INITIAL REVIEW DRAFT

**Regulatory Impact Review
for Proposed Amendment
to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area and the Fishery Management Plan for Groundfish of the Gulf of Alaska**

Removing processing restrictions for squids and sculpins in the BSAI and GOA

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Abstract: This Regulatory Impact Review examines the benefits and costs of proposed alternatives regarding processing and sale of squids and sculpins as part of the Ecosystem Component category in the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area and the Fishery Management Plan for Groundfish of the Gulf of Alaska. The RIR also assesses the potential impact of the alternatives on fishing communities and addresses other social impacts, if there are social impacts distinct from the economic impacts.

List of Acronyms and Abbreviations

Acronym or Abbreviation	Meaning
ABC	Acceptable Biological Catch
ADF&G	Alaska Department of Fish and Game
AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center
AKFIN	Alaska Fisheries Information Network
BSAI	Bering Sea and Aleutian Islands
CAS	Catch Accounting System
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Council	North Pacific Fishery Management Council
C/P	Catcher/Processor
CV	Catcher Vessel
E.O.	Executive Order
EA	Environmental Assessment
EC	Ecosystem Component
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FMA	Fisheries Monitoring and Analysis
FMP	Fishery Management Plan
FONSI	Finding of No Significant Impact
FR	*Federal Register*
GOA	Gulf of Alaska
IRFA	Initial Regulatory Flexibility Analysis
LOA	Length Overall
mt	Metric Tons
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MMPA	Marine Mammal Protection Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fishery Service
NOAA	National Oceanic and Atmospheric Administration
NPFMC	North Pacific Fishery Management Council
Observer Program	North Pacific Observer Program
PSC	Prohibited Species Catch
PPA	Preliminary Preferred Alternative
PSEIS	Programmatic Supplemental Environmental Impact Statement
RFA	Regulatory Flexibility Act
RFFA	Reasonably Foreseeable Future Action
RIR	Regulatory Impact Review
SAFE	Stock Assessment and Fishery Evaluation
SAR	Stock Assessment Report
SBA	Small Business Act
Secretary	Secretary of Commerce
TAC	Total Allowable Catch
U.S.	United States

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Executive Summary

This document analyzes alternatives to reconsider processing restrictions on squids and sculpins, two species recently added to the Ecosystem Component (EC) category in the Fishery Management Plans for groundfish in the Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA). This Regulatory Impact Review provides an assessment of the economic benefits and costs of the proposed alternatives, and their distribution.

Purpose and Need

The Council adopted the following purpose and need statement in October 2019. Staff have identified some additions (underlined) and deletions (~~strikethrough~~) to clarify the purpose and need.

> Squid is defined in the ecosystem component (EC) category in the FMPs for groundfish in the BSAI and GOA. The Council, in October 2019, took action to recommend that sculpins be defined in EC category in the BSAI and GOA as well. There are no directed fisheries for squid or sculpins in either the BSAI or GOA. Incidental catch of squid is retained in some fisheries and often utilized to prevent waste. Typically, sculpins are not retained but can be in some circumstances.
>
> The Council's June 2017 action to reclassify the squid complex into the EC category in the BSAI and GOA groundfish FMPs was based on the best available scientific information and was consistent with the revised National Standard 1 guidelines. ~~However, the f~~ Federal rulemaking to implement the Council's action ~~incorrectly~~ prohibited the use or sale of incidentally caught squid unless processed into fish meal. The June 2017 Council action and supporting analyses indicated: 1) retention of squids would continue at or slightly above current levels, and 2) past production types would continue to be allowed including whole bait and whole fish/food fish. The purpose of this action is to align regulations with the long-standing use of squid, the permissible use of squid based on the Council's June 2017 analysis and preferred alternative, and the permissible use of squid under the EC category.
>
> The Council's recent recommendation to establish sculpins in the EC category would limit the use of sculpins consistent with existing regulations for all other EC category species (50 CFR 679.20(i)). The Council does not wish to increase the time required to move sculpins into the EC category by modifying that action, but intends to review the disposition of sculpins consistent with squids and the flexibility provided by the EC category.

Alternatives

The council adopted the following alternatives for analysis in October 2019.

Alternative 1. Status Quo. Squids and sculpins in both the BSAI and GOA FMPs are designated as non-target ecosystem component species with prohibition on the use of squids and sculpins other than as fishmeal.

Alternative 2. Squids and sculpins in both the BSAI and GOA FMPs are designated as non-target ecosystem component species.

Because squids are already in the EC category, and the Council took final action to move sculpins into the EC category in October 2019, the only real difference in these alternatives is the allowance for processing

and sale of squids and sculpins as either fishmeal only (Alt 1) or without the fishmeal-only regulation (Alt 2). Table ES 1 provides a summary of the two alternatives considered in this action.

Table ES 1 Summary of management measures in Alternatives 1 and 2.

Management Measure	Alt 1- No Action	Alt 2 – No Processing Restrictions
Prohibit Directed Fishing	**Yes** Prohibit directed fishing in regulations at 679.20(i)	**Yes** Prohibit directed fishing in regulations at 679.20(i)
Retention and Sale	**Yes** Retention and sale allowed as fishmeal only, subject to MRA limits.	**Yes** Retention and sale as any product form allowed, subject to MRA limits.
Annual Harvest Specifications	**No** - Periodic reports on biomass information from current surveys will be included in the SAFE - Catch does not accrue to optimum yield cap	**No** - Periodic reports on biomass information from current surveys will be included in the SAFE - Catch does not accrue to optimum yield cap
Incidental Catch Management	**Yes** MRA = 20% for all basis species	**Yes** MRA = 20% for all basis species
Recordkeeping and Reporting	**Yes** Require catch reporting	**Yes** Require catch reporting

Squids

There are at least 15 species of squids in the BSAI and GOA regions (Table 3-1). Most species are associated with the slope and basin, with the highest species diversity along the Bering Sea slope between 200 and 1,500 m. As Alaskan waters are warming, market squid (*Doryteuthis opalescens*) are beginning to show up in GOA waters that were previously too cold for them. Although there are no directed fisheries for any squids in the BSAI or GOA, the State of Alaska Board of Fisheries has received at least one proposal to develop a fishery for market squid.

The AFSC bottom trawl surveys do not employ the appropriate gear or sample in the appropriate places to provide reliable biomass estimates for most squids. *Berryteuthis magister*, *Gonatopsis borealis*, and *Rossia pacifica* are the most common squids in the Eastern Bering Sea slope survey (Table 3-2). In the GOA, *B. magister*, is the most common squid species encountered in the survey (Table 3-3).

Squids are currently managed as EC species in the BSAI and GOA. Establishing harvest specifications for squids before they were placed in the EC category was problematic because reliable biomass estimates for squids do not currently exist. Because of data limitations, squids were assessed as a Tier 6 species in the BSAI and GOA.

Squids are EC species that are caught incidentally in prosecution of groundfish fisheries in the BSAI and GOA. In both the BSAI and GOA, the vast majority of squids are caught in the pollock fisheries. Catch of squid in other target species fisheries is minimal (Table 3-4, Table 3-5). Remarkably, in 2019 squid catch in the BSAI increased greatly to 5,931 mt, which is more than twice the previous high in 2015, and the

highest level since 1981. It is difficult to determine the reasons for the dramatic increase in squid catch in the BSAI, but may include an increase in squid abundance in the BSAI, release from the fleet's necessity to avoid squids, increased encounters with squids as the fleet avoided salmon and sablefish, and potentially the misperception by some that squids could be sold as whole bait.

Annual production of squids to fish meal, whole bait, and whole fish/food fish are shown in Table 4-4. Overall, whole bait was the most common and valuable product type, followed by whole fish/food fish, and fish meal. Total squid production for the main squid processing communities in the BSAI and GOA are shown in Table 4-6 .The main squid processing communities are Dutch Harbor/Unalaska and Kodiak. Squid do not represent a significant proportion of production for any processing community in the BSAI or GOA.

Sculpins

Sculpins are small, demersal, teleost fishes that consist of 4 diverse families off Alaska. Sculpins occupy all benthic habitats along the continental shelf and slope areas, and occupy depths from the nearshore sand and mud bottoms at 20 m to below 1,000 m along the slope and canyon habitats. Sculpins are predators of the shelf and slope ecosystems, consuming a wide variety of benthic prey including commercially important crabs and fishes.

Sculpins are managed as non-target species in the BSAI and GOA, but the Council recently took action (Amendment 121 to the BSAI FMP and 110 to the GOA FMP) to classify sculpins as EC species in both the BSAI and GOA. Sculpins are taken only as bycatch while directed fishing for other species. Total catch (retained and discarded) has ranged from 2% to 6% of the total estimated biomass (Table 3-6). There is no market for sculpins, and there has not been recent interest in marketing sculpin in any product form.

Analysis of impacts of the alternatives

Assessing the effects of the alternatives involves a great degree of speculation because effects are likely to arise from the actions of individual participants in the fisheries. Predicting individual actions and their effects is constrained by incomplete information concerning the fisheries, incomplete economic information, incomplete biological information, and lack of models to predict participant behavior. Because 2019 was the first year that squids were managed as EC species, there are limited data available to predict the impacts of alternatives on catch of squid. Catch of squids in 2019 was approximately 5 times higher than previous years, and was the highest since 1982. Available data suggests that multiple factors, including the overall abundance of squid in the BSAI, release from the fleet's necessity to avoid squids, the effects of avoiding Chinook salmon and sablefish, and the misperception by some processors in 2019 that squids could be sold as whole bait.

Alternative 1

Alternative 1 would continue to manage squids and sculpins as ecosystem component species in the groundfish FMPs for the BSAI and GOA, and processing restrictions limiting processing and sale of squids and sculpins to fish mean only would be maintained. Under Alternative 1 processors may experience higher costs associated with discarding squids or converting fish meal plants to be able to efficiently process squid. Processors would also forgo revenue from the sale of squids as product forms other than fish meal. Overall impacts or forgone revenue from the prohibition of selling squid as whole bait is not significant in comparison to the overall value of the BSAI and GOA groundfish fisheries, but impacts may be significant to individual operators depending on how much of their annual revenue is generated from processing squid.

Because there has never been a significant market for any sculpin products, it is unlikely that imposing processing restrictions to fish meal only would affect the level of incidental catch, or the value of incidental catch of sculpins in the BSAI or GOA.

Alternative 2

Alternative 2 would continue to manage squids and sculpins as ecosystem component species in the groundfish FMPs for the BSAI and GOA, but processing restrictions would be eliminated allowing the processing and sale of squids and sculpins in any product form. Under Alternative 2 processors may be able to generate additional revenue from the sale of squids as whole bait or whole fish/food fish. Total additional revenue would depend on individual processors' decisions to process squids to saleable products or discard. Alternative 2 may also reduce the amount of squid discarded. The potential economic impacts of allowing squids and sculpins to be sold as products other than fish meal are not significant in comparison to the overall value of the BSAI and GOA groundfish fisheries, but impacts m ay be significant to individual operators depending on how much of their annual revenue is generated from processing squids.

Effects on fishing communities and other social impacts

The potential community and social impacts of the alternatives are primarily economic in nature. Analysts did not identify any impacts that would create adverse economic impacts on any fishing community or cause any other adverse social impacts.

Affected small entities

Both alternatives would directly regulate any processor receiving squids or sculpins in the federally managed groundfish fisheries in the BSAI and GOA. As described in Section 4.6.2, for processors currently participating in these fisheries, the economic impacts of Alternative 2 are primarily beneficial or neutral. Processors who wish to process squids and sculpins may still do so in the future, up to the MRAs. It is possible that one or more processors in the BSAI or GOA that processes squids or sculpins under Alternative 2 could be small entities if the processing company and its affiliates worldwide employ fewer than 750 people. Total employment numbers of processing companies and their affiliates worldwide are not available to make that determination.

Management and enforcement considerations

Under both alternatives, squids and sculpins may be retained up to the MRA of 20% for all basis species. Recordkeeping and reporting requirements remain in place under both alternatives. Primary management considerations for Alternative 1 include monitoring catch to ensure that the MRA is not exceeded and monitoring processing products to ensure that squids and sculpins are not processed into forms other than fish meal. Enforcement considerations for Alternative 1 include determining the appropriate penalty for exceeding the MRA for squids and sculpins. Primary management considerations for Alternative 2 include monitoring catch to ensure that the MRA is not exceeded. Enforcement considerations for Alternative 2 include determining the appropriate penalty for exceeding the MRA for squids and sculpins.

Implications for state fisheries

Neither alternative would have any immediate implications for state fisheries. The FMPs do not preclude development of a directed squid fishery (such as for market squid) in state waters. The State of Alaska Board of Fisheries could authorize a state waters fishery for squids as they determine it to be appropriate.

Summary of net benefits to the Nation

Net benefits to the Nation relative to the No Action alternative would likely increase marginally under Alternative 2 by allowing processing and sale of squids and sculpins products and by helping to prevent waste of the incidental catch of these species. Alternative 2 would likely not affect current fishery revenue for sculpins, as a small amount of sculpins is retained and marketed as fish meal, but fishery revenue for squids may increase by allowing sale of squids as whole bait or whole fish/food fish.

1 Introduction

This document analyzes alternatives to reconsider processing restrictions on squids and sculpins, two species recently added to the Ecosystem Component (EC) category in the Fishery Management Plans (FMPs) for groundfish in the Bering Sea and Aleutian Island (BSAI) management area and Gulf of Alaska (GOA).

This document is a Regulatory Impact Review (RIR). The RIR provides an assessment of the economic benefits and costs of the proposed alternatives, and their distribution. This RIR addresses the statutory requirements of the Magnuson Stevens Fishery Conservation and Management Act (MSA), the National Environmental Policy Act (NEPA), and Presidential Executive Order 12866. A RIR is a standard document produced by the North Pacific Fishery Management Council (Council) and the NMFS Alaska Region to provide the analytical background for decision-making.

Based on information to date, this action is not likely to, individually or cumulatively, have a significant effect on the quality of the human environment and therefore may be categorically excluded from the need to prepare an Environmental Assessment (EA).

1.1 Purpose and Need

The Council adopted the following purpose and need statement in October 2019. Staff have identified some minor suggested additions (underlined) and deletions (~~strikethrough~~) to clarify the purpose and need.

> Squid is defined in the ecosystem component (EC) category in the FMPs for groundfish in the BSAI and GOA. The Council, in October 2019, took action to recommend that sculpins be defined in EC category in the BSAI and GOA as well. There are no directed fisheries for squid or sculpins in either the BSAI or GOA. Incidental catch of squid is retained in some fisheries and often utilized to prevent waste. Typically, sculpins are not retained but can be in some circumstances.
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> The Council's June 2017 action to reclassify the squid complex into the EC category in the BSAI and GOA groundfish FMPs was based on the best available scientific information and was consistent with the revised National Standard 1 guidelines. ~~However, the f~~ Federal rulemaking to implement the Council's action ~~incorrectly~~ prohibited the use or sale of incidentally caught squid unless processed into fish meal. The June 2017 Council action and supporting analyses indicated: 1) retention of squids would continue at or slightly above current levels, and 2) past production types would continue to be allowed including whole bait and whole fish/food fish. The purpose of this action is to align regulations with the long-standing use of squid, the permissible use of squid based on the Council's June 2017 analysis and preferred alternative, and the permissible use of squid under the EC category.
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> The Council's recent recommendation to establish sculpins in the EC category would limit the use of sculpins consistent with existing regulations for all other EC category species (50 CFR 679.20(i)). The Council does not wish to increase the time required to move sculpins into the EC category by modifying that action, but intends to review the disposition of sculpins consistent with squids and the flexibility provided by the EC category.

1.2 History of this Action

The MSA requires that each regional fishery management council develop annual catch limits (ACLs) and accountability measures (AMs) for each of its managed fisheries, such that each FMP under its jurisdiction has a mechanism for specifying ACLs at a level that overfishing does not occur in the fishery (16 U.S.C. 1853(a)(15)). The reauthorized MSA strengthened provisions to prevent and end overfishing and rebuild depleted fisheries. NMFS revised National Standard (NS) guidelines at 50 CFR part 600, to integrate these new requirements intended to reduce overfishing with existing provisions related to overfishing, rebuilding overfished stocks, and achieving optimum yield. On January 16, 2009, NMFS issued guidelines for NS (74 FR 3178). NMFS revised those 2009 final NS guidelines on October 18, 2016 (81 FR 71858). Information in this document regarding the NS guidelines reflects the 2016 revisions.

Amendments 96 to the BSAI FMP and 87 to the GOA FMP established the EC category and designated prohibited species (defined in Table 2b to 50 CFR part 679, and includes salmon, steelhead trout, crab, halibut, and herring) and forage fish (as defined in Table 2c to 50 CFR part 679 and § 679.20(i)) as EC species in both the BSAI and GOA FMPs.

Ecosystem component species (50 CFR 600.305(c)(5) & (d)(13) and 50 CFR 600.310(d)(1)) are stocks that a Council or the Secretary has determined do not require conservation and management, but desire to list in an FMP in order to achieve ecosystem management objectives. Retention and personal use of ecosystem species is allowed, subject to maximum retainable amount (MRA) limits. However current Federal regulations at 50 CFR 679.20(i) prohibit the processing and sale of ecosystem component species in Alaska unless they are processed as fishmeal.

> (i) *Forage fish, grenadiers, and squids*—(1) Definition. See Table 2c to 50 CFR part 679.
>
> (2) *Applicability*. The provisions of §679.20(i) apply to all vessels fishing for groundfish in the BSAI or GOA, and to all vessels processing groundfish harvested in the BSAI or GOA.
>
> (3) *Closure to directed fishing*. Directed fishing for forage fish, grenadiers, and squids is prohibited at all times in the BSAI and GOA.
>
> (4) *Limits on sale, barter, trade, and processing*. The sale, barter, trade, or processing of forage fish, grenadiers, and squids is prohibited, except as provided in paragraph (i)(5) of this section.
>
> (5) *Allowable fishmeal production*. Retained catch of forage fish, grenadiers, or squids not exceeding the maximum retainable amount may be processed into fishmeal for sale, barter, or trade.

When Amendments 96/87 were passed by the Council, the stated intention was that prohibited species and forage fish would be in the new EC category, while retaining the current management regime for them[1]. Because retention, processing, and sale of prohibited species and forage fish was not permitted before they were placed in the EC category, retention, processing, and sale was not permitted once they were in the EC category. The Council did not indicate whether or not they intended that any other species added to the EC category would also be excluded from processing and sale, or whether they intended that management measures in place for those species before being moved into the EC category would be retained.

[1] Page vi-vii Environmental Assessment for Amendment 96 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area and Amendment 87 to the Fishery Management Plan for Groundfish of the Gulf of Alaska to Comply with Annual Catch Limit Requirements.

In June 2017, the Council took final action to move squids to the EC category in the BSAI and GOA (BSAI FMP Amendment 117, GOA FMP Amendment 106). Final action had been delayed after June 2016 to allow completion of revised National Standard guidelines, and followed recommendations from the groundfish plan teams in 2015 that consideration be given to moving squids into the EC. Recommendations from the plan teams were based on difficulty in establishing catch specifications for squid in both management areas and concerns that in the Eastern Bering Sea (EBS) pollock fishery, moving away from areas of squid incidental catch interfered with the fleet's avoidance of Chinook and chum salmon and herring prohibited species catch (PSC). Assessment authors, the plan teams, and the Council's Scientific and Statistical Committee (SSC) all agreed that it would be highly unlikely that catch levels at the time would result in conservation concerns for BSAI or GOA squids. The Council, therefore, took initial action in 2015, and final action in June 2017. In contrast to the Amendment 96/87 analysis, the Council was clear in its intention when moving squids to the EC category. When describing the Alternative to move squids to the EC category, the analysis states the Council's intention that "By prohibiting directed fishing, maintaining the MRA, and maintaining record keeping and reporting requirements, the status quo would effectively be maintained while precluding any significant increase in bycatch." Further, in the analysis of impacts of Alternative 2, the RIR[2] states that "Much of the retained catch of squid has been processed into whole bait and whole fish/food fish in the past, and these production types would likely continue to be processed under this option." However, the final rule revised regulations at 679.20 (i)(5) to limit processing of squids into fishmeal, as was done for forage fish and grenadiers. *The inclusion of squids in that paragraph negated the Council's intent in the action to continue to allow processing and sale of squids as whole bait.* At this time, the Council is reviewing whether to recommend revisions to allow processing and sale of squids and sculpins in any product form.

In December 2018, the Council directed staff to produce a discussion paper evaluating the appropriate level of conservation and management required for sculpins in the BSAI and the GOA consistent with the MSA and NS guidelines. The Council's motion directed staff to assess whether the best available scientific information indicates that sculpins could be managed as non-target species, specifically whether sculpins could be identified as "non-target ecosystem component species not in need of conservation and management."

In April 2019, the Council reviewed the discussion paper evaluating the appropriate level of conservation and management required for sculpins in the BSAI and GOA consistent with the MSA and NS guidelines. After review and public testimony, the Council initiated an analysis to designate sculpins in the BSAI and GOA as non-target, EC species. The Council took final action (BSAI FMP Amendment 121, GOA FMP Amendment 110) to move sculpins into the EC category in October 2019. During that analysis, staff noted that moving sculpins into the EC category would result in prohibitions on retention, processing, and sale of sculpins other than as fishmeal as is the case for all other EC species, including squid. Although the Council disagreed with the regulation prohibiting processing and sale of sculpins and squid, they chose to proceed with the change in status for sculpins. At the same meeting, the Council initiated this analysis to reconsider the processing and sale restrictions on squids and sculpins in the EC category. No other species in the EC category are considered in this analysis, and processing and sale restrictions will remain in place for prohibited species, forage fish, and grenadiers under any of the alternatives.

1.3 Description of Management Area

This action pertains to all management areas in the GOA (Figure 1-1) and BSAI (Figure 1-2). In both FMP areas, squids are managed in the EC category, and sculpins will be managed in the EC category if

[2] [2] Page 93 Secretarial Review Draft Environmental Assessment/Regulatory Impact Review for Proposed Amendment 117 (BSAI) and 106 (GOA) to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Groundfish and Gulf of Alaska.

the FMP amendments and implementing regulations regarding sculpins are approved by the Secretary, which is anticipated to be effective in 2021.

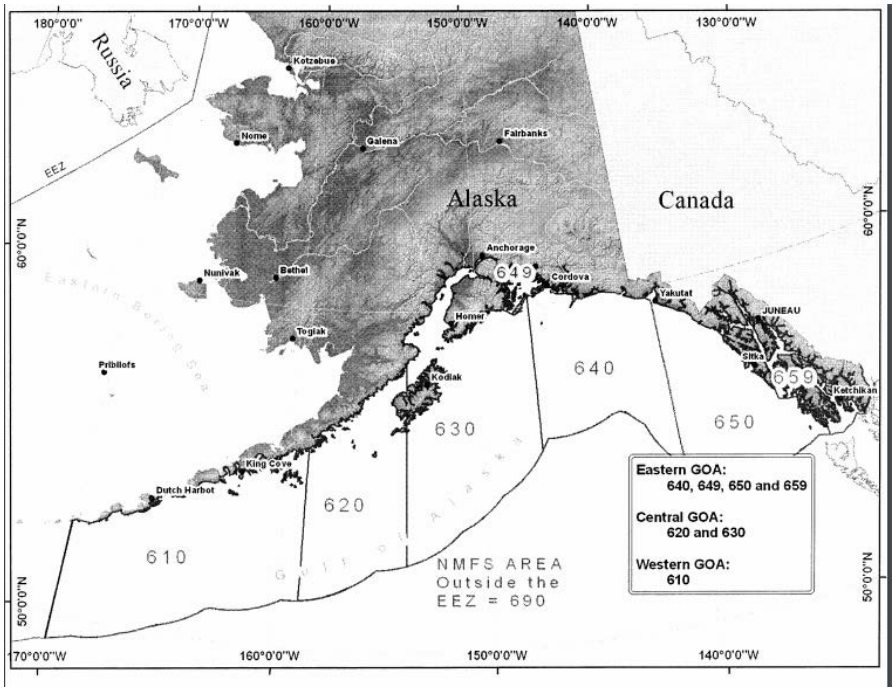

Figure 1-1 NMFS regulatory and reporting areas in the GOA[3]

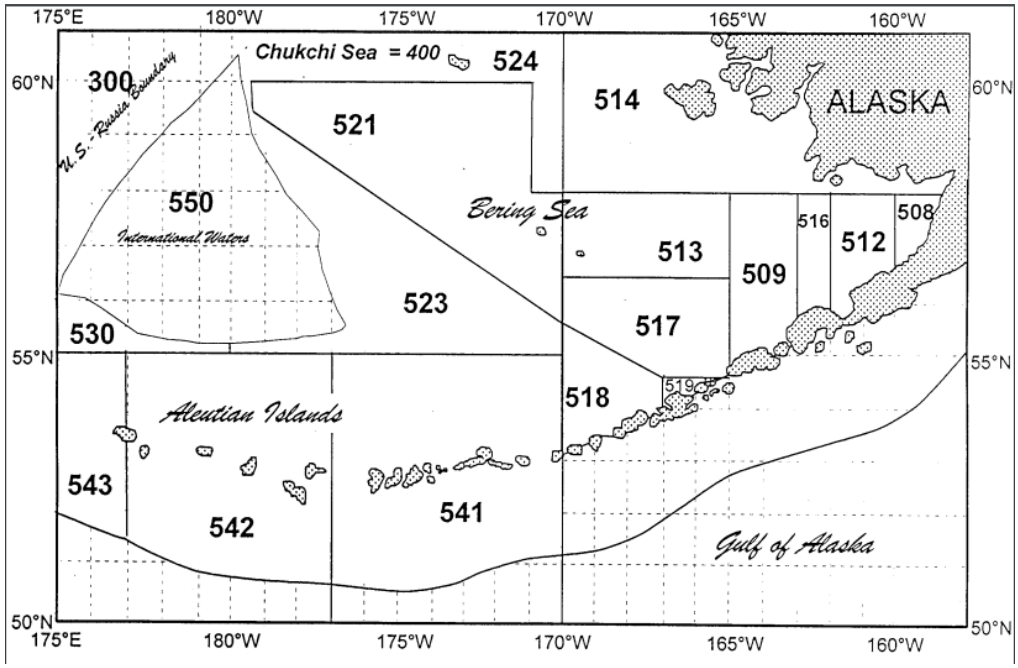

Figure 1-2 NMFS BSAI sub-areas for management[4]

[3] Figure 3 to 50 CFR 679
[4] Figure 1 to 50 CFR 679

2 Description of Alternatives

The Council adopted the following alternatives for analysis in October 2019.

2.1 Alternative 1: Status quo. Squids and sculpins in both the BSAI and GOA FMPs are designated as non-target ecosystem component species with prohibition on the use of squids and sculpins other than as fishmeal.

Under Alternative 1, squids and sculpins remain in the EC category in the BSAI and GOA FMPs, establishment of OFL, ABC, and TACs are not required. Directed fishing for squids and sculpins is prohibited, and the squids and sculpins maximum retainable amount (MRA) when directed fishing for other groundfish species is 20%. The sale, barter, trade, or processing of squids and sculpins is prohibited, except as fishmeal. Recordkeeping and reporting to monitor and report catch and discards of squids and sculpins annually is required.

2.2 Alternative 2: Squids and sculpins in both the BSAI and GOA FMPs are designated as non-target "ecosystem component species".

Under Alternative 2, squids and sculpins remain in the EC category in the BSAI and GOA FMPs, establishment of OFL, ABC, and TACs are not required. Directed fishing for squids and sculpins is prohibited, and the squids and sculpins MRA when directed fishing for other groundfish species is 20%. There is no prohibition on the sale, barter, trade, or processing of incidental, retained squids or sculpins. Recordkeeping and reporting to monitor and report catch and discards of squids and sculpins annually is required.

2.3 Meeting the requirements for Ecosystem Component

Section 302(h)(1) of the MSA requires a Council to prepare an FMP for each fishery under its authority that requires (or in other words, is in need of) conservation and management. NMFS has recently published guidelines to aid the Councils as they consider whether a stock requires conservation and management, and if so, how the Council s should meet the requirements of the National Standards (NS) in section 301(a) of the MSA. The NS general guidelines in 50 CFR 600.305(d) define how stocks should be classified in an FMP, and include descriptions of *Target stocks*, *Non-target species* and *non-target stocks*, and *Ecosystem Component Species*. The analyses for Amendments 117/106 (squid to EC) and Amendments 121/110 (sculpin to EC) provide detailed application of the NS guidelines for squids and sculpins, respectively, and readers are directed to those analyses for that detailed review. The following Table 2-1 and Table 2-2 summarize the application of the NS guidelines regarding squids and sculpins.

Table 2-1 National Standard factors a Council should consider when deciding whether stocks require conservation and management, and their relevance to sculpins in the BSAI and GOA.

National Standard Factor	Relevance to sculpins in Alaska
i. The stock is an important component of the marine environment.	• Sculpins are predators of the shelf and slope ecosystems in the BSAI and GOA.
ii. The stock is caught by the fishery.	• Sculpins are caught incidentally to other groundfish fisheries in the BSAI and GOA.
iii. Whether a FMP can improve or maintain the condition of the stock	• Sculpins are not experiencing overfishing and fishing related mortality is low in both the BSAI and GOA . • There is no directed fishing for sculpins in either the BSAI or GOA. • In the absence of directed fishing, sculpins are very unlikely to become overfished in either the BSAI or GOA.
iv. The stock is a target of a fishery.	• There is no directed fishing for sculpins in either the BSAI or GOA.
v. The stock is important to commercial, recreational, or subsistence users.	• Sculpins are not considered important to commercial or recreational users in either the BSAI or GOA; however, there is some limited ongoing use of sculpins for fish meal. There is also some limited use of sculpins for subsistence by Alaska Natives in the Norton Sound region.
vi. The fishery is important to the Nation or to the regional economy.	• Sculpins have limited economic value relative to other BSAI and GOA groundfish and are not considered important to the National or regional economy.
vii. The need to resolve competing interests and conflicts among user groups, and whether a FMP can further that resolution.	• There is no directed fishing for sculpins in either the BSAI or GOA, no allocations to user groups, and no competing interests or conflicts among user groups relative to sculpins.
viii. The economic condition of a fishery and whether a FMP can produce more efficient utilization.	• Sculpins have limited economic value relative to other BSAI and GOA groundfish. • Retention of sculpins has varied but is currently less than 5% in both the BSAI and GOA.
ix. The needs of a developing fishery, and whether a FMP can produce more efficient utilization.	• There is currently no developing fishery for sculpins in either the BSAI or GOA. • Existing FMPs could adequately manage any new fishery.
x. The extent to which the fishery is already adequately managed by states, by state/Federal programs, or by Federal regulations pursuant to other FMPs or international commissions, or by industry self-regulation, consistent with the requirements of the MSA and other applicable law.	• Currently, there is no directed fishing for sculpins in either the BSAI or GOA in state or Federal waters.

Table 2-2 National Standard factors a Council should consider when deciding whether stocks require conservation and management, and their relevance to squids in the BSAI and GOA.

National Standard Factor	Relevance to squids in Alaska
i. The stock is an important component of the marine environment.	• Squids are important prey species for marine mammals, fish, and other squid.
ii. The stock is caught by the fishery.	• Squids are caught incidentally in the BSAI and GOA groundfish fisheries
iii. Whether a FMP can improve or maintain the condition of the stock	• Squids are short lived and highly productive. • Bottom trawl surveys are considered substantial underestimates of true squid biomass in both the BSAI and GOA. • Fishing related mortality is low compared with estimated predation mortality in food web models. • Squid are unlikely to become overfished in the absence of a directed fishery.
iv. The stock is a target of a fishery.	• There is no directed fishing for squids in either the BSAI or GOA.
v. The stock is important to commercial, recreational, or subsistence users.	• Squids are not considered important to commercial, recreational, or subsistence users.
vi. The fishery is important to the Nation or to the regional economy.	• Squids have limited economic value relative to many of the BSAI and GOA groundfish, and are not considered important to the Nation or to the regional economy.
vii. The need to resolve competing interests and conflicts among user groups, and whether a FMP can further that resolution.	• There is no directed fishery for squids, no allocations, and no conflicts for an FMP to resolve.
viii. The economic condition of a fishery and whether a FMP can produce more efficient utilization.	• There is no directed fishing for squids in either the BSAI or GOA. • Squids have limited economic value relative to many of the BSAI and GOA groundfish.
ix. The needs of a developing fishery, and whether a FMP can produce more efficient utilization.	• There is currently no developing fishery for squids in either the BSAI or GOA. • Market squids have been seen in Southeast Alaska and may become fishable in the future. • Existing FMPs could adequately manage any new fishery.
x. The extent to which the fishery is already adequately managed by states, by state/Federal programs, or by Federal regulations pursuant to other FMPs or international commissions, or by industry self-regulation, consistent with the requirements of the MSA and other applicable law.	• Currently, there is no directed fishing for squids in either the BSAI or GOA in state or Federal waters.

2.4 Comparison of Alternatives

Because squids are already in the EC category, and the Council took final action to move sculpins into the EC category in October 2019, the only real difference in these alternatives is the allowance for processing and sale of squids and sculpins as either fishmeal only (Alt 1) or without the fishmeal-only regulation (Alt 2). Table 2-1 provides a summary of the two alternatives considered in this action.

Table 2-3 Summary of Management Measures in Alternatives 1 and 2

Management Measure	Alt 1- No Action	Alt 2 – No Processing Restrictions
Prohibit Directed Fishing	**Yes** Prohibit directed fishing in regulations at 679.20(i)	**Yes** Prohibit directed fishing in regulations at 679.20(i)
Retention and Sale	**Yes** Retention and sale allowed as fishmeal only, subject to MRA limits.	**Yes** Retention and sale as any product form allowed, subject to MRA limits.
Annual Harvest Specifications	**No** - Periodic reports on biomass information from current surveys will be included in the SAFE - Catch does not accrue to optimum yield cap	**No** - Periodic reports on biomass information from current surveys will be included in the SAFE - Catch does not accrue to optimum yield cap
Incidental Catch Management	**Yes** MRA = 20% for all basis species	**Yes** MRA = 20% for all basis species
Recordkeeping and Reporting	**Yes** Require catch reporting	**Yes** Require catch reporting

3 Biological and Fishery information

3.1 Squids

3.1.1 Squid status and role in the ecosystem

Squid are marine mollusks in the class Cephalopoda (Group Decapodiformes). They are streamlined animals with ten appendages (2 tentacles, 8 arms) extending from the head, and lateral fins extending from the rear of the mantle. Squids are active predators which swim by jet propulsion. Squids are important components in the diets of many seabirds, fish, and marine mammals, as well as voracious predators, themselves, on zooplankton and larval fish (Caddy 1983, Sinclair et al. 1999). In the BSAI and GOA, squids can be found at depths from 10 m to greater than 1500 m. The vertical distribution of squids make some species more available for mammal and seabird predators, and for surveys and fisheries using bottom trawls.

In the BSAI and GOA regions there are at least 15 species of squids (Table 3-1). The most abundant species is *Berryteuthis magister*. All but one, *Rossia pacifica* (North Pacific bobtail squid), are pelagic but *Berryteuthis magister* and *Gonatopsis borealis* (boreopacific armhook squid) are often found near the bottom. The vertical distribution of these three species is the probable cause of their predominance in the NMFS bottom trawl surveys relative to other squid species, although no squid species appear to be well-sampled by NMFS surveys. Most species are associated with the slope and basin, with the highest species diversity along the slope region of the Bering Sea between 200 – 1500 m. Since most of the data come from groundfish survey bottom trawls, the information on abundance and distribution of those species associated with the bottom is much more accurate than that of the pelagic species (Ormseth, 2016b).

Table 3-1. Squids present in the BSAI and GOA.

Class Cephalopoda; Order Oegopsida	
Family Chiroteuthidae	
Chiroteuthis calyx	
Family Cranchiidae	Glass squid
Belonella borealis	
Galiteuthis phyllura	
Family Gonatidae	Armhook squid
Berryteuthis anonychus	Minimal armhook squid
Berryteuthis magister	Magistrate armhook squid
Eogonatus tinro	
Gonatopsis borealis	Boreopacific armhook squid
Gonatus berryi	Berry armhook squid
Gonatus madokai	
Gonatus middendorffi	
Gonatus onyx	Clawed armhook squid
Family Onychoteuthidae	Hooked squid
Moroteuthis robusta	Robust clubhook squid
Onychoteuthis borealijaponicus	Boreal clubhook squid
Class Cephalopoda; Order Sepioidea	
Rossia pacifica	North Pacific bobtail squid

As Alaskan waters are warming, market squid (*Doryteuthis opalescens*) are beginning to show up in GOA waters that were previously considered too cold for them. They have been observed spawning in southeast Alaska since at least 2015[5]. The Alaska Department of Fish and Game (ADF&G) does not do any kind of stock assessment on the amount of squid in southeast Alaska waters, so the numbers of market squid are not known.

Market squid are a saleable eating squid and there is an active fishery for these squid in California, which is managed by the California Fish and Game Commission. There is no active market squid fishery in Alaska, but a proposal has been submitted to the Alaska Board of Fisheries (BOF) to open a state purse seine market squid fishery. The proposal was not authorized, in part because of concerns about bycatch of declining king salmon stocks and a general lack of data on market squid in Alaska.

To date, there has not been any interest in directed fishing for the more common species of squid in Alaskan waters since there is not much of a market, other than selling some incidentally-caught squid as bait. However, should market squid be considered abundant enough to support a Federal fishery in Alaska in the future, the Council could consider the appropriate category for them in the BSAI or GOA FMPs.

3.1.2 Life History

The life histories of squids in the BSAI and GOA are almost entirely unknown (Ormseth, 2016b). Of all the species, only *Rossia pacifica* has benthic larvae and only members of the family Gonatidae and Cranchiidae are known to spawn in the Bering Sea region.

Life history information for BSAI squid can be inferred from data on squid species elsewhere. Relative to most groundfish, squid are highly productive, short-lived animals. They display rapid growth, patchy distribution and highly variable recruitment (O'Dor, 1998). Unlike most fish, squid may spend most of their life in a juvenile phase, maturing late in life, spawning once, and dying shortly thereafter. Many squid populations are composed of spatially segregated schools of similarly sized individuals, which may migrate, forage, and spawn at different times of year over a wide geographic area (Lipinski 1998; O'Dor 1998). Most information on squid refers to *Illex* and *Loligo* species which support commercial fisheries in temperate and tropical waters. Of North Pacific squid, life history is best described for western Pacific stocks (Arkhipkin et al., 1995; Osako and Murata, 1983).

The most commercially important squid in the north Pacific is the magistrate armhook squid, *Berryteuthis magister*. This species is distributed from southern Japan throughout the Bering Sea, Aleutian Islands, and Gulf of Alaska to the U.S. west coast as far south as Oregon (Roper et al. 1984). A study completed in 2008 investigated life history and stock structure of this species in the EBS (Drobny 2008). In the EBS, *B. magister* appear to have an approximately 1-year life cycle. *B. magister* in the EBS appear to grow and mature more quickly than their conspecifics in Russian and Japanese waters. Squid growth appears to be heavily influenced by ocean temperature (Forsythe 2004), which may account for some of the regional and temporal variability.

Populations of *B. magister* and other squid are complex, being made up of multiple cohorts spawned throughout the year. *B. magister* are dispersed during summer months in the western Bering Sea, but form large, dense schools over the continental slope between September and October. Three seasonal cohorts are identified in the region: summer-hatched, fall-hatched, and winter-hatched. Growth, maturation, and mortality rates vary between seasonal cohorts, with each cohort using the same areas for different portions of the life cycle. Juvenile and adult *B. magister* also appear to be separated vertically in the water column.

[5] https://www.seattletimes.com/nation-world/alaska-board-receives-proposal-for-southeast-squid-fishery/

3.1.3 Trawl survey biomass estimates and distribution

The AFSC bottom trawl surveys are directed at groundfish species, and therefore do not employ the appropriate gear or sample in the appropriate places to provide reliable biomass estimates for most squid, which are generally pelagic or, if demersal, reside off bottom. The largest biomass of squid is found at depths below 200 m (Horne and Parker-Stetter 2010). Catches of squid in the EBS shelf survey are highly variable and coefficients of variation are high, and it is likely that few squid inhabit the bottom waters of the shelf (Ormseth, 2016b). The EBS slope survey, which samples the shelf break area and much deeper waters, generally catches greater numbers of squid (Table 3-2), although again coefficients of variation are high. *Berryteuthis magister*, *G. borealis*, and *R. pacifica* are the most common squid in the slope survey (Ormseth, 2015b). In the Aleutian Islands (AI), *B. magister* is the only squid species captured in abundance (Table 3-2).

Biomass estimates for the GOA have fluctuated considerably since 1984, with the 2015 biomass estimate (14,079 t) the highest ever observed (Table 3-3; Ormseth, 2015a). The survey also almost certainly underestimates squid biomass. For example, a mass-balance ecosystem model of the GOA estimates the squid population at 369,309 mt (Ormseth, 2016a).

Squid records from these surveys tend to appear at the edges of the continental shelf in the eastern Bering Sea and in the Aleutian Islands. This is consistent with results from 1988 and 1989 Japanese / U.S. pelagic trawl research surveys in the EBS that indicated that the majority of squid biomass is distributed in pelagic waters off the continental shelf (Sinclair et al. 1999), beyond the current scope of the AFSC surveys. It is also consistent with the observation that the largest biomass of squid is found at depths below 200 m (Horne and Parker-Stetter 2010).

Table 3-2 Survey biomass estimates ("bio" in metric tons) and coefficients of variation (CV) of squids for the EBS shelf, EBS slope, and AI. Estimates are included for the principal species caught in each survey. Numerous species occur on the slope and are included in the "total squid" category for that region. From Ormseth, 2016a.

	EBS Shelf				EBS Slope								AI	
	R. pacifica		*B. magister*		*R. pacifica*		*B. magister*		*G. borealis*		*B. magister*		*Misc. squid*	
	bio	CV	bio	CV	bio	CV	bio	CV	bio	CV	bio	CV	bio	CV
2000	13	0.45	42	0.82							2758	0.18		
2001	20	0.51	280	0.42										
2002	33	0.36	0		52	0.18	1,197	0.12	2	0.74	2,088	0.14	18	0.27
2003	27	0.37	16	1.00										
2004	6	0.82	0		28	0.19	1,418	0.14	52	0.37	3,2501	0.37	14	0.78
2005	13	0.67	0											
2006	9	0.74	47	1.00							1,467	0.14		
2007	11	0.71	0											
2008	8	0.52	0		35	0.33	1,675	0.10	5	0.41			22	0.26
2009	9	0.41	623	1.00										
2010	42	0.60	9	1.00	67	0.25	1,831	0.10	8	0.32	2,444	0.22	17	0.36
2011	25	0.51	1	1.00										
2012	25	0.43	43	1.00	42	0.23	1,284	0.09	13	0.40	4,011	0.28	7	0.33
2013	146	0.84	28	1.00										
2014	24	0.49	0								6,178	0.30		
2015	91	0.40	61	0.66										
2016	41	0.52	7	1.00	29	0.30	1,127	0.20	7	0.30	3,808	0.38	7	0.33

Table 3-3 Biomass estimates and coefficient of variation (CV) of squid species from NMFS GOA bottom trawl surveys, 1984-2015. From Ormseth 2015b.

	Miscellaneous squid		*B. magister*		All squid	
Year	Biomass(t)	CV	Biomass(t)	CV	Biomass(t)	CV
1984	546	0.35	2762	0.15	3308	0.14
1987	577	0.30	4,506	0.34	5,083	0.30
1990	276	0.43	4,033	0.17	4,309	0.16
1993	1,029	0.73	8,447	0.13	9,476	0.14
1996	26	0.28	4,884	0.14	4,911	0.14
1999	254	0.46	1,873	0.13	2,127	0.13
2001	703	0.62	5,909	0.30	6,612	0.27
2003	71	0.23	6,251	0.18	6,322	0.18
2005	249	0.51	4,654	0.18	4,903	0.18
2007	359	0.49	11,681	0.20	12,040	0.20
2009	188	0.61	8,415	0.16	8,603	0.16
2011	392	0.65	4,040	0.13	4,431	0.14
2013	568	0.80	9,675	0.16	10,243	0.16
2015	387	0.65	13,692	0.12	14,079	0.12

3.1.4 Harvest specifications

Establishing harvest specifications for squid before they were placed in the EC category was problematic because reliable biomass estimates for squids currently do not exist. Furthermore, squid are not the target of any directed fishery but are caught incidentally. Biomass estimation is further complicated by their short-life history. Because of these complications, squid were assessed as a Tier 6 species in the BSAI and GOA before they were placed in the EC category in both FMPs in 2018. The status of squids is now reported to the Plan Teams every other year, as part of the forage species report.

Because historical catch has been used to estimate a sustainable level before squids were moved to the EC category, there is very little certainty in the abundance of squids in the BSAI or GOA. This also makes it difficult to estimate the proportion of the population that has been or may be caught incidentally to targeted species fisheries. However, the analysis for Amendment 117 to the BSAI FMP and 106 to the GOA FMP that moved squids to the EC category in the BSAI and GOA assumed that conditions and incidental catch would remain similar to past patterns, and that future catch would be unlikely to result in harm to the squid stocks in the BSAI and GOA.

3.1.5 Catch and retention

Squids are EC species that are caught incidentally in prosecution of groundfish fisheries in the BSAI and GOA. In both the BSAI and GOA, the vast majority of squids are caught in the pollock fisheries. Catch of squid in other target species fisheries is minimal (Table 3-4, Table 3-5).

Table 3-4 Squid catch (mt) and total retained (mt) by target species fishery in the BSAI 2009 – 2018

Target	Catch	Retained
Arrowtooth flounder	530	4
Atka mackerel	151	2
Flathead sole	27	0
Greenland turbot	64	0
Kamchatka flounder	306	1
Other flatfish	16	0
Pacific cod	4	0
Pollock	9,658	6,962
Rock sole	0	0
Rockfish	387	2
Sablefish	8	0
Yellowfin sole	2	0
BSAI total	11,153	6,971

Source: AKFIN December 2019.

Table 3-5 Squid catch (mt) and total retained (mt) by target species fishery in the GOA 2009 - 2018

Target	Catch	Retained
Arrowtooth flounder	129	3
Deep water flatfish	1	0
Flathead sole	2	0
Pacific cod	3	3
Pollock	1,555	1,447
Rex sole	8	0
Rockfish	161	5
Sablefish	9	0
Shallow water flatfish	1	0
GOA Total	1,869	1,458

Source: AKFIN December 2019

Preliminary estimates of squid catch in 2019 in the BSAI is 5,185 mt, and 50 mt in the GOA. The squid catch in the BSAI is more than twice the previous high catch in the modern era (2.364 mt in 2015) and is the highest catch since 1981. The majority of the squid catch in 2019 occurred in the vicinity of Bering Canyon (Ormseth 2019) in the pollock fishery. There are likely a number of factors that contributed to the higher than expected squid catch in 2019, including potentially increased squid biomass, spatial distribution of squid in the EBS, reduced incentive for the pollock fleet to avoid squids, and limitations on the pollock fleet to avoid salmon and sablefish in 2019. In addition, there was some confusion regarding the allowable use of squids and some squids were retained for sale as bait despite the limitation of processing to fishmeal only, at least until NMFS became aware of the practice and informed the processors (M. Furuness, NMFS, personal communication). Current management of squids in the ecosystem component, with processing restricted to fish meal, is an effective conservation measure because, while it lacks catch limits that would otherwise prevent overfishing, limits on retention and processing provide disincentives to avoid large incidental catches. Concern has been raised that removing

the processing limitation on squids will remove disincentives to avoid large incidental catches and may contribute to increased catches of squids in the future.

3.2 Sculpins

3.2.1 Sculpins status and role in the ecosystem

Sculpins are relatively small, demersal, teleost fishes with modified pectoral fins that allow them to grip the substrate, and they lack swim bladders. They consist of four diverse families off Alaska (Cottidae, Hemitripteridae, Psychrolutidae, and Rhamphocottidae). Sculpins are found in both freshwater and marine habitats, and are distributed throughout the BSAI and GOA where they occupy all benthic habitats along continental shelf and slope areas. Sculpins occupy depths from nearshore sand and mud bottoms at 20 m to below 1,000 m along broad sloping and steep canyon areas. Sculpins range in size from less than 10 cm to 80 cm, and size differences may reflect their varied roles in the ecosystem.

Sculpins are predators of the shelf and slope ecosystems (TenBrink and Aydin 2009), consuming a wide variety of benthic prey including commercially important crabs and fishes. Larger sculpin species prey on shrimp, crabs, and fishes including juvenile walleye pollock. Smaller sculpin species feed mainly on shrimp and benthic amphipods.

3.2.2 EBS and AI Survey

The five most abundant species of sculpin from the EBS shelf survey are measured annually: plain and great sculpin since 1998, warty and bigmouth sculpin since 2000, and yellow Irish lord since 2003. Size compositions of blob, bigmouth, spinyhead, and darkfin sculpin are measured on the slope survey, and size compositions of bigmouth yellow Irish lord, and great sculpin are measured on the AI survey.

Research surveys provide biomass estimates for sculpin species in the BSAI. All three regions of the BSAI (EBS shelf, EBS slope, and AI) were sampled in 2004, 2010, 2012, and 2016 (Figure 3-1). The EBS shelf survey is performed annually, and the AI and slope surveys are typically biennial, although there was no AI survey in 2008 and no slope survey in 2014. The low coefficient of variation for most of the biomass estimates of the more abundant species suggests that the EBS shelf bottom trawl survey adequately estimates the biomass of these species (Spies et al. 2016).

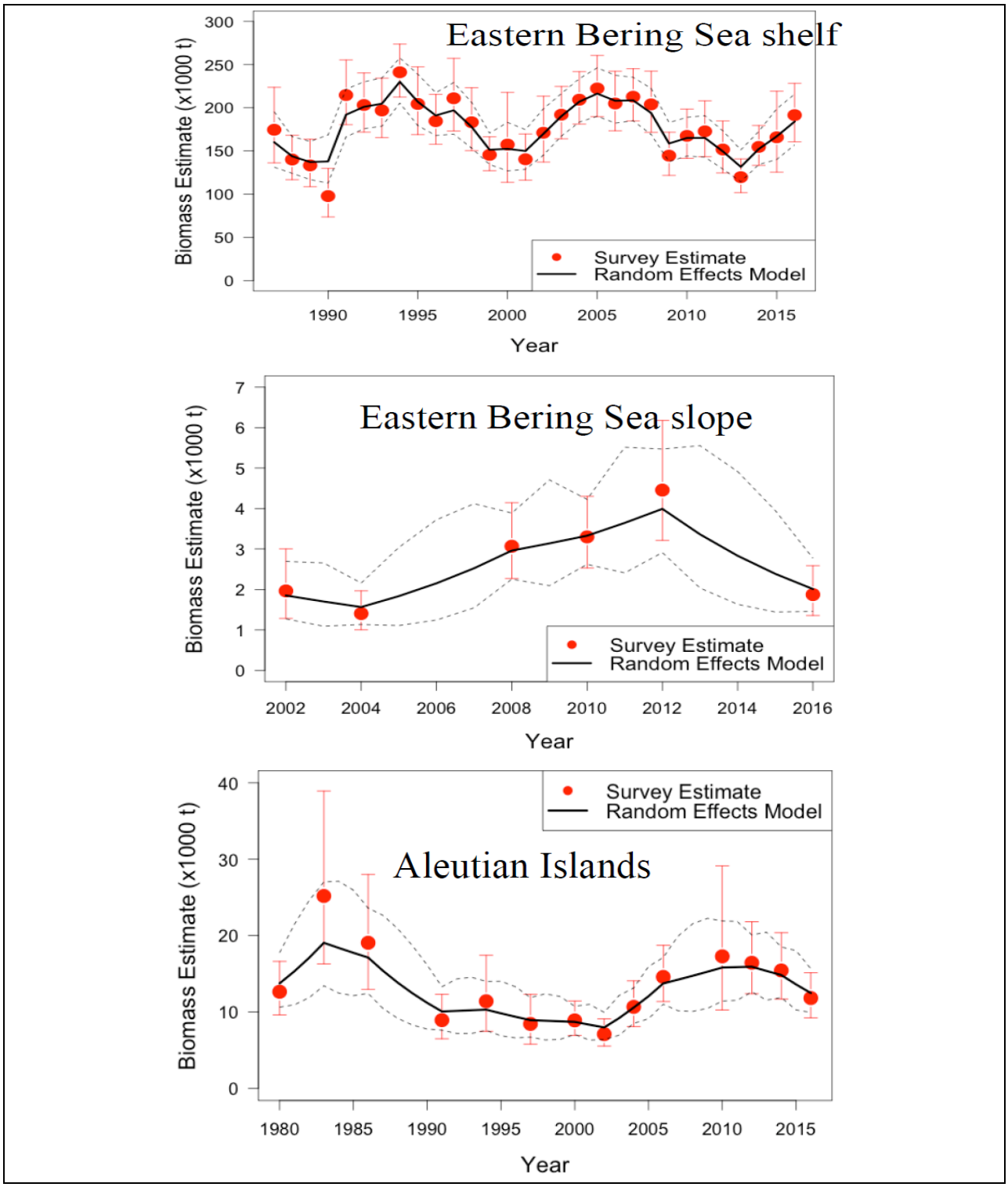

Figure 3-1 **Random effects model estimates of biomass by region for the six most common shelf sculpins (top), slope (middle), and Aleutian Islands (bottom). Error bars represent 95% confidence intervals for survey estimates of biomass, and dotted lines represent 95% confidence intervals from the random effects model. From Spies et al. 2016.**

3.2.2.1 GOA Survey

Aggregate sculpin biomass estimates in the GOA are derived from the GOA bottom trawl surveys (Figure 3-2). In the GOA, approximately 97% of the sculpin biomass is comprised of the larger sculpin species: great, plain, bigmouth, and yellow Irish lord. Yellow Irish lord is currently the most abundant (59% of all sculpin biomass) followed by great sculpin (23%), bigmouth sculpin (14%), and plain sculpin (4%). The low coefficients of variation for the survey biomass estimates of the four most abundant species suggest that the GOA survey is doing an adequate job assessing the biomass of the more abundant species (Spies et al. 2017).

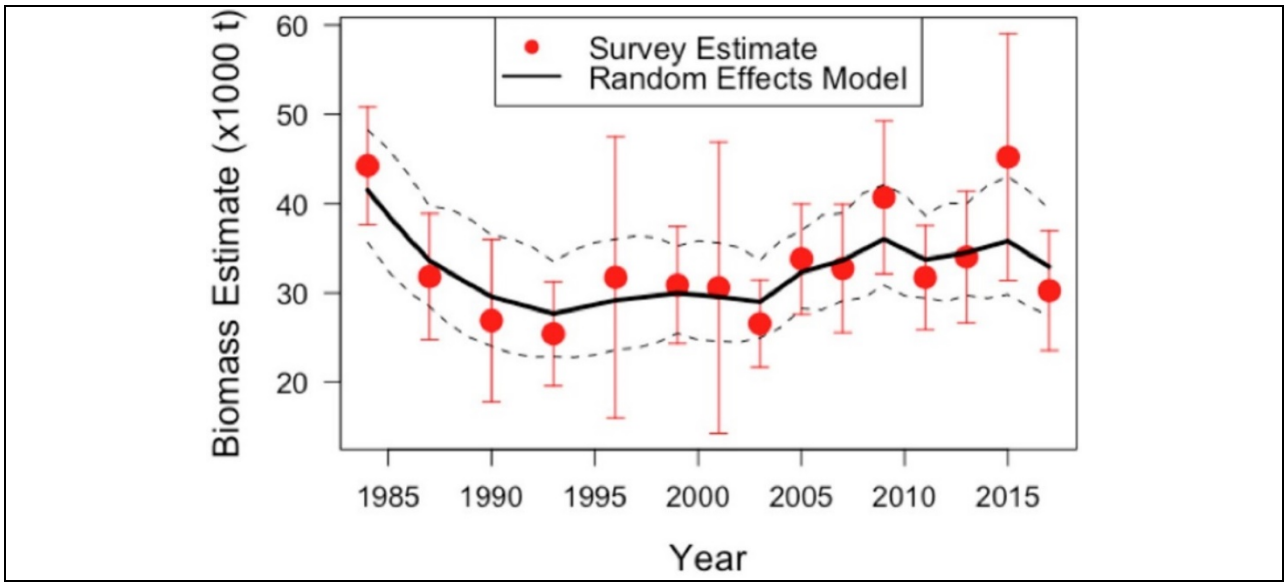

Figure 3-2 Random effects model estimates of biomass for the five most common sculpins in the GOA complex. Error bars represent 95% confidence intervals for survey estimates of biomass, and dotted lines represent 95% confidence intervals from the random effect model. From Spies et al. 2017.

3.2.2.2 Fishery Catch

Sculpins are currently taken only as bycatch while directed fishing for other target species in the BSAI and GOA (Spies et al. 2016). Since 2011, the sculpin complex total catch (retained and discarded) has ranged from 2% to 6% of the total estimated sculpin biomass in the BSAI and GOA (Table 3-6).

Table 3-6 Biomass (Random effects model estimate), total allowable catch (TAC), acceptable biological catch (ABC), Overfishing Limit (OFL), catch of the BSAI (top) and GOA (bottom), and catch/biomass ratio for the sculpin complex 2011 to 2019. *Catch estimated through February 2019.

	BSAI					
Year	Biomass (mt)	OFL (mt)	ABC (mt)	TAC (mt)	Catch (mt)	Catch/Biomass
2011	199,348	58,300	43,700	5,200	5,377	0.03
2012	183,942	58,300	43,700	5,200	5,798	0.03
2013	171,523	56,400	42,300	5,600	5,864	0.03
2014	189,359	56,400	42,300	5,600	4,902	0.03
2015	186,386	52,365	39,725	4,700	5,003	0.03
2016	199,937	52,365	39,725	4,500	4,911	0.02
2017	188,656	56,582	42,387	4,500	5,338	0.03
2018	188,656	53,201	39,995	5,000	5,105	0.03
2019	188,656	53,201	39,995	5,000	5,420	0.03

	GOA					
Year	Biomass (mt)	OFL(mt)	ABC(mt)	TAC (mt)	Catch (mt)	Catch/Biomass
2011	33,729	7,328	5,496	5,496	774	0.02
2012	34,112	7,641	5,731	5,731	794	0.02
2013	34,500	7,641	5,731	5,731	1,964	0.06
2014	35,155	7,448	5,569	5,569	1,182	0.03
2015	35,823	7,448	5,569	5,569	1,018	0.03
2016	34,340	7,338	5,591	5,591	1,330	0.04
2017	32,918	7,338	5,591	5,591	1,316	0.04
2018	34,943	6,958	5,301	5,301	610	0.02
2019	33,124	6,958	5,301	5,301	603	0.02

Source: NMFS AKRO Catch Accounting System, accessed 12/18/2019

If Amendments 121 to the BSAI FMP and 110 to the GOA FMP are approved by the Secretary, ABC, OFL, and TAC will not be identified for sculpins in either the BSAI or GOA. If approved, Amendments 121/110 are not expected to have any effect on total catch of sculpins since sculpins are not targeted or marketed, and are only caught incidentally.

Table 3-7 Total catch in metric tons (mt) of all sculpins by target fishery in the BSAI, 2010– 2019.

Target fishery	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Yellowfin Sole - BSAI	81	110	93	57	43	8	13	8	9	6
Pollock - midwater	28	53	46	30	20	50	41	27	10	8
Pollock - bottom	44	68	68	37	24	2	8	2	0	1
Rock Sole - BSAI	3	3	1	1	3	3	2	0	37	3
Pacific Cod	0	1	0	0	0	0	1	0	7	1
Rockfish	0	1	0	0	0	0	0	1	0	1
Flathead Sole	3	0	1	0	1	1	0	1	0	1
Arrowtooth Flounder	1	0	0	1	0	0	0	1	0	0
Atka Mackerel	2	0	0	0	0	0	1	2	2	1
Alaska Plaice - BSAI	0	0	0	0	0	0	0	0	0	0
Total (t)	163	235	210	126	91	64	67	42	66	21

Source: AKFIN, accessed December 18, 2019

4 Regulatory Impact Review

This Regulatory Impact Review examines the benefits and costs of proposed alternatives limiting processing and sale of squids and sculpins as part of the Ecosystem Component category in the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (BSAI FMP) and the Fishery Management Plan for Groundfish of the Gulf of Alaska (GOA FMP). The RIR also assesses the potential impact of the alternatives on fishing communities and addresses other social impacts, if there are social impacts distinct from the economic impacts. In the case of this RIR, the potential impacts are primarily economic in nature. Analysts did not identify any impacts that would create adverse economic impacts on any fishing community or cause any other adverse social impacts.

The preparation of an RIR is required under Presidential Executive Order (E.O.) 12866 (58 FR 51735, September 30, 1993). The requirements for all regulatory actions specified in E.O. 12866 are summarized in the following Statement from the E.O.:

> In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and Benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider. Further, in choosing among alternative regulatory approaches agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.

E.O. 12866 requires that the Office of Management and Budget review proposed regulatory programs that are considered to be "significant." A "significant regulatory action" is one that is likely to:

- 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, competition, jobs, the environment, public health or safety, or State, local or tribal governments or communities;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this E.O. 12866.

4.1 Statutory Authority

Under the MSA (16 U.S.C. 1801, *et seq*.), the United States has exclusive fishery management authority over all marine fishery resources found within the exclusive economic zone (EEZ). The management of these marine resources is vested in the Secretary and in the regional fishery management councils (Councils). In the Alaska Region, the Council has the responsibility for preparing fishery management plans (FMPs) and FMP amendments for the marine fisheries that require conservation and management, and for submitting its recommendations to the Secretary. Upon approval by the Secretary, NMFS is charged with carrying out the Federal mandates of the Department of Commerce with regard to marine and anadromous fish.

Squids and sculpin harvests in the EEZ off Alaska are managed under the FMPs for Groundfish of the BSAI and GOA. The proposed action would amend these FMPs and Federal regulations at 50 CFR 679.

Actions taken to amend FMPs or implement other regulations governing these fisheries must meet the requirements of all applicable Federal laws, Executive Orders, and regulations.

4.2 Purpose and Need for Action

The Council adopted the following purpose and need statement in October 2019. Staff have identified some minor suggestions (underlined) to clarify the purpose and need.

> Squid is defined in the ecosystem component (EC) category in the FMPs for groundfish in the BSAI and GOA. The Council, in October 2019, took action to recommend that sculpins be defined in EC category in the BSAI and GOA as well. There are no directed fisheries for squid or sculpins in either the BSAI or GOA. Incidental catch of squid is retained in some fisheries and often utilized to prevent waste. Typically, sculpins are not retained but can be in some circumstances.
>
> The Council's June 2017 action to reclassify the squid complex into the EC category in the BSAI and GOA groundfish FMPs was based on the best available scientific information and was consistent with the revised National Standard 1 guidelines. ~~However, the f~~ Federal rulemaking to implement the Council's action ~~incorrectly~~ prohibited the use or sale of incidentally caught squid unless processed into fish meal. The June 2017 Council action and supporting analyses indicated: 1) retention of squids would continue at or slightly above current levels, and 2) past production types would continue to be allowed including whole bait and whole fish/food fish. The purpose of this action is to align regulations with the long-standing use of squid, the permissible use of squid based on the Council's June 2017 analysis and preferred alternative, and the permissible use of squid under the EC category.
>
> The Council's recent recommendation to establish sculpins in the EC category would limit the use of sculpins consistent with existing regulations for all other EC category species (50 CFR 679.20(i)). The Council does not wish to increase the time required to move sculpins into the EC category by modifying that action, but intends to review the disposition of sculpins consistent with squids and the flexibility provided by the EC category.

4.3 Alternatives

Alternative 1: Status quo. Squids and sculpins in both the BSAI and GOA FMPs are designated as non-target ecosystem component species with prohibition on the use of squids and sculpins other than as fishmeal.

Under Alternative 1, establishment of OFL, ABC, and TACs are not required. Directed fishing for squids and sculpins is prohibited, and the squids and sculpins maximum retainable amount when directed fishing for other groundfish species is 20%. The sale, barter, trade, or processing of squids and sculpins is prohibited, except as fishmeal. Recordkeeping and reporting to monitor and report catch and discards of squids and sculpins annually is required.

Alternative 2: Squids and sculpins in both the BSAI and GOA FMPs are designated as non-target "ecosystem component species".

Under Alternative 2, establishment of OFL, ABC, and TACs are not required. Directed fishing for squids and sculpins is prohibited, and the squids and sculpins maximum retainable amount when directed fishing for other groundfish species is 20%. There is no prohibition on the sale, barter, trade,

or processing of incidental, retained squids or sculpins. Recordkeeping and reporting to monitor and report catch and discards of squids and sculpins annually is required.

Because squids are already in the EC category, and the Council took final action to move sculpins into the EC category in October 2019, the only real difference in these alternatives is the allowance for processing and sale of squids and sculpins as either fishmeal only (Alt 1) or without the fishmeal only regulation (Alt 2).

4.4 Methods for analysis of impacts

The evaluation of impacts in this analysis is designed to meet the requirements of E.O. 12866, which dictates that an RIR evaluate the costs and benefits of the alternatives, to include both quantifiable and qualitative considerations. The analysis should provide information for decision makers "to maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach." The costs and benefits of this action with respect to these attributes are described in the sections that follow, comparing the No Action Alternative 1 with the action alternative (Alternative 2). A qualitative assessment of the net benefits to the Nation of the action alternative compared to no action is also provided.

This analysis was prepared using data from NMFS' catch accounting system, which are the best available data to estimate total catch in the groundfish fisheries off Alaska. Total catch estimates are generated from information provided through an extensive fisher observation program. In 2003, NMFS changed the methods used to determine catch estimates from the NMFS blend database (1995-2002) to the catch accounting system (2003-present).

The catch accounting system was implemented to better meet the increasing information needs of fisheries scientists and managers. Currently, the catch accounting system relies on data derived from a mixture of production and observer reports as the basis of the total catch estimates. The 2003 modifications in catch estimation included providing more frequent data summaries at finer spatial and fleet resolution, and the increased use of observer data. Redesigned observer program data collections were implemented in 2008, and include recording sample-specific information in lieu of pooled information, increased use of systematic sampling over simple random and opportunistic sampling, and decreased reliance on observer computations. As a result of these modifications, NMFS is unable to recreate blend database estimates for total catch and retained catch after 2002. Therefore, NMFS is not able to reliably compare historical data from the blend database to the current catch accounting system.

4.5 Description of Fisheries

4.5.1 Squid

Before 2019, squid were managed in the fishery as target species in the BSAI and GOA Groundfish FMPs. Amendments 117/106 (83 FR 13117) moved squids to the non-target EC category and removed the requirements to produce OFL and ABC for squids in either FMP. Most of the information in this section summarizes the harvest before squids were moved to the EC category, although 2019 total catch is also reported. Detailed data on the amount of squid retained, and the disposition of those squid, will not be available until fish ticket and Commercial Operator Annual Report (COAR) data are available later in 2020.

4.5.1.1 Recent Harvests

Squid in the BSAI and GOA were previously managed as a single stock complex that included all known squid species in the management area. Although no directed fishery for squid existed, they were caught and retained as bycatch in sufficiently large numbers that they were managed as target species.

Harvest in the BSAI from 2009 – 2013 was less than 1,000 mt (Table 4-1), but increased substantially from 2014 – 2018, the last year that squid were managed as a target group. Remarkably, in 2019 squid catch in the BSAI increased greatly to 5,931 mt, which is more than twice the previous high in 2015, and the highest level since 1981. It is difficult to determine the reasons for the dramatic increase in squid catch in the BSAI, but may include an increase in squid abundance in the BSAI, release from the fleet's necessity to avoid squids, increased encounters with squids as the fleet avoided salmon and sablefish, and potentially the misperception by some that squids could be sold as whole bait. Some processors were not aware of the prohibition on processing and sale of squids as bait under Amendments 117/106 and sold squid as bait until they were informed by NMFS that this was illegal under existing regulations. Total squid landings in the BSAI and GOA by week is shown in Figure 4-1, and cumulative landings for 2019 is shown in Figure 4-2. The processors were informed by NMFS that processing and selling squid was illegal at the end of July, 2019 (M. Furuness, NMFS, Personal Comm.).

Table 4-1. Catch (mt) and retention (mt) of squid by all groundfish fisheries by FMP area 2009-2019

	BSAI			GOA		
Year	Catch	Retained	% Retained	Catch	Retained	% Retained
2009	360	181	50.4	337	293	86.7
2010	410	270	65.8	131	120	91.6
2011	336	149	44.2	233	188	80.9
2012	688	471	68.5	18	3	13.7
2013	299	112	37.4	322	304	94.6
2014	1,678	993	59.2	94	63	66.6
2015	2,364	1,951	82.6	411	329	80.1
2016	1,286	526	40.9	240	139	57.8
2017	1,996	1,019	51.0	39	12	30.1
2018	1,736	1,299	74.8	43	9	20.3
2019[1]	5,931	2,742	46.2	63	48	76.1

[1]Squid managed in EC category. AKFISH_REPORT_V_CAS_NONTARGET_ESTIMATE accessed January 15, 2020. AKFIN accessed December 18, 2019

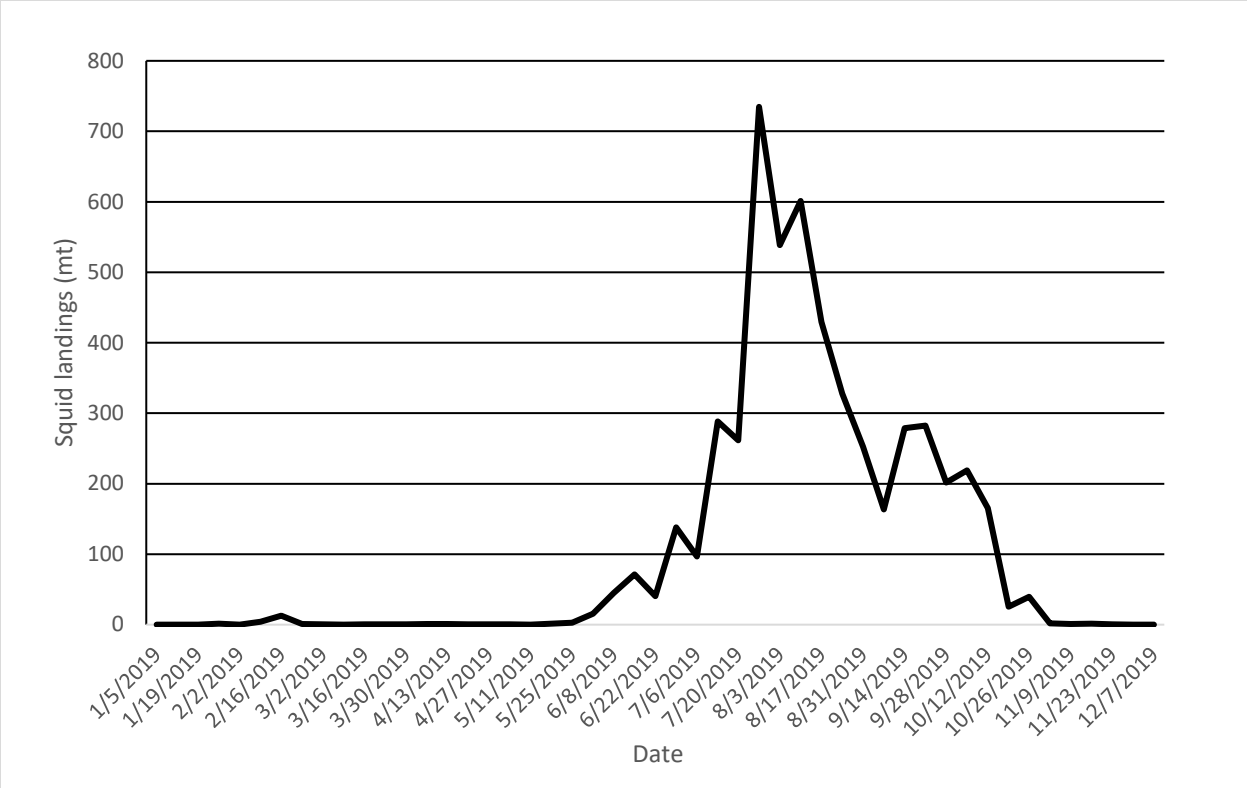

Figure 4-1. Squid landings (mt) by date in the BSAI and GOA in 2019. AKFIN accessed December 23, 2019

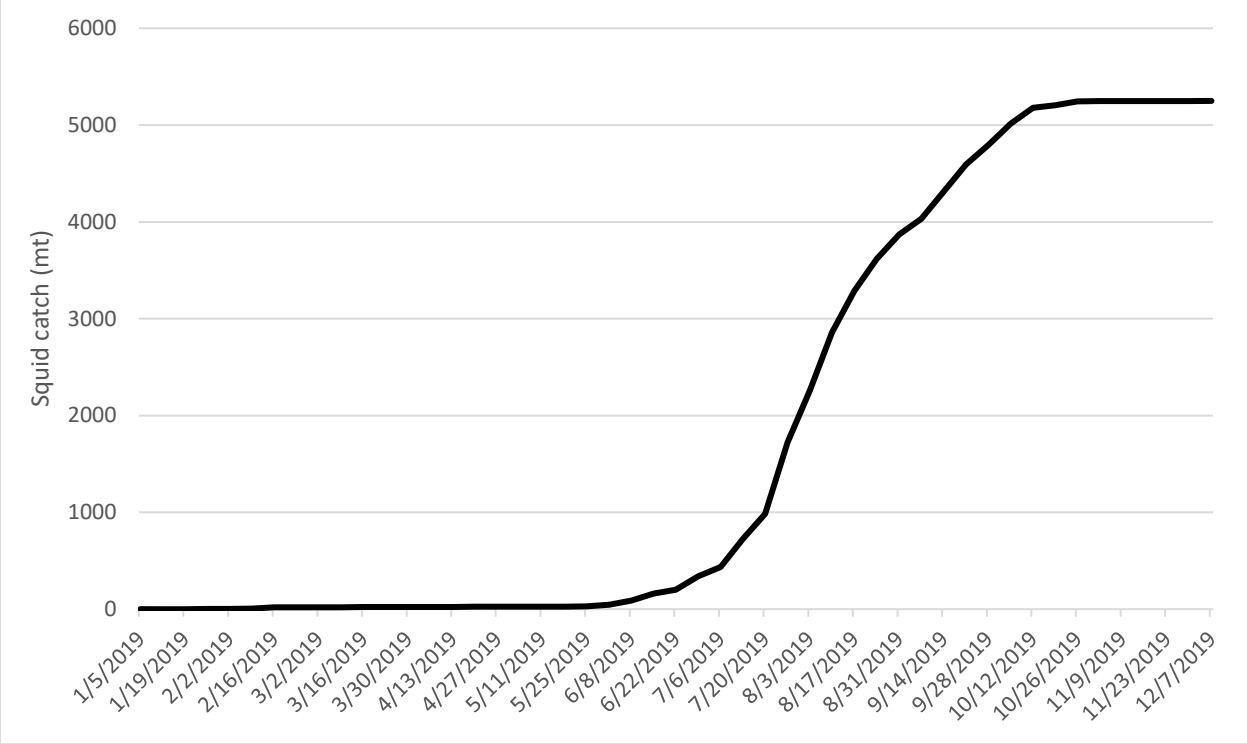

Figure 4-2. Cumulative squid landings (mt) by week in the BSAI and GOA in 2019. AKFIN accessed December 23, 2019.

Squids were first managed as part of the EC category in 2019. As an EC species, stock assessments are not conducted, but data are reported every other year, along with the forage fish report. Therefore, there is no estimate of squid biomass in the BSAI. As such, it is difficult to determine whether the abundance of squids in the BSAI was higher than in recent years, or to understand what proportion of the squid biomass was caught in the 2019 fisheries. In 2017, the ABC for squids in the BSAI was 5,184 mt (Ormseth 2016b), almost exactly the amount of catch in 2019.

The analysis for Amendments 117/106 concluded that action alternatives to move squid into the EC category would not be likely to "decrease nor likely substantially increase the incidental catch of squids in groundfish fisheries as squids do not appear to be targeted in any way", and that "bycatch of squids in the groundfish fisheries… would be similar to that under status quo." In the BSAI, most squid are caught incidentally in the pollock fishery, as also occurred in 2019. The large increase in squid bycatch in the pollock fishery in 2019 suggests that there are factors that were not considered in the original analysis that may be affecting squid bycatch in the BSAI.

In the GOA, nearly all squid are caught incidentally in the pollock fishery in the central GOA. From 2009 – 2019 squid catch in the GOA has been lower than in the BSAI, and much lower since 2014 (Table 4-1).

4.5.1.2 Description of current management

Squid are currently classified in the EC category in both the BSAI and GOA FMPs. Squid are, therefore, not managed in the fishery and no OFL or ABC are specified for squids. Directed fishing for squid is prohibited. An MRA of 20% on squids for all target species limits retention, but squid retention could be much higher in the BSAI than reported in 2019 if the 20% MRA were met regularly. It is not known whether the 20% MRA is likely to be met regularly, or what the impacts of that would be.

4.5.1.3 Harvesting vessels

Both the catcher processor (CP) sector and the catcher vessel (CV) sector catch squid in the BSAI (Table 4-2). From 2009 – 2018 the CP catch ranged from a low of 156 mt in 2010 to a high of 1,127 mt in 2017. Retained catch ranged from a low of 16 mt in 2012 to a high of 395 mt in 2017. The number of vessels retaining squid ranged from 10 – 18. Catch in the CV sector has been more variable, from a low of 91 mt in 2013 to a high of 1,983 mt in 2015. Retained catch has ranged from a low of 90 mt in 2013 to a high of 1,849 mt in 2015. The number of vessels retaining squid ranged from 36 - 82.

In the GOA, the CV sector generally catches and retains much more squid than the CP sector (Table 4-3). Total squid catch in the CP sector in the GOA ranged from 8 mt in 2010 and 2013 to a high of 42 mt in 2015. The number of CP vessels retaining squids was as high as 7. The CV sector squid catch ranged from a low of 4 mt in 2012 to a high of 369 mt in 2015. Retained squids ranged from 2 mt in 2012 to 329 mt 2016. The number of CV vessels retaining squid ranged from 38 – 84.

Table 4-2. Total catch (mt) and retained catch (mt) and the number of vessels retaining squid in the BSAI by sector from 2009 - 2018.

Sector	Year	Catch	Retained	Vessels
CP	2009	213	57	10
	2010	156	22	15
	2011	216	29	18
	2012	209	16	14
	2013	208	22	14
	2014	750	75	10
	2015	380	102	17
	2016	824	227	15
	2017	1,127	395	14
	2018	532	250	12
CV[1]	2009	147	124	36
	2010	255	248	49
	2011	120	119	64
	2012	479	452	77
	2013	91	90	69
	2014	928	914	75
	2015	1,983	1,849	82
	2016	462	297	74
	2017	869	585	68
	2018	1,204	1,041	66

[1] Includes CV delivering shoreside and to motherships
Source: AKFIN accessed December 23, 2019

Table 4-3. Total catch (mt) and retained catch (mt) and the number of vessels retaining squid in the GOA by sector from 2009 – 2018.

Sector	Year	Catch	Retained	Vessels
CP	2009	*	*	*
	2010	8	0	6
	2011	12	0	8
	2012	15	0	4
	2013	8	0	4
	2014	*	*	*
	2015	42	0	7
	2016	11	0	6
	2017	22	0	5
	2018	28	0	5
CV[1]	2009	321	291	38
	2010	123	120	44
	2011	220	188	57
	2012	4	2	70
	2013	313	304	72
	2014	66	62	82
	2015	369	329	84
	2016	228	138	68
	2017	18	12	68
	2018	15	9	57

* Data are confidential
[1] Includes CV delivering shoreside and to motherships
Source: AKFIN accessed December 23, 2019

4.5.1.4 Production

This section provides an overview of squid production and value for recent years before squid were placed in the EC category. Table 4-4 shows the total production of squids to fish meal, whole bait, and whole fish/food fish in the BSAI and GOA, combined, from 2009 – 2018. The number of processors processing squid is limited so some production data are confidential. A small amount of other product forms (gutted only, mantles, stomachs, other) were also reported but are not discussed further. Although most of the fish meal data are confidential, Table 4-4 shows that fish meal was only produced in a few recent years.

Table 4-4. Annual production (in pounds) of squid to fish meal, whole bait, and whole fish/food fish in the BSAI and GOA, combined from 2009 – 2018.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fish Meal								*	*	*
Whole Bait	86,743	389,226	262,897	299,184	277,434	798,976	856,860	*	*	832,476
Whole Fish	313,711	*	*	2,690	24,740	*	*	*	*	*
Processors	7	6	8	10	10	4	4	5	3	7

* Data are confidential
Source: AKFIN accessed December 23, 2019

Overall, from 2009 – 2018, whole bait was the most common product type with 3.8 million pounds and a total gross first wholesale value of $2.3 million, or an average of approximately $0.61/pound (Table 4-5).

Whole fish was the next largest product type at 0.8 million pounds and a total gross first wholesale value of $374,835, or approximately $0.45/pound.

Table 4-5. Total production (in pounds) of squid to fish meal, whole bait, whole fish/food fish, and gross first wholesale value in the BSAI and GOA, combined, from 2009 – 2018.

Product Type	Total Production weight (pounds)	Gross first wholesale value ($)
Fish Meal	9,209	7,115
Whole Bait	3,804,682	2,347,114
Whole Fish	836,147	374,835

Source: AKFIN accessed December 23, 2019

Table 4-6 shows total squid production for the main squid processing communities in the BSAI and GOA from 2009 – 2018. The main communities processing squid are Dutch Harbor/Unalaska and Kodiak. Other communities are combined here to address issues of confidentiality. Squid do not represent a significant portion of production for any processing community in the BSAI or GOA.

Table 4-6. Total squid production (mt) by community in the BSAI and GOA, 2009 – 2018.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Dutch/Unalaska	*	71	42	73	8	592	655	82	320	662
Kodiak	296	125	184	2	276	60	318	127	6	4
Other	126	179	80	379	108	324	1,202	226	270	383

*Data are confidential
Source: AKFIN accessed December 23, 2019

4.5.2 Sculpin

4.5.2.1 Harvests, Management, and Retained Catch

Sculpins are currently taken only as incidental catch in fisheries directed at other target species in the BSAI and GOA. Since 2011, the sculpin complex total catch (retained and discarded) has ranged from 2% to 6% of the total estimated biomass of sculpins in the BSAI and GOA (Table 3-6).

Table 3-6 shows that in the BSAI catch has slightly exceeded the TAC in all years since 2011 except 2014. Catch in the GOA has been below the TAC since 2011. Sculpins in the BSAI were moved to prohibited species status and required to be discarded on October 6, 2017, but not in any other year. Sculpin catch was still substantially below ABC, OFL, and was a small proportion of the biomass in each year.

There is no directed fishery for sculpin species in the BSAI or GOA at this time. Sculpins are caught primarily:

- In the BSAI by:
  - trawl gear in fisheries targeting yellowfin sole, rock sole, and Atka mackerel, and
  - Pacific cod hook-and-line, pot, and trawl fisheries (Table 3-7).
- In the GOA by:
  - Pacific cod trawl, shallow-water flatfish trawl, and IFQ halibut fisheries.

The retained catch of sculpins by gear and sector is shown in Table 4-7, illustrating that most retained catch is in the trawl sector. Sculpins, in general, are not retained, and fishery observer data indicate that the retention rate has been below 10% in the BSAI, and below 20% in the GOA. Since 2013, the retention

rate has been below 5% in both the BSAI and GOA. As noted above, sculpin catch has been substantially below ABC and OFL, and has been a small proportion of the biomass each year.

Table 4-7 Retained Catch of Sculpins in the BSAI and GOA Combined by Gear and Sector in metric tons (mt)

	Catcher Vessels delivering to Shoreside Processing Plants or Stationary Floating Processors		Catcher/Processsors and Motherships		TOTAL		
YEAR	Trawl	Nontrawl	Trawl	Nontrawl	Trawl	Nontrawl	Total
2011	144	4	241	0	384	4	388
2012	164	11	211	2	375	13	388
2013	60	5	126	0	187	5	192
2014	57	16	97	0	154	16	170
2015	41	4	64	0	105	4	109
2016	52	11	68	0	120	11	131
2017	23	8	44	0	67	8	75
2018	32	8	67	0	100	8	107

Source: NMFS AKRO Catch Accounting System, accessed April 2019

4.5.3 Value of Sculpins and Potential for Markets

Ninety-seven percent (97%) of the round weight equivalent of retained sculpins from 2006 - 2018 were processed into fish meal with the small remainder processed as whole fish, headed-and-gutted fish, and fillets. Table 4-8 provides ex-vessel price per pound of CV-caught sculpins for both the BSAI and GOA from 2006 through 2017. The ex-vessel price for sculpins processed into fish meal has routinely been $0.02 per pound or less.

Table 4-8 Ex vessel price per pound of catcher vessel (CV) caught sculpin for fish meal for both BSAI and GOA groundfish fisheries from 2006 through 2017.

	Ex-vessel price per pound of CV sculpins that was processed into fish meal ($)	
Year	BSAI	GOA
2006	0.02	0.02
2007	0.02	0.02
2008	0.01	0.02
2009	0.01	0.02
2010	0.02	0.02
2011	0.02	0.02
2012	0.02	0.02
2013	0.02	0.02
2014	0.02	0.00
2015	0.02	0.02
2016	0.02	0.00
2017	0.02	0.00

Source: AKFIN accessed March 6, 2019

A few Kodiak processors experimented with processing and marketing sculpins between 2006 and 2010, with one selling headed-and-gutted sculpins to a market in Eastern Europe. However, most processors find them too bony and difficult to process; thus, there is no current interest in developing a market for sculpins.

4.6 Analysis of Impacts

This section provides a qualitative analysis of the primary benefits and costs of two alternatives: (1) Status Quo/No Action, (2) Remove the processing restrictions for squids and sculpins in the Ecosystem Component category in the BSAI and GOA FMPs. Assessing the effects of the alternatives involves a great degree of speculation. In general, the effects arise from the actions of individual participants in the fisheries. Predicting individual actions and their effects is constrained by incomplete information concerning the fisheries, incomplete economic information, incomplete biological information and lack of models to predict participant behavior. Exogenous factors such as stock fluctuations, market dynamics, and macro conditions in the global economy also influence the likely response of the participants to each alternative.

Before 2019, squids that were caught incidental to groundfish fisheries could be processed and sold. Section 4.5.1.4 shows that the most common and valuable product type for squids from 2009 – 2018 was whole bait, and the analysis for amendments 117/106 concluded that (assuming processing would be allowed) those product types would continue to be produced at the same rate as in previous years. In fact, despite the prohibition on processing of squids to forms other than fish meal, some processors did produce whole bait from squids in the first part of the 2019 season, until they were informed by NMFS at the end of July (approximately week 30 in the figures below) that bait production was not permitted. Figure 4-1 shows weekly landings of squid in the BSAI and GOA for 2019, and shows that the peak of squid landings during week 30 coincides with the time that processors were informed that processing to bait was prohibited. According to public testimony provided to the Council in December 2019, processing squid to fish meal is difficult for processors because it fouls the equipment, so most processors do not wish to process squid to meal. Given that difficulty, it would be reasonable to expect that if retention and sale of squid as whole bait was affecting squid catch, then landings of squid would decline after processors were informed that sale of squid as bait was prohibited, and retained squid must be processed to fish meal. However, Figure 4-2 shows cumulative landings of squid in the BSAI and GOA for 2019. If the prohibition on processing and sale of whole bait was affecting squid catch, it would be reasonable to expect that the rate of landings (shown as the slope of the line in Figure 4-2) would decline after week 30 when NMFS notified processors of the prohibition on processing to bait. There does not appear to be an obvious decline in the rate of landings in 2019, suggesting that other factors, that may include the overall abundance of squid or the effects of avoiding Chinook salmon and sablefish, were likely affecting the rate of squid landings before and after the processors were informed of the prohibition on processing and sale as bait.

Comparing landings in from 2009 – 2019 in Figure 4-3 and Figure 4-4, it does not appear that the temporal patterns of squid landings were much different in 2019 (in red in Figure 4-3 and Figure 4-4). In all years shown squid catch started at approximately the beginning of July (week 26) and typically peaked at the end of July (week 29-30). The difference in 2019 may be the higher levels of catch after the peak that contributed to the overall higher total landings in 2019. It is notable that those levels of catch occurred after the processors were informed that processing squid to bait was prohibited, suggesting again that other factors, that may include the overall abundance of squid or the effects of avoiding Chinook salmon and sablefish, were likely affecting the rate of squid landings in 2019.

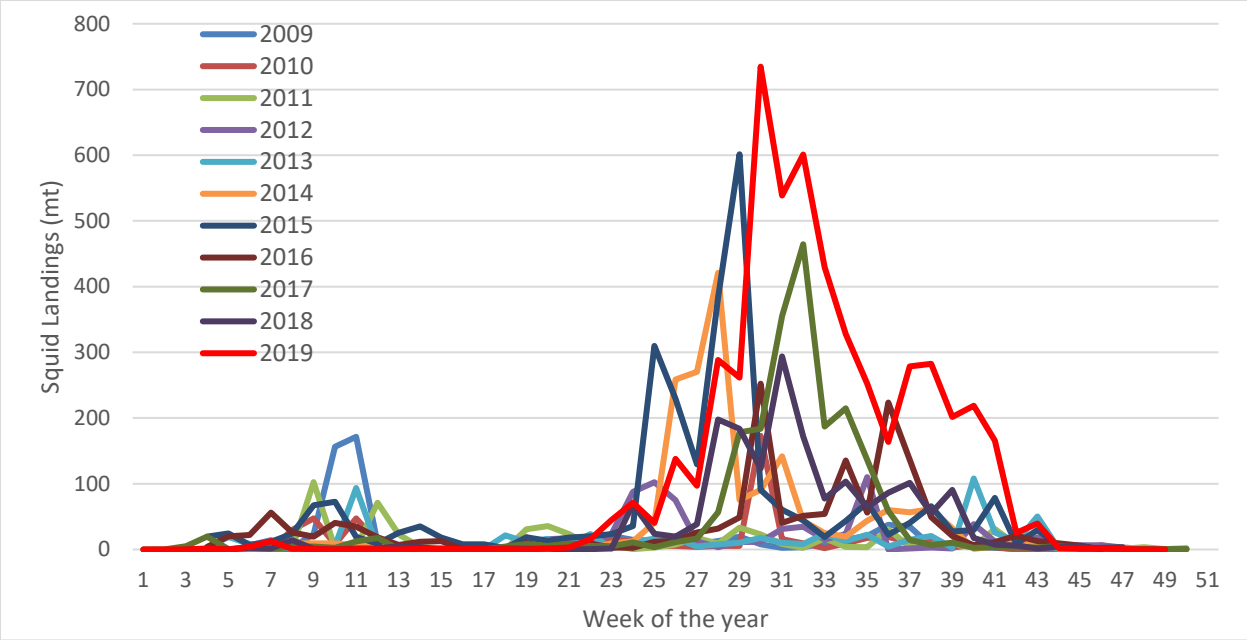

Figure 4-3 Squid landings in the BSAI and GOA for 2009 – 2019. AKFIN 12.23.2019.

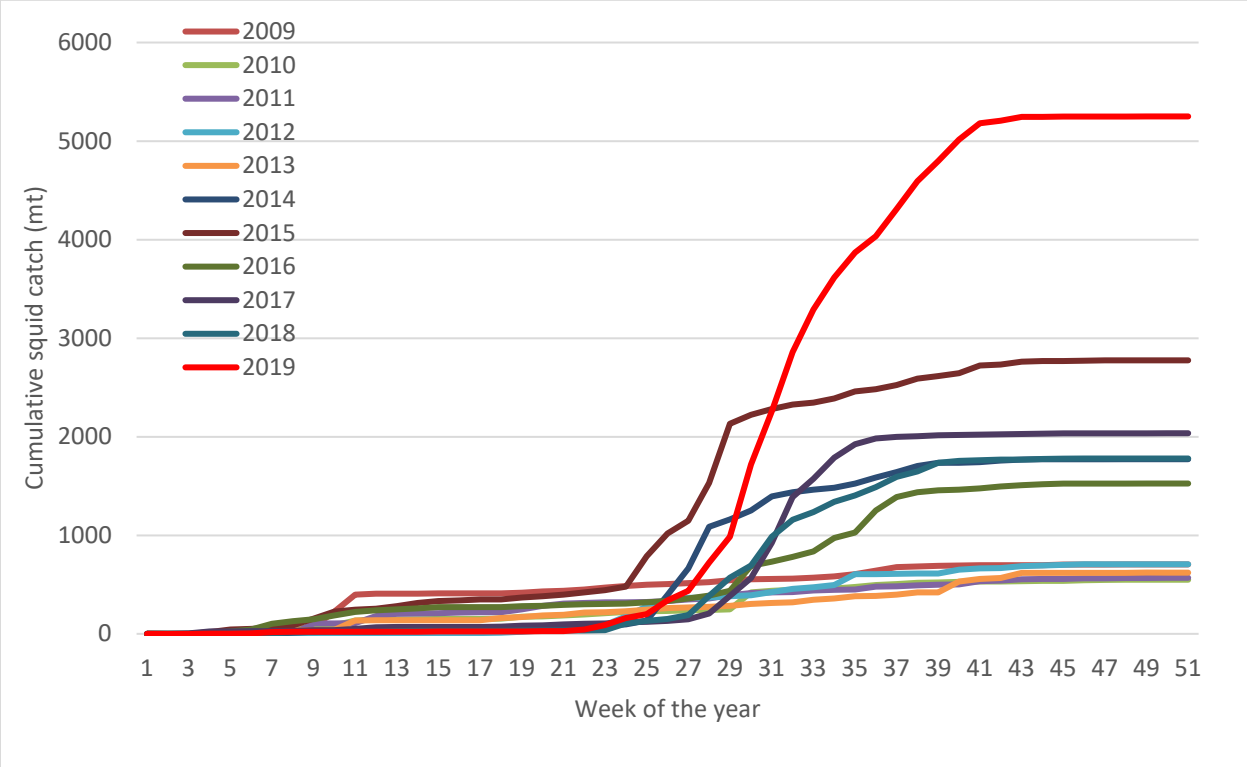

Figure 4-4. Cumulative squid landings (mt) by week in the BSAI and GOA 2009 - 2019. AKFIN 12.23.2019.

Moving squids to the EC component also had the effect of removing the need for vessels fishing for pollock to move away from grounds when the squid encounter rate was high. The analysis for Amendments 117/106 noted that a benefit of moving squids to the EC component included greater flexibility for the pollock fleet to seek areas of higher pollock CPUE while avoiding prohibited species

such as Chinook salmon, or other species with high encounter rates that could be limiting (e.g., sablefish in 2019). If the encounter rates of squid were higher in 2019 than in previous years, and the pollock fleet was making decisions to avoid prohibited species and other species without concern for squid catch rates, then the total catch of squid could be higher than in previous years. Without an assessment of squid abundance in 2019, it is difficult to determine whether those conditions existed in 2019 to explain the higher levels of bycatch. Unfortunately, the same lack of data makes it difficult to predict levels of squid bycatch in the pollock fleet in the near future. The potential removal of incentives to avoid squid by allowing processing and sale further confounds predictions. It would not be surprising if removing the prohibition on production and sale of squid products coincided with an increase in total squid catch, but if such an increase were to occur, it may not be wholly attributed to this action.

Because there has never been a significant market for any sculpin products, and because they are caught and retained at low levels (§4.5.2) it is unlikely that removing processing restrictions on sculpins will change the levels of catch incidental to other fisheries. Fish meal was the most common product from sculpins before the Council took final action to move them to the EC component, and that is unlikely to change under either alternative.

4.6.1 Alternative 1: No action, status quo

Alternative 1 would continue to manage squids and sculpins as ecosystem component species in the groundfish FMPs for the BSAI and GOA. Stock assessments would not be conducted and OFL, ABC, and TAC would not need to be established. Targeting of squids and sculpins would continue to be prohibited, but retention of squids and sculpins up the MRA of 20% would be permitted. Recordkeeping and reporting requirements would be maintained. Processing restrictions limiting processing and sale of squids and sculpins to fish meal only would be maintained, consistent with other ecosystem component species.

For the reasons outlined above it is difficult to predict the levels of incidental catch of squid in the BSAI and GOA. If the anomalously high levels of squid catch seen in 2019 occurred in the future, under Alternative 1 processors would likely experience higher costs associated with discarding squid or converting fish meal plants to be able to efficiently process squid. The total cost would depend on individual processors' decisions to discard or process squid to fish meal. Under Alternative 1, processors would also forgo revenue from the sale of squid as product forms other than fish meal. As shown in Table 4-5, revenue from the sale of whole bait from 2009 – 2018 totaled $2,347,114, while fish meal provided revenue of $7,115 for the same period. It is unlikely that increased sale of fish meal would be able to replace the lost revenue from the sale of whole bait. The overall impacts of forgone revenue from the prohibition of selling squid as whole bait is not significant in comparison to the overall value of the BSAI and GOA groundfish fisheries, but impacts may be significant to individual operators, depending on how much of their annual revenue is generated from processing squid.

Because there has never been a significant market for any sculpin products, and they are caught and retained at low levels, it is unlikely that removing processing restrictions on sculpins will change the level of incidental catch or the value of that catch.

4.6.2 Alternative 2: Remove processing restrictions on squids and sculpins

Alternative 2 would continue to manage squids and sculpins as ecosystem component species in the groundfish FMPs for the BSAI and GOA. Stock assessments would not be conducted and OFL, ABC, and TAC would not need to be established. Targeting of squids and sculpins would continue to be prohibited, but retention of squids and sculpins up to the MRA of 20% would be permitted. Recordkeeping and reporting requirements would be maintained. Processing restrictions limiting processing and sale of squids and sculpin to fish meal would be removed.

For reasons outlined above, it is difficult to predict the levels of incidental catch of squid in the BSAI and GOA. If the anomalously high levels of squid catch seen in 2019 occurred in the future, under Alternative 2 processors may be able to generate additional revenue from the sale of squid as whole bait or whole fish/food fish, as well as preventing waste of incidental squid catch. The total additional revenue would depend on individual processors' decisions to process squid to saleable products or discard. As shown in Table 4-5, revenue from the sale of whole bait from 2009 – 2018 totaled $2,347,114 while whole fish/food fish generated $374,835 for the same period. The potential economic impacts of allowing squid and sculpin to be sold as products other than fish meal are not significant in comparison to the overall value of the BSAI and GOA groundfish fisheries, but impacts may be significant to individual operators depending on how much of their annual revenue is generated from processing squid and sculpin.

4.6.3 Effects on Fishing Communities and Other Social Impacts

The potential community and social impacts of the alternatives are primarily economic in nature. Because the potential economic impacts are limited, analysts did not identify any impacts that would create adverse economic impacts on any fishing community or cause any other adverse social impacts.

4.6.4 Affected Small Entities

The Regulatory Flexibility Act (RFA), first enacted in 1980 and amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (5 U.S.C. 601-612), is 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 economic impacts on small entities as a group distinct from other entities, and on the consideration of alternatives that may minimize adverse economic impacts, while still achieving the stated objective of the action. When an agency publishes a proposed rule, it must either 'certify' that the action will not have a significant adverse economic impact on a substantial number of small entities, and support that certification with the 'factual basis' upon which the decision is based; or it must prepare and make available for public review an Initial Regulatory Flexibility Analysis (IRFA). Under section 603 of the RFA, an IRFA "shall describe the impact of the proposed rule on small entities."

Under 5 U.S.C. 603(b) of the RFA, each IRFA is required to contain:

- A description of the reasons why action by the agency is being considered;
- A succinct statement of the objectives of, and the legal basis for, the proposed rule;
- A description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply (including a profile of the industry divided into industry segments, if appropriate);
- A description of the projected reporting, record keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities that will be subject to the requirement and the type of professional skills necessary for preparation of the report or record;
- An identification, to the extent practicable, of all relevant Federal rules that may duplicate, overlap, or conflict with the proposed rule; and
- A description of any significant alternatives to the proposed rule that accomplish the stated objectives of the proposed action, consistent with applicable statutes, and that would minimize

any significant economic impact of the proposed rule on small entities. Consistent with the stated objectives of applicable statutes, the analysis shall discuss significant alternatives, such as:

1. The establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities;
2. The clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities;
3. The use of performance rather than design standards;
4. An exemption from coverage of the rule, or any part thereof, for such small entities.

When an agency publishes a final rule, it must prepare a Final Regulatory Flexibility Analysis, unless, based on public comment, it chooses to certify the action.

As of January 2017, NMFS Alaska Region will prepare the IRFA in the Classification section of the proposed rule for an action. Therefore, the preparation of a complete IRFA is not necessary for Council final action on this issue. This section of the RIR provides information about the small entities that may be directly regulated by the alternatives and the general nature of those effects. This information is useful for the Council to consider in selecting among the alternatives analyzed in this RIR and for NMFS to use to prepare the IRFA for the proposed rule, should the Council recommend implementation of Alternative 2.

The thresholds applied to determine if an entity or group of entities are "small" under the RFA depend on the industry classification for the entity or entities. Businesses classified as primarily engaged in commercial fishing are considered small entities if they have combined annual gross receipts (revenues) not in excess of $11.0 million for all affiliated operations worldwide (50 CFR 200.2). The most recent estimates of the number of fishing vessels participating in the BSAI and GOA groundfish fisheries that are small entities are provided in Table 2 in the IRFA for the BSAI and GOA Harvest Specifications for 2020-2021 (NMFS 2019). In 2018, there were 182 CVs and 3 C/Ps in the BSAI, and 756 CVs and 3 C/Ps in the GOA that met the definition of small entities. If a vessel has a known affiliation with other vessels – through a business ownership or through a cooperative – the vessel's gross receipts are measured against the small entity threshold based on the total gross revenues of all affiliated vessels. Because public information on business ownership is incomplete, this analysis only considers affiliation in the form of membership in a fishing cooperative. Therefore, estimates likely overstate the number of small entities in the groundfish fisheries off Alaska because some of these vessels are affiliated through common ownership or membership in a cooperative and the affiliated vessels together would exceed the $11.0 million annual gross receipts threshold for small entities.

Both alternatives would directly regulate any processor receiving squids or sculpins in the federally managed groundfish fisheries in the BSAI and GOA. As described in Section 4.6.2, for processors currently participating in these fisheries, the economic impacts of Alternative 2 are primarily beneficial or neutral. Processors who wish to process squids and sculpins may still do so in the future, up to the MRAs. It is possible that one or more processors in the BSAI or GOA that processes squids or sculpins under Alternative 2 could be small entities if the processing company and its affiliates worldwide employ fewer than 750 people. Total employment numbers of processing companies and their affiliates worldwide are not available to make that determination.

4.7 Management and Enforcement Considerations

4.7.1 Alternative 1: Status Quo

Squids are currently managed in the EC category in both the BSAI and GOA FMPs, and sculpins will be managed in the EC category if the FMP amendments and implementing regulations regarding sculpins are

approved by the Secreatary. There have not been directed fisheries for either squids or sculpins in either management area in the recent past, and all catch of squid and sculpins are incidental to other target fisheries. Squid is primarily taken in the pollock fisheries in the BSAI and GOA, and sculpins are taken primarily in the flatfish trawl and fixed gear Pacific cod fisheries.

Squid and sculpins may be retained up to the MRA of 20%. The MRA applies at any time for the duration of a fishing trip for each vessel and is calculated on a trip-by-trip basis. Vessels are not required to retain squid or sculpins up to the MRA, however, the difficulty of manually sorting squids and sculpins from catch at-sea has likely contributed to higher retention than may be desired or occur under different operating conditions. Processors are not permitted to process squid or sculpins into any product form other than fish meal (50 CFR 679.20(i)).

Primary management considerations for Alternative 1:

- Monitoring catch at the individual trip level to ensure that the squids and sculpins MRA is not exceeded; and
- Monitoring processing products to ensure that squids and sculpins are not processed into product forms other than fish meal.

Primary enforcement considerations for Alternative 1:

- Challenge for enforcement to determine appropriate penalty for squids and sculpins MRA overages.

4.7.2 Alternative 2: Squids and sculpins in both the BSAI and GOA FMPs are designated as non-target "ecosystem component species" without processing restrictions.

Under Alternative 2, squids and sculpins would continue to be managed in the EC category in both the BSAI and GOA FMPs if the secretory approves Amendments 121 to the BSAI FMP and 110 to the GOA FMP to move sculpins to the EC category in both FMPs. No directed fisheries for squids or sculpins would be permitted, and all catch of squids and sculpins would be incidental to other target fisheries. Squids and sculpins could be retained up to the MRA of 20%. The MRA would apply at any time for the duration of a fishing trip for each vessel and would be calculated on a trip-by-trip basis. Vessels would not be required to retain squids or sculpins up to the MRA. Processors would be permitted to process squids and sculpins into any product form for sale.

Primary management consideration for Alternative 2:

- Monitoring catch at the individual trip level to ensure that the squids and sculpins MRA is not exceeded.

Primary enforcement considerations for Alternative 2:

- Challenge for enforcement to determine appropriate penalty for squids and sculpins MRA overages.

4.7.3 Implications for State Fisheries

Removing processing restrictions on squids and sculpins would have no immediate implications for State fishery management. The FMPs do not preclude development of directed fisheries in State waters. As discussed in Section 3.1.1, market squid have been observed in State waters in Southeast Alaska. The

State of Alaska Board of Fisheries could authorize a State waters fishery for market squid as they determine it to be appropriate.

In sum, removing processing restrictions for squids and sculpins would represent no additional management or enforcement burdens on the State of Alaska.

A comparison of management considerations under Alternatives 1 and 2 is provided in Table 4-9.

Table 4-9 Comparison of sculpins management under Alternatives 1 and 2

	Alt 1 – No Action	Alt 2 – Remove processing restrictions
Directed Fishing	No	No
MRA	Yes – 20%	Yes – 20%
OFL/ABC/TAC	No	No
Retained for use or sale	Yes – as fish meal	Yes – as any product

4.8 Summation of the Alternatives with Respect to Net Benefit to the Nation

Alternative 1 would continue to manage squids and sculpins as ecosystem component species in both the BSAI and GOA FMPs. Targeting of squids and sculpins would continue to be prohibited, but retention of squids and sculpins up the MRA of 20% would be permitted. Recordkeeping and reporting requirements would be maintained. Processing restrictions limiting processing and sale of squids and sculpins to fish meal only would be maintained, consistent with other EC species.

Alternative 2 would continue to manage squids and sculpins as EC species in the groundfish FMPs for the BSAI and GOA. Targeting of squids and sculpins would continue to be prohibited, but retentuini of squids and sculpins up to the MRA of 20% would be permitted. Recordkeeping and reporting requirements would be maintained. Processing restrictions limiting processing and sale of squids and sculpin to fish meal would be removed.

Net benefits to the Nation relative to the No Action alternative would likely increase marginally under Alternative 2 by allowing processing and sale of squids and sculpins products and by helping to prevent waste of the incidental catch of these species. Alternative 2 would likely not affect current fishery revenue for sculpins, as a small amount of sculpins is retained and marketed as fish meal, but fishery revenue for squids may increase by allowing sale of squids as whole bait or whole fish/food fish.

5 Magnuson-Stevens Act and FMP Considerations

5.1 Magnuson-Stevens Act National Standards

Below are the 10 National Standards (NS) as contained in the MSA (16 U.S.C. 1851), and a brief discussion of how each alternative is consistent NS, where applicable. In recommending a preferred alternative, the Council must consider how to balance the national standards.

NS 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.

Under Alternative 1, the status quo, squids and sculpins would remain as EC species in both the BSAI and GOA FMPs. Processing and sale of squids and sculpins other than fish meal would remain prohibited. Under Alternative 2, processing and sale of squids and sculpins would be permitted in any product form.

Although products from squids or sculpins in the EC are not measured against an OY cap in the BSAI or GOA, Alternative 2 may marginally enhance overall OY by reducing the amount of squids or sculpins that are discarded. Alternative 2 is consistent with management for maximum sustainable yield from the fishery while considering the ecological factors associated with squids and sculpins.

NS 2 — Conservation and management measures shall be based upon the best scientific information available.

Information in this analysis represents the most current, comprehensive set of information available to the Council. Information previously developed on the BSAI and GOA groundfish fisheries, as well as the most recent information available, has been incorporated into this analysis. It represents the best scientific information available.

NS 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.

Squids and sculpins have been managed in the past as part of the BSAI and GOA fisheries. As part of the EC category, harvest specifications are not required for squids and sculpins in the BSAI or GOA, but reports on squid and sculpin biomass and catch would be produced in accordance with the current stock assessment schedule for ecosystem component species.

NS 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 a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

Nothing in the alternatives considers residency as a criterion for the Council's decision. Residents of various states, including Alaska and states of the Pacific Northwest, participate in the major sectors affected by these potential regulations. No discriminations are made among fishermen based on residency or any other criteria. It is not necessary to allocate or assign fishing privileges under either alternative.

NS 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.

The wording of this standard was changed in the last MSA authorization, to consider rather than promote efficiency. Efficiency in the context of this change refers to economic efficiency, and the reason for the change, essentially, is to de-emphasize to some degree the importance of economics relative to other considerations (United States Senate, 1996). The analysis presents information relative to these perspectives and provides information on the economic risks associated with the alternatives in the RIR. Alternative 2 may increase efficiency by limiting the amounts of squids and sculpins discarded and by allowing the processing and sale of product forms other than fish meal.

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

Alternatives 1 and 2 consider and allow for variations among, and contingencies in, fisheries, fishery resources, and catches. No directed fishing would occur under any alternative, although squids and sculpins may be retained up to the authorized MRA. The 20% MRA allows for maximum consideration of variations among and contingencies in fisheries, fishery resources, and catches. In addition, recordkeeping and reporting requirements under all alternatives account for changes in squid and sculpin stock size, location, ecological interactions, and habitat changes, or changes in fishing practices to be noticed. This establishes some protection against uncertainties.

NS 7 — Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

Alternatives 1 and 2 will continue to impose recordkeeping and reporting requirements on the groundfish fishing industry. Neither alternative imposes unnecessary burdens on the economy, on individuals, on private or public organizations, or on Federal, state, or local governments. Thus, all of the alternatives under consideration appear to be consistent with this NS7.

NS 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 by utilizing economic and social data that meet the requirements of National Standard 2, 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 potential economic and social impacts of the alternatives are primarily economic in nature, with some marginal increase in the overall value of the groundfish fisheries projected for Alternative 2 due to the removal of processing restrictions. To the degree that this increase in value represents increased earning and spending in a fishing community, Alternative 2 would benefit that particular fishing community or communities. Analysts did not identify any impacts that would create adverse economic impacts on any fishing community or jeopardize the sustained participation of any fishing community, including subsistence users, in the GOA and BSAI groundfish fisheries.

NS 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.

Ecosystem component species do not require specification of biological reference points, but should be monitored as new, pertinent scientific information becomes available to determine changes in their status or their vulnerability to the fishery. Alternatives 1 and 2 would maintain the MRAs as tools to minimize bycatch of squids and sculpins in other groundfish fisheries to the extent practicable. Retention of record keeping and reporting requirements would provide information necessary to determine whether bycatch of squids and sculpins is minimized to the extent practicable. Relative to the status quo, Alternative 2 would allow processing of squids and sculpins to any product forms rather than to fishmeal only. This

may remove disincentives to avoid squids and sculpins, and may result in increased bycatch of squids and sculpins.

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

None of the alternatives or options proposed would change the way in which any of the GOA or BSAI commercial fisheries are conducted, or reduce the flexibility of fishermen to decide when, where, and how to fish within established regulations. In addition, none of the alternatives would create circumstances that would increase risks to human life at sea. Therefore the alternatives under consideration appear to be consistent with NS10.

5.2 Section 303(a)(9) Fisheries Impact Statement

Section 303(a)(9) of the MSA requires that a fishery impact statement be prepared for each FMP amendment. A fishery impact statement is required to assess, specify, and analyze the likely effects, if any, including the cumulative conservation, economic, and social impacts, of the conservation and management measures on, and possible mitigation measures for (a) participants in the fisheries and fishing communities affected by the plan amendment; (b) participants in the fisheries conducted in adjacent areas under the authority of another Council; and (c) the safety of human life at sea, including whether and to what extent such measures may affect the safety of participants in the fishery (16 U.S.C. 1853(a)(9)).

The proposed action affects the groundfish fisheries in the EEZ off Alaska, which are under the jurisdiction of the Council. Impacts on participants in fisheries conducted in adjacent areas under the jurisdiction of other Councils are not anticipated as a result of this action. The proposed action also is not anticipate to impact the safety of human life at sea, including the safety of participants in the fishery.

5.3 Council's Ecosystem Vision Statement

The Council's Ecosystem Approach Vision Statement was approved by the Council in 2014, and is intended to be given effect through all of the Council's work. The Vision Statement states that:

> *The Council envisions sustainable fisheries that provide benefits for harvesters, processors, recreational and subsistence users, and fishing communities which (1) are maintained by healthy, productive, biodiverse, resilient marine ecosystems that support a range of services; (2) support robust populations of marine species at all trophic levels, including marine mammals and seabirds; and (3) are managed using a precautionary, transparent, and inclusive process that allows for analysis of tradeoffs, accounts for changing conditions, and mitigates threats.*

Under both Alternative 1 and Alternative 2, directed fishing for squids and sculpins would not be allowed. Squids and sculpins could be taken as incidental catch and retained up to the MRA amount, which, under Alternative 1would allow for sale as fishmeal within that MRA amount. Under Alternative 2, squids and sculpins retained up to the MRA amount could be processed for sale as any product form. Under Alternatives 1 and 2 data on squids and sculpins would be reported to the Council regularly, as is practice for other EC species.

Both Alternative 1 and Alternative 2 are consistent with the Council's Ecosystem Approach Vision Statement. However, Alternative 2 allows for marginally greater economic benefits by allowing processing and sale of squids and sculpins in any product form. This is likely to provide some incremental benefit for harvesters, processors, and fishing communities in the BSAI and GOA that is not realized under Alternative 1.

6 Preparers and Persons Consulted

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7 References

Arkhipkin, A.I., V.A. Bizikov, V.V. Krylov, and K.N. Nesis. 1996. Distribution, stock structure, and growth of the squid Berryteuthis magister (Berry, 1913) (Cephalopoda, Gonatidae) during summer and fall in the western Bering Sea. Fish. Bull. 94: 1-30.

Caddy, J.F. 1983. The cephalopods: factors relevant to their population dynamics and to the assessment and management of stocks. In Advances in assessment of world ceaphalopod resources (J.F. Caddy, Ed.), p. 416-452. FAO Fish. Tech. Pap. 231.

Call, K.A., R.R. Ream. 2012. Prey selection of subadult male northern fur seals (*Callorhinus ursinus*) and evidence of dietary niche overlap with adult females during the breeding season. Marine Mammal Science 28(1):1-15.

Drobny, P. 2008. Life history characteristics of the gonatid squid Berryteuthis magister in the eastern Bering Sea. M.S. Thesis, University of Alaska Fairbanks.

Horne J and S Parker-Stetter. 2010. Evaluating acoustics for squid assessment in the Bering Sea. NPRB Project 717 Final Report.

Lipinski, M.R. 1998. Cephalopod life cycles: patterns and exceptions. In Cephalopod biodiversity, ecology, and evolution (A.I.L. Payne, M.R. Lipinski, M.R. Clark and M.A.C. Roeleveld, eds.), p.439-447. S. Afr. J. mar. Sci. 20.

NMFS [National Marine Fisheries Service]. 2004. Programmatic Supplemental Environmental Impact Statement for the Alaska Groundfish Fisheries Implemented Under the Authority of the Fishery Management Plans for the Groundfish Fishery of the Gulf of Alaska and the Groundfish of the Bering Sea and Aleutian Islands Area. NMFS Alaska Region, P.O. Box 21668, Juneau, AK 99802-1668. June 2004. Available at: http://www.alaskafisheries.noaa.gov/sustainablefisheries/seis/intro.htm.

NMFS. 2007. Environmental impact statement for the Alaska groundfish harvest specifications. January 2007. National Marine Fisheries Service, Alaska Region, P.O. Box 21668, Juneau, Alaska 99802-1668. Available at: http://www.alaskafisheries.noaa.gov/index/analyses/analyses.asp.

NMFS. 2019. Stock Assessment and Fishery Evaluation Report for the Groundfish Fisheries of the Gulf of Alaska and Bering Sea/Aleutian Islands Area: Economic Status of the Groundfish Fisheries off Alaska, 2017. Available at: https://www.fisheries.noaa.gov/resource/data/2017-economic-status-groundfish-fisheries-alaska.

NPFMC (North Pacific Fishery Management Council). 2018a. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Regions. North Pacific Fishery Management Council. Anchorage, Alaska. Available at: https://www.fisheries.noaa.gov/alaska/population-assessments/north-pacific-groundfish-stock-assessment-and-fishery-evaluation.

NPFMC 2018b. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska. North Pacific Fishery Management Council. Anchorage, Alaska. Available at: https://www.fisheries.noaa.gov/alaska/population-assessments/north-pacific-groundfish-stock-assessment-and-fishery-evaluation.

NPFMC and NMFS. 2010. Essential Fish Habitat (EFH) 5-year Review for 2010: Summary Report, Final. April 2010. Available at: http://www.fakr.noaa.gov/habitat/efh/review.htm.

NPFMC and NMFS. 2015. Alaska Groundfish Fisheries Programmatic Supplemental Environmental Impact Statement Supplemental Information Report, Final. November 2015. Available at: https://alaskafisheries.noaa.gov/sites/default/files/sir-pseis1115.pdf.

NPFMC and NMFS. 2016. 2016 Review of Essential Fish Habitat (EFH) in the North Pacific Fishery Management Council's Fishery Management Plans: Summary Report, Final. October 2016. Available at: https://npfmc.legistar.com/View.ashx?M=F&ID=4695297&GUID=70949C7D-81C4-40B2-9115-B32A6C78CE37.

O'Dor, R.K. 1998. Can understanding squid life-history strategies and recruitment improve management? In Cephalopod biodiversity, ecology, and evolution (A.I.L. Payne, M.R. Lipinski, M.R. Clark and M.A.C. Roeleveld, eds.), p.193-206. S. Afr. J. mar. Sci. 20.

Ormseth, O. 2015a Assessment of the squid stock complex in the Gulf of Alaska. In, NPFMC. 2015. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska. North Pacific Fishery Management Council. Anchorage, Alaska. Available at: http://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/.

Ormseth, O. 2015b. Assessment of the squid stock complex in the Bering Sea and Aleutian Islands. In, NPFMC. 2015. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska. North Pacific Fishery Management Council. Anchorage, Alaska. Available at: http://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/

Ormseth, O. 2016a Assessment of the squid stock complex in the Gulf of Alaska. In, NPFMC. 2015. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska. North Pacific Fishery Management Council. Anchorage, Alaska. Available at: http://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/.

Ormseth, O. 2016b. Assessment of the squid stock complex in the Bering Sea and Aleutian Islands. In, NPFMC. 2015. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska. North Pacific Fishery Management Council. Anchorage, Alaska. Available at: http://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/

Ormseth, O. 2019. Status of forage species in the Bering Sea and Aleutian Islands region. In, NPFMC. 2019. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea and Aleutian Islands. North Pacific Fishery Management Council. Anchorage, AK.

Osako, M., and M. Murata. 1983. Stock assessment of cephalopod resources in the Northwestern Pacific. In Advances in assessment of world cephalopod resources (J.F. Caddy, ed.), p. 55-144. FAO Fish. Tech. Pap. 231.

Roper, C.F.E., M.J. Sweeney, and C.E. Nauen. 1984. FAO Species Catalogue Vol. 3, Cephalopods of the world. FAO Fisheries Synopsis No. 125, Vol 3.

Sinclair, E.H., A.A. Balanov, T. Kubodera, V.I. Radchenko and Y.A. Fedorets. 1999. Distribution and ecology of mesopelagic fishes and cephalopods. Pages 485-508 in Dynamics of the Bering Sea (T.R. Loughlin and K Ohtani, eds.), Alaska Sea Grant College Program AK-SG-99-03, University of Alaska Fairbanks, 838 pp.

Sinclair, E.H., D.S. Johnson, T.K. Zeppelin, T.S. Gelatt. 2013. Decadal variation in the diet of Western Stock Steller sea lions (*Eumetopias jubatus*). U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-248, 67p.

Spies, I., K. Aydin, D. Nichol, W. Palsson, J. Hoff, T.T. Tenbrink. 2016. Assessment of the sculpin complex in the Bering Sea and Aleutian Islands. Available at: http://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/.

Spies, I., D. Nichol, K. Aydin, T.T. Tenbrink. 2017. Assessment of the sculpin complex in the Gulf of Alaska. Available at: http://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports/.

TenBrink, T.T., K. Aydin. 2009. Life history traits of sculpins in the eastern Bering Sea and Aleutian Islands. North Pacific Research Board Final Report 628, 215 p.

TenBrink, T.T., T. Buckley. 2012. Resource partitioning among *Myoxocephalus* sculpins, and their predator-prey relationships with *Chionoecetes* crabs in the eastern Bering Sea. Marine Ecology Progress Series, 464: 221-235.

TenBrink, T.T., T. Buckley. 2013. Life history aspects of the yellow Irish lord, *Hemilepidotus jordani*, in the eastern Bering Sea and Aleutian Islands. Northwestern Naturalist 94: 126-136.

Tokranov, A.M. 1985. Reproduction of great sculpin, *Myoxocephalus polyacanthocephalus* (Cottidae) in Kamchatka waters. J. Ichthyol. 24(4): 119-127.