500 pound trips in dealer data during the closure supports that some amount of high-grade discarding was occurring.

The Council's MSB Advisory Panel reported that limiting post-closure T2 landings to a 250-pound trip limit would greatly reduce post-closure T2 squid fishing, and during 2016 (a year with substantial post-closure landings), only 1% of post-closure landings occurred on trips landing 250 pounds or less. Based on consensus input from the Council's Advisory Panel, it is expected that substantially less directed fishing would occur in Federal waters if the trip limit is reduced to 250 pounds. If more squid can be caught later in the year, then this alternative would result in a transfer in revenues from the smaller vessels that tend to fish inshore in the summer to those vessels that are active late in the year, which are generally the larger offshore vessels and the opportunity costs of lost revenue during T2 may be somewhat mitigated. However, there have not been T3 closures so adding quota to T3 likely will not increase catch in T3 as the current quota has not been constraining. If catching less squid in any given T2 leads to increased squid productivity (through there being more squid to spawn or better hatching of eggs due to less bottom trawling on spawning grounds), there could be socioeconomic benefits related to higher future commercial catches, improved recreational opportunities (fishing/whale-watching), or additional ecosystem services via squid's role in the ecosystem. The analyses above regarding negative correlations between squid fishing effort in one time period and catch per unit of effort in the subsequent time period do suggest that limiting catch in T2 will have a general positive effect on future squid abundance in the following winter however, and spreading out catch throughout the year to some degree is advisable given the short-lived and overlapping micro-cohort characteristics of longfin squid. There is not sufficient assessment information available however to suggest what the optimum amount in each Trimester should be in terms of maximizing productivity. Because of the higher encounter rate with squid egg mops in the summer, negative impacts to productivity from fishing may be greater during T2.

Overall, one would expect the stream of positive economic impacts to generally continue given the robust status of the squid resource, maintaining the current condition. Depending on the exact linkage between squid seasons, a 250 pound trip limit may overall reduce revenues compared to no action, or could maintain or increase revenues if future productivity increases. The Council determined that the future benefit of maintaining lower T2 catch, even if not quantifiable, outweighs the short term

economic costs by reducing risk to productivity and increasing the likelihood of stable or increasing biomass and catch, particularly in the winter. Therefore the Council concluded that in the long term, 3B would have a positive socioeconomic impact compared to no action. Compared to 5C, this alternative would have more positive impacts because it would more effectively control catch after closures.

The ports described in Section 6.3 as the principal longfin ports could all be impacted, with Point Judith, RI, North Kingston, RI, and Montauk, NY being the top three longfin squid ports.

Socioeconomic impacts from Alternative 5C – Implement a 500-pound trip when T2 closes.

Compared to the no action, this alternative would reduce revenues in T2 in some years when T2 closes. Directed fishing at a 2,500 pound trip limit does occur after closures and can lead to substantial T2 quota overages. T2's performance in 2016 provides the best year to illustrate potential impacts because it had the largest overage. In T2 of 2016, from June 28 to August 31 an additional 5.6 million pounds of longfin squid beyond the quota were caught post-closure when the federal limit was 2,500 pounds, generating approximately $6.4 million in ex-vessel sales. Almost all T2 landings in 2016 after the closure date occurred on trips greater than 500 pounds and could be impacted by this alternative. However, some of the landings are state landings that may be minimally affected by this action. In 2016, after the T2 closure, trips between 500 pounds and 2,500 pounds accounted for 3.4 million pounds yielding $4.0 million. So potentially $4.0 million could be a forgone opportunity in years of high longfin squid abundance during Trimester 2 under this alternative.

In 2016, 123 federal permit holders made landings between 500 pounds and 2,500 pounds from June 28 to August 31- these are the trips most likely to be affected. Their average longfin squid landings value from those trips was $ 32,303 while, while their total landings for 2016 averaged $ 620,887. So the affected landings accounted for only 5.2% of average total landings value.

However, if current catch in T2 is reducing catch later then that forgone catch may be more of an investment, and the effort and LPUE analyses described in Section 7.1 suggest that lower effort in one season is strongly correlated with higher LPUE in the next season. Unfortunately the exact relationship/tradeoff is not yet known, only the directions.

In addition, Council staff received multiple reports from some fishery participants about high-grade discarding of squid post-closure at the 2,500 pound trip limit during T2 of 2016, which could further reduce future productivity. A disproportionate number of exactly 2,500 pound trips during the closure supports that some amount of high-grade discarding was occurring.

The Council's MSB Advisory Panel reported that limiting post-closure T2 landings to a 500-pound trip limit would reduce post-closure T2 squid fishing, and during 2016 (a year with substantial post-closure landings), only 3% of post-closure landings occurred on trips landing 500 pounds or less. Based on consensus input from the Council's Advisory Panel, it is expected that substantially less directed fishing would occur in Federal waters if the trip limit is reduced to 500 pounds. If more squid can be caught later in the year, then this alternative would result in a transfer in revenues from the smaller

vessels that tend to fish inshore in the summer to those vessels that are active late in the year, which are generally the larger offshore vessels and the opportunity costs of lost revenue during T2 may be somewhat mitigated. However, there have not been T3 closures so adding quota to T3 likely will not increase catch in T3 as the current quota has not been constraining. If catching less squid in any given T2 leads to increased squid productivity (through there being more squid to spawn or better hatching of eggs due to less bottom trawling on spawning grounds), there could be socioeconomic benefits related to higher future commercial catches, improved recreational opportunities (fishing/whale-watching), or additional ecosystem services via squid's role in the ecosystem. The analyses above regarding negative correlations between squid fishing effort in one time period and catch per unit of effort in the subsequent time period do suggest that limiting catch in T2 will have a general positive effect on future squid abundance in the following winter however, and spreading out catch throughout the year to some degree is advisable given the short-lived and overlapping micro-cohort characteristics of longfin squid. There is not sufficient assessment information available however to suggest what the optimum amount in each Trimester should be in terms of maximizing productivity. Because of the higher encounter rate with squid egg mops in the summer, negative impacts to productivity from fishing may be greater during T2.

Overall, one would expect the stream of positive economic impacts to generally continue given the robust status of the squid resource. Depending on the exact linkage between squid seasons, a 500 pound trip limit may overall reduce revenues compared to no action, or could maintain or increase revenues if future productivity increases. Compared to 5B, this alternative would have slightly less short-term negative impacts as more trips are covered by a 500-pound trip limit, but if directing does occur at 500 pounds then while the short-term negative impacts may be less, possible long term productivity gains would be less also.

The ports described in Section 6.3 as the principal longfin ports could all be impacted, with Point Judith, RI, North Kingston, RI, and Montauk, NY being the top three longfin squid ports.

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7.5.6 ALTERNATIVE SET 6: *ILLEX* SQUID MORATORIUM PERMIT REQUALIFICATION ALTERNATIVES

Alternatives in this set could be selected in addition to alternatives in other sets or on their own if no action is selected for other sets. This action would not allow new entrants to qualify for a moratorium permit. The Council would only choose one alternative within this set.

Socioeconomic impacts from Alternative 6A (PREFERRED) – No action on *Illex* squid permits.

Participation in the *Illex* squid fishery is described in Section 6, but landings 2014-2016 averaged 5,960 mt with average revenues of $4.9 million. 2017 data, while preliminary, are provided for *Illex* because 2017 was an unusually productive season, with 22,517 mt landed worth $22.2 million and a fishery closure on September 15, 2017 (the first closure in recent history).

Under no action, one would expect this stream of positive economic impacts to generally continue, subject to the high variability of *Illex* squid abundance and/or availability. If additional effort enters the fishery, this would benefit the new entrants but may dilute the amount of quota available to existing participants during times of high abundance/availability. In 2016 there were approximately 64 vessels with currently-issued permits and approximately another 15 that had their permits/histories held in CPH. From 2014-2016 there were 4 of these vessels that derived at least 25% of their revenues from *Illex*, so there are some vessels that appear somewhat dependent on the *Illex* squid fishery. Fishery closures due to additional participation would be most likely to impact those vessels most. However, during the 2017 season catches for these 4 vessels increased from the year before, so they were able to take advantage of the higher *Illex* abundance/availability at least to some degree. There is usually substantial *Illex* quota available throughout the entire year, and this was a key reason why the Council preferred this alternative – in most years there is room for additional effort in the *Illex* fishery, so not eliminating vessels (6A) appeared to maximize socioeconomic benefits compared to any of the action alternatives (6B-6E). The traditional *Illex* ports in Rhode Island and New Jersey would be most likely to benefit from potentially expanded *Illex* catches/revenues (detailed port information for Illex may violate data confidentiality rules).

The distribution of the 64 currently-permitted vessels by principal port are described in the table below.

Table 41. Principal Port States (PPST) of Currently-Permitted *Illex* Vessels

PPST	Vessels
NJ	24
MA	12
RI	9
VA	7
NC	4
NY	4
CT	3
MD	1

From 1997-2015 Federal Moratorium vessels accounted for approximately 93% of *Illex* squid landings, with almost all of the rest caught by vessels with incidental permits (this is an offshore

fishery and state-only landings are minimal). In 2016 Federal Moratorium vessels accounted for almost 100% of *Illex* squid landings.

Socioeconomic impacts from Alternative 6B – *Illex* squid requalification 10,000 pounds any year 1997-2015.

Of the 79 moratorium permits that are currently-issued or in CPH, 49 had some landings in the qualifying period, and 38 would requalify, 5 of which are in CPH. Of the 33 currently-issued requalifying permits, their principal ports are identified in the table below.

Table 42. Principal Port States (PPST) of Requalifying Vessels for 6B

Principal Port State	Requalifying Vessels	Non-Requalifying Vessels
NJ	17	7
RI	5	4
MA	4	8
NC	2	2
NY	2	2
VA	2	5
CT	1	2

Of the 41 vessels that would not requalify most had no landings in the last 3 years (2014-2016). 7 did have landings in 2014-2016, but none had more than 10,000 pounds total, the incidental trip limit, so they would not have been impacted relative to recent performance. The sum of the qualifying vessels best years catches from 1997-2015 equals 77,540,354 pounds.

Compared to the no-action, this alternative would have a positive impact on re-qualifiers because they would have more secure access to the squid quota and the value of their permit would likely increase. Compared to the no-action, this alternative would have a negative impact on non-re-qualifiers because they would lose directed fishing access to the squid quota and would lose the value of their permit. Permits are generally sold as packages (Federal and state) so it is difficult to determine the value of just the squid permit, but staff's research and discussions with individuals involved in permit transactions suggests the added value of an *Illex* moratorium permit may be in the range of $25,000-$75,000 depending on the history associated with the permit.

While vessels would not be directly impacted based on recent landings, 2017 was one of the best *Illex* squid years in recent history, and provides an opportunity to examine a "Best Case Scenario" for revenue generation from access to the directed *Illex* squid fishery. Based on preliminary data, the top 10 moratorium permits averaged $2,015,651 from *Illex* squid in 2017, so there is a high potential value of the permits even if realized value has been low (or zero) in a certain time period.

At this threshold and year range, there are no vessels that are impacted compared to 2014-2016 performance, and in terms of number of requalifying vessels from most to least, 6A>6B>6C>6D>6E. Under this alternative, one would expect this stream of positive economic impacts from *Illex* fishing to

generally continue, but since less vessels would be available to prospect for *Illex* in years where they appear to be less available, there may be less future revenues in some years, and those revenues should follow the number of vessels potentially able to participate, so 6A>6B>6C>6D>6E in terms of future potential revenues and positive socioeconomic benefits.

Socioeconomic impacts from Alternative 6C – *Illex* squid requalification 10,000 pounds any year 1997-2013.

Of the 79 moratorium permits that are currently-issued or in CPH, 47 had some landings in the qualifying period, and 37 would requalify, 5 of which are in CPH. Of the 32 currently-issued requalifying permits, their principal ports are identified in the table below.

Table 43. Principal Port States (PPST) of Requalifying Vessels for 6C

Principal Port State	Requalifying Vessels	Non-Requalifying Vessels
NJ	17	7
RI	5	4
MA	3	9
NC	2	2
NY	2	2
VA	2	5
CT	1	2

Of the 42 vessels that would not requalify most had no landings in the last 3 years (2014-2016). 8 did have landings in 2014-2016, but only 1 had a single landing more than 10,000 pounds total. The sum of the qualifying vessels best years catches from 1997-2015 equals 77,448,424 pounds.

Compared to the no-action, this alternative would have a positive impact on re-qualifiers because they would have more secure access to the squid quota and the value of their permit would likely increase. Compared to the no-action, this alternative would have a negative impact on non-re-qualifiers because they would lose directed fishing access to the squid quota and would lose the value of their permit. Permits are generally sold as packages (Federal and state) so it is difficult to determine the value of just the squid permit, but staff's research and discussions with individuals involved in permit transactions suggests the added value of an *Illex* moratorium permit may be in the range of $25,000-$75,000 depending on the history associated with the permit.

While vessels would be minimally impacted based on recent landings, 2017 was one of the best *Illex* squid years in recent history, and provides an opportunity to examine a "Best Case Scenario" for

revenue generation from access to the directed *Illex* squid fishery. Based on preliminary data, the top 10 moratorium permits averaged $2,015,651 from *Illex* squid in 2017, so there is a high potential value of the permits even if realized value has been low (or zero) in a certain time period.

At this threshold and year range, there is 1 vessel slightly impacted compared to 2014-2016 performance, and in terms of number of requalifying vessels from most to least, 6A>6B>6C>6D>6E. Under this alternative, one would expect this stream of positive economic impacts from *Illex* fishing to generally continue, but since less vessels would be available to prospect for *Illex* in years where they appear to be less available, there may be less future revenues in some years, and those revenues should follow the number of vessels potentially able to participate, so 6A>6B>6C>6D>6E in terms of future potential revenues and positive socioeconomic benefits.

Socioeconomic impacts from Alternative 6D – *Illex* squid requalification 50,000 pounds any year 1997-2013.

Of the 79 moratorium permits that are currently-issued or in CPH, 47 had some landings in the qualifying period, and 35 would requalify, 5 of which are in CPH. Of the 30 currently-issued requalifying permits, their principal ports are identified in the table below.

Table 44. Principal Port States (PPST) of Requalifying Vessels for 6D

Principal Port State	Requalifying Vessels	Non-Requalifying Vessels
NJ	17	7
RI	5	4
MA	2	10
NC	2	2
VA	2	5
CT	1	2
NY	1	3

Of the 44 vessels that would not requalify most had no landings in the last 3 years (2014-2016). 8 did have landings in 2014-2016, but only 1 had a single landing more than 10,000 pounds total. The sum of the qualifying vessels best years catches from 1997-2015 equals 77,448,424 pounds.

Compared to the no-action, this alternative would have a positive impact on re-qualifiers because they would have more secure access to the squid quota and the value of their permit would likely increase. Compared to the no-action, this alternative would have a negative impact on non-re-qualifiers because they would lose directed fishing access to the squid quota and would lose the value of their permit. Permits are generally sold as packages (Federal and state) so it is difficult to determine the value of just the squid permit, but staff's research and discussions with individuals involved in permit transactions

suggests the added value of an *Illex* moratorium permit may be in the range of $25,000-$75,000 depending on the history associated with the permit.

While vessels would be minimally impacted based on recent landings, 2017 was one of the best *Illex* squid years in recent history, and provides an opportunity to examine a "Best Case Scenario" for revenue generation from access to the directed *Illex* squid fishery. Based on preliminary data, the top 10 moratorium permits averaged $2,015,651 from *Illex* squid in 2017, so there is a high potential value of the permits even if realized value has been low (or zero) in a certain time period.

At this threshold and year range, there is 1 vessel slightly impacted compared to 2014-2016 performance, and in terms of number of requalifying vessels from most to least, 6A>6B>6C>6D>6E. Under this alternative, one would expect this stream of positive economic impacts from *Illex* fishing to generally continue, but since less vessels would be available to prospect for *Illex* in years where they appear to be less available, there may be less future revenues in some years, and those revenues should follow the number of vessels potentially able to participate, so 6A>6B>6C>6D>6E in terms of future potential revenues and positive socioeconomic benefits.

Socioeconomic impacts from Alternative 6E – *Illex* squid requalification 100,000 pounds any year 1997-2013.

Of the 79 moratorium permits that are currently-issued or in CPH, 47 had some landings in the qualifying period, and 34 would requalify, 4 of which are in CPH. Of the 30 currently-issued requalifying permits, their principal ports are identified in the table below.

Table 45. Principal Port States (PPST) of Requalifying Vessels for 6E

Principal Port State	Requalifying Vessels	Non-Requalifying Vessels
NJ	17	7
RI	5	4
MA	2	10
NC	2	2
VA	2	5
CT	1	2
NY	1	3

Of the 45 vessels that would not requalify most had no landings in the last 3 years (2014-2016). 8 did have landings in 2014-2016, but only 1 had a single landing more than 10,000 pounds total. The sum of the qualifying vessels best years catches from 1997-2015 equals 77,448,424 pounds.

Compared to the no-action, this alternative would have a positive impact on re-qualifiers because they would have more secure access to the squid quota and the value of their permit would likely increase. Compared to the no-action, this alternative would have a negative impact on non-re-qualifiers because they would lose directed fishing access to the squid quota and would lose the value of their permit.

Permits are generally sold as packages (Federal and state) so it is difficult to determine the value of just the squid permit, but staff's research and discussions with individuals involved in permit transactions suggests the added value of an *Illex* moratorium permit may be in the range of $25,000-$75,000 depending on the history associated with the permit.

While vessels would be minimally impacted based on recent landings, 2017 was one of the best *Illex* squid years in recent history, and provides an opportunity to examine a "Best Case Scenario" for revenue generation from access to the directed *Illex* squid fishery. Based on preliminary data, the top 10 moratorium permits averaged $2,015,651 from *Illex* squid in 2017, so there is a high potential value of the permits even if realized value has been low (or zero) in a certain time period.

At this threshold and year range, there is 1 vessel slightly impacted compared to 2014-2016 performance, and in terms of number of requalifying vessels from most to least, 6A>6B>6C>6D>6E. Under this alternative, one would expect this stream of positive economic impacts from *Illex* fishing to generally continue, but since less vessels would be available to prospect for *Illex* in years where they appear to be less available, there may be less future revenues in some years, and those revenues should follow the number of vessels potentially able to participate, so 6A>6B>6C>6D>6E in terms of future potential revenues and positive socioeconomic benefits.

Socioeconomic impacts from Alternative 6F – *Illex* squid requalification 200,000 pounds any year 1997-2013.

Of the 79 moratorium permits that are currently-issued or in CPH, 47 had some landings in the qualifying period, and 33 would requalify, 4 of which are in CPH. Of the 29 currently-issued requalifying permits, their principal ports are identified in the table below.

Table 46. Principal Port States (PPST) of Requalifying Vessels for 6F

Principal Port State	Requalifying Vessels	Non-Requalifying Vessels
NJ	17	7
RI	5	4
MA	2	10
VA	2	5
CT	1	2
NC	1	3
NY	1	3

Of the 46 vessels that would not requalify most had no landings in the last 3 years (2014-2016). 9 did have landings in 2014-2016, but only 1 had a single landing more than 10,000 pounds total. The sum of the qualifying vessels best years catches from 1997-2015 equals 77,448,424 pounds.

Compared to the no-action, this alternative would have a positive impact on re-qualifiers because they would have more secure access to the squid quota and the value of their permit would likely increase. Compared to the no-action, this alternative would have a negative impact on non-re-qualifiers because they would lose directed fishing access to the squid quota and would lose the value of their permit. Permits are generally sold as packages (Federal and state) so it is difficult to determine the value of just the squid permit, but staff's research and discussions with individuals involved in permit transactions suggests the added value of an *Illex* moratorium permit may be in the range of $25,000-$75,000 depending on the history associated with the permit.

While vessels would be minimally impacted based on recent landings, 2017 was one of the best *Illex* squid years in recent history, and provides an opportunity to examine a "Best Case Scenario" for revenue generation from access to the directed *Illex* squid fishery. Based on preliminary data, the top 10 moratorium permits averaged $2,015,651 from *Illex* squid in 2017, so there is a high potential value of the permits even if realized value has been low (or zero) in a certain time period.

At this threshold and year range, there is 1 vessel slightly impacted compared to 2014-2016 performance, and in terms of number of requalifying vessels from most to least, 6A>6B>6C>6D>6E. Under this alternative, one would expect this stream of positive economic impacts from *Illex* fishing to generally continue, but since less vessels would be available to prospect for *Illex* in years where they appear to be less available, there may be less future revenues in some years, and those revenues should follow the number of vessels potentially able to participate, so 6A>6B>6C>6D>6E in terms of future potential revenues and positive socioeconomic benefits.

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7.6 Cumulative Impacts

7.6.0. Cumulative Impacts Introduction

The proposed measures are considered the most reasonable actions to achieve the FMP's conservation objectives while optimizing the outcomes for fishing communities given the conservation objectives, as per the objectives of the FMP, which are described in Section 4. The expected impacts of each alternative have been analyzed earlier in this section and are summarized in Table 1 in the Executive Summary for the no action/status quo and preferred alternatives.

Definition of Cumulative Effects

A cumulative impact analysis is required by the Council on Environmental Quality's regulation for implementation of NEPA. Cumulative effects are defined under NEPA as "The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other action (40 CFR section 1508.7)."

The cumulative impacts of past, present, and future Federal fishery management actions (including the specification recommendations in this document) should generally be positive. The mandates of the MSA as currently amended and of NEPA require that management actions be taken only after consideration of impacts to the biological, physical, economic, and social dimensions of the human environment. Therefore, it is expected that under the current and proposed management regime, the long term cumulative impacts will contribute toward improving the human environment.

Temporal Scope

The temporal scope of this analysis is primarily focused on actions that have taken place since 1976, when these fisheries began to be managed under the MSA. For endangered and other protected species, the context is largely focused on the 1980s and 1990s, when NMFS began generating stock assessments for marine mammals and turtles that inhabit waters of the U.S. EEZ. In terms of future actions, the analysis considers the period between the expected effective date of this action specifications (September 1, 2018) and Dec 31, 2021, a period of approximately three years. The temporal scope of this analysis does not extend beyond 2021 because the FMP and the issues facing these fisheries may change in ways that can't be effectively predicted.

Geographic Scope

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 and Environmental Consequences sections 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 fishing communities bordering the range of the fisheries for mackerel, longfin squid, *Illex* squid, and butterfish which occur primarily from the U.S.- Canada border to Cape Hatteras, NC, although the management unit includes all the coastal states from Maine to Florida.

Summary of the Past, Present and Reasonably Foreseeable Future Actions

The earliest management actions implemented under this FMP involved the sequential phasing out of foreign fishing for these species in US waters and the development of a domestic fishing fleet. All MSB species are considered to be fully utilized by the US domestic fishery to the extent that sufficient availability would allow full harvest of the DAH/landings quota. More recent actions have also addressed reducing bycatch and habitat impacts.

Past actions

Past actions (http://www.mafmc.org/msb/) which had substantial impacts on the fishery included: the implementation of a limited access program in Amendment 5 to control capacity in the squid and butterfish fisheries; revision of overfishing definitions in Amendment 6; modification of vessel upgrade rules in Amendment 7; and implementation of overfishing and rebuilding control rules and other measures in Amendment 8. Amendment 9 allowed multi-year specifications, extended the moratorium on entry into the *Illex* fishery without a sunset provision; adopted biological reference points recommended by the SARC 34 (2002) for longfin squid; designated EFH for longfin squid eggs, and prohibited bottom trawling by MSB-permitted vessels in Lydonia and Oceanographer Canyons to protect Tilefish EFH. Amendment 1 to the Tilefish FMP created closures in these canyons as well as Veatches and Norfolk canyons for bottom trawling generally. MSB Amendment 10's measures included increasing the longfin squid minimum mesh to 2 1/8 inches in Trimesters 1 and 3 and implementing a butterfish mortality cap in the longfin squid fishery. Amendment 11 implemented mackerel limited access, a recreational-commercial mackerel allocation, and EFH updates. Amendment 12 implemented a Standardized Bycatch Reporting Methodology that was vacated by court order and has been revisited through Amendment 15. Amendment 13 to the MSB FMP implemented Annual Catch Limit and Accountability Measures. Amendment 14 increased and improved reporting and monitoring (vessel, dealer, and observer) of the mackerel and longfin squid fisheries and implemented a catch cap for river herrings and shads in the mackerel fishery since 2014. Monitoring improvements include minimization of unobserved catch, observer facilitation and

assistance, weekly vessel trip reporting, additional trip notification, and electronic vessel monitoring systems and reporting. Amendment 16 implemented protections for deep-water corals. Framework 9 followed-up on Amendment 14's measures to specifically improve observer operations by minimizing slippage (unobserved discards) and NMFS has implemented a new Standardized Bycatch Reporting Methodology in Amendment 15 to address observer assignment deficiencies identified in a previous lawsuit. The Mid-Atlantic Unmanaged Forage Omnibus Amendment restricted the expansion of commercial fisheries for certain forage species, some of which are encountered in the MSB fisheries. Past annual specifications have also limited catches to avoid overfishing.

Future actions

Several future actions are relevant to the MSB fisheries. First, annual specifications actions in future years should avoid overfishing and facilitate harvest of optimum yield, particularly in response to the 2017 Atlantic mackerel assessment. An action in 2018 will establish a rebuilding plan for mackerel along with 2019-2021 specifications. By 2020, the Council is expected to formally integrate Atlantic chub mackerel (*Scomber colias*) into the MSB FMP, implementing an annual catch limit and other measures to prevent overfishing of this species. The Council is planning on revising the goals and objectives of the MBS FMP in 2018, which could indirectly affect future decision-making. The Council is also planning on revising EFH for all species and considering the impacts of fishing on EFH before 2021. The Council plans to consider requiring commercial vessels to submit Vessel Trips Reports (VTRs) to improve reporting before 2021. Future actions at the New England Fishery Management Council (NEFMC) will likely extend deep-water coral protections in the New England area and protect deep-water corals there against any future expansion of the MSB fisheries in the rest of the continental slope. The NEFMC is also considering limited access in the whiting fishery, which may have indirect and as of yet undetermined impacts on the participants in the longfin squid fishery.

Regarding protected resources, a take reduction strategy for long-finned pilot whales (*Globicephala melas*), short-finned pilot whales (*Globicephala macrorhynchus*), white-sided dolphins (*Lagenorhynchus acutus*), and common dolphins (*Delphinus delphis*) has been developed and is described in Section 6.

Overall all of these fishery actions have served to or will reduce effort or the impacts of effort through access limitations, upgrade restrictions, area and gear restrictions, EFH designations, monitoring, and accountability. These reductions have likely benefitted the managed species, habitat, protected resources, and non-target species. By ensuring the continued productivity of the managed resources, the human communities that benefit from catching the managed resources have also benefited in the long term; though at times quota reductions may have caused short-term economic dislocations.

In addition to the direct effects on the environment from fishing, the cumulative effects to the physical and biological dimensions of the environment may also come from non-fishing activities (e.g. climate change, point source and non-point source pollution, shipping, dredging, storm events, wind energy facilities, oil and gas development, construction, etc.). The impacts from these non-fishing activities, primarily stem from habitat loss tied to associated human interaction and alteration or natural disturbances. These activities are widespread and can have localized impacts to habitat such as accretion of sediments from at-sea disposal areas, oil and mineral resource exploration, aquaculture, construction of at-sea wind farms, bulk transportation of petrochemicals and significant storm events. Wherever these activities co-occur, they are likely to work additively or synergistically to decrease habitat quality and as such may indirectly constrain the sustainability of managed species, non-target species, and protected species. Decreased habitat suitability tends to reduce the tolerance of valued ecosystem components to the impacts of fishing effort. Direct negative biological impacts that have been observed in fish and protected resources to result from non-fishing activities include shifting distributions, decreased reproductive ability and success, disrupted or modified food web interactions, and increased disease. The overall impact on the affected species and their habitats on a population level is unknown, but likely to be neutral to low negative.

In addition to guidelines mandated by the MSA, NMFS reviews some of these types of effects during the review process 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 authority. The jurisdiction of these activities is in "waters of the United States" and includes both riverine and marine habitats.

7.6.1. Cumulative Effects Analysis

The cumulative impacts of this FMP were last fully addressed in final form by the EIS for Amendment 14 (http://www.greateratlantic.fisheries.noaa.gov/regs/2013/August/12smba14pr.html). All four species in the management unit are managed primarily via annual specifications to control fishing mortality so the operation of the fishery is generally reviewed annually. As noted above, the cumulative impact of this FMP and annual specification process has been positive after passage of the Magnuson-Stevens Act and since its implementation for both the resources and communities that depend on them. The elimination of foreign fishing, implementation of limited access, and control of fishing effort through annual specifications have had a positive impact on target and non-target species since the current domestic fishery is being prosecuted at lower levels of fishing effort compared to the historical foreign fishery. The foreign fishery was also known to take substantial numbers of marine mammals including common dolphin, white sided dolphin, and pilot whales.

7.6.1. Target Fisheries and Managed Resources

Overall, the cumulative effect of past, present, and reasonably foreseeable future fishing actions has resulted in positive effects on target species. First and foremost, the Council has met the obligations of National Standard 1 by adopting and implementing conservation and management measures that have prevented overfishing, while achieving, on a continuing basis, the optimum yield for the four species. The latest assessment indicates that mackerel were overfished with overfishing occurring in 2016, but existing quotas and improved recruitment are projected to have ended overfishing in 2017 and brought the stock above the overfished threshold by June 2018. Longfin squid were considered overfished in 2000, but remedial action by the Council in subsequent years (i.e., reduced specifications) resulted in stock rebuilding to the point that the species in no longer considered overfished. *Illex* has never been designated as overfished since passage of the Sustainable Fisheries Act. In the case of butterfish, the fishery has been designated as fully rebuilt with a stock status above its target.

In addition to mortality on these stocks due to fishing, there are other indirect effects from non-fishing anthropogenic activities in the Atlantic Ocean (e.g. climate change, point source and non-point source pollution, shipping, dredging, offshore energy development, etc.). In most cases the impacts of past, present and reasonably foreseeable non-fishing activities are negative, but these are generally not quantifiable at present for pelagic and semi-pelagic species like MSB other than noting that climate change is likely to affect at least the distribution of these species (e.g. Overholtz et al 2011[16]). Nonetheless, since these species occur over wide areas of the mid and north Atlantic Ocean and inhabit both inshore and offshore pelagic waters, it is not believed that any indirect anthropogenic activity currently impacts these populations significantly, even when considered together with the direct effects on these populations from fishing.

7.6.2 Essential Fish Habitat (EFH)

Overall, the cumulative effect of past, present, and reasonably foreseeable future fishing actions has resulted in low negative effects on habitat (both in terms of MSB bottom trawl effort generally and on longfin squid eggs from all bottom trawling in applicable areas. Reductions in overall fishing effort and protection of sensitive habitats over time have mitigated negative effects. The effects of the proposed action on habitat are considered neutral, since the action is focused on the number of participants in the longfin squid fishery and not overall effort in or location of the fishery. Climate change is expected to have an impact on the physical characteristics and habitat aspects of marine ecosystems, and possibly change the very nature of these ecosystems. Increased frequency and intensity of extreme weather events, like hurricanes, may change the physical structure of coastal areas. Water circulation, currents, and the proportion of source waters/freshwater intrusion have been observed to be changing (Ecosystem Status Report, NEFSC, 2011) which influences salinity, water

[16] From 1968–2008 the distribution of mackerel shifted about 250 km to the northeast and from deeper off-shelf locations to shallower on-shelf ones.

column stratification, transport of nutrients, and food web processes. All of these factors, in addition to others like ocean acidification and changes to water chemistry (Rebuck et al. in prep), threaten living elements of the marine environment, such as corals and shellfish, and may be related to the observed shifts in the planktonic community structure that forms the basis of the marine food web (ecosystem status report). Many additional activities, as described above, 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. However, impacts from the proposed action were found to be negligible. Therefore, when considering the cumulative effects of this action in combination with past, present, and reasonably foreseeable future actions, impacts will remain low negative and no significant impacts to the physical environment, habitat or EFH from the proposed action are expected.

7.6.3 Protected Species

As described in Section 6.4, there are numerous species which inhabit the environment within the management unit of this FMP that are afforded protection under the ESA and/or the MMPA. As noted above, none of the management measures under the preferred alternatives are expected to result in increases in fishing effort and may reduce effort compared to the no action. Prior to the passage of the Magnuson-Stevens Act and development of this FMP, the foreign prosecution of these fisheries occurred at much higher levels of fishing effort and were likely a major source of mortality for a number of marine mammal stocks, turtles, and sturgeon. The elimination of these fisheries and subsequent controlled development of the domestic fisheries have resulted in lower fishing effort levels. The cumulative effect of the proposed measures in conjunction with past and future management actions under the FMP and take reduction measures developed under the MMPA should continue to reduce the impact of these fisheries on the protected species listed in section 6.4.

The indirectly negative actions described above are localized in nearshore and marine project areas where they occur; therefore, the magnitude of those impacts on protected species is expected to be limited due to limited exposure of the populations at large. Agricultural runoff may be much broader in scope and the impacts of nutrient inputs to the coastal system may be larger in magnitude; however, the impact on protected species is not quantifiable. NMFS has several means under which it can review non-fishing actions of other Federal or state agencies that may impact protected species 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 protected species under NMFS' jurisdiction.

Therefore, no significant cumulative impacts to protected species are expected. The baseline condition would be maintained (i.e. low negative for ESA species and MMPA species that have exceeded PBR; slight positive for MMPA species below PBR), similar to previous years.

7.6.4 Human Communities

National Standard 8 requires that management measures take into account fishing communities. Communities from Maine to North Carolina are involved in the harvesting of mackerel, squid and butterfish. 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.

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 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. As noted above, none of the management measures under the preferred alternatives are expected to result in substantial changes to levels of effort or the character of that effort relative to the status quo. Further limiting fishing after T2 closures will reduce T2 revenues in some years, but analyses presented herein suggest that catch rates of longfin squid improve following lower effort.

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.

The proposed specifications, in conjunction with the past and future actions described above, should have ongoing positive, non-significant cumulative impacts for the communities which depend on these resources by maintaining stock sizes that continue to lead to optimal sustainable harvests.

7.6.5 Non-target Species

Past management measures implemented under this FMP, and described above, which help to control or reduce discards of non-target species in these fisheries, include: 1) limited entry and specifications which are intended to control or reduce fishing effort; 2) incidental and bycatch caps or allowances; and, 3) minimum mesh requirements. Other FMPs have also regulated MSB fishing to minimize bycatch as well, such as the Scup Gear Restricted Areas implemented through the Summer Flounder, Scup, and Black Sea Bass FMP. The proposed action, in conjunction with these past and future actions, will not result in significant cumulative impacts to non-target species.

In addition to mortality on these stocks due to fishing, there are other indirect effects from non-fishing anthropogenic activities in the Atlantic Ocean (e.g. climate change, point source and non-point source pollution, shipping, dredging, etc.), but these are generally not quantifiable at present for pelagic and semi-pelagic species like those most likely to be encountered during MSB-fishing other than noting that climate change is likely to affect at least the distribution of some species (e.g. Overholtz et al 2011). Nonetheless, since most relevant species occur over wide areas of the mid and north Atlantic Ocean and inhabit both inshore and offshore pelagic waters, it is unlikely that any indirect anthropogenic activity currently impacts these populations substantially, especially in relative comparison to the direct effects on these populations as a result of fishing.

As noted above, none of the management measures under the preferred alternatives are expected to result in increased levels of effort or changes to the character of that effort relative to the status quo. The Trimester 2 provisions that more strongly enforce closures will reduce effort in some years but not in a significant manner. The baseline condition would be maintained (i.e. low negative for non-target species), similar to previous years due to ongoing interactions and previous efforts to reduce interactions.

7.6.6 Summary of cumulative impacts

The impacts of the preferred alternatives on the biological, physical, and human environment are described in section 7. The overall implementation of the measures considered via this document are expected to generate neutral to positive impacts by reducing racing to fish by better matching the longfin squid fleet capacity to the available quota. Limitations on fishing after closures during T2 should help avoid overfishing and increase future productivity of the longfin squid stock. Indirect benefits of the preferred alternatives are likely to affect consumers and areas of the economic and social environment that interact in various ways with these fisheries. The impact of the proposed actions, when considered together with past and future actions are not expected to result in significant cumulative impacts on the biological, physical, and human components of the environment. As long as management continues to prevent overfishing and rebuild overfished stocks, the fisheries and their

associated communities should continue to benefit. As noted above, the historical development of the FMP resulted in a number of actions which have impacted these fisheries and other valued ecosystem components. The cumulative effects of past actions in conjunction with the proposed measures and possible future actions are discussed above. Within the construct of that analysis, the Council has concluded that no significant cumulative impacts will result from the proposed specifications.

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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 fleets that would result from the preferred alternatives would have the capacity to fully harvest optimum yield despite the proposed reductions of latent longfin squid moratorium permits and incidental possession limits. The additional restrictions on fishing during T2 after closures (incidental possession reduction), new moratorium incidental catch longfin squid permit, and reductions to longfin squid incidental possession limits would avoid quota overages that could contribute to overfishing.

(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 and 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.

(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 mackerel, squid, and butterfish stocks throughout the range of the species in U.S. waters, in accordance with the jurisdiction of U.S. law.

(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.

The proposed management measures are not expected to discriminate between residents of different States. This action proposes to modify the longfin squid limited access permit system, and the proposed modifications would qualify fishermen in a fair and equitable manner, based on landings history. By limiting participation, the race to fish should be limited, which can have conservation benefits such as increasing the likelihood that fishery closures can be accurately projected and implemented and allowing opportunity for bycatch minimization strategies. If all current participants maximized their landings, they could easily catch and exceed current quotas. Therefore, limiting participation increases the likelihood that landings would not exceed quotas and result in overfishing. The proposed modifications would still permit a wide range of participants, and no one individual or corporation should acquire control of an excessive number of permits.

(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.

By reducing the number of permits, the risk of additional racing to fish should be lowered. This allows vessels to fish in ways that are more efficient given their overall operations and preserve access to the fishery by vessels that have been dependent upon longfin squid based on recent landings history. This would also reduce the likelihood that overfishing would occur by ensuring that catch by latent permits could not cause the overall catch to exceed existing 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). The creation of new limited access longfin squid permits, including the incidental catch permit, preserves opportunities for vessels to target longfin squid at different levels and to land longfin squid caught as bycatch when targeting other fisheries. Recent stock assessments have suggested that the mackerel, squid, and butterfish stocks are all likely particularly sensitive to environmental variables. 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.

(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 the MSB resources.

(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 not eliminate vessels from the fishery who have been actively fishing, which should provide for the sustained participation of fishing communities. Providing more access to quota for existing active participants within a tiered limited access system should add to fishing community stability and resilience The reduction in trip limit after closures in T2 may reduce revenues in T2 is some years. However, this should help protect the squid resource by avoiding fishing beyond the quota during T2, which should help the long-term sustainability of the resource and provide for the sustained participation of fishing communities. Analyses discussed herein also suggest that limiting effort during T2 is likely to improve catch per unit of effort in the following winter. By not reducing the potential to roll-over quota into T2 the Council also preserves a relatively high potential catch during T2 compared to some possible options under consideration. The proposed measures also do not limit participation in the *Illex* fishery.

(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 Magnuson-Stevens Act 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. Previous actions have reduced bycatch in the squid fisheries to the extent practicable, as described elsewhere in this document. By minimizing increases in the race to fish, the proposed permit restrictions could help reduce bycatch by allowing vessels time to fish more carefully. Allowing less active vessels to continue to retain 5,000 pounds of longfin squid should minimize discarding of incidentally caught longfin squid. The lower T2 post-closure trip limit also reduces incentives to continue to target and high grade longfin squid following the closure of the directed fishery during T2.

(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. By minimizing increases in the race to fish, the proposed permit restrictions could help reduce the incentive to fish for quota in dangerous conditions. Proposed permit changes also enable vessels to continue to target longfin and *Illex* squid, maintaining revenue that could be used to maintain vessels and safety equipment.

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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 MSB FMP has evolved over time through 20 Amendments and currently uses Acceptable Biological Catch recommendations from the Council's Scientific and Statistical Committee to sustainably manage the Mackerel, Squid, and Butterfish fisheries. 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 (50 C.F.R. § 648 Subpart B - http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=1e9802ffddb05d0243d9c657fade956c&rgn=div5&view=text&node=50:12.0.1.1.5&idno=50) and summarized at http://www.greateratlantic.fisheries.noaa.gov/regs/infodocs/msbinfosheet.pdf. 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 the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan provides this information. This document updates this 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

This provision is addressed via assessments that are conducted through a peer-reviewed process at the NMFS Northeast Fisheries Science Center. The available information is summarized in every Amendment and Specifications document – see Section 6. Full assessment reports are available at: http://www.nefsc.noaa.gov/saw/.

(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 and capacity analyses (Amendment 11), if Atlantic mackerel, squid, and butterfish 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/squid.

(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 in the form of vessel trip reports, vessel monitoring system trip declarations and catch 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). Amendments 9 and 11 evaluated habitat impacts, updated essential fish habitat designations, and implemented measures to reduce habitat impacts (primarily related to tilefish essential fish habitat). 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.

(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

Amendments 8 and 9 to the fishery management plan established biological reference points for the species in the plan, and Amendment 10 contained measures for butterfish rebuilding. If a fishery is declared overfished or if overfishing is occurring, another Amendment would be undertaken to implement effective corrective measures. A recent omnibus framework will also facilitate streamlined incorporation of new overfished/overfishing reference points.

(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 recently implemented an omnibus amendment to implement a new 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 Atlantic mackerel, squid, and butterfish fisheries are primarily commercial. There are some discards in the recreational mackerel fishery, but these are minimal related to the overall scale of the mackerel fishery. There are no size limits that would lead to regulatory recreational discarding of mackerel. There are no specific catch and release fishery management programs. There is some recreational longfin squid fishing, but it is thought to be relatively minor and the Council can consider if a survey is appropriate to further investigate longfin squid recreational fishing.

(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. There is minimal recreational and charter fishing for squid, and no measures in this action would restrict such activity.

(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.

No rebuilding plans are active (or currently necessary). A rebuilding amendment will likely need to be developed in 2018 for Atlantic mackerel due to a pending stock assessment.

(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 these fisheries, fully described at: http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=1e9802ffddb05d0243d9c657fade956c&rgn=div5&view=text&node=50:12.0.1.1.5&idno=50#50:12.0.1.1.5.2.

8.1.3 Discretionary Provisions of the Magnuson-Stevens Act

Section 303b of the Magnuson-Stevens Act contains 14 additional discretionary provisions for Fishery Management Plans. They may be read on pages 59 and 60 of the National Marine Fisheries Service's redline version of the Magnuson-Stevens Act at: http://www.nmfs.noaa.gov/msa2007/MSA_Amended%20by%20Magnuson-Stevens%20Reauthorization%20Act%20%281-31-07%20draft%29.pdf.

Critical for this action, as discretionary provisions of FMPs, the Magnuson-Stevens Fishery Conservation and Management Act (MSA) states that any FMP may establish a limited access system for the fishery in order to achieve optimum yield if, in developing such system, the Council and the Secretary take into account—

(A) present participation in the fishery;
(B) historical fishing practices in, and dependence on, the fishery;
(C) the economics of the fishery;
(D) the capability of fishing vessels used in the fishery to engage in other fisheries;
(E) the cultural and social framework relevant to the fishery and any affected fishing communities;
(F) the fair and equitable distribution of access privileges in the fishery; and
(G) any other relevant considerations.

As discretionary provisions of FMPs the MSA also allows restriction of fishing by time/season. Both limited access and seasonal management have been previously incorporated into the MSB FMP and this action could modify the existing provisions regarding limited access and/or seasonal management. In addition, MSA discretionary provisions allow measures that require a permit, implement catch limitations, and lower bycatch.

The Council considered a range of options for re-qualifying permits so that present participation and historical practices are accounted for. The information presented in this document also considers the economics of the fishery so that impacts to communities can be accounted for. The ability, or lack of ability of vessels to participate in other fisheries was considered in the following ways: no action is recommended for the *Illex* fishery; the relatively low threshold for longfin squid moratorium requalification and for limited access incidental requalification means that vessels dependent on longfin squid will not be impacted; the permit swap option allows rebalancing of permits where limited access to other fisheries prevents utilization of squid permits; and allowing non-requalifiers for limited access a permit that gives them a 5,000 pound trip limit provides some opportunity to fish for longfin squid even for those vessels that have been inactive.

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, 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. Thus no mitigation is necessary. The adverse impacts of bottom trawls used in MSB fisheries on other managed species (not MSB), which were determined to be more than minimal and not temporary in Amendment 9, were minimized to the extent practicable by the Lydonia and Oceanographer canyon closures to squid fishing. In addition, Amendment 1 to the Tilefish FMP closed those canyons plus Veatch's and Norfolk Canyons to all bottom trawling. Deepwater corals were also protected in Amendment 16. Therefore, the adverse habitat impacts of MSB fisheries "continue to be minimized." Amendment 11 revised the MSB EFH designations and EFH impacts will continue to be monitored and addressed as appropriate.

8.2 NEPA

8.2.1 Finding of No Significant Impact (FONSI)

The Council on Environmental Quality (CEQ) Regulations state that the determination of significance using an analysis of effects requires examination of both context and intensity, and lists ten criteria for intensity (40 CFR 1508.27). In addition, the Companion Manual for National Oceanic and Atmospheric Administration Administrative Order 216-6A provides sixteen criteria, the same ten as the CEQ Regulations and six additional, for determining whether the impacts of a proposed action are significant. Each criterion is discussed below with respect to the proposed action and considered individually as well as in combination with the others.

1. Can the proposed action reasonably be expected to cause both beneficial and adverse impacts that overall may result in a significant effect, even if the effect will be beneficial?

As described in Section 7 of this document, the proposed action is not expected to substantially increase effort, decrease effort, or change the nature of how fishing is conducted for MSB species. There are positive biological impacts associated with the proposed action for maintaining the sustainability of the longfin squid fishery by avoiding quota overages, but they are not expected to be significant. Further limiting access may have some positive socioeconomic impacts for re-qualifiers and some negative socioeconomic impacts for non re-qualifiers but again they are not expected to be significant.

2. Can the proposed action reasonably be expected to significantly affect public health or safety?

As described in Section 7 of this document, none of the proposed measures substantially alter the manner in which the industry conducts fishing activities for the target species. The proposed action could limit competition for fish, allowing operators the flexibility to avoid poor weather conditions, resulting in fewer safety concerns overall. Therefore, the proposed actions in these fisheries are not expected to adversely impact public health or safety.

3. Can the proposed action reasonably be expected to result in significant impacts to unique characteristics of the geographic area, such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas?

The action proposed addresses management of the MSB fisheries, which was established in the FMP and modified in various amendments, frameworks, and specifications. Although there are shipwrecks present in the area where fishing occurs, including some registered on the National Register of Historic Places, vessels typically avoid fishing too close to wrecks due to the possible loss or entanglement of fishing gear. As described in Section 7 of this document, none of the measures substantially alter the manner in which the industry conducts fishing activities for the target species. Therefore, it is not likely that the preferred alternative would adversely affect the historic resources listed above.

4. Are the proposed action's effects on the quality of the human environment likely to be highly controversial?

The proposed action modifies existing measures contained in the FMP. As a result, the effects of the proposed action herein are not expected to be highly controversial. Although this action would reduce the number of longfin squid moratorium permits, efforts were made to preserve access to the directed longfin fishery by vessels that have been active in the fishery in recent years and ensure that vessels that incidentally caught longfin squid when targeting other species could continue to land longfin squid at current levels. Allowing non-requalifiers for limited access a permit that gives them a 5,000 pound trip limit provides some opportunity to fish for longfin squid even for those vessels that have been inactive.

5. Are the proposed action's effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

While there is always a degree of variability in the year to year performance of the relevant fisheries, as described in Section 7 of this document, none of the measures substantially alter the way the industry conducts fishing activities for the target species. Implementing a lower longfin squid trip limit once the T2 quota has been harvested reduces the risk that seasonal closures will result in overages due to vessels targeting longfin squid at higher incidental catch levels, as observed in the past. As a result, the effects on the human environment of the proposed measures are not highly uncertain nor do they involve unique or uncertain risks.

6. Can the proposed action reasonably be expected to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?

The proposed action modifies existing measures and the modifications have been proposed and evaluated consistent with the existing fishery management plan and therefore is neither likely to establish a precedent for future actions with significant effects nor to represent a decision in principle about a future consideration.

7. Is the proposed action related to other actions that when considered together will have individually insignificant but cumulatively significant impacts?

The impacts of the preferred alternatives on the biological, physical, and human environment are described in Section 7 of this document. The overall interaction of the proposed action with other past, present and reasonably foreseeable future actions, including non-fishing activities, are not expected to result in significant cumulative impacts on the biological, physical, and human components of the environment.

8. Can the proposed action reasonably be expected to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources?

The action proposed addresses management of the MSB fisheries, which was established in the FMP and modified in various amendments, frameworks, and specifications. Other types of commercial fishing already occur in this area, and although it is possible that historic or cultural resources such as shipwrecks could be present, vessels try to avoid fishing too close to wrecks due to the possible loss or entanglement of fishing gear. Therefore, it is not likely that the preferred alternative would result in substantial impacts to unique areas.

9. Can the proposed action reasonably be expected to have a significant impact on endangered or threatened species, or their critical habitat as defined under the Endangered Species Act of 1973?

The proposed action is not expected to alter overall fishing operations, lead to a substantial increase of fishing effort, or alter the spatial and/or temporal distribution of current fishing effort (see Section 7 of this document) in a manner that would increase interaction rates with protected species.

This action falls within the range of impacts considered in the Batched Fisheries Biological Opinion for the Atlantic Mackerel, Squid, and Butterfish Fisheries (December 16, 2013). However, in a memorandum dated October 17, 2017, GARFO's Protected Resources Division reinitiated consultation on the Batched Biological Opinion. As part of the reinitiation, it was determined that allowing these fisheries to continue during the reinitiation period will not violate ESA sections 7(a)(2) and 7(d) because it will not increase the likelihood of interactions with protected species above the amount that was previously considered in the 2013 Batched Biological Opinion. Therefore, conducting the proposed action during the reinitiation period would not be likely to jeopardize the continued existence of any whale, sea turtle, Atlantic salmon, or sturgeon species.

As described in section 6.4, the proposed action is not likely to adversely affect any designated critical habitat. The Atlantic mackerel, squid, and butterfish fisheries will not affect the essential physical and biological features of North Atlantic right whales or loggerhead (Northwest Atlantic Ocean DPS) critical habitat and therefore, will not result in the destruction or adverse modification of critical habitat (NMFS 2014a;NMFS2015a,b).

10. Can the proposed action reasonably be expected to threaten a violation of Federal, state, or local law or requirements imposed for environmental protection?

As described in Section 7 of this document, overall fishing effort is not expected to substantially increase in magnitude under the proposed action. In addition, none of the proposed measures are expected to substantially alter fishing methods, activities, or the spatial and/or temporal distribution of fishing effort. Thus, it is not expected that they would threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment. The proposed measures have been found to be consistent with other applicable laws as described in this Section.

11. Can the proposed action reasonably be expected to adversely affect stocks of marine mammals as defined in the Marine Mammal Protection Act?

The MSB fisheries are known to interact with common and white sided dolphins and pilot whales. As described in Section 7 of this document, fishing effort is not expected to substantially increase in magnitude under the proposed measures. In addition, none of the proposed measures are expected to substantially alter fishing methods, activities, or the spatial and/or temporal distribution of fishing effort. Therefore, this action is not expected to adversely affect stocks of marine mammals as defined in the Marine Mammal Protection Act.

12. Can the proposed action reasonably be expected to adversely affect managed fish species?

As described in Section 7 of this document, none of the proposed measures are expected to jeopardize the sustainability of any target species affected by the action. The preferred alternatives are consistent with the FMP and best available scientific information. As such, the proposed action is expected to ensure the long term sustainability of harvests from the MSB stocks. The proposed action is not expected to jeopardize the sustainability of any non-target species (see section 7 of this document) because the proposed measures are not expected to result in substantial increases in overall fishing effort. In addition, none of the measures are expected to substantially alter fishing methods or the temporal and/or spatial distribution of fishing activities. Therefore, none of the proposed actions are expected to jeopardize the sustainability of non-target species.

13. Can the proposed action reasonably be expected to adversely affect essential fish habitat as defined under the Magnuson-Stevens Fishery Conservation and Management Act?

The proposed action is not expected to cause damage to the ocean, coastal habitats, and/or EFH as defined under the Magnuson Stevens Act and identified in the FMP (see Section 7). In general, bottom tending mobile gear, primarily otter trawls, which are used to harvest mackerel, squid, and butterfish, have the potential to adversely affect EFH for the benthic lifestages of a number of species in the Northeast region that are managed by other FMPs. However, because as described in Section 7 of this document none of the management measures proposed in this action should cause any substantial increase in overall fishing effort relative to the status quo, they are not expected to have any substantial negative impact on EFH or on coastal and ocean habitats.

14. Can the proposed action reasonably be expected to adversely affect vulnerable marine or coastal ecosystems, including but not limited to, deep coral ecosystems?

Deep coral ecosystems have been protected from bottom-tending mobile gear used in the MSB fisheries by previous Council actions. Overall fishing effort is not expected to substantially increase in magnitude under the proposed action (see Section 7 of this document). In addition, none of the proposed measures are expected to substantially alter fishing methods, activities, or the spatial and/or temporal distribution of fishing effort. Thus, it is not expected that they would adversely affect vulnerable marine or coastal ecosystems, including but not limited to, deep coral ecosystems.

15. Can the proposed action reasonably be expected to adversely affect biodiversity or ecosystem functioning (e.g., benthic productivity, predator-prey relationships, etc.)?

These fisheries are prosecuted using bottom otter trawls, which have the potential to impact bottom habitats. In addition, a number of non-target species are taken incidentally to the prosecution of these fisheries. However, fishing effort is not expected to substantially increase in magnitude under the proposed measures (see Section 7 of this document). In addition, none of the proposed measures are expected to substantially alter fishing methods, activities or the spatial and/or temporal distribution of fishing effort. Therefore, the proposed action is not expected to have a substantial impact on biodiversity or ecosystem function (e.g. food webs) within the affected area.

16. Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

There is no evidence or indication that these fisheries have ever resulted or would ever result in the introduction or spread of nonindigenous species.

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment prepared for this action, it is hereby determined that these proposed MSB FMP measures will not significantly impact the quality of the human environment as described above and in the supporting Environmental Assessment. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an environmental impact statement for this action is not necessary.

_____ _____

Michael Pentony Date

Greater Atlantic Regional Administrator, NOAA

8.3 Marine Mammal Protection Act

The various species which inhabit 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. Four species of marine mammals are known to interact with the mackerel, squid and butterfish fisheries - long and short finned pilot whales, common dolphin and white sided dolphin. None of the measures are expected to significantly alter fishing methods or activities or result in substantially increased effort. 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 inhabit the management units of the subject fisheries. 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.

8.4 Endangered Species Act

The batched fisheries Biological Opinion completed on December 16, 2013, concluded that the actions considered would not jeopardize the continued existence of any listed species. On October 17, 2017,

NMFS reinitiated consultation on the batched Biological Opinion due to updated information on the decline of Atlantic right whale abundance.

Section 7(d) of the ESA prohibits Federal agencies from making any irreversible or irretrievable commitment of resources with respect to the agency action that would have the effect of foreclosing the formulation or implementation of any reasonable and prudent alternatives during the consultation period. This prohibition is in force until the requirements of section 7(a)(2) have been satisfied. Section 7(d) does not prohibit all aspects of an agency action from proceeding during consultation; non-jeopardizing activities may proceed as long as their implementation would not violate section 7(d). Per the October 17, 2017, memo, it was concluded that allowing those fisheries specified in the batched Biological Opinion to continue during the reinitiation period will not increase the likelihood of interactions with ESA listed species above the amount that would otherwise occur if consultation had not been reinitiated. Based on this, the memo concluded that the continuation of these fisheries during the reinitiation period would not be likely to jeopardize the continued existence of any ESA listed species. Taking this, as well as our analysis of the proposed action into consideration, we do not expect the proposed action, in conjunction with other activities, to result in jeopardy to any ESA listed species.

This action does not represent any irreversible or irretrievable commitment of resources with respect to the FMP that would affect the development or implementation of reasonable and prudent measures during the consultation period. NMFS has discretion to amend its Magnuson-Stevens Act and ESA regulations and may do so at any time subject to the Administrative Procedure Act and other applicable laws. As a result, the Council has preliminarily determined that fishing activities conducted pursuant to this action will not affect endangered and threatened species or critical habitat in any manner beyond what has been considered in prior consultations on this fishery.

8.5 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, the Council is not requesting any abridgement of the rulemaking process for this action.

8.6 Paperwork Reduction Act

The purpose of the Paperwork Reduction Act 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. This action would modify existing collections, including adding new collections associated with the new limited access longfin squid incidental catch permit, permit application and appeal processes, and the longfin squid permit swap provision. While some permits may change as part of this action, no new reporting requirements would be implemented. NMFS is preparing the appropriate supporting statements to document such changes to existing collections under the Paperwork Reduction Act.

8.7 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.

8.8 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 so that intended users may have a full understanding of the proposed action and its implications, as well as 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 Magnuson-Stevens Act; 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 Magnuson-Stevens Act; 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 in this product are based on either assessments subject to peer-review through the Stock Assessment Review Committee or on updates of those assessments prepared by scientists of the Northeast Fisheries Science Center. 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 members of the Mackerel, Squid and Butterfish Monitoring Committee or other 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 years, generally through 2016 except as noted. 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. 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 of this document. All supporting materials, information, data, and analyses within this document have been, to the maximum extent practicable,

properly referenced according to commonly accepted standards for scientific literature to ensure transparency.

The review process used in preparation of this document involves 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.

8.9 Regulatory Flexibility Analysis

The purpose of the Regulatory Flexibility Act is to reduce the impacts of burdensome regulations and recordkeeping requirements on small businesses. To achieve this goal, the Regulatory Flexibility Act requires Federal agencies to describe and analyze the effects of proposed regulations, and possible alternatives, on small business entities. Section 12.0 at the end of this document includes the Regulatory Flexibility Act Analysis.

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

To enhance planning and coordination with respect to new and existing regulations, this Executive Order requires the Office of Management and Budget (OMB) to review regulatory programs that are considered to be significant. Section 12.0 at the end of this document includes the Regulatory Impact Review, which includes an assessment of the costs and benefits of the proposed action, in accordance with the guidelines established by Executive Order 12866. The analysis shows that this action is not a significant regulatory action because it will not affect in a material way the economy or a sector of the economy.

8.11 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 measures 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

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10.0 LIST OF AGENCIES AND PERSONS CONSULTED

In preparing this document the Council 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 or participation with 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.

11.0 LIST OF PREPARERS AND POINT OF CONTACT

This environmental assessment was prepared by the following member of the Council staff: Jason Didden. Review and document improvement was conducted by NMFS staff at the Greater Atlantic Regional Office in Gloucester, MA and the Northeast Fisheries Science Center in Woods Hold, MA. Questions about this environmental assessment or additional copies may be obtained by contacting Jason Didden, Mid-Atlantic Fishery Management Council, 800 N. State Street, Dover, DE 19901 (302-674-2331). This Environmental Assessment may also be accessed by visiting the NMFS Greater Atlantic Region website at http://www.greateratlantic.fisheries.noaa.gov/regs/.

12.0 INITIAL REGULATORY FLEXIBILITY ANALYSIS AND REGULATORY IMPACT REVIEW

12.1 Initial 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. 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.

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 to establish a limited access system. As discretionary provisions of FMPs the MSA also allows restriction of fishing by time/season. Both limited access and seasonal management have been previously incorporated into the MSB FMP and this action could modify the existing provisions regarding limited access and/or seasonal management. In addition, MSA discretionary provisions allow measures that require a permit, implement catch limitations, and lower bycatch.

This action is needed to 1) prevent future unrestrained increases in fishing effort[17] by having too many vessels in the directed longfin squid fishery and 2) to avoid overharvest during T2 of the longfin squid fishery. The purpose of this action is to consider limited access and seasonal (T2) effort controls or other management measures in the squid fisheries.

The purpose and need for this action is described in Section 4.1, while a full description of all alternatives is provided in Section 5. To assist with further evaluation of the measures proposed in this

[17] Unrestrained increases in effort lead to a problem in fisheries management commonly referred to as "racing to fish." In this problem, fishery participants expend more and more capital and effort in an increasingly rushed attempt to catch a limited quota before their catch and the catch of other participants causes a closure of the fishery. More racing to fish is likely to lead to higher bycatch given the hyper focus on rapid catches, and if there is less of a race to fish, fishermen may have more time to execute bycatch minimization strategies, such as moving to a new area after a bycatch event, though such gains are generally more strongly associated with rights-based management (see Holland and Ginter 2001, Fujita and Bonzon 2005, Branch et. al. 2006, Hilborn 2007, and Birkenback et al 2017 for a few examples of many discussions of this issue).

document, the following is a brief summary of the preferred alternatives selected by the Council for this action:

- Alternative 1C (PREFERRED). This alternative would requalify current longfin squid/butterfish permits for a moratorium longfin squid permit if they landed at least 10,000 pounds of longfin squid in any year from 1997-2013. Permits in "Confirmation of Permit History" (CPH) could requalify if they have the required landings. All current moratorium longfin squid/butterfish permits would retain a butterfish moratorium permit regardless (the longfin and butterfish moratorium permits would be separated and access to butterfish would not be changed). If a vessel that currently has a moratorium longfin squid/butterfish permit does not re-qualify it would receive a permit allowing a 5,000-pound longfin squid trip limit.

- Alternative 2B (PREFERRED). This alternative would allow an entity that was issued more than one longfin squid/butterfish moratorium permit as of May 26, 2017 to use a one-time opportunity when re-qualifying to swap active re-qualifying and non-requalifying longfin squid moratorium permits among vessels owned by the same owner(s) of record. Permits in confirmation of permit history (CPH) as of May 26, 2017 could not participate.

- Alternatives 3C and 3C1 (PREFERRED). These alternatives would create a new limited-access incidental longfin squid permit that cannot be reacquired if dropped and make the open access trip limit 250 pounds. Incidental limited access qualification years would be from 1997-2013 and require landings of at least 5,000 pounds in any one year. Possession of a federal commercial squid permit at some point during the qualification period would also be required. The initial trip limit would be 2,500 pounds, adjustable via the specifications process.

- Alternative 4A. No action (PREFERRED). Selection of 4A means that the longfin squid trimester allocations and rollover provisions would remain as current (i.e., the T2 longfin squid quota can be increased by up to 50% due to rollover of unused T1 quota).

- Alternative 5B (PREFERRED). This Alternative would implement a reduced 250-pound trip limit for all longfin squid permits when the directed T2 fishery closes (applies regardless of rollover in any year).

- Alternative 6A. No action (PREFERRED). Selection of 6A means no changes would be made to *Illex* moratorium permits; the existing system of *Illex* moratorium permits and incidental permits would remain in place.

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

The measures proposed in this action apply to the vessels that A) hold limited access permits for longfin squid/butterfish or B) hold an incidental permit for squid. No measures are being proposed for mackerel or *Illex* at this time so the analysis only examines longfin squid moratorium permit holders and incidental permit holders.

Many MSB-permitted vessels hold multiple permits and some small entities own multiple vessels with limited access MSB permits. Staff queried NMFS databases for 2016 longfin squid/butterfish limited access/moratorium permit holders, and then cross-referenced those results with ownership data provided by the Social Science Branch of NMFS' Northeast Fisheries Science Center. This analysis found that 295 separate vessels held longfin squid/butterfish permits in 2016. 222 entities owned those vessels, and based on current SBA definitions (under $11 million to be a commercial fishing small business entity), 214 are small business entities. All of the entities that had revenue fell into the commercial fishing category. 9 small business entities had no revenues. For those small businesses with revenues, their average revenue was $1.4 million in 2016.

This analysis also found that another 1528 separate vessels held incidental squid permits in 2016. 1114 entities owned those vessels, and based on current SBA definitions (under $11 million to be a commercial fishing small business entity and $7.5 million for for-hire operations), 1105 are small business entities (757 commercial, 74 for-hire (based on primary revenue source), 274 without revenue but classified as small businesses for this analysis). In 2016, for those small businesses with revenues, the average revenue for commercial fishing entities was $0.63 million and the average revenue for for-hire entities was $0.17 million.

Description and estimate of economic impacts on small entities

The economic impacts are described in detail in Section 7.5 of this document, and summarized below for the preferred alternatives that would change management measures.

This action would requalify current longfin squid/butterfish permits for a moratorium longfin squid permit if they landed at least 10,000 pounds of longfin squid in any year from 1997-2013. Permits in "Confirmation of Permit History" (CPH) could requalify if they have the required landings. All current moratorium longfin squid/butterfish permits would retain a butterfish moratorium permit regardless (the longfin and butterfish moratorium permits would be separated and access to butterfish would not be changed). If a vessel that currently has a moratorium longfin squid/butterfish permit does not re-qualify it would receive a permit allowing a 5,000-pound longfin squid trip limit.

The 169 vessels that would not re-qualify would be issued a Tier 2 longfin squid permit and be restricted to 5,000 lb (2,268 kg) of longfin squid per trip. From 2014-2016, 75 percent of these vessels (127) did not land any longfin squid. 42 vessels landed some squid; 15 vessels had trips greater than 5,000 pounds and could be affected by having their permits downgraded to only allow trips up to 5,000 pounds. 132 such trips on these 15 vessels occurred from 2014-2016, most in 2016. Had such trips been limited to 5,000 pounds, the forgone revenues would have totaled $1,262,539, or $ 28,056 per vessel annually averaged over 2014-2016. This was only 3% of their total average annual revenues of $ 816,824 over the same time period. For comparison, the top 20 longfin vessels averaged over $1,000,000 in longfin squid in 2016.

This action would also allow an entity that was issued more than one current longfin squid/butterfish moratorium permit as of May 26, 2017 to use a one-time opportunity when re-qualifying to swap active re-qualifying and non-requalifying longfin squid moratorium permits among vessels owned by the same owner(s) of record. Permits in confirmation of permit history (CPH) as of May 26, 2017 could not participate. At most 11 owners could make use of this provision. This Alternative would help mitigate the low impacts of the requalification measure described above by allowing an entity to optimize permit distribution by moving re-qualified longfin squid moratorium permits onto more active vessels.

This action would create a new limited-access incidental longfin squid permit that cannot be reacquired if dropped and make the open access trip limit 250 pounds. Qualification years would be from 1997-2013 and require landings of at least 5,000 pounds in any one year. Possession of a federal commercial squid permit at some point during the qualification period would also be required. The initial trip limit would be 2,500 pounds, adjustable via the specifications process. Since vessels would only need two full incidental trip limits (or more smaller trips) in any one year to qualify for the incidental permit, vessels that do not qualify for a limited access incidental longfin squid permit would not have substantially participated in the fishery and should not be significantly impacted, especially since they could still get a 250 pound open access permit to cover incidental longfin squid landings when targeting other species.

During 2016, 1,528 vessels were issued a squid incidental catch permit. Under Alternative 3C, approximately 346 vessels would qualify and be issued a Tier 3 longfin squid moratorium permit, allowing such vessels to continue landing up to 2,500 lb (1,134 kg) of longfin squid per trip. Out of the 1,182 vessels that would not qualify for a Tier 3 permit under Alternative 3C, 755 (64 percent) did not have any longfin squid landings during the qualifying period, while 427 (36 percent) landed some longfin squid but less than 5,000 lb (1,134 kg) during at least one year of the qualification period. As a result of not receiving a Tier 3 permit they would be limited to 250 pounds per trip/day.

Of the 427 permits with minimal and non-qualifying longfin squid landings, 42 permits took 185 trips between 2014-2016 that landed 250-2,500 lb (113-1,134 kg) of longfin squid, resulting in nearly $200,000 in longfin squid revenue that averaged $1,574 per year for each permit. These are the landings/revenues potentially impacted by going from a 2,500 pound trip limit to a 250 pound trip limit. $1,574 is less than a third of 1% of these 42 vessels' average annual total landings revenues of $607,567 from 2014-2016. Having the open-access trip limit be 250 pounds increases the value of the limited access incidental permit compared to 3C2, which should help achieve the goal of not having vessels drop the incidental permit to fish in state waters during closures more than 3C2.

This action would reduce the longfin squid trip limit to 250-pound per trip for all longfin squid permits when the directed T2 fishery closes (applies regardless of rollover in any year). Since 2007 when trimesters began, substantial T2 quota overages beyond the current base quota of about 8 million pounds have occurred two times (2012 and 2016). Thus this measure appears likely to restrict vessels in only about 1 out of 3 years given recent fishery conditions (2011-2016). T2's performance in 2016 provides the best year to illustrate potential impacts because it had the largest overage. In T2 of 2016, from June 27 to August 31 an additional 5.6 million pounds of longfin squid beyond the quota were caught post-closure when the federal limit was 2,500 pounds, generating approximately $6.4 million in ex-vessel sales. Almost all T2 landings in 2016 after the closure date occurred on trips greater than 250 pounds and could be impacted by this alternative. However, some of the landings are state landings that may be minimally affected by this action. In 2016, after the T2 closure, trips between 250 pounds and 2,500 pounds accounted for 3.4 million pounds yielding $4.1 million. So potentially $4.1 million could be a forgone opportunity in years of high longfin squid abundance during Trimester 2 under this alternative, particularly if a state mirrors Federal regulations implemented by this action. This is most relevant for Massachusetts and Rhode Island – the states responsible for most state landings of longfin squid. In 2016, 129 federal permit holders made landings between 250 pounds and 2,500 pounds from June 27 to August 31- these are the trips most likely to be affected. Their average

longfin squid landings value from those trips was $31,444 while, while their total landings for 2016 averaged $649,473, representing less than 5% of total annual fishing revenue. So the affected landings accounted for only 4.8% of averaged total landings value. There were relatively few vessels (14%) that had these affected landings account for a more substantial part of their 2016 total landings value – 18 had affected longfin squid landings that accounted for more than 20% of their 2016 total landings.

12.2 Regulatory Impact Review

INTRODUCTION

Executive Order 12866 requires a Regulatory Impact Review (RIR) in order to enhance planning and coordination with respect to new and existing regulations. This Executive Order requires the Office of Management and Budget (OMB) to review regulatory programs that are considered to be "significant." The analysis included in this RIR further demonstrates that this action is not a "significant regulatory action" because it will not affect in a material way the economy or a sector of the economy.

Executive Order 12866 requires a review of proposed regulations to determine whether or not the expected effects would be significant, where a significant regulatory action is one that may:

1. Have an annual effect on the economy of $100 million or more, or adversely affect in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

2. Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

3. Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

4. Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

The entire fishery is worth $50 million or less annually, and only a relatively small portion of the overall fishery may be affected by this action, as described in Section 7. Also as described in Section 7, the proposed measures should help maintain the sustainability of the longfin squid fishery, and as such should positively rather than adversely affect the economy, a sector of the economy, productivity, jobs, the environment, public health or safety, or State, local, or tribal governments or communities.

This action is consistent with previous actions by the Council and NOAA Fisheries, and there is no known conflict with other agencies.

There is no known impact on any entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof.

This action is consistent with previous actions by the Council and NOAA Fisheries, and there is no known conflict with legal mandates, the President's priorities, or the principles set forth in the Executive Order.

As such, the Proposed Action is not considered significant as defined by Executive Order 12866.

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