

## Arctic FMP Amendment 2 - amendment text for updating EFH description and non-fishing impacts to EFH (EFH Omnibus Amendment)

*Make the following changes to the Fishery Management Plan for Fish Resources of the Arctic Management Area. When edits to existing sections are proposed, words indicated with ~~strikeout~~ (e.g., ~~strikeout~~) should be deleted from the FMP, and words that are underlined (e.g., underlined) should be inserted into the FMP. Instructions are italicized and highlighted.*

### ***1. In Appendix A's Background section, delete the last paragraph and insert the following new paragraph:***

#### **Background**

In 1996, the Sustainable Fisheries Act amended the Magnuson-Stevens Act to require the description and identification of EFH in FMPs, adverse impacts on EFH, and actions to conserve and enhance EFH. Guidelines were developed by NMFS to assist fishery management councils in fulfilling the requirements set forth by the MSA.

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of essential fish habitat: "waters" includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle.

With respect to type, the information available for almost all species consist primarily of broad geographic distributions based on specific samples from surveys, which have not been linked with habitat characteristics. Furthermore, our ability to precisely define the habitat (and its location) of each life stage of each managed species in terms of its oceanographic (temperature, salinity, nutrient, current), trophic (presence of food, absence of predators), and physical (depth, substrate, latitude, and longitude) characteristics is very limited. Consequently, the information is restricted primarily to the species' position in the water column (e.g., demersal, pelagic), broad biogeographic and bathymetric areas (e.g., 100-200 m zone), and occasional references to known bottom types associations.

Identification of EFH for some species includes historical range information. Traditional knowledge and sampling data have indicated that fish distributions may contract and expand due to a variety of factors including, but not limited to, temperature changes, current patterns, changes in population size, and changes in predator and prey distribution.

The Council first identified EFH in 1998. In preparation of the 1999 EFH Environmental Assessment, EFH Technical Teams composed of stock assessment authors compiled scientific information and prepared the 1999 Habitat Assessment Reports. These reports provided the scientific information baseline to describe EFH. However, where new information does exist, new data helps to fill information gaps in the region's limited habitat data environment.

EFH descriptions were updated in 2005 for the Bering Sea and Aleutian Islands management area and for the Gulf of Alaska for crab, scallops, and groundfish and for all Alaska waters for salmon, including the Arctic Management Area. Stock assessment authors reviewed information contained in the 1999

summaries and applied stock expertise, along with data contained in reference atlases (ADF&G 2007; NOAA 1988 and 1990; NMFS 2005), fishery and survey data (NOAA 1998), and fish identification books (Eschmeyer and Herald 1983; Hart 1973; Mecklenburg et al. 2002), to describe EFH for each life stage using best scientific judgment and interpretation.

In 2005, EFH text and map descriptions for most Council managed species were revised using an analytical approach. The approach focused on fish survey and fishery observer data. For adult and late juvenile life stages, each data set was analyzed for 95 percent of the total accumulated population for the species using GIS. For eggs and larvae, the EFH description is based on presence/absence data from surveys. Where information existed, the area described by these data is identified as EFH. The analyzed EFH data and area were further reviewed by scientific stock assessment authors for accuracy. This review ensures that any outlying areas not considered were included and gaps in the data were considered.

EFH for Arctic species was described in 2009, when the Arctic FMP was first published, as general distribution using the best scientific information available. EFH definitions were updated, where appropriate, in 2016 using updated habitat and species abundance information.

~~The EFH section of the Arctic FMP will undergo similar but simpler review. Fish survey and observer data are not available to analyze in this same manner. However, information does exist to describe EFH in the same manner as was completed for other Council FMPs in 1999 and as revised in 2005. Thus, Arctic EFH for each target species by life stage will be described as a general distribution using the best scientific information available.~~

**2. In Appendix A's section titled, "EFH General Distribution," replace Table A-1 with the table below and make the following edits:**

EFH is described as the general distribution for a species life stage, for all information levels and under all stock conditions. For Arctic EFH, general distribution is the area where presence has been documented by research effort and confirmed by species experts. Confirmation is achieved by review of each EFH description to ensure the area allows for stock and natural condition variances. Further, as specified in the EFH regulations, if little or no information exists for a given species life history stage, and habitat use cannot be inferred from other means, EFH should not be described (50 CFR 600.815(a)(1)(iii)(B)). This includes areas without systematic sampling and those areas where a species may have recruited to opportunistic sampling efforts in small numbers.

Rationale

Basic Rationales for Arctic EFH General Distribution:

- Adequately addresses unpredictable annual differences in spatial distributions of a life stage and changes due to long-term shifts in oceanographic regimes;
- Accounts for habitat production and contribution at some level;
- Allows for a stock's long-term productivity, based on both high and low levels of abundance;
- Reflects the habitat required to maintain healthy stocks within the ecosystem;
- Provides for changes in the natural environmental condition, such as prey movements and areas needed for growth, maturation, and diversity;
- Offers a risk-averse approach and employs an additive ecosystem approach to suggest that, unless the information indicates otherwise, a more inclusive general distribution should describe EFH.

Objective

Describe EFH for Arctic stocks by each life history stage, where information exists. In those areas where information does not exist, then EFH will not be described. (Table A-1)

Table A-1. EFH Information Levels

Arctic FMP EFH Species	Life History Stage				
	Eggs	Larvae	Early Juvenile	Late Juvenile	Adult
Arctic cod	1*	1*	1	1	1
Saffron cod	-	-	-	1	1
Snow crab	1	-	-	1	1

1 indicates general distribution data are available for some or all portions of the geographic range of the species  
\* Logerwell et al. (2015)

EFH descriptions were analyzed through a process that met the objectives of the Magnuson-Stevens Act and EFH regulations. Specifically, the objective was to identify EFH for each target species, by particular life stage and using best scientific information and technology, as only those waters and substrates necessary to the species.

**Rationale**

**Basic Rationales for Arctic EFH General Distribution:**

- ~~• Adequately addresses unpredictable annual differences in spatial distributions of a life stage and changes due to long term shifts in oceanographic regimes;~~
- ~~• Accounts for habitat production and contribution at some level;~~
- ~~• Allows for a stock’s long term productivity, based on both high and low levels of abundance;~~
- ~~• Reflects the habitat required to maintain healthy stocks within the ecosystem;~~
- ~~• Provides for changes in the natural environmental condition, such as prey movements and areas needed for growth, maturation, and diversity;~~
- ~~• Offers a risk averse approach and employs an additive ecosystem approach to suggest that, unless the information indicates otherwise, a more inclusive general distribution should describe EFH.~~

**Methodology**

The analysis examined available information and major data sources for the Arctic: Bering, Chukchi, and Beaufort Seas Coastal and Ocean Zones Strategic Assessment: Data Atlas (NOAA 1988); Fishery observer and catch data for the BSAI Groundfish, BSAI Crab, and Scallop FMP fisheries (Fritz et al. 1998), NMFS triennial survey records; USDOJ Minerals Management Service studies; and, where appropriate, ADF&G survey information to select occurrences where one would reasonably (with high probability) expect to find a certain life stage of that species. Where this information exists, text describes EFH by life history stage. EFH descriptions underwent scientific stock assessment expert review for accuracy. Note: Information is limited for the Arctic Region; the Arctic lacks systematic fisheries stock survey assessments. Because of the limited survey area and single occurrence, the information from the August 2008 AFSC survey of the Beaufort Sea does not provide the type of information necessary to describe EFH for species in the FMU; and therefore, the distribution of EFH may be different from the distribution of species collected during the survey (e. g., snow crab). EFH cannot be described for specific life history stages for some species and is not described for ecosystem

component species, which are not included in the FMUP. General habitat descriptions for several ecosystem component species are in Appendices D and E to this FMP.

**3. In Appendix A, make the following edits to the Arctic EFH Text Descriptions.**

**Arctic EFH Text Descriptions**

EFH Description for Arctic Cod

Eggs, Larvae and Early Juveniles

EFH for these life stages of Arctic cod is the general distribution area for these life stages, located in pelagic and epipelagic waters along the shelf (0 to 200 m) and upper slope (200 to 500 m) throughout Arctic waters. This distribution has been confirmed in the Chukchi Sea and is likely also true for the Beaufort Sea, although data are limited to a single survey in the Beaufort Sea (Logerwell et al. 2015).~~Insufficient information is available to determine EFH for Eggs, Larvae, and Early Juveniles.~~

Late Juveniles

EFH for late juvenile Arctic cod is the general distribution areas for this life stage located in pelagic and epipelagic waters from the nearshore to offshore areas along the entire shelf (0 to 200 m) and upper slope (200 to 500 m) throughout Arctic waters and often associated with ice floes which may occur in deeper waters.

Adults

EFH for adult Arctic cod is the general distribution area for this life stage located in pelagic and epipelagic waters from the nearshore to offshore areas along the entire shelf (0 to 200 m) and upper slope (200 to 500 m) throughout Arctic waters and often associated with ice floes which may occur in deeper waters.

EFH Description for Saffron Cod

Insufficient information is available to determine EFH for Eggs, Larvae, and Early Juveniles.

Late Juveniles

EFH for late juvenile Saffron cod is the general distribution area for this life stage, located in pelagic and epipelagic waters along the coastline, within nearshore bays, and under ice along the inner (0 to 50 m) shelf throughout Arctic waters and wherever there are substrates consisting of sand and gravel.

Adults

EFH for adult Saffron cod is the general distribution area for this life stage, located in pelagic and epipelagic waters along the coastline, within nearshore bays, and under ice along the inner (0 to 50 m) shelf throughout Arctic waters and wherever there are substrates consisting of sand and gravel.

EFH Description for Snow Crab (*C. opilio*)

Eggs

Essential fish habitat of snow crab eggs is inferred from the general distribution of egg-bearing female crab (see Adults).

Insufficient information is available to determine EFH for Larvae and Early Juveniles.

#### Late Juveniles

EFH for late juvenile snow crab is the general distribution area for this life stage, located in bottom habitats along the inner (0 to 50 m) and middle (50 to 100 m) shelf in Arctic waters south of Cape Lisburne, wherever there are substrates consisting mainly of mud.

#### Adults

EFH for adult snow crab is the general distribution area for this life stage, located in bottom habitats along the inner (0 to 50 m) and middle (50 to 100 m) shelf in Arctic waters ~~south of Cape Lisburne~~, wherever there are substrates consisting mainly of mud.

**4. In Appendix B, replace the existing map for snow crab with the map in the attached file.**

**5. Replace Appendix C, Non-fishing Effects on EFH in the Arctic, with the new non-fishing effects section in the attached file.**

**6. In Appendix A, Literature Cited, insert the following references alphabetically.**

Limpinsel, D. E., Eagleton, M. P., and Hanson, J. L., 2017. Impacts to Essential Fish Habitat from Non-Fishing Activities in Alaska. EFH 5 Year Review: 2010 through 2015. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-F/AKR-14, 229p.

Logerwell, E., Busby, M., Carothers, C., Cotton, S., Duffy-Anderson, J., Farley, E., Goddard, P., Heintz, R., Holladay, B., Horne, J., Johnson, S., Lauth, B., Moulton, L., Neff, D., Norcross, B., Partker-Stetter, S., Sformo, T. (2015). Fish communities across a spectrum of habitats in the western Beaufort Sea and Chukchi Sea. *Progress in Oceanography*, 136, 115–132. doi:10.1016/j.pocean.2015.05.013.

Logerwell, E., M. Busby, C. Carothers, S. Cotton, J. Duffy-Anderson, E. Farley, P. Goddard, R. Heintz, B. Holladay, J. Horne, S. Johnson, B. Lauth, L. Moulton, D. Neff, B. Norcross, S. Parker-Stetter, J. Seigle, T. Sformo. 2015. Fish communities across a spectrum of habitats in the western Beaufort Sea and Chukchi Sea. *Progress in Oceanography* 136:115-132.

Simpson, S. C., Eagleton, M. P., Olson, J. V., Harrington, G. A., and Kelly, S. R. 2017. Final Essential Fish Habitat (EFH) 5-year Review, Summary Report: 2010 through 2015. U.S. Dep. Commer., NOAA Tech Memo. NMFS-F/AKR-15, 115p.

[ftp://ftp.library.noaa.gov/noaa\\_documents.lib/NMFS/TM\\_NMFS\\_AFKR/TM\\_NMFS\\_FAKR\\_15.pdf](ftp://ftp.library.noaa.gov/noaa_documents.lib/NMFS/TM_NMFS_AFKR/TM_NMFS_FAKR_15.pdf)

**7. Update the Table of Contents for the FMP.**

## **APPENDIX A. EFH Text Descriptions**

This appendix contains EFH descriptions for fish species within the fishery management unit.

### **Background**

In 1996, the Sustainable Fisheries Act amended the Magnuson-Stevens Act to require the description and identification of EFH in FMPs, adverse impacts on EFH, and actions to conserve and enhance EFH. Guidelines were developed by NMFS to assist fishery management councils in fulfilling the requirements set forth by the MSA.

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of essential fish habitat: “waters” includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; “substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities; “necessary” means the habitat required to support a sustainable fishery and a healthy ecosystem; and “spawning, breeding, feeding, or growth to maturity” covers a species’ full life cycle.

With respect to type, the information available for almost all species consist primarily of broad geographic distributions based on specific samples from surveys, which have not been linked with habitat characteristics. Furthermore, our ability to precisely define the habitat (and its location) of each life stage of each managed species in terms of its oceanographic (temperature, salinity, nutrient, current), trophic (presence of food, absence of predators), and physical (depth, substrate, latitude, and longitude) characteristics is very limited. Consequently, the information is restricted primarily to the species’ position in the water column (e.g., demersal, pelagic), broad biogeographic and bathymetric areas (e.g., 100-200 m zone), and occasional references to known bottom types associations.

Identification of EFH for some species includes historical range information. Traditional knowledge and sampling data have indicated that fish distributions may contract and expand due to a variety of factors including, but not limited to, temperature changes, current patterns, changes in population size, and changes in predator and prey distribution.

The Council first identified EFH in 1998. In preparation of the 1999 EFH Environmental Assessment, EFH Technical Teams composed of stock assessment authors compiled scientific information and prepared the 1999 Habitat Assessment Reports. These reports provided the scientific information baseline to describe EFH. However, where new information does exist, new data helps to fill information gaps in the region’s limited habitat data environment.

EFH descriptions were updated in 2005 for the Bering Sea and Aleutian Islands management area and for the Gulf of Alaska for crab, scallops, and groundfish and for all Alaska waters for salmon, including the Arctic Management Area. Stock assessment authors reviewed information contained in the 1999 summaries and applied stock expertise, along with data contained in reference atlases (ADF&G 2007; NOAA 1988 and 1990; NMFS 2005), fishery and survey data (NOAA 1998), and fish identification books (Eschmeyer and Herald 1983; Hart 1973; Mecklenburg et al. 2002), to describe EFH for each life stage using best scientific judgment and interpretation.

In 2005, EFH text and map descriptions for most Council managed species were revised using an analytical approach. The approach focused on fish survey and fishery observer data. For adult and late

juvenile life stages, each data set was analyzed for 95 percent of the total accumulated population for the species using GIS. For eggs and larvae, the EFH description is based on presence/absence data from surveys. Where information existed, the area described by these data is identified as EFH. The analyzed EFH data and area were further reviewed by scientific stock assessment authors for accuracy. This review ensures that any outlying areas not considered were included and gaps in the data were considered.

EFH for Arctic species was described in 2009, when the Arctic FMP was first published, as general distribution using the best scientific information available. EFH definitions were updated, where appropriate, in 2016 using updated habitat and species abundance information.

## **EFH Descriptive Information Levels**

The regulations specify the following requirements for EFH description.

FMPs must describe and identify EFH in text that clearly states the habitats or habitat types determined to be EFH for each life stage of the managed species. FMPs should explain the physical, biological, and chemical characteristics of EFH and, if known, how these characteristics influence the use of EFH by the species/life stage. FMPs must identify the specific geographic location or extent of habitats described as EFH. FMPs must include maps of the geographic locations of EFH or the geographic boundaries within which EFH for each species and life stage is found....[also] FMPs must demonstrate that the best scientific information available was used in the description and identification of EFH, consistent with national standard 2 (50 CFR 600.815(a)).

The EFH Final Rule (50 CFR 600.815(a)) specifies the following approach to gather and organize the data necessary for identifying EFH. Information is to be described using levels of information, and all levels should be used to identify EFH, if information exists. The goal of this procedure is to include as many levels of analysis as possible within the constraints of the available data. Councils should strive to obtain data sufficient to describe habitat at the highest level of detail (i.e., Level 4).

Level 1: Distribution data are available for some or all portions of the geographic range of the species. At this level, only distribution data are available to describe the geographic range of a species (or life stage). Distribution data may be derived from systematic presence/absence sampling and/or may include information on species and life stages collected opportunistically. In the event that distribution data are available only for portions of the geographic area occupied by a particular life stage of a species, habitat use can be inferred on the basis of distributions among habitats where the species has been found and on information about its habitat requirements and behavior. Habitat use may also be inferred, if appropriate, based on information on a similar species or another life stage.

Level 2: Habitat-related densities of the species are available. At this level, quantitative data (i.e., density or relative abundance) are available for the habitats occupied by a species or life stage. Because the efficiency of sampling methods is often affected by habitat characteristics, strict quality assurance criteria should be used to ensure that density estimates are comparable among methods and habitats. Density data should reflect habitat utilization, and the degree that a habitat is utilized is assumed to be indicative of habitat value. When assessing habitat value on the basis of fish densities in this manner, temporal changes in habitat availability and utilization should be considered.

Level 3: Growth, reproduction, or survival rates within habitats are available. At this level, data are available on habitat-related growth, reproduction, and/or survival by life stage. The habitats contributing the most to productivity should be those that support the highest growth, reproduction, and survival of the species (or life stage).

Level 4: Production rates by habitat are available. At this level, data are available that directly relate the production rates of a species or life stage to habitat type, quantity, quality, and location. Essential habitats are those necessary to maintain fish production consistent with a sustainable fishery and the managed species' contribution to a healthy ecosystem.

The regulations specify that Level 1 information, if available, should be used to identify the geographic range of the species at each life stage. If only Level 1 information is available, distribution data should be evaluated (e.g., using a frequency of occurrence or other appropriate analysis) to identify EFH as those habitat areas most commonly used by the species. Levels 2 through 4 information, if available, should be used to identify EFH as the habitats supporting the highest relative abundance; growth, reproduction, or survival rates; and/or production rates within the geographic range of a species.

### **EFH Scientific Information**

EFH descriptions are interpretations of the best available scientific information. In support of this information, a review of FMP species is contained in Chapter 4 of the EA/RIR/IRFA supporting the development of this FMP.

### **EFH Text Descriptions**

The EFH Final Rule (50 CFR 600.815(a)(1)(iv)(B)) states the following:

FMPs must describe EFH in text, including reference to the geographic location or extent of EFH using boundaries such as longitude and latitude, isotherms, isobaths, political boundaries, and major landmarks. If there are differences between the descriptions of EFH in text, maps, and tables, the textual description is ultimately determinative of the limits of EFH...the boundaries of EFH should be static.

The vastness of Alaska, our increasing knowledge of habitat, and its use in the Arctic make it challenging to describe EFH by text using static boundaries. To address this challenge, NMFS refers to the boundaries as defined by a Fishery Management Unit (FMU) for the FMP as the Arctic Management Area and the fisheries managed by the FMP. The Arctic FMP FMU would be the target species found in the Arctic Management Area listed in Table 3-3. Therefore, EFH will be described for Arctic cod, saffron cod, and snow crab.

### **EFH General Distribution**

EFH is described as the general distribution for a species life stage, for all information levels and under all stock conditions. For Arctic EFH, general distribution is the area where presence has been documented by research effort and confirmed by species experts. Confirmation is achieved by review of each EFH description to ensure the area allows for stock and natural condition variances. Further, as specified in the EFH regulations, if little or no information exists for a given species life history stage, and habitat use cannot be inferred from other means, EFH should not be described (50 CFR 600.815(a)(1)(iii)(B)). This includes areas without systematic sampling and those areas where a species may have recruited to opportunistic sampling efforts in small numbers.

## Rationale

### Basic Rationales for Arctic EFH General Distribution:

- Adequately addresses unpredictable annual differences in spatial distributions of a life stage and changes due to long-term shifts in oceanographic regimes;
- Accounts for habitat production and contribution at some level;
- Allows for a stock's long-term productivity, based on both high and low levels of abundance;
- Reflects the habitat required to maintain healthy stocks within the ecosystem;
- Provides for changes in the natural environmental condition, such as prey movements and areas needed for growth, maturation, and diversity;
- Offers a risk-averse approach and employs an additive ecosystem approach to suggest that, unless the information indicates otherwise, a more inclusive general distribution should describe EFH.

## Objective

Describe EFH for Arctic stocks by each life history stage, where information exists. In those areas where information does not exist, then EFH will not be described. (Table A-1)

Table A-1. EFH Information Levels

Arctic FMP EFH Species	Life History Stage				
	Eggs	Larvae	Early Juvenile	Late Juvenile	Adult
Arctic cod	1*	1*	1	1	1
Saffron cod	-	-	-	1	1
Snow crab	1	-	-	1	1

1 indicates general distribution data are available for some or all portions of the geographic range of the species

\* Logerwell et al. (2015)

EFH descriptions were analyzed through a process that met the objectives of the Magnuson-Stevens Act and EFH regulations. Specifically, the objective was to identify EFH for each target species, by particular life stage and using best scientific information and technology, as only those waters and substrates necessary to the species.

## Methodology

The analysis examined available information and major data sources for the Arctic: Bering, Chukchi, and Beaufort Seas Coastal and Ocean Zones Strategic Assessment: Data Atlas (NOAA 1988); Fishery observer and catch data for the BSAI Groundfish, BSAI Crab, and Scallop FMP fisheries (Fritz et al. 1998), NMFS triennial survey records; USDOI Minerals Management Service studies; and, where appropriate, ADF&G survey information to select occurrences where one would reasonably (with high probability) expect to find a certain life stage of that species. Where this information exists, text describes EFH by life history stage. EFH descriptions underwent scientific stock assessment expert review for accuracy. Note: Information is limited for the Arctic Region; the Arctic lacks systematic fisheries stock survey assessments. Because of the limited survey area and single occurrence, the information from the August 2008 AFSC survey of the Beaufort Sea does not provide the type of information necessary to describe EFH for species in the FMU; and therefore, the distribution of EFH

may be different from the distribution of species collected during the survey (e. g., snow crab). EFH cannot be described for specific life history stages for some species and is not described for ecosystem component species, which are not included in the FMP. General habitat descriptions for several ecosystem component species are in Appendices D and E to this FMP.

## **Arctic EFH Text Descriptions**

### EFH Description for Arctic Cod

#### **Eggs, Larvae and Early Juveniles**

EFH for these life stages of Arctic cod is the general distribution area for these life stages, located in pelagic and epipelagic waters along the shelf (0 to 200 m) and upper slope (200 to 500 m) throughout Arctic waters. This distribution has been confirmed in the Chukchi Sea and is likely also true for the Beaufort Sea, although data are limited to a single survey in the Beaufort Sea (Logerwell et al. 2015).

#### **Late Juveniles**

EFH for late juvenile Arctic cod is the general distribution areas for this life stage located in pelagic and epipelagic waters from the nearshore to offshore areas along the entire shelf (0 to 200 m) and upper slope (200 to 500 m) throughout Arctic waters and often associated with ice floes which may occur in deeper waters.

#### **Adults**

EFH for adult Arctic cod is the general distribution area for this life stage located in pelagic and epipelagic waters from the nearshore to offshore areas along the entire shelf (0 to 200 m) and upper slope (200 to 500 m) throughout Arctic waters and often associated with ice floes which may occur in deeper waters.

### EFH Description for Saffron Cod

Insufficient information is available to determine EFH for Eggs, Larvae, and Early Juveniles.

#### **Late Juveniles**

EFH for late juvenile Saffron cod is the general distribution area for this life stage, located in pelagic and epipelagic waters along the coastline, within nearshore bays, and under ice along the inner (0 to 50 m) shelf throughout Arctic waters and wherever there are substrates consisting of sand and gravel.

#### **Adults**

EFH for adult Saffron cod is the general distribution area for this life stage, located in pelagic and epipelagic waters along the coastline, within nearshore bays, and under ice along the inner (0 to 50 m) shelf throughout Arctic waters and wherever there are substrates consisting of sand and gravel.

### EFH Description for Snow Crab (*C. opilio*)

#### **Eggs**

Essential fish habitat of snow crab eggs is inferred from the general distribution of egg-bearing female crab (see Adults).

Insufficient information is available to determine EFH for Larvae and Early Juveniles.

#### **Late Juveniles**

EFH for late juvenile snow crab is the general distribution area for this life stage, located in bottom habitats along the inner (0 to 50 m) and middle (50 to 100 m) shelf in Arctic waters south of Cape Lisburne, wherever there are substrates consisting mainly of mud.

#### Adults

EFH for adult snow crab is the general distribution area for this life stage, located in bottom habitats along the inner (0 to 50 m) and middle (50 to 100 m) shelf in Arctic waters, wherever there are substrates consisting mainly of mud.

#### Literature Cited

- Alaska Department of Fish and Game (ADF&G). 2007. An atlas to the catalog of waters important for spawning, rearing, or migration of anadromous fishes. ADF&G, Habitat and Restoration Division, 333 Raspberry Road, Anchorage, AK. 99518-1599.
- Eschmeyer, W. N., and E. S. Herald. 1983. A field guide to Pacific coast fishes. Houghton Mifflin Co., Boston. 336 p.
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- Limpinsel, D. E., Eagleton, M. P., and Hanson, J. L., 2017. Impacts to Essential Fish Habitat from Non-Fishing Activities in Alaska. EFH 5 Year Review: 2010 through 2015. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-F/AKR-14, 229p.
- Logerwell, E., Busby, M., Carothers, C., Cotton, S., Duffy-Anderson, J., Farley, E., Goddard, P., Heintz, R., Holladay, B., Horne, J., Johnson, S., Lauth, B., Moulton, L., Neff, D., Norcross, B., Parker-Stetter, S., Sformo, T. (2015). Fish communities across a spectrum of habitats in the western Beaufort Sea and Chukchi Sea. *Progress in Oceanography*, 136, 115–132. doi:10.1016/j.pocean.2015.05.013.
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- NOAA. 1988. Bering, Chukchi, and Beaufort Seas. Coastal and ocean zones, Strategic assessment: Data atlas. U.S. Dep. Commerce., NOAA, NOS.
- NOAA. 1990. West coast of North America. Coastal and ocean zones, Strategic assessment: Data atlas. U.S. Dep. Commerce., NOAA, NOS.
- NOAA. 1998. Catch-per-unit-effort, length, and depth distributions of major groundfish and bycatch species in the Bering Sea, Aleutian Islands and Gulf of Alaska regions based on groundfish fishery observer data. U.S. Dep. Commerce., NOAA Tech. Memo. NMFS-AFSC-88.
- NPFMC. 2005. Essential fish habitat assessment report for the groundfish resources of the Bering Sea

and Aleutian Islands regions. North Pacific Fishery Management Council, 605 W. 4th Ave., Suite 306, Anchorage, AK 99501.

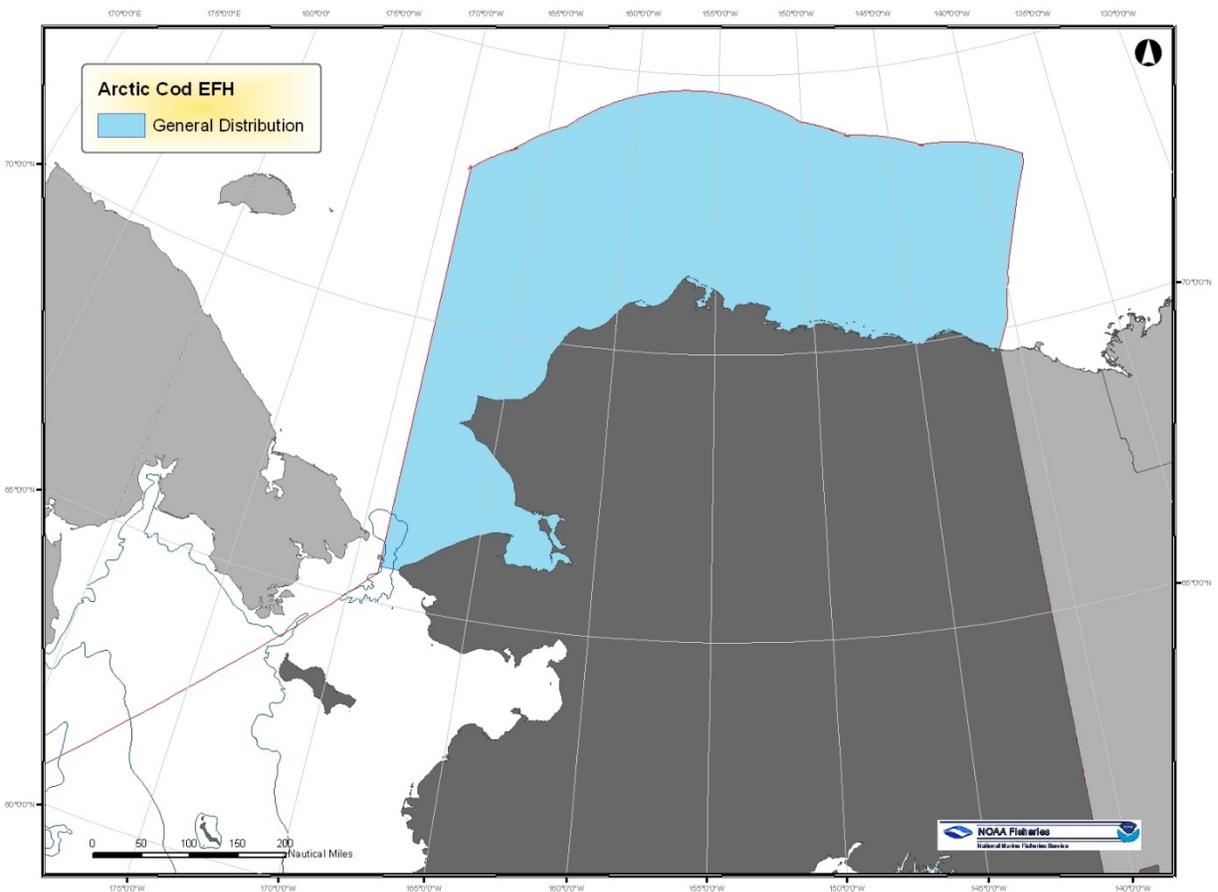
Simpson, S. C., Eagleton, M. P., Olson, J. V., Harrington, G. A., and Kelly, S. R. 2017. Final Essential Fish Habitat (EFH) 5-year Review, Summary Report: 2010 through 2015. U.S. Dep. Commer., NOAA Tech Memo. NMFS-F/AKR-15, 115p.

[ftp://ftp.library.noaa.gov/noaa\\_documents.lib/NMFS/TM\\_NMFS\\_AFKR/TM\\_NMFS\\_FAKR\\_15.pdf](ftp://ftp.library.noaa.gov/noaa_documents.lib/NMFS/TM_NMFS_AFKR/TM_NMFS_FAKR_15.pdf)

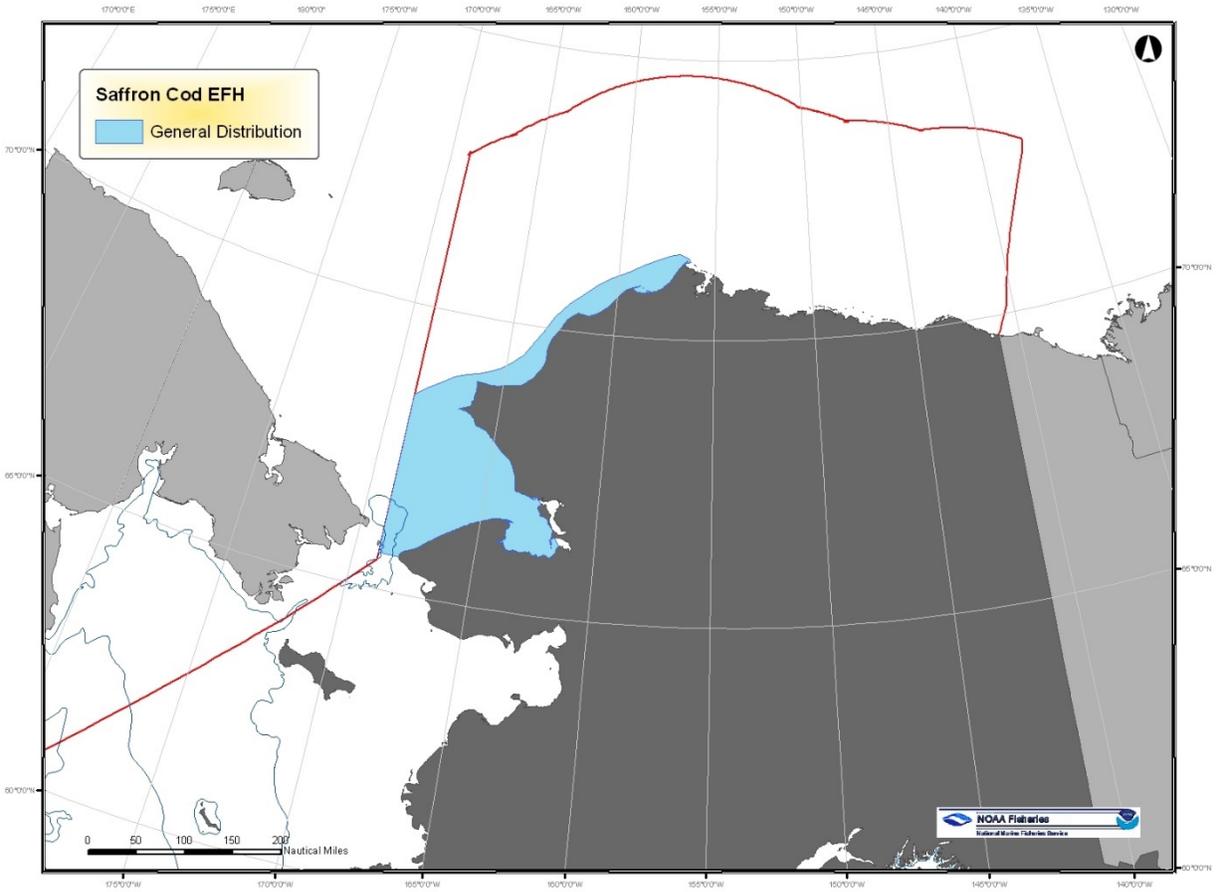
## APPENDIX B. EFH Map Descriptions

FMPs must include maps that display, within the constraints of available information, the geographic location of EFH or the geographic boundaries within which EFH for each species and life stage occurs. A GIS system was used to re-create best information available for this analysis. EFH descriptive maps depict, and are complimentary to, each life history EFH text description, if known. Thus, EFH is to be interpreted using EFH species habitat requirements (text) together with spatial delineations (map).

### EFH Map Description for Arctic Cod Late Juveniles and Adults in the Arctic Management Area



# EFH Map Description for Saffron Cod Late Juveniles and Adults in the Arctic Management Area



# EFH Map Description for Snow Crab (*C. opilio*) Eggs, Late Juveniles, and Adults in the Arctic Management Area

